

TOFINO ASSOCIATES, INC.
NORTHERN AVENUE HOMES, INC.

■ ■ ■ ■ ■ (413) 256-0321

31 Campus Plaza Road, Hadley, MA 01035

November 13, 2008

Northampton Planning Board
City Hall
212 Main Street
Northampton, MA 01060

RE: Application for Special Permit and Site Plan Review/Major Project
North Street Condominiums
Map 25C, Parcels 12 & 17

Dear Members of the Planning Board,

Enclosed for filing with regard to the North Street townhouse condominium project, please find the following:

1. An original and 13 copies of packages containing the following:
Application for Special Permit and Site Plan Review
Project Summary
Building Elevations
Summary of Stormwater Drainage Analysis
Summary of Traffic Study
24x36" Plans
2. Two copies of the full Stormwater Drainage Analysis Report and Management Plan
3. Two copies of the full Traffic Study
4. A certified abutters list and two sets of stamped, addressed envelopes
5. A check in the amount of \$2,682.00 made payable to the City of Northampton.

Additionally, we will file two sets of Planning Board Plans and all supporting material with the Department of Public Works. We are simultaneously submitting a Stormwater Management Permit application with the DPW, and a Notice of Intent with the Conservation Commission.

North Street Condominiums is an infill project consisting of 25 townhouse condominium units on approximately 5.6 acres, located ½ mile from downtown. While the project requires no variances from the Northampton Zoning Ordinance, we are requesting waivers of two of the requirements of Site Plan Review, specifically:

- Waiver of a lighting/photometric plan - The project has no street lights. Houses are set close to the interior streets and there will be adequate ambient lighting from front porch lights
- Waiver of a signage plan – There will be a single sign with the name of the development, which will be located at the entrance to the project on View Avenue, a private way owned by the applicant. No other signs are proposed except for standard City street name signs, and a temporary construction sign in conformance with 350-7.2(L).

We look forward to presenting this project to the Board in the next month. If you should have any questions, please feel free to contact me at the above phone number.

Sincerely,

A handwritten signature in black ink, appearing to read "D. Kohl". The signature is fluid and cursive, with the first letter of the first name being a large, stylized 'D'.

Douglas A. Kohl, President
Tofino Associates, Inc.
Northern Avenue Homes, Inc.

**North Street Condominiums
On-Line Application for Special Permit with Site Plan Review**

Will the project PROTECT adjoining premises from seriously detrimental uses

The location is zoned for residential use, and it is surrounded by other residential uses.

Will the project MITIGATE and **MINIMIZE** traffic impacts

This project is true infill development, within easy walking distance of schools, jobs, retail establishments, restaurants, and entertainment. It also provides an important pedestrian connection from the existing sidewalk on North Street to the Norwottuck bike path.

Will the project PROMOTE a harmonious relationship of structures and open space

The townhouse dwelling units are compactly laid out on the land, and an existing path through the open space will still connect the existing houses, as well as the new townhouses, to the bike path.

Will the project PROTECT the general welfare

The proposed townhouse residential use is not detrimental to the general welfare. It is surrounded by other residential uses.

Will the project AVOID OVERLOADING and **MITIGATE** City resources

The project will not overload the existing City water and sewer in the vicinity, but will most likely add school-aged children. Stormwater is managed on site. The private roadways will be maintained by a Homeowners Association.

Will the project PROMOTE and **NOT HARM** City planning objectives

The project is consistent with City planning objectives to encourage infill development. It provides attractive residential opportunities within walking distance of downtown, as well as open space and a connection to the bike path.

Will the project Meet all zoning requirements

The project meets zoning requirements and does not require any variances.

Which preferred methods of improved circulation are used

Project minimizes curb cuts

Project uses an existing side street

Project uses extra measures to reduce parking need

Project separates vehicular traffic from bicycle and pedestrian traffic

Describe how the project meets the improved circulation goals (above) and how you reduce curb cuts and parking demand.

The project uses an existing curb cut on North Street (an unnamed subdivision street), and View Avenue (an existing, private side street off North Street) for access. No additional curb cuts are required. Parking is provided by a garage and driveway space in most units, so the use of parking lots is minimized. Vehicular and pedestrian traffic is separated by the use of a separate sidewalk from North street to bike path.

How does project mitigate all traffic impacts?

I am providing justification that there will be no increase in traffic impacts from the project

MAJOR PROJECTS: This project mitigates stormwater impacts by:

All catch basins and manholes have 4' sumps

All runoff from a 0.4 inch rainstorm (first flush) will be detained for an average of 6 hours

No increase from PRE to POST-development peak flow during 1, 2, or 10 year NRCS design storm

The impacts are otherwise mitigated (explain)

Runoff is reduced and water is treated through the use of rain gardens/bioswales, a proprietary treatment chamber, an infiltration trench, dry wells, deep sump hooded catch basins, and 2 detention basins. All DEP stormwater requirements are met or exceeded.

I REQUEST a WAIVER from these Site Plan filing requirements (describe why below)

10. Existing and proposed signs locations, dimensions, and details

There will be a single sign with the name of the development to be located at the entrance to the project on View Avenue, a private way owned by the applicant. No other signs are proposed except for standard City street name signs, and a temporary construction sign in conformance with 350-7.2(L).

12. Lighting/Photometric Plan (maximum 0.5 foot candles at property boundary)

No street lights are proposed

North Street Condominiums Project Summary

Introduction

The proposed project consists of a 2-unit townhouse condominium on Northern Avenue and 23 townhouse condominiums off North Street, for a total of 25 new dwelling units. The site consists of 5.59 acres, and is located within easy walking distance of Downtown.

Circulation Systems

Traffic: The vehicular entry to the project is View Avenue, a private way owned by the applicant, and egress is provided by both View Avenue and an unnamed subdivision street. Roads within the project are narrow, with slow speeds.

Pedestrian: The sidewalk into the project provides a connection to the bike path in a vital location, from an existing and much-used sidewalk along North Street.

Parking: The project minimizes concentrated parking areas; 16 of the 25 units have garages with space to park a second vehicle in the driveway. The other 9 units have driveway surface parking either in front of the unit or elsewhere on site. Additional visitor parking spaces are provided throughout the site.

Traffic mitigation: The project is true infill development, within easy walking distance of downtown, the Bridge Street School, and is adjacent to the Norwottuck bike path.

Support Systems

Water and Sewer: The project is served by City water and sewer along both North Street and Northern Avenue.

Lighting: The project has no street lights – houses are set close to the interior streets and there will be adequate ambient lighting from front porch lights

Signs: There will be a single sign with the name of the development to be located at the entrance to the project on View Avenue, a private way owned by the applicant. No other signs are proposed except for standard City street name signs, and a temporary construction sign in conformance with 350-7.2(L).

Refuse Removal: The Homeowners Association will contract with a private company, such as Pedal People, for trash pick-up. There will be a covenant forbidding dumpsters.

Snow Plowing: The condominium roadways will remain private. A Homeowners' Association will contract with a snow removal service. Roadways are designed for easy snow-plowing, with areas to pile snow at the end of the road near units 21 and 22, the end of the road at unit 3, and in the grass area between units 7 and 8. There will be a covenant also requiring the sidewalk to be plowed up to the end of the units. If the Norwottuck bike path is plowed at some time in the future, then the sidewalk will be plowed up to the bike path.

Plantings and Screening

We would be willing to install street trees, and/or screen plantings, and/or a fence along the street opposite units 3 through 8. This would be done only with the consent of the individual abutters.

Street trees: Street trees are provided along roadways wherever there is a sufficient adjacent planting area to accommodate a large street tree. We are also willing, at the discretion of the property owners abutting the streets in and out, to plant street trees on their properties.

Screen Plantings: Evergreens will be planted behind units 14-21 to screen the townhouses from abutting houses.

Entry plantings: Each pair of units has a small planting area in front of the porches. There will be a flowering tree, such as a star magnolia, as well as shrubs and groundcovers, planted in each of these planting beds.

Stormwater Management

The project meets or exceeds all 10 stormwater management standards of the MADEP. All runoff from a 0.4 inch rainstorm (first flush) will be detained for an average of 6 hours. Peak flow rates are maintained or reduced in the 2-, 10-, and 100-year storms. For water quality, there is a stormwater treatment chamber, all catch basins have hoods and deep sumps, all road runoff is pre-treated, rain gardens and bioswales slow and filter stormwater. Dry wells are used to infiltrate roof run off.



Northern Avenue Townhouses

Stepped Units

Northampton, MA

June 5, 2007

Kohl Construction

KUHN · RIDDLE
ARCHITECTS
28 AMITY ST. · SUITE 2B
AMHERST
MASSACHUSETTS 01002

Aleta DeLisle

From: Gloria McPherson [glm@kohlconstruction.com]
Sent: Monday, November 17, 2008 10:21 AM
To: Aleta DeLisle
Subject: [Fwd: Planning Board and Zoning Board Application Form Results]

----- Original Message -----

Subject: Planning Board and Zoning Board Application Form Results
Date: Fri, 14 Nov 2008 11:54:23 -0600 (CST)
From: wfeiden@northamptonma.gov <form_engine@fs12.formsite.com>
Reply-To: wfeiden@northamptonma.gov
To: glm@kohlconstruction.com

Planning Board and Zoning Board Application

Planning and Zoning Boards

Owner First Name
-

*** Owner Last Name OR Business Name**

Tofino Associates

*** Owner Address**

31 Campus Plaza Road

*** City**

Hadley

*** State**

Massachusetts

*** Zip Code**

01035

Applicant First Name
-

*** Applicant Last Name**

Northern Ave Homes

Business (if applicable):
-

*** Applicant Street Address**

31 Campus Plaza Road

*** City**

Hadley

*** State**

Massachusetts

* Zip Code
01035

* Phone
(413) 256-0321

* Email
glm@kohlconstruction.com

* Assessors' Map(s) and Parcel ID(s)
25C-12 and 17

* Parcel Deed Book and Page
8428-219 and 8829-341

* Work Location
8 View Ave and Northern Ave

* Post Office for property
Northampton 01060

* Zoning/Overlay Districts
URB

*** What PERMITS or AMENDMENTS are you applying for?**

- PLANNING Special Permit w/ INTERMEDIATE Site Plan (\$200, except flag lots \$1,000)
- PLANNING Special Permit w/MAJOR Site Plan (\$1,000 plus, unless this is an amendment, \$0.05/sq ft of proposed new building)
- PLANNING Intermediate Site Plan (\$200)
- PLANNING Major Site Plan Approval (\$1,000 plus, unless this is an amendment, \$0.05/sq ft of proposed new building)
- APPROVAL NOT REQUIRED Surveys (\$250/plan page)
- PRELIMINARY SUBDIVISION (\$1,000-Type II or \$600-Type I PLUS \$75 per unit)
- DEFINITIVE SUBDIVISION (Greater of \$3,000 OR \$10/linear foot of new roadway; \$4,600 OR \$14/foot if no preliminary; \$400 PLUS \$10/foot for one lot minor subdivisions; \$500 for Amendments)
- ZONING BOARD Special Permit (\$200)
- ZONING FINDING (\$200)
- APPEAL OF BUILDING COMMISSIONER-Zoning (\$200)
- COMPREHENSIVE 40B PERMIT (\$500 plus \$0.05/sq ft of proposed new building)
- VARIANCE (\$1,000 plus \$0.05/sq ft of proposed new building)
- 43D Permit (Any Planned Village commercial project)

* Relevant sections of zoning and subdivision regulations
350-11.3, 11.4, 11.5, 11.6(A-F)

* Describe project and relief/approvals needed
infill project consisting of 25 townhouse condominium units on approximately 5.6 acres

discussed my application with my neighbors (highly recommended)

I HAVE

Finding Request

*** How does the project meet the Finding criteria?**

The existing property, use, or building is legally preexisting nonconforming

- The project does NOT create a new zoning violation
- The project is NOT more detrimental to the neighborhood than the old use

*** Describe in detail how you meet the Finding Criteria**

Appeal of Building Commissioner Action

*** Are you claiming:**

- The Building Commissioner erred in a zoning related matter
- A UNIQUE injury as a result of such error that meets the standing test

*** Explain in detail 1) What the alleged zoning error the Building Commissioner made and 2) What is the unique injury YOU suffer from the alleged error?**

Comprehensive 40B Permit

*** Check all that apply for your 40B project**

- We are not requesting any waivers
- We are requesting Zoning waivers
- We are requesting Subdivision waivers
- We are requesting waivers of other local rules
- Attached is our Site Eligibility Letter
- Attached is our Draft Affordability Agreement
- Attached is our Financial Proforma in compliance with 40B

*** Explain WHAT waivers are you requesting, WHY, and HOW could you AVOID them?**

Variance Criteria

*** I meet the following Variance Criteria**

- There are UNIQUE circumstances that effect ONLY this property/structure and not other properties in the neighborhood
- A literal enforcement of the zoning would create a HARDSHIP, financial or otherwise
- If denied there would be NO reasonable use of the property
- The hardship is NOT self-imposed
- Relief can be granted without detriment to the public good
- The variance would not substantially derogate from the intent of the zoning
- The request is for the SMALLEST relief possible

*** You must document how you meet ALL of the Variance criteria.**

Special Permit and Site Plan Criteria

*** Will the project**

PROTECT adjoining premises from seriously detrimental uses

*** How**

The location is zoned for residential use, and it is surrounded by other residential uses.

*** Will the project**

MITIGATE and MINIMIZE traffic impacts

*** How**

This project is true infill development, within easy walking distance of schools, jobs, retail establishments, restaurants, and entertainment. It also provides an important pedestrian connection from the existing sidewalk on North Street to the Norwottuck bike path.

*** Will the project**

PROMOTE a harmonious relationship of structures and open space

*** How**

The townhouse dwelling units are compactly laid out on the land, and an existing path through the open space will still connect the existing houses, as well as the new townhouses, to the bike path.

*** Will the project**

PROTECT the general welfare

*** How**

The proposed townhouse residential use is not detrimental to the general welfare. It is surrounded by other residential uses.

*** Will the project**

AVOID OVERLOADING and MITIGATE City resources

*** How**

The project will not overload the existing City water and sewer in the vicinity, but will most likely add school-aged children. Stormwater is managed on site. The private roadways will be maintained by a Homeowners Association.

*** Will the project**

PROMOTE and NOT HARM City planning objectives

*** How**

The project is consistent with City planning objectives to encourage infill development. It provides attractive residential opportunities within walking distance of downtown, as well as open space and a connection to the bike path.

*** Will the project**

Meet all zoning requirements

*** How**

The project meets zoning requirements and does not require any variances.

Which preferred methods of improved circulation are used

Project minimizes curb cuts

Project only uses one curb cut

Project uses a common driveway or shared service road for access

Project uses an existing side street

Project uses extra measures to reduce parking need

Project separates vehicular traffic from bicycle and pedestrian traffic

Project is requesting a reduction in required parking spaces as follows:

*** Describe how meet the improved circulation goals (above) and how you reduce curb cuts and parking demand.**

The project uses an existing curb cut on North Street (an unnamed paper street), and View Avenue (an existing, private side street off North Street) for access. No additional curb cuts are required. Parking is provided by a garage and driveway space in most units, so the use of parking lots is minimized. Vehicular and pedestrian traffic is separated by the use of a separate sidewalk from North street to bike path.

*** How does project mitigate all traffic impacts?**

- I am providing justification that there will be no increase in traffic from the project; OR
- I am mitigating ALL off-site incremental traffic ANYWHERE from the project; OR
- In lieu of studying and mitigating ALL off-site incremental traffic, I am proposing \$2,000 in-lieu of fee per peak hour vehicle trip (\$1,000 for projects within 1/2 mile of downtown or Florence Center)
- I understand that traffic mitigation does NOT replace the need to ensure safe traffic circulation to the site from surrounding streets and nearby intersections

*** MAJOR PROJECTS: This project mitigates stormwater impacts by:**

- All catch basins and manholes have 4' sumps
- All runoff from a 0.4 inch rainstorm (first flush) will be detained for an average of 6 hours
- No increase from PRE to POST-development peak flow during 1, 2, or 10 year NRCS design storm
- The impacts are otherwise mitigated (explain)
- DPW has issued a stormwater permit for the project

*** I REQUEST a WAIVER from these Site Plan filing requirements (describe why below)**

1. Site Plan at 1" = 40' or greater
2. Name and address of the owner and developer, name of project, and date
3. Existing and proposed buildings, property line setbacks, building elevations, exterior entrances/exits
4. Present and proposed use of the land and buildings
5. Existing and proposed topography using 2' contours
6. Wetlands, streams, water bodies, drainage swales, wetlands, unique land features
7. Location of parking and loading, public and private ways, driveways and walkways, access and egress points, proposed surfacing
8. Location and details of all stormwater drainage, detention and water quality facilities, public and private utilities and easements, sewage disposal facilities, water supply facilities
9. Existing and proposed landscaping, trees, plantings, stone walls, buffers, and fencing
10. Existing and proposed signs locations, dimensions, and details
11. Provisions for refuse removal and screening
12. Lighting/Photometric Plan (maximum 0.5 foot candles at property boundary)
13. Erosion control plan (MAJOR projects only)
14. Traffic Study (MAJOR projects only)
15. Stormwater Management Plan AND Drainage Calculations(MAJOR projects only)
16. Plans stamped by Professional Engineer (10. There will be a single sign with the name of the development to be located at the entrance to the project on View Avenue, a private way owned by the applicant. No other signs are proposed except for standard City street name signs, and a temporary co)

*** Add time and place of hearing as soon as it is available**

- I have ALREADY posted the REQUIRED sign so it is visible from a public way

<http://tinyurl.com/23mopt>

ANR Applications must include the following in order to be processed:

1. A box located on the lower right of each plan showing the following:
 - A. Approval Not Required signature block
 - B. A note that "Planning Board Endorsement is not a determination that the lots shown are buildable lots"
 - C. A list of all parcels shown on the plan with a correspondence table to Northampton Assessors Parcel ID
2. An electronic copy of the survey in AutoCAD 2000 format with all parcels closing to an accuracy of 1 in 25,000

3. Control points when required by the Northampton Subdivision Regulations.

<http://www.northamptonma.gov/opd/Abutters%5FLists%5FOld%5FPermits%5FHistoric%5FInventories/>

A 43D project (applies to any project with a commercial or industrial component within the Planned Village District) guarantees that most applications for city permits will be processed within 180 days.

To take advantage of this:

1. You must apply for all relevant permits at the same time at the start of the process.
2. The time clock does not start until the City has determined that the permit applications are complete.

Contact Carolyn Misch, Permt Manager/Senior Planner, Office of Planning and Development, for details.

Gloria McPherson
Project Manager

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Kohl Construction
31 Campus Plaza Rd
Hadley, MA 01035
413 256 0321 x 111

TRAFFIC IMPACT STUDY
North Street Condos
Northampton, MA

Kohl Construction
Hadley, MA

October 14, 2008



Fuss & O'Neill, Inc.
78 Interstate Drive
West Springfield, MA 01089



**TRAFFIC IMPACT STUDY
Proposed Retail Development
Great Barrington, MA**

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TRAFFIC IMPACT STUDY
Proposed Retail Development
Great Barrington, MA

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1. Accident Data Summary

APPENDIX B - FIGURES

1. Site Location Map
2. 2008 Existing Traffic Volumes
3. 2013 Background Traffic Volumes
4. Site Generated Traffic Volumes
5. 2013 Combined Traffic Volumes

APPENDIX C

Automatic Traffic Recorder (ATR) Data

APPENDIX D

Turning Movement Counts

APPENDIX E

Intersection Capacity Analysis Worksheets – Weekday Morning Peak Hour

APPENDIX F

Intersection Capacity Analysis Worksheets – Weekday Afternoon Peak Hour



SUMMARY SHEET

As an aid to reviewers, this Summary Sheet has been included to outline the various study parameters utilized in this report. Although a full explanation of the study methodologies is included in the text of the report, this summary can serve as a useful reference for reviewers.

APPLICANT:

Kohl Construction

DEVELOPMENT SIZE/TYPE:

25 Units - Residential Condominium/Townhome

APPLICATIONS:

City of Northampton Planning Board

BUILD YEAR:

2013 (2008 +5 years)

BACKGROUND TRAFFIC GROWTH FACTOR:

1% - based on available MassHighway continuous count data

TRAFFIC COUNTS:

Data Inc. – October 1, 2008 (Turning Movement Counts)

Data Inc. – October 1-2, 2008 (Automatic Traffic Recorders)

PEAK HOURS ANALYZED:

Morning Peak Hour – 8:00am to 9:00am

Afternoon Peak Hour – 4:15pm to 5:15pm

EXPECTED TRIP GENERATION:

Morning Peak Hour – 17 total trip ends

Afternoon Peak Hour – 19 total trip ends

CAPACITY ANALYSIS:

Technique – 2000 Highway Capacity Manual

Execution – Synchro Professional Software, Version 7.0



1.0 INTRODUCTION

1.1 Purpose of Report and Study Objectives

The following report summarizes the site traffic impact assessment for the development of condominium/townhomes on North Street and Northern Avenue in Northampton. The proposed development will be composed of 25 new dwelling units.. This report presents the results of a field investigation, traffic counts, and analysis of the estimated traffic to be generated by the proposed project.

1.2 Project Overview

The proposed redevelopment site is located northeast of downtown Northampton. The proposed condominium/townhomes will be located on the northwest side of North Street. Twenty-three units will access North Street via View Avenue, a private way and a proposed driveway also accessing North Street. Two of the units will be located at the end of Northern Avenue. The parcel is currently undeveloped.

The study area is primarily a residential area surrounding North Street. North Street connects King Street, on the east end to Bates Street and Day Avenue, on the west end. This study focused on the intersections and driveway used by the proposed development and major intersection at either end of North Street, where new trips will be most concentrated.

2.0 EXISTING CONDITION

2.1 Site of Development

A locus map of the site location and the surrounding area is provided in Appendix B, Figure 1. The property is zoned Urban Residential. Existing land uses surrounding the study area are:

- Single and Multi-Family housing surrounding the site.
- Industrial Park to the northeast
- Central Business District of Northampton to the southwest

Currently the proposed location for the condominium/townhomes is undeveloped.

2.2 Adjacent Roadway Network

The study area of influence includes North Street and Northern Avenue that provide access to the site and the surrounding roadway network.

North Street is a collector roadway that runs northeast-southwest through the study area. Pavement width for North Street is 26 feet in the vicinity of the site. North Street is a 2-lane roadway, without lane delineation, which is under the jurisdiction of the City of Northampton. At the time the traffic count was conducted North Street carried an average daily traffic (ADT) of approximately 4,025 vehicles per day in the vicinity of the site.



Northern Avenue is a dead-end local road under the jurisdiction of the City of Northampton. Pavement width is 20 feet, which includes approximately 8 feet used for on-street parking on the northeast side of the street.

The PVTA does not have a bus route directly passing the site on North Street. There are bus stops within a half mile of the site, however. Sidewalks are provided on both North Street and Northern Avenue.

2.3 Study Area Intersections

The intersections analyzed for this study consist of the following:

1. King St (Route 5) / North Street
2. North Street / Market Street
3. North Street / Northern Avenue
4. North Street, Bates Street and Day Avenue

The intersection of King Street, Summer Street and North Street is signalized and actuated with 2 phases. The southbound approach has two lanes, a through lane and a shared through/left turn lane. The northbound approach has a through lane and right turn lane. The eastbound approach, Summer Street, is one-way entering the intersection with a left lane and a shared through/right turn lane. The westbound approach, North Street, has a shared left/right turn lane.

The intersection of North Street and Market Street is one-way stop sign controlled. The eastbound approach, North Street, is stop controlled and has a shared right/left turn lane. The north and southbound approaches are free flowing. The southbound approach, North Street, operates with a through lane and right turn lane. The northbound approach, Market Street, has a single shared left turn/through lane.

The intersection of North Street and Northern Avenue is one-way stop sign controlled. The North Street moves are free flowing while Northern Avenue is stop controlled. Each approach has a single lane shared for all related moves.

The intersection of North Street, Bates Street and Day Avenue is three-way stop controlled. Each approach has a single lane shared for all movements.

2.4 Traffic Volumes, and Counts

The greatest potential for traffic impact on the roadway network by the proposed development will occur during the weekday morning and afternoon peak hour, the period when traffic demand on North Street is typically at its highest level. In order to determine the traffic impact of the proposed development on adjacent street traffic, weekday morning and afternoon peak period manual turning movement counts were conducted in October at the four existing intersections in the study area. The traffic count data collected indicates that the weekday morning peak hour is 8:00am to 9:00am and the afternoon peak hour is 4:15pm to 5:15pm.



These peak hours was subsequently analyzed for impacts. The existing traffic volumes for these peak hours are shown in Appendix C.

24 hour automatic traffic recorder data was also collected on October 1-2, 2008 on North Street southeast of Northern Avenue. Copies of the ATR traffic data are included in Appendix D of this report.

3.0 BACKGROUND TRAFFIC CONDITIONS

3.1 Growth Rate and Analysis Periods

The proposed project is expected to be completed and fully occupied before the year 2013 (five year projection). Future traffic conditions were estimated by applying a growth factor to all peak hour turning movement traffic volumes to account for regional growth characteristics such as other developments, increasing population, vehicle ownership, workers per household and increased travel mileage. In order to determine a reasonable growth rate for the background traffic volumes within the study area, count data were obtained from MassHighway for Routes 5 and 10 in the vicinity of the site for the years 2002 through 2006.

The count data showed an overall decline in traffic volume over the period data was recorded. Therefore, a growth factor of 1% increase was assumed for this study to be conservative. The data also indicated the month of October has higher than average month traffic volumes. The count data for this study was not adjusted (lower) for the average month.

3.2 Background Developments

There were no other programmed developments anticipated to be completed during the analysis period that would impact traffic within the study area at the time of this study.

3.3 Estimated Volumes

The raw count data for each of the count location were graphically applied to the study area network. The resulting volumes are used as the Base conditions for the traffic estimates. The weekday morning and afternoon 2008 Base condition traffic volume estimates are given in Appendix B, Fig 2. To determine the estimated traffic volumes at the time the project is expected to be fully constructed and occupied the base 2008 volumes were increased with a 1% growth rate for five years to year 2013. This volume estimate provides the 2013 No-Build condition. The weekday morning and afternoon 2013 No-Build condition traffic volume estimates are given in Appendix B, Fig 3.

4.0 PROPOSED CONDITIONS

4.1 Development and Site Access

The proposed development consists of 25 condominium/townhomes. The units are attached in groups with between 2 and 6 units in each group. Seventeen of the dwelling units will have attached garages plus driveway parking space. The remaining units will have driveway surface parking areas and additional visitor parking areas are provided throughout the site.



Two units are isolated on Northern Avenue and will have a driveway at the end of the street. The other 23 units will access the site to and from North Street via two existing private right-of-ways to access North Street. The existing right-of-ways will be reconstructed to accommodate site traffic. The first is an unaccepted street View Avenue. View Avenue will serve as both an entrance and exit to the site. The second is a gravel driveway located between Northern Avenue and View Avenue. The on site portion of this driveway will be restricted to one-way exiting the site only.

4.2 Trip Generation

The expected site generated traffic volume was calculated using existing empirical data from the Institute of Transportation Engineers (ITE) publication Trip Generation, 7th edition, 2003. This publication is an industry-accepted resource for determining trip generation.

Trip generation estimated for the proposed developments were estimated based on the total number of proposed dwelling units. The land use for this development is LUC: 230 Residential Condominium/Townhome.

Based on ITE rates the proposed development is estimated to produce 198 new vehicle trips over a typical 24-hour period on weekdays. During the Weekday Morning peak hour the proposed development is estimated to generate 17 new trips and 19 new trips during the Weekday Afternoon peak hour. Table 1 presents the daily weekday trip estimates and weekday afternoon trip estimates.

TABLE 1 LUC: 230 Residential Condominium/Townhouse Development Trip Generation Estimates		New Vehicle Trips
Weekday (24 Hour)	Entering:	99
	Exiting:	99
	Total:	198
Weekday AM Peak Hour of Adjacent Street Traffic	Entering:	3
	Exiting:	14
	Total:	17
Weekday PM Peak Hour of Adjacent Street Traffic	Entering:	13
	Exiting:	6
	Total:	19

4.3 Trip Distribution



The distribution of new trips accessing the site was applied to the local road network based on consideration of the existing local traffic distribution and the layout of the adjacent roadway network. Arrival and departure distributions of site traffic were first estimated based on existing patterns at Northern Avenue and then subsequent intersection to the limits of the study area. The estimated trips were split between the three access points to the site the Site Driveway, View Avenue and Northern Avenue. The splits were based on the internal circulation and site layout. The one-way driveway will serve 52% of the trips leaving the site. View Avenue will serve 40% of the trips leaving the site and 92% of the trips entering the site. The two units on Northern Avenue comprise about 8% of the site traffic entering and leaving.

4.4 Combined Volumes

The 2013 Build condition traffic estimates were calculated by adding the site traffic to the projected No-Build traffic volumes. The 2013 Build condition traffic volumes are given in Appendix B, Figure 4. The estimated trip generation and trip distribution used for determining the Build condition traffic volumes are included in Appendix B, Figure 3.

5.0 ANALYSIS

5.1 Accident Review

An analysis to determine crash rate per intersection was prepared to review the level of safety at the study area intersections. Accident data was obtained from MassHighway for each of the study area intersections. The records were gathered for the most recent 3 years of available data, 2004 through 2006. The crash rates, expressed as "crashes per Million Entering Vehicles" (MEV), were determined using the turning movement counts and average number of crashes during the three-year period. A summary of the accident data and resulting crash rates is provided in Appendix A, Table A-1.

The crash rate is a measurement used by MassHighway that compares the number of crashes to the number of vehicles passing through a particular intersection. A crash rate at or below the regional average for a similar facility is an indication that there is likely no unusually hazardous condition or predominant safety factor influencing the frequency of crashes at a location. The crash rates were determined to be below the District 2 average with the exception of the King Street, Summer Street and North Street intersection. The elevated experience on King Street could be a result of the lack of a separate southbound left turn phase and also the offset east and west legs of the intersection.

5.2 Intersection Capacity Analyses

Capacity analyses for both signalized and un-signalized intersections were conducted using Synchro Professional Software, version 7.0.

Level of Service has been determined by the methodology of the "2000 Highway Capacity Manual" published by the Transportation Research Board to describe the operating condition of an intersection. LOS is a measure of the Control Delay experienced by stopped vehicles at an intersection, which is rated on a scale from A to F, with each letter grade assigned a range of delay values in seconds per vehicle. LOS A describes a free flowing condition of very low delay



(less than 10 seconds per vehicle), and LOS F describes a congested condition where delays will exceed 50 seconds per vehicle at an unsignalized intersection. Control Delay measures the time accumulated when a motorist approaches an intersection including the initial deceleration, queue move-up time, stopped delay, and final acceleration delay. Therefore, intersections with longer Control Delay times are less acceptable to most drivers.

For unsignalized intersection capacity analyses, LOS provides a description of the delay and operational characteristics of the movements from the minor street (usually stop sign controlled) and left turns from the major street into the minor street. Major street through and right turn vehicles typically experience very little delay. Therefore, they are not rated with a LOS at unsignalized intersections.

Using the above referenced methodologies, weekday morning and afternoon peak hour capacity analyses were conducted at the signalized intersection of King Street (U.S. Route 5 and State Route 10), Summer Street and North Street.

Weekday morning and afternoon peak hour capacity analyses were also conducted at the following un-signalized intersections:

- North Street and Market Street
- North Street & Northern Avenue
- North Street, Bates Street and Day Avenue
- North Street & View Avenue
- North Street & the Site Driveway

Existing (2008) and Future No Build (2013) Capacity Conditions:

During the weekday morning and afternoon peak hours the LOS at the signalized intersection of King Street, Summer Street and North Street will be LOS C or better. The exception is the westbound approach from North Street. The morning peak hour is expected to operate at LOS E under the No-Build condition. The afternoon peak hour is expected to operate at LOS D under the No-Build condition.

During the weekday morning and afternoon peak hours the LOS at the unsignalized intersections will be LOS C or better under both the Base and No-Build conditions. The exception is the westbound approach from North Street.

Build (2013) Capacity Conditions:

During both the morning and afternoon peak hours the added site traffic is not expected to result in changes to the LOS. Slight increases in delay from site traffic are not significant enough to decrease the LOS letter grade. The new site accesses at View Avenue and the Site driveway will operate at LOS B or better under the Build condition.

The summarized results of the capacity analysis are provided in Tables 2 - 5. The capacity analysis worksheets are provided in Appendices E & F.



TABLE 2
WEEKDAY MORNING PEAK HOUR
INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2008 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
King Street (U.S. Route 5) & North Street/Summer Street							
Summer Street	EB L	24.8	C	24.5	C	24.4	C
	EB T/R	24.4	C	24.1	C	24.1	C
North Street	WB L/R	52.8	D	60.6	E	65.2	E
King Street	NB T	9.0	A	9.8	A	10.0	A
	NB R	6.3	A	6.7	A	6.8	A
	SB L/T	9.3	A	10.2	B	10.4	B
OVERALL		20.5	C	22.7	C	24.0	C

TABLE 3
WEEKDAY MORNING PEAK HOUR
UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2007 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
North Street & Market Street							
North Street	EB L/R	17.5	C	19.3	C	19.7	C
Market Street	NB L	6.5	A	6.6	A	6.6	A
North Street & Northern Avenue							
North Street	NB L/T	0.2	A	0.2	A	0.2	A
Northern Avenue	EB L/R	9.7	A	9.7	A	9.9	A
North Street & Bates Street/Day Avenue							
North Street	NB L/R	8.5	A	8.7	A	8.7	A
Bates Street	EB T/R	9.4	A	9.6	A	9.6	A
Day Avenue	WB L/T	8.4	A	8.6	A	8.6	A
North Street & View Avenue							
View Avenue	EB L/R	-	-	-	-	10.0	A
North Street	NB L/T	-	-	-	-	0.1	A
North Street & Site Driveway							
	EB L/R	-	-	-	-	9.9	A

TABLE 4
WEEKDAY AFTERNOON PEAK HOUR
INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2008 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
King Street (U.S. Route 5 and Route 10) & North Street/Summer Street							
Summer Street	EB L	37.5	D	35.0	C	34.6	C
	EB T/R	23.0	C	22.6	C	22.6	C
North Street	WB L/R	44.4	D	48.8	D	49.1	D
King Street	NB T	8.1	A	9.0	A	9.1	A
	NB R	5.0	A	5.4	A	5.5	A
	SB L/T	7.4	A	8.5	A	8.6	A
OVERALL		19.1	B	20.8	C	21.0	C

TABLE 5
WEEKDAY AFTERNOON PEAK HOUR
UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2008 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
North Street & Market Street							
North Street	EB L/R	18.9	C	21.1	C	21.1	C
Market Street	NB L	7.7	A	7.8	A	7.8	A
North Street & Northern Avenue							
North Street	NB L/T	0.3	A	0.3	A	0.3	A
Northern Avenue	EB L/R	10.5	B	10.7	B	10.7	B
North Street & Bates Street/Day Avenue							
North Street	NB L/R	8.0	A	8.0	A	8.1	A
Bates Street	EB T/R	10.6	B	11.0	B	11.1	B
Day Avenue	WB L/T	8.4	A	8.5	A	8.6	A
North Street & View Avenue							
View Avenue	EB L/R	-	-	-	-	10.9	B
North Street	NB L/T	-	-	-	-	0.3	A
North Street & Site Driveway							
	EB L/R	-	-	-	-	10.8	B



5.3 Findings:

With regard to impacts due to added site traffic, there will not be a noticeable impact to operation at the existing intersections. The two proposed site accesses, View Avenue and the Site Driveway, will operate safely and efficiently.

Sight distance viewing to the north and south along North Street at both proposed access points, View Avenue and the Site Driveway, is adequate.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The study indicates that completion and occupancy of the proposed development will generate 17 new entering and exiting vehicle trips per hour at the site during the weekday morning peak and 19 new entering and exiting vehicle trips per hour in the weekday afternoon peak.

The additional traffic generated by the proposed project will result in incremental increase in peak period traffic volumes on North Street that will have minimal impact on traffic operations. The site access intersections with North Street are designed to provide safe and efficient traffic operations and the turning movements can be accommodated without consideration of off-site improvements.

Stormwater Drainage Report

for
**Northern Avenue Housing
Northampton, MA**

November 11, 2008

Prepared by:



**The
Berkshire
Design
Group, Inc.**

4 Allen Place, Northampton, Massachusetts 01060

Prepared for:

Tofino Associates, Inc.
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Hadley, MA 01035

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Appendix A	Pre- and Post Development Hydrologic Calculations
Appendix B	Soil Test Pit Information
Appendix C	TSS Removal Summary and Calculations
Appendix D	Standard 3 Recharge Calculations
Appendix E	Proposed Stormwater Management System Operation & Maintenance Plan
Appendix F	Long Term Pollution Prevention Plan
Appendix G	Stormwater Pollution Prevention and Erosion Control Plan

I. Introduction

The following report presents an analysis of the stormwater management system for the proposed development of 25 housing units located off of Northern Avenue in zoning district URB in Northampton, Massachusetts. The proposed development includes 25 new housing units and associated parking areas, driveways, and sidewalks, utilities, landscape features and stormwater management system. The total site area is approximately 6 acres of which approximately 3.4 will be disturbed by construction activities. The impervious area on site will increase due to the new development and the stormwater management system has been designed to minimize proposed peak flows to reduce or match existing flows off the site. Mechanisms to reduce runoff and treat water quality include a rain garden, a proprietary treatment chamber, infiltration trench, dry wells, deep sump hooded catch basins, and 2 detention basins.

II. Site Terrain and Soils

The project site is comprised of gradual sloping terrain, which generally drains toward the wetlands on the west part of the site.

The USDA Soil Survey of Hampshire County, Massachusetts, Central Part report classifies the site soils as (see attached soil map):

- **(Ra) Raynham Silt Loam**

Hydrologic Group: C
Flood Risk: None
Depth to Water Table: 0.5'-2.0'
Depth to Bedrock: >60"

- **(Au) Amostown-Windsor Silty Substratum**

Hydrologic Group: C
Flood Risk: None
Depth to Water Table: 1.5'-3.0'
Depth to Bedrock: >60"

- **(Ud) Udorthents Smooth**

Soil formed by cutting or filling developed area.
Reference pedon not given.
Assumed Hydrologic Group: C

A series of test pits were conducted on site to determine subsurface conditions. The purpose of the test pits was to evaluate the site for the existence of ledge, the ability of the site to support stormwater drainage components, and for groundwater information. In general, the test pits confirmed the USDA Soil Survey findings for the site as ground water is generally very high throughout the site, thereby reducing the potential areas where infiltration would be feasible. The test pit logs are attached in Appendix B.

III. Existing Conditions

The existing site includes one drainage area: E-1. The existing drainage area boundary is depicted on the Pre-Development Drainage Area Plan (Figure 1). The overall curve number (CN) in existing conditions is 74. The control point to determine peak flow in existing conditions is the stream located on the property line west of the site shown on Figure 1 as E-CP. The following is a brief description of the drainage area:

E-1

E-1 is approximately 7.75 acres in size and contains existing houses, pavement, grass, wooded areas, and a large wetland area on the west part of the site. Runoff flows overland in a southwestern direction through the wetlands and to the stream located southwest of the site.

IV. Proposed Conditions

The stormwater management system in proposed conditions has been designed to treat and reduce runoff on site. The proposed site contains eight drainage areas: P-1, P-2, P-3, P-4, P-5, P-6, P-7 and P-8 (Figure 2) and the overall curve number (CN) in proposed conditions is 80. The control point to determine peak flow in proposed conditions is the stream located on the property line located west of the site shown on Figure 2 as P-CP. The following is a brief description of each drainage area:

P-1

P-1 is approximately 4.99 acres in size and contains the northwestern area of the site consisting of all of the wetland area, grass and wooded areas, and new roof and pavement. The drainage follows a similar pattern as in existing conditions. It flows overland in a southwestern direction through the wetlands and to the stream located southwest of the site. The runoff from the back of the new roof areas located within P-1 are directed to dry wells where the water is infiltrated into the ground. These dry wells are designed to be very shallow (approximately one foot in depth) due to high groundwater throughout the site. The dry wells are designed with an overflow outlet that allows roof water to sheet flow across the land toward the wetlands as it does in existing conditions. The new driveway and front roof

areas of units 1 and 2 will flow in a similar pattern as the pavement and grass area does in existing conditions.

P-2

P-2 is approximately 0.24 acres in size and is located in the eastern portion of the site. It contains a portion of the roof from unit 14 and 15 in which runoff flows through roof leaders into the infiltration trench which overflows into a catch basin within the area. This area also contains a small portion of new pavement, grass, and trees. Excluding the roof, all other runoff from this area is directed into a catch basin which flows into a water quality basin then to a detention basin (DB#2) located on the west part of the site.

P-3

P-3 is approximately 0.65 acres in size and is located in the northeastern part of the site. It contains new pavement and roof areas, grass, and a detention basin. Runoff from this area is directed to a water quality swale which flows into a water catch basin followed by a detention/infiltration basin (DB#1) that discharges approximately 100 ft to the south.

P-4

P-4 is approximately 0.34 acres in size in the east part of the site. It contains a portion of the new roof and pavement area, and grass and wooded areas. Runoff flows into a catch basin which directs the water to the infiltration trench noted in area P-2. The runoff follows the same pattern as area P-2 once within the trench.

P-5

P-5 is approximately 0.19 acres in size and is located toward the center of the developed portion of the site. It contains mostly new pavement and roof areas and a small portion is grass and wooded area. Runoff flows into a catch basin where it is directed to a water quality basin and detention basin (DB#2) which discharges approximately 40ft from the wetland, allowing adequate overland flow to occur.

P-6

P-6 is approximately 0.54 acres in size and is located on the south portion of the site. It contains a portion of the roof areas from units 16-21, new pavement, and grassed areas. The runoff is directed to a grass swale which flows into a catch basin. The catch basin flows through a proprietary stormwater treatment chamber that discharges into a detention basin (DB#2).

P-7

P-7 is approximately 0.27 acres in size and is located on the southwestern portion of the site. It contains approximately mostly new roof and paved areas and only a small portion of the area is grass. The runoff flows southwest to a proprietary treatment chamber which discharges into a detention basin (DB#2).

P-8

P-8 is approximately 0.53 acres in size and is located on the southwestern portion of the site. It contains a portion of the roof areas from units 22-25, new paved area, grass, and a detention basin (DB#2) and water quality basin. The paved area flows through a pre treatment system consisting of a stone diaphragm and grassed area which discharges into the water quality basin (rain garden) which overflows into the detention basin. The remaining area of P-8 sheet flows into the detention basin.

V. Calculations and Design

Drainage calculations were performed on Hydrocad Stormwater Modeling System version 8.0 using Soil Conservation Service (SCS) TR-20 methodology. The SCS method is based on rainfall observations, which were used to develop the Intensity-Duration-Frequency relationship, or IDF curve. The mass curve is a dimensionless distribution of rainfall over time, which indicates the fraction of the rainfall event that occurs at a given time within a 24-hour precipitation event. This synthetic distribution develops peak rates for storms of varying duration and intensities. The SCS distribution provides a cumulative rainfall at any point in time and allows volume dependent routing runoff calculations to occur. These calculations are included in the appendices.

The watershed boundaries for calculation purposes are divided according to the proposed site grading and the natural limits of the drainage areas. The curve numbers (CNs) and times of concentration for the existing and proposed subcatchment areas are based on the soil type and the existing and proposed cover conditions at the site. The soil hydrologic group assumed for the site is noted in Figure 3. Watershed subcatchment areas, runoff coefficients and watercourse slopes are based on survey information.

Calculations were performed for the 2-, 10-, and 100-year frequency storms under existing and proposed conditions. The results of the calculations are presented in Table 1 on the following page. Appendix A presents the Hydrocad calculations.

Flow Rates & Water Quantity

In the post development conditions the runoff from the proposed site will be routed to 2 open detention basins located along west part of the developed site. The proposed detention basins will attenuate peak flows in the proposed conditions through the use of outlet control structures. Stormwater will be discharged to the wetland that receives runoff in existing conditions. Although there are 5 infiltration systems are proposed (1 detention/infiltration basin, 4 dry wells and 1 infiltration trench) these were not included in the hydrocad

calculations in order to provide a more conservative runoff quantity. Table 1 on the following page presents the comparison of flow rates and water quantity at both existing and proposed control points.

Table 1 Peak Flow and Volume Summary

Condition & Point of Analysis	2-Year Storm 3.00"		10-Year Storm 4.50"		100-Year Storm 6.50"	
	Peak Flow Rate(cfs)	Volume (acre-ft)	Peak Flow Rate(cfs)	Volume (acre-ft)	Peak Flow Rate(cfs)	Volume (acre-ft)
Existing – Control Pt. (E-CP)*	4.66	0.563	10.95	1.242	20.77	2.320
Proposed – Control Pt. (P-CP)*	4.62	0.733	10.45	1.477	18.20	2.609

**Names in parentheses refer to HydroCad model and calculations.*

VI. MADEP Stormwater Standards Compliance

The following section details how the project will meet DEP Stormwater Management Policy's ten stormwater management standards.

Standard 1 - Untreated Stormwater

The proposed stormwater system is designed to treat the new point source discharge prior to flowing to the resource area. All new outlets are outfitted with flared ends and rip rap to prevent any erosion from occurring in the area. See Appendix C for TSS removal summary.

Standard 2 - Post-Development Peak Discharge Rates

The stormwater system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates leaving the site. In order to reduce runoff rates in proposed conditions 2 detention basins with outlet control structures are proposed. Note that although 5 infiltration systems are proposed, no exfiltration was included in the runoff calculations in order to maintain a more conservative peak discharge rate. Refer to Table 1 Peak Flow and Volume Summary and Appendix A for HydroCAD calculations.

Standard 3 - Recharge to Groundwater

Recharge to groundwater is designed to infiltrate to the maximum extent practicable in proposed conditions. The entire site consists of hydrologic group "C" soils and there is very high groundwater throughout most of the site (see Appendix B for test pit logs) which caused limitations for infiltration on many areas of the site because the separation of 2 feet from groundwater could not be

met. Where possible, infiltration is proposed: half of the areas of the roof from units 1-15 and 22-25 and a portion of the pavement located toward the center of the development are directed to dry wells and an infiltration trench sized to accommodate these areas. The upper detention/infiltration basin (DB#1) has been designed also hold and infiltrate the required recharge volume for its respective drainage area (see Appendix D for recharge calculations). Due to restrictions of the site terrain and soil conditions, not all of the impervious area could be directed to an infiltration system therefore all 5 of the infiltration systems proposed are designed to hold at least twice the required recharge volume and still drawdown within 72 hours in order to meet Standard 3 to the maximum extent practicable (see Appendix D for recharge calculations).

Standard 4 – Water Quality

The proposed stormwater management system has been designed to remove the average annual Total Suspended Solids (TSS) load in excess of 80% for the proposed site conditions (see Appendix C for calculations). There are 4 separate treatment chains proposed:

Treatment Train 1 (total of 85% TSS removed)

The first treatment chain contains the impervious areas within P-3. The runoff is directed into a water quality swale to a catch basin which discharges into detention/infiltration basin (DB#1) which has been designed to hold the required water quality volume for its respective area which achieves a total TSS removal rate of approximately 85%. Note that the water quality swale was not included in the calculations of total TSS removal in Appendix C to maintain a more conservative removal rate.

Treatment Train 2 (total of 93% TSS removed)

The second treatment chain contains the impervious areas from P-2, P-4, and P-5. The runoff is directed into a catch basins followed by a water quality basin (rain garden) which achieves a total TSS removal rate of approximately 93%. The water quality basin has been designed to hold a larger volume of water (738cf) than the water quality volume required (713cf) for the impervious area directed to it.

Treatment Train 3 (total of 90% TSS removed)

The second treatment chain contains the paved impervious areas from P-8. The runoff is through a pretreatment system consisting of a stone diaphragm and grassed area which discharges into a water quality basin (rain garden) which achieves a total TSS removal rate of approximately 90%. The water quality basin has been designed to hold a larger volume of water (738cf) than the water quality volume required (713cf) for the impervious area directed to it.

Treatment Train 4 (total of 83% TSS removed)

The third treatment chain contains the impervious areas from P-6 and P-7. The runoff is directed into catch basins and then to a proprietary treatment chamber (Stormceptor STC 900*) which achieves a total TSS removal rate of approximately 83%.

**Note: The stormwater treatment chamber has been sized based on MASTEP test evaluations. The attached table in appendix C displays TSS removal rates for systems based on the impervious area directed to the system. See attached Stormceptor sizing chart for impervious areas directed to the stormwater treatment chamber.*

In addition to removal of TSS, a Long Term Pollution Prevention Plan has been created to maintain a clean site and ensure that all BMPs are functioning to their maximum potential. See Appendix F for Long Term Pollution Prevention Plan.

Standard 5 - Higher Potential Pollutant Loads

The proposed project is not expected to yield high potential pollutant loads.

Standard 6 - Protection of Critical Areas

The project site does not discharge to critical areas as defined in MA DEP Stormwater Policy Handbook.

Standard 7 - Redevelopment Projects

The redevelopment of previously developed site standard is not applicable for this project.

Standard 8 - Erosion/Sediment Control

Erosion and sediment controls have been incorporated into the project design to prevent erosion, control sediments, and stabilized exposed soils during construction and land disturbance. See Appendix G for Construction Period Pollution Prevention and Erosion Sedimentation Control.

Standard 9 - Operation/Maintenance Plan

An Operation and Maintenance Plan for the proposed project is included in Appendix E. It includes general controls for construction and long term maintenance of the stormwater management system.

Standard 10 – Prohibition of Illicit Discharges

No Illicit Discharge Compliance Statement is included with this report however one will be submitted prior to the discharge of any stormwater to post-construction BMPs.

VII. Summary

The impervious area from existing to proposed conditions will increase by approximately 51,000 sf from the new roadway and housing units. The proposed stormwater management system is designed to maintain or reduce the peak flow rates in proposed conditions for the 2-, 10-, and 100-year storm frequencies. Special care has been taken to treat runoff with a series of best management practices to ensure water quality and annual TSS removal rates in excess of 80%. These methods include deep sump hooded catch basins, a bioretention basin, a detention/infiltration basin, and a stormwater treatment chamber.

VIII. References

United States Department of Agriculture. 1998. Soil Survey of Hampshire County (Central Part), Massachusetts.

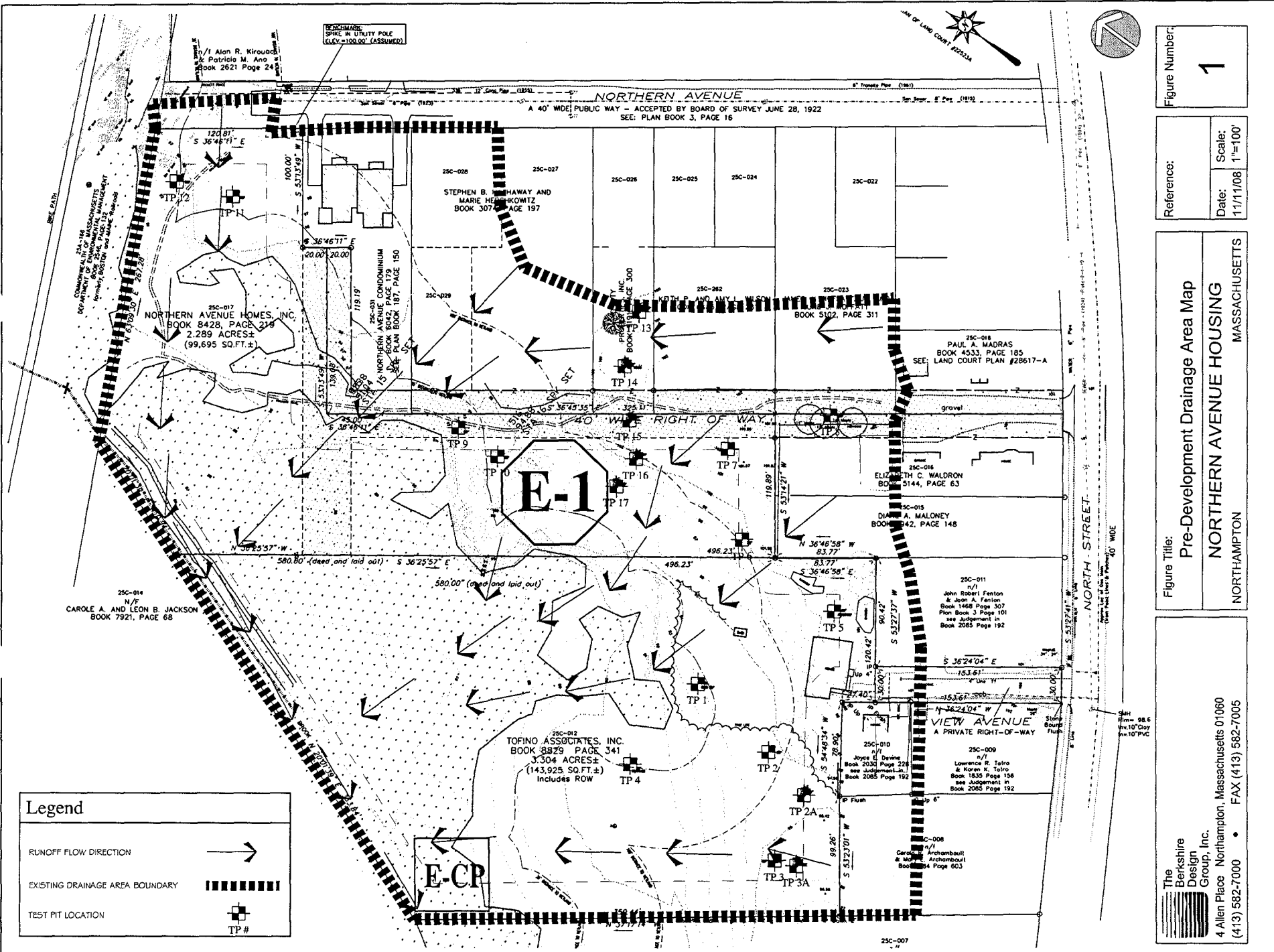


Figure Number:
1

Reference:

Date: 11/11/08
Scale: 1"=100'

Figure Title:
Pre-Development Drainage Area Map
NORTHERN AVENUE HOUSING
NORTHAMPTON MASSACHUSETTS

The Berkshire Design Group, Inc.
4 Allen Place Northampton, Massachusetts 01060
(413) 582-7000 • FAX (413) 582-7005

Legend

RUNOFF FLOW DIRECTION →

EXISTING DRAINAGE AREA BOUNDARY [thick dashed line]

TEST PIT LOCATION [square with crosshair]

TP #

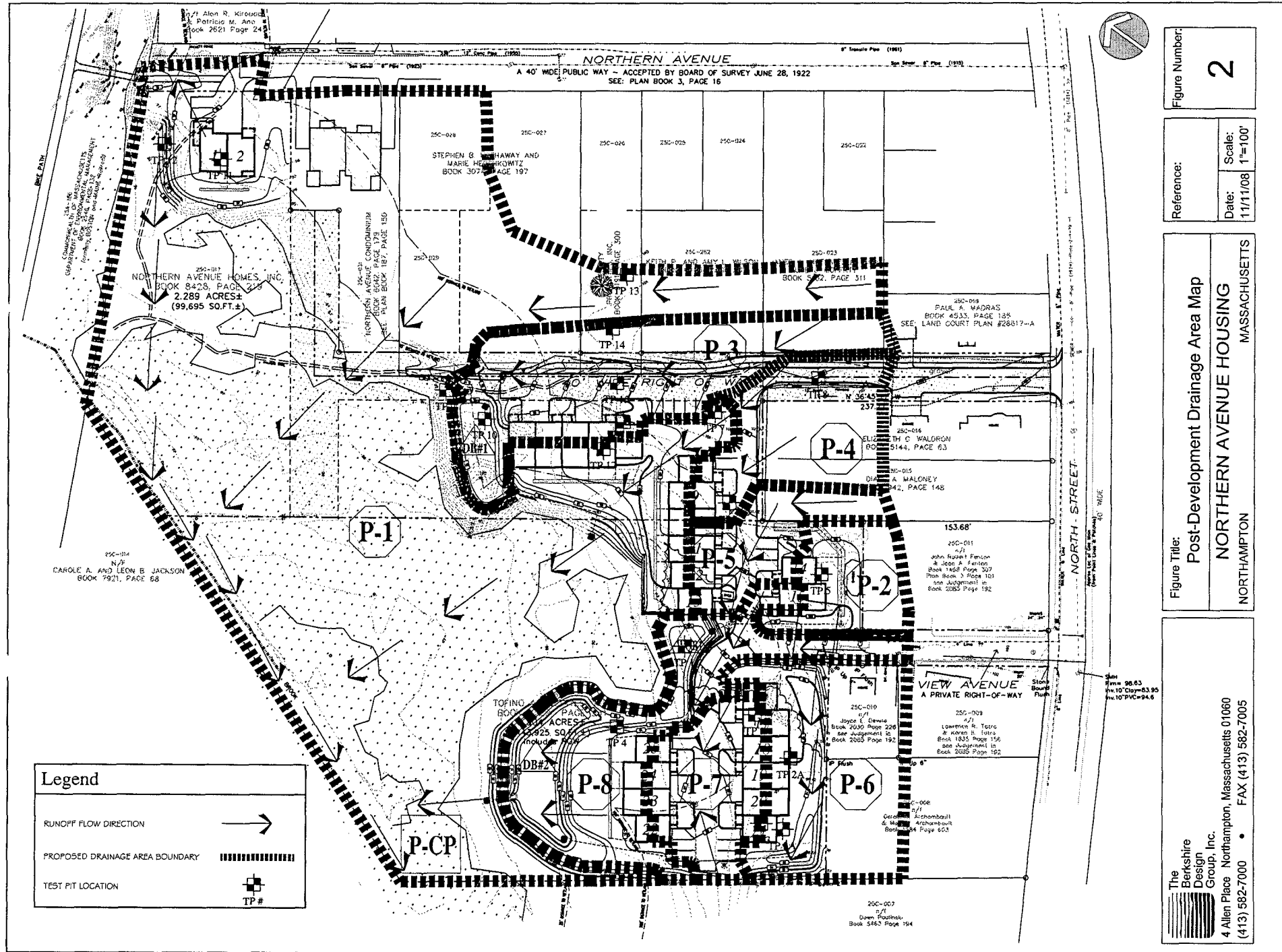


Figure Number:
2

Reference:
Date: 11/11/08
Scale: 1"=100'

Figure Title:
Post-Development Drainage Area Map
NORTHERN AVENUE HOUSING
NORTHAMPTON MASSACHUSETTS

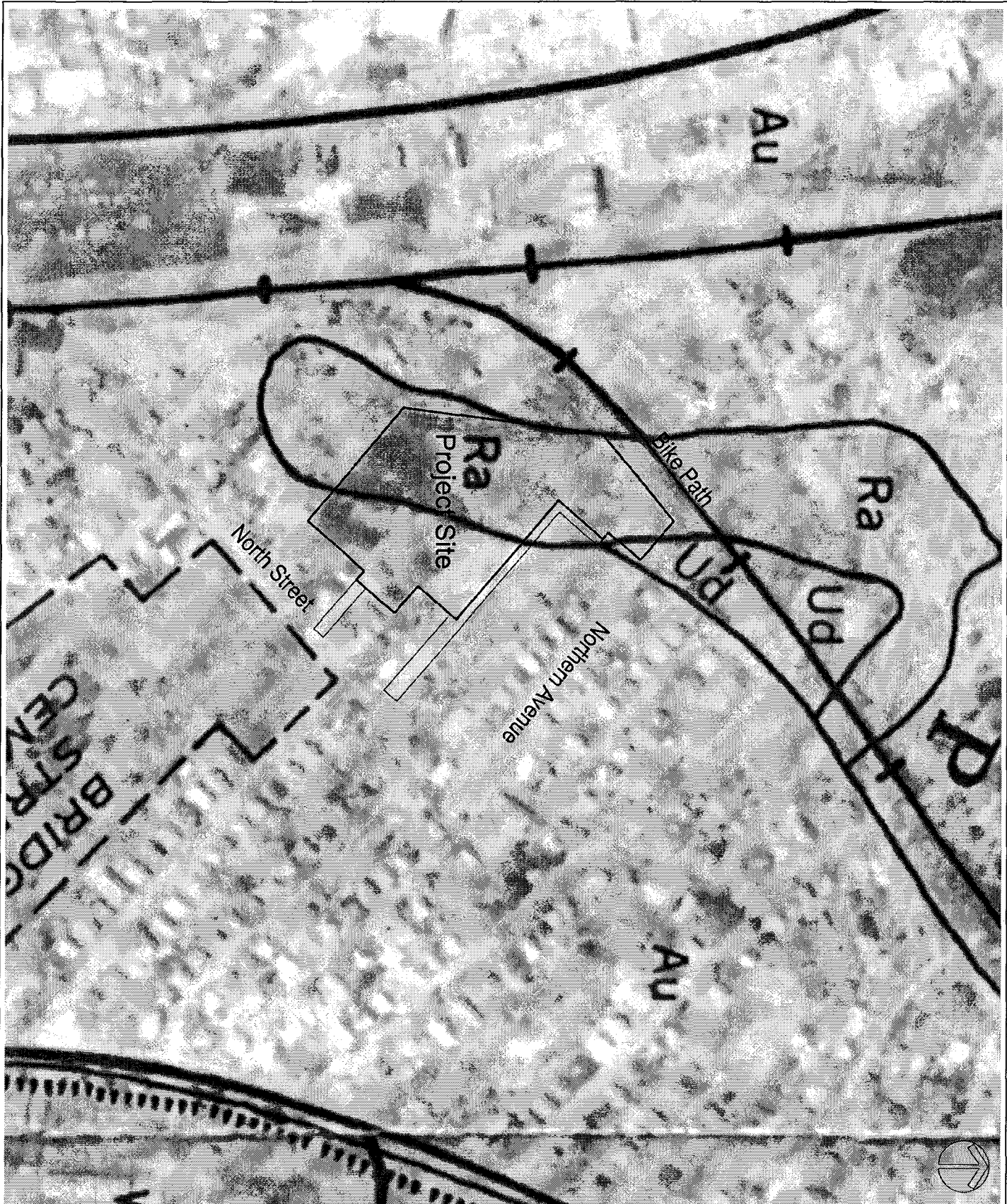
The Berkshire Design Group, Inc.
4 Allen Place Northampton, Massachusetts 01060
(413) 582-7000 • FAX (413) 582-7005

Legend

- RUNOFF FLOW DIRECTION
- PROPOSED DRAINAGE AREA BOUNDARY
- TEST PIT LOCATION

25C-007
1/1
Dawn Podlask
Book 5462 Page 194

344
1"=98.63
1"=10" CLAY=53.95
1"=10" PVC=94.6



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Figure Title:

USDA Soils Map

NORTHERN AVENUE HOUSING

NORTHAMPTON

MASSACHUSETTS

Reference:

Date:
11/11/08

Scale:
1"=300'

Figure Number:

3

250-177
300' abutters pg. 1

ARCHAMBAULT GERALD R & MARY E 150 NORTH ST NORTHAMPTON, MA 01060	BLACK BARBARA L & JOEL 27 NORTHERN AVE NORTHAMPTON, MA 01060	BRADLEY MARILYN J & 24 COLES MEADOW RD NORTHAMPTON, MA 01060
BRIDGENS RUTH H & 12 NORTHERN AVE NORTHAMPTON, MA 01060	CAHILLANE JOHN L & MARY G 46 BRADFORD ST NORTHAMPTON, MA 01060	CAPERS PHYLLIS A & RAYMOND L 48 NORTHERN AVE NORTHAMPTON, MA 01060
CARLBERG IRENE M & 57 WOODMONT RD NORTHAMPTON, MA 01060	CARON JAIME 80 WOODMONT RD NORTHAMPTON, MA 01060	CZELUSNIAK ROBERT F & ABBIE 173 NORTH ST NORTHAMPTON, MA 01060
DENENFELD RENEE JEAN & ANNA D 25 NORTHERN AVE NORTHAMPTON, MA 01060	DEVINE JOYCE E 1 VIEW AVE NORTHAMPTON, MA 01060	DUNN JAMES PATRICK & PATRICIA 52 WOODBINE AVE NORTHAMPTON, MA 01060
DUSHAME LAURA L 52 ORCHARD ST GREENFIELD, MA 01301	FENTON JOHN ROBERT & JOAN A 164 NORTH ST NORTHAMPTON, MA 01060	FREEMAN-DANIELS OWEN D 53A WOODMONT RD NORTHAMPTON, MA 01060
GAYLORD ANN M 77 WOODMONT RD NORTHAMPTON, MA 01060	GUSTAVSEN LISA C 19 UNION ST NORTHAMPTON, MA 01060	HAIGLER JUDY 8 THE LOPE HAYDENVILLE, MA 01039
HALLER LESLI G & MATTHEW G 11 NORTHERN AVE NORTHAMPTON, MA 01060	HATHAWAY STEPHEN B & MARIE 32 NORTHERN AVE NORTHAMPTON, MA 01060	HATHAWAY STEPHEN B & MARIE 32 NORTHERN AVE. NORTHAMPTON, MA 01060
HATHAWAY STEPHEN B & MARIE 32 NORTHERN AVE. NORTHAMPTON, MA 01060	HONEYMAN LARRY & PATRICIA L 190 NORTH ST NORTHAMPTON, MA 01060	JACKSON CAROLE A & 90 WOODMONT RD NORTHAMPTON, MA 01060
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MARDAS PAUL A PO BOX 60185 FLORENCE, MA 01062	MASSACHUSETTS COMMONWEALTH OF DAMON RD NORTHAMPTON, MA 01060	MATUSEK JACOB G & EDITH M 132 RUSSELL ST HADLEY, MA 01035

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MGM REAL ESTATE
ASSOCIATES LLC
32 STRONG RD
SOUTHAMPTON, MA 01073

MOFFAT JAMES A JR & JUNE J
&
16 NORTHERN AVE
NORTHAMPTON, MA 01060

MUNSKA STELLA G & THOMAS
J JR
46 WOODBINE AVE
NORTHAMPTON, MA 01060

~~NORTHAMPTON CITY OF
210 MAIN STREET
NORTHAMPTON, MA 01060~~

NORTHERN AVENUE HOMES
INC
31 CAMPUS PLAZA RD
HADLEY, MA 01035

NOW MARY
186 NORTH ST
NORTHAMPTON, MA 01060

O'CONNOR COLLEEN M
28 WOODBINE AVE #1
NORTHAMPTON, MA 10160

O'CONNOR COLLEEN M
P O BOX 1444
NORTHAMPTON, MA 01061

O'KANE EILEEN
50 NORTHERN AVE
NORTHAMPTON, MA 01060

OLANDER RAE
85 WOODMONT RD
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PAULINSKI DAWN TRUSTEE
25 SYCAMORE ST
SAN FRANCISCO, CA 94110

PELKEY LANCE EDWARD &
87 WOODMONT RD
NORTHAMPTON, MA 01060

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REGISH JOHN P
8 RIVER DR
HADLEY, MA 01035

SHAHAR HAIM
38 WOODBINE AVE
NORTHAMPTON, MA 01060

SMARZ GEORGE A SR TRUSTEE
ONE PRIMROSE PATH
HATFIELD, MA 01038

TATRO LAWRENCE R & KAREN
K
188 BRIDGE ST
NORTHAMPTON, MA 01060

TOFINO ASSOCIATES INC
31 CAMPUS PLAZA RD
HADLEY, MA 01035

TORREY ROSILAND & MARK
STAPLES
45 NORTHERN AVE
NORTHAMPTON, MA 01060

VALENTI LINDA & MARY
WILCZYNSKI
P O BOX 579
FOLLY BEACH, SC 29439

WALDRON ELIZABETH C
176 NORTH ST
NORTHAMPTON, MA 01060

WHITE RICHARD D & ANNE E
33 NORTHERN AVE
NORTHAMPTON, MA 01060

WHITE VICTORIA A
15-17 NORTHERN AVE
NORTHAMPTON, MA 01060

WILSON KEITH P & AMY L
20 NORTHERN AVE
NORTHAMPTON, MA 01060

ZIPPAY MARLA
53B WOODMONT RD UNIT 1
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MARY E
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NORTHAMPTON, MA 01060~~

~~BOSTON & MAINE RAILROAD
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ALBANY, NY 12205-0789~~

~~BRIDGENS RUTH H &
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NORTHAMPTON, MA 01060~~

~~CAPERS PHYLLIS A & RAYMOND
L
48 NORTHERN AVE
NORTHAMPTON, MA 01060~~

~~CARLBERG IRENE M &
57 WOODMONT RD
NORTHAMPTON, MA 01060~~

~~CARON JAIME
80 WOODMONT RD
NORTHAMPTON, MA 01060~~

~~CROUSS TIMOTHY K
6 NORTH BEARS DEN DR
SUNDERLAND, MA 01375~~

~~CZELUSNIAK ROBERT F & ABBIE DEVINE JOYCE E
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NORTHAMPTON, MA 01060~~

~~1 VIEW AVE
NORTHAMPTON, MA 01060~~

~~DUSHAME LAURA L
52 ORCHARD ST
GREENFIELD, MA 01301~~

~~EHLERS T MICHAEL
P O BOX 812
NORTHAMPTON, MA 01061~~

~~FENTON JOHN ROBERT & JOAN
A
164 NORTH ST
NORTHAMPTON, MA 01060~~

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BELCHERTOWN, MA 01007~~

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NORTHAMPTON, MA 01060~~

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FLORENCE, MA 01062~~

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COMMONWEALTH OF
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NORTHAMPTON, MA 01060~~

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128 NORTH ST
NORTHAMPTON, MA 01060~~

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NORTHAMPTON, MA 01060~~

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NORTHAMPTON, MA 01060~~

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87 WOODMONT RD
NORTHAMPTON, MA 01060~~

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87 WOODMONT RD
NORTHAMPTON, MA 01060~~

~~REITER JENNIFER B &
351 PLEASANT ST PMB 222
NORTHAMPTON, MA 01060~~

~~SALVATORE FRANK V &
MURALEE A
136 CROSS PATH ROAD
NORTHAMPTON, MA 01060~~

~~SALVATORE FRANK V &
MURALEE A
136 CROSS PATH RD
NORTHAMPTON, MA 01060~~

~~SPEYER SVETLANA
124 NORTH ST
NORTHAMPTON, MA 01060~~

~~TATRO LAWRENCE R & KAREN
K
188 BRIDGE ST
NORTHAMPTON, MA 01060~~

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31 CAMPUS PLAZA RD
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~~WELCH WILLIAM M II
433 10TH ST NE
WASHINGTON, DC 20002-6119~~

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~~WILSON KEITH P & AMY L
20 NORTHERN AVE
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Stormwater Drainage Report

for
**Northern Avenue Housing
Northampton, MA**

November 11, 2008

Prepared by:



**The
Berkshire
Design
Group, Inc.**

4 Allen Place, Northampton, Massachusetts 01060

Prepared for:

Tofino Associates, Inc.
31 Campus Plaza Road
Hadley, MA 01035



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

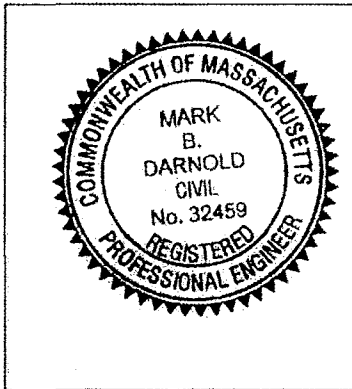
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.


A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



To the best of my knowledge

Signature and Date 11/11/08

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume **for its respective drainage area.**
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs) Not Applicable – Proposed project site is not expected to yield high potential pollutant loads.

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted *prior* to the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does *not* cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas Not Applicable – The project site does not discharge to a critical area.

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a: **site with only "Hydrologic Group C" Soils**
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the **DRAFT** SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted **BEFORE** land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

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Proposed Conditions	3
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- Figure 2 Post Development Drainage Area Map**
- Figure 3 USDA Soils Map**

Appendices

- Appendix A Pre- and Post Development Hydrologic Calculations**
- Appendix B Soil Test Pit Information**
- Appendix C TSS Removal Summary and Calculations**
- Appendix D Standard 3 Recharge Calculations**
- Appendix E Proposed Stormwater Management System Operation & Maintenance Plan**
- Appendix F Long Term Pollution Prevention Plan**
- Appendix G Stormwater Pollution Prevention and Erosion Control Plan**

I. Introduction

The following report presents an analysis of the stormwater management system for the proposed development of 25 housing units located off of Northern Avenue in zoning district URB in Northampton, Massachusetts. The proposed development includes 25 new housing units and associated parking areas, driveways, and sidewalks, utilities, landscape features and stormwater management system. The total site area is approximately 6 acres of which approximately 3.4 will be disturbed by construction activities. The impervious area on site will increase due to the new development and the stormwater management system has been designed to minimize proposed peak flows to reduce or match existing flows off the site. Mechanisms to reduce runoff and treat water quality include a rain garden, a proprietary treatment chamber, infiltration trench, dry wells, deep sump hooded catch basins, and 2 detention basins.

II. Site Terrain and Soils

The project site is comprised of gradual sloping terrain, which generally drains toward the wetlands on the west part of the site.

The USDA Soil Survey of Hampshire County, Massachusetts, Central Part report classifies the site soils as (see attached soil map):

- **(Ra) Raynham Silt Loam**

Hydrologic Group: C
Flood Risk: None
Depth to Water Table: 0.5'-2.0'
Depth to Bedrock: >60"

- **(Au) Amostown-Windsor Silty Substratum**

Hydrologic Group: C
Flood Risk: None
Depth to Water Table: 1.5'-3.0'
Depth to Bedrock: >60"

- **(Ud) Udorthents Smooth**

Soil formed by cutting or filling developed area.
Reference pedon not given.
Assumed Hydrologic Group: C

A series of test pits were conducted on site to determine subsurface conditions. The purpose of the test pits was to evaluate the site for the existence of ledge, the ability of the site to support stormwater drainage components, and for groundwater information. In general, the test pits confirmed the USDA Soil Survey findings for the site as ground water is generally very high throughout the site, thereby reducing the potential areas where infiltration would be feasible. The test pit logs are attached in Appendix B.

III. Existing Conditions

The existing site includes one drainage area: E-1. The existing drainage area boundary is depicted on the Pre-Development Drainage Area Plan (Figure 1). The overall curve number (CN) in existing conditions is 74. The control point to determine peak flow in existing conditions is the stream located on the property line west of the site shown on Figure 1 as E-CP. The following is a brief description of the drainage area:

E-1

E-1 is approximately 7.75 acres in size and contains existing houses, pavement, grass, wooded areas, and a large wetland area on the west part of the site. Runoff flows overland in a southwestern direction through the wetlands and to the stream located southwest of the site.

IV. Proposed Conditions

The stormwater management system in proposed conditions has been designed to treat and reduce runoff on site. The proposed site contains eight drainage areas: P-1, P-2, P-3, P-4, P-5, P-6, P-7 and P-8 (Figure 2) and the overall curve number (CN) in proposed conditions is 80. The control point to determine peak flow in proposed conditions is the stream located on the property line located west of the site shown on Figure 2 as P-CP. The following is a brief description of each drainage area:

P-1

P-1 is approximately 4.99 acres in size and contains the northwestern area of the site consisting of all of the wetland area, grass and wooded areas, and new roof and pavement. The drainage follows a similar pattern as in existing conditions. It flows overland in a southwestern direction through the wetlands and to the stream located southwest of the site. The runoff from the back of the new roof areas located within P-1 are directed to dry wells where the water is infiltrated into the ground. These dry wells are designed to be very shallow (approximately one foot in depth) due to high groundwater throughout the site. The dry wells are designed with an overflow outlet that allows roof water to sheet flow across the land toward the wetlands as it does in existing conditions. The new driveway and front roof

areas of units 1 and 2 will flow in a similar pattern as the pavement and grass area does in existing conditions.

P-2

P-2 is approximately 0.24 acres in size and is located in the eastern portion of the site. It contains a portion of the roof from unit 14 and 15 in which runoff flows through roof leaders into the infiltration trench which overflows into a catch basin within the area. This area also contains a small portion of new pavement, grass, and trees. Excluding the roof, all other runoff from this area is directed into a catch basin which flows into a water quality basin then to a detention basin (DB#2) located on the west part of the site.

P-3

P-3 is approximately 0.65 acres in size and is located in the northeastern part of the site. It contains new pavement and roof areas, grass, and a detention basin. Runoff from this area is directed to a water quality swale which flows into a water catch basin followed by a detention/infiltration basin (DB#1) that discharges approximately 100 ft to the south.

P-4

P-4 is approximately 0.34 acres in size in the east part of the site. It contains a portion of the new roof and pavement area, and grass and wooded areas. Runoff flows into a catch basin which directs the water to the infiltration trench noted in area P-2. The runoff follows the same pattern as area P-2 once within the trench.

P-5

P-5 is approximately 0.19 acres in size and is located toward the center of the developed portion of the site. It contains mostly new pavement and roof areas and a small portion is grass and wooded area. Runoff flows into a catch basin where it is directed to a water quality basin and detention basin (DB#2) which discharges approximately 40ft from the wetland, allowing adequate overland flow to occur.

P-6

P-6 is approximately 0.54 acres in size and is located on the south portion of the site. It contains a portion of the roof areas from units 16-21, new pavement, and grassed areas. The runoff is directed to a grass swale which flows into a catch basin. The catch basin flows through a proprietary stormwater treatment chamber that discharges into a detention basin (DB#2).

P-7

P-7 is approximately 0.27 acres in size and is located on the southwestern portion of the site. It contains approximately mostly new roof and paved areas and only a small portion of the area is grass. The runoff flows southwest to a proprietary treatment chamber which discharges into a detention basin (DB#2).

P-8

P-8 is approximately 0.53 acres in size and is located on the southwestern portion of the site. It contains a portion of the roof areas from units 22-25, new paved area, grass, and a detention basin (DB#2) and water quality basin. The paved area flows through a pre treatment system consisting of a stone diaphragm and grassed area which discharges into the water quality basin (rain garden) which overflows into the detention basin. The remaining area of P-8 sheet flows into the detention basin.

V. Calculations and Design

Drainage calculations were performed on Hydrocad Stormwater Modeling System version 8.0 using Soil Conservation Service (SCS) TR-20 methodology. The SCS method is based on rainfall observations, which were used to develop the Intensity-Duration-Frequency relationship, or IDF curve. The mass curve is a dimensionless distribution of rainfall over time, which indicates the fraction of the rainfall event that occurs at a given time within a 24-hour precipitation event. This synthetic distribution develops peak rates for storms of varying duration and intensities. The SCS distribution provides a cumulative rainfall at any point in time and allows volume dependent routing runoff calculations to occur. These calculations are included in the appendices.

The watershed boundaries for calculation purposes are divided according to the proposed site grading and the natural limits of the drainage areas. The curve numbers (CNs) and times of concentration for the existing and proposed subcatchment areas are based on the soil type and the existing and proposed cover conditions at the site. The soil hydrologic group assumed for the site is noted in Figure 3. Watershed subcatchment areas, runoff coefficients and watercourse slopes are based on survey information.

Calculations were performed for the 2-, 10-, and 100-year frequency storms under existing and proposed conditions. The results of the calculations are presented in Table 1 on the following page. Appendix A presents the Hydrocad calculations.

Flow Rates & Water Quantity

In the post development conditions the runoff from the proposed site will be routed to 2 open detention basins located along west part of the developed site. The proposed detention basins will attenuate peak flows in the proposed conditions through the use of outlet control structures. Stormwater will be discharged to the wetland that receives runoff in existing conditions. Although there are 6 infiltration systems are proposed (1 detention/infiltration basin, 4 dry wells and 1 infiltration trench) these were not included in the hydrocad

calculations in order to provide a more conservative runoff quantity. Table 1 on the following page presents the comparison of flow rates and water quantity at both existing and proposed control points.

Table 1 Peak Flow and Volume Summary

Condition & Point of Analysis	2-Year Storm 3.00"		10-Year Storm 4.50"		100-Year Storm 6.50"	
	Peak Flow Rate(cfs)	Volume (acre-ft)	Peak Flow Rate(cfs)	Volume (acre-ft)	Peak Flow Rate(cfs)	Volume (acre-ft)
Existing Control Pt. (E-CP)*	4.66	0.563	10.95	1.242	20.77	2.320
Proposed Control Pt. (P-CP)*	4.62	0.533	10.45	1.477	18.20	2.609

**Names in parentheses refer to HydroCad model and calculations.*

VI. MADEP Stormwater Standards Compliance

The following section details how the project will meet DEP Stormwater Management Policy's ten stormwater management standards.

Standard 1 - Untreated Stormwater

The proposed stormwater system is designed to treat the new point source discharge prior to flowing to the resource area. All new outlets are outfitted with flared ends and rip rap to prevent any erosion from occurring in the area. See Appendix C for TSS removal summary.

Standard 2 - Post-Development Peak Discharge Rates

The stormwater system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates leaving the site. In order to reduce runoff rates in proposed conditions 2 detention basins with outlet control structures are proposed. Note that although 6 infiltration systems are proposed, no exfiltration was included in the runoff calculations in order to maintain a more conservative peak discharge rate. Refer to Table 1 Peak Flow and Volume Summary and Appendix A for HydroCAD calculations.

Standard 3 - Recharge to Groundwater

Recharge to groundwater is designed to infiltrate to the maximum extent practicable in proposed conditions. The entire site consists of hydrologic group "C" soils and there is very high groundwater throughout most of the site (see Appendix B for test pit logs). The soil conditions caused limitations for infiltration on many areas of the site because the separation of 2 feet from

groundwater could not be met. Where possible, infiltration is proposed: half of the areas of the roof from units 1-15 and 22-25 and a portion of the pavement located toward the center of the development are directed to dry wells and an infiltration trench sized to accommodate these areas. The upper detention/infiltration basin (DB#1) has been designed also hold and infiltrate the required recharge volume for its respective drainage area (see Appendix D for recharge calculations). Due to restrictions of the site terrain and soil conditions, not all of the impervious area could be directed to an infiltration system, therefore all 6 of the infiltration systems proposed are designed to hold at least twice the required recharge volume and still drawdown within 72 hours in order to meet Standard 3 to the maximum extent practicable (see Appendix D for recharge calculations).

Standard 4 – Water Quality

The proposed stormwater management system has been designed to remove the average annual Total Suspended Solids (TSS) load in excess of 80% for the proposed site conditions (see Appendix C for calculations). There are 4 separate treatment chains proposed:

Treatment Train 1(total of 85% TSS removed)

The first treatment chain contains the impervious areas within P-3. The runoff is directed into a water quality swale to a catch basin which discharges into detention/infiltration basin (DB#1) which has been designed to hold the required water quality volume for its respective area which achieves a total TSS removal rate of approximately 85%. Note that the water quality swale was not included in the calculations of total TSS removal in Appendix C to maintain a more conservative removal rate.

Treatment Train 2(total of 93% TSS removed)

The second treatment chain contains the impervious areas from P-2, P-4, and P-5. The runoff is directed into a catch basins followed by a water quality basin (rain garden) which achieves a total TSS removal rate of approximately 93%. The water quality basin has been designed to hold a larger volume of water (738cf) than the water quality volume required (713cf) for the impervious area directed to it.

Treatment Train 3(total of 90% TSS removed)

The second treatment chain contains the paved impervious areas from P-8. The runoff is through a pretreatment system consisting of a stone diaphragm and grassed area which discharges into a water quality basin (rain garden) which achieves a total TSS removal rate of approximately 90%. The water quality basin has been designed to hold a larger volume of water (738cf) than the water quality volume required (713cf) for the impervious area directed to it.

Treatment Train 4 (total of 83% TSS removed)

The third treatment chain contains the impervious areas from P-6 and P-7. The runoff is directed into catch basins and then to a proprietary treatment chamber (Stormceptor STC 900*) which achieves a total TSS removal rate of approximately 83%.

**Note: The stormwater treatment chamber has been sized based on MASTEP test evaluations. The attached table in appendix C displays TSS removal rates for systems based on the impervious area directed to the system. See attached Stormceptor sizing chart for impervious areas directed to the stormwater treatment chamber.*

In addition to removal of TSS, a Long Term Pollution Prevention Plan has been created to maintain a clean site and ensure that all BMPs are functioning to their maximum potential. See Appendix F for Long Term Pollution Prevention Plan.

Standard 5 - Higher Potential Pollutant Loads

The proposed project is not expected to yield high potential pollutant loads.

Standard 6 - Protection of Critical Areas

The project site does not discharge to critical areas as defined in MA DEP Stormwater Policy Handbook.

Standard 7 - Redevelopment Projects

The redevelopment of previously developed site standard is not applicable for this project.

Standard 8 - Erosion/Sediment Control

Erosion and sediment controls have been incorporated into the project design to prevent erosion, control sediments, and stabilized exposed soils during construction and land disturbance. See Appendix G for Construction Period Pollution Prevention and Erosion Sedimentation Control.

Standard 9 - Operation/Maintenance Plan

An Operation and Maintenance Plan for the proposed project is included in Appendix E. It includes general controls for construction and long term maintenance of the stormwater management system.

Standard 10 – Prohibition of Illicit Discharges

No Illicit Discharge Compliance Statement is included with this report however one will be submitted prior to the discharge of any stormwater to post-construction BMPs.

VII. Summary

The impervious area from existing to proposed conditions will increase by approximately 51,000 sf from the new roadway and housing units. The proposed stormwater management system is designed to maintain or reduce the peak flow rates in proposed conditions for the 2-, 10-, and 100-year storm frequencies. Special care has been taken to treat runoff with a series of best management practices to ensure water quality and annual TSS removal rates in excess of 80%. These methods include deep sump hooded catch basins, a bioretention basin, a detention/infiltration basin, and a stormwater treatment chamber.

VIII. References

United States Department of Agriculture. 1998. Soil Survey of Hampshire County (Central Part), Massachusetts.

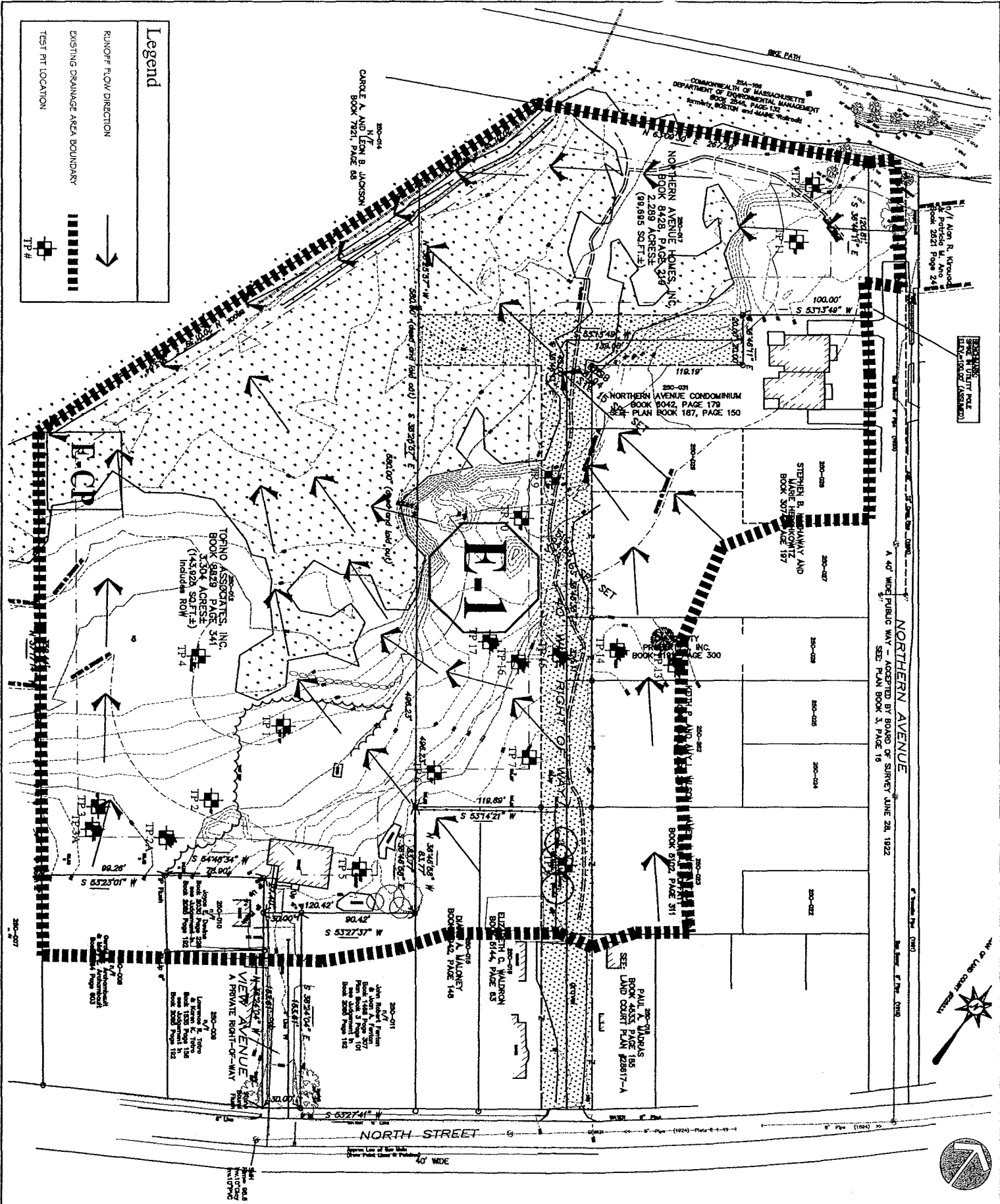
Figures

Legend

RUNOFF FLOW DIRECTION →

EXISTING DRAINAGE AREA BOUNDARY

TEST PIT LOCATION TP #



The Berkshire Design Group, Inc.
 4 Allen Place Northampton, Massachusetts 01060
 (413) 582-7000 • FAX (413) 582-7005

Figure Title:
Pre-Development Drainage Area Map
NORTHERN AVENUE HOUSING
 NORTHAMPTON MASSACHUSETTS

Reference:
 Date: 11/11/08
 Scale: 1"=100'

Figure Number:
1

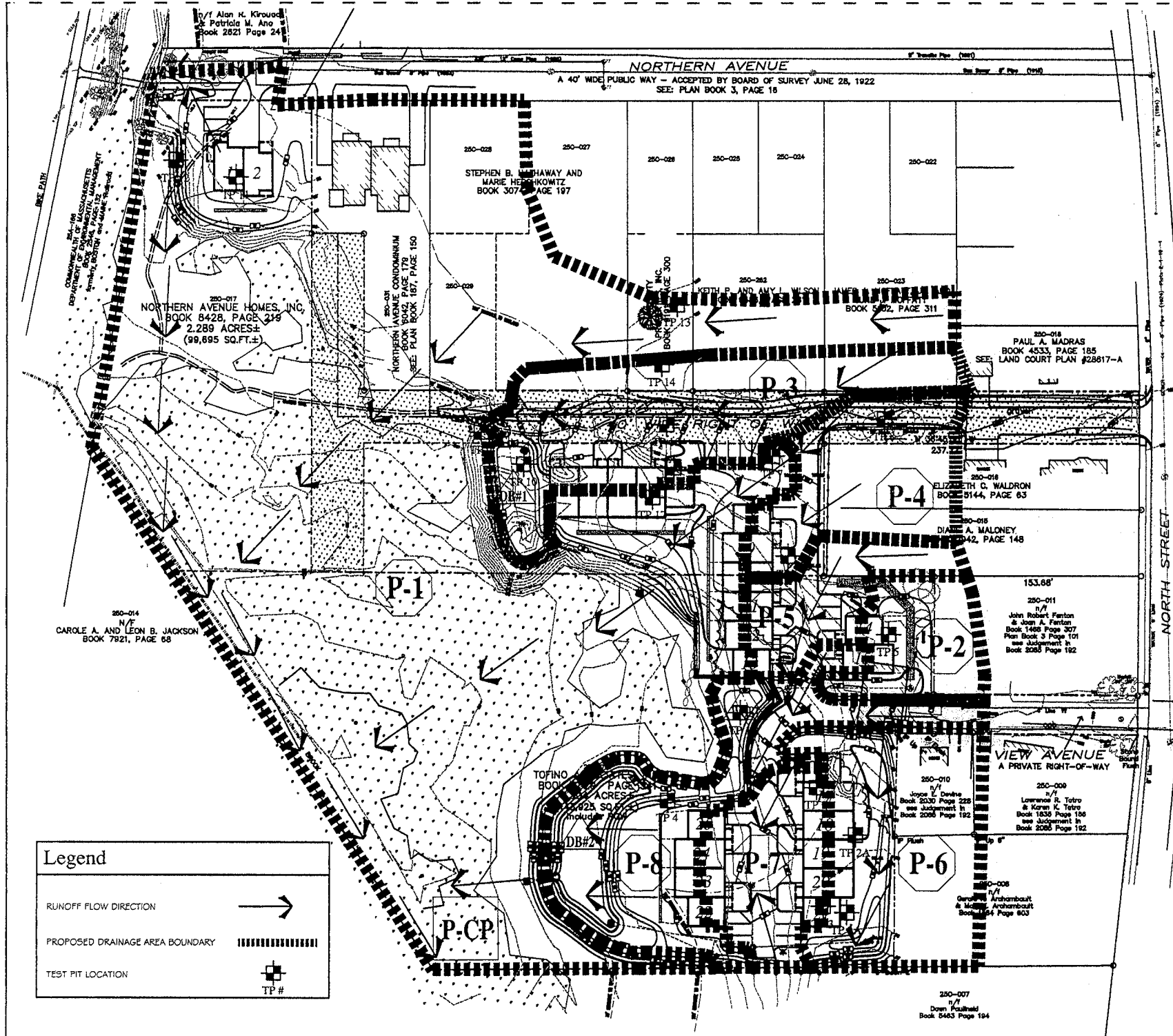


Figure Number:
2

Reference:
Date: 11/1/08
Scale: 1"=100'

Figure Title:
Post-Development Drainage Area Map
NORTHERN AVENUE HOUSING
NORTHAMPTON MASSACHUSETTS

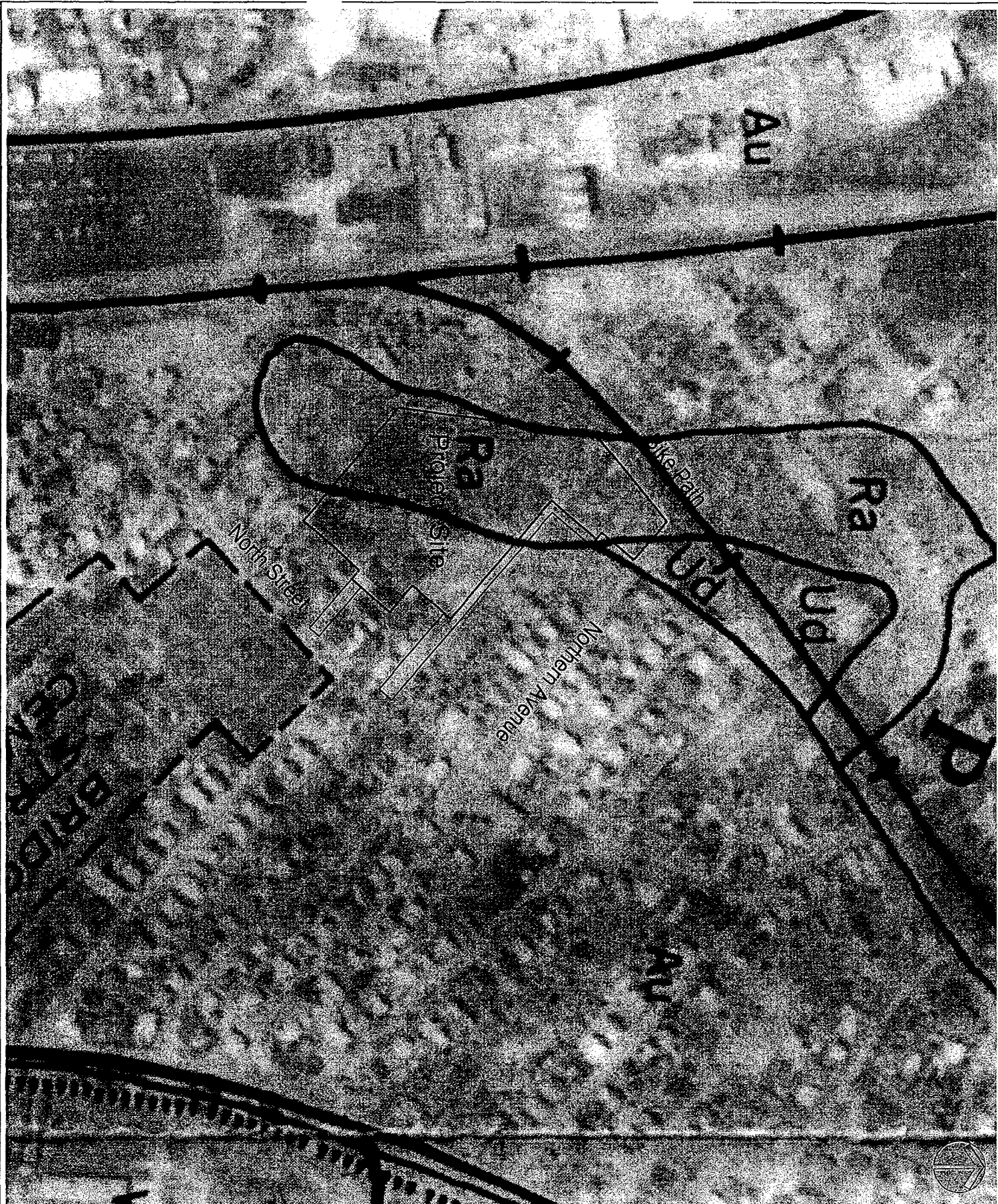
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Legend

- RUNOFF FLOW DIRECTION
- PROPOSED DRAINAGE AREA BOUNDARY
- TEST PIT LOCATION

Sheet 98.63
Rev 10/20/08=83.05
Rev 10/27/08=94.85

250-007
1/1
Down Southfield
Book 5463 Page 184



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Figure Title:

USDA Soils Map

NORTHERN AVENUE HOUSING

NORTHAMPTON

MASSACHUSETTS

Reference:

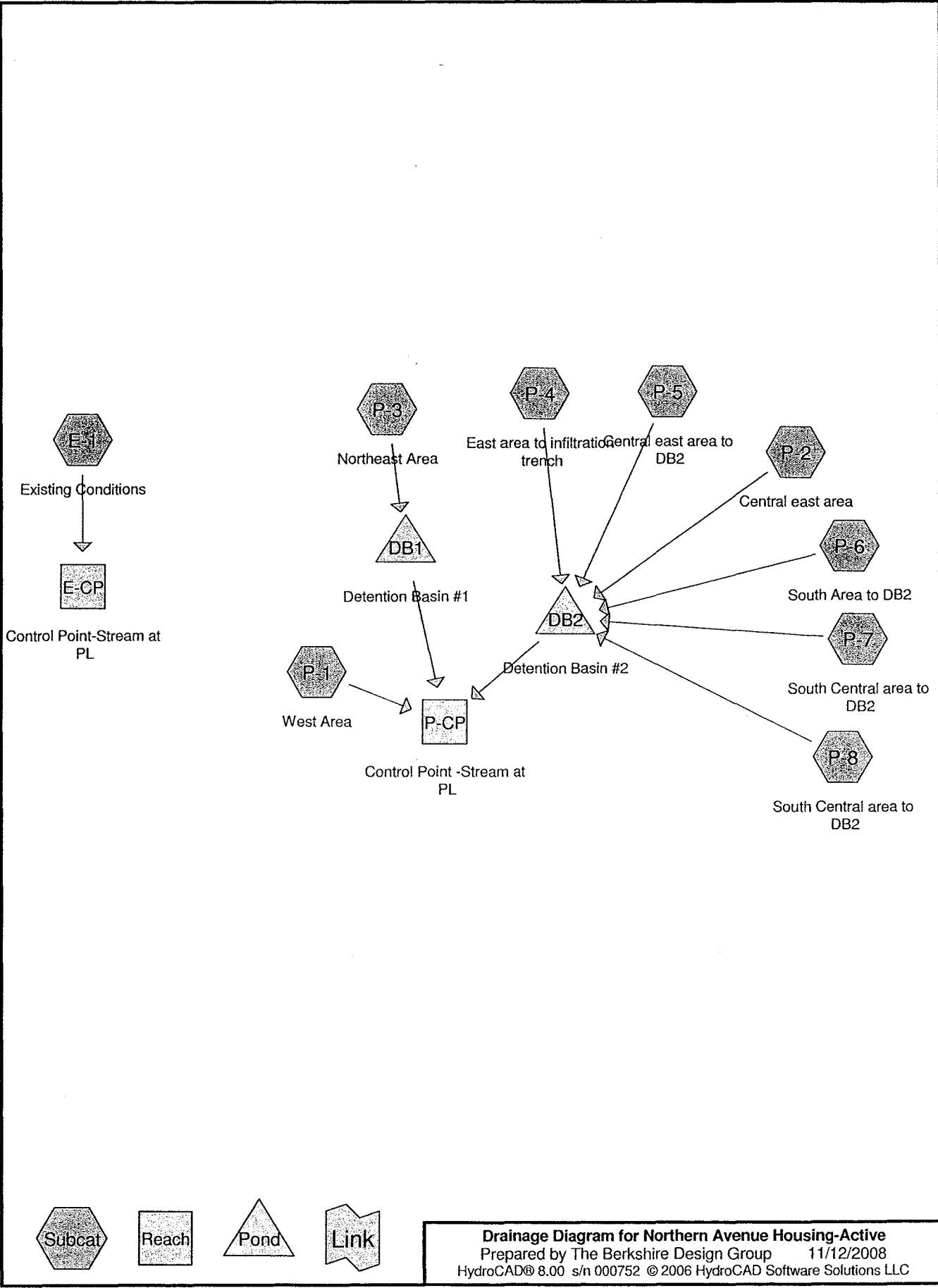
Date:
11/11/08

Scale:
1"=300'

Figure Number:

3

Appendix A – Pre- and Post Development Hydrologic Calculations



Existing Conditions



Control Point-Stream at PL



Northeast Area



Detention Basin #1



East area to infiltration trench



Central east area to DB2



Central east area



South Area to DB2



South Central area to DB2



West Area



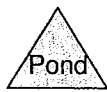
Control Point -Stream at PL



Detention Basin #2



South Central area to DB2



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Area Listing (selected nodes)

<u>Area (acres)</u>	<u>CN</u>	<u>Description (subcats)</u>
5.581	70	Woods, Good, HSG C (E-1,P-1,P-3,P-4,P-5,P-6)
3.482	74	>75% Grass cover, Good, HSG C (E-1,P-1,P-2,P-4,P-5,P-6,P-6,P-7,P-8)
4.416	78	Wetlands (E-1,P-1)
0.257	79	50-75% Grass cover, Fair, HSG C (P-3)
0.135	98	Imp. Bldgs, Pavement (E-1)
1.299	98	Paved parking & roofs (P-1,P-2,P-3,P-4,P-5,P-6,P-7,P-8)
0.290	100	Det Basin (P-3,P-8)
0.034	100	Rain Garden (P-8)
<hr/>		
15.496		

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Type III 24-hr 2-Year Rainfall=2.95"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Existing ConditionsRunoff Area=337,494 sf Runoff Depth>0.87"
Flow Length=570' Tc=23.1 min CN=74 Runoff=4.66 cfs 0.563 af**Subcatchment P-1: West Area**Runoff Area=218,209 sf Runoff Depth>0.98"
Flow Length=351' Tc=19.8 min CN=76 Runoff=3.68 cfs 0.408 af**Subcatchment P-2: Central east area**Runoff Area=8,669 sf Runoff Depth>0.98"
Tc=5.0 min CN=76 Runoff=0.22 cfs 0.016 af**Subcatchment P-3: Northeast Area**Runoff Area=26,786 sf Runoff Depth>1.85"
Flow Length=330' Tc=10.0 min CN=89 Runoff=1.15 cfs 0.095 af**Subcatchment P-4: East area to infiltration trench**Runoff Area=15,343 sf Runoff Depth>1.27"
Flow Length=180' Tc=6.4 min CN=81 Runoff=0.51 cfs 0.037 af**Subcatchment P-5: Central east area to DB2**Runoff Area=9,113 sf Runoff Depth>1.54"
Flow Length=176' Tc=6.3 min CN=85 Runoff=0.37 cfs 0.027 af**Subcatchment P-6: South Area to DB2**Runoff Area=22,259 sf Runoff Depth>1.15"
Flow Length=285' Tc=3.9 min CN=79 Runoff=0.71 cfs 0.049 af**Subcatchment P-7: South Central area to DB2**Runoff Area=11,711 sf Runoff Depth>2.20"
Flow Length=133' Tc=8.8 min CN=93 Runoff=0.61 cfs 0.049 af**Subcatchment P-8: South Central area to DB2**Runoff Area=25,404 sf Runoff Depth>2.02"
Tc=5.0 min CN=91 Runoff=1.37 cfs 0.098 af**Reach E-CP: Control Point-Stream at PL**Inflow=4.66 cfs 0.563 af
Outflow=4.66 cfs 0.563 af**Reach P-CP: Control Point -Stream at PL**Inflow=4.62 cfs 0.733 af
Outflow=4.62 cfs 0.733 af**Pond DB1: Detention Basin #1**Peak Elev=93.23' Storage=1,850 cf Inflow=1.15 cfs 0.095 af
Outflow=0.40 cfs 0.069 af**Pond DB2: Detention Basin #2**Peak Elev=90.40' Storage=5,173 cf Inflow=3.69 cfs 0.277 af
Outflow=0.77 cfs 0.256 afTotal Runoff Area = 15.496 ac Runoff Volume = 1.342 af Average Runoff Depth = 1.04"
88.65% Pervious Area = 13.736 ac 11.35% Impervious Area = 1.759 ac

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Type III 24-hr 2-Year Rainfall=2.95"

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Subcatchment E-1: Existing Conditions

Runoff = 4.66 cfs @ 12.36 hrs, Volume= 0.563 af, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
96,180	78	Wetlands
92,521	74	>75% Grass cover, Good, HSG C
5,881	98	Imp. Bldgs, Pavement
142,912	70	Woods, Good, HSG C
337,494	74	Weighted Average
331,613		Pervious Area
5,881		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	60	0.0200	0.15		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
4.8	280	0.0375	0.97		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.6	230	0.0174	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
23.1	570	Total			

Subcatchment P-1: West Area

Runoff = 3.68 cfs @ 12.30 hrs, Volume= 0.408 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
96,180	78	Wetlands
23,514	74	>75% Grass cover, Good, HSG C
13,949	98	Paved parking & roofs
84,566	70	Woods, Good, HSG C
218,209	76	Weighted Average
204,260		Pervious Area
13,949		Impervious Area

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Type III 24-hr 2-Year Rainfall=2.95"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	89	0.0250	0.18		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.5	62	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.9	200	0.0180	0.34		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
19.8	351	Total			

Subcatchment P-2: Central east area

Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.016 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
7,924	74	>75% Grass cover, Good, HSG C
745	98	Paved parking & roofs
8,669	76	Weighted Average
7,924		Pervious Area
745		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-3: Northeast Area

Runoff = 1.15 cfs @ 12.14 hrs, Volume= 0.095 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
11,211	79	50-75% Grass cover, Fair, HSG C
4,511	100	Det Basin
9,302	98	Paved parking & roofs
1,762	70	Woods, Good, HSG C
26,786	89	Weighted Average
12,973		Pervious Area
13,813		Impervious Area

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Type III 24-hr 2-Year Rainfall=2.95"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0300	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.4	230	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
10.0	330	Total			

Subcatchment P-4: East area to infiltration trench

Runoff = 0.51 cfs @ 12.10 hrs, Volume= 0.037 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
3,068	74	>75% Grass cover, Good, HSG C
5,529	98	Paved parking & roofs
6,746	70	Woods, Good, HSG C
15,343	81	Weighted Average
9,814		Pervious Area
5,529		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0800	0.29		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.2	20	0.0180	2.01		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	60	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.4	180	Total			

Subcatchment P-5: Central east area to DB2

Runoff = 0.37 cfs @ 12.10 hrs, Volume= 0.027 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
2,758	74	>75% Grass cover, Good, HSG C
4,623	98	Paved parking & roofs
1,732	70	Woods, Good, HSG C
9,113	85	Weighted Average
4,490		Pervious Area
4,623		Impervious Area

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Type III 24-hr 2-Year Rainfall=2.95"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0800	0.29		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.1	10	0.0167	1.94		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	66	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.3	176	Total			

Subcatchment P-6: South Area to DB2

Runoff = 0.71 cfs @ 12.07 hrs, Volume= 0.049 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
10,347	74	>75% Grass cover, Good, HSG C
5,500	98	Paved parking & roofs
1,024	74	>75% Grass cover, Good, HSG C
5,388	70	Woods, Good, HSG C
22,259	79	Weighted Average
16,759		Pervious Area
5,500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	80	0.0330	1.56		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.00"
1.5	20	0.1000	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.5	185	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.9	285	Total			

Subcatchment P-7: South Central area to DB2

Runoff = 0.61 cfs @ 12.12 hrs, Volume= 0.049 af, Depth> 2.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
2,278	74	>75% Grass cover, Good, HSG C
9,433	98	Paved parking & roofs
11,711	93	Weighted Average
2,278		Pervious Area
9,433		Impervious Area

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Type III 24-hr 2-Year Rainfall=2.95"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0300	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.2	33	0.0250	3.21		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.8	133	Total			

Subcatchment P-8: South Central area to DB2

Runoff = 1.37 cfs @ 12.07 hrs, Volume= 0.098 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=2.95"

Area (sf)	CN	Description
8,246	74	>75% Grass cover, Good, HSG C
7,521	98	Paved parking & roofs
8,135	100	Det Basin
1,502	100	Rain Garden
25,404	91	Weighted Average
8,246		Pervious Area
17,158		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Reach E-CP: Control Point-Stream at PL

Inflow Area = 7.748 ac, Inflow Depth > 0.87" for 2-Year event
 Inflow = 4.66 cfs @ 12.36 hrs, Volume= 0.563 af
 Outflow = 4.66 cfs @ 12.36 hrs, Volume= 0.563 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach P-CP: Control Point -Stream at PL

Inflow Area = 7.748 ac, Inflow Depth > 1.13" for 2-Year event
 Inflow = 4.62 cfs @ 12.32 hrs, Volume= 0.733 af
 Outflow = 4.62 cfs @ 12.32 hrs, Volume= 0.733 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Type III 24-hr 2-Year Rainfall=2.95"

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Pond DB1: Detention Basin #1

Inflow Area = 0.615 ac, Inflow Depth > 1.85" for 2-Year event
 Inflow = 1.15 cfs @ 12.14 hrs, Volume= 0.095 af
 Outflow = 0.40 cfs @ 12.50 hrs, Volume= 0.069 af, Atten= 66%, Lag= 21.2 min
 Primary = 0.40 cfs @ 12.50 hrs, Volume= 0.069 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 93.23' @ 12.50 hrs Surf.Area= 2,100 sf Storage= 1,850 cf

Plug-Flow detention time= 172.3 min calculated for 0.068 af (72% of inflow)
 Center-of-Mass det. time= 83.1 min (900.2 - 817.1)

Volume	Invert	Avail.Storage	Storage Description
#1	92.20'	5,103 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.20	1,553	0	0
92.80	1,824	1,013	1,013
93.00	1,953	378	1,391
94.00	2,602	2,278	3,668
94.50	3,136	1,435	5,103

Device	Routing	Invert	Outlet Devices
#1	Primary	94.25'	6.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	92.10'	12.0" x 73.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 91.73' S= 0.0051 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean
#3	Device 2	92.80'	6.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.40 cfs @ 12.50 hrs HW=93.23' (Free Discharge)

1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
 2=Culvert (Passes 0.40 cfs of 2.36 cfs potential flow)
 3=Orifice/Grate (Orifice Controls 0.40 cfs @ 2.22 fps)

Pond DB2: Detention Basin #2

Inflow Area = 2.123 ac, Inflow Depth > 1.57" for 2-Year event
 Inflow = 3.69 cfs @ 12.09 hrs, Volume= 0.277 af
 Outflow = 0.77 cfs @ 12.54 hrs, Volume= 0.256 af, Atten= 79%, Lag= 27.2 min
 Primary = 0.77 cfs @ 12.54 hrs, Volume= 0.256 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 90.40' @ 12.54 hrs Surf.Area= 4,437 sf Storage= 5,173 cf

Plug-Flow detention time= 175.8 min calculated for 0.256 af (92% of inflow)

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Type III 24-hr 2-Year Rainfall=2.95"

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Center-of-Mass det. time= 137.0 min (958.7 - 821.7)

Volume	Invert	Avail.Storage	Storage Description
#1	89.00'	17,722 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
89.00	3,003	0	0
90.00	3,981	3,492	3,492
91.00	5,124	4,553	8,045
92.00	6,884	6,004	14,049
92.25	7,500	1,798	15,847
92.50	7,500	1,875	17,722

Device	Routing	Invert	Outlet Devices
#1	Primary	88.90'	12.0" x 10.0' long Culvert CPP, square edge headwall, Ke= 0.500 Outlet Invert= 88.75' S= 0.0150 '/' Cc= 0.900 n= 0.012
#2	Device 1	89.00'	3.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	89.95'	7.0" Vert. Orifice/Grate C= 0.600
#4	Primary	92.20'	6.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.77 cfs @ 12.54 hrs HW=90.40' (Free Discharge)

- 1=Culvert (Passes 0.77 cfs of 3.78 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.27 cfs @ 5.43 fps)
- 3=Orifice/Grate (Orifice Controls 0.50 cfs @ 2.28 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

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Type III 24-hr 10-Year Rainfall=4.45"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Existing ConditionsRunoff Area=337,494 sf Runoff Depth>1.92"
Flow Length=570' Tc=23.1 min CN=74 Runoff=10.95 cfs 1.242 af**Subcatchment P-1: West Area**Runoff Area=218,209 sf Runoff Depth>2.08"
Flow Length=351' Tc=19.8 min CN=76 Runoff=8.21 cfs 0.869 af**Subcatchment P-2: Central east area**Runoff Area=8,669 sf Runoff Depth>2.09"
Tc=5.0 min CN=76 Runoff=0.49 cfs 0.035 af**Subcatchment P-3: Northeast Area**Runoff Area=26,786 sf Runoff Depth>3.24"
Flow Length=330' Tc=10.0 min CN=89 Runoff=1.98 cfs 0.166 af**Subcatchment P-4: East area to infiltration trench**Runoff Area=15,343 sf Runoff Depth>2.50"
Flow Length=180' Tc=6.4 min CN=81 Runoff=1.00 cfs 0.073 af**Subcatchment P-5: Central east area to DB2**Runoff Area=9,113 sf Runoff Depth>2.86"
Flow Length=176' Tc=6.3 min CN=85 Runoff=0.68 cfs 0.050 af**Subcatchment P-6: South Area to DB2**Runoff Area=22,259 sf Runoff Depth>2.33"
Flow Length=285' Tc=3.9 min CN=79 Runoff=1.47 cfs 0.099 af**Subcatchment P-7: South Central area to DB2**Runoff Area=11,711 sf Runoff Depth>3.65"
Flow Length=133' Tc=8.8 min CN=93 Runoff=0.98 cfs 0.082 af**Subcatchment P-8: South Central area to DB2**Runoff Area=25,404 sf Runoff Depth>3.45"
Tc=5.0 min CN=91 Runoff=2.29 cfs 0.168 af**Reach E-CP: Control Point-Stream at PL**Inflow=10.95 cfs 1.242 af
Outflow=10.95 cfs 1.242 af**Reach P-CP: Control Point -Stream at PL**Inflow=10.45 cfs 1.477 af
Outflow=10.45 cfs 1.477 af**Pond DB1: Detention Basin #1**Peak Elev=93.70' Storage=2,913 cf Inflow=1.98 cfs 0.166 af
Outflow=0.76 cfs 0.139 af**Pond DB2: Detention Basin #2**Peak Elev=91.19' Storage=9,037 cf Inflow=6.72 cfs 0.507 af
Outflow=1.59 cfs 0.469 afTotal Runoff Area = 15.496 ac Runoff Volume = 2.784 af Average Runoff Depth = 2.16"
88.65% Pervious Area = 13.736 ac 11.35% Impervious Area = 1.759 ac

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Type III 24-hr 10-Year Rainfall=4.45"

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Subcatchment E-1: Existing Conditions

Runoff = 10.95 cfs @ 12.33 hrs, Volume= 1.242 af, Depth> 1.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
96,180	78	Wetlands
92,521	74	>75% Grass cover, Good, HSG C
5,881	98	Imp. Bldgs, Pavement
142,912	70	Woods, Good, HSG C
337,494	74	Weighted Average
331,613		Pervious Area
5,881		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	60	0.0200	0.15		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
4.8	280	0.0375	0.97		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.6	230	0.0174	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
23.1	570	Total			

Subcatchment P-1: West Area

Runoff = 8.21 cfs @ 12.28 hrs, Volume= 0.869 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
96,180	78	Wetlands
23,514	74	>75% Grass cover, Good, HSG C
13,949	98	Paved parking & roofs
84,566	70	Woods, Good, HSG C
218,209	76	Weighted Average
204,260		Pervious Area
13,949		Impervious Area

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Type III 24-hr 10-Year Rainfall=4.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	89	0.0250	0.18		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.5	62	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.9	200	0.0180	0.34		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
19.8	351	Total			

Subcatchment P-2: Central east area

Runoff = 0.49 cfs @ 12.08 hrs, Volume= 0.035 af, Depth> 2.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
7,924	74	>75% Grass cover, Good, HSG C
745	98	Paved parking & roofs
8,669	76	Weighted Average
7,924		Pervious Area
745		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-3: Northeast Area

Runoff = 1.98 cfs @ 12.14 hrs, Volume= 0.166 af, Depth> 3.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
11,211	79	50-75% Grass cover, Fair, HSG C
4,511	100	Det Basin
9,302	98	Paved parking & roofs
1,762	70	Woods, Good, HSG C
26,786	89	Weighted Average
12,973		Pervious Area
13,813		Impervious Area

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Type III 24-hr 10-Year Rainfall=4.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0300	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.4	230	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
10.0	330	Total			

Subcatchment P-4: East area to infiltration trench

Runoff = 1.00 cfs @ 12.10 hrs, Volume= 0.073 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
3,068	74	>75% Grass cover, Good, HSG C
5,529	98	Paved parking & roofs
6,746	70	Woods, Good, HSG C
15,343	81	Weighted Average
9,814		Pervious Area
5,529		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0800	0.29		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.2	20	0.0180	2.01		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	60	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.4	180	Total			

Subcatchment P-5: Central east area to DB2

Runoff = 0.68 cfs @ 12.09 hrs, Volume= 0.050 af, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
2,758	74	>75% Grass cover, Good, HSG C
4,623	98	Paved parking & roofs
1,732	70	Woods, Good, HSG C
9,113	85	Weighted Average
4,490		Pervious Area
4,623		Impervious Area

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Type III 24-hr 10-Year Rainfall=4.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0800	0.29		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.1	10	0.0167	1.94		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	66	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.3	176	Total			

Subcatchment P-6: South Area to DB2

Runoff = 1.47 cfs @ 12.06 hrs, Volume= 0.099 af, Depth> 2.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
10,347	74	>75% Grass cover, Good, HSG C
5,500	98	Paved parking & roofs
1,024	74	>75% Grass cover, Good, HSG C
5,388	70	Woods, Good, HSG C
22,259	79	Weighted Average
16,759		Pervious Area
5,500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	80	0.0330	1.56		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.00"
1.5	20	0.1000	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.5	185	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.9	285	Total			

Subcatchment P-7: South Central area to DB2

Runoff = 0.98 cfs @ 12.12 hrs, Volume= 0.082 af, Depth> 3.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
2,278	74	>75% Grass cover, Good, HSG C
9,433	98	Paved parking & roofs
11,711	93	Weighted Average
2,278		Pervious Area
9,433		Impervious Area

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Type III 24-hr 10-Year Rainfall=4.45"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0300	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.2	33	0.0250	3.21		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.8	133	Total			

Subcatchment P-8: South Central area to DB2

Runoff = 2.29 cfs @ 12.07 hrs, Volume= 0.168 af, Depth> 3.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.45"

Area (sf)	CN	Description
8,246	74	>75% Grass cover, Good, HSG C
7,521	98	Paved parking & roofs
8,135	100	Det Basin
1,502	100	Rain Garden
25,404	91	Weighted Average
8,246		Pervious Area
17,158		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Reach E-CP: Control Point-Stream at PL

Inflow Area = 7.748 ac, Inflow Depth > 1.92" for 10-Year event
 Inflow = 10.95 cfs @ 12.33 hrs, Volume= 1.242 af
 Outflow = 10.95 cfs @ 12.33 hrs, Volume= 1.242 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach P-CP: Control Point -Stream at PL

Inflow Area = 7.748 ac, Inflow Depth > 2.29" for 10-Year event
 Inflow = 10.45 cfs @ 12.29 hrs, Volume= 1.477 af
 Outflow = 10.45 cfs @ 12.29 hrs, Volume= 1.477 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Type III 24-hr 10-Year Rainfall=4.45"

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Pond DB1: Detention Basin #1

Inflow Area = 0.615 ac, Inflow Depth > 3.24" for 10-Year event
 Inflow = 1.98 cfs @ 12.14 hrs, Volume= 0.166 af
 Outflow = 0.76 cfs @ 12.45 hrs, Volume= 0.139 af, Atten= 62%, Lag= 18.5 min
 Primary = 0.76 cfs @ 12.45 hrs, Volume= 0.139 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 93.70' @ 12.45 hrs Surf.Area= 2,406 sf Storage= 2,913 cf

Plug-Flow detention time= 131.5 min calculated for 0.139 af (83% of inflow)
 Center-of-Mass det. time= 66.0 min (867.3 - 801.3)

Volume	Invert	Avail.Storage	Storage Description
#1	92.20'	5,103 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.20	1,553	0	0
92.80	1,824	1,013	1,013
93.00	1,953	378	1,391
94.00	2,602	2,278	3,668
94.50	3,136	1,435	5,103

Device	Routing	Invert	Outlet Devices
#1	Primary	94.25'	6.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	92.10'	12.0" x 73.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 91.73' S= 0.0051 '/ Cc= 0.900 n= 0.011 Concrete pipe, straight & clean
#3	Device 2	92.80'	6.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.76 cfs @ 12.45 hrs HW=93.70' (Free Discharge)

- 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- 2=Culvert (Passes 0.76 cfs of 3.13 cfs potential flow)
- 3=Orifice/Grate (Orifice Controls 0.76 cfs @ 3.88 fps)

Pond DB2: Detention Basin #2

Inflow Area = 2.123 ac, Inflow Depth > 2.86" for 10-Year event
 Inflow = 6.72 cfs @ 12.08 hrs, Volume= 0.507 af
 Outflow = 1.59 cfs @ 12.50 hrs, Volume= 0.469 af, Atten= 76%, Lag= 24.8 min
 Primary = 1.59 cfs @ 12.50 hrs, Volume= 0.469 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 91.19' @ 12.50 hrs Surf.Area= 5,454 sf Storage= 9,037 cf

Plug-Flow detention time= 136.1 min calculated for 0.469 af (93% of inflow)

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Type III 24-hr 10-Year Rainfall=4.45"

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Center-of-Mass det. time= 97.7 min (904.1 - 806.4)

Volume	Invert	Avail.Storage	Storage Description
#1	89.00'	17,722 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
89.00	3,003	0	0
90.00	3,981	3,492	3,492
91.00	5,124	4,553	8,045
92.00	6,884	6,004	14,049
92.25	7,500	1,798	15,847
92.50	7,500	1,875	17,722

Device	Routing	Invert	Outlet Devices
#1	Primary	88.90'	12.0" x 10.0' long Culvert CPP, square edge headwall, Ke= 0.500 Outlet Invert= 88.75' S= 0.0150 '/' Cc= 0.900 n= 0.012
#2	Device 1	89.00'	3.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	89.95'	7.0" Vert. Orifice/Grate C= 0.600
#4	Primary	92.20'	6.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=1.59 cfs @ 12.50 hrs HW=91.19' (Free Discharge)

- 1=Culvert (Passes 1.59 cfs of 5.06 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.34 cfs @ 6.91 fps)
- 3=Orifice/Grate (Orifice Controls 1.25 cfs @ 4.68 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

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Type III 24-hr 100-Year Rainfall=6.50"

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Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Existing Conditions Runoff Area=337,494 sf Runoff Depth>3.59"
Flow Length=570' Tc=23.1 min CN=74 Runoff=20.77 cfs 2.320 af

Subcatchment P-1: West Area Runoff Area=218,209 sf Runoff Depth>3.80"
Flow Length=351' Tc=19.8 min CN=76 Runoff=15.14 cfs 1.587 af

Subcatchment P-2: Central east area Runoff Area=8,669 sf Runoff Depth>3.81"
Tc=5.0 min CN=76 Runoff=0.89 cfs 0.063 af

Subcatchment P-3: Northeast Area Runoff Area=26,786 sf Runoff Depth>5.21"
Flow Length=330' Tc=10.0 min CN=89 Runoff=3.11 cfs 0.267 af

Subcatchment P-4: East area to infiltration trench Runoff Area=15,343 sf Runoff Depth>4.34"
Flow Length=180' Tc=6.4 min CN=81 Runoff=1.72 cfs 0.127 af

Subcatchment P-5: Central east area to DB2 Runoff Area=9,113 sf Runoff Depth>4.77"
Flow Length=176' Tc=6.3 min CN=85 Runoff=1.11 cfs 0.083 af

Subcatchment P-6: South Area to DB2 Runoff Area=22,259 sf Runoff Depth>4.13"
Flow Length=285' Tc=3.9 min CN=79 Runoff=2.60 cfs 0.176 af

Subcatchment P-7: South Central area to DB2 Runoff Area=11,711 sf Runoff Depth>5.67"
Flow Length=133' Tc=8.8 min CN=93 Runoff=1.49 cfs 0.127 af

Subcatchment P-8: South Central area to DB2 Runoff Area=25,404 sf Runoff Depth>5.44"
Tc=5.0 min CN=91 Runoff=3.52 cfs 0.265 af

Reach E-CP: Control Point-Stream at PL Inflow=20.77 cfs 2.320 af
Outflow=20.77 cfs 2.320 af

Reach P-CP: Control Point -Stream at PL Inflow=18.20 cfs 2.609 af
Outflow=18.20 cfs 2.609 af

Pond DB1: Detention Basin #1 Peak Elev=94.25' Storage=4,363 cf Inflow=3.11 cfs 0.267 af
Outflow=1.04 cfs 0.239 af

Pond DB2: Detention Basin #2 Peak Elev=92.19' Storage=15,401 cf Inflow=10.99 cfs 0.841 af
Outflow=2.21 cfs 0.783 af

Total Runoff Area = 15.496 ac Runoff Volume = 5.015 af Average Runoff Depth = 3.88"
88.65% Pervious Area = 13.736 ac 11.35% Impervious Area = 1.759 ac

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Type III 24-hr 100-Year Rainfall=6.50"

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Subcatchment E-1: Existing Conditions

Runoff = 20.77 cfs @ 12.32 hrs, Volume= 2.320 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
96,180	78	Wetlands
92,521	74	>75% Grass cover, Good, HSG C
5,881	98	Imp. Bldgs, Pavement
142,912	70	Woods, Good, HSG C
337,494	74	Weighted Average
331,613		Pervious Area
5,881		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	60	0.0200	0.15		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
4.8	280	0.0375	0.97		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
11.6	230	0.0174	0.33		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
23.1	570	Total			

Subcatchment P-1: West Area

Runoff = 15.14 cfs @ 12.27 hrs, Volume= 1.587 af, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
96,180	78	Wetlands
23,514	74	>75% Grass cover, Good, HSG C
13,949	98	Paved parking & roofs
84,566	70	Woods, Good, HSG C
218,209	76	Weighted Average
204,260		Pervious Area
13,949		Impervious Area

Northern Avenue Housing-Active

Type III 24-hr 100-Year Rainfall=6.50"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	89	0.0250	0.18		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.5	62	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
9.9	200	0.0180	0.34		Shallow Concentrated Flow, Forest w/Heavy Litter Kv= 2.5 fps
19.8	351	Total			

Subcatchment P-2: Central east area

Runoff = 0.89 cfs @ 12.08 hrs, Volume= 0.063 af, Depth> 3.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
7,924	74	>75% Grass cover, Good, HSG C
745	98	Paved parking & roofs
8,669	76	Weighted Average
7,924		Pervious Area
745		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Subcatchment P-3: Northeast Area

Runoff = 3.11 cfs @ 12.14 hrs, Volume= 0.267 af, Depth> 5.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
11,211	79	50-75% Grass cover, Fair, HSG C
4,511	100	Det Basin
9,302	98	Paved parking & roofs
1,762	70	Woods, Good, HSG C
26,786	89	Weighted Average
12,973		Pervious Area
13,813		Impervious Area

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Type III 24-hr 100-Year Rainfall=6.50"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0300	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.4	230	0.0330	2.72		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
10.0	330	Total			

Subcatchment P-4: East area to infiltration trench

Runoff = 1.72 cfs @ 12.10 hrs, Volume= 0.127 af, Depth> 4.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
3,068	74	>75% Grass cover, Good, HSG C
5,529	98	Paved parking & roofs
6,746	70	Woods, Good, HSG C
15,343	81	Weighted Average
9,814		Pervious Area
5,529		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0800	0.29		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.2	20	0.0180	2.01		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	60	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.4	180	Total			

Subcatchment P-5: Central east area to DB2

Runoff = 1.11 cfs @ 12.09 hrs, Volume= 0.083 af, Depth> 4.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
2,758	74	>75% Grass cover, Good, HSG C
4,623	98	Paved parking & roofs
1,732	70	Woods, Good, HSG C
9,113	85	Weighted Average
4,490		Pervious Area
4,623		Impervious Area

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Type III 24-hr 100-Year Rainfall=6.50"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0800	0.29		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.1	10	0.0167	1.94		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
0.4	66	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
6.3	176	Total			

Subcatchment P-6: South Area to DB2

Runoff = 2.60 cfs @ 12.06 hrs, Volume= 0.176 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
10,347	74	>75% Grass cover, Good, HSG C
5,500	98	Paved parking & roofs
1,024	74	>75% Grass cover, Good, HSG C
5,388	70	Woods, Good, HSG C
22,259	79	Weighted Average
16,759		Pervious Area
5,500		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	80	0.0330	1.56		Sheet Flow, Smooth surfaces n= 0.011 P2= 3.00"
1.5	20	0.1000	0.23		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
1.5	185	0.0200	2.12		Shallow Concentrated Flow, Grassed Waterway Kv= 15.0 fps
3.9	285	Total			

Subcatchment P-7: South Central area to DB2

Runoff = 1.49 cfs @ 12.12 hrs, Volume= 0.127 af, Depth> 5.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
2,278	74	>75% Grass cover, Good, HSG C
9,433	98	Paved parking & roofs
11,711	93	Weighted Average
2,278		Pervious Area
9,433		Impervious Area

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Type III 24-hr 100-Year Rainfall=6.50"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	100	0.0300	0.19		Sheet Flow, Grass: Short n= 0.150 P2= 3.00"
0.2	33	0.0250	3.21		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.8	133	Total			

Subcatchment P-8: South Central area to DB2

Runoff = 3.52 cfs @ 12.07 hrs, Volume= 0.265 af, Depth> 5.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
8,246	74	>75% Grass cover, Good, HSG C
7,521	98	Paved parking & roofs
8,135	100	Det Basin
1,502	100	Rain Garden
25,404	91	Weighted Average
8,246		Pervious Area
17,158		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

Reach E-CP: Control Point-Stream at PL

Inflow Area = 7.748 ac, Inflow Depth > 3.59" for 100-Year event
 Inflow = 20.77 cfs @ 12.32 hrs, Volume= 2.320 af
 Outflow = 20.77 cfs @ 12.32 hrs, Volume= 2.320 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Reach P-CP: Control Point -Stream at PL

Inflow Area = 7.748 ac, Inflow Depth > 4.04" for 100-Year event
 Inflow = 18.20 cfs @ 12.28 hrs, Volume= 2.609 af
 Outflow = 18.20 cfs @ 12.28 hrs, Volume= 2.609 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

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Pond DB1: Detention Basin #1

Inflow Area = 0.615 ac, Inflow Depth > 5.21" for 100-Year event
 Inflow = 3.11 cfs @ 12.14 hrs, Volume= 0.267 af
 Outflow = 1.04 cfs @ 12.49 hrs, Volume= 0.239 af, Atten= 66%, Lag= 21.1 min
 Primary = 1.04 cfs @ 12.49 hrs, Volume= 0.239 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 94.25' @ 12.48 hrs Surf.Area= 2,873 sf Storage= 4,363 cf

Plug-Flow detention time= 112.6 min calculated for 0.239 af (90% of inflow)
 Center-of-Mass det. time= 63.1 min (851.5 - 788.4)

Volume	Invert	Avail.Storage	Storage Description
#1	92.20'	5,103 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.20	1,553	0	0
92.80	1,824	1,013	1,013
93.00	1,953	378	1,391
94.00	2,602	2,278	3,668
94.50	3,136	1,435	5,103

Device	Routing	Invert	Outlet Devices
#1	Primary	94.25'	6.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	92.10'	12.0" x 73.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 91.73' S= 0.0051 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean
#3	Device 2	92.80'	6.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=1.04 cfs @ 12.49 hrs HW=94.25' (Free Discharge)

1=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.14 fps)

2=Culvert (Passes 1.04 cfs of 3.84 cfs potential flow)

3=Orifice/Grate (Orifice Controls 1.04 cfs @ 5.28 fps)

Pond DB2: Detention Basin #2

Inflow Area = 2.123 ac, Inflow Depth > 4.75" for 100-Year event
 Inflow = 10.99 cfs @ 12.08 hrs, Volume= 0.841 af
 Outflow = 2.21 cfs @ 12.52 hrs, Volume= 0.783 af, Atten= 80%, Lag= 26.6 min
 Primary = 2.21 cfs @ 12.52 hrs, Volume= 0.783 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 92.19' @ 12.52 hrs Surf.Area= 7,352 sf Storage= 15,401 cf

Plug-Flow detention time= 123.6 min calculated for 0.783 af (93% of inflow)

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Type III 24-hr 100-Year Rainfall=6.50"

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Center-of-Mass det. time= 87.4 min (880.9 - 793.5)

Volume	Invert	Avail.Storage	Storage Description
#1	89.00'	17,722 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

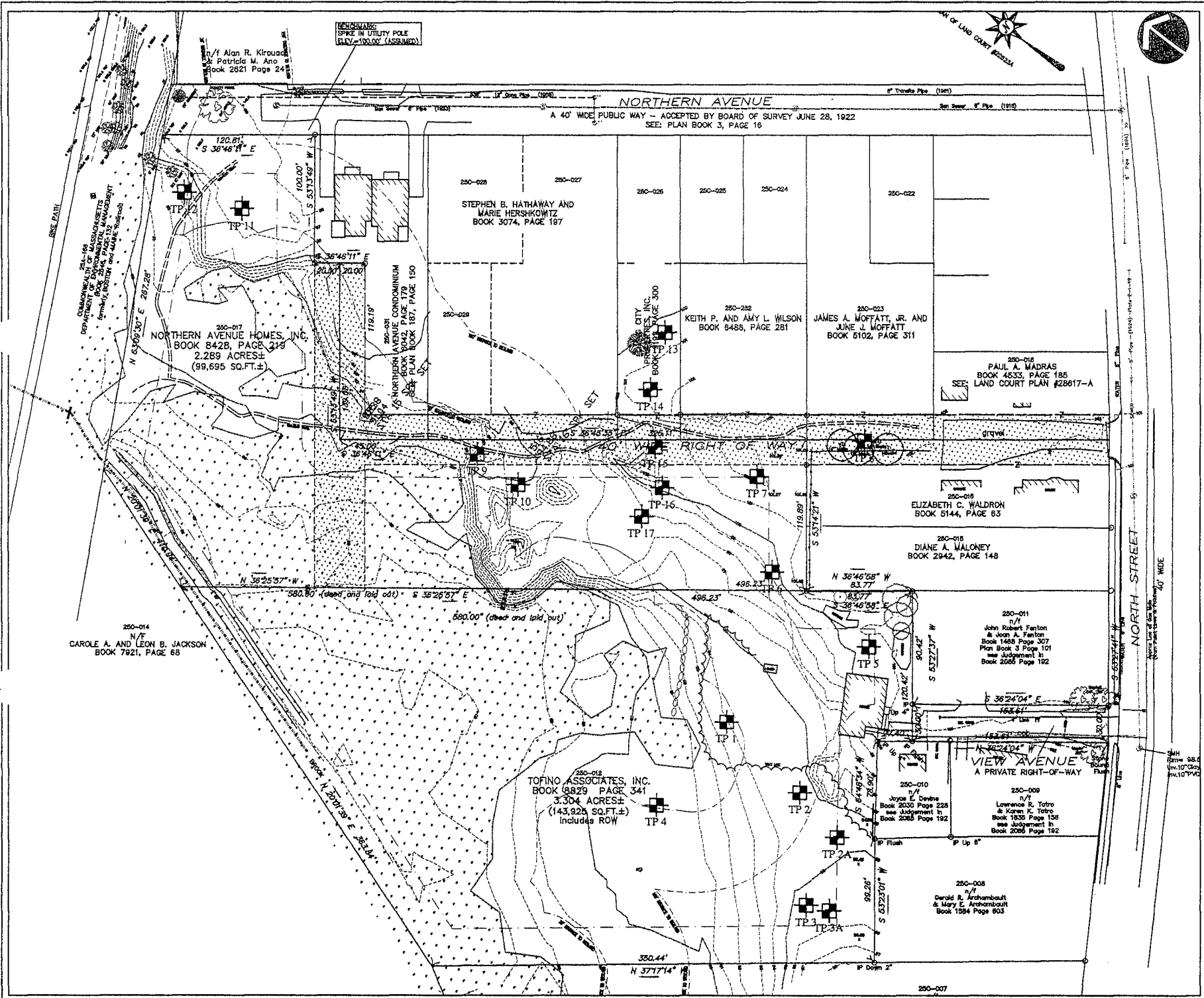
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
89.00	3,003	0	0
90.00	3,981	3,492	3,492
91.00	5,124	4,553	8,045
92.00	6,884	6,004	14,049
92.25	7,500	1,798	15,847
92.50	7,500	1,875	17,722

Device	Routing	Invert	Outlet Devices
#1	Primary	88.90'	12.0" x 10.0' long Culvert CPP, square edge headwall, Ke= 0.500 Outlet Invert= 88.75' S= 0.0150 '/' Cc= 0.900 n= 0.012
#2	Device 1	89.00'	3.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	89.95'	7.0" Vert. Orifice/Grate C= 0.600
#4	Primary	92.20'	6.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=2.21 cfs @ 12.52 hrs HW=92.19' (Free Discharge)

- 1=Culvert (Passes 2.21 cfs of 6.31 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.41 cfs @ 8.43 fps)
- 3=Orifice/Grate (Orifice Controls 1.80 cfs @ 6.72 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Appendix B – Soil Test Pit Information

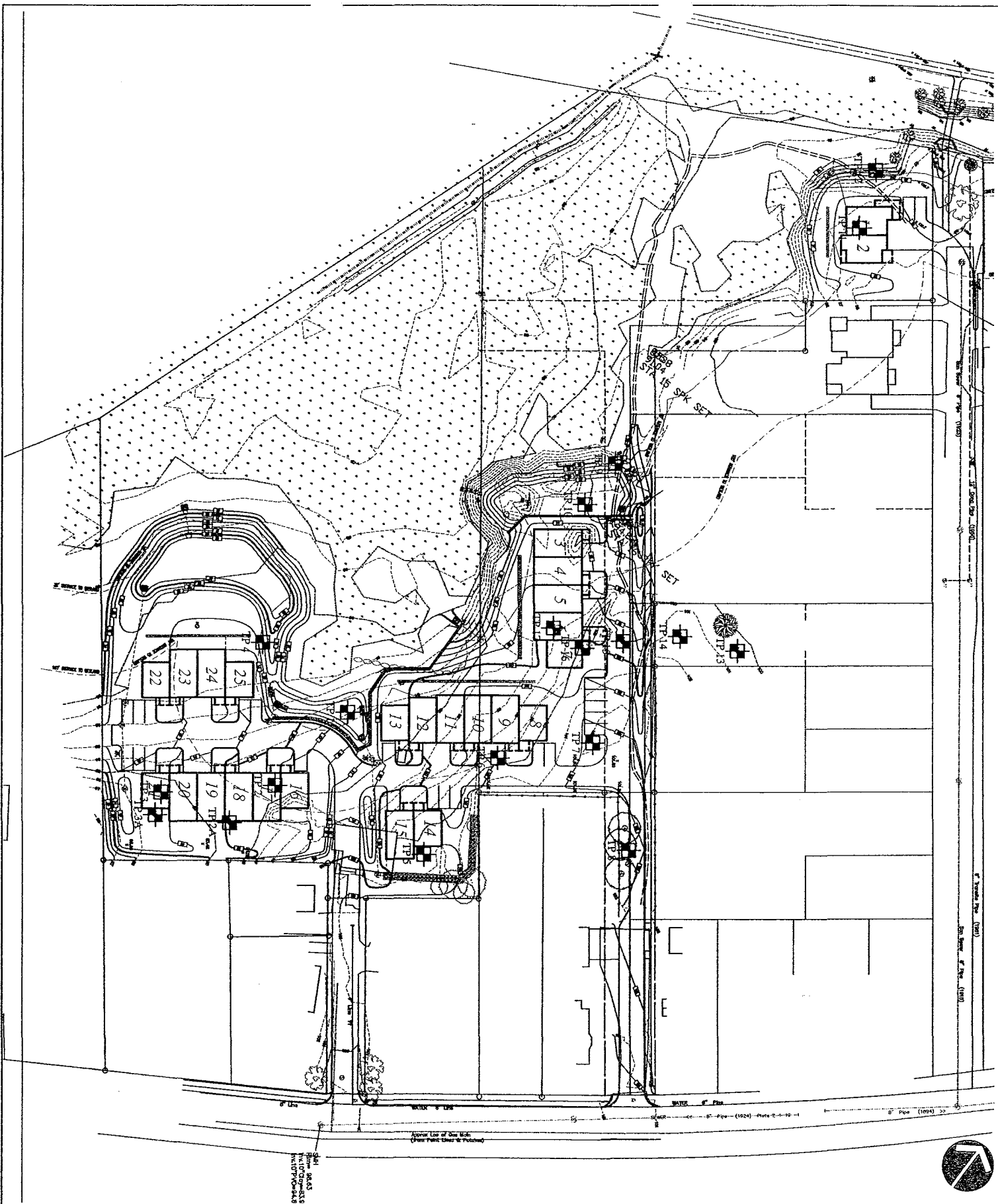


Sheet: **TP1**

Reference:
Date: 11/11/08
Scale: 1"=100'

Figure Title:
Test Pit Location Map (existing conditions)
NORTHERN AVENUE HOUSING
NORTHAMPTON MASSACHUSETTS

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Figure Title:
 Test Pit Location Map (proposed conditions)
NORTHERN AVENUE HOUSING
 NORTHAMPTON MASSACHUSETTS

Reference:
 Date: 11/11/08
 Scale: 1"=100'

Sheet:
TP2



Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By: _____
 Deep Hole Number TP 1 Date: 01/05/07 Time: 9:15am Weather Clear 10 F

Location (identify on site plan) See Plan

Land Use Lawn Area Slope (%) See Plan Surface Stones n/o

Vegetation grass & some trees

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____	Feet	Drainage way _____	Feet
Possible Wet Area _____	Feet	Property Line _____	Feet
Drinking Water Well _____	Feet	Other _____	

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-9"	A	VFSL	10YR3/3	5Y 4/6 <5%	Massive, Friable, roots
9"-21"	B _w	VFSL	2.5Y4/4	5YR4/6 >10% @18"	Massive, Friable
21"-53"	C ₁	VFSL/ Loam	5Y5/2	5YR4/6 >35%	Massive, friable, stratified FS & Loam, some smearing, somewhat firm
53"-80"	C ₂	SL	10YR4/4	2.5YR3/6 >35% throughout	Massive, friable, sloughing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glaciolacustrine Depth to Bedrock: > 80"

Depth to Groundwater: Standing Water in the Hole: 57" @ 15 minutes Weeping from Pit Face: 55"

Estimated Seasonal High Ground Water: 18"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
 Deep Hole Number TP 2 Date: 01/05/07 Time: 9:40am Weather Clear 10 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Norway Spruce

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**
 Open Water Body _____ Feet Drainage way _____ Feet
 Possible Wet Area _____ Feet Property Line _____ Feet
 Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-12"	A	VFSL	10YR3/3	5Y 4/6 <5%	Massive, Friable, some roots, apparent fill at south end of TP down to 36"
12"-19"	B _w	VFSL	2.5Y4/4	5YR4/6 >10% @18"	Massive, Friable
19"-45"	C ₁	VFSL/ Loam	5Y5/2	5YR4/6 >35%	Massive, friable, some smearing, somewhat firm, excavation collapsed

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glaciolacustrine Depth to Bedrock: > 45"

Depth to Groundwater: Standing Water in the Hole: 40" Weeping from Pit Face: _____

Estimated Seasonal High Ground Water: 18"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 2A Date: 10/31/07 Time: 9:00am Weather P-Cloudy 40 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Norway Spruce

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**
Open Water Body _____ Feet Drainage way _____ Feet
Possible Wet Area _____ Feet Property Line _____ Feet
Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-10"	A	VFSL	10YR3/3	5Y 4/6 <5%	Massive, Friable, some roots
10"-30"	B _w	VFSL	2.5Y4/4	5YR4/6 >10% @22"	Massive, Friable, roots to 21"
30"-70"	C ₁	VFSL/ Loam	5Y5/2	5YR4/6 >35%	Massive, friable, some smearing, somewhat firm, excavation collapsed, fine sand in lower 12"

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glaciolacustrine Depth to Bedrock: > 70"

Depth to Groundwater: Standing Water in the Hole: 66" @ 10 minutes Weeping from Pit Face: 66" (rapid)

Estimated Seasonal High Ground Water: 22"

Percolation Test:

Depth to Perc:
Start Pre-Soak 12":
End Pre-Soak 12":
Time at 12":
Time at 9":
Time at 6":
Time (9"-6"):
Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By: _____

Deep Hole Number TP 3 Date: 01/05/07 Time: 10:10am Weather Clear 10 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Norway Spruce

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body	_____	Feet	Drainage way	_____	Feet
Possible Wet Area	_____	Feet	Property Line	_____	Feet
Drinking Water Well	_____	Feet	Other	_____	_____

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-9"	A	VFSL	10YR3/3		Massive, Friable, roots
9"-15"	B _w	VFSL	2.5Y4/4		Massive, Friable, roots
15"-50"	C ₁	VFSL/ Loam	5Y5/2	5YR4/6 >15% @ 20"	Massive, friable, sloughing, stratified FSL & Fine Sand
50"-65"	C ₂	Fine Sand	10YR4/4	2.5YR3/6 >35% throughout	Massive, friable, sloughing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glaciolacustrine Depth to Bedrock: > 65"

Depth to Groundwater: Standing Water in the Hole: 61" Weeping from Pit Face: 55"

Estimated Seasonal High Ground Water: 20"

Percolation Test:

Depth to Perc: _____

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12": _____

Time at 9": _____

Time at 6": _____

Time (9"-6"): _____

Rate: _____

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By: _____

Deep Hole Number TP 3A Date: 10/31/08 Time: 9:30am Weather Clear 10 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Norway Spruce

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____ Feet Drainage way _____ Feet

Possible Wet Area _____ Feet Property Line _____ Feet

Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-7"	A	VFSL	10YR3/3		Massive, Friable, roots
7"-15"	B _w	VFSL	2.5Y4/4		Massive, Friable, roots
15"-70"	C ₁	VFSL/ Loam	5Y5/2	5YR4/6 >15% @ 30"	Massive, friable, roots down to 20", sloughing, stratified FSL & Fine Sand, fine sand at pit bottom, excavation collapsed

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glaciolacustrine Depth to Bedrock: > 70"

Depth to Groundwater: Standing Water in the Hole: 67" @ 5 minutes Weeping from Pit Face: 64" (moderate)

Estimated Seasonal High Ground Water: 30"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
 Deep Hole Number TP 4 Date: 01/05/07 Time: 4:00pm Weather Cloudy 10 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Norway Spruce

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body	_____ Feet	Drainage way	_____ Feet
Possible Wet Area	_____ Feet	Property Line	_____ Feet
Drinking Water Well	_____ Feet	Other	_____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-5"	A	VFSL	10YR3/3	5Y 4/6 <5%	Massive, Friable, roots
5"-15"	B _w	VFSL	2.5Y4/4	5YR4/6 <5% @18"	Massive, Friable, Roots down to 18"
15"-65"	C ₁	FSL	5Y5/2	5YR4/6 >10% @28"	Massive, friable, stratified FSL & Fine Sand, some smearing, somewhat firm

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glaciolacustrine Depth to Bedrock: > 65"

Depth to Groundwater: Standing Water in the Hole: 51" Weeping from Pit Face: 48"

Estimated Seasonal High Ground Water: 28"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 5 Date: 01/05/07 Time: 3:00pm Weather Clear 10 F

Location (identify on site plan) See Plan

Land Use Lawn Area Slope (%) See Plan Surface Stones n/o

Vegetation grass

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body	_____ Feet	Drainage way	_____ Feet
Possible Wet Area	_____ Feet	Property Line	_____ Feet
Drinking Water Well	_____ Feet	Other	_____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-9"	A	VFSL	10YR3/3		Massive, Friable, roots
9"-21"	B _w	VFSL	2.5Y4/4		Massive, Friable
21"-107"	C ₁	VFSL/ Loam	5Y5/2	5YR4/6 >10% @60"	Massive, friable, no cobbles or gravel, stratified VFSL & Fine Sand, some smearing,

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) glaciolacustrine Depth to Bedrock: > 107"

Depth to Groundwater: Standing Water in the Hole: 92" Weeping from Pit Face: 92"

Estimated Seasonal High Ground Water: 60"

Percolation Test:

Depth to Perc: 45"
Start Pre-Soak 12": 3:14
End Pre-Soak 12": 3:36 (8 gals used)
Time at 12": 3:36
Time at 9": 3:42
Time at 6": 4:00
Time (9"-6"): 18 minutes
Rate: 6 min/inch

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 6 Date: 01/05/07 Time: 11:10am Weather Clear 10 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body	_____	Feet	Drainage way	_____	Feet
Possible Wet Area	_____	Feet	Property Line	_____	Feet
Drinking Water Well	_____	Feet	Other	_____	

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-8"	A	Forest Mat	10YR3/3		Massive, Friable, roots
8"-29"	B _w	VFSL	2.5Y4/4		Massive, Friable
29"-88"	C ₁	FSL	5Y5/2	5YR4/6 Distinct >5% @38"	Massive, friable, stratified FSL and Fine Sand, roots throughout, sloughing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 88"

Depth to Groundwater: Standing Water in the Hole: 79" Weeping from Pit Face: 67" (slow)

Estimated Seasonal High Ground Water: 38"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By: _____
 Deep Hole Number TP 7 Date: 01/05/07 Time: 11:45am Weather Clear 10 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**
 Open Water Body _____ Feet Drainage way _____ Feet
 Possible Wet Area _____ Feet Property Line _____ Feet
 Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-8"	A	Forest Mat	10YR3/3		Massive, Friable, roots
8"-19"	B _w	VFSL	2.5Y4/4		Massive, Friable
19"-90"	C ₁	FSL	2.5Y5/3	5YR4/6 Distinct >5% @58"	Massive, friable, stratified FSL and Fine Sand, roots down to 31", sloughing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 90"
 Depth to Groundwater: Standing Water in the Hole: 84" Weeping from Pit Face: 84" (slow)
 Estimated Seasonal High Ground Water: 58"

Percolation Test:
 Depth to Perc: 46"
 Start Pre-Soak 12": 12:18
 End Pre-Soak 12": 12:33 (18 gals used)
 Time at 12": 12:33
 Time at 9": 12:36
 Time at 6": 12:41
 Time (9"-6"): 5 minutes
 Rate: < 2 min/inch

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
 Deep Hole Number TP 8 Date: 01/05/07 Time: 1:45pm Weather P-cloudy 10 F

Location (identify on site plan) See Plan

Land Use Old roadway Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____ Feet	Drainage way _____ Feet
Possible Wet Area _____ Feet	Property Line _____ Feet
Drinking Water Well _____ Feet	Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-15"	Fill				Roadway bed, strong staining at fill/C1 interface (variegated colors)
15"-95"	C ₁	VFSL	2.5Y4/4	5YR4/6 Distinct >5% @60"	Massive, Friable, stratified FSL and Fine Sand

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 108"
 Depth to Groundwater: Standing Water in the Hole: 90" Weeping from Pit Face: 69" (slow)
 Estimated Seasonal High Ground Water: 60"

Percolation Test:

Depth to Perc: 49"
Start Pre-Soak 12": 2:10
End Pre-Soak 12": 2:25 (10 gals used)
Time at 12": 2:25
Time at 9": 2:30
Time at 6": 2:36
Time (9"-6"): 6 minutes
Rate: 2 min/inch

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 9 Date: 01/05/07 Time: 1:20pm Weather P-cloudy 10 F

Location (identify on site plan) See Plan

Land Use Old roadway Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____ Feet Drainage way _____ Feet
Possible Wet Area _____ Feet Property Line _____ Feet
Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-42"	Fill				Silty sand, debris, concrete, brick

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) _____ Depth to Bedrock: > 42"

Depth to Groundwater: Standing Water in the Hole: 36" Weeping from Pit Face: _____

Estimated Seasonal High Ground Water: 36"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 10 Date: 01/05/07 Time: 1:30pm Weather P-cloudy 10 F

Location (identify on site plan) See Plan

Land Use wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____ Feet Drainage way _____ Feet

Possible Wet Area _____ Feet Property Line _____ Feet

Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-65"	Fill				Silty sand, debris, concrete, brick

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) _____ Depth to Bedrock: > 65"

Depth to Groundwater: Standing Water in the Hole: 60" Weeping from Pit Face: 58"

Estimated Seasonal High Ground Water: 58"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 11 Date: 01/06/07 Time: 9:00am Weather P-cloudy 10 F

Location (identify on site plan) See Plan

Land Use wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body	_____	Feet	Drainage way	_____	Feet
Possible Wet Area	_____	Feet	Property Line	_____	Feet
Drinking Water Well	_____	Feet	Other	_____	

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-25"	Fill ₁	FSL	Brwn		Massive, Friable, roots
25"-105"	Fill ₂	FSL	Drk. Brwn		10% cobbles and gravel, some glass and debris @ 100"

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) _____ Depth to Bedrock: > 105"

Depth to Groundwater: Standing Water in the Hole: 96" Weeping from Pit Face: 92" (rapid)

Estimated Seasonal High Ground Water: _____

Percolation Test:

Depth to Perc:
Start Pre-Soak 12":
End Pre-Soak 12":
Time at 12":
Time at 9":
Time at 6":
Time (9"-6"):
Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 12 Date: 01/06/07 Time: 9:00am Weather P-cloudy 10 F

Location (identify on site plan) See Plan

Land Use wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____ Feet Drainage way _____ Feet
Possible Wet Area _____ Feet Property Line _____ Feet
Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-36"	Fill	FSL	Brwn		Loose, Friable, some stones, asphalt
36"-46"	Ap/Bw	FSL	Drk. Brwn/ Brown		10% cobbles and gravel, some glass and debris @ 100"
46"-64"	C ₁	FSL	5Y5/2	5YR4/6 Distinct >5% @38"	Massive, friable, stratified FSL and Fine Sand, roots throughout, sloughing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) _____ Depth to Bedrock: > 64"

Depth to Groundwater: Standing Water in the Hole: 55" Weeping from Pit Face: 50"

Estimated Seasonal High Ground Water: _____

Percolation Test:

Depth to Perc: _____

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate: _____

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By: _____

Deep Hole Number TP 13 Date: 10/31/07 Time: 11:50am Weather P-Cloudy 45 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____	Feet	Drainage way _____	Feet
Possible Wet Area _____	Feet	Property Line _____	Feet
Drinking Water Well _____	Feet	Other _____	

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-4"	A	FSL			Topsoil, Grass, roots
4"-15"	B _w	VFSL	2.5Y4/4		Massive, Friable
15"-68"	C ₁	LS	2.5Y5/3	5YR4/6 Distinct >5% @54"	Massive, friable, some stratified FSL and Fine Sand, roots down to 24", sloughing
68"-108"	C ₂	LS	5Y4/2	7.5YR5/6 >10% throughout	Mass, firm, some smearing
108"-114"	C ₃	SL	5Y4/2	7.5YR5/6 >10% throughout	Mass, firm, smearing, wet, pockets of loam

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 114"

Depth to Groundwater: Standing Water in the Hole: n/o Weeping from Pit Face: 96"

Estimated Seasonal High Ground Water: 54"

Percolation Test:

Depth to Perc:
 Start Pre-Soak 12":
 End Pre-Soak 12":
 Time at 12":
 Time at 9":
 Time at 6":
 Time (9"-6"):
 Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
 Deep Hole Number TP 14 Date: 10/31/07 Time: 10:45am Weather P-Cloudy 45 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____	Feet	Drainage way _____	Feet
Possible Wet Area _____	Feet	Property Line _____	Feet
Drinking Water Well _____	Feet	Other _____	

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-8"	A	Forest Mat	10YR3/3		Massive, Friable, roots
8"-19"	B _w	VFSL	2.5Y4/4		Massive, Friable
19"-87"	C ₁	FLS	2.5Y5/3	5YR4/6 Distinct >5% @75"	Massive, friable, some stratified FSL and Fine Sand, roots down to 24", sloughing
87-112"	C ₂	FLS	5Y4/2	7.5YR5/6 >10% (from excavator bucket)	Mass, firmer than C1, Wet, smearing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 112"
 Depth to Groundwater: Standing Water in the Hole: n/o Weeping from Pit Face: n/o
 Estimated Seasonal High Ground Water: 75"

Percolation Test:

Depth to Perc: 42"
Start Pre-Soak 12": 11:01
End Pre-Soak 12": 11:16 (18 gals used)
Time at 12": 11:16
Time at 9": 11:18
Time at 6": 11:21
Time (9"-6"): 3 minutes
Rate: < 2 min/inch

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
 Deep Hole Number TP 15 Date: 10/31/07 Time: 1:00pm Weather P-Cloudy 45 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____ Feet	Drainage way _____ Feet
Possible Wet Area _____ Feet	Property Line _____ Feet
Drinking Water Well _____ Feet	Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-20"	Fill				Massive, Friable, roots
20"-64"	C ₁	FLS	2.5Y5/3	5YR4/6 Distinct >5% @68"	Massive, friable, some stratified FSL and Fine Sand, roots down to 24", sloughing
64"-106"	C ₂	FLS	5Y4/2	7.5YR5/6 >10% (from excavator bucket)	Mass, firmer than C1, Wet, smearing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 106"

Depth to Groundwater: Standing Water in the Hole: n/o Weeping from Pit Face: n/o

Estimated Seasonal High Ground Water: 68"

Percolation Test:

Depth to Perc:
Start Pre-Soak 12":
End Pre-Soak 12":
Time at 12":
Time at 9":
Time at 6":
Time (9"-6"):
Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 16 Date: 10/31/07 Time: 12:50am Weather P-Cloudy 45 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body	_____	Feet	Drainage way	_____	Feet
Possible Wet Area	_____	Feet	Property Line	_____	Feet
Drinking Water Well	_____	Feet	Other	_____	

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-31"	Fill				Fill over 2" thick macadam layer @ 31"
31"-50"	C ₁	FSL	10YR5/8		Massive, friable, some stratified FSL and Fine Sand, roots down to 24", sloughing
50"-90"	C ₂	LS	5Y4/2	7.5YR5/6 >10% throughout	Mass, firm, some smearing

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 90"
Depth to Groundwater: Standing Water in the Hole: n/o Weeping from Pit Face: n/o
Estimated Seasonal High Ground Water: 50"

Percolation Test:

Depth to Perc:
Start Pre-Soak 12":
End Pre-Soak 12":
Time at 12":
Time at 9":
Time at 6":
Time (9"-6"):
Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Location Address or Lot No. Northern Avenue, Northampton, MA

Test Pits

Performed By M.D'Urso, The Berkshire Design Group Witnessed By:
Deep Hole Number TP 17 Date: 10/31/07 Time: 1:30pm Weather P-Cloudy 45 F

Location (identify on site plan) See Plan

Land Use Wooded Slope (%) See Plan Surface Stones n/o

Vegetation Mixed deciduous and evergreen

Landform _____

Position on Landscape (sketch on back) _____

Distances from: **See Plan**

Open Water Body _____ Feet Drainage way _____ Feet

Possible Wet Area _____ Feet Property Line _____ Feet

Drinking Water Well _____ Feet Other _____ Feet

DEEP OBSERVATION HOLE LOG *					
Depth from Surface(Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-46"	Fill	Silty Sand			Few bricks, cobbles, plastic, roots (new growth)
46"-59"	C ₁	LS	2.5Y5/3	5YR4/6 Distinct >10% throughout	Massive, friable, some stratified FSL and Fine Sand, roots down to 24", sloughing
59"-108"	C ₂	SL	5Y4/2	7.5YR5/6 >35% throughout	Massive, firm, some pockets of loam, smearing, wet @ bottom

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) Glaciolacustrine Depth to Bedrock: > 108"

Depth to Groundwater: Standing Water in the Hole: 6" @ 30 minutes Weeping from Pit Face: 95"

Estimated Seasonal High Ground Water: 54"

Percolation Test:

Depth to Perc:

Start Pre-Soak 12":

End Pre-Soak 12":

Time at 12":

Time at 9":

Time at 6":

Time (9"-6"):

Rate:

Note: This test pit was performed for investigation of general soil conditions and should not be used for purposes related to Title 5 and/or soil suitability assessments for on-site sewage disposal.

Appendix C – TSS Removal Summary



INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Treatment Train 1 for P-3

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	Infiltration Basin	0.80	0.75	0.60	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15

Total TSS Removal =

85%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Northern Avenue, Northampton, MA
 Prepared By: Brian Darnold
 Date: 11/11/2008

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1



The
Berkshire
Design
Group, Inc.

4 Allen Place
Northampton, Massachusetts 01060

Landscape Architecture
Civil Engineering
Planning
Urban Design
Environmental Services

JOB Northern Avenue

SHEET NUMBER 2

CALCULATED BY BCD

CHECKED BY _____

SCALE _____

OF _____

DATE _____

DATE _____

Standard 4 Water Quality

Water Quality Basin 2 ^{HydroCAD name:} (DB1) Detention/Infiltration Basin

Imperious area flowing to *DB1 = Subcatchment P-3
= 9,302 SF

$$D_{DB1} = (0.5 \text{ in}) \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) (9,302 \text{ SF}) = 388 \text{ cF}$$

Provided volume = 1,013 cF

* See hydroCAD calculations for DB1 cumulative storage
up to elevation 92.80'

$$1,013 \text{ cF} > 388 \text{ cF} \checkmark$$

Northern Avenue Housing-Active

Type III 24-hr 2-Year Rainfall=2.95"

Prepared by The Berkshire Design Group

Page 2

HydroCAD® 8.00 s/n 000752 © 2006 HydroCAD Software Solutions LLC

11/12/2008

Pond DB1: Detention Basin #1

Inflow Area = 0.615 ac, Inflow Depth > 1.85" for 2-Year event
 Inflow = 1.15 cfs @ 12.14 hrs, Volume= 0.095 af
 Outflow = 0.40 cfs @ 12.50 hrs, Volume= 0.069 af, Atten= 66%, Lag= 21.2 min
 Primary = 0.40 cfs @ 12.50 hrs, Volume= 0.069 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 93.23' @ 12.50 hrs Surf.Area= 2,100 sf Storage= 1,850 cf

Plug-Flow detention time= 172.3 min calculated for 0.068 af (72% of inflow)
 Center-of-Mass det. time= 83.1 min (900.2 - 817.1)

Volume	Invert	Avail.Storage	Storage Description
#1	92.20'	5,103 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
92.20	1,553	0	0
→ 92.80	1,824	1,013	1,013
93.00	1,953	378	1,391
94.00	2,602	2,278	3,668
94.50	3,136	1,435	5,103

Device	Routing	Invert	Outlet Devices
#1	Primary	94.25'	6.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	92.10'	12.0" x 73.0' long Culvert CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 91.73' S= 0.0051 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean
#3	Device 2	92.80'	6.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.40 cfs @ 12.50 hrs HW=93.23' (Free Discharge)

- ↑ 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
- ↑ 2=Culvert (Passes 0.40 cfs of 2.36 cfs potential flow)
- ↑ 3=Orifice/Grate (Orifice Controls 0.40 cfs @ 2.22 fps)

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Treatment Train 2 for P-2, P-4, and P-5

TSS Removal Calculation Worksheet

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Rain Garden	0.90	0.75	0.68	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08

Total TSS Removal =

93%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Northern Avenue, Northampton, MA
 Prepared By: Brian Darnold
 Date: 1/11/2008

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Treatment Train 3 for P-8

TSS Removal Calculation Worksheet

B BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Rain Garden	0.90	1.00	0.90	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10
	0.00	0.10	0.00	0.10

Total TSS Removal =

90%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Northern Avenue, Northampton, MA
 Prepared By: Brian Darnold
 Date: 11/11/2008

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1



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4 Allen Place
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Landscape Architecture
Civil Engineering
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Environmental Services

JOB Northern Avenue
SHEET NUMBER 1
CALCULATED BY BCD
CHECKED BY _____
SCALE NTS

OF _____
DATE 11/11/08
DATE _____

Standard 4: Water Quality

Water Quality Basin 1 ^{HydroCAD Name:} (WQBI) Rain Garden

Impervious area flowing to WQBI = * Subcatchment P-4
" P-5
" P-8
" P-2

= 5,529 sf
4,623 sf
6,206 sf
745 sf

17,103 sf

Required water quality volume = $D_{wg} * A_{imp}$

$D_{wg} = 0.5in$ (Noncritical area, land is not LUHPPL, nor ripid inf. etc)

$A_{imp} = 16,614 sf$

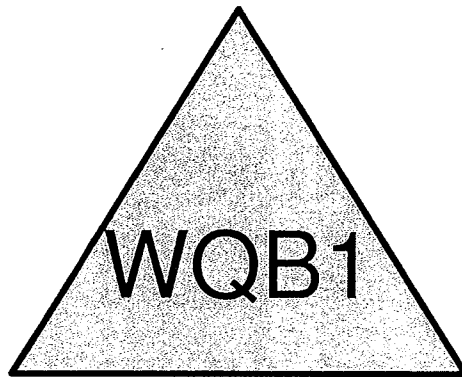
$$\text{Required water quality volume} = (0.5in) * \left(\frac{1ft}{12in}\right) * 17,103 sf$$

$$= 713 cf$$

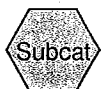
Water quality basin volume = 738 cf

738 cf > 713 cf ✓
→ See WQBI in HydroCAD for volume

*See Appendix A for HydroCAD data including subcatchment and basin sizes



Water Quality Basin 1



Drainage Diagram for Northern Avenue Housing-Active
Prepared by The Berkshire Design Group 11/13/2008
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Northern Avenue Housing-Active

Type III 24-hr 100-Year Rainfall=6.50"

Prepared by The Berkshire Design Group

Page 2

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11/13/2008

Pond WQB1: Water Quality Basin 1

Routing by Stor-Ind method

Peak Elev= 0.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= (not calculated)

Center-of-Mass det. time= (not calculated)

Volume	Invert	Avail.Storage	Storage Description
#1	92.00'	738 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
---------------------	----------------------	---------------------------	---------------------------

92.00	893	0	0
→ 92.70	1,215	738	738

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location: Treatment Train 4 for P-6 and P-7

TSS Removal Calculation Worksheet

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Proprietary Treatment Practice	0.77	0.75	0.58	0.17
	0.00	0.17	0.00	0.17
	0.00	0.17	0.00	0.17
	0.00	0.17	0.00	0.17

Total TSS Removal =

83%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: Northern Avenue, Northampton, MA

Prepared By: Brian Darnold

Date: 11/11/2008

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
 1. From MassDEP Stormwater Handbook Vol. 1

Stormwater Technology: Stormceptor (Hydro Conduit, formerly CSR New England Pipe)

Revised February 2003

The Stormceptor Fact Sheet is one in a series of fact sheets for stormwater technologies and related performance evaluations, which are undertaken by the Massachusetts Strategic Envirotechnology Partnership (STEP).

A summary of the STEP evaluation entitled, *Technology Assessment, Stormceptor CSR New England Pipe*, January 1998 is provided in this fact sheet. When a more thorough understanding of a system is required, the full *Technology Assessment* should be reviewed. Copies are available for downloading from the STEP Web site (www.stepsite.org/progress/reports) or by contacting the STEP Program (Phone: 617/626/1197, FAX: 617/626/1180, email: linda.benevides@state.ma.us). The information in this fact sheet is subject to future updates as additional performance information becomes available.

Description/Definition

Stormceptor is a prefabricated, underground unit that separates oils, grease, and sediment from stormwater runoff when installed with an existing or new pipe conveyance system. The unit is divided into two chambers—a treatment and a flow bypass chamber. During typical storm events, runoff is directed by the inflow weir through a drop pipe into the lower treatment chamber where sediment, oil, and grease are separated from the flow by gravity. The bypass chamber is designed to convey excess stormwater, which overtops the inflow weir, through the system without treatment.

Equipment and Sizing

The on-line Stormceptor units are available in eight sizes ranging from six and twelve feet in diameter with capacities of 900 to 7200 gallons. Since issuing the STEP assessment in 1998, the manufacturer has expanded the Stormceptor product line to include a storm drain inlet (STC 450i) and three units (Models STC 11000, STC 13000, and STC16000). These systems are not included in the STEP evaluation. Users and decision-makers may require additional field test results and new data for these new systems in order to accept performance ratings, particularly if they are higher than those reported in the STEP technology assessment and this fact sheet.

Stormceptor units are available in either precast concrete or fiberglass for special applications. Concrete units are pre-engineered for HS-20 min. traffic loading at the surface. Fiberglass units can be used in areas where

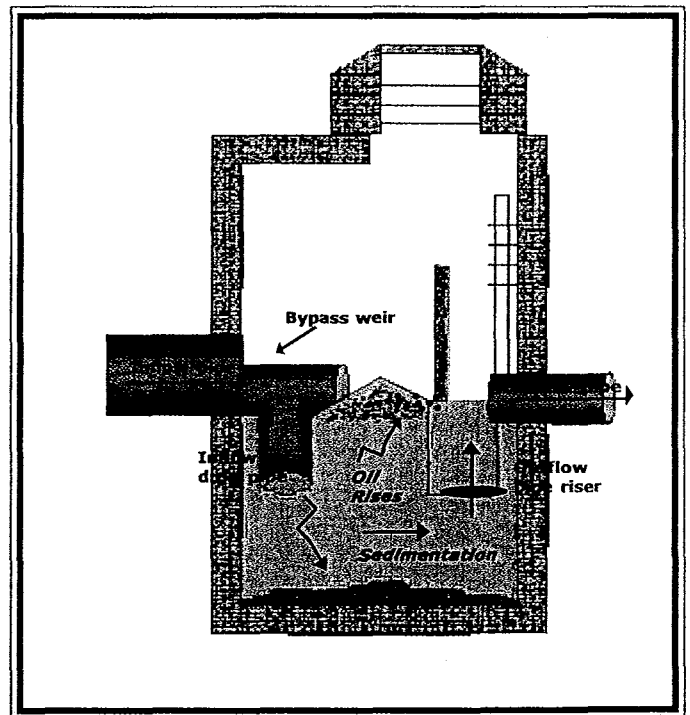


Figure 1. Stormceptor operation during average flow conditions.

there is a potential for oil and chemical spills.

Performance/Effectiveness

The system is designed to provide separation of sediment, oil, and grease from stormwater by routing runoff into a low-turbulence environment where solids settle and oils float out of solution. The system sizing is based on the drainage area, historical rainfall data, and

the solids removal efficiency required. It is recommended that the system be used in combination with other stormwater controls to conform with the Massachusetts Stormwater Management Policy and standards.

An Imperial Model STC 2000 (equivalent to the Model STC 2400) in Edmonton, Canada treats flow from a 9.8 acre commercial parking lot. This system was monitored during four storm events in 1996 and shown to have an average total suspended solids (TSS) removal efficiency of 52 percent. In designing a system to achieve a comparable removal efficiency, the relationship between system size and impervious drainage area should be considered, as detailed in Table 1 and the Technology Assessment Report.

A Model STC 1200 in Westwood, Massachusetts treats flow from 0.65 acres consisting of a paved truck loading area at a manufacturing facility. The unit was monitored for six storm events in 1997, but only four events had measurable TSS influent concentrations. Of these four events, the average TSS removal efficiency was calculated to be 77 percent, which is less than the 80 percent removal targeted by the manufacturer.

Based on these field monitoring results, and when the unit sizing follows the guidance in Table 1, removal efficiencies between 52 percent and 77 percent may be achieved where installations have similar rainfall and land use characteristics as those reviewed for the STEP evaluation. It is recommended that additional field research and new data be evaluated to validate performance ratings higher than those verified by STEP.

Stormceptor Model Number	Maximum Impervious Area (acre)	
	77% TSS removal	52% TSS removal
STC 900	0.45	0.9
STC 1200	0.7	1.45
STC 1800	1.25	2.55
STC 2400	1.65	3.35
STC 3600	2.6	5.3
STC 4800	3.6	7.25
STC 6000	4.6	9.25
STC 7200	5.55	11.25

Table 1: Adapted from the Stormceptor sizing for TSS removal in the STEP Technology Assessment.

Notes: 1) On some sites, the maximum impervious area may need to be reduced to achieve these TSS removal rates. 2) The terms "critical area sizing" (to achieve 77 percent TSS removal) and "treatment train sizing" (for 52 percent removal) are no longer used by the manufacturer, but unit sizing is still applicable.

Specific performance claims for oil and grease were not evaluated by STEP. However, total petroleum hydrocarbons (TPH) were analyzed during the Westwood study. Results indicated that the unit was effective in capturing oils.

Technology Status

The Stormceptor system provides greater solids separation and higher TSS removal efficiencies than oil and grit separators. Stormceptor systems are among the category of hydrodynamic separators, which are flow-through devices with the capacity to settle or separate grit, oil, sediment, or other pollutants from stormwater. According to the U.S. Environmental Protection Agency, "Hydrodynamic separators are most effective where the materials to be removed from runoff are heavy particulates - which can be settled - or floatables - which can be captured, rather than solids with poor settleability or dissolved pollutants."

Although Stormceptor appears to remove sediment, grit, oil, and grease as claimed by the manufacturer, additional research is needed to determine how much sediment moves through the system untreated. The field studies evaluated for the STEP assessment predate the Stormwater Best Management Practice Demonstration Tier II Protocol (2001), which is applicable in Massachusetts and other states in the Technology Acceptance Reciprocity Partnership (TARP), to ensure quality controlled studies that can be shared among participating states. Therefore, interstate reciprocity is not available to the manufacturer, based on performance claims that were evaluated by STEP in 1998. If the TARP Protocol requirements are fulfilled in the future, the manufacturer could pursue reciprocal verification for Stormceptor systems in participating TARP states. More information on the TARP Protocol is available on the following Web site: www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp.

Applications/Advantages

- ⊕ Stormceptor systems identified in Table 1 should be used in combination with other BMPs to remove 80 percent of the average annual load of TSS (DEP Stormwater Policy Standard 4). Systems may be well suited for pretreatment in a mixed component system designed for stormwater recharge.
- ⊕ Performance data show that Stormceptor may provide TSS removal rates in the range of 52 percent to 77 percent when sized according to Table 1. Higher TSS removal rates were achieved during low flow, low intensity storms with less than one third of an inch of runoff. Also, by reducing the impervious drainage area,

relative to the system size, the STEP Technology Assessment Report indicated that higher removal efficiencies may be achievable. However, STEP recommends collection of additional data “representing a varied set of operating conditions over a realistic maintenance cycle to verify TSS removal rates greater than 80 percent.”

- ⊕ The Stormceptor system is suitable for new and retrofit applications. For retrofit applications, it should not take the place of a catch basin for the systems that have been verified. Also, for retrofit applications, it should be installed in lateral lines and not main trunk lines.
- ⊕ The system is particularly well suited in constricted areas and where space is limited.
- ⊕ It also is suitable for use in areas of high potential pollutant loads (DEP Stormwater Policy Standard 5), where it may be used effectively in capturing and containing oil and chemical spills. *Web site:* www.state.ma.us/dep/brp/stormwtr/stormpub.htm.

Considerations/Limitations

- ⊕ Systems are not expected to provide significant nutrient (nitrogen and phosphorus) or fecal coliform removal.
- ⊕ The systems are not recommended for use in critical areas, such as public drinking water supplies, certified vernal pools, public swimming beaches, shellfish growing areas, cold water fisheries, and some Areas of Critical Environmental Concern (ACECs), except as a pretreatment device for BMPs that have been approved by DEP for use in critical areas. The structural BMPs approved for use in critical areas are described in Standard 6 of the Stormwater Management Policy, www.state.ma.us/dep/brp/stormwtr/stormpub.htm.
- ⊕ There is a limited set of useful data for predicting the relationship between treatment efficiency and loading rates. Removal efficiencies have not been demonstrated for all unit sizes.
- ⊕ Further research is needed to determine how much TSS bypasses the treatment chamber during certain, higher velocity storm events which recur less frequently.
- ⊕ Systems require regular maintenance to minimize the potential for washout of the accumulated sediments.

Reliability/Maintenance

All BMPs require scheduled, routine maintenance to ensure that they operate as efficiently as possible. Although maintenance requirements are site specific, a general relationship between cleaning needs and depths of

sediment has been established by the manufacturer. Inspection of the Stormceptor interior should be done after major storm events, particularly in the first year of operation. It is recommended that material in the treatment chamber be pumped out by a vacuum truck semiannually, or when the sediment and pollutant loads reach about 15 percent of the total storage. If the unit is used for spill containment, it should be pumped after the event is contained. Typical cleaning costs were estimated by the manufacturer in 1998 to be \$250, with disposal costs averaging \$300 to \$500. The expected life of a system has been estimated to be 50 to 100 years.

Sediment Depths Indicating Required Maintenance	
Model Number	Sediment Depth (feet)
STC 900	0.5
STC 1200	0.75
STC 1800	1
STC 2400	1
STC 3600	1.25
STC 4800	1
STC 6000	1.5
STC 7200	1.25

Table 2: The Stormceptor system clean out is based on 15 percent of the sediment storage volume in the unit.

References

- Winkler, E.S. 1998. “Technology Assessment, Stormceptor.” University of Massachusetts, Amherst, MA.
STEP Web site: www.stepsite.org/progress/reports
- Massachusetts Department of Environmental Protection and Office of Coastal Zone Management. 1997. “Stormwater Management Handbooks, Volumes One and Two.” Boston, MA. *Handbooks Web site:* www.state.ma.us/dep/brp/stormwtr/stormpub.htm.
- “Performance of a Proprietary Stormwater Treatment Device: The Stormceptor. The Practice of Watershed Protection: Article 120. Thomas. R. Schueler and Heather K. Holland editors. 2000. Ellicott City, MD.
- United States Environmental Protection Agency. “Storm Water Technology Fact Sheet Hydrodynamic Separators.” EPA 832-F-99-017.

Stormceptor Web sites: www.rinkermaterials.com/stormceptor

TARP Web site: www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp.

Stormceptor Sizing Table

Version 3.0.0

Selected Rainfall Station	
State	MASSACHUSETTS
Name	KNIGHTVILLE DAM
ID #	3985
Elev. (ft)	630
Latitude	N 42 deg 17 min
Longitude	W 72 deg 52 min

Site Parameters	
Total Area (ac)	.812
Imperviousness (%)	47
Impervious Area (ac)	.38

Particle Size Distribution		
Diameter (um)	Percent (%)	Velocity (ft/s)
20	20.0	0.0013
60	20.0	0.0052
150	20.0	0.0351
400	20.0	0.2116
2000	20.0	0.9416

Note : Sizing Results vary with particle size distribution. BMP comparisons must use the same particle size distribution. Please call (800) 909-7763 for sizing with other distributions

Stormceptor Sizing Table		
Stormceptor Model	% Runoff Treated	% TSS Removal
STC 450i	97.0	84.2
STC 900	99.3	90.1
STC 1200	99.3	90.3
STC 1800	99.3	90.6
STC 2400	99.9	92.8
STC 3600	99.9	93.4
STC 4800	100.0	94.9
STC 6000	100.0	95.2
STC 7200	100.0	96.1
STC 11000	100.0	97.4
STC 13000	100.0	97.5
STC 16000	100.0	98.0

Comments :

Appendix D – Standard 3 Recharge Calculations



The
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Landscape Architecture
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Urban Design
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JOB Norham Avenue
SHEET NUMBER 1
CALCULATED BY BCD
CHECKED BY _____
SCALE _____

OF _____
DATE 11/11/08
DATE _____

4 Allen Place
Northampton, Massachusetts 01060

Standard 3 Recharge

System Sizing:

Dry Well 1

$$\text{Imp Area to system} = 2310 \text{ sF}$$

$$R_v = (0.25 \text{ in}) \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) (2310 \text{ sF}) = 48 \text{ cF required}$$

$$\text{Provided Volume} = 99 \text{ cF}$$

$$99 \text{ cF} > 48 \text{ cF} \checkmark$$

Dry Well 2

$$\text{Imp Area to system} = 2040 \text{ sF}$$

$$R_v = (0.25 \text{ in}) \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) (2040 \text{ sF}) = 43 \text{ cF required}$$

$$\text{Provided Volume} = 88 \text{ cF}$$

$$88 \text{ cF} > 43 \text{ cF} \checkmark$$

Dry Well 3

$$\text{Imp Area to system} = 1450 \text{ sF}$$

$$R_v = (0.25 \text{ in}) \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) (1450 \text{ sF}) = 31 \text{ cF required}$$

$$\text{Provided Volume} = 67 \text{ cF}$$

$$67 \text{ cF} > 31 \text{ cF} \checkmark$$

Infiltration Trench

$$\text{Imp Area to system} = 6274 \text{ sF}$$

$$R_v = (0.25 \text{ in}) \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) (6274 \text{ sF}) = 131 \text{ cF required}$$

$$\text{Provided Volume} = 278 \text{ cF}$$

$$278 \text{ cF} > 131 \text{ cF} \checkmark$$



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Landscape Architecture
Civil Engineering
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Environmental Services

JOB Northern Avenue
SHEET NUMBER 2 OF _____
CALCULATED BY BED DATE 11/11/08
CHECKED BY _____ DATE _____
SCALE _____

4 Allen Place
Northampton, Massachusetts 01060

Dry Well 4

Imp Area to system = 758 sf

$$R_v = (0.25 \text{ in}) \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) (758 \text{ sf}) = 16 \text{ cf required}$$

Provided volume = 32 cf

$$32 \text{ cf} > 16 \text{ cf} \checkmark$$

Infiltration Basin (Detention Basin #1)

Impervious area to system = 9,302 sf

$$R_v = (0.25 \text{ in}) \left(\frac{1 \text{ ft}}{12 \text{ in}} \right) (9,302 \text{ sf}) = 194 \text{ cf}$$

Provided volume = 1,013 cf

See HydroCAD calculations for DB1 storage
up to 92.80'

$$1,013 \text{ cf} > 194 \text{ cf} \checkmark$$



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Urban Design
Environmental Services

JOB Northern Avenue
SHEET NUMBER 3
CALCULATED BY BCD
CHECKED BY _____
SCALE NTS

OF _____
DATE 11/11/08
DATE _____

Standard 3 Recharge

$$\text{Drawdown in 72 hours} = \frac{R_v}{K (\text{Bottom Area})}$$

Dry Well 1

$$R_v = 99 \text{ cf}$$

$$* K = 0.17 \text{ in/hr}$$

$$\text{Bottom Area} = 248 \text{ sf}$$

$$\frac{99 \text{ cf}}{(0.17 \text{ in/hr} \times \frac{144}{12 \text{ in}}) (248 \text{ sf})} = 28.3 \text{ hrs}$$

$$28.3 \text{ hrs} < 72 \text{ hrs} \checkmark$$

Dry Well 2

$$R_v = 88 \text{ cf}$$

$$* K = 0.17 \text{ in/hr}$$

$$\text{Bottom Area} = 219 \text{ sf}$$

$$\frac{88 \text{ cf}}{(0.17 \text{ in/hr} \times \frac{144}{12 \text{ in}}) (219 \text{ sf})} = 28.4 \text{ hrs}$$

$$28.4 \text{ hrs} < 72 \text{ hours} \checkmark$$

Dry Well 3

$$R_v = 67 \text{ cf}$$

$$* K = 0.17 \text{ in/hr}$$

$$\text{Bottom Area} = 166 \text{ sf}$$

$$\frac{67 \text{ cf}}{(0.17 \text{ in/hr} \times \frac{144}{12 \text{ in}}) (166 \text{ sf})} = 28.5 \text{ hrs}$$

$$28.5 \text{ hrs} < 72 \text{ hrs} \checkmark$$

Infiltration Trench

$$R_v = 278 \text{ cf}$$

$$* K = 0.17 \text{ in/hr}$$

$$\text{Bottom Area} = 700 \text{ sf}$$

$$\frac{278 \text{ cf}}{(0.17 \text{ in/hr} \times \frac{144}{12 \text{ in}}) (700 \text{ sf})} = 28 \text{ hrs}$$

$$28 \text{ hrs} < 72 \text{ hrs} \checkmark$$

* K Values based on Row's Rates in Table 2.3.3 in Vol. 3 chp 1
See Appendix for Test Pit Data



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SHEET NUMBER 7
CALCULATED BY KED
CHECKED BY _____
SCALE NTS

OF _____
DATE 11/11/08
DATE _____

Drawdown in 72 hours

Dry Well 4

$$R_v = 32 \text{ cf}$$

$$*K = 0.17 \text{ in/hr}$$

$$\text{Bottom Area} = 80 \text{ sf}$$

$$\frac{32 \text{ cf}}{(0.17 \text{ in/hr} \times \frac{1 \text{ ft}}{12 \text{ in}}) (80 \text{ sf})} = 28.2 \text{ hrs}$$

$$28.2 \text{ hrs} < 72 \text{ hrs} \checkmark$$

Drawdown in 72 hours

Infiltration Basin (Detention Basin 1)

$$R_v = 1,013 \text{ cf}$$

$$K = 0.17 \text{ in/hr}$$

$$\text{Bottom Area} = 1553 \text{ sf}$$

$$\frac{1,013 \text{ cf}}{(0.17 \text{ in/hr} \times \frac{1 \text{ ft}}{12 \text{ in}}) (1553 \text{ sf})} = 46 \text{ hrs}$$

$$46 \text{ hrs} < 72 \text{ hrs} \checkmark$$



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Environmental Services

JOB Northern Avenue
SHEET NUMBER 5
CALCULATED BY BCD
CHECKED BY _____
SCALE _____

OF _____
DATE 11/11/08
DATE _____

Standard 3 - Recharge

Required Recharge Volume (RV) = $F \times$ Impervious Area

F = target depth factor = 0.25in for hydrologic group C

Impervious Area = 56,602sf

$R_v = (0.25in) \times \left(\frac{1ft}{12in}\right) \times 56,602sf = 1180cf$ Total

(DBI) Infiltration Basin = 9,302sf

Dry Well 4 = 758sf

Total Imp Area sent to infiltration systems: Dry Well 1 = 2,310sf

Dry Well 2 = 2,040sf

Dry Well 3 = 1,450sf

Infiltration Trench = 6,274sf

Total = 22,134sf

$100 \times \frac{22,134sf}{56,602sf} = 39.10\%$ of impervious infiltrated

39.10% < 65% Standard 3 Not Fully met

only to maximum extent

See Next Sheet →

Appendix E – Proposed Stormwater Management System Operation & Maintenance Plan

Proposed Stormwater Management System *Operation & Maintenance Plan*

During Construction

The Contractor shall be responsible for inspection and maintenance during construction.

At all times, siltation fabric fencing, stakes and hay bales sufficient to construct a sedimentation control barrier a minimum of 50 feet long will be stockpiled on the site in order to repair established barriers which may have been damaged or breached.

An inspection of all erosion control and stormwater management systems shall be conducted by the Contractor at least once a week and during all rain storms until the completion of construction. In case of any noted breach or failure, the Contractor shall immediately make appropriate repairs to any erosion control system and notify the engineer of any problems involving stormwater management systems.

A rain storm shall be defined as all or one of the following:

- Any storm in which rain is predicted to last for twelve consecutive hours or more.
- Any storm for which a flash flood watch or warning is issued.
- Any single storm predicted to have a cumulative rainfall of greater than one-half inch.
- Any storm not meeting the previous three thresholds but which would mark a third consecutive day of measurable rainfall.

The Contractor shall also inspect the erosion control and stormwater management systems at times of significant increase in surface water runoff due to rapid thawing when the risk of failure of erosion control measures is significant.

In such instances as remedial action is necessary, the Contractor shall repair any and all significant deficiencies in erosion control systems within two days.

The Conservation Commission shall be notified of any significant failure of stormwater management systems and erosion and sediment control measures and shall be notified of any release of pollutants to a water body (stream, brook, pond, etc.).

The Contractor shall remove the sediment from behind the fence of the sedimentation control barrier when the accumulated sediment has reached one-half of the original installed height of the barrier.

Post-Construction

Stormwater Management System Owner:

The Owner,

Tofino Associates, Inc.
31 Campus Plaza Road
Hadley, MA 01035

shall own the stormwater management system.

Party Responsible for Operation & Maintenance:

The Owner,

Tofino Associates, Inc.
31 Campus Plaza Road
Hadley, MA 01035

shall operate and maintain the stormwater management system.

Inspection & Maintenance Schedule:

1) **Street Sweeping**
Street and parking area sweeping shall take place twice annually.

2) **Rain Garden**

A rain garden/bioretention area has been incorporated into the stormwater system to remove pollutants within the stormwater runoff. Both the pre-treatment stone diaphragm system and bioretention areas should be inspected monthly for sediment build-up, litter and debris, structural damage and standing water. Inspect soil and repair eroded areas within the bioretention system monthly and re-mulch void areas as needed. Treat diseased vegetation as needed. Remove and replace dead vegetation twice per year (spring and fall). Remove invasive species as needed to prevent them from spreading into the bioretention area. Replace mulch every two years in the early spring. In the winter, it is important to ensure that snow is not plowed into the rain garden as this will cause the runoff to bypass the system without proper treatment.

- 3) **Detention Basins** (The following recommendations follow the MADEP Stormwater Policy guidelines.)

Inspections

- a. Initial six months of use.
Examine for stabilization and function, including determination of the duration of water standing in the basin, any sediment erosion, excessive compaction of soils, or low spots.
- b. Twice per year.
Examine basin for the following: differential settlement, cracking, erosion, leakage, or tree growth on embankments, condition of riprap, sediment accumulation, and health of turf where applicable.

Any adverse conditions noted during any inspections shall be addressed by repair or reconsideration of design components.

Mowing and General Maintenance

Occasional mowing (1-2 times per year min.) shall be performed on the side slopes and basin bottom where turf is present. Accumulated grass clippings and/or organic matter and trash and debris shall be removed. Any clogged surface areas can be loosened by deep tilling; tilled areas must be immediately revegetated. Tilling may be used in this manner for no more than two consecutive maintenance periods. Thereafter, sediment in the clogged areas shall be removed, liner material replaced, and revegetation established.

Dredging/Sediment Removal

Accumulated sediment shall be removed from the basin at five (5) year intervals, or as required to maintain the function of the stormwater management system as designed. During this process and until the disturbed sediment has settled, the outlet pipe shall be sealed so as to minimize the risk of conveying sediment beyond the basin.

4) **Grassed Swales**

Swales shall be mowed at least once per growing season to prevent establishment of woody growth and other undesirable plants that inhibit proper performance. Grass vegetation should not be cut shorter than 4". It is important not to engage in excessive mowing operations, as this keeps the grass too short and decreases the efficiency of the vegetation to reduce runoff borne sediments and velocities.

Sediment and debris shall be removed manually at least once per year before the vegetation is adversely impacted.

5) **Hooded Catch Basin and/or Drain Manhole with Sump**

Oil and water separators should be inspected at least four times per year and cleaned annually or more often if required. Oil and sediments should be removed and disposed of in accordance with local, state and federal guidelines and regulations. In the case of an oil or bulk pollutant release, the system must be cleaned immediately following the spill and the proper authorities notified.

6) **Stormwater Treatment Chambers**

The Stormwater Treatment System requires minimal routine maintenance; however, it is important that the system be properly inspected and cleaned when necessary in order to function at its best. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, e.g. heavy winter sanding will cause the grit chamber to fill more quickly, but regular sweeping will slow accumulation. The water quality treatment system shall consist of *Stormceptor* or equal treatment chambers. For more detail of how the *Stormceptor* should be maintained see the *Stormceptor* Owner Manual.

7) **Dry Wells**

Dry wells basins have been incorporated into the stormwater system for the site to specifically receive roof runoff and, therefore, are not expected to receive large amounts of bulk sediments. Proper maintenance of roof gutters that drain to the system will help to protect the integrity of the infiltration basins. Sediments and debris should be removed and disposed of in accordance with local, state and federal guidelines and regulations.

8) **Snow Removal & Management Plan**

General

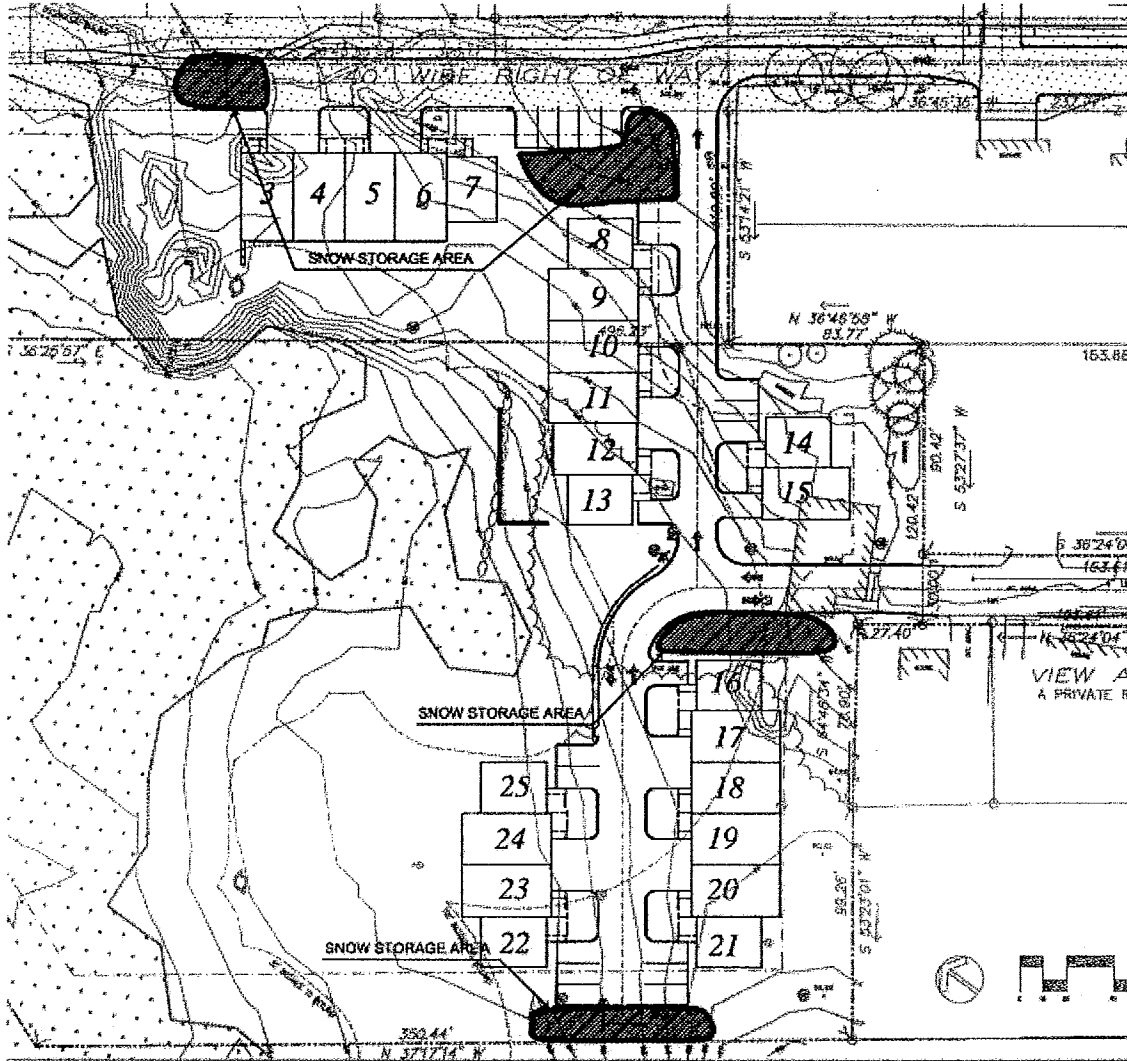
The stormwater management system is designed to accommodate volumes from snow melt. Since plowed snow from paved surface may contain salts, sediment,

oils and various pollutants, all snow melt from vehicular areas on the site shall be routed through the drainage system or removed from the site.

Principles

1. The Owner shall provide a copy of this plan and a schedule or vehicle rotation scheme to plowing contractors such that plowing may occur in an efficient manner. This may be altered based on employee schedules or severity or frequency of snow events.
2. No such snow shall be dumped or stockpiled directly into any resource area or its buffer area or within any area such that untreated snow melt may enter a resource area.
3. Snow removed from the site shall be disposed of such that it or its melt will have no adverse effect on other resource areas.
4. The use of sand or deicing materials shall not be excessive. The Owner is encouraged to utilize alternative eco-friendly solutions throughout the site.
5. The Conservation Commission and DPW shall be notified where a violation of this plan occurs.
6. See Figure 1 on the following page for a graphic depicting the snow stockpiling plan.

Figure 1 – Snow Stockpiling Plan



INSPECTION AND MAINTENANCE REPORT FORM
 For
NORTHERN AVENUE HOUSING – Stormwater Infrastructure

Inspection Schedule:
 FORM TO BE COMPLETED PER SCHEDULE PRESENTED IN OPERATION & MAINTENANCE PLAN

Inspector:

Date: _____ Time: _____

Inspector's Qualifications:

Days Since Last Rainfall:

Amount of Last Rainfall (inches):

Catch Basins

CB	Is Surface Runoff Being Directed to Catch Basins Properly	Are Sediment Traps Installed at Catch Basin Inlets	Are Catch Basin Outlet Hoods Installed and Working Properly	Depth of Sediment in Basin Sump	Are Any Correction Measures Required
CB#1					
CB#2					
CB#3					
CB#4					
CB#5					
CB#6					

Maintenance Required:

To Be Performed By: _____ **On or Before:** _____

STRUCTURAL CONTROLS –CON'T

Stormwater Treatment Chambers

SWTC	Is Surface Runoff Being Directed Through SWTS Properly	Depth of Sediment in Basin Sump	Are Any Correction Measures Required
SWTC #1			

Maintenance Required:

To Be Performed By:

On or Before:

Bioretention Area

Structure	Is Structure Working Properly	Depth of Sediment in Structure	Are Any Correction Measures Required	Additional Notes
Stone/Grass Pretreatment				
Rain Garden				

Maintenance Required:

To Be Performed By:

On or Before:

Grassed Swale

Structure	Is Structure Working Properly	Depth of Sediment in Structure	Are Any Correction Measures Required	Additional Notes
Grass swale				

Maintenance Required:

To Be Performed By:

On or Before:

Stormwater Detention Basin 1

Is Stormwater Entering Basin Correctly	Is Stormwater Being Detained and Discharged Properly	Depth of Sediment in Spreader	Is Rip-Rap Stabilization Properly Installed & Maintained	Is There Any Evidence of Erosion Or unintended Flow Patterns

Maintenance Required:

To Be Performed By:

On or Before:

Stormwater Detention Basin 2

Is Stormwater Entering Basin Correctly	Is Stormwater Being Detained and Discharged Properly	Depth of Sediment in Spreader	Is Rip-Rap Stabilization Properly Installed & Maintained	Is There Any Evidence of Erosion Or unintended Flow Patterns

Maintenance Required:

To Be Performed By:

On or Before:

OTHER CONTROLS

List Other Miscellaneous Controls and Observations

Item	Describe Failure/Inadequate Control	Describe Recommended Remedy

Maintenance Required: _____

To Be Performed By: _____ | **On or Before:** _____

Appendix F – Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan

This plan was developed in compliance with the Massachusetts Department of Environmental Protection Stormwater requirements.

Good Housekeeping

The proposed site is designed to maintain high water quality treatment for all runoff. A general maintenance plan has been prepared and will be followed in a strict and complete manner as required.

Spill Prevention Plan

No hazardous materials are will be stored on site. However the following spill prevention plan will be incorporated into the Long Term Pollution Prevention Plan:

- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the on-site material storage area. Equipment and materials will include, but is not limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported, regardless of size, to the Massachusetts Department of Environmental Protection at 888-304-1133.
- Should a spill occur, the spill prevention plan will be adjusted to include measures to prevent another spill and to cleanup up the spill should another occur. A description of the spill, along with the causes and cleanup measures will be included in the updated spill prevention plan.
- The construction superintendent responsible for daily operation on the construction site will be the spill prevention and cleanup coordinator. The superintendent will designate at least three site personnel to receive spill prevention cleanup and training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the on-site job trailer.

Stormwater BMP Maintenance

A full stormwater operation and maintenance plan has been prepared (see Appendix D of this report) in order to ensure that the system will function properly throughout the year.

Landscape and Lawn Maintenance

Routine mowing and associated maintenance of all landscape features will occur weekly or as needed to prevent excessive growth and debris from occurring on site.

Solid Waste Management

Solid waste is handled on site and will comply with all requirements on a local, state, and federal level.

Parking/Road Area Maintenance

Street sweeping shall occur annually. A full snow management plan has been prepared (see Appendix D) to prevent dirty snow and salt from entering the drainage system.

Training of Staff

All personnel on site will be well briefed on all requirements for implementing the Long Term Pollution Prevention Plan.

Emergency Contact for Implementing Long Term Pollution Prevention Plan

Tofino Associates, Inc.
31 Campus Plaza Rd
Hadley, MA 01035
413 256 0321

Appendix G – Stormwater Pollution Prevention Plan

DRAFT

Stormwater Pollution Prevention Plan

*Prepared in compliance with City of Northampton
Stormwater Management Permit*

*Northern Avenue Housing
Northern Avenue and North Street
Northampton, Massachusetts*

November 11, 2008

Prepared by:



**The
Berkshire
Design
Group, Inc.**

4 Allen Place, Northampton, Massachusetts 01060

Prepared For:

*Tofino Associates, Inc.
31 Campus Plaza Road
Hadley, MA 01035*

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November 11, 2008

SITE & PROJECT DESCRIPTION

Project Name and Location

Northern Avenue Housing
56 Northern Avenue
Northampton MA 01060

Applicant/Owner Name and Address:

Tofino Associates, Inc.
31 Campus Plaza Road
Hadley, MA 01035

Notification – Prior To Construction:

General Contractor/Operator:

City of Northampton
Department of Public Works
30 Locust Street
Northampton, MA 01060

To Be Determined

Mr. Douglas McDonald
NPDES Coordinator
Phone: 413-587-1582

Existing Zoning & Land Use & Site Area

The project parcel is zoned URB district and is located on the west side of Northern Avenue and north of North Street. The site currently contains a large wetland area to the west, with woods, grassed, and small roadway areas throughout the rest of site. The overall curve number in existing conditions is 74 and water flows in a westerly direction through the wetlands and to a small river located at the southwest portion of the property line (see figure 1 on page 3). The total area of the site is approximately 6 acres, of which approximately 3.4 acres will be disturbed by construction activities.

Proposed Project

The proposed development includes 25 new housing units and associated parking areas, driveways, and sidewalks, utilities, landscape features and stormwater management system. A large wetland area exists on the west part of the site and will not be disturbed as a result of construction.

November 11, 2008

Stormwater management will consist of catch basins, manholes, stormwater treatment chambers, 2 surface drainage detention basins (see attached plan EC1), dry wells, an infiltration trench, a rain garden and temporary erosion control devices during construction. Stormwater discharge will flow into the wetlands as it does in existing conditions.

Soil disturbing activities will include: installation of erosion and sediment controls; tree removal and grubbing; grading; excavation for building foundation, utility trenches, and landscape features, and site grading; installation of retaining walls, curbs, fences/guardrails, light pole foundations; paving of driveways, walkways and parking areas; and preparation for final seeding and planting.

Runoff Coefficient

Drainage calculations for this project, developed using the SCS TR20 method, resulted in an SCS overall curve number (CN) of 80 for the proposed project site.

Sequence of Major Construction Activities

The general order of construction activities at the site will be as follows:

1. Hold preconstruction meeting at least one week prior to start of construction
2. Install haybale/silt fence barrier around down slope side of construction area and wetlands and as directed in the Erosion and Sediment Control Plan, Figure 2
3. Install stabilized construction entrances
4. Clear and grub for sedimentation basins
5. Construct detention basins and swales to be used as temporary sedimentation basins during construction activities
6. Convey overland flow directly to sedimentation basins until stormwater infrastructure is constructed
7. Continue clearing and grubbing
8. Stockpile topsoil
9. Install utilities, storm drainage structures and basins, and curbs.
10. Protect stormwater structure inlets with sediment control devices.
11. Install building foundations and construct buildings
12. Grade and apply gravel base to driveways, walkways, and roadways
13. Complete grading and install paving
14. Install permanent seeding and plantings
15. Remove sediments accumulated in sedimentation basin and in front of haybale/silt fence barrier
16. Remove haybale/silt fence barrier and reseed areas disturbed by its removal
17. Remove temporary sedimentation basin outlet piping. Grade and seed areas as specified on the grading and utility plans.
18. Clean and flush all drainage structures and lines
19. Schedule post construction conference and inspection

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Name of Receiving Waters

The site ultimately to a stream which flows to Market Street Brook which is piped parallel to the railroad tracks all the way to the Old Mill River near the Waste Water Treatment Plant off of Hockanum Road. Please see figure 1 below depicting the stream flow direction.

Figure 1



November 11, 2008

CONTROLS DURING CONSTRUCTION**Erosion and Sediment Controls*****General Sedimentation Control Practices***

The following general erosion and sediment controls will be utilized during construction in order to maintain local water quality:

1. Erosion control barriers will be installed prior to clearing and excavation work.
2. Grading and other soil disturbance will be done so as to minimize erosion during wet seasons.
3. A temporary sedimentation basin with required controls will be constructed early in the project to allow the basin to treat runoff prior to discharging from the site.
4. Sediment will periodically be removed from behind sediment trapping devices and from within the temporary sedimentation basin.
5. The clearing of natural vegetation will be minimized; remaining natural vegetation will be protected from nearby construction to the greatest degree possible.
6. Staging and soil stockpile areas shall have a haybale/siltation fence or other approved barrier installed immediately downgradient of such areas.
7. Designated temporary dewatering basins will be used for dewatering.
8. Disturbed areas will be stabilized as soon as possible after construction.
9. Maintenance and cleaning of construction vehicles and equipment will take place in designated staging areas only.

Stabilization Practices

The following stabilization practices will be utilized during construction in order to maintain local water quality:

1. Temporary stabilization: temporary seeding, mulching or other suitable stabilization measures will be utilized to protect disturbed areas and stockpiles during prolonged construction periods.
2. Permanent stabilization: areas disturbed by construction will be permanently stabilized by paving with concrete or bituminous concrete, by installation of plant material, or by seeding and mulching with seed mix as described in the project specifications. Seeded areas will be covered with straw mulch or biodegradable netting in order to protect surface until seed germination.

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Structural Practices

The following structural erosion and sediment controls will be utilized during construction in order to maintain local water quality:

1. Sediment Barriers: silt barriers will be installed along the downslope edge of areas of work.
 - Sediment will be removed from behind silt fence when it reaches half the original height of the fence.
 - Fences will be inspected weekly and both before and after storm events. Repairs and replacement will take place as necessary.
2. Dewatering Basins/collectors: Dewatering basins/collectors will be constructed where required prior to excavation activities. These basins will act to settle suspended solids from pumped groundwater.
 - Dewatering Basins and collectors will be sized according to the amount of groundwater encountered at a particular location.
 - Dewatering Basins will utilize a perforated standpipe wrapped in filter fabric for discharge
3. Catch Basin Filters: Filters consisting of anchored haybales and filter fabric fence, embedded 4-6" in the ground, will surround each existing and proposed catch basin. Filter fabric will also be installed under each inlet grate.
 - Filters will be placed around each catch basin prior to paving or planting.
 - Sediment will be removed when it reaches half of the original height of the filter.
 - Filter fabric under the inlet grate will be monitored and replaced as required.
 - Filters will be removed only after upgradient areas have been permanently stabilized.
4. Dust Control: Dust control will be maintained by sprinkler or water truck during construction to minimize sediment transport and maintain air quality at an acceptable level.
5. Roadway Stabilization: Until final paving takes place, project roadways and parking areas will be stabilized by grading with clean gravel. Emergency access and service roadways will be maintained as clean gravel surfaces. A temporary Stabilized Construction Access will be constructed prior to the start of excavation work.

Stormwater Management

A system for stormwater management has been designed for this project. The system, designed by a professional engineer, utilizes curbs and gutters, catch basins, a stormwater treatment chamber, a rain garden, an infiltration trench, dry wells, and 2 surface detention basins to reduce total suspended solids (TSS) in excess of 80% and ensure that peak flows for 2-, 10-, and 100-

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year storms remain at or near their estimated historic levels. Water from the project site will be discharged to the wetlands on the west part of the site as it does in existing conditions.

A maintenance plan for the stormwater management system has also been developed. The maintenance plan includes removal of oil and sediment from hooded catch basins, removal of oil and sediment from stormwater treatment chambers, clearing of debris for all basins, and annual sweeping of drives and parking lots.

Other Controls

Waste Disposal

Waste Materials: Waste materials will be collected and stored in a lidded metal dumpster rented from a licensed solid waste management company. All trash and construction debris will be stored in the dumpster. The dumpster will be emptied at least twice a week, or more if necessary, and disposed of in accordance with local, state and federal regulation. No construction waste materials will be buried on site. Notices stating these procedures will be posted in the job trailer. Site personnel will be instructed in these procedures and site construction supervisor(s) will ensure that the procedures are followed.

Hazardous Waste: Hazardous waste will be disposed of in the manner specified by local, state and federal regulation or by the manufacturer. Site personnel will be instructed in these procedures and site construction supervisor(s) will ensure that the procedures are followed.

Sanitary Waste: Sanitary waste will be collected from portable units a minimum of three times per week by a licensed sanitary waster contractor and disposed of in accordance with local, state and federal regulation.

Off-Site Vehicle Tracking

A stabilized construction entrance will be provided to help reduce tracking of sediments off the site. Stone will be used, which will be large enough not to become embedded in truck tires, at the entrance. The paved street adjacent to the construction entrance will be swept daily to reduce mud, dirt or sediment tracked from the site. Dump trucks hauling material to and from the site will be covered by tarps as necessary.

Timing of Controls

As indicated in the Sequence of major Activities, the haybale/silt fence barrier, stabilized construction entrance and sedimentation basin will be constructed prior to clearing or grading of any other portions of the site. No excavation or dewatering activities will take place in an area until appropriate dewatering basins or sediment control structures have been installed. Areas where construction activity temporarily ceases for more than 21 days will be stabilized with temporary seed and mulch within 14 days of the last disturbance. Once construction activity ceases permanently in an area that area will be stabilized with plant material or pavement as

November 11, 2008

indicated in the plans. After the entire site is stabilized, the accumulated sediment will be removed from the sediment basin.

November 11, 2008

MAINTENANCE AND INSPECTION PROCEDURES**Erosion and Sediment Control Inspection and Maintenance Practices**

The following inspection and maintenance practices will be utilized in this project to maintain sediment and erosion controls:

- All control measures will be inspected weekly (at a minimum) and following any storm event of 0.5 inches or greater.
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.
- Contractor will stockpile on site or make available all equipment, materials (e.g. filter fabric, haybales, crushed stone, etc.) and labor necessary to make emergency erosion control improvements within four hours if necessary.
- Built-up sediment will be removed from silt fence when it has reached one-third the height of the fence.
- Silt fence will be inspected for depth of sediment, tears, to verify that fabric is securely attached to the stakes and to verify that stakes are firmly in the ground.
- Sediment basin(s) will be inspected for depth of sediment, and accumulated sediment will be removed when it reaches 10 percent of the design capacity or at the end of the job.
- Temporary and permanent seeding will be inspected for bare spots, washouts and healthy growth.
- A maintenance inspection report will be made after each inspection.
- The site contractor will select one or more individuals who will be responsible for inspections, maintenance and repair activities and for completing inspection and maintenance reports.
- Individuals selected for inspection and maintenance responsibilities will receive training in all inspection and maintenance practices necessary for keeping the on-site erosion and sediment controls in good working order.

Non-Stormwater Discharges

It is expected that the following non-stormwater discharges will occur from the site during the construction period:

- Water from water line flushings.
- Pavement wash waters (where no spills or leaks of toxic or hazardous chemicals have occurred).
- Uncontaminated groundwater from dewatering excavations.
- Water from washing the exterior of construction vehicles.

Non-stormwater discharges will be directed to stabilized surfaces or the detention basin prior to discharge. Exterior washing and rinsing of vehicles will take place more than 100 feet from wetlands or waterways.

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Inventory for Pollution Prevention Plan

Asphalt	Masonry block
Cleaning solvents	Metal studs
Concrete	Paints (enamel and latex)
Detergents	Petroleum-based products
Fertilizers	Solvents
Gravel	Wood

Spill Prevention

All employees will be instructed regarding the following spill prevention practices. Notice of these practices will be posted in the job trailer, and the site construction supervisor will hold responsibility for ensuring that the procedures are followed.

Material Management Practices

The following material management practices will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff:

Good Housekeeping

The following good housekeeping practices will be followed on-site during the construction period:

An effort will be made to store only enough product to do the job.

All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.

Products will be kept in their original containers with the original manufacturer's label.

Substances will not be mixed with one another unless recommended by the manufacturer.

Whenever possible, all of a product will be used up before disposing of the container.

Manufacturer's recommendations for proper use and disposal will be followed.

The site superintendent will inspect daily to ensure proper use and disposal of material on-site.

Hazardous Products

The following practices will reduce the risks associated with hazardous materials (e.g. petroleum products, solvents, etc.):

- Products will be kept in original containers unless they are not resealable.
- Original labels and material safety data sheets (MSDS) will be retained; they contain important product information.
- A copy of the Material Safety Data Sheet (MSDS) for each product used in construction will be kept in the job trailer.
- If surplus product must be disposed of, manufacturer' or local- and state-recommended methods for proper disposal will be followed.

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Product Specific Practices

Petroleum Products: All on-site vehicles will be monitored for leaks and will receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed, clearly labeled containers. Any asphalt substances used on-site will be applied according to the manufacturer's recommendations. No vehicle refueling or maintenance will take place within 100 feet of a wetland or waterway. No petroleum-based or asphalt substances will be stored within 100 feet of a wetland or waterway.

Fertilizers: Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to stormwater. Unused fertilizer will be stored in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills. No fertilizers will be stored within 100 feet of a wetland or waterway.

Solvents, Paints and Other Hazardous Substances: All containers will be tightly sealed when not required for use. Excess material will not be discharged to the storm sewer system but will be properly disposed of according to manufacturers' instruction or local and state regulations. No solvents, paints or other hazardous substances will be stored within 100 feet of a wetland or waterway.

Concrete Trucks: Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water on the site.

Spill Control Practices

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturers' recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the on-site material storage area. Equipment and materials will include, but is not limited to, brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material will be reported, regardless of size, to the Massachusetts Department of Environmental Protection at 888-304-1133.
- Should a spill occur, the spill prevention plan will be adjusted to include measures to prevent another spill and to cleanup up the spill should another occur. A description of

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the spill, along with the causes and cleanup measures will be included in the updated spill prevention plan.

- The construction superintendent responsible for daily operation on the construction site will be the spill prevention and cleanup coordinator. The superintendent will designate at least three site personnel to receive spill prevention cleanup and training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the on-site job trailer.

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CERTIFICATION OF COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS

This stormwater pollution prevention plan reflects State of Massachusetts requirements for stormwater management and sediment and erosion control as established by the *Wetlands Protection Act* (310 CMR 10.00) and by the Department of Environmental Protection *Stormwater Management Policy*. To ensure compliance, this plan was prepared in consultation with the following publications:

Commonwealth of Massachusetts, Department of Environmental Protection. *Stormwater Management Policy*. November 1997.

Commonwealth of Massachusetts, Department of Environmental Protection. *Wetlands Protection Act Regulations: 310 CMR 10.00 for Administering M.G.L. Chapter 31, Section 40*. November 1997.

Commonwealth of Massachusetts, Department of Environmental Protection and Office of Coastal Zone Management. *Stormwater Management, Volume One: Stormwater Policy Handbook*. March 1997.

Commonwealth of Massachusetts, Department of Environmental Protection and Office of Coastal Zone Management. *Stormwater Management, Volume Two: Stormwater Technical Handbook*. March 1997.

United States Environmental Protection Agency. *Storm Water Management For Construction Activities, Developing Pollution Prevention Plans And Best Management Practices, Summary Guidance*. October 1992.

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POLLUTION PREVENTION PLAN CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signed: _____

CONTRACTOR'S CERTIFICATION

I certify under penalty of law that I understand the terms and conditions of the general National Pollutant Discharge Elimination System (NPDES) permit that authorizes the stormwater discharges associated with industrial activity from the construction site identified as part of this certification.

Signature	Company	Responsible For
_____	_____	_____
_____	_____	_____
_____	Tel: _____	_____
_____	_____	_____
_____	_____	_____
_____	Tel: _____	_____
_____	_____	_____
_____	_____	_____
_____	Tel: _____	_____

**STORMWATER POLLUTION PREVENTION PLAN
INSPECTION AND MAINTENANCE REPORT FORM**
For
Northern Avenue

Inspection Schedule:
FORM TO BE COMPLETED EVERY 7 DAYS
(General Permit Section 3.10 Inspections)

Inspector:

Date: _____ Time: _____

Inspector's Qualifications:

Days Since Last Rainfall:

Amount of Last Rainfall (inches):

STABILIZATION MEASURES

Area of Site	Date Since Last Disturbed	Date of Next Disturbance	Stabilized? (Yes/No)	Stabilized With	Condition
Access Drive					

Stabilization Required: _____

To Be Performed By: _____ On or Before: _____

STRUCTURAL CONTROLS

Entrance Tracking Pad

Is Sediment Tracking Pad Catching Sediment Before Collector Road	Is Gravel Clean or Filled With Sediment	Is Tracking Pad Width and Length Adequate to be Effective	Does Tracking Pad Require Replacement/Maintenance

Maintenance Required:

To Be Performed By:

On or Before:

Catch Basins

CB	Is Surface Runoff Being Directed to Catch Basins Properly	Are Sediment Traps Installed at Catch Basin Inlets	Are Catch Basin Outlet Hoods Installed and Working Properly	Depth of Sediment in Basin Sump	Are Any Correction Measures Required
CB#1					
CB#2					
CB#3					
CB#4					
CB#5					
CB#6					
CB#7					

Maintenance Required:

To Be Performed By:

On or Before:

STRUCTURAL CONTROLS –CON'T

Stormwater Treatment Chambers

SWTC	Is Surface Runoff Being Directed Through SWTC Properly	Depth of Sediment in Basin Sump	Are Any Correction Measures Required
SWTC #1			

Maintenance Required:

To Be Performed By:	On or Before:
----------------------------	----------------------

Bioretention Area/ Infiltration Trench

Structure	Is Structure Working Properly	Depth of Sediment in Structure	Are Any Correction Measures Required	Additional Notes
Rain Garden				
Infiltration Trench				

Maintenance Required:

To Be Performed By:	On or Before:
----------------------------	----------------------

Stormwater Detention Basin 1

Is Stormwater Entering Basin Correctly	Is Stormwater Being Detained and Discharged Properly	Depth of Sediment in Spreader	Is Rip-Rap Stabilization Properly Installed & Maintained	Is There Any Evidence of Erosion Or unintended Flow Patterns

Maintenance Required:

To Be Performed By:	On or Before:
----------------------------	----------------------

Stormwater Detention Basin 2

Is Stormwater Entering Basin Correctly	Is Stormwater Being Detained and Discharged Properly	Depth of Sediment in Spreader	Is Rip-Rap Stabilization Properly Installed & Maintained	Is There Any Evidence of Erosion Or unintended Flow Patterns

Maintenance Required:

To Be Performed By:

On or Before:

RECOMENDED MODIFICATION(S) TO SWPPP

CHANGES REQUIRED TO THE POLLUTION PREVENTION PLAN

REASONS FOR CHANGES:

MISCELLANEOUS COMMENTS:

INSPECTOR'S CERTIFICATION:

Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

Signature:

Date:

TRAFFIC IMPACT STUDY
North Street Condos
Northampton, MA

Kohl Construction
Hadley, MA

October 14, 2008



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Fuss & O'Neill, Inc.
78 Interstate Drive
West Springfield, MA 01089



TRAFFIC IMPACT STUDY
Proposed Retail Development
Great Barrington, MA

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**TRAFFIC IMPACT STUDY
Proposed Retail Development
Great Barrington, MA**

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SUMMARY SHEET

As an aid to reviewers, this Summary Sheet has been included to outline the various study parameters utilized in this report. Although a full explanation of the study methodologies is included in the text of the report, this summary can serve as a useful reference for reviewers.

APPLICANT:

Kohl Construction

DEVELOPMENT SIZE/TYPE:

25 Units - Residential Condominium/Townhome

APPLICATIONS:

City of Northampton Planning Board

BUILD YEAR:

2013 (2008 +5 years)

BACKGROUND TRAFFIC GROWTH FACTOR:

1% - based on available MassHighway continuous count data

TRAFFIC COUNTS:

Data Inc. – October 1, 2008 (Turning Movement Counts)

Data Inc. – October 1-2, 2008 (Automatic Traffic Recorders)

PEAK HOURS ANALYZED:

Morning Peak Hour – 8:00am to 9:00am

Afternoon Peak Hour – 4:15pm to 5:15pm

EXPECTED TRIP GENERATION:

Morning Peak Hour – 17 total trip ends

Afternoon Peak Hour – 19 total trip ends

CAPACITY ANALYSIS:

Technique – 2000 Highway Capacity Manual

Execution – Synchro Professional Software, Version 7.0



1.0 INTRODUCTION

1.1 Purpose of Report and Study Objectives

The following report summarizes the site traffic impact assessment for the development of condominium/townhomes on North Street and Northern Avenue in Northampton. The proposed development will be composed of 25 new dwelling units.. This report presents the results of a field investigation, traffic counts, and analysis of the estimated traffic to be generated by the proposed project.

1.2 Project Overview

The proposed redevelopment site is located northeast of downtown Northampton. The proposed condominium/townhomes will be located on the northwest side of North Street. Twenty-three units will access North Street via View Avenue, a private way and a proposed driveway also accessing North Street. Two of the units will be located at the end of Northern Avenue. The parcel is currently undeveloped.

The study area is primarily a residential area surrounding North Street. North Street connects King Street, on the east end to Bates Street and Day Avenue, on the west end. This study focused on the intersections and driveway used by the proposed development and major intersection at either end of North Street, where new trips will be most concentrated.

2.0 EXISTING CONDITION

2.1 Site of Development

A locus map of the site location and the surrounding area is provided in Appendix B, Figure 1. The property is zoned Urban Residential. Existing land uses surrounding the study area are:

- Single and Multi-Family housing surrounding the site.
- Industrial Park to the northeast
- Central Business District of Northampton to the southwest

Currently the proposed location for the condominium/townhomes is undeveloped.

2.2 Adjacent Roadway Network

The study area of influence includes North Street and Northern Avenue that provide access to the site and the surrounding roadway network.

North Street is a collector roadway that runs northeast-southwest through the study area. Pavement width for North Street is 26 feet in the vicinity of the site. North Street is a 2-lane roadway, without lane delineation, which is under the jurisdiction of the City of Northampton. At the time the traffic count was conducted North Street carried an average daily traffic (ADT) of approximately 4,025 vehicles per day in the vicinity of the site.



Northern Avenue is a dead-end local road under the jurisdiction of the City of Northampton. Pavement width is 20 feet, which includes approximately 8 feet used for on-street parking on the northeast side of the street.

The PVTA does not have a bus route directly passing the site on North Street. There are bus stops within a half mile of the site, however. Sidewalks are provided on both North Street and Northern Avenue.

2.3 Study Area Intersections

The intersections analyzed for this study consist of the following:

1. King St (Route 5) / North Street
2. North Street / Market Street
3. North Street / Northern Avenue
4. North Street, Bates Street and Day Avenue

The intersection of King Street, Summer Street and North Street is signalized and actuated with 2 phases. The southbound approach has two lanes, a through lane and a shared through/left turn lane. The northbound approach has a through lane and right turn lane. The eastbound approach, Summer Street, is one-way entering the intersection with a left lane and a shared through/right turn lane. The westbound approach, North Street, has a shared left/right turn lane.

The intersection of North Street and Market Street is one-way stop sign controlled. The eastbound approach, North Street, is stop controlled and has a shared right/left turn lane. The north and southbound approaches are free flowing. The southbound approach, North Street, operates with a through lane and right turn lane. The northbound approach, Market Street, has a single shared left turn/through lane.

The intersection of North Street and Northern Avenue is one-way stop sign controlled. The North Street moves are free flowing while Northern Avenue is stop controlled. Each approach has a single lane shared for all related moves.

The intersection of North Street, Bates Street and Day Avenue is three-way stop controlled. Each approach has a single lane shared for all movements.

2.4 Traffic Volumes, and Counts

The greatest potential for traffic impact on the roadway network by the proposed development will occur during the weekday morning and afternoon peak hour, the period when traffic demand on North Street is typically at its highest level. In order to determine the traffic impact of the proposed development on adjacent street traffic, weekday morning and afternoon peak period manual turning movement counts were conducted in October at the four existing intersections in the study area. The traffic count data collected indicates that the weekday morning peak hour is 8:00am to 9:00am and the afternoon peak hour is 4:15pm to 5:15pm.



These peak hours was subsequently analyzed for impacts. The existing traffic volumes for these peak hours are shown in Appendix C.

24 hour automatic traffic recorder data was also collected on October 1-2, 2008 on North Street southeast of Northern Avenue. Copies of the ATR traffic data are included in Appendix D of this report.

3.0 BACKGROUND TRAFFIC CONDITIONS

3.1 Growth Rate and Analysis Periods

The proposed project is expected to be completed and fully occupied before the year 2013 (five year projection). Future traffic conditions were estimated by applying a growth factor to all peak hour turning movement traffic volumes to account for regional growth characteristics such as other developments, increasing population, vehicle ownership, workers per household and increased travel mileage. In order to determine a reasonable growth rate for the background traffic volumes within the study area, count data were obtained from MassHighway for Routes 5 and 10 in the vicinity of the site for the years 2002 through 2006.

The count data showed an overall decline in traffic volume over the period data was recorded. Therefore, a growth factor of 1% increase was assumed for this study to be conservative. The data also indicated the month of October has higher than average month traffic volumes. The count data for this study was not adjusted (lower) for the average month.

3.2 Background Developments

There were no other programmed developments anticipated to be completed during the analysis period that would impact traffic within the study area at the time of this study.

3.3 Estimated Volumes

The raw count data for each of the count location were graphically applied to the study area network. The resulting volumes are used as the Base conditions for the traffic estimates. The weekday morning and afternoon 2008 Base condition traffic volume estimates are given in Appendix B, Fig 2. To determine the estimated traffic volumes at the time the project is expected to be fully constructed and occupied the base 2008 volumes were increased with a 1% growth rate for five years to year 2013. This volume estimate provides the 2013 No-Build condition. The weekday morning and afternoon 2013 No-Build condition traffic volume estimates are given in Appendix B, Fig 3.

4.0 PROPOSED CONDITIONS

4.1 Development and Site Access

The proposed development consists of 25 condominium/townhomes. The units are attached in groups with between 2 and 6 units in each group. Seventeen of the dwelling units will have attached garages plus driveway parking space. The remaining units will have driveway surface parking areas and additional visitor parking areas are provided throughout the site.



Two units are isolated on Northern Avenue and will have a driveway at the end of the street. The other 23 units will access the site to and from North Street via two existing private right-of-ways to access North Street. The existing right-of-ways will be reconstructed to accommodate site traffic. The first is an unaccepted street View Avenue. View Avenue will serve as both an entrance and exit to the site. The second is a gravel driveway located between Northern Avenue and View Avenue. The on site portion of this driveway will be restricted to one-way exiting the site only.

4.2 Trip Generation

The expected site generated traffic volume was calculated using existing empirical data from the Institute of Transportation Engineers (ITE) publication Trip Generation, 7th edition, 2003. This publication is an industry-accepted resource for determining trip generation.

Trip generation estimated for the proposed developments were estimated based on the total number of proposed dwelling units. The land use for this development is LUC: 230 Residential Condominium/Townhome.

Based on ITE rates the proposed development is estimated to produce 198 new vehicle trips over a typical 24-hour period on weekdays. During the Weekday Morning peak hour the proposed development is estimated to generate 17 new trips and 19 new trips during the Weekday Afternoon peak hour. Table 1 presents the daily weekday trip estimates and weekday afternoon trip estimates.

TABLE 1
LUC: 230 Residential Condominium/Townhouse
Development Trip Generation Estimates

	New Vehicle Trips	
Weekday (24 Hour)	Entering:	99
	Exiting:	99
	Total:	198
Weekday AM Peak Hour of Adjacent Street Traffic	Entering:	3
	Exiting:	14
	Total:	17
Weekday PM Peak Hour of Adjacent Street Traffic	Entering:	13
	Exiting:	6
	Total:	19

4.3 Trip Distribution



The distribution of new trips accessing the site was applied to the local road network based on consideration of the existing local traffic distribution and the layout of the adjacent roadway network. Arrival and departure distributions of site traffic were first estimated based on existing patterns at Northern Avenue and then subsequent intersection to the limits of the study area. The estimated trips were split between the three access points to the site the Site Driveway, View Avenue and Northern Avenue. The splits were based on the internal circulation and site layout. The one-way driveway will serve 52% of the trips leaving the site. View Avenue will serve 40% of the trips leaving the site and 92% of the trips entering the site. The two units on Northern Avenue comprise about 8% of the site traffic entering and leaving.

4.4 Combined Volumes

The 2013 Build condition traffic estimates were calculated by adding the site traffic to the projected No-Build traffic volumes. The 2013 Build condition traffic volumes are given in Appendix B, Figure 4. The estimated trip generation and trip distribution used for determining the Build condition traffic volumes are included in Appendix B, Figure 3.

5.0 ANALYSIS

5.1 Accident Review

An analysis to determine crash rate per intersection was prepared to review the level of safety at the study area intersections. Accident data was obtained from MassHighway for each of the study area intersections. The records were gathered for the most recent 3 years of available data, 2004 through 2006. The crash rates, expressed as "crashes per Million Entering Vehicles" (MEV), were determined using the turning movement counts and average number of crashes during the three-year period. A summary of the accident data and resulting crash rates is provided in Appendix A, Table A-1.

The crash rate is a measurement used by MassHighway that compares the number of crashes to the number of vehicles passing through a particular intersection. A crash rate at or below the regional average for a similar facility is an indication that there is likely no unusually hazardous condition or predominant safety factor influencing the frequency of crashes at a location. The crash rates were determined to be below the District 2 average with the exception of the King Street, Summer Street and North Street intersection. The elevated experience on King Street could be a result of the lack of a separate southbound left turn phase and also the offset east and west legs of the intersection.

5.2 Intersection Capacity Analyses

Capacity analyses for both signalized and un-signalized intersections were conducted using Synchro Professional Software, version 7.0.

Level of Service has been determined by the methodology of the "2000 Highway Capacity Manual" published by the Transportation Research Board to describe the operating condition of an intersection. LOS is a measure of the Control Delay experienced by stopped vehicles at an intersection, which is rated on a scale from A to F, with each letter grade assigned a range of delay values in seconds per vehicle. LOS A describes a free flowing condition of very low delay



(less than 10 seconds per vehicle), and LOS F describes a congested condition where delays will exceed 50 seconds per vehicle at an unsignalized intersection. Control Delay measures the time accumulated when a motorist approaches an intersection including the initial deceleration, queue move-up time, stopped delay, and final acceleration delay. Therefore, intersections with longer Control Delay times are less acceptable to most drivers.

For unsignalized intersection capacity analyses, LOS provides a description of the delay and operational characteristics of the movements from the minor street (usually stop sign controlled) and left turns from the major street into the minor street. Major street through and right turn vehicles typically experience very little delay. Therefore, they are not rated with a LOS at unsignalized intersections.

Using the above referenced methodologies, weekday morning and afternoon peak hour capacity analyses were conducted at the signalized intersection of King Street (U.S. Route 5 and State Route 10), Summer Street and North Street.

Weekday morning and afternoon peak hour capacity analyses were also conducted at the following un-signalized intersections:

- North Street and Market Street
- North Street & Northern Avenue
- North Street, Bates Street and Day Avenue
- North Street & View Avenue
- North Street & the Site Driveway

Existing (2008) and Future No Build (2013) Capacity Conditions:

During the weekday morning and afternoon peak hours the LOS at the signalized intersection of King Street, Summer Street and North Street will be LOS C or better. The exception is the westbound approach from North Street. The morning peak hour is expected to operate at LOS E under the No-Build condition. The afternoon peak hour is expected to operate at LOS D under the No-Build condition.

During the weekday morning and afternoon peak hours the LOS at the unsignalized intersections will be LOS C or better under both the Base and No-Build conditions. The exception is the westbound approach from North Street.

Build (2013) Capacity Conditions:

During both the morning and afternoon peak hours the added site traffic is not expected to result in changes to the LOS. Slight increases in delay from site traffic are not significant enough to decrease the LOS letter grade. The new site accesses at View Avenue and the Site driveway will operate at LOS B or better under the Build condition.

The summarized results of the capacity analysis are provided in Tables 2 - 5. The capacity analysis worksheets are provided in Appendices E & F.



TABLE 2
WEEKDAY MORNING PEAK HOUR
INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2008 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
King Street (U.S. Route 5) & North Street/Summer Street							
Summer Street	EB L	24.8	C	24.5	C	24.4	C
	EB T/R	24.4	C	24.1	C	24.1	C
North Street	WB L/R	52.8	D	60.6	E	65.2	E
King Street	NB T	9.0	A	9.8	A	10.0	A
	NB R	6.3	A	6.7	A	6.8	A
	SB L/T	9.3	A	10.2	B	10.4	B
OVERALL		20.5	C	22.7	C	24.0	C

TABLE 3
WEEKDAY MORNING PEAK HOUR
UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2007 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
North Street & Market Street							
North Street	EB L/R	17.5	C	19.3	C	19.7	C
Market Street	NB L	6.5	A	6.6	A	6.6	A
North Street & Northern Avenue							
North Street	NB L/T	0.2	A	0.2	A	0.2	A
Northern Avenue	EB L/R	9.7	A	9.7	A	9.9	A
North Street & Bates Street/Day Avenue							
North Street	NB L/R	8.5	A	8.7	A	8.7	A
Bates Street	EB T/R	9.4	A	9.6	A	9.6	A
Day Avenue	WB L/T	8.4	A	8.6	A	8.6	A
North Street & View Avenue							
View Avenue	EB L/R	-	-	-	-	10.0	A
North Street	NB L/T	-	-	-	-	0.1	A
North Street & Site Driveway							
	EB L/R	-	-	-	-	9.9	A



TABLE 4
WEEKDAY AFTERNOON PEAK HOUR
INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2008 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
King Street (U.S. Route 5 and Route 10) & North Street/Summer Street							
Summer Street	EB L	37.5	D	35.0	C	34.6	C
	EB T/R	23.0	C	22.6	C	22.6	C
North Street	WB L/R	44.4	D	48.8	D	49.1	D
King Street	NB T	8.1	A	9.0	A	9.1	A
	NB R	5.0	A	5.4	A	5.5	A
	SB L/T	7.4	A	8.5	A	8.6	A
OVERALL		19.1	B	20.8	C	21.0	C

TABLE 5
WEEKDAY AFTERNOON PEAK HOUR
UNSIGNALIZED INTERSECTION CAPACITY ANALYSIS: LEVEL OF SERVICE SUMMARY

Intersection	Movement	2008 Existing		2013 No Build		2013 Build	
		Delay	LOS	Delay	LOS	Delay	LOS
North Street & Market Street							
North Street	EB L/R	18.9	C	21.1	C	21.1	C
Market Street	NB L	7.7	A	7.8	A	7.8	A
North Street & Northern Avenue							
North Street	NB L/T	0.3	A	0.3	A	0.3	A
Northern Avenue	EB L/R	10.5	B	10.7	B	10.7	B
North Street & Bates Street/Day Avenue							
North Street	NB L/R	8.0	A	8.0	A	8.1	A
Bates Street	EB T/R	10.6	B	11.0	B	11.1	B
Day Avenue	WB L/T	8.4	A	8.5	A	8.6	A
North Street & View Avenue							
View Avenue	EB L/R	-	-	-	-	10.9	B
North Street	NB L/T	-	-	-	-	0.3	A
North Street & Site Driveway							
	EB L/R	-	-	-	-	10.8	B



5.3 Findings:

With regard to impacts due to added site traffic, there will not be a noticeable impact to operation at the existing intersections. The two proposed site accesses, View Avenue and the Site Driveway, will operate safely and efficiently.

Sight distance viewing to the north and south along North Street at both proposed access points, View Avenue and the Site Driveway, is adequate.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The study indicates that completion and occupancy of the proposed development will generate 17 new entering and exiting vehicle trips per hour at the site during the weekday morning peak and 19 new entering and exiting vehicle trips per hour in the weekday afternoon peak.

The additional traffic generated by the proposed project will result in incremental increase in peak period traffic volumes on North Street that will have minimal impact on traffic operations. The site access intersections with North Street are designed to provide safe and efficient traffic operations and the turning movements can be accommodated without consideration of off-site improvements.

TABLE A-1
ACCIDENT DATA SUMMARY - 2004 THROUGH 2006
STUDY AREA INTERSECTIONS

Criteria	Summer Street, North Street and King Street	North Street and Market Street	North Street and Northern Ave	Bates Street, North Street and Day Ave
YEAR				
2004	9	1	0	0
2005	16	2	0	0
2006	4	0	0	0
Total	29	3	0	0
Average No. of Crashes	9.67	1.00	0.00	0.00
Crash Rate	1.43	0.31	0.00	0.00
TYPE				
Angle	13	2	0	0
Rear-End	7	0	0	0
Head-On	0	0	0	0
Sideswipe	3	0	0	0
Unknown/Other	6	1	0	0
Total	29	3	0	0
SEVERITY				
Property Damage Only	19	2	0	0
Non-fatal Injury	9	1	0	0
Fatality	0	0	0	0
Unknown/Other	1	0	0	0
Total	29	3	0	0
WEATHER				
Clear	14	1	0	0
Rain	2	0	0	0
Snow/Ice	2	1	0	0
Clouds	9	1	0	0
Fog	0	0	0	0
Unknown/Other	2	0	0	0
Total	29	3	0	0
TIME				
Weekday 7:30 AM - 9:30 AM	2	0	0	0
Weekday 3:30 PM - 5:30 PM	6	0	0	0
Other	21	3	0	0
Total	29	3	0	0

District # 2 Average Crash Rates: 0.94 Signalized Intersections
0.85 Unsignalized Intersections

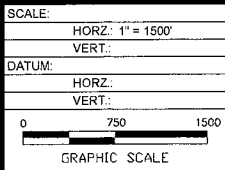
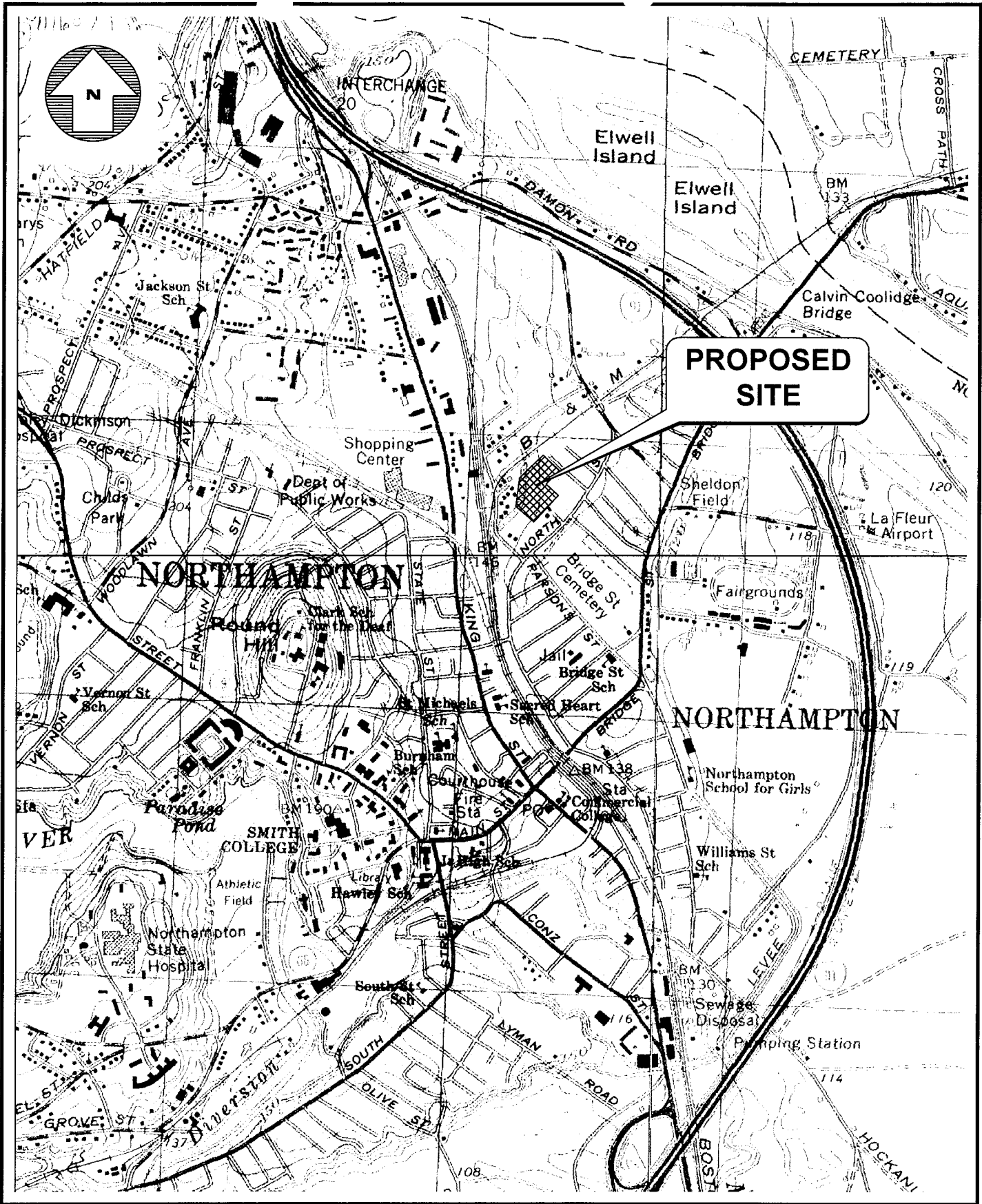
File Path: H:\DWG\F20081183A\10Traffic\LOCUS.dwg Layout: locus West, Oct 15, 2008 - 2:58 PM User: WVanDuzer

CTB:

LWAN

MS VIEW

UCS:



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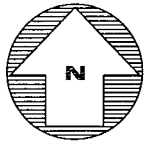
78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

KOHL CONSTRUCTION
LOCUS MAP
NORTH STREET CONDOS

NORTHAMPTON MASSACHUSETTS

PROJ. No. 20081193.A10
DATE: OCTOBER 2008

FIG 1



NOT TO SCALE

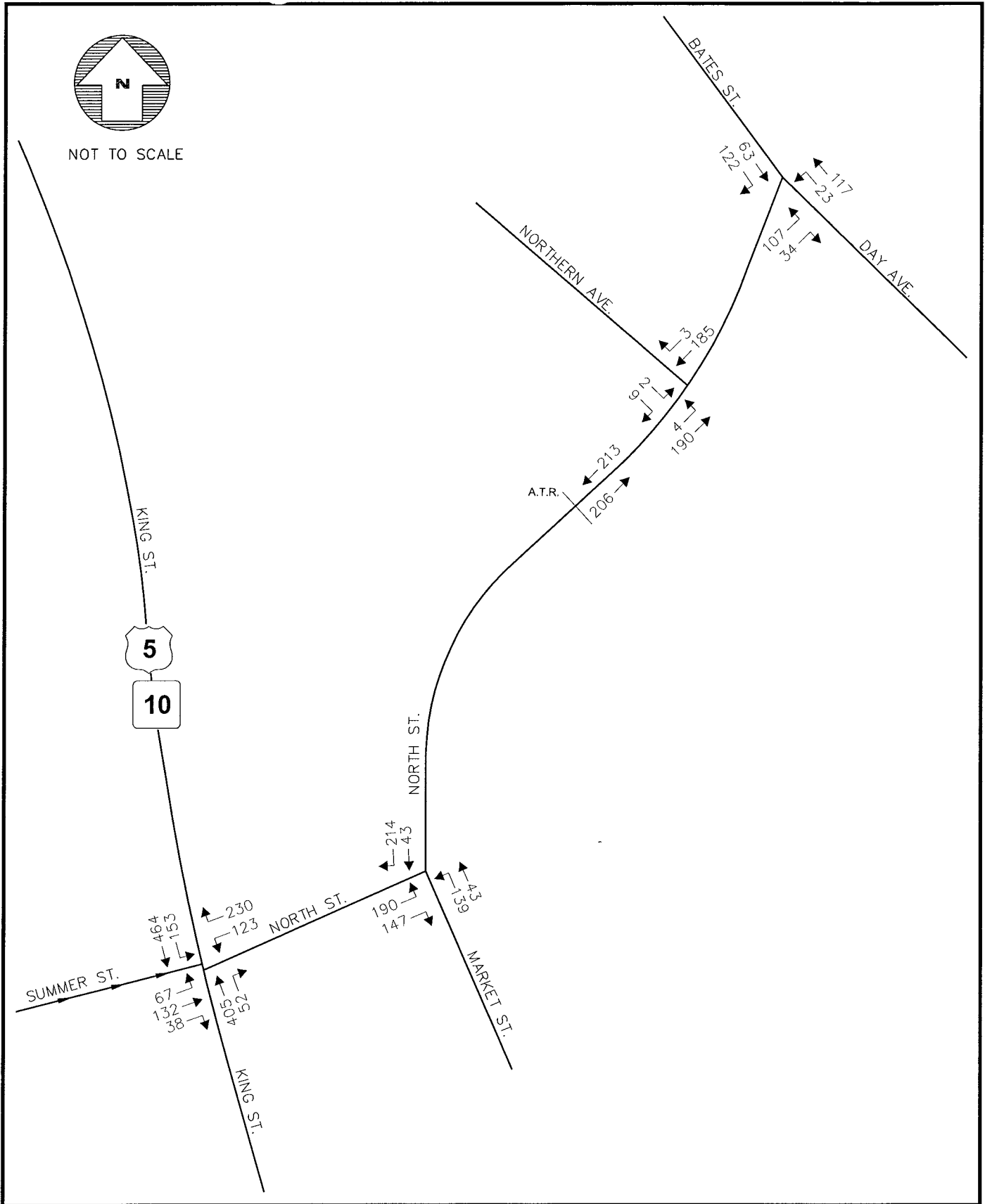
File Path: H:\DWG\IP\20081193\A10\Traffic\20081193A10_TFV.dwg Layout: AM BASE Wed, Oct 15, 2008 - 2:56 PM User: WVanDuzer

CTB:

LMAN:

MS VIEW:

LCS:



SCALE:	HORZ: N.T.S
	VERT:
DATUM:	HORZ:
	VERT:
GRAPHIC SCALE	

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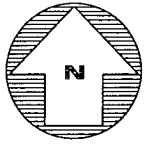
78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

KOHL CONSTRUCTION
2008 BASE TRAFFIC VOLUMES
WEEKDAY MORNING PEAK HOUR
NORTH STREET CONDOS

NORTHAMPTON MASSACHUSETTS

PROJ. No.: 20081193.A10
DATE: OCTOBER 2008

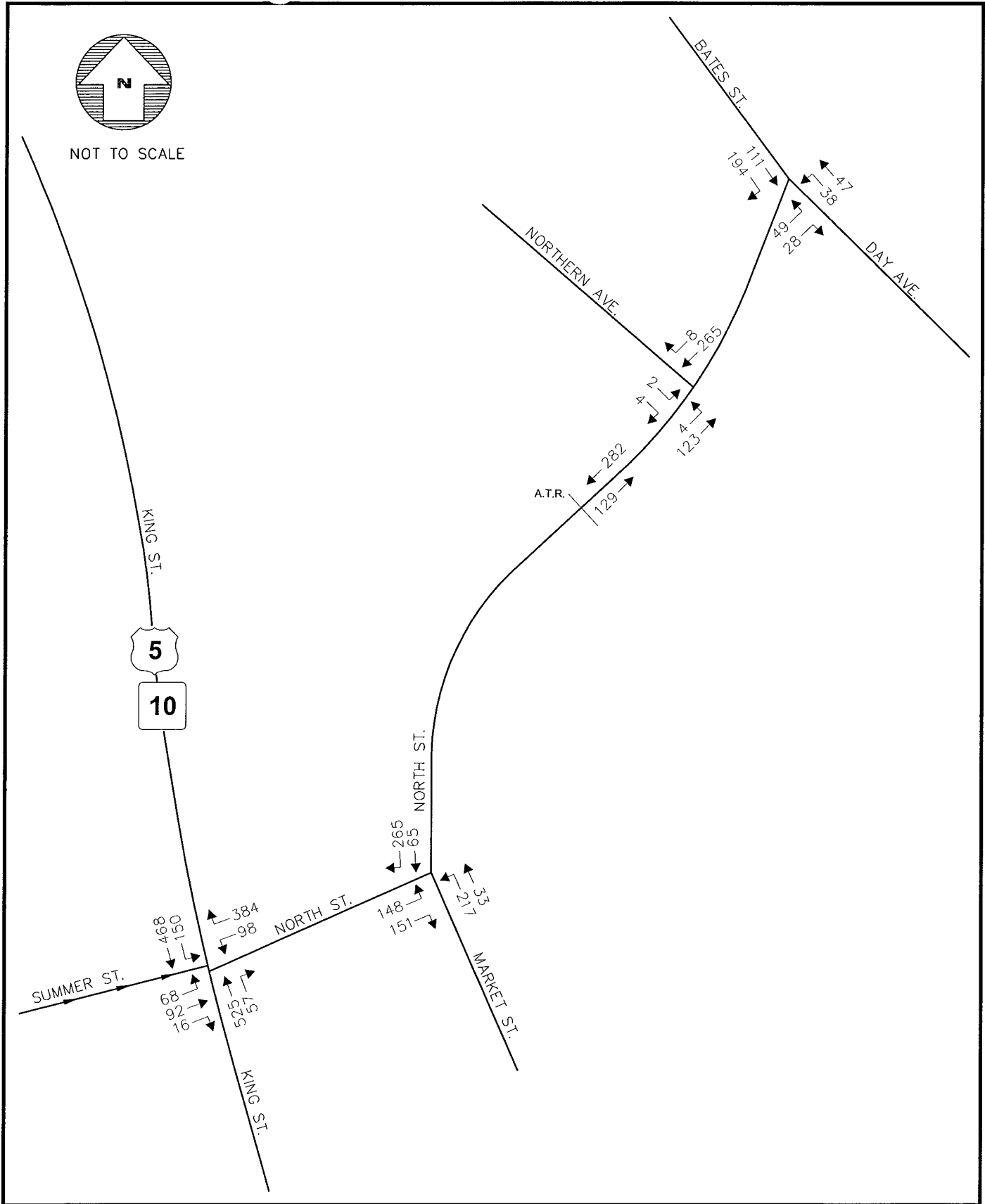
FIG 2



NOT TO SCALE

File Path: H:\DWG\IP\20081193\A10\Traffic\20081193A10_TFV.dwg, Layout: PM BASE Wed, Oct 15, 2008 - 2:56 PM, User: WWarDuzer

MS VIEW, CTB, LMAN, LCS



SCALE:	HORZ.: N.T.S.
	VERT.:
DATUM:	HORZ.:
	VERT.:
GRAPHIC SCALE	

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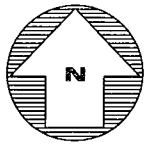
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78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

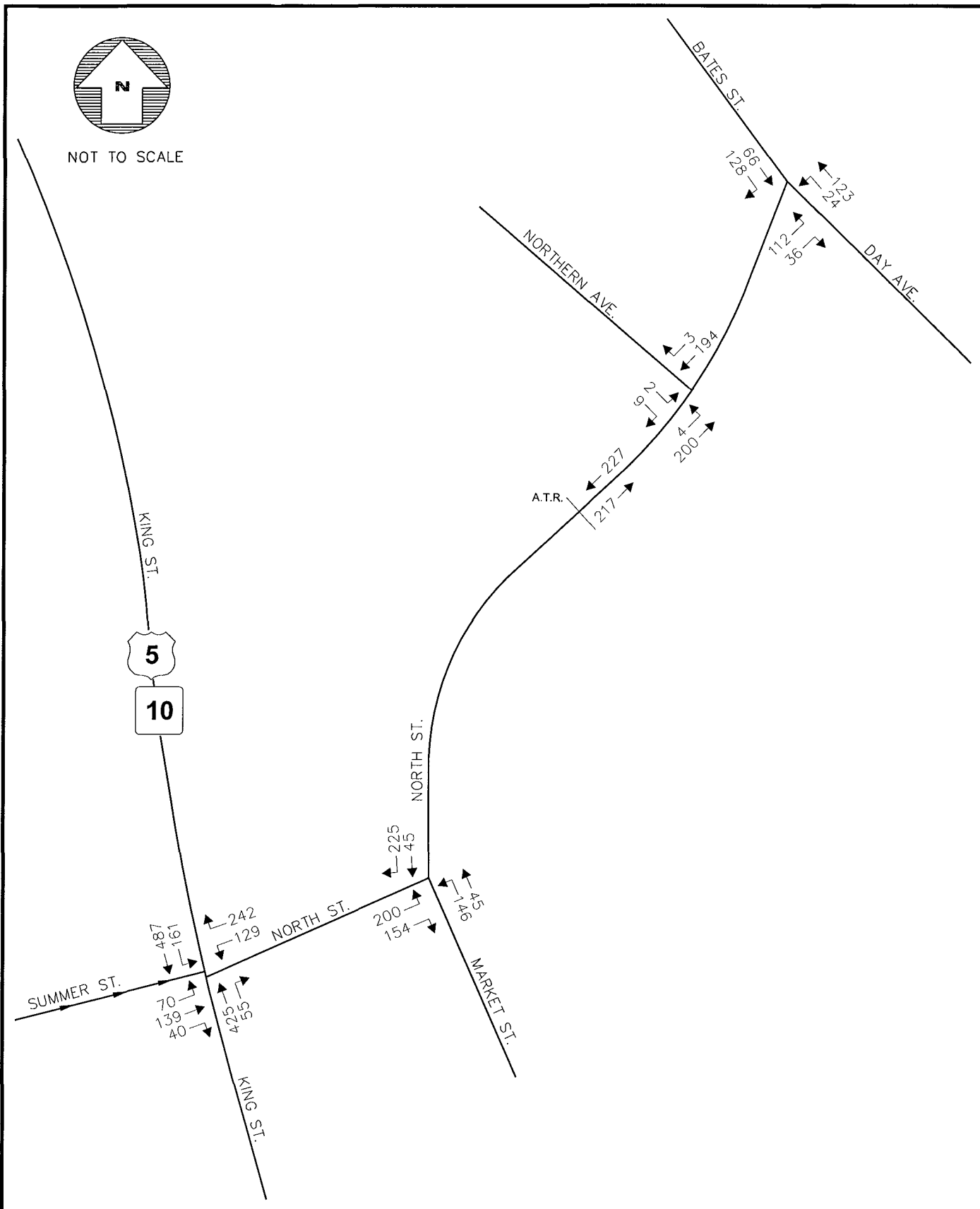
KOHL CONSTRUCTION
2008 BASE TRAFFIC VOLUMES
WEEKDAY AFTERNOON PEAK HOUR
NORTH STREET CONDOS

NORTHAMPTON MASSACHUSETTS

PROJ. No.: 20081193.A10
DATE: OCTOBER 2008
FIG 3



NOT TO SCALE



File Path: H:\DWG\GP20081193A101Traffic\20081193A10_TFV.dwg. Layout: AM NO BUILD. Wed, Oct 15, 2008 - 2:56 PM. User: WrenDulzer

CTB:

LMAN

MS VIEW

UCS:

SCALE:	HORZ.: N.T.S.
	VERT.:
DATUM:	
	HORZ.:
	VERT.:
0	
GRAPHIC SCALE	



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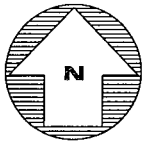
KOHL CONSTRUCTION
2013 NO BUILD TRAFFIC VOLUMES
WEEKDAY MORNING PEAK HOUR
NORTH STREET CONDOS

NORTHAMPTON

MASSACHUSETTS

PROJ. No.: 20081193.A10
DATE: OCTOBER 2008

FIG 4



NOT TO SCALE

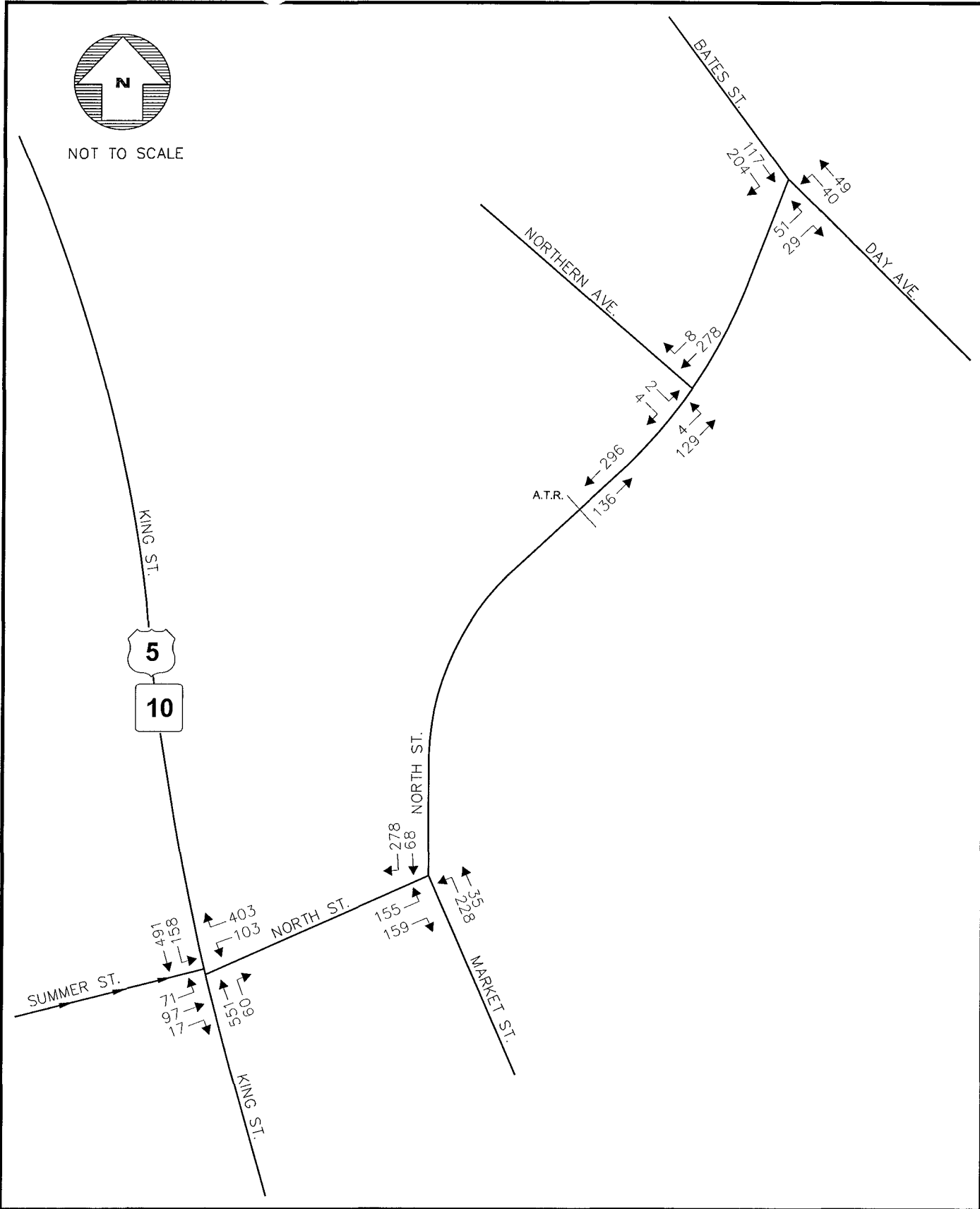
File Path: H:\DWG\IP20081193A\10Traffic\20081193A10_TFV.dwg Layout: PM NO BUILD Wed, Oct 15, 2008 - 2:56 PM User: WVanDuser

CTB:

LMAN:

MS VIEW:

LCS:



SCALE:	
HORZ.:	N.T.S.
VERT.:	
DATUM:	
HORZ.:	
VERT.:	
0	
GRAPHIC SCALE	

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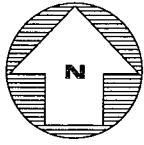
FUSS & O'NEILL
Discipline: to Deliver

78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

KOHL CONSTRUCTION
2013 NO BUILD TRAFFIC VOLUMES
WEEKDAY AFTERNOON PEAK HOUR
NORTH STREET CONDOS

NORTHAMPTON MASSACHUSETTS

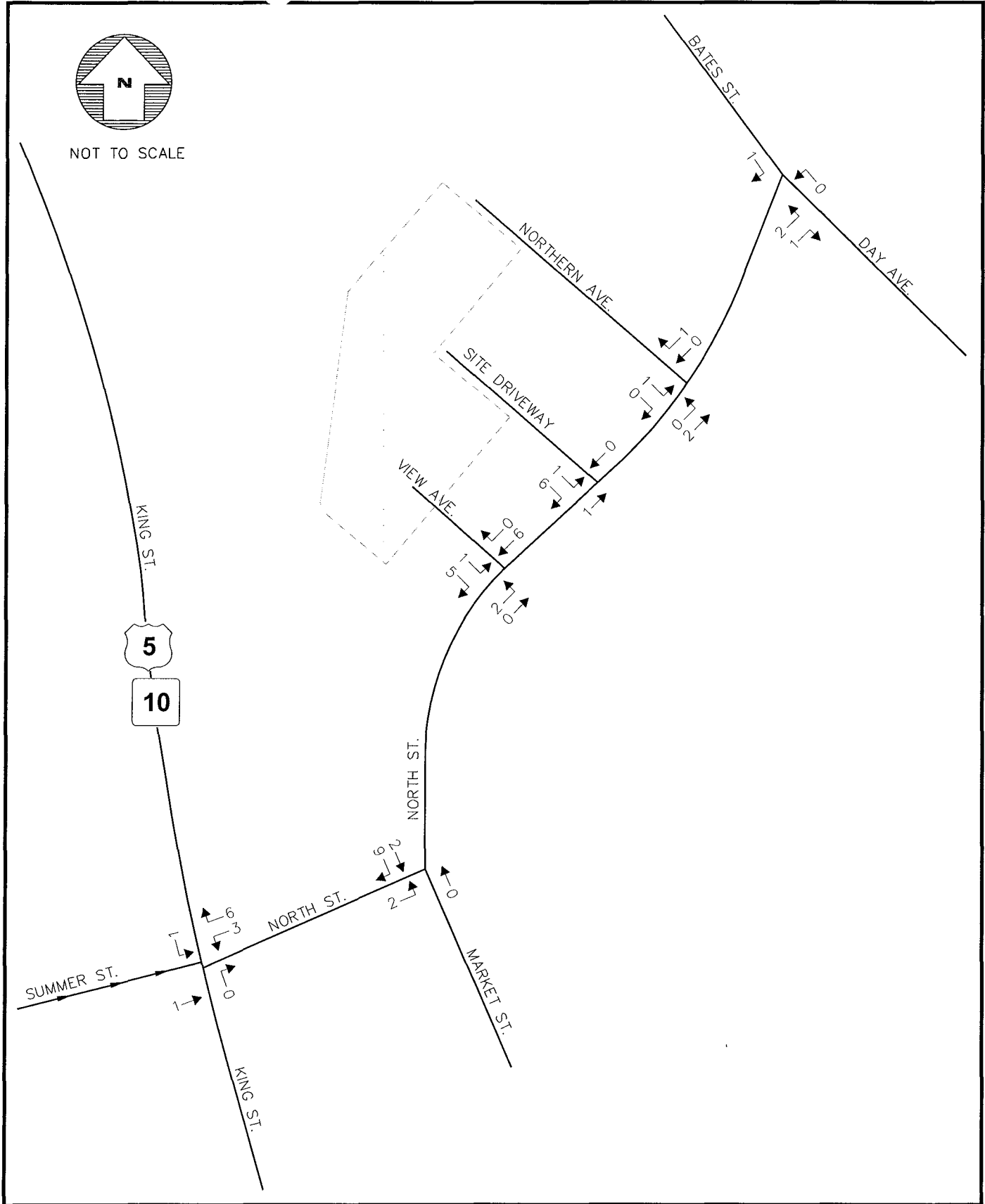
PROJ. No.:	20081193.A10
DATE:	OCTOBER 2008
FIG 5	



NOT TO SCALE

File Path: H:\DWG\IP\20081183\A101Traffic\20081193A10_TFV.dwg. Layout: AM SITE. Wed, Oct 15, 2008 - 2:56 PM. User: WVanDuser

UCS: MS VIEW. LMAN: CTB:



SCALE:	
HORZ.:	N.T.S.
VERT.:	
DATUM:	
HORZ.:	
VERT.:	
0	
GRAPHIC SCALE	

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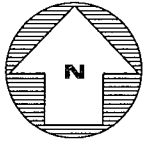
78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

KOHL CONSTRUCTION
SITE TRAFFIC VOLUMES
WEEKDAY MORNING PEAK HOUR
NORTH STREET CONDOS

NORTHAMPTON MASSACHUSETTS

PROJ. No.: 20081193.A10
DATE: OCTOBER 2008

FIG 6



NOT TO SCALE

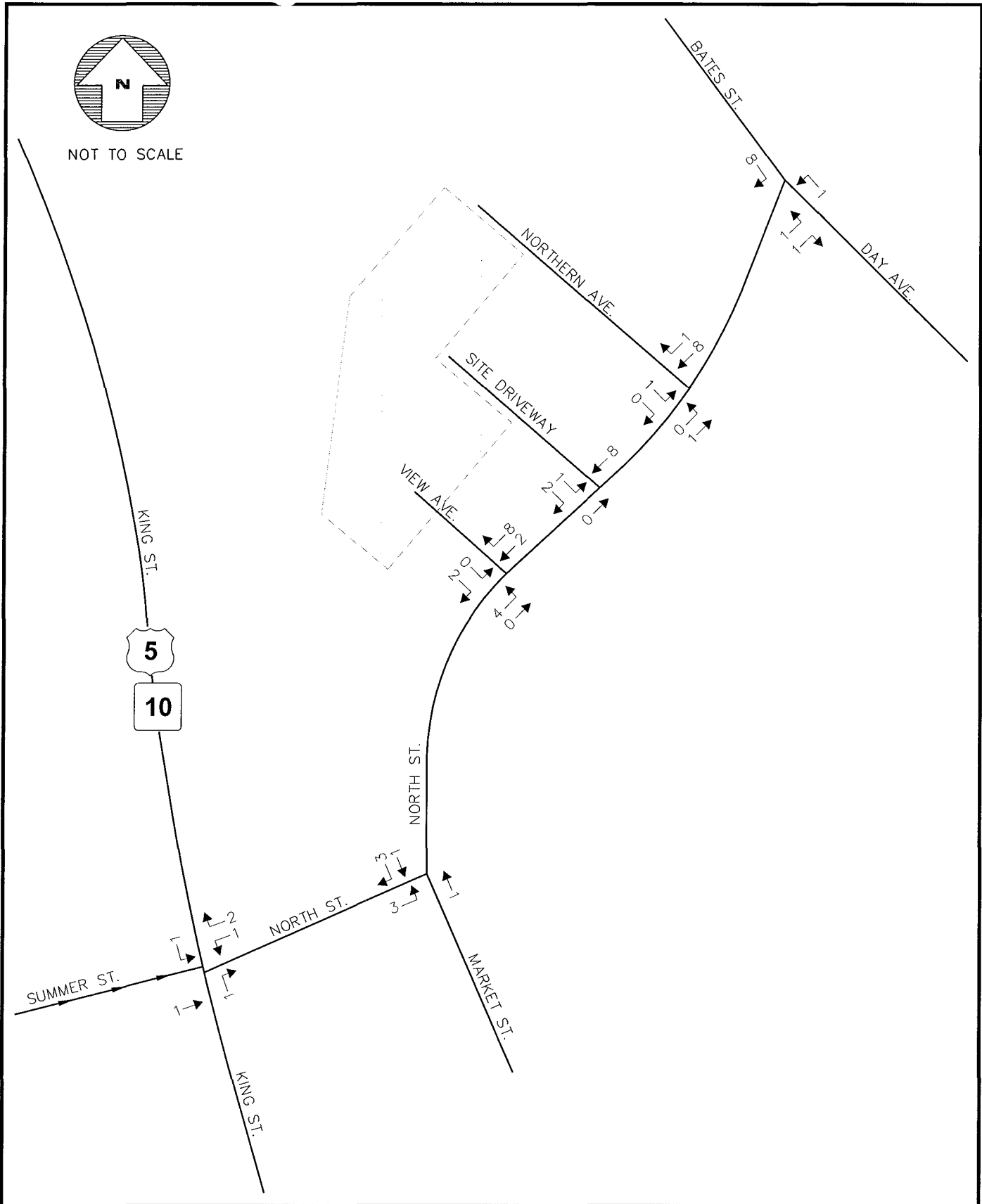
File Path: H:\DWG\IP\2008\183A\10\Traffic\2008183A10_TFV.dwg, Layout: PM SITE, Wed, Oct 15, 2008 - 2:56 PM, User: WVanDuser

CTB:

LWAN:

MS VIEW:

UCS:



SCALE:	
HORZ:	N.T.S.
VERT:	
DATUM:	
HORZ:	
VERT:	
0 GRAPHIC SCALE	

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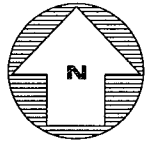


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78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

KOHL CONSTRUCTION
SITE TRAFFIC VOLUMES
WEEKDAY AFTERNOON PEAK HOUR
NORTH STREET CONDOS
NORTHAMPTON MASSACHUSETTS

PROJ. No.: 20081193A10
DATE: OCTOBER 2008
FIG 7

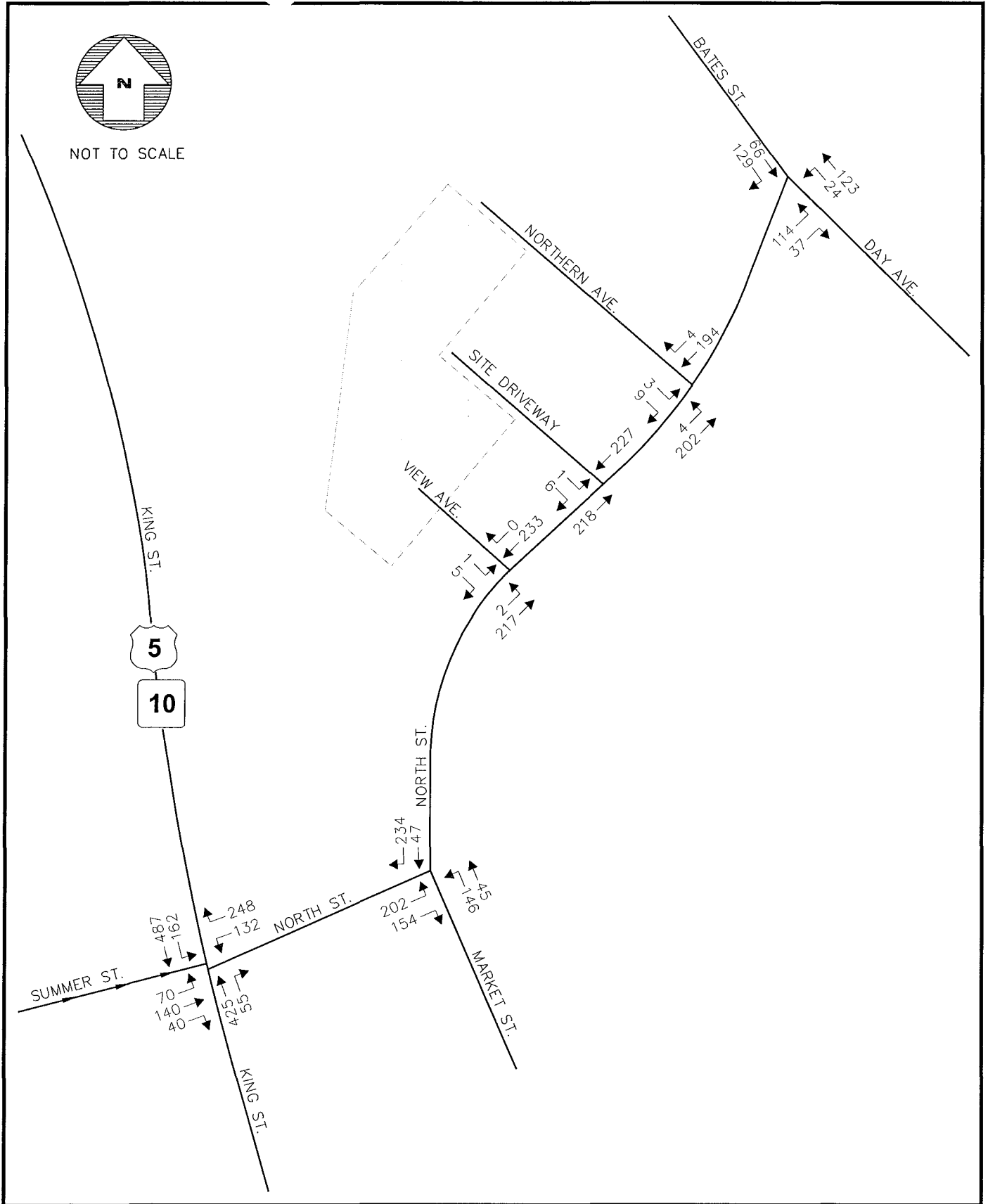


NOT TO SCALE

File Path: H:\DWG\IP2008\1193A\10\Traffic\20081193A10_TFV.dwg, Layout: AM BUILD Wed, Oct 15, 2008 - 2:56 PM User: WVanDuzer

MS VIEW: LMAN: CTE:

UCS:



SCALE:	
HORZ.:	N.T.S.
VERT.:	
DATUM:	
HORZ.:	
VERT.:	
GRAPHIC SCALE	

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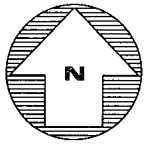
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78 INTERSTATE DR WEST SPRINGFIELD, MA 01089 413.452.0445

KOHL CONSTRUCTION
2013 BUILD TRAFFIC VOLUMES
WEEKDAY MORNING PEAK HOUR
NORTH STREET CONDOS

NORTHAMPTON MASSACHUSETTS

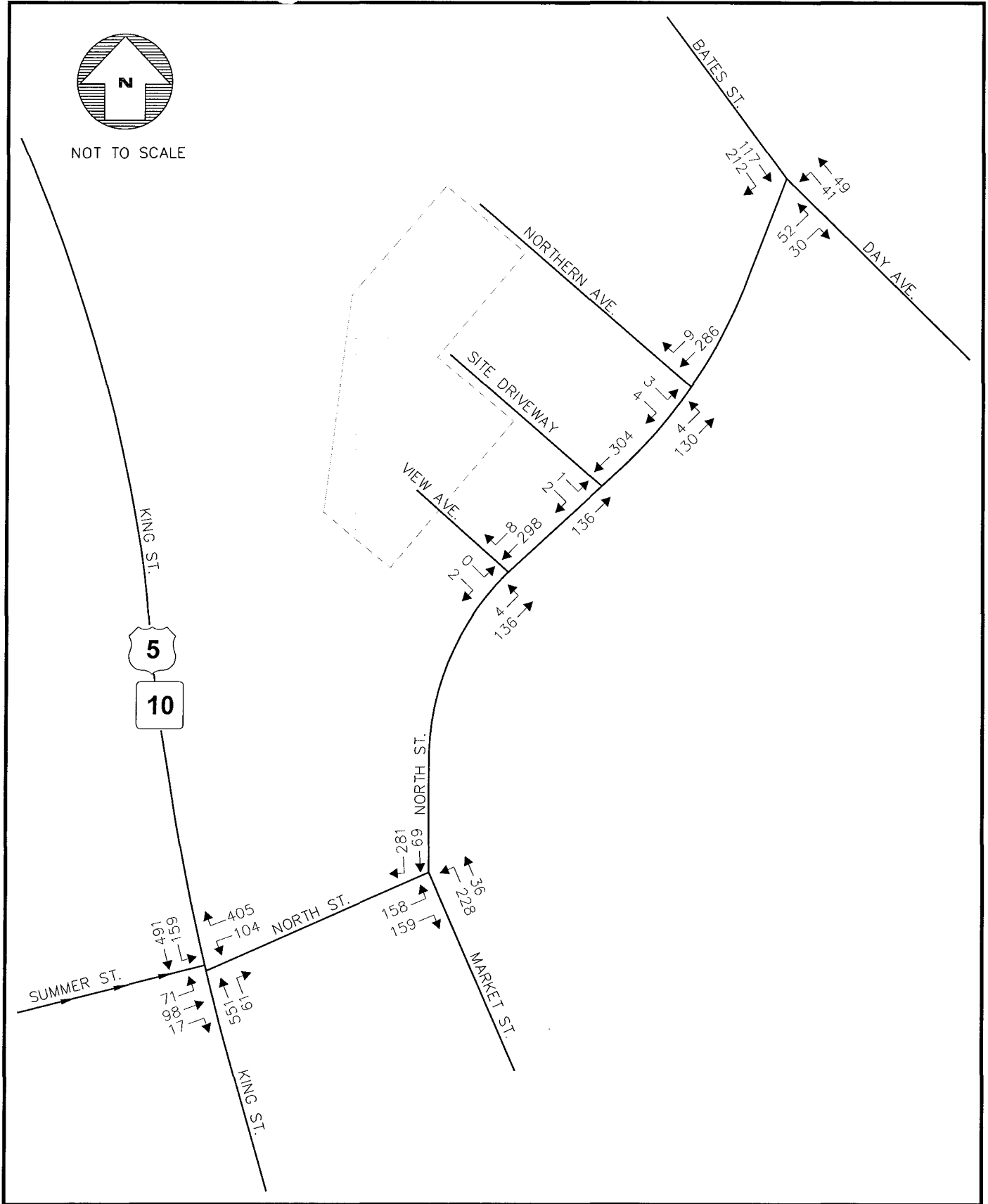
PROJ. No.: 20081193A10
DATE: OCTOBER 2008
FIG 8



NOT TO SCALE

File Path: H:\DWG\2008\193A\10\Traffic\20081193A10_TFV.dwg, Layout: PM BUILD Wed, Oct 15, 2008 - 2:56 PM User: WYanduzer

UCS: LMS VIEW: LMAN: CTB:



SCALE:	HORZ.: N.T.S.
	VERT.:
DATUM:	HORZ.:
	VERT.:
GRAPHIC SCALE	

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KOHL CONSTRUCTION
2013 BUILD TRAFFIC VOLUMES
WEEKDAY AFTERNOON PEAK HOUR
NORTH STREET CONDOS

NORTHAMPTON MASSACHUSETTS

PROJ. No.: 20081193A10
DATE: OCTOBER 2008

FIG 9

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

888-389-9524 or www.datayourequested.com

Location 1: North Street

Location 2: West of Northern Avenue

City, State: Northampton, MA

Date Start: 01-Oct-08

Site Code: 1

Start Time	01-Oct- Wed		Southbound		Northbound		Combined		02-Oct- Thu	Southbound		Northbound		Combined	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.		A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
12:00			0	48	1	27	1	75		5	43	1	25	6	68
12:15			1	48	2	35	3	83		2	49	4	45	6	94
12:30			2	56	3	36	5	92		3	42	1	28	4	70
12:45			0	53	0	34	0	87		0	41	2	28	2	69
01:00			1	27	1	33	2	60		3	26	1	34	4	60
01:15			0	28	0	29	0	57		0	36	0	23	0	59
01:30			0	41	0	26	0	67		1	29	1	26	2	55
01:45			0	31	1	36	1	67		2	35	1	27	3	62
02:00			1	42	3	32	4	74		2	30	1	31	3	61
02:15			0	31	0	26	0	57		0	35	0	25	0	60
02:30			0	44	2	33	2	77		1	38	0	28	1	66
02:45			0	37	0	38	0	75		1	40	1	36	2	76
03:00			0	56	0	41	0	97		0	49	1	46	1	95
03:15			0	49	0	29	0	78		1	46	2	35	3	81
03:30			0	71	0	35	0	106		0	68	0	45	0	113
03:45			0	51	2	32	2	83		0	53	0	35	0	88
04:00			0	55	1	29	1	84		1	55	0	34	1	89
04:15			3	67	0	36	3	103		2	58	0	33	2	91
04:30			1	62	2	35	3	97		1	59	3	43	4	102
04:45			0	73	6	28	6	101		0	52	4	42	4	94
05:00			1	80	3	30	4	110		0	77	7	41	7	118
05:15			2	51	7	36	9	87		1	64	8	47	9	111
05:30			1	62	6	25	7	87		3	54	7	38	10	92
05:45			3	54	3	31	6	85		2	53	1	35	3	88
06:00			1	32	6	28	7	60		3	38	4	29	7	67
06:15			8	30	8	28	16	58		9	44	13	33	22	77
06:30			7	25	9	18	16	43		9	35	13	34	22	69
06:45			9	26	14	11	23	37		8	23	17	26	25	49
07:00			12	19	20	15	32	34		10	24	17	18	27	42
07:15			16	14	26	18	42	32		16	19	16	20	32	39
07:30			20	13	32	11	52	24		21	14	37	24	58	38
07:45			40	15	46	11	86	26		40	13	40	13	80	26
08:00			55	10	48	11	103	21		48	7	44	18	92	25
08:15			47	4	44	9	91	13		51	6	49	13	100	19
08:30			46	14	62	11	108	25		44	14	55	18	99	32
08:45			65	5	52	9	117	14		59	9	47	12	106	21
09:00			27	13	35	14	62	27		27	7	24	10	51	17
09:15			27	12	24	10	51	22		34	23	27	8	61	31
09:30			30	7	29	10	59	17		30	6	28	4	58	10
09:45			57	9	30	3	87	12		24	9	25	3	49	12
10:00			45	3	31	3	76	6		32	3	23	1	55	4
10:15			29	8	33	6	62	14		25	3	24	4	49	7
10:30			29	4	24	4	53	8		29	6	22	4	51	10
10:45			32	4	34	3	66	7		32	4	28	9	60	13
11:00			28	2	20	2	48	4		29	6	23	7	52	13
11:15			22	3	27	6	49	9		18	6	32	1	50	7
11:30			36	1	30	2	66	3		48	2	28	4	76	6
11:45			45	3	26	1	71	4		51	5	22	5	73	10
Total			749	1493	753	1016	1502	2509		728	1458	704	1148	1432	2606
Day Total			2242		1769		4011			2186		1852		4038	
% Total			18.7%	37.2%	18.8%	25.3%				18.0%	36.1%	17.4%	28.4%		
Peak			08:00	04:15	08:00	02:45	08:00	04:15		08:00	04:30	08:00	04:30	08:00	04:30
Vol.			213	282	206	143	419	411		202	252	195	173	397	425
P.H.F.			0.819	0.881	0.831	0.872	0.895	0.934		0.856	0.818	0.886	0.920	0.936	0.900

ADT Not Calculated

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street

Location 2: West of Northern Avenue

888-389-9524 or www.datayourequested.com

City, State: Northampton, MA

Date Start: 01-Oct-08

Southbound

Site Code: 1

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
10/01/08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
00:15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
00:30	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
01:15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15	0	0	0	1	1	1	0	0	0	0	0	0	0	0	3
04:30	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
04:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	1	0	0	2	1	1	0	0	0	0	0	0	0	0	4
05:15	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
05:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:45	0	0	0	1	2	0	0	0	0	0	0	0	0	0	3
06:00	1	0	3	1	2	0	0	0	0	0	0	0	0	0	7
06:15	0	1	3	3	1	0	0	0	0	0	0	0	0	0	8
06:30	0	0	2	5	0	0	0	0	0	0	0	0	0	0	7
06:45	0	0	5	3	1	0	0	0	0	0	0	0	0	0	9
07:00	0	1	11	11	2	0	0	0	0	0	0	0	0	0	25
07:15	1	0	1	6	4	0	0	0	0	0	0	0	0	0	12
07:30	1	3	4	5	3	0	0	0	0	0	0	0	0	0	16
07:45	2	2	6	9	1	0	0	0	0	0	0	0	0	0	20
08:00	2	2	9	15	7	4	0	1	0	0	0	0	0	0	40
08:15	6	7	20	35	15	4	0	1	0	0	0	0	0	0	88
08:30	6	2	13	21	11	2	0	0	0	0	0	0	0	0	55
08:45	1	0	10	15	20	1	0	0	0	0	0	0	0	0	47
09:00	3	2	7	15	16	3	0	0	0	0	0	0	0	0	46
09:15	1	1	19	28	16	0	0	0	0	0	0	0	0	0	65
09:30	11	5	49	79	63	6	0	0	0	0	0	0	0	0	213
09:45	1	2	7	13	4	0	0	0	0	0	0	0	0	0	27
10:00	0	1	8	9	7	1	0	1	0	0	0	0	0	0	27
10:15	1	1	8	14	6	0	0	0	0	0	0	0	0	0	30
10:30	0	1	12	26	17	1	0	0	0	0	0	0	0	0	57
10:45	2	5	35	62	34	2	0	1	0	0	0	0	0	0	141
11:00	3	0	15	14	13	0	0	0	0	0	0	0	0	0	45
11:15	1	4	0	15	9	0	0	0	0	0	0	0	0	0	29
11:30	0	1	4	13	9	2	0	0	0	0	0	0	0	0	29
11:45	2	0	10	12	8	0	0	0	0	0	0	0	0	0	32
12:00	6	5	29	54	39	2	0	0	0	0	0	0	0	0	135
12:15	1	0	5	12	8	2	0	0	0	0	0	0	0	0	28
12:30	0	3	1	8	7	3	0	0	0	0	0	0	0	0	22
12:45	4	1	9	13	7	2	0	0	0	0	0	0	0	0	36
13:00	3	2	14	18	6	2	0	0	0	0	0	0	0	0	45
13:15	8	6	29	51	28	9	0	0	0	0	0	0	0	0	131
Total	34	29	177	298	185	24	0	2	0	0	0	0	0	0	749

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street

Location 2: West of Northern Avenue

City, State: Northampton, MA

888-389-9524 or www.datayourequested.com

Date Start: 01-Oct-08

Southbound

Site Code: 1

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
12 PM	2	1	10	19	14	2	0	0	0	0	0	0	0	0	48
12:15	4	9	10	17	7	1	0	0	0	0	0	0	0	0	48
12:30	2	2	7	24	20	0	1	0	0	0	0	0	0	0	56
12:45	0	0	10	26	11	6	0	0	0	0	0	0	0	0	53
13:00	8	12	37	86	52	9	1	0	0	0	0	0	0	0	205
13:15	1	1	2	12	8	3	0	0	0	0	0	0	0	0	27
13:30	0	1	11	9	7	0	0	0	0	0	0	0	0	0	28
13:45	2	4	9	14	11	1	0	0	0	0	0	0	0	0	41
14:00	0	2	8	12	9	0	0	0	0	0	0	0	0	0	31
14:15	3	8	30	47	35	4	0	0	0	0	0	0	0	0	127
14:30	2	2	15	16	7	0	0	0	0	0	0	0	0	0	42
14:45	1	1	7	10	9	3	0	0	0	0	0	0	0	0	31
15:00	1	2	8	23	9	1	0	0	0	0	0	0	0	0	44
15:15	1	3	13	12	7	1	0	0	0	0	0	0	0	0	37
15:30	5	8	43	61	32	5	0	0	0	0	0	0	0	0	154
15:45	5	1	9	26	14	1	0	0	0	0	0	0	0	0	56
16:00	1	2	24	16	4	2	0	0	0	0	0	0	0	0	49
16:15	2	3	9	39	16	2	0	0	0	0	0	0	0	0	71
16:30	1	1	16	23	9	1	0	0	0	0	0	0	0	0	51
16:45	9	7	58	104	43	6	0	0	0	0	0	0	0	0	227
17:00	1	0	7	27	17	3	0	0	0	0	0	0	0	0	55
17:15	2	3	24	25	12	1	0	0	0	0	0	0	0	0	67
17:30	1	2	11	33	12	3	0	0	0	0	0	0	0	0	62
17:45	2	3	23	20	23	2	0	0	0	0	0	0	0	0	73
18:00	6	8	65	105	64	9	0	0	0	0	0	0	0	0	257
18:15	1	1	11	42	22	3	0	0	0	0	0	0	0	0	80
18:30	1	3	10	26	9	2	0	0	0	0	0	0	0	0	51
18:45	1	2	13	28	14	4	0	0	0	0	0	0	0	0	62
19:00	8	2	9	18	14	2	1	0	0	0	0	0	0	0	54
19:15	11	8	43	114	59	11	1	0	0	0	0	0	0	0	247
19:30	0	3	9	13	6	1	0	0	0	0	0	0	0	0	32
19:45	1	0	5	15	6	3	0	0	0	0	0	0	0	0	30
20:00	0	0	6	13	6	0	0	0	0	0	0	0	0	0	25
20:15	1	1	8	11	5	0	0	0	0	0	0	0	0	0	26
20:30	2	4	28	52	23	4	0	0	0	0	0	0	0	0	113
20:45	1	1	5	9	3	0	0	0	0	0	0	0	0	0	19
21:00	0	1	2	8	2	1	0	0	0	0	0	0	0	0	14
21:15	0	0	7	4	1	1	0	0	0	0	0	0	0	0	13
21:30	0	0	4	8	3	0	0	0	0	0	0	0	0	0	15
21:45	1	2	18	29	9	2	0	0	0	0	0	0	0	0	61
22:00	0	3	3	2	2	0	0	0	0	0	0	0	0	0	10
22:15	0	0	3	0	1	0	0	0	0	0	0	0	0	0	4
22:30	1	0	2	6	4	1	0	0	0	0	0	0	0	0	14
22:45	0	0	0	2	2	1	0	0	0	0	0	0	0	0	5
23:00	1	3	8	10	9	2	0	0	0	0	0	0	0	0	33
23:15	0	0	4	6	2	0	1	0	0	0	0	0	0	0	13
23:30	1	1	4	5	1	0	0	0	0	0	0	0	0	0	12
23:45	0	0	2	3	0	2	0	0	0	0	0	0	0	0	7
24:00	0	0	4	4	1	0	0	0	0	0	0	0	0	0	9
24:15	1	1	14	18	4	0	3	0	0	0	0	0	0	0	41
24:30	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3
24:45	0	0	0	2	6	0	0	0	0	0	0	0	0	0	8
25:00	0	0	1	1	1	1	0	0	0	0	0	0	0	0	4
25:15	0	0	0	0	2	2	0	0	0	0	0	0	0	0	4
25:30	0	0	1	5	10	3	0	0	0	0	0	0	0	0	19
25:45	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
26:00	0	1	1	1	0	0	0	0	0	0	0	0	0	0	3
26:15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
26:30	0	0	2	0	1	0	0	0	0	0	0	0	0	0	3
26:45	0	1	4	1	2	0	1	0	0	0	0	0	0	0	9
Total	47	62	349	632	342	55	6	0	0	0	0	0	0	0	1493

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street

Location 2: West of Northern Avenue

888-389-9524 or www.datayourequested.com

City, State: Northampton, MA

Date Start: 01-Oct-08

Southbound

Site Code: 1

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
10/02/08	0	0	0	2	2	1	0	0	0	0	0	0	0	0	5
00:15	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
00:30	0	1	0	2	0	0	0	0	0	0	0	0	0	0	3
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	2	1	4	2	1	0	0	0	0	0	0	0	0	10
01:15	0	0	1	1	1	0	0	0	0	0	0	0	0	0	3
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
02:00	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2
02:15	1	0	1	2	1	1	0	0	0	0	0	0	0	0	6
02:30	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
04:15	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
04:30	0	0	1	0	1	0	0	0	0	0	0	0	0	0	2
04:45	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
05:00	0	0	1	0	2	0	1	0	0	0	0	0	0	0	4
05:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30	0	0	0	2	1	0	0	0	0	0	0	0	0	0	1
05:45	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3
06:00	0	0	0	2	4	0	0	0	0	0	0	0	0	0	6
06:15	0	0	1	1	1	0	0	0	0	0	0	0	0	0	3
06:30	0	0	1	3	4	1	0	0	0	0	0	0	0	0	9
06:45	0	0	3	6	0	0	0	0	0	0	0	0	0	0	9
07:00	0	0	3	3	2	0	0	0	0	0	0	0	0	0	8
07:15	0	0	8	13	7	1	0	0	0	0	0	0	0	0	29
07:30	0	0	0	7	3	0	0	0	0	0	0	0	0	0	10
07:45	0	1	3	5	6	1	0	0	0	0	0	0	0	0	16
08:00	0	0	4	12	5	0	0	0	0	0	0	0	0	0	21
08:15	3	2	7	16	11	1	0	0	0	0	0	0	0	0	40
08:30	3	3	14	40	25	2	0	0	0	0	0	0	0	0	87
08:45	3	1	4	24	15	1	0	0	0	0	0	0	0	0	48
09:00	1	1	14	15	16	4	0	0	0	0	0	0	0	0	51
09:15	3	5	7	22	5	2	0	0	0	0	0	0	0	0	44
09:30	0	0	14	28	16	1	0	0	0	0	0	0	0	0	59
09:45	7	7	39	89	52	8	0	0	0	0	0	0	0	0	202
10:00	0	1	3	15	7	1	0	0	0	0	0	0	0	0	27
10:15	5	1	8	11	8	1	0	0	0	0	0	0	0	0	34
10:30	0	0	4	15	10	1	0	0	0	0	0	0	0	0	30
10:45	0	3	3	9	7	2	0	0	0	0	0	0	0	0	24
11:00	5	5	18	50	32	5	0	0	0	0	0	0	0	0	115
11:15	1	1	8	15	6	0	1	0	0	0	0	0	0	0	32
11:30	2	2	6	8	5	2	0	0	0	0	0	0	0	0	25
11:45	3	1	2	13	10	0	0	0	0	0	0	0	0	0	29
12:00	0	2	6	15	8	1	0	0	0	0	0	0	0	0	32
12:15	6	6	22	51	29	3	1	0	0	0	0	0	0	0	118
12:30	2	2	4	12	9	0	0	0	0	0	0	0	0	0	29
12:45	0	3	7	6	2	0	0	0	0	0	0	0	0	0	18
13:00	0	2	10	22	12	2	0	0	0	0	0	0	0	0	48
13:15	0	3	8	24	16	0	0	0	0	0	0	0	0	0	51
13:30	2	10	29	64	39	2	0	0	0	0	0	0	0	0	146
13:45	0	3	8	24	16	0	0	0	0	0	0	0	0	0	51
Total	26	33	135	315	194	23	2	0	0	0	0	0	0	0	728

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street
Location 2: West of Northern Avenue
City, State: Northampton, MA

888-389-9524 or www.datayourequested.com

Date Start: 01-Oct-08
Site Code: 1

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
12 PM	1	1	6	13	20	2	0	0	0	0	0	0	0	0	43
12:15	2	1	11	22	11	2	0	0	0	0	0	0	0	0	49
12:30	1	1	9	15	15	1	0	0	0	0	0	0	0	0	42
12:45	0	0	6	25	9	1	0	0	0	0	0	0	0	0	41
13:00	4	3	32	75	55	6	0	0	0	0	0	0	0	0	175
13:15	0	1	1	18	3	3	0	0	0	0	0	0	0	0	26
13:30	0	2	9	18	6	1	0	0	0	0	0	0	0	0	36
13:45	0	1	4	14	8	0	1	1	0	0	0	0	0	0	29
14:00	3	2	3	14	12	1	0	0	0	0	0	0	0	0	35
14:15	3	6	17	64	29	5	1	1	0	0	0	0	0	0	126
14:30	0	1	7	16	6	0	0	0	0	0	0	0	0	0	30
14:45	0	1	6	18	8	2	0	0	0	0	0	0	0	0	35
15:00	2	0	5	13	14	4	0	0	0	0	0	0	0	0	38
15:15	2	1	9	16	11	1	0	0	0	0	0	0	0	0	40
15:30	4	3	27	63	39	7	0	0	0	0	0	0	0	0	143
15:45	1	2	11	25	7	3	0	0	0	0	0	0	0	0	49
16:00	3	1	8	18	13	3	0	0	0	0	0	0	0	0	46
16:15	1	2	13	30	20	2	0	0	0	0	0	0	0	0	68
16:30	0	5	8	23	17	0	0	0	0	0	0	0	0	0	53
16:45	5	10	40	96	57	8	0	0	0	0	0	0	0	0	216
17:00	3	6	10	26	9	1	0	0	0	0	0	0	0	0	55
17:15	5	1	23	21	7	1	0	0	0	0	0	0	0	0	58
17:30	5	10	14	21	8	1	0	0	0	0	0	0	0	0	59
17:45	2	6	13	21	8	2	0	0	0	0	0	0	0	0	52
18:00	15	23	60	89	32	5	0	0	0	0	0	0	0	0	224
18:15	6	8	27	26	9	1	0	0	0	0	0	0	0	0	77
18:30	1	6	22	21	13	1	0	0	0	0	0	0	0	0	64
18:45	4	0	18	19	12	1	0	0	0	0	0	0	0	0	54
19:00	5	5	17	19	6	1	0	0	0	0	0	0	0	0	53
19:15	16	19	84	85	40	4	0	0	0	0	0	0	0	0	248
19:30	3	0	14	13	8	0	0	0	0	0	0	0	0	0	38
19:45	3	3	15	17	5	1	0	0	0	0	0	0	0	0	44
20:00	5	7	5	16	2	0	0	0	0	0	0	0	0	0	35
20:15	4	2	7	6	4	0	0	0	0	0	0	0	0	0	23
20:30	15	12	41	52	19	1	0	0	0	0	0	0	0	0	140
20:45	2	6	4	8	4	0	0	0	0	0	0	0	0	0	24
21:00	1	4	8	4	2	0	0	0	0	0	0	0	0	0	19
21:15	4	2	2	5	1	0	0	0	0	0	0	0	0	0	14
21:30	0	2	5	5	1	0	0	0	0	0	0	0	0	0	13
21:45	7	14	19	22	8	0	0	0	0	0	0	0	0	0	70
22:00	0	0	1	2	2	2	0	0	0	0	0	0	0	0	7
22:15	0	0	2	4	0	0	0	0	0	0	0	0	0	0	6
22:30	1	1	4	4	3	1	0	0	0	0	0	0	0	0	14
22:45	0	1	3	4	1	0	0	0	0	0	0	0	0	0	9
23:00	1	2	10	14	6	3	0	0	0	0	0	0	0	0	36
23:15	0	0	1	3	3	0	0	0	0	0	0	0	0	0	7
23:30	0	1	4	6	11	1	0	0	0	0	0	0	0	0	23
23:45	0	1	0	4	1	0	0	0	0	0	0	0	0	0	6
24:00	0	0	0	4	5	0	0	0	0	0	0	0	0	0	9
24:15	0	2	5	17	20	1	0	0	0	0	0	0	0	0	45
24:30	0	0	0	1	2	0	0	0	0	0	0	0	0	0	3
24:45	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3
25:00	0	0	4	1	1	0	0	0	0	0	0	0	0	0	6
25:15	0	0	2	1	1	0	0	0	0	0	0	0	0	0	4
25:30	0	0	7	5	4	0	0	0	0	0	0	0	0	0	16
25:45	0	1	1	2	2	0	0	0	0	0	0	0	0	0	6
26:00	0	1	0	2	3	0	0	0	0	0	0	0	0	0	6
26:15	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
26:30	0	1	1	2	0	1	0	0	0	0	0	0	0	0	5
26:45	0	4	3	6	5	1	0	0	0	0	0	0	0	0	19
Total	70	98	345	588	314	41	1	1	0	0	0	0	0	0	1458
Grand Total	177	222	1006	1833	1035	143	9	3	0	0	0	0	0	0	4428

15th Percentile : 22 MPH
50th Percentile : 28 MPH
85th Percentile : 33 MPH
95th Percentile : 35 MPH

Stats
Mean Speed(Average) : 27 MPH
10 MPH Pace Speed : 26-35 MPH
Number in Pace : 2868
Percent in Pace : 64.8%
Number of Vehicles > 55 MPH : 0
Percent of Vehicles > 55 MPH : 0.0%

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street

Location 2: West of Northern Avenue

888-389-9524 or www.datayourequested.com

City, State: Northampton, MA

Date Start: 01-Oct-08

Northbound

Site Code: 1

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total
10/01/08	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
00:15	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2
00:30	0	0	1	1	1	0	0	0	0	0	0	0	0	0	3
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	1	2	1	1	1	0	0	0	0	0	0	0	0	0	6
01:15	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
02:00	0	0	0	1	0	1	0	0	0	0	0	0	0	0	2
02:15	0	1	1	1	0	0	0	0	0	0	0	0	0	0	3
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15	0	1	1	1	2	0	0	0	0	0	0	0	0	0	5
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
04:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
05:00	2	0	0	3	1	0	0	0	0	0	0	0	0	0	6
05:15	2	1	0	5	1	0	0	0	0	0	0	0	0	0	9
05:30	0	0	1	0	2	0	0	0	0	0	0	0	0	0	3
05:45	0	1	1	4	1	0	0	0	0	0	0	0	0	0	7
06:00	0	0	2	2	0	1	1	0	0	0	0	0	0	0	6
06:15	0	2	0	0	1	0	0	0	0	0	0	0	0	0	3
06:30	0	3	4	6	4	1	1	0	0	0	0	0	0	0	19
06:45	0	2	1	2	1	0	0	0	0	0	0	0	0	0	6
07:00	0	0	2	5	1	0	0	0	0	0	0	0	0	0	8
07:15	0	1	2	6	0	0	0	0	0	0	0	0	0	0	9
07:30	0	2	2	6	4	0	0	0	0	0	0	0	0	0	14
07:45	0	5	7	19	6	0	0	0	0	0	0	0	0	0	37
08:00	2	0	6	7	3	1	1	0	0	0	0	0	0	0	20
08:15	2	2	10	10	2	0	0	0	0	0	0	0	0	0	26
08:30	2	1	3	20	6	0	0	0	0	0	0	0	0	0	32
08:45	0	1	12	27	6	0	0	0	0	0	0	0	0	0	46
09:00	6	4	31	64	17	1	1	0	0	0	0	0	0	0	124
09:15	7	3	10	23	5	0	0	0	0	0	0	0	0	0	48
09:30	1	2	11	25	5	0	0	0	0	0	0	0	0	0	44
09:45	4	3	17	32	5	1	0	0	0	0	0	0	0	0	62
10:00	3	5	20	17	6	1	0	0	0	0	0	0	0	0	52
10:15	15	13	58	97	21	2	0	0	0	0	0	0	0	0	206
10:30	0	1	12	15	7	0	0	0	0	0	0	0	0	0	35
10:45	4	3	6	8	3	0	0	0	0	0	0	0	0	0	24
11:00	8	3	6	10	2	0	0	0	0	0	0	0	0	0	29
11:15	1	2	7	19	1	0	0	0	0	0	0	0	0	0	30
11:30	13	9	31	52	13	0	0	0	0	0	0	0	0	0	118
11:45	0	3	7	15	6	0	0	0	0	0	0	0	0	0	31
12:00	4	4	12	10	3	0	0	0	0	0	0	0	0	0	33
12:15	2	4	3	11	4	0	0	0	0	0	0	0	0	0	24
12:30	3	4	14	10	3	0	0	0	0	0	0	0	0	0	34
12:45	9	15	36	46	16	0	0	0	0	0	0	0	0	0	122
13:00	1	1	9	7	2	0	0	0	0	0	0	0	0	0	20
13:15	5	5	2	11	4	0	0	0	0	0	0	0	0	0	27
13:30	1	5	6	13	5	0	0	0	0	0	0	0	0	0	30
13:45	4	2	3	13	4	0	0	0	0	0	0	0	0	0	26
14:00	11	13	20	44	15	0	0	0	0	0	0	0	0	0	103
Total	58	66	189	336	97	5	2	0	0	0	0	0	0	0	753

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street

Location 2: West of Northern Avenue

888-389-9524 or www.datayourequested.com

City, State: Northampton, MA

Date Start: 01-Oct-08

Northbound

Site Code: 1

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
12 PM	2	1	9	13	2	0	0	0	0	0	0	0	0	0	27
12:15	1	0	7	19	8	0	0	0	0	0	0	0	0	0	35
12:30	3	10	6	13	4	0	0	0	0	0	0	0	0	0	36
12:45	1	3	8	19	2	1	0	0	0	0	0	0	0	0	34
13:00	7	14	30	64	16	1	0	0	0	0	0	0	0	0	132
13:15	1	4	6	16	6	0	0	0	0	0	0	0	0	0	33
13:30	0	1	8	15	3	2	0	0	0	0	0	0	0	0	29
13:45	3	3	4	10	5	1	0	0	0	0	0	0	0	0	26
14:00	3	5	10	13	5	0	0	0	0	0	0	0	0	0	36
14:15	7	13	28	54	19	3	0	0	0	0	0	0	0	0	124
14:30	1	3	17	9	2	0	0	0	0	0	0	0	0	0	32
14:45	2	1	11	10	2	0	0	0	0	0	0	0	0	0	26
15:00	3	0	14	12	4	0	0	0	0	0	0	0	0	0	33
15:15	3	2	15	10	6	2	0	0	0	0	0	0	0	0	38
15:30	9	6	57	41	14	2	0	0	0	0	0	0	0	0	129
15:45	8	5	13	14	1	0	0	0	0	0	0	0	0	0	41
16:00	2	6	9	10	2	0	0	0	0	0	0	0	0	0	29
16:15	1	1	10	15	8	0	0	0	0	0	0	0	0	0	35
16:30	1	1	13	15	2	0	0	0	0	0	0	0	0	0	32
16:45	12	13	45	54	13	0	0	0	0	0	0	0	0	0	137
17:00	0	1	11	12	4	1	0	0	0	0	0	0	0	0	29
17:15	2	4	15	9	3	3	0	0	0	0	0	0	0	0	36
17:30	1	4	10	13	7	0	0	0	0	0	0	0	0	0	35
17:45	3	1	9	10	5	0	0	0	0	0	0	0	0	0	28
18:00	6	10	45	44	19	4	0	0	0	0	0	0	0	0	128
18:15	4	4	8	11	3	0	0	0	0	0	0	0	0	0	30
18:30	1	2	7	20	5	1	0	0	0	0	0	0	0	0	36
18:45	2	1	10	6	6	0	0	0	0	0	0	0	0	0	25
19:00	8	5	9	8	0	1	0	0	0	0	0	0	0	0	31
19:15	15	12	34	45	14	2	0	0	0	0	0	0	0	0	122
19:30	3	1	9	7	8	0	0	0	0	0	0	0	0	0	28
19:45	1	0	4	17	6	0	0	0	0	0	0	0	0	0	28
20:00	2	2	3	9	2	0	0	0	0	0	0	0	0	0	18
20:15	1	1	4	4	1	0	0	0	0	0	0	0	0	0	11
20:30	7	4	20	37	17	0	0	0	0	0	0	0	0	0	85
20:45	1	3	6	5	0	0	0	0	0	0	0	0	0	0	15
21:00	0	6	6	4	2	0	0	0	0	0	0	0	0	0	18
21:15	0	1	4	4	2	0	0	0	0	0	0	0	0	0	11
21:30	1	2	4	2	1	1	0	0	0	0	0	0	0	0	11
21:45	2	12	20	15	5	1	0	0	0	0	0	0	0	0	55
22:00	1	1	2	5	1	1	0	0	0	0	0	0	0	0	11
22:15	0	1	2	3	3	0	0	0	0	0	0	0	0	0	9
22:30	0	2	3	5	1	0	0	0	0	0	0	0	0	0	11
22:45	0	2	3	3	1	0	0	0	0	0	0	0	0	0	9
23:00	1	6	10	16	6	1	0	0	0	0	0	0	0	0	40
23:15	1	4	2	6	1	0	0	0	0	0	0	0	0	0	14
23:30	1	2	5	2	0	0	0	0	0	0	0	0	0	0	10
23:45	0	2	6	2	0	0	0	0	0	0	0	0	0	0	10
24:00	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3
24:15	2	8	14	12	1	0	0	0	0	0	0	0	0	0	37
24:30	0	0	2	1	0	0	0	0	0	0	0	0	0	0	3
24:45	0	0	2	4	0	0	0	0	0	0	0	0	0	0	6
25:00	0	1	1	2	0	0	0	0	0	0	0	0	0	0	4
25:15	0	1	0	1	1	0	0	0	0	0	0	0	0	0	3
25:30	0	2	5	8	1	0	0	0	0	0	0	0	0	0	16
25:45	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
26:00	0	1	1	4	0	0	0	0	0	0	0	0	0	0	6
26:15	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
26:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
26:45	0	1	3	6	1	0	0	0	0	0	0	0	0	0	11
Total	68	101	311	396	126	14	0	0	0	0	0	0	0	0	1016

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street

Location 2: West of Northern Avenue

888-389-9524 or www.datayourequested.com

City, State: Northampton, MA

Date Start: 01-Oct-08

Northbound

Site Code: 1

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
10/02/08	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
00:15	0	1	0	2	1	0	0	0	0	0	0	0	0	0	4
00:30	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
00:45	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
01:00	1	1	1	4	1	0	0	0	0	0	0	0	0	0	8
01:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
02:00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
02:15	1	1	0	1	0	0	0	0	0	0	0	0	0	0	3
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
03:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	1	1	1	0	0	0	0	0	0	0	0	3
04:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3
04:45	0	1	1	0	2	0	0	0	0	0	0	0	0	0	4
05:00	0	1	2	2	2	0	0	0	0	0	0	0	0	0	7
05:15	2	1	1	2	1	0	0	0	0	0	0	0	0	0	7
05:30	0	0	4	3	1	0	0	0	0	0	0	0	0	0	8
05:45	0	0	0	3	2	1	1	0	0	0	0	0	0	0	7
06:00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
06:15	2	1	5	8	5	1	1	0	0	0	0	0	0	0	23
06:30	0	1	1	1	0	1	0	0	0	0	0	0	0	0	4
06:45	1	1	1	7	3	0	0	0	0	0	0	0	0	0	13
07:00	1	1	2	3	4	2	0	0	0	0	0	0	0	0	13
07:15	0	0	3	6	7	1	0	0	0	0	0	0	0	0	17
07:30	2	3	7	17	14	4	0	0	0	0	0	0	0	0	47
07:45	0	0	2	11	4	0	0	0	0	0	0	0	0	0	17
08:00	3	0	4	6	3	0	0	0	0	0	0	0	0	0	16
08:15	0	0	10	16	11	0	0	0	0	0	0	0	0	0	37
08:30	1	4	7	12	14	2	0	0	0	0	0	0	0	0	40
08:45	4	4	23	45	32	2	0	0	0	0	0	0	0	0	110
09:00	3	2	12	19	8	0	0	0	0	0	0	0	0	0	44
09:15	2	2	21	17	6	1	0	0	0	0	0	0	0	0	49
09:30	1	2	20	21	10	1	0	0	0	0	0	0	0	0	55
09:45	3	4	16	18	6	0	0	0	0	0	0	0	0	0	47
10:00	9	10	69	75	30	2	0	0	0	0	0	0	0	0	195
10:15	2	2	5	12	3	0	0	0	0	0	0	0	0	0	24
10:30	3	5	2	15	2	0	0	0	0	0	0	0	0	0	27
10:45	0	1	8	14	5	0	0	0	0	0	0	0	0	0	28
11:00	1	0	10	11	3	0	0	0	0	0	0	0	0	0	25
11:15	6	8	25	52	13	0	0	0	0	0	0	0	0	0	104
11:30	3	0	11	7	2	0	0	0	0	0	0	0	0	0	23
11:45	0	4	9	8	3	0	0	0	0	0	0	0	0	0	24
12:00	1	1	6	12	2	0	0	0	0	0	0	0	0	0	22
12:15	1	5	18	3	1	0	0	0	0	0	0	0	0	0	28
12:30	5	10	44	30	8	0	0	0	0	0	0	0	0	0	97
12:45	2	2	9	7	3	0	0	0	0	0	0	0	0	0	23
13:00	2	3	15	9	3	0	0	0	0	0	0	0	0	0	32
13:15	2	7	8	7	4	0	0	0	0	0	0	0	0	0	28
13:30	2	1	4	11	4	0	0	0	0	0	0	0	0	0	22
13:45	8	13	36	34	14	0	0	0	0	0	0	0	0	0	105
Total	38	52	212	271	120	10	1	0	0	0	0	0	0	0	704

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street
Location 2: West of Northern Avenue
City, State: Northampton, MA

888-389-9524 or www.datayourequested.com

Date Start: 01-Oct-08

Northbound

Site Code: 1

Start Time	15	20	25	30	35	40	45	50	55	60	65	70	75	999	Total
12 PM	2	2	9	6	2	3	1	0	0	0	0	0	0	0	25
12:15	3	3	15	20	4	0	0	0	0	0	0	0	0	0	45
12:30	1	2	7	16	2	0	0	0	0	0	0	0	0	0	28
12:45	1	4	8	11	4	0	0	0	0	0	0	0	0	0	28
13:00	7	11	39	53	12	3	1	0	0	0	0	0	0	0	126
13:15	0	0	4	19	10	1	0	0	0	0	0	0	0	0	34
13:30	1	1	7	9	4	1	0	0	0	0	0	0	0	0	23
13:45	3	2	9	5	5	1	1	0	0	0	0	0	0	0	26
14:00	4	2	7	12	2	0	0	0	0	0	0	0	0	0	27
14:15	8	5	27	45	21	3	1	0	0	0	0	0	0	0	110
14:30	2	3	7	13	6	0	0	0	0	0	0	0	0	0	31
14:45	1	1	4	9	9	1	0	0	0	0	0	0	0	0	25
15:00	4	0	7	14	3	0	0	0	0	0	0	0	0	0	28
15:15	2	1	7	18	7	1	0	0	0	0	0	0	0	0	36
15:30	9	5	25	54	25	2	0	0	0	0	0	0	0	0	120
15:45	4	1	14	19	6	2	0	0	0	0	0	0	0	0	46
16:00	2	0	12	14	7	0	0	0	0	0	0	0	0	0	35
16:15	5	3	17	15	4	1	0	0	0	0	0	0	0	0	45
16:30	1	1	8	19	6	0	0	0	0	0	0	0	0	0	35
16:45	12	5	51	67	23	3	0	0	0	0	0	0	0	0	161
17:00	10	2	9	12	1	0	0	0	0	0	0	0	0	0	34
17:15	7	4	15	6	1	0	0	0	0	0	0	0	0	0	33
17:30	12	5	14	11	0	1	0	0	0	0	0	0	0	0	43
17:45	11	0	18	12	1	0	0	0	0	0	0	0	0	0	42
18:00	40	11	56	41	3	1	0	0	0	0	0	0	0	0	152
18:15	6	3	15	14	3	0	0	0	0	0	0	0	0	0	41
18:30	12	7	17	10	1	0	0	0	0	0	0	0	0	0	47
18:45	8	6	9	15	0	0	0	0	0	0	0	0	0	0	38
19:00	8	3	9	12	2	1	0	0	0	0	0	0	0	0	35
19:15	34	19	50	51	6	1	0	0	0	0	0	0	0	0	161
19:30	7	4	11	4	2	1	0	0	0	0	0	0	0	0	29
19:45	6	5	8	10	3	0	0	1	0	0	0	0	0	0	33
20:00	6	5	11	12	0	0	0	0	0	0	0	0	0	0	34
20:15	3	2	10	8	2	1	0	0	0	0	0	0	0	0	26
20:30	22	16	40	34	7	2	0	1	0	0	0	0	0	0	122
20:45	2	2	6	8	0	0	0	0	0	0	0	0	0	0	18
21:00	5	0	7	7	1	0	0	0	0	0	0	0	0	0	20
21:15	2	10	3	9	0	0	0	0	0	0	0	0	0	0	24
21:30	1	4	3	4	0	1	0	0	0	0	0	0	0	0	13
21:45	10	16	19	28	1	1	0	0	0	0	0	0	0	0	75
22:00	0	3	7	7	1	0	0	0	0	0	0	0	0	0	18
22:15	0	0	5	5	2	1	0	0	0	0	0	0	0	0	13
22:30	1	2	4	5	6	0	0	0	0	0	0	0	0	0	18
22:45	1	1	8	2	0	0	0	0	0	0	0	0	0	0	12
23:00	2	6	24	19	9	1	0	0	0	0	0	0	0	0	61
23:15	0	3	2	4	1	0	0	0	0	0	0	0	0	0	10
23:30	0	2	4	1	0	1	0	0	0	0	0	0	0	0	8
23:45	0	0	1	2	0	0	1	0	0	0	0	0	0	0	4
24:00	0	0	2	1	0	0	0	0	0	0	0	0	0	0	3
24:15	0	5	9	8	1	1	1	0	0	0	0	0	0	0	25
24:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
24:45	0	0	1	2	1	0	0	0	0	0	0	0	0	0	4
25:00	0	1	2	1	0	0	0	0	0	0	0	0	0	0	4
25:15	0	0	3	5	1	0	0	0	0	0	0	0	0	0	9
25:30	0	1	7	8	2	0	0	0	0	0	0	0	0	0	18
25:45	1	1	3	2	0	0	0	0	0	0	0	0	0	0	7
26:00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
26:15	0	0	2	2	0	0	0	0	0	0	0	0	0	0	4
26:30	0	0	2	2	0	0	0	0	0	0	0	0	0	0	4
26:45	0	0	2	1	2	0	0	0	0	0	0	0	0	0	5
27:00	1	1	7	6	2	0	0	0	0	0	0	0	0	0	17
Total	145	101	354	414	112	18	3	1	0	0	0	0	0	0	1148
Grand Total	309	320	1066	1417	455	47	6	1	0	0	0	0	0	0	3621

15th Percentile : 19 MPH
50th Percentile : 26 MPH
85th Percentile : 30 MPH
95th Percentile : 34 MPH

Stats
Mean Speed(Average) : 25 MPH
10 MPH Pace Speed : 21-30 MPH
Number in Pace : 2483
Percent in Pace : 68.6%
Number of Vehicles > 55 MPH : 0
Percent of Vehicles > 55 MPH : 0.0%

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street
Location 2: West of Northern Avenue
City, State: Northampton, MA
Southbound

888-389-9524 or www.datayourequested.com

Date Start: 01-Oct-08
Site Code: 1

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classe	Total
10/01/08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
00:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
00:30	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
01:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
02:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
03:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
04:30	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	3	1	0	0	0	0	0	0	0	0	0	0	0	4
05:15	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
05:30	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
05:45	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3
06:00	0	3	3	0	0	0	0	0	0	0	0	0	0	1	7
06:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
06:30	0	5	3	0	0	0	0	0	0	0	0	0	0	0	8
06:45	0	2	3	0	2	0	0	0	0	0	0	0	0	0	7
07:00	0	6	3	0	0	0	0	0	0	0	0	0	0	0	9
07:15	0	14	9	0	2	0	0	0	0	0	0	0	0	0	25
07:30	0	10	1	0	0	0	0	0	0	0	0	0	0	1	12
07:45	0	8	7	0	0	0	0	0	0	0	0	0	0	1	16
08:00	0	13	5	0	0	0	0	0	0	0	0	0	0	2	20
08:15	0	26	11	0	0	1	0	1	0	0	0	0	0	1	40
08:30	0	57	24	0	0	1	0	1	0	0	0	0	0	5	88
08:45	2	33	11	0	1	1	0	0	0	0	0	0	0	7	55
09:00	1	33	10	0	2	0	0	0	0	0	0	0	0	1	47
09:15	0	30	13	0	1	1	0	0	0	0	0	0	0	1	46
09:30	1	48	12	0	2	0	0	0	0	0	0	0	0	2	65
09:45	4	144	46	0	6	2	0	0	0	0	0	0	0	11	213
10:00	0	20	6	0	1	0	0	0	0	0	0	0	0	0	27
10:15	0	17	8	0	2	0	0	0	0	0	0	0	0	0	27
10:30	0	22	5	0	1	1	0	0	0	0	0	0	0	1	30
10:45	0	39	18	0	0	0	0	0	0	0	0	0	0	0	57
11:00	0	98	37	0	4	1	0	0	0	0	0	0	0	1	141
11:15	0	32	8	0	1	1	0	0	0	0	0	0	0	3	45
11:30	0	15	12	0	1	0	0	0	0	0	0	0	0	1	29
11:45	1	13	11	0	3	1	0	0	0	0	0	0	0	0	29
12:00	0	23	5	0	0	0	0	1	0	0	0	0	0	3	32
12:15	1	83	36	0	5	2	0	1	0	0	0	0	0	7	135
12:30	0	20	5	0	2	0	0	0	0	0	0	0	0	1	28
12:45	0	13	9	0	0	0	0	0	0	0	0	0	0	0	22
13:00	1	19	10	0	3	0	0	0	0	0	0	0	0	3	36
13:15	2	34	7	0	1	0	0	0	0	0	0	0	0	1	45
13:30	3	86	31	0	6	0	0	0	0	0	0	0	0	5	131
Total	8	493	187	0	23	6	0	2	0	0	0	0	0	30	749
Percent	1.1%	65.8%	25.0%	0.0%	3.1%	0.8%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street
Location 2: West of Northern Avenue
City, State: Northampton, MA
Southbound

888-389-9524 or www.datayourequested.com

Date Start: 01-Oct-08
Site Code: 1

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classe	Total
12 PM	1	31	13	0	1	0	0	0	0	0	0	0	0	2	48
12:15	0	37	10	0	1	0	0	0	0	0	0	0	0	0	48
12:30	0	41	10	0	1	1	0	0	0	0	0	0	0	3	56
12:45	1	36	14	0	2	0	0	0	0	0	0	0	0	0	53
13:00	2	145	47	0	5	1	0	0	0	0	0	0	0	5	205
13:15	1	17	7	0	1	0	0	0	0	0	0	0	0	1	27
13:15	0	23	5	0	0	0	0	0	0	0	0	0	0	0	28
13:30	0	27	10	0	2	0	0	0	0	0	0	0	0	2	41
13:45	0	19	8	0	4	0	0	0	0	0	0	0	0	0	31
14:00	1	86	30	0	7	0	0	0	0	0	0	0	0	3	127
14:00	1	30	6	0	4	0	0	0	0	0	0	0	0	1	42
14:15	0	21	9	0	0	0	0	0	0	0	0	0	0	1	31
14:30	1	32	8	0	2	0	0	0	0	0	0	0	0	1	44
14:45	0	23	12	0	2	0	0	0	0	0	0	0	0	0	37
15:00	2	106	35	0	8	0	0	0	0	0	0	0	0	3	154
15:00	2	30	16	1	1	1	0	0	0	0	0	0	0	5	56
15:15	0	33	12	1	3	0	0	0	0	0	0	0	0	0	49
15:30	1	50	12	0	3	1	0	2	0	0	0	0	0	2	71
15:45	0	37	11	0	2	0	0	0	0	0	0	0	0	1	51
16:00	3	150	51	2	9	2	0	2	0	0	0	0	0	8	227
16:00	0	43	9	0	1	0	0	1	0	0	0	0	0	1	55
16:15	0	55	7	0	2	1	0	0	0	0	0	0	0	2	67
16:30	0	48	13	0	0	0	0	0	0	0	0	0	0	1	62
16:45	0	57	14	0	0	0	0	0	0	0	0	0	0	2	73
17:00	0	203	43	0	3	1	0	1	0	0	0	0	0	6	257
17:00	0	58	17	0	3	1	0	0	0	0	0	0	0	1	80
17:15	0	42	6	0	2	0	0	0	0	0	0	0	0	1	51
17:30	0	50	10	0	0	0	0	0	0	0	0	0	0	2	62
17:45	3	36	3	1	3	0	0	0	0	0	0	0	0	8	54
18:00	3	186	36	1	8	1	0	0	0	0	0	0	0	12	247
18:00	0	24	8	0	0	0	0	0	0	0	0	0	0	0	32
18:15	0	23	7	0	0	0	0	0	0	0	0	0	0	0	30
18:30	0	22	1	0	1	0	0	0	0	0	0	0	0	1	25
18:45	1	20	3	0	1	0	0	0	0	0	0	0	0	1	26
19:00	1	89	19	0	2	0	0	0	0	0	0	0	0	2	113
19:00	1	15	2	0	0	0	0	0	0	0	0	0	0	1	19
19:15	0	13	1	0	0	0	0	0	0	0	0	0	0	0	14
19:30	0	11	2	0	0	0	0	0	0	0	0	0	0	0	13
19:45	0	11	4	0	0	0	0	0	0	0	0	0	0	0	15
20:00	1	50	9	0	0	0	0	0	0	0	0	0	0	1	61
20:00	0	10	0	0	0	0	0	0	0	0	0	0	0	0	10
20:15	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
20:30	0	12	1	0	0	0	0	0	0	0	0	0	0	1	14
20:45	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5
21:00	0	31	1	0	0	0	0	0	0	0	0	0	0	1	33
21:00	0	11	1	0	1	0	0	0	0	0	0	0	0	0	13
21:15	0	9	2	0	0	0	0	0	0	0	0	0	0	1	12
21:30	0	7	0	0	0	0	0	0	0	0	0	0	0	0	7
21:45	0	9	0	0	0	0	0	0	0	0	0	0	0	0	9
22:00	0	36	3	0	1	0	0	0	0	0	0	0	0	1	41
22:00	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
22:15	0	8	0	0	0	0	0	0	0	0	0	0	0	0	8
22:30	0	3	0	0	1	0	0	0	0	0	0	0	0	0	4
22:45	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4
23:00	0	16	2	0	1	0	0	0	0	0	0	0	0	0	19
23:00	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
23:15	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3
23:30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
23:45	0	2	0	0	1	0	0	0	0	0	0	0	0	0	3
Total	13	1105	277	3	45	5	0	3	0	0	0	0	0	42	1493
Percent	0.9%	74.0%	18.6%	0.2%	3.0%	0.3%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	

Data Acquisition, Transformation & Analysis, Inc.

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Date Start: 01-Oct-08
Site Code: 1

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classe	Total
10/02/08	0	4	0	0	1	0	0	0	0	0	0	0	0	0	5
00:15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
00:30	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	9	0	0	1	0	0	0	0	0	0	0	0	0	10
01:15	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
01:45	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2
02:00	0	4	0	0	1	0	0	0	0	0	0	0	0	1	6
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
02:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
02:45	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2	4
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
04:30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
05:30	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3
05:45	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
06:00	0	4	2	0	0	0	0	0	0	0	0	0	0	0	6
06:00	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
06:15	0	8	1	0	0	0	0	0	0	0	0	0	0	0	9
06:30	0	7	1	0	1	0	0	0	0	0	0	0	0	0	9
06:45	0	5	3	0	0	0	0	0	0	0	0	0	0	0	8
07:00	0	23	5	0	1	0	0	0	0	0	0	0	0	0	29
07:00	0	5	4	0	1	0	0	0	0	0	0	0	0	0	10
07:15	0	13	2	0	0	0	0	0	0	0	0	0	0	1	16
07:30	0	12	8	0	1	0	0	0	0	0	0	0	0	0	21
07:45	0	30	7	0	0	0	0	1	0	0	0	0	0	2	40
08:00	0	60	21	0	2	0	0	1	0	0	0	0	0	3	87
08:00	0	30	12	0	2	0	0	1	0	0	0	0	0	3	48
08:15	1	29	19	0	2	0	0	0	0	0	0	0	0	0	51
08:30	0	28	12	1	0	0	0	0	0	0	0	0	0	3	44
08:45	0	49	8	0	2	0	0	0	0	0	0	0	0	0	59
09:00	1	136	51	1	6	0	0	1	0	0	0	0	0	6	202
09:00	0	20	6	0	1	0	0	0	0	0	0	0	0	0	27
09:15	0	19	10	0	2	0	0	0	0	0	0	0	0	3	34
09:30	0	20	9	0	1	0	0	0	0	0	0	0	0	0	30
09:45	0	22	2	0	0	0	0	0	0	0	0	0	0	0	24
10:00	0	81	27	0	4	0	0	0	0	0	0	0	0	3	115
10:00	0	22	7	0	1	1	0	0	0	0	0	0	0	1	32
10:15	0	14	9	0	0	0	0	0	0	0	0	0	0	2	25
10:30	0	20	6	0	1	0	0	0	0	0	0	0	0	2	29
10:45	0	20	10	0	2	0	0	0	0	0	0	0	0	0	32
11:00	0	76	32	0	4	1	0	0	0	0	0	0	0	5	118
11:00	0	17	8	0	3	0	0	0	0	0	0	0	0	1	29
11:15	0	11	6	0	0	1	0	0	0	0	0	0	0	0	18
11:30	2	29	13	0	4	0	0	0	0	0	0	0	0	0	48
11:45	1	40	10	0	0	0	0	0	0	0	0	0	0	0	51
Total	3	97	37	0	7	1	0	0	0	0	0	0	0	1	146
Percent	0.5%	68.1%	24.2%	0.1%	3.6%	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	2.9%	728

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12 PM	0	32	7	0	3	0	0	0	0	0	0	0	0	1	43
12:15	0	34	11	0	1	0	0	0	0	0	0	0	0	3	49
12:30	2	30	7	0	2	0	0	0	0	0	0	0	0	1	42
12:45	0	33	8	0	0	0	0	0	0	0	0	0	0	0	41
13:00	2	129	33	0	6	0	0	0	0	0	0	0	0	5	175
13:15	0	17	8	0	1	0	0	0	0	0	0	0	0	0	26
13:30	0	26	7	0	1	1	0	1	0	0	0	0	0	0	36
13:45	0	19	7	0	2	1	0	0	0	0	0	0	0	0	29
14:00	0	19	10	0	2	0	0	0	0	0	0	0	0	4	35
14:15	0	81	32	0	6	2	0	1	0	0	0	0	0	4	126
14:30	1	19	8	0	2	0	0	0	0	0	0	0	0	0	30
14:45	0	23	11	0	0	0	0	1	0	0	0	0	0	0	35
15:00	0	31	4	0	1	0	0	0	0	0	0	0	0	2	38
15:15	0	23	13	0	1	1	0	0	0	0	0	0	0	2	40
15:30	1	96	36	0	4	1	0	1	0	0	0	0	0	4	143
15:45	0	35	12	1	0	0	0	0	0	0	0	0	0	1	49
16:00	1	33	6	0	2	1	0	1	0	0	0	0	0	2	46
16:15	0	45	20	0	1	1	0	0	0	0	0	0	0	1	68
16:30	0	38	12	0	3	0	0	0	0	0	0	0	0	0	53
16:45	1	151	50	1	6	2	0	1	0	0	0	0	0	4	216
17:00	1	40	11	0	1	0	0	0	0	0	0	0	0	2	55
17:15	1	40	13	0	0	0	0	0	0	0	0	0	0	4	58
17:30	0	41	11	0	2	0	0	0	0	0	0	0	0	5	59
17:45	2	33	15	0	1	0	0	0	0	0	0	0	0	1	52
18:00	4	154	50	0	4	0	0	0	0	0	0	0	0	12	224
18:15	2	62	7	0	1	0	0	0	0	0	0	0	0	5	77
18:30	1	52	9	0	0	0	0	0	0	0	0	0	0	2	64
18:45	0	41	7	0	2	0	0	0	0	0	0	0	0	4	54
19:00	1	38	10	0	0	0	0	0	0	0	0	0	0	4	53
19:15	4	193	33	0	3	0	0	0	0	0	0	0	0	15	248
19:30	0	32	4	0	0	0	0	0	0	0	0	0	0	2	38
19:45	0	28	13	0	0	0	0	0	0	0	0	0	0	3	44
20:00	2	24	4	0	1	0	0	1	0	0	0	0	0	3	35
20:15	0	18	1	0	1	0	0	0	0	0	0	0	0	3	23
20:30	2	102	22	0	2	0	0	1	0	0	0	0	0	11	140
20:45	0	19	3	0	1	0	0	0	0	0	0	0	0	1	24
21:00	0	16	2	0	0	0	0	0	0	0	0	0	0	1	19
21:15	0	8	1	0	1	1	0	0	0	0	0	0	0	3	14
21:30	0	11	2	0	0	0	0	0	0	0	0	0	0	0	13
21:45	0	54	8	0	2	1	0	0	0	0	0	0	0	5	70
22:00	0	6	1	0	0	0	0	0	0	0	0	0	0	0	7
22:15	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6
22:30	0	11	2	0	0	0	0	0	0	0	0	0	0	1	14
22:45	0	9	0	0	0	0	0	0	0	0	0	0	0	0	9
23:00	0	32	3	0	0	0	0	0	0	0	0	0	0	1	36
23:15	0	5	2	0	0	0	0	0	0	0	0	0	0	0	7
23:30	0	20	3	0	0	0	0	0	0	0	0	0	0	0	23
23:45	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6
24:00	0	7	1	0	1	0	0	0	0	0	0	0	0	0	9
24:15	0	38	6	0	1	0	0	0	0	0	0	0	0	0	45
24:30	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
24:45	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
25:00	0	5	1	0	0	0	0	0	0	0	0	0	0	0	6
25:15	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
25:30	0	15	1	0	0	0	0	0	0	0	0	0	0	0	16
25:45	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6
26:00	0	5	1	0	0	0	0	0	0	0	0	0	0	0	6
26:15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
26:30	0	4	1	0	0	0	0	0	0	0	0	0	0	0	5
26:45	0	17	2	0	0	0	0	0	0	0	0	0	0	0	19
Total	14	1062	276	1	34	6	0	4	0	0	0	0	0	61	1458
Percent	1.0%	72.8%	18.9%	0.1%	2.3%	0.4%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	4.2%	
Grand Total	39	3156	916	5	128	19	0	11	0	0	0	0	0	154	4428
Percent	0.9%	71.3%	20.7%	0.1%	2.9%	0.4%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	3.5%	

Data Acquisition, Transformation & Analysis, Inc.

50 Alden Avenue
Belchertown, MA 01007

Location 1: North Street
Location 2: West of Northern Avenue
City, State: Northampton, MA

888-389-9524 or www.datayourequested.com

Date Start: 01-Oct-08

Northbound

Site Code: 1

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classe	Total
10/01/08	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
00:15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
00:30	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
00:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6
01:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
02:15	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
03:00	0	3	2	0	0	0	0	0	0	0	0	0	0	0	5
03:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
04:00	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
04:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
05:00	1	2	2	0	0	0	0	0	0	0	0	0	0	1	6
05:15	0	5	2	0	0	0	0	0	0	0	0	0	0	0	9
05:30	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
05:45	0	4	2	0	1	0	0	0	0	0	0	0	0	0	7
06:00	0	5	1	0	0	0	0	0	0	0	0	0	0	0	6
06:15	0	2	1	0	0	0	0	0	0	0	0	0	0	0	3
06:30	0	14	4	0	1	0	0	0	0	0	0	0	0	0	19
06:45	0	3	3	0	0	0	0	0	0	0	0	0	0	0	6
07:00	0	4	4	0	0	0	0	0	0	0	0	0	0	0	8
07:15	0	5	4	0	0	0	0	0	0	0	0	0	0	0	9
07:30	0	8	5	0	1	0	0	0	0	0	0	0	0	0	14
07:45	0	8	5	0	1	0	0	0	0	0	0	0	0	0	14
08:00	0	20	16	0	1	0	0	0	0	0	0	0	0	0	37
08:15	0	16	4	0	0	0	0	0	0	0	0	0	0	0	20
08:30	0	19	4	0	1	0	0	0	0	0	0	0	0	2	26
08:45	0	28	1	0	1	0	0	0	0	0	0	0	0	2	32
09:00	1	34	10	0	0	0	0	1	0	0	0	0	0	0	46
09:15	1	97	19	0	2	0	0	1	0	0	0	0	0	4	124
09:30	4	28	8	0	2	1	0	1	0	0	0	0	0	4	48
09:45	0	35	6	0	1	1	0	0	0	0	0	0	0	1	44
10:00	1	52	5	0	0	0	0	0	0	0	0	0	0	4	62
10:15	1	38	10	0	0	1	0	0	0	0	0	0	0	2	52
10:30	6	153	29	0	3	3	0	1	0	0	0	0	0	11	206
10:45	0	29	4	0	2	0	0	0	0	0	0	0	0	0	35
11:00	1	18	4	0	0	0	0	0	0	0	0	0	0	1	24
11:15	1	21	5	0	0	0	0	0	0	0	0	0	0	2	29
11:30	0	26	4	0	0	0	0	0	0	0	0	0	0	0	30
11:45	2	94	17	0	2	0	0	0	0	0	0	0	0	3	118
12:00	2	18	9	0	1	0	0	1	0	0	0	0	0	0	31
12:15	0	23	8	0	0	0	0	0	0	0	0	0	0	2	33
12:30	0	17	5	0	1	0	0	0	0	0	0	0	0	1	24
12:45	0	22	6	0	1	1	0	1	0	0	0	0	0	3	34
13:00	2	80	28	0	3	1	0	2	0	0	0	0	0	6	122
13:15	0	17	2	0	0	0	0	0	0	0	0	0	0	1	20
13:30	0	16	5	1	0	0	0	0	0	0	0	0	0	5	27
13:45	0	23	6	0	0	1	0	0	0	0	0	0	0	0	30
14:00	1	19	3	0	0	1	0	0	0	0	0	0	0	2	26
14:15	1	75	16	1	0	2	0	0	0	0	0	0	0	8	103
Total	13	550	134	1	12	6	0	4	0	0	0	0	0	33	753
Percent	1.7%	73.0%	17.8%	0.1%	1.6%	0.8%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	4.4%	

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Northbound

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Date Start: 01-Oct-08
Site Code: 1

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classe	Total
12 PM	0	16	9	0	0	0	0	0	0	0	0	0	0	2	27
12:15	0	24	10	1	0	0	0	0	0	0	0	0	0	0	35
12:30	1	28	4	0	0	1	0	0	0	0	0	0	0	2	36
12:45	0	23	10	0	0	0	0	0	0	0	0	0	0	1	34
13:00	1	91	33	1	0	1	0	0	0	0	0	0	0	5	132
13:15	0	27	1	0	2	1	0	1	0	0	0	0	0	1	33
13:30	0	20	6	0	2	0	0	0	1	0	0	0	0	0	29
13:45	0	19	6	0	0	0	0	0	0	0	0	0	0	1	26
14:00	0	26	7	0	1	0	0	0	0	0	0	0	0	2	36
14:15	0	92	20	0	5	1	0	1	1	0	0	0	0	4	124
14:30	0	24	6	0	1	0	0	0	0	0	0	0	0	1	32
14:45	0	17	6	0	0	0	0	0	0	0	0	0	0	3	26
15:00	1	24	3	0	2	0	0	0	0	0	0	0	0	3	33
15:15	0	32	3	0	2	0	0	0	0	0	0	0	0	1	38
15:30	1	97	18	0	5	0	0	0	0	0	0	0	0	8	129
15:45	3	27	6	0	0	0	0	0	0	0	0	0	0	5	41
16:00	0	22	6	0	1	0	0	0	0	0	0	0	0	0	29
16:15	2	25	7	0	0	0	0	0	0	0	0	0	0	1	35
16:30	0	23	6	0	2	0	0	0	0	0	0	0	0	1	32
16:45	5	97	25	0	3	0	0	0	0	0	0	0	0	7	137
17:00	0	24	5	0	0	0	0	0	0	0	0	0	0	0	29
17:15	1	26	6	0	0	0	0	0	0	0	0	0	0	3	36
17:30	0	29	3	0	2	0	0	0	0	0	0	0	0	1	35
17:45	0	20	4	0	0	0	0	0	0	0	0	0	0	4	28
18:00	1	99	18	0	2	0	0	0	0	0	0	0	0	8	128
18:15	1	25	2	0	0	0	0	0	0	0	0	0	0	2	30
18:30	1	31	3	0	0	0	0	0	0	0	0	0	0	1	36
18:45	0	20	3	0	0	0	0	0	0	0	0	0	0	2	25
19:00	1	20	3	0	1	0	0	1	0	0	0	0	0	5	31
19:15	3	96	11	0	1	0	0	1	0	0	0	0	0	10	122
19:30	0	25	1	0	1	0	0	0	0	0	0	0	0	1	28
19:45	0	27	1	0	0	0	0	0	0	0	0	0	0	0	28
20:00	0	16	0	0	0	0	0	0	0	0	0	0	0	2	18
20:15	0	8	2	0	0	0	0	0	0	0	0	0	0	1	11
20:30	0	76	4	0	1	0	0	0	0	0	0	0	0	4	85
20:45	0	14	0	0	0	1	0	0	0	0	0	0	0	0	15
21:00	0	18	0	0	0	0	0	0	0	0	0	0	0	0	18
21:15	0	11	0	0	0	0	0	0	0	0	0	0	0	0	11
21:30	2	6	2	0	0	0	0	0	0	0	0	0	0	1	11
21:45	2	49	2	0	0	1	0	0	0	0	0	0	0	1	55
22:00	0	8	3	0	0	0	0	0	0	0	0	0	0	0	11
22:15	0	9	0	0	0	0	0	0	0	0	0	0	0	0	9
22:30	0	11	0	0	0	0	0	0	0	0	0	0	0	0	11
22:45	0	8	0	0	1	0	0	0	0	0	0	0	0	0	9
23:00	0	36	3	0	1	0	0	0	0	0	0	0	0	0	40
23:15	0	12	2	0	0	0	0	0	0	0	0	0	0	0	14
23:30	0	8	1	0	0	0	0	0	0	0	0	0	0	1	10
23:45	0	10	0	0	0	0	0	0	0	0	0	0	0	0	10
24:00	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
24:15	0	33	3	0	0	0	0	0	0	0	0	0	0	1	37
24:30	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
24:45	0	5	1	0	0	0	0	0	0	0	0	0	0	0	6
25:00	0	2	2	0	0	0	0	0	0	0	0	0	0	0	4
25:15	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
25:30	0	13	3	0	0	0	0	0	0	0	0	0	0	0	16
25:45	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
26:00	0	4	2	0	0	0	0	0	0	0	0	0	0	0	6
26:15	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
26:30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
26:45	0	9	2	0	0	0	0	0	0	0	0	0	0	0	11
Total	13	788	142	1	18	3	0	2	1	0	0	0	0	48	1016
Percent	1.3%	77.6%	14.0%	0.1%	1.8%	0.3%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	4.7%	

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Date Start: 01-Oct-08

Northbound

Site Code: 1

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classe	Total
10/02/08	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
00:15	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
00:30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
00:45	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
01:00	0	7	1	0	0	0	0	0	0	0	0	0	0	0	8
01:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
01:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:45	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3
02:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
02:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
03:15	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
03:30	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
03:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
04:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:45	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
05:00	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
05:15	0	7	0	0	0	0	0	0	0	0	0	0	0	0	7
05:30	0	3	2	0	0	0	0	0	0	0	0	0	0	2	7
05:45	0	5	3	0	0	0	0	0	0	0	0	0	0	0	8
06:00	0	5	2	0	0	0	0	0	0	0	0	0	0	0	7
06:15	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
06:30	0	13	8	0	0	0	0	0	0	0	0	0	0	2	23
06:45	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
07:00	0	7	5	0	1	2	0	0	0	0	0	0	0	0	13
07:15	0	3	7	0	0	0	0	0	0	0	0	0	0	1	13
07:30	0	14	3	0	0	0	0	0	0	0	0	0	0	0	17
07:45	0	28	15	0	1	2	0	0	0	0	0	0	0	1	47
08:00	0	13	4	0	0	0	0	0	0	0	0	0	0	0	17
08:15	0	10	3	0	1	0	0	0	0	0	0	0	0	2	16
08:30	0	31	5	0	1	0	0	0	0	0	0	0	0	0	37
08:45	0	28	10	0	1	0	0	0	0	0	0	0	0	1	40
09:00	0	82	22	0	3	0	0	0	0	0	0	0	0	3	110
09:15	0	32	7	0	0	0	0	0	1	0	0	0	0	4	44
09:30	0	34	11	0	2	0	0	0	0	0	0	0	0	2	49
09:45	0	49	3	0	1	0	0	0	0	0	0	0	0	2	55
10:00	0	39	5	0	1	0	0	0	0	0	0	0	0	2	47
10:15	0	154	26	0	4	0	0	0	1	0	0	0	0	10	195
10:30	0	20	2	0	0	0	0	0	0	0	0	0	0	2	24
10:45	0	17	5	0	2	0	0	0	0	0	0	0	0	3	27
11:00	0	22	6	0	0	0	0	0	0	0	0	0	0	0	28
11:15	0	16	8	0	0	0	0	0	0	0	0	0	0	1	25
11:30	0	75	21	0	2	0	0	0	0	0	0	0	0	6	104
11:45	1	8	12	0	0	0	0	0	0	0	0	0	0	2	23
12:00	0	23	1	0	0	0	0	0	0	0	0	0	0	0	24
12:15	0	17	3	0	0	0	0	1	0	0	0	0	0	1	22
12:30	0	21	4	0	2	0	0	0	0	0	0	0	0	1	28
12:45	1	69	20	0	2	0	0	1	0	0	0	0	0	4	97
13:00	0	19	2	0	1	0	0	0	0	0	0	0	0	1	23
13:15	0	24	6	0	1	0	0	0	0	0	0	0	0	1	32
13:30	1	17	8	0	1	0	0	0	0	0	0	0	0	1	28
13:45	1	16	4	0	0	0	0	0	0	0	0	0	0	1	22
14:00	2	76	20	0	3	0	0	0	0	0	0	0	0	4	105
Total	3	518	133	0	15	2	0	1	1	0	0	0	0	31	704
Percent	0.4%	73.6%	18.9%	0.0%	2.1%	0.3%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	4.4%	

Data Acquisition, Transformation & Analysis, Inc.

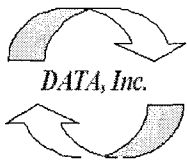
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888-389-9524 or www.datayourequested.com

Date Start: 01-Oct-08
Site Code: 1

Start Time	Bikes	Cars & Trailers	2 Axle Long	Buses	2 Axle 6 Tire	3 Axle Single	4 Axle Single	<5 Axl Double	5 Axle Double	>6 Axl Double	<6 Axl Multi	6 Axle Multi	>6 Axl Multi	Not Classe	Total
12 PM	0	21	3	0	0	0	0	0	0	0	0	0	0	1	25
12:15	0	34	7	0	0	1	0	0	0	0	0	0	0	3	45
12:30	1	21	4	0	1	0	0	0	0	0	0	0	0	1	28
12:45	0	22	4	0	2	0	0	0	0	0	0	0	0	0	28
13:00	1	98	18	0	3	1	0	0	0	0	0	0	0	5	126
13:15	0	28	4	0	2	0	0	0	0	0	0	0	0	0	34
13:30	1	16	4	0	1	0	0	0	0	0	0	0	0	1	23
13:45	2	16	4	0	1	0	0	0	0	0	0	0	0	3	26
14:00	1	16	5	0	0	1	0	0	0	0	0	0	0	4	27
14:15	4	76	17	0	4	1	0	0	0	0	0	0	0	8	110
14:30	1	21	6	0	1	0	0	0	0	0	0	0	0	2	31
14:45	0	21	3	0	0	0	0	0	0	0	0	0	0	1	25
15:00	1	18	4	0	1	0	0	0	0	0	0	0	0	4	28
15:15	2	23	7	0	1	0	0	0	0	0	0	0	0	3	36
15:30	4	83	20	0	3	0	0	0	0	0	0	0	0	10	120
15:45	0	35	6	0	1	0	0	0	0	0	0	0	0	4	46
16:00	2	25	6	0	0	0	0	0	0	0	0	0	0	2	35
16:15	1	26	13	0	2	0	0	0	0	0	0	0	0	3	45
16:30	1	26	7	0	1	0	0	0	0	0	0	0	0	0	35
16:45	4	112	32	0	4	0	0	0	0	0	0	0	0	9	161
17:00	0	20	4	0	1	0	0	0	0	0	0	0	0	9	34
17:15	1	21	5	0	0	0	0	2	0	0	0	0	0	4	33
17:30	2	26	2	0	1	0	0	0	0	0	0	0	0	12	43
17:45	0	28	3	0	2	0	0	0	0	0	0	0	0	9	42
18:00	3	95	14	0	4	0	0	2	0	0	0	0	0	34	152
18:15	3	29	4	0	0	1	0	0	0	0	0	0	0	4	41
18:30	1	29	7	0	0	1	0	0	0	0	0	0	0	9	47
18:45	0	26	6	0	0	0	0	0	0	0	0	0	0	6	38
19:00	1	26	1	0	0	1	0	0	0	0	0	0	0	6	35
19:15	5	110	18	0	0	3	0	0	0	0	0	0	0	25	161
19:30	1	19	3	0	1	0	0	0	0	0	0	0	0	5	29
19:45	1	21	6	0	1	0	0	0	0	0	0	0	0	4	33
20:00	2	26	1	0	1	0	0	0	0	0	0	0	0	4	34
20:15	0	21	2	0	0	0	0	0	0	0	0	0	0	3	26
20:30	4	87	12	0	3	0	0	0	0	0	0	0	0	16	122
20:45	0	16	1	0	0	0	0	0	0	0	0	0	0	1	18
21:00	0	14	1	0	0	0	0	0	0	0	0	0	0	5	20
21:15	0	21	2	0	1	0	0	0	0	0	0	0	0	0	24
21:30	0	11	1	0	0	0	0	0	0	0	0	0	0	1	13
21:45	0	62	5	0	1	0	0	0	0	0	0	0	0	7	75
22:00	0	18	0	0	0	0	0	0	0	0	0	0	0	0	18
22:15	0	12	0	0	1	0	0	0	0	0	0	0	0	0	13
22:30	0	16	1	0	0	0	0	0	0	0	0	0	0	1	18
22:45	0	12	0	0	0	0	0	0	0	0	0	0	0	0	12
23:00	0	58	1	0	1	0	0	0	0	0	0	0	0	1	61
23:15	0	10	0	0	0	0	0	0	0	0	0	0	0	0	10
23:30	0	7	1	0	0	0	0	0	0	0	0	0	0	0	8
23:45	0	3	1	0	0	0	0	0	0	0	0	0	0	0	4
24:00	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3
24:15	0	23	2	0	0	0	0	0	0	0	0	0	0	0	25
24:30	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
24:45	0	3	1	0	0	0	0	0	0	0	0	0	0	0	4
25:00	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
25:15	0	7	2	0	0	0	0	0	0	0	0	0	0	0	9
25:30	0	15	3	0	0	0	0	0	0	0	0	0	0	0	18
25:45	1	4	1	0	0	0	0	0	0	0	0	0	0	1	7
26:00	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
26:15	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4
26:30	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5
26:45	0	5	0	0	0	0	0	0	0	0	0	0	0	0	5
27:00	1	14	1	0	0	0	0	0	0	0	0	0	0	1	17
Total	26	833	143	0	23	5	0	2	0	0	0	0	0	116	1148
Percent	2.3%	72.6%	12.5%	0.0%	2.0%	0.4%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	10.1%	
Grand Total	55	2689	552	2	68	16	0	9	2	0	0	0	0	228	3621
Percent	1.5%	74.3%	15.2%	0.1%	1.9%	0.4%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	6.3%	



Data Acquisition, Transformation & Analysis

50 Alden Avenue
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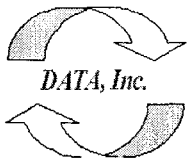
N/S: North Street
 E/W: Northern Avenue
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ Northern
 Site Code : 3
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:30 AM	0	17	0	0	17	0	0	0	0	0	0	29	0	0	29	2	0	2	1	5	51
07:45 AM	0	37	0	0	37	0	0	0	0	0	2	47	0	0	49	1	0	1	0	2	88
Total	0	54	0	0	54	0	0	0	0	0	2	76	0	0	78	3	0	3	1	7	139
08:00 AM	0	46	1	0	47	0	0	0	0	0	1	49	0	0	50	1	0	2	2	5	102
08:15 AM	0	37	1	0	38	0	0	0	0	0	1	45	0	0	46	0	0	3	2	5	89
08:30 AM	0	47	1	0	48	0	0	0	0	0	1	56	0	0	57	1	0	1	3	5	110
08:45 AM	0	55	0	0	55	0	0	0	0	0	1	40	0	0	41	0	0	3	0	3	99
Total	0	185	3	0	188	0	0	0	0	0	4	190	0	0	194	2	0	9	7	18	400
09:00 AM	0	24	0	0	24	0	0	0	0	0	3	27	0	0	30	1	0	1	2	4	58
09:15 AM	0	26	0	0	26	0	0	0	0	0	1	17	0	0	18	0	0	3	2	5	49
Grand Total	0	289	3	0	292	0	0	0	0	0	10	310	0	0	320	6	0	16	12	34	646
Apprch %	0	99	1	0		0	0	0	0		3.1	96.9	0	0		17.6	0	47.1	35.3		
Total %	0	44.7	0.5	0	45.2	0	0	0	0	0	1.5	48	0	0	49.5	0.9	0	2.5	1.9	5.3	
PCs and Peds																					
% PCs and Peds	0	99	100	0	99	0	0	0	0	0	100	100	0	0	100	100	0	100	100	100	99.5
HVs and Bikes	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
% HVs and Bikes	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	46	1	0	47	0	0	0	0	0	1	49	0	0	50	1	0	2	2	5	102
08:15 AM	0	37	1	0	38	0	0	0	0	0	1	45	0	0	46	0	0	3	2	5	89
08:30 AM	0	47	1	0	48	0	0	0	0	0	1	56	0	0	57	1	0	1	3	5	110
08:45 AM	0	55	0	0	55	0	0	0	0	0	1	40	0	0	41	0	0	3	0	3	99
Total Volume	0	185	3	0	188	0	0	0	0	0	4	190	0	0	194	2	0	9	7	18	400
% App. Total	0	98.4	1.6	0		0	0	0	0		2.1	97.9	0	0		11.1	0	50	38.9		
PHF	.000	.841	.750	.000	.855	.000	.000	.000	.000	.000	1.000	.848	.000	.000	.851	.500	.000	.750	.583	.900	.909



Data Acquisition, Transformation & Analysis

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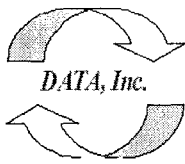
N/S: North Street
 E/W: Day Street / Bates Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ Day
 Site Code : 4
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- HVs and Bikes

Start Time	None From North				Day Street From East				North Street From South				Bates Street From West				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
07:30 AM	0	0	0	0	0	2	0	0	1	0	0	0	0	1	1	0	5
07:45 AM	0	0	0	0	0	0	0	0	2	0	0	0	1	1	6	0	10
Total	0	0	0	0	0	2	0	0	3	0	0	0	1	2	7	0	15
08:00 AM	0	0	0	0	0	3	0	0	2	0	0	0	0	1	2	0	8
08:15 AM	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
Total	0	0	0	0	0	4	0	0	2	0	0	0	0	2	8	0	16
09:00 AM	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	3
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3
Grand Total	0	0	0	0	0	7	0	0	7	0	0	0	1	5	17	0	37
Apprch %	0	0	0	0	0	100	0	0	100	0	0	0	4.3	21.7	73.9	0	
Total %	0	0	0	0	0	18.9	0	0	18.9	0	0	0	2.7	13.5	45.9	0	

Start Time	None From North					Day Street From East					North Street From South					Bates Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	0	0	0	0	0	2	0	0	2	1	0	0	0	1	0	1	1	0	2	5
07:45 AM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	1	1	6	0	8	10
08:00 AM	0	0	0	0	0	0	3	0	0	3	2	0	0	0	2	0	1	2	0	3	8
08:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
Total Volume	0	0	0	0	0	0	6	0	0	6	5	0	0	0	5	1	4	9	0	14	25
% App. Total	0	0	0	0	0	0	100	0	0	100	100	0	0	0	100	7.1	28.6	64.3	0		
PHF	.000	.000	.000	.000	.000	.000	.500	.000	.000	.500	.625	.000	.000	.000	.625	.250	1.000	.375	.000	.438	.625



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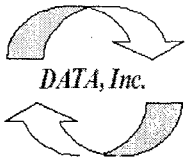
N/S: North Street
 E/W: Day Street / Bates Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ Day
 Site Code : 4
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	None From North				Day Street From East				North Street From South				Bates Street From West				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
07:30 AM	0	0	0	0	1	37	0	0	28	0	2	0	0	9	14	0	91
07:45 AM	0	0	0	0	6	27	0	0	34	0	4	0	1	9	29	0	110
Total	0	0	0	0	7	64	0	0	62	0	6	0	1	18	43	0	201
08:00 AM	0	0	0	0	9	51	0	0	25	0	11	0	0	15	25	0	136
08:15 AM	0	0	0	0	5	25	0	0	28	0	7	1	0	13	20	0	99
08:30 AM	0	0	0	0	6	23	0	0	38	0	8	4	0	8	26	0	113
08:45 AM	0	0	0	0	3	18	0	1	16	0	8	0	0	27	51	0	124
Total	0	0	0	0	23	117	0	1	107	0	34	5	0	63	122	0	472
09:00 AM	0	0	0	0	1	12	0	0	16	0	5	0	0	12	19	0	65
09:15 AM	0	0	0	0	3	9	0	0	7	0	5	0	0	9	27	0	60
Grand Total	0	0	0	0	34	202	0	1	192	0	50	5	1	102	211	0	798
Apprch %	0	0	0	0	14.3	85.2	0	0.4	77.7	0	20.2	2	0.3	32.5	67.2	0	
Total %	0	0	0	0	4.3	25.3	0	0.1	24.1	0	6.3	0.6	0.1	12.8	26.4	0	
PCs and Peds	0	0	0	0	34	195	0	1	185	0	50	5	0	97	194	0	761
% PCs and Peds	0	0	0	0	100	96.5	0	100	96.4	0	100	100	0	95.1	91.9	0	95.4
HVs and Bikes	0	0	0	0	0	7	0	0	7	0	0	0	1	5	17	0	37
% HVs and Bikes	0	0	0	0	0	3.5	0	0	3.6	0	0	0	100	4.9	8.1	0	4.6

Start Time	None From North					Day Street From East					North Street From South					Bates Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	9	51	0	0	60	25	0	11	0	36	0	15	25	0	40	136
08:15 AM	0	0	0	0	0	5	25	0	0	30	28	0	7	1	36	0	13	20	0	33	99
08:30 AM	0	0	0	0	0	6	23	0	0	29	38	0	8	4	50	0	8	26	0	34	113
08:45 AM	0	0	0	0	0	3	18	0	1	22	16	0	8	0	24	0	27	51	0	78	124
Total Volume	0	0	0	0	0	23	117	0	1	141	107	0	34	5	146	0	63	122	0	185	472
% App. Total	0	0	0	0		16.3	83	0	0.7		73.3	0	23.3	3.4		0	34.1	65.9	0		
PHF	.000	.000	.000	.000	.000	.639	.574	.000	.250	.588	.704	.000	.773	.313	.730	.000	.583	.598	.000	.593	.868



Data Acquisition, Transformation & Analysis

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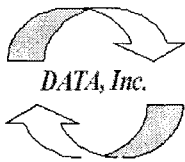
N/S: King Street
 E/W: North Street / Summer Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ King
 Site Code : 1
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- HVs and Bikes

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:30 AM	0	3	0	0	3	0	0	0	0	0	0	7	1	0	8	0	0	1	0	1	12
07:45 AM	1	1	0	0	2	0	0	0	0	0	0	7	0	2	9	0	0	0	1	1	12
Total	1	4	0	0	5	0	0	0	0	0	0	14	1	2	17	0	0	1	1	2	24
08:00 AM	1	3	0	0	4	0	0	0	1	1	0	4	0	0	4	0	0	0	0	0	9
08:15 AM	0	3	0	0	3	0	0	1	1	2	0	3	0	0	3	0	1	1	0	2	10
08:30 AM	0	2	0	1	3	0	0	0	0	0	0	2	1	1	4	1	1	0	1	3	10
08:45 AM	0	3	0	1	4	0	0	1	1	2	0	2	0	1	3	0	0	0	1	1	10
Total	1	11	0	2	14	0	0	2	3	5	0	11	1	2	14	1	2	1	2	6	39
09:00 AM	1	1	0	0	2	0	0	0	0	0	0	1	1	0	2	0	1	0	1	2	6
09:15 AM	0	2	0	0	2	0	0	0	1	1	0	3	0	0	3	0	0	1	0	1	7
Grand Total	3	18	0	2	23	0	0	2	4	6	0	29	3	4	36	1	3	3	4	11	76
Apprch %	13	78.3	0	8.7		0	0	33.3	66.7		0	80.6	8.3	11.1		9.1	27.3	27.3	36.4		
Total %	3.9	23.7	0	2.6	30.3	0	0	2.6	5.3	7.9	0	38.2	3.9	5.3	47.4	1.3	3.9	3.9	5.3	14.5	

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	3	0	0	3	0	0	0	0	0	0	7	1	0	8	0	0	1	0	1	12
07:45 AM	1	1	0	0	2	0	0	0	0	0	0	7	0	2	9	0	0	0	1	1	12
08:00 AM	1	3	0	0	4	0	0	0	1	1	0	4	0	0	4	0	0	0	0	0	9
08:15 AM	0	3	0	0	3	0	0	1	1	2	0	3	0	0	3	0	1	1	0	2	10
Total Volume	2	10	0	0	12	0	0	1	2	3	0	21	1	2	24	0	1	2	1	4	43
% App. Total	16.7	83.3	0	0		0	0	33.3	66.7		0	87.5	4.2	8.3		0	25	50	25		
PHF	.500	.833	.000	.000	.750	.000	.000	.250	.500	.375	.000	.750	.250	.250	.667	.000	.250	.500	.250	.500	.896



Data Acquisition, Transformation & Analysis

50 Alden Avenue
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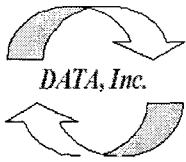
N/S: King Street
 E/W: North Street / Summer Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ King
 Site Code : 1
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total	
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total		
07:30 AM	14	85	0	1	100	13	0	36	0	49	0	86	10	1	97	9	7	6	0	22	268	
07:45 AM	40	91	0	0	131	20	0	33	0	53	0	112	14	2	128	16	32	6	1	55	367	
Total	54	176	0	1	231	33	0	69	0	102	0	198	24	3	225	25	39	12	1	77	635	
08:00 AM	36	97	0	0	133	22	0	47	2	71	0	109	8	1	118	16	28	5	2	51	373	
08:15 AM	44	124	0	0	168	29	0	58	2	89	0	102	11	0	113	16	33	12	2	63	433	
08:30 AM	39	133	0	1	173	31	0	64	1	96	0	93	16	2	111	18	46	10	4	78	458	
08:45 AM	34	110	0	2	146	41	0	68	2	111	0	101	17	3	121	17	25	11	5	58	436	
Total	153	464	0	3	620	123	0	237	7	367	0	405	52	6	463	67	132	38	13	250	1700	
09:00 AM	29	94	0	0	123	18	0	31	1	50	0	80	12	0	92	21	15	9	2	47	312	
09:15 AM	25	103	0	0	128	17	0	41	3	61	0	99	6	0	105	10	14	9	1	34	328	
Grand Total	261	837	0	4	1102	191	0	378	11	580	0	782	94	9	885	123	200	68	17	408	2975	
Apprch %	23.7	76	0	0.4		32.9	0	65.2	1.9		0	88.4	10.6	1		30.1	49	16.7	4.2			
Total %	8.8	28.1	0	0.1	37	6.4	0	12.7	0.4	19.5	0	26.3	3.2	0.3	29.7	4.1	6.7	2.3	0.6	13.7		
PCs and Peds																						
% PCs and Peds	98.9	97.8	0	50	97.9	100	0	99.5	63.6	99	0	96.3	96.8	55.6	95.9	99.2	98.5	95.6	76.5	97.3	97.4	
HVs and Bikes																						
% HVs and Bikes	1.1	2.2	0	50	2.1	0	0	0.5	36.4	1	0	3.7	3.2	44.4	4.1	0.8	1.5	4.4	23.5	2.7	2.6	

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	36	97	0	0	133	22	0	47	2	71	0	109	8	1	118	16	28	5	2	51	373
08:15 AM	44	124	0	0	168	29	0	58	2	89	0	102	11	0	113	16	33	12	2	63	433
08:30 AM	39	133	0	1	173	31	0	64	1	96	0	93	16	2	111	18	46	10	4	78	458
08:45 AM	34	110	0	2	146	41	0	68	2	111	0	101	17	3	121	17	25	11	5	58	436
Total Volume	153	464	0	3	620	123	0	237	7	367	0	405	52	6	463	67	132	38	13	250	1700
% App. Total	24.7	74.8	0	0.5		33.5	0	64.6	1.9		0	87.5	11.2	1.3		26.8	52.8	15.2	5.2		
PHF	.869	.872	.000	.375	.896	.750	.000	.871	.875	.827	.000	.929	.765	.500	.957	.931	.717	.792	.650	.801	.928



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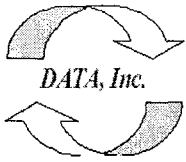
N/S: North Street / Market Street
 E/W: North Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ Market
 Site Code : 2
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- HVs and Bikes

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:30 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	2
07:45 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
Total	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	4
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	2
08:15 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
08:45 AM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Total	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	4	0	0	1	5	8
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3
09:15 AM	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Grand Total	0	2	5	0	7	0	0	0	0	0	0	0	0	0	0	8	0	1	1	10	17
Apprch %	0	28.6	71.4	0		0	0	0	0		0	0	0	0		80	0	10	10		
Total %	0	11.8	29.4	0	41.2	0	0	0	0	0	0	0	0	0	0	47.1	0	5.9	5.9	58.8	

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:15 AM																					
08:15 AM	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	2
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	2
08:45 AM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3
Total Volume	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0	6	0	0	0	6	9
% App. Total	0	0	100	0		0	0	0	0		0	0	0	0		100	0	0	0		
PHF	.000	.000	.375	.000	.375	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.500	.000	.000	.000	.500	.750



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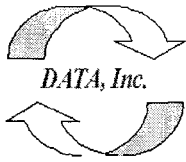
N/S: North Street / Market Street
 E/W: North Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ Market
 Site Code : 2
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:30 AM	0	8	26	0	34	0	0	0	0	0	25	9	0	0	34	19	0	20	1	40	108
07:45 AM	0	11	37	0	48	0	0	0	0	0	15	11	0	1	27	51	0	36	0	87	162
Total	0	19	63	0	82	0	0	0	0	0	40	20	0	1	61	70	0	56	1	127	270
08:00 AM	0	13	50	0	63	0	0	0	0	0	24	11	0	1	36	42	0	31	2	75	174
08:15 AM	0	6	47	0	53	0	0	0	0	0	29	10	0	1	40	49	0	39	1	89	182
08:30 AM	0	9	56	0	65	0	0	0	0	0	41	13	0	2	56	57	0	45	0	102	223
08:45 AM	0	15	60	0	75	0	0	0	0	0	45	9	0	4	58	42	0	33	0	75	208
Total	0	43	213	0	256	0	0	0	0	0	139	43	0	8	190	190	0	148	3	341	787
09:00 AM	0	10	23	0	33	0	0	0	0	0	19	6	0	1	26	33	0	26	1	60	119
09:15 AM	0	9	31	0	40	0	0	0	0	0	24	3	0	1	28	23	0	24	0	47	115
Grand Total	0	81	330	0	411	0	0	0	0	0	222	72	0	11	305	316	0	254	5	575	1291
Apprch %	0	19.7	80.3	0		0	0	0	0		72.8	23.6	0	3.6		55	0	44.2	0.9		
Total %	0	6.3	25.6	0	31.8	0	0	0	0	0	17.2	5.6	0	0.9	23.6	24.5	0	19.7	0.4	44.5	
PCs and Peds																					
% PCs and Peds	0	97.5	98.5	0	98.3	0	0	0	0	0	100	100	0	100	100	97.5	0	99.6	80	98.3	98.7
HVs and Bikes																					
% HVs and Bikes	0	2.5	1.5	0	1.7	0	0	0	0	0	0	0	0	0	0	2.5	0	0.4	20	1.7	1.3

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	13	50	0	63	0	0	0	0	0	24	11	0	1	36	42	0	31	2	75	174
08:15 AM	0	6	47	0	53	0	0	0	0	0	29	10	0	1	40	49	0	39	1	89	182
08:30 AM	0	9	56	0	65	0	0	0	0	0	41	13	0	2	56	57	0	45	0	102	223
08:45 AM	0	15	60	0	75	0	0	0	0	0	45	9	0	4	58	42	0	33	0	75	208
Total Volume	0	43	213	0	256	0	0	0	0	0	139	43	0	8	190	190	0	148	3	341	787
% App. Total	0	16.8	83.2	0		0	0	0	0		73.2	22.6	0	4.2		55.7	0	43.4	0.9		
PHF	.000	.717	.888	.000	.853	.000	.000	.000	.000	.000	.772	.827	.000	.500	.819	.833	.000	.822	.375	.836	.882



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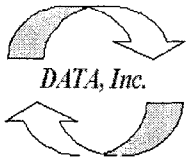
N/S: North Street
 E/W: Northern Avenue
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : AM_North @ Northern
 Site Code : 3
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- HVs and Bikes

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	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
08:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 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	0	0	0	0	0	0	0	0	0	3
09:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Apprch %	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %	0	100	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.750	.000	.000	.750	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.750



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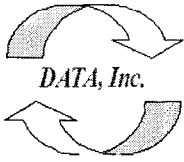
N/S: North Street
 E/W: Northern Avenue
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : PM_North @ Northern
 Site Code : 3
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- HVs and Bikes

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
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	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
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	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
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apprch %	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
Total %																					

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak I of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
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	0	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% App. Total	0	0	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000



Data Acquisition, Transformation & Analysis

50 Alden Avenue
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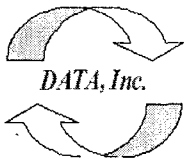
N/S: North Street
 E/W: Northern Avenue
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : PM_North @ Northern
 Site Code : 3
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:30 PM	0	63	1	0	64	0	0	0	0	0	0	27	0	0	27	1	0	2	4	7	98
03:45 PM	0	48	1	0	49	0	0	0	0	0	1	22	0	0	23	1	0	1	3	5	77
Total	0	111	2	0	113	0	0	0	0	0	1	49	0	0	50	2	0	3	7	12	175
04:00 PM	0	49	1	0	50	0	0	0	0	0	1	30	0	0	31	1	0	1	1	3	84
04:15 PM	0	65	2	0	67	0	0	0	0	0	1	34	0	0	35	1	0	0	6	7	109
04:30 PM	0	61	1	0	62	0	0	0	0	0	0	28	0	0	28	0	0	2	1	3	93
04:45 PM	0	61	3	0	64	0	0	0	0	0	2	24	0	0	26	0	0	2	2	4	94
Total	0	236	7	0	243	0	0	0	0	0	4	116	0	0	120	2	0	5	10	17	380
05:00 PM	0	78	2	0	80	0	0	0	0	0	1	37	1	0	39	1	0	0	1	2	121
05:15 PM	0	44	0	0	44	0	0	0	0	0	2	23	0	0	25	1	0	0	2	3	72
Grand Total	0	469	11	0	480	0	0	0	0	0	8	225	1	0	234	6	0	8	20	34	748
Apprch %	0	97.7	2.3	0		0	0	0	0		3.4	96.2	0.4	0		17.6	0	23.5	58.8		
Total %	0	62.7	1.5	0	64.2	0	0	0	0	0	1.1	30.1	0.1	0	31.3	0.8	0	1.1	2.7	4.5	
PCs and Peds	0	100	100	0	100	0	0	0	0	0	100	100	100	0	100	100	0	100	100	100	100
HVs and Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% HVs and Bikes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Start Time	North Street From North					None From East					North Street From South					Northern Avenue From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	65	2	0	67	0	0	0	0	0	1	34	0	0	35	1	0	0	6	7	109
04:30 PM	0	61	1	0	62	0	0	0	0	0	0	28	0	0	28	0	0	2	1	3	93
04:45 PM	0	61	3	0	64	0	0	0	0	0	2	24	0	0	26	0	0	2	2	4	94
05:00 PM	0	78	2	0	80	0	0	0	0	0	1	37	1	0	39	1	0	0	1	2	121
Total Volume	0	265	8	0	273	0	0	0	0	0	4	123	1	0	128	2	0	4	10	16	417
% App. Total	0	97.1	2.9	0		0	0	0	0		3.1	96.1	0.8	0		12.5	0	2.5	62.5		
PHF	.000	.849	.667	.000	.853	.000	.000	.000	.000	.000	.500	.831	.250	.000	.821	.500	.000	.500	.417	.571	.862



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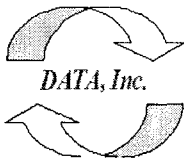
N/S: North Street
 E/W: Day Street / Bates Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : PM_North @ Day
 Site Code : 4
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- HVs and Bikes

Start Time	None From North					Day Street From East					North Street From South					Bates Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	2	0	2	4
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	3	3
Total	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	5	0	5	7
04:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	2
04:15 PM	0	0	0	0	0	0	1	0	0	1	3	0	0	0	3	0	0	1	0	1	5
04:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	4
04:45 PM	0	0	0	0	0	0	1	0	0	1	2	0	0	0	2	0	0	1	0	1	4
Total	0	0	0	0	0	0	3	0	0	3	6	0	0	0	6	0	2	4	0	6	15
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	1	0	0	1	0	0	0	0	0	0	1	0	0	1	2
Grand Total	0	0	0	0	0	0	4	0	0	4	8	0	0	0	8	0	3	9	0	12	24
Appreh %	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	25	75	0	0	
Total %	0	0	0	0	0	0	16.7	0	0	16.7	33.3	0	0	0	33.3	0	12.5	37.5	0	50	

Start Time	None From North					Day Street From East					North Street From South					Bates Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	2
04:15 PM	0	0	0	0	0	0	1	0	0	1	3	0	0	0	3	0	0	1	0	1	5
04:30 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	4
04:45 PM	0	0	0	0	0	0	1	0	0	1	2	0	0	0	2	0	0	1	0	1	4
Total Volume	0	0	0	0	0	0	3	0	0	3	6	0	0	0	6	0	2	4	0	6	15
% App. Total	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	33.3	66.7	0	0	
PHF	.000	.000	.000	.000	.000	.000	.750	.000	.000	.750	.500	.000	.000	.000	.500	.000	.250	1.000	.000	.500	.750



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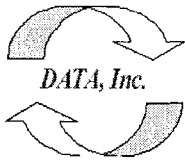
N/S: North Street
 E/W: Day Street / Bates Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : PM_North @ Day
 Site Code : 4
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	None From North					Day Street From East					North Street From South					Bates Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:30 PM	0	0	0	0	0	7	9	0	0	16	17	0	3	0	20	0	31	56	0	87	123
03:45 PM	0	0	0	0	0	4	5	0	0	9	12	0	2	0	14	0	18	33	0	51	74
Total	0	0	0	0	0	11	14	0	0	25	29	0	5	0	34	0	49	89	0	138	197
04:00 PM	0	0	0	0	0	2	9	0	0	11	14	0	2	1	17	0	21	47	0	68	96
04:15 PM	0	0	0	0	0	10	10	0	0	20	16	0	9	0	25	0	34	45	0	79	124
04:30 PM	0	0	0	0	0	5	11	0	0	16	8	0	6	0	14	0	26	47	0	73	103
04:45 PM	0	0	0	0	0	10	18	0	0	28	13	0	3	0	16	0	22	44	0	66	110
Total	0	0	0	0	0	27	48	0	0	75	51	0	20	1	72	0	103	183	0	286	433
05:00 PM	0	0	0	0	0	13	8	0	0	21	12	0	10	0	22	0	29	58	0	87	130
05:15 PM	0	0	0	0	0	6	17	0	0	23	8	0	3	0	11	0	22	28	0	50	84
Grand Total	0	0	0	0	0	57	87	0	0	144	100	0	38	1	139	0	203	358	0	561	844
Appreh %	0	0	0	0		39.6	60.4	0	0		71.9	0	27.3	0.7		0	36.2	63.8	0		
Total %	0	0	0	0	0	6.8	10.3	0	0	17.1	11.8	0	4.5	0.1	16.5	0	24.1	42.4	0	66.5	
PCs and Peds																					
% PCs and Peds	0	0	0	0	0	100	95.4	0	0	97.2	92	0	100	100	94.2	0	98.5	97.5	0	97.9	97.2
HVs and Bikes																					
% HVs and Bikes	0	0	0	0	0	0	4.6	0	0	2.8	8	0	0	0	5.8	0	1.5	2.5	0	2.1	2.8

Start Time	None From North					Day Street From East					North Street From South					Bates Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	0	0	0	0	10	10	0	0	20	16	0	9	0	25	0	34	45	0	79	124
04:30 PM	0	0	0	0	0	5	11	0	0	16	8	0	6	0	14	0	26	47	0	73	103
04:45 PM	0	0	0	0	0	10	18	0	0	28	13	0	3	0	16	0	22	44	0	66	110
05:00 PM	0	0	0	0	0	13	8	0	0	21	12	0	10	0	22	0	29	58	0	87	130
Total Volume	0	0	0	0	0	38	47	0	0	85	49	0	28	0	77	0	111	194	0	305	467
% App. Total	0	0	0	0		44.7	55.3	0	0		63.6	0	36.4	0		0	36.4	63.6	0		
PHF	.000	.000	.000	.000	.000	.731	.653	.000	.000	.759	.766	.000	.700	.000	.770	.000	.816	.836	.000	.876	.898



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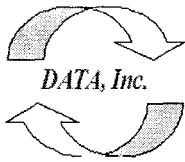
N/S: King Street
 E/W: North Street / Summer Street
 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : Not Named 4
 Site Code : 1
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- HVs and Bikes

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:30 PM	0	1	0	0	1	0	0	0	2	2	0	5	0	4	9	0	0	0	3	3	15
03:45 PM	0	3	0	1	4	1	0	0	2	3	0	4	0	2	6	0	0	0	1	1	14
Total	0	4	0	1	5	1	0	0	4	5	0	9	0	6	15	0	0	0	4	4	29
04:00 PM	0	2	0	0	2	0	0	0	1	1	0	2	0	4	6	0	0	0	1	1	10
04:15 PM	0	1	0	1	2	0	0	0	0	0	0	1	0	1	2	1	0	0	5	6	10
04:30 PM	1	3	0	1	5	0	0	0	1	1	0	1	0	0	1	0	0	0	1	1	8
04:45 PM	0	1	0	0	1	0	0	1	2	3	0	0	1	2	3	0	0	0	2	2	9
Total	1	7	0	2	10	0	0	1	4	5	0	4	1	7	12	1	0	0	9	10	37
05:00 PM	1	0	0	0	1	1	0	0	1	2	0	3	0	1	4	0	0	0	2	2	9
05:15 PM	0	2	0	1	3	1	0	0	1	2	0	2	0	0	2	0	0	0	0	0	7
Grand Total	2	13	0	4	19	3	0	1	10	14	0	18	1	14	33	1	0	0	15	16	82
Apprch %	10.5	68.4	0	21.1		21.4	0	7.1	71.4		0	54.5	3	42.4		6.2	0	0	93.8		
Total %	2.4	15.9	0	4.9	23.2	3.7	0	1.2	12.2	17.1	0	22	1.2	17.1	40.2	1.2	0	0	18.3	19.5	

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	1	0	0	1	0	0	0	2	2	0	5	0	4	9	0	0	0	3	3	15
03:45 PM	0	3	0	1	4	1	0	0	2	3	0	4	0	2	6	0	0	0	1	1	14
04:00 PM	0	2	0	0	2	0	0	0	1	1	0	2	0	4	6	0	0	0	1	1	10
04:15 PM	0	1	0	1	2	0	0	0	0	0	0	1	0	1	2	1	0	0	5	6	10
Total Volume	0	7	0	2	9	1	0	0	5	6	0	12	0	11	23	1	0	0	10	11	49
% App. Total	0	77.8	0	22.2		16.7	0	0	83.3		0	52.2	0	47.8		9.1	0	0	90.9		
PHF	.000	.583	.000	.500	.563	.250	.000	.000	.625	.500	.000	.600	.000	.688	.639	.250	.000	.000	.500	.458	.817



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N/S: King Street
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 City, State: Northampton, Ma
 Client: FandO / S. Savaria

File Name : Not Named 4
 Site Code : 1
 Start Date : 10/1/2008
 Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:30 PM	30	143	0	0	173	25	0	91	6	122	0	156	8	6	170	21	25	10	5	61	526
03:45 PM	29	132	0	3	164	22	0	85	8	115	0	140	19	2	161	22	26	6	6	60	500
Total	59	275	0	3	337	47	0	176	14	237	0	296	27	8	331	43	51	16	11	121	1026
04:00 PM	32	122	0	0	154	23	0	56	2	81	0	149	5	6	160	18	25	6	1	50	445
04:15 PM	39	118	0	1	158	22	0	79	1	102	0	126	12	2	140	17	27	8	5	57	457
04:30 PM	33	119	0	2	154	24	0	112	3	139	0	142	15	3	160	16	23	3	3	45	498
04:45 PM	37	101	0	0	138	19	0	103	5	127	0	116	16	3	135	17	17	1	6	41	441
Total	141	460	0	3	604	88	0	350	11	449	0	533	48	14	595	68	92	18	15	193	1841
05:00 PM	41	130	0	1	172	29	0	90	5	124	0	141	14	2	157	18	25	4	11	58	511
05:15 PM	45	131	0	1	177	18	0	108	2	128	0	136	8	0	144	21	19	4	0	44	493
Grand Total	286	996	0	8	1290	182	0	724	32	938	0	1106	97	24	1227	150	187	42	37	416	3871
Apprch %	22.2	77.2	0	0.6		19.4	0	77.2	3.4		0	90.1	7.9	2		36.1	45	10.1	8.9		
Total %	7.4	25.7	0	0.2	33.3	4.7	0	18.7	0.8	24.2	0	28.6	2.5	0.6	31.7	3.9	4.8	1.1	1	10.7	
PCs and Peds	1088																				
% PCs and Peds	99.3	98.7	0	50	98.5	98.4	0	99.9	68.8	98.5	0	98.4	99	41.7	97.3	99.3	100	100	59.5	96.2	97.9
HVs and Bikes	0																				
% HVs and Bikes	0.7	1.3	0	50	1.5	1.6	0	0.1	31.2	1.5	0	1.6	1	58.3	2.7	0.7	0	0	40.5	3.8	2.1

Start Time	King Street From North					North Street From East					King Street From South					Summer Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	33	119	0	2	154	24	0	112	3	139	0	142	15	3	160	16	23	3	3	45	498
04:45 PM	37	101	0	0	138	19	0	103	5	127	0	116	16	3	135	17	17	1	6	41	441
05:00 PM	41	130	0	1	172	29	0	90	5	124	0	141	14	2	157	18	25	4	11	58	511
05:15 PM	45	131	0	1	177	18	0	108	2	128	0	136	8	0	144	21	19	4	0	44	493
Total Volume	156	481	0	4	641	90	0	413	15	518	0	535	53	8	596	72	84	12	20	188	1943
% App. Total	24.3	75	0	0.6		17.4	0	79.7	2.9		0	89.8	8.9	1.3		38.3	44.7	6.4	10.6		
PHF	.867	.918	.000	.500	.905	.776	.000	.922	.750	.932	.000	.942	.828	.667	.931	.857	.840	.750	.455	.810	.951



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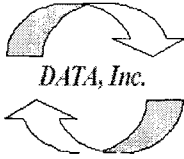
N/S: North Street / Market Street
E/W: North Street
City, State: Northampton, Ma
Client: FandO / S. Savaria

File Name : PM_North @ Market
Site Code : 2
Start Date : 10/1/2008
Page No : 1

Groups Printed- HVs and Bikes

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:30 PM	0	0	1	9	10	0	0	0	2	2	0	0	0	1	1	0	0	1	3	4	17
03:45 PM	0	0	2	14	16	0	0	0	4	4	0	0	0	0	0	1	0	1	0	2	22
Total	0	0	3	23	26	0	0	0	6	6	0	0	0	1	1	1	0	2	3	6	39
04:00 PM	0	1	0	7	8	0	0	0	1	1	0	0	0	0	0	1	0	1	5	7	16
04:15 PM	0	0	1	11	12	0	0	0	4	4	0	0	0	1	1	2	0	0	4	6	23
04:30 PM	0	0	0	6	6	0	0	0	3	3	0	0	0	0	0	0	0	3	2	5	14
04:45 PM	0	0	0	10	10	0	0	0	1	1	1	1	0	1	3	2	0	0	7	9	23
Total	0	1	1	34	36	0	0	0	9	9	1	1	0	2	4	5	0	4	18	27	76
05:00 PM	0	0	1	13	14	0	0	0	1	1	0	0	0	1	1	0	0	1	2	3	19
05:15 PM	0	0	1	10	11	0	0	0	4	4	2	0	0	2	4	0	0	2	5	7	26
Grand Total	0	1	6	80	87	0	0	0	20	20	3	1	0	6	10	6	0	9	28	43	160
Apprch %	0	1.1	6.9	92		0	0	0	100		30	10	0	60		14	0	20.9	65.1		
Total %	0	0.6	3.8	50	54.4	0	0	0	12.5	12.5	1.9	0.6	0	3.8	6.2	3.8	0	5.6	17.5	26.9	

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	0	0	6	6	0	0	0	3	3	0	0	0	0	0	0	0	3	2	5	14
04:45 PM	0	0	0	10	10	0	0	0	1	1	1	1	0	1	3	2	0	0	7	9	23
05:00 PM	0	0	1	13	14	0	0	0	1	1	0	0	0	1	1	0	0	1	2	3	19
05:15 PM	0	0	1	10	11	0	0	0	4	4	2	0	0	2	4	0	0	2	5	7	26
Total Volume	0	0	2	39	41	0	0	0	9	9	3	1	0	4	8	2	0	6	16	24	82
% App. Total	0	0	4.9	95.1		0	0	0	100		37.5	12.5	0	50		8.3	0	25	66.7		
PHF	.000	.000	.500	.750	.732	.000	.000	.000	.563	.563	.375	.250	.000	.500	.500	.250	.000	.500	.571	.667	.788



Data Acquisition, Transformation & Analysis

50 Alden Avenue

Belchertown, MA 01007

888-389-9524 or www.datayourequested.com

N/S: North Street / Market Street

E/W: North Street

City, State: Northampton, Ma

Client: FandO / S. Savaria

File Name : PM_North @ Market

Site Code : 2

Start Date : 10/1/2008

Page No : 1

Groups Printed- PCs and Peds - HVs and Bikes

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:30 PM	0	12	72	9	93	0	0	0	2	2	36	4	0	1	41	35	0	34	3	72	208
03:45 PM	0	13	52	14	79	0	0	0	4	4	52	7	0	0	59	36	0	40	0	76	218
Total	0	25	124	23	172	0	0	0	6	6	88	11	0	1	100	71	0	74	3	148	426
04:00 PM	0	8	45	7	60	0	0	0	1	1	30	6	1	0	37	35	0	30	5	70	168
04:15 PM	0	11	67	11	89	0	0	0	4	4	44	8	0	1	53	35	0	41	4	80	226
04:30 PM	0	13	65	6	84	0	0	0	3	3	63	8	0	0	71	35	0	35	2	72	230
04:45 PM	0	20	62	10	92	0	0	0	1	1	58	10	0	1	69	37	0	33	7	77	239
Total	0	52	239	34	325	0	0	0	9	9	195	32	1	2	230	142	0	139	18	299	863
05:00 PM	0	21	71	13	105	1	0	0	1	2	52	7	0	1	60	39	0	40	2	81	248
05:15 PM	0	13	53	10	76	0	0	0	4	4	68	4	0	2	74	34	0	44	5	83	237
Grand Total	0	111	487	80	678	1	0	0	20	21	403	54	1	6	464	286	0	297	28	611	1774
Apprch %	0	16.4	71.8	11.8		4.8	0	0	95.2		86.9	11.6	0.2	1.3		46.8	0	48.6	4.6		
Total %	0	6.3	27.5	4.5	38.2	0.1	0	0	1.1	1.2	22.7	3	0.1	0.3	26.2	16.1	0	16.7	1.6	34.4	
PCs and Peds																					
% PCs and Peds	0	99.1	98.8	0	87.2	100	0	0	0	4.8	99.3	98.1	100	0	97.8	97.9	0	97	0	93	91
HVs and Bikes																					
% HVs and Bikes	0	0.9	1.2	100	12.8	0	0	0	100	95.2	0.7	1.9	0	100	2.2	2.1	0	3	100	7	9

Start Time	North Street From North					None From East					Market Street From South					North Street From West					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	13	65	6	84	0	0	0	3	3	63	8	0	0	71	35	0	35	2	72	230
04:45 PM	0	20	62	10	92	0	0	0	1	1	58	10	0	1	69	37	0	33	7	77	239
05:00 PM	0	21	71	13	105	1	0	0	1	2	52	7	0	1	60	39	0	40	2	81	248
05:15 PM	0	13	53	10	76	0	0	0	4	4	68	4	0	2	74	34	0	44	5	83	237
Total Volume	0	67	251	39	357	1	0	0	9	10	241	29	0	4	274	145	0	152	16	313	954
% App. Total	0	18.8	70.3	10.9		10	0	0	90		88	10.6	0	1.5		46.3	0	48.6	5.1		
PHF	.000	.798	.884	.750	.850	.250	.000	.000	.563	.625	.886	.725	.000	.500	.926	.929	.000	.864	.571	.943	.962



TABLE A
LEVEL OF SERVICE CRITERIA
FOR
INTERSECTIONS

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	≤ 10
B	>10 and ≤ 20
C	>20 and ≤ 35
D	>35 and ≤ 55
E	>55 and ≤ 80
F	>80

Source: Highway Capacity Manual 2000, Exhibit 16-2.




















LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE CONTROL DELAY (Sec. Per Vehicle)
A	0 - 10
B	>10 and ≤ 15
C	>15 and ≤ 25
D	>25 and ≤ 35
E	>35 and ≤ 50
F	>50

Source: Highway Capacity Manual 2000, Exhibit 17-2.

Lanes, Volumes, Timings
1: North St. & King St.

10/15/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	67	132	38	123	0	230	0	405	52	153	464	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		200	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		143			471			282			275	
Travel Time (s)		3.3			10.7			6.4			6.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	3%	2%	0%	0%	1%	0%	3%	2%	1%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	72	183	0	0	379	0	0	435	56	0	664	0
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8					2	6		
Detector Phase	4	4		8	8			2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0			22.0	22.0	22.0	22.0	
Total Split (s)	27.0	27.0	0.0	27.0	27.0	0.0	0.0	53.0	53.0	53.0	53.0	0.0
Total Split (%)	33.8%	33.8%	0.0%	33.8%	33.8%	0.0%	0.0%	66.3%	66.3%	66.3%	66.3%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0			2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None			Max	Max	Max	Max	
Act Effct Green (s)	19.9	19.9			19.9			47.1	47.1		47.1	
Actuated g/C Ratio	0.26	0.26			0.26			0.60	0.60		0.60	
v/c Ratio	0.35	0.39			0.92			0.39	0.06		0.44	
Control Delay	28.9	24.1			48.5			9.8	2.3		9.9	
Queue Delay	0.0	0.0			0.0			0.0	0.0		0.0	
Total Delay	28.9	24.1			48.5			9.8	2.3		9.9	
LOS	C	C			D			A	A		A	
Approach Delay		25.4			48.5			8.9			9.9	
Approach LOS		C			D			A			A	
Queue Length 50th (ft)	29	66			128			107	0		88	
Queue Length 95th (ft)	66	121			#290			167	14		127	
Internal Link Dist (ft)		63			391			202			195	
Turn Bay Length (ft)									200			
Base Capacity (vph)	228	517			447			1114	978		1508	
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	0.32	0.35			0.85			0.39	0.06		0.44	

Lanes, Volumes, Timings
 1: North St. & King St.

10/15/2008

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 78
 Natural Cycle: 45
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.92
 Intersection Signal Delay: 20.0
 Intersection Capacity Utilization 87.1%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: C
 ICU Level of Service E

Splits and Phases: 1: North St. & King St.

↑ ø2	→ ø4
53 s	27 s
↓ ø6	← ø8
53 s	27 s

HCM Signalized Intersection Capacity Analysis
 1: North St. & King St.

10/15/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕			↑	↗		↕	
Volume (vph)	67	132	38	123	0	230	0	405	52	153	464	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00		0.95	
Frt	1.00	0.97			0.91			1.00	0.85		1.00	
Flt Protected	0.95	1.00			0.98			1.00	1.00		0.99	
Satd. Flow (prot)	1787	1787			1692			1845	1583		3504	
Flt Permitted	0.43	1.00			0.75			1.00	1.00		0.70	
Satd. Flow (perm)	807	1787			1286			1845	1583		2498	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	72	142	41	132	0	247	0	435	56	165	499	0
RTOR Reduction (vph)	0	13	0	0	86	0	0	0	22	0	0	0
Lane Group Flow (vph)	72	170	0	0	293	0	0	435	34	0	664	0
Heavy Vehicles (%)	1%	3%	2%	0%	0%	1%	0%	3%	2%	1%	2%	0%
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8					2	6		
Actuated Green, G (s)	19.9	19.9			19.9			47.1	47.1		47.1	
Effective Green, g (s)	19.9	19.9			19.9			47.1	47.1		47.1	
Actuated g/C Ratio	0.26	0.26			0.26			0.60	0.60		0.60	
Clearance Time (s)	5.0	5.0			5.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	206	456			328			1114	956		1508	
v/s Ratio Prot		0.09						0.24				
v/s Ratio Perm	0.09				c0.23				0.02		c0.27	
v/c Ratio	0.35	0.37			0.89			0.39	0.04		0.44	
Uniform Delay, d1	23.8	23.9			28.0			8.0	6.3		8.3	
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2	1.0	0.5			24.8			1.0	0.1		0.9	
Delay (s)	24.8	24.4			52.8			9.0	6.3		9.3	
Level of Service	C	C			D			A	A		A	
Approach Delay (s)		24.5			52.8			8.7			9.3	
Approach LOS		C			D			A			A	

Intersection Summary

HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
 2: North St. & Market St.

10/15/2008



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (vph)	190	147	139	43	43	214
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	75			75
Storage Lanes	1	0	0			1
Taper Length (ft)	25	25	25			25
Link Speed (mph)	30			30	30	
Link Distance (ft)	471			196	172	
Travel Time (s)	10.7			4.5	3.9	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	0%	0%	0%	0%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	383	0	0	207	49	243
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 42.8% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 2: North St. & Market St.

10/15/2008



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (veh/h)	190	147	139	43	43	214
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	216	167	158	49	49	243
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	414	49	292			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	414	49	292			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	59	84	88			
cM capacity (veh/h)	522	1025	1281			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	383	207	49	243
Volume Left	216	158	0	0
Volume Right	167	0	0	243
cSH	664	1281	1700	1700
Volume to Capacity	0.58	0.12	0.03	0.14
Queue Length 95th (ft)	92	11	0	0
Control Delay (s)	17.5	6.5	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	17.5	6.5	0.0	
Approach LOS	C			

Intersection Summary			
Average Delay		9.1	
Intersection Capacity Utilization		42.8%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 14: North St. & Bates St.

10/15/2008



Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	107	34	63	122	23	117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	403		673			909
Travel Time (s)	9.2		15.3			20.7
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	0%	3%	7%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	164	0	215	0	0	163
Sign Control	Stop		Stop			Stop

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	36.2%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 14: North St. & Bates St.

10/15/2008



Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations	Y		Y			Y
Sign Control	Stop		Stop			Stop
Volume (vph)	107	34	63	122	23	117
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	124	40	73	142	27	136

Direction, Lane #	NB 1	SE 1	NW 1
Volume Total (vph)	164	215	163
Volume Left (vph)	0	73	27
Volume Right (vph)	40	0	136
Hadj (s)	-0.12	0.16	-0.43
Departure Headway (s)	4.4	4.6	4.3
Degree Utilization, x	0.20	0.28	0.20
Capacity (veh/h)	777	742	763
Control Delay (s)	8.5	9.4	8.4
Approach Delay (s)	8.5	9.4	8.4
Approach LOS	A	A	A

Intersection Summary			
Delay		8.8	
HCM Level of Service		A	
Intersection Capacity Utilization		36.2%	ICU Level of Service
Analysis Period (min)		15	A

Lanes, Volumes, Timings
 22: North St. & Northern Ave.

10/15/2008



Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↔	
Volume (vph)	4	190	185	3	2	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30	30		30	
Link Distance (ft)		92	212		622	
Travel Time (s)		2.1	4.8		14.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	211	204	0	12	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 23.2% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 22: North St. & Northern Ave.

10/15/2008






















Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↔	
Volume (veh/h)	4	190	185	3	2	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	207	201	3	2	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	204				418	203
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	204				418	203
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1379				594	843

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	211	204	12
Volume Left	4	0	2
Volume Right	0	3	10
cSH	1379	1700	783
Volume to Capacity	0.00	0.12	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.2	0.0	9.7
Lane LOS	A		A
Approach Delay (s)	0.2	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		23.2%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
1: North St. & King St.

10/15/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	140	40	132	0	248	0	425	55	162	487	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		200	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		143			471			282			275	
Travel Time (s)		3.3			10.7			6.4			6.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	3%	2%	0%	0%	1%	0%	3%	2%	1%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	194	0	0	409	0	0	457	59	0	698	0
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8					2	6		
Detector Phase	4	4		8	8			2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0			22.0	22.0	22.0	22.0	
Total Split (s)	27.0	27.0	0.0	27.0	27.0	0.0	0.0	53.0	53.0	53.0	53.0	0.0
Total Split (%)	33.8%	33.8%	0.0%	33.8%	33.8%	0.0%	0.0%	66.3%	66.3%	66.3%	66.3%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0			2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None			Max	Max	Max	Max	
Act Effct Green (s)	21.4	21.4			21.4			47.0	47.0		47.0	
Actuated g/C Ratio	0.27	0.27			0.27			0.59	0.59		0.59	
v/c Ratio	0.35	0.39			0.96			0.42	0.06		0.48	
Control Delay	29.0	24.1			58.2			10.4	2.3		10.8	
Queue Delay	0.0	0.0			0.0			0.0	0.0		0.0	
Total Delay	29.0	24.1			58.2			10.4	2.3		10.8	
LOS	C	C			E			B	A		B	
Approach Delay		25.5			58.2			9.5			10.8	
Approach LOS		C			E			A			B	
Queue Length 50th (ft)	30	71			149			114	0		96	
Queue Length 95th (ft)	69	128			#330			177	14		138	
Internal Link Dist (ft)		63			391			202			195	
Turn Bay Length (ft)									200			
Base Capacity (vph)	219	508			433			1092	961		1446	
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	0.34	0.38			0.94			0.42	0.06		0.48	

Lanes, Volumes, Timings
 1: North St. & King St.

10/15/2008

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 79.4
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.96
 Intersection Signal Delay: 22.8
 Intersection Capacity Utilization 91.2%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: North St. & King St.

↑ ø2	→ ø4
53 s	27 s
↓ ø6	← ø8
53 s	27 s

HCM Signalized Intersection Capacity Analysis
 1: North St. & King St.

10/15/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕			↑	↗		↖↗	
Volume (vph)	70	140	40	132	0	248	0	425	55	162	487	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00		0.95	
Fr't	1.00	0.97			0.91			1.00	0.85		1.00	
Flt Protected	0.95	1.00			0.98			1.00	1.00		0.99	
Satd. Flow (prot)	1787	1787			1692			1845	1583		3504	
Flt Permitted	0.42	1.00			0.73			1.00	1.00		0.69	
Satd. Flow (perm)	791	1787			1259			1845	1583		2446	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	75	151	43	142	0	267	0	457	59	174	524	0
RTOR Reduction (vph)	0	13	0	0	85	0	0	0	24	0	0	0
Lane Group Flow (vph)	75	181	0	0	324	0	0	457	35	0	698	0
Heavy Vehicles (%)	1%	3%	2%	0%	0%	1%	0%	3%	2%	1%	2%	0%
Turn Type	Perm			Perm				Perm		Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8				2		6		
Actuated Green, G (s)	21.4	21.4			21.4			47.0	47.0		47.0	
Effective Green, g (s)	21.4	21.4			21.4			47.0	47.0		47.0	
Actuated g/C Ratio	0.27	0.27			0.27			0.59	0.59		0.59	
Clearance Time (s)	5.0	5.0			5.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	213	482			339			1092	937		1448	
v/s Ratio Prot		0.10						0.25				
v/s Ratio Perm	0.09				0.26				0.02		0.29	
v/c Ratio	0.35	0.38			0.95			0.42	0.04		0.48	
Uniform Delay, d1	23.4	23.6			28.5			8.8	6.8		9.2	
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2	1.0	0.5			36.7			1.2	0.1		1.2	
Delay (s)	24.4	24.1			65.2			10.0	6.8		10.4	
Level of Service	C	C			E			A	A		B	
Approach Delay (s)		24.2			65.2			9.6			10.4	
Approach LOS		C			E			A			B	

Intersection Summary			
HCM Average Control Delay	24.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	79.4	Sum of lost time (s)	11.0
Intersection Capacity Utilization	91.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
 2: North St. & Market St.

10/15/2008



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↖			↗	↑	↘
Volume (vph)	202	154	146	45	47	234
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	75			75
Storage Lanes	1	0	0			1
Taper Length (ft)	25	25	25			25
Link Speed (mph)	30			30	30	
Link Distance (ft)	471			196	172	
Travel Time (s)	10.7			4.5	3.9	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	0%	0%	0%	0%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	405	0	0	217	53	266
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 44.4% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 2: North St. & Market St.

10/15/2008



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (veh/h)	202	154	146	45	47	234
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	230	175	166	51	53	266
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	436	53	319			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	436	53	319			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	54	83	87			
cM capacity (veh/h)	501	1020	1252			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	405	217	53	266
Volume Left	230	166	0	0
Volume Right	175	0	0	266
cSH	642	1252	1700	1700
Volume to Capacity	0.63	0.13	0.03	0.16
Queue Length 95th (ft)	111	11	0	0
Control Delay (s)	19.7	6.6	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	19.7	6.6	0.0	
Approach LOS	C			

Intersection Summary			
Average Delay		10.0	
Intersection Capacity Utilization		44.4%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 4: Site Driveway & North St.

10/15/2008



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↓			↑	↑	
Volume (vph)	1	6	0	218	227	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30			30	30	
Link Distance (ft)	291			226	155	
Travel Time (s)	6.6			5.1	3.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	8	0	0	237	247	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

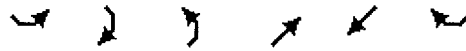
Intersection Capacity Utilization 21.9%

ICU Level of Service A

Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 4: Site Driveway & North St.

10/15/2008












Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↔			↑	↑	
Volume (veh/h)	1	6	0	218	227	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	7	0	237	247	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	484	247	247			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	484	247	247			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	546	797	1331			

Direction, Lane #	SE 1	NE 1	SW 1
Volume Total	8	237	247
Volume Left	1	0	0
Volume Right	7	0	0
cSH	748	1700	1700
Volume to Capacity	0.01	0.14	0.15
Queue Length 95th (ft)	1	0	0
Control Delay (s)	9.9	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.9	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		21.9%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 14: North St. & Bates St.

10/15/2008

						
Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	114	37	66	129	24	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	403		673			909
Travel Time (s)	9.2		15.3			20.7
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	0%	3%	7%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	176	0	227	0	0	171
Sign Control	Stop		Stop			Stop

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 37.8% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 14: North St. & Bates St.

10/15/2008



Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations	Y		↑			↑
Sign Control	Stop		Stop			Stop
Volume (vph)	114	37	66	129	24	123
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	133	43	77	150	28	143

Direction, Lane #	NB 1	SE 1	NW 1
Volume Total (vph)	176	227	171
Volume Left (vph)	0	77	28
Volume Right (vph)	43	0	143
Hadj (s)	-0.12	0.16	-0.43
Departure Headway (s)	4.5	4.7	4.4
Degree Utilization, x	0.22	0.29	0.21
Capacity (veh/h)	769	736	752
Control Delay (s)	8.7	9.6	8.6
Approach Delay (s)	8.7	9.6	8.6
Approach LOS	A	A	A

Intersection Summary			
Delay		9.0	
HCM Level of Service		A	
Intersection Capacity Utilization		37.8%	ICU Level of Service A
Analysis Period (min)		15	



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↘			↕	↕	
Volume (vph)	1	5	2	217	233	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30			30	30	
Link Distance (ft)	212			491	226	
Travel Time (s)	4.8			11.2	5.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	2%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	6	0	0	238	253	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 23.0% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 20: View Ave. & North St.

10/15/2008



Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↘			↖	↗	
Volume (veh/h)	1	5	2	217	233	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1	5	2	236	253	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	493	253	253			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	493	253	253			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	99	100			
cM capacity (veh/h)	538	790	1324			

Direction, Lane #	SE 1	NE 1	SW 1
Volume Total	7	238	253
Volume Left	1	2	0
Volume Right	5	0	0
cSH	733	1324	1700
Volume to Capacity	0.01	0.00	0.15
Queue Length 95th (ft)	1	0	0
Control Delay (s)	10.0	0.1	0.0
Lane LOS	A	A	
Approach Delay (s)	10.0	0.1	0.0
Approach LOS	A		

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		23.0%	ICU Level of Service
Analysis Period (min)		15	A

Lanes, Volumes, Timings
 22: North St. & Northern Ave.

10/15/2008



Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↕	
Volume (vph)	4	202	194	4	3	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30	30		30	
Link Distance (ft)		92	212		622	
Travel Time (s)		2.1	4.8		14.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	224	215	0	13	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 23.8% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 22: North St. & Northern Ave.

10/15/2008






















Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↖	↗		↘	
Volume (veh/h)	4	202	194	4	3	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	220	211	4	3	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	215				441	213
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	215				441	213
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1367				575	832

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	224	215	13
Volume Left	4	0	3
Volume Right	0	4	10
cSH	1367	1700	749
Volume to Capacity	0.00	0.13	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.2	0.0	9.9
Lane LOS	A		A
Approach Delay (s)	0.2	0.0	9.9
Approach LOS			A

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		23.8%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
1: North St. & King St.

10/15/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	139	40	129	0	242	0	425	55	161	487	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		200	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		143			471			282			275	
Travel Time (s)		3.3			10.7			6.4			6.3	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles (%)	1%	3%	2%	0%	0%	1%	0%	3%	2%	1%	2%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	75	192	0	0	399	0	0	457	59	0	697	0
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8					2	6		
Detector Phase	4	4		8	8			2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Minimum Split (s)	21.0	21.0		21.0	21.0			22.0	22.0	22.0	22.0	
Total Split (s)	27.0	27.0	0.0	27.0	27.0	0.0	0.0	53.0	53.0	53.0	53.0	0.0
Total Split (%)	33.8%	33.8%	0.0%	33.8%	33.8%	0.0%	0.0%	66.3%	66.3%	66.3%	66.3%	0.0%
Yellow Time (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
All-Red Time (s)	1.0	1.0		1.0	1.0			2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	4.0	5.0	5.0	4.0	4.0	6.0	6.0	6.0	6.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None			Max	Max	Max	Max	
Act Effct Green (s)	21.0	21.0		21.0	21.0			47.1	47.1		47.1	
Actuated g/C Ratio	0.27	0.27		0.27	0.27			0.60	0.60		0.60	
v/c Ratio	0.35	0.39		0.95	0.95			0.42	0.06		0.48	
Control Delay	29.0	24.1		55.3	55.3			10.3	2.3		10.6	
Queue Delay	0.0	0.0		0.0	0.0			0.0	0.0		0.0	
Total Delay	29.0	24.1		55.3	55.3			10.3	2.3		10.6	
LOS	C	C		E	E			B	A		B	
Approach Delay		25.5		55.3	55.3			9.4			10.6	
Approach LOS		C		E	E			A			B	
Queue Length 50th (ft)	30	70		143	143			114	0		96	
Queue Length 95th (ft)	69	127		#317	#317			177	14		137	
Internal Link Dist (ft)		63		391	391			202			195	
Turn Bay Length (ft)									200			
Base Capacity (vph)	222	510		435	435			1098	965		1459	
Starvation Cap Reductn	0	0		0	0			0	0		0	
Spillback Cap Reductn	0	0		0	0			0	0		0	
Storage Cap Reductn	0	0		0	0			0	0		0	
Reduced v/c Ratio	0.34	0.38		0.92	0.92			0.42	0.06		0.48	

Lanes, Volumes, Timings
 1: North St. & King St.

10/15/2008

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 79.1
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.95
 Intersection Signal Delay: 21.9
 Intersection Capacity Utilization 90.6%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: C
 ICU Level of Service E

Splits and Phases: 1: North St. & King St.

↑ ø2	→ ø4
53 s	27 s
↓ ø6	← ø8
53 s	27 s

HCM Signalized Intersection Capacity Analysis
 1: North St. & King St.

10/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷			↕			↕	↷		↕	
Volume (vph)	70	139	40	129	0	242	0	425	55	161	487	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0			6.0	6.0		6.0	
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00		0.95	
Flt	1.00	0.97			0.91			1.00	0.85		1.00	
Flt Protected	0.95	1.00			0.98			1.00	1.00		0.99	
Satd. Flow (prot)	1787	1787			1692			1845	1583		3504	
Flt Permitted	0.42	1.00			0.73			1.00	1.00		0.69	
Satd. Flow (perm)	798	1787			1263			1845	1583		2451	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	75	149	43	139	0	260	0	457	59	173	524	0
RTOR Reduction (vph)	0	13	0	0	85	0	0	0	24	0	0	0
Lane Group Flow (vph)	75	179	0	0	314	0	0	457	35	0	697	0
Heavy Vehicles (%)	1%	3%	2%	0%	0%	1%	0%	3%	2%	1%	2%	0%
Turn Type	Perm		Perm				Perm		Perm		Perm	
Protected Phases		4			8			2				6
Permitted Phases	4			8					2	6		
Actuated Green, G (s)	21.0	21.0			21.0			47.0	47.0			47.0
Effective Green, g (s)	21.0	21.0			21.0			47.0	47.0			47.0
Actuated g/C Ratio	0.27	0.27			0.27			0.59	0.59			0.59
Clearance Time (s)	5.0	5.0			5.0			6.0	6.0			6.0
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0			3.0
Lane Grp Cap (vph)	212	475			336			1098	942			1458
v/s Ratio Prot		0.10						0.25				
v/s Ratio Perm	0.09				c0.25				0.02			c0.28
v/c Ratio	0.35	0.38			0.93			0.42	0.04			0.48
Uniform Delay, d1	23.5	23.7			28.3			8.6	6.6			9.1
Progression Factor	1.00	1.00			1.00			1.00	1.00			1.00
Incremental Delay, d2	1.0	0.5			32.3			1.2	0.1			1.1
Delay (s)	24.5	24.2			60.6			9.8	6.7			10.2
Level of Service	C	C			E			A	A			B
Approach Delay (s)		24.3			60.6			9.4				10.2
Approach LOS		C			E			A				B

Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	79.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lanes, Volumes, Timings
 2: North St. & Market St.

10/15/2008



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (vph)	200	154	146	45	45	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	75			75
Storage Lanes	1	0	0			1
Taper Length (ft)	25	25	25			25
Link Speed (mph)	30			30	30	
Link Distance (ft)	471			196	172	
Travel Time (s)	10.7			4.5	3.9	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Heavy Vehicles (%)	2%	0%	0%	0%	0%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	402	0	0	217	51	256
Sign Control	Stop			Free	Free	

Intersection Summary
 Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 44.3% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 2: North St. & Market St.

10/15/2008



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↗
Volume (veh/h)	200	154	146	45	45	225
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	227	175	166	51	51	256
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	434	51	307			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	434	51	307			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	55	83	87			
cM capacity (veh/h)	503	1023	1265			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	402	217	51	256
Volume Left	227	166	0	0
Volume Right	175	0	0	256
cSH	646	1265	1700	1700
Volume to Capacity	0.62	0.13	0.03	0.15
Queue Length 95th (ft)	108	11	0	0
Control Delay (s)	19.3	6.6	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	19.3	6.6	0.0	
Approach LOS	C			

Intersection Summary			
Average Delay		9.9	
Intersection Capacity Utilization		44.3%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 14: North St. & Bates St.

10/15/2008



Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	112	36	66	128	24	123
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	403		673			909
Travel Time (s)	9.2		15.3			20.7
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	2%	0%	3%	7%	0%	3%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	172	0	226	0	0	171
Sign Control	Stop		Stop			Stop

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 37.5% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 14: North St. & Bates St.

10/15/2008



Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations	Y		1			1
Sign Control	Stop		Stop			Stop
Volume (vph)	112	36	66	128	24	123
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	130	42	77	149	28	143

Direction, Lane #	NB 1	SE 1	NW 1
Volume Total (vph)	172	226	171
Volume Left (vph)	0	77	28
Volume Right (vph)	42	0	143
Hadj (s)	-0.12	0.16	-0.43
Departure Headway (s)	4.5	4.7	4.4
Degree Utilization, x	0.21	0.29	0.21
Capacity (veh/h)	769	736	754
Control Delay (s)	8.7	9.6	8.6
Approach Delay (s)	8.7	9.6	8.6
Approach LOS	A	A	A

Intersection Summary			
Delay		9.0	
HCM Level of Service		A	
Intersection Capacity Utilization	37.5%		ICU Level of Service A
Analysis Period (min)	15		

Lanes, Volumes, Timings
 22: North St. & Northern Ave.

10/15/2008



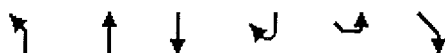
Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↔	
Volume (vph)	4	200	194	3	2	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30	30		30	
Link Distance (ft)		92	212		622	
Travel Time (s)		2.1	4.8		14.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	0%	0%	0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	221	214	0	12	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 23.7% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 22: North St. & Northern Ave.

10/15/2008



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↔	
Volume (veh/h)	4	200	194	3	2	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	4	217	211	3	2	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	214				439	212
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	214				439	212
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1368				577	833

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	222	214	12
Volume Left	4	0	2
Volume Right	0	3	10
cSH	1368	1700	771
Volume to Capacity	0.00	0.13	0.02
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.2	0.0	9.7
Lane LOS	A		A
Approach Delay (s)	0.2	0.0	9.7
Approach LOS			A

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		23.7%	ICU Level of Service A
Analysis Period (min)		15	



TABLE A
LEVEL OF SERVICE CRITERIA
FOR
INTERSECTIONS

LEVEL OF SERVICE CRITERIA FOR SIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (SEC)
A	≤ 10
B	>10 and ≤ 20
C	>20 and ≤ 35
D	>35 and ≤ 55
E	>55 and ≤ 80
F	>80

Source: Highway Capacity Manual 2000, Exhibit 16-2.

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	AVERAGE CONTROL DELAY (Sec. Per Vehicle)
A	0 - 10
B	>10 and ≤ 15
C	>15 and ≤ 25
D	>25 and ≤ 35
E	>35 and ≤ 50
F	>50

Source: Highway Capacity Manual 2000, Exhibit 17-2.

Lanes, Volumes, Timings
1: North St. & King St.

10/15/2008



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕			↑	↗		↖↗	
Volume (vph)	68	92	16	98	0	384	0	525	57	150	468	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		25	0		200	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30				30
Link Distance (ft)		143			471			282				275
Travel Time (s)		3.3			10.7			6.4				6.3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	1%	2%	1%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	72	115	0	0	513	0	0	559	61	0	658	0
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2				6
Permitted Phases	4			8					2	6		
Detector Phase	4	4		8	8			2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0			20.0	20.0	20.0	20.0	
Total Split (s)	27.0	27.0	0.0	27.0	27.0	0.0	0.0	53.0	53.0	53.0	53.0	0.0
Total Split (%)	33.8%	33.8%	0.0%	33.8%	33.8%	0.0%	0.0%	66.3%	66.3%	66.3%	66.3%	0.0%
Yellow Time (s)	3.5	3.5		3.5	3.5			3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5			0.5	0.5	0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None			Max	Max	Max	Max	
Act Effct Green (s)	19.0	19.0			19.0			49.2	49.2		49.2	
Actuated g/C Ratio	0.25	0.25			0.25			0.65	0.65		0.65	
v/c Ratio	0.64	0.24			0.91			0.46	0.06		0.42	
Control Delay	53.2	21.4			35.7			9.2	2.0		8.4	
Queue Delay	0.0	0.0			0.0			0.0	0.0		0.0	
Total Delay	53.2	21.4			35.7			9.2	2.0		8.4	
LOS	D	C			D			A	A		A	
Approach Delay		33.6			35.7			8.5			8.4	
Approach LOS		C			D			A			A	
Queue Length 50th (ft)	30	39			126			136	0		82	
Queue Length 95th (ft)	#89	79			#304			211	13		119	
Internal Link Dist (ft)		63			391			202			195	
Turn Bay Length (ft)									200			
Base Capacity (vph)	136	571			635			1214	1043		1555	
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	0.53	0.20			0.81			0.46	0.06		0.42	

Lanes, Volumes, Timings
 1: North St. & King St.

10/15/2008

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 76.2
 Natural Cycle: 50
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.91
 Intersection Signal Delay: 17.9
 Intersection Capacity Utilization 90.7%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: B
 ICU Level of Service E

Splits and Phases: 1: North St. & King St.

↑ ø2	→ ø4
53 s	27 s
↓ ø6	← ø8
53 s	27 s

HCM Signalized Intersection Capacity Analysis
 1: North St. & King St.

10/15/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	68	92	16	98	0	384	0	525	57	150	468	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0		
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00		0.95		
Flt Frt	1.00	0.98			0.89			1.00	0.85		1.00		
Flt Protected	0.95	1.00			0.99			1.00	1.00		0.99		
Satd. Flow (prot)	1787	1858			1675			1881	1583		3531		
Flt Permitted	0.24	1.00			0.90			1.00	1.00		0.67		
Satd. Flow (perm)	449	1858			1527			1881	1583		2408		
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	
Adj. Flow (vph)	72	98	17	104	0	409	0	559	61	160	498	0	
RTOR Reduction (vph)	0	8	0	0	186	0	0	0	22	0	0	0	
Lane Group Flow (vph)	72	107	0	0	327	0	0	559	39	0	658	0	
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	1%	2%	1%	1%	0%	
Turn Type	Perm			Perm					Perm	Perm			
Protected Phases		4			8			2			6		
Permitted Phases	4			8					2	6			
Actuated Green, G (s)	19.0	19.0			19.0			49.2	49.2		49.2		
Effective Green, g (s)	19.0	19.0			19.0			49.2	49.2		49.2		
Actuated g/C Ratio	0.25	0.25			0.25			0.65	0.65		0.65		
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0		
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0		3.0		
Lane Grp Cap (vph)	112	463			381			1215	1022		1555		
v/s Ratio Prot		0.06						c0.30					
v/s Ratio Perm	0.16				c0.21				0.02		0.27		
v/c Ratio	0.64	0.23			0.86			0.46	0.04		0.42		
Uniform Delay, d1	25.6	22.8			27.3			6.8	4.9		6.6		
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00		
Incremental Delay, d2	12.0	0.3			17.1			1.3	0.1		0.8		
Delay (s)	37.5	23.0			44.4			8.1	5.0		7.4		
Level of Service	D	C			D			A	A		A		
Approach Delay (s)		28.6			44.4			7.8			7.4		
Approach LOS		C			D			A			A		
Intersection Summary													
HCM Average Control Delay			19.1									HCM Level of Service	B
HCM Volume to Capacity ratio			0.57										
Actuated Cycle Length (s)			76.2									Sum of lost time (s)	8.0
Intersection Capacity Utilization			90.7%									ICU Level of Service	E
Analysis Period (min)			15										
c Critical Lane Group													

Lanes, Volumes, Timings
 2: North St. & Market St.

10/15/2008



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↘			↕	↕	↗
Volume (vph)	148	151	217	33	65	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	75			75
Storage Lanes	1	0	0			1
Taper Length (ft)	25	25	25			25
Link Speed (mph)	30			30	30	
Link Distance (ft)	471			196	172	
Travel Time (s)	10.7			4.5	3.9	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	0%	3%	0%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	315	0	0	263	68	279
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 44.5% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 2: North St. & Market St.

10/15/2008



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (veh/h)	148	151	217	33	65	265
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	156	159	228	35	68	279
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	560	68	347			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	560	68	347			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	61	84	81			
cM capacity (veh/h)	397	992	1223			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	315	263	68	279
Volume Left	156	228	0	0
Volume Right	159	0	0	279
cSH	569	1223	1700	1700
Volume to Capacity	0.55	0.19	0.04	0.16
Queue Length 95th (ft)	84	17	0	0
Control Delay (s)	18.9	7.7	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	18.9	7.7	0.0	
Approach LOS	C			

Intersection Summary			
Average Delay		8.6	
Intersection Capacity Utilization		44.5%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 14: North St. & Bates St.

10/15/2008



Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations	Y		↑			↑
Volume (vph)	49	28	111	194	38	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	403		673			909
Travel Time (s)	9.2		15.3			20.7
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	10%	0%	2%	2%	0%	6%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	90	0	355	0	0	99
Sign Control	Stop		Stop			Stop

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 36.7% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 14: North St. & Bates St.

10/15/2008



Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations	Y		↑			↑
Sign Control	Stop		Stop			Stop
Volume (vph)	49	28	111	194	38	47
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	57	33	129	226	44	55

Direction, Lane #	NB 1	SE 1	NW 1
Volume Total (vph)	90	355	99
Volume Left (vph)	0	129	44
Volume Right (vph)	33	0	55
Hadj (s)	-0.11	0.11	-0.19
Departure Headway (s)	4.4	4.4	4.7
Degree Utilization, x	0.11	0.43	0.13
Capacity (veh/h)	777	803	697
Control Delay (s)	8.0	10.6	8.4
Approach Delay (s)	8.0	10.6	8.4
Approach LOS	A	B	A

Intersection Summary			
Delay		9.8	
HCM Level of Service		A	
Intersection Capacity Utilization		36.7%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 22: North St. & Northern Ave.

10/15/2008



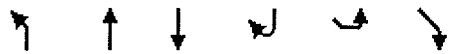
Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↕	
Volume (vph)	4	123	265	8	2	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30	30		30	
Link Distance (ft)		92	212		622	
Travel Time (s)		2.1	4.8		14.1	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	150	321	0	7	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 24.4% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 22: North St. & Northern Ave.

10/15/2008






















Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↕	
Volume (veh/h)	4	123	265	8	2	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	145	312	9	2	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	321				471	316
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	321				471	316
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1250				553	729

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	149	321	7
Volume Left	5	0	2
Volume Right	0	9	5
cSH	1250	1700	659
Volume to Capacity	0.00	0.19	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.3	0.0	10.5
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	10.5
Approach LOS			B

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		24.4%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
1: North St. & King St.

10/15/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	98	17	104	0	405	0	551	61	159	491	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		25	0		200	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		143			471			282			275	
Travel Time (s)		3.3			10.7			6.4			6.3	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	1%	2%	1%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	122	0	0	542	0	0	586	65	0	691	0
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8					2	6		
Detector Phase	4	4		8	8			2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0			20.0	20.0	20.0	20.0	
Total Split (s)	27.0	27.0	0.0	27.0	27.0	0.0	0.0	53.0	53.0	53.0	53.0	0.0
Total Split (%)	33.8%	33.8%	0.0%	33.8%	33.8%	0.0%	0.0%	66.3%	66.3%	66.3%	66.3%	0.0%
Yellow Time (s)	3.5	3.5		3.5	3.5			3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5			0.5	0.5	0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None			Max	Max	Max	Max	
Act Effct Green (s)	20.6	20.6			20.6			49.1	49.1		49.1	
Actuated g/C Ratio	0.27	0.27			0.27			0.63	0.63		0.63	
v/c Ratio	0.62	0.24			0.93			0.49	0.06		0.47	
Control Delay	49.2	21.4			40.0			10.0	2.0		9.3	
Queue Delay	0.0	0.0			0.0			0.0	0.0		0.0	
Total Delay	49.2	21.4			40.0			10.0	2.0		9.3	
LOS	D	C			D			A	A		A	
Approach Delay		32.0			40.0			9.2			9.3	
Approach LOS		C			D			A			A	
Queue Length 50th (ft)	32	42			148			148	0		90	
Queue Length 95th (ft)	#93	83			#342			225	14		131	
Internal Link Dist (ft)		63			391			202			195	
Turn Bay Length (ft)									200			
Base Capacity (vph)	137	559			624			1189	1025		1464	
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	0.55	0.22			0.87			0.49	0.06		0.47	

Lanes, Volumes, Timings
 1: North St. & King St.

10/15/2008

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 77.7
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 19.4
 Intersection Capacity Utilization 94.6%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Intersection LOS: B
 ICU Level of Service F

Splits and Phases: 1: North St. & King St.

↑ ø2	→ ø4
53 s	27 s
↓ ø6	← ø8
53 s	27 s

HCM Signalized Intersection Capacity Analysis
 1: North St. & King St.

10/15/2008



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕			↑	↗		↖↗	
Volume (vph)	71	98	17	104	0	405	0	551	61	159	491	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00		0.95	
Flt	1.00	0.98			0.89			1.00	0.85		1.00	
Flt Protected	0.95	1.00			0.99			1.00	1.00		0.99	
Satd. Flow (prot)	1787	1858			1675			1881	1583		3531	
Flt Permitted	0.25	1.00			0.90			1.00	1.00		0.65	
Satd. Flow (perm)	462	1858			1522			1881	1583		2318	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	76	104	18	111	0	431	0	586	65	169	522	0
RTOR Reduction (vph)	0	8	0	0	180	0	0	0	24	0	0	0
Lane Group Flow (vph)	76	114	0	0	362	0	0	586	41	0	691	0
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	1%	2%	1%	1%	0%
Turn Type	Perm			Perm				Perm	Perm			
Protected Phases		4			8			2			6	
Permitted Phases	4			8				2	6			
Actuated Green, G (s)	20.6	20.6			20.6			49.1	49.1		49.1	
Effective Green, g (s)	20.6	20.6			20.6			49.1	49.1		49.1	
Actuated g/C Ratio	0.27	0.27			0.27			0.63	0.63		0.63	
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	122	493			404			1189	1000		1465	
v/s Ratio Prot		0.06						c0.31				
v/s Ratio Perm	0.16				c0.24				0.03		0.30	
v/c Ratio	0.62	0.23			0.90			0.49	0.04		0.47	
Uniform Delay, d1	25.1	22.3			27.5			7.6	5.4		7.5	
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2	9.5	0.2			21.6			1.5	0.1		1.1	
Delay (s)	34.6	22.6			49.1			9.1	5.5		8.6	
Level of Service	C	C			D			A	A		A	
Approach Delay (s)		27.2			49.1			8.7			8.6	
Approach LOS		C			D			A			A	

Intersection Summary

HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	77.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lanes, Volumes, Timings
 2: North St. & Market St.

10/15/2008



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (vph)	158	159	228	36	69	281
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	75			75
Storage Lanes	1	0	0			1
Taper Length (ft)	25	25	25			25
Link Speed (mph)	30			30	30	
Link Distance (ft)	471			196	172	
Travel Time (s)	10.7			4.5	3.9	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	0%	3%	0%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	333	0	0	278	73	296
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 46.4% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 2: North St. & Market St.

10/15/2008



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↔	↔	↔
Volume (veh/h)	158	159	228	36	69	281
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	166	167	240	38	73	296
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None	None		
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	591	73	368			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	591	73	368			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	56	83	80			
cM capacity (veh/h)	375	987	1201			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	334	278	73	296
Volume Left	166	240	0	0
Volume Right	167	0	0	296
cSH	544	1201	1700	1700
Volume to Capacity	0.61	0.20	0.04	0.17
Queue Length 95th (ft)	103	19	0	0
Control Delay (s)	21.6	7.8	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	21.6	7.8	0.0	
Approach LOS	C			

Intersection Summary			
Average Delay		9.6	
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 4: Site Driveway & North St.

10/15/2008



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↔			↑	↓	
Volume (vph)	1	2	0	136	304	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30			30	30	
Link Distance (ft)	206			239	155	
Travel Time (s)	4.7			5.4	3.5	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	3	0	0	160	358	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 26.0% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 4: Site Driveway & North St.

10/15/2008












Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↶			↑	↑	
Volume (veh/h)	1	2	0	136	304	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	1	2	0	160	358	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	518	358	358			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	518	358	358			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	522	691	1212			

Direction, Lane #	SE 1	NE 1	SW 1
Volume Total	4	160	358
Volume Left	1	0	0
Volume Right	2	0	0
cSH	624	1700	1700
Volume to Capacity	0.01	0.09	0.21
Queue Length 95th (ft)	0	0	0
Control Delay (s)	10.8	0.0	0.0
Lane LOS	B		
Approach Delay (s)	10.8	0.0	0.0
Approach LOS	B		

Intersection Summary		
Average Delay	0.1	
Intersection Capacity Utilization	26.0%	ICU Level of Service A
Analysis Period (min)	15	

Lanes, Volumes, Timings
 14: North St. & Bates St.

10/15/2008

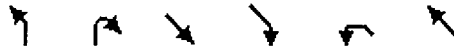
						
Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	52	30	117	212	41	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	403		673			909
Travel Time (s)	9.2		15.3			20.7
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	10%	0%	2%	2%	0%	6%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	95	0	383	0	0	105
Sign Control	Stop		Stop			Stop

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 38.7% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 14: North St. & Bates St.

10/15/2008



Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations	↙		↘			↕
Sign Control	Stop		Stop			Stop
Volume (vph)	52	30	117	212	41	49
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	60	35	136	247	48	57
Direction, Lane #	NB 1	SE 1	NW 1			
Volume Total (vph)	95	383	105			
Volume Left (vph)	0	136	48			
Volume Right (vph)	35	0	57			
Hadj (s)	-0.11	0.11	-0.18			
Departure Headway (s)	4.5	4.4	4.8			
Degree Utilization, x	0.12	0.47	0.14			
Capacity (veh/h)	767	799	683			
Control Delay (s)	8.1	11.1	8.6			
Approach Delay (s)	8.1	11.1	8.6			
Approach LOS	A	B	A			
Intersection Summary						
Delay			10.2			
HCM Level of Service			B			
Intersection Capacity Utilization			38.7%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
 20: View Ave. & North St.

10/15/2008



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	↔			↔	↔	
Volume (vph)	0	2	4	136	298	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30			30	30	
Link Distance (ft)	158			479	239	
Travel Time (s)	3.6			10.9	5.4	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2	0	0	165	360	0
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 26.2% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 20: View Ave. & North St.

10/15/2008



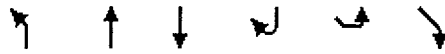
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations	Y			↑	↑	
Volume (veh/h)	0	2	4	136	298	8
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	2	5	160	351	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	525	355	360			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	525	355	360			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	515	693	1210			

Direction, Lane #	SE 1	NE 1	SW 1
Volume Total	2	165	360
Volume Left	0	5	0
Volume Right	2	0	9
cSH	693	1210	1700
Volume to Capacity	0.00	0.00	0.21
Queue Length 95th (ft)	0	0	0
Control Delay (s)	10.2	0.3	0.0
Lane LOS	B	A	
Approach Delay (s)	10.2	0.3	0.0
Approach LOS	B		

Intersection Summary		
Average Delay		0.1
Intersection Capacity Utilization	26.2%	ICU Level of Service A
Analysis Period (min)		15

Lanes, Volumes, Timings
 22: North St. & Northern Ave.

10/15/2008



Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↕	
Volume (vph)	4	130	286	9	3	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30	30		30	
Link Distance (ft)		92	212		622	
Travel Time (s)		2.1	4.8		14.1	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	158	347	0	9	0
Sign Control		Free	Free		Stop	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 25.6% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 22: North St. & Northern Ave.

10/15/2008






















Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↔	↔		↔	
Volume (veh/h)	4	130	286	9	3	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	153	336	11	4	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	347				504	342
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	347				504	342
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	99
cM capacity (veh/h)	1223				529	705

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	158	347	8
Volume Left	5	0	4
Volume Right	0	11	5
cSH	1223	1700	617
Volume to Capacity	0.00	0.20	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.3	0.0	10.9
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	10.9
Approach LOS			B

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		25.6%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
1: North St. & King St.

10/15/2008

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	71	97	17	103	0	403	0	551	60	158	491	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		25	0		200	0		0
Storage Lanes	1		0	0		0	0		1	0		0
Taper Length (ft)	25		25	25		25	25		25	25		25
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30				30
Link Distance (ft)		143			471			282				275
Travel Time (s)		3.3			10.7			6.4				6.3
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	1%	2%	1%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	121	0	0	539	0	0	586	64	0	690	0
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8					2	6		
Detector Phase	4	4		8	8			2	2	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0		20.0	20.0			20.0	20.0	20.0	20.0	
Total Split (s)	27.0	27.0	0.0	27.0	27.0	0.0	0.0	53.0	53.0	53.0	53.0	0.0
Total Split (%)	33.8%	33.8%	0.0%	33.8%	33.8%	0.0%	0.0%	66.3%	66.3%	66.3%	66.3%	0.0%
Yellow Time (s)	3.5	3.5		3.5	3.5			3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5			0.5	0.5	0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None			Max	Max	Max	Max	
Act Effct Green (s)	20.4	20.4			20.4			49.1	49.1		49.1	
Actuated g/C Ratio	0.26	0.26			0.26			0.63	0.63		0.63	
v/c Ratio	0.63	0.24			0.93			0.49	0.06		0.47	
Control Delay	50.5	21.4			39.4			9.9	2.0		9.2	
Queue Delay	0.0	0.0			0.0			0.0	0.0		0.0	
Total Delay	50.5	21.4			39.4			9.9	2.0		9.2	
LOS	D	C			D			A	A		A	
Approach Delay		32.6			39.4			9.1			9.2	
Approach LOS		C			D			A			A	
Queue Length 50th (ft)	32	41			145			148	0		89	
Queue Length 95th (ft)	#94	82			#338			225	13		130	
Internal Link Dist (ft)		63			391			202			195	
Turn Bay Length (ft)									200			
Base Capacity (vph)	137	560			626			1192	1026		1472	
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	0.55	0.22			0.86			0.49	0.06		0.47	

Lanes, Volumes, Timings
 1: North St. & King St.

10/15/2008

Intersection Summary

Area Type: Other
 Cycle Length: 80
 Actuated Cycle Length: 77.5
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.93
 Intersection Signal Delay: 19.2
 Intersection LOS: B
 Intersection Capacity Utilization 94.4%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 1: North St. & King St.

↑ ø2	← ø4
53 s	27 s
↓ ø6	← ø8
53 s	27 s

HCM Signalized Intersection Capacity Analysis
1: North St. & King St.

10/15/2008

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗			↕			↑	↗		↖↗	
Volume (vph)	71	97	17	103	0	403	0	551	60	158	491	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0			4.0	4.0		4.0	
Lane Util. Factor	1.00	1.00			1.00			1.00	1.00		0.95	
Flt	1.00	0.98			0.89			1.00	0.85		1.00	
Flt Protected	0.95	1.00			0.99			1.00	1.00		0.99	
Satd. Flow (prot)	1787	1858			1675			1881	1583		3531	
Flt Permitted	0.24	1.00			0.90			1.00	1.00		0.65	
Satd. Flow (perm)	460	1858			1523			1881	1583		2325	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	76	103	18	110	0	429	0	586	64	168	522	0
RTOR Reduction (vph)	0	8	0	0	181	0	0	0	23	0	0	0
Lane Group Flow (vph)	76	113	0	0	358	0	0	586	41	0	690	0
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%	0%	1%	2%	1%	1%	0%
Turn Type	Perm			Perm					Perm	Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8					2	6		
Actuated Green, G (s)	20.4	20.4			20.4			49.1	49.1		49.1	
Effective Green, g (s)	20.4	20.4			20.4			49.1	49.1		49.1	
Actuated g/C Ratio	0.26	0.26			0.26			0.63	0.63		0.63	
Clearance Time (s)	4.0	4.0			4.0			4.0	4.0		4.0	
Vehicle Extension (s)	3.0	3.0			3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	121	489			401			1192	1003		1473	
v/s Ratio Prot		0.06						c0.31				
v/s Ratio Perm	0.17				c0.23				0.03		0.30	
v/c Ratio	0.63	0.23			0.89			0.49	0.04		0.47	
Uniform Delay, d1	25.2	22.4			27.5			7.6	5.3		7.4	
Progression Factor	1.00	1.00			1.00			1.00	1.00		1.00	
Incremental Delay, d2	9.8	0.2			21.3			1.5	0.1		1.1	
Delay (s)	35.0	22.6			48.8			9.0	5.4		8.5	
Level of Service	C	C			D			A	A		A	
Approach Delay (s)		27.4			48.8			8.7			8.5	
Approach LOS		C			D			A			A	
Intersection Summary												
HCM Average Control Delay			20.8									HCM Level of Service C
HCM Volume to Capacity ratio			0.61									
Actuated Cycle Length (s)			77.5							8.0		
Intersection Capacity Utilization			94.4%									ICU Level of Service F
Analysis Period (min)			15									
c Critical Lane Group												

Lanes, Volumes, Timings
 2: North St. & Market St.

10/15/2008



Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↑	↑
Volume (vph)	155	159	228	35	68	278
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0	75			75
Storage Lanes	1	0	0			1
Taper Length (ft)	25	25	25			25
Link Speed (mph)	30			30	30	
Link Distance (ft)	471			196	172	
Travel Time (s)	10.7			4.5	3.9	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	3%	3%	0%	3%	0%	1%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	330	0	0	277	72	293
Sign Control	Stop			Free	Free	

Intersection Summary

Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 46.1% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 2: North St. & Market St.

10/15/2008



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Y			↑	↓	↘
Volume (veh/h)	155	159	228	35	68	278
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	163	167	240	37	72	293
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	588	72	364			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	588	72	364			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	57	83	80			
cM capacity (veh/h)	376	988	1206			

Direction, Lane #	EB 1	NB 1	SB 1	SB 2
Volume Total	331	277	72	293
Volume Left	163	240	0	0
Volume Right	167	0	0	293
cSH	548	1206	1700	1700
Volume to Capacity	0.60	0.20	0.04	0.17
Queue Length 95th (ft)	99	19	0	0
Control Delay (s)	21.1	7.8	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	21.1	7.8	0.0	
Approach LOS	C			

Intersection Summary			
Average Delay		9.4	
Intersection Capacity Utilization		46.1%	ICU Level of Service A
Analysis Period (min)		15	

Lanes, Volumes, Timings
 14: North St. & Bates St.

10/15/2008












Lane Group	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Volume (vph)	51	29	117	204	40	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)	30		30			30
Link Distance (ft)	403		673			909
Travel Time (s)	9.2		15.3			20.7
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Heavy Vehicles (%)	10%	0%	2%	2%	0%	6%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	0	373	0	0	104
Sign Control	Stop		Stop			Stop

Intersection Summary
 Area Type: Other
 Control Type: Unsignalized
 Intersection Capacity Utilization 38.1% ICU Level of Service A
 Analysis Period (min) 15

HCM Unsignalized Intersection Capacity Analysis
 14: North St. & Bates St.

10/15/2008

						
Movement	NBL	NBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Volume (vph)	51	29	117	204	40	49
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	59	34	136	237	47	57
Direction, Lane #	NB 1	SE 1	NW 1			
Volume Total (vph)	93	373	103			
Volume Left (vph)	0	136	47			
Volume Right (vph)	34	0	57			
Hadj (s)	-0.11	0.11	-0.18			
Departure Headway (s)	4.5	4.4	4.8			
Degree Utilization, x	0.12	0.45	0.14			
Capacity (veh/h)	769	799	688			
Control Delay (s)	8.0	11.0	8.5			
Approach Delay (s)	8.0	11.0	8.5			
Approach LOS	A	B	A			
Intersection Summary						
Delay			10.0			
HCM Level of Service			B			
Intersection Capacity Utilization			38.1%	ICU Level of Service		A
Analysis Period (min)			15			

Lanes, Volumes, Timings
 22: North St. & Northern Ave.

10/15/2008

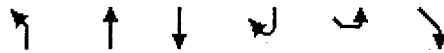


Lane Group	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↕	↕		↕	
Volume (vph)	4	129	287	8	2	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Link Speed (mph)		30	30		30	
Link Distance (ft)		92	212		622	
Travel Time (s)		2.1	4.8		14.1	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	157	347	0	7	0
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type:	Other
Control Type:	Unsignalized
Intersection Capacity Utilization	25.6%
Analysis Period (min)	15
	ICU Level of Service A

HCM Unsignalized Intersection Capacity Analysis
 22: North St. & Northern Ave.

10/15/2008



Movement	NBL	NBT	SBT	SBR	SEL	SER
Lane Configurations		↔	↔		↔	
Volume (veh/h)	4	129	287	8	2	4
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	152	338	9	2	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	347				504	342
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	347				504	342
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	99
cM capacity (veh/h)	1223				529	705

Direction, Lane #	NB 1	SB 1	SE 1
Volume Total	156	347	7
Volume Left	5	0	2
Volume Right	0	9	5
cSH	1223	1700	635
Volume to Capacity	0.00	0.20	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.3	0.0	10.7
Lane LOS	A		B
Approach Delay (s)	0.3	0.0	10.7
Approach LOS			B

Intersection Summary			
Average Delay		0.2	
Intersection Capacity Utilization		25.6%	ICU Level of Service A
Analysis Period (min)		15	

**NOTICE OF INTENT
FOR**

**NORTH STREET CONDOMINIUMS
NORTHAMPTON, MA.**

**PREPARED BY
TOFINO ASSOCIATES, INC
AND
NORTHERN AVENUE HOMES, INC
NOVEMBER 14, 2008**

**TOFINO ASSOCIATES, INC
NORTHERN AVENUE HOMES, INC
31 CAMPUS PLAZA ROAD
HADLEY, MA 01035
(413) 256-0321**

City of Northampton--Wetlands Application

This form is required for all applications filed under the Northampton Wetlands Ordinance

File with the Office of Planning and Development, 210 Main Street, Northampton, MA 01060

We recommend applicants consult with the Land Use and Conservation Planner (587-1263) before applying

1. Check what kind of permit you are requesting

- Request for Determination of Applicability (WPA form 1)
- Notice of Intent (WPA form 3)
- Abbreviated Notice of Resource Area Delineation (WPA form 4A)

2. Property Street Address: 8 View Avenue and Northern Avenue

3. Assessors' Map and Parcel: 256-12 Second lot (if any) **Map and Parcel(s):** 256-11
Additional property description: _____

4. Check the items enclosed. Your application will not be accepted if any items are missing.

- The appropriate completed Massachusetts DEP application
<http://www.mass.gov/dep/water/approvals/wwforms.htm>
- Completed versions of this Wetlands Application
- Nine (9) copies of the fully completed and collated application packages (forms, plans and attachments)
- All plans **folded** (not rolled) and collated with each application packet
- For **Notice of Intent** applications **only**, submit the following:
 - Appropriate Notice of Intent Conservation Commission Fees
<http://www.northamptonma.gov/opd/uploads/listWidget/2533/opd%20fees.pdf>
 - An abutters list of all property owners within at least 100 feet of the property line of your project. Abutters lists may be generated at www.NorthamptonMA.gov/opd (click on Database: Abutters, Permits and Historic). Computers are available at City Hall, Forbes and Lilly Libraries.
- For **Request for Determination** applications, appropriate Request for Determination of Applicability Fees
<http://www.northamptonma.gov/opd/uploads/listWidget/2533/opd%20fees.pdf>
- For **Notice of Resource Area Delineation** use Notice of Intent Fee
<http://www.northamptonma.gov/opd/uploads/listWidget/2533/opd%20fees.pdf>
- A #10 business envelope addressed to the applicant.

5. Provide an Existing Conditions Site Plan. Check the items shown on that plan. You may request a waiver from submittal requirements, with a reason for the waiver request.

- Boundary of entire lot and notation of lot area
- Context of adjacent lots, if necessary to show extent of wetland/Riverfront Area
- Numbered wetland flags
- Existing and potential vernal pools
- 50' AND 100' wetland buffer; 20' buffer
- Mean Annual High Water line, for Riverfront Area permits
- 100' inner riparian zone AND 200' outer riparian zone, for Riverfront Area permits
- Existing structures, impervious surfaces (ie: pavement, gravel) and lawn areas
- Edge of vegetation accurately measured or surveyed
- Significant (8"+ Diameter Breast Height) trees within the limit of work area that are also within the 200' Riverfront Area, Bordering Vegetated Wetland, or 100' wetland buffer
- 2' contours
- Elevations in feet (not meters), for projects within the floodplain
- Zoning setbacks
- 1:20 scale, if possible

6. **If new work is proposed, provide a Proposed Site Plan. Check the items shown on that plan.**
You may request a waiver from submittal requirements, with a reason for the waiver request.

- Grading/proposed new contours
- Hardscape (i.e.: footprint of house, driveway, walkways, terraces, etc...)
- Any removal of vegetation and significant trees within the Riverfront Area, wetland and buffer
- Landscaping and plantings within the Riverfront Area, wetland and wetland buffer
- Location of erosion control barrier
- Limit of work line
- Utility lines
- Stormwater Management Form (use DEP form www.mass.gov/dep/brp/ww/wwforms.htm), if required
- N/A Wildlife assessment if the site is in a habitat resource area based on NHESP maps, Northampton Potential and Certified Vernal Pools Map or otherwise required by the Act or Ordinance.
- At the same scale as the Existing Conditions Site Plan
- N/A For new homes in the Riverfront Area only, documentation of the date the lot was recorded.

7. **We have provided and requested information and believe and understand that (initial each item below):**

- JG Application deadline is one calendar month prior to a public hearing. If the application is incomplete or waivers are requested, however, the public hearing may be delayed;
- JG We will check for the date and time of our public hearing at www.NorthamptonMA.gov or in the *Daily Hampshire Gazette* Legal Ads section. Such notice is posted seven days prior to the public hearing;
- JG The Conservation Commission may request an alternatives analysis for work proposed within the buffer zone of a wetland;
- JG The Conservation Commission and their representatives have permission to enter the property;
- JG All documents and plans submitted are in the public domain and may be copied freely in any form; and
- JG The City will record Orders of Conditions and Order of Resource Area Delineations at the Hampshire County Registry of Deeds.

8. **PLEASE COMPLETE ONLY IF APPLYING FOR A NOTICE OF INTENT or ABBREVIATED NOTICE OF RESOURCE AREA DELINEATION:**

JG We certify under the pains and penalties of perjury, that PRIOR to filing this application all abutters were notified of this application pursuant to the requirements of M.G.L. c. 131 § 40. Notice must be made in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

Applicant (print or type): Water Associates, Inc. and Northampton Area Homeowners Assn. Applicant Signature: [Signature]
Address: 31 Campus Plaza Rd, Hadley Applicant Phone: 416-758-1111
Owner (print or type): _____ Owner Signature: _____
Address: _____ Owner Phone: _____
Date submitted: 11-11-05

The Northampton Conservation Commission generally meets on the 2nd and 4th Thursdays of each month in Hearing Room 18 located on the 2nd floor of City Hall, 210 Main Street

**NOTICE OF INTENT
NORTH STREET CONDOMINIUMS
PROJECT NARRATIVE**

This Notice of Intent is being submitted to the Northampton Conservation Commission for the construction of a 25-unit townhouse condominium project, with associated roadway and stormwater management system, on property consisting of 2 parcels totaling approximately 5.6 acres, located ½ mile from downtown.

Existing Conditions

The property is located off View Avenue, a private way off North Street owned by the applicant, and off the end of Northern Avenue. There is an intermittent stream that flows from the Industrial Park on the north, through a culvert under the new bike path. The stream is also fed by the storm drain system on Northern Avenue, which flows into the swale adjacent to the bike path. There are bordering vegetated wetlands associated with the intermittent stream. The property slopes gradually and drains toward the BVW.

The wetland and areas of upland within the wetland have some significant native trees, but there are many invasive plant species in the area, including multi-flora rose, honeysuckle, and poison ivy. The adjacent uplands are also degraded by historic filling, masonry and other construction and road building debris.

The property has an existing house near View Avenue, for which a demolition permit has already been obtained. The house is surrounded by lawn, with a low stone wall at the edge of a portion of the lawn, and a plantation of non-native Norway Spruces beyond the lawn.

Proposed Work

The proposed project consists of a duplex on Northern Avenue and 23 townhouse condominiums off North Street, for a total of 25 new dwelling units, with associated roadways, parking areas, driveways, sidewalks, utilities, landscaping and stormwater management system. There is approximately 2.2 acres of Bordering Vegetated Wetland. No alteration of any resource area is proposed, but a large portion of the project falls within the Buffer Zone of the BVW.

Five of the six buildings, each containing 2-6 units, fall within the 100-foot Buffer Zone. All buildings are outside the 35 foot wetland buffer.

Roof run-off is infiltrated through the use of linear dry wells at the rear of units 1-2, 3-7, 8-13, and 22-25. Roof run-off from units 14-15, as well as some road run-off, is also treated in the infiltration trench behind units 14-15. All road run-off is pretreated before it enters a detention basin. Mechanisms to treat water quality include a rain garden/bio-retention basin, proprietary treatment chamber, and deep sump hooded catch basins.

There are 2 detention basins and a bio-retention basin, each located within the 100-foot Buffer Zone. All grading, pipes and outfall structures are kept at least 12 feet from the BVW.

Utilities will be installed to service the lots as follows:

Sewer: All units are sewered by the City sewer system.

Water: All units are serviced by the City water system.

Electric, Telephone and Cable Systems: All units are served by underground services.

Natural Gas: All units are served by underground gas service.

No work is proposed that will enter or alter the 2.2 acre Bordering Vegetated Wetland resource areas.

Relationship to the Northampton Wetlands Protection Ordinance

The North Street condominium project is a true infill project, providing an attractive residential option within easy walking distance of schools, jobs, retail establishments, restaurants and entertainment.

Section 337-10(B) of the City Code states that "To encourage infill development, which is considered more sustainable under the principles of smart growth and generally has a smaller environmental footprint than development in outlying areas, in ... Urban Residential-B... Zoning Districts, the Conservation Commission hereby waives any of the § 337-10 performance standards that are over and above state law with the exception of the setback requirements in Table (1):

<i>Zoning District</i>	<i>No-Encroachment Zone</i>
Urban Residential-B and Urban Residential-C	35 feet from wetlands; 10 feet from wetlands may be allowed at the discretion of the Conservation Commission if applicant provides extraordinary mitigation, replication, restoration or open space preservation measures

The plans show all buildings at least 35 feet from the BVW. Grading, walls, yards, patios, and certain components of the stormwater management system are kept at least 12 feet from the BVW. To the best of our knowledge, this is the first time a request has been made to reduce the No Encroachment Zone from 35 feet to 10 feet under this specific section of the new City Wetlands Ordinance. We are interested in discussing with the Conservation Commission what mitigation or open space preservation measures would be appropriate to permit the proposed reduction.

Bordering Vegetated Wetland Delineation Method

The boundaries of the Bordering Vegetated Wetlands on site were flagged by Chuck Dauchy using wetland vegetation and soil indicators, and were accepted by the Northampton Conservation Commission with a positive determination issued August 24, 2007. A copy of the Determination is attached to this Notice of Intent.

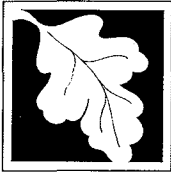
Mitigation of Potential Impacts to Resource Areas

Erosion controls will consist of entrenched silt fencing, located no closer than 10' to the wetland buffer as shown on the plan. This will be the limit of work line. Erosion controls will remain in place until construction is complete and exposed soils have been successfully stabilized by vegetation.

Wetland markers, clearly visible at 18 inches above grade, have been installed and will remain in place during construction. Afterward, they will be hammered flush with the ground and left in place permanently.

Additional Information

USGS Location Map
WPA Form 3 – Notice of Intent
Notification Sent to Abutters
Abutters List for Map 25C, Parcels 12 and 17
Summary Stormwater Report
Determination of Applicability, Issued August 24, 2007
"Site Plan" by the Berkshire Design Group, dated
Full Stormwater Report



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

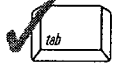
Document Transaction Number

Northampton

City/Town

Important:

When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (Note: electronic filers will click on button to locate project site):

Northern Avenue	Northampton	01060
a. Street Address	b. City/Town	c. Zip Code
Latitude and Longitude:		
25C	d. Latitude	e. Longitude
f. Assessors Map/Plat Number	g. Parcel /Lot Number	

2. Applicant:

a. First Name	b. Last Name	
Tofino Associates, Inc. and Northern Avenue Homes, Inc.		
c. Organization		
31 Campus Plaza Road		
d. Street Address		
Hadley	MA	01035
e. City/Town	f. State	g. Zip Code
(413) 256-0321	(413) 256-0130	
h. Phone Number	i. Fax Number	j. Email Address

3. Property owner (required if different from applicant): Check if more than one owner

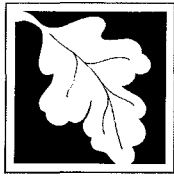
a. First Name	b. Last Name	
c. Organization		
d. Street Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

a. First Name	b. Last Name	
c. Company		
d. Street Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

\$5,250	\$2,612.50	\$2,637.50 + \$100.00 local fee
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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A. General Information (continued)

6. General Project Description:

The proposed project consists of a duplex on Northern Avenue and 23 townhouse condominiums off North Street, for a total of 25 new dwelling units, with associated stormwater management, site, utility and road work. A portion of the project falls within the Buffer Zone of BVW. No alteration of any resource area is proposed.

7a. Project Type Checklist:

- | | |
|---|---|
| 1. <input type="checkbox"/> Single Family Home | 2. <input checked="" type="checkbox"/> Residential Subdivision |
| 3. <input type="checkbox"/> Limited Project Driveway Crossing | 4. <input type="checkbox"/> Commercial/Industrial |
| 5. <input type="checkbox"/> Dock/Pier | 6. <input type="checkbox"/> Utilities |
| 7. <input type="checkbox"/> Coastal Engineering Structure | 8. <input type="checkbox"/> Agriculture (e.g., cranberries, forestry) |
| 9. <input type="checkbox"/> Transportation | 10. <input type="checkbox"/> Other |

7b. Is any portion of the proposed activity eligible to be treated as a limited project subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. Yes No If yes, describe which limited project applies to this project:

2. Limited Project

8. Property recorded at the Registry of Deeds for:

Hampshire

a. County

Book 8428, Page 219

c. Book and Page

b. Certificate # (if registered land)

Book 8829, Page 341

d. Book and Page

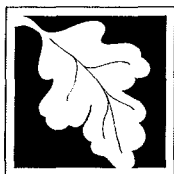
B. Buffer Zone & Resource Area Impacts (temporary & permanent)

- Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet	2. square feet
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. linear feet 3. cubic yards dredged	2. linear feet



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number _____

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City/Town _____

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

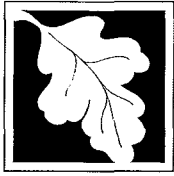
<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet _____ 3. cubic feet of flood storage lost _____	2. square feet _____ 4. cubic feet replaced _____
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet _____ 2. cubic feet of flood storage lost _____	3. cubic feet replaced _____
f. <input type="checkbox"/> Riverfront Area	1. Name of Waterway (if available) _____	
2. Width of Riverfront Area (check one):		
<input type="checkbox"/> 25 ft. - Designated Densely Developed Areas only		
<input type="checkbox"/> 100 ft. - New agricultural projects only		
<input type="checkbox"/> 200 ft. - All other projects		
3. Total area of Riverfront Area on the site of the proposed project:		_____ square feet
4. Proposed alteration of the Riverfront Area:		
a. total square feet _____	b. square feet within 100 ft. _____	c. square feet between 100 ft. and 200 ft. _____
5. Has an alternatives analysis been done and is it attached to this NOI?		<input type="checkbox"/> Yes <input type="checkbox"/> No
6. Was the lot where the activity is proposed created prior to August 1, 1996?		<input type="checkbox"/> Yes <input type="checkbox"/> No

3. Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users:
Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	1. square feet _____ 2. cubic yards dredged _____	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	1. square feet _____	2. cubic yards beach nourishment _____
e. <input type="checkbox"/> Coastal Dunes	1. square feet _____	2. cubic yards dune nourishment _____



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Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number _____

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Northampton _____

City/Town _____

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	1. linear feet _____	
g. <input type="checkbox"/> Rocky Intertidal Shores	1. square feet _____	
h. <input type="checkbox"/> Salt Marshes	1. square feet _____	2. sq ft restoration, rehab., creation _____
i. <input type="checkbox"/> Land Under Salt Ponds	1. square feet _____ 2. cubic yards dredged _____	
j. <input type="checkbox"/> Land Containing Shellfish	1. square feet _____	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above _____ 1. cubic yards dredged _____	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	1. square feet _____	

4. Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

_____ a. square feet of BWV

_____ b. square feet of Salt Marsh

C. Other Applicable Standards and Requirements

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to <http://www.mass.gov/dfwele/dfw/nhesp/nhregmap.htm>.

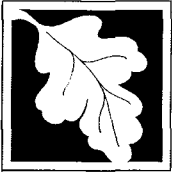
a. Yes No **If yes, include proof of mailing or hand delivery of NOI to:**

**Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
Route 135, North Drive
Westborough, MA 01581**

2008 (MassGIS)

b. Date of map _____

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.C, and include requested materials with this Notice of Intent (NOI); OR complete Section C.1.d, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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C. Other Applicable Standards and Requirements (cont'd)

1. c. Submit Supplemental Information for Endangered Species Review *

- 1. Percentage/acreage of property to be altered:
 - (a) within wetland Resource Area _____ percentage/acreage
 - (b) outside Resource Area _____ percentage/acreage
- 2. Assessor's Map or right-of-way plan of site
- 3. Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **
 - (a) Project description (including description of impacts outside of wetland resource area & buffer zone)
 - (b) Photographs representative of the site
 - (c) MESA filing fee (fee information available at: <http://www.mass.gov/dfwele/dfw/nhesp/nhenvmesa.htm>)
Make check payable to "Natural Heritage & Endangered Species Fund" and **mail to NHESP** at above address
Projects altering 10 or more acres of land, also submit:
 - (d) Vegetation cover type map of site
 - (e) Project plans showing Priority & Estimated Habitat boundaries

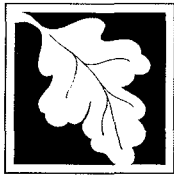
d. OR Check One of the Following

- 1. Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, <http://www.mass.gov/dfwele/dfw/nhesp/nhenvexemptions.htm>; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)
- 2. Separate MESA review ongoing.

a. NHESP Tracking Number	b. Date submitted to NHESP
--------------------------	----------------------------
- 3. Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see www.nhesp.org regulatory review tab). Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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C. Other Applicable Standards and Requirements (cont'd)

2. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. Not applicable – project is in inland resource area only

b. Yes No If yes, include proof of mailing or hand delivery of NOI to either:

South Shore - Cohasset to Rhode Island, and the Cape & Islands:

North Shore - Hull to New Hampshire:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
838 South Rodney French Blvd.
New Bedford, MA 02744

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

3. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

a. Yes No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

b. ACEC

4. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

a. Yes No

5. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

a. Yes No

6. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

a. Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

- 1. Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
- 2. A portion of the site constitutes redevelopment
- 3. Proprietary BMPs are included in the Stormwater Management System.

b. No. Check why the project is exempt:

- 1. Single-family house
- 2. Emergency road repair
- 3. Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

Online Users:
Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

Northampton

City/Town

D. Additional Information

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2. Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.
3. Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.
4. List the titles and dates for all plans and other materials submitted with this NOI.

Notice of Intent Plans for North Street Condominiums, sheets L1-5, EC1

a. Plan Title

The Berkshire Design Group

Mark Darnold

b. Prepared By

c. Signed and Stamped by

November 11, 2008

varies

d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

5. If there is more than one property owner, please attach a list of these property owners not listed on this form.
6. Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.
7. Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.
8. Attach NOI Wetland Fee Transmittal Form
9. Attach Stormwater Report, if needed.

E. Fees

1. Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

5083

2. Municipal Check Number

11-10-2008

3. Check date

5077

4. State Check Number

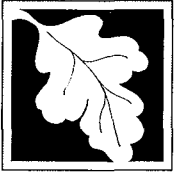
11-10-2008

5. Check date

Northern Avenue Homes, Inc.

6. Payor name on check: First Name

7. Payor name on check: Last Name



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

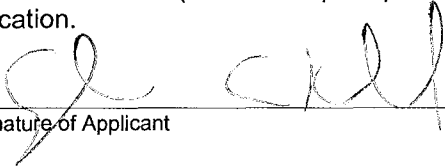
Northampton

City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

	11-13-2008
1. Signature of Applicant	2. Date
3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	6. Date

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:

If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
NOI Wetland Fee Transmittal Form
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important:
 When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A. Applicant Information

1. Applicant:

a. First Name		b. Last Name	
Tofino Associates, Inc. and Northern Avenue Homes, Inc.			
c. Organization			
31 Campus Plaza Road			
d. Mailing Address			
Hadley		MA	01035
e. City/Town		f. State	g. Zip Code
(413) 256-0321	(413) 256-0130		
h. Phone Number	i. Fax Number	j. Email Address	

2. Property Owner (if different):

a. First Name		b. Last Name	
c. Organization			
d. Mailing Address			
e. City/Town		f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email Address	

3. Project Location:

Northern Avenue	Northampton
a. Street Address	b. City/Town

B. Fees

The fee should be calculated using the following six-step process and worksheet. **Please see Instructions before filling out worksheet.**

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract \$12.50. To calculate the city/town share of the fee, divide the total fee in half and add \$12.50.

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
NOI Wetland Fee Transmittal Form
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Category 3(b) – each building	5	\$1,050	\$5,250
Step 5/Total Project Fee:			\$5,250

Step 6/Fee Payments:

Total Project Fee:	\$5,250
State share of filing Fee:	\$2,612.50
City/Town share of filling Fee:	\$2,637.50
	a. Total Fee from Step 5
	b. 1/2 Total Fee less \$12.50
	c. 1/2 Total Fee plus \$12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

5077

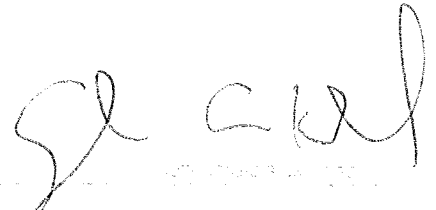
NORTHERN AVENUE HOMER INC.
31 CAMPUS PLAZA ROAD, SUITE 3
HADLEY, MA 01035
(413) 256-0321

Pay: *****Two thousand six hundred twelve dollars and 50 cents

November 10, 2008 5077 \$*****2,612.50

Commonwealth of Massachusetts

PAY
TO THE
ORDER
OF



⑈005077⑈ ⑆211871772⑆ 1054265434⑈

NORTHERN AVENUE HOMER INC.
31 CAMPUS PLAZA ROAD, SUITE 3
HADLEY, MA 01035
(413) 256-0321

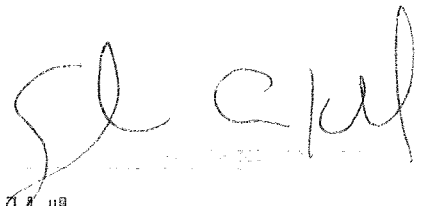
5083

Pay: *****Two thousand seven hundred thirty-seven dollars and 50 cents

November 10, 2008 5083 \$*****2,737.50

City of Northampton
212 Main Street
Northampton, MA 01060

PAY
TO THE
ORDER
OF



⑈005083⑈ ⑆211871772⑆ 1054265434⑈



Checklist for Stormwater Report

A. Introduction

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

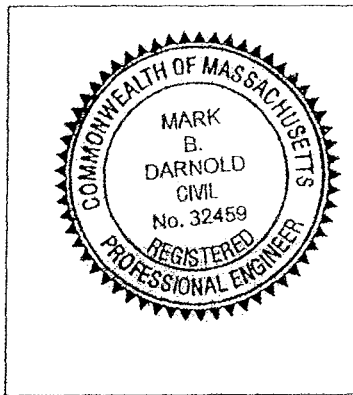
A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application

To the best of my knowledge

Registered Professional Engineer Block and Signature



Mark B. Darnold 11/11/08
Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume **for its respective drainage area.**
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

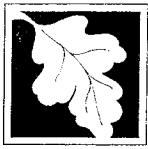
Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs) Not Applicable – Proposed project site is not expected to yield high potential pollutant loads.

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted *prior to* the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does *not* cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas Not Applicable – The project site does not discharge to a critical area.

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a: *site with only "Hydrologic Group C" Soils*
- Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the **DRAFT** SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Notification to Abutters

Under the Massachusetts Wetlands Protection Act
and the City of Northampton Wetlands Protection Ordinance

In accordance with the second paragraph of Massachusetts General Laws Chapter 131, Section 40 and the Town of Amherst Wetlands Protection Bylaw, you are hereby notified of the following.

- A. The name of the applicant is Tofino Associates, Inc. and Northern Avenue Homes, Inc.
- B. The applicant has filed a Notice of Intent with the Conservation Commission for the municipality of Northampton under the Wetlands Protection Act (General Laws Chapter 131, section 40) and the City of Northampton Wetlands Protection Ordinance.
- C. The address of the property where the Orders of Conditions is requested is 8 View Avenue and Northern Avenue Parcel ID: Map 25C, Parcels 12 and 17.
- D. Copies of the filings may be examined by contacting the Northampton Conservation Commission.
- E. Copies of the filings may be obtained from either (check one):
the applicant , or the applicant's representative
by calling this telephone number (413) 256-0321 between the hours of 9 am and 5 pm
on the following days of the week: Monday through Friday
for a printing fee of \$50.00.

NOTE: Notice of the public hearing, including its exact date, time, and location, will be published at least five (5) days in advance in the Daily Hampshire Gazette.

NOTE: Notice of the public hearing, including its date, time, and location, will be posted in the City Hall not less than forty-eight (48) hours in advance.

NOTE: Details of the public hearing, including its date, time, and location, can be seen at the City Website calendar at www.NorthamptonMA.gov/calendar/

NOTE: You also may contact your local Conservation Commission or the nearest Department of Environmental Protection Regional Office for more information about this application or the Wetlands Protection Act. To contact DEP, call:

Central Region: 508-792-7650

Northeast Region: 617-935-2160

Southeast Region: 508-946-2800

Western Region: 413-784-1100

256 - 12 100 abeller

ARCHAMBAULT GERALD R
& MARY E
150 NORTH ST
NORTHAMPTON, MA 01060

CARLBERG IRENE M &
57 WOODMONT RD
NORTHAMPTON, MA 01060

DEVINE JOYCE E
1 VIEW AVE
NORTHAMPTON, MA 01060

FENTON JOHN ROBERT &
JOAN A
164 NORTH ST
NORTHAMPTON, MA 01060

FREEMAN-DANIELS OWEN D
53A WOODMONT RD
NORTHAMPTON, MA 01060

JACKSON CAROLE A &
90 WOODMONT RD
NORTHAMPTON, MA 01060

~~MALONEY DIANE A
168 NORTH ST
NORTHAMPTON, MA 01060~~

~~MASSACHUSETTS
COMMONWEALTH OF
DAMON RD
NORTHAMPTON, MA 01060~~

MCELHANEY DOUGLAS J &
51 WOODMONT RD
NORTHAMPTON, MA 01060

~~NORTHAMPTON CITY OF
210 MAIN STREET
NORTHAMPTON, MA 01060~~

~~NORTHERN AVENUE HOMES
INC
31 CAMPUS PLAZA RD
HADLEY, MA 01035~~

OLANDER RAE
85 WOODMONT RD
NORTHAMPTON, MA 01060

PAULINSKI DAWN TRUSTEE
25 SYCAMORE ST
SAN FRANCISCO, CA 94110

PELKEY LANCE EDWARD &
87 WOODMONT RD
NORTHAMPTON, MA 01060

REITER JENNIFER B &
351 PLEASANT ST PMB 222
NORTHAMPTON, MA 01060

TATRO LAWRENCE R &
KAREN K
188 BRIDGE ST
NORTHAMPTON, MA 01060

~~TOFINO ASSOCIATES INC
31 CAMPUS PLAZA RD
HADLEY, MA 01035~~

~~WALDRON ELIZABETH C
176 NORTH ST
NORTHAMPTON, MA 01060~~

ZIPPAY MARLA
53B WOODMONT RD UNIT 1
NORTHAMPTON, MA 01060

250. 177 1000 abutting.

CAPERS PHYLLIS A &
RAYMOND L
48 NORTHERN AVE
NORTHAMPTON, MA 01060

FENTON JOHN ROBERT &
JOAN A
164 NORTH ST
NORTHAMPTON, MA 01060

~~HATHAWAY STEPHEN B &
MARIE
32 NORTHERN AVE
NORTHAMPTON, MA 01060~~

HATHAWAY STEPHEN B &
MARIE
32 NORTHERN AVE.
NORTHAMPTON, MA 01060

~~HATHAWAY STEPHEN B &
MARIE
32 NORTHERN AVE.
NORTHAMPTON, MA 01060~~

JACKSON CAROLE A &
90 WOODMONT RD
NORTHAMPTON, MA 01060

LAVALLE ROLAND L &
GABRIELE
P O BOX 686
NORTHAMPTON, MA 01061

MALONEY DIANE A
168 NORTH ST
NORTHAMPTON, MA 01060

MARDAS PAUL A
PO BOX 60185
FLORENCE, MA 01062

MASSACHUSETTS
COMMONWEALTH OF
DAMON RD
NORTHAMPTON, MA 01060

MESSER TIMOTHY A &
EILEEN A
49 NORTHERN AVE
NORTHAMPTON, MA 01060

~~MESSER TIMOTHY A &
EILEEN A
49 NORTHERN AVE
NORTHAMPTON, MA 01060~~

MOFFAT JAMES A JR & JUNE
J &
16 NORTHERN AVE
NORTHAMPTON, MA 01060

NORTHERN AVENUE
HOMES INC
31 CAMPUS PLAZA RD
HADLEY, MA 01035

O'KANE EILEEN
50 NORTHERN AVE
NORTHAMPTON, MA 01060

TOFINO ASSOCIATES INC
31 CAMPUS PLAZA RD
HADLEY, MA 01035

TORREY ROSILAND &
MARK STAPLES
45 NORTHERN AVE
NORTHAMPTON, MA 01060

WALDRON ELIZABETH C
176 NORTH ST
NORTHAMPTON, MA 01060

WHITE RICHARD D & ANNE
E
33 NORTHERN AVE
NORTHAMPTON, MA 01060

WILSON KEITH P & AMY L
20 NORTHERN AVE
NORTHAMPTON, MA 01060

Stormwater Drainage Report

for
**Northern Avenue Housing
Northampton, MA**

November 11, 2008

Prepared by:



**The
Berkshire
Design
Group, Inc.**

4 Allen Place, Northampton, Massachusetts 01060

Prepared for:

**Tofino Associates, Inc.
31 Campus Plaza Road
Hadley, MA 01035**

Table of Contents

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Figure 2	Post Development Drainage Area Map
Figure 3	USDA Soils Map

Appendices

Appendix A	Pre- and Post Development Hydrologic Calculations
Appendix B	Soil Test Pit Information
Appendix C	TSS Removal Summary and Calculations
Appendix D	Standard 3 Recharge Calculations
Appendix E	Proposed Stormwater Management System Operation & Maintenance Plan
Appendix F	Long Term Pollution Prevention Plan
Appendix G	Stormwater Pollution Prevention and Erosion Control Plan

I. Introduction

The following report presents an analysis of the stormwater management system for the proposed development of 25 housing units located off of Northern Avenue in zoning district URB in Northampton, Massachusetts. The proposed development includes 25 new housing units and associated parking areas, driveways, and sidewalks, utilities, landscape features and stormwater management system. The total site area is approximately 6 acres of which approximately 3.4 will be disturbed by construction activities. The impervious area on site will increase due to the new development and the stormwater management system has been designed to minimize proposed peak flows to reduce or match existing flows off the site. Mechanisms to reduce runoff and treat water quality include a rain garden, a proprietary treatment chamber, infiltration trench, dry wells, deep sump hooded catch basins, and 2 detention basins.

II. Site Terrain and Soils

The project site is comprised of gradual sloping terrain, which generally drains toward the wetlands on the west part of the site.

The USDA Soil Survey of Hampshire County, Massachusetts, Central Part report classifies the site soils as (see attached soil map):

- **(Ra) Raynham Silt Loam**

Hydrologic Group: C
Flood Risk: None
Depth to Water Table: 0.5'-2.0'
Depth to Bedrock: >60"

- **(Au) Amostown-Windsor Silty Substratum**

Hydrologic Group: C
Flood Risk: None
Depth to Water Table: 1.5'-3.0'
Depth to Bedrock: >60"

- **(Ud) Udorthents Smooth**

Soil formed by cutting or filling developed area.
Reference pedon not given.
Assumed Hydrologic Group: C

A series of test pits were conducted on site to determine subsurface conditions. The purpose of the test pits was to evaluate the site for the existence of ledge, the ability of the site to support stormwater drainage components, and for groundwater information. In general, the test pits confirmed the USDA Soil Survey findings for the site as ground water is generally very high throughout the site, thereby reducing the potential areas where infiltration would be feasible. The test pit logs are attached in Appendix B.

III. Existing Conditions

The existing site includes one drainage area: E-1. The existing drainage area boundary is depicted on the Pre-Development Drainage Area Plan (Figure 1). The overall curve number (CN) in existing conditions is 74. The control point to determine peak flow in existing conditions is the stream located on the property line west of the site shown on Figure 1 as E-CP. The following is a brief description of the drainage area:

E-1

E-1 is approximately 7.75 acres in size and contains existing houses, pavement, grass, wooded areas, and a large wetland area on the west part of the site. Runoff flows overland in a southwestern direction through the wetlands and to the stream located southwest of the site.

IV. Proposed Conditions

The stormwater management system in proposed conditions has been designed to treat and reduce runoff on site. The proposed site contains eight drainage areas: P-1, P-2, P-3, P-4, P-5, P-6, P-7 and P-8 (Figure 2) and the overall curve number (CN) in proposed conditions is 80. The control point to determine peak flow in proposed conditions is the stream located on the property line located west of the site shown on Figure 2 as P-CP. The following is a brief description of each drainage area:

P-1

P-1 is approximately 4.99 acres in size and contains the northwestern area of the site consisting of all of the wetland area, grass and wooded areas, and new roof and pavement. The drainage follows a similar pattern as in existing conditions. It flows overland in a southwestern direction through the wetlands and to the stream located southwest of the site. The runoff from the back of the new roof areas located within P-1 are directed to dry wells where the water is infiltrated into the ground. These dry wells are designed to be very shallow (approximately one foot in depth) due to high groundwater throughout the site. The dry wells are designed with an overflow outlet that allows roof water to sheet flow across the land toward the wetlands as it does in existing conditions. The new driveway and front roof

areas of units 1 and 2 will flow in a similar pattern as the pavement and grass area does in existing conditions.

P-2

P-2 is approximately 0.24 acres in size and is located in the eastern portion of the site. It contains a portion of the roof from unit 14 and 15 in which runoff flows through roof leaders into the infiltration trench which overflows into a catch basin within the area. This area also contains a small portion of new pavement, grass, and trees. Excluding the roof, all other runoff from this area is directed into a catch basin which flows into a water quality basin then to a detention basin (DB#2) located on the west part of the site.

P-3

P-3 is approximately 0.65 acres in size and is located in the northeastern part of the site. It contains new pavement and roof areas, grass, and a detention basin. Runoff from this area is directed to a water quality swale which flows into a water catch basin followed by a detention/infiltration basin (DB#1) that discharges approximately 100 ft to the south.

P-4

P-4 is approximately 0.34 acres in size in the east part of the site. It contains a portion of the new roof and pavement area, and grass and wooded areas. Runoff flows into a catch basin which directs the water to the infiltration trench noted is area P-2. The runoff follows the same pattern as area P-2 once within the trench.

P-5

P-5 is approximately 0.19 acres in size and is located toward the center of the developed portion of the site. It contains mostly new pavement and roof areas and a small portion is grass and wooded area. Runoff flows into a catch basin where it is directed to a water quality basin and detention basin (DB#2) which discharges approximately 40ft from the wetland, allowing adequate overland flow to occur.

P-6

P-6 is approximately 0.54 acres in size and is located on the south portion of the site. It contains a portion of the roof areas from units 16-21, new pavement, and grassed areas. The runoff is directed to a grass swale which flows into a catch basin. The catch basin flows through a proprietary stormwater treatment chamber that discharges into a detention basin (DB#2).

P-7

P-7 is approximately 0.27 acres in size and is located on the southwestern portion of the site. It contains approximately mostly new roof and paved areas and only a small portion of the area is grass. The runoff flows southwest to a proprietary treatment chamber which discharges into a detention basin (DB#2).

P-8

P-8 is approximately 0.53 acres in size and is located on the southwestern portion of the site. It contains a portion of the roof areas from units 22-25, new paved area, grass, and a detention basin (DB#2) and water quality basin. The paved area flows through a pre treatment system consisting of a stone diaphragm and grassed area which discharges into the water quality basin (rain garden) which overflows into the detention basin. The remaining area of P-8 sheet flows into the detention basin.

V. Calculations and Design

Drainage calculations were performed on Hydrocad Stormwater Modeling System version 8.0 using Soil Conservation Service (SCS) TR-20 methodology. The SCS method is based on rainfall observations, which were used to develop the Intensity-Duration-Frequency relationship, or IDF curve. The mass curve is a dimensionless distribution of rainfall over time, which indicates the fraction of the rainfall event that occurs at a given time within a 24-hour precipitation event. This synthetic distribution develops peak rates for storms of varying duration and intensities. The SCS distribution provides a cumulative rainfall at any point in time and allows volume dependent routing runoff calculations to occur. These calculations are included in the appendices.

The watershed boundaries for calculation purposes are divided according to the proposed site grading and the natural limits of the drainage areas. The curve numbers (CNs) and times of concentration for the existing and proposed subcatchment areas are based on the soil type and the existing and proposed cover conditions at the site. The soil hydrologic group assumed for the site is noted in Figure 3. Watershed subcatchment areas, runoff coefficients and watercourse slopes are based on survey information.

Calculations were performed for the 2-, 10-, and 100-year frequency storms under existing and proposed conditions. The results of the calculations are presented in Table 1 on the following page. Appendix A presents the Hydrocad calculations.

Flow Rates & Water Quantity

In the post development conditions the runoff from the proposed site will be routed to 2 open detention basins located along west part of the developed site. The proposed detention basins will attenuate peak flows in the proposed conditions through the use of outlet control structures. Stormwater will be discharged to the wetland that receives runoff in existing conditions. Although there are 5 infiltration systems are proposed (1 detention/infiltration basin, 4 dry wells and 1 infiltration trench) these were not included in the hydrocad

calculations in order to provide a more conservative runoff quantity. Table 1 on the following page presents the comparison of flow rates and water quantity at both existing and proposed control points.

Table 1 Peak Flow and Volume Summary

Condition & Point of Analysis	2-Year Storm 3.00"		10-Year Storm 4.50"		100-Year Storm 6.50"	
	Peak Flow Rate(cfs)	Volume (acre-ft)	Peak Flow Rate(cfs)	Volume (acre-ft)	Peak Flow Rate(cfs)	Volume (acre-ft)
Existing – Control Pt. (E-CP)*	4.66	0.563	10.95	1.242	20.77	2.320
Proposed – Control Pt. (P-CP)*	4.62	0.733	10.45	1.477	18.20	2.609

**Names in parentheses refer to HydroCad model and calculations.*

VI. MADEP Stormwater Standards Compliance

The following section details how the project will meet DEP Stormwater Management Policy’s ten stormwater management standards.

Standard 1 - Untreated Stormwater

The proposed stormwater system is designed to treat the new point source discharge prior to flowing to the resource area. All new outlets are outfitted with flared ends and rip rap to prevent any erosion from occurring in the area. See Appendix C for TSS removal summary.

Standard 2 - Post-Development Peak Discharge Rates

The stormwater system is designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates leaving the site. In order to reduce runoff rates in proposed conditions 2 detention basins with outlet control structures are proposed. Note that although 5 infiltration systems are proposed, no exfiltration was included in the runoff calculations in order to maintain a more conservative peak discharge rate. Refer to Table 1 Peak Flow and Volume Summary and Appendix A for HydroCAD calculations.

Standard 3 - Recharge to Groundwater

Recharge to groundwater is designed to infiltrate to the maximum extent practicable in proposed conditions. The entire site consists of hydrologic group “C” soils and there is very high groundwater throughout most of the site (see Appendix B for test pit logs) which caused limitations for infiltration on many areas of the site because the separation of 2 feet from groundwater could not be

met. Where possible, infiltration is proposed: half of the areas of the roof from units 1-15 and 22-25 and a portion of the pavement located toward the center of the development are directed to dry wells and an infiltration trench sized to accommodate these areas. The upper detention/infiltration basin (DB#1) has been designed also hold and infiltrate the required recharge volume for its respective drainage area (see Appendix D for recharge calculations). Due to restrictions of the site terrain and soil conditions, not all of the impervious area could be directed to an infiltration system therefore all 5 of the infiltration systems proposed are designed to hold at least twice the required recharge volume and still drawdown within 72 hours in order to meet Standard 3 to the maximum extent practicable (see Appendix D for recharge calculations).

Standard 4 – Water Quality

The proposed stormwater management system has been designed to remove the average annual Total Suspended Solids (TSS) load in excess of 80% for the proposed site conditions (see Appendix C for calculations). There are 4 separate treatment chains proposed:

Treatment Train 1(total of 85% TSS removed)

The first treatment chain contains the impervious areas within P-3. The runoff is directed into a water quality swale to a catch basin which discharges into detention/infiltration basin (DB#1) which has been designed to hold the required water quality volume for its respective area which achieves a total TSS removal rate of approximately 85%. Note that the water quality swale was not included in the calculations of total TSS removal in Appendix C to maintain a more conservative removal rate.

Treatment Train 2(total of 93% TSS removed)

The second treatment chain contains the impervious areas from P-2, P-4, and P-5. The runoff is directed into a catch basins followed by a water quality basin (rain garden) which achieves a total TSS removal rate of approximately 93%. The water quality basin has been designed to hold a larger volume of water (738cf) than the water quality volume required (713cf) for the impervious area directed to it.

Treatment Train 3(total of 90% TSS removed)

The second treatment chain contains the paved impervious areas from P-8. The runoff is through a pretreatment system consisting of a stone diaphragm and grassed area which discharges into a water quality basin (rain garden) which achieves a total TSS removal rate of approximately 90%. The water quality basin has been designed to hold a larger volume of water (738cf) than the water quality volume required (713cf) for the impervious area directed to it.

Treatment Train 4 (total of 83% TSS removed)

The third treatment chain contains the impervious areas from P-6 and P-7. The runoff is directed into catch basins and then to a proprietary treatment chamber (Stormceptor STC 900*) which achieves a total TSS removal rate of approximately 83%.

**Note: The stormwater treatment chamber has been sized based on MASTEP test evaluations. The attached table in appendix C displays TSS removal rates for systems based on the impervious area directed to the system. See attached Stormceptor sizing chart for impervious areas directed to the stormwater treatment chamber.*

In addition to removal of TSS, a Long Term Pollution Prevention Plan has been created to maintain a clean site and ensure that all BMPs are functioning to their maximum potential. See Appendix F for Long Term Pollution Prevention Plan.

Standard 5 - Higher Potential Pollutant Loads

The proposed project is not expected to yield high potential pollutant loads.

Standard 6 - Protection of Critical Areas

The project site does not discharge to critical areas as defined in MA DEP Stormwater Policy Handbook.

Standard 7 - Redevelopment Projects

The redevelopment of previously developed site standard is not applicable for this project.

Standard 8 - Erosion/Sediment Control

Erosion and sediment controls have been incorporated into the project design to prevent erosion, control sediments, and stabilized exposed soils during construction and land disturbance. See Appendix G for Construction Period Pollution Prevention and Erosion Sedimentation Control.

Standard 9 - Operation/Maintenance Plan

An Operation and Maintenance Plan for the proposed project is included in Appendix E. It includes general controls for construction and long term maintenance of the stormwater management system.

Standard 10 – Prohibition of Illicit Discharges

No Illicit Discharge Compliance Statement is included with this report however one will be submitted prior to the discharge of any stormwater to post-construction BMPs.

VII. Summary

The impervious area from existing to proposed conditions will increase by approximately 51,000 sf from the new roadway and housing units. The proposed stormwater management system is designed to maintain or reduce the peak flow rates in proposed conditions for the 2-, 10-, and 100-year storm frequencies. Special care has been taken to treat runoff with a series of best management practices to ensure water quality and annual TSS removal rates in excess of 80%. These methods include deep sump hooded catch basins, a bioretention basin, a detention/infiltration basin, and a stormwater treatment chamber.

VIII. References

United States Department of Agriculture. 1998. Soil Survey of Hampshire County (Central Part), Massachusetts.

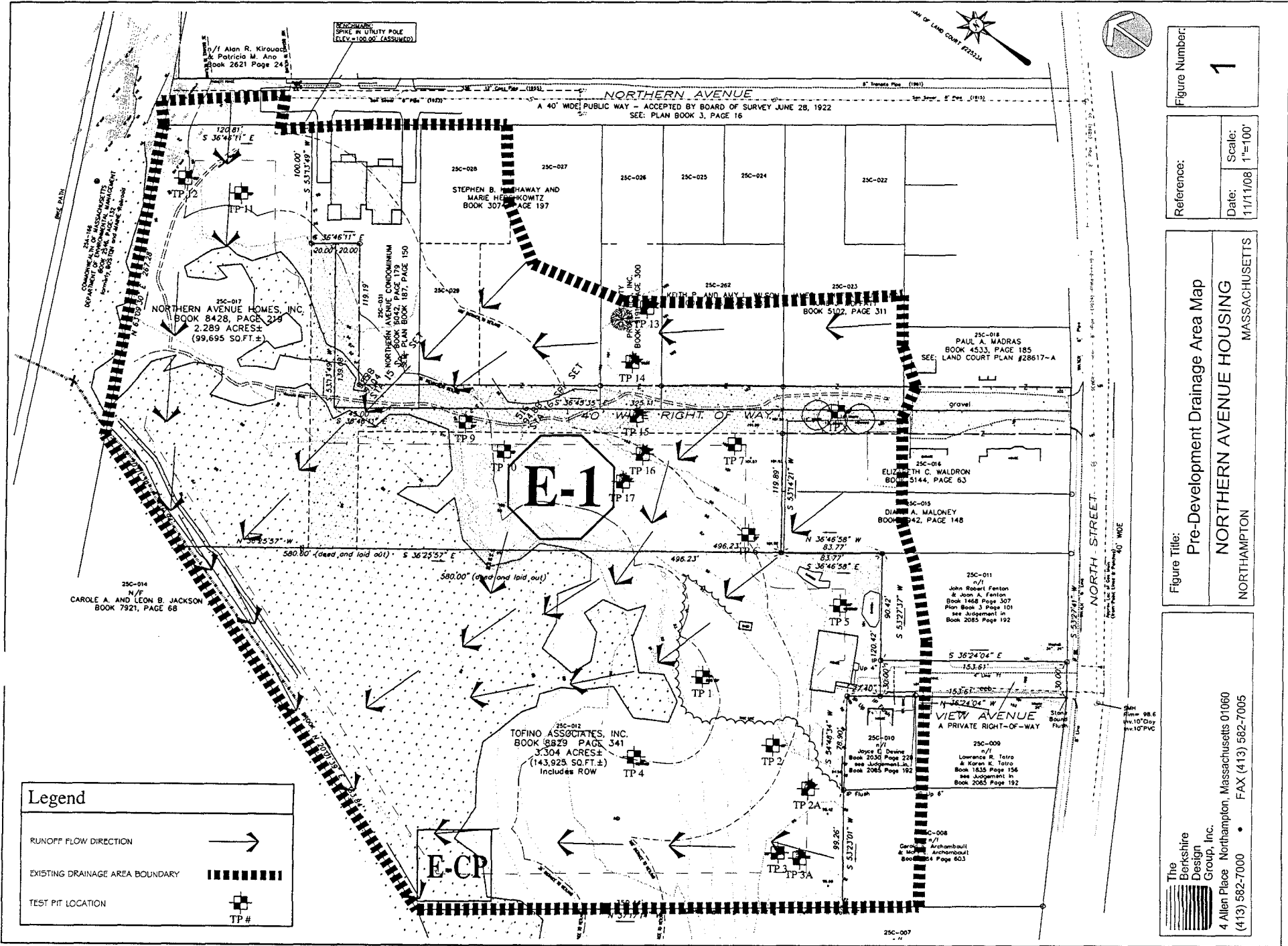


Figure Number:
1

Reference:
Date: 11/11/08
Scale: 1"=100'

Figure Title:
Pre-Development Drainage Area Map
NORTHERN AVENUE HOUSING
NORTHAMPTON
MASSACHUSETTS

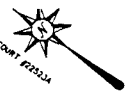
The Berkshire Design Group, Inc.
4 Allen Place Northampton, Massachusetts 01060
(413) 582-7000 • FAX (413) 582-7005

Legend

RUNOFF FLOW DIRECTION →

EXISTING DRAINAGE AREA BOUNDARY [Dashed Line]

TEST PIT LOCATION [TP #]



NORTHERN AVENUE
A 40' WIDE PUBLIC WAY - ACCEPTED BY BOARD OF SURVEY JUNE 28, 1922
SEE: PLAN BOOK 3, PAGE 16

40' WIDE RIGHT OF WAY

NORTH STREET
40' WIDE

VIEW AVENUE
A PRIVATE RIGHT-OF-WAY

NORTHERN AVENUE HOMES, INC.
BOOK 8428, PAGE 216
2.289 ACRES±
(99,695 SQ.FT.±)

**STEPHEN B. HAWAY AND
MARIE HECHT-KOWITZ**
BOOK 3074, PAGE 197

PAUL A. MADRAS
BOOK 4533, PAGE 185
SEE: LAND COURT PLAN #28617-A

ELIZABETH C. WALDRON
BOOK 5144, PAGE 63

DIAN A. MALONEY
BOOK 5142, PAGE 148

**John Robert Fenton
& Joan A. Fenton**
Book 1468 Page 307
Plan Book 3 Page 101
see Judgement in
Book 2085 Page 192

TOFINO ASSOCIATES, INC.
BOOK 8829 PAGE 341
3.304 ACRES±
(143,925 SQ.FT.±)
Includes ROW

Joyce E. Deane
Book 2036 Page 274
see Judgement in
Book 2085 Page 192

**Lawrence R. Tetto
& Karen K. Tetto**
Book 1655 Page 156
see Judgement in
Book 2085 Page 192

**Carol Archambault
& M. Archambault**
Book 5004 Page 603

**SPRING
SPOKE W. UTILITY POLE**
ELEV=100.00' (ASSUMED)

Spot
Elev= 98.6
thru 10' Day
thru 10' PVC

25C-007

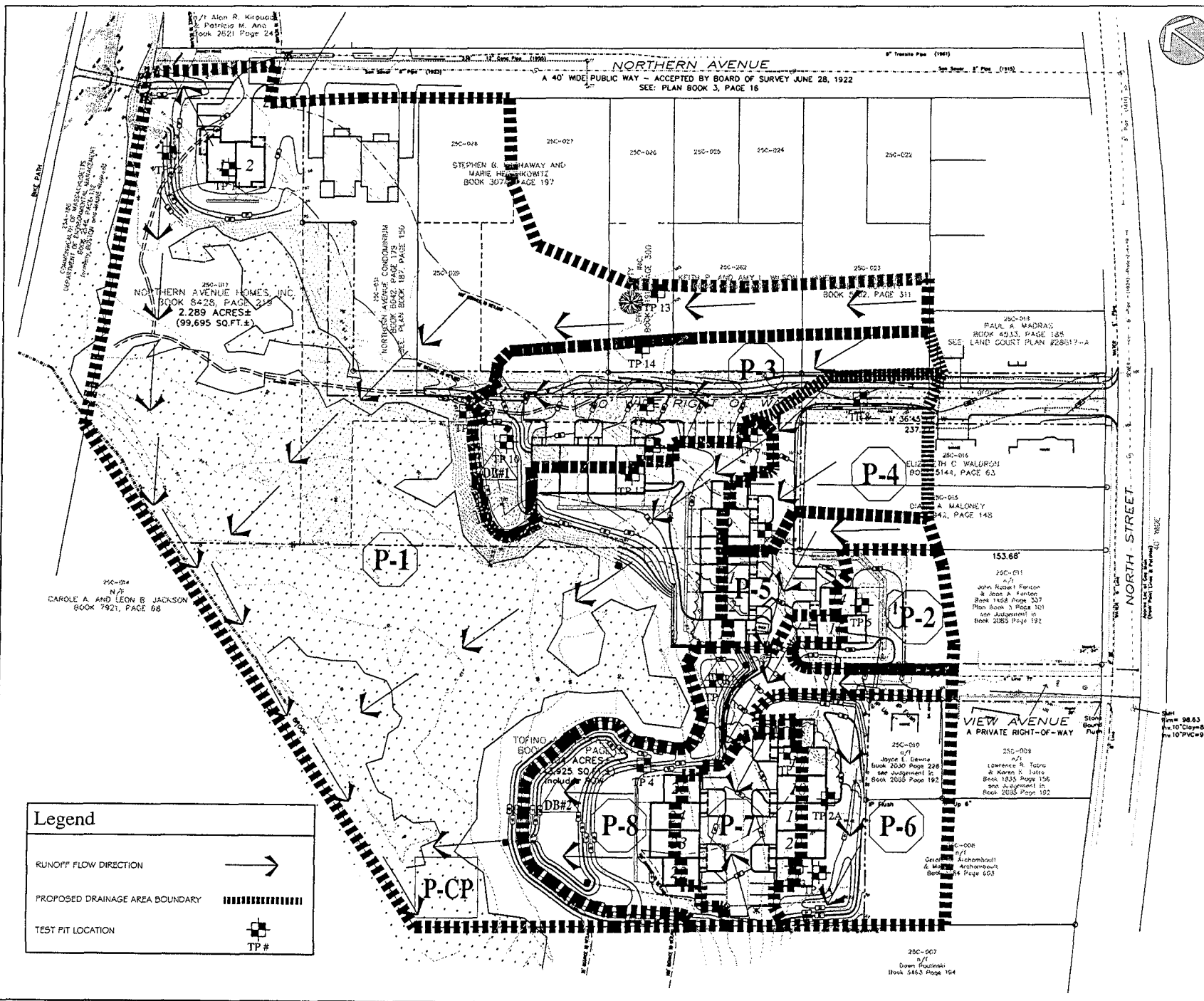


Figure Number:
2

Reference:
Date: 11/11/08
Scale: 1"=100'

Figure Title:
Post-Development Drainage Area Map
NORTHERN AVENUE HOUSING
NORTHAMPTON MASSACHUSETTS

Legend

RUNOFF FLOW DIRECTION →

PROPOSED DRAINAGE AREA BOUNDARY [thick dashed line]

TEST PIT LOCATION [square with crosshair]

TP #

The Berkshire Design Group, Inc.
4 Allen Place Northampton, Massachusetts 01060
(413) 582-7000 • FAX (413) 582-7005

Scale: 1"=100'
Date: 11/11/08

250-067
Dawn Redinski
Book 5463 Page 164

250-010
Joyce L. Ewens
Book 2000 Page 228
see submittal C
Book 2005 Page 192

VIEW AVENUE
A PRIVATE RIGHT-OF-WAY

250-028
Lawrence R. Tarru
& Karen S. Jairo
Book 1835 Page 156
see submittal B
Book 2005 Page 192

250-011
John, Robert Fenelon
& Leon A. Kerston
Book 1408 Page 307
Plan Book 3 Page 101
see submittal B
Book 2005 Page 192

250-015
D. A. MALONEY
Book 144, Page 148

250-016
ELIZABETH C WALDROP
Book 1144, Page 63

250-018
PAUL A MADRAG
BOOK 4513, PAGE 188
SEE LAND COURT PLAN #28817-A

250-023
BOOK # 22, PAGE 311

NORTHERN AVENUE
A 40' WIDE PUBLIC WAY - ACCEPTED BY BOARD OF SURVEY JUNE 28, 1922
SEE: PLAN BOOK 3, PAGE 15

250-181
NORTHERN AVENUE HOMES, INC.
BOOK 8428, PAGE 219
2.289 ACRES±
(99,695 SQ.FT.±)

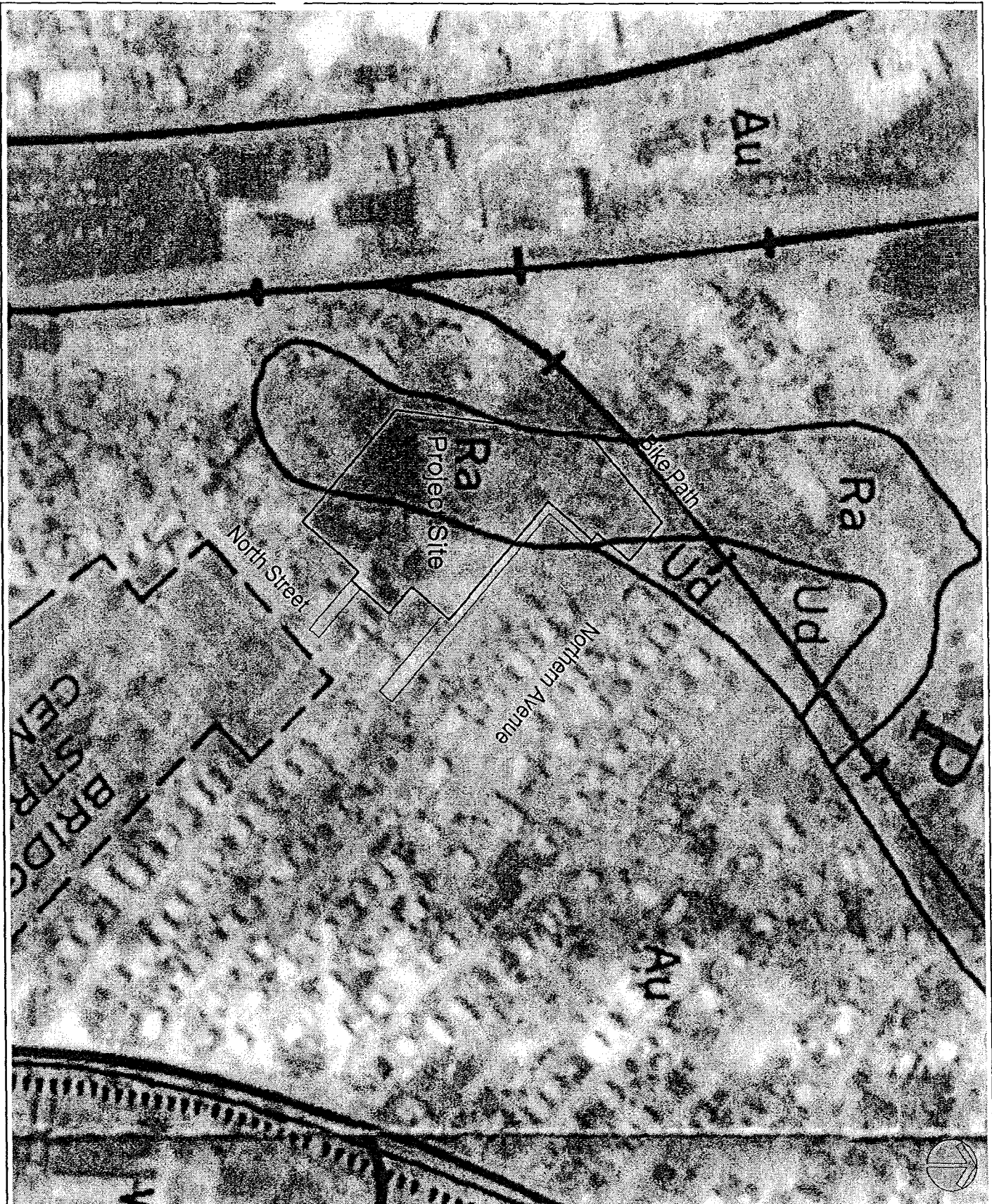
STEPHEN G. SHAWAY AND
MARIE HEINIKOWITZ
BOOK 3074, PAGE 197

250-031
NORTHERN AVENUE CONDOMINIUM
PLAN BOOK 187, PAGE 159

250-034
CAROLE A. AND LEON B JACKSON
BOOK 7921, PAGE 68

TOPPING BOG
2.925 SQ. ACRES
including

Scale: 1"=100'
Date: 11/11/08



The
Berkshire
Design
Group, Inc.

4 Allen Place Northampton, Massachusetts 01060
(413) 582-7000 • FAX (413) 582-7005

Figure Title:

USDA Soils Map

NORTHERN AVENUE HOUSING

NORTHAMPTON

MASSACHUSETTS

Reference:

Date:
11/1/08

Scale:
1"=300'

Figure Number:

3



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

A. General Information

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



From:

Northampton
Conservation Commission

To: Applicant

Northern Avenue Homes, Inc and Tofino
Associates
31 Campus Plaza Road
Mailing Address

Hadley MA 01035
City/Town State Zip Code

Property Owner (if different from applicant):

Douglas Kohl
Name
31 Campus Plaza Road
Mailing Address

Hadley MA 01035
City/Town State Zip Code

1. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

"Topographic" Plan of Land in Northampton, Massachusetts prepared for Northern Avenue Homes, Inc. August 20, 2007
Date

Title Date

Title Date

2. Date Request Filed:

June 20, 2007

B. Determination

Pursuant to the authority of M.G.L. c. 131, § 40, the Conservation Commission considered your Request for Determination of Applicability, with its supporting documentation, and made the following Determination.

Project Description (if applicable):

Resource Area Delineation

Project Location:

Northern Avenue
Street Address

25C
Assessors Map/Plat Number

Northampton
City/Town

12 & 17
Parcel/Lot Number



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

The following Determination(s) is/are applicable to the proposed site and/or project relative to the Wetlands Protection Act and regulations:

Positive Determination

Note: No work within the jurisdiction of the Wetlands Protection Act may proceed until a final Order of Conditions (issued following submittal of a Notice of Intent or Abbreviated Notice of Intent) or Order of Resource Area Delineation (issued following submittal of Simplified Review ANRAD) has been received from the issuing authority (i.e., Conservation Commission or the Department of Environmental Protection).

1. The area described on the referenced plan(s) is an area subject to protection under the Act. Removing, filling, dredging, or altering of the area requires the filing of a Notice of Intent.

2a. The boundary delineations of the following resource areas described on the referenced plan(s) are confirmed as accurate. Therefore, the resource area boundaries confirmed in this Determination are binding as to all decisions rendered pursuant to the Wetlands Protection Act and its regulations regarding such boundaries for as long as this Determination is valid.

The intermittent stream and wetlands delineation, as shown on the referenced plan, have been confirmed as accurate. Vernal pools have been identified within the area shown as wetlands and have not been delineated.

2b. The boundaries of resource areas listed below are not confirmed by this Determination, regardless of whether such boundaries are contained on the plans attached to this Determination or to the Request for Determination.

3. The work described on referenced plan(s) and document(s) is within an area subject to protection under the Act and will remove, fill, dredge, or alter that area. Therefore, said work requires the filing of a Notice of Intent.

4. The work described on referenced plan(s) and document(s) is within the Buffer Zone and will alter an Area subject to protection under the Act. Therefore, said work requires the filing of a Notice of Intent or ANRAD Simplified Review (if work is limited to the Buffer Zone).

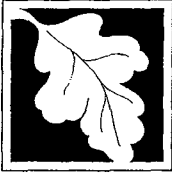
5. The area and/or work described on referenced plan(s) and document(s) is subject to review and approval by:

City of Northampton
Name of Municipality

Pursuant to the following municipal wetland ordinance or bylaw:

Northampton Wetlands Ordinance
Name

Chapter 337 of the Code of Ordinances



WPA Form 2 – Determination of Applicability

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

6. The following area and/or work, if any, is subject to a municipal ordinance or bylaw but not subject to the Massachusetts Wetlands Protection Act:

7. If a Notice of Intent is filed for the work in the Riverfront Area described on referenced plan(s) and document(s), which includes all or part of the work described in the Request, the applicant must consider the following alternatives. (Refer to the wetland regulations at 10.58(4)c. for more information about the scope of alternatives requirements):

- Alternatives limited to the lot on which the project is located.
- Alternatives limited to the lot on which the project is located, the subdivided lots, and any adjacent lots formerly or presently owned by the same owner.
- Alternatives limited to the original parcel on which the project is located, the subdivided parcels, any adjacent parcels, and any other land which can reasonably be obtained within the municipality.
- Alternatives extend to any sites which can reasonably be obtained within the appropriate region of the state.

Negative Determination

Note: No further action under the Wetlands Protection Act is required by the applicant. However, if the Department is requested to issue a Superseding Determination of Applicability, work may not proceed on this project unless the Department fails to act on such request within 35 days of the date the request is post-marked for certified mail or hand delivered to the Department. Work may then proceed at the owner's risk only upon notice to the Department and to the Conservation Commission. Requirements for requests for Superseding Determinations are listed at the end of this document.

1. The area described in the Request is not an area subject to protection under the Act or the Buffer Zone.
2. The work described in the Request is within an area subject to protection under the Act, but will not remove, fill, dredge, or alter that area. Therefore, said work does not require the filing of a Notice of Intent.
3. The work described in the Request is within the Buffer Zone, as defined in the regulations, but will not alter an Area subject to protection under the Act. Therefore, said work does not require the filing of a Notice of Intent, subject to the following conditions (if any).

4. The work described in the Request is not within an Area subject to protection under the Act (including the Buffer Zone). Therefore, said work does not require the filing of a Notice of Intent, unless and until said work alters an Area subject to protection under the Act.



Massachusetts Department of Environmental Protection
 Bureau of Resource Protection - Wetlands
WPA Form 2 – Determination of Applicability
 Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Determination (cont.)

5. The area described in the Request is subject to protection under the Act. Since the work described therein meets the requirements for the following exemption, as specified in the Act and the regulations, no Notice of Intent is required:

Exempt Activity (site applicable statutory/regulatory provisions)

6. The area and/or work described in the Request is not subject to review and approval by:

Name of Municipality

Pursuant to a municipal wetlands ordinance or bylaw.

Name

Ordinance or Bylaw Citation

C. Authorization

This Determination is issued to the applicant and delivered as follows:

by hand delivery on

by certified mail, return receipt requested on

Aug 24, 2007
Date

Date

This Determination is valid for **three years** from the date of issuance (except Determinations for Vegetation Management Plans which are valid for the duration of the Plan). This Determination does not relieve the applicant from complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

This Determination must be signed by a majority of the Conservation Commission. A copy must be sent to the appropriate DEP Regional Office (see <http://www.mass.gov/dep/about/region.findyour.htm>) and the property owner (if different from the applicant).

Signatures:

[Signature]
[Signature]
[Signature]

C. Mason
[Signature]
[Signature]

Aug 23, 2007
Date