Final Report

Ingleside Park
Feasibility Study and
Permitting Project

40 Shattuck Ave, Suite 110
Andover, Massachusetts 01810
866-702-6372

Project Number: 231789
Town of Winthrop, MA
June 28, 2019

TABLE OF CONTENTS

APPENDICES

BACKGROUND

The Town of Winthrop (the Town) was awarded a Coastal Zone Management (CZM) grant to complete a feasibility study and begin permitting to improve drainage infrastructure within Ingleside Park, along Brookfield Road, and at the outfall at Donovan's Beach. The project evaluated existing and future environmental conditions and identified alternatives, both nature-based and conventional, to increase resiliency and reduce the frequency of flooding within the watershed.

Execution of this feasibility study was completed in seven (7) tasks, as follows:

1. Task 1 - Kickoff Meeting/Identify and Review Existing Information
2. Task 2 - Wetland Resource Identification and Site Evaluations
3. Task 3- Analysis of Coastal Processes
4. Task 4 - Drainage Analysis
5. Task 5 - Stormwater Management (Nature-Based and Conventional) Alternatives Analysis
6. Task 6 - Conceptual Design
7. Task 7 - Final Documentation and Visualizations

This Final Report is completed under Task 7 – Final Documentation and Visualizations. The purpose of this report is to summarize Tasks 1 through 6 and provide additional information to the Town of Winthrop to advance the final project design.

1. TASK 1 – KICKOFF MEETING/IDENTIFY AND REVIEW EXISTING CONDITIONS

1.1 TASK 1.1 – KICKOFF MEETING

Woodard & Curran coordinated a kickoff meeting held via conference call on October 10, 2018. The following individuals were present on the call:

- Arthur Leventis (Woodard & Curran)
- Hernan Peralta (Woodard & Curran)
- Colleen Kennedy (Woodard & Curran)
- Steve Calla (Director of Public Works – Town of Winthrop)
- Patricia Bowie (Massachusetts Office of CZM)

The purpose of the meeting was to discuss project schedule, goals, anticipated inhibitors, and variations proposed in the original scope submitted to the Massachusetts Office of CZM for the original grant application. Woodard & Curran's Task 1 submittal is included in **Appendix A**.

1.2 TASK 1.2 AND 1.3 – DATA AND EXISTING CONDITION REVIEW

Woodard & Curran reviewed the Town's existing drainage distribution system plans, existing survey plans completed during previous work located around Ingleside Park, and available record drawings. The existing information was reviewed to determine data gaps and identify areas where additional survey was necessary to accurately model existing conditions and proposed alternatives. Information relative to wetland resources including eelgrass, shellfish beds, historical shoreline change rates, and current Federal Emergency Management Agency (FEMA) flood zones was provided in a separate memorandum by LEC Environmental Consultants, Inc. More information on this memorandum is located in Section 3.1.

2. TASK 2 – EXISTING CONDITIONS SURVEY REVIEW

Woodard & Curran obtained and reviewed aerial photographs, U.S. Geological Survey (USGS) topographic quadrant maps, Natural Resource Conservation Service (NRCS) soil survey maps, and other data necessary to adequately assess the project area. The locations of the wetland delineation flags were surveyed as part of this task. An existing conditions survey was prepared by Coughlin Environmental Services, LLC of Stoneham, Massachusetts. The survey is included in **Appendix B**.

3. TASK 3 – ANALYSIS OF COASTAL PROCESS

3.1 SITE EVALUATION AND COASTAL SURVEY

LEC Environmental Consultants, Inc. (LEC) of Plymouth, Massachusetts, served as the Certified Wetland Scientist for this project. LEC conducted a site evaluation to identify and characterize Wetland Resource Areas within the project limits and to determine their boundaries. Wetland Resource Area boundary determinations were based on criteria enumerated in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, s. 40, the Act) and its implementing Regulations (310 CMR 10.00), the Federal Clean Water Act (33 U.S.C. 1344, s.404), and the Town of Winthrop Wetlands Protection Ordinance (Chapter 12.40). Wetland resource areas located within the Project include Coastal Beach, Salt Marsh, Land Subject to Tidal Action and Land Under the Ocean. LEC's site evaluation, titled Environmental Permitting Due Diligence Memorandum – Ingleside Park Drainage Improvements and dated February 7, 2019, is included in **Appendix C**.

Attachment C of LEC's memorandum includes an existing conditions coastal survey prepared by Coughlin Environmental Services, LLC. The survey shows the extents of FEMA flood zones and floodplains as well as mean lower low water (MLLW), mean low water (MLW), mean high water (MHW), and mean higher high water (MHHW) levels.

Woodard & Curran will continue to coordinate with LEC to prepare the following Federal, State, and local permits, forms, and applications to implement the project improvements:

- Massachusetts Environmental Policy (MEPA) Environmental Notification Form
- Notice of Intent (NOI) Application
- Combined MassDEP Chapter 91 Waterway License and Water Quality Certification (WQC), under Section 401 of the Clean Water Act
- Section 404 United States Army Corps of Engineers (ACOE) Preconstruction Notification

3.2 INFRASTRUCTURE INVESTIGATION

Childs Engineering Corporation (Childs) of Bellingham, Massachusetts, prepared a memorandum titled Ingleside Park Outfall in Winthrop, MA, in February 2019 summarizing their site investigation of the Ingleside Park outfall, tide gate, and surrounding area. Childs concluded that replacing both the tide gate enclosure and outfall pipe would be necessary to increase the size of the outfall pipes. Childs' outfall investigation memorandum is included in **Appendix D**.

4. TASK 4 – DRAINAGE ANALYSIS OF EXISTING CONDITIONS

4.1 TASK 4.1 – WATERSHED MODELING

Woodard & Curran completed a watershed modeling analysis to evaluate the existing conditions of the Town of Winthrop's drainage infrastructure and identify alternatives to increase resiliency and reduce the frequency of flooding within the watershed.

Improvements to the existing stormwater are deemed necessary based on tidal conditions, a deteriorating tide gate and significant flooding events observed at Ingleside Park, such as a September 30th, 2017 storm where the Winthrop Transcript reported that up to four (4) inches of rain fell within an hour on the morning of. Drainage improvements may include increased inlet capacity, tide gate reconstruction, underground stormwater detention and installation of a pump station. Possible reduction of the existing watershed was analyzed to determine if reducing that total watershed area could be possible by rerouting existing drain lines to other adjacent drainage networks. A memorandum summarizing the work completed under Task 4.1 – Watershed Modeling is included in **Appendix E**.

5. TASK 5 – IDENTIFY ALTERNATIVES AND EVALUATE PERFORMANCE

5.1 TASK 5.1 – IDENTIFY ALTERNATIVES & EVALUATE PERFORMANCE

Woodard & Curran completed an alternatives analysis to evaluate potential ways to improve the closed drainage system within Ingleside Park and surrounding areas to reduce the frequency of surface flooding. Primarily, alternatives were explored to increase the capacity of the system including increasing pipe diameters, increasing inlet grate capacities, installing a precast sub-surface detention basin, installing a pump station, and replacing the existing tide gate and outfall pipe. The three alternatives presented were as follows:

- Alternative 1: Includes upgrades to the pipe network and collection system and increasing capacity.
- Alternative 2: Includes improvements identified in Alternative 1 with the addition of an 2-million gallon underground precast concrete storage tank to provide additional storage.
- Alternative 3: Includes improvements identified in the first two alternatives with the addition of a pump station. The pump station is intended to provide drainage during high tide cycles or under elevated sea level conditions.

Based on modeling results, these proposed improvements will detain water and reduce surface flooding caused by increased storm intensities seen during recent years and lack of outlet capacity due to the limited gradient in the system and tidal tailwater conditions. Woodard & Curran recommended proceeding with Alternative 3 to achieve the greatest flood mitigation improvements. The combination system of the pump station and underground storage tank is deemed most efficient preventing surface flooding and emptying the tank. The proposed pump station will be activated when the storage tank meets the maximum fill line, allowing the pump to only be run when necessary during large storm events. The pump assists the emptying the tanks and sending larger volumes of water to the receiver, the Donovan's Beach outfall pipe. A memorandum summarizing the work completed under Task 5.1 – Identify Alternatives & Evaluate Performance is included in **Appendix F.**

Woodard & Curran also reviewed the following green infrastructure systems to determine whether alternative stormwater treatment measures could be feasibly implemented as part of this project:

- Permeable Pavement
- Constructed Stormwater Detention Basins
- Rain Gardens/Bioretention Systems
- Tree Box Filters
- Bioswales
- Shoreline Sand Dunes

It was determined the above green infrastructure measures would be beneficial to retain the volume of runoff generated by only a 1-year or 2-year storm event. In particular, permeable pavement, rain gardens,

and tree box filters appeared to be the most suitable options. However, we concluded that the initial cost and annual maintenance associated with the systems may not be beneficial for the Town due to the historic levels of flooding experienced in the Ingleside Park watershed. Installing multiple green infrastructure systems designed to treat less than one acre of stormwater runoff would not be efficient for a 156-acre watershed.

If the Town of Winthrop is still interested in further examining and implementing green infrastructure systems, Woodard & Curran will work with the Town to include them in the next steps of the design process. A memorandum summarizing Woodard & Curran's review of green infrastructure systems is included in **Appendix G**.

6. TASK 6 – CONCEPTUAL DESIGN

Woodard & Curran created conceptual design drawings for the chosen alternative selected in Task 5, Alternative 3. The conceptual drawing package includes existing condition plans, drainage and grading plans, site improvement plans, and construction details. These drawings are included in **Appendix H**.

7. CONCLUSION

This report summarizes Woodard & Curran's efforts in completing an alternative analysis and evaluation of green infrastructure systems to determine which stormwater treatment measures could be feasibly implemented as part of the Ingleside Park Feasibility and Permitting Project. It has been concluded that a combination system of the pump station and underground stormwater storage tank is the most effective option in mitigating flooding that results from high intensity rainfall. Ingleside Park is located in an urban setting which offers minimal land availability and workable space, which makes an underground storage tank a viable solution. The system proposed, will work to provide a reduction in stormwater runoff and increase public safety from urban flooding hazards.

APPENDIX A: KICKOFF MEETING MEMORANDUM

COMMITMENT & INTEGRITY
DRIVE RESULTS

40 Shattuck Road | Suite 110
Andover, Massachusetts 01810
www.woodardcurran.com

T 866.702.6371
T 978.557.8150
F 978.557.7948

MEMORANDUM

TO: Patricia Bowie; Coastal Resiliency Specialist – MA Office of Coastal Zone Management (CZM)

FROM: Woodard & Curran

CC: Steve R. Calla ; Director of Public Works – Town of Winthrop, MA

DATE: February 1, 2019

RE: Ingleside Park Feasibility Study and Permitting
Task 1 – Kickoff Meeting/Identify and Review Existing Information

---

The Town of Winthrop has been awarded a CZM grant to complete a feasibility study and begin permitting to improve drainage infrastructure within Ingleside Park, along Brookfield Road and the outfall at Donovan's Beach. The project will evaluate existing and future environmental conditions and identify alternatives to increase resiliency and reduce the frequency of flooding within the watershed. This memorandum summarizes work completed under Task 1 of the grant.

Task 1.1: Kickoff Meeting:

A kickoff meeting was held via conference call on October 10, 2018.The following individuals were present on the call:

Arthur Leventis (Woodard & Curran)

Hernan Peralta (Woodard & Curran)

Colleen Kennedy (Woodard & Curran)

Steve Calla (Director of Public Works – Town of Winthrop)

Patricia Bowie (CZM)

The purpose of the meeting was to discuss the goals of the project and the schedule approved as part of the grant application. The discussion included the following topics.

Project Overview and Goals: Woodard & Curran provided a brief overview of the project area and issues and challenges the Town has experienced. These included:

- The outfall and tide gate at Donovan's Beach will need to be evaluated. It is anticipated the outfall, tide gate and tide gate structure will need to be replaced.
- The Town has experience flooding in Ingleside Park, Walden Street and adjacent to Brookfield Road. During some storm events there is a need to close Walden Road due to flooding until tides subside.
- Flooding is most prevalent when heavy rainfall occurs during rising tides.
- Flooding impacts Walden Street, a private parking lot adjacent to Walden Street, and facilities in Ingleside Park including tennis courts, a street hockey court, a skateboard park, and the baseball field.

- Goals of the project include reducing flooding impacts to maintain traffic flow on Walden Street, reduce impacts to the private parking lot and Ingleside Park facilities and address sources of bacteria contributing to the outfall at Donovan's Beach.
- The failing sewer infrastructure in the Town's Centre Business District is suspected to be the largest source of bacteria contributing. The outlet for this large watershed combines with the outlet for Ingleside Park upstream of the Donovan's Beach tide gate and outfall. The Town is currently finalizing design of sewer, drain and water infrastructure improvements.
- Conducting stormwater sampling within the limits of the CBD infrastructure improvements project and at the outlet manhole for this watershed was proposed to confirm whether this is the likely source of bacteria. If confirmed, infrastructure improvement proposed in the project may address the bacteria issues experienced at Donovan's Beach.

Project Schedule: The project schedule was reviewed and discussed. Subsequent to the kickoff meeting, a revised schedule was submitted by Woodard & Curran. (see attached).

Tasks 1.2 and 1.3: Data and Existing Conditions Review:

Woodard & Curran reviewed the Town's existing drainage distribution system plans, existing surveys completed during previous work in and around Ingleside Park and available record drawings. The existing information was reviewed to determine data gaps and identify areas where additional survey was needed to accurately model existing conditions and proposed alternatives. Information relative to wetland resources, including eelgrass, shellfish beds and historical shoreline change rates will be provided in separate memorandums from our sub-consultants, LEC Environmental Consultants, Inc. and Childs Engineering Corporation.

FY18 MVP Action Grant Scope - Winthrop

Task Description		Deliverables	Deliverable Due Date	Invoice Due Date	Grant	Match	Total
Task 1: Kickoff Meeting/Identify and Review Existing Information					$2,095.00		$2,095.00
Sub-task 1.1 Kickoff Meeting	This Task will include a meeting between the Town, CZM and its consultants to discuss timeline, anticipated project inhibitors, and/or any last-minute changes from CZM.	Sign-in sheet, agenda, meeting notes	~~8/31/2018~~ 10/10/18	~~9/30/2018~~ 12/30/18	$0.00	$0.00	$0.00
Sub-task 1.2 Review Data	Compile existing information related to topography and bathymetry, wetland resources, including eelgrass and shellfish beds, historical shoreline change rates and current FEMA flood zones. Data gaps will be identified as the basis for supplemental data collection if required. A meeting with the Town will be scheduled as part of this task to discuss the project and to solicit data and input for this effort.	Memorandum of results	~~8/31/2018~~ 12/30/18	~~9/30/2018~~ 1/31/18	$0.00	$0.00	$0.00
Sub-task 1.3 Existing Conditions Review	Review existing conditions	Memorandum of results	8/31/2018	9/30/2018	$0.00	$0.00	$0.00
Task 2: Site Spot Evaluations							

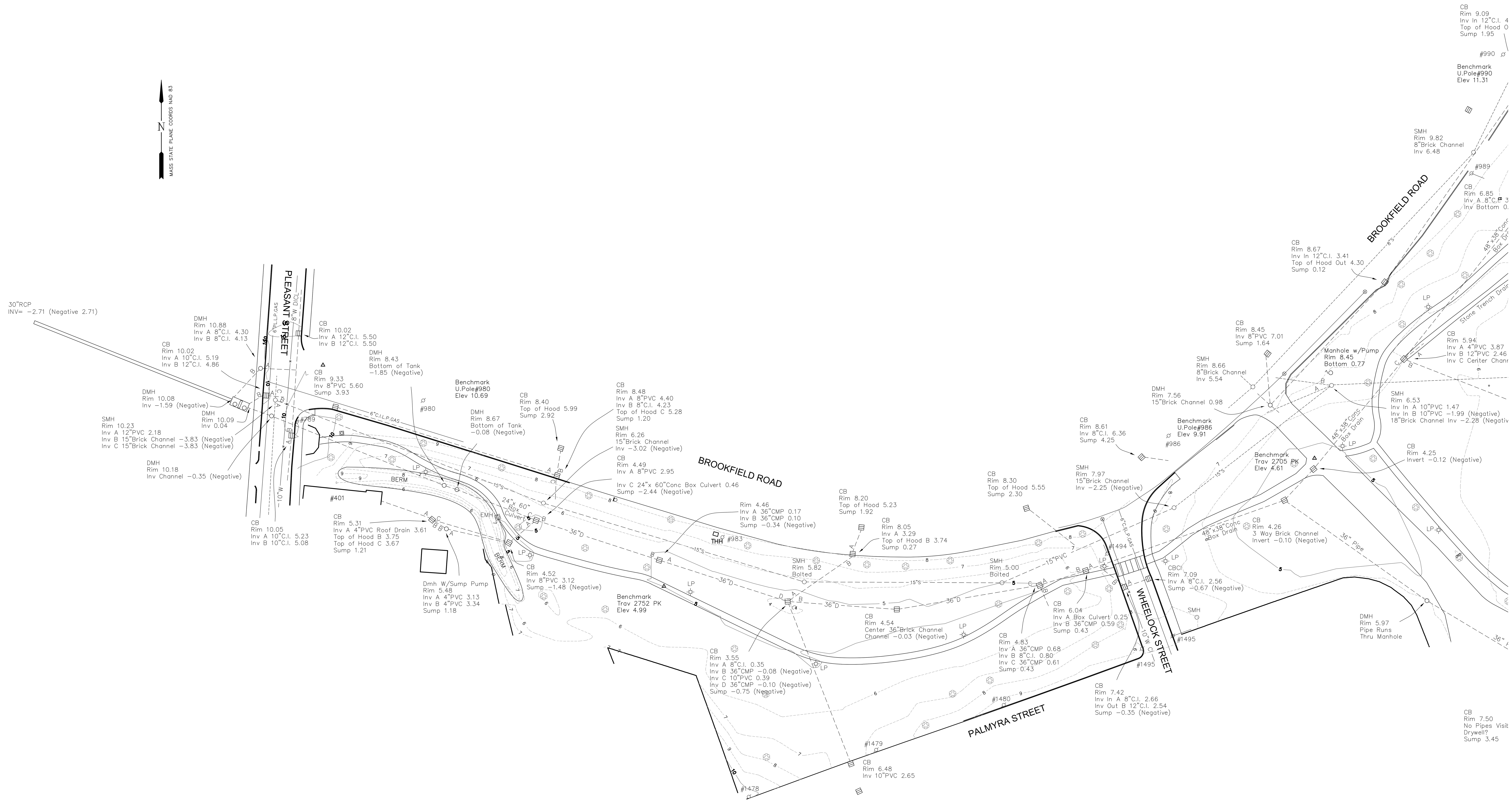
Sub-task 2.1 Survey Upload Boundary RTK	Spot elevations at the site will be obtained to determine the elevation of the culvert. A site topographic survey will be completed to determine the site boundaries, present location of the shoreline, the locations of the wetland resources flagged in Task 2, and the elevations of the upland adjacent to the landward edge of the marsh.	Site topo survey and field notes	~~8/31/2018~~ 1/31/19	~~9/30/2018~~ 2/28/19	$5,510.00	$5.75	$5,515.75
Sub-task 2.2 Develop Plan	Develop Plan	Plan	8/31/2018	9/30/2018	$0.00	$1,000.00	$1,000.00
Task 3: Analysis of Coastal Process							
Sub-task 3.1 Assess Shoreline Change, Storm Surge and Sea Level Rise	An existing coastal model, the Boston Harbor Flood Risk (BH-FR) Model developed by Woods Hole Group for MassDOT and FHWA, will be utilized to evaluate the coastal processes at the site. A statistical model will be applied to the data to calculate the 5-, 10-, 25-, 50- and 100-year return periods for the local wave heights and water levels at the project site. This information will be used to inform the design criteria for the nature-based alternatives. Up to 10 years of historical aerial photography, recent orthoimagery and shoreline surveys will be compiled to calculate both long- and short-term shoreline change rates.	Memorandum of results	~~10/31/2018~~ 1/31/19	~~11/30/2018~~ 2/28/19	$17,160.00	$0.00	$17,160.00
Task 4: Drainage Analysis							

Sub-task 4.1 Watershed Modeling	Develop an existing conditions hydrologic/hydraulic model to serve as a baseline condition from which to evaluate potential mitigation measures. The modeling will consist of two components; a hydrologic model that will estimate the rate and volume of runoff generated from the watershed under various storm events and a riverine hydraulic model that will estimate the elevation and aerial extents of flooding that results from the runoff generated from the watershed. W&C is presently proposing to utilize HydroCAD and HEC-RAS computer software to conduct the hydrologic and hydraulic modeling. Following completion and review of the data collection efforts, W&C will meet with the Client to discuss to advantages, if any, of using Bentley's SewerGEMS or Wallingford's Infoworks RS/CS software to perform these analyses.	Hydrologic/Hydraulic Model and Memorandum of results	~~12/31/2018~~ 1/31/19	~~1/31/2019~~ 2/28/19	$8,352.00	$38,960.00	$47,312.00
Task 5: Stormwater Management Alternative Analysis							

Sub-task 5.1 Identify Alternatives & Evaluate Performance	A meeting with CZM and the Town will be held to identify nature-based alternatives that can increase the resiliency and reduce the flooding of the area. With the improved knowledge of coastal processes, up to three (3) conceptual conventional and/or nature-based alternatives will be identified and evaluated. The alternatives analysis will use a criteria matrix approach, including such indicators as feasibility, design life, level of protection provided, permitability, cost, public and environmental benefits and avoidance of adverse impacts. This task will identify profile geometry and length required, preliminarily quantify materials needed, and assess performance/maintenance requirements as the basis for recommending conceptual layout(s).	Memorandum of results	~~1/31/2019~~ 2/28/19	~~2/28/2019~~ 3/31/19	$0.00	$11,000.00	$11,000.00
Task 6: Preliminary Engineering Design							
Sub-task 6.1 Preliminary Design	Based on the chosen alternative selected in Task 5, preliminary engineering designs will be produced detailing the design specifications for the preferred alternative.	Preliminary designs and specifications	~~3/31/2019~~ 4/16/19	4/30/2019	$70,886.00	$500.00	$71,386.00
Sub-task 6.2 Permitting	Prepare permitting documents	Copy of permitting documents	~~3/31/2019~~ 4/16/19	4/30/2019	$40,792.00	$0.00	$40,792.00
Task 7: Final Documentation and Visualizations							

Sub-task 7.1 Prepare Draft Report	A summary report will be completed that will summarize Tasks 1 through 6 and will provide the additional information needed for the Town to advance the selected nature-based alternative to a final design.	Draft Report	5/1/2019	6/1/2019	$4,530.00	$800.00	$5,330.00
Sub-task 7.2 Prepare Final Report	Incorporate comments from Town, EEA and CZM	Final Report	6/1/2019	6/30/2019	$0.00	$0.00	$0.00
Sub-task 7.3 Public Outreach	Hold public at least two public meetings to discuss project and outcomes	Sign-in sheets, agenda, meeting notes and summary, presentation and other outreach materials	5/31/2019	6/30/2019	$7,474.00	$0.00	$7,474.00
TOTAL PROJECT COST					$156,799.00	$52,266	$209,065

APPENDIX B: COUGHLIN ENVIRONMENTAL SERVICES, LLC EXISTING CONDITIONS SURVEY



NOTES

HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

VERTICAL DATUM IS NORTH GEODETIC VERTICAL DATUM OF 1929 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

THE UNDERGROUND UTILITIES SHOWN ARE BASED ON VISIBLE OBSERVATIONS, FIELD SURVEY, AND RECORD INFORMATION PROVIDED BY OTHERS. IT IS NOT WARRANTED THAT ALL UNDERGROUND UTILITIES ARE SHOWN. THE LOCATIONS SHOWN ARE TO BE CONSIDERED APPROXIMATE.

DIGSAFE MUST BE NOTIFIED PRIOR TO ANY EXCAVATIONS. ANY DISCREPANCIES IN THE LOCATION OF UNDERGROUND UTILITIES SHOWN SHALL BE REPORTED TO THE ENGINEER FOR REVIEW.

40 20 0 40 80 120

ELECTRICAL:

CIVIL:

REV.	DRW:	DSG:	CHK:	DESCRIPTION	DATE
1.	SMM			PARK CONTOURS	3/12/12

EXISTING CONDITIONS

WALDEN ST - READ ST
BEAL ST - LINCOLN ST
SHORT ST - WALDEN PL
INGLESIDE PARK
WINTHROP, MA

Prepared For
WOODARD & CURRAN
35 NEW ENGLAND BUSINESS CENTER SUITE 180
ANDOVER, MA 01810

COUGHLIN ENVIRONMENTAL SERVICES, LLC

CONSULTING ENGINEERS AND PLANNERS

62 Montvale Avenue **Phone: (781) 832-1002**
Stoneham, MA 02180-3637 **Fax: (781) 438-9654**
Email: mail@coughlinenvironmental.com

DATE: FEBRUARY 6, 2012

CES NO.: SCALE: 1"=40'

SHEET 1 OF 4

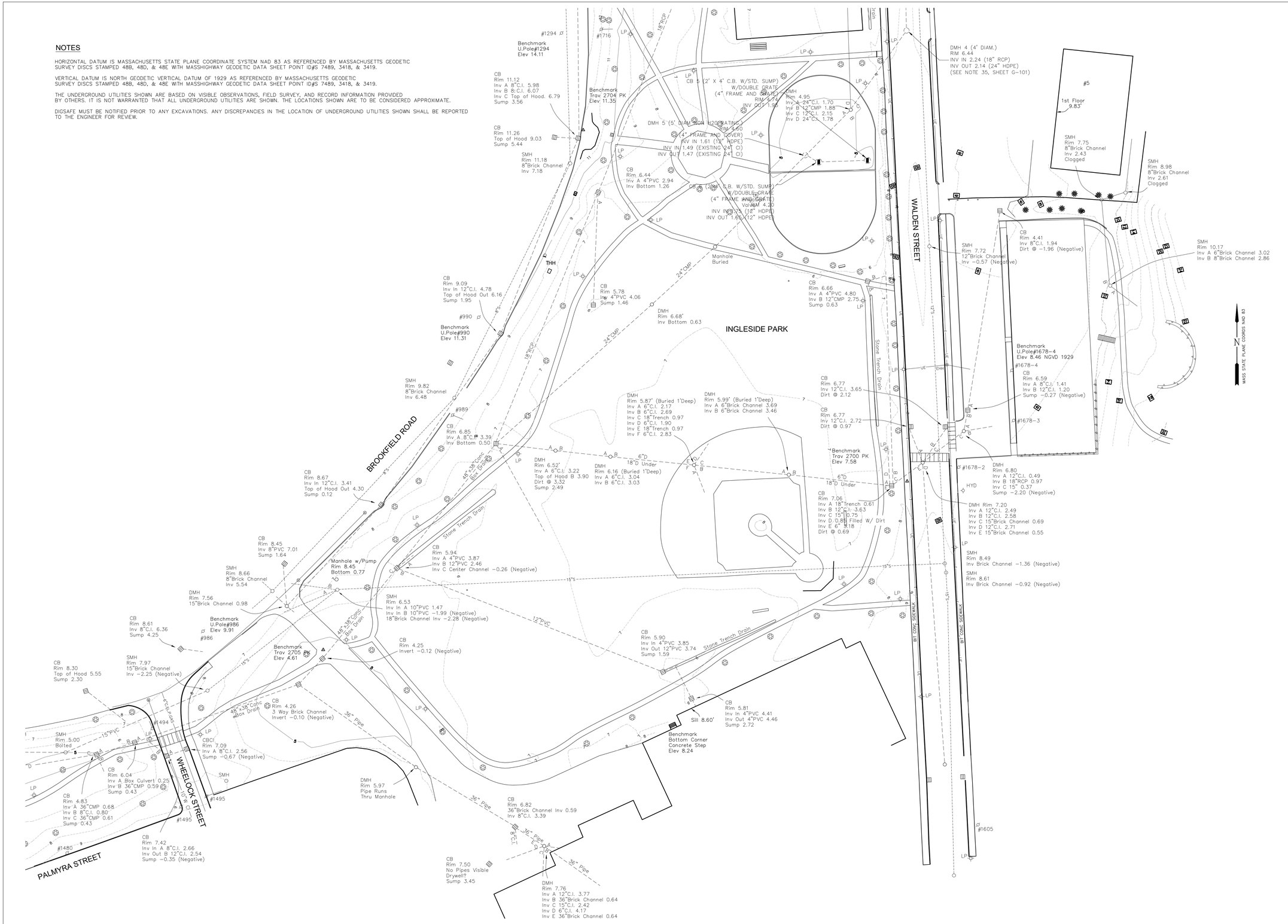
NOTES

HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

VERTICAL DATUM IS NORTH GEODETIC VERTICAL DATUM OF 1929 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

THE UNDERGROUND UTILITIES SHOWN ARE BASED ON VISIBLE OBSERVATIONS, FIELD SURVEY, AND RECORD INFORMATION PROVIDED BY OTHERS. IT IS NOT WARRANTED THAT ALL UNDERGROUND UTILITIES ARE SHOWN. THE LOCATIONS SHOWN ARE TO BE CONSIDERED APPROXIMATE.

DIGSAFE MUST BE NOTIFIED PRIOR TO ANY EXCAVATIONS. ANY DISCREPANCIES IN THE LOCATION OF UNDERGROUND UTILITIES SHOWN SHALL BE REPORTED TO THE ENGINEER FOR REVIEW.



DRW:	SMM	DSG:	CHK:	ELECTRICAL:	CIVIL:
NO.	DESCRIPTION	DATE			
1.	PARK CONTOURS	1/31/12			

EXISTING CONDITIONS

WALDEN ST - READ ST
BEAL ST - LINCOLN ST
SHORT ST - WALDEN PL
INGLESIDE PARK
WINTHROP, MA

Prepared For

WOODARD & CURRAN
35 NEW ENGLAND BUSINESS CENTER SUITE 180
ANDOVER, MA 01810

COUGHLIN ENVIRONMENTAL SERVICES, LLC

CONSULTING ENGINEERS AND PLANNERS

62 Montvale Avenue
Stoneham, MA 02180-3637
Phone: (781) 832-1002
Fax: (781) 438-9654
Email: mail@coughlinenvironmental.com

DATE: FEBRUARY 6, 2012

CES NO.: SCALE: 1"=40'

SHEET 2 OF 4

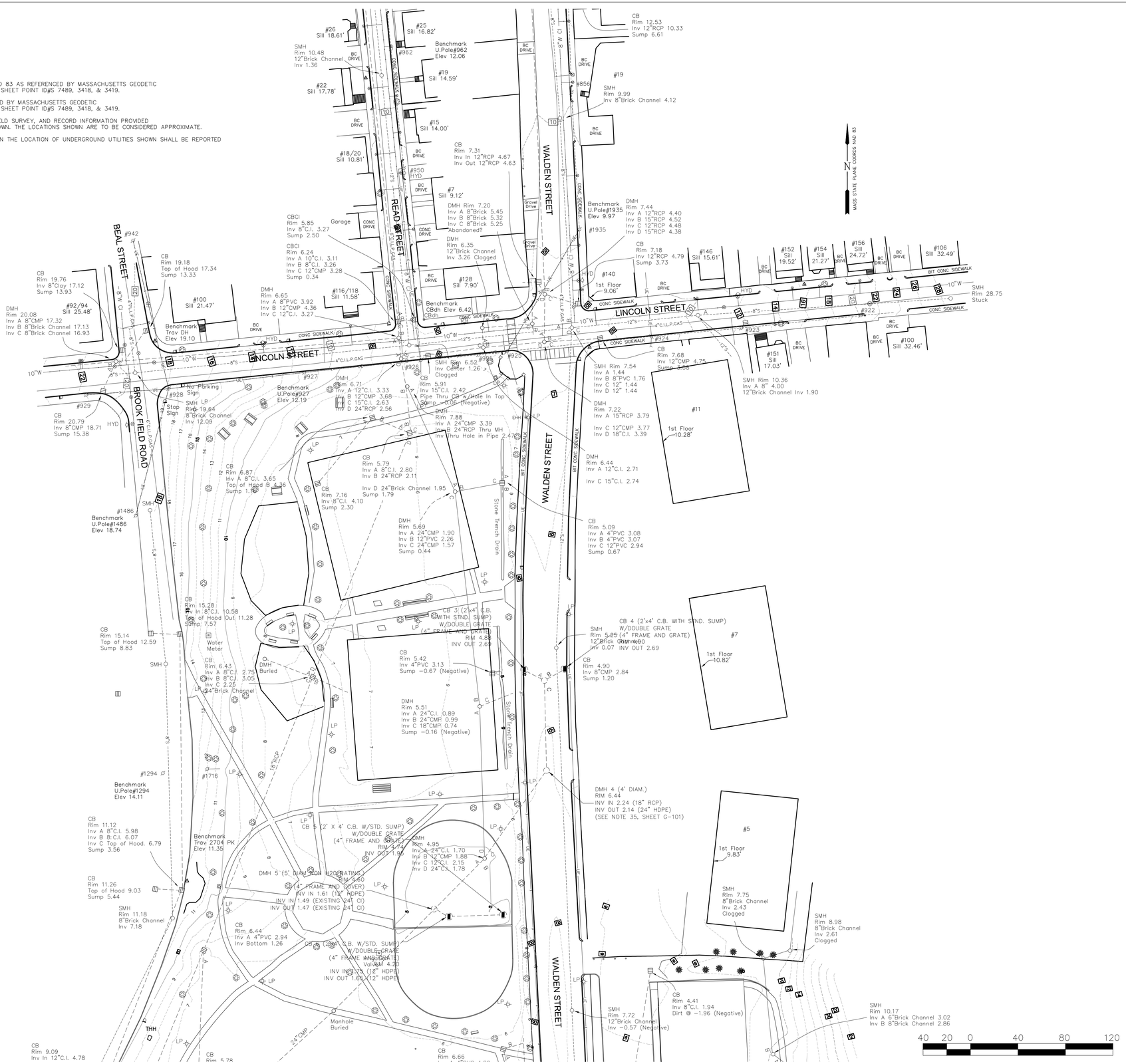
NOTES

HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

VERTICAL DATUM IS NORTH GEODETIC VERTICAL DATUM OF 1929 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

THE UNDERGROUND UTILITIES SHOWN ARE BASED ON VISIBLE OBSERVATIONS, FIELD SURVEY, AND RECORD INFORMATION PROVIDED BY OTHERS. IT IS NOT WARRANTED THAT ALL UNDERGROUND UTILITIES ARE SHOWN. THE LOCATIONS SHOWN ARE TO BE CONSIDERED APPROXIMATE.

DIGSAFE MUST BE NOTIFIED PRIOR TO ANY EXCAVATIONS. ANY DISCREPANCIES IN THE LOCATION OF UNDERGROUND UTILITIES SHOWN SHALL BE REPORTED TO THE ENGINEER FOR REVIEW.



DRW:	DSG:	CHK:	ELECTRICAL:	CIVIL:
SMM				

REV.	DESCRIPTION	DATE
1.	PARK CONTOURS	3/13/12

EXISTING CONDITIONS

WALDEN ST - READ ST
BEAL ST - LINCOLN ST
SHORT ST - WALDEN PL
INGLESIDE PARK
WINTHROP, MA

Prepared For

WOODARD & CURRAN
35 NEW ENGLAND BUSINESS CENTER SUITE 180
ANDOVER, MA 01810

COUGHLIN ENVIRONMENTAL SERVICES, LLC

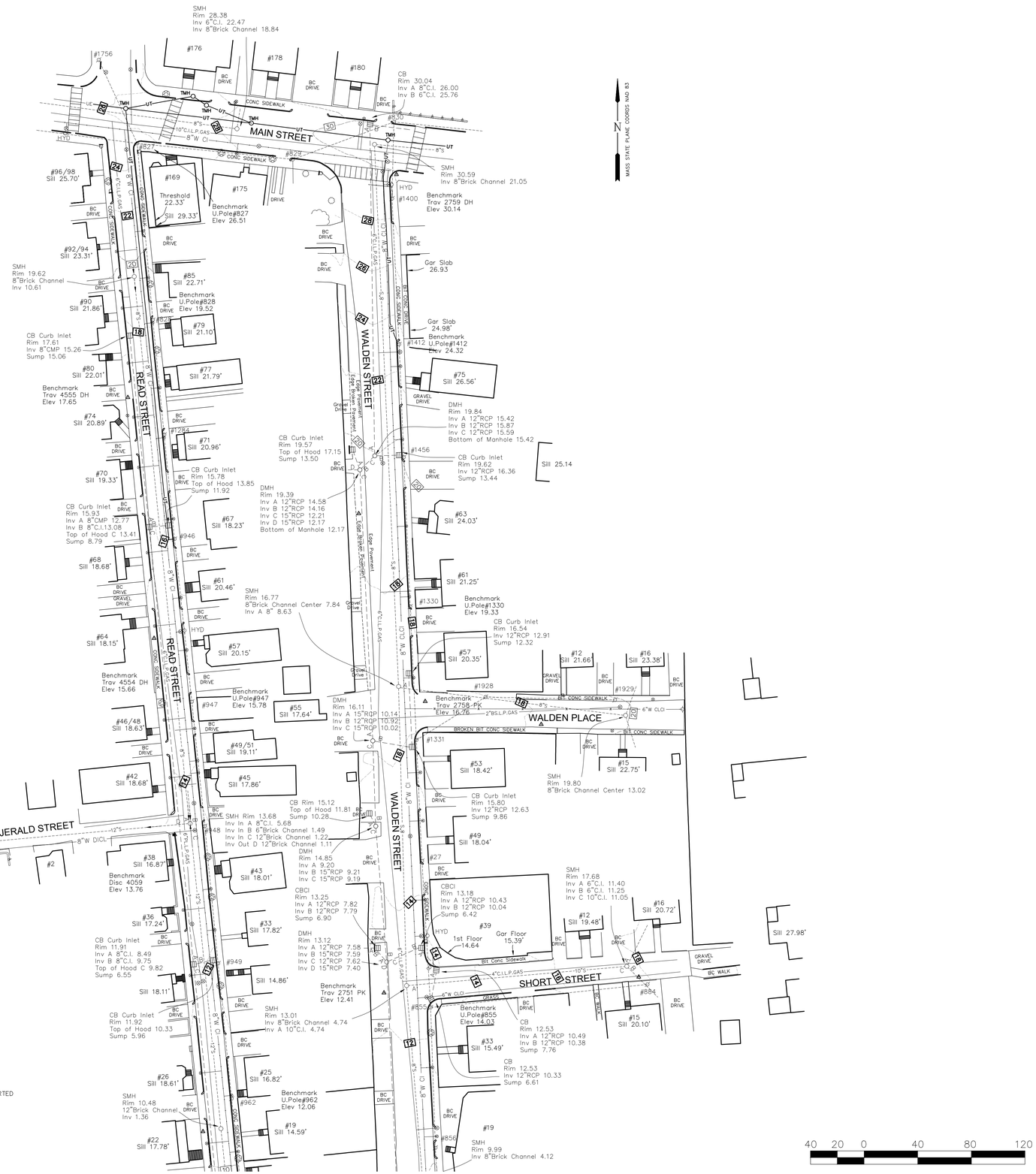
CONSULTING ENGINEERS AND PLANNERS

62 Montvale Avenue
Stoneham, MA 02180-3637
Phone: (781) 832-1002
Fax: (781) 438-9654
Email: mail@coughlinenvironmental.com

DATE: FEBRUARY 6, 2012

CES NO.: | SCALE: 1"=40'

SHEET 3 OF 4



NOTES

HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

VERTICAL DATUM IS NORTH GEODETIC VERTICAL DATUM OF 1929 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.

THE UNDERGROUND UTILITIES SHOWN ARE BASED ON VISIBLE OBSERVATIONS, FIELD SURVEY, AND RECORD INFORMATION PROVIDED BY OTHERS. IT IS NOT WARRANTED THAT ALL UNDERGROUND UTILITIES ARE SHOWN. THE LOCATIONS SHOWN ARE TO BE CONSIDERED APPROXIMATE.

DIGSAFE MUST BE NOTIFIED PRIOR TO ANY EXCAVATIONS. ANY DISCREPANCIES IN THE LOCATION OF UNDERGROUND UTILITIES SHOWN SHALL BE REPORTED TO THE ENGINEER FOR REVIEW.

ELECTRICAL:

CIVIL:

CHK:

DSG:

SMM:

DRW:

NO.	DESCRIPTION	DATE
1.	PARK CONTOURS	3/12/12

EXISTING CONDITIONS

WALDEN ST - READ ST
BEAL ST - LINCOLN ST
SHORT ST - WALDEN PL
INGLESIDE PARK
WINTHROP, MA

Prepared For:

WOODARD & CURRAN
35 NEW ENGLAND BUSINESS CENTER SUITE 180
ANDOVER, MA 01810

COUGHLIN ENVIRONMENTAL SERVICES, LLC

CONSULTING ENGINEERS AND PLANNERS

62 Montvale Avenue
Stoneham, MA 02180-3637
Phone: (781) 832-1002
Fax: (781) 438-9654
Email: mail@coughlinenvironmental.com

DATE: FEBRUARY 6, 2012

CES NO.: SCALE: 1"=40'

SHEET 4 OF 4

APPENDIX C: LEC ENVIRONMENTAL CONSULTANTS, INC. ENVIRONMENTAL PERMITTING DUE DILIGENCE MEMORANDUM

Environmental Permitting Due Diligence Memorandum
Ingleside Park Drainage Improvements
Winthrop, MA
February 7, 2019

This Memorandum summarizes Environmental Permitting Due Diligence completed to date for the *Ingleside Park Drainage Improvements Project* in Winthrop, MA. This document is based on our December 10, 2018 site evaluation, our understanding of the conceptual project/limit of work, and research and review of applicable mapping resources. It is our understanding that stormwater drainage improvements to reduce the frequency and duration of flooding incidents within the park will include a new stormwater outfall seaward of Donovan Beach. Since this work will involve direct impacts to jurisdictional Wetland Resource Areas and areas below Mean High Water (MHW), this Memo focuses on that aspect of the project.

This Memo includes a description of the existing site and resource area conditions as it pertains to potential environmental permitting requirements and considerations under the following statutes and regulations:

- The *Massachusetts Wetlands Protection Act* (WPA; M.G.L. c. 131, s. 40) and its implementing *Regulations* (310 CMR 10.00), and the *Winthrop Wetlands Protection Ordinance* (Chapter 12.40)*;*
- *The Massachusetts Environmental Policy Act* (MEPA) and associated MEPA Regulations (301 CMR 11.00);
- *Massachusetts Water Quality Certification* (WQC) *Regulations* (314 CMR 9.00);
- *Massachusetts Public Waterfront Act* (M.G.L. c. 91, s. 1-63), the associated *Massachusetts Waterways Regulations* (310 CMR 9.00); and
- *Federal Clean Water Act* (33 U.S.C. 1344, Section 404) as administered by the Army Corps of Engineers (ACOE).

General Site Description

Ingleside Park is located in the western portion of Winthrop and is surrounded by residential development to the north and east, with commercial/industrial development to the south. The park contains recreational fields and courts, playgrounds, a pavilion, walking paths, and extensive manicured lawn areas (Attachment A). No wetlands, rivers, streams or other waterbodies were observed within Ingleside Park and the Park is not located in the 100-year floodplain according to FEMA.

The project site also includes Donovan Beach (Attachment B), a small public beach located adjacent to the westernmost portion of Ingleside Park on the shoreline of Boston Harbor. Pleasant Street (Route 145) extends between Donovan Beach and Ingleside Park. Donovan Beach contains coastal Wetland Resource Areas including Coastal Beach, Salt Marsh, Land Subject to Tidal Action, and Land Under the Ocean. According to the survey completed by Coughlin Environmental Services, LLC (Attachment C), nearly the entire beach is within the coastal 100-year floodplain (Attachment D) regulated as Land Subject to Coastal

Storm Flowage (LSCSF) and the MHW elevation for Donovan Beach is elevation 5.14.

In addition to Coastal Wetland Resource Areas and jurisdictional areas below MHW, the intertidal and subtidal areas may provide suitable habitat for shellfish; however, our evaluation did not include a shellfish survey. According to MassGIS datalayers, the intertidal zone contains suitable habitat for soft-shelled clams (*Mya arenaria*) and is mapped as a "prohibited" area on the "Shellfish Growing Areas" by Massachusetts Division of Marine Fisheries (DMF) (Attachment E). In addition, no seagrass beds are mapped in the vicinity of the site.

The site does not lie within Estimated Habitat of Rare Wildlife or Priority Habitats of Rare Species, according to the Natural Heritage and Endangered Species Program (NHESP). The site does not occur within an Area of Critical Environmental Concern (ACEC), as designated by Massachusetts Department of Conservation and Recreation (DCR).

Findings and Recommendations

Based on the site evaluation and associated research, the project will involve activities which trigger permitting under the *Massachusetts Wetlands Protection Act* (WPA; M.G.L. c. 131, s. 40), its implementing *Regulations* (310 CMR 10.00) and the *Winthrop Wetlands Protection Ordinance* (Chapter 12.40); the *Chapter 91 Waterways Regulations* (310 CMR 9.00); and the *Federal Clean Water Act* (33 U.S.C. 1344, Section 404). Additional permitting and review by the MEPA office under the MEPA Regulations (301 CMR 11.00) and by DEP under the *Massachusetts Water Quality Certification* (WQC) *Regulations* (314 CMR 9.00) is likely required but additional project details must be evaluated to definitively determine all permitting requirements. In addition to reviewing the project once design plans are developed, we recommend consultation with DMF and the local Shellfish Warden to better understand potential marine habitat concerns that may affect the project.

Attachments

Attachment A

Aerial Map

LEC Environmental Consultants, Inc.
Plymouth, MA
508.746.9491
www.lecenvironmental.com

Attachment A: Aerial Orthophoto

Ingleside Park and Donovan Beach
Winthrop, Massachusetts

N

February 7, 2019

Attachment B

Donovan Beach Aerial

Attachment B: Aerial Orthophoto

Donovan Beach
Winthrop, Massachusetts

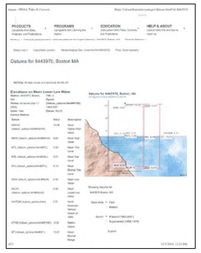
N

February 7, 2019

LEC Environmental Consultants, Inc.
Plymouth, MA
508.746.9491
www.lecenvironmental.com

Attachment C

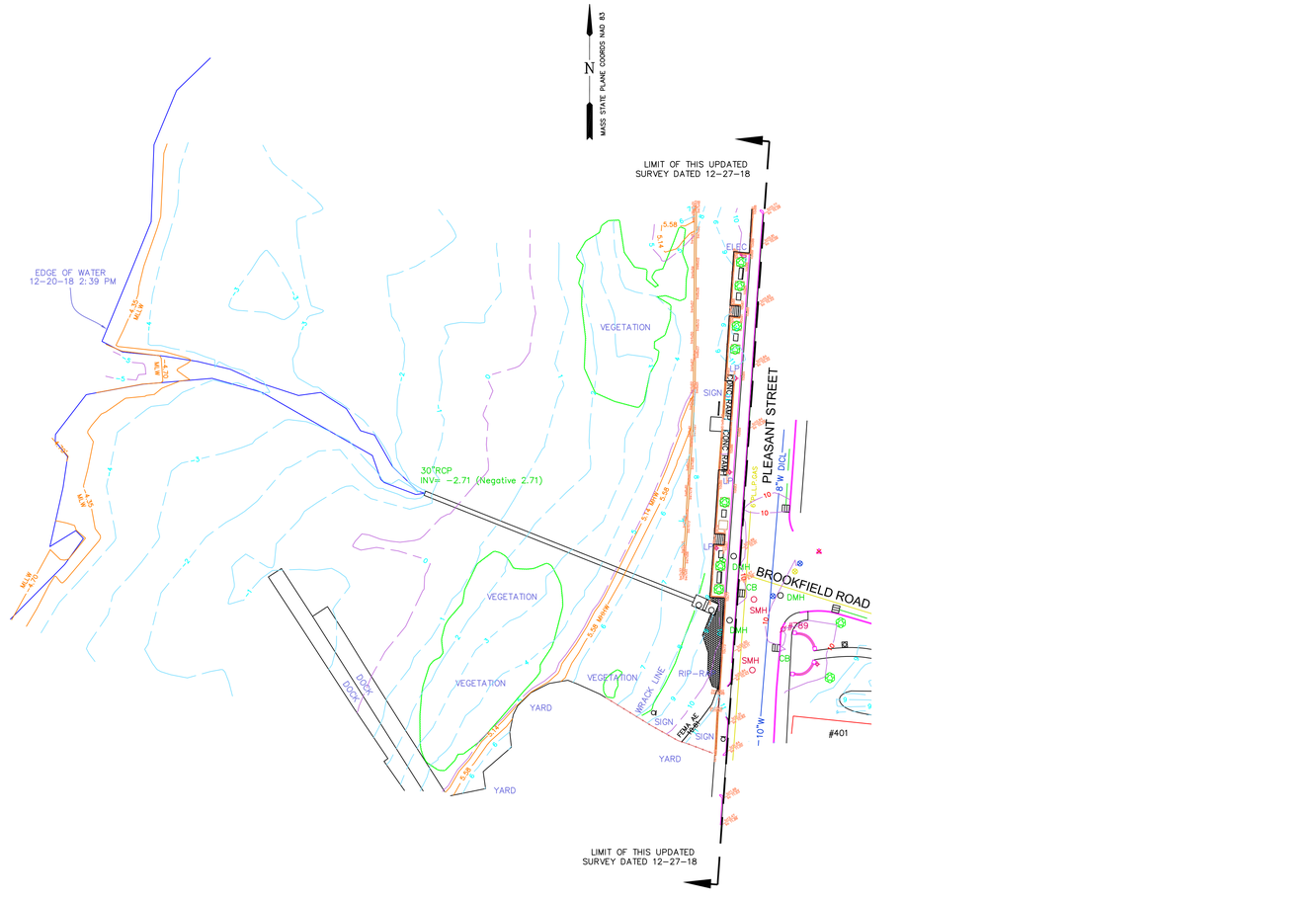
Existing Conditions Plan, Prepared by Coughlin Environmental Service LLC,
Dated December 27, 2018



DATUM CONVERSIONS

	RELATIVE TO MLLW	NAVD 88	NGVD 29
MHHW	10.28	4.77	5.58
MHW	9.84	4.33	5.14
NAVD 88	5.51	0.00	0.81
MLW	0.35	−5.16	−4.35
MLLW	0.00	−5.51	−4.70

FEMA MAP 25025C0038J EFFECTIVE DATE 3–16–16
ZONE AE FLOOD ELEVATION 10.0 NAVD 88
ZONE AE FLOOD ELEVATION 10.81 NGVD 29



NOTES

HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT IDs 7489, 3418, & 3419.

VERTICAL DATUM IS NORTH GEODETIC VERTICAL DATUM OF 1929 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT IDs 7489, 3418, & 3419.

THE UNDERGROUND UTILITIES SHOWN ARE BASED ON VISIBLE OBSERVATIONS, FIELD SURVEY, AND RECORD INFORMATION PROVIDED BY OTHERS. IT IS NOT WARRANTED THAT ALL UNDERGROUND UTILITIES ARE SHOWN. THE LOCATIONS SHOWN ARE TO BE CONSIDERED APPROXIMATE.

DIGSAFE MUST BE NOTIFIED PRIOR TO ANY EXCAVATIONS. ANY DISCREPANCIES IN THE LOCATION OF UNDERGROUND UTILITIES SHOWN SHALL BE REPORTED TO THE ENGINEER FOR REVIEW.

40 20 0 40 80 120

ELECTRICAL:

CIVIL:

DRW:	SMM	DSG:	CHK:	DATE	DESCRIPTION	REV.

EXISTING CONDITIONS

DONOVAN BEACH
PLEASANT STREET
BROOKFIELD ROAD
INGLESIDE PARK
WINTHROP, MA
Prepared For
WOODARD & CURRAN
35 NEW ENGLAND BUSINESS CENTER SUITE 180
ANDOVER, MA 01810

COUGHLIN ENVIRONMENTAL SERVICES, LLC
CONSULTING ENGINEERS AND PLANNERS
62 Montvale Avenue
Stoneham, MA 02180-3637
Phone: (781) 832-1002
Fax: (781) 438-9654
Email: mail@coughlinenvironmental.com

DATE: DECEMBER 27, 2018

CES NO.: SCALE: 1"=40'

SHEET 1 OF 1

Attachment D

FEMA Flood Insurance Rate Map

Attachment D: FEMA Flood Insurance Rate Map Community Panel 25025 C 0038J Dated March 16, 2016

Ingleside Park and Donovan Beach
Winthrop, Massachusetts

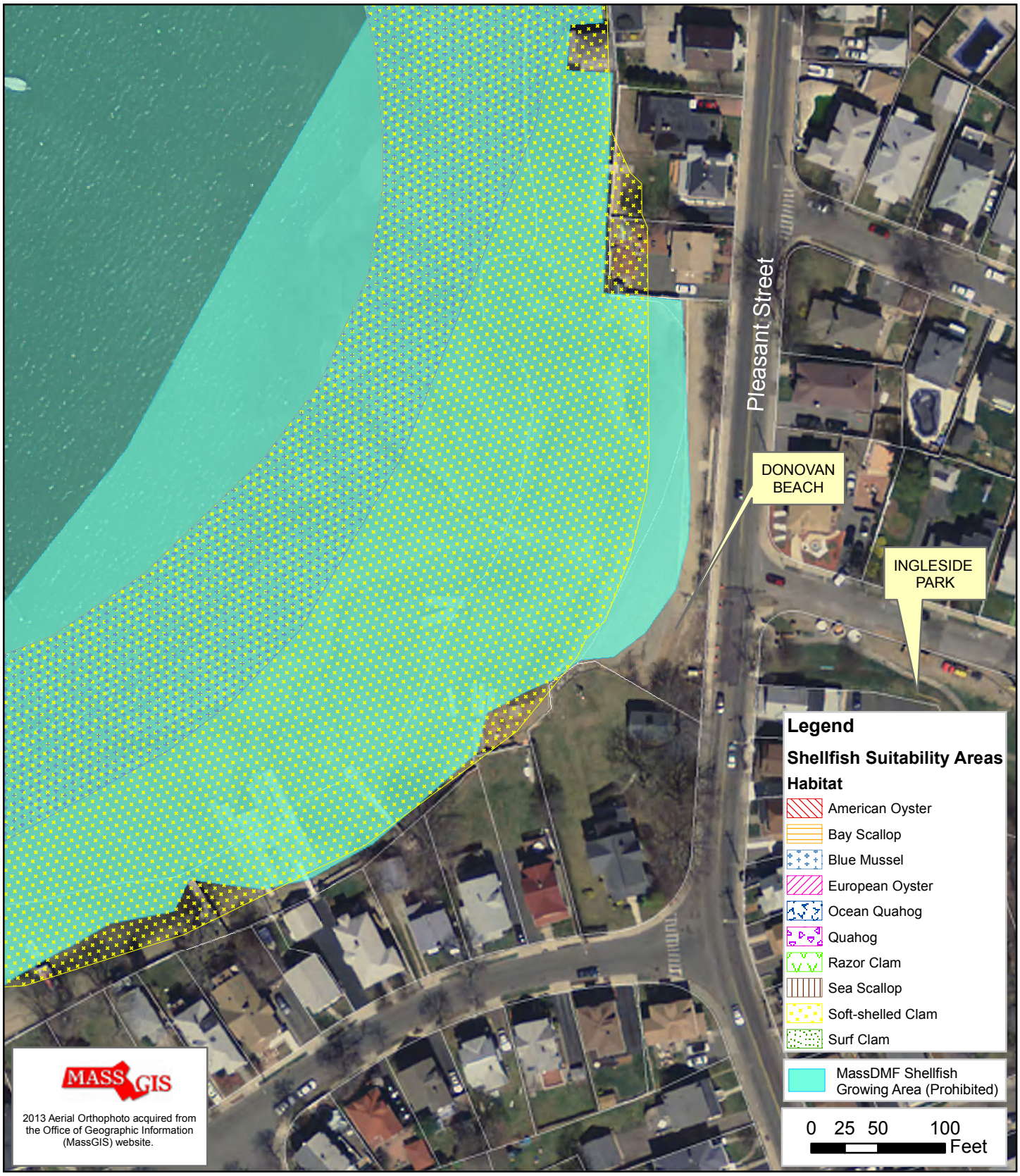
N

February 7, 2019

LEC Environmental Consultants, Inc.
Plymouth, MA
508.746.9491
www.lecenvironmental.com

Attachment E

Shellfish Aerial



Attachment E: Aerial Orthophoto MassDMF Shellfish Suitability and Growing Areas

Ingleside Park and Donovan Beach
Winthrop, Massachusetts

LEC Environmental Consultants, Inc.
Plymouth, MA
508.746.9491
www.lecenvironmental.com

N

February 7, 2019

APPENDIX D: CHILDS ENGINEERING CORPORATION OUTFALL INVESTIGATION MEMORANDUM

CHILDS ENGINEERING CORPORATION
34 WILLIAM WAY, BELLINGHAM, MA 02019 (508) 966-9092 FAX (508) 966-9096

February 4, 2019

Ken Mavrogeorge, P.E.
Project Manager
Woodard & Curran, Inc.
40 Shattuck Road, Suite 110,
Andover, MA 01810,

Re: Ingleside Park Outfall in Winthrop, MA.

Dear Mr. Mavrogeorge,

On January 15, 2019 Childs Engineering Corporation conducted a site investigation of the outfall, tide gate, and surrounding area. During the inspection of the outfall it was noted that the concrete surrounding the outfall had deteriorated significantly and along there did not appear to be significant movement of the pipe or head wall it was in need of repair or replacement (see Photo 1). We also inspected inside of the tide gate chambers and noted that on the upstream side the trash screen was significantly corroded and on the downstream side the tidal gate itself was also heavily corroded (see Photo 1).

The area surrounding the outfall was fairly flat but there a significant channel from the outfall caused by the water flowing from it (see Photo 3). The amount of stormwater flowing out appears to be enough to prevent the pipe or channel from building up significant amounts of sediment deposits. The slope gently rises up to the tide gate that is adjacent to the road. The road appears to be located at the high point, then inshore of the road the grade drops back down before then steadily rise back up to the park (see Photo 4). The elevation and a typical section can be seen in Figure X-101.

Based on the site visit and our conversations about the potential for increasing the size of the outfall pipes we believe that it would be best to replace both the tide gate enclosure and the outfall pipe. The length of pipe will likely depend on the diameter of the proposed pipe but as we understand it the Town would like as much of the pipe as possible buried in the beach to minimize the visual intrusion as much as possible.

As far of the analysis of the structure we looked at the various water elevations based on local data. This including looking at the current data from NOAA and FEMA for the tides, still water elevations for the 1% and 0.2% chance storms, as well as the

NOAA SLOSH models for predicting the storm surge from hurricanes. All these water levels are shown in Figure SK-01, and compared to the elevations of the outfall structure and road. In addition, we also looked at the latest sea level rise figures for the City of Boston and the Commonwealth of Massachusetts. These values are included below in Table 1.

	BH-FRM[1]	Kopp[2]
2030	9”	1.2’
2050	21”	2.4’
2070	36”	4.2’

Table 1 – Comparison of Sea Level Rise Predictions

[1]Boston Harbor Flood Risk Map taken from Climate Ready Boston based on the recommendations of the Boston Research Advisorary Group (BRAG) October 2015 through January 2016.

[2]The DeConto and Kopp, 2017, analysis for Massachusetts consisted of a probabilistic assessment of future relative sea level rise at each tide gauge location given two future atmospheric greenhouse gas concentration pathways. The data displayed was in the ‘high’ range. This data was taken from ResilientMA.org.

Based off our research and to stay consistent with the work that the town of Winthrop is doing we chose to evaluate the 2030 and 2070 1% storm event for the wave modeling, based on FEMA data but taking into account the City of Boston’s (BH-FRM) predictions for sea level rise. We felt that gave realistic picture of what may happen moving forward. However, it should be noted that the worst condition on any new outfall headwall structure will be seen in the current conditions as breaking waves, that have the strongest forces, are currently able to break directly at the structure whereas in the future the water may be deeper but that would allow the waves to pass over the structure.

The water level showed that the outfall is currently exposed at low tide that was able to be checked on site and that the 1% storm would over top the road in 2030 by a few inches but in 2050 the road would be over topped by 16 inches.

Once the outfall pipes has been sized we will be able to determine how far out to place the headwall and therefore will be able to calculate the size of the wave at that locations. In addition, once we have the invert elevations for the new pipes at the tide gate we will be able to calculate how long the gates would be closed and therefore allow you to predict the amount of water that would need to be stormed or infiltrated prior to being released.

The next steps in the project will be to continue to work with you to define the invert elevations at a new proposed tide gate chamber and the size of the outfall pipes. With this we will be able to develop a plan showing the new length and profile of the outfall pipe and then using current and proposed coastal data will be able to predict the wave conditions at the outfall. This information will all be wrapped up in the Concept Design sketches

If you have any questions or would like additional information please don't hesitate to reach out.

Respectfully Submitted,

CHILDS ENGINEERING CORPORATION

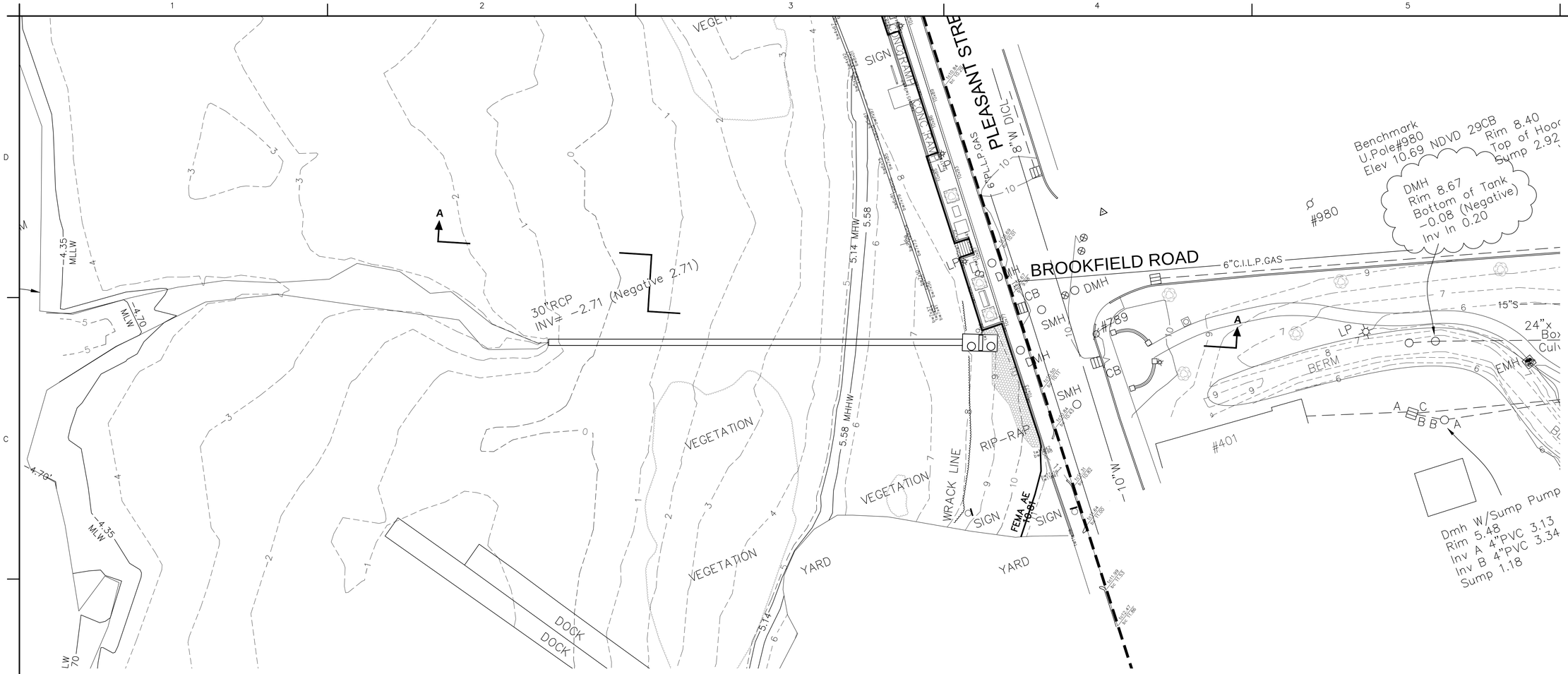
Charlie M. Roberts, P.E., D. PE
President

Photo 1 – Outfall at the point of discharge at Mean Low Water with broken up concrete and separated pipes.

Photo 2 – Inside the tide gate structure looking at the corroded tide gate on the downstream side.

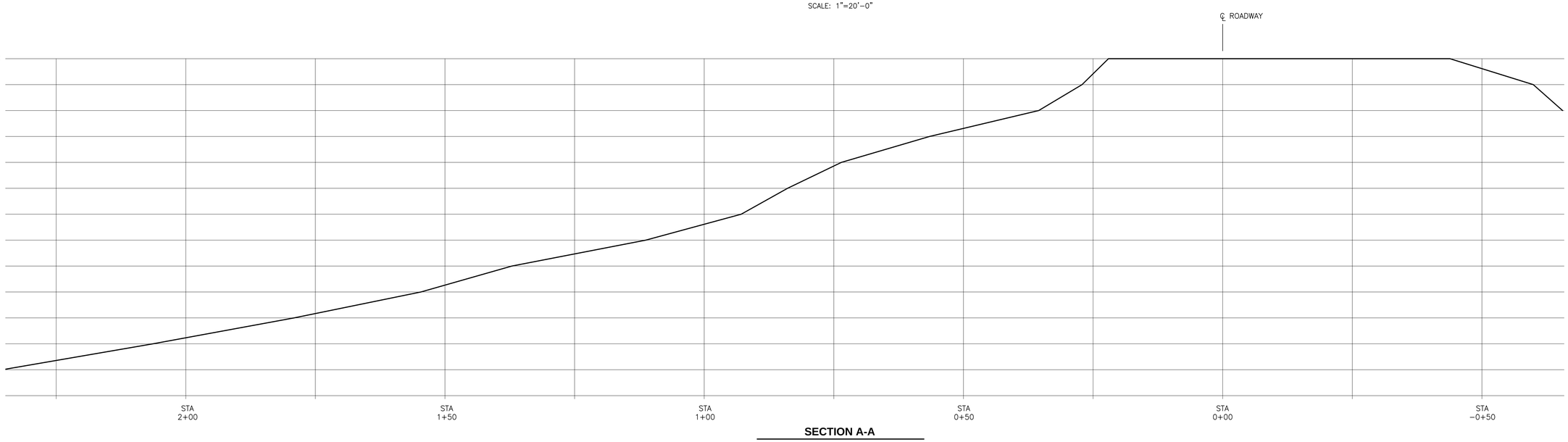
Photo 3 – Snow covered beach rising slowly back up towards the road.

Photo 4 – Looking outshore from the opposite side of the road, show the road at the high point of the transect.



SITE PLAN

SCALE: 1"=20'-0"



SECTION A-A

SCALE: HORIZ. 1"=10'-0" VERT. 1/2"=1'-0"

CHILDS ENGINEERING CORPORATION
34 WILLIAM WAY, BELLINGHAM, MA 02019 U.S.A.
Phone: (508) 966-9092 Fax: (508) 966-9096
E-mail: mail@childseng.com

Mark	Description	Date	Appr.

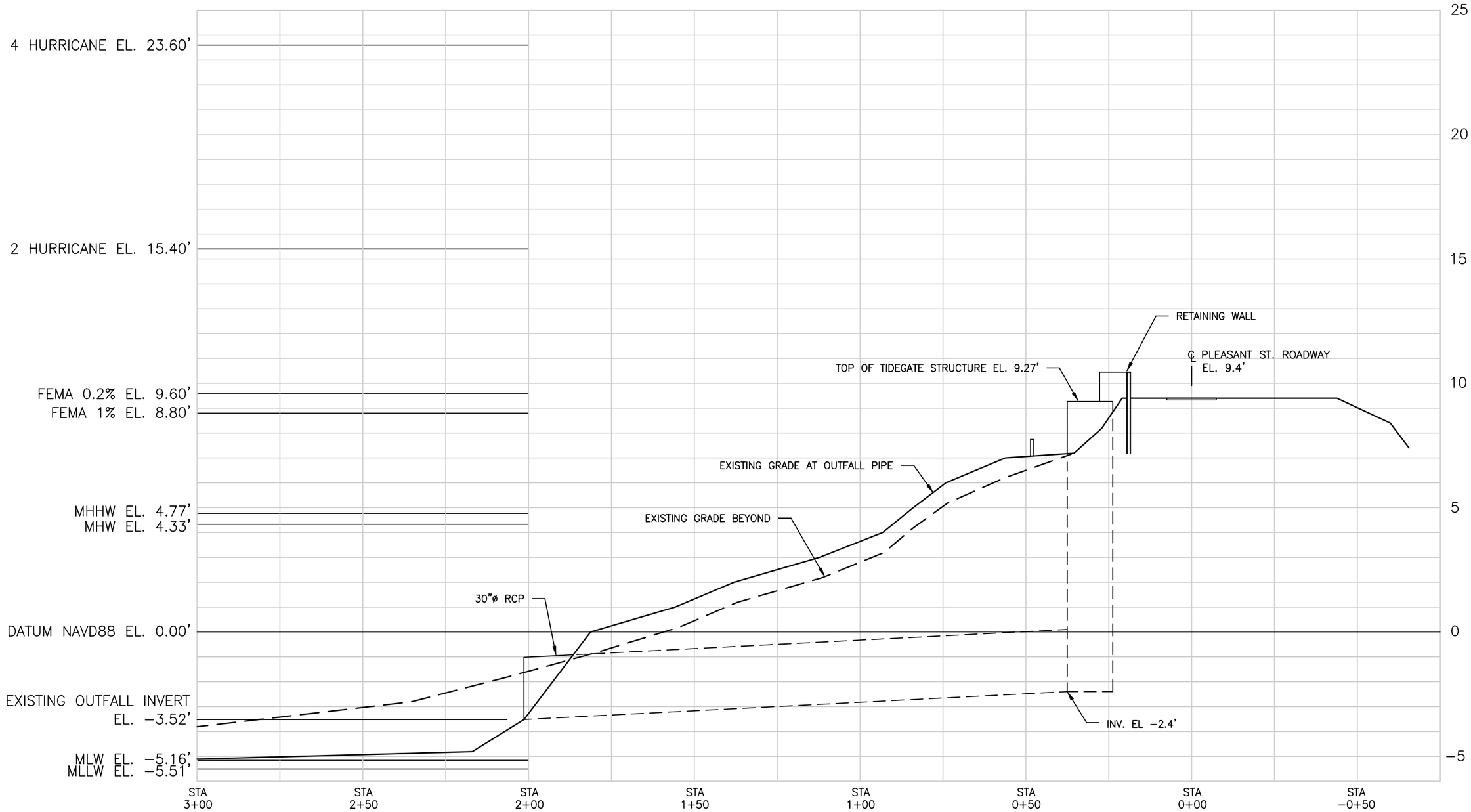
Designed by: CMR	Date: 02/01/19		
Cad by: CMR	Design file no. 285719 X-101		
Checked by: TEQ	Scale: AS NOTED	Reviewed by: CMR	

WINTHROP OUTFALL
W. & C.
WINTHROP, MA

SITE PLAN
AND SECTION

Sheet reference number:
X-101
Sheet 1 of

TOM QUINN K:\2857-19.00 WINTHROP OUTFALL - W&C\CADD\CURRENT WORKING DWGS\285719 X-101 SITE PLAN.DWG Feb 01, 2019 - 4:48pm



GRADE PROFILE

SCALE: HORIZ. 1"=30'−0" VERT. 1/4"=1'−0"

CHILDS ENGINEERING CORPORATION
34 WILLIAM WAY, BELLINGHAM, MA 02019 U.S.A.
Phone: (508) 966−9092 Fax: (508) 966−9096
E−mail: mail@childseng.com

Mark	Description	Date	Appr.

Designed by: CMR		Date: 02/04/19	
Dwn by: TEQ	Ckd by: CMR	Design file no. 285719 SK−01	
Reviewed by: CMR		Scale: AS NOTED	

WINTHROP OUTFALL
W & C
WINTHROP, MA

PROFILE AT EXISTING OUTFALL

Sheet reference number: SK−01
Sheet 1 of 1

APPENDIX E: WATERSHED MODELING MEMORANDUM

COMMITMENT & INTEGRITY
DRIVE RESULTS

40 Shattuck Road | Suite 110
Andover, Massachusetts 01810
www.woodardcurran.com

T 866.702.6371
T 978.557.8150
F 978.557.7948

MEMORANDUM

TO: Patricia Bowie; Coastal Resiliency Specialist – MA Office of Coastal Zone Management (CZM)

FROM: Woodard & Curran

CC: Steven Calla, Director of Public Works, Town of Winthrop, MA

Date: February 8, 2019

RE: Ingleside Park Feasibility Study and Permitting
Task 4.1 Watershed Modeling

The Town of Winthrop, Massachusetts (Town) has been awarded a CZM grant to complete a feasibility study, conceptual design, and permitting improvements to the drainage infrastructure within Ingleside Park, along Brookfield Road, and the outfall pipe on Donovan Beach. Task 4.1 of the grant includes an analysis which aims to evaluate the existing conditions of the drainage infrastructure and identify alternatives to increase resiliency and reduce the frequency of flooding within the watershed. This memorandum summarizes work completed under *Task 4.1 Watershed Modeling* of the CZM grant.

Figure 1. Ingleside Park Flooding

Ingleside Park experiences large ponding when extreme storm events coincide with high tide elevations. On September 30, 2017 the Town experienced a large storm event as such. Reports from the Winthrop Transcript indicated that up to four inches of rain fell within an hour. The photos titled Figure 1 and Figure 2 depict the flooding occurred on that day.

1. DRAINAGE ANALYSIS

Methodology:

Figure 2. Flooding at Street Hockey Court

The existing hydraulic model was developed using Autodesk's, Storm and Sanitary Analysis Program running a fully dynamic simulation. Hydrologic runoff was developed using Natural Resources Conservation Service (NRCS) TR-20 methods for infiltration, Kirpich Time of Concentration, and Clark unit hydrographs. Hydraulic computations were performed using Hydrodynamic Routing and Hazen-Williams pressure flows. The model was built to simulate flow through catch basin inlets, the network of pipes and across the watershed's streets. The existing watershed area analyzed is approximately 152.5 acres.

Land Cover & Soils:

Land cover and soils datasets were used to develop hydrologic curve numbers (CN). Land cover was determined by visual inspection of aerial photography developed by USGS and soils characteristics were obtained from USDA's current soil survey. The land cover across the study area was assumed to be either grass covered parks or dense residential. The soils within the project area consist of Urban Land and Merrimac-Urban Land as seen in the soils map from the NRCS Web Soils Survey provided in Appendix A.

Curve Numbers of 98 (paved parking and roofs), 80 (D soils, >75% grass cover), 77 (A soils, 1/8 Acre Lots, 65% impervious) and 92 (D soils, 1/8 Acre Lots, 65% impervious) were used based on the standard methods described in TR-55. These land coverage characteristics are based on the assumed ratio of impervious area across the sub-catchment. Based on the observed density of commercial and residential properties, a coverage of 85% of impervious area was assumed.

Topography:

The area that was analyzed for this project has a peak elevation of approximately 30.59 feet at the intersection of Main Street and Walden Street and a low point of -2.71 at Outfall 1at Donovan's Beach.

Catchment boundaries were developed from a high resolution, Digital Elevation Model (DEM) obtained from the Massachusetts Bureau of Geographic Information (MassGIS) and site survey (Appendix B). For existing infrastructure, this information was supplemented with GIS data, drainage maps and as-built drawing provided by the Town.

Rainfall:

The 2-year, 10-year, 25-year, 50-year and 100-year 24-hour storm events were derived from the *Northeast Regional Climate Center, Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada* (Cornell Atlas), by Cornell University. The analysis used the NRCS Type III rainfall distribution pattern, as recommended by TR-20 for the project location. Design calculations are attached to this memorandum in Appendix B.

Table 1.0: Cornell Rainfall Data

Storm Event	Rainfall (inches)
2-year	3.27
10-year	4.90
25-year	6.17
50-year	7.34
100-year	8.75

Pre-development Condition:

Ingleside Park is surrounded by Brookfield Street, Lincoln Street, Walden Street and Pleasant Street. The elevations of these streets average around 8.0' - 18.0' which is higher than Ingleside Park, with the exception of the baseball field which as high point of 8.39'. The park contains many catch basin inlets that overflow during large storm events due to tidal flows which were observed entering the municipal storm drainage system during field visits by Woodard & Curran staff.

To determine the peak flow rates and volume of stormwater runoff, the pre-development condition was analyzed at Point of Analysis 1 (PA-1) located at the pipe outfall in Donovan's Beach. In total there are 74 catchment areas analyzed in the pre-development condition which contribute to PA-1. Stormwater runoff from each of these catchments travels via overland flow to an existing catch basin where it is collected and transferred via pipe or gutter to the PA-1. A tidal curve for Outfall 1 was modeled with the following coastal information provided by Coughlin Environmental Services, LLC.

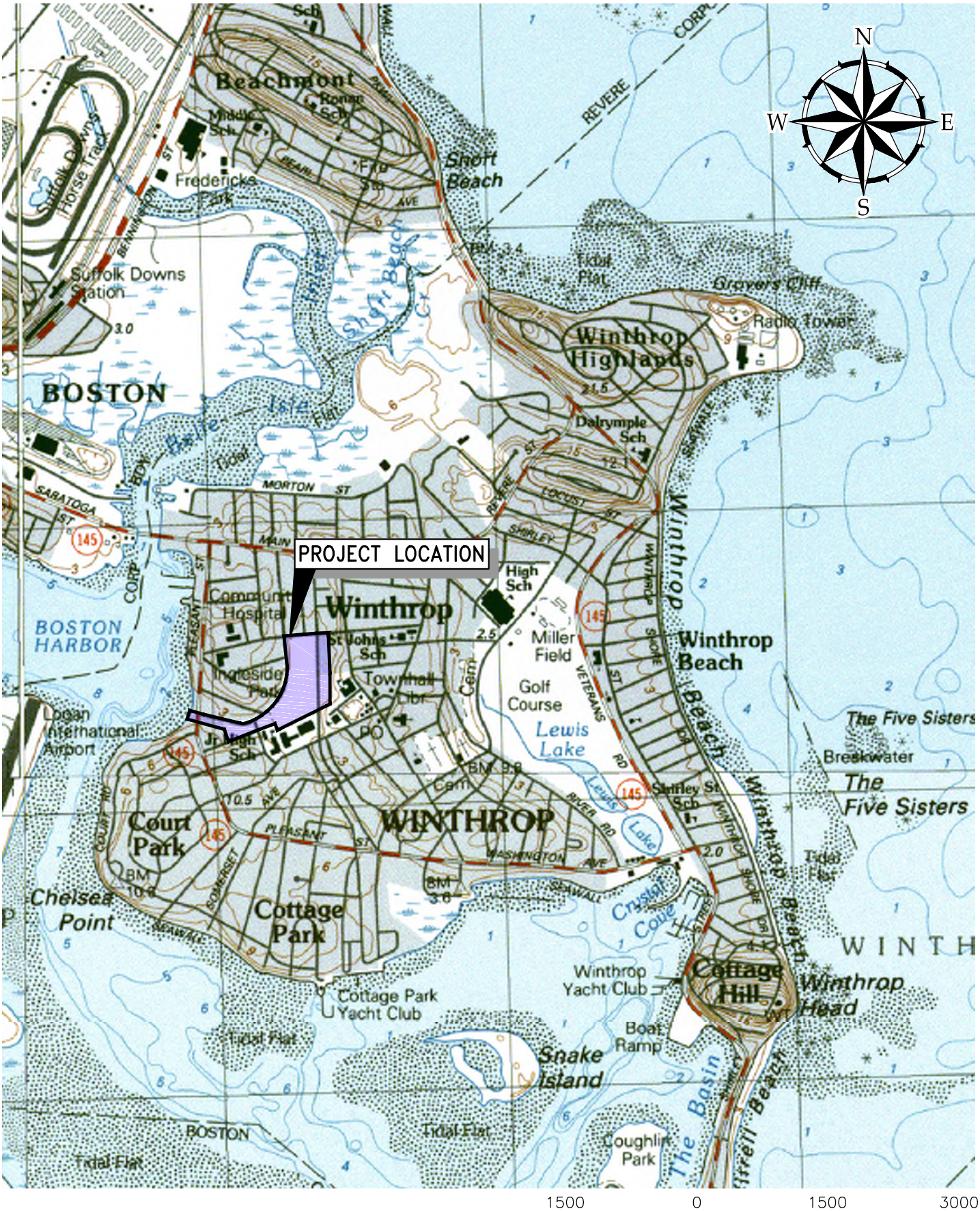
Table 1.1: Coastal Information

EVENT	NGVD 29
MHHW	5.58
MHW	5.14
NAVD 88	0.81
MLW	- 4.35
MLLW	- 4.70

Conclusions:

Based on the observed flooding of Ingleside Park and the tidal flows within the municipal stormwater system, improvements to the drainage system within Ingleside Park are necessary. Improvements including increased inlet capacity, tide gate reconstruction, underground stormwater detention and the possible reduction of the watershed areas by rerouting stormwater to other parts of the Town should be evaluated and analyzed to compare ways to improve the reliability of the system.

APPENDIX A: SUPPORTING DOCUMENTATION



WOODARD &CURRAN
35 New England Business Center
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

SITE LOCATION MAP

DESIGNED BY:	CHECKED BY:
DRAWN BY: CTK	LOCUS MAP.DWG

WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO:	231789.00
DATE:	01/31/19
SCALE:	SCALE

LOCUS

Map Scale: 1:8,190 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 14, Sep 12, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land, 0 to 15 percent slopes	23.8	15.1%
603	Urban land, wet substratum, 0 to 3 percent slopes	42.1	26.8%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	68.9	43.8%
653	Udorthents, sandy	5.4	3.4%
655	Udorthents, wet substratum	17.1	10.9%
Totals for Area of Interest		**157.3**	**100.0%**

22x34 SHEET

1:1

LEGEND

INGLESIDE PARK WATERSHED **(152.5 ACRES)**

LIMIT OF TOWN CENTER WATERSHED (56 ACRES)

200' 0 200' 400'

BAR SCALE
1" = 200'
CHECK GRAPHIC SCALE BEFORE USING

40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY:
DRAWN BY: CTK
CHECKED BY:
INGLESIDE PARK AERIAL MP.dwg

WATERSHED AERIAL MAP

TOWN OF WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 231789.00
DATE: JAN. 2019
SCALE: 1"=200'
SHEET: 1 OF 1

AERIAL

\\woodardcurran.net\shared\Projects\02320058.00 Winthrop, MA – Ingleside Park Drainage\wip\Drawings\Watershed\Ingleside Park Aerial Map.dwg, Feb 06, 2019 – 9:37am

APPENDIX B: DESIGN CALCULATIONS

22x34 SHEET
1:1

LEGEND

INGELSIDE PARK WATERSHED AREA = 152.5 ACRES

TOWN CENTER WATERSHED AREA = 56 ACRES

POINT OF ANALYSIS
OUTFALL AT DONOVAN'S BEACH
INV=-2.71

MAIN STREET
PLEASANT ST
ATLANTIC STREET
REVERE STREET
FRANKLIN STREET
MAIN STREET
CROSS STREET
LINOCLN STREET
WINTHROP STREET
INGLESIDE PARK
BROOKFIELD RD
WALDEN STREET
PAULINE STREET
CROSS STREET
RIVER ROAD
COURT ROAD
BIRCH ROAD
LOWELL RD
SOMERSET AVENUE
WOODSIDE AVENUE
WINTHROP STREET
RIVER ROAD
BOWDOIN STREET
COURT ROAD
SARGENT STREET
BARTLETT ROAD
PLEASANT ST
BATES AVENUE
WASHINGTON AVENUE

200' 0 200' 400'

BAR SCALE
1" = 200'
CHECK GRAPHIC SCALE BEFORE USING

40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE
	DESIGNED BY:	CHECKED BY:
	DRAWN BY: CTK	INGLESIDE PARK WATERSHED.dwg

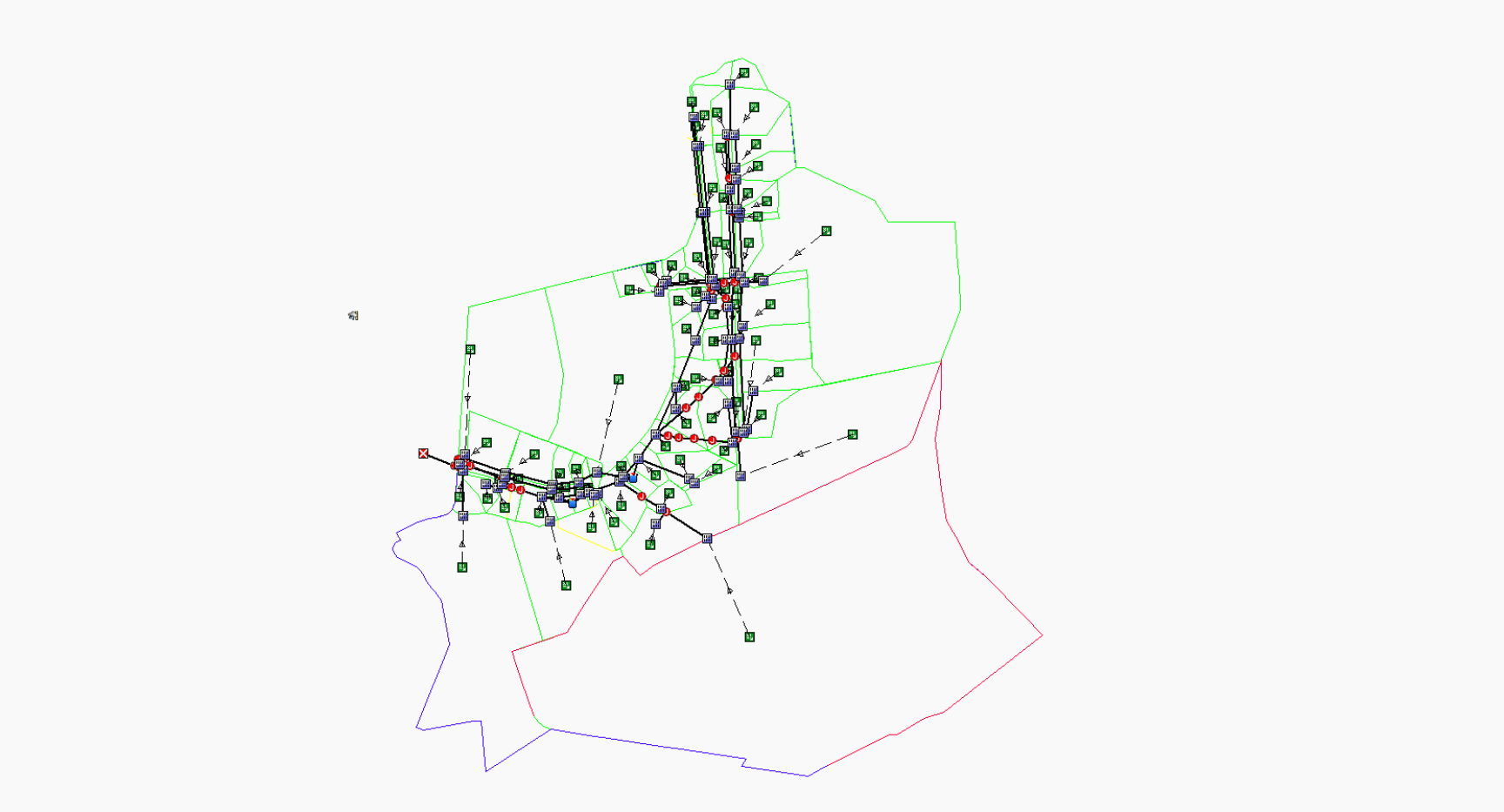
EXISTING CONDITIONS WATERSHED MAP

TOWN OF WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 232058.00
DATE: FEBRUARY 2019
SCALE: 1"=200'
SHEET: 1 OF 1

FIG. 1



COMMITMENT & INTEGRITY DRIVE RESULTS
WOODARD & CURRAN

40 Shattuck Road
Andover, MA 01810
Tel.(866)702-6371

CLIENT: Town of Winthrop, MA
PROJECT: Ingelside Park Feasability Study and Permitting Project

DESIGNED BY	CTK	DATE	1/31/2019		
CHECKED BY	JK	DATE	2/7/2019	PROJECT NO.	231789.00
REVISED BY	CTK	DATE	2/7/2019	SHEET NO.	1 of 1

SN	Element ID	Area (acres)	Drainage Node ID	Weighted Curve Number	Average Slope (%)	Flow Length (ft)	Rain Gage ID	Total Precipitation (inches)	Total Runoff (inches)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)	Runoff Volume (Acre -Feet)	Description
1	Sub-1	56.63	Town Center Model	81.00				6.20	4.04	205.51		19.065	Inflow from upstream Model
2	Sub-10	0.34	Field Inlet - (74)	80.00	0.3000	181.52	Rain Gage-01	6.17	3.94	1.37	0 00:05:00	0.112	
3	Sub-11	0.35	Field Inlet - (111)	84.00	0.3000	134.58	Rain Gage-01	6.17	4.36	1.55	0 00:05:00	0.127	
4	Sub-12	0.47	Field Inlet - (112)	84.00	0.3000	148.12	Rain Gage-01	6.17	4.36	2.05	0 00:05:00	0.171	
5	Sub-13	0.24	Field Inlet - (113)	80.00	1.0000	214.29	Rain Gage-01	6.17	3.93	0.98	0 00:05:00	0.079	
6	Sub-14	1.40	Road Inlet - (117)	92.00	1.0000	248.54	Rain Gage-01	6.17	5.24	6.95	0 00:05:00	0.611	
7	Sub-15	0.67	Field Inlet - (1)	80.00	0.3000	172.32	Rain Gage-01	6.17	3.94	2.72	0 00:05:00	0.220	
8	Sub-16	1.02	Road Inlet - (108)	92.00	1.0000	251.21	Rain Gage-01	6.17	5.24	5.05	0 00:05:00	0.445	
9	Sub-17	0.11	Road Inlet - (109)	98.00	1.0000	230.39	Rain Gage-01	6.17	5.93	0.57	0 00:05:00	0.054	
10	Sub-18	0.30	Field Inlet - (2)	80.00	0.3000	93.92	Rain Gage-01	6.17	3.93	1.22	0 00:05:00	0.098	
11	Sub-19	0.21	Field Inlet - (3)	80.00	0.3000	96.97	Rain Gage-01	6.17	3.93	0.85	0 00:05:00	0.069	
12	Sub-2	12.21	Basin Collector 2	77.00	1.0000	1245.61	Rain Gage-01	6.17	3.63	41.57	0 00:11:06	3.694	
13	Sub-20	0.38	Road Inlet - (119)	92.00	1.0000	147.82	Rain Gage-01	6.17	5.24	1.87	0 00:05:00	0.166	
14	Sub-21	0.19	Road Inlet - (1)	92.00	1.0000	112.53	Rain Gage-01	6.17	5.24	0.95	0 00:05:00	0.083	
15	Sub-22	0.08	Road Inlet - (120)	98.00	1.0000	162.18	Rain Gage-01	6.17	5.93	0.43	0 00:05:00	0.040	
16	Sub-23	0.09	Field Inlet - (4)	80.00	0.3000	80.04	Rain Gage-01	6.17	3.93	0.36	0 00:05:00	0.029	
17	Sub-24	0.89	Road Inlet - (124)	92.00	1.0000	291.26	Rain Gage-01	6.17	5.24	4.41	0 00:05:00	0.389	
18	Sub-25	0.55	Road Inlet - (123)	92.00	1.0000	293.75	Rain Gage-01	6.17	5.24	2.73	0 00:05:00	0.240	
19	Sub-26	0.95	Field Inlet - (8)	80.00	0.3000	252.01	Rain Gage-01	6.17	3.94	3.82	0 00:05:09	0.312	
20	Sub-27	0.54	Field Inlet - (10)	80.00	0.3000	150.36	Rain Gage-01	6.17	3.94	2.17	0 00:05:00	0.177	
21	Sub-28	0.36	Field Inlet - (9)	80.00	0.3000	176.29	Rain Gage-01	6.17	3.94	1.45	0 00:05:00	0.118	
22	Sub-29	0.56	Field Inlet - (11)	80.00	0.3000	185.26	Rain Gage-01	6.17	3.94	2.28	0 00:05:00	0.184	
23	Sub-3	4.11	Basin Collector 3	92.00	1.0000	534.43	Rain Gage-01	6.17	5.24	20.28	0 00:05:47	1.795	
24	Sub-30	0.77	Field Inlet - (12)	80.00	0.3000	217.66	Rain Gage-01	6.17	3.94	3.10	0 00:05:00	0.253	
25	Sub-31	0.25	Field Inlet - (13)	80.00	0.3000	219.28	Rain Gage-01	6.17	3.93	1.01	0 00:05:00	0.082	
26	Sub-32	0.68	Field Inlet - (13)	80.00	0.3000	256.69	Rain Gage-01	6.17	3.94	2.74	0 00:05:13	0.223	
27	Sub-33	0.24	Field Inlet - (86)	80.00	0.3000	105.94	Rain Gage-01	6.17	3.93	0.98	0 00:05:00	0.079	
28	Sub-34	0.72	Field Inlet - (82)	80.00	0.3000	261.35	Rain Gage-01	6.17	3.94	2.91	0 00:05:18	0.236	
29	Sub-35	1.01	Field Inlet- (96)	80.00	0.3000	251.41	Rain Gage-01	6.17	3.94	4.08	0 00:05:09	0.332	
30	Sub-36	0.20	Road Inlet - (86)	98.00	1.0000	461.00	Rain Gage-01	6.17	5.93	1.03	0 00:05:10	0.099	
31	Sub-37	0.95	Road Inlet - (106)	98.00	1.0000	164.43	Rain Gage-01	6.17	5.93	4.92	0 00:05:00	0.469	
32	Sub-38	0.28	Field Inlet - (76)	80.00	0.3000	115.48	Rain Gage-01	6.17	3.93	1.14	0 00:05:00	0.092	
33	Sub-39	0.65	Field Inlet - (77)	80.00	0.3000	252.57	Rain Gage-01	6.17	3.94	2.63	0 00:05:10	0.213	
34	Sub-4	3.33	Basin Collector 5	92.00	1.0000	333.20	Rain Gage-01	6.17	5.24	16.51	0 00:05:00	1.454	

35	Sub-40	1.62	Road Inlet - (126)	92.00	1.0000	500.00	Rain Gage-01	6.17	5.24	8.01	0	00:05:30	0.707
36	Sub-41	0.50	Field Inlet - (95)	80.00	0.3000	150.40	Rain Gage-01	6.17	3.94	2.02	0	00:05:00	0.164
37	Sub-42	0.68	Field Inlet - (73)	80.00	0.3000	133.28	Rain Gage-01	6.17	3.94	2.74	0	00:05:00	0.223
38	Sub-43	0.54	Field Inlet - (93)	80.00	0.3000	160.22	Rain Gage-01	6.17	3.94	2.17	0	00:05:00	0.177
39	Sub-44	0.37	Field Inlet - (83)	80.00	0.3000	152.70	Rain Gage-01	6.17	3.94	1.50	0	00:05:00	0.121
40	Sub-45	0.12	Field Inlet - (84)	80.00	0.3000	109.89	Rain Gage-01	6.17	3.93	0.49	0	00:05:00	0.039
41	Sub-46	0.17	Field Inlet - (72)	80.00	0.3000	114.22	Rain Gage-01	6.17	3.93	0.70	0	00:05:00	0.056
42	Sub-47	0.13	Road Inlet - (67)	98.00	1.0000	365.69	Rain Gage-01	6.17	5.93	0.66	0	00:05:00	0.064
43	Sub-48	0.24	Road Inlet- (63)	98.00	1.0000	393.04	Rain Gage-01	6.17	5.93	1.26	0	00:05:00	0.119
44	Sub-49	0.34	Road Inlet - (49)	98.00	1.0000	337.47	Rain Gage-01	6.17	5.93	1.76	0	00:05:00	0.168
45	Sub-5	9.46	Basin Collector 7	61.00	1.0000	1131.63	Rain Gage-01	6.17	2.12	18.59	0	00:10:18	1.671
46	Sub-50	0.67	Road Inlet - (48)	77.00	1.0000	295.37	Rain Gage-01	6.17	3.63	2.53	0	00:05:00	0.203
47	Sub-51	0.47	Road Inlet - (47)	92.00	1.0000	324.04	Rain Gage-01	6.17	5.24	2.32	0	00:05:00	0.205
48	Sub-52	0.16	Road Inlet - (44)	77.00	1.0000	201.50	Rain Gage-01	6.17	3.63	0.60	0	00:05:00	0.048
49	Sub-53	0.38	Road Inlet - (45)	77.00	1.0000	264.54	Rain Gage-01	6.17	3.63	1.42	0	00:05:00	0.115
50	Sub-54	0.42	Road Inlet - (46)	77.00	1.0000	245.51	Rain Gage-01	6.17	3.63	1.59	0	00:05:00	0.127
51	Sub-55	0.16	Road Inlet - (43)	92.00	1.0000	117.68	Rain Gage-01	6.17	5.24	0.79	0	00:05:00	0.070
52	Sub-56	0.60	Road Inlet - (50)	92.00	1.0000	330.69	Rain Gage-01	6.17	5.24	2.98	0	00:05:00	0.262
53	Sub-57	0.53	Road Inlet - (42)	92.00	1.0000	283.48	Rain Gage-01	6.17	5.24	2.63	0	00:05:00	0.231
54	Sub-58	0.75	Road Inlet - (41)	77.00	1.0000	314.41	Rain Gage-01	6.17	3.63	2.82	0	00:05:00	0.227
55	Sub-59	0.99	Road Inlet - (40)	77.00	1.0000	445.11	Rain Gage-01	6.17	3.63	3.73	0	00:05:01	0.299
56	Sub-6	15.94	Basin Collector 8	77.00	1.0000	740.81	Rain Gage-01	6.17	3.63	58.08	0	00:07:26	4.822
57	Sub-60	1.26	Road Inlet - (39)	77.00	1.0000	316.60	Rain Gage-01	6.17	3.63	4.75	0	00:05:00	0.381
58	Sub-61	0.45	Road Inlet - (27)	77.00	1.0000	206.64	Rain Gage-01	6.17	3.63	1.69	0	00:05:00	0.136
59	Sub-62	0.32	Road Inlet - (57)	98.00	1.0000	398.26	Rain Gage-01	6.17	5.93	1.66	0	00:05:00	0.158
60	Sub-63	0.41	Road Inlet - (38)	92.00	1.0000	238.33	Rain Gage-01	6.17	5.24	2.03	0	00:05:00	0.179
61	Sub-64	0.65	Road Inlet - (55)	92.00	1.0000	377.33	Rain Gage-01	6.17	5.24	3.24	0	00:05:00	0.284
62	Sub-65	0.03	Road Inlet - (56)	98.00	1.0000	144.54	Rain Gage-01	6.17	5.91	0.17	0	00:05:00	0.015
63	Sub-66	0.09	Road Inlet - (51)	98.00	1.0000	326.44	Rain Gage-01	6.17	5.93	0.47	0	00:05:00	0.044
64	Sub-67	0.62	Road Inlet - (52)	92.00	1.0000	327.48	Rain Gage-01	6.17	5.24	3.08	0	00:05:00	0.271
65	Sub-68	0.37	Road Inlet - (37)	95.00	1.0000	257.84	Rain Gage-01	6.17	5.58	1.90	0	00:05:00	0.172
66	Sub-69	0.27	Road Inlet - (58)	92.00	1.0000	184.76	Rain Gage-01	6.17	5.24	1.33	0	00:05:00	0.118
67	Sub-70	0.24	Road Inlet - (61)	92.00	1.0000	201.15	Rain Gage-01	6.17	5.24	1.21	0	00:05:00	0.105
68	Sub-71	0.50	Road Inlet - (62)	92.00	1.0000	351.91	Rain Gage-01	6.17	5.24	2.48	0	00:05:00	0.218
69	Sub-72	0.54	Road Inlet - (54)	92.00	1.0000	342.02	Rain Gage-01	6.17	5.24	2.67	0	00:05:00	0.236
70	Sub-73	1.57	Road Inlet- (88)	98.00	1.0000	272.56	Rain Gage-01	6.17	5.93	8.14	0	00:05:00	0.776
71	Sub-74	1.27	Road Inlet - (105)	83.45	1.0000	391.55	Rain Gage-01	6.17	4.30	5.50	0	00:05:00	0.455
72	Sub-7s	6.80	Basin Collector 1	77.00	1.0000	883.51	Rain Gage-01	6.17	3.63	24.33	0	00:08:31	2.057
73	Sub-8	0.46	Road Inlet - (115)	77.00	1.0000	221.38	Rain Gage-01	6.17	3.63	1.74	0	00:05:00	0.139
74	Sub-9	10.33	Basin Collector 4	86.38	1.0000	1198.63	Rain Gage-01	6.17	4.61	43.66	0	00:10:46	3.968
	Total :	**153.15**						**Total:**	**337.41**		**Total:**		**51.643**
											Total Runoff (inch)		**4.046**

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	70.988 degrees West
Latitude	42.378 degrees North
Elevation	0 feet
Date/Time	Tue, 11 Dec 2018 09:05:59 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.70	0.87	1.10	**1yr**	0.75	1.04	1.28	1.64	2.11	2.73	3.02	**1yr**	2.42	2.90	3.32	4.02	4.70	**1yr**
2yr	0.35	0.54	0.67	0.89	1.11	1.41	**2yr**	0.96	1.28	1.63	2.05	2.59	3.27	3.63	**2yr**	2.90	3.49	4.00	4.75	5.39	**2yr**
5yr	0.42	0.65	0.81	1.09	1.39	1.77	**5yr**	1.20	1.62	2.06	2.60	3.27	4.12	4.61	**5yr**	3.64	4.43	5.06	6.00	6.73	**5yr**
10yr	0.47	0.74	0.93	1.26	1.64	2.11	**10yr**	1.42	1.92	2.47	3.12	3.91	4.90	5.53	**10yr**	4.34	5.32	6.04	7.16	7.97	**10yr**
25yr	0.56	0.88	1.12	1.55	2.05	2.66	**25yr**	1.77	2.42	3.11	3.94	4.95	6.17	7.03	**25yr**	5.46	6.76	7.65	9.05	9.97	**25yr**
50yr	0.62	1.00	1.29	1.80	2.43	3.18	**50yr**	2.10	2.89	3.74	4.73	5.92	7.34	8.43	**50yr**	6.50	8.11	9.14	10.81	11.82	**50yr**
100yr	0.72	1.16	1.50	2.12	2.88	3.79	**100yr**	2.49	3.44	4.46	5.65	7.07	8.75	10.13	**100yr**	7.75	9.74	10.93	12.92	14.02	**100yr**
200yr	0.82	1.33	1.73	2.48	3.42	4.52	**200yr**	2.95	4.10	5.34	6.77	8.45	10.43	12.17	**200yr**	9.23	11.70	13.08	15.44	16.63	**200yr**
500yr	0.98	1.62	2.11	3.06	4.29	5.72	**500yr**	3.70	5.17	6.76	8.58	10.70	13.17	15.52	**500yr**	11.65	14.92	16.59	19.56	20.86	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.25	0.39	0.47	0.64	0.78	0.87	**1yr**	0.68	0.85	1.17	1.44	1.79	2.54	2.58	**1yr**	2.25	2.48	2.76	3.30	4.29	**1yr**
2yr	0.33	0.51	0.63	0.86	1.06	1.26	**2yr**	0.91	1.23	1.45	1.93	2.50	3.17	3.50	**2yr**	2.80	3.37	3.86	4.60	5.22	**2yr**
5yr	0.39	0.60	0.75	1.03	1.31	1.52	**5yr**	1.13	1.48	1.73	2.25	2.89	3.79	4.21	**5yr**	3.35	4.05	4.64	5.53	6.22	**5yr**
10yr	0.44	0.67	0.83	1.16	1.50	1.75	**10yr**	1.30	1.71	1.99	2.52	3.23	4.35	4.81	**10yr**	3.85	4.63	5.34	6.33	7.06	**10yr**
25yr	0.50	0.77	0.95	1.36	1.79	2.09	**25yr**	1.55	2.04	2.36	2.94	3.75	5.22	5.75	**25yr**	4.62	5.53	6.42	7.60	8.32	**25yr**
50yr	0.56	0.85	1.06	1.53	2.05	2.40	**50yr**	1.77	2.35	2.69	3.30	4.19	6.03	6.56	**50yr**	5.33	6.31	7.40	8.72	9.69	**50yr**
100yr	0.63	0.95	1.19	1.72	2.36	2.74	**100yr**	2.04	2.68	3.06	3.72	4.69	6.95	7.48	**100yr**	6.15	7.19	8.54	10.00	11.07	**100yr**
200yr	0.71	1.07	1.35	1.96	2.73	3.15	**200yr**	2.36	3.08	3.49	4.18	5.25	8.03	8.54	**200yr**	7.11	8.21	9.87	11.43	12.68	**200yr**
500yr	0.83	1.24	1.59	2.32	3.30	3.77	**500yr**	2.84	3.69	4.15	4.87	6.09	9.77	10.16	**500yr**	8.64	9.77	11.99	13.69	15.19	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.31	0.47	0.57	0.77	0.95	1.12	**1yr**	0.82	1.09	1.31	1.77	2.26	2.89	3.24	**1yr**	2.55	3.12	3.56	4.29	5.05	**1yr**
2yr	0.36	0.56	0.69	0.93	1.15	1.36	**2yr**	0.99	1.33	1.57	2.08	2.69	3.40	3.79	**2yr**	3.01	3.65	4.17	4.97	5.62	**2yr**
5yr	0.45	0.70	0.86	1.18	1.51	1.79	**5yr**	1.30	1.75	2.07	2.69	3.44	4.44	5.04	**5yr**	3.93	4.84	5.52	6.51	7.29	**5yr**
10yr	0.55	0.85	1.05	1.46	1.89	2.20	**10yr**	1.63	2.15	2.56	3.28	4.14	5.44	6.27	**10yr**	4.81	6.03	6.83	8.02	8.91	**10yr**
25yr	0.72	1.09	1.35	1.93	2.55	2.90	**25yr**	2.20	2.83	3.40	4.25	5.30	7.11	8.41	**25yr**	6.29	8.09	9.07	10.60	11.66	**25yr**
50yr	0.87	1.32	1.65	2.37	3.18	3.59	**50yr**	2.75	3.51	4.21	5.19	6.41	8.72	10.52	**50yr**	7.72	10.11	11.23	13.09	14.07	**50yr**
100yr	1.06	1.61	2.02	2.91	3.99	4.42	**100yr**	3.45	4.32	5.23	6.34	7.73	10.68	13.17	**100yr**	9.45	12.66	13.91	16.18	17.19	**100yr**
200yr	1.30	1.95	2.48	3.58	5.00	5.47	**200yr**	4.31	5.34	6.50	7.72	9.31	13.08	16.51	**200yr**	11.57	15.87	17.21	20.01	21.01	**200yr**
500yr	1.70	2.52	3.25	4.72	6.71	7.22	**500yr**	5.79	7.06	8.68	10.05	11.95	17.07	22.24	**500yr**	15.11	21.38	22.78	26.53	27.40	**500yr**

Powered by ACIS Northeast Regional Climate Center

APPENDIX F: ALTERNATIVE IDENTIFICATION AND PERFORMANCE EVALUATION MEMORANDUM

COMMITMENT & INTEGRITY
DRIVE RESULTS

40 Shattuck Road | Suite 110
Andover, Massachusetts 01810
www.woodardcurran.com

T 866.702.6371
T 978.557.8150
F 978.557.7948

MEMORANDUM

TO: Patricia Bowie; Coastal Resiliency Specialist – MA Office of Coastal Zone Management

FROM: Woodard & Curran

CC: Steven Calla, Director of Public Works, Town of Winthrop, MA

Date: April 15, 2019

RE: Ingleside Park Feasibility Study and Permitting
Task 5.1 Identify Alternatives & Evaluate Performance

---

1. BACKGROUND

The Town of Winthrop, Massachusetts (Town) has been awarded a Coastal Zone Management (CZM) grant to complete a feasibility study, conceptual design, and permitting assessment for the drainage infrastructure within Ingleside Park and the outfall at Donovan's Beach. Task 5.1 of the grant includes an alternative analysis which aims to evaluate potential alternatives to increase resiliency and reduce the frequency of flooding within the watershed. This memorandum summarizes work completed under *Task 5.1 Identify Alternatives & Evaluate Performance* of the CZM grant.

2. METHODOLOGY

Improvements to the closed drainage system within Ingleside Park and surrounding areas were proposed to increase the capacity of the system and reduce surface flooding. This was done by increasing pipe diameters, increasing inlet grate capacities, installing a precast sub-surface detention basin, installing a pump station, and replacing the existing tide gate and outfall pipe. Based on modeling results, these proposed improvements will detain water and reduce surface flooding caused by increased storm intensities seen during recent years and lack of outlet capacity due to the limited gradient in the system and tidal tailwater conditions.

Drainage Analysis:

We analyzed and compared drainage patterns under existing conditions to various alternatives. The proposed alternatives were analyzed using Autodesk's, Storm and Sanitary Analysis Program running a fully dynamic simulation. This software utilizes the U.S. Environmental Protection Agency (EPA) Stormwater Management Model (SWMM) engine and is equivalent to the SewerGEMS and Infoworks RS/CS, allowing us to model individual pipe runs and inlets. Hydraulic modeling software capable of modeling dual drainage systems (i.e., surface drainage hydrology and closed underground pipe networks) was necessary to simulate the drainage system in detail, including drainage inlets which often limit flow into systems. The modeling software used to evaluate existing and proposed conditions is the same software that has been used to design other recent stormwater system improvements for the Town.

Runoff:

Hydrologic runoff was developed using Natural Resources Conservation Service (NRCS) TR-20 methods for infiltration, Kirpich Time of Concentration and NRCS unit hydrographs. Hydraulic computations were done using Hydrodynamic Routing and Hazen-Williams pressure flows. Using field data from recent topographic surveys and Town record drawings, the simulation was built to simulate flow through inlets, system pipe network and streets as needed to properly evaluate the system.

The total area analyzed was approximately 153 acres in both the existing and proposed conditions. While the total area analyzed was held constant, the sub-catchment areas that comprise the larger watershed were modified to reflect changes to the drainage patterns resulting from proposed new or relocated catch basins.

Land Cover & Soils:

Land cover and soils datasets were used to develop hydrologic curve numbers. Land cover was determined by visual inspection of aerial photography collected by U.S. Geological Survey (USGS) and soils characteristics were obtained from U.S. Department of Agriculture (USDA's) current soil survey. Study area land cover was found to be heavy commercial/urban or dense residential. The soils within the project area consist of Urban Land and Merrimac-Urban Land as seen in soils map provided in Appendix A.

Curve Numbers (shown below) were developed using NRCS (TR55) Standard methods.

Land Cover	Soils	Imperviousness	CN
Paved Parking and Roofs	N/A	85% Impervious	98
Over 75% Grass Cover	D soils	Low	80
1/8 Acre Lots	A Soils	65% Impervious	77
1/8 Acre Lots	D Soils	65% Impervious	92

Land cover and soils will not change from existing to proposed, so the above curve numbers were used for both existing and proposed condition analyses.

Topography:

The area that was analyzed for this project has a peak elevation of approximately 30.59 feet at the intersection of Walden Street and Main Street and a low point of -2.71 at Donovan's Beach Outlet. Catchment boundaries were developed from a high resolution, Digital Elevation Model (DEM) obtained from the Massachusetts Bureau of Geographic Information (MassGIS) and site survey prepared by Coughlin Environmental LLC. For existing infrastructure, this information was supplemented with GIS data, drainage maps and as-built drawings provided by the Town.

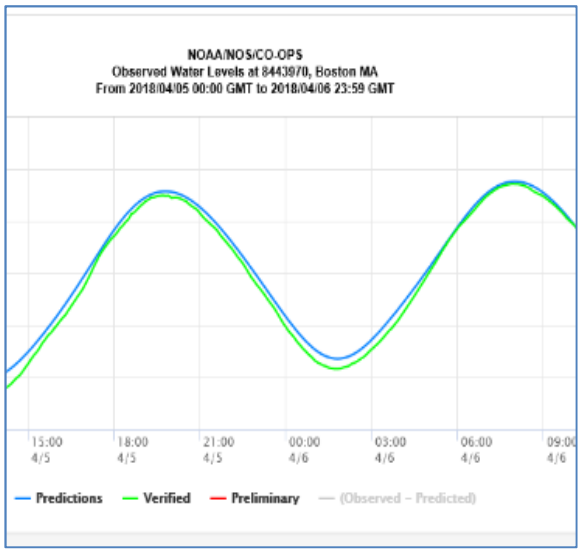
Rainfall:

Rainfall depths were obtained from the *Northeast Regional Climate Center, Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada* (Cornell Atlas), by Cornell University. The analysis used the NRCS Type III rainfall distribution pattern, as recommended by TR-20 for the project location. Rain events (listed below) were assumed to have a duration of 24-hours.

Annual Chance Occurrence (Event)	Rainfall Depth (inch)
20% (5-Year)	4.12
10% (10-Year)	4.90
4% (25-Year)	6.17
2% (50-Year)	7.34

Outfall Tailwater:

The outfall tailwater levels are set with a tidal curve derived from tide elevation data collected at National Oceanic and Atmospheric Administration (NOAA) tide gauge 8443970 (Boston, MA) (example shown to right). The curve derived from an early spring tide was shifted to match the mean higher, high water (MHHW) mark of 4.77 feet (North American Vertical Datum [NAVD], 1988). The MHHW mark elevation was developed as part of the outlet evaluation and design. Sea level rise was accounted for by increasing the tidal curve elevations by the estimated amount of rise (36-inch) developed as part of the Boston Harbor Flood Risk (BH-FR) Model develped in 2015 to look at extreme weather and climate change. Alternative effectieness was then evaluated by simulating drainage system response to both the current and future tidal conditions.



Proposed Improvements

Three alternative drainage system improvements were evaluated for this report. The improvements were cumulative, where additional improvements were added to each alternative.

- Alternative 1: Includes upgrades to the pipe network and collection system, adding capacity.
- Alternative 2: Includes improvements identified in Alternative 1 with the addition of an underground precast concrete detention basin to provide additional storage during high tide cycles.
- Alternative 3: Includes improvements identified in the first two alternatives with the addition of a pump station. The pump station is intended to provide drainage during high tide cycles or under elevated sea level conditions.

Details for each alternative are outlined below.

Alternative 1: Capacity Improvements:

Outfall Replacement

Improvements to replace the broken tide gate and upgrade the existing outfall pipe at Donovan's Beach are recommended under Alternative 1. For the analysis, the outfall pipe was increased to a 60-inch diameter pipe to increase available flow capacity. We also assumed that the existing tide gate would be replaced with a tide gate capable of allowing stormwater to freely flow out of the municipal drainage system while preventing tidal influx. During final design, the need to utilize multiple smaller diameter outfall pipes, due to cover limitations, will be considered if Alternative 1 is selected. The smaller diameter outfall pipes will have the equivalent flow capacity as the 60-inch outfall modeled in our analysis.

Pipeline Capacity

The Town replaced failing storm drain infrastructure in 2012 beginning at the tide gate structure to approximately 500 linear feet upstream of the tide gate structure. The existing drain in this location was replaced with a new 60-inch high-density polyethylene (HDPE) pipe and new manhole structures. The remaining storm drain trunk line from the manhole in Ingleside Park near the intersection of Read Street and Lincoln Street to the section replaced in 2012 is believed to be a combination of various drain sizes ranging from 18-inch diameter pipe to 48-inch x 38-inch box drain based on record information. For the analysis of Alternative 1, we assumed the existing storm drain trunk line, upstream of the 2012 improvements, would be replaced with an elliptical 48-inch x 76-inch pipe or multiple smaller diameter pipes with equivalent capacity. Elliptical pipe or other lower profile options is recommended to work within the existing cover limits and limited fall of run. Increasing the existing pipe diameter will allow for adequate capacity in the storm drain system during low tidal elevations.

Walden Street Improvements

The drain inlet at the municipal parking lot adjacent to the basketball courts on Walden Street will be upgraded under Alternative 1 to increase inlet capacity. Upgrades to the basins in this area have been designed to reduce flooding on the basketball parking lot and eliminate ponding in the neighboring apartment complex lot to the north.

The upgrades include the addition of drop inlets, with high flow grates, that would connect to a new 24-inch trunk line. The north-end inlet would be sized to accommodate inflow from the adjacent parking lot and the drainage infrastructure located within it. Pipe outlets to street system would be upgraded to 24-inches in diameter with a one-way check valve to prevent backflow into the parking lot. It should be noted that the northern catch basin in this parking lot is the lowest inlet in system upstream of Wheelock Street.

Inlet Capacity Improvements

To improve the ability of the drainage system to capture stormwater runoff, the proposed design includes two measures that will increase the intake capacity of the system. The first measure is the installation of catch basin grates with greater open area when compared to the current standard grate utilized by the Town. The selected grate is proposed to be "Sag" Neenah Foundry R-3571-A and "On Grade" Neenah Foundry R-3570 Type A or equivalent. This grate has an open area of approximately 2.4 square feet (sf) versus the existing grates which has approximately 1.0 sf of open area. The second measure was to add multiple inlet grates to catch basins that will receive excessive flow. This condition typically occurs where flow from private property could not be intercepted in another way.

Other Pipe Capacity Upgrades

The model predicts most of the stormwater runoff is conveyed throughout the project area via overland flow and through the streets. A new line would be added to the system running north, along the west side of Ingleside Park (see photo to the right) picking up water running down Beal, Read and Walden Streets and collecting on Lincoln Street. This system is intended to help keep water off Walden Street and out of the apartment parking lot to the east.

Pipe upgrades are assumed from Pauline Street to the main trunk line in Ingleside Park at Wheelock Street to increase capacity of the Town Center system. The proposed upgrades include an increase in capacity equivalent to a 48-inch x 76-inch elliptical pipe to account for minimal cover over a long run. For this assessment, the pipe alignment leading from Town Center was unchanged and is still under the building north of Pauline Street.

Existing drainage runs under Ingleside Park baseball field were upgraded to eliminate adverse slopes and increase capacity of runs. The upgrade was designed with 18-inch to 36-inch pipes.

Alternative 2: Underground Detention Basin:

A 2 million-gallon, precast concrete underground detention basin (StormTrap Single Trap), measuring approximately 4 feet x 260 feet x 292 feet would be constructed under the ballfield in Ingleside Park (approximate location shown to the left). A concrete precast tank was determined the most viable material for storage chambers when compared to plastic chambers due to the amount of added void space within the system and the concerns with high groundwater. A minimum 36-inch pipe size was used to convey water from the existing system branches into the tank.

To size the underground basin, it was assumed that the recently designed Town Center improvements, which are scheduled to go to construction in August of 2019, have been completed and outflows from modelling performed to design storm drain improvements in that project were used as an inflow for the existing and proposed models for this study.

Alternative 3: Pump and Force Main to Ocean:

A pump and force main were assumed to be constructed to allow the drainage system to discharge stormwater to the ocean under tidal conditions. The pump curve used to model the pumps are for 500 and 1,000 gallon per minute units (Flygt N 3069 & N 3102). Simulations were run assuming pumps would convey stormwater from the tank to the ocean directly, but final design will have pump station discharge to ocean side of tide gate enclosure.

Alternative Analysis and Results

The alternatives listed above were simulated with tidal conditions controlling the backwater on the system. The simulations were then run again to determine the impact of sea level rise on the alternatives. For each run, depth and elevations were observed at five key locations shown below. The locations show below are:

1. Inlet at north end of Walden Street municipal parking lot.
2. Catch basin on north end of system on Walden Street.
3. Ponding area just downstream of Wheelock Street.
4. Ponding area on top of or storage tank in the fields of Ingleside Park.
5. Inlet just downstream of lower ponding area.

Existing Condition:

Existing conditions were analyzed to establish a baseline for surface flooding at Ingleside Park and the surrounding areas. There were 74 catchment areas analyzed under existing conditions. Water from each of these catchments travels via overland flow to an existing catch basin where it is collected and transferred via pipe or gutter to the next point of analysis. Water exited the system at Donovan's Beach. A function flap gate was assumed at the outlet of system, preventing backflow.

Existing condition modeling indicates there is limited capacity in the current system. Additionally, it showed that for flows higher than the 10-year event, water uses streets as its primary flow path to Ingleside Park.

Proposed Conditions:

Proposed conditions analyzed each Alternative discussed above. There were 74 catchment areas analyzed under proposed conditions. Water from each of these catchments travels via overland flow to an existing catch basin where it is collected and transferred via pipe or gutter to the next point of analysis.

For each alternative analysis, we assumed the drainage improvements proposed in the Town's Center Business District Infrastructure Improvements Project have been completed. The 22-inch brick channel has been revised to a 48-inch x 76-inch oval pipe conveying water for the system as described above.

3. CONCLUSION

Our modeling and analyses were based on the 25-year design storm and considered projected sea level rise. There were multiple constraints that drove our analyses and limited the feasible mitigation alternatives. The most significant constraint was related to the existing topography. In the area of analysis, most of the existing drainage system and catch basin inlets are below the 4.77-foot MHHW elevation. As a result, the existing system does not drain during rising tides. Instead stormwater entering the system is contained within the drainage system until it reaches capacity, at which point stormwater runoff ponds until the tide subsides to a level that allows the system to drain. The lack of a properly functioning tide gate appears to further reduce the limited system capacity by allowing tidal influx. The severity and frequency of flooding that currently occurs is expected to increase with projected sea level rise. We considered multiple alternatives to mitigate the issues in this watershed but due to the topography limitations and concerns related to sea level rise, the three alternatives provided herein were determined to be the most feasible alternatives to consider.

Of the alternatives analyzed, Alternative 3 provides greatest flood mitigation improvements for the 25-year design storm and projected sea level rise used in our analysis. The combination of additional storage capacity, a pump and a properly functioning tide gate provides needed storage during smaller storm events, limits capacity reduction in the system created by tidal influx, and provides the ability to drain the system when storms occur during rising tide cycles, or for larger storms that exceed the systems storage capacity.

This alternative will result in increased short-term and long-term operation and maintenance costs for the Town. The Town will incur electrical costs, additional annual maintenance costs related to maintaining the pump and replacement costs once the pump has reached its useful life. It is recommended that a cost-benefit analysis be completed during design to optimize the pump size and size of the underground detention basin if this alternative is selected. Should the Town decide that the additional operation, maintenance and replacement costs associated with Alternative 3 are undesirable, Alternative 2 can provide flood mitigation improvements and reduce the frequency and extent of flooding that is currently experienced. However, while the frequency and extent of flooding is reduced under Alternative 2, flooding is expected to occur for the 10-year or greater design storms.

Woodard & Curran also reviewed green infrastructure systems to determine whether acceptable alternative stormwater treatment measures could be implemented. Unfortunately, with the limited availability of public land and workable space in the head waters of this drainage basin, we could not determine a feasible green infrastructure option capable of treating the volume of flow for this watershed. We recommend considering tree box filters strategically placed at catch basin inlets in and around the park to provide some treatment for stormwater runoff.

Woodard & Curran reviewed sampling and analysis results completed under the Town's Illicit Discharge Detection and Elimination (IDDE) program to determine if a treatment system should be considered to treat bacteria in the stormwater system. Elevated bacteria readings have been obtained at Donovan's Beach, located at the outfall of the study area, during periodic sampling. The Town's IDDE sampling work included sampling the storm drain system tributary to the Ingleside Park storm drain system.

This area, locally identified as the Town Center, will undergo replacement of existing sewer, water and storm drain infrastructure. Construction is anticipated to begin in August of 2019. Due to the planned

infrastructure improvements and additional work that will be completed under the Town's IDDE program to identify the source of illicit discharges, we do not recommend considering a stormwater treatment system for bacteria at this time. Instead, we recommend the Town continues its IDDE work, complete construction of the proposed infrastructure improvements and re-samples the initial sample locations. It is anticipated that the illicit discharge sources will be removed by the infrastructure improvements and IDDE work and that these improvements may reduce or even eliminate the bacteria concerns at Donovan's Beach.

APPENDIX G: GREEN INFRASTRUCTURE SYSTEMS REVIEW

COMMITMENT & INTEGRITY
DRIVE RESULTS

40 Shattuck Road | Suite 110
Andover, Massachusetts 01810
www.woodardcurran.com

T 866.702.6371
T 978.557.8150
F 978.557.7948

MEMORANDUM

TO: Erikk Hokenson; Coastal Resiliency Specialist – MA Office of Coastal Zone Management

FROM: Woodard & Curran

CC: Steven Calla, Director of Public Works, Town of Winthrop, MA

Date: May 10, 2019

RE: Ingleside Park Feasibility Study and Permitting
Task 5.1 Identify Alternatives & Evaluate Performance

This memorandum responds to Erikk Hokenson's (Coastal Zone Management, CZM) April 24, 2019 email comments regarding CZM's concern with the limited use of green infrastructure techniques for the Ingleside Park Feasibility Study and Permitting Project. As apart of the Task 5.1 Alternative Analysis Evaluation, Woodard & Curran reviewed green infrastructure systems to determine whether acceptable alternative stormwater treatment measures could be implemented within the referenced project. With the limited availability of public land and workable space; none were determined a feasible option of treating the large volume of flow required for this watershed.

Woodard and Curran reviewed the following green infrastructure systems during the Task 5.1 evaluation.

Permeable Pavement

Permeable Pavement is designed to allow percolation or infiltration of stormwater through the surface into the soil below where stormwater is naturally filtered, and pollutants are removed. Permeable pavement was determined to be a non-viable option for this project because of the anticipated level of groundwater in the area would restrict the effectiveness of the system.

One of the few bituminous concrete pavement areas that were looked at for permeable or porous pavement was the Walden Street Basketball Court parking lot. The parking lot has an approximate area of 12,300 sf, consisting of 22 parking spaces. Permeable pavement could be used in this location to aid in flood protection, but alone, it would not provide enough infiltration for the desired 25-year storm event

Another area suitable for permeable or porous pavement is the paved parking strip that runs through Ingleside Park between the existing Middle School and Edgehill Road. This parking strip runs parallel to Wheelock Street and is a two-way drive to the Middle School rear parking lot. This two-way drive is approximal 8,675 sf and contains 14 parallel parking spots. The rear parking lot of the Middle school is approximately 16,300 sf and contains 22 spaces and an additional 6 spaces at a loading dock.

One other area that may be an option for permeable pavement would be the Pillar House Apartments parking lot, located at 11, 7 and 5 Walden Street. The parking lot is adjacent to the Walden Street Basketball court parking lot but is located on private property and not included within the project scope limits.

Constructed Stormwater Detention Basin

Above ground detention basins are designed to allow large amounts of rain water to enter the basin and slowly discharge water through an outlet structure in a controlled manner. While the park itself is a large open area, an above ground detention basin that is sized to mitigate the effects of the 25-year storm

cannot be sited here without significantly impacting the public recreational areas which is utilized for recreational sports, town fairs and summer programs.

Rain Garden / Bioretention Systems

Rain gardens or bioretention systems, are filtration devices that are designed to hold, filter, and sometimes infiltrate rain water runoff from smaller contributing area such as roofs, driveways, patios or lawns. While Ingleside Park has enough greenspace to propose multiple small rain gardens sporadically throughout the park, the high groundwater and large area of the park make such systems non-viable methods of stormwater treatment due to the number of systems that would be required to treat the park area. In addition, the maintenance required for such systems would be a significant long-term burden to the Town.

Tree Box Filters

Tree Box Filters are self-contained bioretention systems that are designed to collect rain water by diverting runoff form the into a cut into the curb. They can be enhanced with specially engineered soils and native plant species to absorb water and filter pollutants. Tree box filter systems are ideal for urban settings such as Winthrop, MA but are designed only to treat small drainage areas similar to a typical catch basin (<0.1 acre). Large watersheds, like the one for Ingleside Park, can be treated by uniformly distributing many units thought out the proposed stormwater design. It should be noted that tree box filters do not provide flood mitigation and thus supplemental storage would still be required.

The current conceptual design plan proposes the use of the Filterra units by Contech Stormwater Solutions and proposes 15 units along the Brookfield Road gutters. This method alone would not be able to provide treatment for the entire 156-acre watershed but would provide some level of treatment, the proposed Filterra locations were chosen in close proximity to existing catch basins to collect bypass flows and other downhill locations were runoff can be received.

Bioswale

Similar to ran gardens, bioswales are designed to capture and convey water, while allowing it to infiltrate the ground slowly over a period of 24 to 48 hours. While Ingleside Park has enough greenspace to propose a bioswale, the underlying soils having low infiltration rates and high groundwater make these options ineffective for flood mitigation for such large storm events

Shoreline Sand Dunes

The project's outfall is located at Simon J. Donovan Beach where the existing drainage system discharges from a 30" RCP pipe into the ocean. Donovan's beach contains an existing seawall, approximately 310 linear feet, that runs along almost the entire length of the public beach. The existing seawall is no greater than 3 feet at any location. Sand dunes are designed to prevent or delay flooding of inland areas and damage to inland structure. Sand dunes were not considered a viable alternative for Donovan's beach because of square footage required for installation would leave limited space for recreational use.

Conclusion

The above green infrastructure measures would be beneficial to retain the volume of runoff that would be generated by a 1 or 2-year storm event. Woodard & Curran does not believe that the initial cost and annual maintenance associated with the above systems would be beneficial for this project due to the historic level of flooding experienced in this area. Installing multiple green infrastructure systems designed to treat less than one acre of stormwater runoff is not efficient for a watershed sized 156 acres. Woodard

and Curran recommends that the most effective method of flood protection for the 25-year storm event and future increasing storm intensities is to install a subsurface stormwater tank. Woodard & Curran is open to discussing the above alternatives or others that may not have been considered with the Town and representatives from Coastal Zone Management to determine if additional green infrastructure measures are feasible and cost effective for the 25-year design storm and the size of this watershed.

APPENDIX H: CONCEPTUAL DESIGN DRAWINGS

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS
INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

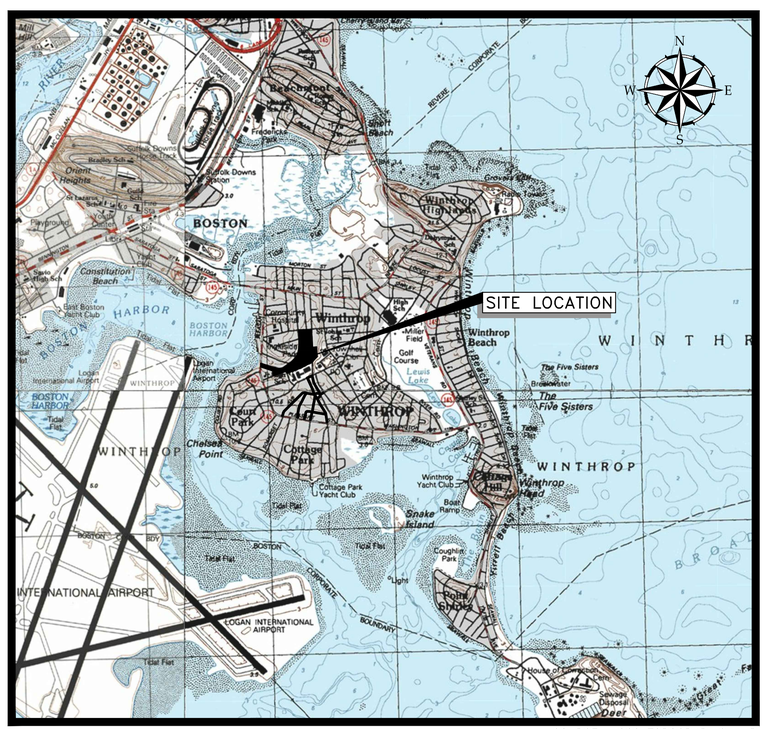
PROJECT NO. 231789

APRIL 2019

NOT FOR CONSTRUCTION

PROJECT LOCATION MAP

WOODARD & CURRAN
40 SHATTUCK ROAD, SUITE 110
ANDOVER, MASSACHUSETTS 01810
866-702-6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS



SITE LOCATION MAP

SOURCE: USGS TOPOGRAPHIC MAP

SCALE: 1" = 2,000'

GENERAL:

1. COMPLY WITH CURRENT MASSACHUSETTS DEPARTMENT OF HIGHWAY DIVISION CONSTRUCTION STANDARDS AND SPECIFICATIONS AS INDICATED IN THE GENERAL REQUIREMENTS AND IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL CODES.
2. IMPLEMENT EROSION AND WATER CONTROL MEASURES PER THE GENERAL REQUIREMENTS.
3. SUBMIT TRAFFIC AND PEDESTRIAN CONTROL PLANS AND IMPLEMENT TRAFFIC AND PEDESTRIAN CONTROL MEASURES PER THE GENERAL REQUIREMENTS.
4. IMPLEMENT DAILY MEASURES FOR SAFETY, SECURITY AND PROTECTION OF THE WORK AT THE END OF EACH DAY PER THE GENERAL REQUIREMENTS.
5. CONSTRUCTION EQUIPMENT, CONSTRUCTION VEHICLES AND WORKER'S PERSONAL VEHICLES MAY NOT BE PARKED IN PUBLIC PARKING SPACES OR LOTS OR ON PRIVATELY-OWNED LOTS UNLESS PERMISSION HAS BEEN GRANTED IN WRITING BY OWNER.
6. CONTRACTOR IS RESPONSIBLE FOR LOCATING AND SECURING AN AREA(S) TO STORE MATERIALS AND EQUIPMENT. STAGING AREA WILL NOT BE PROVIDED BY OWNER.
7. STORE MATERIALS WHICH COULD BE A POTENTIAL SOURCE OF STORM WATER POLLUTION SUCH AS GASOLINE, DIESEL, FUEL, HYDRAULIC OIL, ETC. IN A STORAGE TRAILER OR COVERED LOCATION OR TAKE OFF-SITE AT THE END OF EACH DAY. LEGALLY DISPOSE OF IN A MANNER CONSISTENT WITH LAWS AND REGULATIONS.
8. REPAIR DAMAGE TO SURFACE FEATURES, SUBSURFACE FEATURES AND SUBSURFACE INFRASTRUCTURE AT NO ADDITIONAL COST TO OWNER. REPLACE PAVEMENT, WALKS, CURBS, ETC. THAT MUST BE CUT OR THAT ARE DAMAGED DURING CONSTRUCTION WITH MATCHING MATERIALS.
9. ESTABLISH AND MAINTAIN ALL CONTROL POINTS AND BENCH MARKS NECESSARY FOR EXECUTION OF THE WORK.
10. SET OR RESET ANY EXISTING PROPERTY LINE MONUMENTATION DISTURBED DURING CONSTRUCTION BY A PROFESSIONAL LICENSED SURVEYOR REGISTERED IN THE STATE OF MASSACHUSETTS AT NO ADDITIONAL COST TO OWNER.
11. AREAS DISTURBED DURING CONSTRUCTION AND NOT RESTORED WITH IMPERVIOUS SURFACES (PAVEMENTS, WALKS, ETC.) SHALL RECEIVE 4-INCHES OF LOAM AND SEED.
12. LIMITS OF WORK DEPICTED ON THE DRAWINGS REPRESENT THE LIMITS OF SURFACE AND SUBSURFACE DISTURBANCE AND REPLACEMENT OF EXISTING SURFACE FEATURES SUCH AS PAVEMENTS, SIDEWALKS, CURBING, ETC. NO ADDITIONAL COMPENSATION SHALL BE PROVIDED FOR WORK PERFORMED BEYOND THESE LIMITS. ANY DISTURBANCE BEYOND THESE LIMITS SHALL BE RESTORED TO OWNER'S SATISFACTION AT NO ADDITIONAL COST TO OWNER. HOWEVER TEMPORARY USE OF OWNERS PROPERTY ADJACENT TO THE LIMITS OF WORK MAY BE ALLOWED FOR LIMITED, SPECIFICALLY ALLOWED ACTIVITIES AND CONTRACTOR OPERATIONS.
13. ALL DRAINAGE INLETS WITHIN THE LIMIT OF WORK AND WITHIN 300 FEET DOWN GRADIENT OF THE LIMITS SHALL RECEIVE SILT SACK INLET PROTECTION SEDIMENT CONTROL, WHICH SHALL BE MAINTAINED AND REPLACED IN ACCORDANCE WITH THE GENERAL REQUIREMENTS.
14. PROVIDE APPROPRIATE SIGNAGE, BARRIERS, FENCES, TEMPORARY WALKWAYS, ETC. IN ACCORDANCE WITH THE GENERAL REQUIREMENTS. RESTRICT ACCESS TO SITE WHILE MAINTAINING ACCESS TO LOCAL BUSINESSES AND PROPERTIES.
15. SITE SAFETY IS THE RESPONSIBILITY OF THE CONTRACTOR DURING WORK HOURS AND NON-WORK HOURS. PROVIDE SAFETY MEASURES FOR THE DURATION OF THE PROJECT TO MAINTAIN SITE SAFETY. OPEN TRENCHES SHALL NOT BE PERMITTED DURING NON-WORKING HOURS.
16. SNOW REMOVAL SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR WHEN ROAD PLATES ARE IN USE AND TRENCHES ARE UNPAVED.
17. PROVIDE TRAFFIC MANAGEMENT IN ACCORDANCE WITH THE GENERAL REQUIREMENTS AND APPROVED CONSTRUCTION PHASING. WHENEVER POSSIBLE, MAINTAIN ONE LANE OPEN TO TRAFFIC TO ALLOW FOR ALTERNATING TRAFFIC FLOW. SUBMIT TRAFFIC MANAGEMENT PLAN FOR EACH PHASE OF CONSTRUCTION PRIOR TO SITE MOBILIZATION. REFER TO CONSTRUCTION SEQUENCING NOTES FOR ANTICIPATED CONSTRUCTION PHASING. TRAFFIC MANAGEMENT PLAN REQUIRES REVIEW BY THE WINTHROP POLICE DEPARTMENT, WINTHROP FIRE DEPARTMENT, WINTHROP DEPARTMENT OF PUBLIC WORKS AND ENGINEER AND APPROVAL BY OWNER.
18. NORMAL TRAFFIC PATTERNS SHALL BE RE-ESTABLISHED AT THE END OF EACH WORK DAY.
19. PROVIDE A DETAILED CONSTRUCTION SCHEDULE FOR EACH PHASE TO THE OWNER AND ENGINEER FOR REVIEW AND APPROVAL.
20. COMPACT TRENCHES IN ACCORDANCE WITH THE REQUIREMENTS OF SECTION 31 00 00 OF THE SPECIFICATIONS
21. APPLY AND PAY FOR ALL LOCAL, STATE AND FEDERAL PERMITS NECESSARY TO COMPLETE THE WORK. ALL ASSOCIATED COSTS SHALL BE INCIDENTAL TO THE MOBILIZATION ITEM IN THE BID FORM.

EXISTING CONDITIONS:

1. PLANS WERE PREPARED FROM A COMPILATION OF SITE SURVEYS PROVIDED BY COUGHLIN ENVIRONMENTAL, LLC PERFORMED FROM FEBRUARY 2012 – DECEMBER 2018 AND SUPPLEMENTED WITH ORTHOIMAGERY TAKEN FROM MASSGIS.
5. HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.
6. VERTICAL DATUM IS NORTH GEODETIC VERTICAL DATUM OF 1929 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.
6. ELEVATIONS SHOWN, IN U.S. SURVEY FEET, ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
7. PROPERTY LINES WERE ESTABLISHED BY COUGHLIN ENVIRONMENTAL, LLC AND ARE BASED ON AVAILABLE INFORMATION FROM THE TOWN ASSESSORS OFFICE.
8. DIGSAFE MUST BE NOTIFIED PRIOR TO ANY EXCAVATIONS. ANY DISCREPANCIES IN THE LOCATION OF UNDERGROUND UTILITIES SHOWN SHALL BE REPORTED TO THE ENGINEER FOR REVIEW.

LAYOUT:

1. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SCALED TO ACTUAL DIMENSIONS OR LOCATION ON THE DRAWINGS. THE CONTRACTOR SHALL REFER TO THE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.
2. DO NOT RELY SOLELY ON ELECTRONIC VERSIONS OF DRAWINGS, SPECIFICATIONS, AND DATA FILES OBTAINED FROM THE ENGINEER AND FIELD VERIFY LOCATION OF PROJECT FEATURES.
3. VERIFY PROPOSED LAYOUT WITH ITS RELATIONSHIP TO THE EXISTING SITE SURVEY AND VERIFY ALL DIMENSIONS, SITE CONDITIONS, AND MATERIAL SPECIFICATIONS. NOTIFY THE OWNER AND ENGINEER OF ANY DISCREPANCIES BEFORE COMMENCING OR PROCEEDING WITH WORK.
4. COORDINATE WITH OWNER AND OWNER'S REPRESENTATIVE TO CONDUCT TEST PITS TO VERIFY EXISTING CONDITIONS.
5. VERIFY EXISTING PAVEMENT ELEVATIONS AT INTERFACE WITH PROPOSED PAVEMENTS, AND EXISTING GROUND ELEVATIONS ADJACENT TO MANHOLES AND DRAINAGE OUTLETS TO ASSURE PROPER TRANSITIONS BETWEEN EXISTING AND PROPOSED FACILITIES.
6. ALL DIMENSIONS AND RADII ARE TO THE FACE OF CURB UNLESS OTHERWISE NOTED.
7. ALL FULL DEPTH PAVEMENT REPLACEMENT SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE MASSDOT SPECIFICATIONS, LATEST REVISIONS.
8. REFER TO LANDSCAPING PLANS FOR LANDSCAPING LAYOUT AND MATERIALS.

UTILITIES:

1. LOCATIONS, SIZES AND TYPES OF EXISTING UTILITIES SHOWN ARE AN APPROXIMATE REPRESENTATION ONLY. NEITHER THE OWNER NOR THE ENGINEER HAS INDEPENDENTLY VERIFIED THIS INFORMATION SHOWN ON THE DRAWINGS. UTILITY INFORMATION SHOWN DOES NOT GUARANTEE THE ACTUAL EXISTENCE, SERVICEABILITY, OR OTHER DATA CONCERNING THE UTILITIES, NOR DOES IT GUARANTEE THAT ALL EXISTING UTILITIES PRESENT ARE SHOWN ON THE DRAWINGS.
2. NOTIFY 'DIG SAFE' AND OWNERS OF UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATION AT LEAST 72 HOURS BEFORE COMMENCING ANY EXCAVATION OR DEMOLITION. 'DIG SAFE' TELEPHONE NO.: 811 OR (888) 344-7233. MAINTAIN WATER, GAS, SEWER, ELECTRIC AND OTHER UTILITIES AT ALL TIMES DURING CONSTRUCTION.
3. WHERE AN EXISTING UTILITY IS FOUND TO BE IN CONFLICT WITH PROPOSED WORK OR EXISTING CONDITIONS DIFFER FROM THOSE SHOWN SUCH THAT THE WORK CANNOT BE COMPLETED AS INTENDED, DETERMINE THE LOCATION, ELEVATION, AND SIZE OF THE UTILITY AND FURNISH TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT PER THE GENERAL AND SUPPLEMENTARY CONDITIONS.
4. RIM ELEVATIONS FOR DRAIN AND SEWER MANHOLES ARE APPROXIMATE. SET/RESET UTILITY CASTINGS SUCH AS MANHOLE FRAME AND COVERS, WATER AND GAS GATES, PULL BOXES AND OTHER SUCH ITEMS AS FOLLOWS:
   A. PAVEMENTS AND CONCRETE SURFACES: FLUSH
   B. ALL SURFACES ALONG ACCESSIBLE ROUTES: FLUSH
   C. LANDSCAPE OR LOAM AND SEE AREAS: ONE INCH ABOVE SURROUNDING AREA AND TAPER EARTH TO THE RIM ELEVATION.
   D. ADJUSTMENT OF CASTINGS SHALL BE CONSIDERED INCIDENTAL TO THE WORK AND WILL NOT BE MEASURED OR PAID FOR SEPARATELY.
5. INVESTIGATE EXISTING CONDITIONS, FIELD VERIFY EXISTING UTILITY AND SUB-SURFACE STRUCTURE LOCATIONS, AND COORDINATE WITH UTILITY OWNER TO VERIFY SEPARATION FROM EXISTING AND PROPOSED UTILITIES PRIOR TO CONSTRUCTION. CONTACT THE ENGINEER IMMEDIATELY UPON DISCOVERING CONFLICTS WITH THE EXISTING AND PROPOSED UTILITY LOCATIONS.
6. TEST PIT PROPOSED UTILITY CROSSINGS AND CONNECTIONS TO EXISTING UTILITIES TO VERIFY DEPTH, DIAMETER, AND VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UTILITIES. NOTIFY ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION.
7. SUPPORT AND PROTECT EXISTING UTILITIES FROM DAMAGE DURING EXECUTION OF THE WORK. SUPPORT AND PROTECTION SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT. NO SEPARATE PAYMENT SHALL BE MADE.
8. COORDINATE WITH PROVIDERS OPERATING UTILITY POLES TO SUPPLY POLE SUPPORTS DURING CONSTRUCTION ACTIVITIES AS NECESSARY. PROVIDE BRACING AND SUPPORT AS NEEDED. WORK SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT. NO SEPARATE PAYMENT SHALL BE MADE.
9. LINEAR FOOT (LF) DIMENSIONS SHOWN FOR PROPOSED STORM DRAINS AND SEWERS ARE APPROXIMATE. THE DIMENSION IS MEASURED FROM THE INSIDE WALL OF THE UPSTREAM STRUCTURE TO THE INSIDE WALL OF THE DOWNSTREAM STRUCTURE.
10. LOCATION AND LENGTH OF SEWER AND WATER SERVICE LATERALS INDICATED ON THE DRAWINGS ARE FOR ESTIMATING PURPOSES. VERIFY ACTUAL SERVICE LATERAL LOCATIONS AND DEPTHS PRIOR TO INSTALLING WYES AND CORPORATIONS.
11. REPLACE SEWER AND WATER SERVICE LATERALS TO THE PROPERTY LINE UNLESS OTHERWISE SHOWN OR DIRECTED. IN LOCATIONS WHERE WALLS, PLANTERS, OR OTHER VEGETATION MUST BE PROTECTED, THE SERVICE SHALL EXTEND AS CLOSE TO THE PROPERTY LINE AS PRACTICAL, AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.
12. ALL NEW BURIED WATER MAIN SHALL HAVE A MINIMUM 5 FEET OF COVER UNLESS NOTED OTHERWISE OR APPROVED BY THE ENGINEER. BURIED PIPE WITH LESS THAN 5 FEET OF COVER SHALL HAVE A MINIMUM OF 4-INCHES OF RIGID INSULATION WITH AN R-VALUE OF R-20 INSTALLED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
13. WHERE CUT-IN VALVES AND/OR HYDRANTS ARE SHOWN, PROVIDE TEMPORARY CAPS, COUPLINGS OR REDUCERS AS REQUIRED TO CUT IN VALVES AND HYDRANTS TO ESTABLISH INSTALLATION OR PROVIDE TEMPORARY BYPASS FEEDS REQUIRED TO COMPLETE THE WORK. TEMPORARY CAPS, COUPLINGS AND REDUCERS ARE CONSIDERED INCIDENTAL TO THE WORK AND SHALL NOT BE MEASURED FOR PAYMENT.
14. SOLID SLEEVES ARE SHOWN ON THE DRAWINGS FOR ALL CONNECTIONS TO EXISTING WATER MAINS. IF OUTER DIAMETER OF EXISTING WATER MAIN IS FOUND TO BE GREATER THAN THE MAXIMUM OUTER DIAMETER COMPATIBLE WITH SOLID SLEEVES, INSTALL A COUPLING TO COMPLETE CONNECTION WITH EXISTING WATER MAIN.
15. PLUG ENDS OF WATER MAINS TO BE ABANDONED IN PLACE WITH HYDRAULIC CEMENT. PLUG SEAL SHALL BE WATER-TIGHT. ALL COSTS ASSOCIATED WITH ABANDONING EXISTING WATER MAIN IN PLACE SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.
16. PROVIDE WRITTEN NOTIFICATION TO ANY PROPERTY THAT WILL BE WITHOUT WATER DUE TO A SCHEDULED SHUTDOWN. DELIVER WRITTEN NOTIFICATION TO EACH PROPERTY AT LEAST 72 HOURS IN ADVANCE OF SCHEDULED SHUTDOWN. PROVIDE DRAFT OF NOTIFICATION TO THE OWNER FOR REVIEW AND APPROVAL PRIOR TO DISTRIBUTION.
17. IMMEDIATELY NOTIFY OWNER AND ENGINEER WHEN A LEAD SERVICE IS IDENTIFIED. OWNER MAY REQUIRE CONTRACTOR REPLACE LEAD SERVICE TO THE WATER METER. DO NOT CONNECT NEW SERVICE TO EXISTING LEAD SERVICE WITHOUT WRITTEN PERMISSION FROM OWNER. PAYMENT FOR LEAD SERVICES REPLACED FROM THE CURB STOP TO THE METER SHALL BE AS DEFINED IN THE BID DOCUMENTS.

GRADING AND DRAINAGE NOTES:

1. THE FILLING OF SOIL OVER THE ROOTS OF TREES TO BE PRESERVED IS PROHIBITED.
2. SUITABLE SOIL SHALL BE PLACED IN LAYERS TO THE REQUIRED ELEVATIONS AS SHOWN ON THE DRAWINGS. FILL, BACKFILL AND COMPACT TO PRODUCE MINIMUM SUBSEQUENT SETTLEMENT OF THE MATERIAL AND PROVIDE ADEQUATE SUPPORT FOR THE SURFACE TREATMENT OR STRUCTURE TO BE PLACED ON THE MATERIAL. PLACE MATERIAL IN APPROXIMATELY HORIZONTAL LAYERS OF BEGINNING AT LOWEST AREA TO BE FILLED. DO NOT IMPAIR DAMAGE. DO NOT USE ON-SITE TOPSOIL AS FILL MATERIAL.
3. CASTINGS FOR EXISTING STRUCTURES TO REMAIN AND PROPOSED STRUCTURES SHALL BE SET TO THE PROPOSED ELEVATIONS SHOWN ON THE DRAWINGS.
4. EXCESS SOILS (SURPLUS) SHALL BE DISPOSED OFF-SITE IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.
5. CONTRACTOR SHALL PROVIDE PITCH TO NEWLY GRADED AREAS AS SHOWN ON PLANS TO ALLOW SURFACE DRAINAGE AND TO PREVENT THE ACCUMULATION OF WATER.

ABBREVIATIONS

ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE	FT	FOOT
APPROX/±	APPROXIMATELY	HDPE	HIGH DENSITY POLYETHYLENE
BC	BOTTOM OF CURB	IN	INCHES
BIT	BITUMINOUS	INV	INVERT
BLDG	BUILDING	LW	LIMIT OF WORK
BOT	BOTTOM	MAX	MAXIMUM
℄	CENTERLINE	MH	MANHOLE
CB	CATCH BASIN	MIN	MINIMUM
CI	CAST IRON	MTL	METAL
CLDI	CONCRETE LINED DUCTILE IRON	NO.	NUMBER
CMP	CORRUGATED METAL PIPE	NTS	NOT TO SCALE
CO	CLEANOUT	OC	ON CENTER
CONC.	CONCRETE	OD	OUTSIDE DIAMETER
CONST	CONSTRUCTION	PSI	POUNDS PER SQUARE INCH
CONT	CONTINUOUS	PVC	POLYVINYL CHLORIDE
DI	DUCTILE IRON	R	RADIUS
DIA/⌀	DIAMETER	RCP	REINFORCED CONCRETE PIPE
DLCB	DOUBLE GRATE CATCH BASIN	REINF	REINFORCED
DMH	DRAIN MANHOLE	REQ'D	REQUIRED
EA	EACH	RET	RETAINING WALL
EL	ELEVATION	ROW	RIGHT OF WAY
ELEC COND	ELECTRICAL CONDUIT	SMH	SEWER MANHOLE
EOP	EDGE OF PAVEMENT	STD	STANDARD
EQUIP	EQUIPMENT	TBM	TEMPORARY BENCH MARK
EXIST/EX.	EXISTING	TOC	TOP OF CURB
FFE	FINISHED FLOOR ELEVATION	TYP	TYPICAL
FIN	FINISHED	UP	UTILITY POLE
FM	FORCE MAIN	VGC	VERTICAL GRANITE CURB
FND	FOUND	WG	WATER GATE VALVE

LEGEND

EXISTING

- UTILITY POLE WITH TRANSFORMER
- UTILITY POLE WITH RISER
- UTILITY POLE WITH RISER AND TRANSFORMER
- UTILITY POLE WITH LIGHT AND TRANSFORMER
- UTILITY POLE WITH LIGHT, TRANSFORMER, AND RISER
- UTILITY POLE WITH LIGHT AND RISER
- UTILITY POLE WITH LIGHT
- UTILITY POLE
- HANDHOLE
- I-BEAM
- TELEPHONE MANHOLE
- RISER
- COLUMN
- GROUND LIGHT
- ELECTRIC BOX
- FLAG POLE
- MAILBOX
- TREE
- SHRUB
- VALVES AND CURB STOPS
- CULVERT
- WG WATER GATE
- HYDRANT
- CATCH BASIN
- SEWER MANHOLE
- DRAIN MANHOLE
- E ELECTRIC METER
- NO LABEL MANHOLE
- LIGHT POLE
- SIGN
- HANDICAPPED PARKING
- ELECTRIC HANDHOLE
- WHH WATER HANDHOLE
- RR SPK RAILROAD SPIKE
- IRF IRON ROD FOUND
- SB STONE BOUND FOUND
- CB CONCRETE BOUND FOUND
- SBDH STONE BOUND FOUND WITH DRILL HOLE
- CBDH CONCRETE BOUND FOUND WITH DRILL HOLE
- IPF IRON PIPE FOUND
- DHF DRILL HOLE FOUND

PROPOSED

- LIMIT OF NEW PAVEMENT
- DRAIN MANHOLE
- CATCH BASIN
- SEWER MANHOLE
- WATER GATE VALVE
- HYDRANT
- CURB STOP
- SITE LIGHTING
- BIKE RACK
- TREE

EXISTING LINETYPES

- ABUTTERS LOT LINE
- PROPERTY LINE
- EASEMENT
- 10 CONTOUR
- WOOD FENCE
- IRON FENCE
- GUARDRAIL
- W WATER LINE
- C CABLE LINE
- C CABLE LINE
- T TELEPHONE LINE
- E ELECTRIC LINE
- OHW OVERHEAD WIRE
- D DRAIN LINE
- S SEWER LINE
- G GAS LINE

PROPOSED LINETYPES

- SILT SOCK EROSION CONTROL
- PROPOSED WOOD GUARDRAIL
- PROPOSED DRAIN LINE
- 122 CONTOUR (1' OR 2' INTERVAL)
- 120 CONTOUR (INDEX)
- W WATER LINE
- S SEWER LINE
- CHAIN LINK FENCE

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY: ADL / CHECKED BY: ADL / KM
DRAWN BY: MRM / CTK / 0231789_2001-NOTES.DWG

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: APRIL 2019
SCALE: AS NOTED
SHEET: 1 OF 15

GENERAL NOTES, LEGEND & ABBREVIATIONS

G-001

EROSION CONTROL NOTES:

THESE MEASURES ARE INTENDED TO PROVIDE GENERAL REQUIREMENTS FOR EROSION AND SEDIMENTATION CONTROL. A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORMWATER POLLUTION PREVENTION PLAN (SWPPP) WILL BE PREPARED, BY ENGINEER, FOR THIS PROJECT AND MAY REQUIRE ADDITIONAL EROSION AND SEDIMENTATION CONTROL MEASURES. CONTRACTOR SHALL FOLLOW ALL MEASURES REQUIRED FOR THE PROJECT.

THE PURPOSE OF EROSION CONTROLS IS TO PREVENT SEDIMENT FROM MOVING ONTO, AROUND, OR OFF OF THE CONSTRUCTION SITE. PROPERLY INSTALLED AND MAINTAINED EROSION CONTROLS ARE THE PRIMARY DEFENSE AGAINST SEDIMENT POLLUTION.

SEDIMENTATION CONTROLS ARE A SECOND LINE OF DEFENSE AGAINST MOVING SEDIMENT. THE PURPOSE IS TO PREVENT SEDIMENT FROM LEAVING THE CONSTRUCTION SITE AND ENTERING ENVIRONMENTALLY SENSITIVE AREAS.

RUNOFF CONTROLS ARE USED TO SLOW THE VELOCITY OF CONCENTRATED WATER FLOWS. BY INTERCEPTING AND DIVERTING STORMWATER RUNOFF TO A STABILIZED OUTLET OR TREATMENT BMP, EROSION AND SEDIMENTATION ARE REDUCED.

THIS SECTION DESCRIBES THE SET OF MEASURES THAT WILL BE INSTALLED BEFORE AND DURING THE CONSTRUCTION PROJECT TO CONTROL POLLUTANTS IN STORMWATER DISCHARGES THAT WILL OCCUR AT THE SITE. SUCH MEASURES MAY INCLUDE: PERIMETER CONTROLS, STOCK PILE COVERING, STORM DRAIN INLET PROTECTION, CHECK DAMS, AND TEMPORARY SEEDING.

PLEASE NOTE: THE OPERATOR SHOULD INITIATE APPROPRIATE VEGETATIVE PRACTICES ON ALL DISTURBED AREAS AS SOON AS POSSIBLE BUT NOT MORE THAN FOURTEEN (14) DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS TEMPORARILY OR PERMANENTLY CEASED.

1. MINIMIZE DISTURBED AREAS AND PROTECT NATURAL FEATURES AND SOIL

   AS FAR AS IS PRACTICABLE, EXISTING VEGETATION SHALL BE PROTECTED AND LEFT IN PLACE, IN ACCORDANCE WITH THE CLEARING LIMITS SHOWN ON THE APPROVED PLANS. PRIOR TO ANY LAND DISTURBANCE ACTIVITIES COMMENCING ON THE SITE, THE CONTRACTOR SHALL PHYSICALLY MARK LIMITS OF DISTURBANCE (LOD) ON THE SITE AND ANY AREAS TO BE PROTECTED WITHIN THE SITE, SO THAT WORKERS CAN CLEARLY IDENTIFY THE AREAS TO BE PROTECTED.

   THE APPENDED PROJECT DRAWNGS IDENTIFY THE LIMIT OF DISTURBANCE ALONG WITH AREAS AND OBJECTS TO BE PROTECTED.

2. PHASE CONSTRUCTION ACTIVITY

   PROPER SEQUENCING OF CONSTRUCTION ACTIVITIES IS ESSENTIAL TO MAXIMIZE THE EFFECTIVENESS OF EROSION AND SEDIMENT CONTROL MEASURES. CONSTRUCTION SEQUENCING AND TIMING OF CONSTRUCTION ACTIVITIES WILL INCLUDE:

   2.1. INSTALLATION OF ALL EROSION AND SEDIMENT CONTROLS THAT ARE REQUIRED TO BE IN PLACE AND FUNCTIONAL BEFORE ANY EARTHWORK BEGINS. THIS SHALL BE DONE IN ACCORDANCE WITH THE NPDES SWPPP FOR THIS PROJECT, THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, AND THE MASSACHUSETTS STORMWATER HANDBOOK. UPON ACCEPTABLE COMPLETION OF SITE PREPARATION AND INSTALLATION OF EROSION AND SEDIMENT CONTROLS, SITE CONSTRUCTION ACTIVITIES MAY COMMENCE. ROUTINE INSPECTION AND MAINTENANCE AND/OR MODIFICATION OF EROSION AND SEDIMENT CONTROLS WHILE EARTHWORK IS BEING DONE IS REQUIRED.

   2.2. UPON COMMENCEMENT OF SITE CONSTRUCTION ACTIVITIES, THE OPERATOR SHALL INITIATE APPROPRIATE STABILIZATION PRACTICES ON ALL DISTURBED AREAS AS SOON AS POSSIBLE BUT NOT MORE THAN FOURTEEN (14) DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS TEMPORARILY OR PERMANENTLY CEASED.

   2.3. FINAL STABILIZATION OF ANY DISTURBED AREAS AFTER EARTHWORK HAS BEEN COMPLETED.

3. PHASED CLEARING/GRUBBING

   ONLY AREAS THAT CAN BE REASONABLY EXPECTED TO HAVE ACTIVE CONSTRUCTION WORK BEING PERFORMED WITHIN 14–DAYS OF DISTURBANCE WILL BE CLEARED/GRUBBED AT ANY ONE TIME. IT IS NOT ACCEPTABLE TO CLEAR AND GRUB THE ENTIRE CONSTRUCTION SITE IF PORTIONS WILL NOT BE ACTIVE WITHIN THE 14– DAY TIME–FRAME. PROPER PHASING OF CLEARING AND GRUBBING ACTIVITIES SHALL INCLUDE TEMPORARY STABILIZATION TECHNIQUES FOR AREAS CLEARED AND GRUBBED THAT WILL NOT BE ACTIVE WITHIN THE 14 DAY TIME FRAME.

   NO UNDISTURBED AREAS SHALL BE CLEARED OF EXISTING VEGETATION AFTER OCTOBER 15TH OF ANY CALENDAR YEAR OR DURING ANY PERIOD OF FULL OR LIMITED WINTER SHUTDOWN. ALL DISTURBED SOILS EXPOSED PRIOR TO OCTOBER 15 OF ANY CALENDAR YEAR SHALL BE SEEDED OR PROTECTED BY THAT DATE. ANY SUCH AREAS THAT DO NOT HAVE ADEQUATE VEGETATIVE STABILIZATION, AS DETERMINED BY THE SITE OPERATOR OR DESIGNATED INSPECTOR, BY NOVEMBER 15 OF ANY CALENDAR YEAR, MUST BE STABILIZED THROUGH THE USE OF EROSION CONTROL MATTING OR HAY MULCH, IN ACCORDANCE WITH SPECIFICATIONS CONTAINED WITHIN THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS. IF WORK CONTINUES WITHIN ANY OF THESE AREAS DURING THE PERIOD FROM OCTOBER 15 THROUGH APRIL 15, CARE MUST BE TAKEN TO ENSURE THAT ONLY THE AREA REQUIRED FOR THAT DAY'S WORK IS EXPOSED, AND ALL ERODIBLE SOIL MUST BE RESTABILIZED WITHIN 5 WORKING DAYS.

   CLEARING/GRUBBING SHALL NOT TAKE PLACE DURING A RAIN EVENT IF EROSION IS LIKELY TO OCCUR; NOR SHALL IT OCCUR IF A RAIN EVENT IS FORECASTED AND APPROPRIATE EROSION CONTROLS CANNOT BE INSTALLED PRIOR TO THE STORM.

   AFTER CLEARING, AND BY THE END OF EACH DAY'S GRUBBING OPERATION, THE SITE OPERATOR SHALL INSTALL EROSION CONTROL MEASURES THAT ARE INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER. SUCH EROSION CONTROL MEASURES SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS.

4. MONITORING WEATHER CONDITIONS

   CARE SHALL BE TAKEN TO AVOID HAVING UNSTABILIZED AREAS EXPOSED DURING PRECIPITATION EVENTS. WEATHER FORECASTS SHALL BE ROUTINELY CHECKED, AND IN THE CASE OF AN EXPECTED PRECIPITATION EVENT OF OVER 0.25–INCHES OVER A 24–HOUR PERIOD, ALL BMPS SHALL BE INSPECTED, AND MAINTAINED AS NECESSARY, PRIOR TO THE WEATHER EVENT.

   IN THE CASE OF AN EXTREME WEATHER FORECAST (GREATER THAN ONE–INCH OF RAIN OVER A 24–HOUR PERIOD), ADDITIONAL EROSION/SEDIMENT CONTROLS SHALL BE INSTALLED WHERE APPROPRIATE.

   THE WEATHER GAUGE STATION AND WEBSITE THAT SHALL BE UTILIZED TO MONITOR WEATHER CONDITIONS ON THE CONSTRUCTION SITE IS AS FOLLOWS:

   THE CONTRACTOR CAN MONITOR THE WEATHER CONDITIONS ON WWW.WUNDERGROUND.COM, WWW.WEATHER.COM, OR SIMILAR WEATHER INFORMATION SOURCE. THE LOGAN INTERNATIONAL AIRPORT WEATHER GAUGE OR SIMILAR, REPRESENTATIVE WEATHER GAUGE SHALL BE THE WEATHER GAUGE UTILIZED FOR THIS PROJECT.

5. INITIATING STABILIZATION PROCEDURES

   UPON COMPLETION AND ACCEPTANCE OF SITE PREPARATION AND INITIAL INSTALLATION OF EROSION AND SEDIMENT CONTROLS THE OPERATOR SHALL INITIATE APPROPRIATE STABILIZATION PRACTICES DURING ALL PHASES OF CONSTRUCTION ON ALL DISTURBED AREAS AS SOON AS POSSIBLE BUT NOT MORE THAN FOURTEEN (14) DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS TEMPORARILY OR PERMANENTLY CEASED.

6. CONTROL STORMWATER FLOWING ONTO AND THROUGH THE PROJECT

   STRUCTURAL BMPS ARE USED TO DIVERT FLOWS FROM EXPOSED SOILS, RETAIN OR DETAIN FLOWS, OR OTHERWISE LIMIT RUNOFF AND THE DISCHARGE OF POLLUTANTS FROM EXPOSED AREAS OF THE SITE.

   BMPS SHALL BE INSTALLED AS DEPICTED ON THE APPROVED PLAN SET AND IN ACCORDANCE WITH MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS OR THE MASSACHUSETTS STORMWATER HANDBOOK.

   THE CONTRACTOR SHALL PROVIDE EROSION CONTROL MEASURES SUCH AS DIVERSION CHANNELS, SEDIMENTATION OR FILTRATION SYSTEMS, BERMS, STAKED HAY BALES, SEEDING, MULCHING OR OTHER SPECIAL SURFACE TREATMENTS AS ARE REQUIRED TO PREVENT SILTING AND MUDDYING OF STREAMS, RIVERS, IMPOUNDMENTS, LAKES, ETC. ALL EROSION CONTROL MEASURES SHALL BE IN PLACE IN AN AREA PRIOR TO ANY CONSTRUCTION ACTIVITY IN THAT AREA.

7. STABILIZE SOILS

   DISTURBED AREAS THAT WILL NOT HAVE ACTIVE CONSTRUCTION ACTIVITY OCCURRING WITHIN FOURTEEN (14) DAYS MUST BE STABILIZED USING THE BMPS DEPICTED ON THE APPROVED SWPPP PLAN SET AND IN ACCORDANCE WITH APPLICABLE MEASURES SPECIFIED IN THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS OR THE MASSACHUSETTS STORMWATER HANDBOOK.

   THE CONTRACTOR SHALL STABILIZE THE DISTURBED SOILS THROUGH SEEDING, HYDROSEEDING, MULCHING AND DUST CONTROL THROUGH USE OF WATER. FOR TURF'S AND GRASSES, STABILIZE FINAL GRADED AREAS WITHIN SEVEN DAYS OF GRADE PREPARATION BY PREPARING TOPSOIL AND THEN APPLYING SEED AND MULCH. FOR DUST CONTROL, STABILIZE EXPOSED SOILS DURING DRY WEATHER BY APPLYING WATER SITE–WIDE.

8. PROTECT SLOPES

   SLOPES THAT WILL HAVE CONCENTRATED STORMWATER FLOW MUST BE PROTECTED USING THE BMPS DEPICTED ON THE APPROVED SWPPP PLAN SET AND IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS OR THE MASSACHUSETTS STORMWATER HANDBOOK.

   IF THE SLOPE STABILIZATION BMPS FAIL AND EROSION OCCURS, THEN ALTERNATIVE CONTROL MEASURES MAY BE USED UPON APPROVAL OF THE SITE OWNER, WHICH MAY INCLUDE COMPOST FILTER SOOKS, FIBER ROLLS, GRAVEL BAG BERMS, EROSION CONTROL MATS/BLANKETS, AND TEMPORARY VEGETATIVE COVER.

9. PROTECT STORM DRAIN INLETS

   STORM DRAIN INLET PROTECTION MEASURES PREVENT SOIL AND DEBRIS FROM ENTERING STORM DRAIN INLETS. THESE MEASURES ARE USUALLY TEMPORARY AND ARE IMPLEMENTED BEFORE A SITE IS DISTURBED. ALL STORMWATER INLETS AND/OR CATCH BASINS THAT ARE OPERATIONAL DURING CONSTRUCTION AND MAY RECEIVE SEDIMENT–LADEN STORMWATER FLOW FROM THE CONSTRUCTION SITE MUST BE PROTECTED USING ANY OF THE BMPS OUTLINED IN THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS OR THE MASSACHUSETTS STORMWATER HANDBOOK.

   POSSIBLE CONTROL MEASURES THAT MAY BE USED INCLUDE COMPOST FILTER SOCKS, FIBER ROLLS, GRAVEL BAG BERMS, OR CATCH BASIN INSERTS. (PLEASE NOTE: HAYBALE/SILT FENCE PROTECTION MEASURES DO NOT WORK ON PAVED SURFACES).

   THE CONTRACTOR SHALL PROTECT THE STORM DRAIN INLETS WITH BALED HAY CATCH BASIN INLET PROTECTION DETAIL DEPICTED IN THE CONTRACT DRAWNGS. ALL EROSION CONTROL MEASURES SHALL BE IN PLACE IN AN AREA PRIOR TO ANY CONSTRUCTION ACTIVITY IN THAT AREA.

10. ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

    PERIMETER CONTROLS SHALL BE INSTALLED, AND MAINTAINED, AS DEPICTED ON THE APPROVED SWPPP PLAN SET AND IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS OR THE MASSACHUSETTS STORMWATER HANDBOOK.

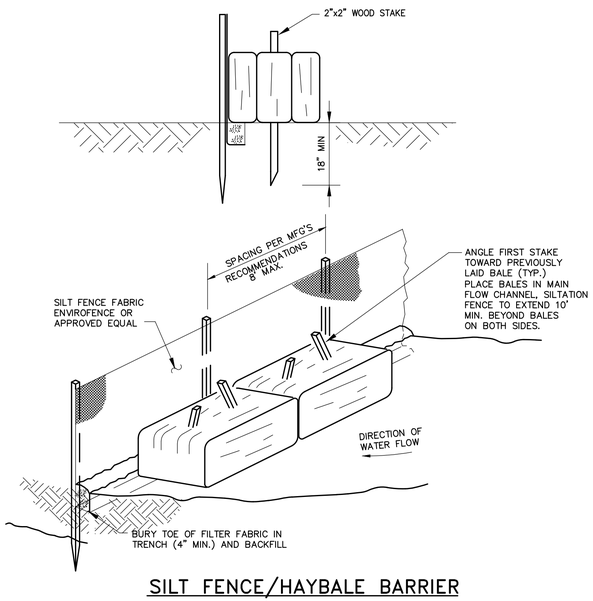
    IF THE BALED HAY AND/OR SILT FENCE EROSION CHECKS FAIL TO CONTAIN THE SEDIMENT ON–SITE, THEN ALTERNATIVE CONTROL MEASURES MAY BE SUBSTITUTED WITH APPROVAL OF THE SITE OWNER. SUCH MEASURES MAY INCLUDE (BUT ARE NOT LIMITED TO) COMPOST FILTER SOCKS OR STRAW WATTLES (FIBER ROLLS).

    THE CONTRACTOR SHALL ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS AT LEAST 48 HOURS BEFORE SITE CLEARING AND SOIL DISTURBANCE. THE SEDIMENT CONTROLS SHALL BE DOWNHILL OF DISTURBED AREAS IN ACCORDANCE WITH THE DETAILS DEPICTED IN THE DRAWINGS. ALL EROSION CONTROL MEASURES SHALL BE IN PLACE IN AN AREA PRIOR TO ANY CONSTRUCTION ACTIVITY IN THAT AREA.

11. RETAIN SEDIMENT ON–SITE AND CONTROL DEWATERING PRACTICES

    SEDIMENT TRAPS, BASINS, AND BARRIERS ARE USED TO RETAIN SEDIMENT ON THE SITE TO PROTECT STREAMS, LAKES, DRAINAGE SYSTEMS, AND ADJACENT PROPERTY. THESE DEVICES ARE USED AT THE OUTLETS OF CHANNELS, DIVERSIONS, AND OTHER RUNOFF CONVEYANCE MEASURES TO ALLOW SEDIMENT–FILLED WATER TO POOL AND THE SEDIMENT TO SETTLE. THESE MEASURES ARE OFTEN USED AS THE LAST LINE OF DEFENSE TO STOP SEDIMENT FROM LEAVING THE SITE.

    DISCHARGE OF SEDIMENT–LADEN WATER INTO STORM DRAINS, STREAMS, RIVERS, LAKES OR WETLANDS PRIOR TO SEDIMENT REMOVAL IS PROHIBITED. A TEMPORARY SEDIMENT TRAP OR BASIN MAY BE INSTALLED AND MAINTAINED AS NECESSARY WITHIN THE SITE BOUNDARIES AND IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS OR THE MASSACHUSETTS STORMWATER HANDBOOK.

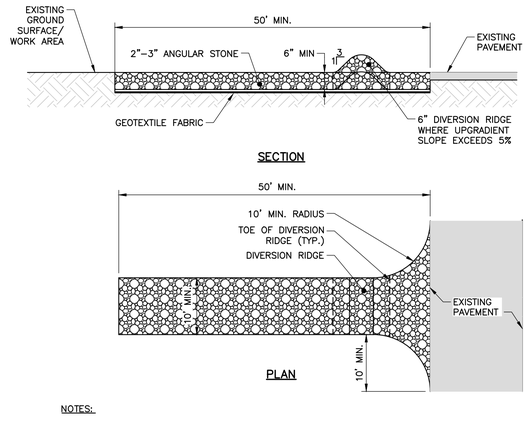


SILT FENCE/HAYBALE BARRIER

N.T.S.

NOTES:

1. INSTALL FABRIC ON UPHILL SIDE OF SUPPORT POSTS.
2. SILT FENCE WILL NOT BE USED IN DRAINAGE WAYS.
3. CONTRACTOR TO REMOVE SILT AS NECESSARY TO MAINTAIN FABRIC EFFECTIVENESS.

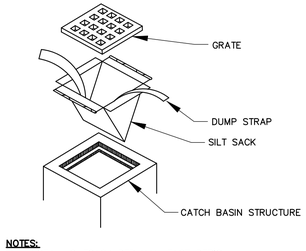


NOTES:

1. CONTRACTOR TO INSTALL STABILIZED CONSTRUCTION EXIT AS NEEDED FOR UNSTABILIZED AREA.
2. GRADE TOWARDS SEDIMENT BARRIER WHEN NECESSARY TO MANAGE FLOW.
3. INCREASE MINIMUM LENGTH TO 100' WHERE TRACKED SEDIMENTS CONTAIN LESS THAN 80% SAND OR AS NECESSARY FOR HEAVY CONSTRUCTION.

STABILIZED CONSTRUCTION EXIT

N.T.S.



NOTES:

1. INSTALL SILTSACK PER MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. EMPTY OR REMOVE SEDIMENT FROM SILTSACK WHEN RESTRAINT CORD IS NO LONGER VISIBLE. CLEAN, RINSE, AND REPLACE AS NEEDED.
2. SILTSACKS TO BE INSTALLED DURING CONSTRUCTION OPERATIONS WHEN THE POTENTIAL FOR SEDIMENT TO ENTER EXISTING & PROPOSED BASINS EXISTS.

SILTSACK INLET DETAIL

N.T.S.

WOODARD & CURRAN
COMMITMENT & INTEGRITY DRIVE RESULTS
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

REV	DESCRIPTION	DATE

DESIGNED BY: ADL | CHECKED BY: ADL / KM
DRAWN BY: MRM / CTK | 0231789.2001-NOTES.DWG

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

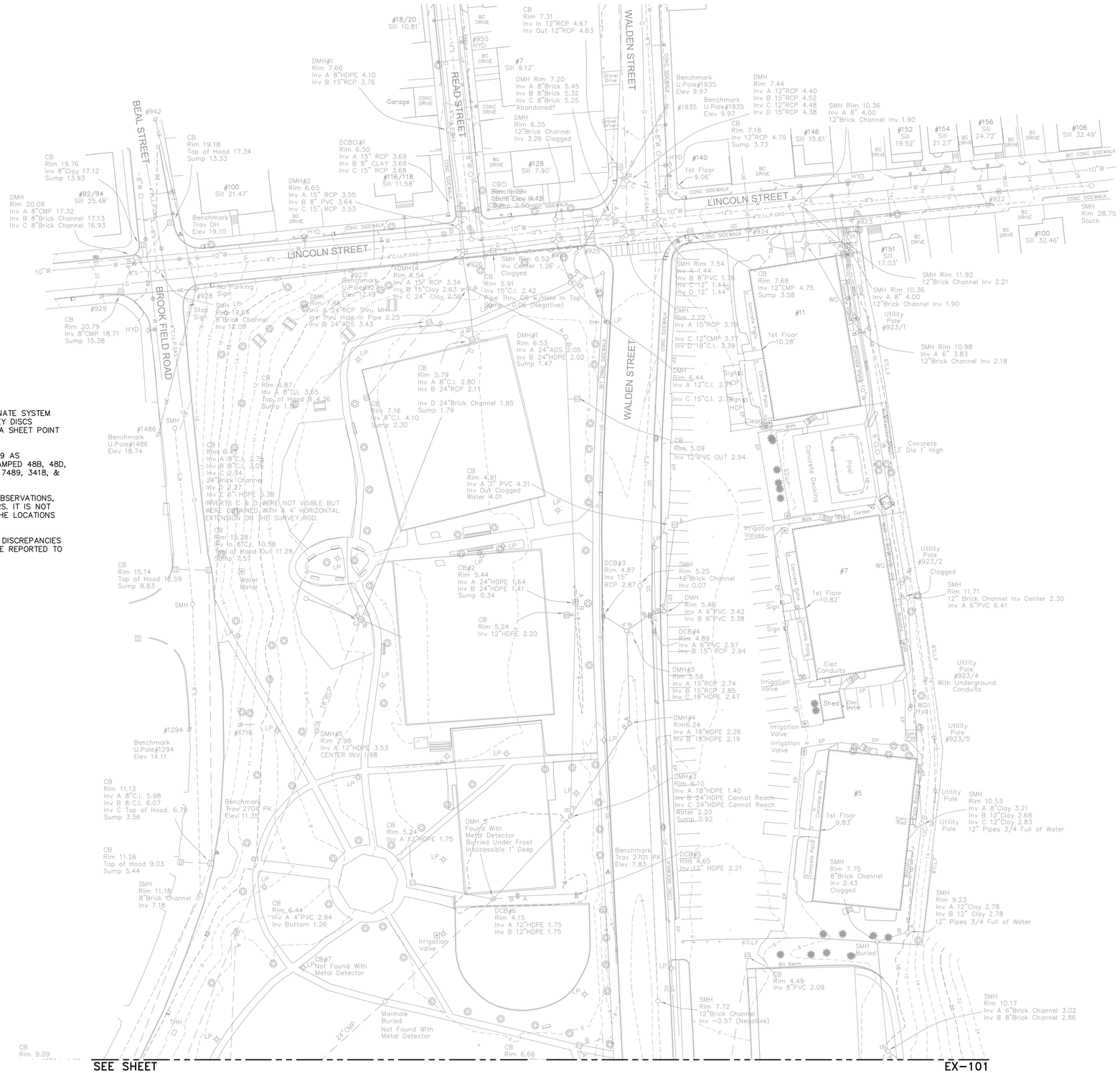
EROSION CONTROL PLAN

JOB NO.: 0231789.00
DATE: APRIL 2019
SCALE: AS NOTED
SHEET: 2 OF 15

G-002

SURVEYOR(S) NOTES

1. HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD 83 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.
2. VERTICAL DATUM IS NORTH GEODETIC VERTICAL DATUM OF 1929 AS REFERENCED BY MASSACHUSETTS GEODETIC SURVEY DISCS STAMPED 48B, 48D, & 48E WITH MASSHIGHWAY GEODETIC DATA SHEET POINT ID#S 7489, 3418, & 3419.
3. THE UNDERGROUND UTILITIES SHOWN ARE BASED ON VISIBLE OBSERVATIONS, FIELD SURVEY, AND RECORD INFORMATION PROVIDED BY OTHERS. IT IS NOT WARRANTED THAT ALL UNDERGROUND UTILITIES ARE SHOWN. THE LOCATIONS SHOWN ARE TO BE CONSIDERED APPROXIMATE.
4. DIGSAFE MUST BE NOTIFIED PRIOR TO ANY EXCAVATIONS. ANY DISCREPANCIES IN THE LOCATION OF UNDERGROUND UTILITIES SHOWN SHALL BE REPORTED TO THE ENGINEER FOR REVIEW.



BAR SCALE
1" = 40'
CHECK GRAPHIC SCALE BEFORE USING

40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY: ADL | CHECKED BY: ADL / KM
DRAWN BY: SURVEYS/MRM | 0231789-EX-100.DWG

NORTH EXISTING CONDITIONS PLAN

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: MAY 2019
SCALE: 1" = 40'
SHEET: 3 OF XXX

EX-100

SEE SHEET — EX-100

EX-102 — SEE SHEET

INGLESIDE PARK

BROOKFIELD ROAD

WALDEN STREET

WHEELOCK STREET

PALMYRA STREET

ATHLETIC FACILITY

Stone Trench Drain

CB
Rim 9.09
Inv In 12"C.I. 4.78
Top of Hood Out 6.16
Sump 1.95

Benchmark
U.Pole#990
Elev 11.31
#990

CB
Rim 5.86
Inv 12"HDPE 3.28

Manhole
Buried
Not Found With
Metal Detector

DMH
Rim 6.68'
Inv Bottom 0.63

DMH#7
Rim 6.94
Inv In 12"HDPE 2.39
Center Inv 18"RCP 1.18

SMH
Rim 9.82
8"Brick Channel
Inv 6.48
#989

CB
Rim 6.85
Inv A 8"C.P. 3.39
Inv Bottom 0.50

CB
Rim 8.67
Inv In 12"C.I. 3.41
Top of Hood Out 4.30
Sump 0.12

DMH
Rim 6.52'
Inv A 6"C.I. 3.22
Top of Hood B 3.90
Dirt @ 3.32
Sump 2.49

DMH
Rim 6.16 (Buried 1'Deep)
Inv A 6"C.I. 3.04
Inv B 6"C.I. 3.03

DMH
Rim 5.83" (Buried 1'Deep)
Inv A 6"C.I. 2.17
Inv B 6"C.I. 2.69
Inv C 18"Trench 0.97
Inv D 6"C.I. 1.90
Inv E 18"Trench 0.97
Inv F 6"C.I. 2.83

DMH
Rim 5.99' (Buried 1'Deep)
Inv A 6"Brick Channel 3.69
Inv B 6"Brick Channel 3.46

CB
Rim 6.66
Inv A 4"PVC 4.80
Inv B 12"CMP 2.75
Sump 0.63

SMH
Rim 7.72
12"Brick Channel
Inv -0.57 (Negative)

SMH
Rim 1
Inv A
Inv B

Benchmark
U.Pole#1678-4
Elev 8.46 NGVD 1929
#1678-4

CB
Rim 6.59
Inv A 8"C.I. 1.41
Inv B 12"C.I. 1.20
Sump -0.27 (Negative)

#1678-3

CB
Rim 6.77
Inv 12"C.I. 3.65
Dirt @ 2.12

CB
Rim 6.77
Inv 12"C.I. 2.72
Dirt @ 0.97

Benchmark
Tray 2700 PK
Elev 7.58

#1678-2

DMH
Rim 6.80
Inv A 12"C.I. 0.49
Inv B 18"RCP 0.97
Inv C 15" 0.37
Sump -2.20 (Negative)

CB
Rim 7.06
Inv A 18"Trench 0.61
Inv B 12"C.I. 3.63
Inv C 15" 0.75
Inv D 0.85 Filled W/ Dirt
Inv E 6" 3.18
Dirt @ 0.69

DMH Rim 7.20
Inv A 12"C.I. 2.49
Inv B 12"C.I. 2.58
Inv C 15"Brick Channel 0.69
Inv D 12"C.I. 2.71
Inv E 15"Brick Channel 0.55

SMH
Rim 8.49
Inv Brick Channel -1.36 (Negative)

SMH
Rim 8.61
Inv Brick Channel -0.92 (Negative)

CB
Rim 8.45
Inv 8"PVC 7.01
Sump 1.64

SMH
Rim 8.66
8"Brick Channel
Inv 5.54

Manhole w/Pump
Rim 8.45
Bottom 0.27

DMH
Rim 7.56
15"Brick Channel 0.98

CB
Rim 8.61
Inv 8"C.I. 6.36
Sump 4.25

Benchmark
U.Pole#986
Elev 9.91
#986

SMH
Rim 7.97
15"Brick Channel
Inv -2.25 (Negative)

CB
Rim 8.30
Top of Hood 5.55
Sump 2.30

SMH
Rim 5.00
Bolted

CB
Rim 6.04
Inv A Box Culvert 0.25
Inv B 36"CMP 0.59
Sump 0.43

CB
Rim 4.83
Inv A 36"CMP 0.68
Inv B 8"C.I. 0.80
Inv C 36"CMP 0.61
Sump 0.43

CB
Rim 7.42
Inv In A 8"C.I. 2.66
Inv Out B 12"C.I. 2.54
Sump -0.35 (Negative)

CB
Rim 5.94
Inv A 4"PVC 3.87
Inv B 12"PVC 2.46
Inv C Center Channel -0.26 (Negative)

SMH
Rim 6.53
Inv In A 10"PVC 1.47
Inv In B 10"PVC -1.99 (Negative)
18"Brick Channel Inv -2.28 (Negative)

CB
Rim 4.25
Invert -0.12 (Negative)

Benchmark
Trav 2705 PK
Elev 4.61

CB
Rim 4.26
3 Way Brick Channel
Invert -0.10 (Negative)

CB
Rim 5.90
Inv In 4"PVC 3.85
Inv Out 12"PVC 3.74
Sump 1.59

CB
Rim 5.81
Inv In 4"PVC 4.41
Inv Out 4"PVC 4.46
Sump 2.72

Sill 8.60'

Benchmark
Bottom Corner
Concrete Step
Elev 8.24

CBOC
Rim 7.09
Inv A 8"C.I. 2.56
Sump -0.67 (Negative)

DMH
Rim 5.97
Pipe Runs
Thru Manhole

CB
Rim 6.82
36"Brick Channel Inv 0.59
Inv 8"C.I. 3.39

CB
Rim 7.50
No Pipes Visible
Drywell?
Sump 3.45

DMH
Rim 7.76
Inv A 12"C.I. 3.77
Inv B 36"Brick Channel 0.64
Inv C 15"C.I. 2.42
Inv D 6"C.I. 4.17
Inv E 36"Brick Channel 0.64

#1494
#1495
#1480
#1605

12"PVC
15"PVC
18"RCP
24"CMP
36" Pipe
48"x38" Conc Box Drain
BIT CONC SIDEWALK
CROSSWALK
HYD
EHH
LP
TMH
SMH
DMH
CB

40' 0 40' 80'
BAR SCALE
1" = 40'
CHECK GRAPHIC SCALE BEFORE USING

CONCEPTUAL SET - NOT FOR CONSTRUCTION

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE
DESIGNED BY: ADL	CHECKED BY: ADL / KM	
DRAWN BY: SURVEYS/JMW	0231789-EX-100.DWG	

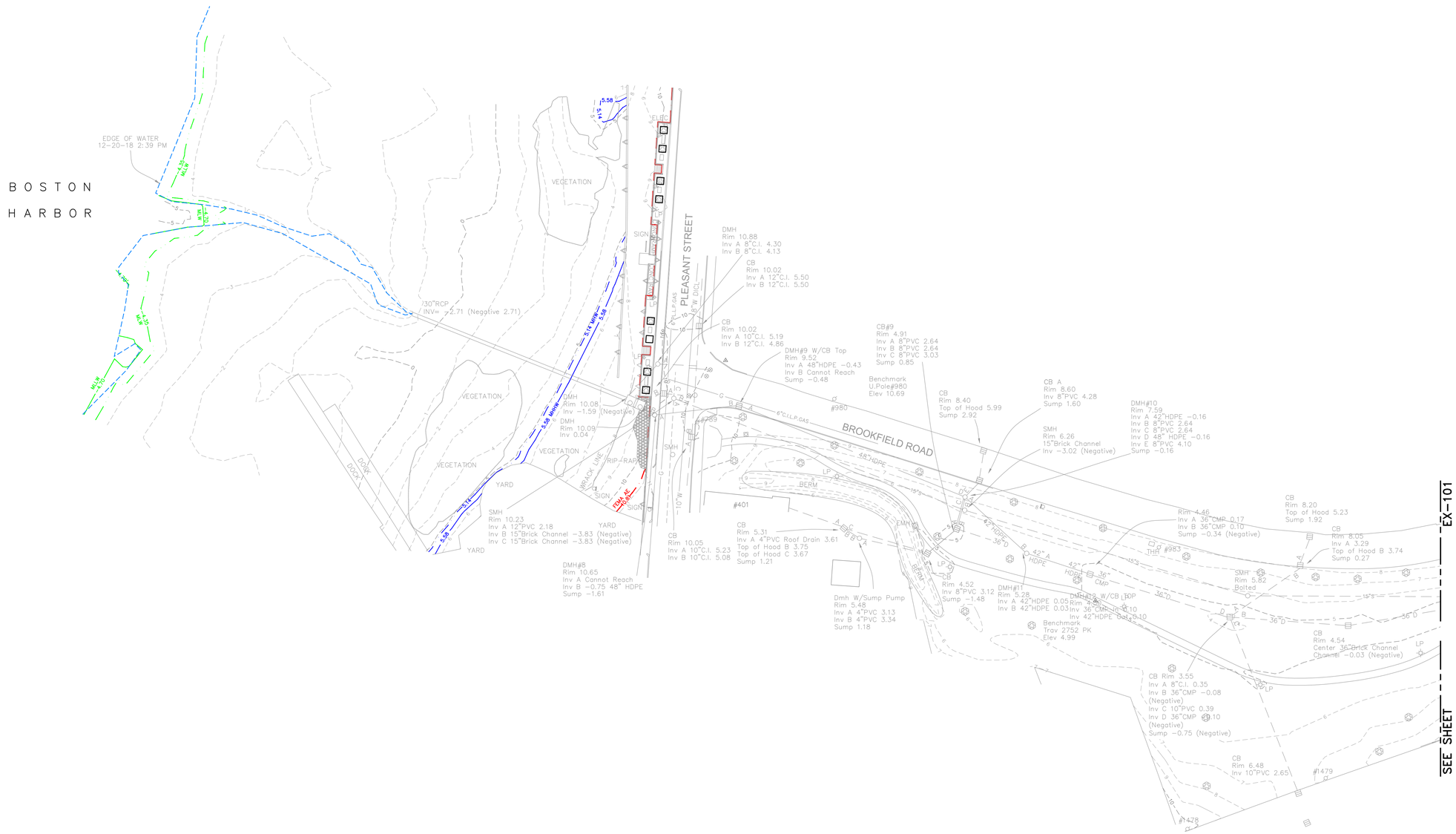
SOUTH EXISTING CONDITIONS PLAN

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: MAY 2019
SCALE: 1" = 40'
SHEET: 4 OF XXX

EX-101



40' 0 40' 80'

BAR SCALE
1" = 40'
CHECK GRAPHIC SCALE BEFORE USING

CONCEPTUAL SET - NOT FOR CONSTRUCTION

40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE
	DESIGNED BY: ADL	CHECKED BY: ADL / KM
	DRAWN BY: SURVEYS/MRM	0231789-EX-100.DWG

SW EXISTING CONDITIONS PLAN

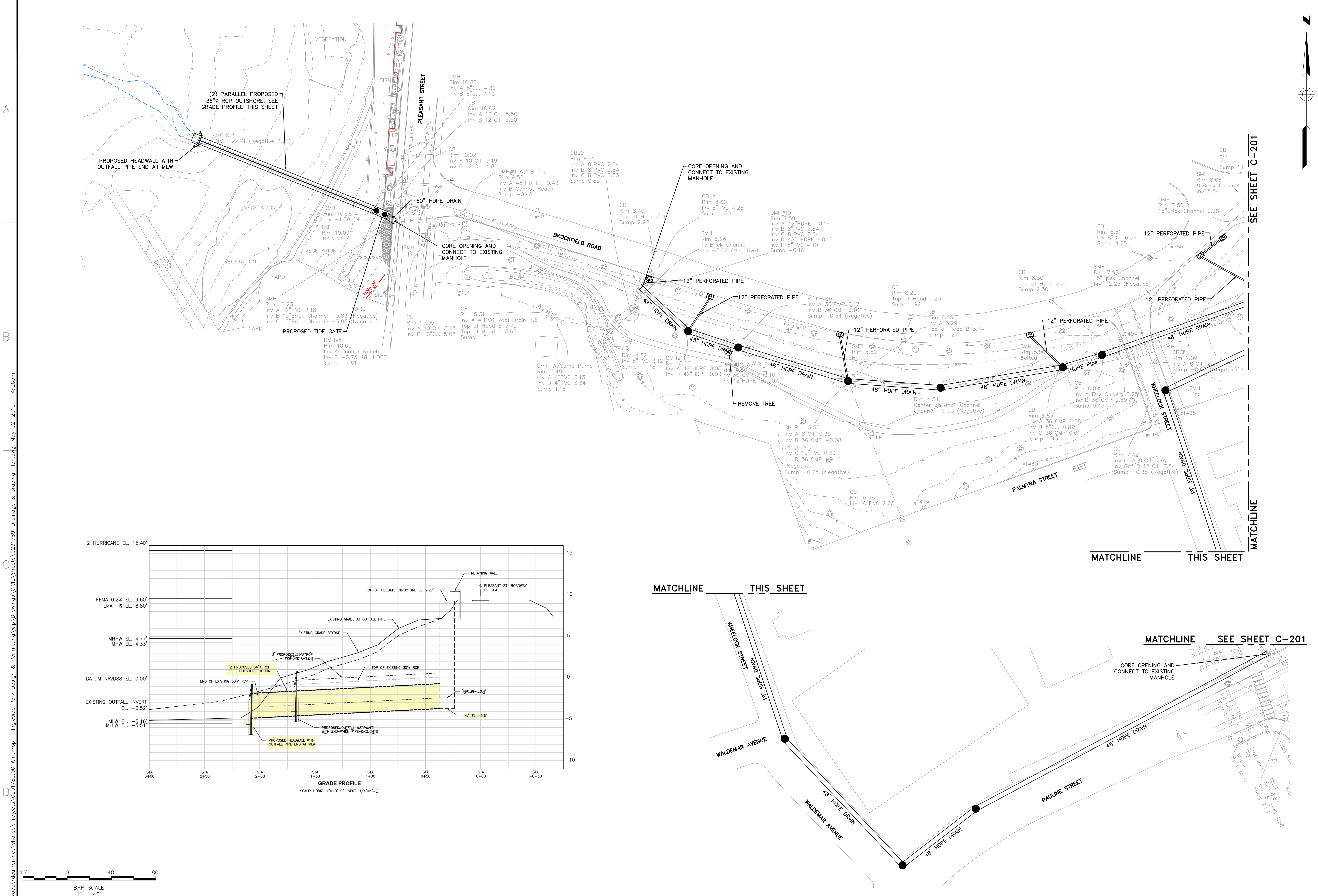
TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: MAY 2019
SCALE: 1" = 40'
SHEET: 5 OF XXX

EX-102

22x34 SHEET
1:1



\\woodardcurran.net\shared\Projects\0231789.00 Winthrop - Ingleside Park Design & Permitting\wip\Drawings\CIVIL\Sheets\0231789-Drainage & Grading Plan.dwg, May 02, 2019 - 4:26pm

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY: CTK | CHECKED BY: ADL/KAM
DRAWN BY: CTK | 0231789-DRAINAGE & GRAD*.dwg

DRAINAGE & GRADING PLAN I

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: FEBRUARY 2018
SCALE: 1"=40'
SHEET: 6 OF 15

C-200

22x34 SHEET
1:1

MATCHLINE

SEE SHEET C-202

SEE SHEET C-200

MATCHLINE

SEE SHEET C-200

12" PERFORATED PIPE

12" PERFORATED PIPE

12" PERFORATED PIPE

60" HDPE DRAIN

CORE OPENING AND CONNECT TO EXISTING MANHOLE

48" HDPE DRAIN (BURIED)

12" PERFORATED PIPE

12" PERFORATED PIPE

12" PERFORATED PIPE

12" PERFORATED PIPE

REMOVE TREE

12" PERFORATED PIPE

12" HDPE DRAIN (BURIED)

REMOVE TREE

BROOKFIELD ROAD

INGLESIDE PARK

WALDEN STREET

24" HDPE DRAIN

PROPOSED DOUBLE CATCH BASIN

24" HDPE DRAIN

(BURIED)

48" HDPE DRAIN

36" HDPE DRAIN

24" HDPE DRAIN

24" HDPE DRAIN

12" PERFORATED PIPE

48" HDPE DRAIN

PROPOSED UNDERGROUND VAULT FOR MECHANICAL PUMP. SEE DETAIL SHEET C-403

48" HDPE DRAIN

48" HDPE DRAIN

48" HDPE DRAIN

(BURIED)

24" HDPE DRAIN

12" HDPE DRAIN

PROPOSED UNDERGROUND 2MG STORAGE TANK 260'x294'. SEE DETAIL SHEET C-402

REMOVE AND DISPOSE OF EXISTING 36" DRAIN PIPE

CORE OPENING AND CONNECT TO EXISTING MANHOLE

PAULINE STREET

MATCHLINE

SEE SHEET C-200

N

MASS STATE PLANE COORDS (NAD 83)

BAR SCALE
1" = 40'
CHECK GRAPHIC SCALE BEFORE USING

40' 0 40' 80'

\\woodardcurran.net\shared\Projects\0231789.00 Winthrop - Ingleside Park Design & Permitting\wip\Drawings\CIVIL\Sheets\0231789-Drainage & Grading Plan.dwg, May 02, 2019 - 4:27pm

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE
DESIGNED BY: CTK	CHECKED BY: AJL/KAM	
DRAWN BY: CTK	0231789-DRAINAGE & GRAD*.dwg	

DRAINAGE & GRADING PLAN II

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: FEBRUARY 2018
SCALE: 1"=40'
SHEET: 7 OF 15

C-201

MATCHLINE — SEE SHEET C-103

MATCHLINE — SEE SHEET C-201

WALDEN STREET

READ STREET

BEAL STREET

BROOKFIELD ROAD

LINCOLN STREET

MASS STATE PLANE COORDS NAD 83

CORE OPENING AND CONNECT TO EXISTING MANHOLE

24" HDPE DRAIN

48" HDPE DRAIN

54" HDPE DRAIN

12" PERFORATED PIPE

BAR SCALE
1" = 40'
CHECK GRAPHIC SCALE BEFORE USING

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

REV	DESCRIPTION	DATE

DESIGNED BY: CTK
DRAWN BY: CTK
CHECKED BY: AJL/KAM
0231789-DRAINAGE & GRAD*.dwg

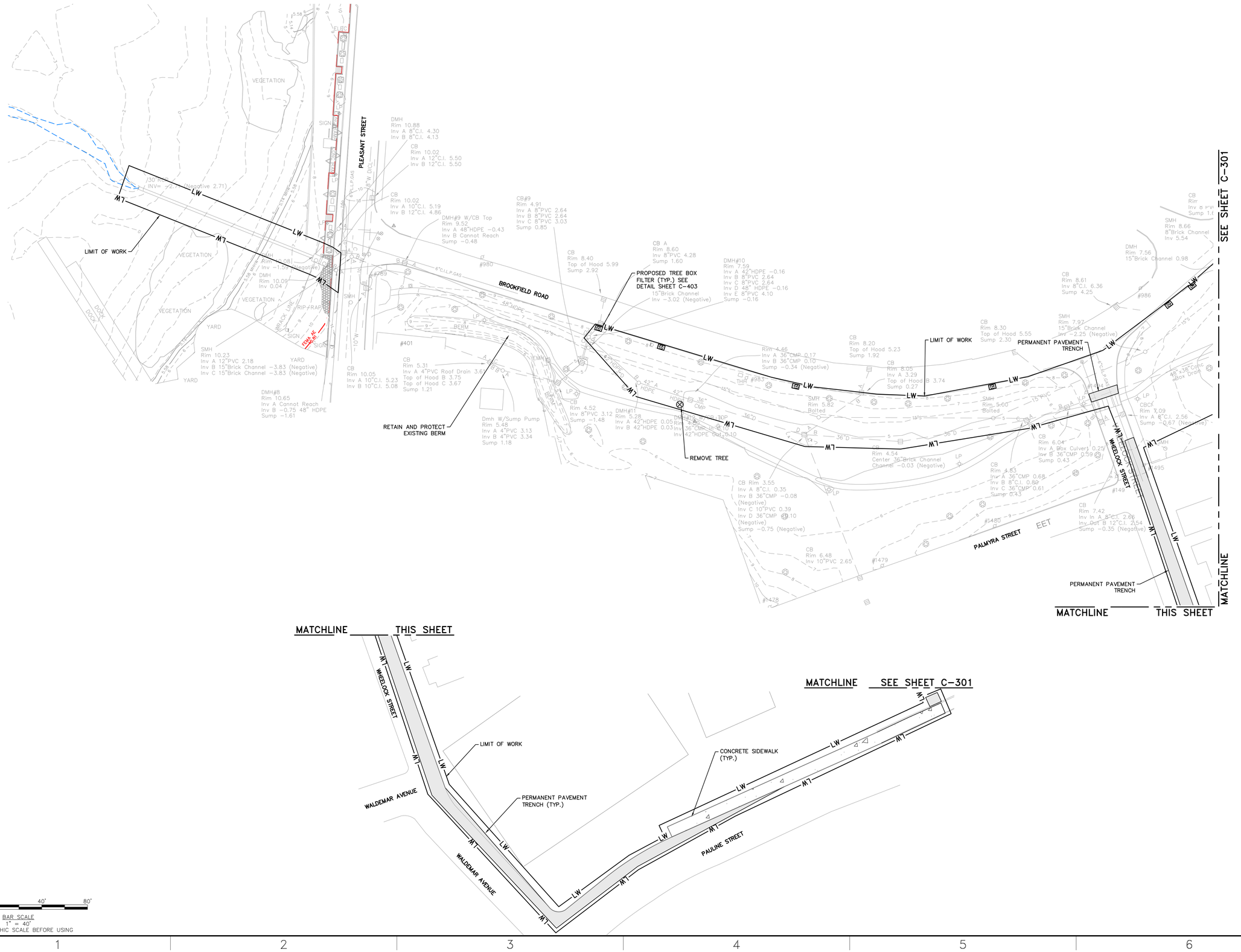
DRAINAGE & GRADING PLAN III

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: FEBRUARY 2018
SCALE: 1"=40'
SHEET: 8 OF 15

C-202



40' 0 40' 80'

BAR SCALE
1" = 40'
CHECK GRAPHIC SCALE BEFORE USING

\\woodardcurran.net\shared\Projects\0231789.00 Winthrop - Ingleside Park Design & Permitting\wip\Drawings\CIVIL\Sheets\0231789-Site Improvements Plan C-300 - C-302.dwg, May 02, 2019 - 4:27pm

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

REV	DESCRIPTION	DATE
DESIGNED BY: CTK	CHECKED BY: AJL/KAM	
DRAWN BY: CTK	0231789-SITE IMPROVEMENT.dwg	

SITE IMPROVEMENTS PLAN I

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: FEBRUARY 2018
SCALE: 1"=40'
SHEET: 9 OF 15

C-300

MATCHLINE — SEE SHEET C-302

MATCHLINE — SEE SHEET C-300

PROPOSED TREE BOX FILTER (TYP.) SEE DETAIL SHEET C-403

PROPOSED ASPHALT SIDEWALK

REMOVE TREE

RELOCATE LIGHT POLE

REMOVE TREE

RETAIN AND PROTECT EXISTING PARK COURTS

RE-PAVE EXISTING PARKING LOT

PERMANENT PAVEMENT TRENCH (TYP.)

PERMANENT PAVEMENT TRENCH (TYP.)

RE-CONSTRUCT BASEBALL FIELD

PROPOSED ASPHALT SIDEWALK

INGLESIDE PARK

WALDEN STREET

BROOKFIELD ROAD

ATHLETIC FACILITY

350.00

300.00

N

~ NAE COORDS NAD 83

BAR SCALE
1" = 40'
CHECK GRAPHIC SCALE BEFORE USING

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

REV	DESCRIPTION	DATE
DESIGNED BY: CTK	CHECKED BY: AJL/KAM	
DRAWN BY: CTK	0231789-SITE IMPROVEMENT.dwg	

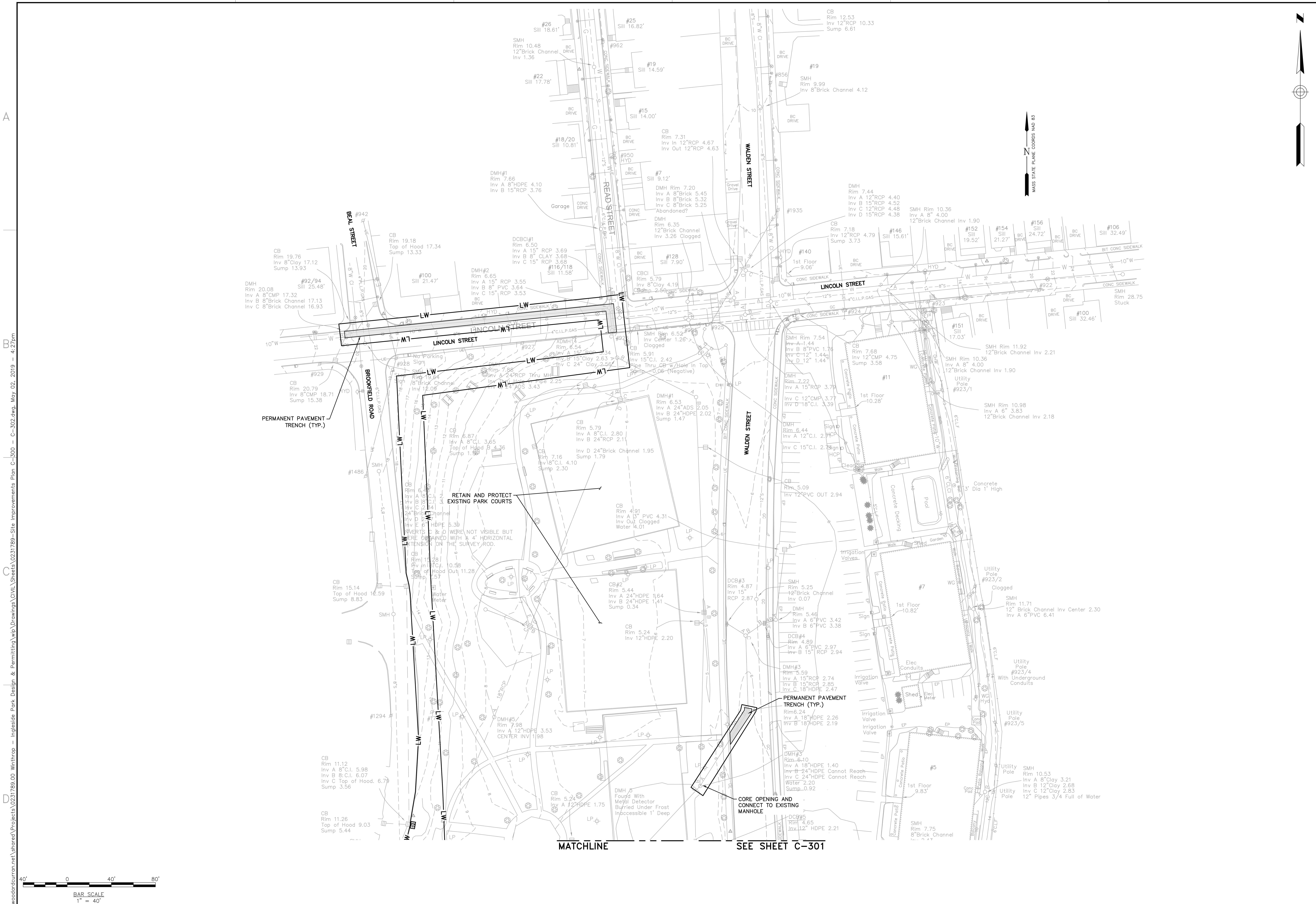
SITE IMPROVEMENTS PLAN II

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: FEBRUARY 2018
SCALE: 1"=40'
SHEET: 10 OF 15

C-301



\\woodardcurran.net\shared\Projects\0231789.00 Winthrop - Ingleside Park Design & Permitting\wp\Drawings\CIVIL\Sheets\0231789-Site Improvements Plan C-300 - C-302.dwg, May 02, 2019 - 4:27pm

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY: CTK
DRAWN BY: CTK
CHECKED BY: ADL/KAM
0231789-SITE IMPROVEMENTS.dwg

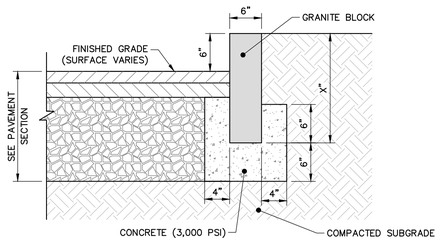
SITE IMPROVEMENT PLANS III

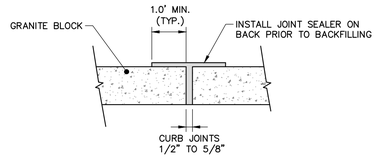
TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: FEBRUARY 2018
SCALE: 1"=40'
SHEET: 11 OF 15

C-302

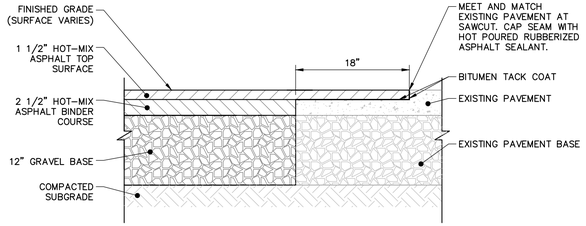




PLAN VIEW

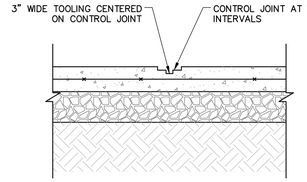
VERTICAL GRANITE CURB

NOT TO SCALE



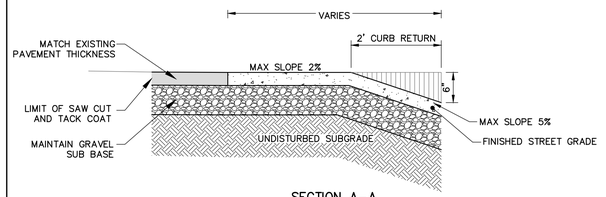
HOT-MIX ASPHALT PAVEMENT BUTT JOINT

NOT TO SCALE

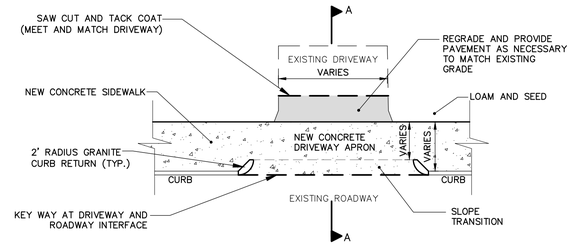


SIDEWALK CONTROL JOINT

NOT TO SCALE



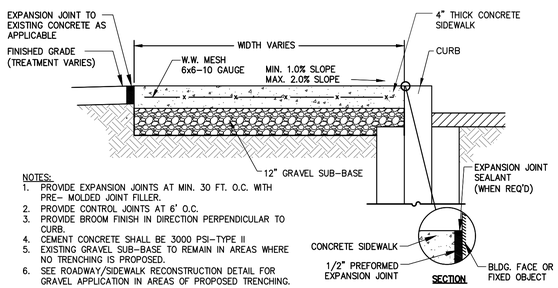
SECTION A-A



PLAN VIEW

RECONSTRUCT PAVEMENT (DRIVEWAY)

NOT TO SCALE



NOTES:
1. PROVIDE EXPANSION JOINTS AT MIN. 30 FT. O.C. WITH PRE- MOLDED JOINT FILLER.
2. PROVIDE CONTROL JOINTS AT 6' O.C.
3. PROVIDE BROOM FINISH IN DIRECTION PERPENDICULAR TO CURB.
4. CEMENT CONCRETE SHALL BE 3000 PSI-TYPE II
5. EXISTING GRAVEL SUB-BASE TO REMAIN IN AREAS WHERE NO TRENCHING IS PROPOSED.
6. SEE ROADWAY/SIDEWALK RECONSTRUCTION DETAIL FOR GRAVEL APPLICATION IN AREAS OF PROPOSED TRENCHING.

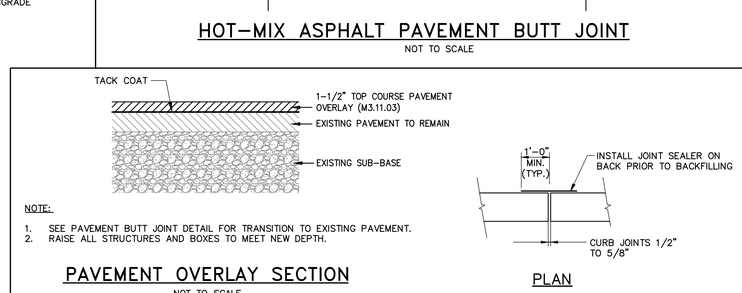
TYPICAL CEMENT CONCRETE SIDEWALK DETAIL

NOT TO SCALE

NOTE:
UNLESS OTHERWISE NOTED, HOT-MIX ASPHALT SHALL MEET THE SPECIFICATIONS OUTLINED IN SECTION M3 OF MASSACHUSETTS HIGHWAY DEPARTMENT 1995 STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGES.

TYPICAL HOT-MIX ASPHALT PAVEMENT PARKING LOT

NOT TO SCALE

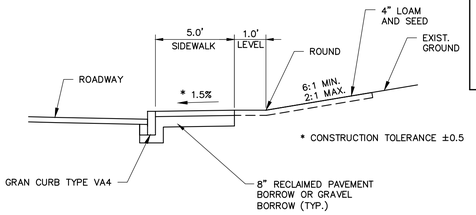


NOTE:
1. SEE PAVEMENT BUTT JOINT DETAIL FOR TRANSITION TO EXISTING PAVEMENT.
2. RAISE ALL STRUCTURES AND BOXES TO MEET NEW DEPTH.

PAVEMENT OVERLAY SECTION

NOT TO SCALE

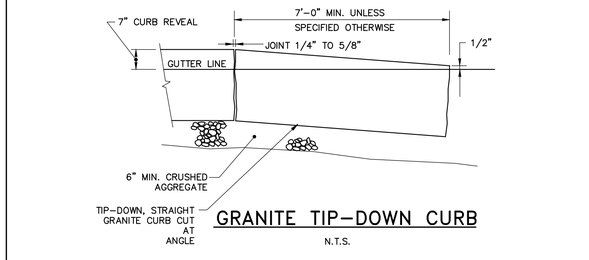
PLAN



NOTE:
1. SIDEWALK EXPANSION JOINTS SHALL BE SPACED AT INTERVALS NOT TO EXCEED 6 FEET

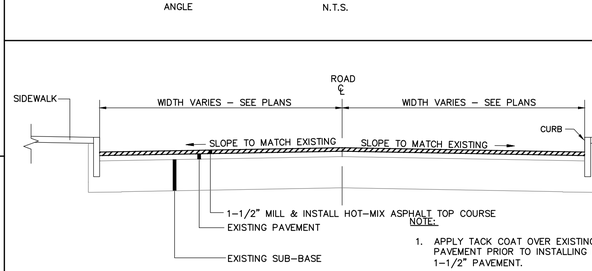
TYPICAL SECTION

N.T.S.



GRANITE TIP-DOWN CURB

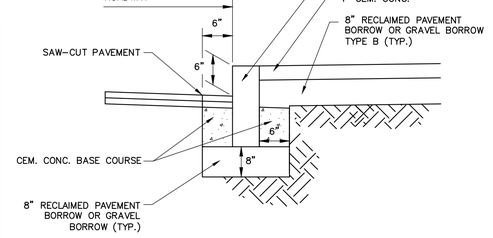
N.T.S.



NOTE:
1. APPLY TACK COAT OVER EXISTING PAVEMENT PRIOR TO INSTALLING NEW 1-1/2" PAVEMENT.
2. PROTECT OR RE-SET ALL STRUCTURES & BOXES.

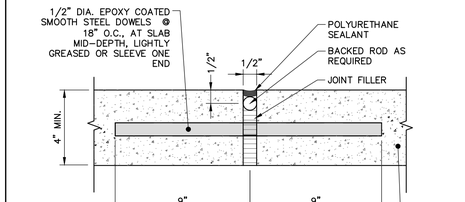
MILL AND OVERLAY SECTION

NOT TO SCALE



METHOD OF SETTING VERTICAL CURB

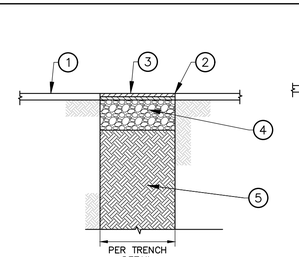
N.T.S.



NOTES:
1. EXPANSION JOINTS SHALL BE 60' O.C.
2. DISCONTINUE REINFORCING AT EACH SIDE OF JOINT.
3. DOWELS SHALL BE CUT STRAIGHT AND DEBURRED.

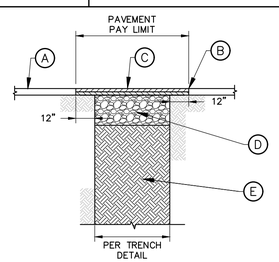
CONCRETE SIDEWALK EXPANSION JOINT

NOT TO SCALE



TEMPORARY

NOTES:
1. EXISTING PAVEMENT
2. SAWCUT, TACK COAT EDGES (TYP)
3. 2" HOT-MIX ASPHALT BINDER COURSE
4. 12" GRAVEL BASE COURSE
5. FINAL BACKFILL PER TRENCH DETAIL

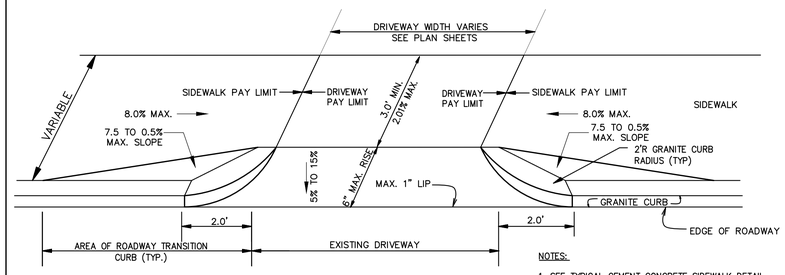


PERMANENT

NOTES:
A. EXISTING PAVEMENT
B. SAWCUT, TACK COAT EDGES (TYP) SEAL JOINTS BY INFRARED TECHNIQUES
C. 1 1/2" HOT-MIX ASPHALT TOP COURSE
2 1/2" HOT-MIX ASPHALT BINDER COURSE
OR MATCH EXISTING PAVEMENT SECTION IF > 4".
D. 12" GRAVEL BASE COURSE
E. FINAL BACKFILL PER TRENCH DETAIL

PAVEMENT DETAIL

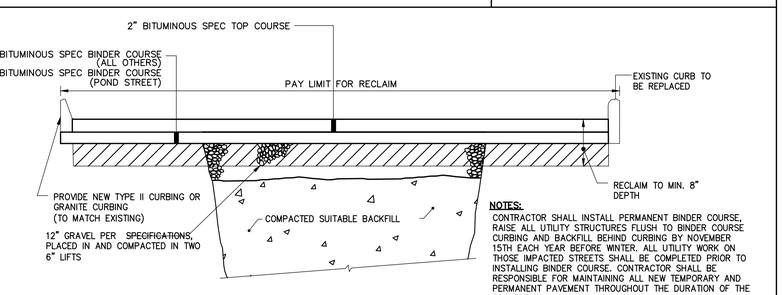
NOT TO SCALE



NOTES:
1. SEE TYPICAL CEMENT CONCRETE SIDEWALK DETAIL FOR SUB-BASE MATERIAL REQUIREMENTS
2. CONFIRM GRADES WITH ENGINEER PRIOR TO INSTALLATION.

TYPICAL CONCRETE DRIVEWAY DETAIL

NOT TO SCALE



NOTES:
CONTRACTOR SHALL INSTALL PERMANENT BINDER COURSE, RAISE ALL UTILITY STRUCTURES FLUSH TO BINDER COURSE CURBING AND BACKFILL BEHIND CURBING BY NOVEMBER 15TH EACH YEAR BEFORE WINTER. ALL UTILITY WORK ON THOSE IMPACTED STREETS SHALL BE COMPLETED PRIOR TO INSTALLING BINDER COURSE. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL NEW TEMPORARY AND PERMANENT PAVEMENT THROUGHOUT THE DURATION OF THE PROJECT.

RECLAIM AND OVERLAY PAVEMENT DETAIL

N.T.S.

40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE
DESIGNED BY: ADL	CHECKED BY: ADL / KM	
DRAWN BY: MRM / CTK	02/1789.015-DWL-REV.DWG	

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

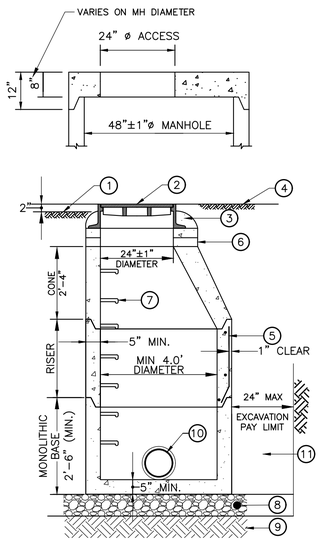
INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

CIVIL DETAILS I

JOB NO.: 02.31789.00
DATE: APRIL 2019
SCALE: AS NOTED
SHEET: 12 OF 15

C-400

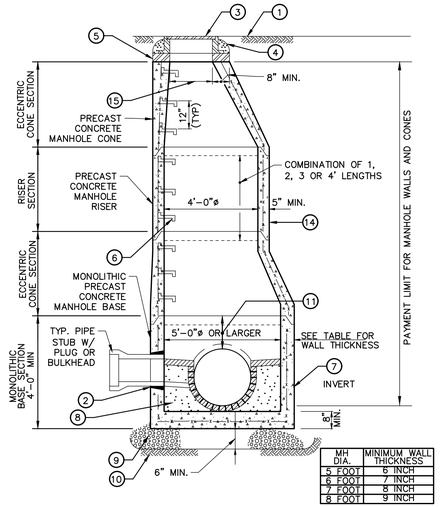
30% PROGRESS - NOT FOR CONSTRUCTION



1. UNPAVED SURFACE
2. MANHOLE FRAME & COVER
3. FRAME TO BE SET IN FULL BED OF MORTAR WITH BITUMINOUS ASPHALT COLLAR
4. PAVED SURFACE
5. MIN. 0.12 SQ. IN. STEEL PER VERTICAL FOOT, PLACED ACCORDING TO ASTM C-478
6. ADJUST TO GRADE WITH BRICK OR PRECAST CONCRETE RINGS: MAX. 8" ADJUSTMENT
7. MANHOLE STEP @ 12" O.C. (TYP)
8. 12" COMPACTED GRAVEL BORROW OR ¾" CRUSHED STONE BEDDING
9. UNDISTURBED SUBGRADE OR SUITABLE COMPACTED FILL
10. PROVIDE "V" OPENINGS (WITH 2" CLEARANCE TO OUTSIDE PIPE). MORTAR PIPE JOINTS
11. COMPACTED GRAVEL BORROW BACKFILL

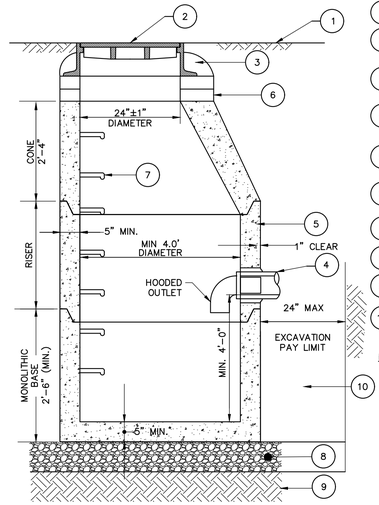
NOTES:
1. PRECAST CONCRETE STRUCTURES AND CASTINGS SHALL BE SUITABLE FOR HS20 LOADINGS.
2. PRECAST CONCRETE STRUCTURES SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM-C-478.
3. ALTERNATE SLAB TOP MAY BE USED AS DICTATED BY DESIGN AND/OR FIELD CONDITIONS.
4. UNLESS OTHERWISE NOTED, MANHOLES SHALL BE 48" I.D.

PRECAST CONCRETE DRAIN MANHOLE
N.T.S.



MH DIA.	MINIMUM WALL THICKNESS
5 FOOT	6 INCH
6 FOOT	7 INCH
7 FOOT	8 INCH
8 FOOT	9 INCH

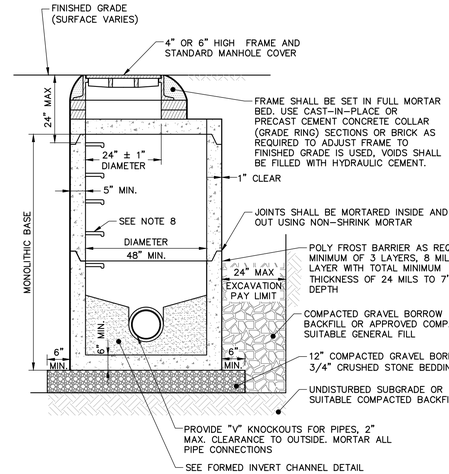
5' DIA. OR LARGER PRECAST CONCRETE MANHOLE
N.T.S.



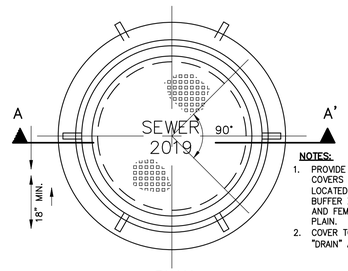
1. PAVED SURFACE
2. FRAME & GRATE (4 FLANGE) USE 3 FLANGE WHEN ADJACENT TO CURB.
3. FRAME TO BE SET IN FULL BED OF MORTAR WITH BITUMINOUS ASPHALT COLLAR
4. PROVIDE "V" OPENINGS (WITH 2" CLEARANCE TO OUTSIDE PIPE). MORTAR PIPE JOINTS.
5. MIN. 0.12 SQ. IN. STEEL PER VERTICAL FOOT, PLACED ACCORDING TO ASTM C-478
6. ADJUST TO GRADE WITH BRICK OR PRECAST CONCRETE RINGS: MAX. 8" ADJUSTMENT
7. MANHOLE STEP @ 12" O.C. (TYP)
8. 12" OF ¾" CRUSHED STONE BEDDING
9. UNDISTURBED SUBGRADE OR SUITABLE COMPACTED FILL
10. COMPACTED GRAVEL BORROW BACKFILL

NOTES:
1. PRECAST CONCRETE STRUCTURES AND CASTINGS SHALL BE SUITABLE FOR HS20 LOADINGS.
2. PRECAST CONCRETE STRUCTURES SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM-C-478.
3. ALTERNATE SLAB TOP MAY BE USED AS DICTATED BY DESIGN AND/OR FIELD CONDITIONS.
4. UNLESS OTHERWISE NOTED, CATCH BASINS SHALL BE 48" I.D.
5. PROVIDE 24"X24" OPENING FOR SINGLE GRATE CATCH BASIN (CB) AND 24"X36" OPENING FOR DOUBLE GRATE CATCH BASIN (DCB).

PRECAST CONCRETE CATCH BASIN
N.T.S.

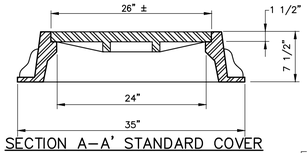


SHALLOW DRAINAGE MANHOLE
NOT TO SCALE

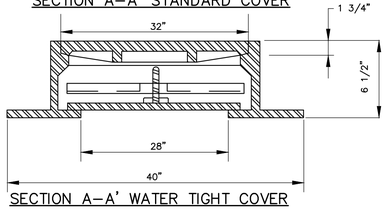


NOTES:
1. PROVIDE WATERTIGHT MANHOLE COVERS FOR ALL MANHOLES LOCATED IN THE 100' WETLAND BUFFER ZONE, OR IN ANY GREEN AND FEMA 100-YEAR FLOOD PLAIN.
2. COVER TO READ "SEWER" OR "DRAIN" AND YEAR "2017"

PLAN

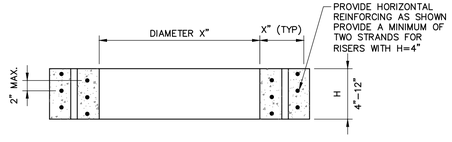


SECTION A-A' STANDARD COVER

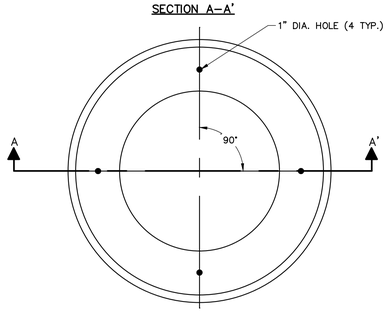


SECTION A-A' WATER TIGHT COVER

SEWER & DRAIN MANHOLE FRAME & COVER



SECTION A-A'

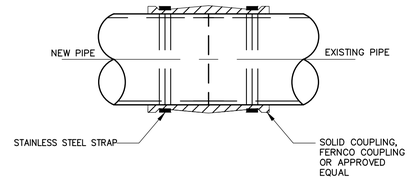


PLAN

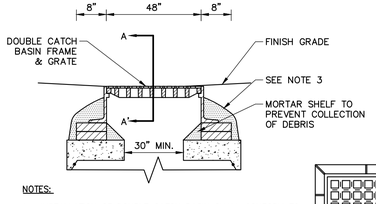
NOTES:
1. PROVIDE CAST-IN INSERTS IN PRECAST MANHOLE CONES AND FLAT TOPS. LOCATIONS TO MATCH HOLES IN GRADE RING.
2. PROVIDE HEIGHT (H) OF 4" MINIMUM TO 12" MAX AS REQUIRED TO BRING FRAME TO FINAL GRADE.
3. FOR FRAME ADJUSTMENTS OF LESS THAN 4" USE APPROVED ALTERNATE MANHOLE FRAME AND/OR ATTACH FRAME DIRECTLY TO PRECAST MANHOLE CONE.
4. CONTRACTOR MAY USE BRICKS TO BRING MANHOLE TO GRADE.

PRECAST CONCRETE GRADE RING
NOT TO SCALE

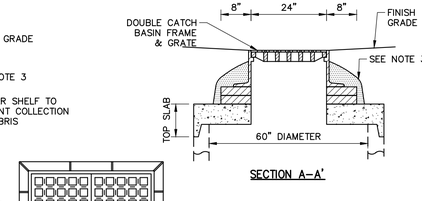
CATCH BASIN MARKER
NOT TO SCALE



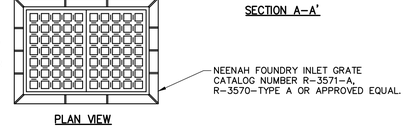
NEW PIPE TO EXISTING DRAIN OR SEWER PIPE CONNECTION
NOT TO SCALE



NOTES:
1. INSTALLATION OF DOUBLE CATCH BASIN SHALL CONFORM TO PRECAST CONCRETE CATCH BASIN DETAIL ON THIS SHEET.
2. DOUBLE GRATE CATCH BASINS SHALL HAVE A 60" DIAMETER INSIDE DIMENSION.
3. STANDARD DOUBLE CATCH BASIN FRAME AND GRATE(S) SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH BRICK OR PRECAST CONCRETE RINGS (8" MAXIMUM ADJUSTMENT).



SECTION A-A'



PLAN VIEW

PRECAST CONCRETE DOUBLE CATCH BASIN GRATE
NOT TO SCALE

30% PROGRESS - NOT FOR CONSTRUCTION

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

REV.	DESCRIPTION	DATE

DESIGNED BY: ADL / KM
DRAWN BY: MRM / CTK
CHECKED BY: ADL / KM
0231789.00.15-CIVIL-REV.DWG

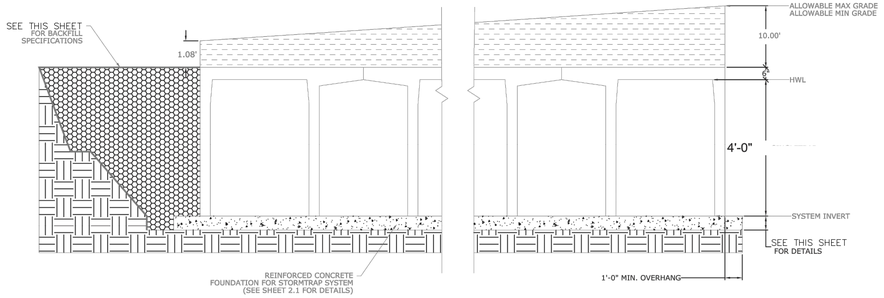
CIVIL DETAILS II

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: APRIL 2019
SCALE: AS NOTED
SHEET: 13 OF 15

C-401



SINGLETRAP

STORMTRAP STRUCTURAL DESIGN CRITERIA

1. STORMTRAP MODULES SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/ OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 1.08' MAX. 10.00' (CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS).
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE REQUIRED TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.

RECOMMENDED ACCESS OPENING SPECIFICATION

1. A TYPICAL ACCESS OPENING FOR THE STORMTRAP SYSTEM ARE 2'-0" IN DIAMETER. ACCESS OPENINGS LARGER THAN 3'-0" IN DIAMETER NEED TO BE APPROVED BY STORMTRAP. ALL OPENINGS MUST RETAIN AT LEAST 1'-0" OF CLEARANCE FROM THE END OF THE STORMTRAP MODULE UNLESS NOTED OTHERWISE. ALL ACCESS OPENINGS TO BE LOCATED ON INSIDE LEG UNLESS OTHERWISE SPECIFIED.

2. PLASTIC COATED STEEL STEPS PRODUCED BY M.A. INDUSTRIES PART #PS3-PFC OR APPROVED EQUAL (SEE STEP DETAIL) ARE PROVIDED INSIDE ANY MODULE WHERE DEEMED NECESSARY. THE HIGHEST STEP IN THE MODULE IS TO BE PLACED A DISTANCE OF 1'-0" FROM THE INSIDE EDGE OF THE STORMTRAP MODULES. ALL ENSUING STEPS SHALL BE PLACED WITH A MAXIMUM DISTANCE OF 1'-4" BETWEEN THEM. STEPS MAY BE MOVED OR ALTERED TO AVOID OPENINGS OR OTHER IRREGULARITIES IN THE MODULE.

3. STORMTRAP LIFTING INSERTS MAY BE RELOCATED TO AVOID INTERFERENCE WITH ACCESS OPENINGS OR THE CENTER OF GRAVITY OF THE MODULE AS NEEDED.

4. STORMTRAP ACCESS OPENINGS MAY BE RELOCATED TO AVOID INTERFERENCE WITH INLET AND/OR OUTLET PIPE OPENINGS SO PLACEMENT OF STEPS IS ATTAINABLE.

5. ACCESS OPENINGS SHOULD BE LOCATED IN ORDER TO MEET THE APPROPRIATE MUNICIPAL REQUIREMENTS. STORMTRAP RECOMMENDS AT LEAST TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.

6. USE PRECAST ADJUSTING RINGS AS NEEDED TO MEET GRADE. STORMTRAP RECOMMENDS FOR COVER OVER 2' TO USE PRECAST BARREL OR CONE INSPECTIONS. (PROVIDED BY OTHERS)

RECOMMENDED PIPE OPENING SPECIFICATION

1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'-0".

2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE Ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.

3. CONNECTING PIPES SHALL BE INSTALLED WITH A 1'-0" CONCRETE COLLAR, AND AN AGGREGATE CRADLE FOR AT LEAST ONE PIPE LENGTH (SEE PIPE CONNECTION DETAIL). A STRUCTURAL GRADE CONCRETE OR HIGH STRENGTH, NON-SHRINK GROUT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI SHALL BE USED.

4. THE ANNULAR SPACE BETWEEN THE PIPE AND THE HOLE SHALL BE FILLED WITH HIGH STRENGTH NON-SHRINK GROUT.

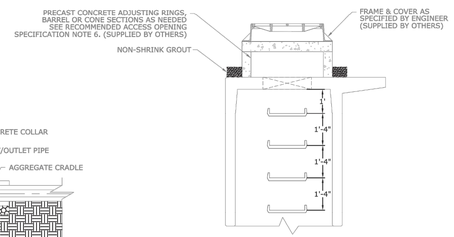
RECOMMENDED PIPE INSTALLATION INSTRUCTIONS

1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.

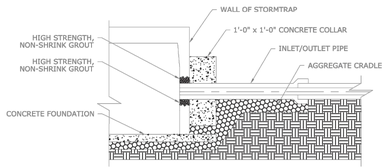
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.

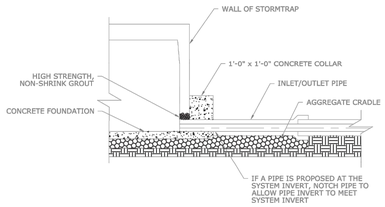
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

NOTE: ALL ANCILLARY PRODUCTS RECOMMENDED AND SHOWN ON THIS SHEET ARE RECOMMENDATIONS ONLY AND SUBJECT TO CHANGE PER THE INSTALLING CONTRACTOR.

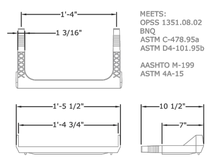


RISER / STAIR DETAIL

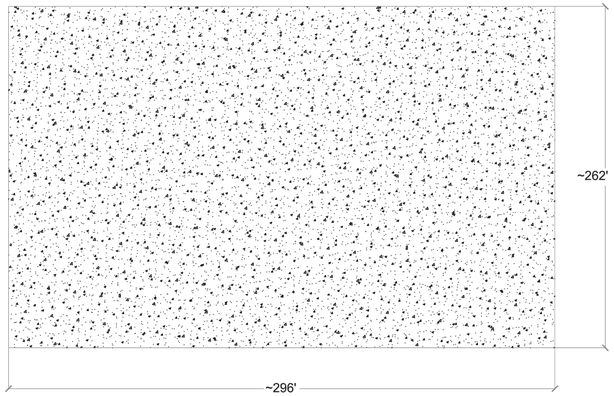


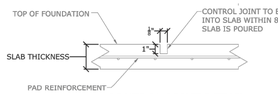


PIPE CONNECTION DETAIL



STEP DETAIL





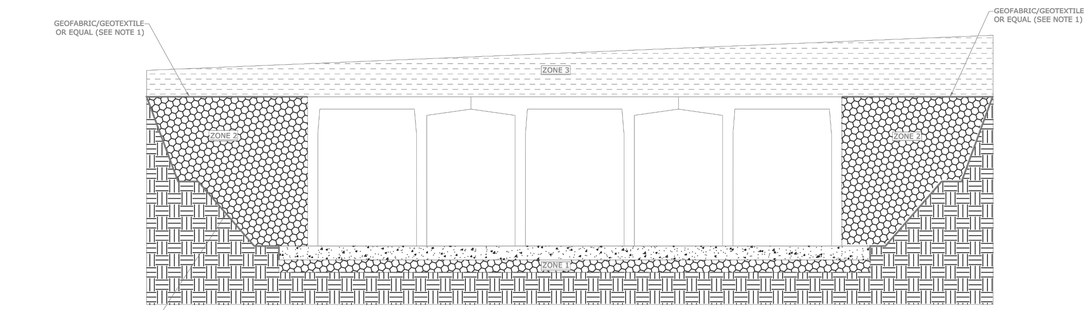
CONTROL JOINT DETAIL

STORMTRAP FOUNDATION DETAIL

NOTES:

1. CONCRETE STRENGTH @ 28 DAYS, 5%-8% ENTRAINED AIR, 4" MAX. SLUMP.
2. NET ALLOWABLE SOIL PRESSURE AS INDICATED ON SHEET 1.0.
3. SOIL CONDITIONS TO BE VERIFIED ON SITE BY OTHERS.
4. REBAR: ASTM A-615 GRADE 60. BLACK BAR.
5. DIMENSION OF FOUNDATION MUST HAVE 1'-0" OVERHANG BEYOND EXTERNAL FACE OF MODULE.
6. DIMENSION OF STORMTRAP SYSTEM ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
7. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
8. THE CONTROL JOINTS SHALL BE BETWEEN (IF REQUIRED BY ENGINEER OF RECORD) 16'-0" TO 24'-0" MAX APART.
9. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.

MAXIMUM SYSTEM COVER	SLAB THICKNESS	CONCRETE STRENGTH	REINFORCEMENT (BOTH DIRECTIONS)
6" - 12"	0'-8"	4000 PSI	#4 @ 18" O.C.
>1'-0" - 2'-0"	0'-8"	4000 PSI	#4 @ 16" O.C.
>2'-0" - 3'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.
>3'-0" - 4'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.
>4'-0" - 5'-0"	0'-8"	4000 PSI	#5 @ 18" O.C.
>5'-0" - 6'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.
>6'-0" - 7'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.
>7'-0" - 8'-0"	0'-9"	4000 PSI	#5 @ 12" O.C.
>8'-0" - 9'-0"	0'-10"	4000 PSI	#5 @ 12" O.C.
>9'-0" - 10'-0"	0'-10"	4500 PSI	#5 @ 12" O.C.



BACKFILL DETAIL

STORMTRAP ZONE INSTALLATION SPECIFICATIONS/PROCEDURES

1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL AGGREGATE/STONE MATERIAL IS WELL SEATED AND PROPERLY INTER LOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MATERIAL SHALL BE CLEAN, CRUSHED, ANGULAR No. 5 (AASHTO M43) AGGREGATE. IF NATIVE EARTH IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED.
2. DURING PLACEMENT OF MATERIAL OVERTOP THE SYSTEM, AT NO TIME SHALL MACHINERY BE USED OVERTOP THAT EXCEEDS THE DESIGN LIMITATIONS OF THE SYSTEM. WHEN PLACEMENT OF MATERIAL OVERTOP, MATERIAL SHALL BE PLACED SUCH THAT THE DIRECTION OF PLACEMENT IS PARALLEL WITH THE OVERALL LONGITUDINAL DIRECTION OF THE SYSTEM WHENEVER POSSIBLE.
3. THE FILL PLACED OVERTOP THE SYSTEM SHALL BE PLACED AT A MINIMUM OF 6" LIFTS. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL OVERTOP THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVERTOP THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS TO NOT EXCEED THE DESIGN CAPACITY OF THE SYSTEM. IN SOME CASES, IN ORDER TO ACHIEVE REQUIRED COMPACTION, HAND COMPACTION MAY BE NECESSARY IN ORDER NOT TO EXCEED THE ALLOTTED DESIGN LOADING.

ZONE CHART

ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1 (OPTIONAL)	FOUNDATION AGGREGATE	
ZONE 2	BACKFILL	
ZONE 3	FINAL COVER OVERTOP	

UNDERGROUND STORMWATER STORAGE TANK

NOT TO SCALE

NOTE:
1. UNDERGROUND STORAGE TANK SHALL CONSIST OF STORMTRAP SINGLE-TRAP 4-0 OR APPROVED EQUIVALENT.

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

REV	DESCRIPTION	DATE

DESIGNED BY: ADL
DRAWN BY: MRM / CTK
CHECKED BY: ADL / KM
0231789.DTLS-CIVIL-REV.DWG

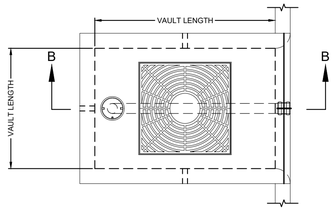
CIVIL DETAILS III

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

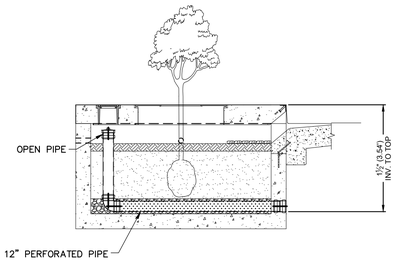
INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: APRIL 2019
SCALE: AS NOTED
SHEET: 14 OF 15

C-402



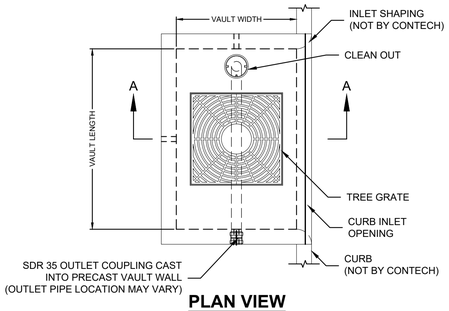
PLAN VIEW



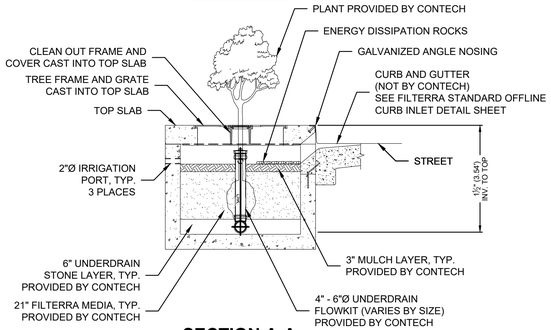
SECTION B-B

FT LONG SIDE INLET CONFIGURATION					
DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (L x W)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0604	N/A CA	6 x 4	6 x 4	4" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE



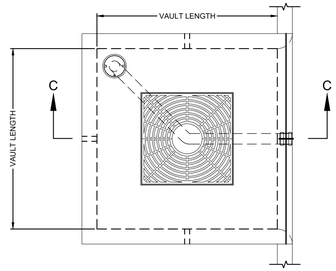
PLAN VIEW



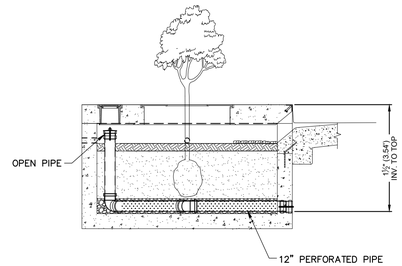
SECTION A-A

FT SHORT SIDE INLET CONFIGURATION					
DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0406	N/A CA	4 x 6	4 x 6	4" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE



PLAN VIEW



SECTION C-C

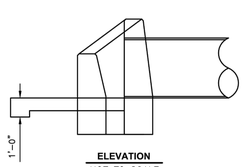
FT SQUARE INLET CONFIGURATION					
DESIGNATION	AVAILABILITY	MEDIA BAY SIZE	VAULT SIZE (W x L)	OUTLET PIPE DIA	TREE GRATE QTY & SIZE
FT0404	ALL	4 x 4	4 x 4	4" SDR 35	(1) 3' x 3'
FT0606	ALL	6 x 6	6 x 6	4" SDR 35	(1) 3' x 3'

N/A = NOT AVAILABLE

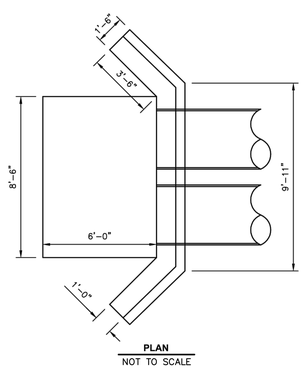
TREE BOX FILTER

NOT TO SCALE

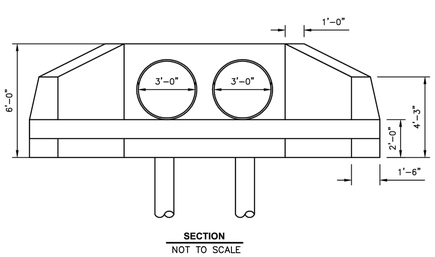
NOTE:
1. TREEBOX FILTER SHALL CONSIST OF CONTECH FILTERRA OR APPROVED EQUIVALENT.



ELEVATION
NOT TO SCALE



PLAN
NOT TO SCALE

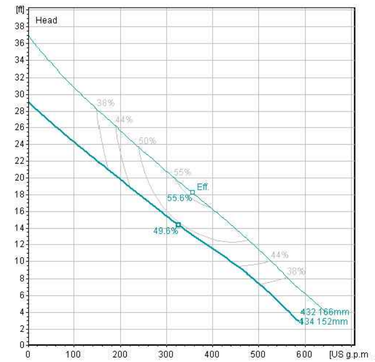


SECTION
NOT TO SCALE

WINGED CONCRETE HEADWALL

NOT TO SCALE

N 3069 MT 3 phase Adaptive 4 poles 60hz US



MECHANICAL PUMP

NOT TO SCALE

NOTE:
1. PUMP SHALL CONSIST OF XYLEM FLYGT N 3069 OR APPROVED EQUIVALENT.

WOODARD & CURRAN
40 Shattuck Road, Suite 110
Andover, Massachusetts 01810
866.702.6371 | www.woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

REV.	DESCRIPTION	DATE

DESIGNED BY: ADL
DRAWN BY: MRM / CTK
CHECKED BY: ADL / KM
2017/Rel. 01.5-CIVIL-REV.DWG

CIVIL DETAILS IV

TOWN OF WINTHROP
1 METCALF SQUARE
WINTHROP, MASSACHUSETTS

INGLESIDE PARK FEASIBILITY STUDY AND PERMITTING PROJECT

JOB NO.: 0231789.00
DATE: APRIL 2019
SCALE: AS NOTED
SHEET: 15 OF 15

C-403

woodardcurran.com

COMMITMENT & INTEGRITY DRIVE RESULTS