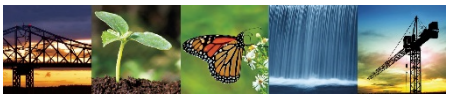

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M E M O R A N D U M

To: Tom Hutcheson, Town Manager
Town of Dalton, MA
462 Main Street
Dalton, MA 01226

From: Rosalie T. Starvish, M.S., P.E., CFM, CPMSM
Stephen L. Lecco, A.I.C.P., C.E.P., P.W.S.
Nathaniel L. Russell, P.E.
GZA GeoEnvironmental, Inc.
1350 Main Street Suite 1400
Springfield, MA 01103

Date: March 6, 2023

File No.: 15.0166994.00

Re: Walker Brook Preliminary Engineering Study (Flood Mitigation) – Preliminary Design Drawings (25% Design) and Basis of Design

---

Dear Mr. Hutcheson:

In accordance with our contract executed on September 27, 2021, GZA GeoEnvironmental, Inc. (GZA) is pleased to provide the attached preliminary design drawings (**Attachment G**) for the proposed Walker Brook flood mitigation alternative to the Town of Dalton (Client; the Town). GZA prepared this memorandum to summarize the basis of design, including a summary of field data collected, design assumptions, estimated construction costs, and recommendations for future services to enable advancement of the design, permitting, and ultimately, construction of the project.

This report is subject to the Limitations included as **Attachment A**.

BACKGROUND

The Walker Brook Preliminary Engineering Study including the following field data collection efforts and analyses:

- General reconnaissance site visit and review of Town records performed by GZA on December 10, 2021;
- A closed-circuit television (CCTV) inspection of the Walker Brook culvert performed by National Water Main Cleaning Co. and observed by GZA on May 17, 2022;
- Geomorphic stream assessment conducted by Field Geology Services in 2022;

- Hydrologic and hydraulic modeling prepared by GZA to evaluate existing conditions and several flood mitigation alternatives;
- Review and delineation of wetland resources within the project area by GZA on October 20, 2022;
- Subsurface exploration program with borings conducted by Seaboard Drilling, Inc. and observed by GZA on December 27 through 29, 2022; and
- Topographical survey completed by Hill Engineers in December 2022 through February 2023, as presented in **Attachment B**.

The following memoranda summarizing various field data collection efforts and analyses were previously provided under separate cover:

- Summary of Potential Flood Mitigation Options, March 2, 2022
- Preliminary Cost Opinions for Flood Mitigation Alternatives, September 16, 2022
- Hydrologic and Hydraulic Analysis, October 20, 2022
- Video Survey Summary, November 9, 2022

Other data collection efforts and analyses are described in the following additional reports or memoranda which are attached to this memorandum:

- Wetlands letter report (**Attachment C**)
- Geomorphic Assessment Report (**Attachment D**)
- Geotechnical Data Memorandum (**Attachment E**)

FLOOD MITIGATION ALTERNATIVES

GZA identified three (3) primary flood mitigation alternatives, which were described in GZA's above referenced March 2, 2022 memorandum and presented to the Town at Selectboard meetings on August 8 and October 11, 2022. . Based on review with the Town, the alternative "Proposed Conditions #2 (PC2)" was deemed the most advantageous for meeting the Town's needs and was selected for preliminary design. This alternative includes maintaining the existing culvert and constructing a new culvert to supplement the existing, starting from the headwall at High Street and extending along Field Street extension, 1st Street, and Glennon Avenue, and includes two potential options for re-connecting to Walker Brook downstream of Main Street.

The new culvert would act as a diversion to convey Walker Brook flood flows through the High Street neighborhood, along an alignment that follows public rights-of-way to the extent practical to limit direct impacts on private property. Under this alternative, the existing Walker Brook culvert would remain in service, potentially with minor

improvements (slip lining, see below), to convey normal (non-flood) brook flows and would continue to accept local runoff via existing storm drainage infrastructure. Potential benefits to this approach are as follows:

- The existing Walker Brook baseflows would be maintained immediately downstream of the culverted section, avoiding adverse environmental impacts to the brook itself.
- Locating the new culvert within existing rights-of-way, to the extent possible, limits private property impacts and reduces need for coordination with private landowners and acquisition or easements.
- By keeping the existing Walker Brook culvert in place, the conveyance of local runoff can be maintained without requiring significant changes to the existing storm drainage infrastructure. Note, additional improvements to the existing drainage system may be necessary to address local deficiencies in the piping and structures, or where construction of the new culvert necessitates changes to the existing utilities or drainage patterns.
- The existing Walker Brook culvert would provide a built-in water diversion to convey flow during construction, helping to reduce construction phase impacts related to the project.

The condition of the existing culvert where it extends through the rear portion of the private properties along Glennon Avenue is not well documented and may require repair or replacement to maintain function in the future. This alternative does not directly address the repair or replacement of that section of culvert. However, it is recommended that this alternative be accompanied by a project to slip line the existing culvert, which would be intended to enhance the structural stability of the existing culvert and reduce the risk of future culvert failure. Depending on the nature and extent of the culvert lining utilized, the hydraulic capacity of the existing culvert could be reduced.

PRELIMINARY DESIGN ASSUMPTIONS

GZA considered two potential options for the proposed culvert's downstream re-connection/discharge to Walker Brook. Option 1 included construction of the proposed culvert along the north side of Main Street (Route 9) from Glennon Avenue to the existing cross-culvert of Walker Brook under Main Street, which is currently in poor condition. Option 2 included crossing the proposed culvert under Main Street directly south of Glennon Avenue and across private property on the south side of Main Street before discharging via a new outfall to Walker Brook. Both Option 1 and Option 2 proposed culvert were designed to have a minimum slope of 1%. Upon examination of the existing roadway profiles, and the depths of the existing cross-culvert and utilities within the right of ways, it was determined that Option 1 was infeasible. Further, Option 1 would likely require improvements to or replacement of the Main Street cross-culvert to avoid further deterioration, necessitating coordination with MassDOT.

Option 2 would require construction of the downstream-most portion of the culvert and associated drainage structures on private property. Additionally, a properly designed energy dissipation structure(s) to reduce discharge velocities and prevent excessive erosion at the return to Walker Brook would be required.

Under both options considered, due to the construction of the proposed culvert, it is likely that the work will require additional temporary or permanent work within the right-of-way. This work may include the reconstruction of sidewalks, temporary or permanent relocation of utilities, etc.

CONCEPTUAL LEVEL COST OPINION

GZA updated the conceptual-level opinion of construction cost for the flood mitigation alternative, PC2, as presented in **Attachment F** and summarized below in **Table 1.** The cost to line approximately 1,200 linear feet of the existing culvert is presented as part of the total cost for alternative PC2.

The conceptual-level opinion of construction cost presented in this memorandum were developed based on the preliminary design and without detailed design. In preparing the cost opinion, GZA estimated approximate quantities of work and utilized a combination of sources of unit cost information which may include published RS Means Cost Data; cost data from federal, state, or local transportation agency web sites; discussions with local experienced contractors; and GZA's experience with costs for similar projects in similar locations. Because these conceptual-level estimate was made prior to the completion of detailed design and permitting, there is a higher degree of uncertainty regarding the actual nature and scope of the work that will be performed. As such, the potential margin of error is expected to be larger than would be anticipated for cost estimates developed after detailed design and a contingency of 30% was assumed to cover the occurrence of eventual refinements to the scope of the project and to mitigate the potential for unplanned events or discoveries during construction. Costs associated with additional survey; geotechnical evaluations; civil engineering design services; permitting; designer services during construction; resident engineer services; unforeseen utility impacts or wetland mitigation requirements; or temporary and permanent easements are not included in the estimate of cost. Notwithstanding these limitations, the opinion of Project cost are provided to inform the Town about the potential magnitude of anticipated construction costs and to furnish information for the Town's use in evaluating the economic feasibility of proceeding with the project and the project's potential for further development. The estimate of cost may also be used to help establish a preliminary construction budget.

Table 1: Summary of Conceptual-Level Opinion of Construction Costs for Flood Mitigation Alternatives

ITEM	ESTIMATED COST	
Site Preparation & Site Demolition	$	714,100
Earthwork & Improvements	$	3,097,345
Roadwork & Pavement	$	516,500
Landscaping & Site Restoration	$	48,800
TOTAL (2023 DOLLARS) =	**$**	**4,376,800**
TOTAL WITH 10% DESIGN CONTINGENCY =	**$**	**4,814,500**
TOTAL WITH 10% CONSTRUCTION CONTINGENCY =	**$**	**5,296,000**
TOTAL WITH ADDITIONAL 5% INFLATION FACTOR (OVER 3 YRS)[1] =	**$**	**6,130,800**

Notes:

1. Assumes escalation for inflation at 5% annually for three years.
2. Cost opinions exclude police detail or traffic control that may be needed for execution of the work.

REQUIRED ADDITIONAL ANALYSES

While the data collected and evaluated as part of this project addressed the required elements to develop the preliminary design for the Walker Brook flood mitigation, more information and data are anticipated to be needed to advance this design beyond the preliminary level. Below is a compiled list of assessments, analysis and information needed for the next steps of this project.

- Coordination with MassDOT will be required for work to be conducted within Main Street/MassDOT Right of Way.

- Coordination with private property owners as needed to secure permissions for access to complete the work. At a minimum, the Town will need to seek Right of Entry for temporary access during construction. Permanent drainage easements may be recommended for future access and maintenance of the existing and proposed culvert.

- Additional geotechnical explorations and evaluations in locations previously not studied.

- Confirmation of the actual locations and materials of construction of utilities (water and sewer) which were estimated based on information provided by Town staff to develop the topographic survey.

- Confirmation of the size, material, and condition of the existing culvert behind Glennon Avenue, to facilitate the design and implementation of slip lining the culvert.

As the preliminary design is further refined to advance the plans to 75% permit-level drawings and then 100% construction-level drawings, the following additional engineering and analyses should be advanced:

- Advancement of the hydrologic and hydraulic analysis to further evaluate downstream conditions as a result of the proposed work, and to support design of the diversion structure, energy dissipation requirements and permitting considerations.

- Detailed proposed conditions grading and terrain modeling, earthwork calculations, cross-sections and profiles. This information will be used to develop more accurate estimates of the volumes of fill and material removed to construct the culvert. The volume of onsite material that must be disposed off-site will impact construction costs.

- Project phasing planning and associated engineering construction cost estimate updates.

- Construction details for the diversion structure and new outfall with energy dissipation structure.

- Development of restoration plans for disturbed areas and work on private property.

- Design of both short term (construction phase) and long-term erosion controls within the channel downstream of the new outfall.

- Design of detailed layout, profile and details for utility relocations.

PERMITTING CONSIDERATIONS

The project will require permitting under the Massachusetts Wetlands Protection Act for work in or near Walker Brook at the upstream and downstream limits of the proposed culvert. Additional permits that may be applicable for activities within wetland and waterbody resources include Section 401 of the Clean Water Act and the Massachusetts Surface Water Quality Standards (314 CMR 4.00) and 401 Water Quality Certification (314 CMR 9.00), as well as Section 404 of the Clean Water Act as implemented by the General Permits (GPs) issued for the Commonwealth of

Massachusetts by the U.S. Army Corps of Engineers. The applicability of these permits will need to be reviewed upon further refinement and understanding of impacts to wetland resources.

Based on a review of the Massachusetts interactive Geographic Information System, MassMapper, there is mapped Estimated and Priority Habitat associated with East Branch Housatonic River, downstream of Walker Brook and it is therefore assumed that review or approval of the Project by the Natural Heritage Endangered Species Program (NHESP) may be required.

CLOSING

It has been a pleasure to work with the Town of Dalton to develop an approach to mitigating the risk of flooding along the Walker Brook culvert. We trust that the information contained in this memorandum meets your needs at this time. Please feel free to contact us if you have any questions or comments.

Attachments:

- Attachment A – Limitations
- Attachment B – Existing Conditions Site Plan, Drawing Numbers CX101 through CX106, Hill Engineers, 2/20/2023.
- Attachment C – Wetlands letter report
- Attachment D – Geomorphic Assessment Report
- Attachment E – Geotechnical Data Memorandum
- Attachment F - Conceptual-Level Opinions of Construction Cost
- Attachment G – 25% Draft Preliminary Design Drawings

ATTACHMENT A

LIMITATIONS

USE OF REPORT

1. GeoEnvironmental, Inc. (GZA) prepared this Report on behalf of, and for the exclusive use of the Client for the stated purpose(s) and location(s) identified in the Report. Use of this Report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. Our findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Report and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered and reviewed during the course of our work. Conditions other than described in this Report may be found at the subject location(s).

3. The interpretations and conclusions presented in the Report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of the described services. The work described in this Report was carried out in accordance with the agreed upon Terms and Conditions of Engagement.

4. GZA's evaluation was performed in accordance with generally accepted practices of qualified professionals performing the same type of services at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. The findings are dependent on numerous assumptions and uncertainties inherent in the review process.

5. Basis of Opinion of Cost Unless otherwise stated, our opinions of cost are only for comparative and general planning purposes. These opinions are based on the limited data and the conditions and assumptions described in the Report. The cost estimates may involve approximate quantity evaluations and are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in the Report. Further, since we have no control over when the work will take place nor the labor and material costs required to plan and execute the anticipated work, our cost opinions were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

6. Cost opinions presented in the Report are based on a combination of sources and may include published RS Means Cost Data; past bid documents; cost data from federal, state or local transportation agency web sites; discussions with local experienced contractors; and GZA's experience with costs for similar projects at similar locations. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation. Actual costs will likely vary depending on the quality of materials and installation; manufacturer of the materials or equipment; field conditions; geographic location; access restrictions; phasing of the work; subcontractor mark-ups; quality of the contractor(s); project management exercised; and the availability of time to thoroughly solicit competitive pricing. In view of these limitations, the costs presented in the Report should be considered "order of magnitude" and used for budgeting and comparison purposes only. Detailed quantity and cost estimating should be performed by experienced professional cost estimators to evaluate actual costs. The opinions of cost in the Report should not be interpreted as a bid or offer to perform the work. Unless stated otherwise, all costs are based on present value.

7. The opinions of costs are based only on the quantity and/or cost items identified in the Report, and should not be assumed to include other costs such as legal, administrative, permitting or others. The estimate also does not include any costs with respect to third-party claims, fines, penalties, or other charges which may be assessed against any responsible party because of either the existence of present conditions or the future existence or discovery of any such conditions.

RELIANCE ON INFORMATION FROM OTHERS

8. In conducting our work, GZA has relied upon certain information made available by public agencies, Client, and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Any inconsistencies in this information which we have noted are discussed in the Report.

COMPLIANCE WITH CODES AND REGULATIONS

9. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations with codes and regulations by other parties are beyond our control.

ADDITIONAL INFORMATION

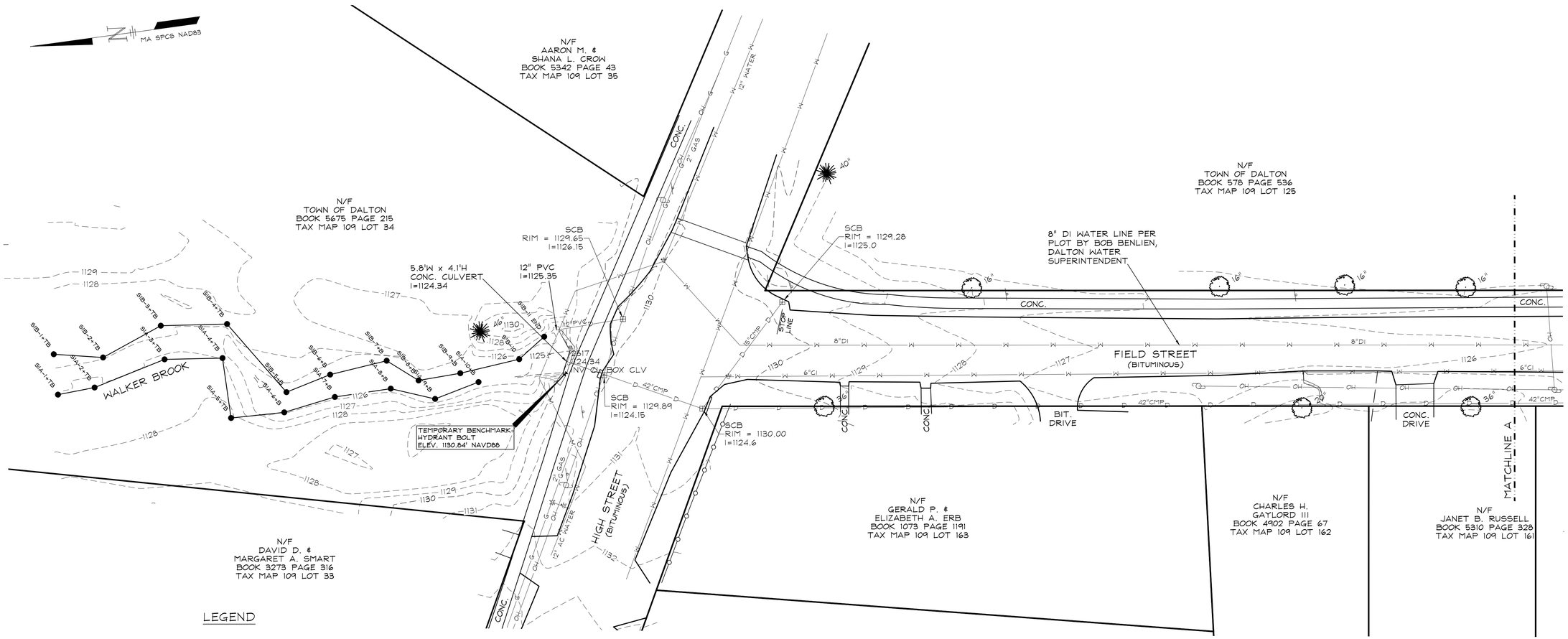
10. In the event that the Client or others authorized to use this Report obtain information on conditions at the site(s) not contained in this Report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the opinions stated in this Report.

ADDITIONAL SERVICES

11. GZA recommends that we be retained to provide services during any future investigations, design, implementation activities, construction, and/or property development/ redevelopment at the Site(s). This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

ATTACHMENT B

EXISTING CONDITIONS SITE PLAN, DRAWING NUMBERS CX101 THROUGH CX106, HILL ENGINEERS, 2/20/2023



LEGEND

REBAR FOUND	EXISTING CONTOUR
IRON PIN FOUND	EDGE OF BITUMINOUS
BOUND FOUND	WOODEN FENCE
BENCH MARK	WIRE FENCE
HAND HOLE	CHAIN LINK FENCE
LIGHT POLE	GAS SERVICE
UTILITY POLE	WATER SERVICE
CATCH BASIN	STORM DRAIN
DRAIN MANHOLE	SANITARY SEWER
SANITARY MANHOLE	OVERHEAD WIRES
TELEPHONE MANHOLE	UNDERGROUND TELEPHONE
DIRECTIONAL FLOW ARROW	GUARD RAIL
SIGN	APPROXIMATE PROPERTY LINE
WATER SHUTOFF	APPROXIMATE EXISTING EASEMENT LINE
HYDRANT	EDGE OF BUSHES/HEDGE
GAS VALVE	RCP — REINFORCED CONC. PIPE
DECIDUOUS TREE (SIZE)	PVC — PVC PIPE
CONIFEROUS TREE (SIZE)	CI — CAST IRON PIPE
SHRUB	VC — VITREOUS CLAY PIPE
STONE RETAINING WALL	• S1-B-1 — RESOURCE AREA FLAG
	DYL — DOUBLE YELLOW LINE
	SWL — SINGLE WHITE LINE
	EDGE OF WATER (EOW)

GENERAL PLAN NOTES:

1. THE TOPOGRAPHIC SURVEY WAS PERFORMED IN NOVEMBER AND DECEMBER 2022, BY HILL-ENGINEERS, ARCHITECTS, PLANNERS, INC.
2. PROPERTY LINES SHOWN HEREON ARE APPROXIMATE AND ARE BASED UPON A COMPILATION OF AVAILABLE MONUMENTATION LOCATED IN THE FIELD, DALTON ASSESSOR'S MAPS AND RECORD PLANS.
3. THE VERTICAL DATUM IS BASED ON NAVD 88, AND WAS OBTAINED BY GPS OBSERVATION.
4. UTILITIES SHOWN HEREON WERE BASED UPON FIELD LOCATIONS AND PLANS PROVIDED BY BOTH THE TOWN OF DALTON ENGINEERING OFFICE AND BERKSHIRE GAS. THE COMPLETENESS AND ACCURACY OF THESE PLANS HAVE NOT BEEN VERIFIED; THEREFORE THE UTILITIES SHOWN ARE FOR REFERENCE ONLY. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "DIG-SAFE" AND HAVE ALL UNDERGROUND UTILITIES MARKED ON THE GROUND.

SHEET 1 OF 6

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PROFESSIONAL ENGINEER AND SURVEYOR
2/20/23

REV.	DESCRIPTION	DR'N	CK'D.	DATE
A	FOR REVIEW AND COMMENT	JPM		12/23/22
B	FOR REVIEW AND COMMENT	JPM		1/19/23
C	FOR REVIEW AND COMMENT	JPM		2/15/23
D	FINAL	JPM		2/16/23
E	FINAL-REVISED	JPM		2/20/23

GZA ENVIRONMENTAL, INC.
1350 MAIN STREET, SUITE 1400
SPRINGFIELD, MA 01103

PROJECT DESCRIPTION
TOWN OF DALTON
WALKER BROOK PRELIMINARY
ENGINEERING STUDY

DRAWING TITLE
EXISTING CONDITIONS
SITE PLAN

DRAWN BY	JPM
DATE DRAWN	2/20/23
SCALE	1"=20'
APV'D BY	

CAD CODE:
SRV-2418-001-CX101M.dwg

GRAPHIC SCALE:
0 20 40

PROJECT NUMBER:
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DRAWING NUMBER	REV.
CX101	E

MA SPCS NAD83

SEE CX103

SEE CX101

N/F
TOWN OF DALTON
BOOK 578 PAGE 536
TAX MAP 109 LOT 125

SCB
RIM = 1124.47
I=1121.7
WATER EL.=1121.3

SCB
RIM = 1124.76
(A) I=1122.3
(B) I=1122.2

SCB
RIM = 1124.49
I=1122.7
WATER EL.=1122.6

RCB
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(B) I=1119.25

DMH
RIM = 1125.42
BOTTOM OF
STRUCTURE = 1119.7

SCB
RIM = 1125.80
(A) I=1121.35
(B) I=1121.3
(C) I=1121.4

SCB
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(A) I=1123.1
(B) I=1123.15
(C) I=1123.0

SCB
RIM I=1122

FIELD STREET
(BITUMINOUS)

FIRST STREET
(BITUMINOUS)

MATCHLINE A

MATCHLINE B

N/F
JANET B. RUSSELL
BOOK 5310 PAGE 328
TAX MAP 109 LOT 161

N/F
PAULA M. MILLER
BOOK 4938 PAGE 140
TAX MAP 109 LOT 160

N/F
FRANK, JR. &
SARAH L. ALFONSO
BOOK 6684 PAGE 320
TAX MAP 109 LOT 159

N/F
RICHARD J. &
ELIZABETH M. GNARA
BOOK 1449 PAGE 91
TAX MAP 109 LOT 158

N/F
JON A. &
JANET M. MACHT
BOOK 6966 PAGE 209
TAX MAP 109 LOT 157

N/F
EDWARD J.
RATTIGAN, TR.
BOOK 4595 PAGE 8
TAX MAP 109 LOT 156

N/F
33 FIELD STREET
EXT. NOM. TRUST
BOOK 6349 PAGE 257
TAX MAP 109 LOT 155

N/F
LUCIANO R. SILVA
BOOK 5722 PAGE 158
TAX MAP 109 LOT 154

SHEET 2 OF 6

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CAD CODE:
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GRAPHIC SCALE:
0 20 40

PROJECT NUMBER:
SRV-2418-001

DRAWING NUMBER	REV.
CX102	E

N
MA SPCS NAD83

SEE CX102

MATCHLINE B

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(B) I=1119.25

N/F
TOWN OF DALTON
BOOK 578 PAGE 536
TAX MAP 109 LOT 125

SMH
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(A) I=1118.05
(B) I=1117.95

SCB
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(B) I=1120.1

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(C) I=1123.0

SCB
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(B) I=1121.3
(C) I=1121.4

FIRST STREET
(BITUMINOUS)

STOP LINE

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SMH
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WATER LEVEL EL.=1121.1

GLENNON AVENUE
(BITUMINOUS)

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(C) I=1123.45

SCB
RIM = 1129.04
I=1124.3

FIELD STREET
BITUMINOUS)

N/F
S. SHANA FILKINS
BOOK 5670 PAGE 248
TAX MAP 109 LOT 145

N/F
SHARON R. LAVERDA
BOOK 2723 PAGE 151
TAX MAP 109 LOT 132

N/F
MICHAEL J. &
NANCY E. HOPPER
BOOK 1647 PAGE 640
TAX MAP 109 LOT 124

N/F
JEFFREY S. &
TRISHA A. LAFLEUR
BOOK 3217 PAGE 156
TAX MAP 109 LOT 123

N/F
SARAH E. ZACK
BOOK 5644 PAGE 112
TAX MAP 109 LOT 122

N/F
MARY H. LEVITT
BOOK 1097 PAGE 203
TAX MAP 109 LOT 121

SEE CX104

SHEET 3 OF 6

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CAD CODE:
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PROJECT NUMBER:
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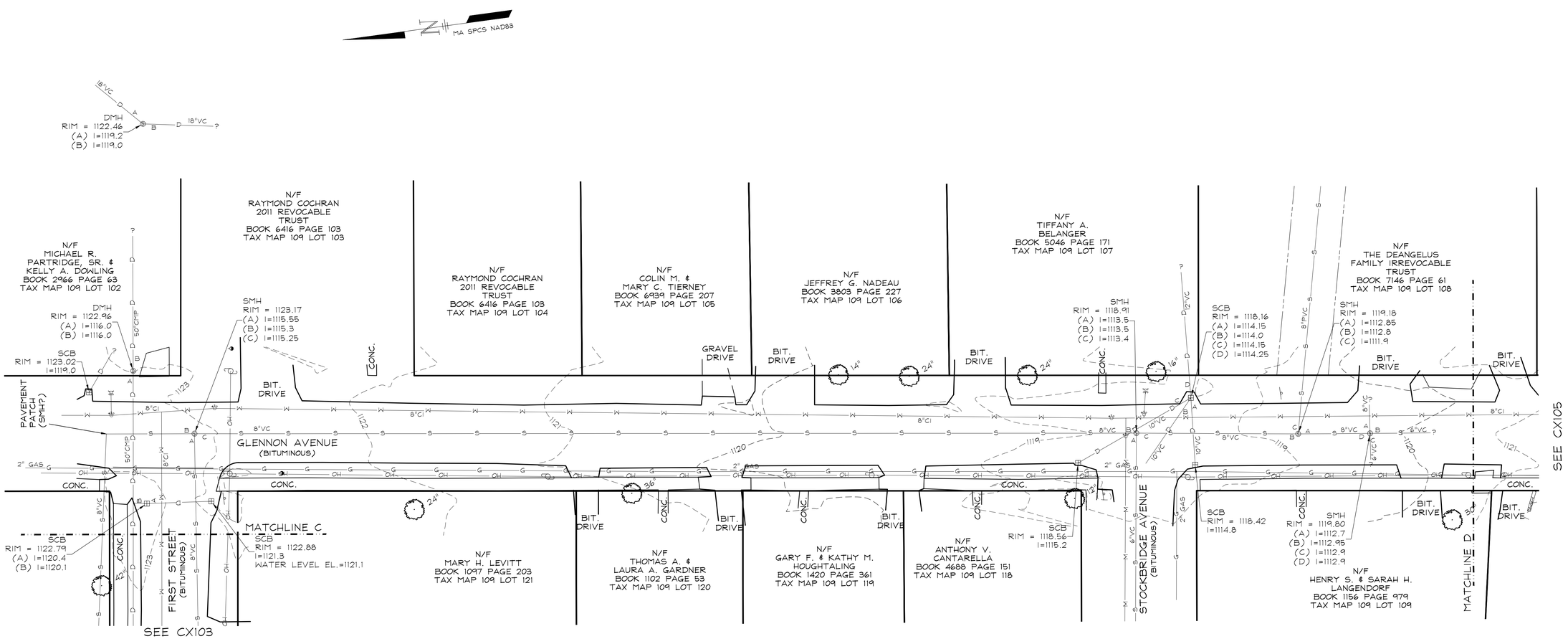
DRAWING NUMBER	REV.
CX103	E



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PROFESSIONAL LAND SURVEYOR
2/20/23

REV.	DESCRIPTION	DR'N	CK'D.	DATE
A	FOR REVIEW AND COMMENT	JPM		12/23/22
B	FOR REVIEW AND COMMENT	JPM		1/19/23
C	FOR REVIEW AND COMMENT	JPM		2/15/23
D	FINAL	JPM		2/16/23
E	FINAL-REVISED	JPM		2/20/23

GZA ENVIRONMENTAL, INC.
1350 MAIN STREET, SUTIE 1400
SPRINGFIELD, MA 01103

DRAWING TITLE
EXISTING CONDITIONS SITE PLAN

PROJECT DESCRIPTION
TOWN OF DALTON
WALKER BROOK PRELIMINARY ENGINEERING STUDY

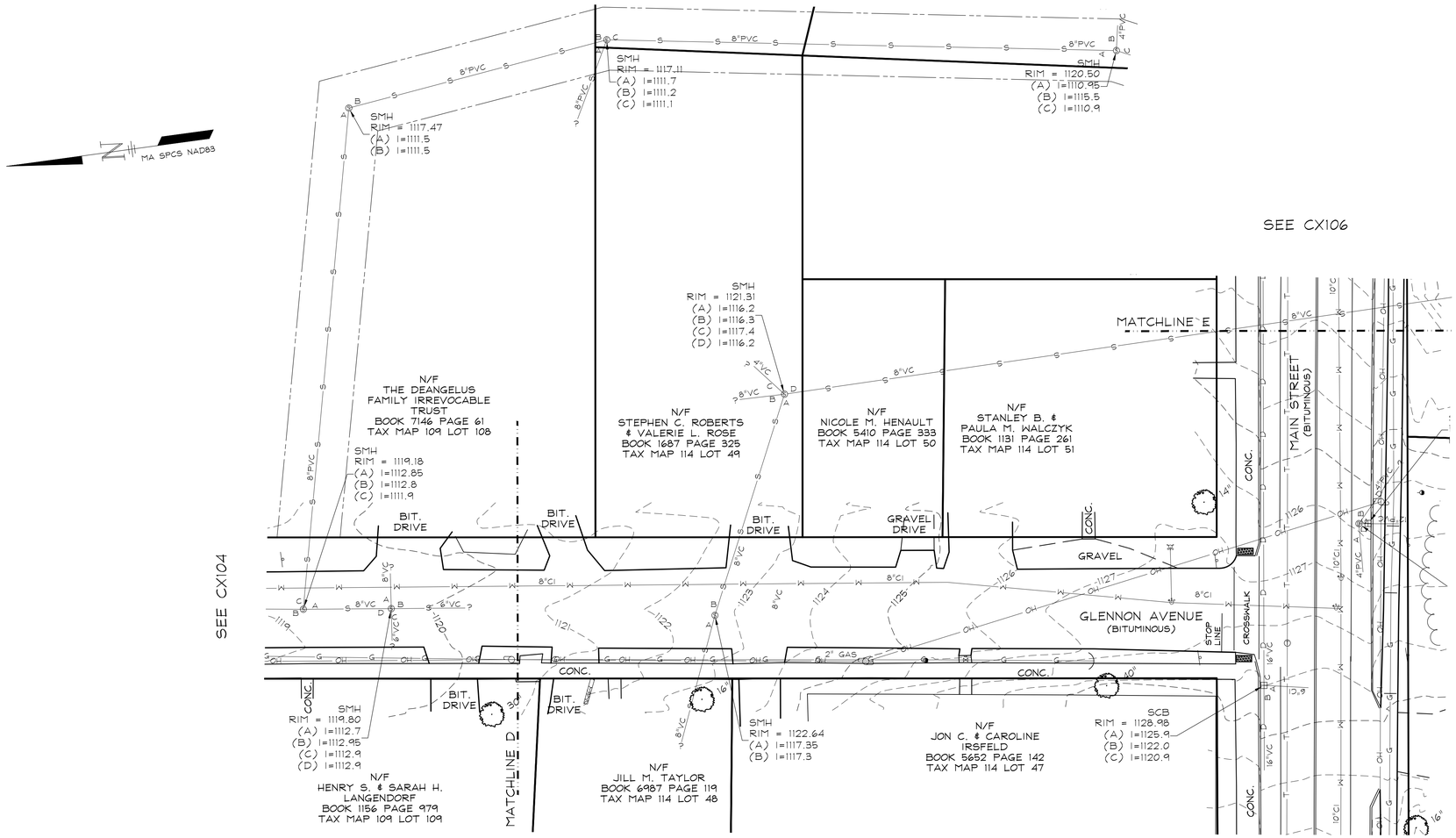
DRAWN BY	JPM
DATE DRAWN	2/20/23
SCALE	1"=20'
APV'D BY	

CAD CODE: SRV-2418-001-CX101M.dwg

GRAPHIC SCALE: 0 20 40

PROJECT NUMBER: SRV-2418-001

DRAWING NUMBER	REV.
CX104	E



SHEET 5 OF 6

Hill
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50 Depot Street
Dalton, MA 01226
(413) 684-0925
44 Spring Street
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(413) 743-0013
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COMMONWEALTH OF MASSACHUSETTS
JOHN PATRICK MACOLINI
No. 40765
PROFESSIONAL ENGINEER AND SURVEYOR
2/20/23

REV.	DESCRIPTION	DR'N	CK'D.	DATE
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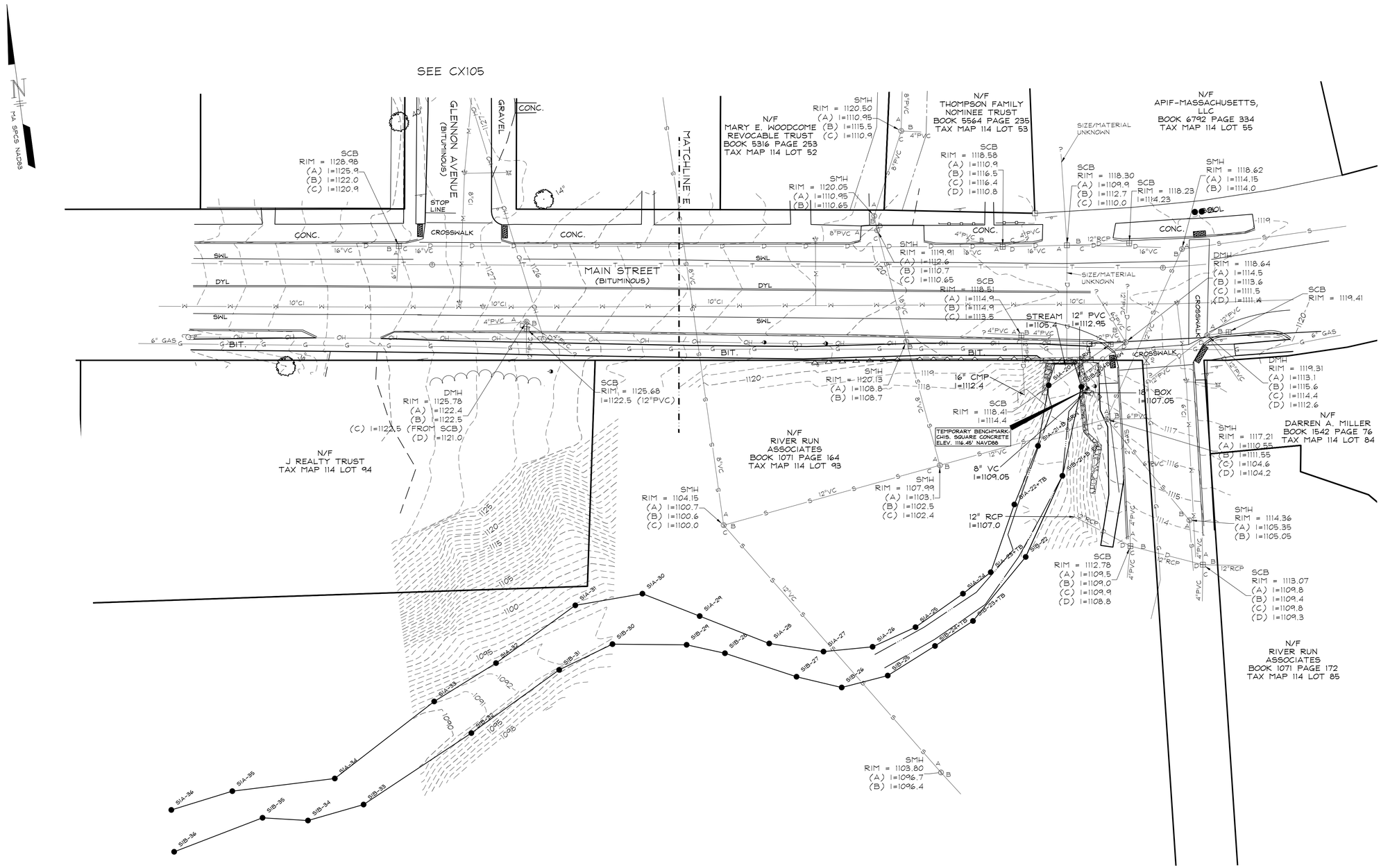
PROJECT NUMBER:
SRV-2418-001

DRAWING NUMBER	REV.
CX105	E



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GRAPHIC SCALE: 0 20 40

PROJECT NUMBER:
SRV-2418-001

DRAWING NUMBER	REV.
CX106	E

ATTACHMENT C

WETLANDS LETTER REPORT

Proactive by Design

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CONSTRUCTION MANAGEMENT

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March 6, 2023
15.0166994.00

Office of the Town Manager
Town of Dalton
462 Main Street
Dalton, MA 01226
Attn: Tom Hutcheson

Re: Wetland Assessment and Delineation Letter Report
Walker Brook
Dalton, MA

Dear Mr. Hutcheson,

In accordance with our contract executed on September 27, 2021, GZA GeoEnvironmental, Inc. (GZA) conducted a wetland assessment and delineation of a portion of Walker Brook from approximately 200 feet upstream of High Street to approximately 200 feet downstream of Main Street in Dalton, MA (Site). The intention of the assessment was to delineate the mean annual high water (MAHW) of Walker Brook and to determine if additional regulated wetland resources are present adjacent to the culvert on the Site and/or the proposed future culvert corridors. This letter report provides an overview of our assessment methodology and findings. Figure 1 shows the approximate limits of flagged MAHW to define the Riverfront Area. No other wetland resource areas were observed within 100 feet of the buried portion of Walker Brook culvert.

Figure 1: Delineated MAHW

Assessment Findings

Desktop Survey

GZA reviewed MassGIS to assess if State-regulated resources are present on the Site (**Table 1**). The USGS Topographic Quadrangle mapping dated 1995 indicates that the portion of Walker Brook within the Site is a perennial river per 310 CMR 10.58(2); which imparts a Riverfront Area on the Site. The portions of Walker Brook that were evaluated for MAHW are outlined in red on **Figure 1**. FEMA Q3 Flood Zone data from 1997 paper FIRMs indicate the presence of Flood Zone A (an area of 100-year flooding

for which no base flood elevation has been determined). The desktop survey did not identify other regulated wetland resources on the Site.

Table 1. Summary of Massachusetts On-Site Resources from MassGIS

Resource	Present
Areas of Critical Environmental Concern (ACEC)	No
Outstanding Resource Water (ORW)	No
Priority Habitat for Rare and Endangered Species	No
Certified Vernal Pools	No
FEMA Floodplain, A Zone	Yes
Riverfront Area	Yes
Bank	Yes
Bordering Vegetated Wetland	No

Site Observations

On Thursday October 20, 2022, an Environmental Scientist from GZA conducted a wetland assessment and resource delineation at the above referenced Site. Our wetland assessment and delineation methodology is consistent with 1995 Massachusetts Department of Environmental Protection (MassDEP) Handbook titled, *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetland Protection Act* and the *Corps of Engineers Wetland Delineation Manual, Environmental Laboratory. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS; Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region, ed. J.S. Wakely, R.W. Lichvar, and C. C. Noble; ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center (Version 2.0).* The resource areas observed on the Site are presumed to be under the jurisdiction of the Wetlands Protection Act (WPA; M.G.L. c. 131, § 40), its companion regulations (310 CMR 10.00), and Section 404 of the federal Clean Water Act as administered by the U.S. Army Corps of Engineers (Corps).

The Site includes approximately 2,800 linear feet of Walker Brook starting approximately 200 feet upstream of High Street and ending approximately 200 feet downstream of Main Street. The central portion of the Site contains an approximately 2,400-foot-long culverted section of Walker Brook, which flows under streets, green space, and residential properties. In addition to flagging the MAHW of daylighted portions of Walker Brook, GZA explored the route of the existing culvert for the presence of surface wetland resource areas along with a proposed alternate culvert route.

Photo 1: View of forested portion of Site upstream of the High Street culvert entrance. Note that the stream was dry at the time of the survey due to prolonged drought conditions.

The northern portion of the Site upstream of High Street is forested and contains hiking trails. Vegetation in this area is dominated by red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), white pine (*Pinus strobus*), black cherry (*Prunus serotina*), striped maple (*Acer pensylvanicum*), American elm (*Ulmus americana*), and Christmas fern (*Polystichum acrostichoides*). The central portion of the Site upstream of the culvert is characterized by residential and mixed-use development. The southern portion of the Site contains Norway maple (*Acer platanoides*), American beech (*Fagus grandifolia*), sugar maple, American elm, and staghorn sumac (*Rhus typhina*). GZA delineated MAHW along the portions of Walker Brook following 310 CMR 10.58(2)(a) 3 since the culverted portion of Walker Brook is in excess of 200 feet in length and therefore does not have a Riverfront Area. No areas of Bordering Vegetated Wetland (BVW) were identified. The culverted portion of Walker Brook would still qualify as Bank at 310 CMR 10.54(2). The 100-year floodplain elevation at the northern end of the Site was not field identified and clear evidence indicating extent of flooding was not obvious. No other jurisdictional resource areas were observed.

Wetland Resource Descriptions

Riverfront Areas (MAHW Flags S1A1 – S1A12 and S1B1 – S1-B11)

The delineated MAHW in the northern portion of the Site was within a forested area upstream of the High Street culvert (Photo 2). The stream channel was dry at the time of the site visit and no residual pools were observed. The stream channel is approximately 8-12 feet wide in this area and occasionally has small side arms and floodplain benches. The first observed break in slope above what is presumed to be a non-drought condition water level was flagged as Mean Annual High Water (MAHW). Wetland flags S1A1 and S1B1 were placed approximately 200 feet upstream of the High Street culvert and S1A12 was placed on the culvert headwall while S1B11 was placed near the culvert headwall.

Photo 2: Walker Brook channel upstream of High Street.

Riverfront Area (MAHW Flags S1A20 – S1A36 and S1B20 – S1-B36)

The delineated MAHW in the southern portion of the Site was located in a partially forested area downstream of the Main Street culvert (Photo 3). A very small amount of pooled water was observed downstream of the concrete culvert outlet and level spreader. No flow was observed within the heavily modified and rip-rapped channel. The first observed break in slope above what is presumed to be a non-drought conditions water level was flagged as mean annual high water (MAHW), which begins the 200-feet Riverfront Area. Wetland flags S1A20 and S1B20 were placed near the corner of the culvert outlet

wing walls and flags S1A36 and S1B36 end open upstream of Walker Brooks confluence with the East Branch Housatonic River.

The delineated MAHW is assumed to support six (6) of the eight (8) interests of the Wetland Protection Act Regulations described at 310 CMR 10.01(2) including protection of public and private water supply, protection of ground water supply, flood control, storm damage prevention, prevention of pollution, and protection of wildlife habitat.

Photo 3: Walker Brook downstream of Main Street.

Bank (Not flagged)

The culverted portion of Walker Brook while no longer qualifying as having a Riverfront Area but would still have a Bank as defined by 310 CMR 10.54(2)(a). This Bank was not delineated in the field and is defined by the internal width of the culvert.

Photo 4: View of the Bank present within Walker Brook culvert.

Bordering Land Subject to Flooding (BLSF - Not Flagged)

FEMA Q3 Flood Zone data from 1997 paper FIRMs indicates the presence of Flood Zone A (an area of 100-year flooding for which no base flood elevation has been determined). This area was not flagged or evaluated in the field.

Summary of Findings

Based upon our desktop survey and field assessment, GZA delineated portions of the MAHW that begins the Riverfront Area resource and identified the presence of Bank and BLSF resource areas associated with Walker Brook. These resource areas include 200-foot Riverfront Areas at the northern and southern ends of the Site and a 100-foot jurisdictional Buffer Zone that extends landward from the culvert. The resource areas and their Buffer Zones are jurisdictional under the WPA and its companion Regulations. The Bank resources would qualify as Waters of the U.S. and would be regulated by the Corps under Section 404 of the Federal Clean Water Act. The Corp jurisdiction does not include an additional Buffer Zone.

Alteration of the soil or vegetation within a wetland resource or its Buffer Zone constitutes work and requires approval, at a minimum, from the Dalton Conservation Commission and adherence to specific performance standards.

Should you have any questions, please feel free to contact Joe Rogers at 413-218-2959 or Dan Nitzsche at 413-478-0946.

Sincerely,
GZA GeoEnvironmental, Inc.

Joe Rogers, PWS, CESSWI
Project Manager

Daniel M. Nitzsche, CPESC, CESSWI, SE
Consultant Reviewer

Encl: Natural Resource Survey and Assessment Limitations

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) has prepared this report on behalf of, and for the exclusive use of the TOWN OF DALTON, ("Client") for the stated purpose(s) and location(s) identified in the report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not identified in the agreement, for any use, without our prior written permission, shall be at that party's risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Report and/or proposal, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the data gathered and observations made during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

LIMITS TO OBSERVATIONS

4. Natural resource characteristics are inherently variable. Biological community composition and diversity can be affected by seasonal, annual or anthropogenic influences. In addition, soil conditions are reflective of subsurface geologic materials, the composition and distribution of which vary spatially.

5. The observations described in this report were made on the dates referenced and under the conditions stated therein. Conditions observed and reported by GZA reflect the conditions that could be reasonably observed based upon the visual observations of surface conditions and/or a limited observation of subsurface conditions at the specific time of observation. Such conditions are subject to environmental and circumstantial alteration and may not reflect conditions observable at another time.

6. The conclusions and recommendations contained in this report are based upon the data obtained from a limited number of surveys performed during the course of our work on the site, as described in the Report. There may be variations between these surveys and other past or future surveys due to inherent environmental and circumstantial variability.

RELIANCE ON INFORMATION FROM OTHERS

7. Preparation of this Report may have relied upon information made available by Federal, state and local authorities; and/or work products prepared by other professionals as specified in the report. Unless specifically stated, GZA did not attempt to independently verify the accuracy or completeness of that information.

COMPLIANCE WITH REGULATIONS AND CODES

8. GZA's services were performed to render an opinion on the presence and/or condition of natural resources as described in the Report. Standards used to identify or assess these resources as well as regulatory jurisdiction, if any, are stated in the Report. Standards for identification of jurisdictional resources and regulatory control over them may vary between

governmental agencies at Federal, state and local levels and are subject to change over time which may affect the conclusions and findings of this report.

NEW INFORMATION

9. In the event that the Client or others authorized to use this report obtain information on environmental regulatory compliance issues at the site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this work, may modify the conclusions stated in this report.

ADDITIONAL SERVICES

10. GZA recommends that we be retained to provide further investigation, if necessary, which would allow GZA to (1) observe compliance with the concepts and recommendations contained herein; (2) evaluate whether the manner of implementation creates a potential new finding; and (3) evaluate whether the manner of implementation affects or changes the conditions on which our opinions were made.

ATTACHMENT D

GEOMORPHIC ASSESSMENT REPORT

Field Geology Services
Fluvial Geomorphology

PO Box 824 | Portland, Maine 04104
207.491.9541
wwwfield-geology.com

March 17, 2023

Via Electronic Mail

Rosalie Starvish, PE
Senior Project Manager
GZA
1350 Main Street, Suite 1400
Springfield, MA 01103

Re: Geomorphic assessment of flood hazards on Walker Brook in Dalton, MA

Dear Ms. Starvish:

This letter discusses a geomorphic assessment of Walker Brook in Dalton, MA completed to better understand flood hazards in the town and identify potential mitigation strategies. Walker Brook, after emanating from the steep mountain slopes to the north, flows through the town before entering the East Branch Housatonic River (Figure 1). A long undersized culvert begins at High Street at the upstream end of the Town's residential area and extends for approximately 2,200 ft before daylighting again downstream of Main Street (Route 9). Historically, flood inundation from Walker Brook has been a problem downstream of High Street when runoff overwhelms the culvert, passes over High Street, and floods the Senior Center and the large Town-owned field surrounding it. (A school that previously existed in the field also experienced periodic flooding before its demolition.) The Town has been seeking to address the sources and impacts of flooding from Walker Brook for decades and in 2021 received funding through a FEMA Hazard Mitigation Grant Program Advanced Assistance Grant to perform a comprehensive engineering assessment and develop a cohesive plan for addressing the flooding problems along Walker Brook.

The geomorphic assessment was completed as part of the engineering assessment and plan development. The geomorphic assessment consisted of a(n): review of watershed characteristics (Appendix 1), analysis of maps, (historical) aerial photographs, and archival documents (Appendix 2), site reconnaissance, recording of important channel and floodplain features during a walk along the length of the stream, topographic survey of two areas (Appendix 3). The findings from these different components of the geomorphic assessment are woven into the discussion below about the physical setting, changes along the stream through time, flood hazards, and potential mitigation activities.

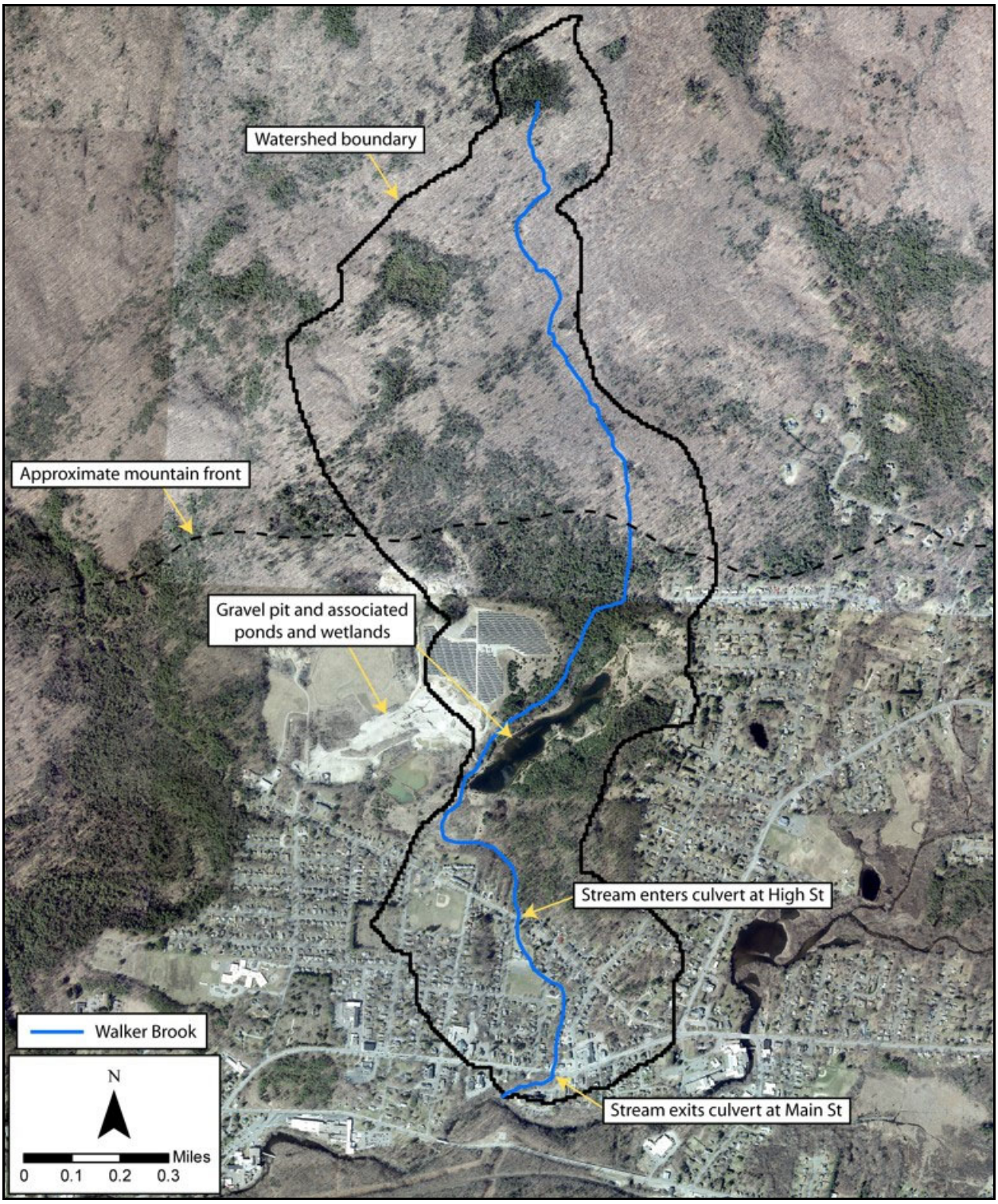


Figure 1. Location of Walker Brook and its watershed in Dalton, MA.

Physical setting and changes through time

Walker Brook drains a 1.06 mi^2 watershed (Appendix 1) and can be subdivided into four reaches of uneven length that are morphologically distinct. From upstream, the first reach (Reach 1) is

the steep confined channel flowing down the steep forested mountain side until reaching the base of slope. The surface is covered with large boulders near the downstream end of the reach where a visual inspection was undertaken (Figure 2a). The soils map confirms the presence of an extremely stony sandy loam (loam = a mixture of sand, silt, and clay) on the steep mountain slope derived from glacial till that is draped over the underlying bedrock (Web citation 1). No significant changes in channel position are evident when comparing historical aerial photographs and topographic maps extending back to 1947 (Appendix 2 and Web citation 2) nor are such changes expected in the future given the confined bouldery reach.

Figure 2. Ground photographs showing characteristics of a) Reach 1, b) Reach 2, c) Reach 3, and 4) Reach 4.

Reach 2, extending from the mountain front to High Street, has a relatively gentle gradient compared to Reach 1 and is an unconfined sinuous, sometimes multi-threaded, channel with a forested buffer (Figure 2b). Large wood and a small beaver dam were also observed in the channel. The upper portion of the reach passes through an area of active gravel pits with the channel flowing through ponded and wetland areas formed in former gravel pits and other disturbed land. To what extent wetlands may have existed naturally in the area, if at all, is unknown. As measured through a topographic survey just upstream of High Street, the floodplain is approximately 300 ft wide, and the bankfull channel width (averaged from three cross sections) is 18.5 ft, whereas the width of the High Street culvert is only 5.7 ft (Appendix 3). The High Street road grade blocks the floodplain and constricts the channel's width by more than 50 percent (Figure 3). The channel's position in the upper portion of the reach has been greatly altered in the past as the location of active gravel pits has shifted from time to time (Appendix 2 and Web citation 2). While the channel's position at the downstream end of the reach has not

significantly shifted, if at all, the floodplain has likely been narrowed by artificial fill (indicated on the soils map – see Web Citation 2) in order to construct the residential properties just upstream of High Street.

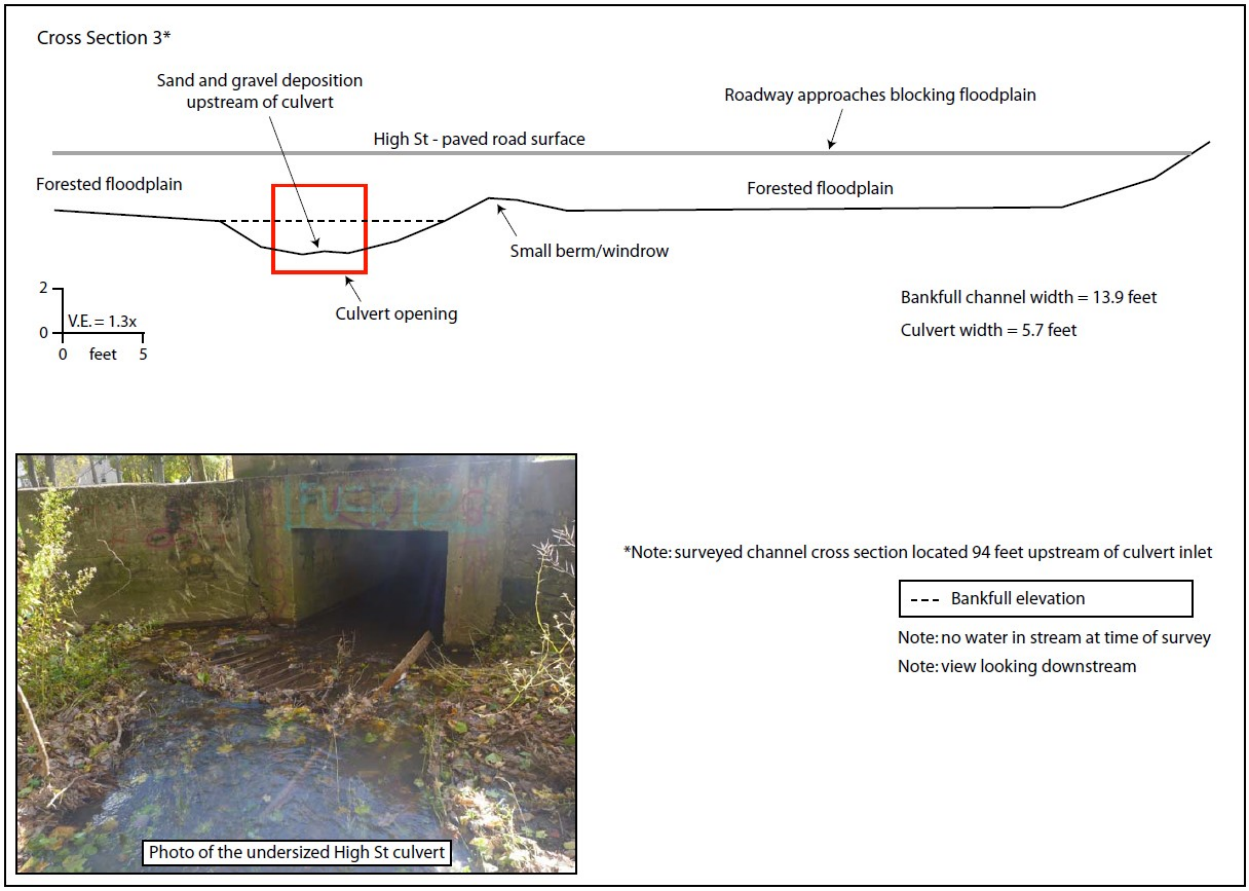


Figure 3. Channel cross section showing the extent to which High St and the undersized culvert constrict channel and floodplain flow.

Reach 3 runs from High Street downstream to Main Street and flows entirely within a culvert for the reach's total length of approximately 2,200 ft (Figure 3). The culvert was inspected in 1981 by Tighe & Bond/SCI Consulting Engineers and was found to actually consist of a series of connected circular and box culverts with areas of damage, rust, and erosion. The exact timing of culverting is uncertain but the 1952 aerial photograph (Appendix 2) appears to show an open channel in the Town-owned parcel upstream of the school building but was already culverted from the school to Main Street. This suggests the full length of the culvert was completed in phases and is consistent with the 1981 inspection report that found multiple differently shaped pipes. The culvert does not precisely follow the alignment of the previously sinuous (but likely partially straightened) open channel shown on topographic maps and still visible (but largely infilled) behind the Dalton post office (Figure 2c). The channel previously flowed through the open field (i.e., Town-owned parcel) to the east of the Senior Center and previous school, although the entire field is likely a portion of the natural floodplain with artificial fill (indicated on the soils map) on which the adjacent residential homes were built placed on the remainder of that floodplain. Between the field and Main Street, the culvert has to pass under at least one of the residential properties.

Reach 4 is in a daylighted channel downstream of Main Street and ends at Walker Brook's confluence of the East Branch Housatonic River. Purposefully placed boulders line the banks and bed of the channel for nearly the entire length of the reach (Figure 2d). The channel takes a sharp turn exiting the culvert and flows against a high forested bank (the right bank looking downstream) for most of the reach. The trees on the slope are going straight and no signs of bank instability were observed. However, a small log jam is present about half way through the reach (Figure 4) that crosses the entire channel with a bankfull width of 21 ft (Appendix 3). The channel currently flows along the edge of an alluvial fan (i.e., inland delta) formed as sediment spread out radially as Walker Brook entered the less confining East Branch valley with much of the landform likely created shortly after deglaciation when abundant sediment was likely supplied to Walker Brook. The current channel underwent a significant realignment at some point before publication of the 1876 Beers Atlas (Appendix 2). Prior to this time the channel flowed more or less straight into the East Branch just to the east of the Senior Center (Web citation 2 – see 1893 topo showing an older channel alignment) as opposed to presently flowing around the northern and western side of the facility. The Senior Center opened in 2011 in renovated facilities that were part of the West & Glennon's woolen mill first opened in 1865, was rebuilt after a fire in 1875, and underwent some changes in 1884 (Web citation 3). Given the timing, the change in channel alignment would appear associated with operation of the woolen mill.

Figure 4. Log jam fully spanning the channel in Reach 4.

Flood hazards

The physical setting, channel realignments, and other human modifications of the channel and watershed all contribute to and help recognize flood hazards along Walker Brook even where no such flooding has occurred before. Three different types of flood hazards could potentially occur on Walker Brook: 1) flood inundation, 2) bank erosion, and 3) channel avulsion (i.e., rapid shift

in channel location). All three hazard types could potentially be enhanced by rapid sedimentation that could infill the channel, divert flow into the adjacent banks, or both. How each reach may contribute to or be affected by these hazards is discussed below.

Since Reach 1 is undeveloped, no flood hazards exist within the reach itself but the possibility that considerable sediment could delivered downstream (and exacerbate flooding) must be considered, especially in light of the large mass failures that delivered large volumes of sediment to rivers and streams in the region during Tropical Storm Irene (Yellen et al., 2014). The sediment on the steep hillslopes surrounding Reach 1 is predominated by boulders (Figure 2a) and sand (Web citation 1), so less likely to produce a large mass failure than the more clay-rich finer-grained sediments associated with the Tropical Storm Irene slope instabilities. No visible signs of instability were observed on the steep slopes in Reach 1. The trees are growing straight (Figure 2a), no flat benches just downslope of oversteepened concentric scarps are present on topographic maps (Web citation 2 and Google Earth), and narrow treeless scars running downslope are absent on aerial photographs (Appendix 1 and Google Earth). Consequently, the likelihood of a mass failure event generating and transporting downstream large volumes of sediment is considered highly unlikely within an engineering time scale (i.e., hundreds of years).

Reach 2 is also largely undeveloped and, thus, flood damages within the reach are unlikely. Given that the stream currently flows through old abandoned gravel pits, the possibility of an avulsion shifting the channel through an active gravel pit must be considered, but further detailed topographic surveying would be needed to assess whether such an event is likely during an engineering time scale. The wetland and ponds through which the stream flows, the wide floodplain, and the presence of large wood in the channel make Reach 2 critical for attenuating peak flows and storing sediment, thereby reducing flood hazards further downstream. The severe constriction created by the High Street culvert at the downstream end of Reach 2 (Figure 3) will cause a backwatering effect upstream that will induce deposition. The resulting bars could deflect flow into the adjacent banks and create minor bank erosion but is unlikely to cause damage to the adjoining properties as the current average bankfull width of 18.5 ft (Appendix 3) falls within the range of expected widths based on regional curves developed from relatively undisturbed streams elsewhere in the region (Appendix 1). Inundation of the homes upstream of High Street due to backwatering is unlikely as overtopping of High Street is likely to occur first and would prevent further backwatering.

Reach 3 experiences periodic flood inundation when the backwatering upstream of High Street becomes so severe that flow overtops High Street and spills into the Town-owned field downstream, creating flood impacts at the Senior Center and previously the school that used to be in the field. The adjacent homes are more elevated so less prone to flooding problems. A portion of the field near where the school building once stood is persistently wet (Figure 5) and may reflect leaking from the underlying culvert that was reported rusted in places during the 1981 inspection. Depending on the nature of the soil and artificial fill at this location, the leaking could potentially cause underground erosion (i.e., piping) that could lead to the collapse of the overlying soil and creation of sinkholes above the culvert. However, no surficial signs of piping were observed.

Figure 5. Persistently wet area in Town-owned field near the former school building.

Reach 4 is susceptible to inundation, bank erosion, and channel avulsions during a severe flood despite any recent history of hazardous conditions in the reach. The realignment and armoring of the channel along the high bank on Reach 4 represents an unstable configuration prone to rapid adjustment if the boulder armor fails anywhere along its length or the channel's banks are overtopped. While the range of bankfull channel widths in the reach (Appendix 3) fall within the expected range for the region (Appendix 1), the widths vary along the reach with narrower points prone to the formation of log jams (Figure 4). A log jam completely damming the channel during a large flood could redirect flow into the banks with high velocities, causing the boulder armor to settle (as the fines around the boulders are eroded), exposing the finer soils underneath, and causing severe bank erosion that could threaten the access road to and parking areas for the Senior Center. An unarmored channel is likely to erode less dramatically as erosion can occur along its length, whereas an armored channel will erode aggressively and severely at a single point where the armor fails. A log jam blocking the channel could also elevate the water surface upstream sufficiently to overtop the banks and inundate the alluvial fan surface on which the Senior Center rests. The sharp bend in the channel just downstream of Main Street is another location where flow could overtop the banks as flow on the outside of a sharp bend can become superelevated above the overall water surface. Both upstream of a log jam or sharp bend rapid sediment deposition is possible (due to a reduction in flow velocity) that would enhance the risk of flood inundation but also increase the risk of a channel avulsion if the flow inundating the surface is sufficient enough to carve a new channel. A new avulsion channel carved straight from Main Street to the East Branch east of the Senior Center would be a more stable configuration than the current channel and would more or less follow the natural alignment of the channel that is depicted on the 1893 topographic map (Appendix 2). The steep 3.8 percent grade through the reach makes the potential erosion, inundation, and avulsion hazards more likely, but the stability of the high slope (from where trees would likely need to be derived to form a problematic log jam) and the apparent good condition of the armor indicate that the hazards described above are unlikely to occur and only during the most severe flooding conditions.

Potential mitigation activities

Both management and engineering activities could be used to mitigate flood hazards on Walker Brook. Below is a discussion of mitigation activities in each reach.

No flood hazards are present in Reach 1 but could supply a source of sediment that could exacerbate flooding issues downstream. Given the stability of the slopes and nature of the soils (i.e., sand and boulders), the likelihood for mass failures to occur and generate considerable sediment is considered highly unlikely. While future land use and development pressures are hard to anticipate, the Town could take steps, if it or the State has not already, to protect the upper watershed in its current condition to ensure the risk of mass failures does not increase. Clearcutting of the forest on the steep slopes would be an example of a destabilizing activity that is unlikely to occur in the near future with adoption of land us restrictions or establishment of conservation easements examples of management strategies that could be undertaken to ensure long-term stability of the steep mountain slopes.

Only minor flood hazards are present in Reach 2 given the limited development. Under current conditions Reach 2 serves as a buffer between the upper watershed and the developed residential portion of town that attenuates peak flood flows and stores sediment, reducing the impact of floods in town. Future activities that simplify the channel (e.g., straightening of meanders, removal of in-stream wood) or constrain the floodplain through the addition or artificial fill would move floodwaters and sediment more efficiently downstream. Consequently, the Town might, if it has not already, consider management activities, such as zoning regulations or conservation easements, that would prevent such channel simplification and thereby preserve the buffering capacity of Reach 2.

Flood hazards experienced in Reach 3 (and at the very downstream end of Reach 2) are largely the result of the undersized culvert passing under High Street due to backwatering upstream that eventually overtops the road and spills into the Town-owned field downstream. The only way to eliminate the backwatering caused by the constrictive culvert is to replace the structure with a bridge or causeway that fully spans the channel and floodplain. Since the culvert (or, more accurately, series of culverts) extends more than 2,000 ft down to Main Street, the culvert replacement would essentially require daylighting the channel and restoring the floodplain through town. This would also serve to restore habitat, but to prevent flooding to adjacent properties beyond the restored floodplain (but not necessarily greatly elevated above it) would likely require the construction of setback levees on the back edge of the floodplain. Given the current and proposed future uses of the Town-owned parcel and the likely need to remove homes to properly daylight the entire length of the culvert, this option is not a practical engineering solution to the flood hazards. Even if daylighting the channel will never be implemented, envisaging what is necessary to completely restore flood conveyance (and habitat) is important for appreciating the limitations and constraints of other potential solutions for addressing flood hazards through town. Building additional culvert capacity and flood detention basins (to be detailed in the engineering assessment) will address flooding only up to the capacity of these structures to convey or hold back the floodwaters. Consequently, such efforts will likely address the problems caused by smaller to moderate floods but larger floods will likely remain an issue.

Reach 4 downstream of Main Street is prone to severe damages in the event of flood inundation, severe bank erosion, and/or a channel avulsion – all of which are considered possible during a severe storm that causes a blockage of the channel (due to a log/ice jam or rapid sediment deposition). The original and likely more stable configuration of the channel basically ran straight from Main Street into the East Branch just west of the Senior Center. Restoring that former channel alignment would eliminate the sharp bend in the current channel that increases the chances for log jam formation and flood inundation and keeps the channel from flowing against the high bank that, if destabilized, could become a source of sediment and logs .to the stream. However, realigning the channel is impractical in terms of access and evacuation to and from the Senior Center. The only realistic steps to be taken is to monitor the reach annually and after each significant flooding event. The monitoring should include an inspection: 1) of the armored banks and bed for any damage, settling, or soil exposure underneath the boulders; 2) of the steep hillslope along the right bank (looking downstream) for any signs of instabilities such as leaning trees, exposed soils, or any other indications of downslope soil movement; 3) for signs of deposition in the channel that would be detectable by the obscuring of the boulder armor; and 4) for wood in the channel, particularly for the formation of log jams blocking the channel. If any problematic signs emerge then certain actions might be taken such as the repair of the boulder armor and/or removal of large and plugged log jams and thick accumulations (>1.5 ft) of sediment on the stream bottom. In addition, the Town should develop an evacuation plan for the Senior Center, if one does not exist already, that considers the possibility of both flood inundation and, more problematically but far less likely, a channel avulsion with a new channel carved between the facilities and Main Street. The lack of past problems in Reach 4 should not be construed as evidence that no hazards exist in the area, so preparations should be made now to ensure the Town is ready to address any such problems that might develop during future large floods that are expected to increase in frequency and intensity with climate change, particularly along smaller streams such as Walker Brook (Web citation 4).

The geomorphic assessment of Walker Brook has identified flood hazards in Dalton, MA and potential flood mitigation activities that can be undertaken to reduce those hazards. Please let me know if you have any further questions regarding the assessment results or if you need further assistance to move any of the discussed mitigation strategies forward. Feel free to contact me at any time at 207-491-9541 or jfield@field-geology.com. The appendices referenced above are attached below along with the cited references.

Sincerely,

John Field, PhD

References

Yellen, B., Woodruff, J.D., Kratz, L.N., Mabee, S.B., Morrison, J., and Martini, A.M., 2014, Source, conveyance, and fate of suspended sediments following Hurricane Irene, New England, USA: Geomorphology, v. 226, p. 124-134.

Web citations

Web citation 1: https://websoilsurvey.nrcs.usda.gov/app/ (Accessed March 13, 2023).

Web citation 2: https://web.archive.org/web/20190813023905/http://docs.unh.edu/towns/DaltonMassachusettsMapList.htm (Accessed March 13, 2023).

Web citation 3: https://sites.rootsweb.com/~maberksh/towns/dalton/DaltonGazetteer.htm (Accessed March 14, 2023).

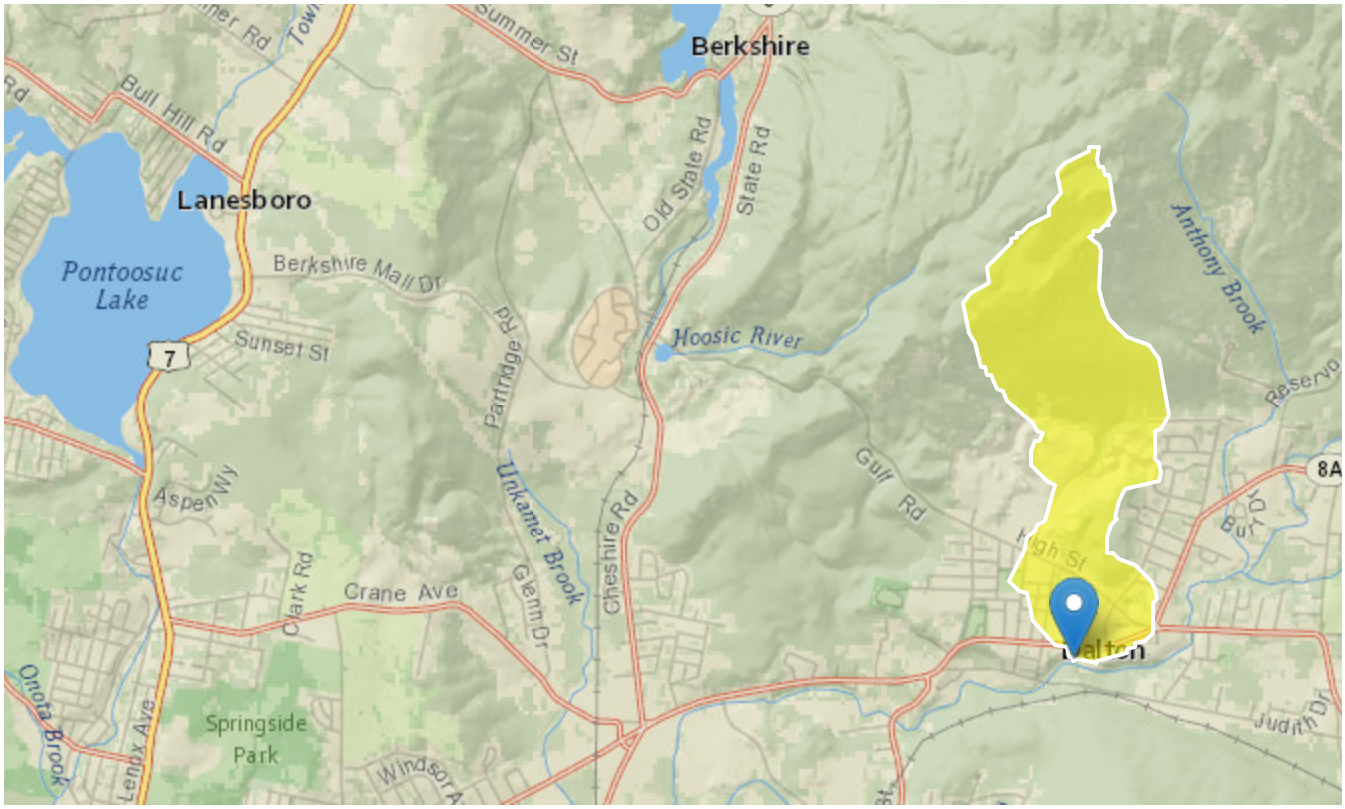
Web citation 4: https://resilientma.mass.gov/changes/extreme-weather (Accessed March 17, 2023).

APPENDIX 1

(StreamStats report with watershed characteristics)

StreamStats Report

Region ID: MA
Workspace ID: MA20220818183528214000
Clicked Point (Latitude, Longitude): 42.47219, -73.16650
Time: 2022-08-18 14:35:48 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
ACRSDFT	Area underlain by stratified drift	0.35	square miles
BSLDEM10M	Mean basin slope computed from 10 m DEM	11.224	percent
BSLDEM250	Mean basin slope computed from 1:250K DEM	8.044	percent

Parameter Code	Parameter Description	Value	Unit
CAT1ROADS	Length of interstates lmtd access highways and ramps for lmtd access highways, includes cloverleaf interchanges (USGS Ntl Transp Dataset)	0	miles
CAT2ROADS	Length of sec hwy or maj connecting roads; main arteries & hwys not lmtd access, usually in the US Hwy or State Hwy systems (USGS Ntl Transp Dataset)	0	miles
CAT3ROADS	Length of local connecting roads; roads that collect traffic from local roads & connect towns, subdivisions & neighborhoods (USGS Nat Transp Dataset)	0.47	miles
CAT4ROADS	Length of local roads; generally paved street, road, or byway that usually have single lane of traffic in each direction (USGS Ntnl Transp Dataset)	3.99	miles
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	63007.3	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	916574.2	meters
CROSCOUNT1	Number of intersections between streams and roads, where the roads are interstate, limited access highway, or ramp (CAT1ROADS)	0	dimensionless
CROSCOUNT2	Number of intersections between streams and roads, where the roads are secondary highway or major connecting road (CAT2ROADS)	0	dimensionless
CROSCOUNT3	Number of intersections between streams and roads, where roads are local conecting roads (CAT3ROADS)	1	dimensionless
CROSCOUNT4	Number of intersections between streams and roads, where roads are local roads (CAT4ROADS)	3	dimensionless
CRSDFT	Percentage of area of coarse-grained stratified drift	32.27	percent

Parameter Code	Parameter Description	Value	Unit
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	294	feet per mi
DRFTPERSTR	Area of stratified drift per unit of stream length	0.17	square mile per mile
DRNAREA	Area that drains to a point on a stream	1.06	square miles
ELEV	Mean Basin Elevation	1380	feet
FOREST	Percentage of area covered by forest	66.53	percent
LAKEAREA	Percentage of Lakes and Ponds	1.62	percent
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	1.86	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	19.9	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	7.85	percent
LFPLENGTH	Length of longest flow path	3.06	miles
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	1	dimensionless
MAXTEMPC	Mean annual maximum air temperature over basin area, in degrees Centigrade	12.6	degrees C
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	62965	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	914855	feet
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	32.27	percent
PRECPRIS00	Basin average mean annual precipitation for 1971 to 2000 from PRISM	47.8	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	2.04	miles
WETLAND	Percentage of Wetlands	2.22	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	0.16	512
ELEV	Mean Basin Elevation	1380	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	1.86	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	PIu	ASEp
50-percent AEP flood	75.5	ft^3/s	36.4	157	42.3
20-percent AEP flood	132	ft^3/s	62.5	279	43.4
10-percent AEP flood	180	ft^3/s	82.9	391	44.7
4-percent AEP flood	253	ft^3/s	112	572	47.1
2-percent AEP flood	316	ft^3/s	135	741	49.4
1-percent AEP flood	386	ft^3/s	159	938	51.8
0.5-percent AEP flood	464	ft^3/s	184	1170	54.1
0.2-percent AEP flood	579	ft^3/s	218	1540	57.6

Peak-Flow Statistics Citations

Zarriello, P.J.,2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (https://dx.doi.org/10.3133/sir20165156)

Bankfull Statistics

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	11.224	percent	2.2	23.9

Bankfull Statistics Parameters [Appalachian Highlands D Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	0.07722	940.1535

Bankfull Statistics Parameters [New England P Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	3.799224	138.999861

Bankfull Statistics Parameters [USA Bieger 2015]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	0.07722	59927.7393

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
Bankfull Width	16.7	ft	21.3
Bankfull Depth	1.03	ft	19.8
Bankfull Area	16.9	ft^2	29
Bankfull Streamflow	54.9	ft^3/s	55

Bankfull Statistics Flow Report [Appalachian Highlands D Bieger 2015]

Statistic	Value	Unit
Bieger_D_channel_width	15.6	ft
Bieger_D_channel_depth	1.14	ft

Statistic	Value	Unit
Bieger_D_channel_cross_sectional_area	18	ft^2

Bankfull Statistics Disclaimers [New England P Bieger 2015]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Bankfull Statistics Flow Report [New England P Bieger 2015]

Statistic	Value	Unit
Bieger_P_channel_width	25.7	ft
Bieger_P_channel_depth	1.39	ft
Bieger_P_channel_cross_sectional_area	35.7	ft^2

Bankfull Statistics Flow Report [USA Bieger 2015]

Statistic	Value	Unit
Bieger_USA_channel_width	12.6	ft
Bieger_USA_channel_depth	1.22	ft
Bieger_USA_channel_cross_sectional_area	17.6	ft^2

Bankfull Statistics Flow Report [Area-Averaged]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	ASEp
Bankfull Width	16.7	ft	21.3
Bankfull Depth	1.03	ft	19.8
Bankfull Area	16.9	ft^2	29
Bankfull Streamflow	54.9	ft^3/s	55
Bieger_D_channel_width	15.6	ft	
Bieger_D_channel_depth	1.14	ft	
Bieger_D_channel_cross_sectional_area	18	ft^2	
Bieger_P_channel_width	25.7	ft	
Bieger_P_channel_depth	1.39	ft	

Statistic	Value	Unit	ASEp
Bieger_P_channel_cross_sectional_area	35.7	ft^2	
Bieger_USA_channel_width	12.6	ft	
Bieger_USA_channel_depth	1.22	ft	
Bieger_USA_channel_cross_sectional_area	17.6	ft^2	

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M.,2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (http://pubs.usgs.gov/sir/2013/5155/)
Bieger, Katrin; Rathjens, Hendrik; Allen, Peter M.; and Arnold, Jeffrey G.,2015, Development and Evaluation of Bankfull Hydraulic Geometry Relationships for the Physiographic Regions of the United States, Publications from USDA-ARS / UNL Faculty, 17p. (https://digitalcommons.unl.edu/usdaarsfacpub/1515?utm_source=digitalcommons.unl.edu%2Fusdaarsfacpub%2F1515&utm_medium=PDF&utm_campaign=PDFCoverPages)

Low-Flow Statistics

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	8.044	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.17	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1

Low-Flow Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.168	ft^3/s
7 Day 10 Year Low Flow	0.0971	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Flow-Duration Statistics

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.17	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	8.044	percent	0.32	24.6

Flow-Duration Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
50 Percent Duration	1.01	ft^3/s
60 Percent Duration	0.69	ft^3/s
70 Percent Duration	0.535	ft^3/s
75 Percent Duration	0.443	ft^3/s
80 Percent Duration	0.453	ft^3/s

Statistic	Value	Unit
85 Percent Duration	0.359	ft^3/s
90 Percent Duration	0.318	ft^3/s
95 Percent Duration	0.198	ft^3/s
98 Percent Duration	0.134	ft^3/s
99 Percent Duration	0.0972	ft^3/s

Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

August Flow-Duration Statistics

August Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	8.044	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.17	square mile per mile	0	1.29
MAREGION	Massachusetts Region	1	dimensionless	0	1

August Flow-Duration Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

August Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
August 50 Percent Duration	0.376	ft^3/s

August Flow-Duration Statistics Citations

Ries, K.G., III,2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (http://pubs.usgs.gov/wri/wri004135/)

Probability Statistics

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	1.06	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	32.27	percent	0	100
FOREST	Percent Forest	66.53	percent	0	100
MAREGION	Massachusetts Region	1	dimensionless	0	1

Probability Statistics Flow Report [Perennial Flow Probability]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PC
Probability Stream Flowing Perennially	0.919	dim	71

Probability Statistics Citations

Bent, G.C., and Steeves, P.A.,2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006–5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

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Application Version: 4.10.1

StreamStats Services Version: 1.2.22

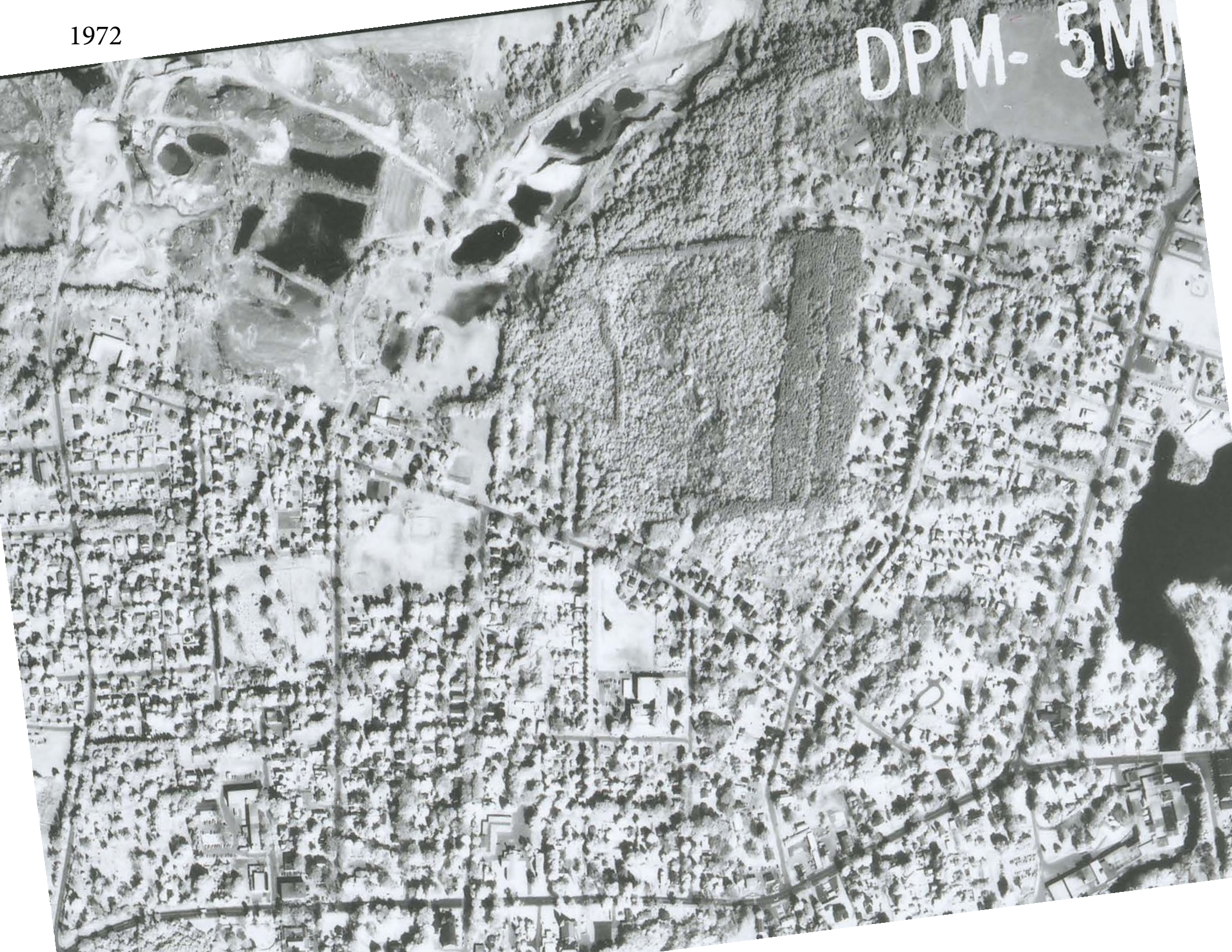
NSS Services Version: 2.2.1

APPENDIX 2

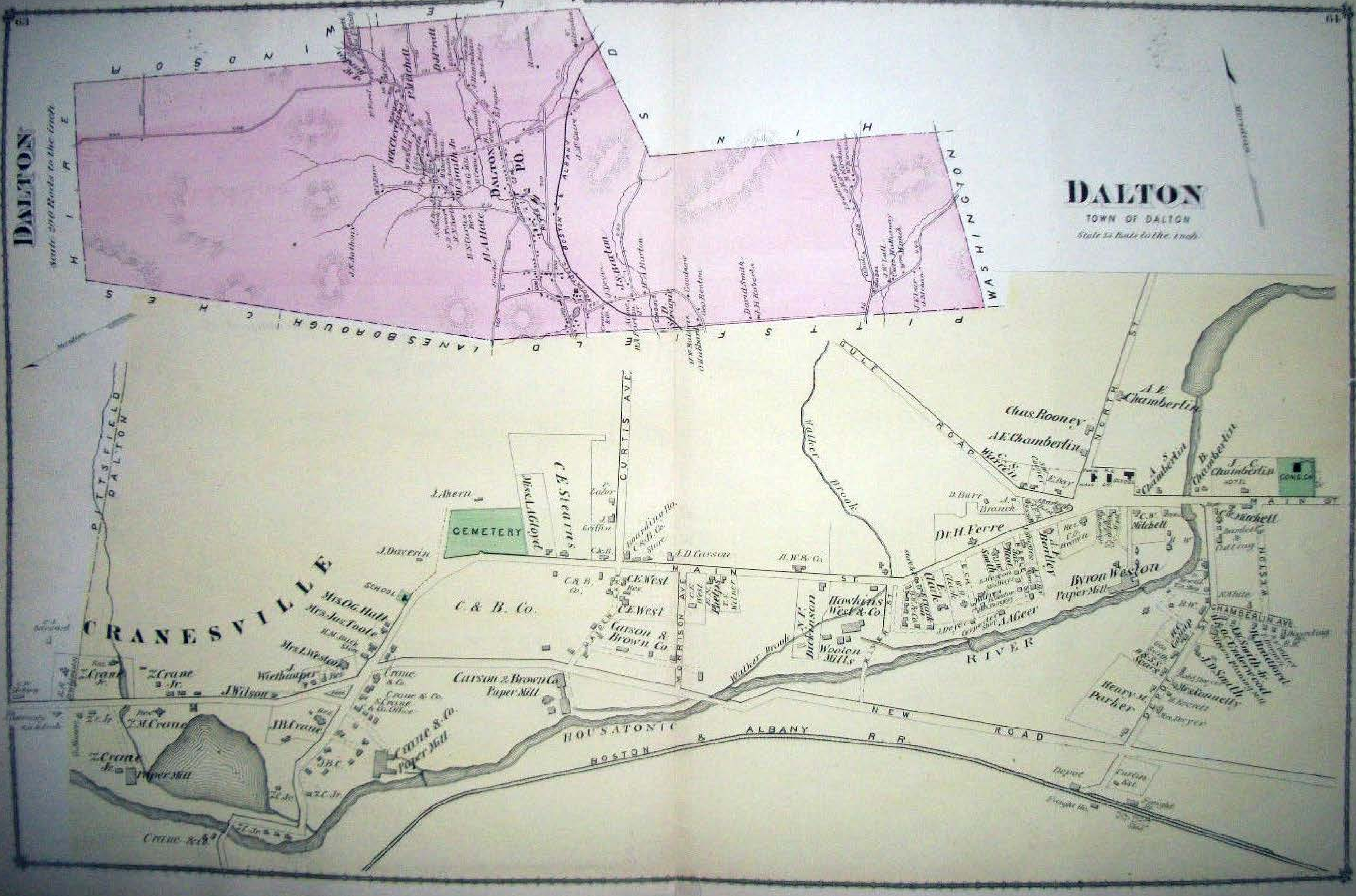
(Aerial photos, maps, and archival documents)

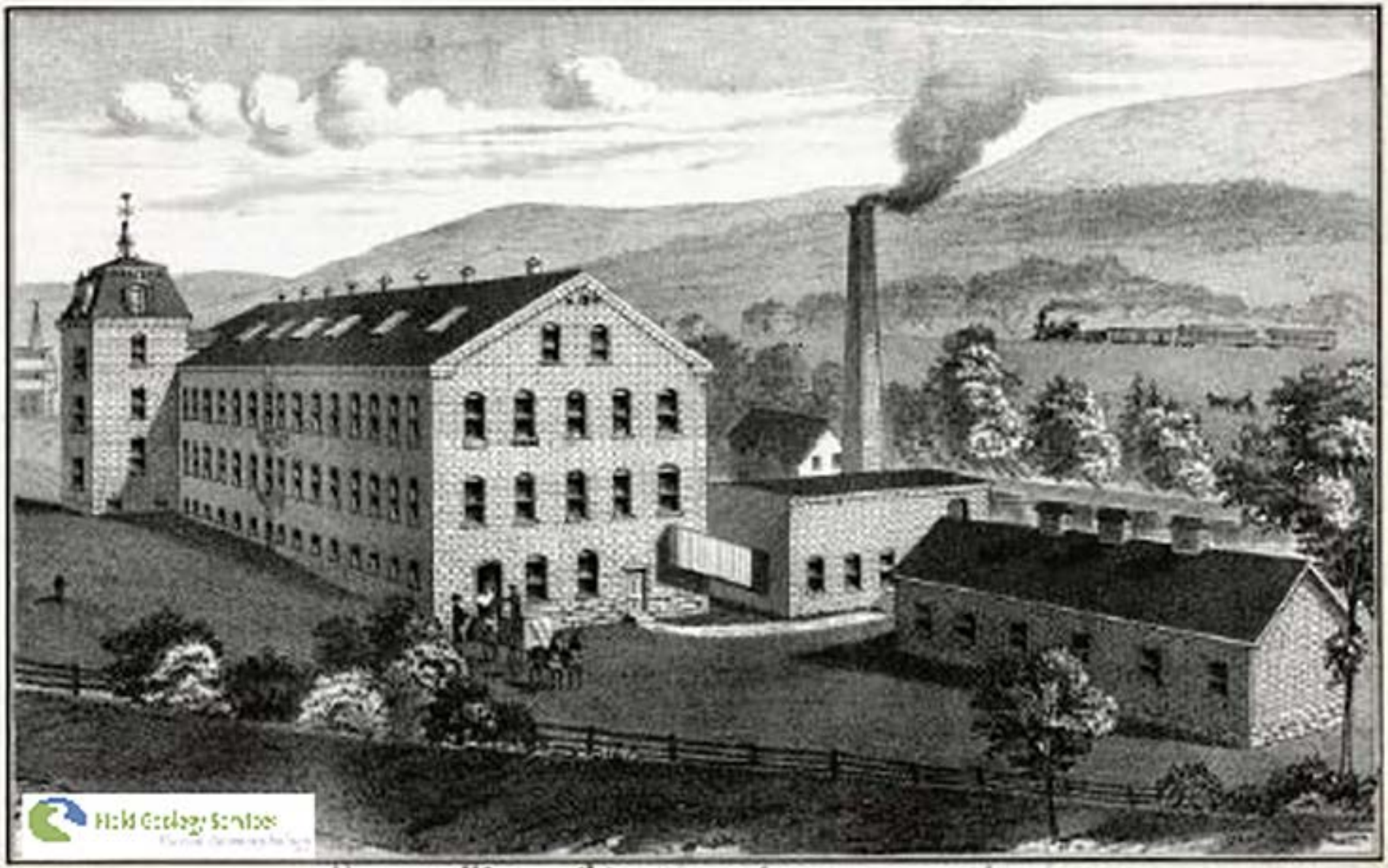
1952

1972




1980


DALTON
TOWN OF DALTON
DALTON
Scale 200 Rods to the inch
WINDSOR
HINSDALE
LANESBOROUGH
CHESHIRE
PITTSFIELD
WASHINGTON
DALTON P.O.
CRANESVILLE
CEMETERY
SCHOOL
C. & B. Co.
Carson & Brown Co
Carson & Brown Co. Paper Mill
Crane & Co. Paper Mill
Paper Mill
Byron Weston Paper Mill
Hawkins West & Co.
Wooten Mills
HOUSATONIC
RIVER
BOSTON & ALBANY R.R.
NEW ROAD
MAIN ST
GULF ROAD
NORTH ST
CURTIS AVE
MORRISON AVE
CHAMBERLIN AVE
WESTON
PITTSFIELD DALTON
Walker Brook
HOTEL
Depot
Chas. Rooney
A.E. Chamberlin
A.S. Chamberlin
B. Chamberlin
J.C. Chamberlin
Dr. H. Ferre
C.E. Stearns
C.E. West
J.D. Carson
J. Ahern
J. Daverin
Mrs. O.G. Hall
Mrs. Jas. Toole
Mrs. J. Weston
Z. Crane
Z. Crane Jr.
Z.M. Crane
J.B. Crane
J. Wilson
Crane & Co.
N.P. Dickinson
J.A. Geer
C.W. Mitchell
J.D. Smith
Henry M. Parker



HAWKINS WEST & CO'S WOOLEN MILLS DALTON, MASS.

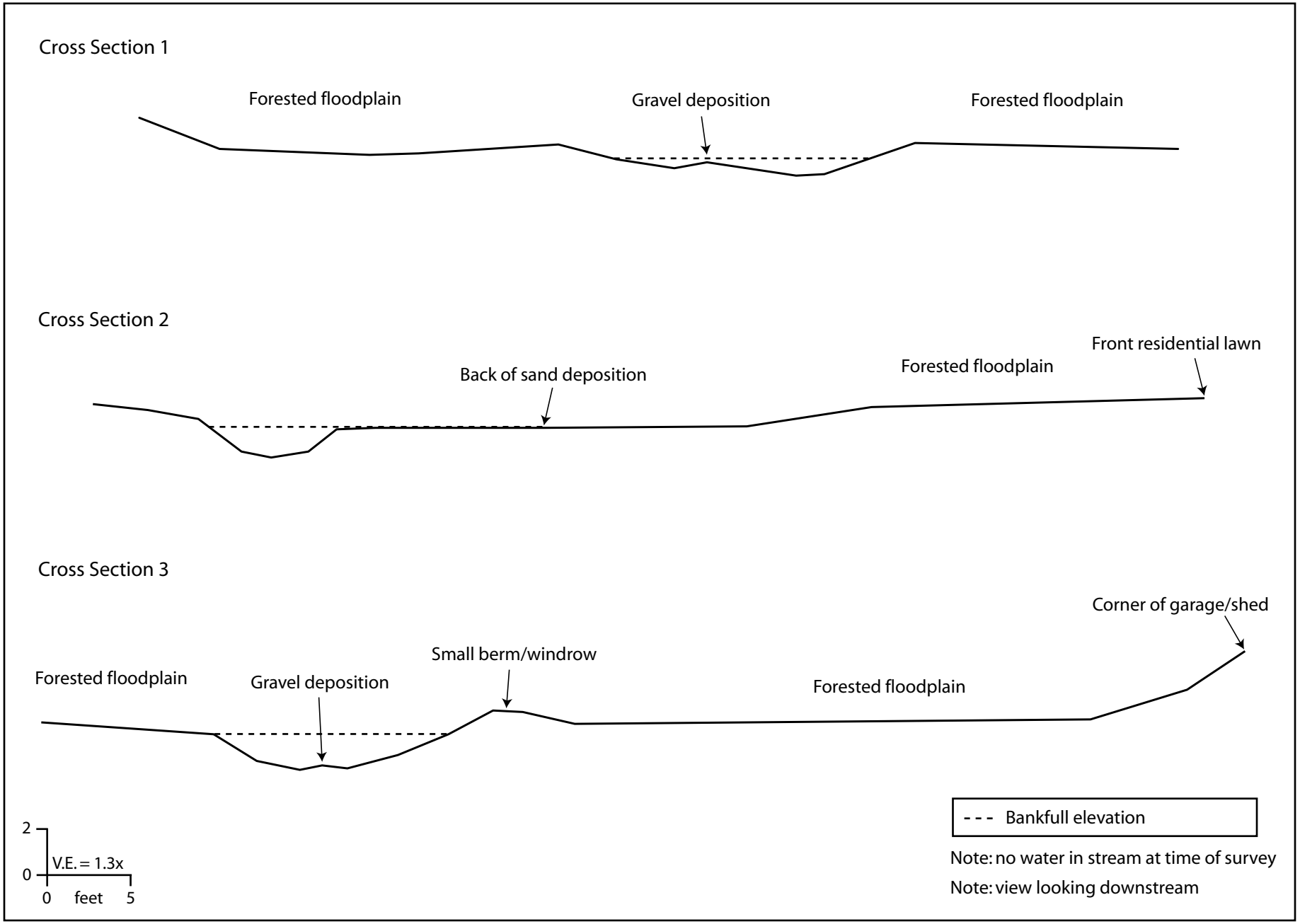
LARGE FIRE AT DALTON, MASS.

The fine woollen mill of Hawkins, West & Co., at Dalton, was burned, on Monday afternoon, with all the machinery and stock. The fire caught about 3 o'clock in the picker room, which was in a separate building, and was communicated to the manufactory through the belt holes. The flames spread with great rapidity, the whole building being in flames so quickly that nothing was saved except a very

small quantity of cloth. A despatch was sent to Pittsfield for aid, and the No. 2 steamer arrived at 5½ o'clock, too late, however, to be of service. The company had five sets of cards, and manufactured repellants and cassimeres, and eighty hands are thrown out of employment. The firm consists of W. J. Hawkins, Charles E. and John K. West, and Christopher Glennon, and they will at once rebuild the mill. The loss is placed at from $75,000 to $80,000, with an insurance of $60,000, in different Pittsfield agencies, in the Fire Association of Philadelphia, the Ætna of Hartford and many other companies. Two small dwelling-houses adjacent were also burned; insured for $300 each in the Berkshire Mutual of Pittsfield.

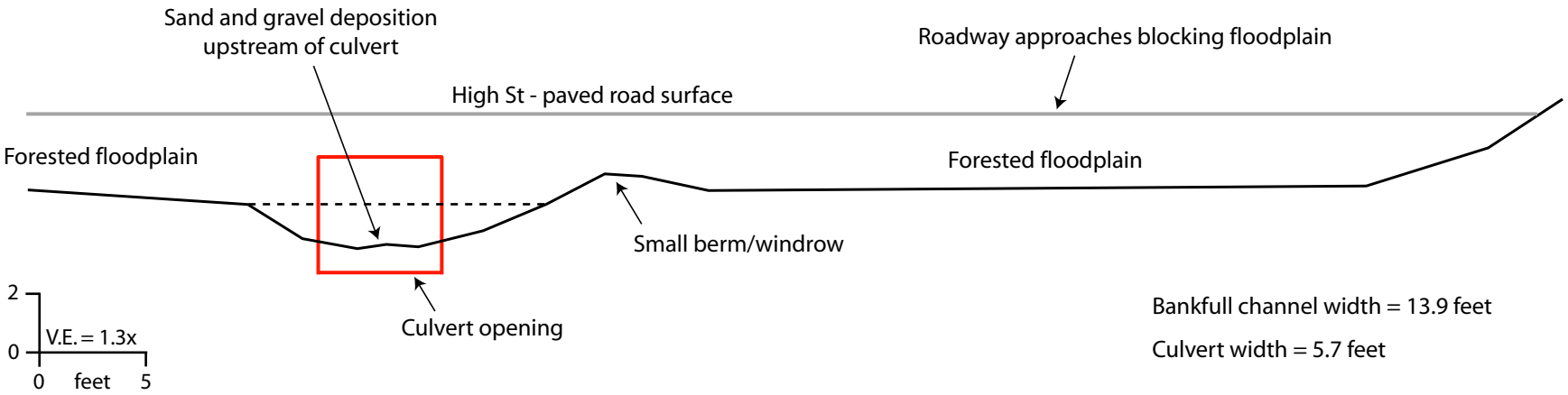
APPENDIX 3

(Topographic surveys)



Walker Brook - Surveyed channel cross sections. (Upstream of High Street)

Cross Section 3*



Bankfull channel width = 13.9 feet

Culvert width = 5.7 feet

Photo of the undersized High St culvert

*Note: surveyed channel cross section located 94 feet upstream of culvert inlet

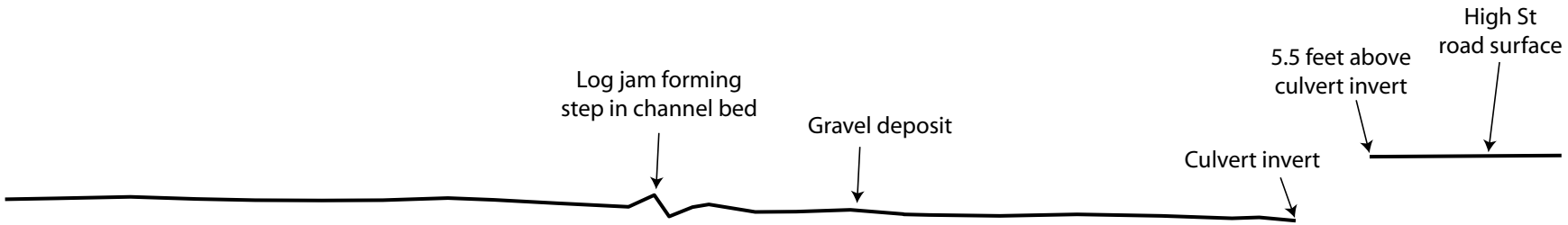
--- Bankfull elevation

Note: no water in stream at time of survey

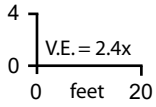
Note: view looking downstream

Channel cross section showing the extent to which High St and the undersized culvert constrict channel and floodplain flow. (Upstream of High Street)

Longitudinal profile



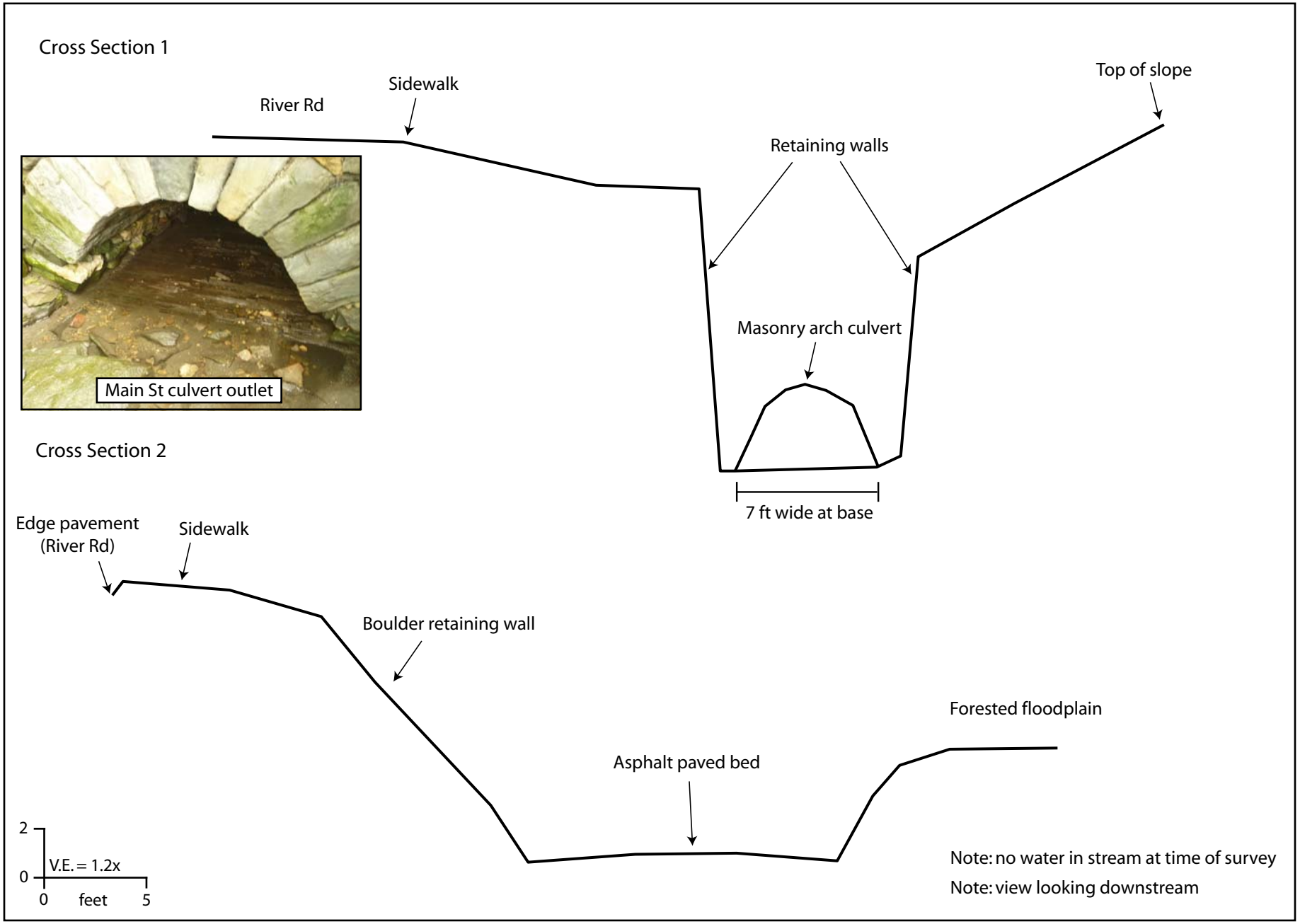
Slope of channel bed = 0.00674



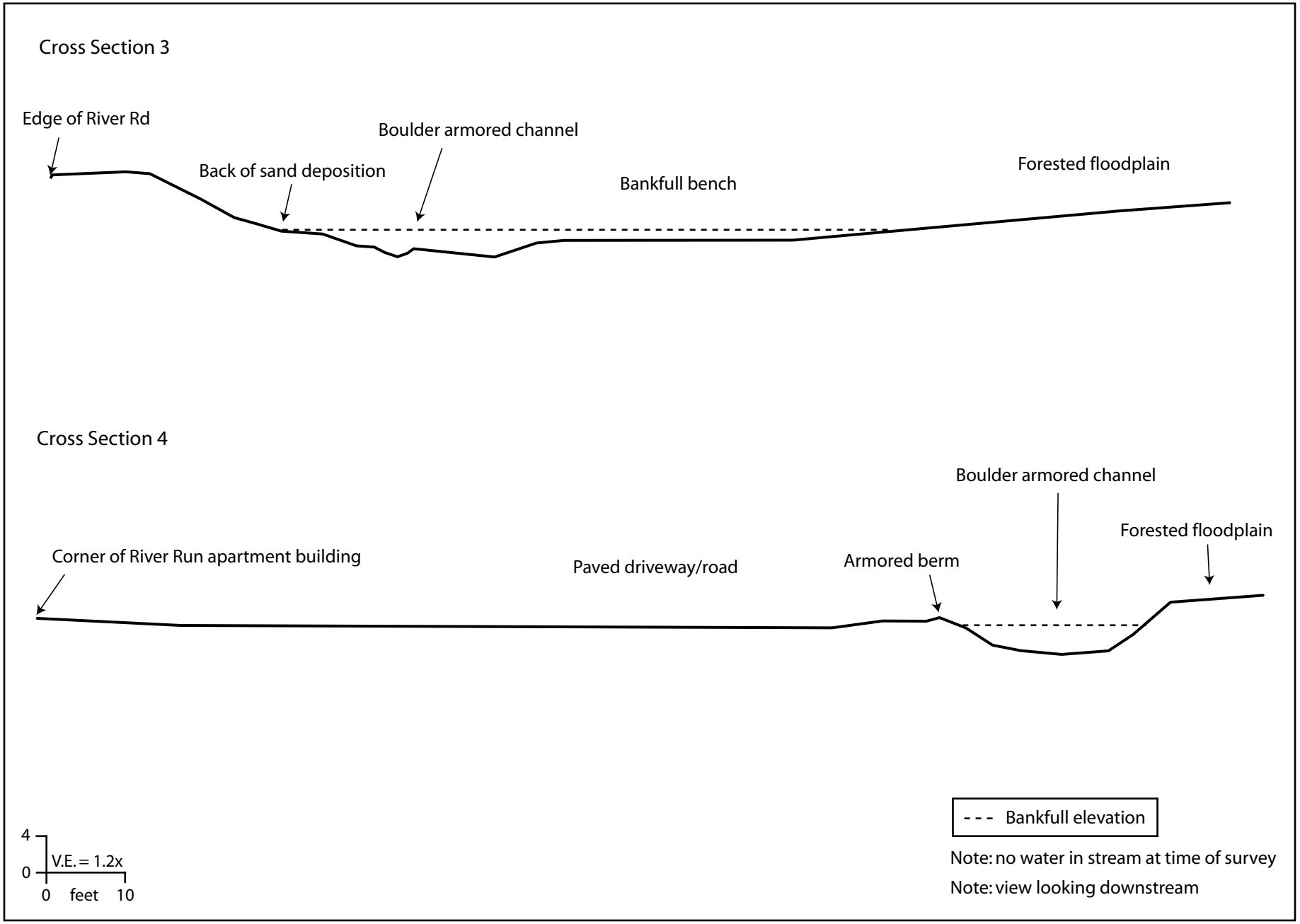
Note: flow from left to right

Note: no water in stream at time of survey

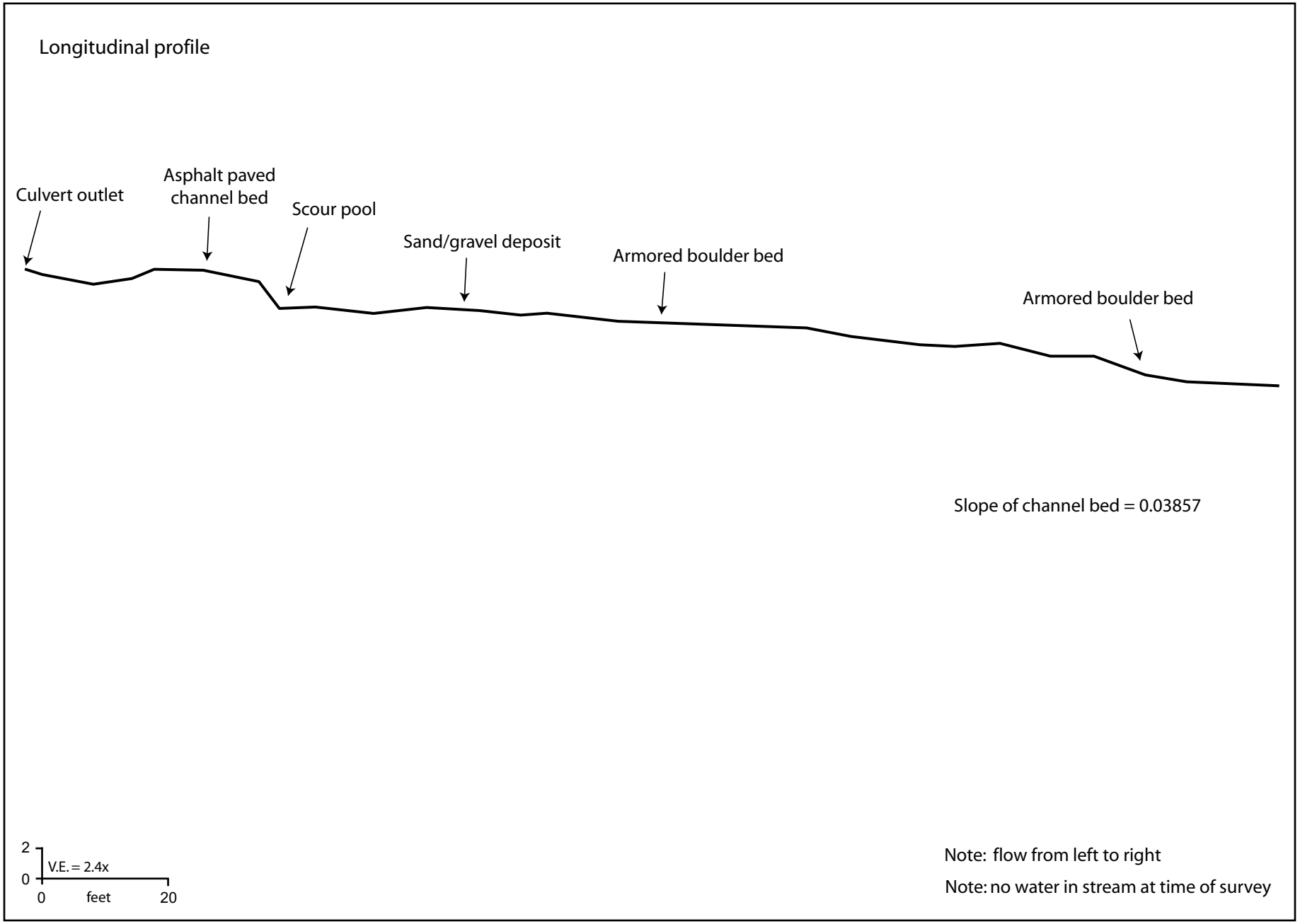
Longitudinal profile of Walker Brook upstream of High St.



Walker Brook - Surveyed channel cross sections. (Downstream of Main Street)



Walker Brook - Surveyed channel cross sections. (Downstream of Main Street)



Longitudinal profile of Walker Brook downstream of Main St.

ATTACHMENT E

GEOTECHNICAL DATA MEMORANDUM

Known for excellence.
Built on trust.

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

1350 Main Street
Suite 1400
Springfield, MA 01103
T: 413.726.2100
F: 413.732.1249
www.gza.com

M E M O R A N D U M

To: Mr. Tom Hutcheson, Town Manager

From: Nathaniel L. Russell, P.E., GZA

Date: March 3, 2023

File No.: 15.0166994.00

Re: Summary of Preliminary Subsurface Explorations
Walker Brook Preliminary Engineering Study
Dalton, Massachusetts

In accordance with our contract executed on September 27, 2021, GZA GeoEnvironmental, Inc. (GZA), performed subsurface explorations to support preliminary design of a new stormwater culvert to increase capacity of the existing Walker Brook Culvert extending between High Street and Main Street, in Dalton, MA.

Elevations in this report are in feet and referenced to the North American Vertical Datum of 1988 (NAVD88), unless otherwise indicated. This report is subject to the limitations included in **Attachment 1**.

SUBSURFACE EXPLORATIONS

Nine test borings, GZ-1 through GZ-10, were drilled by Seaboard Drilling of Chicopee, Massachusetts (Seaboard) between December 27 and 29, 2022 using hollow stem augers with a truck-mounted drill rig. Split spoon soil samples were obtained continuously over the upper 12 feet and at 5-foot intervals thereafter, or as noted on the logs, in general accordance with ASTM D 1586, the Standard Penetration Test (SPT). The SPT consists of advancing a 1-3/8 inch inside diameter standard split spoon sampler at least 18 inches with a 140-pound hammer dropping from a height of 30 inches. The SPT value, referred to as the "N" value, is the number of blows required to drive the sampler from 6 to 18 inches of penetration, a commonly used indicator of soil density and consistency.

The borings were drilled to depths ranging from 17 to 34 feet below ground surface (bgs). After completion, the borings were backfilled with cuttings to existing grade. In paved areas, the top 3 inches of the borings were backfilled with compacted cold patch asphalt.

A representative from GZA observed the drilling, classified the subsurface materials, collected representative samples, and prepared boring logs. The approximate locations of the borings are shown on **Figure 1.** Logs of the borings are included in **Appendix B.**

SUBSURFACE CONDITIONS

Based on the borings, subsurface conditions consisted of pavement underlain by existing fill over naturally deposited alluvial soils (Silt, Silt and Fine Sand, Sand and Gravel) and Glacial Till.

The following presents a generalized description of the subsurface strata encountered in the explorations in order of increasing depth:

SOIL

PAVEMENT

Approximately 4- to 6-inches of pavement bituminous and/or cement concrete pavement was encountered at the ground surface test borings GZ-1 through GZ-6. Note that test borings GZ-7 through GZ-10 were drilled off the edge pavement of the roadway.

FILL

FILL was encountered below the pavement or topsoil at test borings GZ-1 through GZ-7. The FILL ranged from approximately 5 to 13.5 feet in thickness and generally consisted very loose to medium dense SILT, SILT and Sand, SAND and Silt, or fine to coarse SAND, with varying percentages of Gravel and Silt. SPT-N values obtained in the fill ranged from 4 to 25 blows-per-foot (bpf).

Based on the information presented on publicly-available historic topographic maps, our understanding of the site development history and current topographic conditions, the FILL encountered in the test borings is likely related to prior utility construction and may consist, at least partially, of existing native soils obtained from previous excavations.

SILT, SILT AND FINE SAND

SILT and/or SILT AND FINE SAND was encountered at the ground surface or beneath the Fill at all test borings except borings GZ-10. At GZ-8, SILT was encountered at approximately 0.5 to 4.5-feet bgs and SILT AND FINE SAND was encountered from approximately 10 to 14.5-feet bgs. At GZ-10, SILT FINE SAND was encountered at approximately 13 feet bgs. The stratum generally consisted of loose to medium dense, SILT with up to 50 percent fine Sand, and up to 10 percent Gravel. SPT-N values obtained in the SILT/SILT AND FINE SAND stratum ranged from 7 to 25 bpf.

SAND AND GRAVEL

SAND AND GRAVEL was encountered at test borings GZ-8, GZ-9 and GZ-10, as follows: GZ-8, approximately 4.5 to 10-feet bgs, and 14.5 to 26.5-feet bgs; GZ-9, approximately 5 to 17-feet bgs; GZ-10, approximately 5 to 17-feet bgs. The stratum generally consisted of medium dense to very dense fine to coarse SAND with up to 35-percent Gravel or GRAVEL with up to 35% fine to coarse Sand, with varying percentages of Silt. SPT-N values obtained in the SAND AND GRAVEL stratum ranged from 10 to 63 bpf.

GLACIAL TILL

GLACIAL TILL was encountered beneath the SAND AND GRAVEL at test boring GZ-9. The GLACIAL TILL stratum generally consisted of medium dense to very dense, SILT and fine to coarse Sand, with up to 20 precent Gravel, or fine to coarse SAND and SILT, with up to 20 percent Gravel. SPT-N values in the GLACIAL TILL stratum ranged from 13 to 60 bpf.

REFUSAL

Auger or sampler refusal was encountered at the following locations: GZ-8, approximately 26.1-feet bgs (sampler) and 26.5-feet bgs (auger); GZ-9, approximately 21.3-feet bgs (sampler) and 34-feet bgs (sampler and auger); and GZ-10, approximately 6.2-feet bgs (sampler) and 20-feet bgs (sampler and auger).

Refusals may be due to the drilling encountering boulders or bedrock.

GROUNDWATER

The approximate depth to groundwater at the exploration locations was estimated based on observed changes in the apparent moisture content of the recovered samples. The estimated depth to groundwater ranged from approximately 11- to 22-feet bgs, corresponding to approximately El. 1109 to 1116 feet. The depth to groundwater general increased (was deeper) moving from north to south along the proposed culvert alignment. The estimated groundwater levels described herein do not represent stabilized water level measurements. It should be noted that fluctuations in groundwater levels will likely occur due to seasonal variations in precipitation and temperature, site features, and other factors different from those existing at the time of the explorations and measurements.

Attachments:

- Figure 1 – Exploration Location Plan
- Attachment 1 – Limitations
- Attachment 2 – GZA Test Boring Logs

GENERAL NOTES

1. BASE MAP TAKEN FROM GOOLE EARTH PRO., .
2. LOCATION OF EXPLORATIONS WERE DETERMINED BY LINE-OF-SITE AND MEASUREMENT FROM EXISTING FEATURES AND SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND

TEST BORING DRILLED BY SEABOARD BETWEEN DECEMBER 27 AND 29, 2022

GZ-2

WALKER BROOK

DALTON, MASSACHUSETTS

SUMMARY OF PRELIMINARY SUBSURFACE EXPLORATIONS
EXPLORATION LOCATION PLAN

PREPARED BY: GZA GeoEnvironmental, Inc. Engineers and Scientists www.gza.com		PREPARED FOR: TOWN OF DALTON	
PROJ MGR: RS	REVIEWED BY: RS	CHECKED BY: SLL	FIGURE 1
DESIGNED BY: JH	DRAWN BY: NR	SCALE: NTS	
DATE: MARCH 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO:

ATTACHMENT 1

LIMITATIONS

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the contract documents, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in Proposal for Services and/or Report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the design has been altered in any way, GZA shall be so notified and afforded the opportunity to revise the report,as appropriate, to reflect the unanticipated changed conditions .

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

SUBSURFACE CONDITIONS

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs. The nature and extent of variations between these explorations may not become evident until further exploration or construction. If variations or other latent conditions then become evident, it will be necessary to reevaluate the conclusions and recommendations of this report.

6. In preparing this report, GZA relied on certain information provided by the Client, state and local officials, and other parties referenced therein which were made available to GZA at the time of our evaluation. GZA did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

7. Water level readings have been made in test holes (as described in this Report) and monitoring wells at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this Report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The water table encountered in the course of the work may differ from that indicated in the Report.

8. GZA's services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

9. Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

COMPLIANCE WITH CODES AND REGULATIONS

10. We used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

COST ESTIMATES

11. Unless otherwise stated, our cost estimates are only for comparative and general planning purposes. These estimates may involve approximate quantity evaluations. Note that these quantity estimates are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we have no control over either when the work will take place or the labor and material costs required to plan and execute the anticipated work, our cost estimates were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

ADDITIONAL SERVICES

12. GZA recommends that we be retained to provide services during any future: site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

ATTACHMENT 2

TEST BORING LOGS

LOG KEY

GZA
Geo Environmental, Inc.
Engineers and Scientists

BURMISTER SOIL CLASSIFICATION

COMPONENT	NAME	PROPORTIONAL TERM	PERCENT BY WEIGHT
MAJOR	GRAVEL, SAND, FINES*		>50
Minor	Gravel, Sand, Fines*	and	35 - 50
		some	20-35
		little	10-20
		trace	0-10

*See identification of fines table.

IDENTIFICATION OF FINES

Material	PI	Atterberg Thread Dia.
SILT	0	Cannot Roll
Clayey SILT	1-5	1/4"
SILT & CLAY	5-10	1/8"
CLAY & SILT	10-20	1/16"
Silty CLAY	20-40	1/32"
CLAY	>40	1/64"

GRADATION DESIGNATION	PROPORTION OF COMPONENT
Fine to coarse	All fractions > 10%
Medium to coarse	<10% fine
Fine to medium	<10% coarse
Coarse	<10% fine and medium
Medium	<10% coarse and fine
Fine	<10% coarse and medium

PLASTIC SOILS

Consistency	Blows/Ft. SPT N-Value
Very Soft	< 2
Soft	2 - 4
Medium Stiff	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	>30

GRAVEL & SAND

Density	Blows/Ft. SPT N-Value
Very Loose	< 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS) (ASTM D 2487)

MAJOR DIVISIONS			Group Symbols
Coarse Grained Soils More than 50% of material larger than No. 200 sieve.	Gravel More than 50% larger than No. 4 sieve.	Clean Gravels (Little or no fines)	GW GP
		Gravels with Fines (Appreciable amount of fines)	GM GC
	Sand More than 50% smaller than No. 4 sieve.	Clean Sands (Little or no fines)	SW SP
		Sands with Fines (Appreciable amount of fines)	SM SC
Fine Grained Soils More than 50% of material smaller than No. 200 sieve.		Silts and Clays Liquid Limit <50	ML CL
		Silts and CLays Liquid Limit >50	OL MH CH OH
		Highly Organic Soils	Pt

ORGANIC SOIL CLASSIFICATION

Fibrous PEAT (Pt) - Lightweight, spongy, mostly visible organic matter, water squeezes readily from sample. Typically near top of deposit.
Fine Grained PEAT (Pt) - Lightweight, spongy, little visible organic matter, water squeezes readily from sample. Typically below fibrous peat.
Organic Silt (OL) - Typically gray to dark gray, often has strong H2S odor. Typically contains shells or shell fragments. Lightweight. Usually found near coastal regions. May contain wide range of sand fractions.
Organic Clay (OH) - Typically gray to dark gray, high plasticity. Usually found near coastal regions. May contain wide range of sand fractions. Need organic content test for final identification.

ABBREVIATIONS

MR = Mud Rotary
HSA = Hollow Stem Auger
SSA = Solid Stem Auger
SS = Split Spoon Sampler
U = Undisturbed Sample (Shelby Tube)
MC = Modified California Sampler
V = Vibracore
M = Macrocore

USCS = Unified Soil Classification System (ASTM D2487)
NYCBC = New York City Building Code
WOR = Weight of Rods
WOH= Weight of Hammer
SPT = Standard Penetration Test (ASTM D1586)

Tv = Field Vane Shear Test (Torvane) Shear Strength
PP = Pocket Penetrometer Shear Strength
PI = Plasticity Index
Wn = Moisture Content
CO = Consolidation
UC = Unconfined Compression Test
UU = Unconsolidated Undrained (Triaxial) Test
SI = Sieve Analysis
DS = Direct Shear
PID = Photoionization Detector
ppm = Parts Per Million
REC = Recovery
RQD = Rock Quality Designation
▼ = Measured Water Level

N-Value = Cumulative number of uncorrected blows for the middle two six-inch intervals (blows/foot).

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-1
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 17
Date Start - Finish: 12/27/2022 - 12/27/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/27/22	-	15'	See Note 3

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		SS-1	0.5-2.5	24	17	31 9 11 9	20	SS-1: Medium dense, brown, fine to coarse SAND, trace Gravel, trace Silt	1 2		0.5	ASPHALT	1126.5
		SS-2	2.5-4.5	24	16	7 3 3 2	6	SS-2: Top 5": Brown, fine to coarse SAND, trace Silt Bottom 11": Gray, SILT, and fine Sand, trace Organics				FILL	
5		SS-3	5-7	24	7	5 3 4 5	7	SS-3: Loose, gray, fine to coarse SAND, some Gravel, little Silt			7		1120.0
		SS-4	7-9	24	18	7 6 6 8	12	SS-4: Top 6": Brown, fine SAND and Silt Bottom 12": Grayish-brown, SILT and fine Sand					
10		SS-5	10-12	24	16	10 7 8 8	15	SS-5: Medium dense, brownish-gray, fine SAND, little Silt				SILT AND FINE SAND	
15		SS-6	15-17	24	18	5 6 5 4	11	SS-6: Medium dense, brown, gray, Clayey SILT, some fine Sand	3		17		1110.0
								End of Exploration at 17 feet.	4				
20													
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Augered through approximately 6-inches of pavement.
3 - Groundwater depth estimated from observed change in soil sample moisture content.
4 - Upon completion, borehole backfilled with drill cuttings to approximately 3-inches below ground surface. Pavement repaired with approximately 3-inches of cold patch.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-1

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-2
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 17
Date Start - Finish: 12/27/2022 - 12/27/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/27/22	-	11'	See Note 3

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0.5-2.5	24	16	31 12 10 9	22	SS-1: Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel	1 2		0.5	ASPHALT	1126.5
		SS-2	2.5-4.5	24	12	7 12 7 7	19	SS-2: Medium dense, grayish-brown, fine to coarse SAND, some Gravel, little Silt				FILL	
5		SS-3	5-7	24	14	9 5 6 7	11	SS-3: Medium dense, brown, SILT, some fine Sand			5		1122.0
		SS-4	7-9	24	22	8 10 10 10	20	SS-4: Top 6": Brown, SILT and fine Sand Middle 3": Brown, fine to coarse SAND, some Gravel, little Silt Bottom 13": Brown, SILT and fine Sand					
10		SS-5	10-12	24	16	4 7 7 8	14	SS-5: Medium dense, grayish-brown, SILT and fine Sand	3			SILT AND FINE SAND	
15		SS-6	15-17	24	24	8 12 13 13	25	SS-6: Medium dense, gray, Clayey SILT and fine Sand			17		1110.0
								End of Exploration at 17 feet.	4				
20													
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Augered through approximately 6-inches of pavement.
3 - Groundwater depth estimated from observed change in soil sample moisture content.
4 - Upon completion, borehole backfilled with drill cuttings to approximately 3-inches below ground surface. Pavement repaired with approximately 3-inches of cold patch.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-2

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-3
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 17
Date Start - Finish: 12/27/2022 - 12/27/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/27/22	-	11'	See Note 3

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0.5-2.5	24	14	24 11 9 8	20	SS-1: Medium dense, brown, fine to coarse SAND, some Gravel, little Silt	1 2		0.5	ASPHALT	1126.5
		SS-2	2.5-4.5	24	12	9 8 7 4	15	SS-2: Top 4": Brown, fine to coarse SAND, little Gravel, little Silt Bottom 8": Gray, SILT, some fine Sand				FILL	
5		SS-3	5-7	24	17	8 10 13 14	23	SS-3: Medium dense, brownish-gray, fine to coarse SAND, some Gravel, little Silt			7		1120.0
		SS-4	7-9	24	11	13 11 9 7	20	SS-4: Medium dense, gray, SILT and fine Sand					
10		SS-5	10-12	24	18	3 4 4 6	8	SS-5: Loose, gray, SILT and fine Sand	3			SILT AND FINE SAND	
15		SS-6	15-17	24	17	3 5 6 5	11	SS-6: Medium dense, gray, SILT and fine Sand			17		1110.0
								End of Exploration at 17 feet.	4				
20													
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Augered through approximately 6-inches of pavement.
3 - Groundwater depth estimated from observed change in soil sample moisture content.
4 - Upon completion, borehole backfilled with drill cuttings to approximately 3-inches below ground surface. Pavement repaired with approximately 3-inches of cold patch.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-3

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-4
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 17
Date Start - Finish: 12/27/2022 - 12/27/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/27/22	-	11'	See Note 4

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		SS-1	0.5-2.5	24	16	23 12 13 12	25	SS-1: Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel	1 2		0.5	ASPHALT	1126.5
		SS-2	2.5-4.5	24	16	10 7 6 7	13	SS-2: Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel				FILL	
5		SS-3	5-7	24	12	3 7 13 10	20	SS-3: Medium dense, brown, SILT, some fine to coarse SAND, trace Gravel			5		1122.0
		SS-4	7-9	24	17	14 8 6 5	14	SS-4: Medium dense, brown, SILT, some fine to coarse Sand, little Gravel	3				
10		SS-5	10-12	24	16	3 4 4 5	8	SS-5: Loose, gray, SILT and fine Sand	4			SILT AND FINE SAND	
15		SS-6	15-17	24	17	4 8 7 9	15	SS-6: Medium dense, gray, Clayey SILT and fine Sand			17		1110.0
								End of Exploration at 17 feet.	5				
20													
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Augered through approximately 6-inches of pavement.
3 - Pieces of wood in soil at approximately 7.5 feet below ground surface (bgs).
4 - Groundwater depth estimated from observed change in soil sample moisture content.
5 - Upon completion, borehole backfilled with drill cuttings to approximately 3-inches bgs. Pavement repaired with approximately 3-inches of cold patch.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-4

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-5
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 17
Date Start - Finish: 12/28/2022 - 12/28/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/28/22	-	Not observed	

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0.5-2.5	24	19	60 18 7 4	25	SS-1: Medium dense, brown, fine to coarse SAND, some Gravel, little Silt	1 2		0.5	ASPHALT	1126.5
		SS-2	2.5-4.5	24	7	5 5 12 17	17	SS-2: Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel					
5		SS-3	5-7	24	13	5 3 4 4	7	SS-3: Top 3": Brown, fine SAND, little Silt Middle 4": Dark gray, fine to coarse SAND, some Gravel, trace Silt				FILL	
		SS-4	7-9	24	21	6 11 8 5	19	Bottom 6": Brown, SILT and fine Sand SS-4: Top 14": Gray, Clayey SILT and fine Sand Bottom 7": Gray, fine to coarse SAND, some Gravel, little Silt					
10		SS-5	10-12	24	14	4 3 4 4	7	SS-5: Loose, tan, fine to coarse SAND, little Gravel, trace Silt			13.5		1113.5
15		SS-6	15-17	24	21	6 7 8 7	15	SS-6: Medium dense, gray, SILT and fine Sand				SILT AND FINE SAND	
											17		1110.0
								End of Exploration at 17 feet.	3				
20													
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Augered through approximately 6-inches of pavement.
3 - Upon completion, borehole backfilled with drill cuttings to approximately 3-inches below ground surface. Pavement repaired with approximately 3-inches of cold patch.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-5

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-6
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 22
Date Start - Finish: 12/28/2022 - 12/28/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/28/22	-	12'	See Note 4

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	STRATUM Depth (ft.)	STRATUM Description	STRATUM Elev. (ft.)
		SS-1	0.5-2.5	24	12	1 2 3 3	5	SS-1: Loose, brown, SILT, little fine to coarse SAND, little Gravel	1 2		0.5	CONCRETE	1126.5
		SS-2	2.5-4.5	24	20	2 2 2 3	4	SS-2: Very loose to loose, grayish-brown, SILT, little fine to medium Sand, trace Gravel					
5		SS-3	5-7	24	15	2 3 6 10	9	SS-3: Loose, brownish-gray, SILT, some fine to medium Sand, little Gravel				FILL	
		SS-4	7-9	24	6	11 9 9 7	18	SS-4: Medium dense, brown, SILT and fine to coarse Sand					
											9.5		1117.5
10		SS-5	10-12	24	16	7 4 3 4	7	SS-5: Loose, brown, SILT and fine Sand	3 4				
15		SS-6	15-17	24	17	4 4 4 4	8	SS-6: Loose, gray, SILT and fine Sand				SILT AND FINE SAND	
20		SS-7	20-22	24		4 6 13 9	19	SS-7: Medium dense, gray, SILT and fine Sand					
											22		1105.0
								End of Exploration at 22 feet.	5				
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Augered through approximately 6-inches of pavement/concrete (sidewalk).
3 - Auger grinding at approximately 11-feet below ground surface (bgs).
4 - Groundwater depth estimated from observed change in soil sample moisture content.
5 - Upon completion, borehole backfilled with drill cuttings to approximately 3-inches bgs. Pavement repaired with approximately 3-inches of cold patch.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-6

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-7
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 22
Date Start - Finish: 12/28/2022 - 12/28/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/28/22	-	18'	See Note 3

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	1-3	24	17	4 3 3 3	6	SS-1: Loose, brown, SILT, little Gravel, trace fine to coarse Sand	1 2				
		SS-2	3-4	24	16	2 2 3 4	5	SS-2: Loose, brown, SILT, little fine to coarse Sand					
5		SS-3	5-7	24	6	4 4 3 2	7	SS-3: Loose, brown, fine to coarse SAND, little Gravel, little Silt				FILL	
		SS-4	7-9	24	4	4 4 7 10	11	SS-4: Medium dense, brown, SILT and fine to coarse Sand					
10		SS-5	10-12	24	18	5 8 7 9	15	SS-5: Top 5": Brown, SILT and fine Sand Bottom 13": Tan, fine to coarse SAND, little Gravel, trace Silt			13.5		1113.5
15		SS-6	15-17	24	19	6 6 7 7	13	SS-6: Medium dense, gray, SILT and fine Sand, trace coarse Sand	3			SILT AND FINE SAND	
20		SS-7	20-22	24	19	3 5 6 6	11	SS-7: Med. dense gray, Clayey SILT, some fine Sand			22		1105.0
								End of Exploration at 22 feet.	4				
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Advanced borehole with augers to approximately 12-inches below ground surface (bgs) prior to start of sampling.
3 - Groundwater depth estimated from observed change in soil sample moisture content.
4 - Upon completion, borehole backfilled with drill cuttings to ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-7

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-8
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-3
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 26.5
Date Start - Finish: 12/28/2022 - 12/28/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/28/22	-	12'	See Note 3

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0-2	24	12	3 3 2 2	5	SS-1: Top 6": Dark gray, fine to coarse SAND, some Silt, little Gravel Bottom 6": Brown, SILT and fine Sand	1		0.5	SAND	1126.5
		SS-2	2-4	24	13	11 7 5 5	12	SS-2: Top 5": Brown, SILT and fine Sand Bottom 7": STONE FRAGMENTS				SILT	
5		SS-3	5-7	24	9	10 15 25 25	40	SS-3: Dense, tan, fine to coarse SAND, some Gravel, trace Silt			4.5		1122.5
		SS-4	7-9	24	13	20 23 19 14	42	SS-4: Dense, tan, fine to coarse SAND, some Gravel, little Silt	2			SAND AND GRAVEL	
10		SS-5	10-12	24	15	4 5 6 5	11	SS-5: Gray, SILT and fine Sand			10		1117.0
		SS-6	12-14	24	15	10 7 8 7	15	SS-6: Gray, SILT, trace fine to coarse Sand, trace Gravel	3			SILT AND FINE SAND	
15		SS-7	15-17	24	9	6 13 33 20	46	SS-7: Dense, SILT and fine to coarse Sand, little Gravel			14.5		1112.5
		SS-8	17-19	24	11	18 18 19 18	37	SS-8: Dense, tan, GRAVEL, some Silt, little fine Sand					
20		SS-9	20-22	24	10	7 12 9 7	21	SS-9: Medium dense, tan, GRAVEL and fine to coarse Sand, little Silt				SAND AND GRAVEL	
		SS-10	22-24	24	6	7 9 11 14	20	SS-10: Medium dense, tan, GRAVEL and fine to coarse Sand, little Silt	4				
25		SS-11	25-27	13	11	12 19 50/1"	R	SS-11: Tan, fine to coarse SAND, some Gravel, little Silt	5		26.5		1100.5
								End of Exploration at 26.5 feet.	6				
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Auger grinding observed at approximately 7 feet below ground surface (bgs).
3 - Groundwater depth estimated from observed change in soil sample moisture content.
4 - Auger grinding observed at approximately 23 feet bgs.
5 - Sampler refusal at approximately 26.1 feet bgs, auger refusal at approximately 26.5 feet bgs.
6 - Upon completion, borehole backfilled with drill cuttings to ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-8

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-9
SHEET: 1 of 2
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 34
Date Start - Finish: 12/29/2022 - 12/29/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/29/22	-	20'	See Note 4

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0-2	24	8	4 4 3 3	7	SS-1: Loose, brown, SILT, some fine to coarse Sand, trace Gravel	1				
		SS-2	2-4	24	18	4 7 47 14	54	SS-2: Top 11": Brown, SILT, little fine to coarse Sand Bottom 7": STONE FRAGMENTS	2			SILT AND SAND	
5		SS-3	5-7	24	14	8 17 14 10	31	SS-3: Dense, tan, fine to coarse SAND, some Gravel, little Silt			5		1122.0
		SS-4	7-9	24	11	14 13 43 20	56	SS-4: Very dense, tan, fine to coarse SAND, some Gravel, little Silt					
10		SS-5	10-12	24	10	18 50 13 15	63	SS-5: Very dense, tan, GRAVEL and fine to coarse Sand, little Silt	3			SAND AND GRAVEL	
15		SS-6	15-17	24	2	13 7 5 8	12	SS-6: Medium dense, brown, fine to coarse SAND and GRAVEL, trace Silt			17		1110.0
		SS-7	17-19	24	18	6 6 7 7	13	SS-7 Med. dense, brown SILT and fine to coarse Sand, little Gravel					
20		SS-8	20-22	24	9	9 18 50/3"	R	SS-8: SILT and fine to coarse Sand, little Gravel	4 5			GLACIAL TILL	
25		SS-9	25-27	24	21	11 10 24 22	34	SS-9: Dense, brown, fine to coarse SAND and SILT, little Gravel					
		SS-10	27-29	24	14	11 27 33 35	60	SS-10: Very dense, reddish-brown, fine to coarse SAND and SILT, some Gravel					
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Auger grinding observed at approximately 3.5, 8 and 11 feet below ground surface (bgs).
3 - Advanced borehole with augers through possible cobbles/boulders from approximately 12 to 15 feet bgs.
4 - Groundwater depth estimated from observed change in soil sample moisture content.
5 - Sampler refusal at approximately 21.3 feet bgs. Advanced borehole with augers to approximately 24 feet bgs.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-9

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-9
SHEET: 2 of 2
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 34
Date Start - Finish: 12/29/2022 - 12/29/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/29/22	-	20'	See Note 4

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Sample Pen. (in)	Sample Rec. (in)	Sample Blows (per 6 in.)	Sample SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-11	30-32	24	24	22 26 28 28	54	SS-11: Very dense, brown, fine to coarse SAND and SILT, little Gravel				GLACIAL TILL	
											34		1093.0
35		SS-12	34-36	0	0	50/0"		SS-12: End of Exploration at 34 feet.	6 7				
40													
45													
50													
55													
60													

REMARKS

6 - Sampler and auger refusal at approximately 34 feet bgs.
7 - Upon completion, borehole backfilled with drill cuttings to ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-9

TEST BORING LOG

GZA GeoEnvironmental, Inc.
Engineers and Scientists

Walker Brook
Dalton, Massachusetts

EXPLORATION NO.: GZ-10
SHEET: 1 of 1
PROJECT NO: 15.0166994.00
REVIEWED BY: NLR

Logged By: J. Hyslip
Drilling Co.: Seaboard Drilling
Foreman: Mike Kern

Type of Rig: Truck
Rig Model: Mobile B-53
Drilling Method: HSA

Boring Location: See Plan
Ground Surface Elev. (ft.): 1127
Final Boring Depth (ft.): 20
Date Start - Finish: 12/29/2022 - 12/29/2022

H. Datum: See Plan
V. Datum: NAVD 88

Hammer Type: Automatic
Hammer Weight (lb.): 140 lbs
Hammer Fall (in.): 30"
Auger or Casing O.D./I.D Dia (in.): 7.625/4.25

Sampler Type: Split Spoon
Sampler O.D. (in.): 1-3/8"/2"
Sampler Length (in.): 30"
Core Barrel Size: N/A

Groundwater Depth (ft.)

Date	Time	Water Depth	Stab. Time
12/29/22	-	13'	See Note 5

Depth (ft)	Casing Blows/ Core Rate	Sample No.	Sample Depth (ft.)	Pen. (in)	Rec. (in)	Blows (per 6 in.)	SPT Value	Sample Description and Identification (Modified Burmister Procedure)	Remark	Field Test Data	Depth (ft.)	STRATUM Description	Elev. (ft.)
		SS-1	0-2	24	10	4 4 6 4	10	SS-1: Medium dense, dark brown, fine to coarse SAND, some Silt, trace Gravel	1				
		SS-2	2-4	24	13	4 17 9 14	26	SS-2: Medium dense, gray, fine to coarse SAND, some Silt, little Gravel	2			SAND AND GRAVEL	
5		SS-3	5-7	24	5	28 50/2"	R	SS-3: STONE FRAGMENTS	3 4		5		1122.0
10		SS-4	11-13	24	6	21 37 22 12	59	SS-4: Very dense, gray, fine to coarse SAND, trace Silt, Stone Fragments in sample				SAND AND GRAVEL (POSSIBLE COBBLES)	
		SS-5	13-15	24	15	4 10 11 11	21	SS-5: Medium dense, brown, fine SAND and SILT	5		13		1114.0
15		SS-6	15-17	24	15	7 8 10 8	18	SS-6: Medium dense, brown, SILT and fine Sand				SILT AND FINE SAND	
		SS-7	17-19	24	15	7 7 7 8	14	SS-7: Brown, SILT and fine Sand					
20											20		1107.0
		SS-8	20-20			50/0"	R	SS-8: No Penetration End of Exploration at 20 feet.	6 7				
25													
30													

REMARKS

1 - Ground surface estimated from topographic survey, Existing Conditions Site Plan, Drawings CX101 through CX106, dated February 20, 2023, prepared by Hill Engineers, Architects, Planners, of Dalton, MA.
2 - Slow penetration/auger grinding observed from approximately 3 to 11 feet and at 20 feet below ground surface (bgs).
3 - Sampler refusal encountered at approximately 5.7 feet bgs.
4 - Advanced borehole with augers through possible cobbles/boulders from approximately 5 to 11 feet bgs.
5 - Groundwater depth estimated from observed change in soil sample moisture content.
6 - Sampler and auger refusal at approximately 20 feet bgs.
7 - Upon completion, borehole backfilled with drill cuttings to ground surface.

Stratification lines represent approximate boundaries between soil and bedrock types. Actual transitions may be gradual.

Exploration No.: GZ-10

ATTACHMENT F

CONCEPTUAL-LEVEL OPINION OF CONSTRUCTION COST

25% DESIGN WALKER BROOK PRELIM. ENGINEERING STUDY, DALTON, MA

GZA GeoEnvironmental
1350 Main Street, Suite 1400
Springfield, MA 01103

Owner: TOWN OF DALTON

GZA Project #: 15.0166994.00

Ref. : 022 RSMeans Data from GORDIAN v.8.7, 2022 Release

Standard Union Labor, Pittsfield, MA, MassDOT Weighted Bid Prices - Massachusetts Department of Transportation - Highway Division Construction Project Estimator

Notes:

Calculated by: MJS Date: 3/2/2023
Checked by: RTS Date: 3/3/2023
Back-Checked by: NR Date: 3/6/2023

25% DESIGN - LEVEL OPINION OF CONSTRUCTION COST - FLOOD MITIGATION ALTERNATIVE PC2

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXT.	TO
SITE PREPARATION & SITE DEMOLITION					$714,100.00
CONSTRUCTION ENTRANCE / ACCESS / SECURITY	1	LS	$ 11,500.00	$ 11,500.00	
MOBILIZATION	1	LS	$ 326,000.00	$ 326,000.00	
SITE PREP & DEMOLITION OF EXISTING STRUCTURES	1	LS	$ 301,570.00	$ 301,570.00	
CONTROL & DIVERSION OF WATER	1	LS	$ 50,000.00	$ 50,000.00	
PERIMETER EROSION CONTROL	1,250	LF	$ 20.00	$ 25,000.00	
EARTHWORK AND IMPROVEMENTS					$3,097,345.00
CAST-IN-PLACE CEM. CONCRETE, FOR ABUTMENTS & HEADWALLS INCL. STEEL REINFORCEMENT	45	CY	$ 2,000.00	$ 90,000.00	
60" CLASS IV RCP PIPE	2,170	LF	$ 410.00	$ 889,700.00	
42" CLASS IV RCP PIPE	45	LF	$ 245.00	$ 11,025.00	
12" CLASS IV RCP PIPE	45	LF	$ 179.00	$ 8,055.00	
WATER MAIN IMPROVEMENTS	1	LS	$ 232,665.00	$ 232,665.00	
8" SEWER PIPE	1,420	LF	$ 125.00	$ 177,500.00	
DRAINAGE MANHOLES (96" DIA.)	10	EA	$ 20,000.00	$ 200,000.00	
SEWER MANHOLES & CATCH BASINS (48" DIA.)	16	EA	$ 6,000.00	$ 96,000.00	
SEWER / DRAINAGE MANHOLE & CATCH BASIN FRAME & GRATE	26	EA	$ 900.00	$ 23,400.00	
WATER DIVERSION STRUCTURE, CONCRETE BOX WITH BAFFLE SYSTEM	1	LS	$ 20,000.00	$ 20,000.00	
SLIPLINE EXISTING CULVERT	1,200	LF	$ 260.00	$ 312,000.00	
TRENCHING, INCLUDES TRENCH BOX, BACKFILL TRENCH & COMPACTION	19,500	BCY	$ 50.00	$ 975,000.00	
BULK EXCAVATION	2,000	BCY	$ 1.00	$ 2,000.00	
SOIL MANAGEMENT	3,000	BCY	$ 20.00	$ 60,000.00	
ROADWORK AND PAVEMENT					$516,500.00
FINE GRADING AND COMPACTION	6,150	S.Y.	$ 7.00	$ 43,050.00	
ASHPHALT CONCRETE PAVING, BASE COURSE (4" THICK)	1,155	TON	$ 92.00	$ 106,260.00	
ASHPHALT CONCRETE PAVING, INTERMEDIATE COURSE (2" THICK)	580	TON	$ 112.50	$ 65,250.00	
ASHPHALT CONCRETE PAVING, SURFACE COURSE (2" THICK)	580	TON	$ 122.00	$ 70,760.00	
CEM. CONC. WALK	1,100	S.Y.	$ 70.00	$ 77,000.00	
DENSE GRADED CRUSHED STONE FOR BASE	1,920	C.Y.	$ 75.00	$ 144,000.00	
DRIVEWAY REPAIR	45	TON	$ 225.00	$ 10,125.00	
LANDSCAPING & SITE RESTORATION					$48,800.00
LANDSCAPE PLANTINGS ALLOWANCE	25	EA	$ 50.00	$ 1,250.00	
TOPSOIL PLACEMENT, SCREENED 6" THICK	100	C.Y.	$ 75.00	$ 7,500.00	
SITE RESTORATION	1	LS	$ 40,000.00	$ 40,000.00	
			TOTAL (2023 DOLLARS) =	**$4,376,800.00**	
			TOTAL WITH 10% DESIGN CONTINGENCY =	**$4,814,500.00**	
			TOTAL WITH 10% CONSTRUCTION CONTINGENCY =	**$5,296,000.00**	
			TOTAL WITH ADDITIONAL 5% INFLATION FACTOR (OVER 3 YRS) =	**$6,130,800.00**	

NOTES:

1. Refer to GZA Memorandum, Walker Brook Preliminary Engineering Study (Flood Mitigation) – Preliminary Design Drawings (25% Complete) and Basis of Design, dated March 6, 2023.
2. Cost opinion subject to Limitations attached to GZA Memorandum referenced in Note 1.

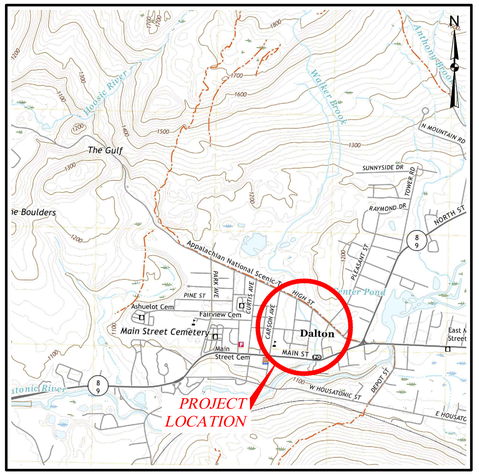
ATTACHMENT G

25% DRAFT PRELIMINARY DESIGN DRAWINGS

WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MASSACHUSETTS
MARCH, 2023

25% DRAFT PLANS
NOT FOR CONSTRUCTION

DRAWING LIST:



LOCUS PLAN
U.S.G.S. SPRINGFIELD NORTH QUAD 2018 & SPRINGFIELD SOUTH QUAD 2018

PREPARED FOR:
Town of DALTON
462 Main Street
Dalton, MA 01226

SURVEYOR:
Hill engineers architects planners
50 Depot Street
Dalton, MA 01226

DESIGNER:
GZA GeoEnvironmental, Inc.
Engineers and Scientists
ONE FINANCIAL PLAZA
1350 Main Street, Suite 1400
Springfield, MA 01103
413-726-2100

NOTES:

1. AERIAL IMAGE – MassGIS DATA: 2021 AERIAL IMAGERY, MAPS.MASSGIS.DIGITAL.MASS.GOV/MASSMAPPER/MASSMAPPERT.HTML

25% DRAFT PLANS
NOT FOR CONSTRUCTION

0 40' 80' 160' 240'

SCALE IN FEET 1" = 80'

NO.	ISSUE/DESCRIPTION	BY	DATE

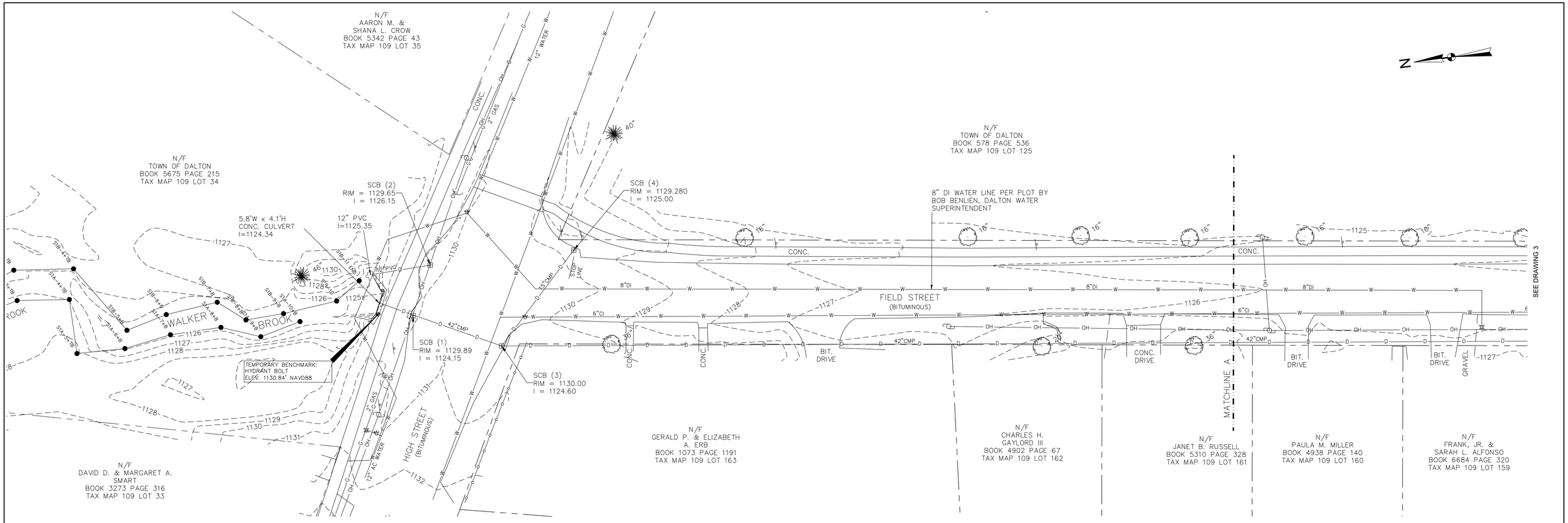
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

SHEET INDEX PLAN

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 1
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 1-OF-16



LEGEND

◉	REBAR FOUND	------1017------	EXISTING CONTOUR
○	IRON PIN FOUND	------1015------	
⊠	BOUND FOUND	———	EDGE OF BITUMINOUS
	BENCH MARK	—□———□—	WOODEN FENCE
HH	HAND HOLE	——x———x——	WIRE FENCE
☼	LIGHT POLE	—○———○—	CHAIN LINK FENCE
	UTILITY POLE	———G———	GAS SERVICE
⊞	CATCH BASIN	———W———	WATER SERVICE
Ⓓ	DRAIN MANHOLE	———D———	STORM DRAIN
Ⓢ	SANITARY MANHOLE	———S———	SANITARY SEWER
Ⓣ	TELEPHONE MANHOLE	——— OH———	OVERHEAD WIRES
⟹	DIRECTIONAL FLOW ARROW	———T———	UNDERGROUND TELEPHONE
—o—	SIGN	- - - - - - - - - - -	GUARD RAIL
	WATER SHUTOFF	—— — —— — ——	APPROXIMATE PROPERTY LINE
	HYDRANT	∩∩∩∩∩∩∩∩∩∩	EDGE OF BUSHES/HEDGE
GV	GAS VALVE	RCP	REINFORCED CONC. PIPE
		PVC	PVC PIPE
10"	DECIDUOUS TREE (SIZE)	CI	CAST IRON PIPE
		VC	VITREOUS CLAY PIPE
10"	CONIFEROUS TREE (SIZE)	• SI-B-1	RESOURCE AREA FLAG
	SHRUB		
	STONE RETAINING WALL		

GENERAL PLAN NOTES:

1. TOPOGRAPHIC AND BOUNDARY INFORMATION BASED ON EXISTING CONDITIONS PLAN ENTITLED, "EXISTING CONDITIONS SITE PLAN, TOWN OF DALTON, WALKER BROOK PRELIMINARY ENGINEERING STUDY," PREPARED FOR GZA GeoEnvironmental, INC., PREPARED BY HILL – ENGINEERS, ARCHITECTS, PLANNERS, INC. OF DALTON, MA DATED FEBRUARY 20, 2023
2. THE VERTICAL DATUM IS BASED ON NAVD 88, AND WAS OBTAINED BY GPS OBSERVATION.
3. UTILITIES SHOWN HEREON WERE BASED UPON FIELD LOCATIONS AND PLANS PROVIDED BY BOTH THE TOWN OF DALTON ENGINEERING OFFICE AND BERKSHIRE GAS. THE COMPLETENESS AND ACCURACY OF THESE PLANS HAVE NOT BEEN VERIFIED; THEREFORE THE UTILITIES SHOWN ARE FOR REFERENCE ONLY. PRIOR TO ANY CONSTRUCTION, THE CONTRACTOR SHALL CONTACT "DIG–SAFE" AND HAVE ALL UNDERGROUND UTILITIES MARKED ON THE GROUND.
4. WETLAND RESOURCE DELINEATION PERFORMED BY GZA GeoEnvironmental, INC., OCTOBER 2022 AND LOCATED BY HILL–ENGINEERS, ARCHITECTS, PLANNERS, INC., NOVEMBER/DECEMBER 2022.

25% DRAFT PLANS
NOT FOR CONSTRUCTION

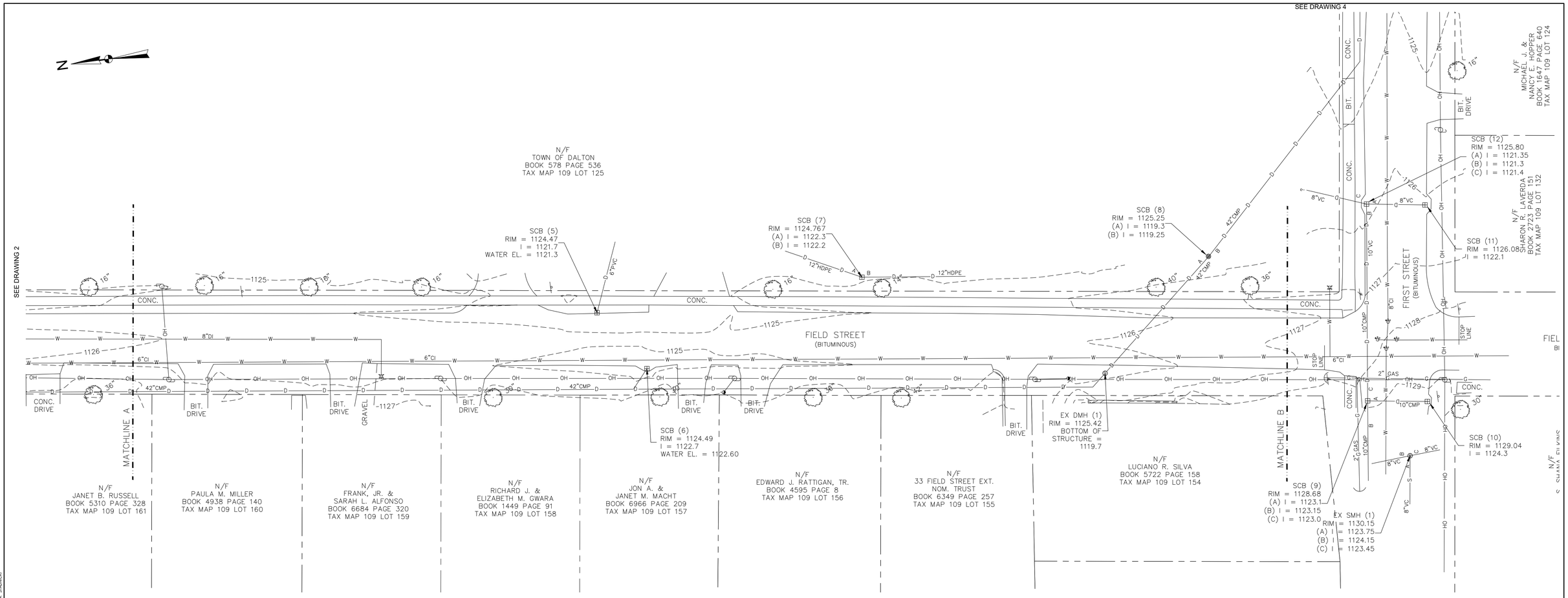
0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

EXISTING CONDITIONS I
HIGH STREET/FIELD STREET EXT.

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: TOWN OF DALTON 462 MAIN STREET DALTON, MA 01226	
PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 2
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 2-OF-16



LEGEND

REBAR FOUND	EXISTING CONTOUR
IRON PIN FOUND	EDGE OF BITUMINOUS
BOUND FOUND	WOODEN FENCE
BENCH MARK	WIRE FENCE
HAND HOLE	CHAIN LINK FENCE
LIGHT POLE	GAS SERVICE
UTILITY POLE	WATER SERVICE
CATCH BASIN	STORM DRAIN
DRAIN MANHOLE	SANITARY SEWER
SANITARY MANHOLE	OVERHEAD WIRES
TELEPHONE MANHOLE	UNDERGROUND TELEPHONE
DIRECTIONAL FLOW ARROW	GUARD RAIL
SIGN	APPROXIMATE PROPERTY LINE
WATER SHUTOFF	EDGE OF BUSHES/HEDGE
HYDRANT	RCP — REINFORCED CONC. PIPE
GAS VALVE	PVC — PVC PIPE
	CI — CAST IRON PIPE
DECIDUOUS TREE (SIZE)	VC — VITREOUS CLAY PIPE
CONIFEROUS TREE (SIZE)	SI-B-1 — RESOURCE AREA FLAG
SHRUB	
STONE RETAINING WALL	

GENERAL PLAN NOTES:

1. TOPOGRAPHIC AND BOUNDARY INFORMATION BASED ON EXISTING CONDITIONS PLAN ENTITLED, "EXISTING CONDITIONS SITE PLAN, TOWN OF DALTON, WALKER BROOK PRELIMINARY ENGINEERING STUDY," PREPARED FOR GZA GeoEnvironmental, INC., PREPARED BY HILL – ENGINEERS, ARCHITECTS, PLANNERS, INC. OF DALTON, MA DATED FEBRUARY 20, 2023
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4. WETLAND RESOURCE DELINEATION PERFORMED BY GZA GeoEnvironmental, INC., OCTOBER 2022 AND LOCATED BY HILL–ENGINEERS, ARCHITECTS, PLANNERS, INC., NOVEMBER/DECEMBER 2022.

25% DRAFT PLANS
NOT FOR CONSTRUCTION

0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

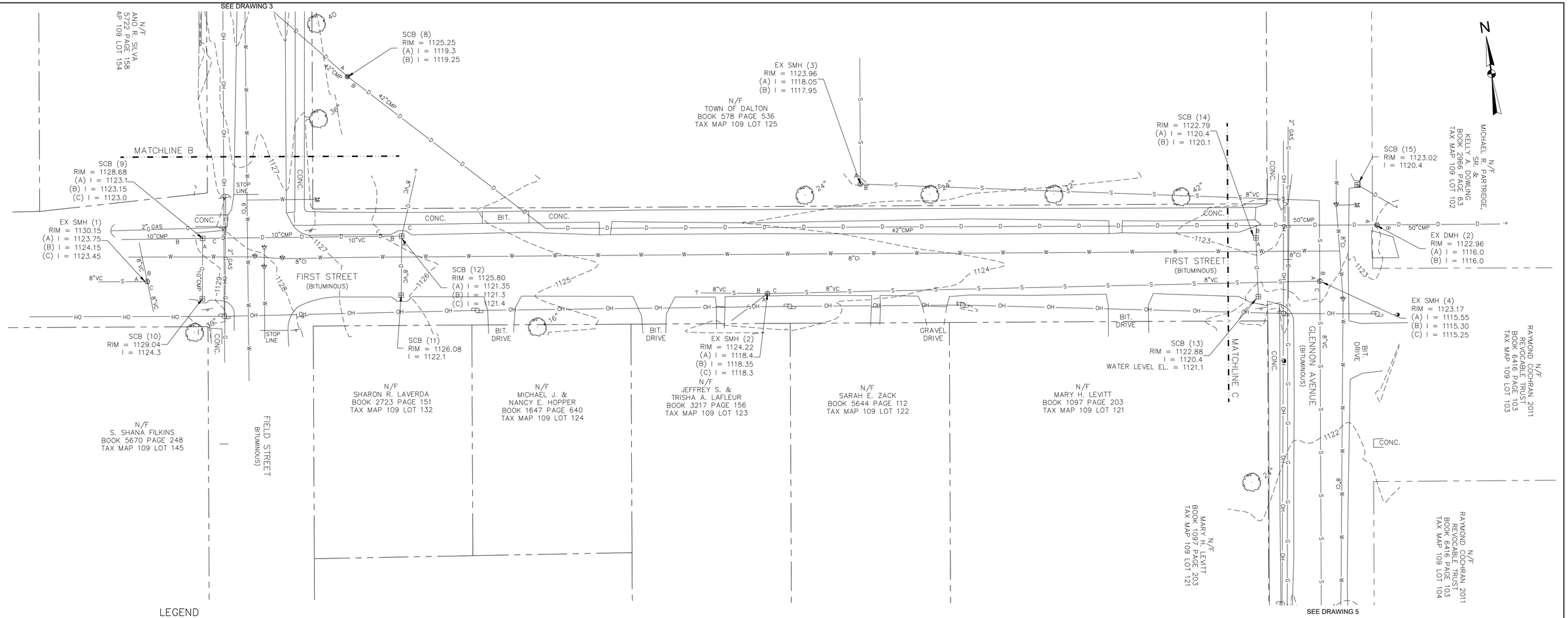
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

EXISTING CONDITIONS II
FIELD STREET EXT./1ST STREET

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 3
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 3-OF-16



LEGEND

REBAR FOUND	EXISTING CONTOUR
IRON PIN FOUND	EDGE OF BITUMINOUS
BOUND FOUND	WOODEN FENCE
BENCH MARK	WIRE FENCE
HAND HOLE	CHAIN LINK FENCE
LIGHT POLE	GAS SERVICE
UTILITY POLE	WATER SERVICE
CATCH BASIN	STORM DRAIN
DRAIN MANHOLE	SANITARY SEWER
SANITARY MANHOLE	OVERHEAD WIRES
TELEPHONE MANHOLE	UNDERGROUND TELEPHONE
DIRECTIONAL FLOW ARROW	GUARD RAIL
SIGN	APPROXIMATE PROPERTY LINE
WATER SHUTOFF	EDGE OF BUSHES/HEDGE
HYDRANT	REINFORCED CONC. PIPE
GAS VALVE	PVC PIPE
DECIDUOUS TREE (SIZE)	CAST IRON PIPE
CONIFEROUS TREE (SIZE)	VITREOUS CLAY PIPE
SHRUB	RESOURCE AREA FLAG
STONE RETAINING WALL	

GENERAL PLAN NOTES:

1. TOPOGRAPHIC AND BOUNDARY INFORMATION BASED ON EXISTING CONDITIONS PLAN ENTITLED, "EXISTING CONDITIONS SITE PLAN, TOWN OF DALTON, WALKER BROOK PRELIMINARY ENGINEERING STUDY," PREPARED FOR GZA GeoEnvironmental, INC., PREPARED BY HILL – ENGINEERS, ARCHITECTS, PLANNERS, INC. OF DALTON, MA DATED FEBRUARY 20, 2023
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4. WETLAND RESOURCE DELINEATION PERFORMED BY GZA GeoEnvironmental, INC., OCTOBER 2022 AND LOCATED BY HILL–ENGINEERS, ARCHITECTS, PLANNERS, INC., NOVEMBER/DECEMBER 2022.

25% DRAFT PLANS
NOT FOR CONSTRUCTION

0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

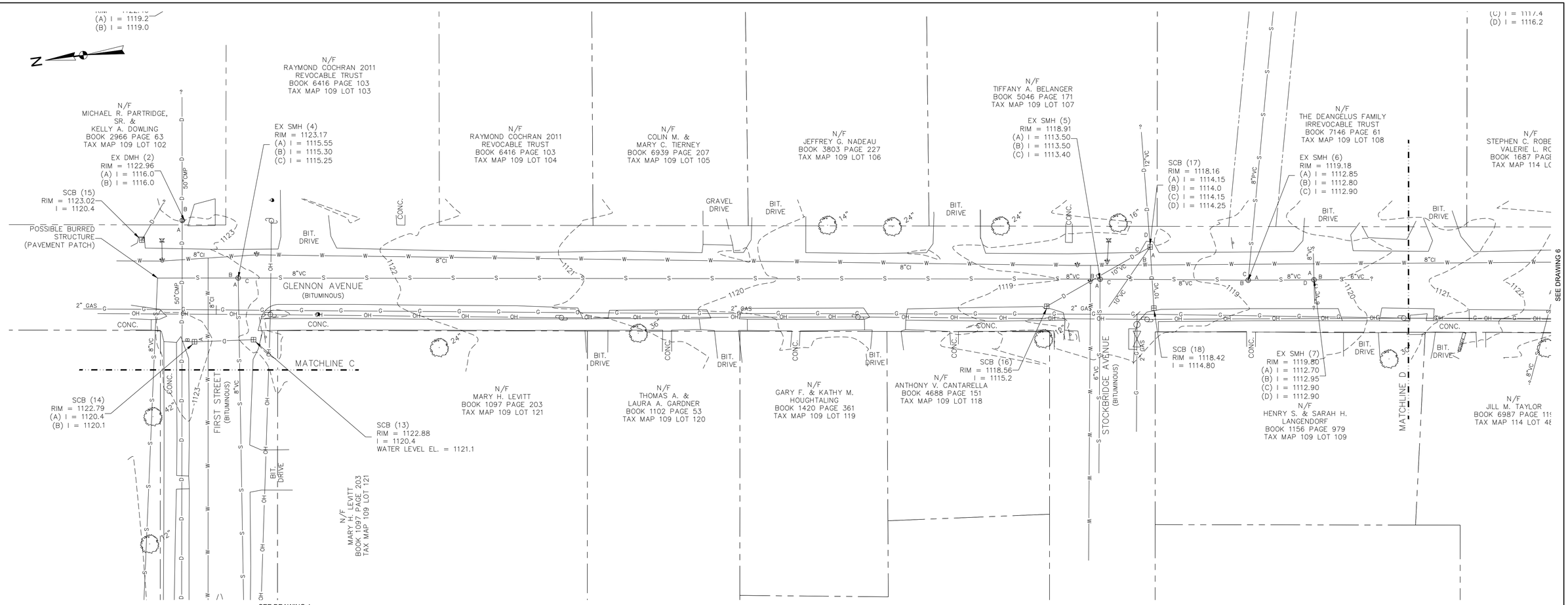
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

EXISTING CONDITIONS III
FIELD STREET EXT./1ST STREET/GLENNON AVE.

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 4
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 4-OF-16



LEGEND

REBAR FOUND	EXISTING CONTOUR
IRON PIN FOUND	EDGE OF BITUMINOUS
BOUND FOUND	WOODEN FENCE
BENCH MARK	WIRE FENCE
HAND HOLE	CHAIN LINK FENCE
LIGHT POLE	GAS SERVICE
UTILITY POLE	WATER SERVICE
CATCH BASIN	STORM DRAIN
DRAIN MANHOLE	SANITARY SEWER
SANITARY MANHOLE	OVERHEAD WIRES
TELEPHONE MANHOLE	UNDERGROUND TELEPHONE
DIRECTIONAL FLOW ARROW	GUARD RAIL
SIGN	APPROXIMATE PROPERTY LINE
WATER SHUTOFF	EDGE OF BUSHES/HEDGE
HYDRANT	RCP — REINFORCED CONC. PIPE
GAS VALVE	PVC — PVC PIPE
	CI — CAST IRON PIPE
DECIDUOUS TREE (SIZE)	VC — VITREOUS CLAY PIPE
CONIFEROUS TREE (SIZE)	SI-B-1 — RESOURCE AREA FLAG
SHRUB	
STONE RETAINING WALL	

GENERAL PLAN NOTES:

1. TOPOGRAPHIC AND BOUNDARY INFORMATION BASED ON EXISTING CONDITIONS PLAN ENTITLED, "EXISTING CONDITIONS SITE PLAN, TOWN OF DALTON, WALKER BROOK PRELIMINARY ENGINEERING STUDY," PREPARED FOR GZA GeoEnvironmental, INC., PREPARED BY HILL – ENGINEERS, ARCHITECTS, PLANNERS, INC. OF DALTON, MA DATED FEBRUARY 20, 2023
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4. WETLAND RESOURCE DELINEATION PERFORMED BY GZA GeoEnvironmental, INC., OCTOBER 2022 AND LOCATED BY HILL-ENGINEERS, ARCHITECTS, PLANNERS, INC., NOVEMBER/DECEMBER 2022.

25% DRAFT PLANS
NOT FOR CONSTRUCTION

0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

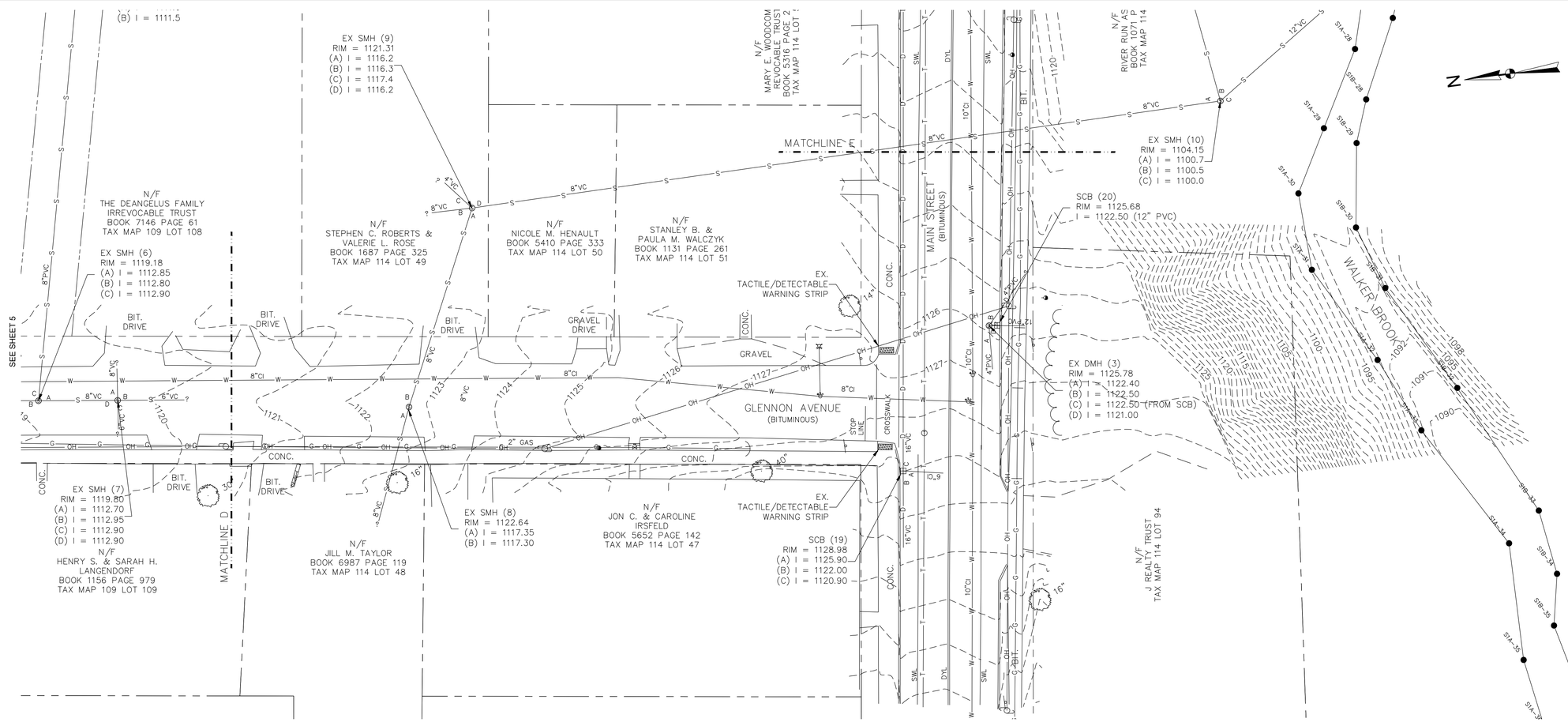
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

EXISTING CONDITIONS IV
1ST STREET/GLENNON AVE.

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 5
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 5-OF-16



LEGEND

◉	REBAR FOUND	-------1017-------	EXISTING CONTOUR
○	IRON PIN FOUND	———	EDGE OF BITUMINOUS
☒	BOUND FOUND	—□———□—	WOODEN FENCE
	BENCH MARK	——x———x——	WIRE FENCE
HH	HAND HOLE	—○———○—	CHAIN LINK FENCE
☼	LIGHT POLE	———G———	GAS SERVICE
	UTILITY POLE	———W———	WATER SERVICE
⊞	CATCH BASIN	———D———	STORM DRAIN
Ⓓ	DRAIN MANHOLE	———S———	SANITARY SEWER
Ⓢ	SANITARY MANHOLE	——— OH———	OVERHEAD WIRES
Ⓣ	TELEPHONE MANHOLE	———T———	UNDERGROUND TELEPHONE
⟹	DIRECTIONAL FLOW ARROW	- - - - - - - - - - - -	GUARD RAIL
	SIGN	—— - - —— - - ——	APPROXIMATE PROPERTY LINE
GV	WATER SHUTOFF	∩∩∩∩∩∩∩∩∩∩∩∩	EDGE OF BUSHES/HEDGE
	HYDRANT	RCP	REINFORCED CONC. PIPE
GV	GAS VALVE	PVC	PVC PIPE
		CI	CAST IRON PIPE
10"	DECIDUOUS TREE (SIZE)	VC	VITREOUS CLAY PIPE
10"	CONIFEROUS TREE (SIZE)	• SI-B-1	RESOURCE AREA FLAG
	SHRUB		
	STONE RETAINING WALL		

GENERAL PLAN NOTES:

1. TOPOGRAPHIC AND BOUNDARY INFORMATION BASED ON EXISTING CONDITIONS PLAN ENTITLED, "EXISTING CONDITIONS SITE PLAN, TOWN OF DALTON, WALKER BROOK PRELIMINARY ENGINEERING STUDY," PREPARED FOR GZA GeoEnvironmental, INC., PREPARED BY HILL – ENGINEERS, ARCHITECTS, PLANNERS, INC. OF DALTON, MA DATED FEBRUARY 20, 2023
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4. WETLAND RESOURCE DELINEATION PERFORMED BY GZA GeoEnvironmental, INC., OCTOBER 2022 AND LOCATED BY HILL–ENGINEERS, ARCHITECTS, PLANNERS, INC., NOVEMBER/DECEMBER 2022.

25% DRAFT PLANS
NOT FOR CONSTRUCTION

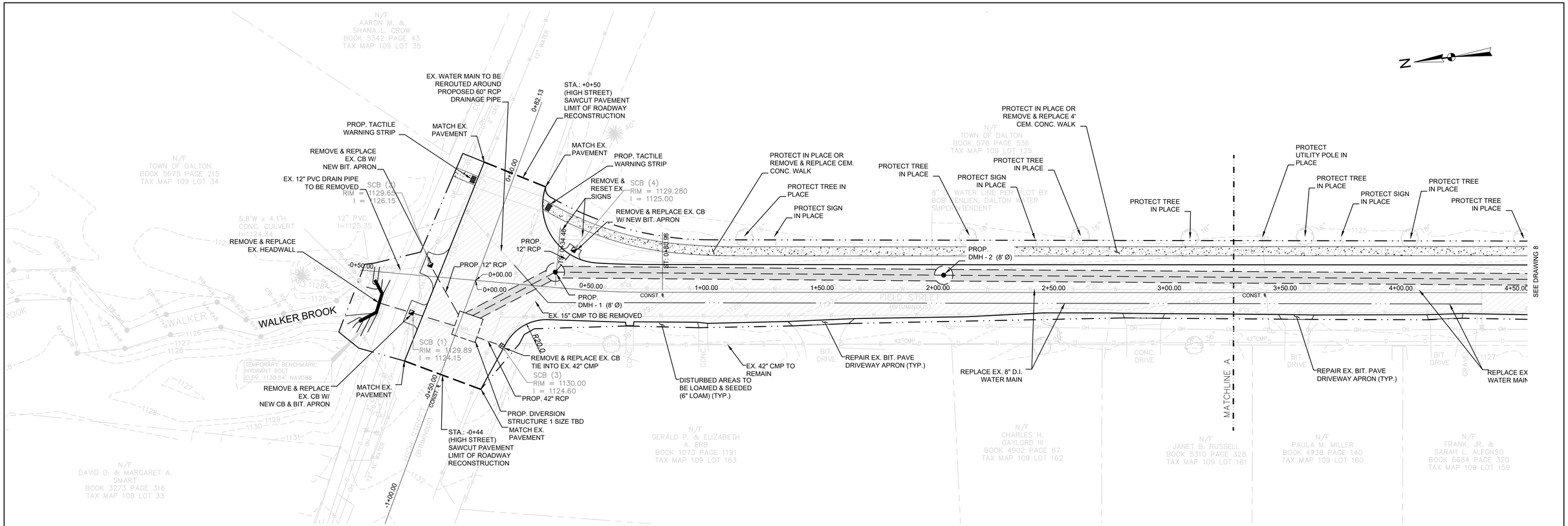
0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

EXISTING CONDITIONS V
GLENNON AVE./MAIN STREET/WALKER BROOK

PREPARED BY: GZA GeoEnvironmental, Inc. www.gza.com		PREPARED FOR: TOWN OF DALTON 462 MAIN STREET DALTON, MA 01226	
PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 6
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 6-OF-16



GENERAL PLAN NOTES:

1. BOUNDARY AND TOPOGRAPHIC INFORMATION IS BASED ON AN EXISTING SURVEY PLAN ENTITLED "EXISTING CONDITIONS SITE PLAN, TOWN OF DALTON. WALKER BROOK PRELIMINARY ENGINEERING STUDY" PREPARED FOR, GZA GeoEnvironmental INC. AND PREPARED BY HILL–ENGINEERS, ARCHITECTS, PLANNERS, INC., OF DALTON, MA.
2. THE VERTICAL DATUM IS BASED ON NAVD 88, AND WAS OBTAINED BY GPS OBSERVATION.
3. THE ACCURACY AND COMPLETENESS OF UNDERGROUND AND OVERHEAD UTILITIES AS SHOWN ON THE PLANS ARE NOT GUARANTEED. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT LOCATION, SIZE, TYPE, ETC. OF ALL UTILITIES THAT MAY BE AFFECTED BY THE WORK OF THIS PROJECT. ALL DRAIN AND SANITARY SEWER STRUCTURES OWNED BY THE TOWN OF DALTON SHALL BE ADJUSTED TO NEW LINE AND GRADE BY THE CONTRACTOR, AS DIRECTED BY THE PLANS OR THE ENGINEER. UTILITY POLES OR GUY POLES ALONG PROJECT SHALL BE PROTECTED BY THE CONTRACTOR.
4. ALL MATERIALS AND CONSTRUCTION METHODS AND DETAILS FOR THIS PROJECT SHALL CONFORM TO THE LATEST EDITION OF THE "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES", MASSACHUSETTS DEPARTMENT OF TRANSPORTATION, AS AMENDED, REFERRED TO HEREIN AS THE "STANDARD SPECIFICATIONS".
5. ALL STAGING AREAS SHALL BE PROCURED BY THE CONTRACTOR. REPAIR OF ANY DAMAGE TO PRIVATE PROPERTY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
6. ALL PROPOSED CATCH BASIN FRAMES AND COVERS SHALL BE AS LEBARON FOUNDRY, INC. MODEL NO. LF–248–2, OR EQUIVALENT. ALL PROP. CATCH BASINS SHALL BE AS SHOWN IN MHD (SD) 201.4.0 EXCEPT THAT THE SUMP SHALL BE 4'–0" DEEP. ALL CATCH BASINS SHALL BE EQUIPPED WITH HOODS AS PER MHD (SD) 201.12.0. ALL CATCH BASINS GRATES SHALL BE MARKED WITH LETTERING CAST INTO THE GRATE, "DUMP NO WASTE! DRAINS TO WATERWAYS".
7. ALL PROP. DRAINAGE AND SAN. SEWER STRUCTURES SHALL BE SUPPORTED WITH A 12" CRUSHED STONE (M2.01.1) FOUNDATION.
8. ALL REINFORCED CONCRETE PIPE USED ON THIS PROJECT SHALL BE CLASS IV, UNLESS OTHERWISE DESIGNATED ON THE PLANS.
9. ALL EXISTING DRAIN AND SAN. SEWER LINES TO BE REPLACED SHALL BE ABANDONED IN PLACE. IF THEY CONFLICT WITH ANY PROP. WORK THEY SHALL BE REMOVED OR AS CALLED OUT ON THE PLANS.
10. WHERE LINES OR STRUCTURES ARE ABANDONED IN PLACE, THE CONTRACTOR SHALL ENSURE THAT ALL CONNECTING PIPES, INLETS, AND OUTLETS ARE PLUGGED. ALL LIVE CONNECTIONS SHALL BE CONNECTED TO THE NEW NETWORK TO THE SATISFACTION OF THE ENGINEER.
11. CATCH BASIN, DROP INLET, AND MANHOLE FRAMES AND GRATES/COVERS SHALL BE PROPERLY ALIGNED WITH THE OPENINGS IN THE PRECAST STRUCTURES.
12. ALL EXISTING PAVEMENT MARKINGS SHALL BE REPLACED IN KIND AFTER FINAL PAVING OF ROAD RECONSTRUCTION AREAS.
13. ALL STRUCTURE STATIONS AND OFFSETS ARE TO THE CENTER POINT OF THE PROP. GRATE OR COVER.
14. NEW SIDEWALKS, WHEELCHAIR RAMPS, PRIVATE WALKS AND DRIVEWAYS SHALL BE CONSTRUCTED TO THE NEAREST SCORE LINE OR EXPANSION JOINT IN THE EXISTING ADJACENT SURFACES OR AS DIRECTED BY THE TOWN. PROP. CEMENT CONCRETE SIDEWALKS SHALL INCLUDE REMOVAL OF EXISTING SIDEWALK SURFACES.
15. ALL WHEELCHAIR RAMPS SHALL MEET THE LATEST REQUIREMENTS OF THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD AND THE LATEST STANDARD SPECIFICATIONS.
16. IN EXCAVATION AREAS, ALL TOPSOIL SHALL BE REMOVED TO A DEPTH OF 6" (MINIMUM) OR AS DIRECTED BY THE TOWN AND SHALL BE STOCKPILED FOR RE–SPREADING AFTER BACKFILLING IS COMPLETED.
17. MAILBOXES, FENCES, STREET SIGNS, ETC. THAT NEED TO BE REMOVED AND RESET OR RELOCATED SHALL BE DONE SO TO THE SATISFACTION OF THE ENGINEER. ALL ITEMS SHALL BE SET TO MHD STANDARDS.
18. CONTRACTOR SHALL COMPLY IN ALL RESPECTS WITH ALL ENVIRONMENTAL PERMITS ISSUED FOR THIS PROJECT.
19. ALL DISTURBED AREAS NOT OTHERWISE SURFACED SHALL RECEIVE 6" LOAM AND SEED AND BE ESTABLISHED AS LAWNS.

LEGEND

- PROPOSED DRAINAGE MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED SEWER MANHOLE
- PROPOSED WATER SHUTOFF VALVE
- PROPOSED LIMIT OF WORK
- PROPOSED SANITARY SEWER
- PROPOSED DRAINAGE LINE
- PROPOSED WATER MAIN
- PROPOSED 60" RCP CULVERT
- PROPOSED ROAD RECONSTRUCTION
- PROPOSED CEM. CONC. WALK

25% DRAFT PLANS
NOT FOR CONSTRUCTION

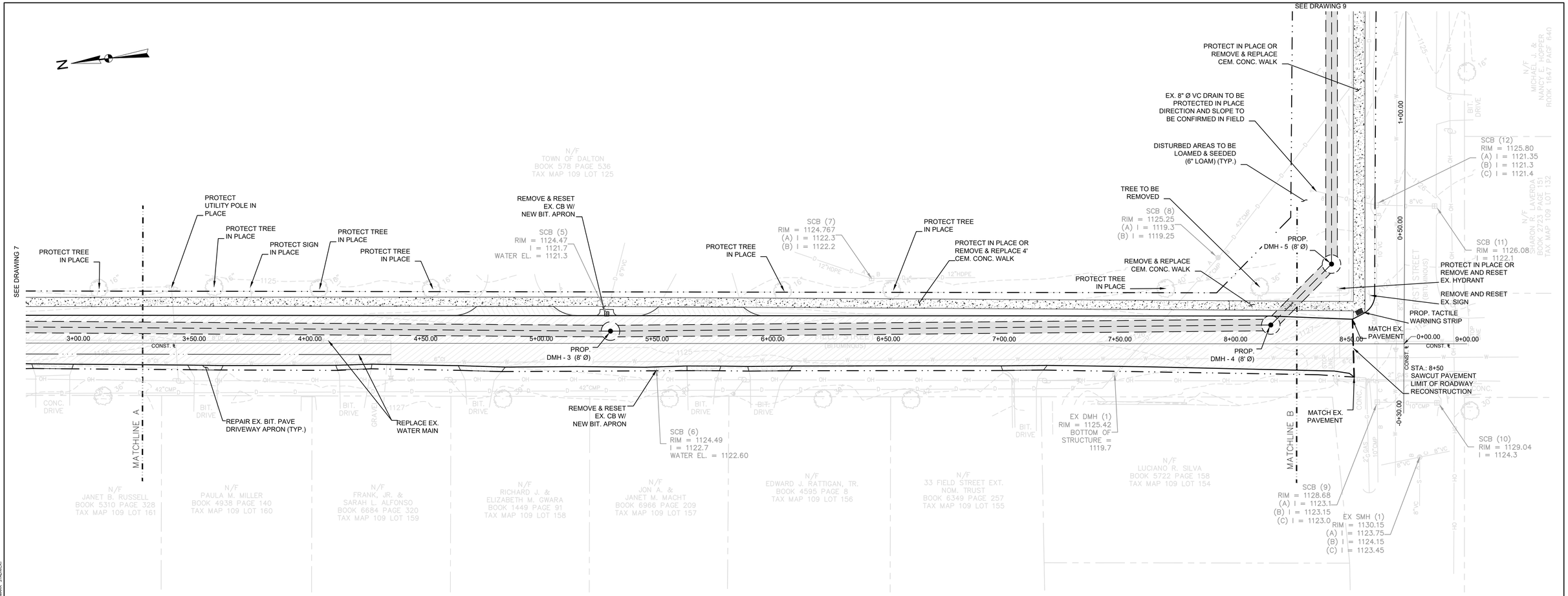
0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT LAYOUT I
HIGH STREET/FIELD STREET EXT.

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. www.gza.com		TOWN OF DALTON 462 MAIN STREET DALTON, MA 01226	
PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 7
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 7-OF-16



LEGEND

- PROPOSED DRAINAGE MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED SEWER MANHOLE
- PROPOSED WATER SHUTOFF VALVE
- PROPOSED LIMIT OF WORK
- PROPOSED SANITARY SEWER
- PROPOSED DRAINAGE LINE
- PROPOSED WATER MAIN
- PROPOSED 60" RCP CULVERT
- PROPOSED ROAD RECONSTRUCTION
- PROPOSED CEM. CONC. WALK

25% DRAFT PLANS
NOT FOR CONSTRUCTION

0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

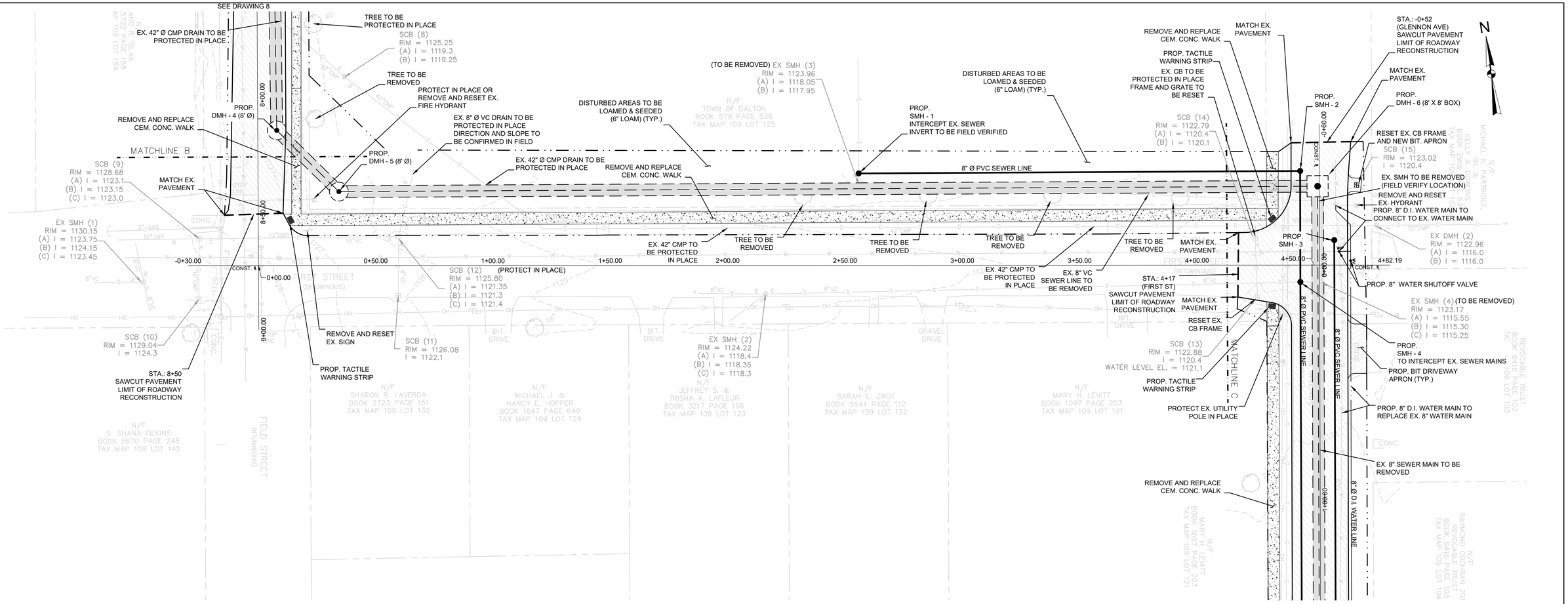
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT LAYOUT II
FIELD STREET EXT./1ST STREET

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 8
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 8-OF-16



NOTES:

1. EXISTING SEWER MAIN WITHIN PROJECT LIMITS IN GLENNON AVE TO BE REMOVED. PROPOSED 8" PVC SEWER MAINS TO BE INSTALLED ON BOTH SIDES OF PROPOSED CULVERT. EXISTING SEWER SERVICES TO BE LOCATED IN FIELD AND CONNECTED TO PROPOSED SEWER MAINS.
2. EXISTING 8" WATER MAIN WITHIN PROJECT LIMITS IN GLENNON AVE TO BE REPLACED WITH NEW 8" DUCTILE IRON (D.I.) WATER MAIN. EXISTING CONNECTIONS TO BE LOCATED IN FIELD AND ADJUSTED TO CONNECT TO THE PROPOSED WATER MAIN.
3. UTILITY POLES, GUY WIRES AND GUY POLES TO BE PROTECTED IN PLACE. IF PROTECTING IN PLACE IS UNFEASIBLE, UTILITY POLES MAY BE TEMPORARY RELOCATED.
4. SIDEWALKS AT STREET INTERSECTIONS SHALL MEET ADA STANDARDS. TACTILE WARNING STRIPS SHALL BE INSTALLED.
5. EXISTING GAS MAINS AND SERVICES SHALL EITHER BE PROTECTED IN PLACE, OR TEMPORARY RELOCATED UNDER THE GUIDE OF THE PROVIDER.
6. TREES ALONG EASTERN SIDE OF GLENNON AVE TO BE PROTECTED IN PLACE.

LEGEND

- PROPOSED DRAINAGE MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED SEWER MANHOLE
- WV PROPOSED WATER SHUTOFF VALVE
- PROPOSED LIMIT OF WORK
- PROPOSED SANITARY SEWER
- PROPOSED DRAINAGE LINE
- PROPOSED WATER MAIN
- PROPOSED 60" RCP CULVERT
- PROPOSED ROAD RECONSTRUCTION
- PROPOSED CEM. CONC. WALK

25% DRAFT PLANS
NOT FOR CONSTRUCTION

0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

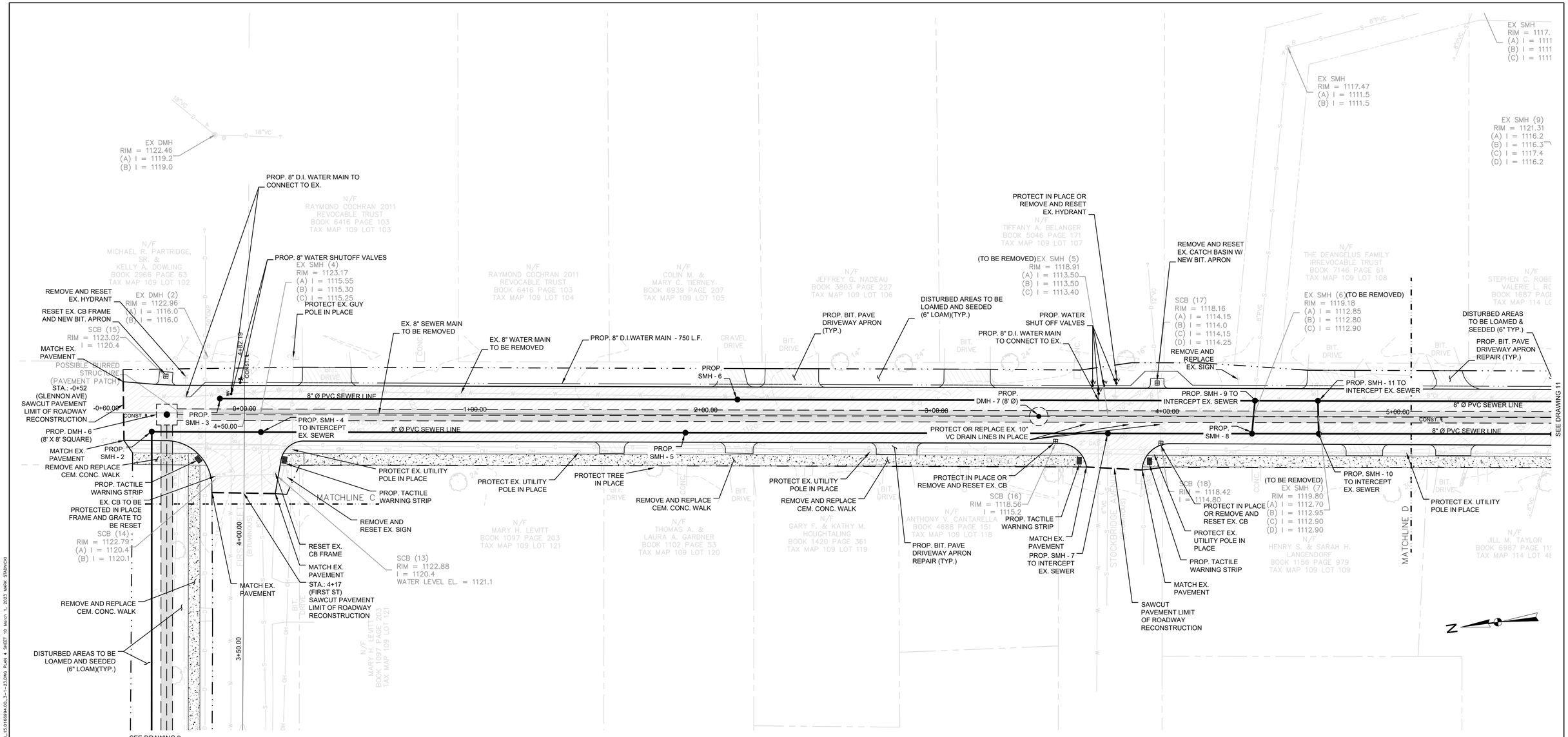
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT LAYOUT III
FIELD STREET EXT./1ST STREET/GLENNON AVE.

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 9
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 9-OF-16



NOTES:

1. EXISTING SEWER MAIN WITHIN PROJECT LIMITS IN GLENNON AVE TO BE REMOVED. PROPOSED 8" PVC SEWER MAINS TO BE INSTALLED ON BOTH SIDES OF PROPOSED CULVERT. EXISTING SEWER SERVICES TO BE LOCATED IN FIELD AND CONNECTED TO PROPOSED SEWER MAINS.
2. EXISTING 8" WATER MAIN WITHIN PROJECT LIMITS IN GLENNON AVE TO BE REPLACED WITH NEW 8" DUCTILE IRON (D.I.) WATER MAIN. EXISTING CONNECTIONS TO BE LOCATED IN FIELD AND ADJUSTED TO CONNECT TO THE PROPOSED WATER MAIN.
3. UTILITY POLES, GUY WIRES AND GUY POLES TO BE PROTECTED IN PLACE. IF PROTECTING IN PLACE IS UNFEASIBLE, UTILITY POLES MAY BE TEMPORARY RELOCATED.
4. SIDEWALKS AT STREET INTERSECTIONS SHALL MEET ADA STANDARDS. TACTILE WARNING STRIPS SHALL BE INSTALLED.
5. EXISTING GAS MAINS AND SERVICES SHALL EITHER BE PROTECTED IN PLACE, OR TEMPORARY RELOCATED UNDER THE GUIDE OF THE PROVIDER.
6. TREES ALONG EASTERN SIDE OF GLENNON AVE TO BE PROTECTED IN PLACE.

LEGEND

- PROPOSED DRAINAGE MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED SEWER MANHOLE
- PROPOSED WATER SHUTOFF VALVE
- PROPOSED LIMIT OF WORK
- PROPOSED SANITARY SEWER
- PROPOSED DRAINAGE LINE
- PROPOSED WATER MAIN
- PROPOSED 60" RCP CULVERT
- PROPOSED ROAD RECONSTRUCTION
- PROPOSED CEM. CONC. WALK

25% DRAFT PLANS
NOT FOR CONSTRUCTION

0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

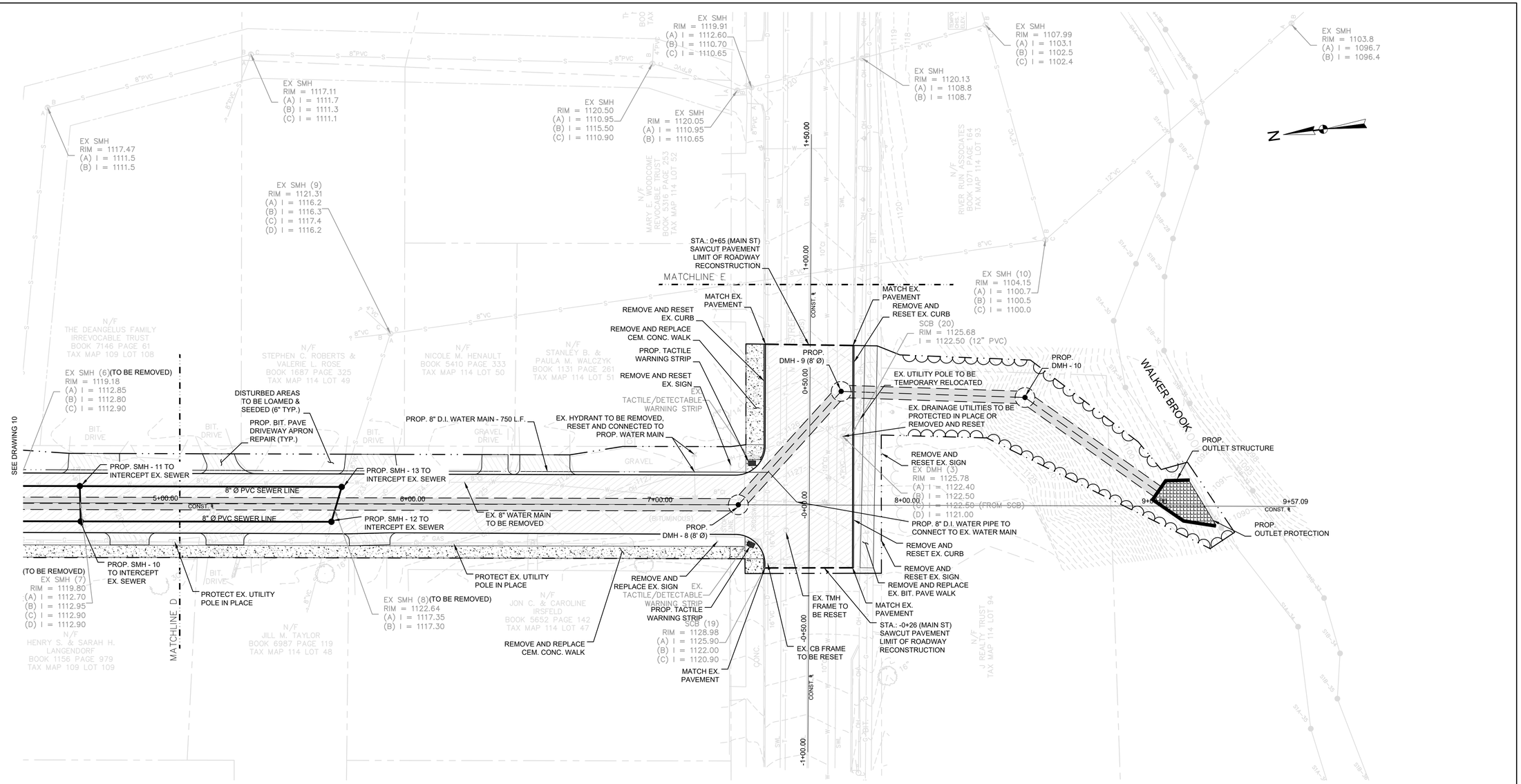
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT LAYOUT IV
1ST STREET/GLENNON AVE.

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 10
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 10-OF-16



NOTES:

1. EXISTING SEWER MAIN WITHIN PROJECT LIMITS IN GLENNON AVE TO BE REMOVED. PROPOSED 8" PVC SEWER MAINS TO BE INSTALLED ON BOTH SIDES OF PROPOSED CULVERT. EXISTING SEWER SERVICES TO BE LOCATED IN FIELD AND CONNECTED TO PROPOSED SEWER MAINS.
2. EXISTING 8" WATER MAIN WITHIN PROJECT LIMITS IN GLENNON AVE TO BE REPLACED WITH NEW 8" DUCTILE IRON (D.I.) WATER MAIN. EXISTING CONNECTIONS TO BE LOCATED IN FIELD AND ADJUSTED TO CONNECT TO THE PROPOSED WATER MAIN.
3. UTILITY POLES, GUY WIRES AND GUY POLES TO BE PROTECTED IN PLACE. IF PROTECTING IN PLACE IS UNFEASIBLE, UTILITY POLES MAY BE TEMPORARY RELOCATED.
4. SIDEWALKS AT STREET INTERSECTIONS SHALL MEET ADA STANDARDS. TACTILE WARNING STRIPS SHALL BE INSTALLED.
5. EXISTING GAS MAINS AND SERVICES SHALL EITHER BE PROTECTED IN PLACE, OR TEMPORARY RELOCATED UNDER THE GUIDE OF THE PROVIDER.
6. TREES ALONG EASTERN SIDE OF GLENNON AVE TO BE PROTECTED IN PLACE.

LEGEND

- PROPOSED DRAINAGE MANHOLE
- PROPOSED CATCH BASIN
- PROPOSED SEWER MANHOLE
- WV PROPOSED WATER SHUTOFF VALVE
- PROPOSED LIMIT OF WORK
- PROPOSED SANITARY SEWER
- PROPOSED DRAINAGE LINE
- PROPOSED WATER MAIN
- PROPOSED TREE CLEARING LIMIT
- PROPOSED 60" RCP CULVERT
- PROPOSED ROAD RECONSTRUCTION
- PROPOSED CEM. CONC. WALK

25% DRAFT PLANS
NOT FOR CONSTRUCTION

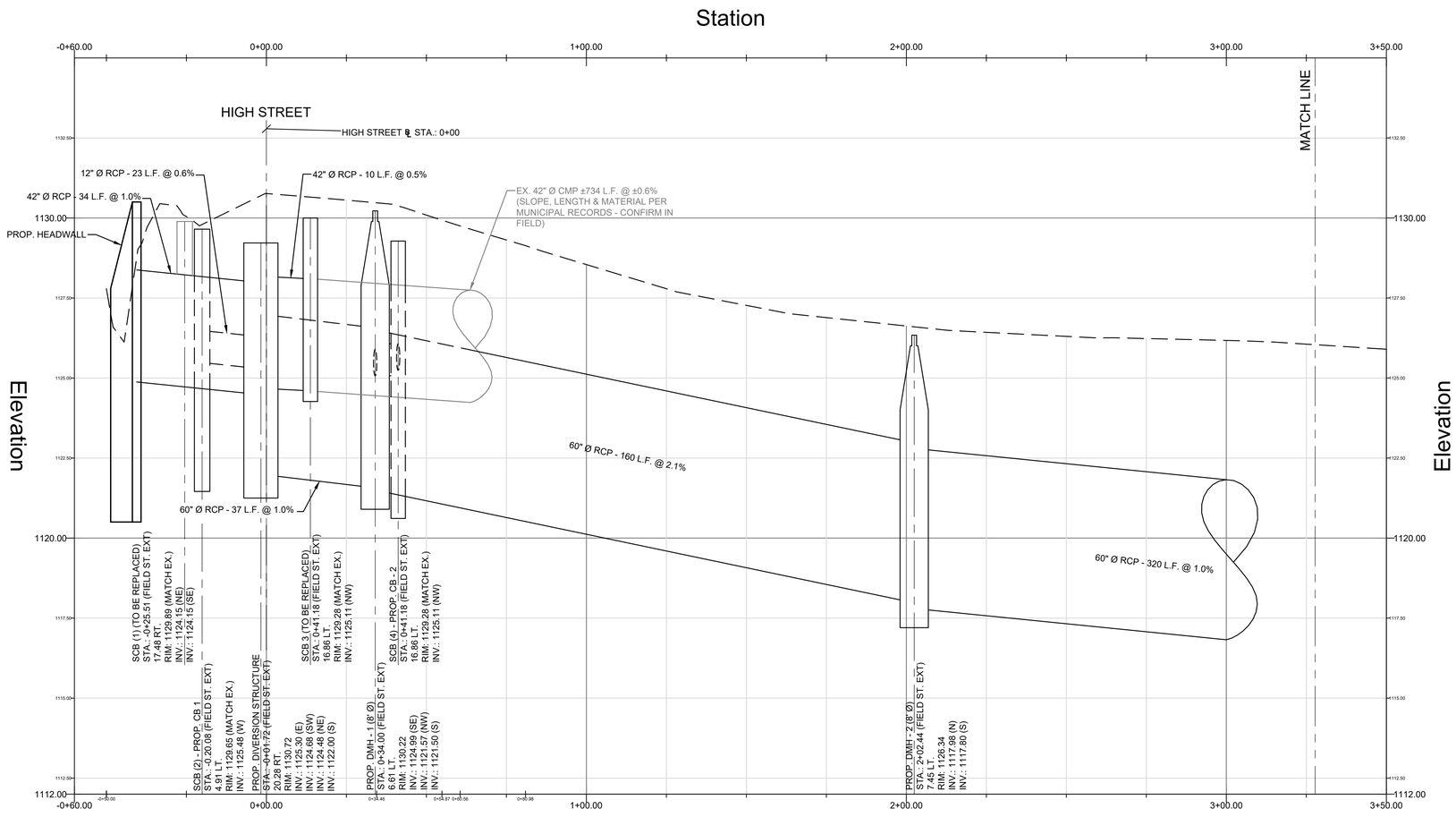
0 10' 20' 40' 60'
SCALE IN FEET 1" = 20'

NO.	ISSUE/DESCRIPTION	BY	DATE

WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT LAYOUT V
GLENNON AVE./MAIN STREET/WALKER BROOK

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. www.gza.com		TOWN OF DALTON 462 MAIN STREET DALTON, MA 01226	
PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 11
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 11-OF-16



PROFILE–FIELD STREET EXT.
STA: –0+60.00 TO 3+50
VERT. 1"=2'
HOR. 1"=20'

25% DRAFT PLANS
NOT FOR CONSTRUCTION

NO.	ISSUE/DESCRIPTION	BY	DATE

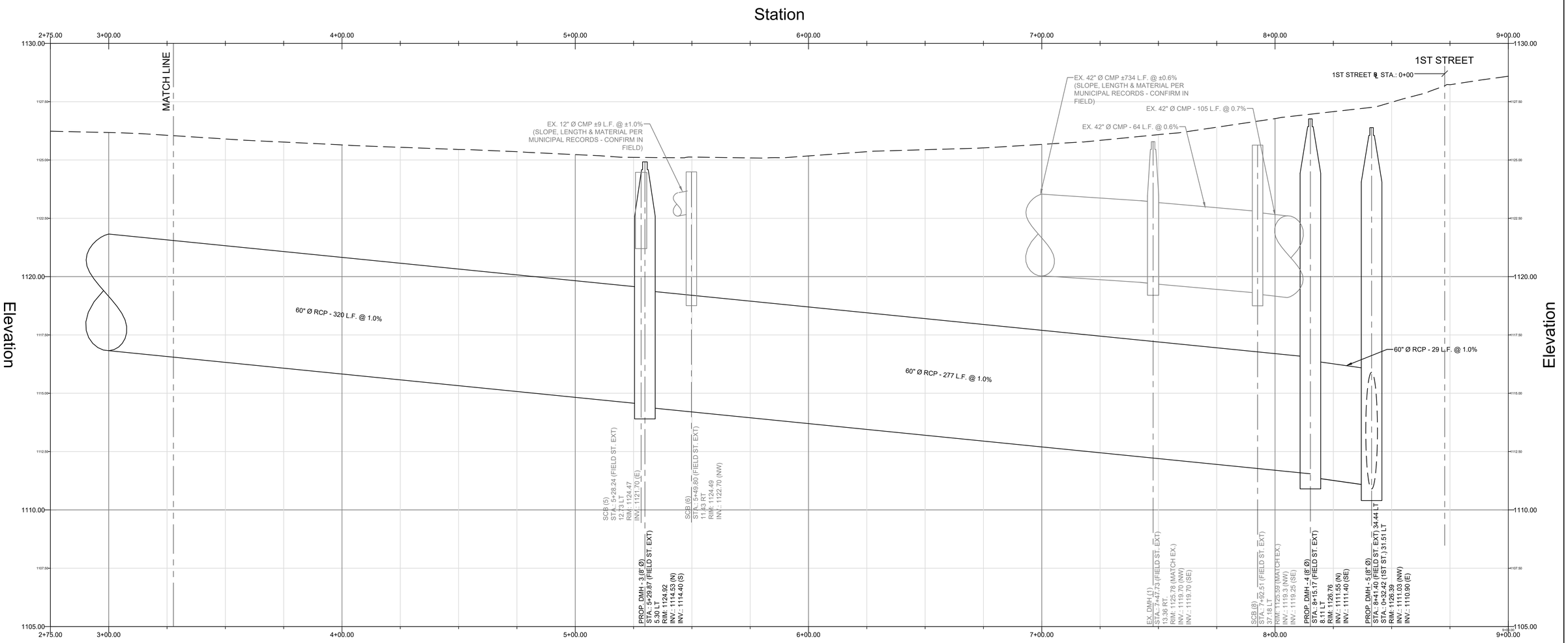
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT PROFILE I
HIGH STREET/FIELD STREET EXT.

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 12
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 12-OF-16



Station

PROFILE–FIELD STREET EXT.

STA: 2+75 TO 9+00
VERT. 1"=2'
HOR. 1"=20'

25% DRAFT PLANS
NOT FOR CONSTRUCTION

NO.	ISSUE/DESCRIPTION	BY	DATE

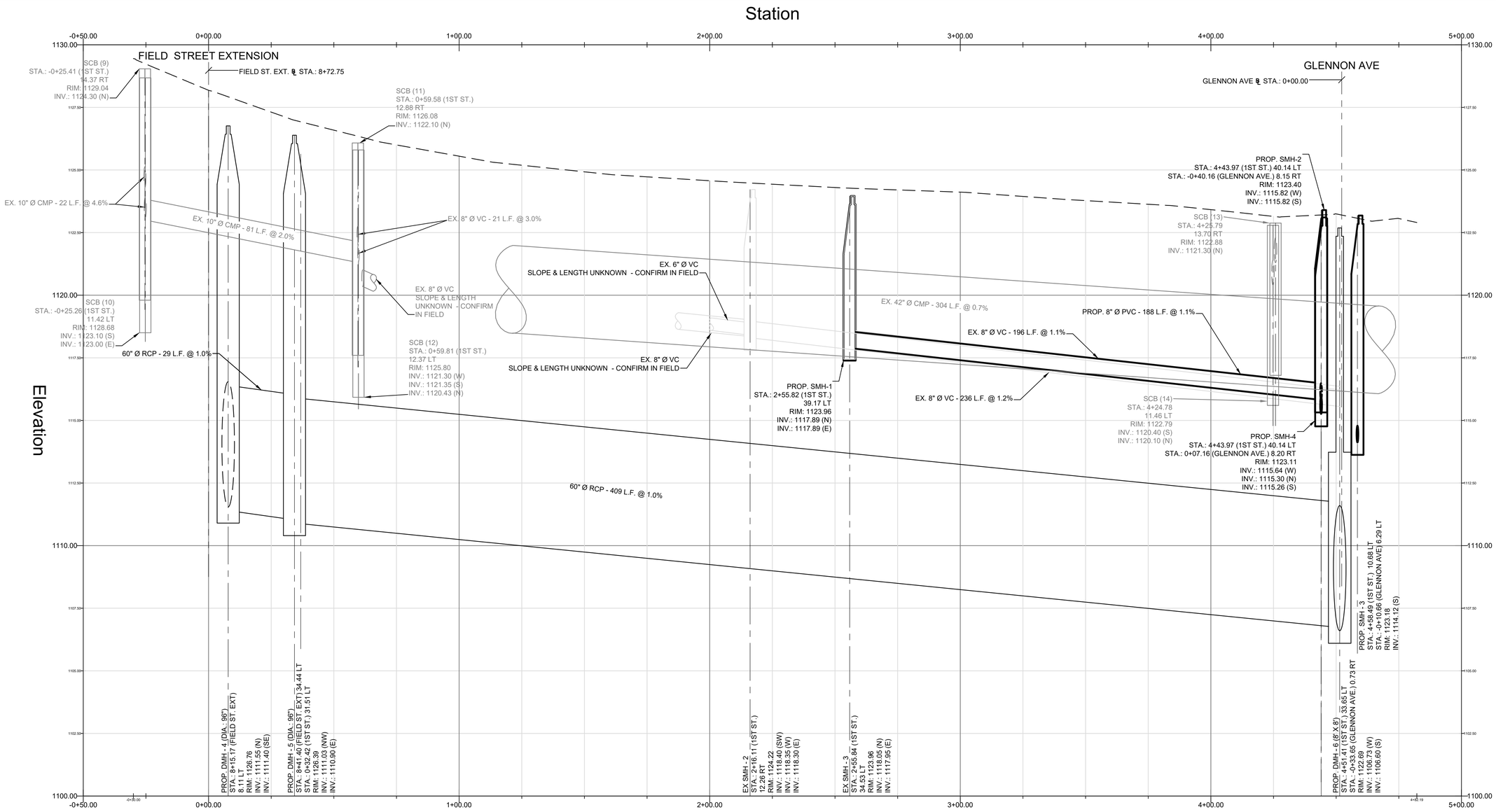
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT PROFILE II
FIELD STREET EXT./1ST STREET

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 13
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 13-OF-16



Station

PROFILE–1ST STREET
STA: –0+50 TO 5+00
VERT. 1"=2'
HOR. 1"=20'

25% DRAFT PLANS
NOT FOR CONSTRUCTION

NO.	ISSUE/DESCRIPTION	BY	DATE

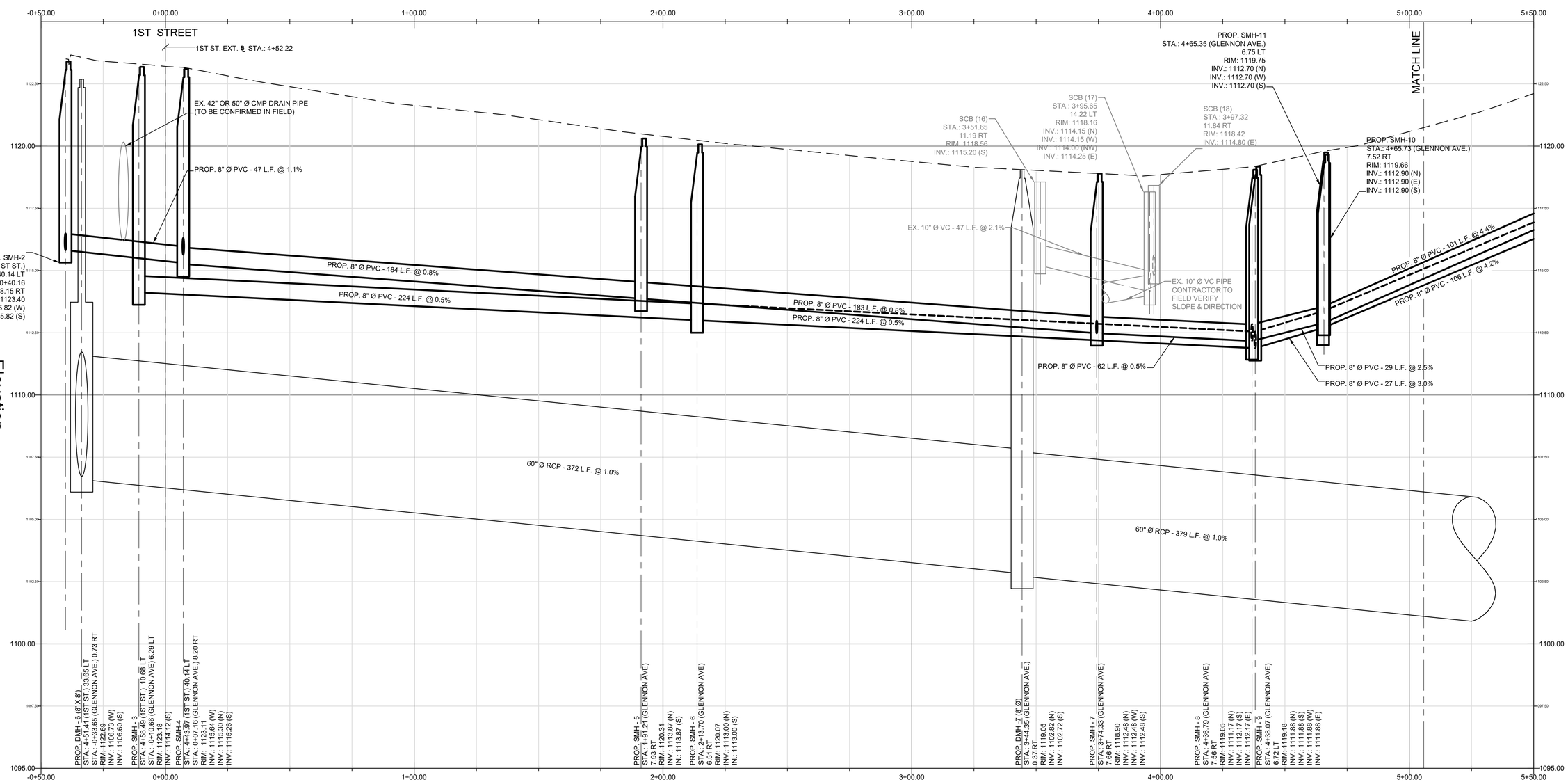
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT PROFILE III
FIELD STREET EXT./1ST STREET/GLENNON AVE.

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING 14
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 14-OF-16



Station

PROFILE – GLENNON AVE
STA: –0+50 TO 5+50
VERT. 1"=2'
HOR. 1"=20'

25% DRAFT PLANS
NOT FOR CONSTRUCTION

NO.	ISSUE/DESCRIPTION	BY	DATE

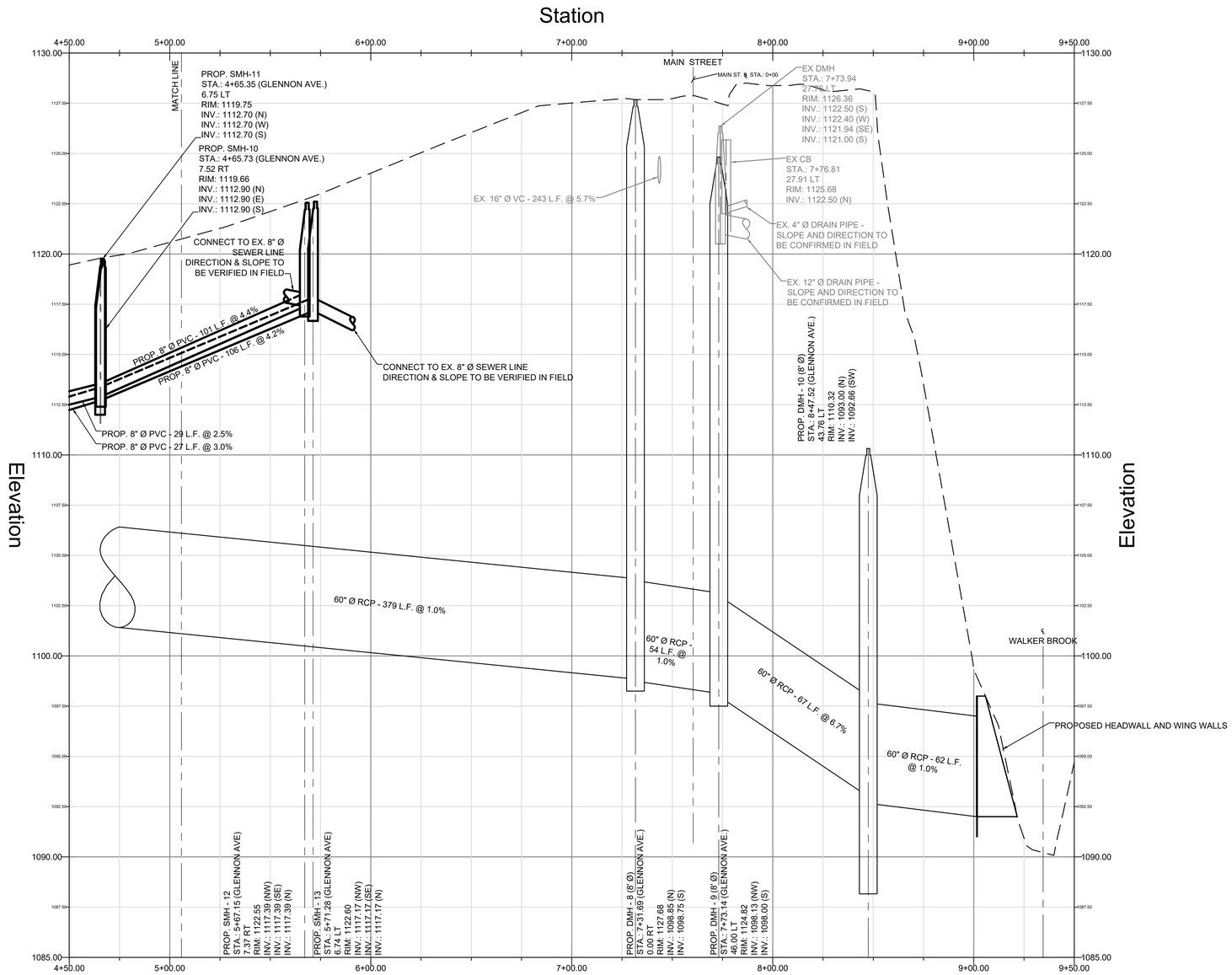
WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT PROFILE IV
1ST STREET/GLENNON AVE.

PREPARED BY:
GZA GeoEnvironmental, Inc.
www.gza.com

PREPARED FOR:
TOWN OF DALTON
462 MAIN STREET
DALTON, MA 01226

PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	**15**
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 15-OF-16



PROFILE – GLENNON AVE

STA: 4+50 TO 9+50
VERT. 1"=3'
HOR. 1"=30'

25% DRAFT PLANS
NOT FOR CONSTRUCTION

NO.	ISSUE/DESCRIPTION	BY	DATE

WALKER BROOK PRELIMINARY ENGINEERING STUDY
PRELIMINARY DESIGN
TOWN OF DALTON, MA

PROPOSED CULVERT PROFILE V
GLENNON AVE./MAIN STREET/WALKER BROOK

PREPARED BY:		PREPARED FOR:	
GZA GeoEnvironmental, Inc. www.gza.com		TOWN OF DALTON 462 MAIN STREET DALTON, MA 01226	
PROJ MGR: RTS	REVIEWED BY: NLR	CHECKED BY: SLL	DRAWING
DESIGNED BY: RTS	DRAWN BY: MJS	SCALE: AS-SHOWN	**16**
DATE: MARCH, 2023	PROJECT NO. 15.0166994.00	REVISION NO. -	SHEET NO. 16-OF-16