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1350 Main Street
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www.gza.com



MEMORANDUM

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.
Nathaniel L. Russell, P.E.
GZA GeoEnvironmental, Inc.
1350 Main Street Suite 1400
Springfield, MA 01103

Date: March 2, 2022

File No.: 15.0166994.00

Re: Walker Brook Preliminary Engineering Study (Flood Mitigation) –
Summary of Potential Flood Mitigation Options

Dear Mr. Hutcheson:

In accordance with our contract executed on September 27, 2021, GZA GeoEnvironmental, Inc. (GZA) is providing this memorandum to the Town of Dalton (Client; the Town) to summarize potential flood mitigation options for Walker Brook. This memorandum summarizes the benefits, drawbacks, and other pertinent considerations to enable selection of the preferred mitigation options.

This report is subject to the Limitations included in **Attachment 1**.

BACKGROUND AND OBJECTIVES

The Town of Dalton has sought to address the sources and impacts of flooding from Walker Brook since at least the early 1980's. As stated in the Town's Hazard Mitigation Plan:

“An area of great concern is Walker Brook, which used to flow through a natural channel into the East Branch of the Housatonic River. The brook has been captured in underground pipes beginning at High Street, from where it flows underground until shortly before its confluence with the Housatonic at Main Street. The High Street area where Walker Brook goes underground periodically floods due to the pipe being undersized. The flooding will cross High Street and occasionally flood Field Street Extension. The Old High School building [since demolished] and the Senior Center are impacted by flooding from Walker Brook.”



The Town applied for and received a FEMA Hazard Mitigation Grant Program (HMGP) Advanced Assistance Grant to perform an engineering assessment and develop a coordinated plan on how to address the recurring flooding that occurs in the residential area around Walker Brook.

The objective of this memorandum is to present potential flood mitigation options evaluated by GZA for Walker Brook, including a description of the benefits, drawbacks, and other pertinent considerations, to assist the Town with selection of their preferred mitigation components that will be further developed as part of the preliminary design.

GZA referred to information from the following sources regarding the existing Walker Brook culvert system and to identify previous mitigation options considered:

- Comprehensive Environmental, Inc. (June 30, 2021), *Dalton Green Infrastructure Assessment* (“Document A”);
- Hill Engineers (11-18-2015), *Town of Dalton Hazard Mitigation Grant Program Exhibit B-3. Project Drawings Proposed Site Plan* (“Document B”);
- Tighe & Bond/SCI Consulting Engineers – Environmental Specialists (June 1981), *Report on the Walker Brook Storm Drainage System for the Town of Dalton, Massachusetts* (“Document C”);
- USDA, Soil Conservation Service (July 1981), *Preliminary Report, Walker Brook, Dalton, Massachusetts, Flood Prevention Measure sponsored by Town of Dalton and Berkshire Conservation District in the Berkshire-Franklin Resource Conservation and Development Area* (“Document D”).

These documents are referenced herein as documents A through D, respectively.

SITE DESCRIPTION

The Walker Brook watershed is located in Berkshire County, Massachusetts, in the town of Dalton (see **Figure 1**). The 1.06 mi² watershed is approximately 72% forested, 15% developed, 7% Grassland, and 3% wetland with the remaining drainage area split between water and bare land according to 2016 Massachusetts land cover/land use data accessed from MassGIS. Most of the watershed’s topography is characterized by steep (hilly) terrain. There is a large sand and gravel mine (gravel pit) with man-made water supply ponds in the center of the watershed. More than 80% of the watershed is undeveloped and discharges to a culvert located near the intersection of High Street and Field Street. Walker Brook then flows underground, through an approximately 2,200 foot-long culvert, before daylighting near the intersection of Main Street (Route 9) and River Street. From there, the brook flows down a steep, boulder-laden channel to its confluence with the East Branch Housatonic River.

The lower ±20% of the watershed, between High Street and Main Street, where the brook is culverted, consists primarily of single-family residential development. At the center of this neighborhood is a large Town-owned parcel. A Senior Center with parking, recently constructed, occupies the northern portion of the parcel, while the southern portion of the parcel is currently an open field where the former Nessacus Middle School once stood.

The Walker Brook culvert, between High Street and Main Street, was inspected by Tighe & Bond/SCI Consulting Engineers – Environmental Specialists in 1981, as described in the *Report on the Walker Brook Storm Drainage System for the Town of Dalton, Massachusetts*. The culvert was described in the 1981 report as “a series of circular and box culverts. These culverts vary greatly in size, shape, slope and material”. Many of the culvert sections were reported as



being in “good condition,” but there were discrete areas with documented severe wear and damage, rust, and erosion. The 1981 report listed five (5) areas needing immediate repair, as follows:

1. *The boiler plate arch section between Station 1+57 and Station 1+82 has failed. The bituminous concrete invert has been eroded and this erosion has undermined the right wall.*
2. *A 16 foot long section of galvanized, 48-inch C.M.P. under First Street at Station 9+91 has rusted along the lower left and right sides for its entire length.*
3. *A sanitary sewer connection at Station 1+45 is active and is discharging raw sewage into the culvert.*
4. *The manhole at Station 4+26 appears to be buried.*
5. *At Station 0+93 there is a 12 inch hole in the left side of a mortared stone box culvert.*

Neither the Town, nor GZA, was able to locate additional studies or reports to provide evidence that any of these identified deficiencies were repaired. The ages and existing condition of the culvert components are currently unknown.

SCOPE OF WORK

GZA’s Scope of Work for the Walker Brook Preliminary Engineering Study (Flood Mitigation) includes an assessment of Walker Brook and its watershed, including a geomorphic stream assessment and hydrologic and hydraulic evaluation, to better understand the factors influencing the ongoing flooding issues, and develop potential options for addressing the flooding, which commonly occurs at High Street and within the neighborhood between High Street and Main Street. The preferred option, to be advanced to preliminary (~25%) design, will be selected by GZA in consultation with the Town.

FLOOD MITIGATION OPTIONS

FLOOD MITIGATION OPTIONS IDENTIFIED IN PREVIOUS STUDIES

One of the earliest studies of potential flood mitigation options provided to GZA for review is Document D, as referenced above in the Background and Objectives section. This study outlined five (5) potential alternatives, as follows:

1. Construct dams at existing gravel pits to detain flows from the upper watershed. The report concluded that this would provide little mitigation for floods in the lower watershed.
2. Construct a pipe system (48-inch diameter RCP) to supplement the existing pipe system from High Street to Route 9, along the same alignment as the existing culvert. Include curb inlet drains for local runoff.
3. Replace existing Walker Brook culvert with 60-inch diameter RCP. Would need to also address collection of local runoff.



4. Construct an above-ground channel to supplement the existing pipe conveyance.
5. Floodproof the school (N/A; school has since been demolished).

The report noted that existing detention storage provided by the gravel pits should be maintained, and that the pits filling with water would no longer provide flood detention capacity. During a field reconnaissance of the watershed on December 10, 2021, GZA observed that the brook enters a man-made pond in the vicinity of the gravel pits. The existing pond was filled with water and therefore, does not likely continue to provide significant detention storage for large runoff-producing events.

Comprehensive Environmental, Inc. (CEI) performed an evaluation of potential green stormwater infrastructure and nature-based projects for the Town, including in locations along Walker Brook between High Street and Main Street (Document A). CEI identified two potential projects, summarized as follows:

1. Green Stormwater Infrastructure: The proposed project includes an infiltration basin and sediment forebay within the grassy area north of the Senior Center, which would accept local stormwater runoff from two catch basins near the intersection of High Street and Field Street, and would have an overflow to the existing Walker Brook culvert in the event that stormwater flows exceed basin capacity. A large infiltration basin and sediment forebay would also be constructed within the grassy area south of the Senior Center to accept local runoff, and would have an overflow to the existing Walker Brook culvert in the event that stormwater flows exceed basin capacity.
2. Walker Brook Stream Daylighting: A new headwall would be installed north of High Street to direct Walker Brook through a new, upsized culvert across High Street to a settling basin in the northern corner of the grassed field north of the Senior Center. The settling basin would also accept local runoff from High Street and Field Street. A meandering channel simulating natural conditions would then convey Walker Brook behind the Senior Center and south to an infiltration basin next to the Senior Center. A second culvert beneath the Senior Center parking lot would then connect the infiltration basin to another stretch of designed channel through the open field parcel. The designed channel would enter a new headwall near the intersection of 1st Street and Glennon Avenue, before being piped within a new culvert to its outfall location south of Main Street.

The proposed flood mitigation solution presented by Hill Engineers (Document B) presents a flood mitigation option which includes the construction of a detention basin in the existing Walker Brook upstream of High Street and a new 60-inch diameter reinforced concrete pipe drain along the same alignment as the existing Walker Brook culvert, while maintaining the existing culverts under High Street and Main Street. The existing Walker Brook culvert would be abandoned as part of this option. This alternative does not include the replacement or enlargement of the culverts beneath High Street or Main Street.

ADDITIONAL FLOOD MITIGATION OPTIONS

GZA, in coordination with Field Geology Services, LLC (referred to as the GZA-Field Team), reviewed the previously identified flood mitigation options as described above, and under consideration of the potential benefits and drawbacks of those options, developed a list of additional mitigation options or variations of previously developed mitigation options for the Town's consideration, as outlined below:



1. Complete daylighting of Walker Brook between High Street and Main Street. The 1981 USDA report included an option to construct a surface channel to supplement the existing pipe conveyance. This option included shallow road-side waterways between High Street and 1st Street, with about 700 linear feet of vegetated channel extending towards Route 9. Under this alternative, we assume the vegetated channel would follow the existing path of the piped Walker Brook culvert, which runs behind the residential homes along Glennon Avenue. The CEI study also presented an option that includes stream daylighting between High Street and 1st Street, with the flow then being conveyed via a culvert from 1st Street to Main Street. Neither of these options would result in the complete daylighting of Walker Brook, in which a fully-naturalized channel, with connected floodplain, would be constructed between High Street and Main Street.

Fully-daylighting Walker Brook would require adequate space to develop the necessary cross-section for the brook to convey baseflows and flood flows via a natural channel and floodplain, which would require property acquisitions and/or easements. The benefits of complete stream daylighting typically include increased flood storage capacity and conveyance and the elimination of constriction points which can reduce peak flows and help to limit downstream flooding while also providing habitat diversity, enhanced pollutant removal, and aesthetic and recreational benefits. The potential challenges include private property impacts and coordination with landowners, utility conflicts, and potential maintenance requirements.

2. Construct diversion culvert to convey Walker Brook flood flows from High Street to a point downstream of the neighborhood. The USDA 1981 report discussed an option to construct a pipe system (48-inch diameter RCP) to supplement the existing Walker Brook pipe system from High Street to Route 9, following the same alignment as the existing culvert. A variation of this option would be to construct a diversion culvert to convey Walker Brook flood flows around the High Street neighborhood along a new alignment to follow public rights-of-way to the extent possible and limit construction on private property. The existing Walker Brook culvert would remain in service 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:

- Maintaining the existing Walker Brook baseflows in the open channel downstream of the culverted section avoids adverse environmental impacts to the brook itself.
- Locating the alignment within existing rights-of-way, to the extent possible, limits 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 is maintained without requiring changes to the existing storm drainage infrastructure.

With this option, it may be possible to direct discharge from the diversion culvert directly into the East Branch Housatonic River, which would reduce flood risk from Walker Brook to the River Run Apartments south of Main Street. The discharge location for the diversion culvert will have to be carefully evaluated for potential increases in peak flows downstream. One challenge associated with this option is the potential for utility conflicts within rights-of-way along the culvert alignment. This option does not offer habitat diversity, enhanced pollutant removal, or aesthetic and recreational benefits that may be associated with a daylighted stream.



3. Construct detention system in the open field south of Senior Center, with the following potential variations:
 - a. Construct detention system in the open field and enlarge existing Walker Brook culvert.
 - b. Construct detention system in the open field with a new culvert to divert excess flows, while maintaining the existing Walker Brook culvert.

None of the previously identified flood mitigation options reviewed by GZA-Field Team take full advantage of the large, ± 2 -acre open space south of the Senior Center. This area could potentially be utilized for construction of a large detention area to detain excess flows from Walker Brook and thereby reduce downstream peak flows and flooding potential. However, preliminary calculations performed by GZA indicate that the volume of detention required for sufficient mitigation of Walker Brook flooding would exceed the capacity that could be made available within this space. Therefore, a detention system would need to be combined with other measures, such as enlarging pipe sizes or diverting flood flows. Enlargement of the existing Walker Brook culvert or construction of a secondary culvert would reduce flooding potential in the area between High Street and Main Street but may also result in increases in peak flows downstream of Main Street. Some amount of detention will be required to mitigate peak flow increases.

Any option which does not improve the existing Walker Brook culvert will leave the existing culvert vulnerable to localized failures due to age and deterioration.

DISCUSSION AND RECOMMENDATIONS

As described above, the current condition, sizes, and dimensions of the existing culvert have not been verified by the GZA-Field Team. The 1981 Tighe & Bond study identified significant deterioration in portions of the culvert. Those areas may have been subsequently repaired; however, no documentation of repairs has been provided to GZA. We recommend that the condition of the existing culvert be inspected by closed circuit television (CCTV), or other methods, as appropriate, to assess and document current conditions and corresponding risk of continued deterioration and potential failure. The information provided by this inspection would assist in evaluating if any components of the existing culvert should be repaired, replaced, or abandoned, as needed to be compatible with the selected flood mitigation option.

The selected flood mitigation components will need to be evaluated with hydrologic and hydraulic modeling to estimate the sizes and capacities required to mitigate flooding conditions between High Street and Main Street. Combination of aspects of more than one of the mitigation options described in this memorandum may be needed to adequately reduce the potential for flooding and comply with regulatory requirements. In GZA's opinion, the flood mitigation components should be selected to meet the following objectives:

- Make use of the large open, Town-owned parcel south of the Senior Center;
- Minimize construction on private property, if possible;
- Provide detention to avoid downstream impacts, specifically to reduce potential for increases in peak flow rates downstream of Main Street that would be associated with other mitigation measures;



- Maintain existing infrastructure for local runoff; and
- Provide co-benefits to flood mitigation, such as water quality and habitat improvements.

GZA recommends the following combination of flood mitigation components to meet the above-listed objectives:

- Daylighting of Walker Brook below High Street and around the Senior Center, similar to the daylighting option presented by CEI, with some modifications, including the potential reconfiguration of the Senior Center parking lot to allow for additional open channel. The design should provide for the separation of local runoff/drainage from the newly daylighted stream. The daylighted portion of the stream would be conveyed into a culvert sized to accommodate the peak flows.
- Maintain the existing Walker Brook culvert in place to accept local runoff/drainage, provided that its condition is found to be acceptable and/or any identified deficiencies can be readily addressed.
- Take advantage of the large open space in the lot of the demolished school building to include floodplain and detention storage along the daylighted Walker Brook.

The capacity of a new daylighted channel with associated floodplain and detention storage to accommodate Walker Brook peak flood flows will depend on the available space within Town-owned properties in relation to the size of channel needed. GZA will perform hydrologic and hydraulic analyses to evaluate the level of mitigation provided by a stream daylighting option and to assess whether or not this approach would be sufficient alone or would need to be combined with other measures, such as enlarging pipe sizes or diverting flood flows.

Although not necessarily required to address the flooding potential between High Street and Main Street, the following items may also be considered by the Town as part of a comprehensive project addressing Walker Brook: (1) replacement of the culvert beneath Main Street, and (2) modification of the Walker Brook channel downstream of Main Street or other options to reduce the vulnerability to flooding at the River Run Apartments.

CLOSING AND NEXT STEPS

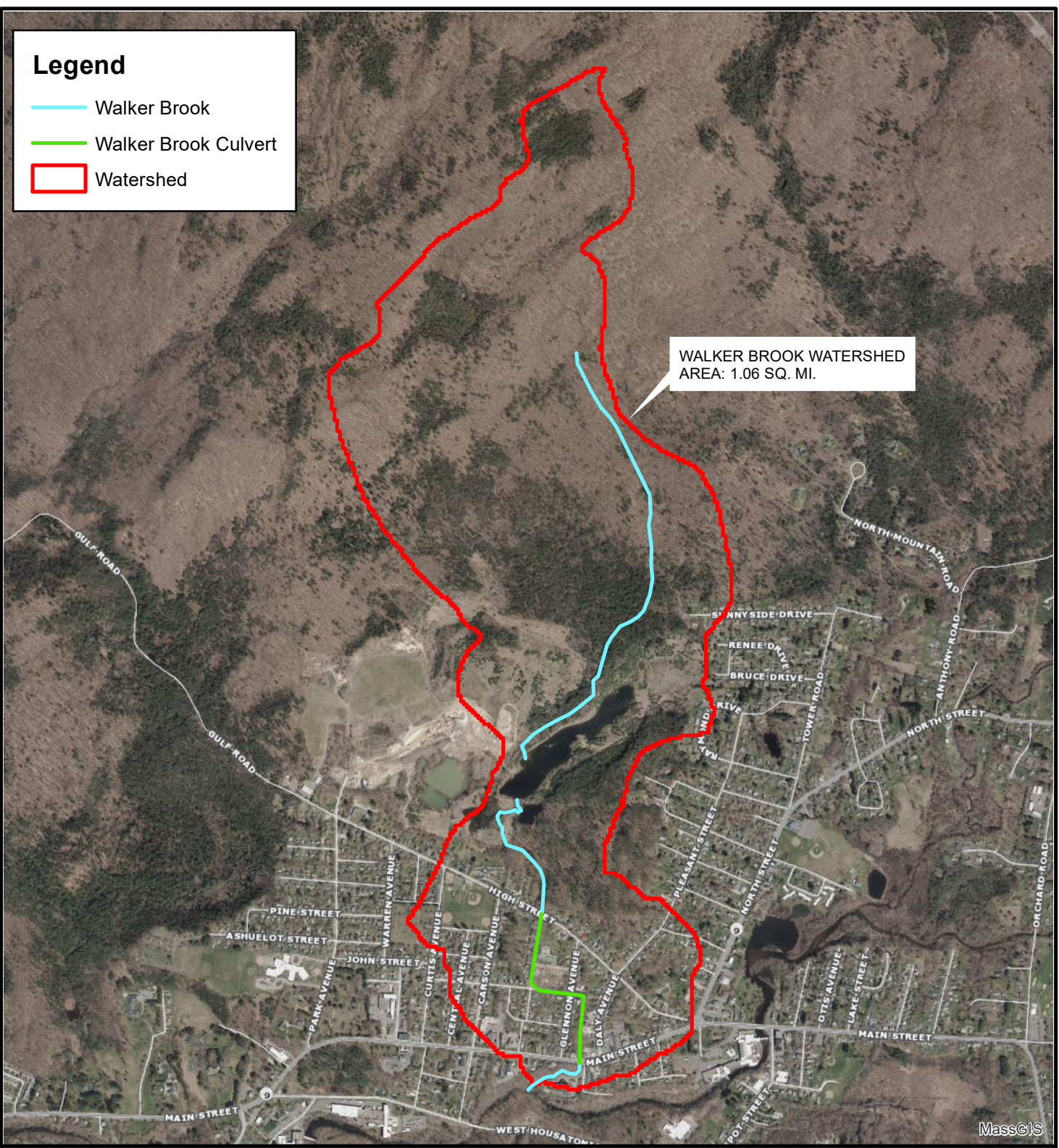
The GZA-Field Team would be pleased to meet with the Town to review the proposed mitigation options summarized in this memorandum, and to obtain feedback to inform the finalization of the preferred mitigation components for more detailed analysis. As appropriate, we will revise this memorandum to address comments received from the Town.

Attachments:

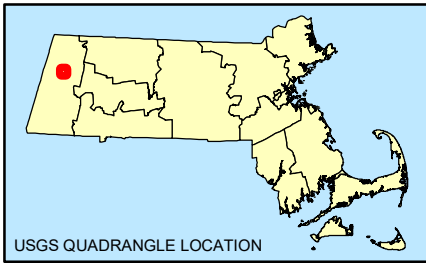
- Figure 1 – Site Locus
- Attachment 1 - Limitations

Legend

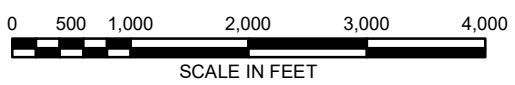
-  Walker Brook
-  Walker Brook Culvert
-  Watershed




WALKER BROOK WATERSHED
AREA: 1.06 SQ. MI.



SOURCE: THIS MAP CONTAINS MASSACHUSETTS 2019 USGS COLOR ORTHO IMAGERY



	PROJ. MGR.: RS DESIGNED BY: MEC REVIEWED BY: RS OPERATOR: MEC DATE: 2/28/2022	WALKER BROOK WATERSHED	JOB NO. 15.0166994.00
	WALKER BROOK PRELIMINARY ENGINEERING STUDY (FLOOD MITIGATION) TOWN OF DALTON, MA		FIGURE NO. 1



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. The findings are not an absolute characterization of operations and maintenance preparedness, but rather serve to evaluate minimum standards of performance provided by the documentation reviewed.

RELIANCE ON INFORMATION FROM OTHERS

5. 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

6. 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

7. 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

8. 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.