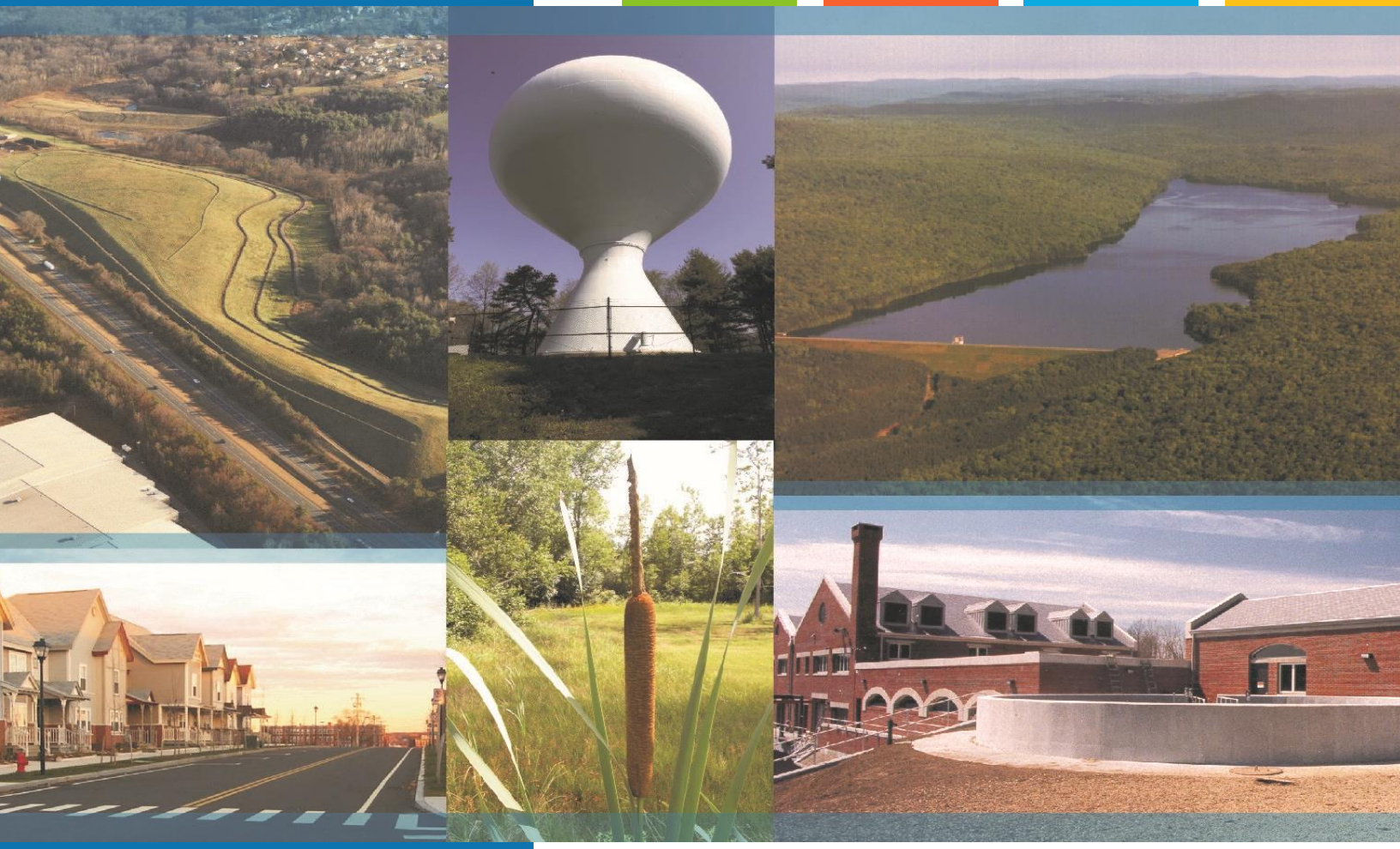

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DUDLEYVILLE ROAD RESTORATION EVALUATION

Marjorie McGinnis, Town Administrator
Richard Nathhorst, Town of Leverett
Raymond Bradley, Town of Leverett
Town of Leverett, MA

December 8, 2023

Tighe&Bond

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Dudleyville Road Restoration Evaluation

TO: Marjorie McGinnis, Leverett Town Administrator
Richard Nathhorst, Town of Leverett
Raymond Bradley, Town of Leverett

FROM: Alex Bouthillette, PE, Tighe & Bond

COPY: Alex Fagnand, ENV SP, PE; Zach Chornyak, PE, Tighe & Bond

DATE: December 8, 2023

Tighe & Bond has performed an evaluation of a 1.4-mile section of Dudleyville Road in Leverett, Massachusetts. Dudleyville Road is a partial gravel road connecting North Leverett Road to Montague Road at the Leverett-Shutesbury Town Line. The gravel portion of the roadway requires extensive maintenance to remain serviceable, and often becomes impassible after large rain events or during the spring thaw. The roadway also features several culverts that feed into the brook on the southern side of the roadway.

Our evaluation is intended to summarize the existing conditions, propose an appropriate solution for restoration of the roadway, and present an Opinion of Probable Construction Cost (OPCC) for the work. This memorandum documents the process taken by Tighe & Bond including discussion of appropriate design criteria and applicable permitting requirements, if the Town chooses to advance a reconstruction project on Dudleyville Road.

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Attachments

A – Figures

- Figure 1 – USGS Site Location Map
- Figure 2 – Priority Resource Map
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C – Opinion of Probable Construction Cost

D – Topographic Survey of a Portion of Dudleyville Road, *Northeast Survey Consultants*

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G – Traffic Volume Data

H – Conceptual Site Plans – Dudleyville Road Restoration Evaluation

- Sheet G-001 – Key Plan
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- Sheets C-101 through C-116 – Conceptual Plan and Profile
- Sheet C-201 – Typical Sections
- Sheets C-301 through C-307 – Cross Sections
- Sheet C-501 – Slope Restoration Detail Alternatives

I – MassDOT Standard Details

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Section 1 Existing Conditions



Image 1: Impassable Conditions

1.1 Project Location

Dudleyville Road is a rural local road connecting North Leverett Road to Montague Road in Leverett, MA. Dudleyville Road includes a paved roadway between North Leverett Road and Briggs Road and a gravel segment from Briggs Road to Montague Road at the Leverett-Shutesbury Town Line. Dudleyville Road is in the vicinity of the Brushy Mountain Conservation Area and Sawmill Brook as shown in Attachment A, Figure 1.

The gravel section, which is the primary focus of this study, is about 1.1 miles long with the surrounding landscape consisting primarily of forest land. The surface of the gravel roadway is generally composed of gravel with an approximate width of 18-feet. The road surface requires extensive maintenance throughout the year to remain passable. During the spring thaw or after large rain events, the road can become impassable. The gravel road section of Dudleyville Road is included on the MassDOT Road Inventory. The terrain is considered a mixture of rolling and level terrain. Survey completed for this study identified right of way along the gravel section with a width of approximately 34 feet.

1.2 Wetland Resource Areas and Flood Mapping

Tighe & Bond conducted Phase 1 of the existing conditions evaluations relative to bridged and culverted stream crossings within the Dudleyville Road roadway right-of-way (ROW) between North Leverett Road and the Shutesbury Town line on May 11 and on May 15, 2023. The delineation was performed in accordance with Massachusetts Department of Environmental Protection (MassDEP) wetland resource area delineation guidelines, 310 CMR 10.00 and the Southampton Wetlands Protection Bylaw. The evaluation also included

a review of Massachusetts Geographic Information System (MassGIS) mapping and other publicly available resources.

In summary, a total of four (4) bridged/culverted crossings, with one (1) over the Sawmill River and three (3) over Dudleyville Brook, 28 cross culverts. The associated Banks and Mean Annual High Water (MAHW) were delineated during Phase 1 of Wetland resource area evaluations. Phase 2 involved a desktop review, evaluating the remaining jurisdictional wetland resource areas along and within approximately 100 feet of the proposed limits of work.

The wetland resource areas observed in the field are described herein. The resource areas are summarized individually. Evaluations of dominant vegetation in the tree, scrub-shrub, and herbaceous strata were performed using leaf identification.

Attachment E summarizes Inland Bank/MAHW/wetland resource areas by flag series delineated along the subject parcel during field evaluations.

Culvert series 2 through 10, 13 through 16, 27, and 28 are associated with upland drainage to roadside ditch and centerline conveyance via culvert to non WPA resource areas. Classification is assumed to be roadside Right-of-Way (ROW) within 310 CMR 10.58 Riverfront Area, identifying these culverts to be outside the jurisdiction of the Wetlands Protection Act.

No online flood mapping through FEMA is available for this location.

1.3 Rare Species

The Massachusetts Natural Heritage Atlas, 15th Edition (August 1, 2021) and Massachusetts Geographic Information System (MassGIS) interactive mapping tool (August 2021), were consulted during the review of the site. According to these resources, Dudleyville Road is not located within the limits of mapped Estimated or Priority Habitats of Rare Species.

1.4 Zoning & Adjacent Land Use

The roadway and surrounding land uses were reviewed against the 2020 Town of Leverett Zoning Bylaws[1]. The land area adjacent to the gravel section of Dudleyville Road are zoned primarily as Rural Residential (RR). The paved section of Dudleyville Road is zoned as Residential/Village (RV). As there are no municipal roadway design standards, the zoning bylaws were referenced to understand a typical gravel roadway in Leverett and gain better insight into the existing use of Dudleyville Road. In the conceptual design of the roadway, Massachusetts Department of Transportation (MassDOT) Standards were considered, which is further discussed in Section 2.2. Per the Town's Zoning Ordinance.

[1] Town of Leverett, Massachusetts. (2020). Zoning By-Laws.

TABLE-1
Summary of Zoning Bylaws

	RV	RR
Minimum lot area (sq. ft.)	40,000	60,000
Minimum lot frontage (ft.)	200	200
Minimum front yard (ft.)	40	40
Minimum side yard (ft.)	20	25
Minimum rear yard (ft.)	30	30
Maximum building height (ft.)	35	35
Maximum lot coverage (%):		
by buildings	15	10
by buildings, structures, and impervious surfaces	35	25

The abutting lands are a mixture of public and privately owned. Most parcels are owned by private citizens; with exception in the parcel containing Brushy Mountain Wildlife Management Area.

According to the "2008 FRCOG Leverett Zoning Map"[2], a section of project adjacent land has been designated as an Aquifer Protection Overlay District; this district is under a conservation restriction to prevent contamination of water resources providing public water supply. If applicable, according to the "2020 Zoning By Laws", a special permit is required during the "removal of earth, loam, sand, and gravel, or any other mineral, in excess of 10 yards, not incidental to construction of a building." Brushy Mountain Wildlife Management Area and Paul C. Jones Working Forest Wildlife Conservation Easement are both considered Protected and Recreational Open Space areas that are adjacent to the project area. No proposed roadway related work is expected to be performed in these areas.

1.4.1 Existing Users

The road serves local traffic, with private residences located on the roadway, and a cut-through from Leverett to Shutesbury. There has also been a recent increase in large vehicles, such as tractor trailers and delivery vehicles, utilizing the cut-through. During heavy rainfall and after the spring thaw, portions of the roadway can become impassable and some residents cannot access their properties.

1.4.2 Intersecting Streets and Access

Dudleyville Road intersects with Briggs Road in the paved section of the roadway, about 1,000 feet south of the North Leverett Road intersection.

[2] Town of Leverett, Massachusetts. (2008). Official Zoning Map.

1.5 Existing Traffic Volume Data

Dudleyville Road is a local road in Leverett, MA, bounded by North Leverett Road to the northwest and Montague Road at the Leverett-Shutesbury town line to the southeast. The gravel roadway connects several residences surrounded by undeveloped, heavily wooded areas. The Annual Average Daily Traffic (AADT) was 261 on July 14, 2014, the last recorded volume in the MassDOT Transportation Data Management System (TDMS). The existing traffic volume data is attached in Attachment G.



Image 2: TDMS ATR Counts[3]

On June 6 and 7 of 2023, Boston Traffic Data deployed an Automatic Traffic Recorder (ATR) about 400 feet south of North Leverett Road. The recorded AADTs were 215 (103 northbound and 112 southbound) and 238 (121 northbound and 117 southbound), respectively. These counts were slightly lower than the 261 count that was recorded in July of 2014. The mean speed on June 6, 2023 was 26.4 miles per hour in the northbound direction and 23.1 miles per hour in the southbound direction. The mean speed on June 7, 2023 was 24.4 miles per hour in the northbound direction and 22.5 miles per hour in

[3] MassDOT Transportation Data Management System. (n.d.). Retrieved August 15, 2023, from https://mhd.public.ms2soft.com/tcds/tsearch.asp?loc=Mhd&mod=

the southbound direction. The classification of vehicles was mostly Class 2 (Passenger Cars) and Class 3 (Vans/ Pick-Up Trucks) with a few Class 1 (Motorcycles), Class 4 (Buses), and Class 5 (2 Axle 6 Tires) vehicles. As depicted in the ATR data, existing use of Dudleyville Road is primarily for access to residences; however, logging and delivery vehicles utilize Dudleyville Road to access their properties and adjacent municipalities.

1.6 Hydraulic & Hydrologic (H&H) Analysis

Preliminary H&H analyses were conducted for the culverts along Dudleyville Road. Separate analyses were performed for those crossings which convey flow at named streams and those that serve as drainage cross culverts. Both of the analyses were performed using the HydroCAD stormwater modeling program which is based on the United States Department of Agriculture's (USDA) Technical Release 10 program (TR-20). The models were developed using information from GeoHEC-HMS, and using soil characteristics, watershed characteristics, and ground cover/land use types within the watersheds provided by USGS and GIS mapping. The 24-hour precipitation events used in this study were estimated for this location based on the National Oceanic and Atmospheric Administration's (NOAA) Atlas 14 Volume 10 data[4], which is the current regulatory standard for precipitation depth. A Type III storm distribution curve was assumed to distribute the precipitation total across the 24-hour storm duration.

1.6.1 Culverts at Perennial Streams

A preliminary H&H analysis was performed for the crossings which convey flow at named streams (at Bridge 1, Culvert 1, Culvert 22, and Culverts 24/25, as described in Section 1.2 above). The intent of the analysis was to determine an approximate maximum size of a replacement culvert which meets the Massachusetts Stream Crossing Standards and MassDOT hydraulic requirements when a span is classified as a bridge. A bridge is a structure on a public right of way with a span equal to or greater than 10 feet. Bridge structures are regulated by MassDOT and require 2 feet of freeboard from the low chord of the bridge to the water surface elevation in the hydraulic design storm, which in this case is the 25-year storm event based on Dudleyville Road's functional classification as a local road. Reconstruction of any bridges along Dudleyville Road would be subject to MassDOT's Chapter 85 Review which significantly increases the design requirements.

1.6.1.1 Existing Conditions

Bridge 1 is an existing structure with a hydraulic opening that is 20-feet-wide and 7.8-feet-tall. The existing crossing does not meet stream crossing standards because the width of the hydraulic opening is less than 1.2 times bankfull width, as described in Section 1.6.1.2 below. The existing crossing meets openness ratio requirements. Under existing conditions, Bridge 1 can convey the 10-year storm event with 2 feet of freeboard as required by MassDOT.

[4] Perica, Sanja, et al. "Precipitation-Frequency Atlas of the United States. Volume 10 Version 3.0. Northeastern States." (Revised 2019).



Image 3: Bridge 1

Culvert 1 is an existing round pipe with a diameter of 7 feet. The existing crossing does not meet stream crossing standards because the width of the hydraulic opening is less than 1.2 times bankfull width, as described in Section 1.6.1.2 below. The existing crossing meets openness ratio requirements. Under existing conditions, Culvert 1 can convey the 10-year storm event without overtopping the culvert. This crossing is less than 10-feet in width, so it is not classified as a bridge per MassDOT; however, replacing this crossing may lead to a span greater than 10 feet due to bankfull width requirements. If the crossing span was increased to greater than 10 feet, this crossing would be considered a bridge and subject to Chapter 85 review by MassDOT. As such, 2 feet of freeboard above the hydraulic design storm is required. This crossing currently has 2 feet of freeboard in the design storm, though it is not required with the existing geometry.



Image 4: Culvert 1

Culvert 22 is an existing round pipe with a diameter of 5.5 feet. The existing crossing does not meet stream crossing standards because the width of the hydraulic opening is less than 1.2 times bankfull width, as described in Section 1.6.1.2 below. The existing crossing meets openness ratio requirements. Under existing conditions, Culvert 22 can convey the 10-year storm event without overtopping the culvert. This crossing is less than 10-feet in width, so it is not classified as a bridge per MassDOT; however, replacing this crossing may lead to a crossing with a span greater than 10 feet due to bankfull width requirements. If the crossing span was increased to greater than 10 feet, this crossing would be considered a bridge and subject to Chapter 85 review by MassDOT. As such, 2 feet of freeboard above the hydraulic design storm is required. This crossing currently has more than 2 feet of freeboard in the design storm, though it is not required with the existing geometry.



Image 5: Culvert 22

Culverts 24 and 25 are existing round pipes with 3-foot and 2-foot diameters. The existing crossing does not meet stream crossing standards because the width of the hydraulic opening is less than 1.2 times bankfull width, as described in Section 1.6.1.2 below, and because it does not meet openness ratio requirements. Under existing conditions, Culverts 24 and 25 cannot convey the 10-year storm event without overtopping the culvert. Additionally, replacing this crossing may lead to a crossing with a span greater than 10 feet due to bankfull width requirements. If the crossing span was increased to greater than 10 feet, this crossing would be considered a bridge and subject to Chapter 85 review by MassDOT. As such, 2 feet of freeboard above the hydraulic design storm is required. This crossing does not currently meet freeboard requirements.



Image 6: Culverts 24 and 25

Summary information on the existing hydraulic openings, including type, dimensions, openness ratio, and ability to pass hydraulic design storm are provided in Table 2 below.

Table 2
Existing Hydraulic Openings

Bridge/Culvert Name	Station	Type	Size	Length (ft)	Openness Ratio	Passes Hydraulic Design Storm?
Bridge 1	2+41	Box	20′ x 7.8′	18	8.7	Yes – with necessary freeboard
Culvert 1	5+61	Round	7′	35	1.1	Yes - freeboard not required
Culvert 22	54+52	Round	5.5′	28	0.9	Yes - freeboard not required
Culverts 24/25	59+58	Round (2)	1′ / 2′	30′ / 30′	0.33	No

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1.6.1.2 Bankfull Width

The bankfull widths at each of the crossings were determined based on field measurements and are as follows: 20 feet at Bridge 1, 20 feet at Culvert 1, 12 feet at Culvert 22, and 10 feet at Culverts 24/25. The Massachusetts Stream Crossing Standards recommend a culvert opening of 1.2-times the bankfull width, so an opening of 24 feet at Bridge 1, 24 feet at Culvert 1, 14.4 feet at Culvert 22, and 12 feet at Culverts 24/25 would be required to meet the standards. The Massachusetts Stream Crossing Standards also indicate the ratio of cross-sectional area to crossing length should be at least 0.82 feet and the crossing should be wide relative to its length. Additional information on each of the crossing's compliance with the openness ratio requirements is provided in Section 1.6.1.3 below.

1.6.1.3 Hydraulic Review

The proposed culverts and bridges were sized based on the requirements of the Massachusetts Stream Crossing Standards and the ability of each crossing to pass the 10-year hydraulic design storm with 2 feet of freeboard. The following hydraulic openings were modeled for each crossing.

Table 3
Modeled Hydraulic Openings

Bridge/Culvert Name	Station	Width (ft)	Height (ft)	Length (ft)	Openness Ratio	Passes Hydraulic Design Storm?
Bridge 1	2+41	24	7.8	20	9.4	Yes – with necessary freeboard
Culvert 1	5+61	24	7	35	4.8	Yes – with necessary freeboard
Culvert 22	54+52	14.4	5.5	30	2.6	Yes – with necessary freeboard
Culverts 24/25	59+58	12	4	30	1.6	Yes – with necessary freeboard

To comply with the Stream Crossing Standards, the structure spans would exceed 10 feet and therefore the resulting structures would be classified as "bridges." Each of the modeled hydraulic openings can pass the hydraulic design storm (the 10-year storm event) with 2 feet of freeboard per MassDOT requirements. Note this analysis was limited in nature and does not consider tailwater conditions. A more in-depth analysis would be required to verify the hydraulic capacities of each crossing.

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The analysis determined required sizing of stream crossings given current regulations and did not take into account the conditions of the existing crossings or the presence of existing flooding issues. Existing crossings do not need to be replaced if they are in good/fair condition. Future condition review and structural analysis efforts should be performed on the structures, as necessary.

1.6.1.4 Water Quality

The existing stormwater infrastructure along Dudleyville Road does not have any method of managing water quality. Along most of Dudleyville Road, stormwater erodes the swales due to the lack of vegetation. The stormwater runoff also erodes the gravel roadway. Cross culverts flow freely into Dudleyville Brook with no energy dissipation. Over time, these issues cause washouts, create ruts, and comprise the integrity of the gravel roadway.

1.6.2 Drainage Cross Culverts

A preliminary H&H analysis was performed for the drainage cross culverts. The intent of the analysis was to determine an approximate maximum size of a replacement culvert which can convey the 25-year storm event in accordance with requirements for cross culverts on a local road as defined in the Massachusetts Department of Transportation (MassDOT) Project Development and Design Guide (PDDG). Manning's equation was used to determine the minimum size of a round HDPE culvert which could pass the 25-year storm event.

1.6.2.2 Recommended Actions and Sizing

A total of 20 existing drainage cross culverts are proposed to be replaced, 5 new culverts are proposed to be installed, 1 existing culvert is proposed to be retained, and 3 existing culverts are proposed to be removed. Recommended sizing was determined for each of the replacement culverts as described above. using Manning's equation. The culverts are generally proposed at 250- to 300-foot intervals based on requirements from the MassDOT PDDG and to generally maintain existing drainage patterns. A minimum diameter of 18 inches was assumed and all recommendations are for round, double wall, corrugated exterior/smooth interior HDPE pipes. Recommended culvert actions and sizing are provided in Table 4 below.

Table 4
Recommended Drainage Cross Culvert Actions and Sizing

Culvert Name	Existing Size (inches)	Culvert Station	Recommended Action	Recommended Size (inches)
Culvert 2	24	11+93	Replace	30
New Culvert 2A	-	13+25	Install New Culvert	18
Culvert 3	12	15+47	Replace	24
Culvert 4	15	17+41	Replace	18
Culvert 5	15	19+03	Replace	24

Culvert 6	15	20+53	Replace	18
Culvert 7	12	22+11	Remove	-
Culvert 7A	-	23+25	Install New Culvert	24
Culvert 7B	-	25+90	Install New Culvert	24
Culvert 8	12	27+18	Replace	18
Culvert 9	12	29+26	Replace	24
Culvert 10	12	31+67	Replace	36
Culvert 11	12	32+25	Remove	-
Culvert 12	15	34+65	Replace	18
Culvert 13	12	37+36	Replace	18
Culvert 14	18	38+25	Replace	18
Culvert 15	15	39+45	Replace	24
Culvert 16	12	41+90	Replace	30
New Culvert 16A	-	42+60	Install New Culvert	24
Culvert 17	15	45+61	Replace	24
Culvert 18	12	47+00	Replace	24
Culvert 19	12	47+71	Remove	-
Culvert 20	12	50+70	Replace	18
Culvert 21	15	52+18	Replace	18
Culvert 23	15	57+79	Replace	18
New Culvert 25A	-	62+05	Install New Culvert	18
Culvert 26	47	64+32	Retain Existing	47
Culvert 27	12	67+93	Replace	18
Culvert 28	12	69+95	Replace	18

The analysis determined recommended sizing of drainage cross culverts given hydrologic conditions and did not take into account the conditions of the existing crossings or the

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presence of existing flooding issues. Existing crossings do not need to be replaced if they are in good condition and adequately sized.

1.7 Geotechnical

A limited geotechnical program was used for this study to investigate and collect information on the subsurface conditions in select areas along Dudleyville Road. Geotechnical borings were performed in six locations on Dudleyville Road. Test pits were performed by the Town in four locations and soil samples were taken and brought to a lab for testing.

The borings primarily show the roadway is constructed on sands and gravels, groundwater was observed to be at an average depth of approximately 6' deep, and bedrock is assumed to be approximately 13' down from the surface of the road.

The test pits were performed at locations indicated by the Town Highway Department to have the most issues with poor roadway conditions. In the past, these locations have required extensive repairs in the Spring after the Winter thaw. The test pits show the upper 18" of the existing roadway is constructed with sandy gravel and two of the test pits showed the presence of a woven geosynthetic fabric, presumed to assist in stabilizing the roadway.

The soil strata observed beneath the upper 18" gravel surface generally transitioned to a silty sand material with a much higher percentage of fines (silt/clay). The section of Dudleyville Road that becomes impassable was investigated through Test Pit #1 and Boring #2. Test pit #1 (STA 18+55) presented an 8"+ thick layer of black organic peat-like material at 40" deep, which was not observed in any other test pit. The woven geosynthetic fabric was observed in the same test pit, indicating the fabric may have been used to correct instability within the roadway structure caused by the existing organic layer. The black organic peat material is likely causing water retention under the road and settling under the traffic loading, creating deformation of the road surface. No groundwater was observed in the test pit.

Boring #2 (STA 20+35) identified a soil composition of sand and gravel for the first 10 feet. At 15 feet, the gravel was almost entirely replaced by silt. Groundwater was observed at a depth of 12 feet.

Groundwater, through the presence of weeping into the excavation, was observed in two of the test pits at approximately 48" deep. This depth appears to be relatively consistent with the groundwater observed with the borings.

The boring logs and the Soil samples from the Test pits are provided in Attachment F. Additionally, the boring and test pit locations are shown on the Conceptual Plans in Attachment H.

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Section 2 Design Standards

2.1 Town of Leverett Subdivision Standards

The concept roadway improvements are proposed within the existing right-of-way of Dudleyville Road. The reconstruction of the existing road would not be considered a new subdivision requiring Planning Board approval. However, to encourage consistency with the Town's existing roadway network, we reviewed the Town subdivision design standards included in Section 4000: Required Improvements of the Town of Leverett "Rules and Regulations Governing the Subdivision of Land"[5] dated, 2005. The Town of Leverett Subdivision Standard states:

- *All construction details, materials, methods, and specifications shall conform to the current requirements of the "Commonwealth of Massachusetts, Standard Specifications for Highways and Bridges, Boston, Massachusetts" as supplemented, and shall be under the supervision of the Board, official, or agent designated by the Board.*

The referenced standards, including the MassDOT Standard Specification and Construction Standard Details, the AASHTO Green Book and Low Volume Roads manual, and the MUTCD are all appropriate for Dudleyville Road and were used for the concept roadway improvements. These standards were compared against the subdivision standards to identify any potential inconsistencies.

2.1.1 Minor Residential Street

The Town of Leverett defines a minor residential street as "a street which can be expected to handle less traffic than a collector street and which serves no abutting land zoned for business or industry". Dudleyville Road would be considered a minor residential street based on this definition and the limited traffic data discussed in Section 1.5. Designing the concept improvements for a higher use would increase the minimum roadway width to 30-feet which would be a significant challenge for the majority of Dudleyville Road. A 30-foot-wide road would also be much wider than the existing maintained sections of Dudleyville Road at both ends of the study area. Table 5, below, provides the Town's minimum standards for a minor residential street.

[5] Town of Leverett, Massachusetts. (2005). Rules and Regulations Governing the Subdivision of Land.

TABLE 5
Minimum Specifications for a Minor Residential Street

Standard	Minimum	Standard	Minimum
ROW Width (ft)	50	Centerline radius (ft)	150
Paved width (ft)	24	Minimum grade	0.5%
Intersection angle	60°	Maximum grade	10%
Street centerline off-set, same side of road (ft)	250	Curbing requirements	Both sides
Street centerline off-set, opposite side of road (ft)	125	Tree belt, both sides of street (ft)	5
Stopping site distance (at 3.5 feet above pavement)	150	Sidewalk Requirements	One side
Curb radius (ft)	15	Bicycle facilities	Determine by the Town

The concept road improvements generally meet the Town's requirements with a few exceptions. To match with the adjacent sections and minimize site impacts and project cost, an 18-foot-wide gravel road was selected for the concept. This width is similar to the existing width at both ends of the study area. Also, due to the mountainous terrain, many sections of the proposed road improvements exceed the Town's maximum grade of 10%. The east end of the unmaintained section of Dudleyville Road is at elevation 950 and drops to an elevation of 635 at the west end resulting in an average grade of 4% over the 1.4 miles of improvements.

The Town standards note a paved road in accordance with MassDOT standards, however the conceptual drawings provide four roadway surface material alternatives. The concept improvements include proposed drainage swales and cross culverts to mitigate potential future road washouts. The Town should consider paving all or parts of the improved road to minimize future maintenance, particularly in areas with very steep grades.

2.1.2 Tree Clearing

The current roadway width is generally 18-feet wide and the area surrounding the existing road is wooded. The widening and grading of the improved road will require some tree removal and selective clearing. An estimated 2 acres of wooded areas adjacent to the existing road will be disturbed based on the conceptual road improvements. Tree clearing or tree trimming/pruning would also be beneficial by allowing more sunlight to cast on the roadway, encouraging drying of the damp gravel road surface. These activities may warrant further review and discussion at the Town level, and the tree warden should be consulted as part of any future preliminary design efforts.

2.2 AASHTO Geometric Design for Low Volume Roads

As noted earlier, Dudleyville Road is a low volume roadway. For purposes of this study we used the American Association of State Highway and Transportation Officials' (AASHTO) "Guidelines for Geometric Design of Low-Volume Local Roads (ADT ≤ 400)" as noted in the Town's subdivision standards. Based on the traffic counts and the presence of logging and delivery vehicles, continued maintenance of Dudleyville Road is required. It should also be noted that cut through volumes will likely increase depending on the roadway improvements. Below is a summary of select design parameters from the guidelines that were used when developing the conceptual roadway improvement plans. Many of these parameters are more restrictive than the parameters provided in the Town's subdivision standards.

2.2.1 Functional Class

The roadway functional class dictates the design criteria. Based on the discussion of existing conditions, Dudleyville Road may be considered under these functional classes.

- **Rural Minor Access Road** – The existing roadway is unpaved and unmaintained. It is used to provide access to the adjacent private properties.

- **Rural Recreational and Scenic Roads** – All roads in Leverett are designated as scenic roads. However, the road is unlikely to service motor homes, campers, or vehicles hauling boats and there are no nearby campgrounds or waterfront access points to consider.

Based on the existing characteristics and potential uses of property along the road (See Section 1.4), the Rural Minor Access Road functional class was selected for Dudleyville Road.

2.2.2 Design Speed

AASHTO provides design criteria in increments of 5 mile per hours. Design speeds should be selected which are appropriate for the roadway and that speed is used to correlate the various features of the design. The selected design speed should be a logical one with respect to the anticipated operating speed, topography, adjacent land use, and functional classification of the road. The selected design speed should be consistent with the speeds that drivers are likely to expect on a given road. A design speed of 30 miles per hour was used in developing the conceptual road improvements. Based on the narrow road width and steep terrain the actual posted speed limit is recommended to be lower.

2.2.3 Roadway Width

The Town's subdivision standards recommend a minimum width of 24 feet for minor residential streets. AASHTO's Table 4.1 provides a minimum roadway width by design speed and functional class for low volume rural roads. Based on Table 4.1, the minimum roadway width for a Rural Minor Access Road is 18 feet for design speeds up to 40 miles per hour. In the context of the existing road, an 18-foot-wide road is recommended.

2.2.4 Horizontal Alignment

The AASHTO guide provides minimum horizontal radii for various design speeds and road superelevation rates. MassDOT does not recommend introducing superelevation of roadways for design speeds under 30 miles per hour, therefore the concept road

improvements include a crowned roadway for the entire length. The corresponding minimum horizontal radius for a crowned road at 30 miles per hour is 335 feet. The proposed horizontal alignment is intended to match existing conditions and stay within the existing right-of-way due to the extensive environmental resource areas and steep roadway embankments. These existing conditions limit the ability to realign the roadway and meet all AASHTO horizontal standards. All horizontal curves are within Town Standards, but six do not meet the AASHTO minimum curve radius. Four of the six curves that fail to meet AASHTO Standards occur within the paved section of the roadway, west of Briggs Road.

2.2.5 Stopping Sight Distance

Stopping Sight Distance (SSD) is defined as the distance required for a motor vehicle operator to perceive an object in their path and come to a complete stop. Roadway segments can be classified as "Higher Risk" locations if they are near intersections, narrow bridges, railroad-highway grade crossing, sharp curves, or steep downgrades. The conceptual improvements for Dudleyville Road feature steep downgrades in several areas. Conservatively, the SSD for a 30 MPH design speed should be 165 feet. Providing this sight distance will be important to prevent collisions with pedestrians, wildlife, and stopped vehicles along the route.

2.2.6 Clear Zones & Guardrail

On very low-volume local roads, clear zones are generally not considered cost effective and should only be added if they can be provided at very little or no additional cost. Crash history of an area should be considered, but generally, clear zone widths from 0-6 feet are acceptable. By utilizing minimal clear zones permitted on very low-volume local roads, tree excavation and impacts to forested areas can be limited. Potential areas for expanded clear zones should be further evaluated during preliminary design.

Guardrail is also considered impractical on very low-volume roads except in circumstances where the potential consequences of road departure could be extremely severe. The concept improvements include guardrail installation at an intermittent stream location where larger vertical drop-offs are anticipated and water is present at the bottom of the embankment. There are additional sections of steep slope adjacent to the roadway that should be further evaluated for guardrail consideration during future design development.

2.2.7 Vertical Alignment

As previously discussed, the average roadway grade through the study area is about 4%. However, the actual grades vary along the road, including some sections in excess of 10%. For 30 MPH and Mountainous terrain on a *Rural Natural* roadway, AASHTO recommends a maximum grade of 14%. There are no areas in excess of the recommended maximum grade.

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Section 3 Regulatory Jurisdiction

The wetland areas described in this memorandum, including associated Buffer Zones to inland Bank and BVW, are subject to protection and jurisdiction under the Massachusetts Wetlands Protection Act (MAWPA; M.G.L. c. 131, § 40), which is administered by the Town of Leverett Conservation Commission. Vegetated wetlands and streams (and rivers) are subject to further jurisdiction under Sections 401 and 404 of the Clean Water Act, as administered by MassDEP and the United States Army Corps of Engineers (Corps).

Additionally, there are non-wetlands agency reviews that may be relevant to the scope of work at this location. These include the Massachusetts Historical Commission's review per 950 CMR 71.00 and, for projects that require federal permits, compliance with Section 106 of the National Historic Preservation Act of 1966 (as amended).

The following environmental regulatory permit applications and/or reviews are likely relevant to this project.

- MAWPA Notice of Intern (Leverett Conservation Commission)
- NPDES Construction General Permit (CGP) Stormwater Pollution Prevention Plan (SWPPP) (US EPA)
- Clean Water Act Section 404 Pre-construction Notification (Corps)

3.1 Massachusetts Wetlands Protection Act (MAWPA)

The Massachusetts Wetlands Protection Act (MAWPA; M.G.L. c. 131, § 40) is administered by the Town of Leverett Conservation Commission. The MAWPA establishes jurisdiction over work in and near wetland resource areas included inland Bank, Land Under Water Bodies and Waterways, Bordering Vegetated Wetlands (BVW), Bordering Land Subject to Flooding (BLSF, i.e., the limits of 100-year flooding), and the 200-foot Riverfront Area of perennial streams. The Conservation Commission reviews applications, typically Notices of Intent (NOI), for compliance with resource area performance standards set forth in the MAWPA implementing regulations (310 CMR 10.00). The permit application process entails public notice in the local newspaper, as well as notification of project abutters (NOI only), and review by the Conservation Commission during one or more public hearings. Applications to the Conservation Commission are concurrently reviewed by the Massachusetts Department of Environmental Protection (MassDEP). The Conservation Commission may also choose to conduct a site visit to the project area. Upon completion of their review, the Conservation Commission votes to approve or deny the project. Approval of the project results in the issuance of a permit (Order of Conditions) that is subsequently recorded at the Registry of Deeds and is valid for a period of three (3) years.

3.2 National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP)

Under the USEPA NPDES program, a Notice of Intent, General Permit, and Stormwater Pollution Prevention Plan (SWPPP) for discharge of stormwater are required for cumulative construction site disturbances in excess of one acre. The concept road improvements include a disturbance area of approximately 3 acres, well over the 1-acre threshold. The completion and submittal of a Notice of Intent required under the USEPA NPDES program

is completed prior to construction, often by the contractor on behalf of the contractor and Town.

3.3 Clean Water Act Section 404

This program is administered by the United States Army Corps of Engineers (Corps) under the General Permits for the Commonwealth of Massachusetts (MA GPs). The MA GPs establishes general permits and general conditions for project that include fill or dredging activities within Waters of the US, such as vegetated wetlands and waterways. We anticipate the proposed project will qualify for review under General Permit 10 and 14. Under the MA GPs, projects can qualify for Self-Verification (SV) Notification if the project meets the noted conditions, including cumulative impacts to wetlands and waters of the US totaling less than 5,000 sf. Based on the concept design, Self-Verification is anticipated.

3.4 Massachusetts Environmental Policy Act (MEPA)

In addition to the permits previously discussed, if State funds are used for construction of the improvements or a State permit is otherwise required for the work, the project becomes subject to environmental review pursuant to Section 11.01(2)(b) of the MEPA regulations (301 CMR 11.00). Based on the concept design, one or more MEPA review thresholds are met or exceeded and a filing would be required.

The Project meets the following Environmental Notification Form (ENF) review threshold:

- Land: 301 CMR 11.03(6)(b)(2) – *cut five or more living public shade trees of 14 or more inches in diameter at breast height.*

For new projects filed after January 1, 2022, all ENF/EENFs must conform to the requirements set forth in the MEPA Public Involvement Protocol for Environmental Justice (EJ) Populations (the Public Involvement Protocol) and the MEPA Interim Protocol for Analysis of Project Impacts on EJ Populations (the Analysis of Project Impacts), both effective January 1, 2022. If the project was within an EJ designated geographic area it would require an Environmental Impact Report (EIR). A review of current EJ population mapping indicates Dudleyville is beyond 5 miles from a mapped EJ population and would not require an EIR.

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Section 4 Recommendations

With the design criteria discussed in Section 2 and in the context of the regulatory information presented in Section 3, several roadway rehabilitation alternatives are available to the Town. The alternatives include regrading and resurfacing the existing gravel road, chipseal (oil and stone), hot mix asphalt pavement, and chipseal (oil and stone) over hot mix asphalt pavement. Each rehabilitation method will be paired with drainage improvements to more efficiently remove stormwater from the roadway surface and discharge it through roadway cross culverts. One of the primary reasons for the existing deficiencies is the existing stormwater management.

Based on geotechnical observations through the means of test pits and borings, it is evident that a large portion of Dudleyville Road is built on unsuitable materials such as peat. Organic material was discovered in Test Pit #1 at STA 18+55 and a high percentage of fines (silt/clay) were present in both this test pit and Boring #2 (STA 20+35). Additional geotechnical investigations are recommended to determine the limits of the organic peat material. The additional data will provide a better understanding of the extent of material to be removed and replaced with suitable backfill. If it is determined that peat is present for a large portion of Dudleyville Road, it would significantly increase the magnitude of this work.

Each alternative assumes installation of geotextile fabric for base stabilization, excavation of the existing organic peat material and replacement with suitable material, limited rock excavation, water quality improvements, and traffic controls to manage detours due to the narrow roadway conditions. Geotextile fabric should be installed in many locations beneath the gravel base material to assist in the stabilization of the roadway. At locations where Dudleyville Brook encroaches on the roadway and steep slopes are present, slope stabilization methods should be installed to prevent further erosion. Several slope stabilization alternatives are presented in the conceptual design. These alternatives provide options for hard armoring and green infrastructure to improve the bank of Dudleyville Brook and to effectively stabilize the steep slopes.

Each alternative assumes the first 1,200 linear feet of existing pavement on Dudleyville Road will be milled and overlayed.

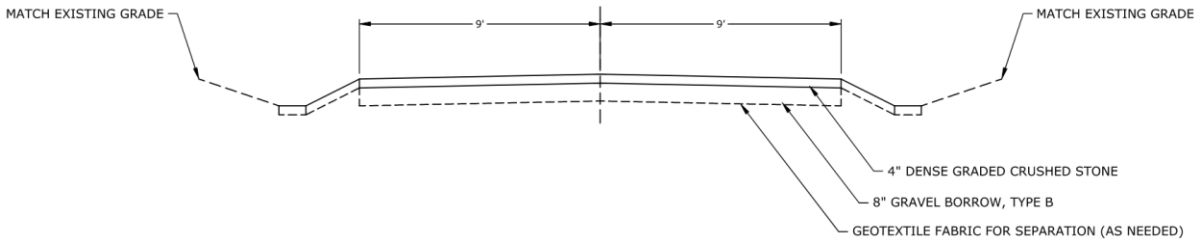
Water quality improvement measures have also been implemented into the conceptual design. The existing conditions have no means of managing water quality, as stormwater flows freely into Dudleyville Brook. The conceptual plans show the use of deep sump hooded drop inlets for culverts under 18 inches in diameter. These structures will be able to settle out suspended solids, capture floatables, and reduce the number of contaminants entering Dudleyville Brook. Culverts with a diameter greater than 18 inches will utilize headwalls with modified rockfill to help reduce the runoff velocity and trap sediment and leaf litter. Tree trimming and selective clearing along the edge of the roadway is also proposed. This will help to increase surface water evaporation and allow for easier vegetation and stabilization of the grass-lined swales.

While there are no formal recommendations proposed for culverts at perennial streams on the conceptual plans, future improvements should consider the anticipated sizing included in Section 1.6.1, Massachusetts Stream Crossing Standards, and MassDOT's Chapter 85 Review. The requirements associated may increase the crossing span and cost to reconstruct the bridges/culverts. Additional hydraulic analysis, geotechnical

investigation, and structural analysis should be considered prior to finalizing the design of these culverts/bridges. The Chapter 85 Review process, required for structures spanning ten feet or greater, significantly increases design requirements.

Gravel Road Resurfacing - Regrading and resurfacing the existing road includes removing a minimum of one foot of existing base material, adding geotextile fabric, removing unsuitable organic materials, spreading and compacting dense graded crushed stone to provide a compact and smooth riding surface, and reshaping the roadway with a crown and an appropriate cross slope to quickly remove the stormwater from the roadway surface.

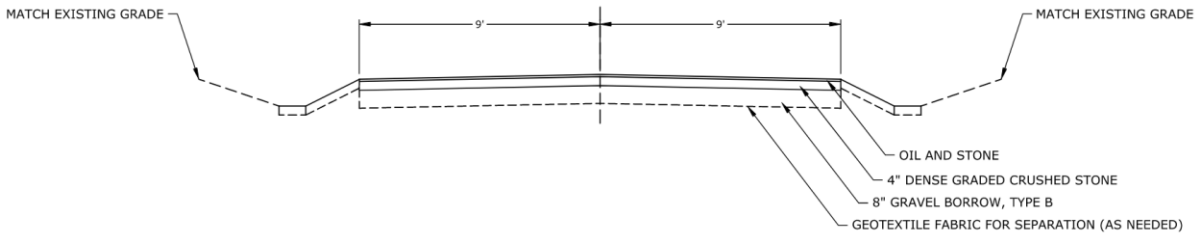
Reshaping and resurfacing the gravel roadway will provide immediate improvement to the riding surface; however, will deteriorate over time as it has in the past. The stormwater improvements will reduce the rate of deterioration; however, as an unpaved surface, it will be subjected to erosive stormwater forces and will continue to erode and deform. The presence of large logging and delivery vehicles will likely also lead to premature rutting. This alternative will require annual maintenance and potentially require maintenance after large storm events.



DUDLEYVILLE ROAD TYPICAL SECTION - GRAVEL RESURFACING
NO SCALE

Chipseal - Chipseal offers an intermediate level of roadway rehabilitation by stabilizing the roadway surface. Similar to the gravel road resurfacing, removing a minimum of one foot of base material, installing geotextile fabric, removing unsuitable organic materials, and spreading dense graded crushed stone should be performed. The bituminous layer is applied across the gravel surface and the stone is applied and compacted into the bituminous layer.

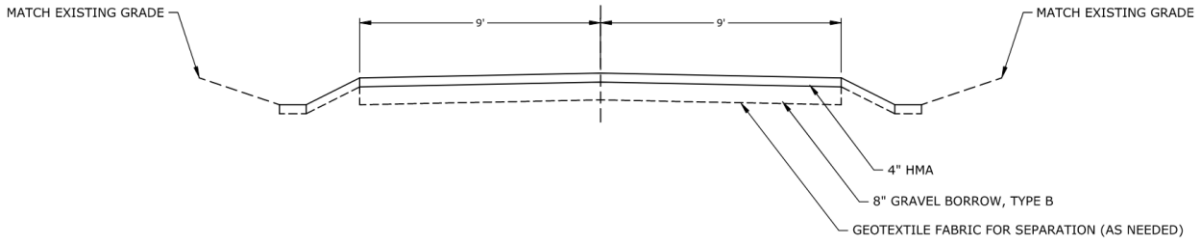
Chipseal provides a cost-effective option to stabilize the road surface and provide a smooth riding surface with improved traction and skid-resistance. The installation process is relatively quick and can be driven on the same day. This alternative will require maintenance approximately every five years, likely requiring another application of the bituminous layer and additional stone. However, the roadway should be continuously monitored to identify any locations that require maintenance more frequently.



DUDLEYVILLE ROAD TYPICAL SECTION - OIL AND STONE
NO SCALE

Full Depth Roadway Reconstruction - Another alternate treatment is paving the roadway surface with hot mix asphalt pavement. This offers the highest level of surface stabilization and longevity. For such a large intervention, we recommend installing a minimum of 8" of well-draining gravel roadway base material prior to installing the pavement. The installation process includes excavating at least one foot of existing roadway material and installing new gravel borrow to establish a sound roadway base. Select areas of the roadway where silt and peat are present will require additional excavation to eliminate unsuitable base material. Approximately 4-inches of hot mix asphalt pavement (1.5-inches of top course pavement over 2.5-inches of binder course pavement) will be installed over the gravel borrow roadway base.

Use of hot mix asphalt pavement results in a more expensive roadway rehabilitation method but also provides the longest lifespan and least amount of maintenance. A newly constructed road can be expected to last 20+ years, as long as a proper pavement management program is implemented. Paving Dudleyville Road would potentially result in an increase in the volume of vehicles that utilize the roadway as a cut through between Leverett and Shutesbury. The pavement management program should account for this by monitoring users and crack sealing when appropriate.

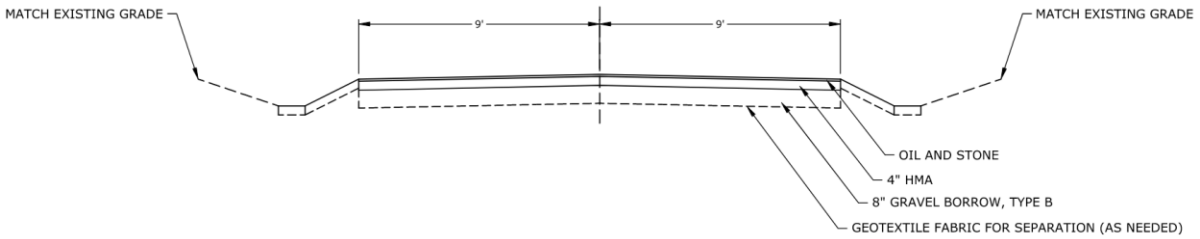


DUDLEYVILLE ROAD TYPICAL SECTION - FULL DEPTH RECONSTRUCTION
NO SCALE

Chipseal over Hot Mix Asphalt – As with the other alternatives, a minimum of one foot of existing base material and any uncovered organic material should be removed prior to installing new gravel borrow.

Chipseal on its own provides a cost-effective option to stabilize the road surface and provide a smooth riding surface with improved traction and skid-resistance. By combining the chipseal and hot mix asphalt roadway treatment methods, the lifespan of the roadway will be maximized while also maintaining the county road aesthetic. The chipseal installation process is relatively quick and can be driven on the same day. This alternative will require maintenance approximately every five years, likely requiring another

application of the bituminous layer and additional stone. However, the hot mix asphalt layer of the roadway can be expected to last 20+ years, if a pavement management program is implemented. The volume of heavy vehicles such as logging and delivery vehicles should be closely monitored to determine if addition maintenance is required.



DUDLEYVILLE ROAD TYPICAL SECTION - HOT MIX ASPHALT WITH OIL AND STONE
NO SCALE

The restoration of Dudleyville Road will require major reconstruction efforts to correct the stormwater management and underlying soil concerns. For potential cost saving measures, a combination of these rehabilitation methods can be used over the length of Dudleyville Road. For example, locations with steeper roadway grades can be paved to mitigate erosion within the roadway while the flatter roadway grades can be chipsealed or resurfaced with gravel. A phased approach to reconstruction may be used to first address the underlying soils concerns. The successful management of stormwater may improve the roadway surface condition enough to delay excavation of the poor underlying soils and additional geotechnical exploration to the following construction season.

Additional design and environmental permitting services need to be completed prior to reconstruction.

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Section 5 Opinion of Probable Construction Cost (OPCC)

Tighe & Bond developed an OPCC based on the conceptual roadway improvements plan. The OPCC uses MassDOT pay items for roadway construction and associated weighted average bid prices for those items (December 2023). Construction contingencies based on the level of design and percentage estimates for design, permitting, and construction phase services are also included in the OPCC.

It is generally good practice to use MassDOT standard pay items for road construction projects in the Commonwealth. The weighted average bid pricing is a robust data set based on bids received by MassDOT for projects administered across the state and is reflective of current pricing. However, construction costs can vary from the weighted average bid pricing depending on availability of local sources of material, method of rock removal, and ability to re-use excavated materials on-site as backfill.

At the study phase of a project, certain assumptions must be made in preparation of the OPCC. These assumptions can affect the proposed quantities for certain units of work. For instance, the proposed grading scheme has a significant impact on the volumes of earth excavation and required borrow material.

The intent of the grading shown on the concept plans is to minimize rock excavation and provide drainage opportunities to minimize future washout of the gravel road. The concept includes swales and cross culverts to promote runoff to travel along its natural flow path from east to west along the hillside. The concept also includes new cross culverts approximately every 300 feet of roadway in addition to replacing the existing cross culverts. Further refinement of the design, including lower design speed or fewer drainage improvements could lower the OPCC, but would likely increase the potential for future repair work (e.g., from washouts). The OPCC includes alternatives for gravel road resurfacing, chipsealing, paving the roadway, and costs associated with reconstructing the roadway with asphalt topped with a chipseal surface.

The OPCC assumed a depth of rock based on the geotechnical boring data, visual observations, and surficial geology. As noted above, the intent of the grading was to minimize rock excavation and to provide sufficient depth of material over the bedrock to reduce future washouts. Each OPCC alternative carried 100 cubic yards of rock excavation. A subsurface investigation to determine depth and type of rock will lead to a more accurate rock removal quantity, a better understanding of appropriate rock removal methods, and refinement to the assumed quantity of material that can be reused as fill during construction.

The OPCC carried approximately 1,100 cubic yards of excavation and gravel borrow related to the removal of organic peat material. This volume assumes organic material is present at a depth of four feet for a 500-foot section of Dudleyville Road. Additional geotechnical investigations are recommended to provide a better understanding of the limits of the organic material.

The itemized OPCCs are included as Attachment C to this memorandum. A summary table is included in Table 6 below. The OPCC for resurfacing and reshaping the gravel road and drainage improvements is approximately $2.18 million, without engineering and

permitting services, based on current MassDOT weighted average bid pricing. With additional engineering, permitting, and full-time construction phase services, the total project value is approximately $2.50 million. This value is intended to provide a range of expected costs based on the presented concept and considering the discussions presented in this section. The OPCC alternative for chipsealing the roadway is approximately $2.76 million, the alternative for paving the roadway is approximately $2.90 million, and the alternative for chipsealing over the paved roadway is approximately $3.49 million. With additional services the total project values are approximately $3.20 million, $3.30 million, and $4.00 million, respectively.

Table 6
Alternative Treatment Costs

Construction Alternative	OPCC Estimate (without additional services)	OPCC Estimate (with additional services)
Gravel Road Resurfacing	$2.18 million	$2.50 million
Chipseal	$2.76 million	$3.20 million
Full Depth Roadway Reconstruction	$2.90 million	$3.30 million
Chipseal over Hot Mix Asphalt	$3.49 million	$4.00 million

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Section 6 Potential Grant and Funding Opportunities

Based on the qualifying conditions of Dudleyville Road and the Town of Leverett, there are several grants available for funding the reconstruction of roadway. While the following options are recommended, it should be stated that there are many other grants that can provide financial resources to the Town of Leverett.

6.1 Municipal Vulnerability Preparedness Action Grant

The Municipal Vulnerability Preparedness Action Grant assists select communities with projects that address climate change impacts. The Action Grants are available to municipalities who have completed the Community Resilience Building (CRB) process and received the "MVP Community" designation from the Executive Office of Energy and Environmental Affairs (EEA). An Expression of Interest (EOI) form can be submitted prior to the Request for Responses (RFR) release date but is not required. However, this option is recommended as it will generate feedback and in turn create a more competitive application. These submissions are reviewed on a rolling basis with earlier submissions being prioritized. The grant requires municipalities to match 25% of the total project cost. More information can be found at the link below:

https://www.mass.gov/info-details/mvp-action-grant

6.2 MassWorks Infrastructure Program

The MassWorks Infrastructure Program provides financial resources for improvements to public infrastructure such as roadways, bridges, and culverts. All public entities are eligible to apply for funding and priority is given to projects that facilitate new growth or address road safety issues. MassWorks is part of the One Stop for Growth Development Continuum which utilizes a single application portal to support many different funding programs. Grant awards received through this program can be used for construction, engineering design, permitting, bidding, and construction administration. There is no maximum award amount and match funds are not required. However, applications that have secured funding from other sources will be more competitive. More information can be found at the link below:

https://www.mass.gov/info-details/massworks-infrastructure-program

6.3 Rural and Small Town Development Fund

The Rural and Small Town Development Fund provides funding for transportation and infrastructure projects. This fund is also part of the One Stop for Growth Development Continuum which streamlines the application process. Funding is available to small towns with populations less than 7,000 or with a population density of less than 500 per square mile. Funding can be used for construction, engineering design, permitting, bidding, and construction administration. Approximately $3 million is available each year with grant awards ranging from $50,000 to $500,000. More information can be found at the link below:

https://www.mass.gov/how-to/rural-and-small-town-development-fund

6.4 FEMA Hazard Mitigation Assistance Grant

The Federal Emergency Management Agency (FEMA) Hazard Mitigation Assistance Grant provides funding for projects that provide sustainable, long-term solutions that reduce the impact of disasters in the future. The Building Resilient Infrastructure and Communities (BRIC) and the Flood Mitigation Assistance (FMA) grant programs provide financial resources at the state and local level. Approximately $1 billion in funding is available for the BRIC grant program; $800 million is available for the FMA program. More information can be found at the link below:

https://www.fema.gov/grants/mitigation

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ATTACHMENT A

FIGURES

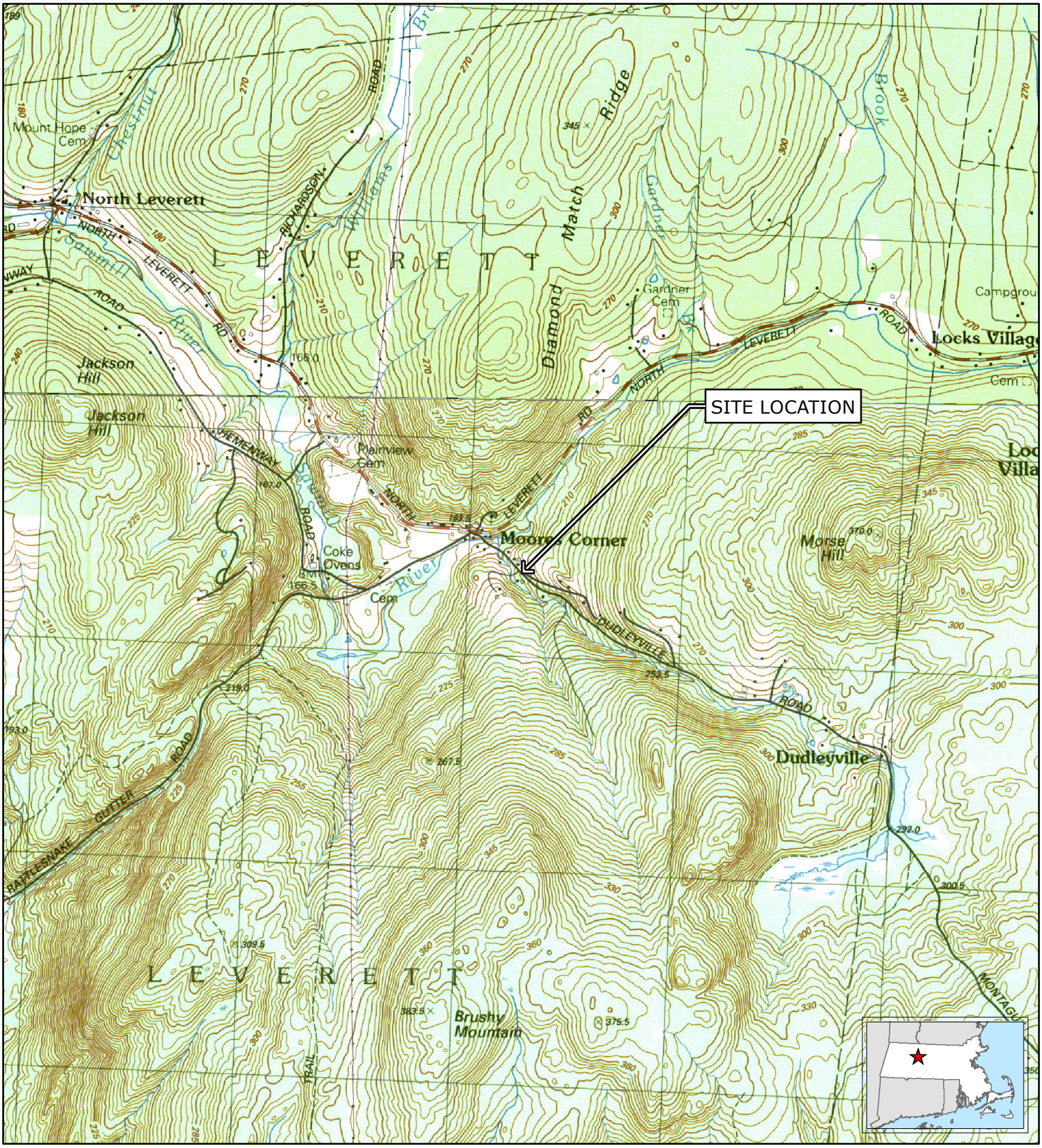

FIGURE 1
SITE LOCATION

Dudleyville Road
Restoration Project
Leverett, Massachusetts

June 2023

Tighe&Bond

Based on USGS Topographic Map for
Shutesbury, MA [Site Quad] and
Millers Falls, MA Revised 1990.
Contour Interval Equals 3-meters and 6-meters respectively.

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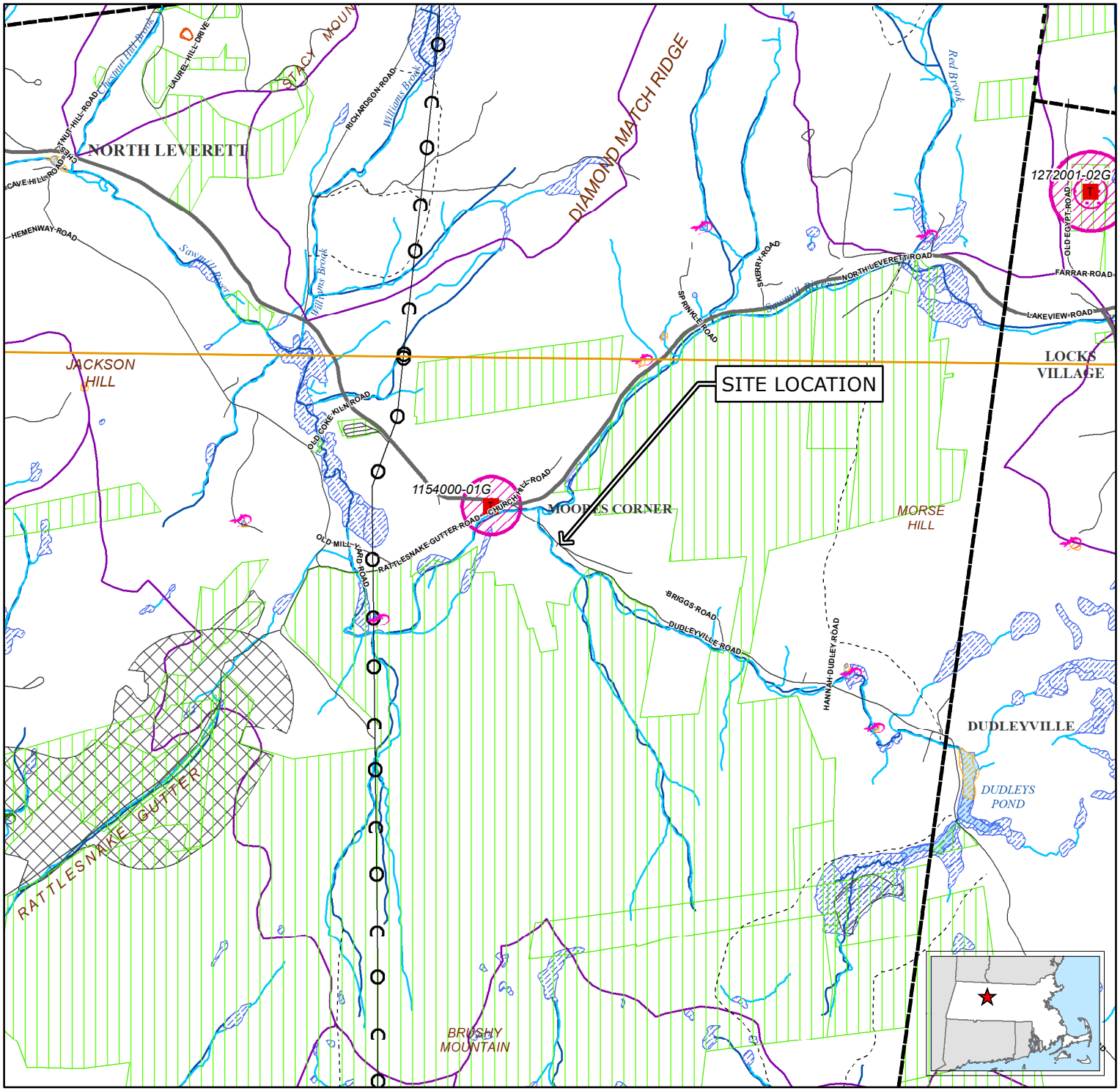

Legend

- NHESP Certified Vernal Pools
- NHESP Potential Vernal Pools
- Non-Landfill Solid Waste Sites
- Proposed Well
- Emergency Surface Water
- Community Public Water Supply - Surface Water
- Community Public Water Supply - Groundwater
- Non-Community Non-Transient Public Water Supply
- Non-Community Transient Public Water Supply
- Limited Access Highway
- Multi-Lane Highway, NOT Limited Access
- Other Numbered Route
- Major Road - Arterials and Collectors
- Minor Street or Road
- Aqueducts
- Hydrologic Connections
- Stream/Intermittent Stream
- Powerline
- Pipeline
- Track or Trail
- Trains
- Public Surface Water Supply Protection Area (Zone A)
- DEP Approved Wellhead Protection Area (Zone I)
- DEP Approved Wellhead Protection Area (Zone II)
- DEP Interim Wellhead Protection Area (IWPA)
- Protected and Recreational Open Space
- Solid Waste Landfill
- Area of Critical Environmental Concern (ACEC)
- NHESP Priority Habitats for Rare Species
- NHESP Estimated Habitats for Rare Wildlife
- EPA Designated Sole Source Aquifer
- Major Drainage Basin
- Sub Drainage Basin
- MassDEP Open Water
- MassDEP Inland Wetlands
- MassDEP Coastal Wetlands
- MassDEP Not Interpreted Wetlands
- Public Surface Water Supply (PSWS)
- Water Bodies
- Non-Potential Drinking Water Source Area - High Yield
- Non-Potential Drinking Water Source Area - Medium Yield
- Potentially Productive Medium Yield Aquifer
- Potentially Productive High Yield Aquifer
- County Boundary
- Municipal Boundary
- USGS Quadrangle Sheet Boundary

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Feet

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FIGURE 2
PRIORITY RESOURCES

Dudleyville Road
Restoration Project
Leverett, Massachusetts

Data source: Bureau of Geographic Information (MassGIS), Commonwealth of Massachusetts, Executive Office of Technology
Data valid as of June 2023.

June 2023

Tighe&Bond

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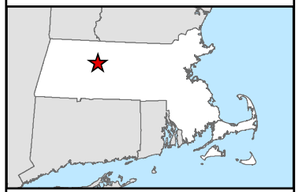
FIGURE 3
ORTHOPHOTOGRAPH



LEGEND

- Culvert
- Stream
- Delineated Bank
- Delineated Wetland Boundary
- 100-Foot Buffer Zone
- 200-Foot Riverfront Area
- Vegetated Wetland Area
- MassDEP Open Water
- MassDEP Inland Wetlands
- MassDEP Coastal Wetlands
- MassDEP Not Interpreted Wetlands
- Parcel Boundary
- Town Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2021).

2. Parcels (FY2023) downloaded from MassGIS and are approximate.
Labled in the map by Parcel ID.

3. Wetlands downloaded from MassGIS.

4. Stream based on MassDEP Hydrology and field delineation.

Dudleyville Road
Restoration Project
Leverett, Massachusetts

November 2023

Page# 1

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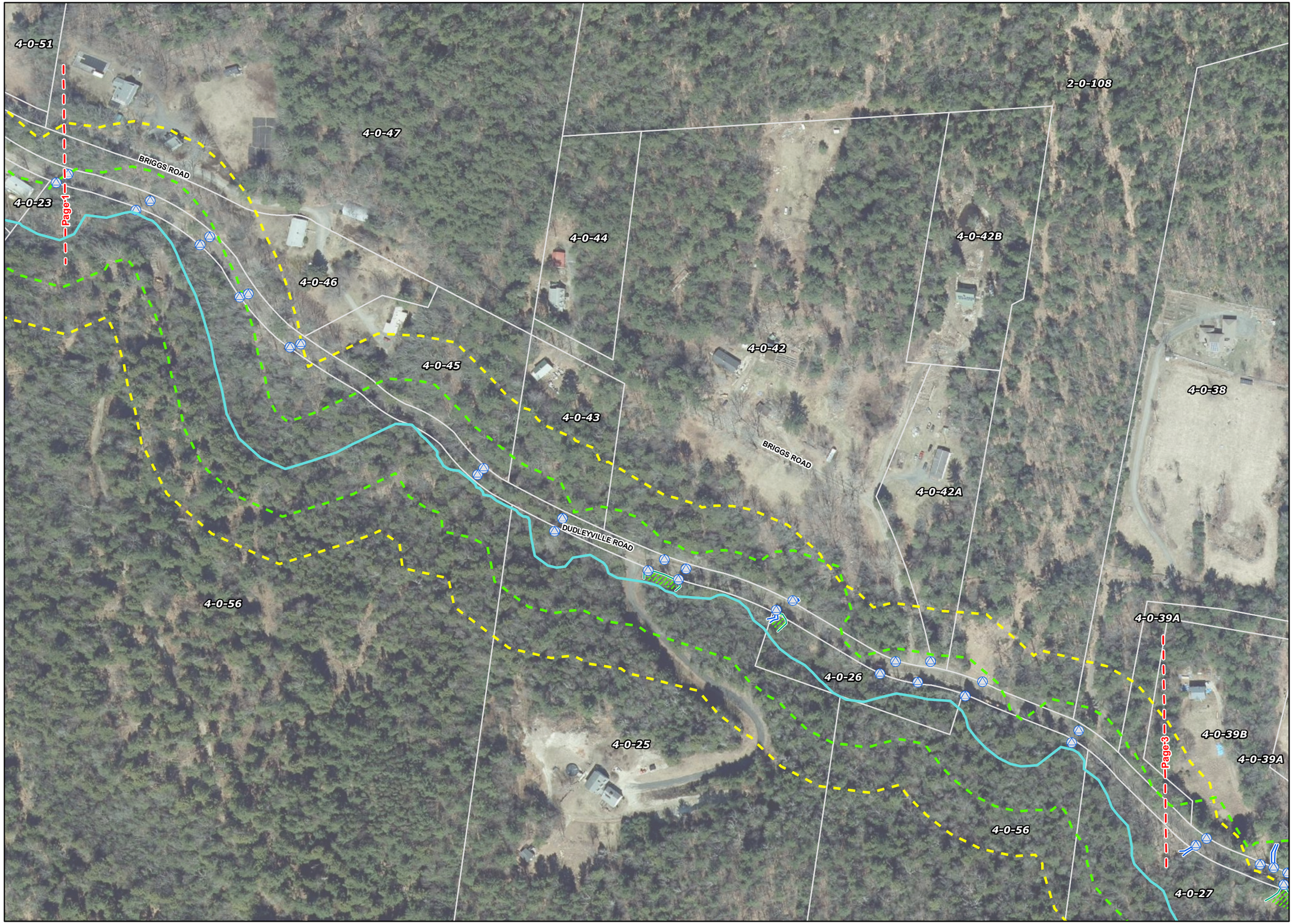
FIGURE 3
ORTHOPHOTOGRAPH



LEGEND

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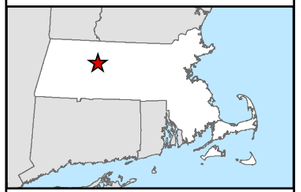
LOCUS MAP



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Dudleyville Road
Restoration Project
Leverett, Massachusetts

November 2023

Page# 2

Tighe&Bond

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FIGURE 3
ORTHOPHOTOGRAPH



LEGEND

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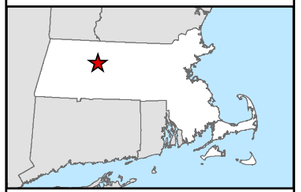
- MassDEP Open Water
- MassDEP Inland Wetlands
- MassDEP Coastal Wetlands
- MassDEP Not Interpreted Wetlands
- Parcel Boundary
- Town Boundary

LOCUS MAP



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NOTES

1. Based on MassGIS Color Orthophotography (2021).

2. Parcels (FY2023) downloaded from MassGIS and are approximate.
Labled in the map by Parcel ID.

3. Wetlands downloaded from MassGIS.

4. Stream based on MassDEP Hydrology and field delineation.

Dudleyville Road
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Page# 3

Tighe&Bond

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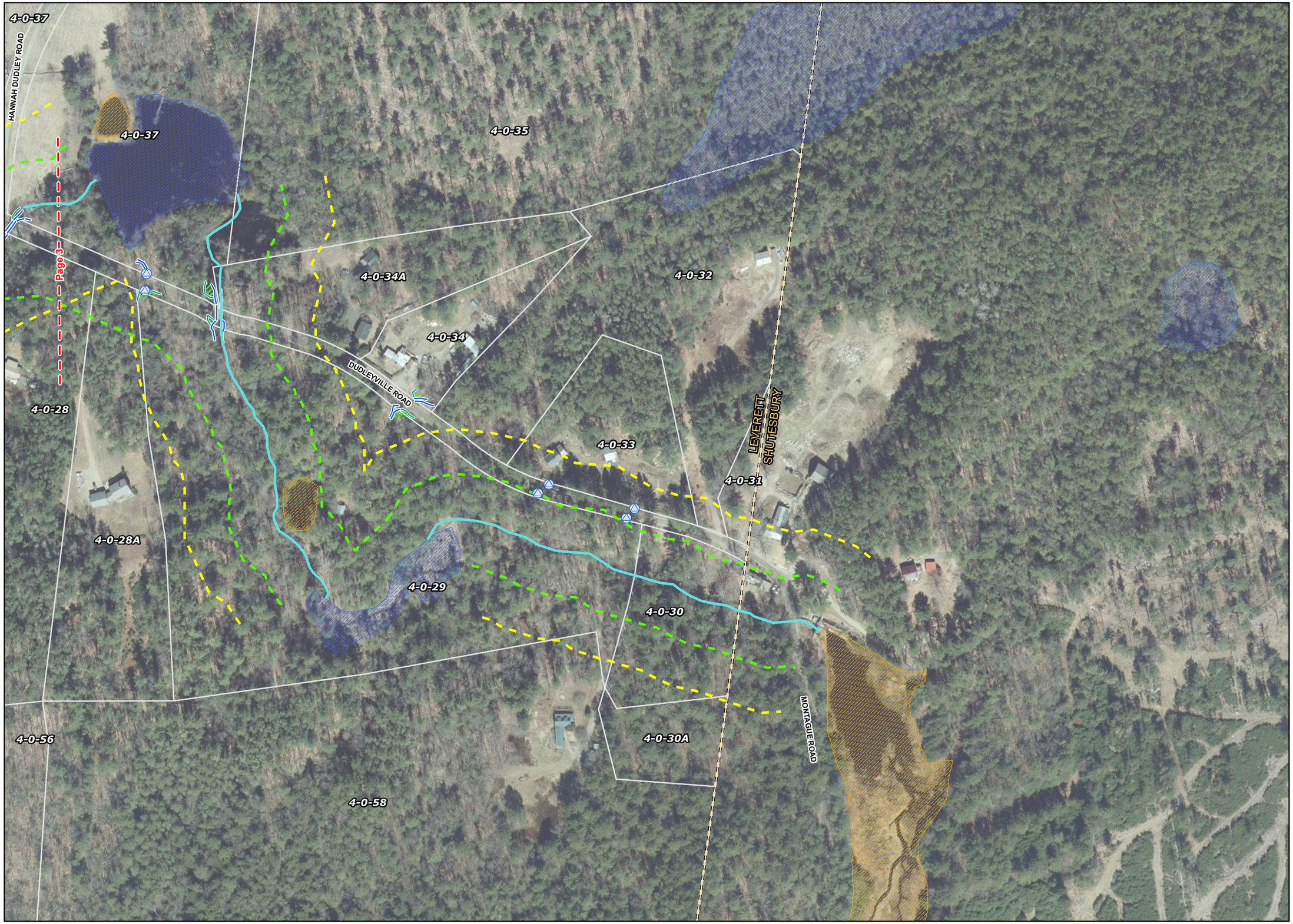
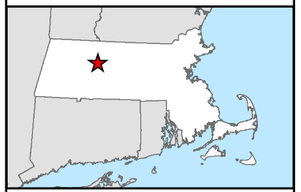


FIGURE 3
ORTHOPHOTOGRAPH

LEGEND

- Culvert
- Stream
- Delineated Bank
- Delineated Wetland Boundary
- 100-Foot Buffer Zone
- 200-Foot Riverfront Area
- Vegetated Wetland Area
- MassDEP Open Water
- MassDEP Inland Wetlands
- MassDEP Coastal Wetlands
- MassDEP Not Interpreted Wetlands
- Parcel Boundary
- Town Boundary

LOCUS MAP



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1. Based on MassGIS Color Orthophotography (2021).

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4. Stream based on MassDEP Hydrology and field delineation.

Dudleyville Road
Restoration Project
Leverett, Massachusetts

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Page# 4

Tighe&Bond

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ATTACHMENT B

SITE PHOTOGRAPHS

Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 1	**Date:** 5/11/2023	**Direction Taken:** West
Description: Flag Series B1B-1/2 marking MAHW of Sawmill River at 2 Dudleyville Road, Leverett, MA, 01054		



Photograph No.: 2	**Date:** 5/11/2023	**Direction Taken:** Northeast
Description: Flag Series B1B-3 TT BVW1D-1 marking MAHW of Sawmill River at 2 Dudleyville Road, Leverett, MA, 01054		



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 3	**Date:** 5/11/2023	**Direction Taken:** East

Description: View of the Sawmill River Bypass Channel delineated as Flag Series BVW1C-1/3, and BVW1D-1/3.



Photograph No.: 4	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: View of the Sawmill River Bypass Channel. Shown : Flag Series BVW1C-3



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 5	**Date:** 5/25/2023	**Direction Taken:** Southeast

Description: Overview of Bank Series B1B-1/3 and BVW1C-D-1/3 MAHW below Dudleyville Road.



Photograph No.: 6	**Date:** 5/11/2023	**Direction Taken:** East

Description: Upstream view of the Sawmill River Bank Series B1A-B-1/5 and BVW1C-D-1/3



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 7	**Date:** 5/11/2023	**Direction Taken:** West
Description: Downstream view of the Sawmill River at 3 and 1 Dudleyville Road, Leverett, MA, 01054.		



Photograph No.: 8	**Date:** 5/11/2023	**Direction Taken:** North
Description: View of the Flag Series B1F-1/4 and current conditions of Bridge 1 at 1 Dudleyville Road, Leverett, MA, 01054		



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 9	**Date:** 5/11/2023	**Direction Taken:** Southeast
Description: View of Flag Series B1E-1/4 at 3 Dudleyville Road as seen from B1F-3 at 1 Dudleyville Road, Leverett, MA.		



Photograph No.: 10	**Date:** 5/11/2023	**Direction Taken:** West
Description: View of Flag Series B1F-1/3 from 1 Dudleyville Road, Leverett, MA.		



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 11	**Date:** 5/11/2023	**Direction Taken:** North
Description: View of Bridge 2 Culvert and Dudleyville Road crossing from Flag Series B2B-2 at 5 Dudleyville Road, Leverett, MA.		



Photograph No.: 12	**Date:** 5/11/2023	**Direction Taken:** South
Description: Upstream view of Dudleyville Brook from Bridge 2 viewing Flag Series B2A-1/4 and B2B-1/4. Background property is 7 Dudleyville Road		



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 13	**Date:** 5/11/2023	**Direction Taken:** East
Description: View of Flag Series B2A-2/4 at 7 Dudleyville Road, Leverett, MA.		



Photograph No.: 14	**Date:** 5/11/2023	**Direction Taken:** South
Description: View of Flag Series B2B-1/4 from B2B-3 at 7 Dudleyville Road, Leverett, MA.		



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.15:	**Date:** 5/11/2023	**Direction Taken:** North

Description: View of Bridge 2 and Flag Series B2B-1/4 from B2B-3 at 7 Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 16	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: View of uppermost Inlet of Culvert 1 at 12 Briggs Road, Leverett, MA.



Photograph No.: 17	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: Downslope view of Outlet Channel from 12 Briggs Road, conveying to Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.18:	**Date:** 5/11/2023	**Direction Taken:** North

Description: Upslope view of Culvert 1 at 12 Briggs Road as viewed from Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.19:	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: View of Stormwater Drainage Channel at 19 Dudleyville Road Leverett, MA, draining to Dudleyville Brook.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.20:	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: Upstream view of Culvert 2 at 23 Dudleyville Road Leverett, MA, draining to Dudleyville Brook.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.21:	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: Inlet view of Culvert 2 at 23 Dudleyville Road Leverett, MA, draining to Dudleyville Brook.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.22:	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: Outlet Channel conveying stormwater from Culvert 2 at 23 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 23	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: Culvert 2 Inlet, Roadside Ditch, Dudleyville Road, Leverett, MA.



Photograph No.: 24	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 3 outlet, conveying to Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 25	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: Culvert 3 Outlet Channel at Dudleyville Brook, Dudleyville Road, Leverett, MA.



Photograph No.: 26	**Date:** 5/11/2023	**Direction Taken:** East

Description: Cowls Lumber Bridge as viewed from Culvert 3 junction at Dudleyville Brook (upstream), Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.27:	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Roadside Stormwater Culvert 4, Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.28:	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: Culvert 4 Outlet Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.29:	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: Roadside Stormwater Channel, Culvert 5 Inlet, Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.30:	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 5 Outlet, Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 31	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 5 Inlet at roadside Stormwater Channel, Dudleyville Road, Leverett, MA.



Photograph No.: 32	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: View of the drainage channel conveying Dudleyville Road Stormwater from Culvert 5 to Dudleyville Brook, Dudleyville Road, Leverett, MA..



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 33	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Culvert 5 drainage channel and overturned tree roots. Dudleyville Road, Leverett, MA.



Photograph No.: 34	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: View of Dudleyville Road and Culvert 6 outlet area. Property in background is 24 Briggs Road. Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 35	**Date:** 5/11/2023	**Direction Taken:** North
Description: Culvert 6 Outlet, Dudleyville Road, Leverett, MA..		



Photograph No.: 36	**Date:** 5/11/2023	**Direction Taken:** North
Description: View of Culvert 6 Outlet damage, Dudleyville Road, Leverett, MA.		



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.37:	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 7 Inlet, Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 38	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: Culvert 7 Outlet, Dudleyville Road, Leverett, MA.



Photograph No.: 39	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert 7 Outlet drainage area looking downstream with Dudleyville Brook and Dudleyville Road, Leverett, MA..



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 40	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: Culvert 7 Outlet, Posted Conservation Easement Property, Dudleyville Road, Leverett, MA.



Photograph No.: 41	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 7 Outlet drainage area looking upstream Dudleyville Brook, Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.42:	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Culvert 7 area with Conservation Easement Markings, Dudleyville Road and Brook, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 43	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 8 roadside ditch, Dudleyville Road.



Photograph No.: 44	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert 8 Inlet at roadside stormwater ditch.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.45:	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert 8 Outlet looking upslope, Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 46	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert 8 Inlet at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 47	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 8 Outlet, Dudleyville Brook — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

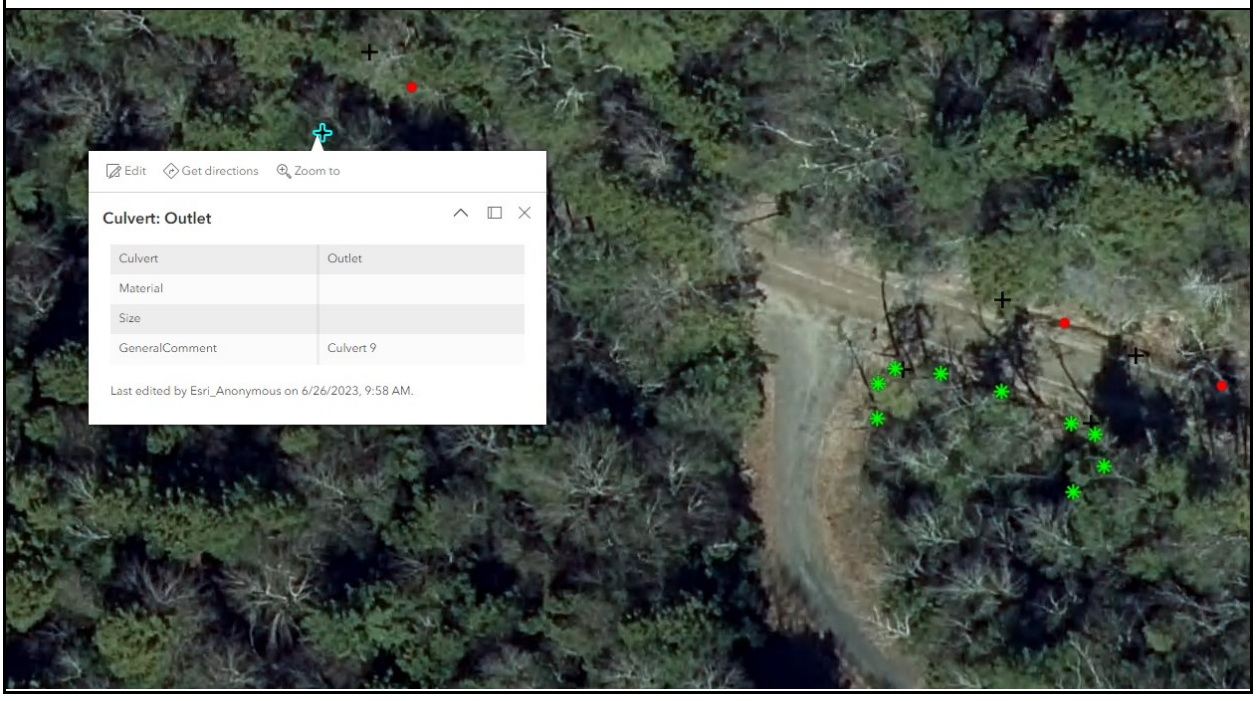
Photograph No.: 48	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: Area of Culvert 9 Inlet at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 49	**Date:** 5/11/2023	**Direction Taken:** N/A

Description: Culvert 9 Outlet, Dudleyville Brook (Not Pictured) Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 50	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert 10 inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 51	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: Culvert 10 Outlet discharges to BVW-3 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 52	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 11 inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 53	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: Culvert 11 Outlet discharges to BVW-3 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 54	**Date:** 5/11/2023	**Direction Taken:** North

Description: BVW 3, Up-gradient — Dudleyville Road, Leverett, MA.



Photograph No.: 55	**Date:** 5/11/2023	**Direction Taken:** East

Description: BVW-3, Road View — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 56	**Date:** 5/11/2023	**Direction Taken:** West

Description: BVW 3, Downstream — Dudleyville Road, Leverett, MA.



Photograph No.: 57	**Date:** 5/11/2023	**Direction Taken:** South

Description: BVW-3, Down-gradient — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 58	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 12 inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 59	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert 12 Outlet discharges to BVW-4 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 60	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: BVW 4, Up-gradient — Dudleyville Road, Leverett, MA.



Photograph No.: 61	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: BVW-4, Down-gradient — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 62	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Culvert 13 inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 63	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert 13 Outlet discharges to Dudleyville Brook — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 64	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Culvert 14 inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 65	**Date:** 5/11/2023	**Direction Taken:** South

Description: Culvert 14 Outlet discharges to Dudleyville Brook — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 66	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Culvert 15 Inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 67	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert 15 Outlet discharges to Dudleyville Brook — Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 68	**Date:** 5/11/2023	**Direction Taken:** Southeast
Description: Culvert 16 Inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.		



Photograph No.: 69	**Date:** 5/11/2023	**Direction Taken:** South
Description: Culvert 16 Outlet discharges to Dudleyville Brook — Dudleyville Road, Leverett, MA.		



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 70	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 17 Inlet, at roadside stormwater ditch — Dudleyville Road, Leverett, MA.



Photograph No.: 71	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert 17 Outlet discharges to Bank-5 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 72	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert-17 Outlet & Bank-5 — Dudleyville Road, Leverett, MA.



Photograph No.: 73	**Date:** 5/11/2023	**Direction Taken:** South

Description: Bank-5 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 74	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 18 Outlet, at roadside stormwater ditch — 92 Dudleyville Road, Leverett, MA.



Photograph No.: 75	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert 18 Outlet discharges to Bank-6 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 76	**Date:** 5/11/2023	**Direction Taken:** North

Description: Bank-6, Upstream — Dudleyville Road, Leverett, MA.



Photograph No.: 77	**Date:** 5/11/2023	**Direction Taken:** East

Description: Bank-6 to Culvert 19 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 78	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert 19 Outlet at BVW 7 — Dudleyville Road, Leverett, MA.



Photograph No.: 79	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert 19 Outlet at BVW 7 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 80	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: BVW 7 — Dudleyville Road, Leverett, MA.



Photograph No.: 81	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: BVW 7 — Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 82	**Date:** 5/11/2023	**Direction Taken:** South

Description: Culvert 20 Inlet, at roadside stormwater ditch — 102 Dudleyville Road, Leverett, MA.



Photograph No.: 83	**Date:** 5/11/2023	**Direction Taken:** North

Description: Household Discharge to Culvert-20 at — 102 Dudleyville Road, Leverett, MA



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 84	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: Household Discharge to Culvert-20 at — 102 Dudleyville Road, Leverett, MA.



Photograph No.: 85	**Date:** 5/11/2023	**Direction Taken:** East

Description: Household Discharge to Culvert-20 at — 102 Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 86	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert-20 Outlet to BVW-8 — Dudleyville Road, Leverett, MA.



Photograph No.: 87	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: BVW-8 at — 121 Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 88	**Date:** 5/11/2023	**Direction Taken:** Southeast
Description: BVW-8 at — 121 Dudleyville Road, Leverett, MA.		



Photograph No.: 89	**Date:** 5/11/2023	**Direction Taken:** West
Description: Culvert-21 Inlet, at roadside stormwater ditch Culvert-21 Outlet to BVW-9 — Dudleyville Road, Leverett, MA.		



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 90	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert-21 Outlet to BVW-9 at — 102 Dudleyville Road, Leverett, MA.



Photograph No.: 91	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: BVW-9 at — 102 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 92	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert-21 Outlet to BVW-9 at — 102 Dudleyville Road, Leverett, MA.



Photograph No.: 93	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert-22 at — 114 Dudleyville Road, Leverett, MA



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 94	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: BVW-10 at — 114 Dudleyville Road, Leverett, MA.



Photograph No.: 95	**Date:** 5/11/2023	**Direction Taken:** North

Description: BVW-10 at — 114 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 96	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Culvert-22 Inlet at — 114 Dudleyville Road, Leverett, MA.



Photograph No.: 97	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: Culvert-22 Outlet, at roadside stormwater ditch — 102 Dudleyville Road.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 98	**Date:** 5/11/2023	**Direction Taken:** Southeast

Description: Culvert-23 Inlet at Bank-11 B / C — 114 Dudleyville Road, Leverett, MA.



Photograph No.: 99	**Date:** 5/11/2023	**Direction Taken:** South

Description: Culvert-23 Downstream at Bank-11 B / C — 114 Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 100	**Date:** 5/11/2023	**Direction Taken:** North

Description: Culvert-23 Outlet at BVW-11-A — 114 Dudleyville Road, Leverett, MA.



Photograph No.: 101	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: -23 Outlet at BVW-11-A — 114 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 102	**Date:** 5/11/2023	**Direction Taken:** South

Description: Bank-12 D/E Upstream & BVW-12 at Culvert-24 / 25 — 0 Dudleyville Road, Leverett, MA.



Photograph No.: 103	**Date:** 5/11/2023	**Direction Taken:** North

Description: Bank-12 A/C Downstream & BVW-12 at Culvert-24 / 25 — 114 / 140 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 104	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert-24 / 25 at — 114 / 140 Dudleyville Road, Leverett, MA.



Photograph No.: 105	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert-24 / 25 — 0 / 140 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 106	**Date:** 5/11/2023	**Direction Taken:** Northwest

Description: Culvert-24 / 25 Inlet & Bank—BVW-12 at — 114 / 140 Dudleyville Road, Leverett, MA.



Photograph No.: 107	**Date:** 5/11/2023	**Direction Taken:** South

Description: Culvert-24 / 25 Outlet & Bank / BVW-12 at — 0 / 140 Dudleyville Road, Leverett, MA.



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 108	**Date:** 5/11/2023	**Direction Taken:** Northwest
Description: Culvert-26 Inlet at Bank-13 A/C & BVW-13B — 150 Dudleyville Road, Leverett, MA.		



Photograph No.: 109	**Date:** 5/11/2023	**Direction Taken:** South
Description: Culvert-26 Outlet at Bank-13 D / E & BVW-13 F — 0 Dudleyville Road, Leverett, MA.		



Photographic Log

Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 110	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert-27 Inlet at — 160 Dudleyville Road, Leverett, MA.



Photograph No.: 111	**Date:** 5/11/2023	**Direction Taken:** Southwest

Description: Culvert-27 Outlet (Buried) at — 0 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 112	**Date:** 5/11/2023	**Direction Taken:** West

Description: Culvert-28 Inlet at — 163 Dudleyville Road, Leverett, MA.



Photograph No.: 113	**Date:** 5/11/2023	**Direction Taken:** East

Description: Culvert-28 Outlet (Buried) at — 163 Dudleyville Road, Leverett, MA.



Client: Town of Leverett **Job Number:** L0792-003

Site: Dudleyville Road Restoration Evaluation
Existing Conditions Documentation

Photograph No.: 114	**Date:** 5/11/2023	**Direction Taken:** Northeast

Description: Culvert-28 Outlet at — 163 Dudleyville Road, Leverett, MA.



Photograph No.: 115	**Date:** 5/11/2023	**Direction Taken:** South

Description: Culvert-28 Outlet (Buried) at — 163 Dudleyville Road, Leverett, MA.



ATTACHMENT C

CONCEPTUAL OPINION OF PROBABLE CONSTRUCTION COST

Tighe&Bond

Dudleyville Road Reconstruction Evaluation
Leverett, MA

Conceptual Opinion of Probable Construction Cost

Option 1: Gravel Road Resurfacing

December 2023

ITEM NO.	QUANTITY	UNIT	ITEM	UNIT PRICE	AMOUNT
101.	2	A	Clearing and Grubbing	$ 50,000	$ 100,000
120.	7,300	CY	Earth Excavation	$ 45	$ 328,500
121.	100	CY	Class A Rock Excavation	$ 125	$ 12,500
141.1	40	CY	Test Pit for Exploration	$ 100	$ 4,000
151.	5,100	CY	Gravel Borrow	$ 55	$ 280,500
170.	14,000	SY	Fine Grading and Compacting - Subgrade Area	$ 6	$ 77,000
209.1	13	EA	Drop Inlet, Type DF	$ 5,000	$ 65,000
222.3	13	EA	Frame and Grate (or Cover) Municipal Standard	$ 1,150	$ 14,950
235.18	35	EA	Headwall	$ 3,450	$ 120,750
252.12	400	FT	12 Inch Corrugated Plastic Pipe	$ 104	$ 41,600
252.18	400	FT	18 Inch Corrugated Plastic Pipe	$ 138	$ 55,200
252.24	300	FT	24 Inch Corrugated Plastic Pipe	$ 165	$ 49,500
252.30	100	FT	30 Inch Corrugated Plastic Pipe	$ 190	$ 19,000
252.36	100	FT	36 Inch Corrugated Plastic Pipe	$ 215	$ 21,500
258.	200	SY	Stone for Pipe Ends	$ 150.00	$ 30,000
402.	1,350	CY	Dense Graded Crushed Stone for Sub-Base	$ 100.00	$ 135,000
440.1	3,000	GAL	Calcium Chloride For Roadway Dust Control	$ 0.50	$ 1,500.00
443.	20	MGL	Water for Roadway Dust Control	$ 50	$ 1,000
450.23	300	TON	Superpave Surface Course - 12.5 (SSC - 12.5)	$ 270	$ 81,000
452.	200	GAL	Asphalt Emulsion for Tack Coat	$ 11	$ 2,150
620.12	100	FT	Guardail, TL-2 (Single Faced)	$ 36	$ 3,575
627.92	2	EA	Guardrail Flared End Treatment, TL-2	$ 5,800	$ 11,600
698.3	7,000	SY	Geotextile Fabric for Separation	$ 6	$ 42,000
748.	1	LS	Mobilization	$ 48,000	$ 48,000
751.	200	CY	Loam for Roadsides	$ 80	$ 16,000
756.	1	LS	NPDES Stormwater Pollution Prevention Plan	$ 7,000	$ 7,000
765.	1,300	SY	Seeding	$ 2	$ 2,990
767.121	4,000	FT	Sediment Control Barrier	$ 6	$ 24,000
767.9	1,300	SY	Jute Mesh	$ 6	$ 7,800
852.	100	SF	Safety Signing for Traffic Management	$ 25	$ 2,500
986.	600	TON	Modified Rockfill	$ 75	$ 45,000
998.1	1	ALL	Monthly Price Adjustment for Hot Mix Asphalt Mixtures	$ 10,000	$ 10,000
998.2	1	ALL	Monthly Price Adjustment for Diesel Fuel	$ 5,000	$ 5,000
998.3	1	ALL	Monthly Price Adjustment for Gasoline	$ 5,000	$ 5,000
998.4	1	ALL	Monthly Price Adjustment for Portland Cement in Concrete	$ 1,000	$ 1,000
998.5	1	ALL	Monthly Price Adjustment for Steel	$ 1,000	$ 1,000

Construction Sub Total:	$	1,674,000
30% Construction Contingency:	$	503,000
Construction Total:	**$**	**2,177,000**
Engineering Design & Permitting Services (8%):	$	133,920
Construction Engineering Services (10%):	$	167,400
Project Total:	**$**	**2,478,320**
Say:	**$**	**2,500,000**

Tighe&Bond

Dudleyville Road Reconstruction Evaluation
Leverett, MA

Conceptual Opinion of Probable Construction Cost

Option 2: Chipseal

December 2023

ITEM NO.	QUANTITY	UNIT	ITEM	UNIT PRICE	AMOUNT
101.	2	A	Clearing and Grubbing	$ 50,000	$ 100,000
120.	7,300	CY	Earth Excavation	$ 45	$ 328,500
121.	100	CY	Class A Rock Excavation	$ 125	$ 12,500
141.1	40	CY	Test Pit for Exploration	$ 100	$ 4,000
151.	5,100	CY	Gravel Borrow	$ 55	$ 280,500
170.	14,000	SY	Fine Grading and Compacting - Subgrade Area	$ 6	$ 77,000
209.1	13	EA	Drop Inlet, Type DF	$ 5,000	$ 65,000
222.3	13	EA	Frame and Grate (or Cover) Municipal Standard	$ 1,150	$ 14,950
235.18	35	EA	Headwall	$ 3,450	$ 120,750
252.12	400	FT	12 Inch Corrugated Plastic Pipe	$ 104	$ 41,600
252.18	400	FT	18 Inch Corrugated Plastic Pipe	$ 138	$ 55,200
252.24	300	FT	24 Inch Corrugated Plastic Pipe	$ 165	$ 49,500
252.30	100	FT	30 Inch Corrugated Plastic Pipe	$ 190	$ 19,000
252.36	100	FT	36 Inch Corrugated Plastic Pipe	$ 215	$ 21,500
258.	200	SY	Stone for Pipe Ends	$ 150	$ 30,000
402.	1,350	CY	Dense Graded Crushed Stone for Sub-Base	$ 100	$ 135,000
440.1	3,000	GAL	Calcium Chloride For Roadway Dust Control	$ 0.50	$ 1,500.00
443.	20	MGL	Water for Roadway Dust Control	$ 50	$ 1,000
450.23	300	TON	Superpave Surface Course - 12.5 (SSC - 12.5)	$ 270	$ 81,000
452.	200	GAL	Asphalt Emulsion for Tack Coat	$ 11	$ 2,150
455.	12,200	SY	Chipseal	$ 36	$ 439,200
620.12	100	FT	Guardail, TL-2 (Single Faced)	$ 36	$ 3,575
627.92	2	EA	Guardrail Flared End Treatment, TL-2	$ 5,800	$ 11,600
698.3	7,000	SY	Geotextile Fabric for Separation	$ 6	$ 42,000
748.	1	LS	Mobilization	$ 61,000	$ 61,000
751.	200	CY	Loam for Roadsides	$ 80	$ 16,000
756.	1	LS	NPDES Stormwater Pollution Prevention Plan	$ 7,000	$ 7,000
765.	1,300	SY	Seeding	$ 2	$ 2,990
767.121	4,000	FT	Sediment Control Barrier	$ 6	$ 24,000
767.9	1,300	SY	Jute Mesh	$ 6	$ 7,800
852.	100	SF	Safety Signing for Traffic Management	$ 25	$ 2,500
986.	600	TON	Modified Rockfill	$ 75	$ 45,000
998.1	1	ALL	Monthly Price Adjustment for Hot Mix Asphalt Mixtures	$ 10,000	$ 10,000
998.2	1	ALL	Monthly Price Adjustment for Diesel Fuel	$ 5,000	$ 5,000
998.3	1	ALL	Monthly Price Adjustment for Gasoline	$ 5,000	$ 5,000
998.4	1	ALL	Monthly Price Adjustment for Portland Cement in Concrete	$ 1,000	$ 1,000
998.5	1	ALL	Monthly Price Adjustment for Steel	$ 1,000	$ 1,000

Construction Sub Total:	$	2,126,000
30% Construction Contingency:	$	638,000
Construction Total:	**$**	**2,764,000**
Engineering Design & Permitting Services (8%):	$	170,080
Construction Engineering Services (10%):	$	212,600
Project Total:	**$**	**3,146,680**
Say:	**$**	**3,200,000**

Tighe&Bond

Dudleyville Road Reconstruction Evaluation
Leverett, MA

Conceptual Opinion of Probable Construction Cost

Option 3: Full Depth Reconstruction

December 2023

ITEM NO.	QUANTITY	UNIT	ITEM	UNIT PRICE	AMOUNT
101.	2	A	Clearing and Grubbing	$ 50,000	$ 100,000
120.	7,300	CY	Earth Excavation	$ 45	$ 328,500
121.	100	CY	Class A Rock Excavation	$ 125	$ 12,500
141.1	40	CY	Test Pit for Exploration	$ 100	$ 4,000
151.	5,100	CY	Gravel Borrow	$ 55	$ 280,500
170.	14,000	SY	Fine Grading and Compacting - Subgrade Area	$ 6	$ 77,000
209.1	13	EA	Drop Inlet, Type DF	$ 5,000	$ 65,000
222.3	13	EA	Frame and Grate (or Cover) Municipal Standard	$ 1,150	$ 14,950
235.18	35	EA	Headwall	$ 3,450	$ 120,750
252.12	400	FT	12 Inch Corrugated Plastic Pipe	$ 104	$ 41,600
252.18	400	FT	18 Inch Corrugated Plastic Pipe	$ 138	$ 55,200
252.24	300	FT	24 Inch Corrugated Plastic Pipe	$ 165	$ 49,500
252.30	100	FT	30 Inch Corrugated Plastic Pipe	$ 190	$ 19,000
252.36	100	FT	36 Inch Corrugated Plastic Pipe	$ 215	$ 21,500
258.	200	SY	Stone for Pipe Ends	$ 150	$ 30,000
440.1	3,000	GAL	Calcium Chloride For Roadway Dust Control	$ 0.50	$ 1,500.00
443.	20	MGL	Water for Roadway Dust Control	$ 50	$ 1,000
450.23	1,400	TON	Superpave Surface Course - 12.5 (SSC - 12.5)	$ 270	$ 378,000
450.32	2,100	TON	Superpave Intermediate Course - 19.0 (SIC - 19.0)	$ 175	$ 367,500
452.	1,100	GAL	Asphalt Emulsion for Tack Coat	$ 11	$ 11,825
620.12	100	FT	Guardail, TL-2 (Single Faced)	$ 36	$ 3,575
627.92	2	EA	Guardrail Flared End Treatment, TL-2	$ 5,800	$ 11,600
698.3	7,000	SY	Geotextile Fabric for Separation	$ 6	$ 42,000
748.	1	LS	Mobilization	$ 64,000	$ 64,000
751.	200	CY	Loam for Roadsides	$ 80	$ 16,000
756.	1	LS	NPDES Stormwater Pollution Prevention Plan	$ 7,000	$ 7,000
765.	1,300	SY	Seeding	$ 2	$ 2,990
767.121	4,000	FT	Sediment Control Barrier	$ 6	$ 24,000
767.9	1,300	SY	Jute Mesh	$ 6	$ 7,150
852.	100	SF	Safety Signing for Traffic Management	$ 25	$ 2,500
986.	600	TON	Modified Rockfill	$ 75	$ 45,000
998.1	1	ALL	Monthly Price Adjustment for Hot Mix Asphalt Mixtures	$ 10,000	$ 10,000
998.2	1	ALL	Monthly Price Adjustment for Diesel Fuel	$ 5,000	$ 5,000
998.3	1	ALL	Monthly Price Adjustment for Gasoline	$ 5,000	$ 5,000
998.4	1	ALL	Monthly Price Adjustment for Portland Cement in Concrete	$ 1,000	$ 1,000
998.5	1	ALL	Monthly Price Adjustment for Steel	$ 1,000	$ 1,000

Construction Sub Total:	$	2,228,000
30% Construction Contingency:	$	669,000
Construction Total:	**$**	**2,897,000**
Engineering Design & Permitting Services (8%):	$	178,240
Construction Engineering Services (10%):	$	222,800
Project Total:	**$**	**3,298,040**
Say:	**$**	**3,300,000**

Tighe&Bond

Dudleyville Road Reconstruction Evaluation
Leverett, MA

Conceptual Opinion of Probable Construction Cost

Option 4: Chipseal over Hot Mix Asphalt

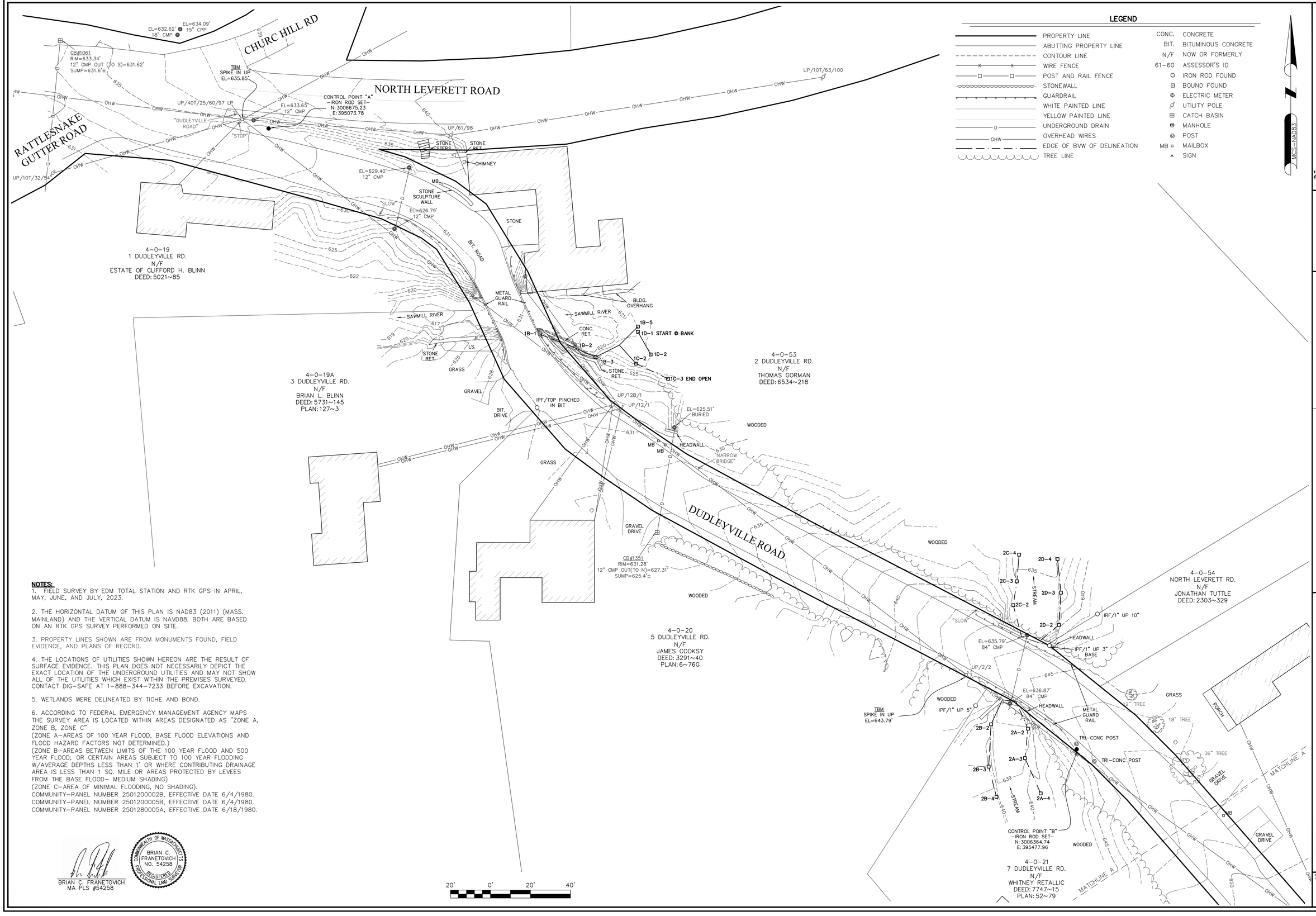
December 2023

ITEM NO.	QUANTITY	UNIT	ITEM	UNIT PRICE	AMOUNT
101.	2	A	Clearing and Grubbing	$ 50,000	$ 100,000
120.	7,300	CY	Earth Excavation	$ 45	$ 328,500
121.	100	CY	Class A Rock Excavation	$ 125	$ 12,500
141.1	40	CY	Test Pit for Exploration	$ 100	$ 4,000
151.	5,100	CY	Gravel Borrow	$ 55	$ 280,500
170.	14,000	SY	Fine Grading and Compacting - Subgrade Area	$ 6	$ 77,000
209.1	13	EA	Drop Inlet, Type DF	$ 5,000	$ 65,000
222.3	13	EA	Frame and Grate (or Cover) Municipal Standard	$ 1,150	$ 14,950
235.18	35	EA	Headwall	$ 3,450	$ 120,750
252.12	400	FT	12 Inch Corrugated Plastic Pipe	$ 104	$ 41,600
252.18	400	FT	18 Inch Corrugated Plastic Pipe	$ 138	$ 55,200
252.24	300	FT	24 Inch Corrugated Plastic Pipe	$ 165	$ 49,500
252.30	100	FT	30 Inch Corrugated Plastic Pipe	$ 190	$ 19,000
252.36	100	FT	36 Inch Corrugated Plastic Pipe	$ 215	$ 21,500
258.	200	SY	Stone for Pipe Ends	$ 150	$ 30,000
440.1	3,000	GAL	Calcium Chloride For Roadway Dust Control	$ 0.50	$ 1,500.00
443.	20	MGL	Water for Roadway Dust Control	$ 50	$ 1,000
450.23	1,400	TON	Superpave Surface Course - 12.5 (SSC - 12.5)	$ 270	$ 378,000
450.32	2,100	TON	Superpave Intermediate Course - 19.0 (SIC - 19.0)	$ 175	$ 367,500
452.	1,100	GAL	Asphalt Emulsion for Tack Coat	$ 11	$ 11,825
455.	12,200	SY	Chipseal	$ 36	$ 439,200
620.12	100	FT	Guardail, TL-2 (Single Faced)	$ 36	$ 3,575
627.92	2	EA	Guardrail Flared End Treatment, TL-2	$ 5,800	$ 11,600
698.3	7,000	SY	Geotextile Fabric for Separation	$ 6	$ 42,000
748.	1	LS	Mobilization	$ 78,000	$ 78,000
751.	200	CY	Loam for Roadsides	$ 80	$ 16,000
756.	1	LS	NPDES Stormwater Pollution Prevention Plan	$ 7,000	$ 7,000
765.	1,300	SY	Seeding	$ 2	$ 2,990
767.121	4,000	FT	Sediment Control Barrier	$ 6	$ 24,000
767.9	1,300	SY	Jute Mesh	$ 6	$ 7,150
852.	100	SF	Safety Signing for Traffic Management	$ 25	$ 2,500
986.	600	TON	Modified Rockfill	$ 75	$ 45,000
998.1	1	ALL	Monthly Price Adjustment for Hot Mix Asphalt Mixtures	$ 10,000	$ 10,000
998.2	1	ALL	Monthly Price Adjustment for Diesel Fuel	$ 5,000	$ 5,000
998.3	1	ALL	Monthly Price Adjustment for Gasoline	$ 5,000	$ 5,000
998.4	1	ALL	Monthly Price Adjustment for Portland Cement in Concrete	$ 1,000	$ 1,000
998.5	1	ALL	Monthly Price Adjustment for Steel	$ 1,000	$ 1,000

Construction Sub Total:	$	2,681,000
30% Construction Contingency:	$	805,000
Construction Total:	**$**	**3,486,000**
Engineering Design & Permitting Services (8%):	$	214,480
Construction Engineering Services (10%):	$	268,100
Project Total:	**$**	**3,968,580**
Say:	**$**	**4,000,000**

ATTACHMENT D

SURVEY DRAWINGS



LEGEND

PROPERTY LINE		CONC.	CONCRETE
ABUTTING PROPERTY LINE		BIT.	BITUMINOUS CONCRETE
CONTOUR LINE		N/F	NOW OR FORMERLY
WIRE FENCE		61–60	ASSESSOR'S ID
POST AND RAIL FENCE		○	IRON ROD FOUND
STONEWALL		⊡	BOUND FOUND
GUARDRAIL		⊕	ELECTRIC METER
WHITE PAINTED LINE		⌀	UTILITY POLE
YELLOW PAINTED LINE		⊞	CATCH BASIN
UNDERGROUND DRAIN		ⓜ	MANHOLE
OVERHEAD WIRES		◎	POST
EDGE OF BVW OF DELINEATION		MB ▫	MAILBOX
TREE LINE		⏚	SIGN

MASS-NAD83

NOTES:

1. FIELD SURVEY BY EDM TOTAL STATION AND RTK GPS IN APRIL, MAY, JUNE, AND JULY, 2023.

2. THE HORIZONTAL DATUM OF THIS PLAN IS NAD83 (2011) (MASS. MAINLAND) AND THE VERTICAL DATUM IS NAVD88. BOTH ARE BASED ON AN RTK GPS SURVEY PERFORMED ON SITE.

3. PROPERTY LINES SHOWN ARE FROM MONUMENTS FOUND, FIELD EVIDENCE, AND PLANS OF RECORD.

4. THE LOCATIONS OF UTILITIES SHOWN HEREON ARE THE RESULT OF SURFACE EVIDENCE. THIS PLAN DOES NOT NECESSARILY DEPICT THE EXACT LOCATION OF THE UNDERGROUND UTILITIES AND MAY NOT SHOW ALL OF THE UTILITIES WHICH EXIST WITHIN THE PREMISES SURVEYED. CONTACT DIG-SAFE AT 1-888-344-7233 BEFORE EXCAVATION.

5. WETLANDS WERE DELINEATED BY TIGHE AND BOND.

6. ACCORDING TO FEDERAL EMERGENCY MANAGEMENT AGENCY MAPS THE SURVEY AREA IS LOCATED WITHIN AREAS DESIGNATED AS "ZONE A, ZONE B, ZONE C"
(ZONE A–AREAS OF 100 YEAR FLOOD, BASE FLOOD ELEVATIONS AND FLOOD HAZARD FACTORS NOT DETERMINED.)
(ZONE B–AREAS BETWEEN LIMITS OF THE 100 YEAR FLOOD AND 500 YEAR FLOOD; OR CERTAIN AREAS SUBJECT TO 100 YEAR FLOODING W/AVERAGE DEPTHS LESS THAN 1' OR WHERE CONTRIBUTING DRAINAGE AREA IS LESS THAN 1 SQ. MILE OR AREAS PROTECTED BY LEVEES FROM THE BASE FLOOD– MEDIUM SHADING)
(ZONE C–AREA OF MINIMAL FLOODING, NO SHADING).
COMMUNITY–PANEL NUMBER 2501200002B, EFFECTIVE DATE 6/4/1980.
COMMUNITY–PANEL NUMBER 2501200005B, EFFECTIVE DATE 6/4/1980.
COMMUNITY–PANEL NUMBER 2501280005A, EFFECTIVE DATE 6/18/1980.

BRIAN C. FRANETOVICH
MA PLS #54258

COMMONWEALTH OF MASSACHUSETTS
BRIAN C. FRANETOVICH
NO. 54258
REGISTERED PROFESSIONAL LAND SURVEYOR

NORTHEAST SURVEY CONSULTANTS
3 FERRY STREET
STUDIO 1 EAST
EASTHAMPTON, MA 01027
(413) 203-5144

EXISTING CONDITIONS SURVEY

SURVEYOR:	–
DRAFTING:	–
FIELD WORK:	–
PROJECT NUMBER:	23-039
DRAWING NAME:	23-039.DWG

BCF ENGINEER:
JED DESIGN:
NAE MAK HORZ. SCALE: 1"=20'
VERT. SCALE:
DATE: 7-13-2023

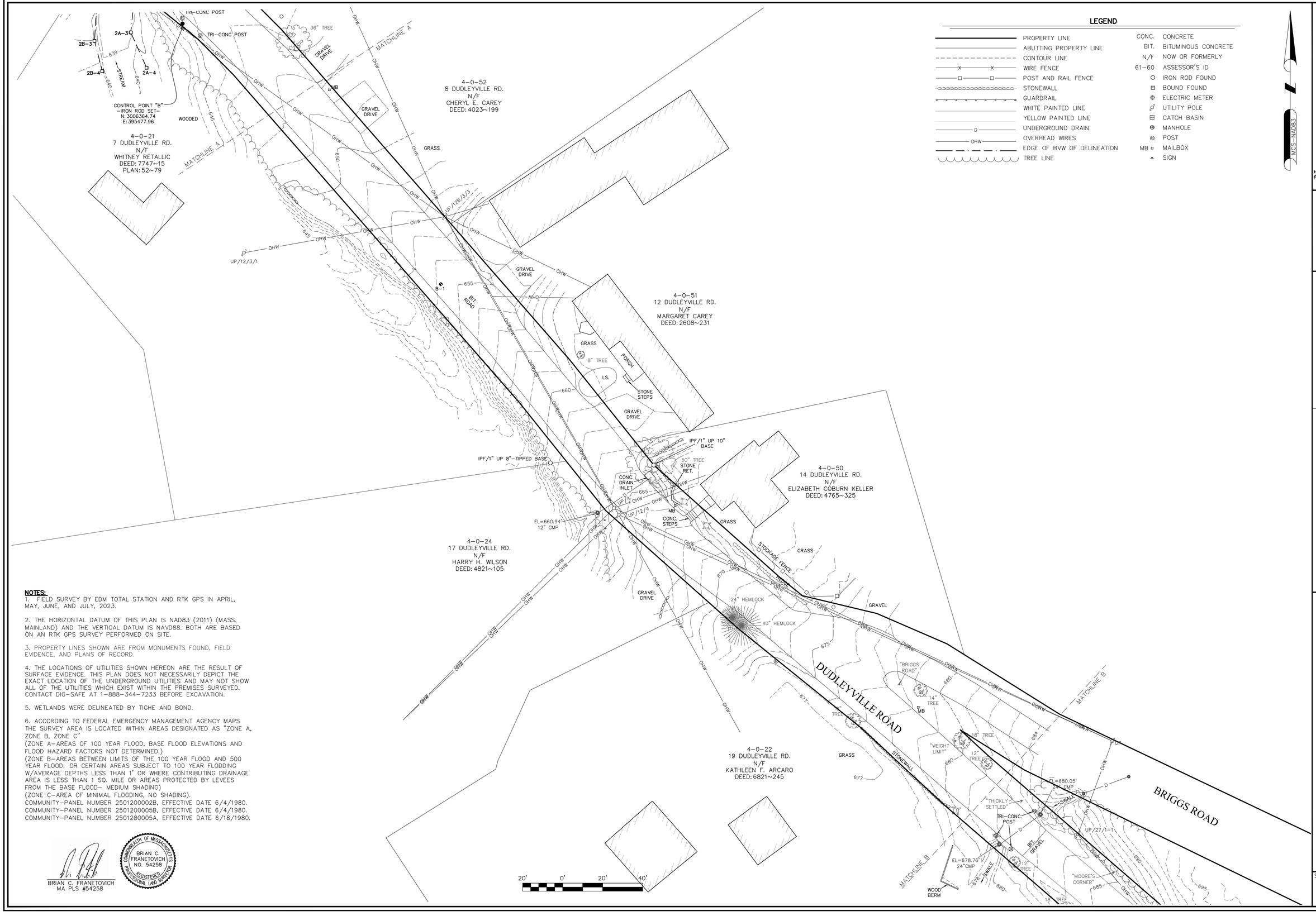
PLAN OF LAND IN LEVERETT, MA

FRANKLIN REGISTRY

PREPARED FOR

TIGHE AND BOND

SHEET NO.
1 OF 13



LEGEND

	PROPERTY LINE	CONC.	CONCRETE
	ABUTTING PROPERTY LINE	BIT.	BITUMINOUS CONCRETE
	CONTOUR LINE	N/F	NOW OR FORMERLY
x x	WIRE FENCE	61-60	ASSESSOR'S ID
□ □	POST AND RAIL FENCE	○	IRON ROD FOUND
	STONEWALL	⊡	BOUND FOUND
	GUARDRAIL	ⓔ	ELECTRIC METER
	WHITE PAINTED LINE		UTILITY POLE
	YELLOW PAINTED LINE	⊞	CATCH BASIN
D	UNDERGROUND DRAIN	Ⓜ	MANHOLE
OHW	OVERHEAD WIRES	◎	POST
	EDGE OF BVW OF DELINEATION	MB ▫	MAILBOX
	TREE LINE		SIGN

MCS-NAD83

NOTES:

1. FIELD SURVEY BY EDM TOTAL STATION AND RTK GPS IN APRIL, MAY, JUNE, AND JULY, 2023.

2. THE HORIZONTAL DATUM OF THIS PLAN IS NAD83 (2011) (MASS. MAINLAND) AND THE VERTICAL DATUM IS NAVD88. BOTH ARE BASED ON AN RTK GPS SURVEY PERFORMED ON SITE.

3. PROPERTY LINES SHOWN ARE FROM MONUMENTS FOUND, FIELD EVIDENCE, AND PLANS OF RECORD.

4. THE LOCATIONS OF UTILITIES SHOWN HEREON ARE THE RESULT OF SURFACE EVIDENCE. THIS PLAN DOES NOT NECESSARILY DEPICT THE EXACT LOCATION OF THE UNDERGROUND UTILITIES AND MAY NOT SHOW ALL OF THE UTILITIES WHICH EXIST WITHIN THE PREMISES SURVEYED. CONTACT DIG-SAFE AT 1-888-344-7233 BEFORE EXCAVATION.

5. WETLANDS WERE DELINEATED BY TIGHE AND BOND.

6. ACCORDING TO FEDERAL EMERGENCY MANAGEMENT AGENCY MAPS THE SURVEY AREA IS LOCATED WITHIN AREAS DESIGNATED AS "ZONE A, ZONE B, ZONE C"
(ZONE A-AREAS OF 100 YEAR FLOOD, BASE FLOOD ELEVATIONS AND FLOOD HAZARD FACTORS NOT DETERMINED.)
(ZONE B-AREAS BETWEEN LIMITS OF THE 100 YEAR FLOOD AND 500 YEAR FLOOD; OR CERTAIN AREAS SUBJECT TO 100 YEAR FLODDING W/AVERAGE DEPTHS LESS THAN 1' OR WHERE CONTRIBUTING DRAINAGE AREA IS LESS THAN 1 SQ. MILE OR AREAS PROTECTED BY LEVEES FROM THE BASE FLOOD- MEDIUM SHADING)
(ZONE C-AREA OF MINIMAL FLOODING, NO SHADING).
COMMUNITY-PANEL NUMBER 2501200002B, EFFECTIVE DATE 6/4/1980.
COMMUNITY-PANEL NUMBER 2501200005B, EFFECTIVE DATE 6/4/1980.
COMMUNITY-PANEL NUMBER 2501280005A, EFFECTIVE DATE 6/18/1980.

BRIAN C. FRANETOVICH
MA PLS #54258

COMMONWEALTH OF MASSACHUSETTS
BRIAN C. FRANETOVICH
NO. 54258
REGISTERED PROFESSIONAL LAND SURVEYOR

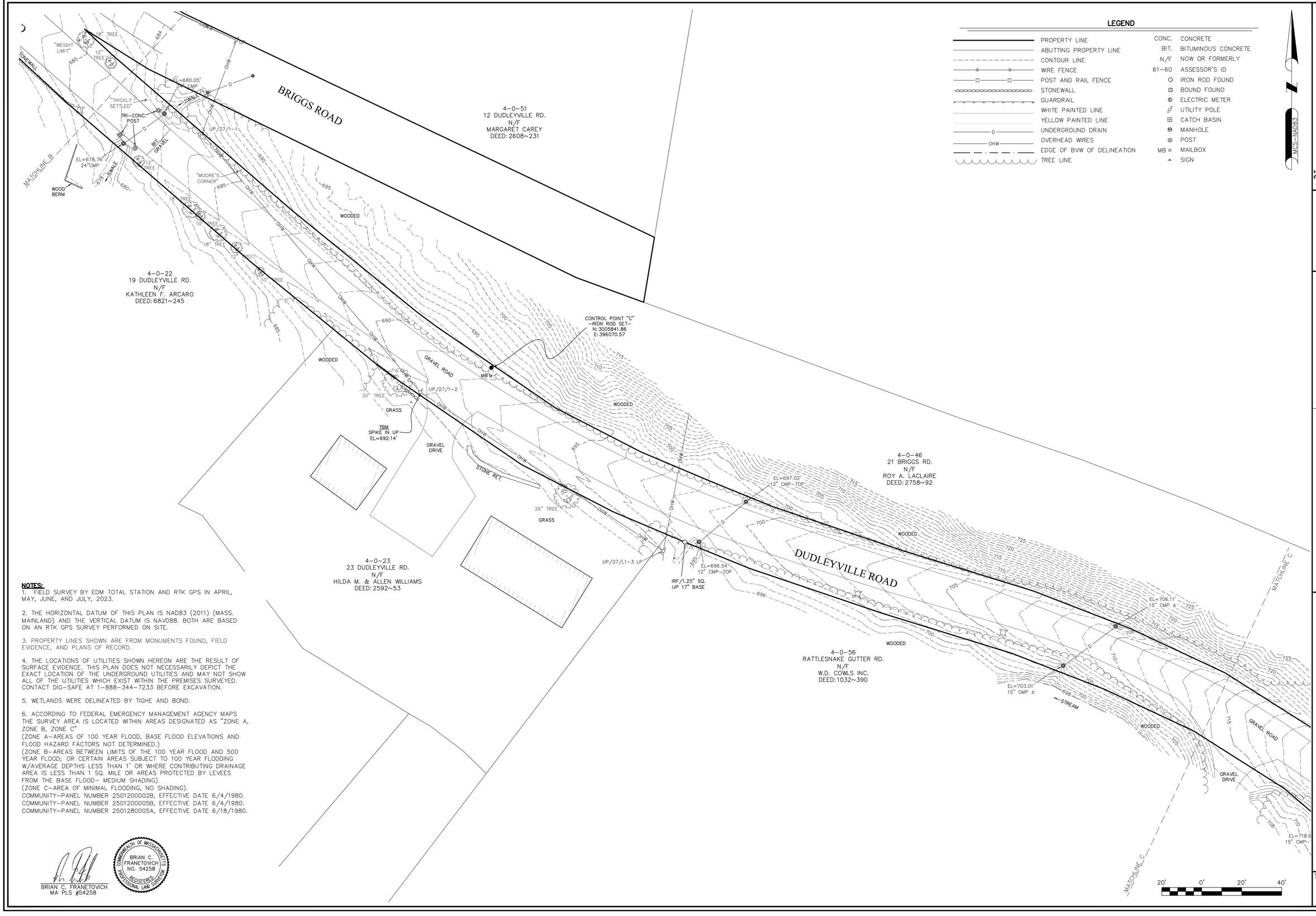
NORTHEAST SURVEY CONSULTANTS
3 FERRY STREET
STUDIO 1 EAST
EASTHAMPTON, MA 01027
(413) 203-5144

EXISTING CONDITIONS SURVEY

SURVEYOR:	BCF	ENGINEER:	-
DRAFTING:	JED	DESIGN:	-
FIELD WORK:	NAE MAK	HORZ. SCALE:	1"=20'
PROJECT NUMBER:	23-039	VERT. SCALE:	-
DRAWING NAME:	23-039.DWG	DATE:	7-13-2023

PLAN OF LAND IN
LEVERETT, MA
FRANKLIN REGISTRY
PREPARED FOR
TIGHE AND BOND

SHEET NO.
2 OF 13



LEGEND

PROPERTY LINE		CONC.	CONCRETE
ABUTTING PROPERTY LINE		BIT.	BITUMINOUS CONCRETE
CONTOUR LINE		N/F	NOW OR FORMERLY
WIRE FENCE		61-60	ASSESSOR'S ID
POST AND RAIL FENCE			IRON ROD FOUND
STONEWALL			BOUND FOUND
GUARDRAIL			ELECTRIC METER
WHITE PAINTED LINE			UTILITY POLE
YELLOW PAINTED LINE			CATCH BASIN
UNDERGROUND DRAIN			MANHOLE
OVERHEAD WIRES			POST
EDGE OF BVW OF DELINEATION		MB	MAILBOX
TREE LINE			SIGN

MASS-NAD83

NOTES:

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COMMUNITY-PANEL NUMBER 2501200005B, EFFECTIVE DATE 6/4/1980.
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20' 0' 20' 40'

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FRANKLIN REGISTRY

PREPARED FOR

TIGHE AND BOND

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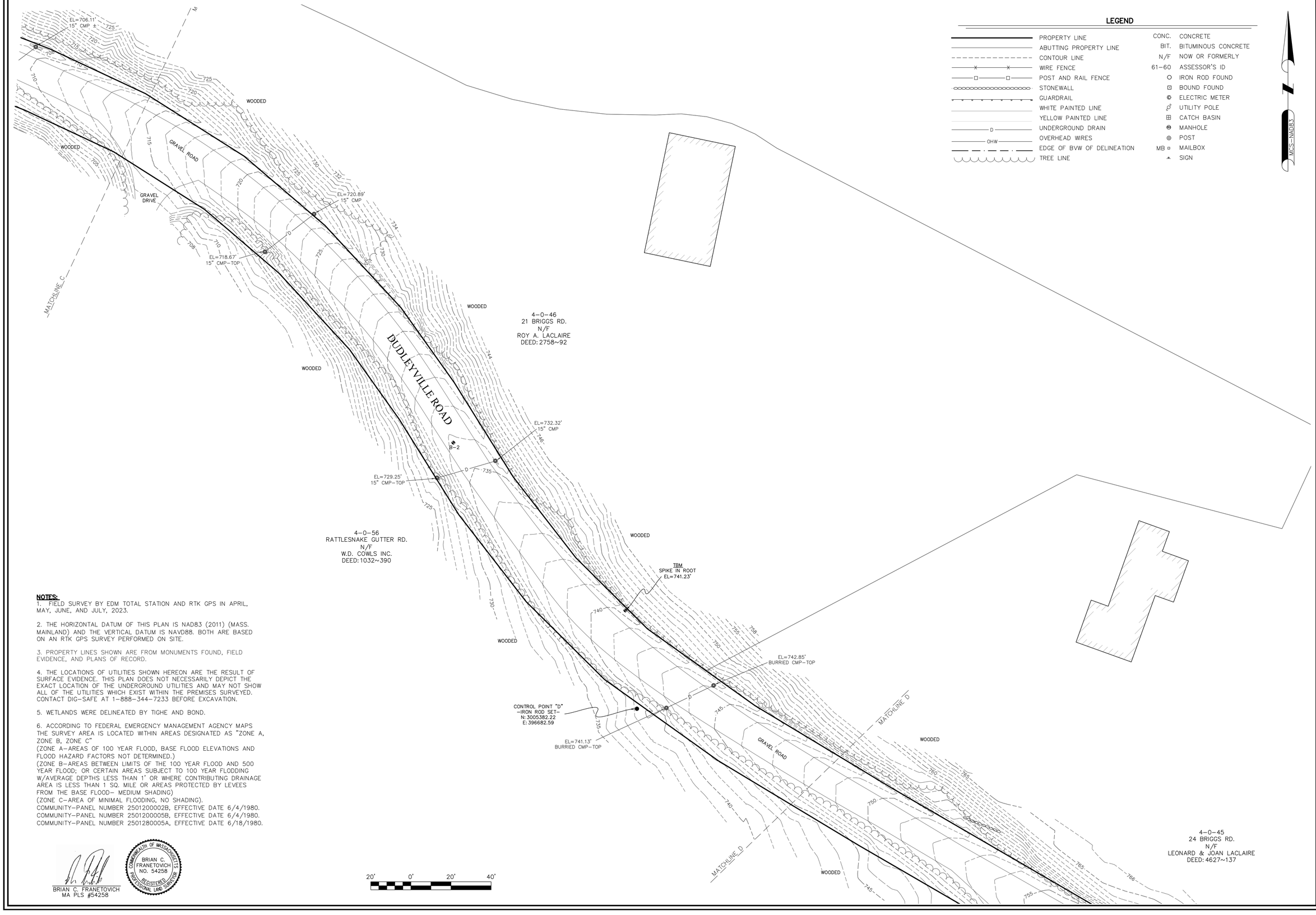

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FRANKLIN REGISTRY

PREPARED FOR

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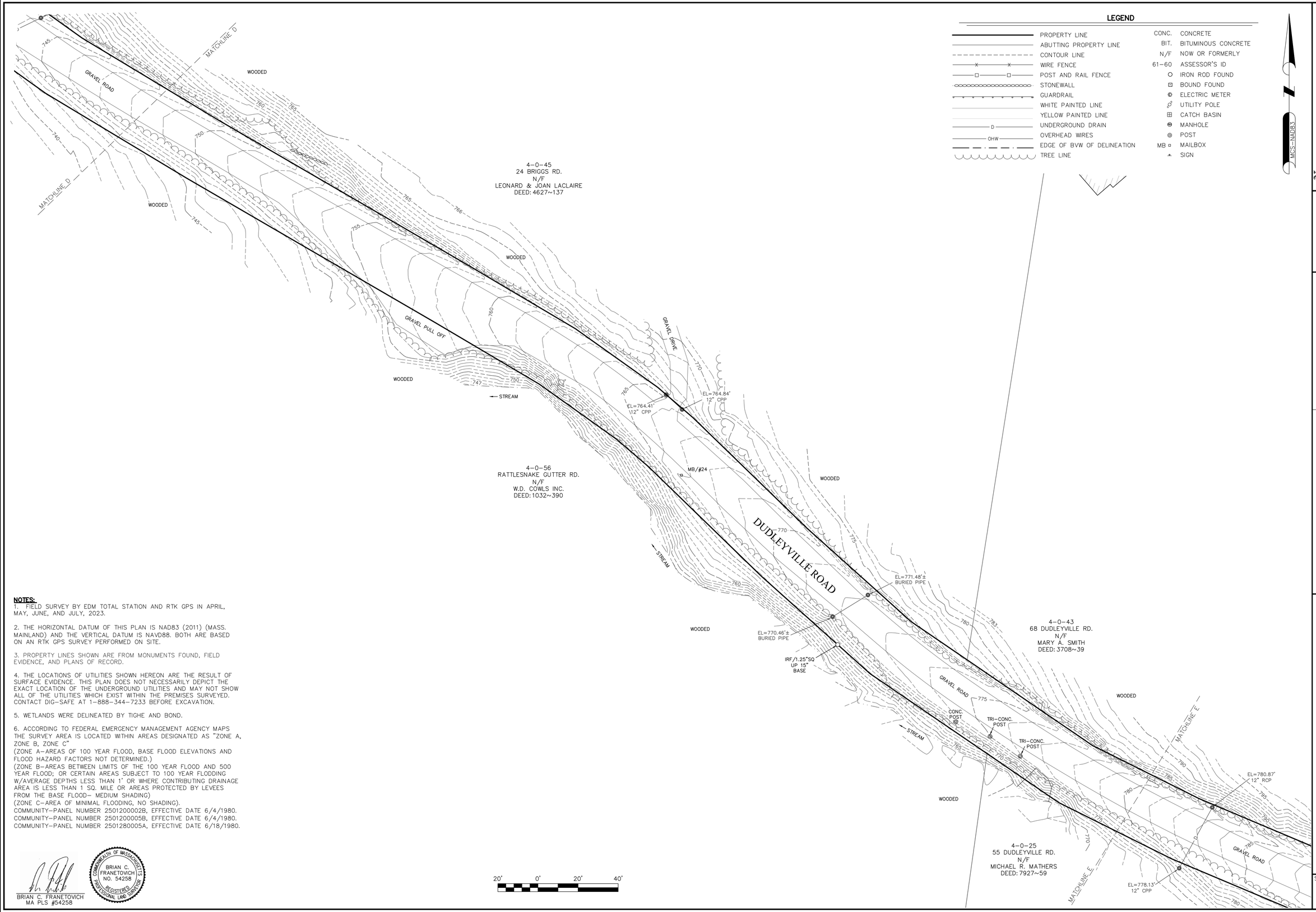

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EXISTING CONDITIONS SURVEY

PLAN OF LAND IN LEVERETT, MA

FRANKLIN REGISTRY

PREPARED FOR

TIGHE AND BOND

SURVEYOR:	–
DRAFTING:	BCF
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PROJECT NUMBER:	NAE MAK
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ENGINEER:	–
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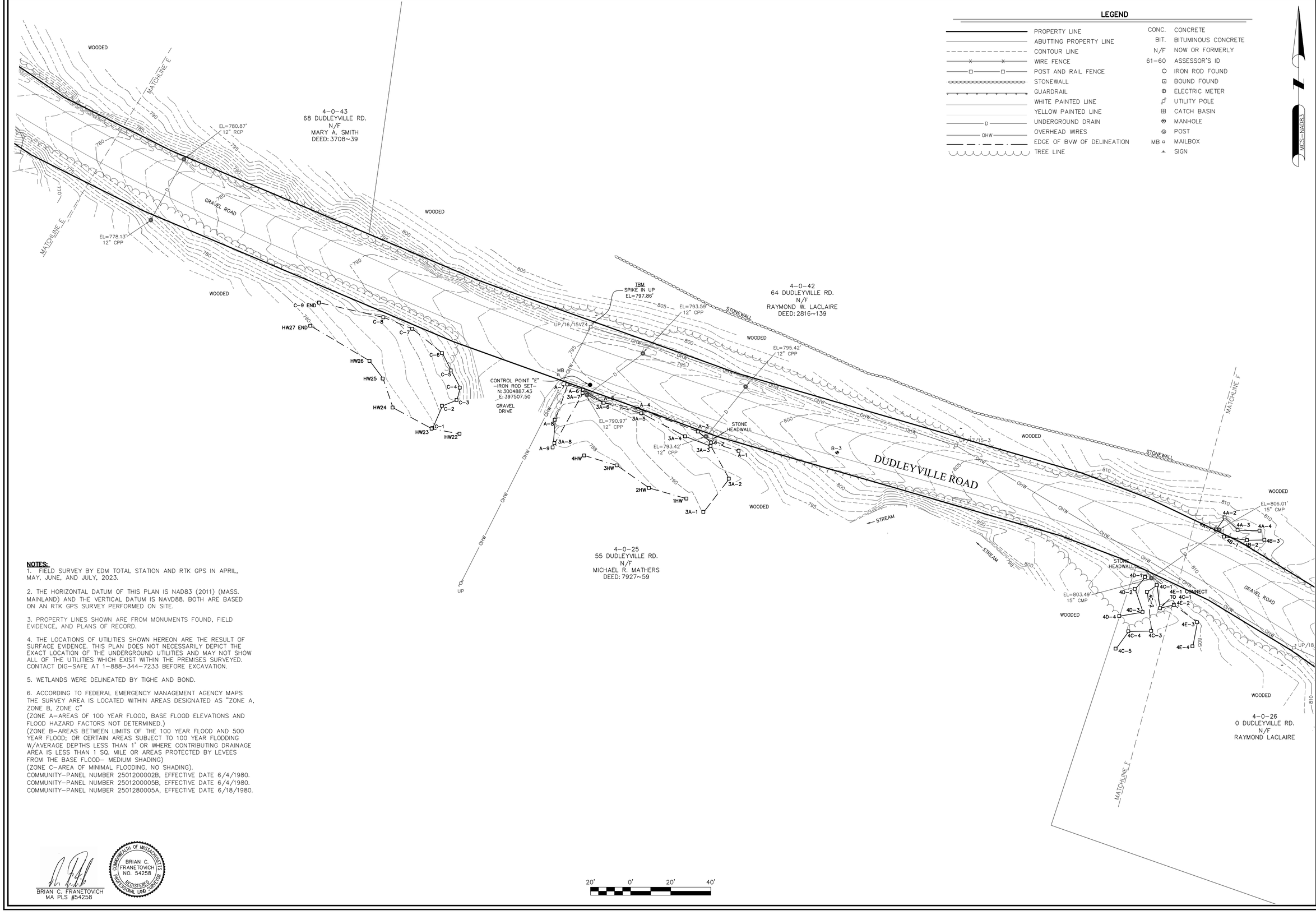
SHEET NO.
5 OF 13



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3 FERRY STREET
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(413) 203-5144

EXISTING CONDITIONS SURVEY

SURVEYOR:	–
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PROJECT NUMBER:	23–039
DRAWING NAME:	23–039.DWG
ENGINEER:	–
DESIGN:	–
HORZ. SCALE:	1"=20'
VERT. SCALE:	–
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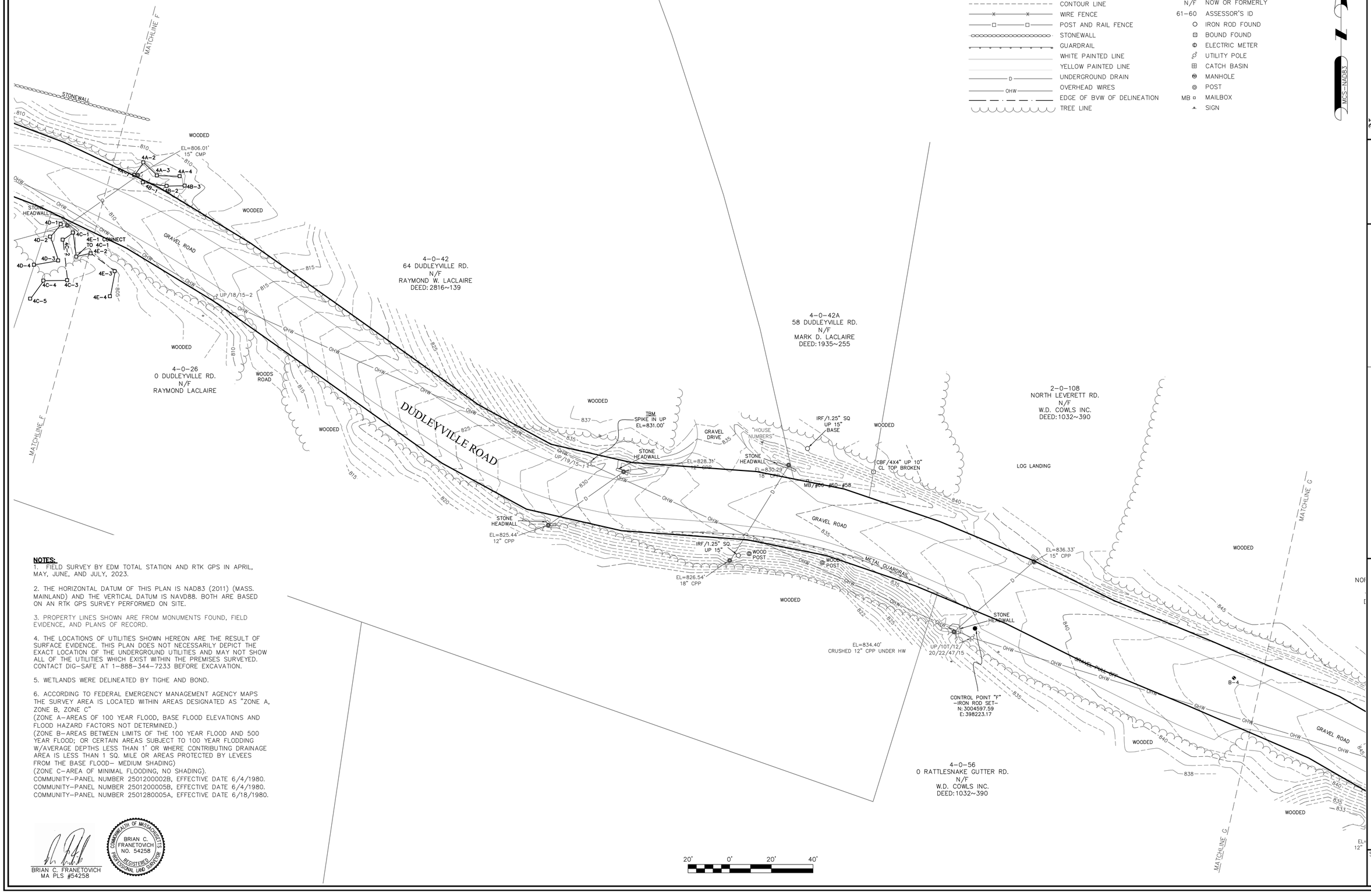
PLAN OF LAND IN LEVERETT, MA

FRANKLIN REGISTRY

PREPARED FOR

TIGHE AND BOND

SHEET NO.
6 OF 13



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PLAN OF LAND IN LEVERETT, MA

FRANKLIN REGISTRY

PREPARED FOR

TIGHE AND BOND

SHEET NO.
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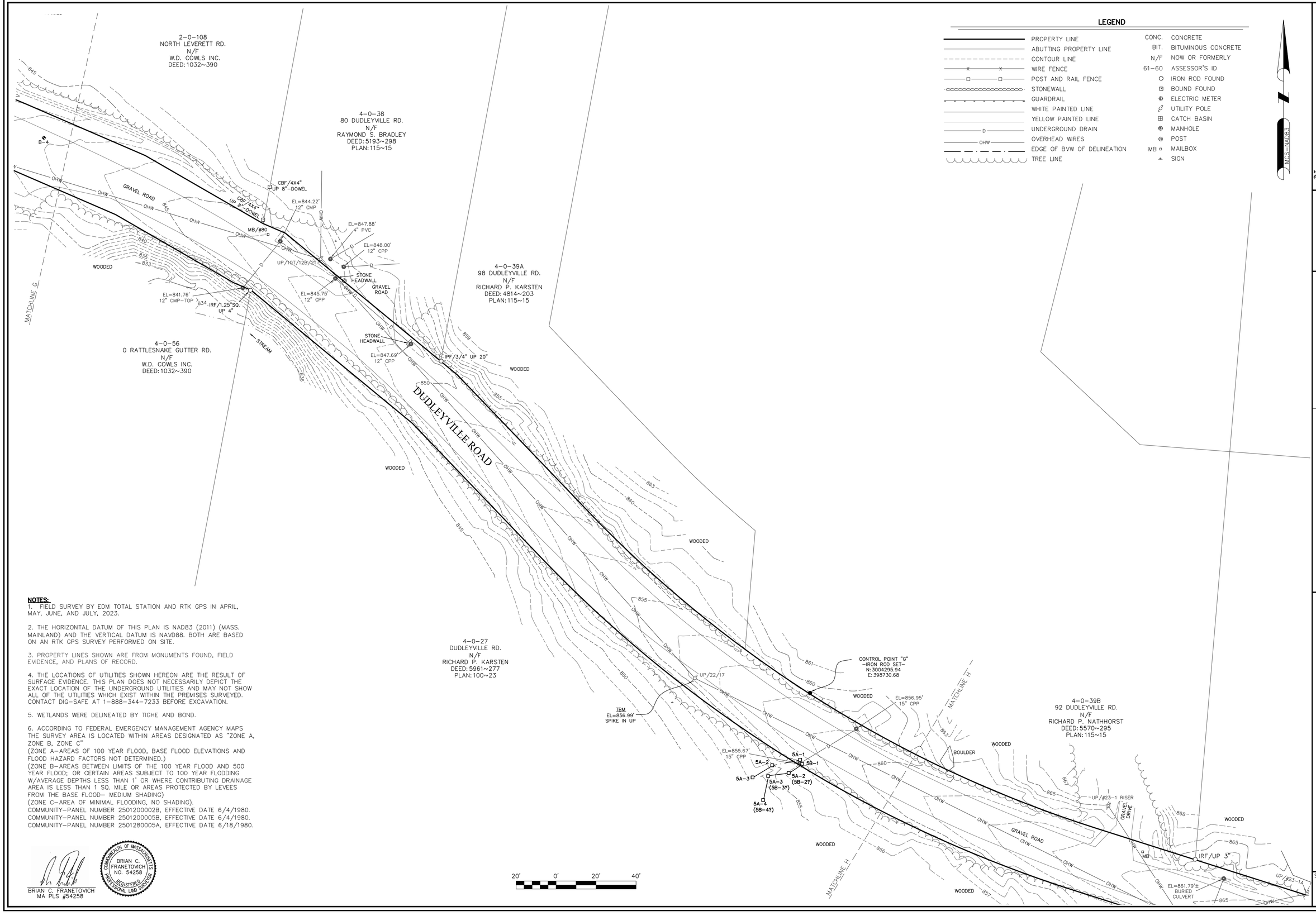

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MASS-NAD83

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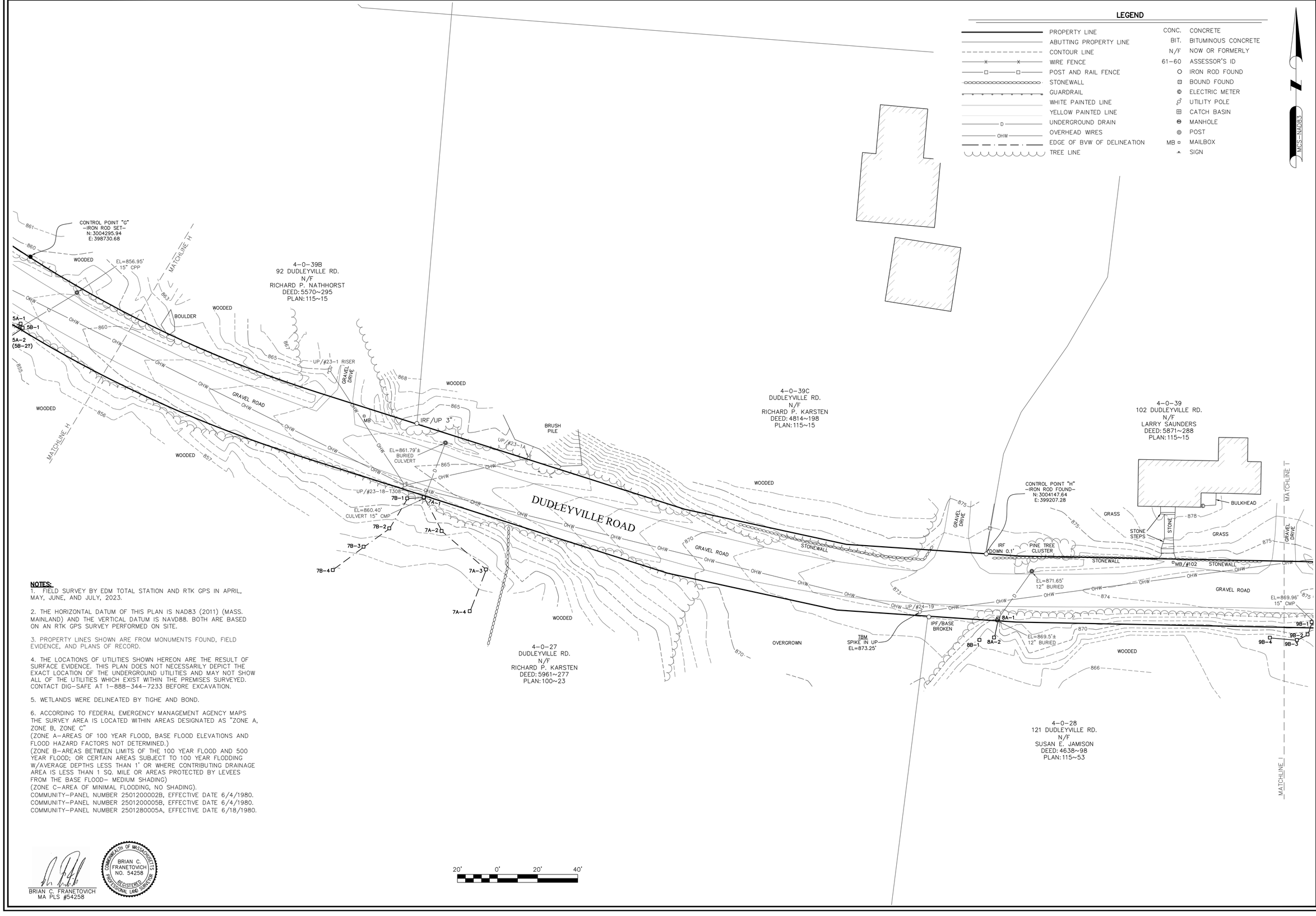

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TIGHE AND BOND

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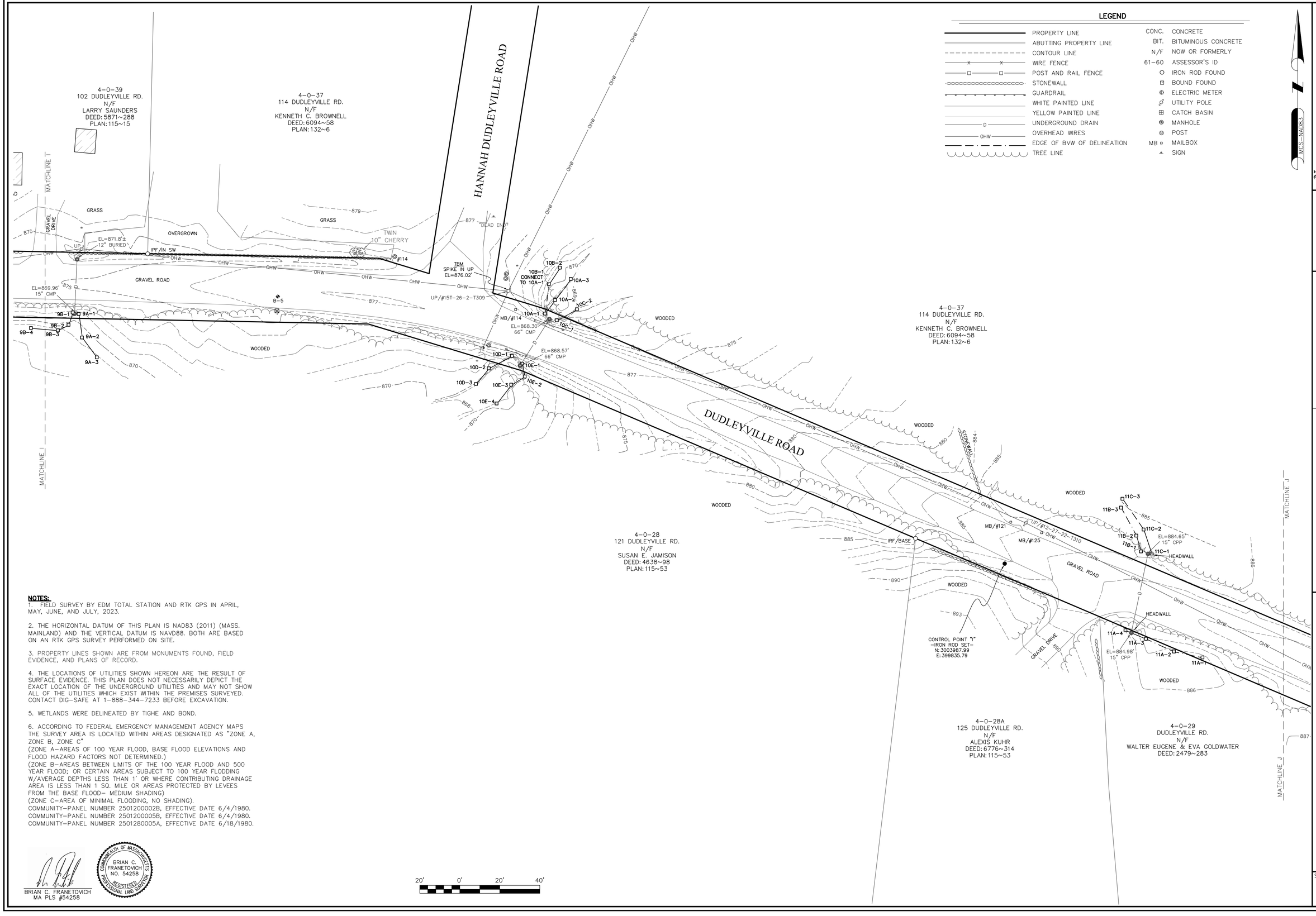

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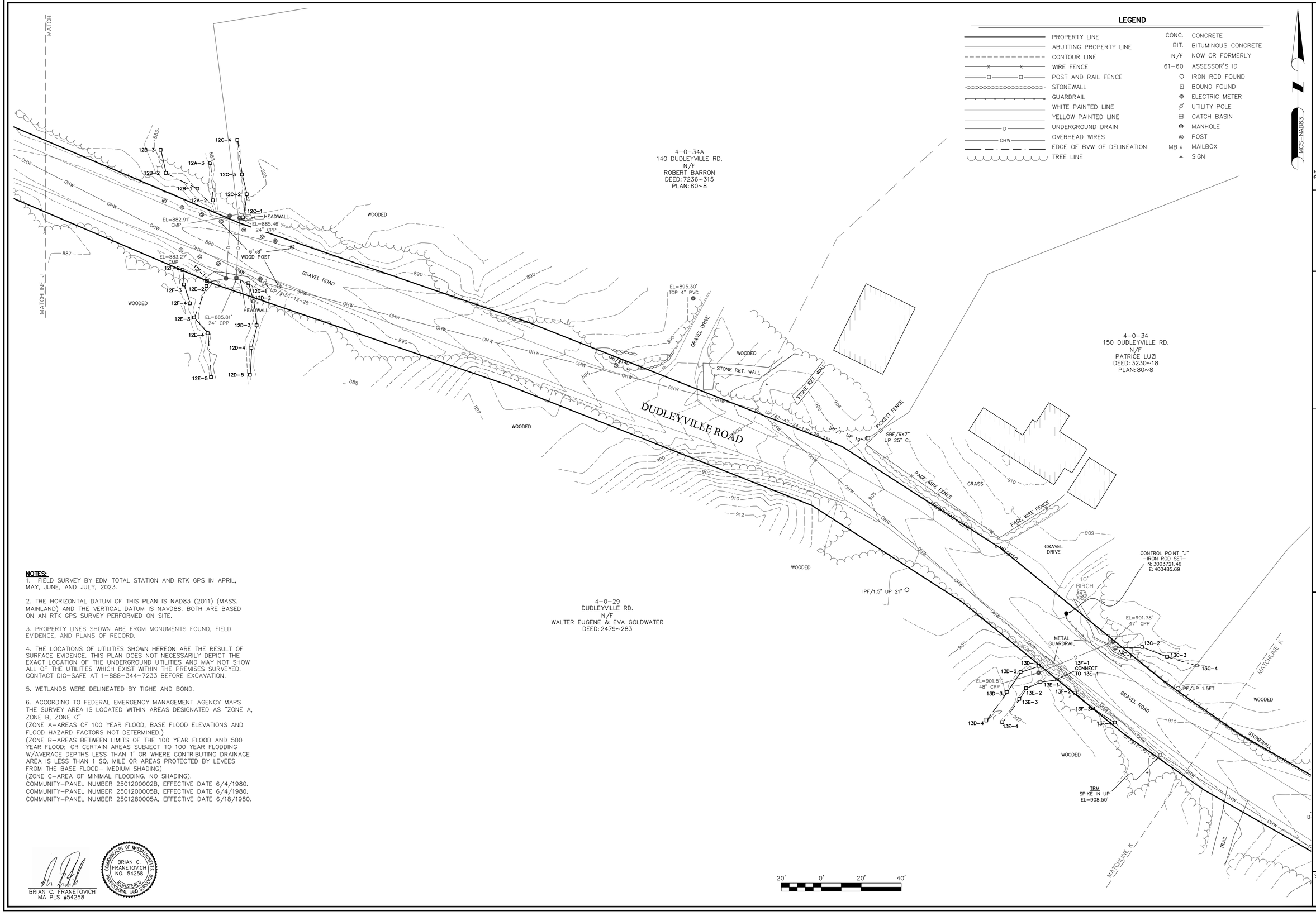
EXISTING CONDITIONS SURVEY

SURVEYOR:	–
DRAFTING:	BCF
FIELD WORK:	JED
PROJECT NUMBER:	NAE MAK
DRAWING NAME:	23-039.DWG
ENGINEER:	–
DESIGN:	–
HORZ. SCALE:	1"=20'
VERT. SCALE:	–
DATE:	7-13-2023

PLAN OF LAND IN
LEVERETT, MA
FRANKLIN REGISTRY
PREPARED FOR
TIGHE AND BOND

SHEET NO.
10 OF 13



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EXISTING CONDITIONS SURVEY

SURVEYOR:	–
DRAFTING:	BCF
FIELD WORK:	JED
PROJECT NUMBER:	NAE MAK
DRAWING NAME:	23–039
ENGINEER:	–
DESIGN:	–
HORZ. SCALE:	1"=20'
VERT. SCALE:	–
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	23–039.DWG

PLAN OF LAND IN
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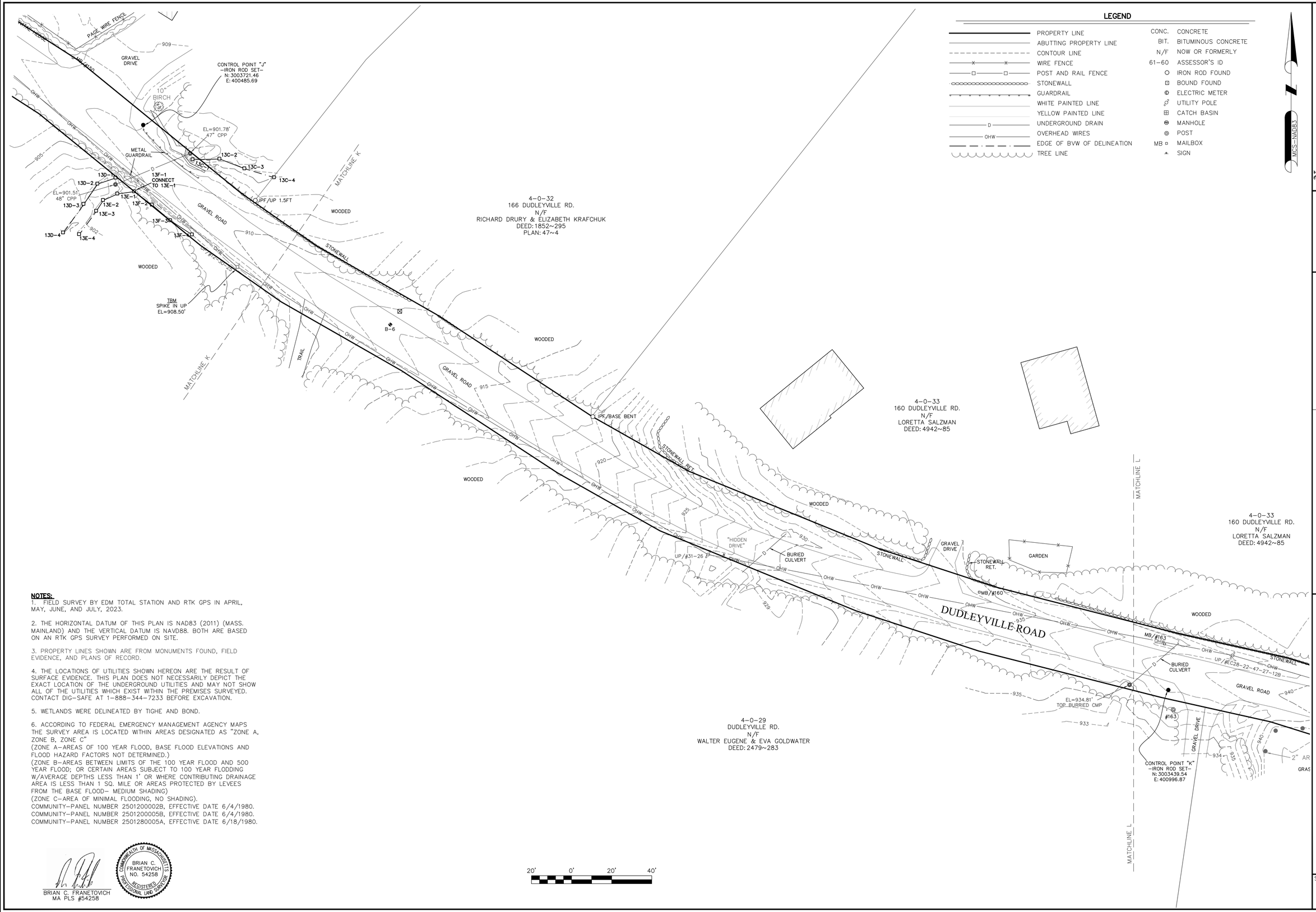
SHEET NO.
11 OF 13



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EXISTING CONDITIONS SURVEY

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ENGINEER:	–
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FIELD WORK:	NAE MAK
HORZ. SCALE:	1"=20'
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VERT. SCALE:	–
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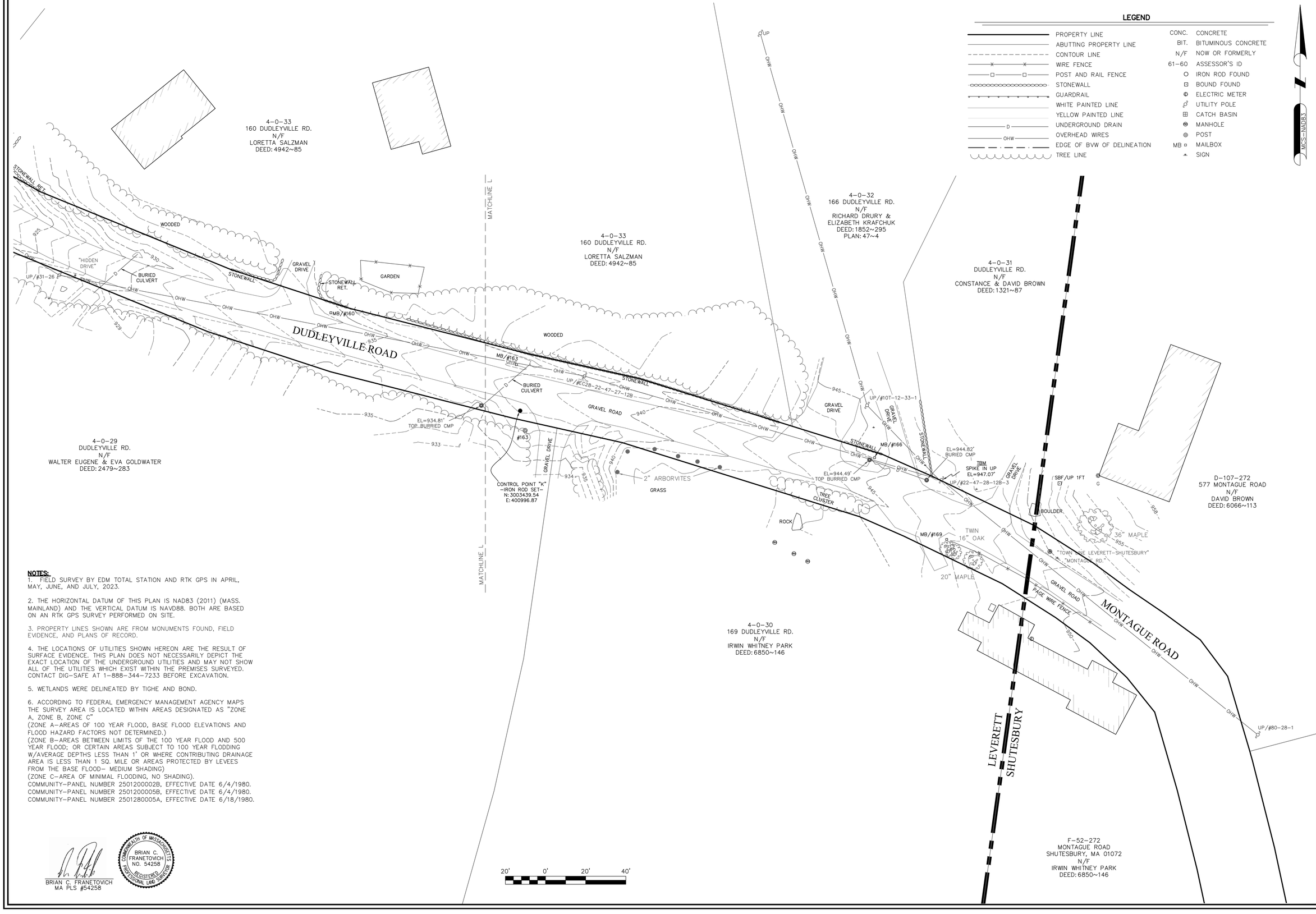
PLAN OF LAND IN LEVERETT, MA

FRANKLIN REGISTRY

PREPARED FOR

TIGHE AND BOND

SHEET NO. 12 OF 13



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PLAN OF LAND IN
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SHEET NO.
13 OF 13

ATTACHMENT E

WETLAND DATA

TABLE-1
Summary of Inland Bank and Mean Annal High Water Line Flagging – Non-jurisdictional (MAWPA) culverts highlighted in grey.

Flag Series	Culvert/ Bridge ID	Culvert Location	STA	Bank/ MAHW	Stream Type (Perennial/Intermittent)
1A/1F	Bridge 1	*42.49417, -72.46765*	2+41	Coincident	Perennial (Sawmill River)
11C/D	Bordering Vegetated Wetland 1	*42.49411, -72.46742*	2+99	Coincident	Intermittent (Sawmill River Bypass Channel)
2A/D	Bridge 2 Culvert 1	*42.49370, -72.46669*	5+61	Coincident	Perennial (Dudleyville Brook)
	Culvert 2	*42.49253, -72.46499*	11+93	Coincident	Intermittent
	Culvert 3	*42.49194, -72.46405*	15+47	Coincident	Intermittent
	Culvert 4	*42.49180482, -72.46322253*	17+41	Coincident	Intermittent
	Culvert 5	*42.49153696, -72.46280524*	19+03	Coincident	Intermittent
	Culvert 6	*42.4912194, -72.46246977*	20+53	Coincident	Intermittent
	Culvert 7	*42.49091363, -72.4620463*	22+11	Coincident	Intermittent
	Culvert 8	*42.49014308, -72.46047574*	27+18	Coincident	Intermittent
	Culvert 9	*42.48980006, -72.45983043*	29+26	Coincident	Intermittent
	Culvert 10	*42.48956465, -72.45904887*	31+67	Coincident	Intermittent
	Culvert 11	*42.48951177, -72.45879564*	32+25	Coincident	Intermittent
3A/1-8	Bordering Vegetated Wetland 3	*42.48952, -72.45894*	31+82	Coincident	Perennial
	Culvert 12	*42.48933089, -72.45798138*	34+65	Coincident	Intermittent
4A/4E	Wetland-4	*42.489398, -72.457999*	34+36	Coincident	Perennial
	Culvert 13	*42.4889468, -72.45711289*	37+36	Coincident	Intermittent
	Culvert 14	*42.48902407, -72.45669406*	38+25	Coincident	Intermittent
	Culvert 15	*42.48881587, -72.45640358*	39+45	Coincident	Intermittent
	Culvert 16	*42.48853651, -72.45551248*	41+90	Coincident	Intermittent
	Culvert 17	*42.48791208, -72.45447189*	45+61	Coincident	Intermittent
5A/5B	Wetland 5	*42.487940, -72.454480*	45+43	Coincident	Intermittent
	Culvert 18	*42.48780022, -72.45393626*	47+00	Coincident	Intermittent
6A/6B	Wetland 6	*42.487754, -72.453888*	47+17	Coincident	Intermittent

	Culvert 19	*42.48767491, -72.45373687*	47+71	Coincident	Intermittent
7A/ 7B	Bordering Vegetated Wetland	*42.487633, -72.453586*	48+08	Coincident	Perennial
	Culvert 20	*42.48751832, -72.45266813*	50+70	Coincident	Intermittent
8A/8B	Bordering Vegetated Wetland	*42.487446, -72.452715*	50+45	Coincident	Perennial
	Culvert 21	*42.48752034, -72.45207829*	52+18	Coincident	Intermittent
9A/9B	Bordering Vegetated Wetland	*42.48750799, -72.45206803*	52+19	Coincident	Perennial
10A-E	Bridge 3	*42.487481, -72.451145*	54+52	Coincident	Perennial (Dudleyville Brook)
	Culvert 22				
10B/C	Bordering Vegetated Wetland	*42.48754842, -72.45120569*	54+46	Coincident	Perennial
	Culvert 23	*42.48709675, -72.45010139*	57+79	Coincident	Intermittent
11A-1/6	Bordering Vegetated Wetland	*42.48707771, -72.44996818*	58+90	Coincident	Perennial
11B/C	Wetland 11	*42.487214, -72.450236*	57+32	Coincident	Perennial
12A-C/E	Bridge 4	*42.48701139, -72.449501*	59+58	Coincident	Perennial (Dudleyville Brook)
	Culvert 24				Perennial
	Culvert 25				
12B/F	Bordering Vegetated Wetland	*42.48706073, -72.44955754*	59+24	Coincident	Perennial
13A/C-E	Wetland 13	*42.48645315, -72.44784992*	64+32		Intermittent
13B/F	Bordering Vegetated Wetland	*42.48646655, -72.44785626*	64+27	Coincident	Perennial
	Culvert 26	*42.486409, -72.447983*	64+32	Coincident	Intermittent
	Culvert 27	*42.48587903, -72.44681893*	67+93	Coincident	Intermittent
	Culvert 28	*42.48573158, -72.4460787*	69+95	Coincident	Intermittent

1.2.1 Bank

Non-jurisdictional (MAWPA) culverts highlighted in grey.

1.2.1.1 B1A-1 to B1F-4 / B1B-1 to B1E-4 (Bridge 1)

Southern Bank: 1B-5 to 1E-4

Northern Bank: 1A-4 to 1F-4

Location: *42.494182, -72.467676 (STA 2+41)*

Bank flag series 1B-5 to 1E-4 / 1A-4 to 1F-4 corresponds with the southern and northern Banks of the Sawmill River where it is spanned by Bridge 1. Bridge 1 is composed of a steel frame and concrete base with a wooden deck over stacked field stone vertical abutments. At this location the Sawmill River, shown as perennial on the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), is approximately 20 feet wide.

Both Banks are primarily composed of large stone and exposed bedrock. The Historic John Wesley Watson Grist/Sawmill (MACRIS LEV.49) is present on the northern bank, concentrated immediately upstream of the northern bridge abutment at 2 Dudleyville Road. This historic property is located in the Moore's Corner neighborhood. At the time of this field work, flow through the crossing was moderate to high with water depths estimated to reach up to two (2) to three (3) feet in areas. Dominant vegetation observed along both Banks consists of eastern hemlock (*Tsuga canadensis*), sugar maple (*Acer saccharum*) and gray birch (*Betula populifolia)*. Bordering Vegetated Wetlands are delineated within the mill bypass channel on the southeastern bank.

1.2.1.2 B2A-1 to B2A-8 / B2B-1 to B2B-10 (Culvert 1)

Western Bank: 2B-1- to 2C-4

Eastern Bank: 2A-1 to 2D-4

Location: *42.49370, -72.46669 (STA 5+61)*

1.2.1.3 Bank flag series 2B-1 to 2C-4 / 2A-1 to 2D-4 corresponds with the western and eastern banks of Dudleyville Brook where it is spanned by Culvert 1. Culvert 1 is composed of an 84-inch corrugated steel culvert approximately 12 feet across and stacked field stone masonry. At this location Dudleyville Brook, shown as perennial on the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), is approximately 20 feet wide. Both Banks are primarily composed of large stone and cobble with tree roots exposed at the surface. Dudleyville Brook is bordered by Historic Buildings located at 7 Dudleyville Road (LEV 187) and 8 Dudleyville Road (LEV.51 Jonah Hunt House). At the time of this field work, flow through the crossing was low to moderate with water depths estimated to reach up to one (1) to two (2) feet in areas. Dominant vegetation observed along both banks consists of Norway Maple (*Acer platanoides*), Paper Birch (*Betula papyrifera*) and American Chestnut (*Castanea dentata*).

1.2.1.4 Culvert 2

Inlet: *42.49255811, -72.46483186*

Outlet: *42.49245325, -72.46507687*

Location: *42.49253, -72.46499 (STA 11+93)*

Culvert-2 corresponds with the inlet and outlet of a stormwater drainage culvert and surface canal that is conveyed beneath Dudleyville Road by a 24-inch corrugated metal culvert between 21 Briggs Road and 12/19 Dudleyville Road. (Site is not shown on the most current USGS topographic map). The drainage ditch located at 21 Briggs Road is visible in aerial imagery. The culvert opening is approximately 1 foot wide by 1 foot tall at both ends and is recessed into a stone block basin measuring 3 feet across, located approximately 1 foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert flows in a northeastern to southwestern alignment with limited water flow observed along much of its extent. The area is a mixed use residential/forested roadway with sloping topography descending to Dudleyville. The drainage ditch and more flat, gently sloping topography present after the culvert outlet. Dominant vegetation observed at both ends of the culvert includes Northern Red Oak (*Quercus rubra*), Eastern White Pine (*Pinus strobus),* and White Ash (*Fraxinus americana*).

1.2.1.5 Culvert 3

Inlet: *42.491965, -72.46390576*

Outlet: *42.49190966, -72.46400468*

Location: *42.49194, -72.46405 (STA 15+47)*

Culvert-3 corresponds with the inlet and outlet of a stormwater culvert not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by 12-inch corrugated metal culvert. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with limited water flow observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined and the basin is composed of muck and leaf detritus. The culvert outlet empties into a manmade drainage channel that flows alongside the property at 23 Dudleyville Road, then into Dudleyville Brook. Bank heights range from one (1) to four (4) inches on both sides of the culvert. The banks on either side of the drainage ditch consist largely of soil, stream bed substrate and organic and roadside debris. Dominant vegetation observed includes Eastern Hemlock *(Tsuga Canadensis),* Eastern White Pine *(Pinus strobus),* American Beech *(Fagus grandiflora),* and Northern Red Oak *(Quercus rubra).*

1.2.1.6 Culvert 4

Inlet: *42.49180482, -72.46322253*

Outlet: *42.49175, -72.46334*

Location: *42.49179, -72.46328 (STA 17+41)*

Culvert-4 corresponds with the inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by 15-inch corrugated metal pipe. The culvert opening is recessed into a fieldstone

basin measuring approximately three (3) feet across, located approximately (1) foot below the roadway and fed by a roadside drainage ditch. Water was not observed to be free flowing, but the leaf detritus remains saturated. The drainage end of the culvert is exposed, protruding from soil without fieldstone headwall, and deposits onto a steep bank of Dudleyville Brook which is composed of down cut soil, streambed substrate and silt. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with limited water flow observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined Dominant vegetation observed includes Northern Red Oak *(Quercus rubra)* Paper Birch (*Betula papyrifera*), Outlet:New York Fern (*Amauropelta noveboracensis*), Canadian Wild Ginger (*Asarum canadense*), Solomon's-Seal (*Polygonatum odoratum*) and Paper Birch (*Betula papyrifera*).

1.2.1.7 Culvert 5

Inlet: *42.49158804, -72.46272553*

Outlet: *42.49153696, -72.46280524*

Location: *42.49157, -72.46275 (STA 19+03)*

Culvert-5 corresponds with the inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by 15-inch corrugated metal pipe. Culvert 5 is located just upstream of a wooden bridge composed of lumber and stacked river rock wall at Cowl's Tree Farm. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately (1) foot below the roadway and fed by a roadside drainage ditch. Water was observed flowing through the culvert despite the impoundment. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with limited water flow observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined. The culvert outlet extends out of the fieldstone headwall featuring a prominent fieldstone cap over the top of the pipe. Dominant vegetation observed includes European Hornbeam (*Carpinus betulus*), American beech (*Fagus. grandifolia),* Paper Birch (*Betula papyrifera*)*,* Eastern Hemlock (*Tsuga canadensis*) sedges (*Carex spp.) and* New York Fern (*Amauropelta noveboracensis*), Canadian Wild Ginger (*Asarum canadense*), Solomon's-Seal (*Polygonatum odoratum).*

1.2.1.8 Culvert 6

Inlet: *42.49123931, -72.46239727*

Outlet: *42.4912194. -72.46246977*

Location: *42.49124, -72.46240 (STA 20+53)*

Culvert-6 corresponds with the inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 15-inch corrugated steel pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. Standing water was observed in the culvert due to leaf litter and deformation of the culvert ends. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with limited water flow observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined Dominant vegetation observed includes Eastern Hemlock (*Tsuga canadensis*) Bigleaf Witch-Hazel (*Hamamelis ovalis*) Boxelder Maple (*Acer negundo*), Sugar Maple (*Acer saccharum*), Cinnamon Fern (*Osmundastrum cinnamomeum*) and Large-leaved Wood-Aster (*Eurybia macrophylla*).

1.2.1.9 Culvert 7

Inlet: *42.49093429, -72.46195787*

Outlet: *42.49091363, -72.4620463*

Location: *42.49094, -72.46201 (STA 22+11)*

Culvert-7 corresponds with the inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 15-inch corrugated steel pipe. The culvert opening is recessed into a fieldstone basin measuring approximately 3 feet across, located approximately 1 foot below the roadway and fed by a roadside drainage ditch. Standing water was observed in the culvert due to leaf litter and deformation of the culvert ends. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with limited water flow observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined Dominant vegetation includes White Ash (*Fraxinus americana*) Eastern Hemlock (*Tsuga canadensis),* White Oak *(Quercus alba*) Sensitive Fern (*Onoclea sensibilis*) and Cinnamon Fern (*Osmundastrum cinnamomeum*).

1.2.1.10 Culvert 8

Inlet: *42.49018246, -72.46042482*

Outlet: *42.49014308. -72.46047574*

Location: *42.4918*, *-72.46048 (STA 27+18)*

Culvert-8 corresponds with the inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 15-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with limited water flow observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined The culvert is collapsed at both ends. Land is Posted Conservation Easement Private Property (Cowls). Dominant vegetation includes Eastern White Pine (Pinus strobus), Red Pine (Pinus resinosa), Eastern Hemlock (Tsuga canadensis), American Beech (*Fagus grandifolia*), and Bigleaf Aster (*Eurybia macrophylla*).

1.2.1.11 Culvert 9

Inlet: *42.48987985, -72.45977766*

Outlet: *42.48980006, -72.45983043*

Location: *42.48986, -72.45974 (STA 29+26)*

Culvert-9 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 12-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with limited water flow observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined Standing water was observed. Dominant vegetation includes Eastern Hemlock (*Tsuga canadensis*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*), and Canada Mayflower (*Maianthemum canadense*).

1.2.1.12 Culvert 10

Inlet: *42.4896343, -72.45891494*

Outlet: *42.48956465, -72.45904887*

Location: *42.48962, -72.45814 (STA 31+67)*

Culvert-10 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 12-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. At the approach to the culvert inlet the topography is gently inclined Culvert 10 feeds BVW3. Dominant vegetation includes Eastern Hemlock (Tsuga canadensis), American Beech (Fagus grandifolia), Swamp Birch (*Betula alleghaniensis*), Sensitive Fern (*Onoclea sensibilis*).

1.2.1.13 3A 1-8 Bordering Vegetated Wetland 3

West Bank: *42.48955105, -72.45908294*

East Bank: *42.48946899, -72.45877821*

Location: *42.48954272, -72.45891648 (STA 31+82)*

1.2.1.14 Culvert 11

Inlet: *42.48957854, -72.45873472*

Outlet: *42.48951177, -72.45879564*

Location: *42.48954272, -72.45891648 (STA 32+35)*

Culvert-11 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 12-inch corrugated metal pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. Culvert 10 feeds BVW3. Dominant vegetation includes Eastern Hemlock (Tsuga canadensis), American Beech (Fagus grandifolia), Swamp Birch (*Betula alleghaniensis*), Sensitive Fern (*Onoclea sensibilis).*

1.2.1.15 Culvert 12

Inlet: *42.48938928. -72.45784445*

Outlet: *42.48933089, -72.45798138*

Location: *42.48953, -72.45860 (STA 34+65)*

Culvert-12 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 15-inch corrugated metal pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (Tsuga canadensis), American Beech (Fagus grandifolia), Swamp Birch (*Betula alleghaniensis*), Sensitive Fern (*Onoclea sensibilis).*

1.2.1.16 B4A-1 to B4B-8 / B4C-1 to B4D-4 Wetland 4

Northeastern Bank: B4A-4- to 4B-3

Southwestern Bank: B4C-5 to 4D-4

Location: *42.48932677, -72.45796836 (STA 34+36)*

Flag series B4A-1 to B4B-8 / B4C-1 to B4D-4 corresponds with the northeastern and southwestern limits of Wetland 4 which is bisected by Dudleyville Road and Culvert 11 At this location the Dudleyville Brook, shown as perennial on the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), forms the southern border of Wetland 4.

1.2.16.1 B4E-1/5 Bordering Vegetated Wetland 4

Eastern Bank: *42.48924967, -72.45789415*

Flag series B4E-1 / 5 corresponds with the western limits of Bordering Vegetated Wetland 4 which is bordered by Dudleyville Road to the north. At this location the Dudleyville Brook, shown as perennial on the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), forms the southern border of Wetland 4.

1.2.1.17 Culvert 13

Inlet: *42.48902275. -72.45698463*

Outlet: *42.4889468, -72.45711289*

Location: *42.48899, -72.45704 (STA 37+36)*

Culvert-13 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 12-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (Tsuga canadensis), Sugar Maple (*Acer saccarum*), Japanese Knotweed (*Reynoutria japonica*), Bluntlobe Cliff Fern (*Woodsia obtusia)*.

1.2.1.18 Culvert 14

Inlet: *42.48902407. -72.45669406*

Outlet: *42.48881587, -72.45640358*

Location: *42.48897, -72.45676 (STA 38+25)*

Culvert 14 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by an 18-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (Tsuga canadensis), White Pine (*Pinus strobus*), Japanese Knotweed (*Reynoutria japonica*), Burning Bush (*Euonymus alatus),* Christmas Fern *(Polystichum acrostichoides)*. Additionally, Land is Posted Conservation Easement Private Property (Cowls).

1.2.1.19 Culvert 15

Inlet: *42.48890432. -72.45625932*

Outlet: *42.48881587, -72.45640358*

Location: *42.48889, -72.45635 (STA 39+45)*

Culvert 15 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 12-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (*Tsuga canadensis*), White Pine (*Pinus strobus*), Japanese Knotweed (*Reynoutria japonica*), Burning Bush (*Euonymus alatus*), Christmas Fern (*Polystichum acrostichoides*). Additionally, Land is Posted Conservation Easement Private Property (Cowls).

1.2.1.20 Culvert 16

Inlet: *42.48861034. -72.45545523*

Outlet: *42.48853651, -72.45551248*

Location: *42.48858, -72.45546 (STA 41+90)*

Culvert 16 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 12-inch corrugated steel pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (*Tsuga canadensis*), White Pine (*Pinus strobus*), Japanese Knotweed (Reynoutria japonica), Burning Bush (*Euonymus alatus*), Hedge False Bindweed (*Calystegia sepium*). Additionally, Land is Posted Conservation Easement Private Property (Cowls).

1.2.1.21 Culvert 17

Inlet: *42.48795593. -72.45438337*

Outlet: *42.48791208, -72.45447189*

Location: *42.48796, -72.45548 (STA 45+61)*

Culvert 17 corresponds with inlet and outlet openings of a stormwater culvert (not shown on the most current USGS topographic map) that is conveyed beneath Dudleyville Road by a 15-inch corrugated plastic pipe. The culvert opening is approximately one (1) foot wide by one (1) foot tall at both ends and is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeastern to southwestern alignment with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (*Tsuga canadensis*), White Pine (*Pinus strobus*), Japanese Knotweed (Reynoutria japonica), Burning Bush (*Euonymus alatus*), Hedge False Bindweed (*Calystegia sepium*). Additionally, Land is Posted Conservation Easement Private Property (Cowls).

1.2.1.22 B5A 1 / 4 to B5B 1 / 4 (Wetland 5)

Northeastern Bank: B5A-1- to B5A-4

Southwestern Bank: B5B-1 to 5B-4

Location: *42.48788, -72.45451 (STA 45+43)*

Flag series B5A-1 to B5A-4 / B5B-1 to B5B-4 corresponds with the northeastern and southwestern limits of Wetland 5 which flows from Culvert 17 at the right shoulder, across from 92 Dudleyville Road. At this location the Dudleyville Brook, shown as perennial on

the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), forms the southern border of Wetland 5.

1.2.1.23 Culvert 18

Inlet: *42.48778021. -72.45382291*

Outlet: *42.48780022, -72.45393626*

Location: *42.48796, -72.45548 (STA 47+00)*

Culvert 18 corresponds with inlet and outlet openings of a roadside stormwater culvert (not shown on the most current USGS topographic map) that is conveyed alongside Dudleyville Road by a 12-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows an east to west alignment from Wetland 6 with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (*Tsuga canadensis*), White Pine (*Pinus strobus*), Shortleaf Fig *(Ficus citrifolia*), Sensitive Fern (*Onoclea sensibilis),* Corn Speedwell (*Veronica arvensis*)*.*

1.2.1.24 B6A 1 / 4 to B6B 1 / 4 (Wetland 6)

Western Bank: B6A-1- to B6A-4

Eastern Bank: B6B-1 to B6B-4

Location: *42.48777691, -72.4538215 (STA 47+17)*

Flag series B6A-1 to B6A-4 / B6B-1 to B6B-4 corresponds with the northwestern and northeastern limits of Wetland 6 which discharges though Culvert 17 on the north side at 92 Dudleyville Road. As such, and per 310 CMR 10.58(2)(a)(1)(c), this stream is intermittent.

Dominant vegetation includes Eastern Hemlock (*Tsuga canadensis*), White Pine (*Pinus strobus*), Shortleaf Fig *(Ficus citrifolia*), Sensitive Fern (*Onoclea sensibilis),* Corn Speedwell (*Veronica arvensis*).

1.2.1.25 Culvert 19

Inlet: *42.48774886. -72.45370538*

Outlet: *42.48767491, -72.45373687*

Location: *42.48769, -72.45376 (STA 47+71)*

Culvert 19 corresponds with inlet and outlet openings of a roadside stormwater culvert (not shown on the most current USGS topographic map) that is conveyed under Dudleyville Road by a 15-inch corrugated plastic pipe. The recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeast to southwest alignment from the roadside and discharges into Bordering Vegetated Wetland 7 with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (Tsuga canadensis), Mountain Laurel (*Kalmia latifolia*), Interrupted Fern (*Osmunda claytoniana),* Common Burdock (*Arctium minus*).

1.2.1.26 B7A-1 to B7A-4 / B7B-1 to B7B-4 (Bordering Vegetated Wetland 7)

West Bank: B7B 1 / 4

East Bank: B7A 1 / 4

Location: *42.48767263, -72.45374757 (STA 48+08)*

Flag series B7A-1 to B7-4 / B7B-1 to B7B-4 corresponds with the northwestern and northeastern limits of Wetland 6 which discharges though Culvert 18 south of 92 Dudleyville Road. Dudleyville Brook forms the southern border of BVW 7. As such, and per 310 CMR 10.58(2)(a)(1)(c), this stream is perennial.

The culvert follows an east to west alignment from Wetland 6 with flowing water observed along much of its extent. Dominant vegetation includes Eastern Hemlock (Tsuga canadensis), Mountain Laurel (*Kalmia latifolia*), Interrupted Fern (*Osmunda claytoniana),* Common Burdock (*Arctium minus*).

1.2.1.27 Culvert 20

Inlet: *42.48759. -72.45260*

Outlet: *42.48751832, -72.45266813*

Location: *42.48755, -72.45263 (STA 50+70)*

Culvert 20 corresponds with inlet and outlet openings of a roadside stormwater culvert (not shown on the most current USGS topographic map) that is conveyed under Dudleyville Road by a 12-inch corrugated steel pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch which serves as a catchment basin for greywater at 102 Dudleyville Road. Culvert 19 discharges into Bordering Vegetated Wetland 8. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a northeast to southwest alignment. Flowing water with depths between 3-inches to 5-inches on either end of roadside ditch, culvert, and wetland. Dominant vegetation includes Eastern Walnut (*Juglans recia*), White Pine (*Pinus strobus*), Sensitive Fern (*Onoclea sensibilis),* Jewelweed, (*Impatiens capensis*).

1.2.1.28 B8A-1 to B8A-4 / B8B-1 to B8B-3 (Bordering Vegetated Wetland 8)

West Bank: B8B 1 / 3

East Bank: B8A 1 / 4

Location: *42.48740514, -72.4526098 (STA 50+45)*

Flag series B8A-1 to B8-4 / B8B-1 to B8B-3 corresponds with the western and eastern limits of Wetland 8 which discharges though Culvert 20 at 1114 Dudleyville Road. Dudleyville Brook forms the southern border of BVW 8. As such, and per 310 CMR 10.58(2)(a)(1)(c), this stream is perennial.

Bordering Vegetated Wetland 8 with trickling flow observed along much of its extent. Dominant vegetation includes American Hornbeam (*Carpinus caroliniana*), White Pine (*Pinus strobus*), Skunk Cabbage (Symplocarpus foetidus), Coltsfoot (*Tussilago farfara*).

1.2.1.29 Culvert 21

Inlet: *42.48758563. -72.45207192*

Outlet: *42.48752034, -72.45207829*

Location: *42.48755, -72.45263 (STA 52+18)*

Culvert 21 corresponds with inlet and outlet openings of a roadside stormwater culvert (not shown on the most current USGS topographic map) that is conveyed under Dudleyville Road by a 12-inch corrugated steel pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway and fed by a roadside drainage ditch which serves as a catchment basin for greywater at 102 Dudleyville Road. Culvert 20 discharges into Bordering Vegetated Wetland 9. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent.

The culvert follows a north to south alignment. Flowing water with depths between 3-inches to 5-inches on either end of roadside ditch, culvert, and wetland. Dominant vegetation includes Blue Ash (*Fraxinus quadrangulata*), Sensitive Fern (*Onoclea sensibilis),*Indian Camphorweed *(Pluchea indica).*

1.2.1.30 B10A-1 to B10A-4 / B10B-1 to B10B-4 (Culvert 22)

West Bank: B10A 1 / 4 to B10D 1 / 4

East Bank: B10C 1 / 4 to B10E 1 / 4

Location: *42.48749, -72.45124 (STA 54+52)*

Bank flag series B10A-1 to B10A-4 / B10C-1 to B10C-3 corresponds with the western and eastern banks of Dudleyville Brook where it is spanned by Culvert 22. Culvert 22 is composed of a 66-inch corrugated steel culvert approximately 12 feet across and stacked field stone masonry. At this location Dudleyville Brook, shown as perennial on the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), is approximately 12 feet wide. Both Banks are primarily composed of large stone and cobble. Substrate consists of cobble / gravel downstream and sand / silt upstream. Site appears to be heavily modified by beavers. At the time of this field work, flow through the crossing was low to moderate with water depths estimated to reach up to six (6) inches to one (1) foot in areas. Dominant vegetation observed along both banks

consists of Sugar Maple (Acer saccharum), American Beech (*Fagus grandifolia*), Eastern White Pine (Pinus strobus), and Sensitive Fern (*Onoclea sensibilis*).

1.2.1.31 Culvert 23

Inlet: *42.48720315. -72.45009137*

Outlet: *42.48709675, -72.45010139*

Location: *42.48715, -72.45008 (STA 57+79)*

Culvert 23 corresponds with inlet and outlet openings of a discharge stream channel (shown on the most current USGS topographic map) that is conveyed under Dudleyville Road by a 15-inch corrugated plastic pipe. The culvert opening is recessed into a fieldstone basin measuring approximately three (3) feet across, located approximately one (1) foot below the roadway. Culvert 23 is fed by flag series **B11B 1 / 4 and B11C 1 / 4**. Culvert 23 discharges into Bordering Vegetated Wetland 11, flag series **BVW11A 1 / 6.** As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is perennial.

The culvert follows a slightly northwest to southeast alignment. Flowing water with depths between three (3) to five (5) inches. Dominant vegetation includes Blue Ash (*Fraxinus quadrangulata*), Eastern White Pine (*Pinus Strobus*) , Swamp White Oak, (*Quercus bicolor*), Sensitive Fern (*Onoclea sensibilis),* and sedges.

1.2.1.32 B11B 1 / 4 and B11C 1 / 4 to BVW11A 1 / 6

West Bank: B11B 1 / 4 to BVW11A 4 / 6

East Bank: B11C 1 / 4 to BVW11A 1 / 3

Location: *42.48749, -72.45124 (STA 57+32)*

1.2.1.33 B12A-1 / 4 to B12E-1 / 5 and BVW12B-1 / 4 to B12C-1 / 4 and B12D-1 / 5 (Culvert 24 and Culvert 25)

West Bank: B12A-1 / 4 to B12E 1 / 5 and BVW12B-1 / 4 to BVW12F-1 / 4

East Bank: B12C 1 / 4 to B12D 1 / 5

Location: *42.48715, -72.45007 (STA 59+58)*

Bank flag series B12A-1 / 4 to BVW12F-1 / 4 corresponds with the western and eastern banks of Dudleyville Brook (shown on the most current USGS topographic map). The primary culvert (Culvert 24) has an opening of approximately three (3) feet wide by three (3) feet tall at both ends and is recessed into a fieldstone basin measuring (12) feet across, located approximately one (1) foot below the roadway. A secondary culvert, (Culvert 25) composed of a 24-inch corrugated plastic pipe is positioned to the left of the main culvert and is approximately one (1) foot above the water line, measuring approximately one (1) foot across and one (1) foot below the roadway.

At this location Dudleyville Brook, (shown as perennial on the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), is approximately ten (10) feet wide. Both Banks are primarily composed of cobble and till upstream with sand / silt downstream. At the time of this field work, flow through the

crossing was moderate to high with water depths estimated between one (1) foot to three (3) feet upstream and three (3) inches to six (6) inches downstream.

Dominant vegetation observed along both banks consists of Swamp White Oak (*Quercus bicolor*), American Beech (*Fagus grandifolia*), Eastern White Pine (Pinus strobus), Eastern Hemlock (*Tsuga canadensis*), Sensitive Fern (*Onoclea sensibilis*). and Virginia Snakeroot (*Aristolochia serpenteria*).

1.2.1.34 B13A-1 / 3 and BVW13B-1 / 4 / and B13C-1 / 4 to B13D-1 / 4, B B13E-1 / 4 and BVW13F-1 / 4 (Culvert 26)

West Bank: B13A 1 / 3 and BVW13B-1 / 3 to B13D 1 / 4

East Bank: B13C 1 / 4 to B13E 1 / 4 and BVW13F-1 / 4

Location: *42.48749, -72.45124 (STA 64+32)*

Bank flag series B13D-1 / 4 to B13A-1 / 3 and BVW13B-1 / 3 to B13E-1 / 4 and BVW13F-1 / 4 to B13C-1 / 4 corresponds with the western and eastern banks of Dudleyville Brook at 150 Dudleyville Road. The main culvert consists of a 48-inch corrugated plastic pipe. The opening is approximately three (3) feet wide by three (3) feet tall at both ends and protrudes approximately three (3) feet from a fieldstone basin measuring (12) feet across, located approximately one (1) foot below the roadway.

At this location Dudleyville Brook, shown as intermittent on the most recent USGS topographic map of the area and presumed perennial per 310 CMR 10.58(2)(a)(1)(a)), is approximately three (3) feet wide. Both Banks are primarily composed of cobble / silt. Substrate consists of cobbles / sand / silt. At the time of this field work, flow through the crossing was low to moderate with water depths estimated to reach up to six (6) inches to one (1) foot in areas. Dominant vegetation observed along both banks consists of Sugar Maple (Acer saccharum), American Beech (*Fagus grandifolia*), Indian Plum (*Oemleria cerasiformis*), Sensitive Fern (*Onoclea sensibilis*).and Japanese Barberry (*Berberis thunbergii*).

1.2.1.35 Culvert 27

Inlet: *42.48593442. -72.44672621*

Outlet: *42.48587903, -72.44681893*

Location: *42.48590, -72.44683 (STA 67+93)*

Culvert 27 corresponds with inlet and outlet openings of a roadside stormwater culvert (not shown on the most current USGS topographic map) that is conveyed under Dudleyville Road by corrugated plastic pipe. The culvert opening is located approximately (1) foot below the roadway buried by roadside debris and drains to a filled channel,.

The culvert follows a northeast to southwest alignment with flowing water observed along much of its extent. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent. Dominant vegetation includes Burning Bush (*Eunymus alatus*), Eastern White Pine (*Pinus strobus*), Sensitive Fern (Onoclea sensibilis), and club moss (*Lycopodium digitatum*).

1.2.1.36 Culvert 28

Inlet: *42.48577678. -72.44602092*

Outlet: *42.48573158, -72.4460787*

Location: *42.48576, -72.44608 (STA 69+95)*

Culvert 28 corresponds with inlet and outlet openings of a roadside stormwater culvert (not shown on the most current USGS topographic map) that is conveyed under / and across Dudleyville Road at 160 Dudleyville Road The culvert consists of corrugated metal pipe and the dimensions are unknown as it is collapsed and filled in. Its current state of use is as a roadside ditch and channel.

The culvert follows a northeast to southwest alignment without any water observed along its extent. As such, and per 310 CMR 10.58(2)(a)(1)(c), the stream is intermittent. Dominant vegetation includes Sugar Maple (*Acer saccharum*), (Eastern White Pine (Pinus strobus), Swamp White Oak (*Quercus bicolor*) Sensitive Fern (Onoclea sensibilis), and Garlic Mustard (*Alliaria petiolata*).

TABLE-2
Summary of Culvert Locations by StreamStats Report Number

Flag Series	Culvert/Bridge ID	Culvert Location	StreamStats Report Number
B1A-1 to B1F-4 / B1B-1 to B1E-4	Bridge 1	*42.49417, -72.46765*	1
B2A-1 to B2A-8 / B2B-1 to B2B-10	Culvert 1	*42.49370, -72.46669*	2
B10A-1 to B10A-4 / B10B-1 to B10B-4	Culvert 22	*42.487481, -72.451145*	3
B11B 1 / 4 and B11C 1 / 4 to BVW11A 1 / 6	Culvert 23	*42.48709675, -72.45010139*	3
B12A-1 / 4 to B12E-1 / 5 and BVW12B-1 / 4 to B12C-1 / 4 and B12D-1 / 5	Culvert 24	*42.48701139, -72.449501*	3

ATTACHMENT F

GEOTECHNICAL DATA

Martin

Geo-Environmental, LLC

Drilling Contractors

P.O. Box 646
Belchertown, MA 01007 Tel: (413) 323-8700

Boring #: B-1 Start: 4-25-2023 Finish: 4-25-2023

Sheet: 1 of 1

Client: Tighe & Bond Inspector: A. Bouthilette

Project: Test Borings #: L0792-003

Location: Dudleyville Rd. Leverett MA

Well Locus: _____

Drill/Crew: J. Martin

Auger 2.25”	Casing Size	Sampling As Directed	Core Barrel	Utility Clearance #: 20231610588 Town Permit #:

Sample No.	Depth Range	Blows per 6 “				REC.	Strata Change	Sample Descriptions
		0-6	6-12	12-18	18-24			
S-1	1-3’	9	11	10	10	14”		Brown fine-medium SAND, little gravel, trace silt. DRY
S-2	3-5’	6	19	15	18	16”		Brown fine-medium SAND, little gravel. DRY
S-3	5-7’	20	16	13	26	14”		Brown dense fine-medium SAND and SILT, little gravel. WET
S-4	10-	8	12	12	25	20”		Brown fine SAND and SILT, little gravel. WET
	12’							
S-5	15-	12	21	38	32	18”		Brown fine SAND, some silt, rock in tip. WET
	17’							
								EOB 17’ WATER 5’

Field Obs. Only	Location:		Rig: Mobile B-53
Portions Used Trace: 0-10% Little: 10-20% Some: 20-35% And: 35-50%	Weather:		Hammer: 140 lb. Auto

Martin

Geo-Environmental, LLC

Drilling Contractors

P.O. Box 646
Belchertown, MA 01007 Tel: (413) 323-8700

Boring #: B-2 Start: 4-25-2023 Finish: 4-25-2023

Sheet: 1 of 1

Client: Tighe & Bond Inspector: A. Bouthilette

Project: Test Borings #: L0792-003

Location: Dudleyville Rd. Leverett MA

Well Locus: _____

Drill/Crew: J. Martin

Auger 2.25”	Casing Size	Sampling As Directed	Core Barrel	Utility Clearance #: 20231610588 Town Permit #:

Sample No.	Depth Range	Blows per 6 “				REC.	Strata Change	Sample Descriptions
		0-6	6-12	12-18	18-24			
S-1	1-3’	8	15	12	12	15”		Gray fine-medium SAND and GRAVEL. DRY
S-2	3-5’	12	9	2	3	14”		Gray fine-medium SAND and GRAVEL, brown silt in spoon
								tip. DRY
S-3	5-7’	7	16	16	20	14”		Brown fine-medium SAND and GRAVEL, little silt. MOIST
S-4	10-	4	9	9	10	15”		Brown fine-medium SAND, little gravel, little silt. WET
	12’							
S-5	15-	6	14	19	18	22”		Gray dense SILT and fine SAND, trace gravel. WET
	17’							
								EOB 17’ WATER 12’

Field Obs. Only	Location:		Rig: Mobile B-53
Portions Used Trace: 0-10% Little: 10-20% Some: 20-35% And: 35-50%	Weather:		Hammer: 140 lb. Auto

Martin

Geo-Environmental, LLC

Drilling Contractors

P.O. Box 646
Belchertown, MA 01007 Tel: (413) 323-8700

Boring #: B-3 Start: 4-25-2023 Finish: 4-25-2023

Sheet: 1 of 1

Client: Tighe & Bond Inspector: A. Bouthilette

Project: Test Borings #: L0792-003

Location: Dudleyville Rd. Leverett MA

Well Locus: _____

Drill/Crew: J. Martin

Auger 2.25”	Casing Size	Sampling As Directed	Core Barrel	Utility Clearance #: 20231610588 Town Permit #:

Sample No.	Depth Range	Blows per 6 “				REC.	Strata Change	Sample Descriptions
		0-6	6-12	12-18	18-24			
S-1	1-3’	6	11	9	7	15”		Gray fine-medium SAND, some gravel, some silt. DRY
S-2	3-5’	3	18	50/1”		3”		Gray fine-medium SAND, some gravel, trace silt. DRY
S-3	5-7’	10	11	12	15	11”		Gray fine-medium SAND, trace gravel, trace silt. DRY
S-4	10-	9	12	16	15	18”		Brown fine SAND and SILT, trace gravel. WET
	12’							
								Auger Refusal 13’
								EOB 13’ WATER 7’

Field Obs. Only	Location:		Rig: Mobile B-53
Portions Used Trace: 0-10% Little: 10-20% Some: 20-35% And: 35-50%	Weather:		Hammer: 140 lb. Auto

Martin

Geo-Environmental, LLC

Drilling Contractors

P.O. Box 646
Belchertown, MA 01007 Tel: (413) 323-8700

Boring #: B-4 Start: 4-25-2023 Finish: 4-25-2023

Sheet: 1 of 1

Client: Tighe & Bond Inspector: A. Bouthilette

Project: Test Borings #: L0792-003

Location: Dudleyville Rd. Leverett MA

Well Locus: _____

Drill/Crew: J. Martin

Auger 2.25”	Casing Size	Sampling As Directed	Core Barrel	Utility Clearance #: 20231610588 Town Permit #:

Sample No.	Depth Range	Blows per 6 “ 0-6	6-12	12-18	18-24	REC.	Strata Change	Sample Descriptions
S-1	1-3’	8	10	15	14	15”		Brown fine-medium SAND, little gravel, trace silt. DRY
S-2	3-5’	5	5	15	17	17”		Brown fine-medium SAND, some silt, little gravel. WET
S-3	5-7’	4	14	26	25	16”		Gray fine-medium SAND, some gravel, little silt. WET
								Auger Refusal 9’
								OFFSET Auger refusal 9’
								EOB 9’ WATER 3’

Field Obs. Only	Location:		Rig: Mobile B-53
Portions Used Trace: 0-10% Little: 10-20% Some: 20-35% And: 35-50%	Weather:		Hammer: 140 lb. Auto

Martin

Geo-Environmental, LLC

Drilling Contractors

P.O. Box 646
Belchertown, MA 01007 Tel: (413) 323-8700

Boring #: B-5 Start: 4-25-2023 Finish: 4-25-2023

Sheet: 1 of 1

Client: Tighe & Bond Inspector: A. Bouthilette

Project: Test Borings #: L0792-003

Location: Dudleyville Rd. Leverett MA

Well Locus: _____

Drill/Crew: J. Martin

Auger 2.25”	Casing Size	Sampling As Directed	Core Barrel	Utility Clearance #: 20231610588 Town Permit #:

Sample No.	Depth Range	Blows per 6 “				REC.	Strata Change	Sample Descriptions
		0-6	6-12	12-18	18-24			
S-1	1-3’	13	13	9	7	15”		Brown fine-medium SAND, little gravel, trace silt. DRY
S-2	3-5’	5	5	5	5	17”		Brown fine-medium SAND, little silt, trace gravel. DRY
S-3	5-7’	17	22	13	10	18”		Brown fine-medium SAND, some silt, little gravel. WET
								Auger Refusal 9’
S-4	10-	25	34	31	41	24”		Brown fine SAND, little silt, little gravel. WET
	17’							
								Auger Refusal 13’
								EOB 13’ WATER 4’

Field Obs. Only	Location:		Rig: Mobile B-53
Portions Used Trace: 0-10% Little: 10-20% Some: 20-35% And: 35-50%	Weather:		Hammer: 140 lb. Auto

Martin

Geo-Environmental, LLC

Drilling Contractors

P.O. Box 646
Belchertown, MA 01007 Tel: (413) 323-8700

Boring #: B-6 Start: 4-25-2023 Finish: 4-25-2023

Sheet: 1 of 1

Client: Tighe & Bond Inspector: A. Bouthilette

Project: Test Borings #: L0792-003

Location: Dudleyville Rd. Leverett MA

Well Locus: _____

Drill/Crew: J. Martin

Auger 2.25”	Casing Size	Sampling As Directed	Core Barrel	Utility Clearance #: 20231610588 Town Permit #:

Sample No.	Depth Range	Blows per 6 “				REC.	Strata Change	Sample Descriptions
		0-6	6-12	12-18	18-24			
S-1	1-3’	14	12	16	10	15”		Brown fine-medium SAND, little gravel, trace silt. DRY
S-2	3-5’	10	11	9	8	0”		No Recovery, spoon DRY
S-3	5-7’	6	7	8	7	19”		Tan fine-coarse SAND. WET
S-4	10-	50/5”				2”		Tan fine-medium SAND, some gravel, weathered rock in
	12’							spoon tip. WET
								Auger Refusal 14’
								EOB 14’ WATER 5’
								EOB 17’ WATER 5’

Field Obs. Only	Location:		Rig: Mobile B-53
Portions Used Trace: 0-10% Little: 10-20% Some: 20-35% And: 35-50%	Weather:		Hammer: 140 lb. Auto

Tighe&Bond
Engineers | Environmental Specialists

Project/Site Information
Dudleyville Road
Leverett, MA

Test Pit No. 1
Page No. 1 of 1
File No.
Checked By:

18

T&B Rep. N. Day
Weather Overcast
Contractor Leverett DPW
Operator Matt
Make Volvo Model EWR150E
Capacity Reach ft.
Date 6/27/23
Ground Elev.
Time Started 8:00 AM
Time Completed 830 AM

Depth (feet)	Soil Description	Sample No.	PID Reading (ppm)	Excavation Effort	Boulder Count/ Class	Note
0	0"-18" Brown gravel Brown M-C Sand Some gravel t. Silt filter fabric @ 18"	S.1 TP1	N/A	M	None	—
1		S.2	N/A	M	None	—
2	18"-33" Brown M-C Sand Some grave t. Silt	S.3	N/A	M	A/5%	—
3	33"-40 Gray f-C Sand Some grave t. Silt	S.4	N/A	E	None	—
4	40-48 - Black Organics.					
5	End exploration @ 48"					
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Notes:

Test Pit Plan
3' 6'
Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" +

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

Tighe&Bond
Engineers | Environmental Specialists

Project/Site Information

Test Pit No. 2
Page No. 1 of 1
File No.
Checked By:

T&B Rep. N. Day
Weather Overcast
Contractor Leverett DPW
Operator Matt
Make Volvo Model EWR150
Capacity ____ Reach ____ ft.
Date 6/27/23
Ground Elev.
Time Started 8:45 AM
Time Completed 9:15 AM

Depth (feet)	Soil Description	Sample No.	PID Reading (ppm)	Excavation Effort	Boulder Count/ Class	Note
0	0-18" Brown M-C Sand Some gravel t. Silt	S.5	N/A	D	NONE	—
1	18" filter fabric.		N/A	M	A 10%	—
2	18" - 31" Brown M-C Sand Some grave t. Silt		N/A	M	A 10%	—
3	31" - 55" f-M Tan Sand Little gravel + Silt	S.6				
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Notes: Modeling @ 40"
G.W. @ 54" @ 8:56AM

Test Pit Plan

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" +

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(X) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Groundwater

Tighe&Bond
Engineers | Environmental Specialists

Project/Site Information

Test Pit No. 3
Page No. 1 of 1
File No.
Checked By:

T&B Rep. N. Day
Weather Sunny
Contractor Leverett DPW
Operator Matt
Make Volvo Model EWR150
Capacity ____ Reach ____ ft.
Date 6/27/23
Ground Elev.
Time Started 915
Time Completed 9:45

Depth (feet)	Soil Description	Sample No.	PID Reading (ppm)	Excavation Effort	Boulder Count/ Class	Note
0	0-18" M-C Sand Some gravel trace Silt. Brown	S.7	N/A	M	NONE	—
1						
2	18"-34" Brown M-C Sand Little gravel + Silt		N/A	M	~~A/10%~~ NONE	
3			N/A	M	A/10%	—
4	34"-54" f-M Sand Yellow Brown trace gravel + Silt	S.8	N/A	M	A/10%	—
5	54"-60" Brown C Sand Some gravel + Silt - Saturated.					
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Notes: Modeling @ 36"
No filter fabric.

Test Pit Plan

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" +

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
( ) Encountered
(X) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Ground-water

Tighe&Bond
Engineers | Environmental Specialists

Project/Site Information

Test Pit No. 4
Page No. 1 of 1
File No.
Checked By:

T&B Rep. NDay
Weather Overcast
Contractor Leverett DPW
Operator Matt
Make Volvo Model EWR150
Capacity Reach ft.
Date 6/27
Ground Elev.
Time Started 1000 AM
Time Completed 1100 AM

Depth (feet)	Soil Description	Sample No.	PID Reading (ppm)	Excavation Effort	Boulder Count/ Class	Note
0	0-28" Brown M-C Sand Some gravel t. Silt.	S-9	N/A	D	—	
1				D	—	
2	28"-47" Gray Very f Sand t. Silt			D	A 10%	
3		S-10		D	A-15%	
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						

Notes:
Modeling @ 28"
Weeping @ 48"

Test Pit Plan

Volume = _____ cu. yd.

Boulder Class

Letter Designation	Size Range Classification
A	6" - 17"
B	18" - 36"
C	36" +

Excavation Effort
E-----Easy
M-----Moderate
D-----Difficult

Proportions Used

TRACE (TR.)	0 - 10%
LITTLE (LI.)	10 - 20%
SOME (SO.)	20 - 35%
AND	35 - 50%

Abbreviations
F = Fine
M = Medium
C = Coarse
V = Very
F/M = Fine to medium
F/C = Fine to coarse
GR = Gray
BN = Brown
YEL = Yellow

GROUNDWATER
(X) Encountered
( ) Not Encountered

Elapsed Time to Reading (Hours)	Depth to Groundwater

M:\Explorations\[Test Pit Log1.xlsx]TP-1

Thielsch
DIVISION OF THE RISE GROUP

195 Frances Avenue
Cranston RI, 02910
Phone: (401)-467-6454
Fax: (401)-467-2398
cts.thielsch.com
Let's Build a Solid Foundation

Client Information:	
Tighe & Bond	
Providence, RI	
Project Manager:	A. Fagnand
Assigned By:	Nick Day
Collected By:	N. Day

Project Information:	
Dudleyville Road Leverett MA	
Leverette, MA	
Project Number:	L-0792-03
Summary Page:	1 of 1
Report Date:	07.12.23

LABORATORY TESTING DATA SHEET, Report No.: 7423-G-125

Source	Sample No.	Depth (ft)	Laboratory No.	Identification Tests								Proctor / CBR / Permeability Tests								Laboratory Log and Soil Description
				As Rcvd Moisture Content %	LL %	PL %	Gravel %	Sand %	Fines %	Org. %	pH	g_d MAX (pcf) W_{opt} (%)	g_d MAX (pcf) W_{opt} (%) (Corr.)	Dry unit wt. (pcf)	Test Moisture Content %	Target Test Setup as % of Proctor	CBR @ 0.1"	CBR @ 0.2"	Permeability cm/sec	
				D2216	D4318		D6913			D2974	D4792	D1557								
TP 1	S-1	0-1.5	23-S-2901				45.9	40.0	14.1											Brown silty gravel with sand
TP 1	S-2	1.5-2	23-S-2902				38.6	52.3	9.1											Brown poorly graded sand with silt and gravel
TP 1	S-3	2-3.5	23-S-2903				41.7	48.2	10.1											Brown poorly graded sand with silt and gravel
TP 3	S-8	3-4.5	23-S-2904				7.5	61.9	30.6											Brown silty sand
TP 4	S-10	2-4	23-S-2905				0.6	45.5	53.9											Brown sandy silt

Date Received: **07.07.23** Reviewed By: Date Reviewed: **07.12.23**

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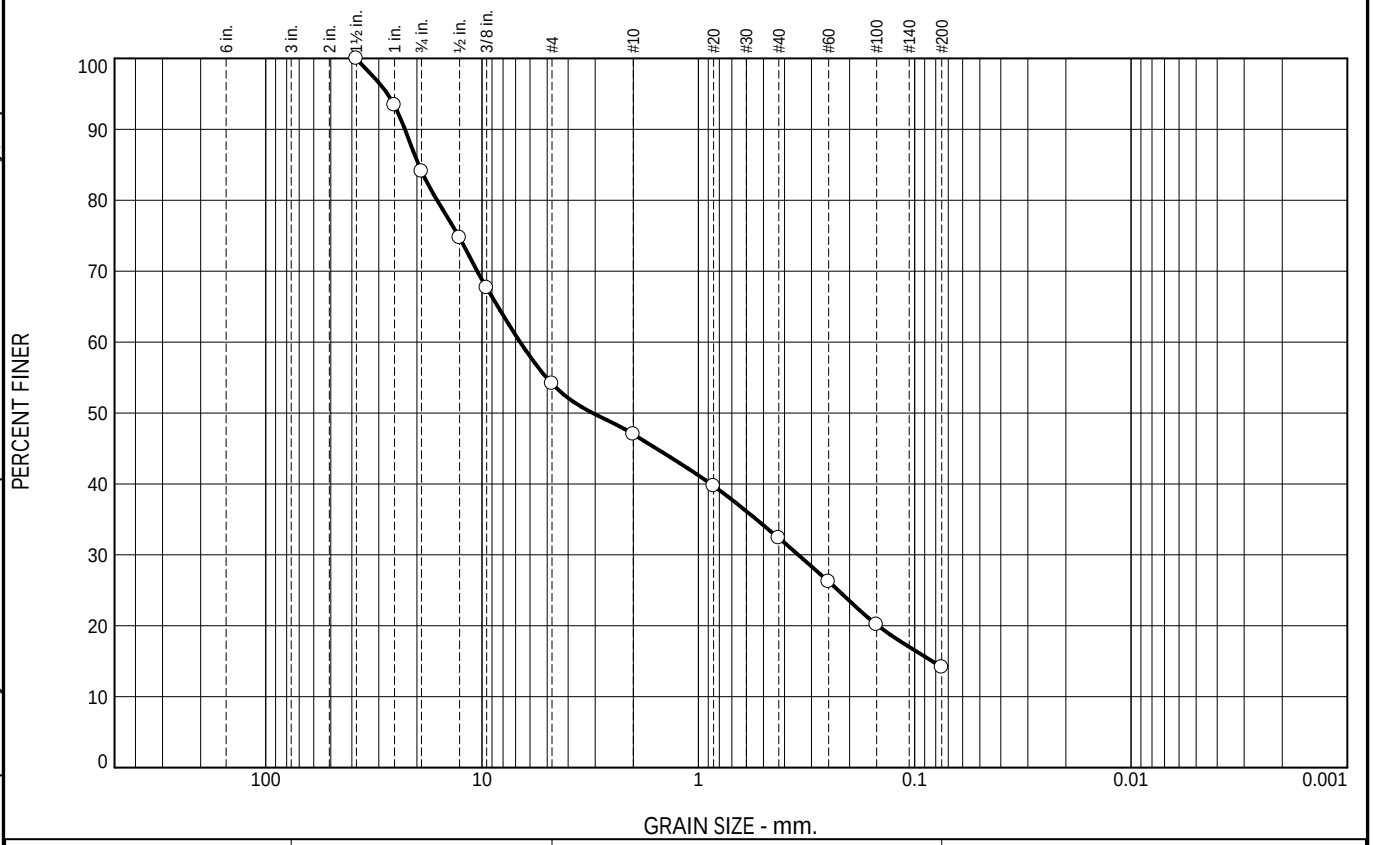
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.9	30.0	7.1	14.6	18.3	14.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	93.4		
3/4"	84.1		
1/2"	74.7		
3/8"	67.6		
#4	54.1		
#10	47.0		
#20	39.7		
#40	32.4		
#60	26.2		
#100	20.2		
#200	14.1		

* (no specification provided)

Soil Description

Brown silty gravel with sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 22.7083 D_{85}= 19.6577 D_{60}= 6.6657
D_{50}= 3.0846 D_{30}= 0.3451 D_{15}= 0.0830
D_{10}= C_u= C_c=

Classification

USCS= GM AASHTO= A-1-b

Remarks

Source of Sample: Test Pits Depth: 0-1.5'
Sample Number: TP-1 / S-1

Date: 07.12.23

Thielsch Engineering Inc.

Cranston, RI

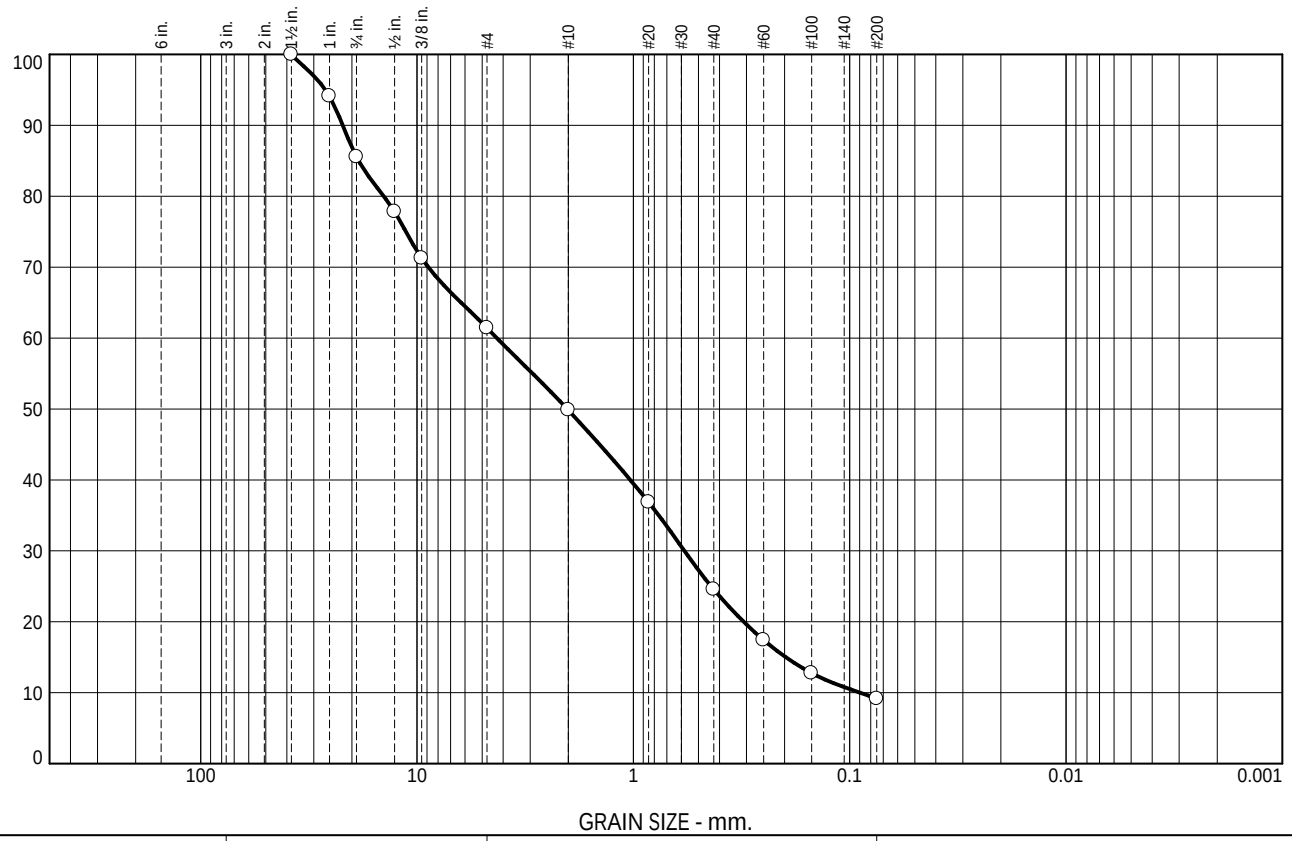
Client: Tighe & Bond
Project: Dudleyville Road
Leverett, MA
Project No: L-0792-03

Figure 23-S-2901

Tested By: GO / JB Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	14.5	24.1	11.6	25.2	15.5	9.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	94.1		
3/4"	85.5		
1/2"	77.8		
3/8"	71.3		
#4	61.4		
#10	49.8		
#20	36.9		
#40	24.6		
#60	17.4		
#100	12.8		
#200	9.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 22.0585 D_{85}= 18.6255 D_{60}= 4.2761
D_{50}= 2.0213 D_{30}= 0.5811 D_{15}= 0.1974
D_{10}= 0.0895 C_u= 47.75 C_c= 0.88

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Source of Sample: Test Pits Depth: 1.5-2'
Sample Number: TP-1 / S-2

Date: 07.12.23

Thielsch Engineering Inc.

Cranston, RI

Client: Tighe & Bond
Project: Dudleyville Road
Leverett, MA
Project No: L-0792-03

Figure 23-S-2902

Tested By: GO / JB Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	23.0	18.7	9.7	19.4	19.1	10.1	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1 1/2"	94.1		
1"	86.3		
3/4"	77.0		
1/2"	69.4		
3/8"	66.0		
#4	58.3		
#10	48.6		
#20	38.0		
#40	29.2		
#60	22.0		
#100	15.5		
#200	10.1		

* (no specification provided)

Soil Description

Brown poorly graded sand with silt and gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 30.3051 D_{85}= 24.2942 D_{60}= 5.5318
D_{50}= 2.2523 D_{30}= 0.4523 D_{15}= 0.1433
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-1-a

Remarks

Source of Sample: Test Pits Depth: 2-3.5'
Sample Number: TP-1 / S-3

Date: 07.11.23

Thielsch Engineering Inc.

Cranston, RI

Client: Tighe & Bond
Project: Dudleyville Road
Leverett, MA
Project No: L-0792-03

Figure 23-S-2903

Tested By: GO / JB Checked By: Rebecca Roth

These results are for the exclusive use of the client for whom they were obtained. This report only relates to items inspect and/or tested. No warranty, expressed or implied, is made.

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.9	5.6	6.4	19.1	36.4	30.6	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 1/2"	100.0		
1"	99.1		
3/4"	98.1		
1/2"	96.1		
3/8"	95.0		
#4	92.5		
#10	86.1		
#20	77.9		
#40	67.0		
#60	57.0		
#100	46.2		
#200	30.6		

* (no specification provided)

Soil Description

Brown silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.2306 D_{85}= 1.7542 D_{60}= 0.2912
D_{50}= 0.1784 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample visually classified as non-plastic.

Source of Sample: Test Pits Depth: 3-4.5'
Sample Number: TP-3 / S-8

Date: 07.12.23

Thielsch Engineering Inc.

Cranston, RI

Client: Tighe & Bond
Project: Dudleyville Road
Leverett, MA
Project No: L-0792-03

Figure 23-S-2904

Tested By: GO / JB Checked By: Rebecca Roth

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Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	1.5	5.5	38.5	53.9	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2"	100.0		
3/8"	99.7		
#4	99.4		
#10	97.9		
#20	95.6		
#40	92.4		
#60	86.8		
#100	77.6		
#200	53.9		

* (no specification provided)

Soil Description

Brown sandy silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.3235 D_{85}= 0.2201 D_{60}= 0.0889
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(0)

Remarks

Sample visually classified as non-plastic.

Source of Sample: Test Pits Depth: 2-4'
Sample Number: TP-4 / S-10

Date: 07.12.23

Thielsch Engineering Inc.

Cranston, RI

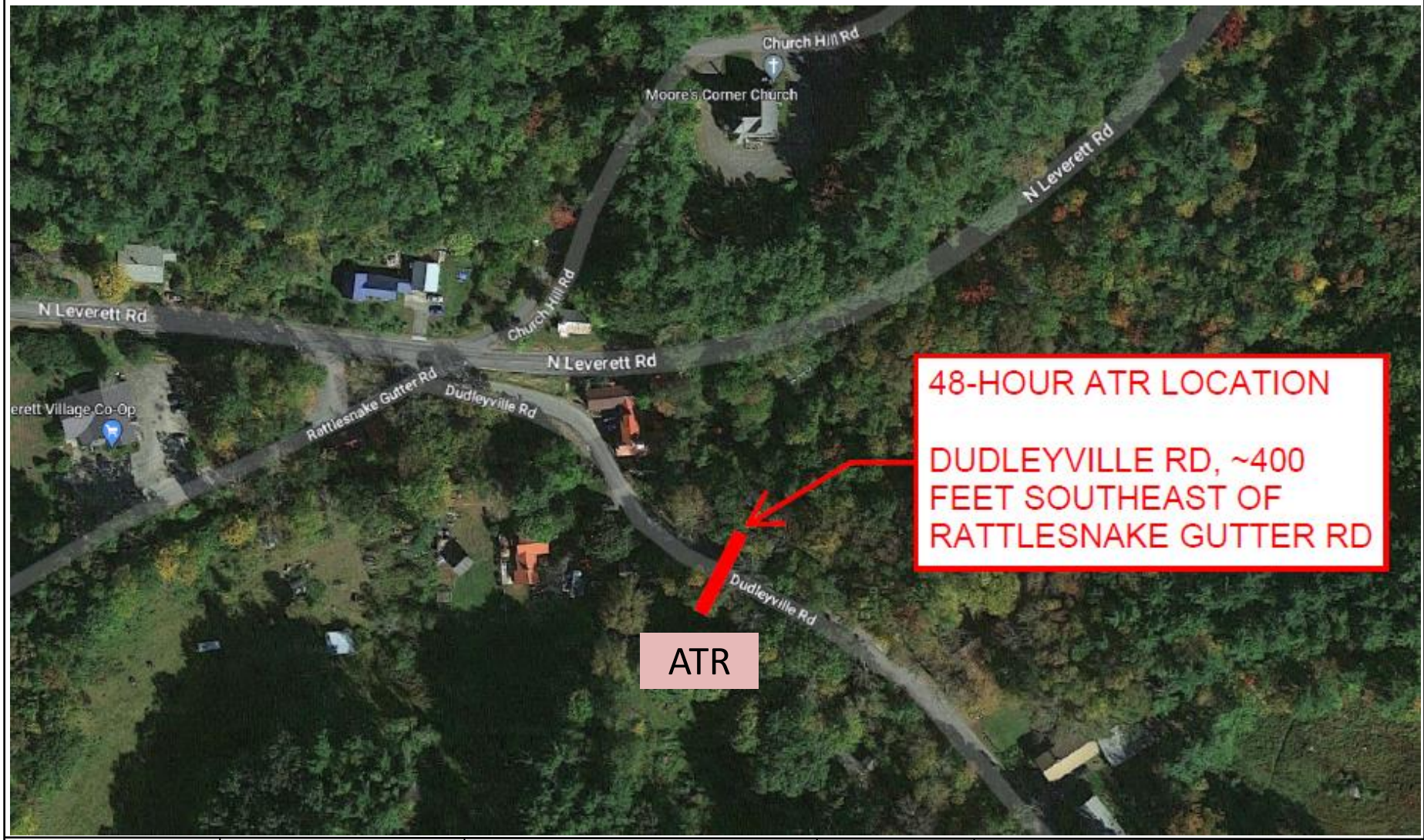
Client: Tighe & Bond
Project: Dudleyville Road
Leverett, MA
Project No: L-0792-03

Figure 23-S-2905

Tested By: GO / JB Checked By: Rebecca Roth

ATTACHMENT G

TRAFFIC VOLUME DATA



BOSTON TRAFFIC DATA	BTD ID: 1222_1_TB	Leverett, MA	# of TMC's: 00	Client: Tighe & Bond
		Collected on June 6 to 7, 2023	# of ATR's: 01	Contact: Matthew Stoutz, PE, PTOE, RSP1

Volume Report

Job 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400’ south of Rattlesnake Gutter Rd/N Leverette Rd

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Tuesday, June 6, 2023

Time	Total		NB		SB		Time	Total		NB		SB	
0000	0		0		0		1200	5		2		3	
0015	0		0		0		1215	3		2		1	
0030	0		0		0		1230	3		1		2	
0045	0	0	0	0	0	0	1245	2	13	1	6	1	7
0100	0		0		0		1300	1		0		1	
0115	0		0		0		1315	3		2		1	
0130	0		0		0		1330	2		0		2	
0145	2	2	1	1	1	1	1345	3	9	2	4	1	5
0200	0		0		0		1400	2		1		1	
0215	0		0		0		1415	6		2		4	
0230	0		0		0		1430	9		5		4	
0245	0	0	0	0	0	0	1445	7	24	3	11	4	13
0300	0		0		0		1500	7		5		2	
0315	0		0		0		1515	5		2		3	
0330	1		1		0		1530	7		2		5	
0345	0	1	0	1	0	0	1545	4	23	1	10	3	13
0400	3		2		1		1600	4		3		1	
0415	0		0		0		1615	3		3		0	
0430	0		0		0		1630	5		0		5	
0445	0	3	0	2	0	1	1645	3	15	1	7	2	8
0500	0		0		0		1700	10		0		10	
0515	0		0		0		1715	7		2		5	
0530	1		1		0		1730	8		2		6	
0545	0	1	0	1	0	0	1745	5	30	1	5	4	25
0600	1		1		0		1800	5		2		3	
0615	1		1		0		1815	2		2		0	
0630	1		1		0		1830	1		0		1	
0645	5	8	3	6	2	2	1845	3	11	0	4	3	7
0700	2		2		0		1900	2		1		1	
0715	3		3		0		1915	0		0		0	
0730	2		2		0		1930	4		3		1	
0745	2	9	0	7	2	2	1945	2	8	2	6	0	2
0800	1		1		0		2000	2		2		0	
0815	4		3		1		2015	0		0		0	
0830	8		5		3		2030	1		0		1	
0845	5	18	5	14	0	4	2045	2	5	0	2	2	3
0900	1		1		0		2100	1		0		1	
0915	2		2		0		2115	1		1		0	
0930	1		1		0		2130	1		1		0	
0945	3	7	1	5	2	2	2145	3	6	0	2	3	4
1000	3		0		3		2200	1		0		1	
1015	7		3		4		2215	0		0		0	
1030	1		0		1		2230	0		0		0	
1045	2	13	1	4	1	9	2245	0	1	0	0	0	1
1100	2		1		1		2300	0		0		0	
1115	4		3		1		2315	0		0		0	
1130	2		1		1		2330	0		0		0	
1145	0	8	0	5	0	3	2345	0	0	0	0	0	0
							Total	**215**		**103**		**112**	

Volume Report

Job 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400’ south of Rattlesnake Gutter Rd/N Leverette Rd

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Wednesday, June 7, 2023

Time	Total		NB		SB		Time	Total		NB		SB	
0000	0		0		0		1200	5		4		1	
0015	0		0		0		1215	5		3		2	
0030	0		0		0		1230	6		4		2	
0045	0	0	0	0	0	0	1245	5	21	3	14	2	7
0100	0		0		0		1300	6		3		3	
0115	0		0		0		1315	5		4		1	
0130	0		0		0		1330	2		0		2	
0145	0	0	0	0	0	0	1345	2	15	1	8	1	7
0200	0		0		0		1400	2		1		1	
0215	0		0		0		1415	5		3		2	
0230	0		0		0		1430	2		0		2	
0245	0	0	0	0	0	0	1445	3	12	2	6	1	6
0300	0		0		0		1500	8		4		4	
0315	0		0		0		1515	4		1		3	
0330	0		0		0		1530	4		1		3	
0345	0	0	0	0	0	0	1545	7	23	6	12	1	11
0400	3		2		1		1600	6		2		4	
0415	0		0		0		1615	6		1		5	
0430	0		0		0		1630	4		1		3	
0445	1	4	1	3	0	1	1645	3	19	1	5	2	14
0500	0		0		0		1700	7		4		3	
0515	0		0		0		1715	9		6		3	
0530	1		1		0		1730	8		3		5	
0545	1	2	1	2	0	0	1745	2	26	2	15	0	11
0600	2		2		0		1800	3		1		2	
0615	0		0		0		1815	4		2		2	
0630	2		2		0		1830	4		2		2	
0645	3	7	2	6	1	1	1845	3	14	0	5	3	9
0700	2		1		1		1900	2		0		2	
0715	2		2		0		1915	2		0		2	
0730	4		4		0		1930	7		2		5	
0745	4	12	2	9	2	3	1945	4	15	0	2	4	13
0800	2		2		0		2000	0		0		0	
0815	7		5		2		2015	2		0		2	
0830	2		1		1		2030	0		0		0	
0845	5	16	3	11	2	5	2045	2	4	0	0	2	4
0900	5		3		2		2100	2		0		2	
0915	2		1		1		2115	0		0		0	
0930	4		3		1		2130	0		0		0	
0945	2	13	1	8	1	5	2145	1	3	0	0	1	3
1000	2		1		1		2200	0		0		0	
1015	3		1		2		2215	0		0		0	
1030	2		1		1		2230	0		0		0	
1045	5	12	4	7	1	5	2245	0	0	0	0	0	0
1100	3		1		2		2300	0		0		0	
1115	5		2		3		2315	1		0		1	
1130	5		2		3		2330	0		0		0	
1145	6	19	3	8	3	11	2345	0	1	0	0	0	1
							Total	**238**		**121**		**117**	

Speed Report

Job 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400’ south of Rattlesnake Gutter Rd/N Leverette Rd
Dir Northbound
Tuesday, June 6, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Time	Total	Speed Bins (mph)															
		0 5	5 10	10 15	15 20	20 25	25 30	30 35	35 40	40 45	45 50	50 55	55 60	60 65	65 70	70 75	75 80
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
0400	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
0500	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
0600	6	0	0	1	0	3	2	0	0	0	0	0	0	0	0	0	0
0700	7	0	0	0	2	1	3	1	0	0	0	0	0	0	0	0	0
0800	14	0	0	0	1	4	6	3	0	0	0	0	0	0	0	0	0
0900	5	0	0	0	0	1	1	2	1	0	0	0	0	0	0	0	0
1000	4	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
1100	5	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0
1200	6	0	0	0	1	0	2	3	0	0	0	0	0	0	0	0	0
1300	4	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0
1400	11	0	0	1	1	5	1	1	2	0	0	0	0	0	0	0	0
1500	10	0	0	0	1	4	4	1	0	0	0	0	0	0	0	0	0
1600	7	0	0	0	1	2	2	2	0	0	0	0	0	0	0	0	0
1700	5	0	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0
1800	4	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0
1900	6	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0
2000	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
2100	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**103**	**0**	**0**	**2**	**7**	**34**	**31**	**24**	**5**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**0.00%**	**0.00%**	**1.94%**	**6.80%**	**33.01%**	**30.10%**	**23.30%**	**4.85%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Maximum = 38.2 mph, Minimum = 13.1 mph, Mean = 26.4 mph
85% Speed = 31.53 mph, 95% Speed = 35.37 mph, Median = 26.28 mph
10 mph Pace = 21 - 31, Number in Pace = 73 (70.87%)
Variance = 26.01, Standard Deviation = 5.10 mph

Speed Report

Job 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400’ south of Rattlesnake Gutter Rd/N Leverette Rd
Dir Northbound
Wednesday, June 7, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Time	Total	Speed Bins (mph)															
		0 5	5 10	10 15	15 20	20 25	25 30	30 35	35 40	40 45	45 50	50 55	55 60	60 65	65 70	70 75	75 80
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0400	3	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
0500	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
0600	6	0	0	0	0	2	2	2	0	0	0	0	0	0	0	0	0
0700	9	0	0	0	2	6	1	0	0	0	0	0	0	0	0	0	0
0800	11	0	0	1	1	3	3	2	1	0	0	0	0	0	0	0	0
0900	8	0	0	0	2	2	1	3	0	0	0	0	0	0	0	0	0
1000	7	0	0	0	1	1	4	1	0	0	0	0	0	0	0	0	0
1100	8	0	0	1	2	4	1	0	0	0	0	0	0	0	0	0	0
1200	14	0	0	0	0	6	6	2	0	0	0	0	0	0	0	0	0
1300	8	0	0	1	0	5	2	0	0	0	0	0	0	0	0	0	0
1400	6	0	0	0	1	3	1	1	0	0	0	0	0	0	0	0	0
1500	12	0	0	0	2	6	4	0	0	0	0	0	0	0	0	0	0
1600	5	0	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0
1700	15	0	0	0	5	5	4	1	0	0	0	0	0	0	0	0	0
1800	5	0	0	0	1	1	1	2	0	0	0	0	0	0	0	0	0
1900	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**121**	**0**	**0**	**4**	**18**	**46**	**36**	**15**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**0.00%**	**0.00%**	**3.31%**	**14.88%**	**38.02%**	**29.75%**	**12.40%**	**1.65%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Maximum = 36.1 mph, Minimum = 10.3 mph, Mean = 24.4 mph
85% Speed = 29.61 mph, 95% Speed = 33.30 mph, Median = 24.49 mph
10 mph Pace = 17 - 27, Number in Pace = 84 (69.42%)
Variance = 26.84, Standard Deviation = 5.18 mph

Speed Report

Job 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400’ south of Rattlesnake Gutter Rd/N Leverette Rd
Dir Southbound
Tuesday, June 6, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Time	Total	Speed Bins (mph)															
		0 5	5 10	10 15	15 20	20 25	25 30	30 35	35 40	40 45	45 50	50 55	55 60	60 65	65 70	70 75	75 80
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0400	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
0500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0600	2	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
0700	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
0800	4	0	0	0	1	2	1	0	0	0	0	0	0	0	0	0	0
0900	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
1000	9	0	0	0	1	7	0	1	0	0	0	0	0	0	0	0	0
1100	3	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0
1200	7	0	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0
1300	5	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	0
1400	13	0	0	0	4	5	4	0	0	0	0	0	0	0	0	0	0
1500	13	0	0	0	1	8	4	0	0	0	0	0	0	0	0	0	0
1600	8	0	0	0	1	4	3	0	0	0	0	0	0	0	0	0	0
1700	25	0	0	1	2	12	10	0	0	0	0	0	0	0	0	0	0
1800	7	0	0	0	1	5	1	0	0	0	0	0	0	0	0	0	0
1900	2	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
2000	3	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0
2100	4	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0
2200	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
2300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**112**	**0**	**0**	**2**	**19**	**59**	**31**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**0.00%**	**0.00%**	**1.79%**	**16.96%**	**52.68%**	**27.68%**	**0.89%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Maximum = 32.1 mph, Minimum = 13.5 mph, Mean = 23.1 mph
85% Speed = 26.79 mph, 95% Speed = 28.88 mph, Median = 23.24 mph
10 mph Pace = 18 - 28, Number in Pace = 95 (84.82%)
Variance = 12.39, Standard Deviation = 3.52 mph

Speed Report

Job 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400’ south of Rattlesnake Gutter Rd/N Leverette Rd
Dir Southbound
Wednesday, June 7, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Time	Total	Speed Bins (mph)															
		0 5	5 10	10 15	15 20	20 25	25 30	30 35	35 40	40 45	45 50	50 55	55 60	60 65	65 70	70 75	75 80
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0400	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0600	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
0700	3	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0
0800	5	0	0	1	0	1	3	0	0	0	0	0	0	0	0	0	0
0900	5	0	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0
1000	5	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
1100	11	0	0	0	4	4	3	0	0	0	0	0	0	0	0	0	0
1200	7	0	0	1	3	2	1	0	0	0	0	0	0	0	0	0	0
1300	7	0	0	0	0	6	0	1	0	0	0	0	0	0	0	0	0
1400	6	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0
1500	11	0	0	0	4	6	1	0	0	0	0	0	0	0	0	0	0
1600	14	0	0	0	4	6	3	1	0	0	0	0	0	0	0	0	0
1700	11	0	0	0	2	6	3	0	0	0	0	0	0	0	0	0	0
1800	9	0	0	1	2	3	3	0	0	0	0	0	0	0	0	0	0
1900	13	0	0	1	5	4	3	0	0	0	0	0	0	0	0	0	0
2000	4	0	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0
2100	3	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2300	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Total	**117**	**0**	**0**	**5**	**28**	**53**	**27**	**4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**0.00%**	**0.00%**	**4.27%**	**23.93%**	**45.30%**	**23.08%**	**3.42%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Maximum = 32.9 mph, Minimum = 12.5 mph, Mean = 22.5 mph
85% Speed = 26.52 mph, 95% Speed = 28.92 mph, Median = 22.87 mph
10 mph Pace = 17 - 27, Number in Pace = 98 (83.76%)
Variance = 15.36, Standard Deviation = 3.92 mph

Classification Report

Job # 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400' south of Rattlesnake Gutter Rd/N Leverette Rd
Direction Northbound
Tuesday, June 6, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Time	Total	Class 1 Motorcycle	Class 2 Passenger Car	Class 3 Vans, Pick up Trucks	Class 4 Bus	Class 5 2 Axle 6 Tires	Class 6 3 Axle Unit	Class 7 4 Axles or more Unit	Class 8 3 or 4 Axle Trailer	Class 9 5 Axle Trailer	Class 10 6 Axle or more Trailer	Class 11 5 Axle or less Multi-Trailer	Class 12 6 Axle Multi-Trailer	Class 13 7 Axle or more Multi-Trailer
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0400	2	0	2	0	0	0	0	0	0	0	0	0	0	0
0500	1	0	0	1	0	0	0	0	0	0	0	0	0	0
0600	6	0	6	0	0	0	0	0	0	0	0	0	0	0
0700	7	0	7	0	0	0	0	0	0	0	0	0	0	0
0800	14	0	10	4	0	0	0	0	0	0	0	0	0	0
0900	5	1	2	2	0	0	0	0	0	0	0	0	0	0
1000	4	0	4	0	0	0	0	0	0	0	0	0	0	0
1100	5	1	4	0	0	0	0	0	0	0	0	0	0	0
1200	6	0	6	0	0	0	0	0	0	0	0	0	0	0
1300	4	0	4	0	0	0	0	0	0	0	0	0	0	0
1400	11	0	10	1	0	0	0	0	0	0	0	0	0	0
1500	10	2	4	3	1	0	0	0	0	0	0	0	0	0
1600	7	1	4	2	0	0	0	0	0	0	0	0	0	0
1700	5	0	3	2	0	0	0	0	0	0	0	0	0	0
1800	4	0	2	2	0	0	0	0	0	0	0	0	0	0
1900	6	0	5	1	0	0	0	0	0	0	0	0	0	0
2000	2	0	2	0	0	0	0	0	0	0	0	0	0	0
2100	2	0	2	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**103**	**5**	**79**	**18**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**4.85%**	**76.70%**	**17.48%**	**0.97%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Classification Report

Job # 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400' south of Rattlesnake Gutter Rd/N Leverette Rd
Direction Northbound
Wednesday, June 7, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
DataRequest@BostonTrafficData.com
www.BostonTrafficData.com

Time	Total	Class 1 Motorcycle	Class 2 Passenger Car	Class 3 Vans, Pick up Trucks	Class 4 Bus	Class 5 2 Axle 6 Tires	Class 6 3 Axle Unit	Class 7 4 Axles or more Unit	Class 8 3 or 4 Axle Trailer	Class 9 5 Axle Trailer	Class 10 6 Axle or more Trailer	Class 11 5 Axle or less Multi-Trailer	Class 12 6 Axle Multi-Trailer	Class 13 7 Axle or more Multi-Trailer
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0400	3	0	3	0	0	0	0	0	0	0	0	0	0	0
0500	2	0	1	1	0	0	0	0	0	0	0	0	0	0
0600	6	0	5	1	0	0	0	0	0	0	0	0	0	0
0700	9	0	8	1	0	0	0	0	0	0	0	0	0	0
0800	11	1	8	2	0	0	0	0	0	0	0	0	0	0
0900	8	0	5	2	1	0	0	0	0	0	0	0	0	0
1000	7	0	7	0	0	0	0	0	0	0	0	0	0	0
1100	8	0	6	2	0	0	0	0	0	0	0	0	0	0
1200	14	0	10	4	0	0	0	0	0	0	0	0	0	0
1300	8	0	6	1	1	0	0	0	0	0	0	0	0	0
1400	6	1	4	1	0	0	0	0	0	0	0	0	0	0
1500	12	0	8	4	0	0	0	0	0	0	0	0	0	0
1600	5	0	4	1	0	0	0	0	0	0	0	0	0	0
1700	15	1	10	3	0	1	0	0	0	0	0	0	0	0
1800	5	0	5	0	0	0	0	0	0	0	0	0	0	0
1900	2	0	2	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**121**	**3**	**92**	**23**	**2**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**2.48%**	**76.03%**	**19.01%**	**1.65%**	**0.83%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Classification Report

Job # 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400' south of Rattlesnake Gutter Rd/N Leverette Rd
Direction Southbound
Tuesday, June 6, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
Office: 978-746-1259
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Time	Total	Class 1 Motorcycle	Class 2 Passenger Car	Class 3 Vans, Pick up Trucks	Class 4 Bus	Class 5 2 Axle 6 Tires	Class 6 3 Axle Unit	Class 7 4 Axles or more Unit	Class 8 3 or 4 Axle Trailer	Class 9 5 Axle Trailer	Class 10 6 Axle or more Trailer	Class 11 5 Axle or less Multi-Trailer	Class 12 6 Axle Multi-Trailer	Class 13 7 Axle or more Multi-Trailer
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0400	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0600	2	0	2	0	0	0	0	0	0	0	0	0	0	0
0700	2	0	1	0	1	0	0	0	0	0	0	0	0	0
0800	4	0	2	1	1	0	0	0	0	0	0	0	0	0
0900	2	0	1	0	0	1	0	0	0	0	0	0	0	0
1000	9	0	7	2	0	0	0	0	0	0	0	0	0	0
1100	3	0	3	0	0	0	0	0	0	0	0	0	0	0
1200	7	0	5	2	0	0	0	0	0	0	0	0	0	0
1300	5	0	5	0	0	0	0	0	0	0	0	0	0	0
1400	13	0	9	4	0	0	0	0	0	0	0	0	0	0
1500	13	0	11	2	0	0	0	0	0	0	0	0	0	0
1600	8	0	6	2	0	0	0	0	0	0	0	0	0	0
1700	25	0	17	6	0	2	0	0	0	0	0	0	0	0
1800	7	0	7	0	0	0	0	0	0	0	0	0	0	0
1900	2	0	2	0	0	0	0	0	0	0	0	0	0	0
2000	3	0	3	0	0	0	0	0	0	0	0	0	0	0
2100	4	0	3	1	0	0	0	0	0	0	0	0	0	0
2200	1	0	1	0	0	0	0	0	0	0	0	0	0	0
2300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	**112**	**0**	**87**	**20**	**2**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**0.00%**	**77.68%**	**17.86%**	**1.79%**	**2.68%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

Classification Report

Job # 1222_1_TB_ATR
Area Leverett, MA
Location Dudleyville Road, about 400' south of Rattlesnake Gutter Rd/N Leverette Rd
Direction Southbound
Wednesday, June 7, 2023

BOSTON TRAFFIC DATA
PO BOX 1723, Framingham, MA 01701
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DataRequest@BostonTrafficData.com
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Time	Total	Class 1 Motorcycle	Class 2 Passenger Car	Class 3 Vans, Pick up Trucks	Class 4 Bus	Class 5 2 Axle 6 Tires	Class 6 3 Axle Unit	Class 7 4 Axles or more Unit	Class 8 3 or 4 Axle Trailer	Class 9 5 Axle Trailer	Class 10 6 Axle or more Trailer	Class 11 5 Axle or less Multi-Trailer	Class 12 6 Axle Multi-Trailer	Class 13 7 Axle or more Multi-Trailer
0000	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0400	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0500	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0600	1	0	1	0	0	0	0	0	0	0	0	0	0	0
0700	3	0	1	1	1	0	0	0	0	0	0	0	0	0
0800	5	0	3	1	1	0	0	0	0	0	0	0	0	0
0900	5	0	3	1	1	0	0	0	0	0	0	0	0	0
1000	5	0	4	1	0	0	0	0	0	0	0	0	0	0
1100	11	0	9	2	0	0	0	0	0	0	0	0	0	0
1200	7	0	6	1	0	0	0	0	0	0	0	0	0	0
1300	7	0	6	1	0	0	0	0	0	0	0	0	0	0
1400	6	1	4	1	0	0	0	0	0	0	0	0	0	0
1500	11	0	9	2	0	0	0	0	0	0	0	0	0	0
1600	14	0	11	3	0	0	0	0	0	0	0	0	0	0
1700	11	0	8	3	0	0	0	0	0	0	0	0	0	0
1800	9	0	8	1	0	0	0	0	0	0	0	0	0	0
1900	13	0	12	1	0	0	0	0	0	0	0	0	0	0
2000	4	1	2	1	0	0	0	0	0	0	0	0	0	0
2100	3	0	2	1	0	0	0	0	0	0	0	0	0	0
2200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2300	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Total	**117**	**2**	**90**	**22**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	100.00%	**1.71%**	**76.92%**	**18.80%**	**2.56%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**	**0.00%**

ATTACHMENT H

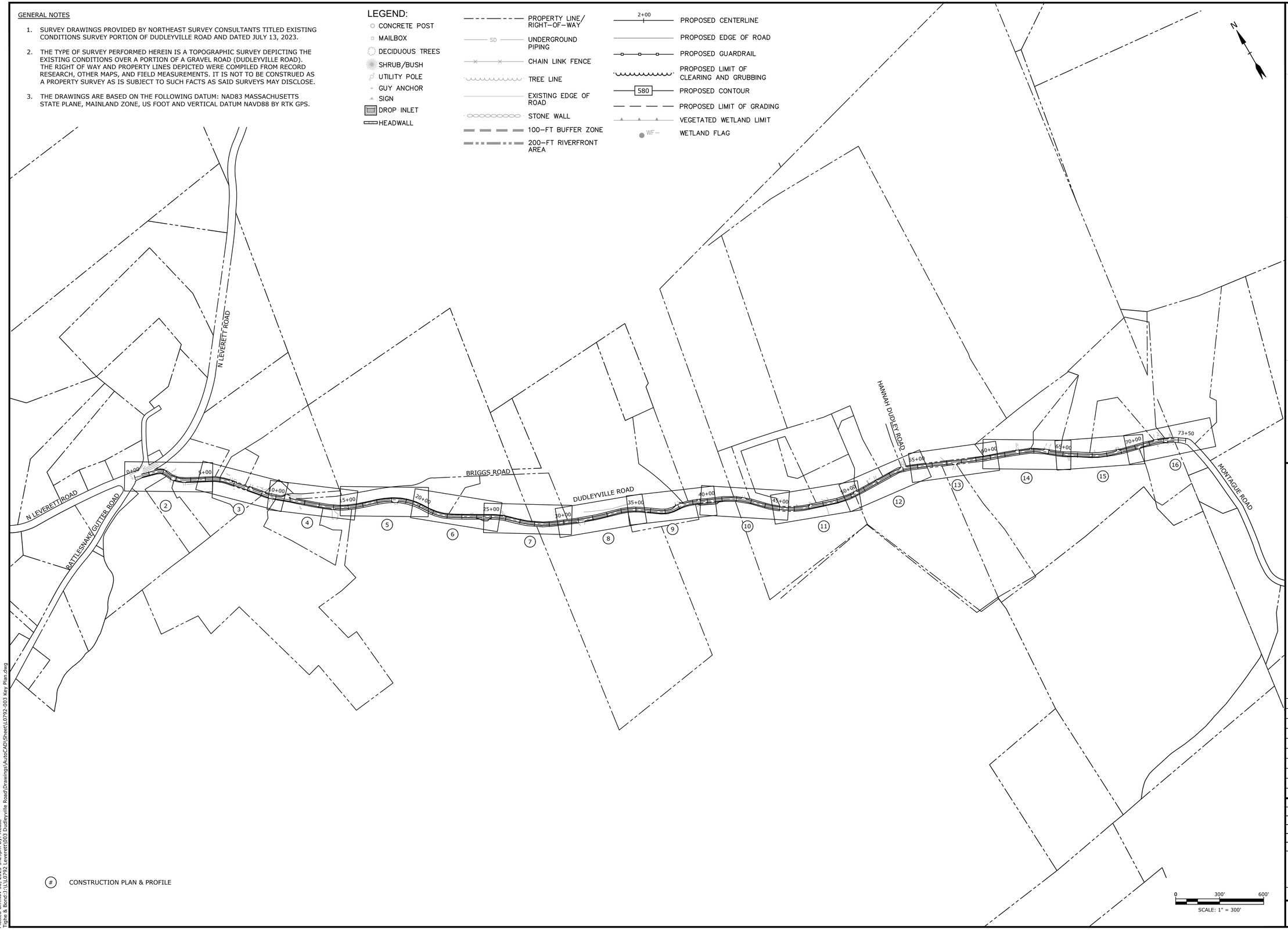
CONCEPTUAL DRAWINGS

GENERAL NOTES

1. SURVEY DRAWINGS PROVIDED BY NORTHEAST SURVEY CONSULTANTS TITLED EXISTING CONDITIONS SURVEY PORTION OF DUDLEYVILLE ROAD AND DATED JULY 13, 2023.
2. THE TYPE OF SURVEY PERFORMED HEREIN IS A TOPOGRAPHIC SURVEY DEPICTING THE EXISTING CONDITIONS OVER A PORTION OF A GRAVEL ROAD (DUDLEYVILLE ROAD). THE RIGHT OF WAY AND PROPERTY LINES DEPICTED WERE COMPILED FROM RECORD RESEARCH, OTHER MAPS, AND FIELD MEASUREMENTS. IT IS NOT TO BE CONSTRUED AS A PROPERTY SURVEY AS IS SUBJECT TO SUCH FACTS AS SAID SURVEYS MAY DISCLOSE.
3. THE DRAWINGS ARE BASED ON THE FOLLOWING DATUM: NAD83 MASSACHUSETTS STATE PLANE, MAINLAND ZONE, US FOOT AND VERTICAL DATUM NAVD88 BY RTK GPS.

LEGEND:

- CONCRETE POST
- MAILBOX
- DECIDUOUS TREES
- SHRUB/BUSH
- UTILITY POLE
- GUY ANCHOR
- SIGN
- DROP INLET
- HEADWALL
- PROPERTY LINE/ RIGHT-OF-WAY
- SD — UNDERGROUND PIPING
- CHAIN LINK FENCE
- TREE LINE
- EXISTING EDGE OF ROAD
- STONE WALL
- 100-FT BUFFER ZONE
- 200-FT RIVERFRONT AREA
- 2+00 — PROPOSED CENTERLINE
- PROPOSED EDGE OF ROAD
- PROPOSED GUARDRAIL
- PROPOSED LIMIT OF CLEARING AND GRUBBING
- 580 — PROPOSED CONTOUR
- PROPOSED LIMIT OF GRADING
- VEGETATED WETLAND LIMIT
- WF— WETLAND FLAG



CONSTRUCTION PLAN & PROFILE

Tighe&Bond

CONCEPTUAL DESIGN SET

THIS DOCUMENT IS INCOMPLETE AND IS RELEASED TEMPORARILY FOR PROGRESS REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING OR CONSTRUCTION PURPOSES.

Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 Key Plan.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

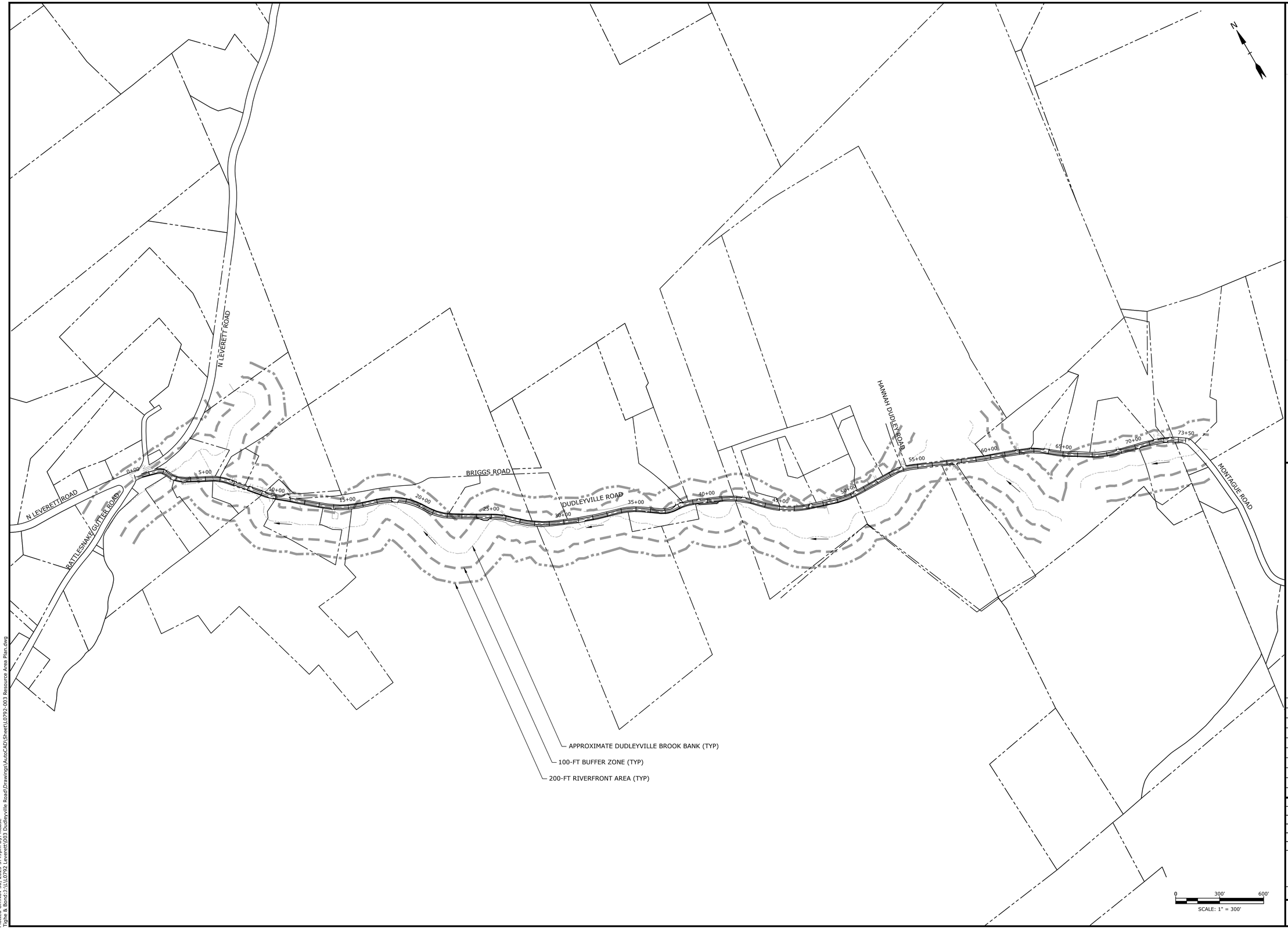
KEY PLAN

SCALE: 1" = 300'

G-001

SHEET 1 OF 26

Last Saved: 11/28/2023
Plotted On:Nov 30, 2023-3:29pm By: RCase
Tighe & Bond:J:\L\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 Key Plan.dwg



Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 Resource Area Plan.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

RESOURCE AREA PLAN

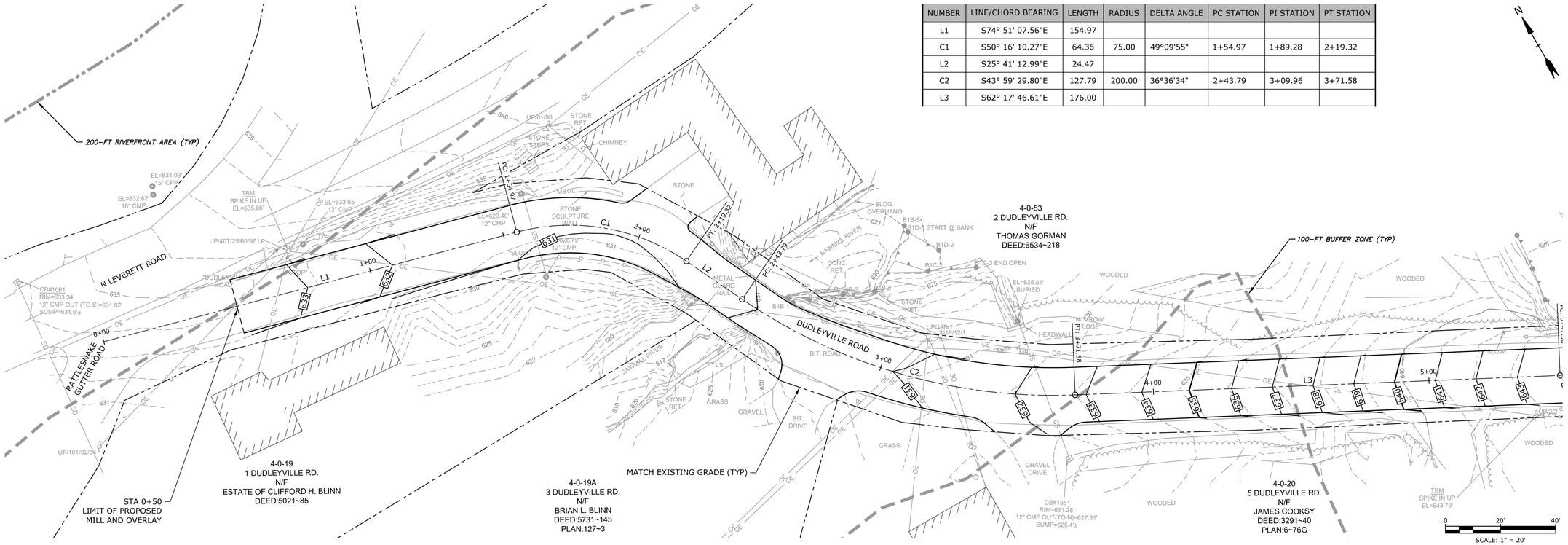
SCALE: 1" = 300'

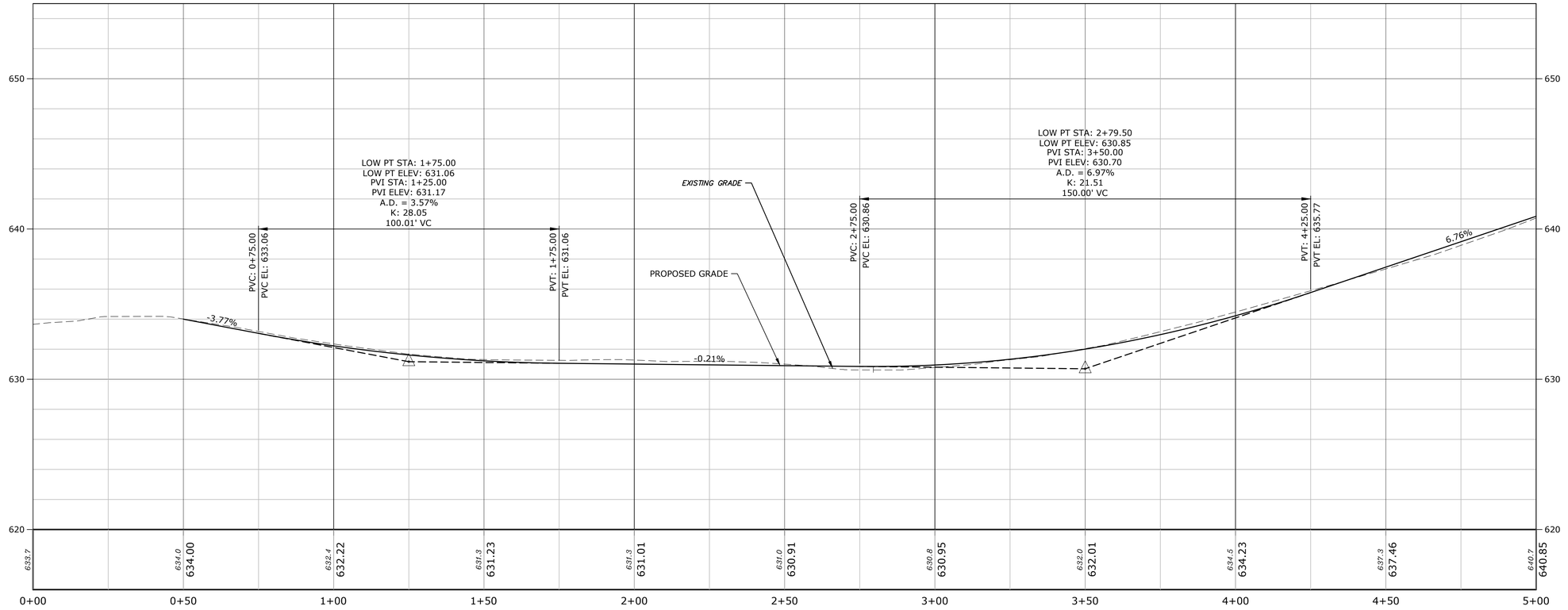
G-002

SHEET 2 OF 26

Last Saved: 11/30/2023
Plotted On:Nov 30, 2023-3:49pm By: RCase
Tighe & Bond:J:\L\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 Resource Area Plan.dwg

NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L1	S74° 51' 07.56"E	154.97					
C1	S50° 16' 10.27"E	64.36	75.00	49°09'55"	1+54.97	1+89.28	2+19.32
L2	S25° 41' 12.99"E	24.47					
C2	S43° 59' 29.80"E	127.79	200.00	36°36'34"	2+43.79	3+09.96	3+71.58
L3	S62° 17' 46.61"E	176.00					





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CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 PlanProf.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

CONSTRUCTION PLAN & PROFILE

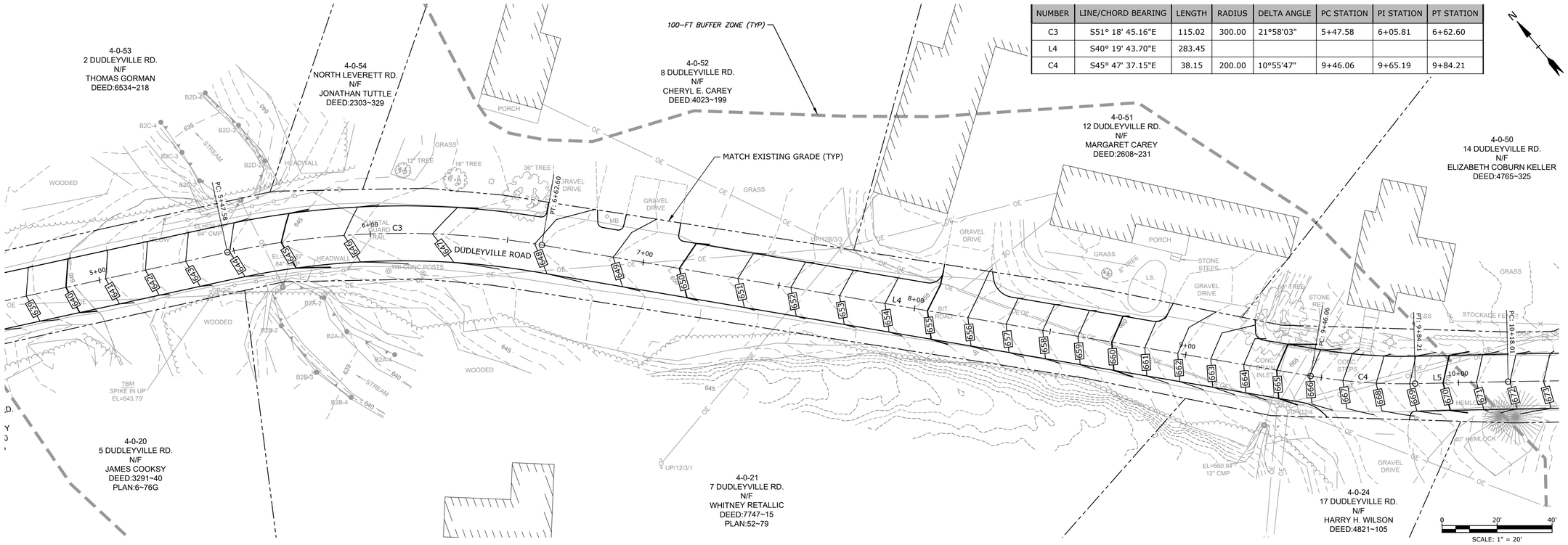
SCALE: HOR: 1" = 20' VERT: 1" = 4'

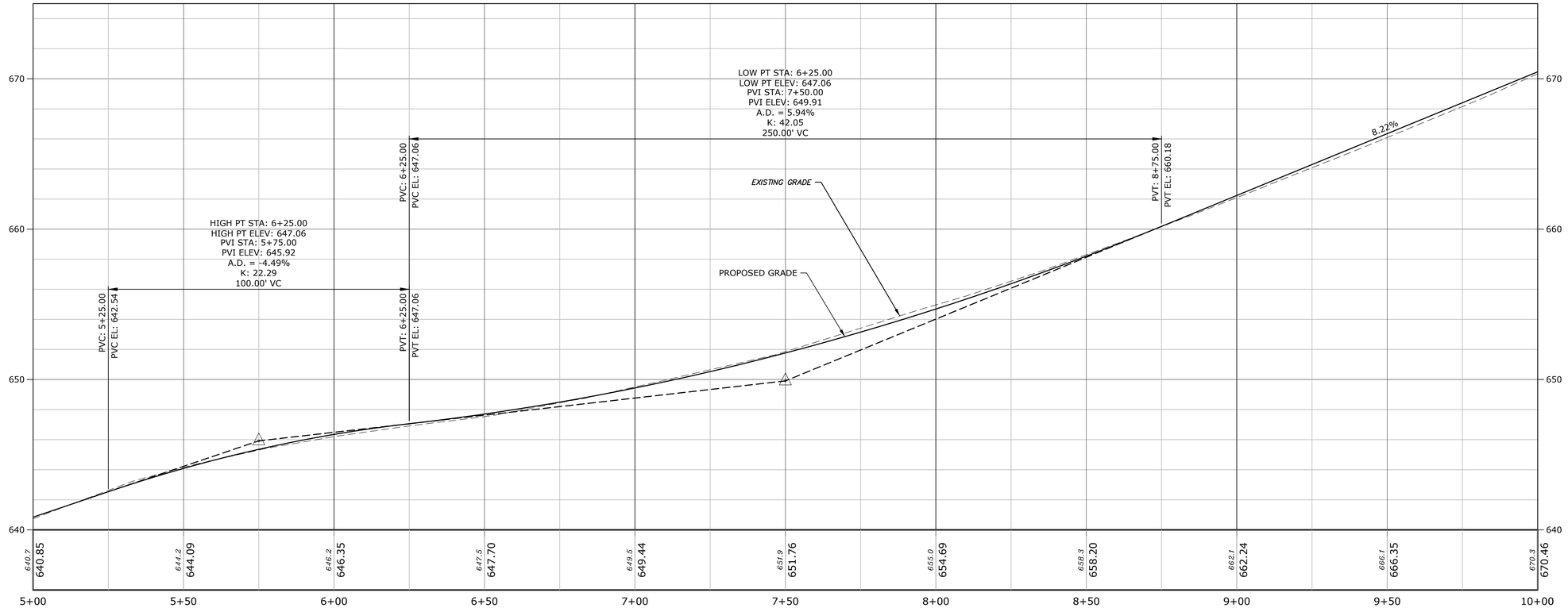
C-101

SHEET 3 OF 26

Last Saved: 11/30/2023
Plotted: Dec 04, 2023 - 3:30pm By: RCase
Tighe & Bond:\L\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 PlanProf.dwg

NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
C3	S51° 18' 45.16"E	115.02	300.00	21°58'03"	5+47.58	6+05.81	6+62.60
L4	S40° 19' 43.70"E	283.45					
C4	S45° 47' 37.15"E	38.15	200.00	10°55'47"	9+46.06	9+65.19	9+84.21





Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 PlanProf.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

CONSTRUCTION PLAN & PROFILE

SCALE: HOR: 1" = 20' VERT: 1" = 4'

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SHEET 4 OF 26

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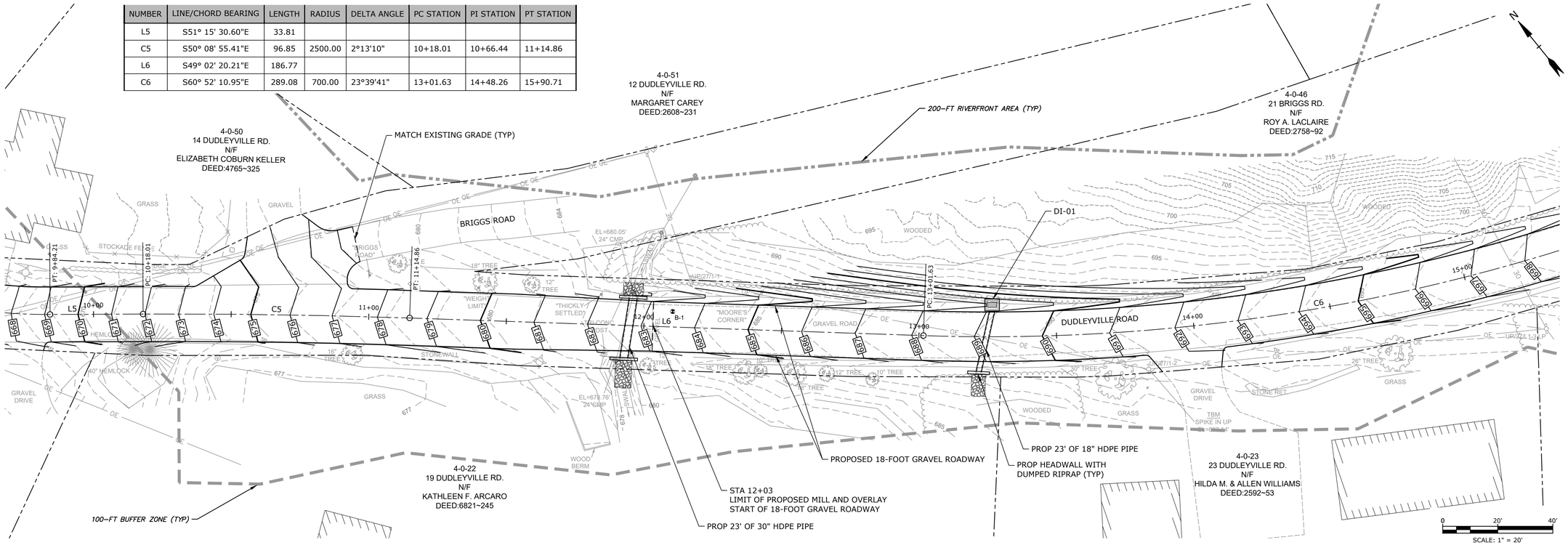
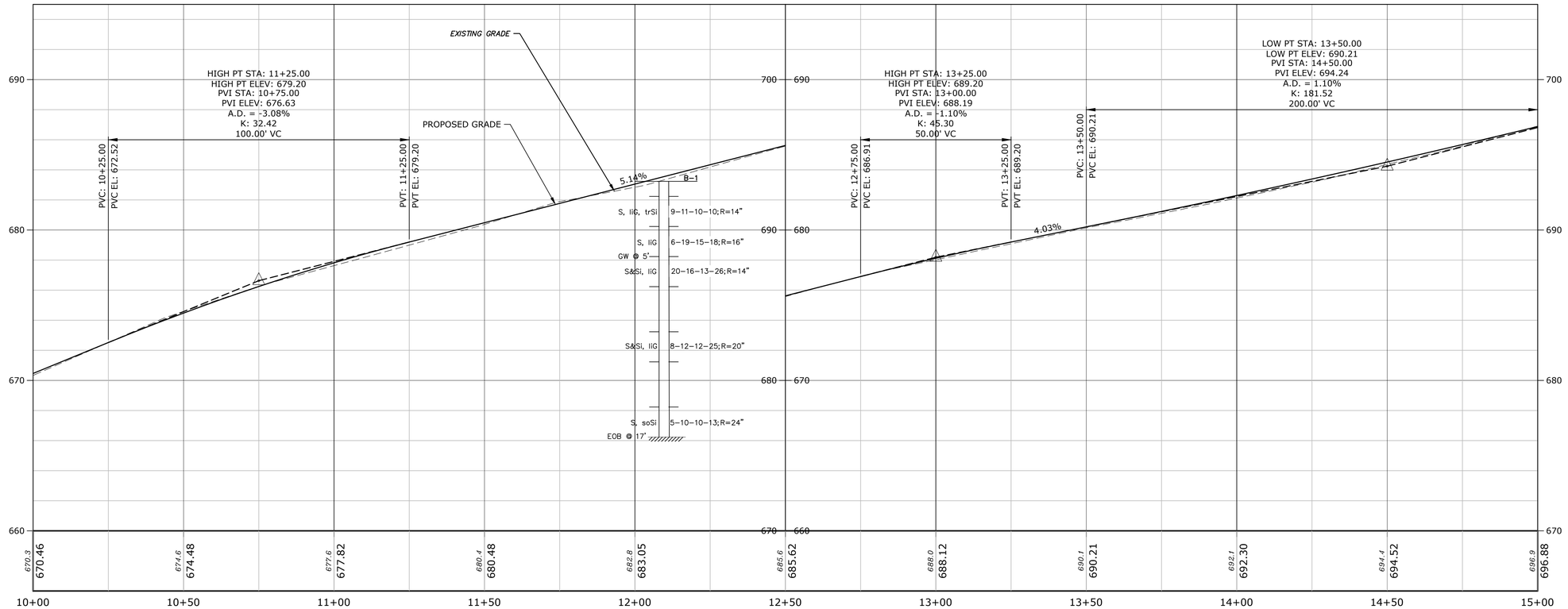
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L5	S51° 15' 30.60"E	33.81					
C5	S50° 08' 55.41"E	96.85	2500.00	2°13'10"	10+18.01	10+66.44	11+14.86
L6	S49° 02' 20.21"E	186.77					
C6	S60° 52' 10.95"E	289.08	700.00	23°39'41"	13+01.63	14+48.26	15+90.71





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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION
PROJECT NO:		L0792-003
DATE:		NOVEMBER 2023
FILE:		L0792-003 PlanProf.dwg
DRAWN BY:		RMC
DESIGNED/CHECKED BY:		AGB
APPROVED BY:		ADF

CONSTRUCTION PLAN & PROFILE

SCALE: HOR: 1" = 20' VERT: 1" = 4'

C-103
SHEET 5 OF 26

Last Saved: 11/30/2023
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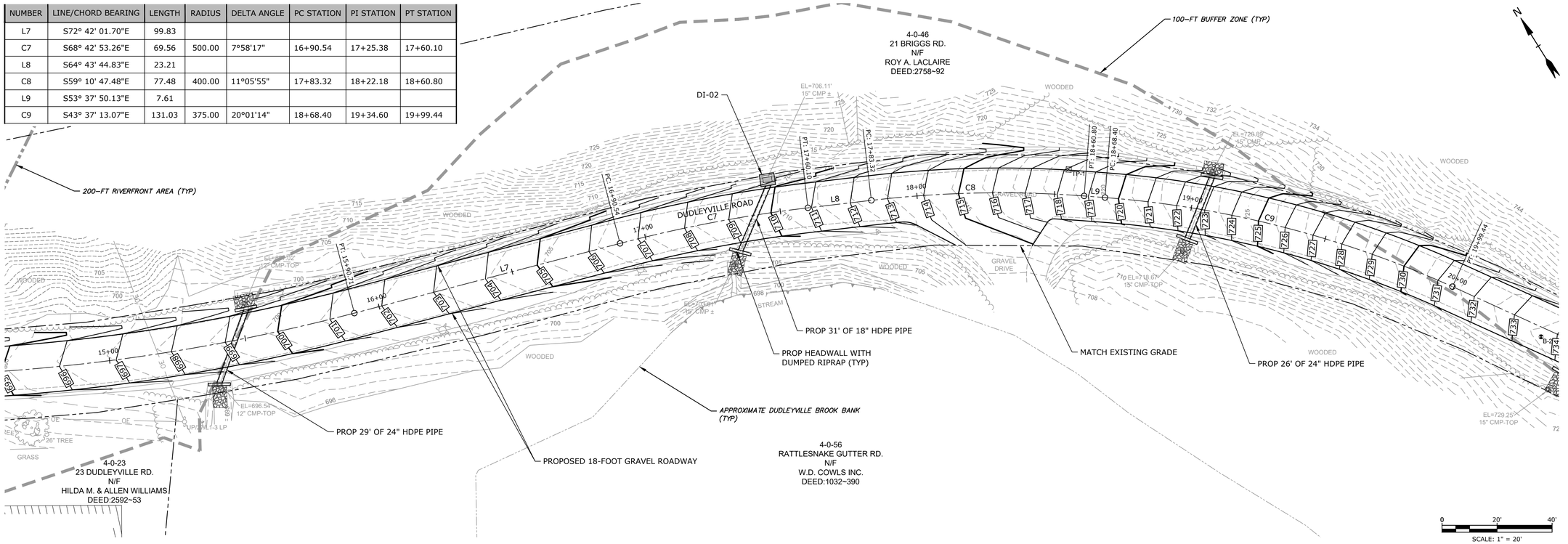
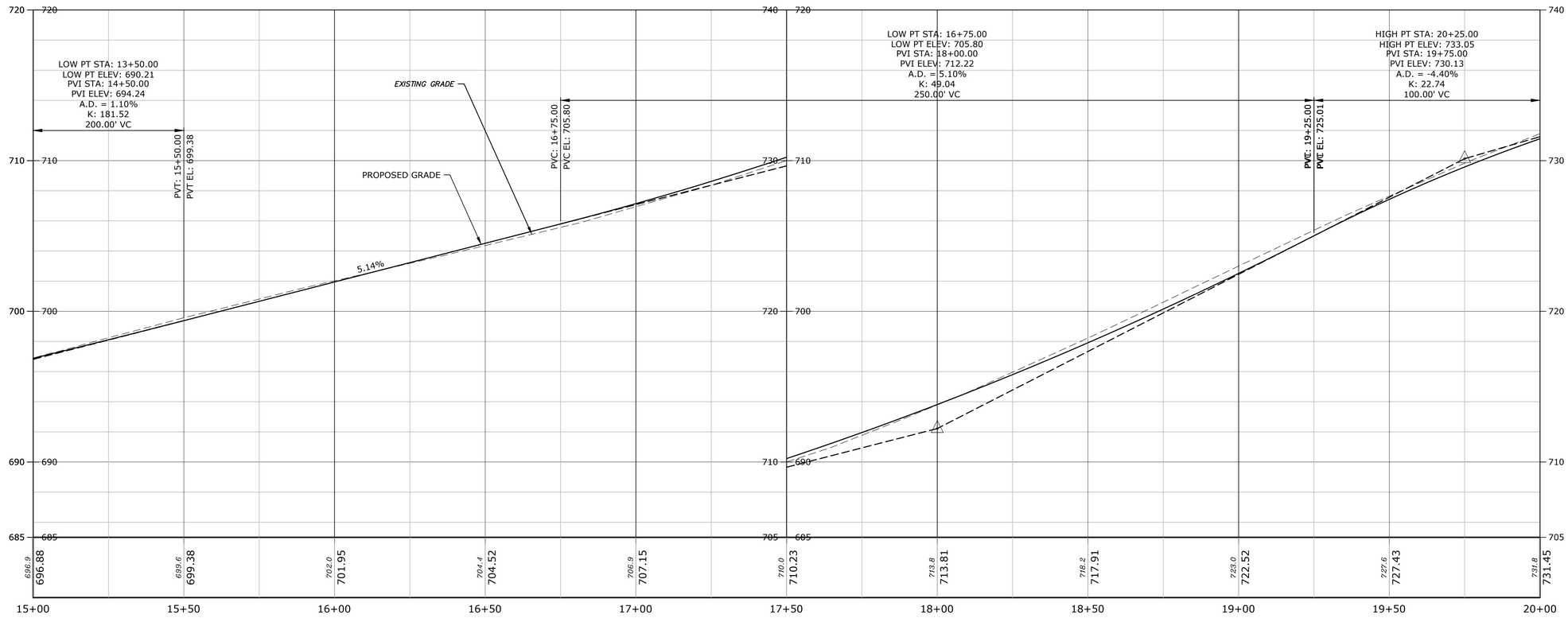
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L7	S72° 42' 01.70"E	99.83					
C7	S68° 42' 53.26"E	69.56	500.00	7°58'17"	16+90.54	17+25.38	17+60.10
L8	S64° 43' 44.83"E	23.21					
C8	S59° 10' 47.48"E	77.48	400.00	11°05'55"	17+83.32	18+22.18	18+60.80
L9	S53° 37' 50.13"E	7.61					
C9	S43° 37' 13.07"E	131.03	375.00	20°01'14"	18+68.40	19+34.60	19+99.44





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C-104
SHEET 6 OF 26

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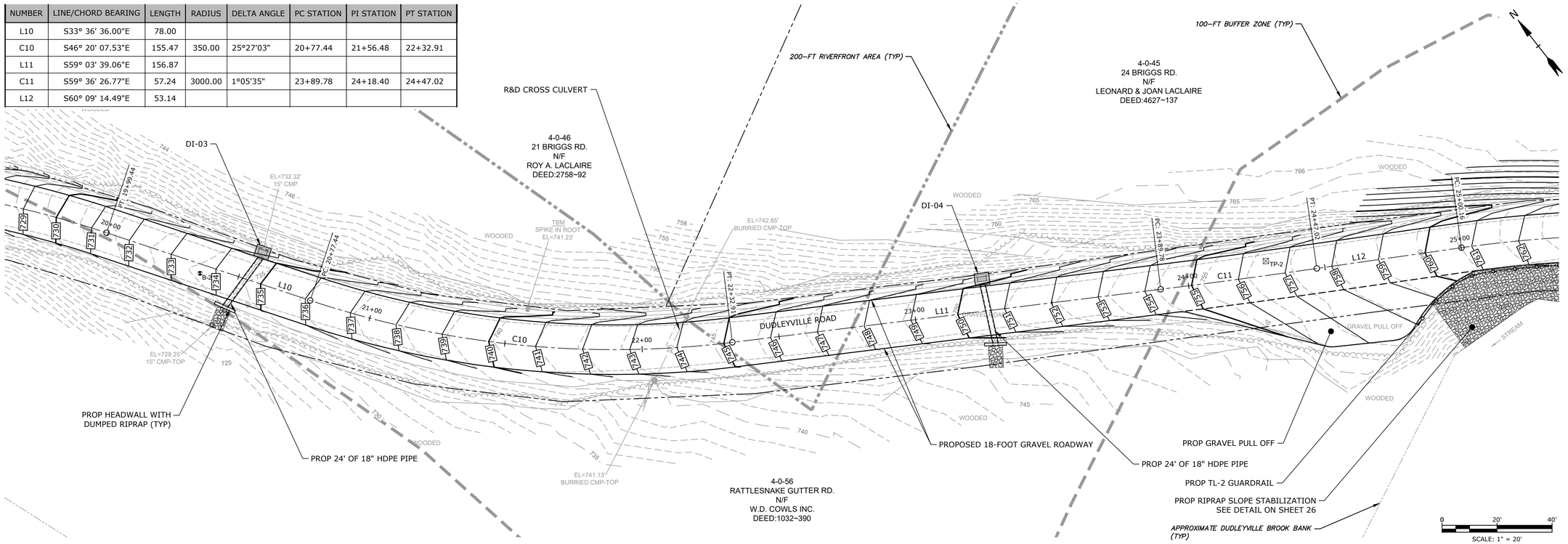
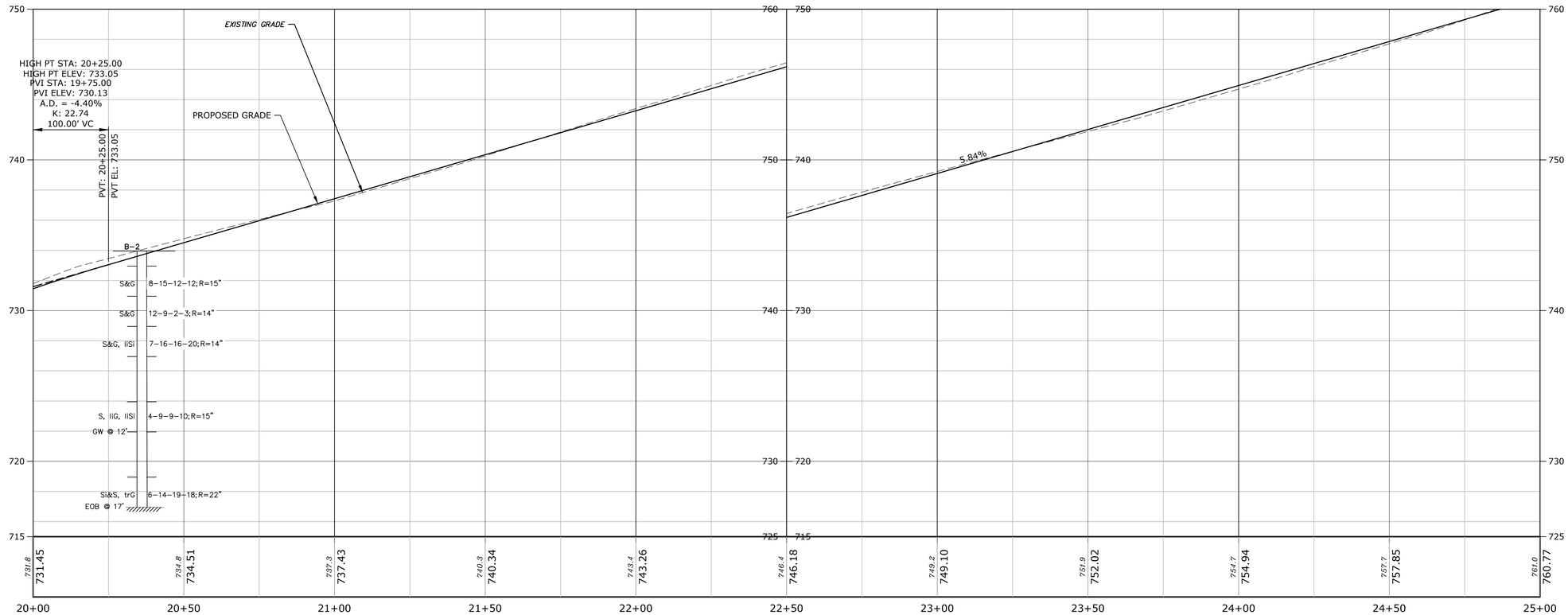
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L10	S33° 36' 36.00"E	78.00					
C10	S46° 20' 07.53"E	155.47	350.00	25°27'03"	20+77.44	21+56.48	22+32.91
L11	S59° 03' 39.06"E	156.87					
C11	S59° 36' 26.77"E	57.24	3000.00	1°05'35"	23+89.78	24+18.40	24+47.02
L12	S60° 09' 14.49"E	53.14					





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C-105

SHEET 7 OF 26

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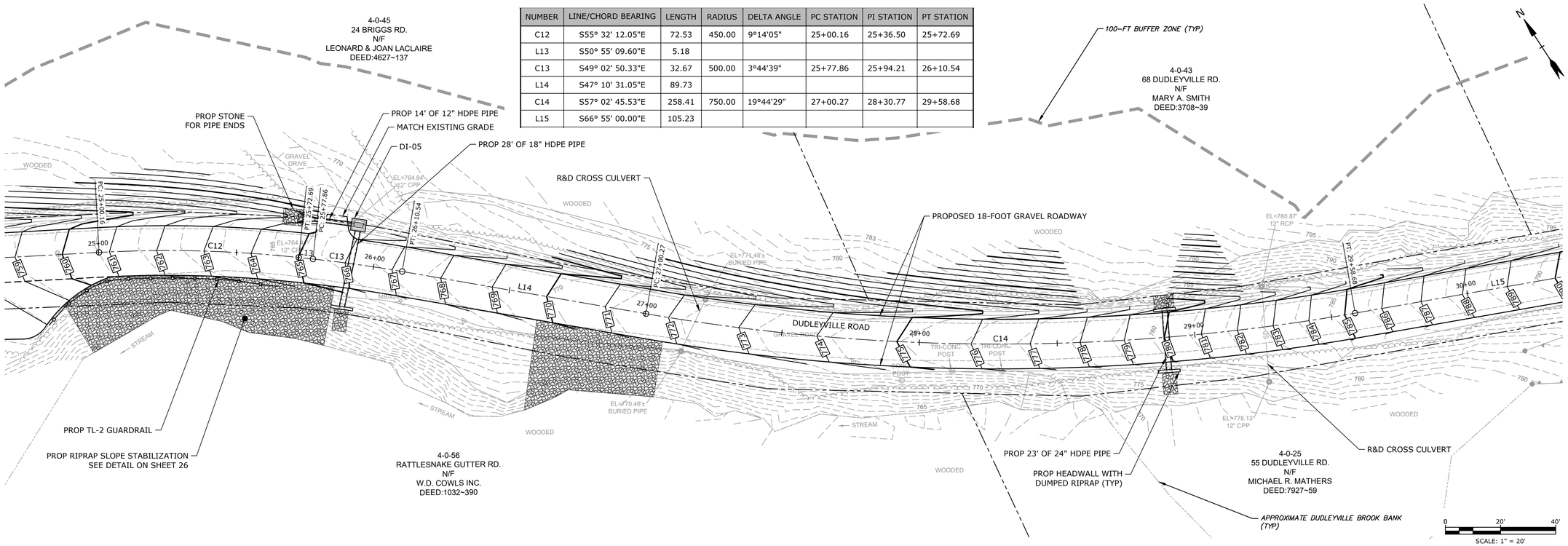
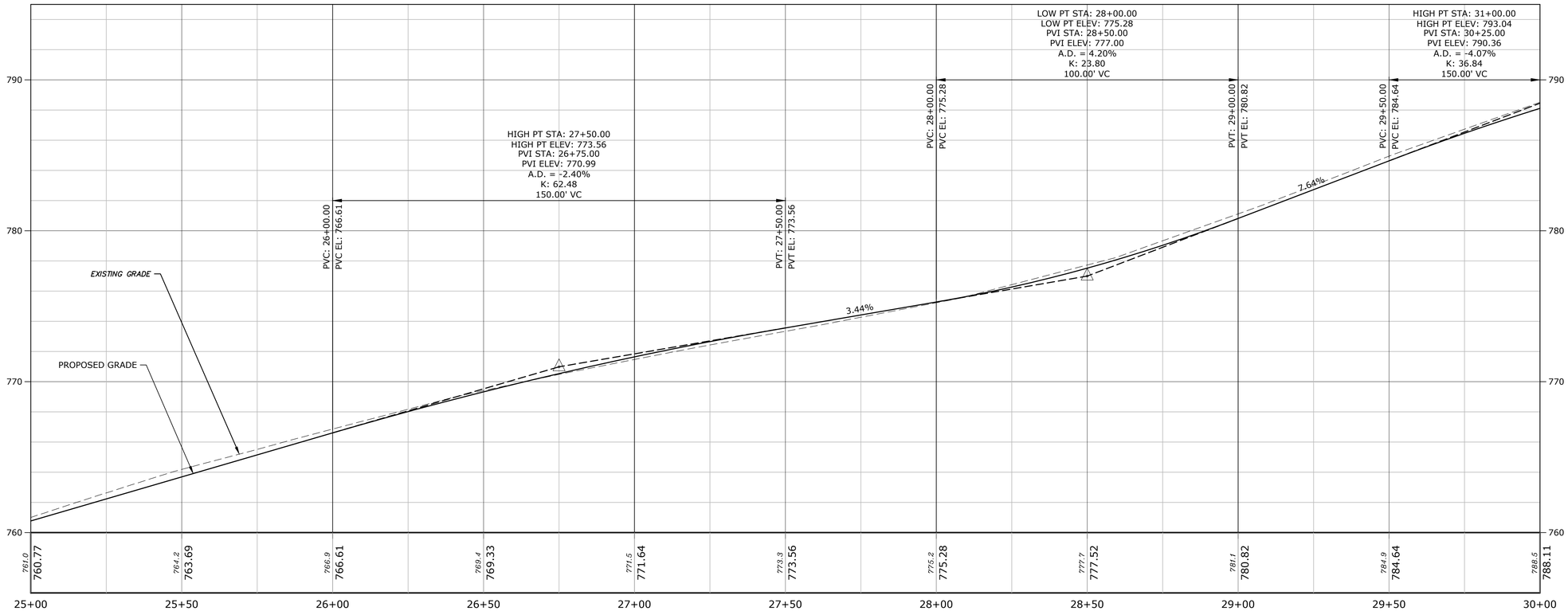
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
C12	S55° 32' 12.05"E	72.53	450.00	9°14'05"	25+00.16	25+36.50	25+72.69
L13	S50° 55' 09.60"E	5.18					
C13	S49° 02' 50.33"E	32.67	500.00	3°44'39"	25+77.86	25+94.21	26+10.54
L14	S47° 10' 31.05"E	89.73					
C14	S57° 02' 45.53"E	258.41	750.00	19°44'29"	27+00.27	28+30.77	29+58.68
L15	S66° 55' 00.00"E	105.23					





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C-106
SHEET 8 OF 26

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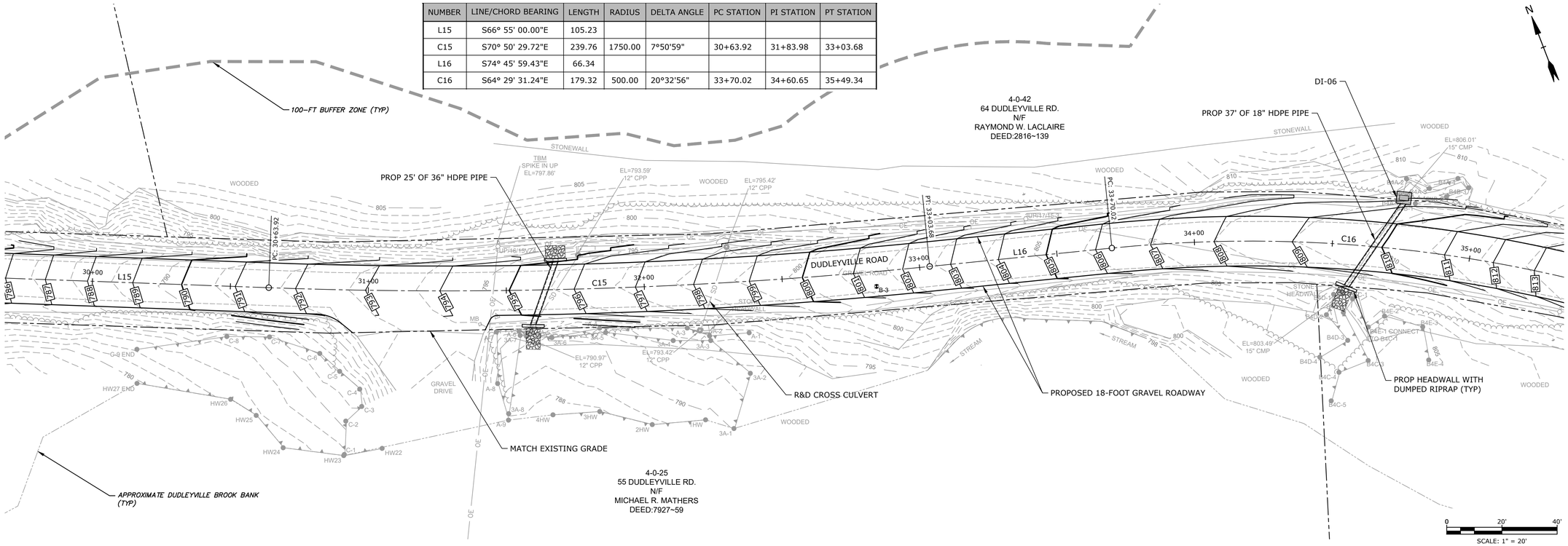
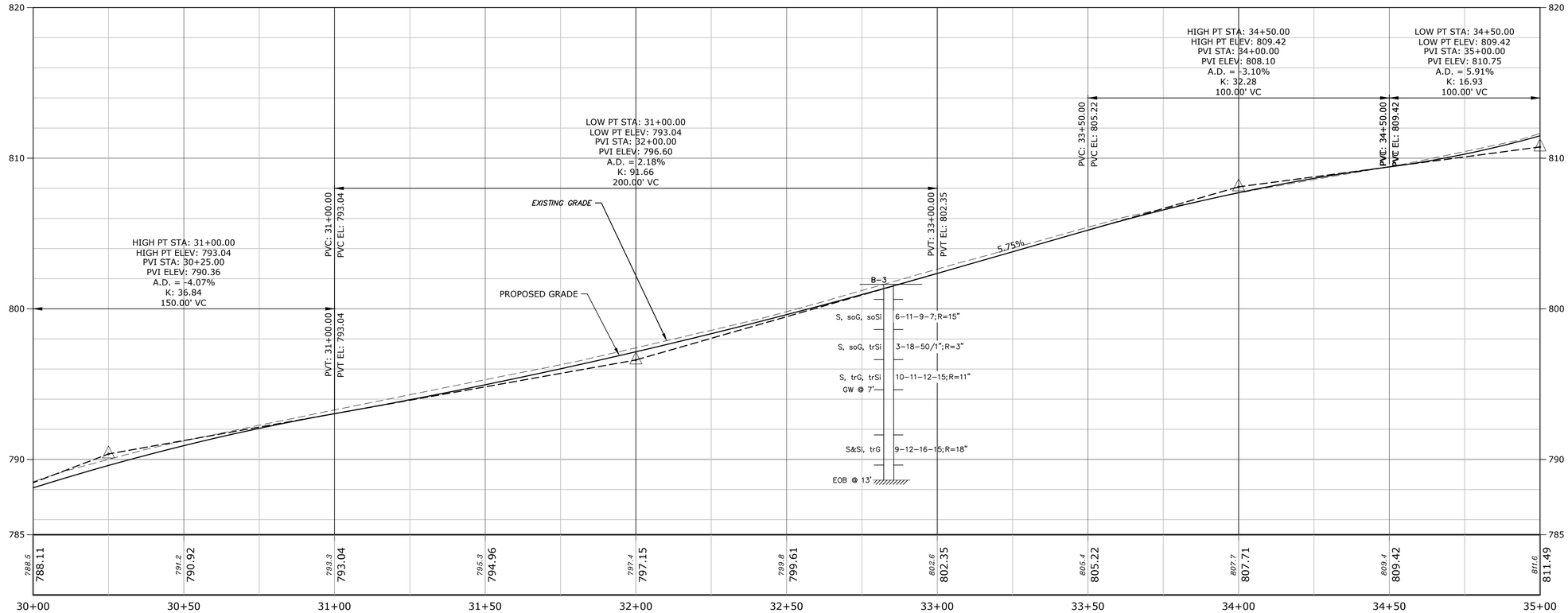
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L15	S66° 55' 00.00"E	105.23					
C15	S70° 50' 29.72"E	239.76	1750.00	7°50'59"	30+63.92	31+83.98	33+03.68
L16	S74° 45' 59.43"E	66.34					
C16	S64° 29' 31.24"E	179.32	500.00	20°32'56"	33+70.02	34+60.65	35+49.34





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Dudleyville Road Restoration Evaluation

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C-107

SHEET 9 OF 26

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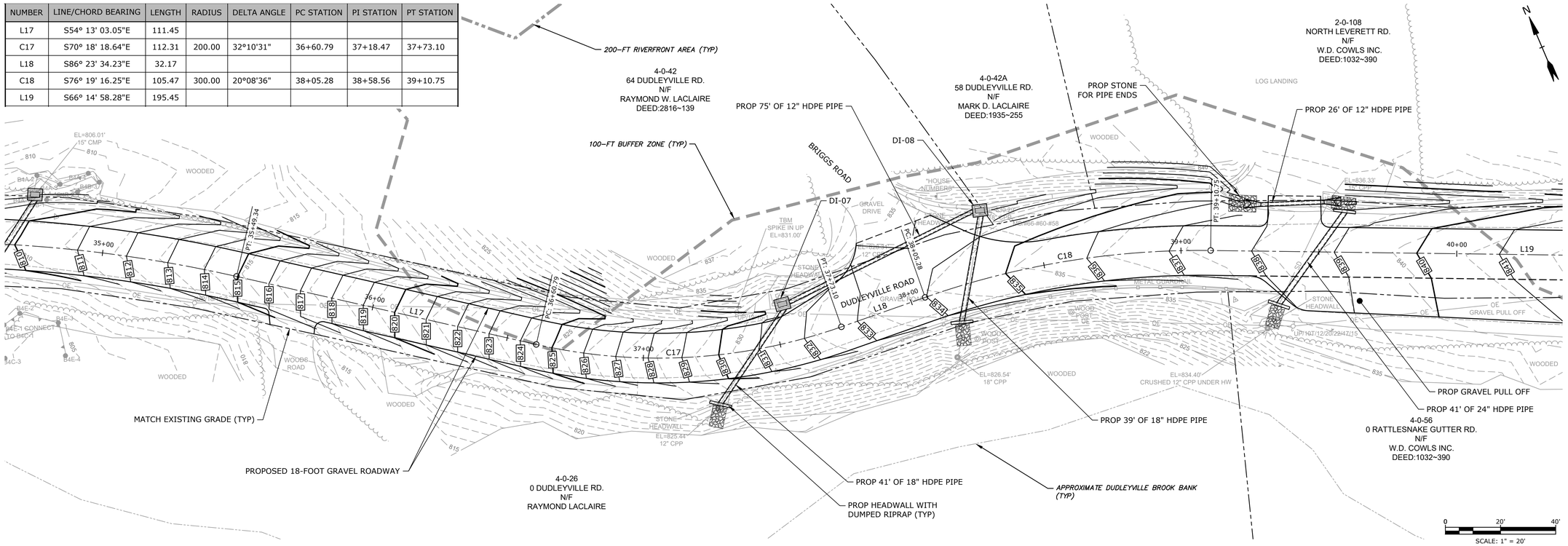
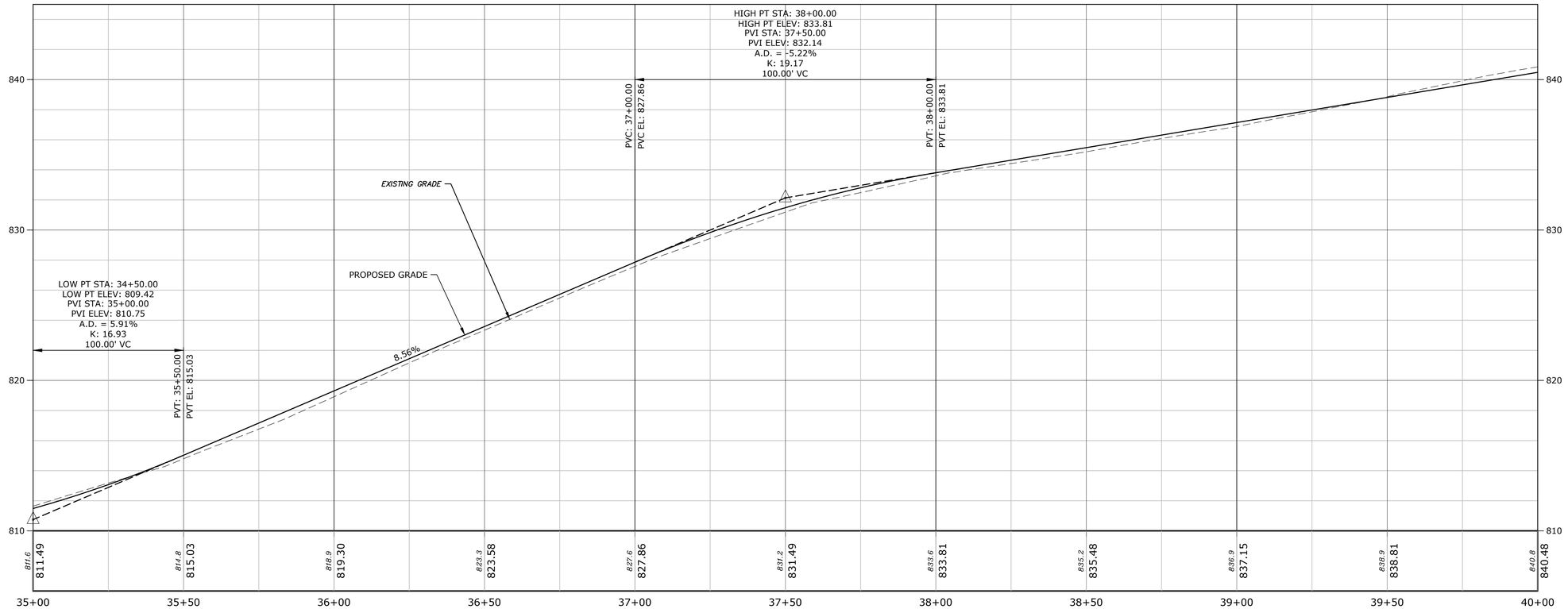
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L17	S54° 13' 03.05"E	111.45					
C17	S70° 18' 18.64"E	112.31	200.00	32°10'31"	36+60.79	37+18.47	37+73.10
L18	S86° 23' 34.23"E	32.17					
C18	S76° 19' 16.25"E	105.47	300.00	20°08'36"	38+05.28	38+58.56	39+10.75
L19	S66° 14' 58.28"E	195.45					





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C-108

SHEET 10 OF 26

Last Saved: 11/30/2023
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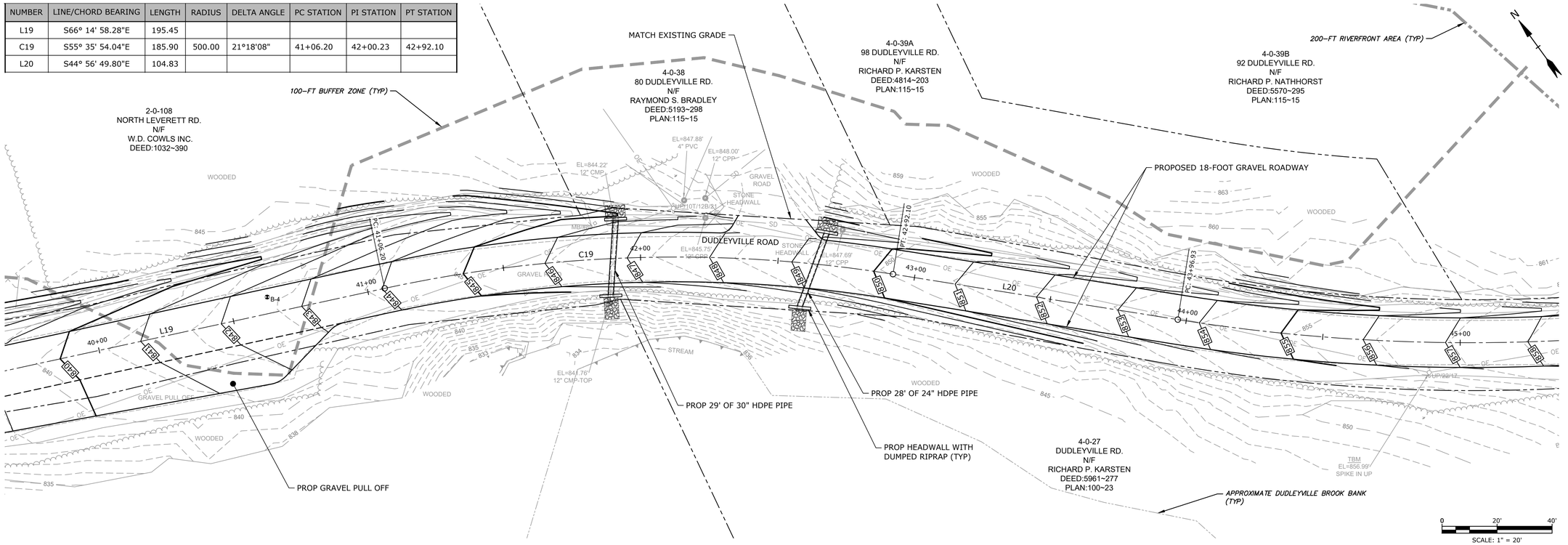
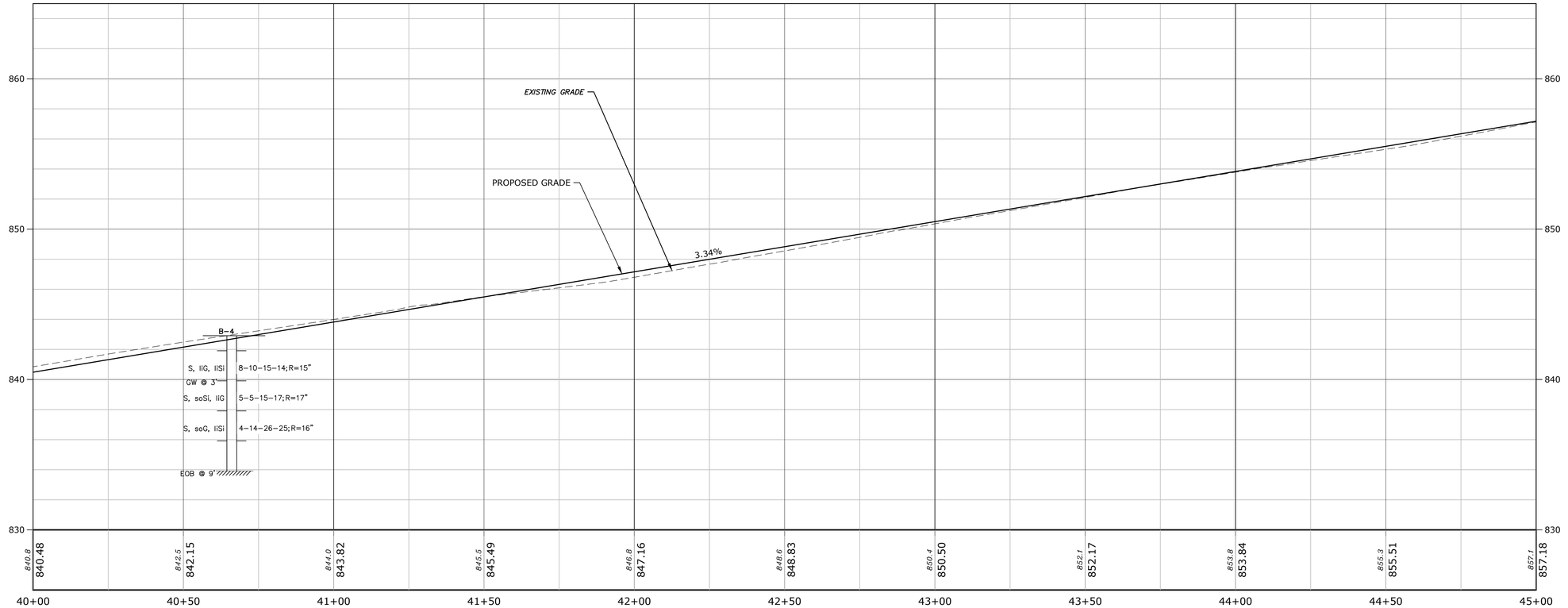
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L19	S66° 14' 58.28"E	195.45					
C19	S55° 35' 54.04"E	185.90	500.00	21°18'08"	41+06.20	42+00.23	42+92.10
L20	S44° 56' 49.80"E	104.83					





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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

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DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

CONSTRUCTION PLAN & PROFILE

SCALE: HOR: 1" = 20' VERT: 1" = 4'

C-109

SHEET 11 OF 26

Last Saved: 11/30/2023
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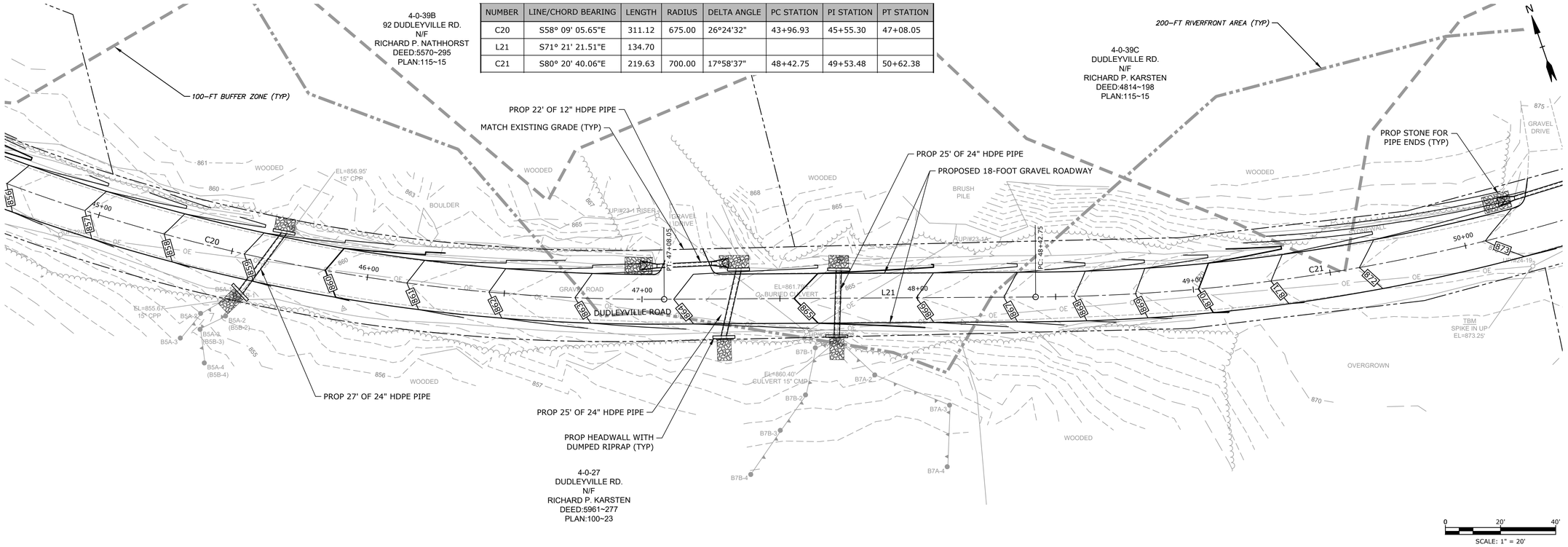
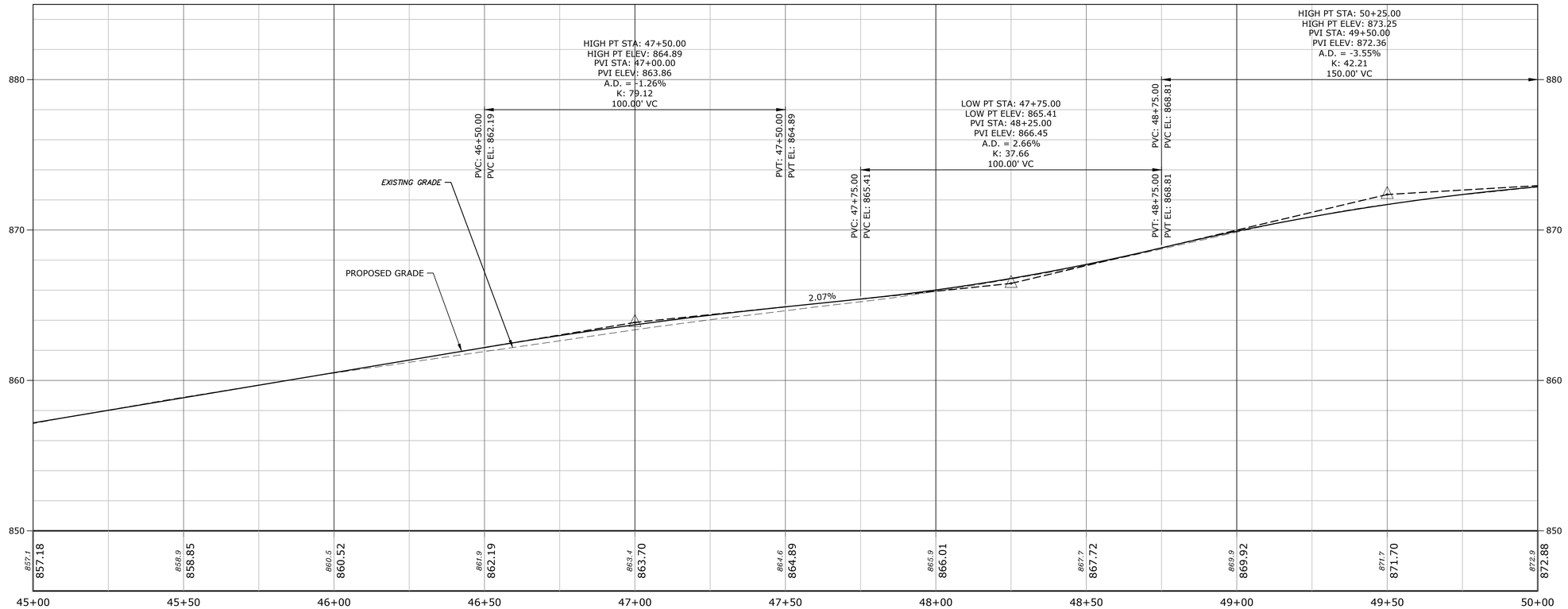
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
C20	S58° 09' 05.65"E	311.12	675.00	26°24'32"	43+96.93	45+55.30	47+08.05
L21	S71° 21' 21.51"E	134.70					
C21	S80° 20' 40.06"E	219.63	700.00	17°58'37"	48+42.75	49+53.48	50+62.38





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CONSTRUCTION PLAN & PROFILE

SCALE: HOR: 1" = 20' VERT: 1" = 4'

C-110
SHEET 12 OF 26

Last Saved: 11/30/2023
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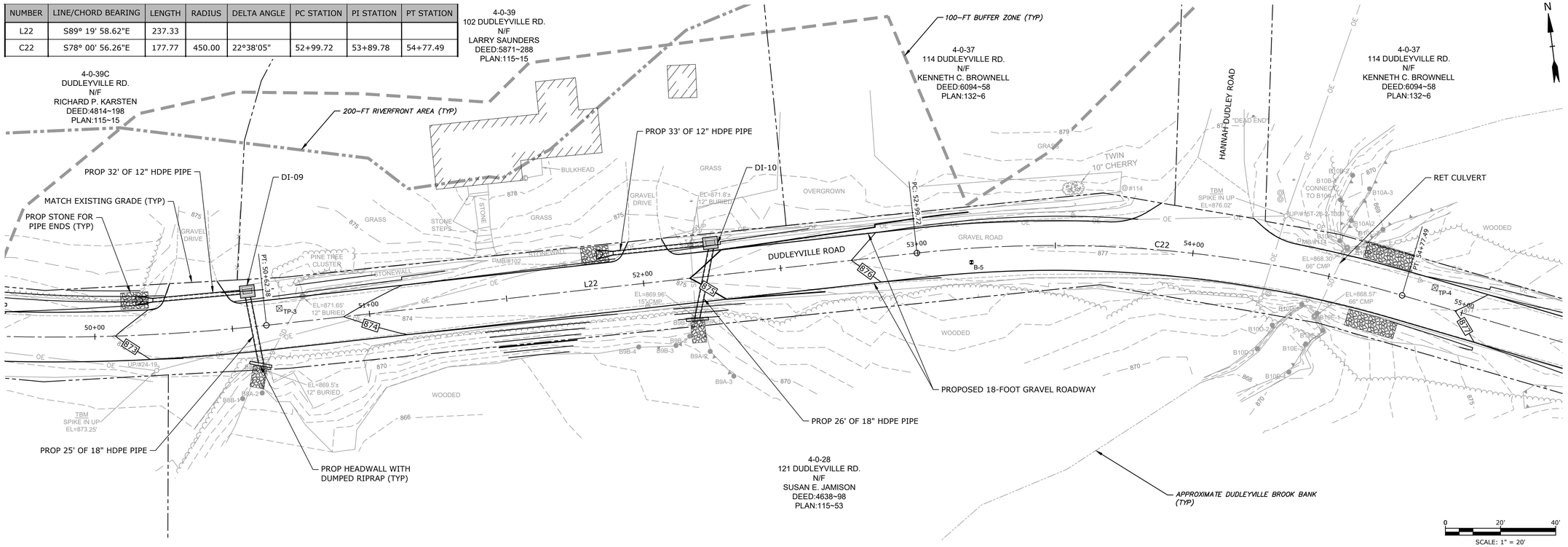
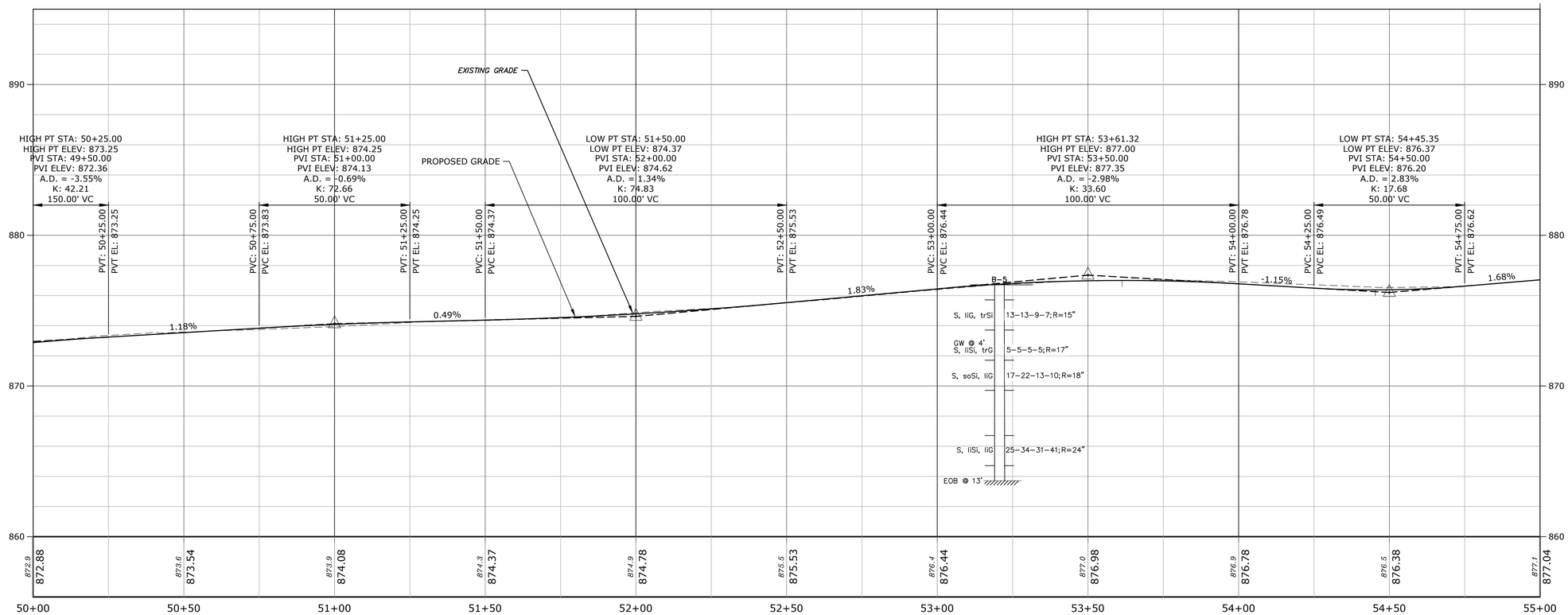
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L22	S89° 19' 58.62"E	237.33					
C22	S78° 00' 56.26"E	177.77	450.00	22°38'05"	52+99.72	53+89.78	54+77.49





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CONSTRUCTION PLAN & PROFILE

SCALE: HOR: 1" = 20' VERT: 1" = 4'

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SHEET 13 OF 26

Last Saved: 11/30/2023
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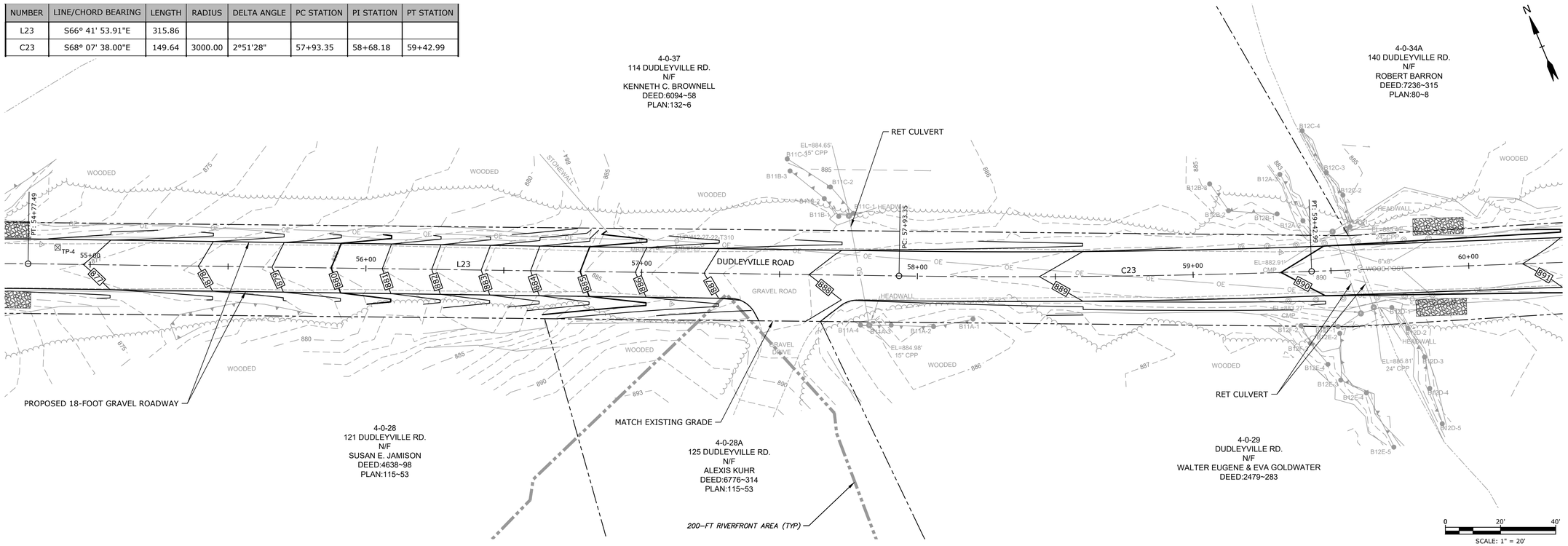
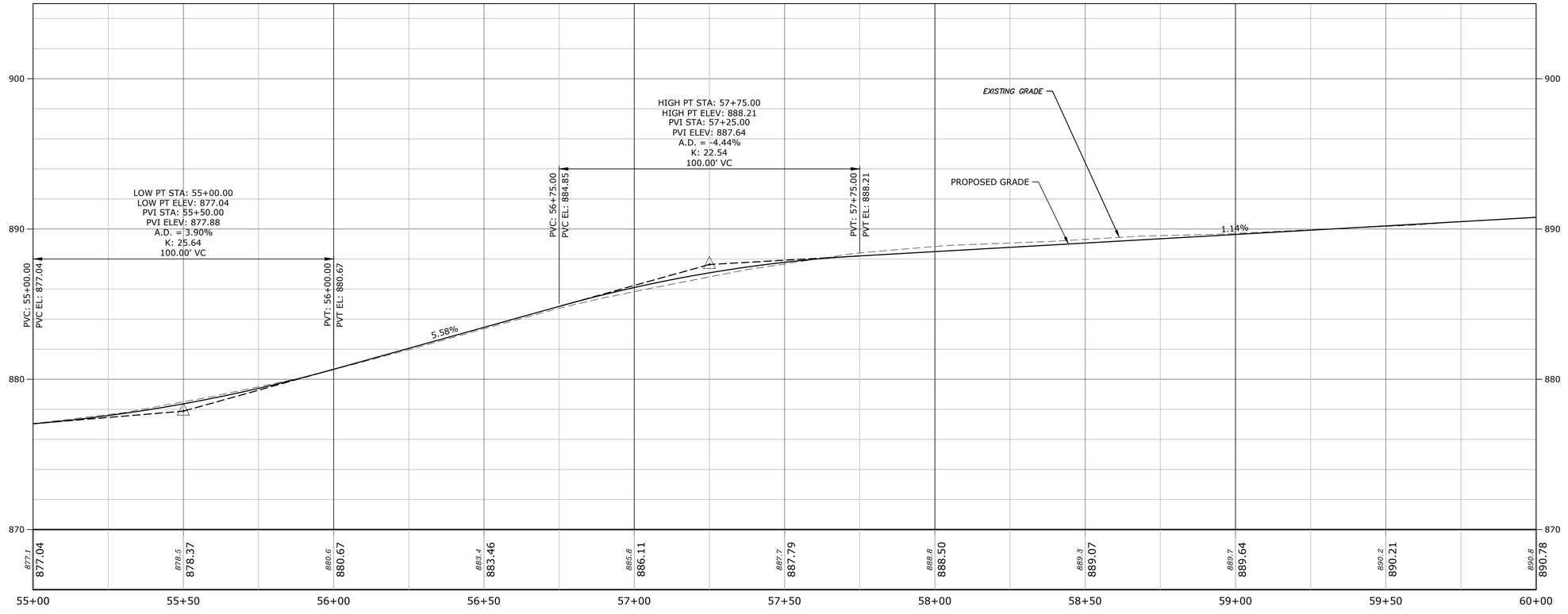
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L23	S66° 41' 53.91"E	315.86					
C23	S68° 07' 38.00"E	149.64	3000.00	2°51'28"	57+93.35	58+68.18	59+42.99





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CONSTRUCTION PLAN & PROFILE

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C-112

SHEET 14 OF 26

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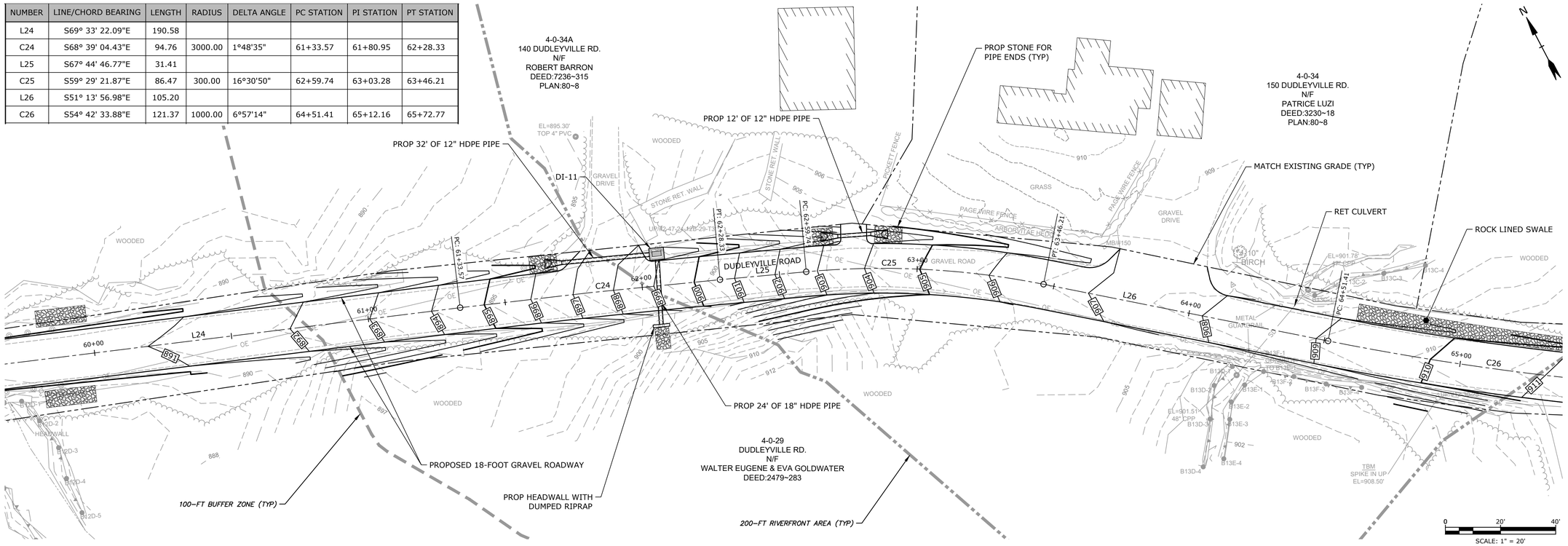
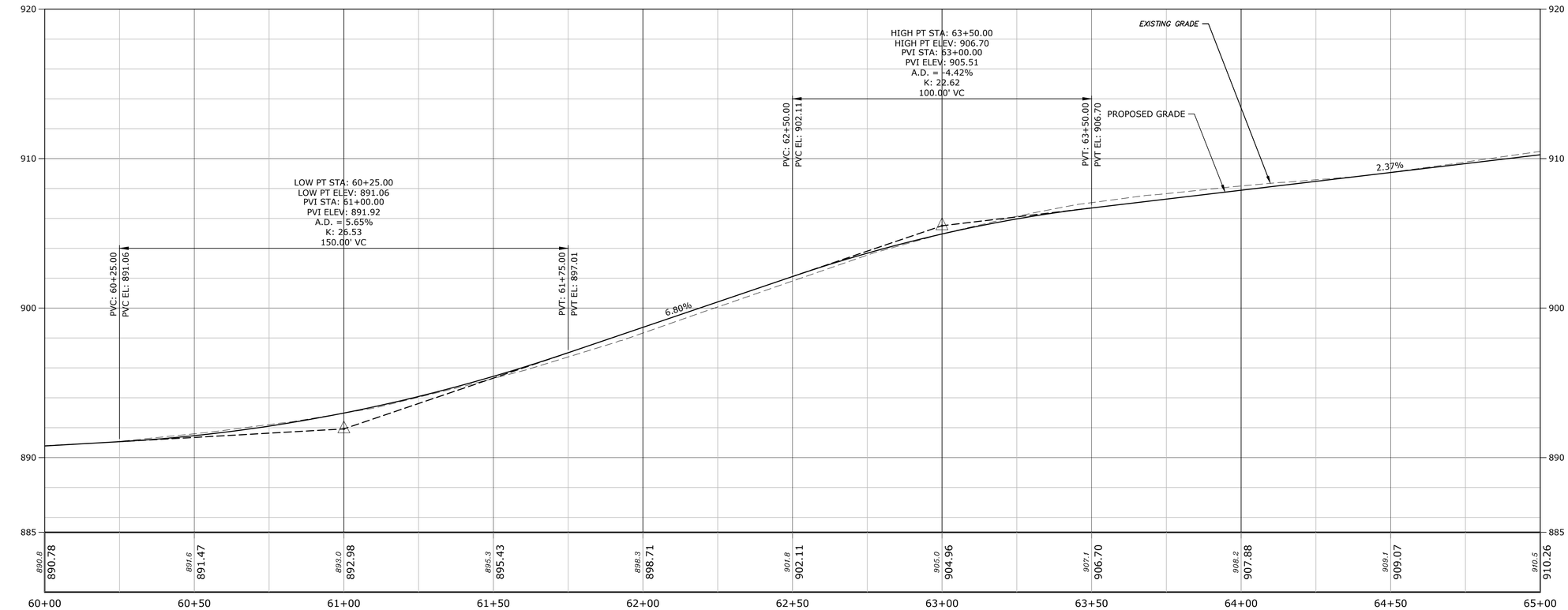
NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L24	S69° 33' 22.09"E	190.58					
C24	S68° 39' 04.43"E	94.76	3000.00	1°48'35"	61+33.57	61+80.95	62+28.33
L25	S67° 44' 46.77"E	31.41					
C25	S59° 29' 21.87"E	86.47	300.00	16°30'50"	62+59.74	63+03.28	63+46.21
L26	S51° 13' 56.98"E	105.20					
C26	S54° 42' 33.88"E	121.37	1000.00	6°57'14"	64+51.41	65+12.16	65+72.77





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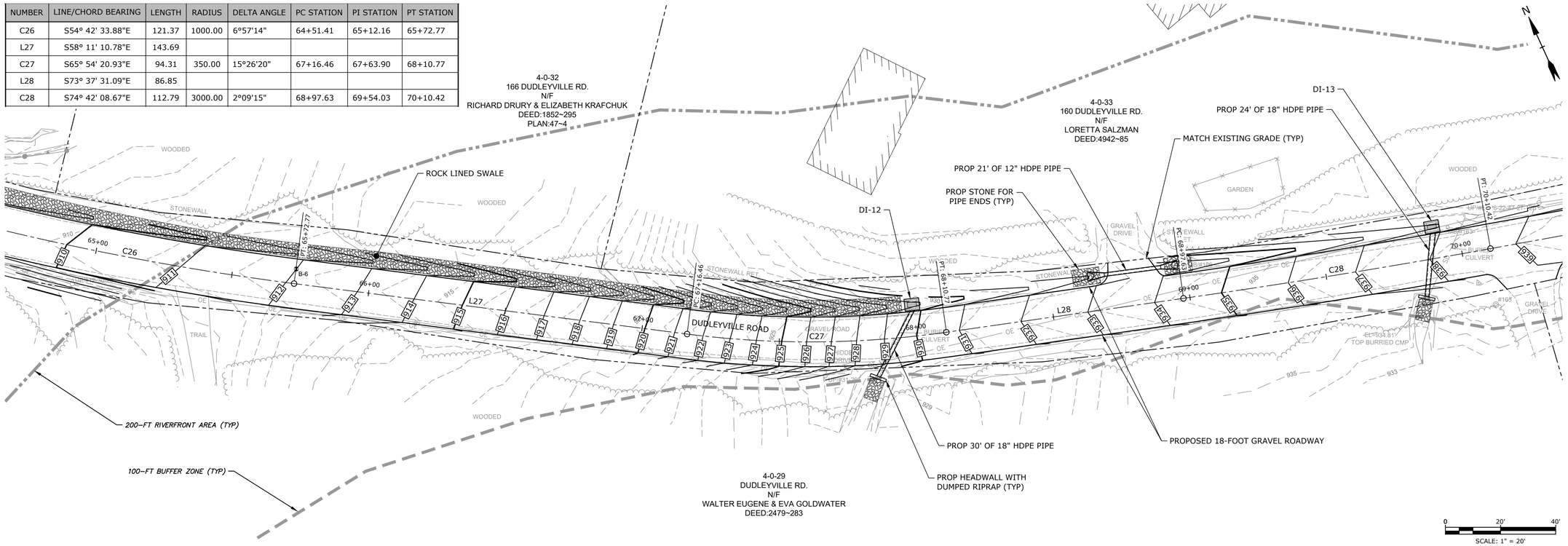
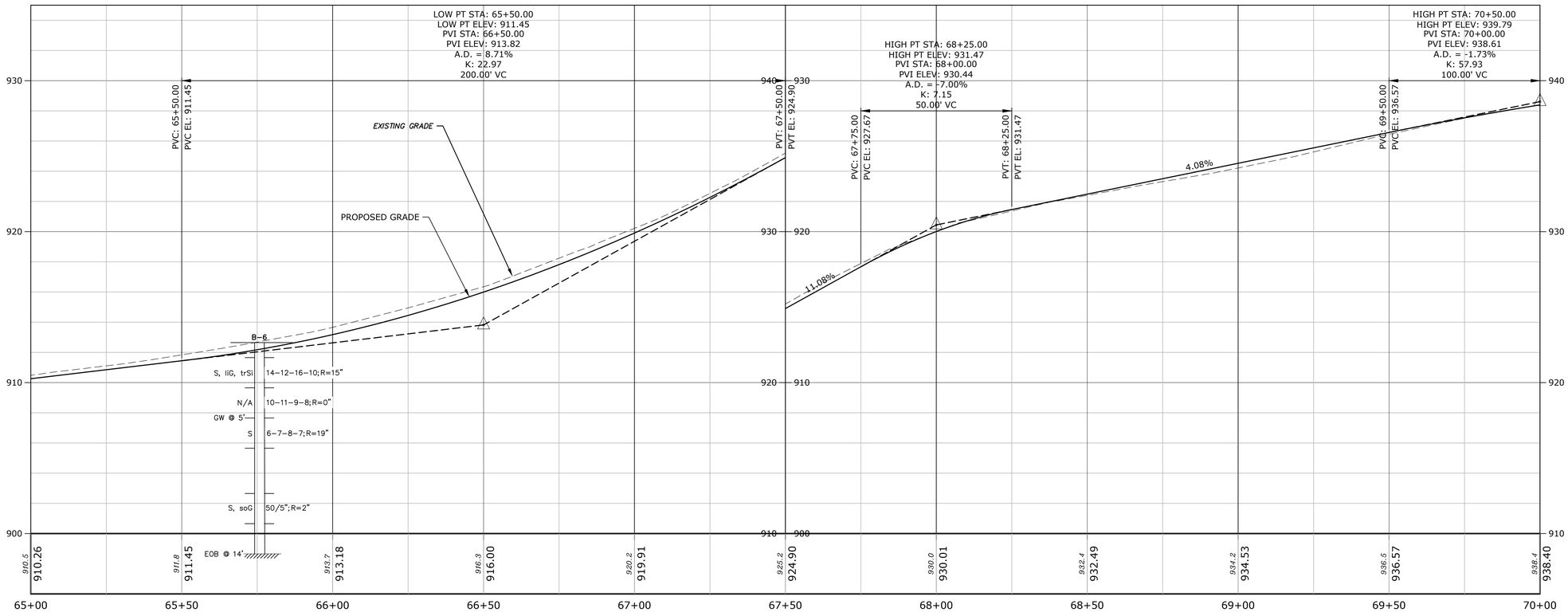
SHEET 15 OF 26

Last Saved: 11/30/2023
Plotted On:Nov 30, 2023-3:34pm By: RCase
Tighe & Bond:J:\L\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 PlanProf.dwg

NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
C26	S54° 42' 33.88"E	121.37	1000.00	6°57'14"	64+51.41	65+12.16	65+72.77
L27	S58° 11' 10.78"E	143.69					
C27	S65° 54' 20.93"E	94.31	350.00	15°26'20"	67+16.46	67+63.90	68+10.77
L28	S73° 37' 31.09"E	86.85					
C28	S74° 42' 08.67"E	112.79	3000.00	2°09'15"	68+97.63	69+54.03	70+10.42





Tighe&Bond

CONCEPTUAL DESIGN SET

THIS DOCUMENT IS INCOMPLETE AND IS RELEASED TEMPORARILY FOR PROGRESS REVIEW ONLY. IT IS NOT INTENDED FOR BIDDING OR CONSTRUCTION PURPOSES.

Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 PlanProf.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

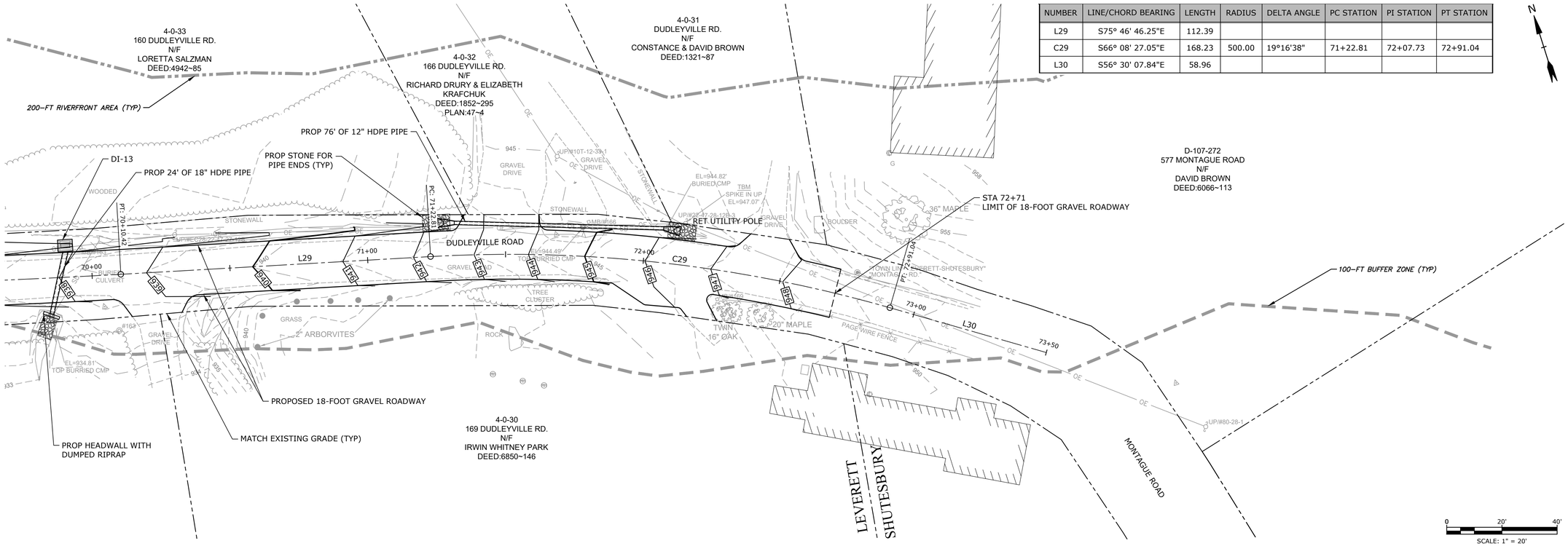
CONSTRUCTION PLAN & PROFILE

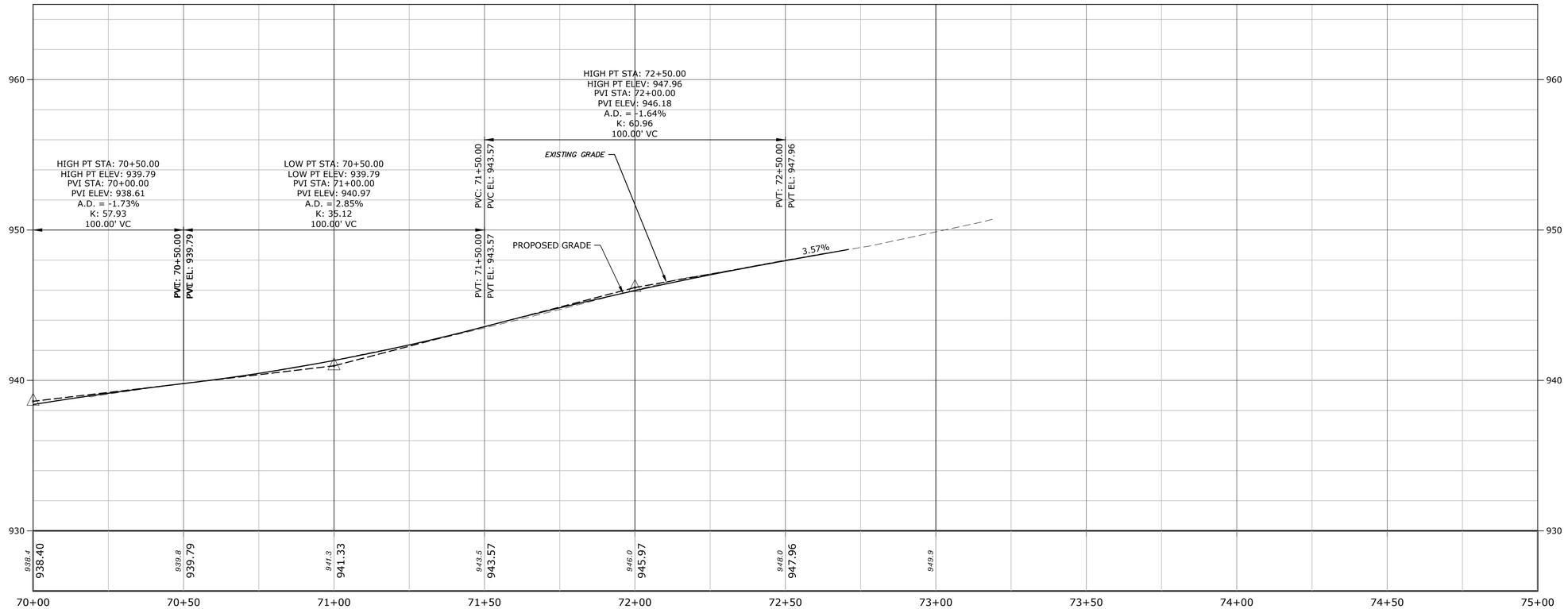
SCALE: HOR: 1" = 20' VERT: 1" = 4'

C-114
SHEET 16 OF 26

Last Saved: 11/30/2023
Plotted: Dec 04, 2023 - 3:34pm By: RCase
Tighe & Bond:\L\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 PlanProf.dwg

NUMBER	LINE/CHORD BEARING	LENGTH	RADIUS	DELTA ANGLE	PC STATION	PI STATION	PT STATION
L29	S75° 46' 46.25"E	112.39					
C29	S66° 08' 27.05"E	168.23	500.00	19°16'38"	71+22.81	72+07.73	72+91.04
L30	S56° 30' 07.84"E	58.96					





Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 PlanProf.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

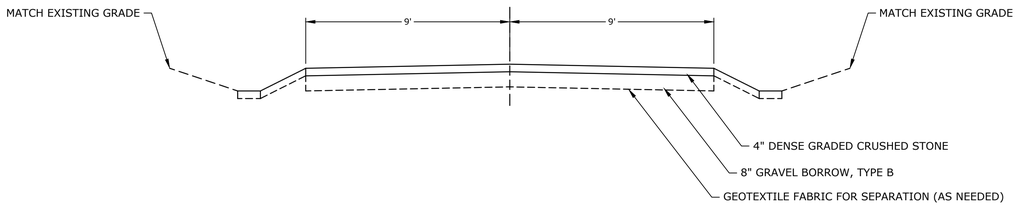
CONSTRUCTION PLAN & PROFILE

SCALE: HOR: 1" = 20' VERT: 1" = 4'

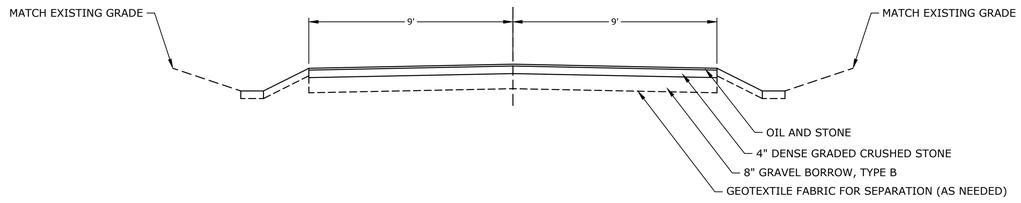
C-115

SHEET 17 OF 26

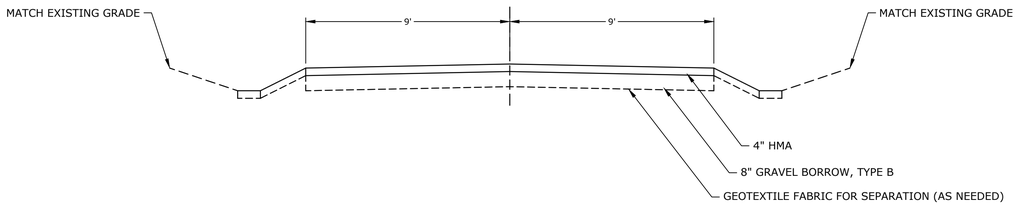
Last Saved: 11/30/2023
Plotted On:Nov 30, 2023-3:34pm By: RCase
Tighe & Bond:J:\L\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 PlanProf.dwg



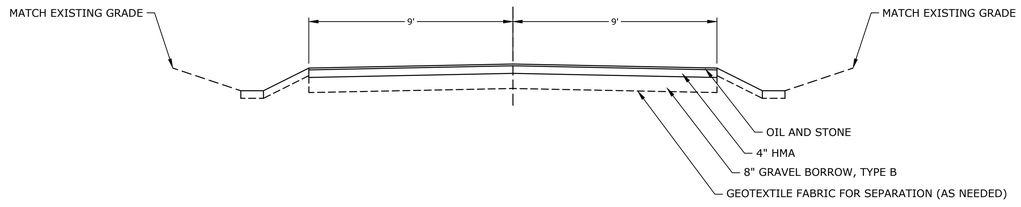
DUDLEYVILLE ROAD TYPICAL SECTION - GRAVEL RESURFACING
NO SCALE



DUDLEYVILLE ROAD TYPICAL SECTION - OIL AND STONE
NO SCALE



DUDLEYVILLE ROAD TYPICAL SECTION - FULL DEPTH RECONSTRUCTION
NO SCALE



DUDLEYVILLE ROAD TYPICAL SECTION - HOT MIX ASPHALT WITH OIL AND STONE
NO SCALE

Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

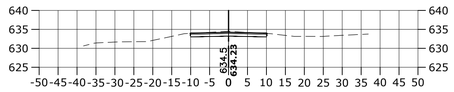
PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 TypicalSections.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

TYPICAL SECTIONS

SCALE: NO SCALE

C-201
SHEET 18 OF 26

Last Saved: 11/17/2023
Plotted On: May 30, 2023 - 3:35pm By: RCote
Tighe & Bond:)\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 TypicalSections.dwg



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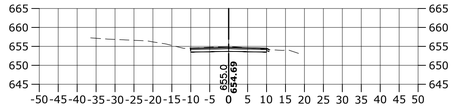

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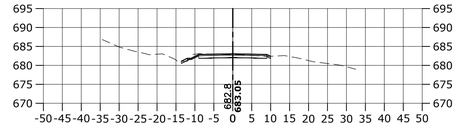

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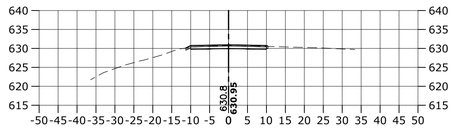

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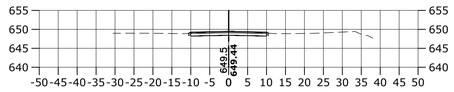

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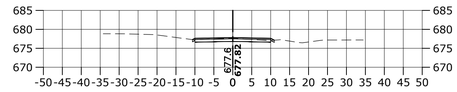

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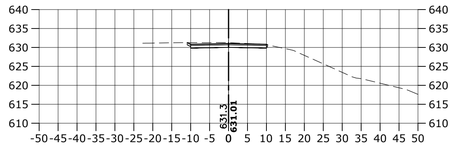

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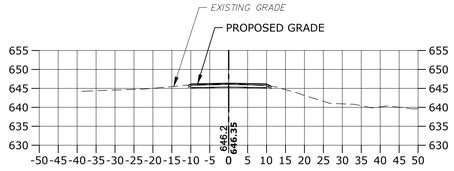

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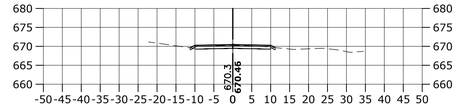

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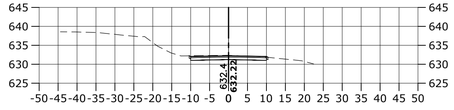

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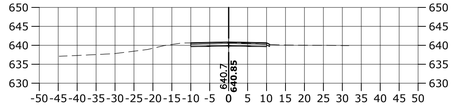

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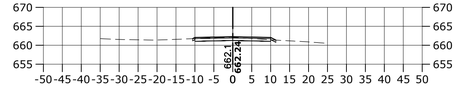

STATION: 9+00

0 20' 40'

SCALE: 1" = 20'

Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 CrossSections.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

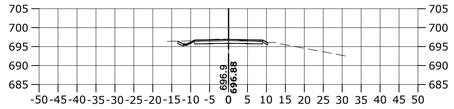
CROSS SECTIONS

SCALE: 1" = 20'

C-301

SHEET 19 OF 26

Last Saved: 11/17/2023
Plotted On: Nov 20, 2023 - 3:35pm By: RCate
Tighe & Bond:)\L\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 CrossSections.dwg



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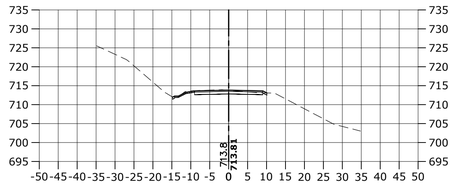
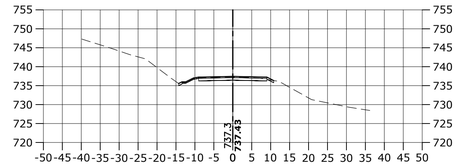


STATION: 18+00



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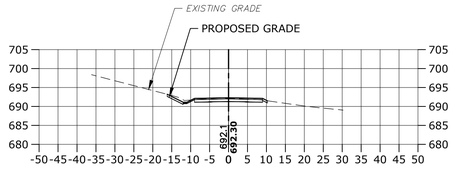

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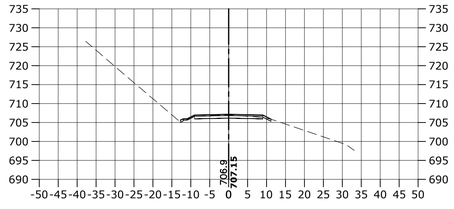

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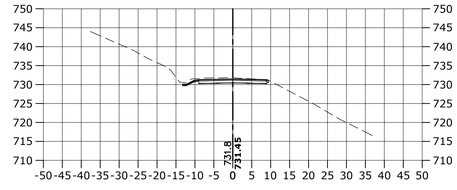

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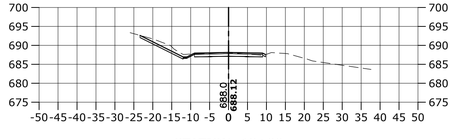

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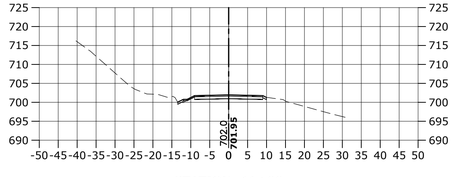

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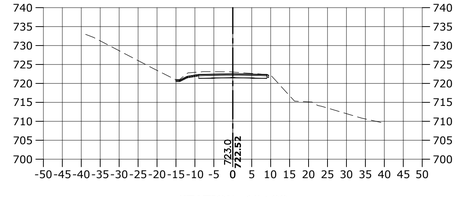

STATION: 19+00

0 20' 40'

SCALE: 1" = 20'

Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 CrossSections.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

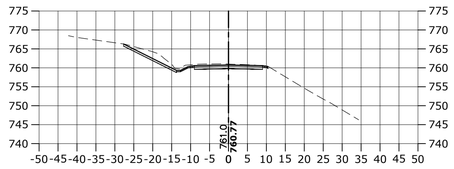
CROSS SECTIONS

SCALE: 1" = 20'

C-302

SHEET 20 OF 26

Last Saved: 11/17/2023
Plotted On: Nov 20, 2023 - 3:35pm By: RCote
Tighe & Bond:\\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 CrossSections.dwg



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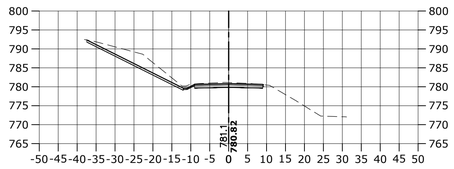

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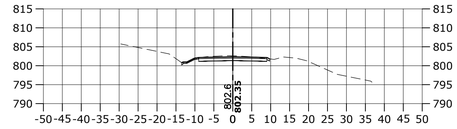

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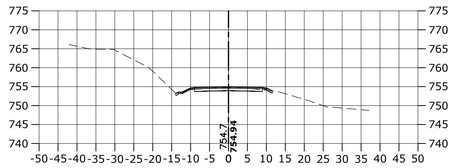

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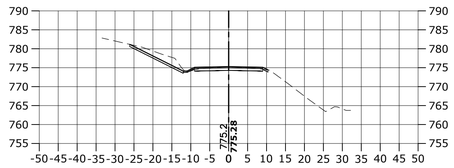

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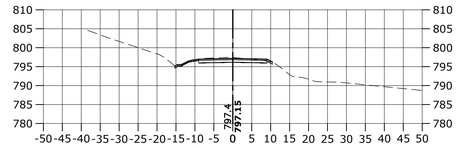

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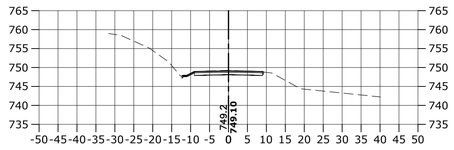

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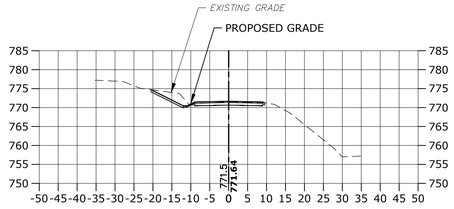

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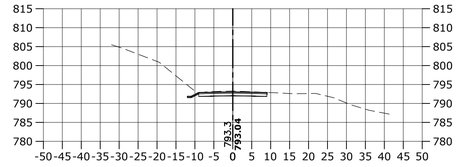
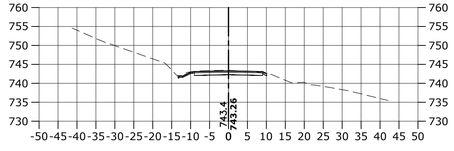


STATION: 31+00



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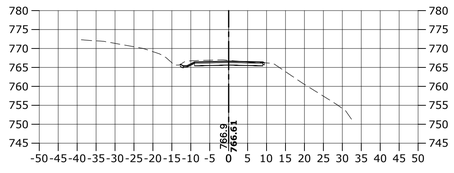
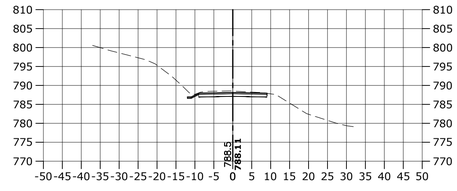


STATION: 26+00



STATION: 30+00

0 20' 40'

SCALE: 1" = 20'

Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 CrossSections.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

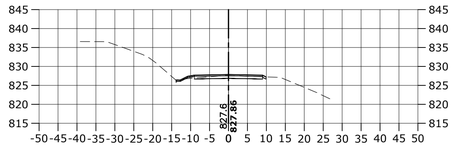
CROSS SECTIONS

SCALE: 1" = 20'

C-303

SHEET 21 OF 26

Last Saved: 11/17/2023
Plotted On: Nov 20, 2023 - 3:35pm By: RCate
Tighe & Bond:\\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 CrossSections.dwg



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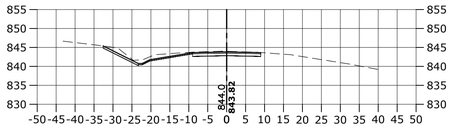

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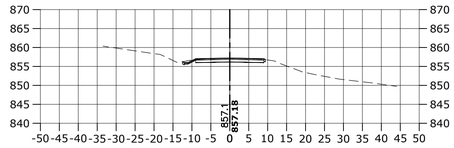

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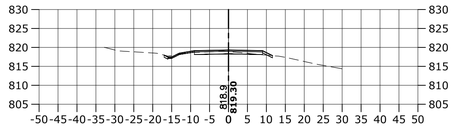

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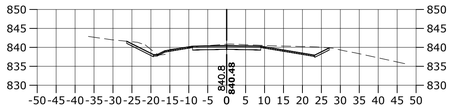

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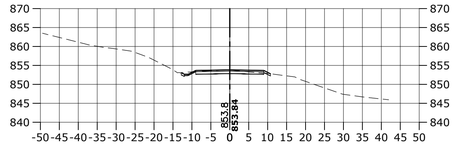

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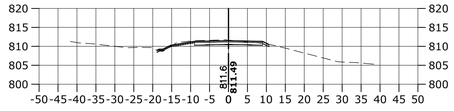

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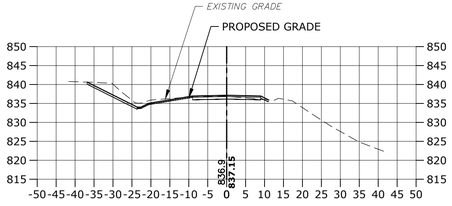

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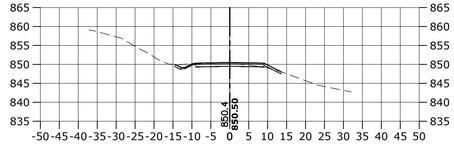

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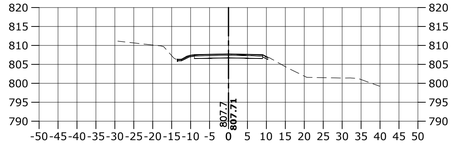

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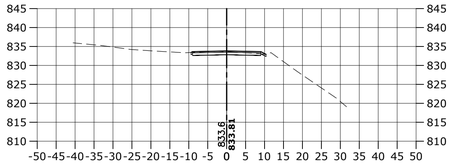

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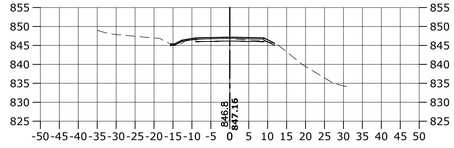

STATION: 42+00

0 20' 40'

SCALE: 1" = 20'

Tighe&Bond

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 CrossSections.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

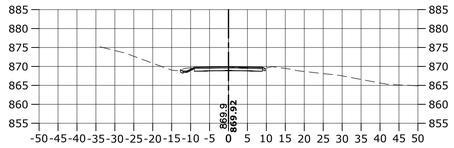
CROSS SECTIONS

SCALE: 1" = 20'

C-304

SHEET 22 OF 26

Last Saved: 11/17/2023
Plotted On: Nov 20, 2023 - 3:35pm By: RCate
Tighe & Bond:\\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 CrossSections.dwg



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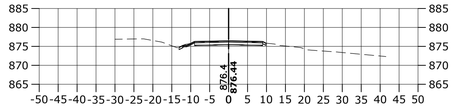

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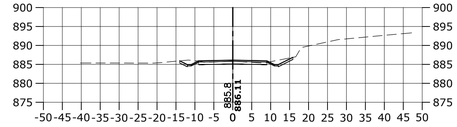

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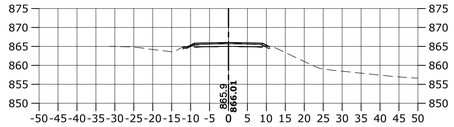

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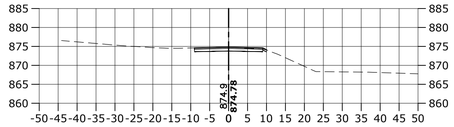

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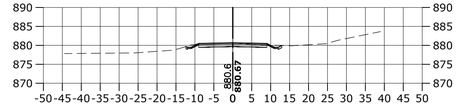

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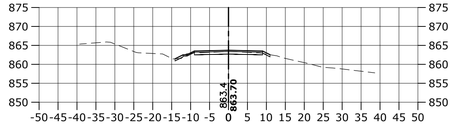

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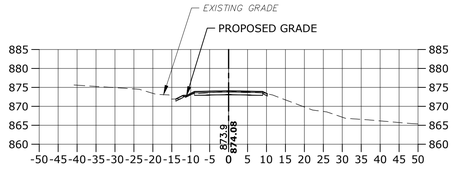

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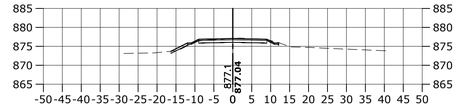

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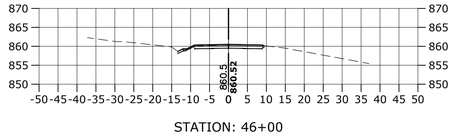

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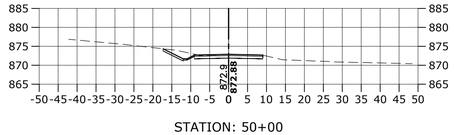

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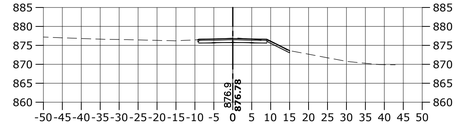

STATION: 54+00

0 20' 40'

SCALE: 1" = 20'

Tighe&Bond

CONCEPTUAL DESIGN SET

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

MARK	DATE	DESCRIPTION

PROJECT NO:	L0792-003
DATE:	NOVEMBER 2023
FILE:	L0792-003 CrossSections.dwg
DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

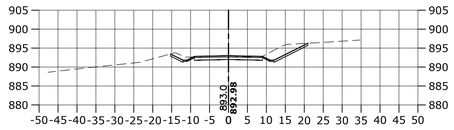
CROSS SECTIONS

SCALE: 1" = 20'

C-305

SHEET 23 OF 26

Last Saved: 11/17/2023
Plotted On: Nov 20, 2023 - 3:35pm By: RCate
Tighe & Bond:\\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 CrossSections.dwg



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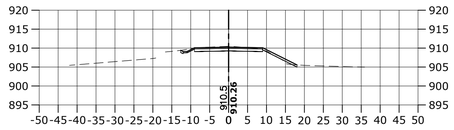

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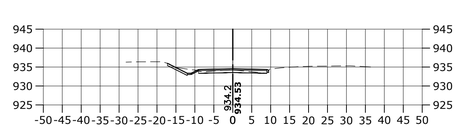

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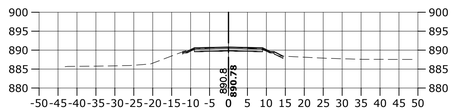

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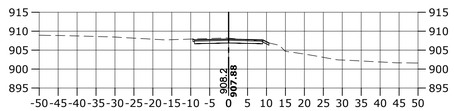

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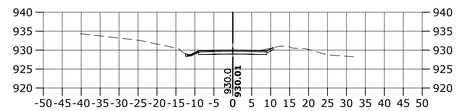

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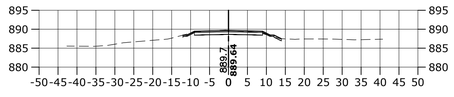

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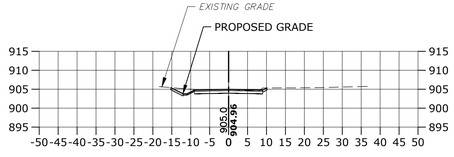

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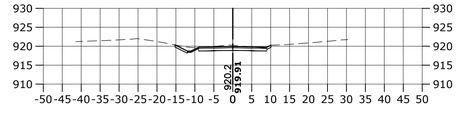

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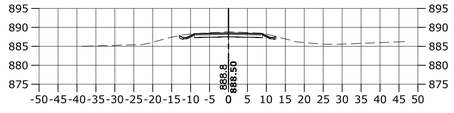

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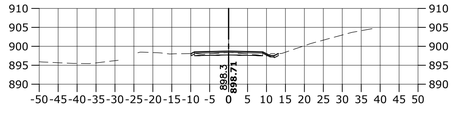

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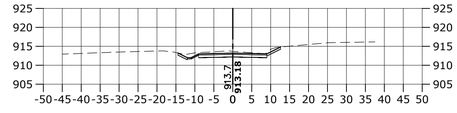

STATION: 66+00

0 20' 40'

SCALE: 1" = 20'

Tighe&Bond

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

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DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

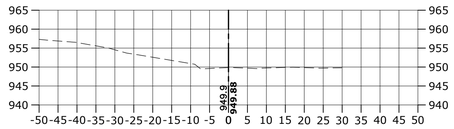
CROSS SECTIONS

SCALE: 1" = 20'

C-306

SHEET 24 OF 26

Last Saved: 11/17/2023
Plotted On: Nov 20, 2023 - 3:35pm By: RCote
Tighe & Bond:\\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 CrossSections.dwg



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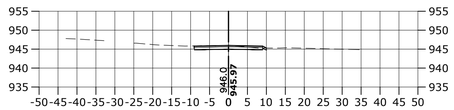

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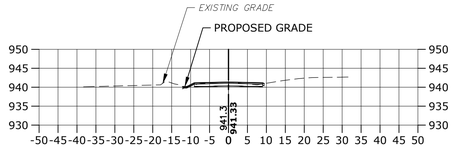

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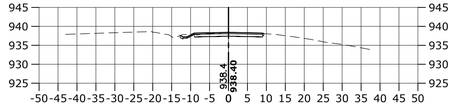

STATION: 70+00



SCALE: 1" = 20'

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Leverett, MA

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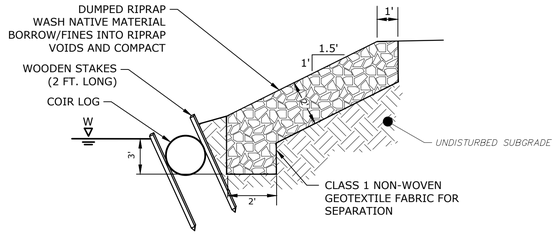
CROSS SECTIONS

SCALE: 1" = 20'

C-307

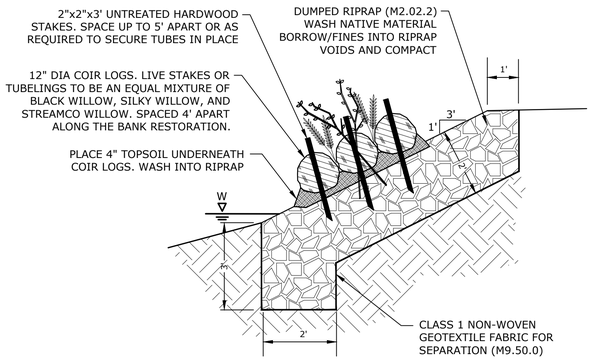
SHEET 25 OF 26

Last Saved: 11/17/2023
Printed On: Nov 20, 2023 3:35pm By: RCate
Tighe & Bond:\\L0792 Leverett\003 Dudleyville Road\Drawings\AutoCAD\Sheet\L0792-003 CrossSections.dwg

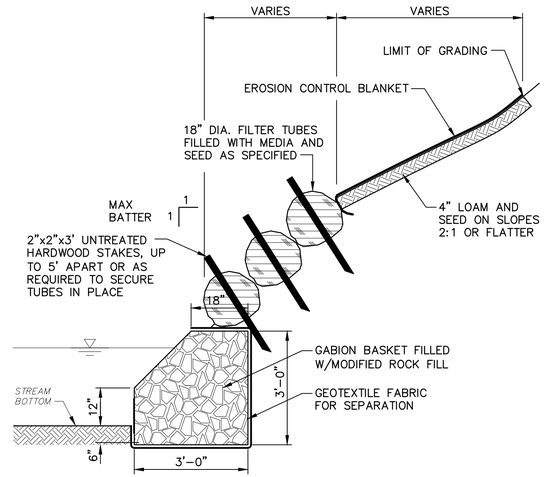


RIPRAP SLOPE STABILIZATION
TYPICAL SECTION
NO SCALE

NOTE:
1. TOE OF SLOPE RESTORATION IN THE GENERAL AREA OF THE FORMER FOUNDATION SHALL CONSIST OF THE COIR LOG, NATIVE SEED MIX, AND 100% BIODEGRADABLE EROSION CONTROL BLANKETS. SEED MIX SHALL BE APPLIED AT THE MANUFACTURER'S RECOMMENDED RATE OF 23 LBS PER ACRE.



RIPRAP SLOPE STABILIZATION
TYPICAL SECTION
NO SCALE



BANK STABILIZATION
NO SCALE

NOTES:
SLOPE AREAS
SLOPES 2:1 OR STEEPER:
PER BANK STABILIZATION DETAIL PROVIDED ON THE DRAWINGS
SLOPES 4:1 TO 2:1:
EROSION CONTROL BLANKET OVER 4" LOAM BORROW AND SEED
SLOPES FLATTER THAN 4:1:
4" LOAM BORROW AND SEED.

Tighe&Bond

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Dudleyville Road Restoration Evaluation

Town of Leverett

Leverett, MA

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DRAWN BY:	RMC
DESIGNED/CHECKED BY:	AGB
APPROVED BY:	ADF

SLOPE RESTORATION
DETAIL ALTERNATIVES

SCALE: NO SCALE

C-501
SHEET 26 OF 26

Last Saved: 11/30/2023
Plotted: Nov 30, 2023 - 3:36pm By: DCase
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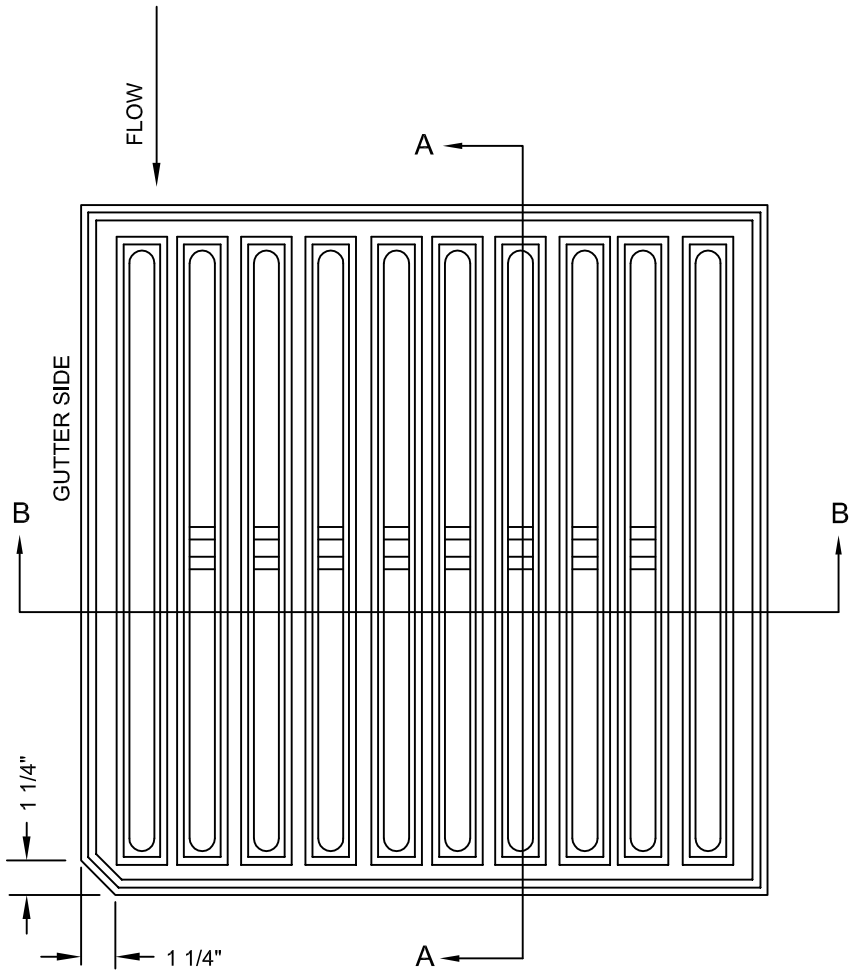
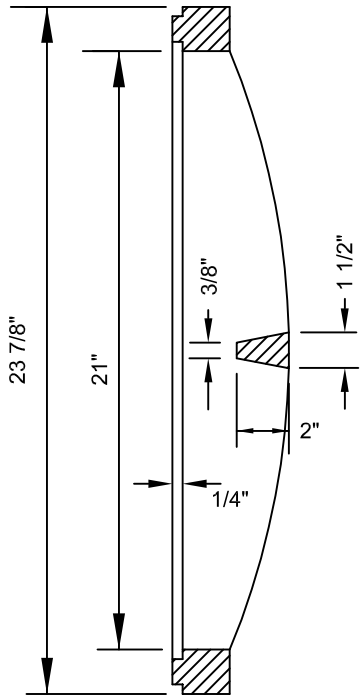
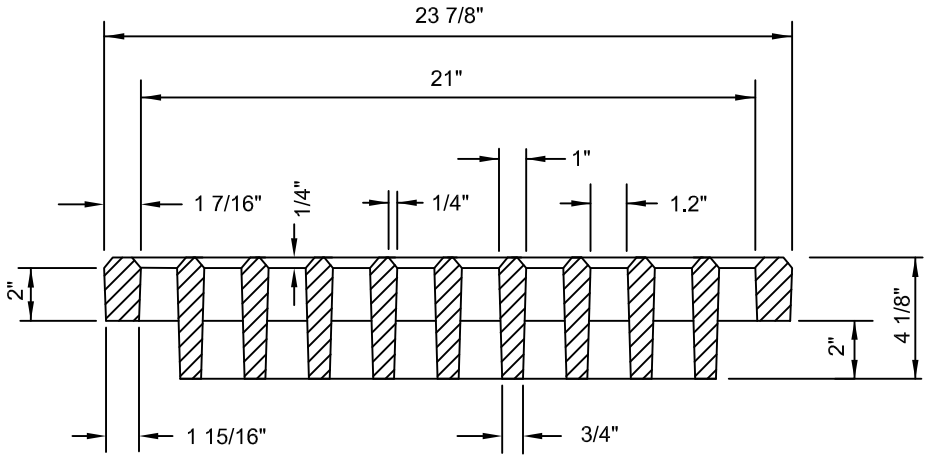
ATTACHMENT I

MASSDOT STANDARD DETAILS





SECTION A-A



SECTION B-B

NOTES:

1. MATERIAL - CAST IRON; SEE STANDARD SPECIFICATIONS
2. MINIMUM MASS - 210 LBS.

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CONSTRUCTION STANDARDS

DROP INLET GRATE

DATE OF ISSUE
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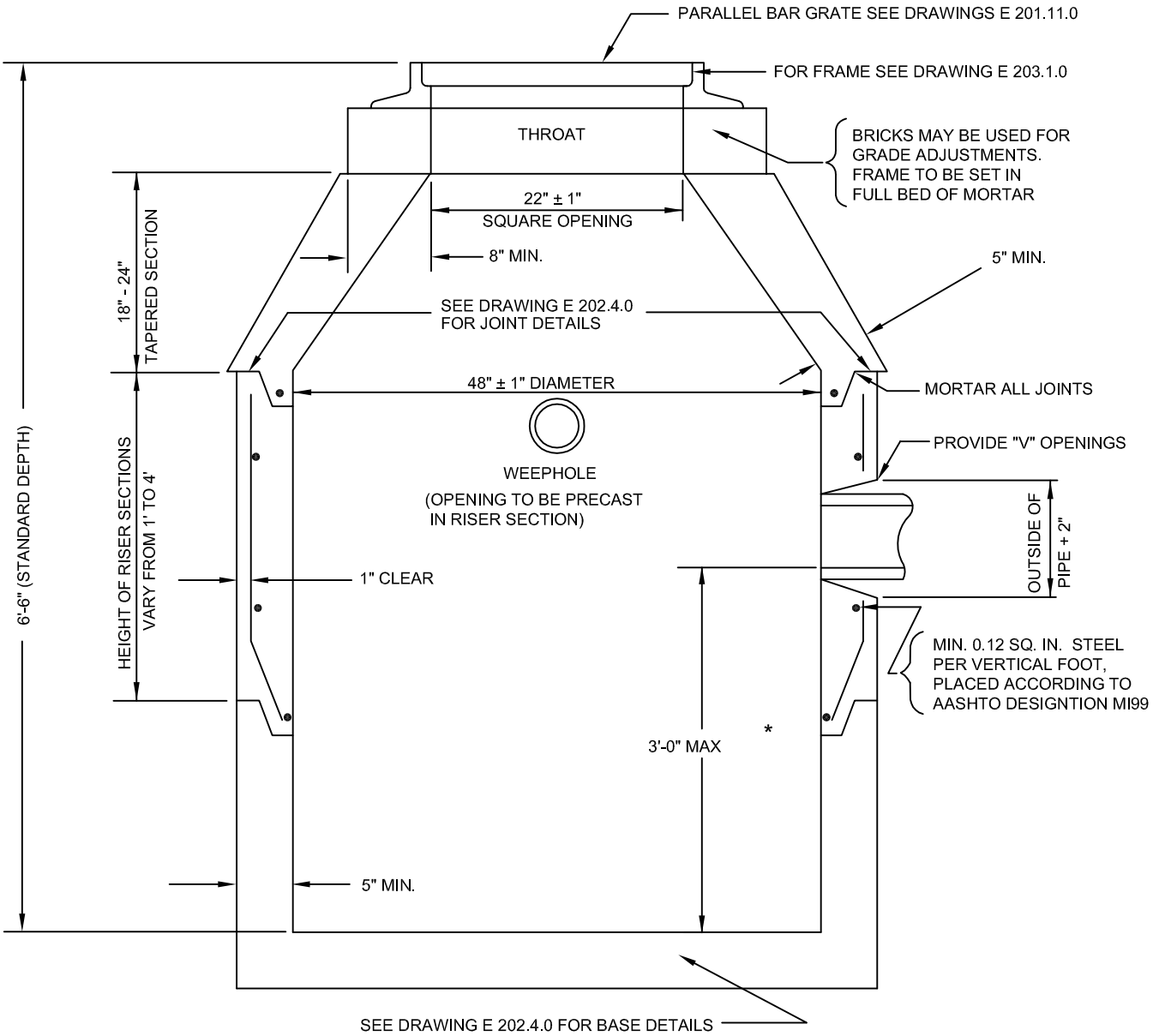
DRAWING NUMBER
E 201.11.0



* MINIMUM DEPTH OF SUMP TO BE 2'

NOTES:

1. DETAILS NOT INDICATED ABOVE ARE TO BE SIMILAR TO THOSE SHOWN ON DRAWING E 203.3.0
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHOD, SEE LATEST STANDARD SPECIFICATIONS
3. THIS DROP INLET IS NOT TO BE USED AT ANY LOCATION WHERE IT MAY PRESENT A HAZARD TO VEHICLES THAT RUN OFF THE ROAD. FOR FLUSH TYPE SEE DRAWING E 203.6.0

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CONSTRUCTION STANDARDS

DROP INLET TYPE D

DATE OF ISSUE
OCTOBER 2017

DRAWING NUMBER
E 203.5.0

CONSTRUCTION STANDARDS

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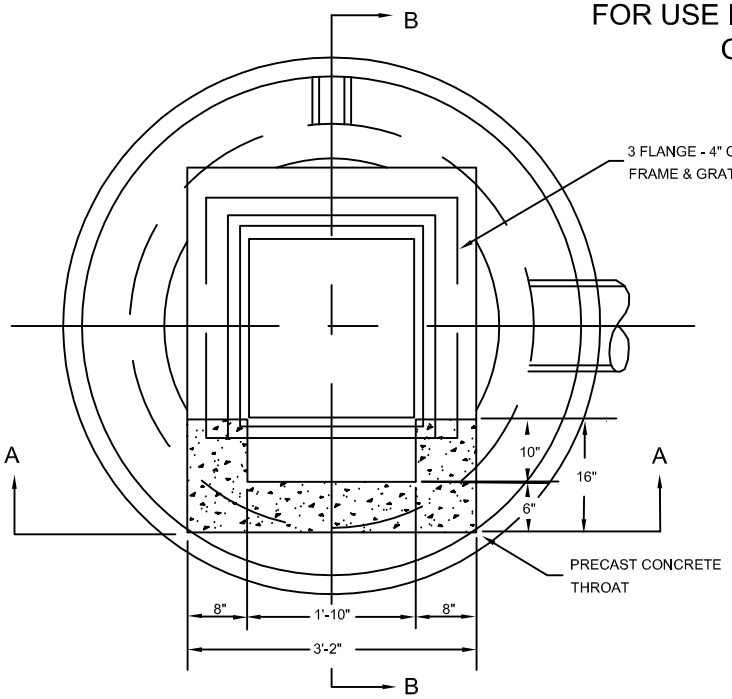
FLUSH DROP INLET THROAT

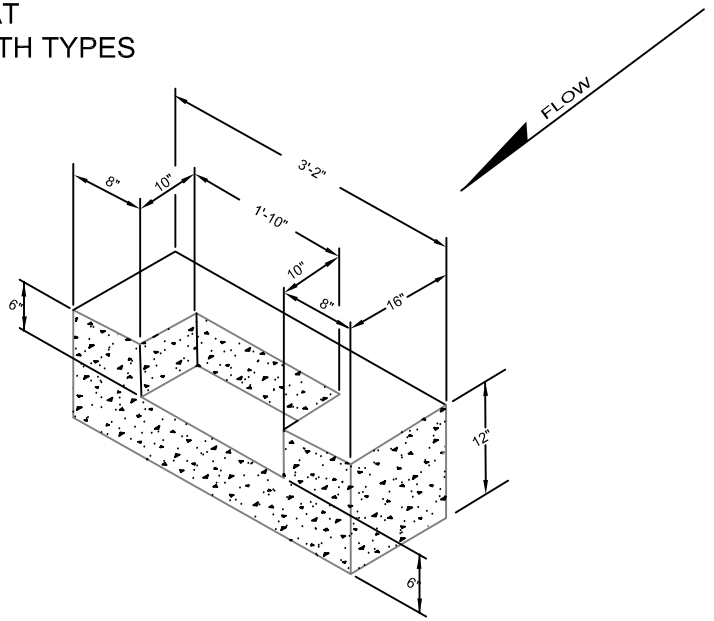
DATE OF ISSUE
OCTOBER 2017

DRAWING NUMBER
E 203.7.0

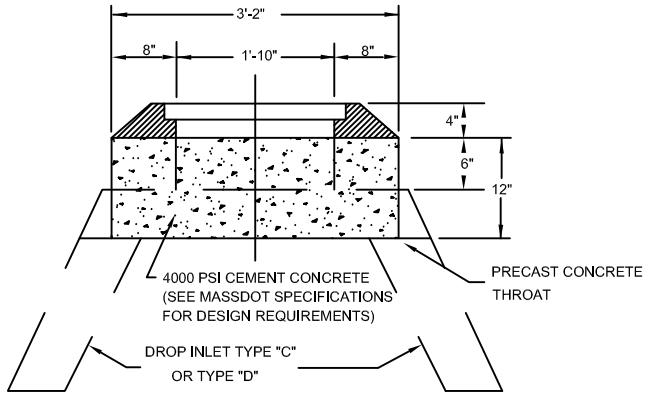
PRECAST CONCRETE THROAT FOR USE IN MEDIANS & DITCHES WITH TYPES CF AND DF DROP INLETS



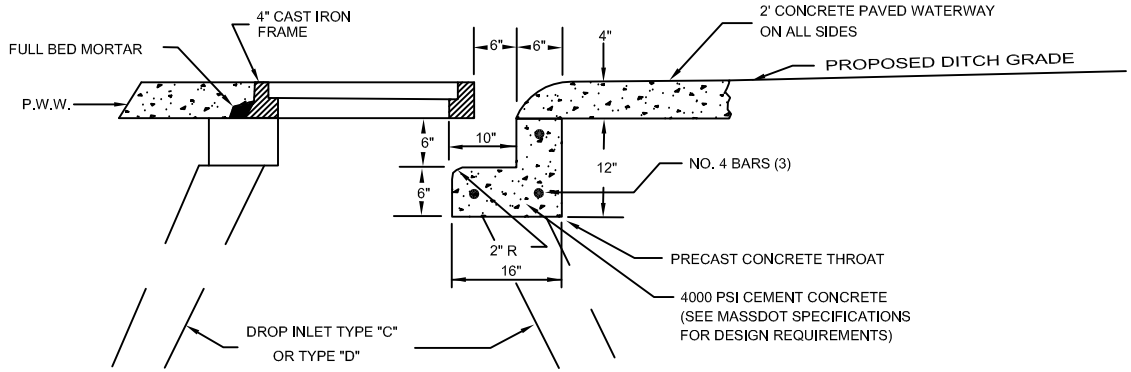
PLAN



ISOMETRIC OF PRECAST CONCRETE THROAT OPENING



SECTION A-A



SECTION B-B

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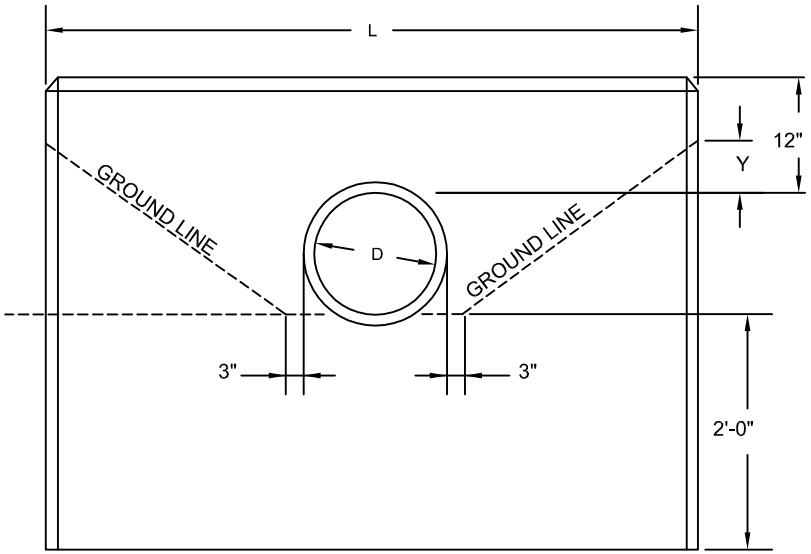
CONSTRUCTION STANDARDS

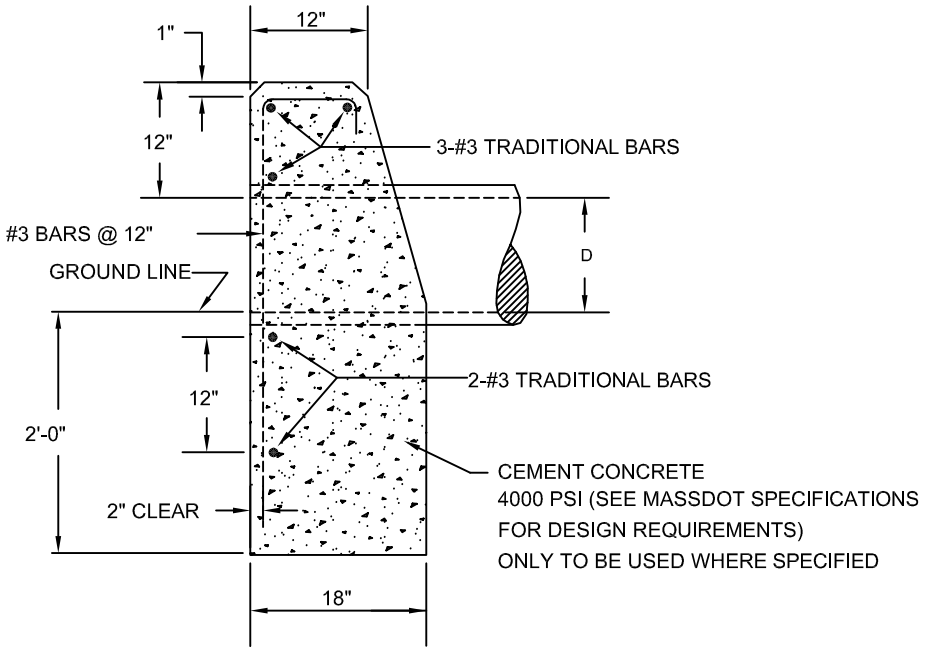
CONCRETE AND FIELD STONE MASONRY PIPE ENDS FOR 8" TO 30" PIPE

DATE OF ISSUE
OCTOBER 2017

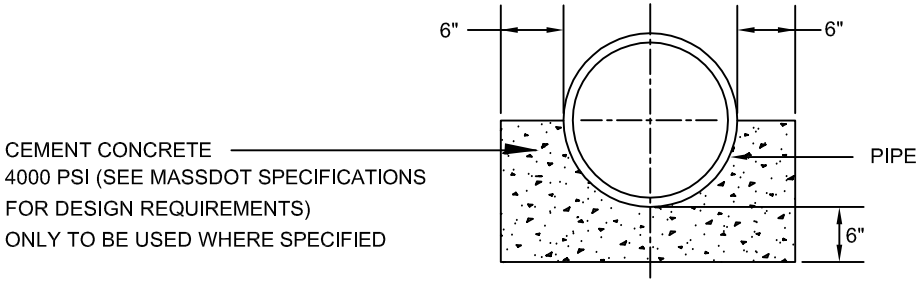
DRAWING NUMBER
E 206.4.0



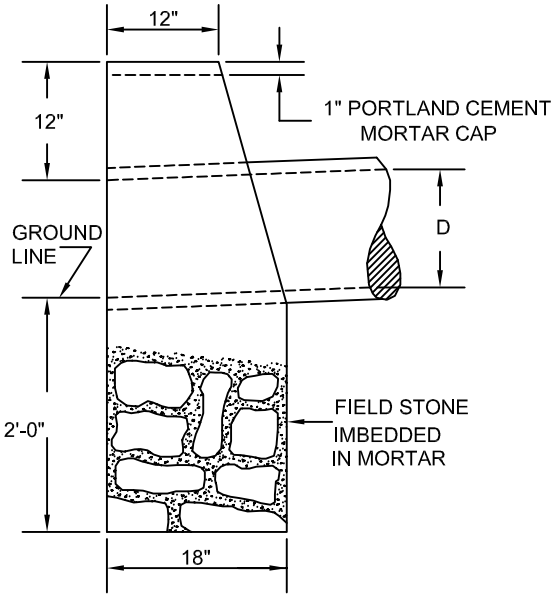
FRONT ELEVATION



END ELEVATION



CONCRETE CRADLE
FOR PIPE CULVERTS



END ELEVATION

NOTES:

1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE LATEST STANDARD SPECIFICATIONS.
2. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.
3. PAYMENTS WILL BE BASED ON THE ACCOMPANYING TABLE.
4. FOR QUANTITY TABLES SEE E 206.4.1

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CONSTRUCTION STANDARDS

QUANTITY TABLES FOR CONCRETE AND FIELD STONE MASONRY PIPE ENDS

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ENGLISH UNITS								
PIPE DIAM. D	1 1/2 : 1 SLOPE				2 : 1 SLOPE			
	L	CONC. OR F.S.M. CU. YDS.	STEEL LBS.	TRENCH EXCAV. 1'-0" DEPTH CU. FT.	L	CONC. OR F.S.M. CU. YDS.	STEEL LBS.	TRENCH EXCAV. 1'-0" DEPTH CU. FT.
8"	4'-2"	0.77	15	21.60	5'-10"	1.08	21	27.40
10"	4'-10"	0.92	20	23.91	6'-8"	1.28	23	30.35
12"	5'-6"	1.08	21	26.25	7'-6"	1.49	29	33.25
15"	6'-6"	1.34	24	29.75	8'-9"	1.82	32	37.63
18"	7'-6"	1.61	30	33.25	10'-0"	2.18	39	42.00
21"	8'-6"	1.95	34	37.35	11'-6"	2.62	43	47.25
24"	9'-3"	2.16	35	39.38	12'-6"	2.97	50	50.75
30"	10'-6"	2.63	44	43.75	15'-0"	3.86	62	59.50
	Y	4" FOR 1 1/2 : 1 SLOPE						
		6" FOR 2 : 1 SLOPE						

CONSTRUCTION STANDARDS

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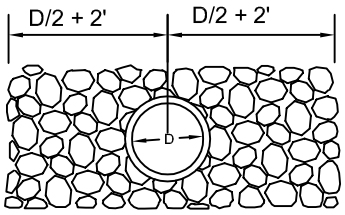
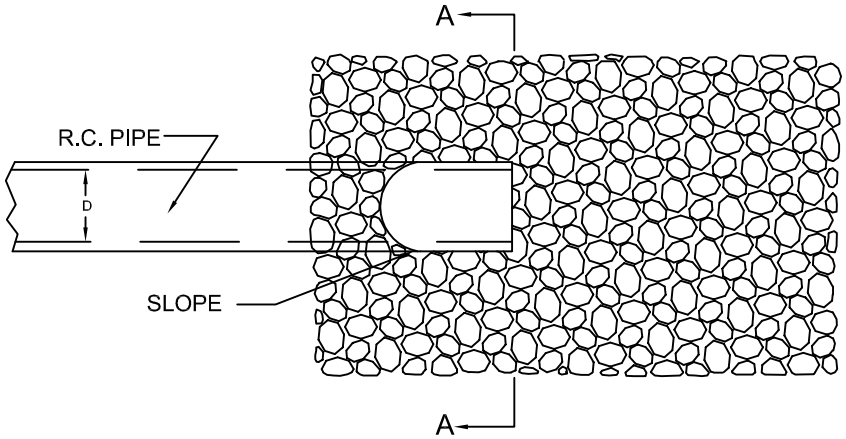
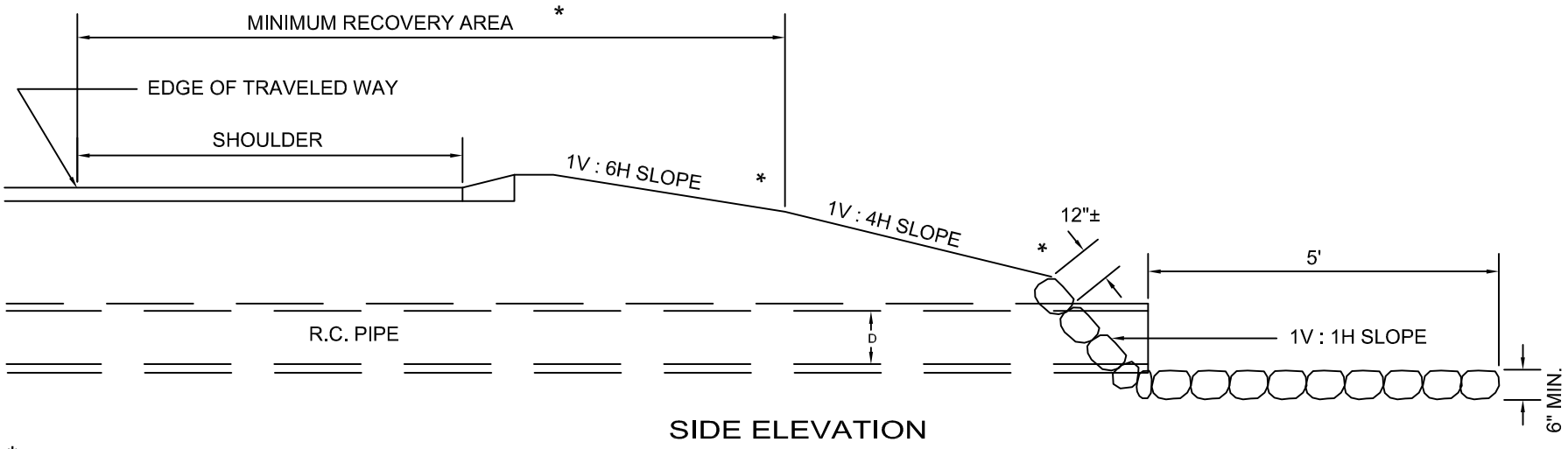
STONE PIPE ENDS FOR PIPES 24" AND LESS IN DIA.



SECTION A-A



PLAN



SIDE ELEVATION

* SEE TYPICAL SECTIONS.

NOTES:

1. STONE TREATMENT OF PIPE ENDS SHALL NOT BE USED IN THE VEHICLE RECOVERY AREA.
2. MINIMUM MASS PER STONE = 50 LBS; MAXIMUM MASS PER STONE = 125 LBS.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

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E 206.7.0

NOTES:

1. ALL DIMENSIONS OF STANDARD GUARDRAIL COMPONENTS, INCLUDING PANELS, POSTS, OFFSET BLOCKS, BOLTS, NUTS, WASHERS AND HOLES, ARE BASED UPON ENGLISH UNIT CONVERSIONS OF THE AASHTO-ARTBA-AGC JOINT COMMITTEE TASK FORCE 13 REPORT: *A GUIDE TO STANDARDIZING HIGHWAY BARRIER HARDWARE* (http://www.aashtotf13.org/Barrier-Hardware.php).

2. ALL GUARDRAIL MATERIALS SHALL CONFORM TO M8.07.0 UNLESS OTHERWISE INDICATED.

3. APPROVAL BY THE ENGINEER IS REQUIRED WHERE A DIFFERING GUARDRAIL CONFIGURATION IS REQUIRED FOR CONSTRUCTABILITY BEYOND THE OPTIONS SHOWN IN THESE STANDARDS OR THE PLANS.

4. THE BEGIN OR END STATION LABELS SHOWN IN THESE STANDARDS CORRESPOND TO THE STATION AND OFFSET CALLOUTS SPECIFIED IN THE PLANS.

5. USE 12'-6" NOMINAL LENGTH PANELS UNLESS OTHERWISE INDICATED IN THESE STANDARDS OR THE PLANS.

6. ALL LAP SPLICES SHALL BE MIDSPAN UNLESS OTHERWISE SHOWN.

7. LAP SPLICES SHALL BE CONSTRUCTED WITH THE SPLICE RIDGE ORIENTED DOWNSTREAM OF THE FINAL DIRECTION OF TRAFFIC IN THE NEAREST TRAVEL LANE. REORIENTING LAP SPLICES FOR TEMPORARY TRAFFIC CONTROL IS NOT REQUIRED.

8. STANDARD POSTS SHALL BE STEEL OR TIMBER, UNLESS OTHERWISE INDICATED IN THE PLANS, FABRICATED TO THE DIMENSIONS SHOWN ON 400.1.4. POSTS OF A SINGLE MATERIAL TYPE SHALL BE USED THROUGHOUT AN ENTIRE RUN OF GUARDRAIL; EXCEPTIONS ARE ALLOWED ONLY WHEN SPECIFIC MATERIAL TYPES ARE REQUIRED FOR TRANSITIONS, END TREATMENTS, AND/OR ANCHORAGES.

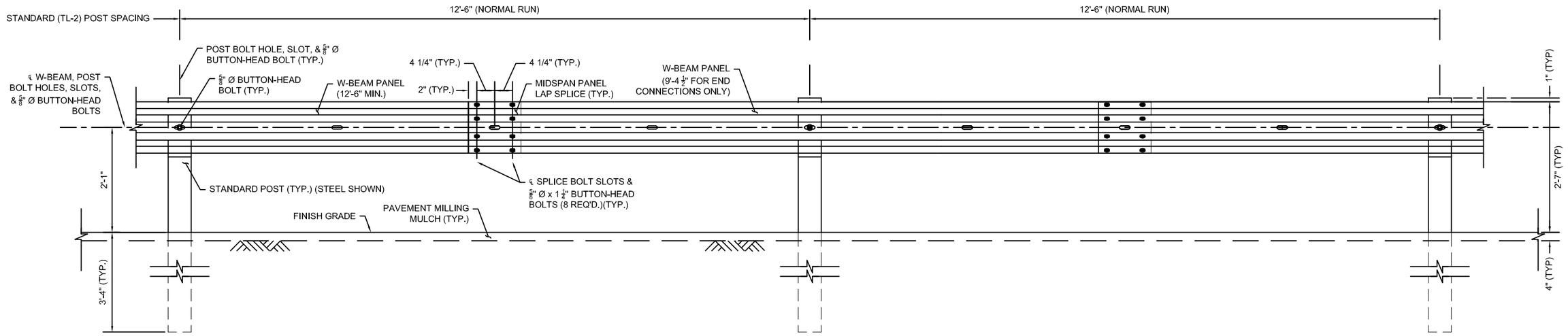
9. DEEP POST SHALL ONLY BE USED WHERE INDICATED IN THESE STANDARDS OR THE PLANS.

10. OFFSET BLOCKS, WHERE REQUIRED, SHALL BE TIMBER AND FABRICATED TO THE NOMINAL DIMENSIONS SHOWN ON 400.1.4. PLASTIC OR COMPOSITE OFFSET BLOCKS OF THE SAME NOMINAL DIMENSIONS THAT ARE LISTED ON THE QUALIFIED CONSTRUCTION MATERIALS LIST MAY BE SUBSTITUTED. OFFSET BLOCKS OF A SINGLE MATERIAL TYPE SHALL BE USED THROUGHOUT AN ENTIRE RUN OF GUARDRAIL; EXCEPTIONS ARE ALLOWED ONLY WHEN SPECIFIC MATERIAL TYPES ARE REQUIRED FOR TRANSITIONS, END TREATMENTS, AND/OR ANCHORAGES.

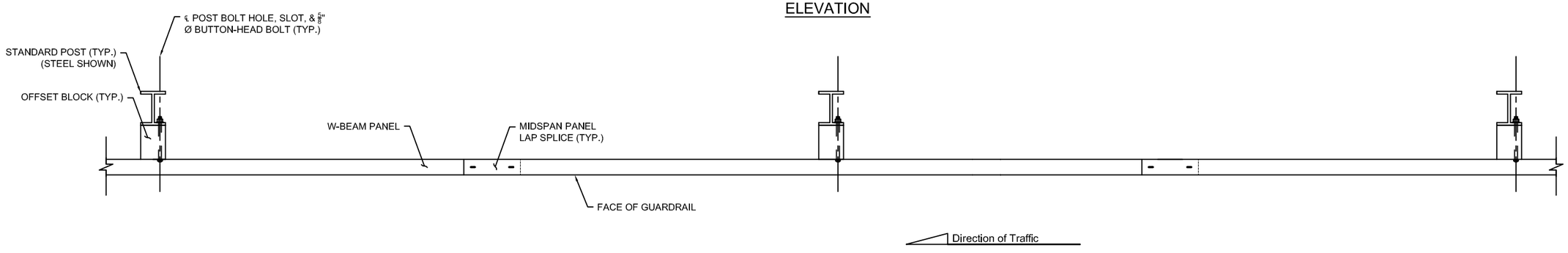
11. PAVEMENT MILLING MULCH, WHERE CALLED FOR IN THE STANDARDS, SHALL CONFORM TO SECTION 739.

12. GUARDRAIL DELINEATORS, CONFORMING TO SECTION 601, SHALL BE INSTALLED AT 25' INTERVALS WITHIN 100' OF AN END TREATMENT OR TRAILING ANCHORAGE AND AT 100' INTERVALS IN ALL OTHER AREAS UNLESS OTHERWISE SHOWN IN THE PLANS.

13. MINIMUM OFFSET DISTANCE FROM FACE OF W-BEAM PANEL TO A FIXED (NON-BREAKAWAY) OBJECT SHALL BE 48" FOR TL-2 AND 60" FOR TL-3.



ELEVATION



PLAN

NOTES:

1. A 9'-4 3/4" PANEL IS REQUIRED WHEN TRANSITIONING TO TL-3 W-BEAM GUARDRAIL TO MAINTAIN PROPER POST SPACING.

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CONSTRUCTION STANDARDS
SECTION 400

GUARDRAIL, TL-2

DATE OF ISSUE
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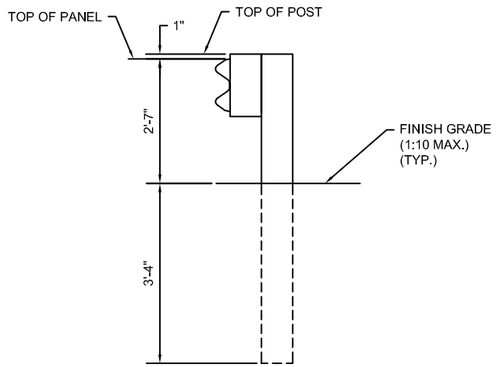
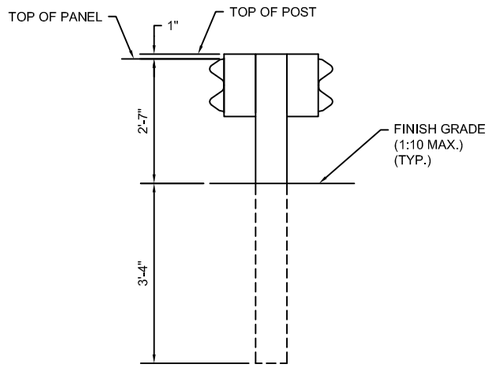
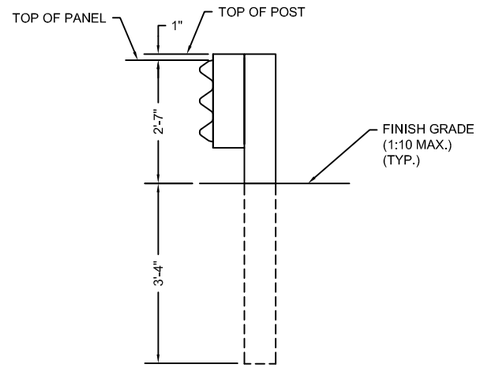
DRAWING NUMBER
400.1.2



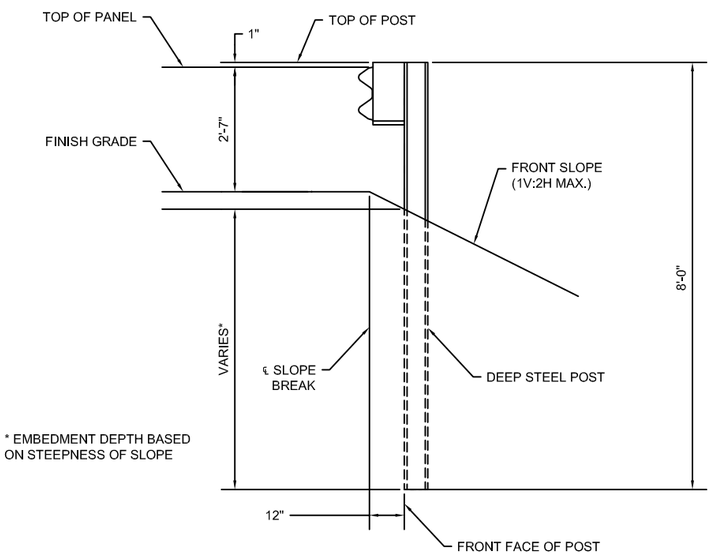
W-BEAM



DOUBLE FACED
W-BEAM



THRIE-BEAM



SLOPE BREAK CONDITION
STEEL DEEP POST

NOTES:

1. CONSTRUCTION TOLERANCE FOR PANEL HEIGHT = ± 1".

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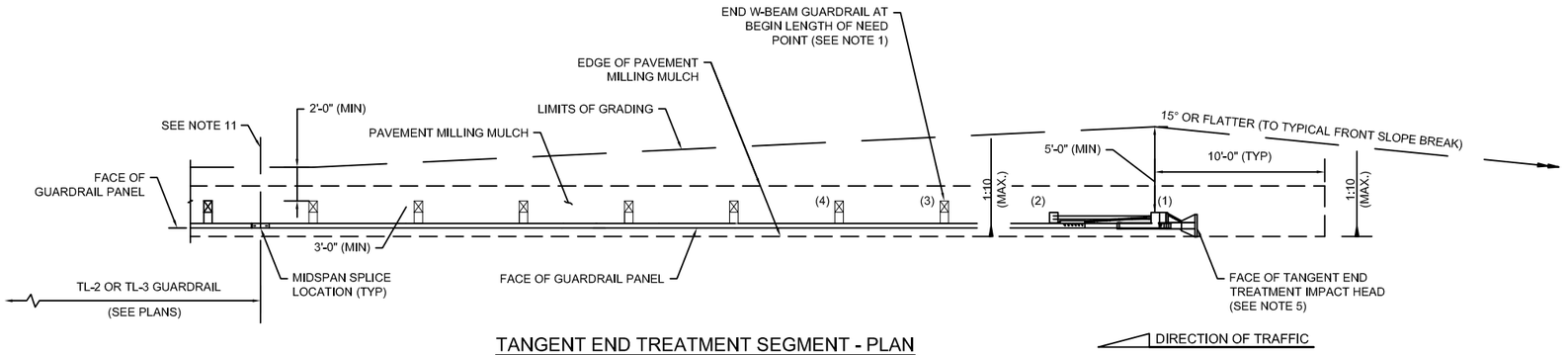
CONSTRUCTION STANDARDS
SECTION 400

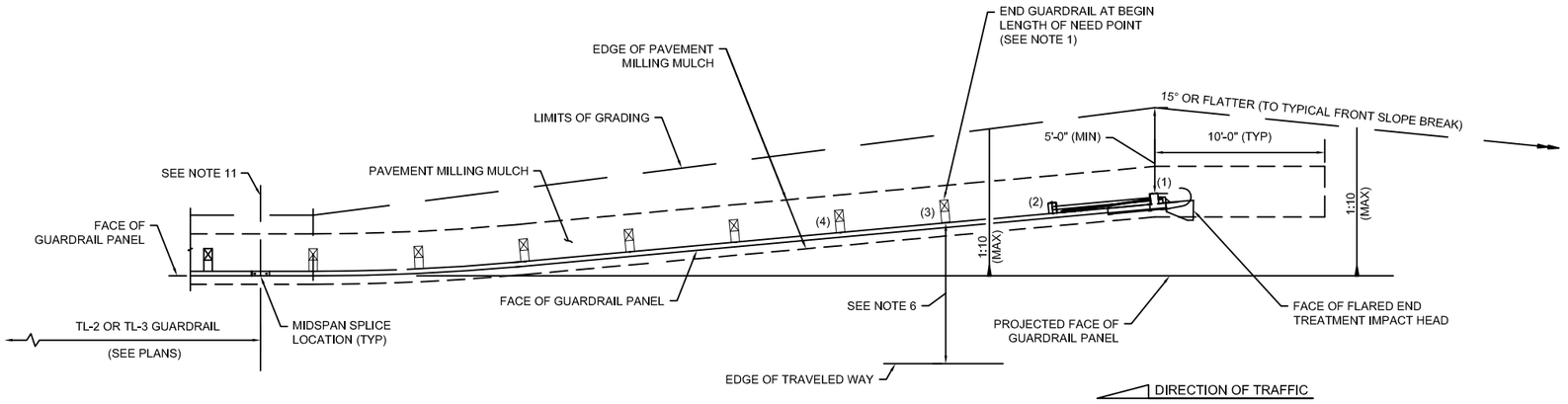
GUARDRAIL MOUNTING HEIGHTS & POST DEPTHS

DATE OF ISSUE
OCTOBER 2017

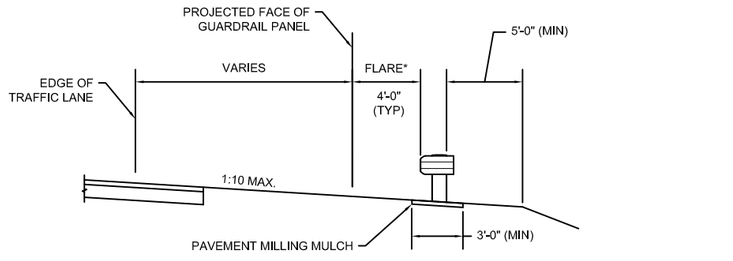
DRAWING NUMBER
400.1.5



TANGENT END TREATMENT SEGMENT - PLAN

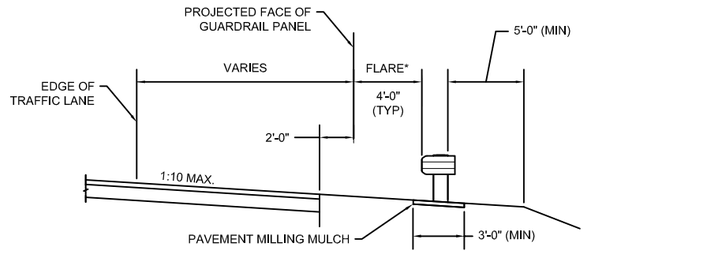


FLARED END TREATMENT SEGMENT - PLAN



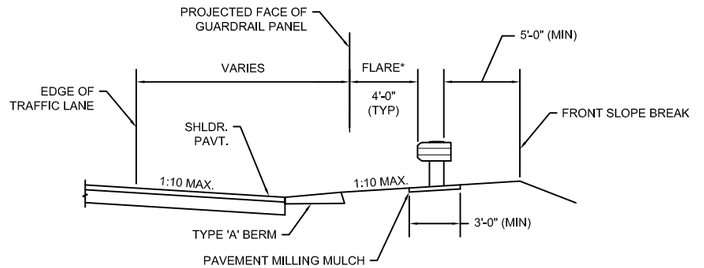
*FLARE IF CALLED FOR IN PLANS, OTHERWISE ALIGN WITH PROJECTED FACE OF GUARDRAIL (SEE NOTES 3 & 5)

SECTION AT POST (1)
WITH UNPAVED SHOULDER



*FLARE IF CALLED FOR IN PLANS, OTHERWISE ALIGN WITH PROJECTED FACE OF GUARDRAIL (SEE NOTES 3 & 5)

SECTION AT POST (1)
WITH FULLY PAVED SHOULDER



*FLARE IF CALLED FOR IN PLANS, OTHERWISE ALIGN WITH PROJECTED FACE OF GUARDRAIL (SEE NOTES 3 & 5)

SECTION AT POST (1)
WITH TYPE 'A' BERM

NOTES:

1. INSTALL GUARDRAIL AT STATION AND OFFSET SHOWN IN THE PLANS. THE END OF THE GUARDRAIL SHOWN IN THE PLANS CORRESPONDS WITH THE BEGIN LENGTH OF NEED POINT FOR THE END TREATMENT (SHOWN AT POST 3 IN THESE STANDARDS, BUT MAY VARY BY MANUFACTURER).
2. PROPRIETARY END TREATMENTS MAY VARY IN SIZE AND SHAPE FROM WHAT IS DEPICTED IN THESE STANDARDS. HOWEVER, THE MAXIMUM SLOPES AND MINIMUM OFFSETS DIMENSIONED FROM THE POSTS SHOWN HEREIN SHALL STILL APPLY.
3. END TREATMENT TEST LEVEL AND TYPE (TANGENT OR FLARED) SHALL BE SPECIFIED IN THE PLANS.
4. CONSTRUCT TANGENT AND FLARED END TREATMENTS IN ACCORDANCE WITH THE MANUFACTURER'S UNIQUE DRAWING DETAILS, PROCEDURES, AND SPECIFICATIONS.
5. AT THE DISCRETION OF THE ENGINEER, THE FACE OF THE TANGENT END TREATMENT IMPACT HEAD MAY BE OFFSET UP TO 2'-0" FROM THE PROJECTED FACE OF GUARDRAIL TO MINIMIZE NUISANCE HITS. THE OFFSET SHALL OCCUR OVER THE ENTIRE LENGTH OF THE END TREATMENT UNLESS OTHERWISE SPECIFIED BY THE MANUFACTURER.
6. LATERAL OFFSET OF FLARED END TREATMENT SHALL BE DETERMINED BY THE DESIGN ENGINEER FOLLOWING THE METHODOLOGY FOUND IN THE *ROADSIDE DESIGN GUIDE* AND SHOULD FALL WITHIN THE ALLOWABLE TOLERANCES SPECIFIED BY THE MANUFACTURER. LATERAL OFFSET SHALL BE MEASURED FROM THE EDGE OF TRAVELED WAY TO THE FACE OF THE GUARDRAIL AT POST #3.
7. END TREATMENTS SHALL NOT TERMINATE CURVED W-BEAM SEGMENTS.
8. END TREATMENT IMPACT HEAD DELINEATION SHALL CONFORM TO 601.63.
9. INSTALL GRADING AS SHOWN HEREIN UNDER SEPARATE PAY ITEMS.
10. SEE 400.2.2 FOR APPROACH TERMINAL GEOMETRY FOR GUARDRAIL INSTALLED ADJACENT TO CURB AND DOUBLE FACED GUARDRAIL.
11. MAINTAIN 2'-0" (MIN) OFFSET TO FRONT SLOPE BREAK DOWNSTREAM OF MIDSPAN SPLICE LOCATION AT ALL TIMES. IF, DOWNSTREAM OF THE SPLICE, GRADING CONSTRAINTS INHIBIT THIS MINIMUM OFFSET THEN USE DEEP STEEL POSTS AND TRANSITION TO A SLOPE BREAK CONDITION DESIGN PER THE DETAIL IN 400.1.5 UNTIL THE 2'-0" OFFSET CAN BE MET.

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CONSTRUCTION STANDARDS
SECTION 400

APPROACH GEOMETRY : SINGLE FACED

DATE OF ISSUE
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DRAWING NUMBER
400.2.1

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