GEOTECHNICAL INVESTIGATION REPORT DOWNEAST RAIL TRAIL PIN 9636

Ellsworth, Maine

Submitted To: Maine Department of Transportation
Multi-Modal Program
16 State House Station
Augusta, ME 04333-0016

Submitted By: Golder Associates Inc.
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Project No.: 093-87156

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September 18, 2009

Project No.: 093-87156

Mr. Joel Kittredge
Maine Department of Transportation
Multi-Modal Program
16 State House Street
Augusta, ME 04333-0016

RE: GEOTECHNICAL INVESTIGATION REPORT
RAIL TRAIL DESIGN SUPPORT, DOWNEAST TRAIL
ELLSWORTH, MAINE
MAINEDOT PIN 009636.00

Dear Mr. Kittredge:

Golder Associates Inc. (Golder) is pleased to submit this Geotechnical Investigation Report to the Maine Department of Transportation (MaineDOT) for the design of the proposed Downeast Trail in Ellsworth, Maine. Our report summarizes the findings of our field investigations and laboratory testing for the trail, discusses interpreted subsurface conditions, and presents recommended geotechnical criteria for design and construction. We conducted our services in accordance with our Stand Alone Project Contract with the Multi-Modal Department of MaineDOT dated June 17, 2009. It has been a pleasure working with MaineDOT on this project. Please contact us if you have any questions concerning our report or require additional geotechnical information.

Sincerely,

GOLDER ASSOCIATES INC.

for Jeffrey D. Lloyd, E.I.T.
Geotechnical Engineer

Jay R. Smerekanicz, P.G.
Senior Consultant and Associate

Mark S. Peterson, P.E.
Senior Consultant and Associate

STATE OF MAINE
MARK S. PETERSON
No. 4787
LICENSED
PROFESSIONAL ENGINEER

cc: Brian Ackley, Tetra Tech Rizzo

Enclosure: Geotechnical Investigation Report

JRS/MSP/JDL/drb

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1.0 INTRODUCTION

The Maine Department of Transportation (MaineDOT) is planning to construct a new recreational trail in Ellsworth, Maine that will become part of the Downeast Trail. The new trail will be constructed adjacent to the northeast side of an existing railroad track (presently inactive), and will extend from the intersection of Routes 1A and 179 at the northwest end, to Birch Avenue at the southeast end. The length of this portion of trail is about 6,800 feet (ft) and is shown on the design drawings for the project, prepared by Tetra Tech Rizzo (TTR)[1]. The adjacent railroad does not currently carry rail traffic; however railroad construction is occurring to rehabilitate the tracks for scenic railway operation.

The trail project is planned to include an 8 foot wide paved trail with edge of pavement located roughly 10 to 15 feet (ft) away from the existing rail track. The trail profile grade will range above and below the track grade and the trail will be separated from the near rail by slopes typically at 2H:1V (horizontal to vertical) or flatter. Drainage features for the project are planned to include two large culverts, open stone french drain trenches, a small number of catch basins, and cuts and fills required for project grading.

In a December 16, 2008 memorandum to MaineDOT, TTR[2] requested a geotechnical investigation program be conducted using bedrock probes and test borings to assess bedrock surface depth conditions, and to support final design for the two culverts, selected catch basins and the drainage trenches. Golder Associates Inc. (Golder) developed a scope of work for the geotechnical investigation based on TTR's request, and our proposed work program was incorporated into our contract agreement with MaineDOT dated June 17, 2009. Our services included site reconnaissance, geotechnical borings, bedrock probes, geotechnical laboratory testing of select soil samples, and assessment of geotechnical criteria for design and construction.

Project stationing (in feet) used in this report is the existing centerline of the rails, starting near Station (Sta) 1427+00 at the northwest end (at the intersection of the rail and Routes 1A and 179), to near Sta 1494+00 at the southeast end (at Birch Avenue). Please note that a second stationing designation for the rail trail is shown on the drawings, and the correlation between the two station designations is 1426+89.14 = 1+00.00.

[1] Tetra Tech Rizzo, Design Drawing Set (34 sheets) titled "State of Maine Department of Transportation, Plans, Ellsworth, Hancock County, Downeast Trail, Project No. STP-9636.00, Length 1.268 Miles, A Grading, Base & Pavement Project", undated and unstamped PDF files provided to Golder created 05/29/08.

[2] Memorandum from Brian Ackley (TTR) to Joel Kittredge (MaineDOT) titled "Ellsworth, PIN 9636, Geotechnical Investigation Request," dated December 16, 2008.

2.0 GEOTECHNICAL FIELD INVESTIGATION

Golder's field investigation included surface reconnaissance and subsurface explorations based on the requested program identified in TTR's December 16, 2008 memorandum. TTR's memorandum identified specific locations and drilling depths for two (2) test borings and 20 rock probes. In further discussions with MaineDOT and TTR, a third boring location was added on the southwest side of the railroad track alignment at Sta 1446+93 to support the replacement of the culvert carrying Davis Brook under the rail line.

In mid August 2009, prior to the start of the subsurface exploration program, the MaineDOT survey crew placed project stationing markers along the trail alignment. On August 18, 2009, Golder laid out proposed probe and boring locations the in the field by measuring the offset from the northeast track, making adjustments to the test boring locations to accommodate drill rig access based on local topographic conditions. Two of the MaineDOT stationing markers, at P-5 and P-6, had been removed prior to Golder's arrival, but the locations were remarked by Golder. Golder contacted "Dig Safe" to provide utility clearance for all borehole locations prior to initiating the field investigation.

We compiled our site-specific "Health and Safety Plan" (HASP) for the field program based on our understanding of the potential risks to which field personnel may be exposed while performing work in the project area. A Golder geotechnical engineer laid out the exploration locations, conducted surface reconnaissance, monitored the drilling operations on a full-time basis, selected sample locations, and logged the subsurface conditions encountered. The field program was completed in accordance with "Modified Level D" personal protection.

2.1 Site Reconnaissance

On February 26, 2009 and May 7, 2009, Golder representatives performed site reconnaissance to observe the general geologic conditions along the northwestern portion of the project and to complete planning for the exploration program. During the course of the subsurface exploration program completed in August 2009, Golder personnel mapped the locations of bedrock outcrop and boulders exposed along the proposed trail alignment.

2.2 Subsurface Explorations

The subsurface explorations included three test borings and 20 bedrock probes along the proposed trail alignment at the locations shown on the annotated design drawings presented in Appendix A. Boring depths varied from 6.2 ft to 10.42 ft below ground surface (bgs), and bedrock probes varied from 0.17 ft to 10 ft bgs. The explorations were made over a three-day period between August 19 and 21, 2009. Table 1 presents a summary of the completed exploration program.

Golder subcontracted Maine Test Borings (MTB), of Brewer, Maine to conduct the explorations. An MTB crew drilled seven bedrock auger probes (P-1 through P-6 and P-8) and one test boring (B-2) using a Mobile Drill B-53 track-mounted rotary drill rig. MTB completed two test borings (B-1 and B-1A) using a tripod drill rig due to access constraints. At the completion of each boring, MTB removed the drilling tools and allowed the borehole to partially collapse before backfilling the remaining open borehole with drill cuttings.

Due to access constraints related to maneuvering the track-mounted drill rig to many of the proposed probe locations, MTB completed 11 bedrock probes (P-10 through P-20) using a compact excavator to dig test pits. The test pits were backfilled after completion. Two additional bedrock probes (P-7 and P-9) were completed by Golder using a small diameter 4 ft long steel rock probe driven by hand due to access constraints and apparent shallow bedrock and/or boulders in the immediate area.

The seven bedrock probes completed with the drill rig used 4-inch diameter solid stem augers to advance the hole to the depths identified by TTR or to refusal, whichever was encountered first. Golder logged the auger probes based on returned cuttings at the surface and on the drill rig behavior. The eleven bedrock probe test pits completed with the excavator were logged by Golder for refusal depth and any significant lithologic changes. Several test pit locations (P-14, P-18 through P-20) had to be moved closer to the railroad in order to be in reach of the excavator due to uneven topography. Table 1 includes a summary of the bedrock probe information including as-drilled station, offsets, elevations, excavation date, and probe depth.

Drilling methods at the test boring locations varied depending on the equipment used. The track mounted Mobile B-53 rig was used at boring B-2 and the hole was advanced with 4-inch diameter solid stem augers with continuous Standard Penetration Test (SPT) open-hole sampling (using a 140 pound safety hammer) in accordance with ASTM D1586. At borings B-1 and B-1A a tripod rig was used to drive continuous SPT slit spoon samples at 2-foot intervals with a 140 pound donut hammer. Golder collected soil samples from each SPT split spoon for visual identification and laboratory testing. Golder recorded sample lithologic descriptions, sample recovery lengths, groundwater conditions, and SPT blow counts. MTB drilled the geotechnical borings to 10 ft bgs or to refusal, whichever was encountered first. Appendix B contains logs of the geotechnical borings.

On August 26 and 27, 2009 MaineDOT completed a survey of the as-drilled locations and ground surface elevations for the geotechnical borings and bedrock probes. The locations are reported as station and offset from the centerline of the existing railroad track, and elevations are reported in feet referenced to the railroad monument elevations. Please note that the offsets provided in Table 1 reference the centerline of the railroad track, and not the northeast rail as listed in TTR's December 16, 2008 memorandum.

2.3 Geotechnical Laboratory Testing

Golder selected four soil samples from the geotechnical borings for mechanical gradation and moisture content analyses according to ASTM methods. In addition, two Atterberg Limit determinations were performed. Golder's geotechnical laboratory in Atlanta, Georgia conducted the analyses. Golder used the results of gradation tests to classify the soils and estimate soil engineering properties. The gradation and moisture content test results are presented in Appendix C, and are summarized in Table 2.

3.0 SUBSURFACE CONDITIONS

3.1 Regional Geology

The site is located in eastern Maine, where two types of glacial till are generally present in the region: lodgement or basal till deposited as the continental glacier advanced; and ablation or meltout till deposited over the basal till as the ice sheet front retreated. The till consists of a heterogeneous mixture of boulders, gravel, sand, silt and clay, and is rarely stratified[3]. The basal till tends to be slightly finer grained and is very compact with low permeability and poor drainage, having borne the weight of the glacial ice mass. The ablation till is loose and coarser-grained than the basal till, with moderate permeability and fair to good drainage due to a higher sand content. The till generally overlies bedrock, and is in turn overlain by Late Quaternary glaciomarine clays, which are overlain by recent swamp, marsh and bog deposits, and recent stream alluvium, flood plain, stream terrace and alluvial fan deposits. Overburden material depths are estimated to range between 0 to about 30 ft in the Ellsworth area[4].

The regional bedrock consists of metasedimentary and metavolcanic rocks mapped as the Late Cambrian- or Early Ordovician-aged Ellsworth Formation[5,6]. The Ellsworth Formation is described as a dark green, light green to green weathering, quartz-feldspar-muscovite-chlorite schist, with numerous disrupted fine-grained quartz veins showing multiple deformation.

3.2 Site Conditions

Soil and bedrock conditions encountered at the explorations included the following sequence of materials. Not all deposits were encountered at all explorations.

3.2.1 Miscellaneous Fill

Miscellaneous fill, consisting of reworked glacial till materials and railroad embankment gravel (with coal fragments) was encountered in some bedrock probe/test pit locations. This fill was presumably placed as embankment material during railroad construction and maintenance. At bedrock probe P-3, an oil or coal odor was noted, indicating the fill materials may be environmentally impacted, possibly by past railroad operations. The fill materials were found to be generally loose to dense, and only a few feet thick.

3.2.2 Alluvium

Alluvium consisting of a thin layer (a few inches) of loose, gray, wet, coarse to fine sand was encountered at the surface in geotechnical borings B-1 and B-1A at Davis Brook. Alluvial soils are likely limited to stream areas, such as Davis Brook.

[3] Borns, H.W. and Andersen, B., 1982. Reconnaissance Surficial Geology of the Ellsworth Quadrangle, Maine. Maine Geological Survey Open-File Report No. 82-3, scale 1:62,500.
[4] Locke, D.B., 2000. Surficial Materials Map of the Ellsworth Quadrangle, Maine Geological Survey Open-File Report No. 00-199, scale 1:24,000.
[5] Pollock, J., 2008. Bedrock Geology of the Ellsworth Quadrangle, Maine. Maine Geological Survey Open-File Report No. 08-88, scale 1:24,000.
[6] Berry, H.N.IV, and Osberg, P.H., 1986. A Stratigraphic Synthesis of Eastern Maine and Western New Brunswick, in: Studies in Maine Geology - Volume 2: Structure and Stratigraphy, Tucker, R.D. and Marvineey, R.G., eds., Maine Geological Survey, p. 1-32.

3.2.3 *Glaciomarine Clay*

Glaciomarine silty clay was encountered in all three geotechnical borings (B-1, B-1A and B-2), and in bedrock probe P-14. The glaciomarine clay consists of dark greenish gray to olive gray, soft to hard, mottled silty clay, with trace to some medium to fine sand, and trace fine gravel. Blow counts per 12 inches (i.e., corrected N_{60}-values) range from 3 (boring B-2) to 52 (boring B-1A). Pocket penetrometer test values on SPT split spoon samples are shown on the boring logs and ranged from 0.75 tons per square foot (tsf) to 3.5 tsf, and were generally greater than 1.75 tsf. The upper 2 to 4 ft of the silty clay deposit was typically soft to medium stiff, and underlying materials were consistently stiff to very stiff or hard. At the Davis Brook area (borings B-1 and B-1A), the stiff to very stiff silty clay strata were encountered about 2.5 ft bgs (about Elevation 118.5 ft). At the unnamed stream at Sta 1467+40 (boring B-2) the stiff silty clay strata was encountered about 4 ft bgs (about Elevation 114.3 ft). Thin layers (up to 0.3 ft) of dark olive gray to greenish gray, medium dense, coarse to fine sand occur within the silty clay, and contain some fine gravel and some organics (borings B-1 and B-1A). Geotechnical laboratory index testing of the silty clay indicates it is classified as CL according to the Unified Soil Classification System. Moisture of the clay ranges from 21.1 to 48.6 percent. Atterberg limits variations from tests on three soil samples are as follows:

- Liquid limit range: 37 to 43
- Plastic limit range: 21 to 23
- Plasticity index range: 15 to 20
- Liquidity index range: 0.10 to 0.27

Geotechnical laboratory testing results of the glaciomarine clay are presented in Table 2.

3.2.4 *Glacial Till*

Glacial till was encountered in many of the bedrock probe locations and possibly in geotechnical boring B-2, where the driller reported numerous cobbles below a layer of glaciomarine clay. In B-2, a 0.4 ft layer of dense, fine gravelly coarse to fine sand, with some silt and little clay was encountered beneath the boulders that is likely ablation till. The thickness of till encountered in test pits generally ranged from less than one foot to about five feet. In the test pits shallower than five feet deep, the till was found to lie directly on bedrock. The till commonly contained cobbles and boulders.

3.2.5 *Bedrock*

Bedrock consisting of the Ellsworth Formation schist and metavolcanics was encountered in several of bedrock probe locations. Depth to bedrock from the investigation locations ranges from 0.17 ft (bedrock probe P-17) to greater than 10.42 ft (geotechnical boring B-2) as summarized on Table 1 and shown on the annotated plans in Appendix C. The bedrock surface is variable throughout the project, but rises to within five feet of the ground surface between Sta 1436 to 1443, 1454 to 1465, 1469 to 1481 and 1484 (i.e., southeast end of project). The bedrock surface is about 10 feet deep between Sta 1427 (at the northwest end of the project) to about 1436. Bedrock outcrops occur along the rail line between Sta 1479+50 to 1481+00 (RT); 1485+00 to 1485+30 (LT); 1487+40 (LT); and 1487+80 to 1489+60 (LT and RT). Boulders and/or bedrock outcrop were also noted along the rail line at Sta 1435+30 (RT); 1436+10 (LT); 1445+30 (RT); 1446+50 (RT); 1455+60 to 1456+00 (LT); 1457+70 to 1459+60 (RT and LT); 1463+10 (LT); 1463+70 (LT); 1468+50 to 1470+00 (LT); 1472+40 to 1474+10 (LT); 1475+55 (LT); 1480+45 to 1480+90 (LT); and 1486+50 (LT). These locations are shown on the annotated plans in Appendix A.

Golder collected a hand sample of the schist bedrock exposed at Sta 1488+25 RT, which according to the regional geologic map[5], consists of the Egypt Member of the Ellsworth Formation. Field tests indicate the rock sample has a grade of R2, consisting of moderately weak rock. This corresponds to an approximate uniaxial compressive strength range of 3,500 to 7,500 pounds per square inch (psi), which is consistent with that reported of schist[7].

3.3 Groundwater

Groundwater levels measured in borings B-1, B-1A and B-2 during drilling ranged from the ground surface to 1 ft bgs. These borings were located adjacent to flowing streams, and groundwater levels are at or just below the ground surface at these locations. Groundwater was not encountered in the test pits. Groundwater levels fluctuate due to natural variations in season, precipitation and temperature, and to other variations such as construction and groundwater pumping.

[7] Hoek, E. and Bray, J.W., 1981. Rock Slope Engineering, Revised 3rd Ed., E&FN Spon, London, 358 p.

4.0 GEOTECHNICAL EVALUATION

4.1 General

This section describes the conditions encountered by Golder at structures associated with the trail and our evaluation of pertinent geotechnical criteria for design and construction.

4.2 Stream Culverts

4.2.1 Davis Brook Culvert

A new culvert structure is planned beneath the trail at the Davis Brook crossing at Sta 1447+00. The brook currently flows under the railroad tracks through a 5-ft diameter concrete culvert structure, which has suffered loss of concrete in the abutments and wing walls due to erosion and weathering. TTR's design drawings indicate the new culvert will be a 4.5-ft by 4.5-ft box culvert with an invert at about Elevation 120 ft. We understand the new culvert may be limited in extent beneath the new trail only or it may be extended beneath the existing railroad tracks thereby requiring removal of the existing concrete culvert structure.

As discussed in Section 3.0 the subsurface conditions at the test borings at this area were explored below the brook grade level (i.e. the soil materials comprising the existing railroad track subgrade were not explored). The boring near the trail alignment (boring B-1) encountered about 2.6 ft of medium stiff silty clay overlying stiff to very stiff silty clay extending to the bedrock surface about 7 ft bgs (about Elevation 114.0 ft). The boring on the west-southwest side of the rail track (boring B-1A) encountered about 2.3 ft of loose sand and silt with occasional organics overlying very stiff silty clay that extended to the bedrock surface about 6.2 ft bgs (about Elevation 114.9 ft). The surface of the stiff to very stiff silty clay layer in this area is interpreted to be at about Elevation 118.5 ft and slopes downward gently to the northeast.

Foundation Support: Based on the subsurface conditions encountered we conclude that the new culvert can be adequately supported on the layer of stiff to very stiff silty clay encountered at about Elevation 118.5 ft. or on a layer of ¾ inch crushed stone placed between the stiff silty clay layer and the base of the culvert. For bearing contact pressures less than 3,000 pounds per square foot (psf) we expect that foundation settlement of the culvert constructed on a properly prepared subgrade will be less than 1 inch. The planned thickness and arrangement of approach fills on either side of the new culvert were not available to Golder during this evaluation; however, assuming the approach fills are less than 5 ft thick, and the subgrade consists of undisturbed stiff to very stiff silty clay, foundation settlements beneath culvert approach fills should be less than 1 inch. To maintain undisturbed soil subgrade beneath the new culvert we recommend the following provisions be implemented:

- Remove soft and loose soils at the bottom of the stream channel to expose olive gray stiff to very stiff silty clay. Excavate the final subgrade with a smooth edged backhoe bucket.
- Dewater the subgrade by temporarily lowering the water table below the culvert subgrade by 1 to 2 ft. Refer to Section 5.3 for further discussion regarding dewatering.

- Cover the undisturbed subgrade with a stabilization geotextile and place a layer of ¾ inch crushed stone at least 6 inches thick between the geotextile and the base of the box culvert. We recommend the crushed stone layer be carried at least 2 ft laterally beyond the exterior dimension of the new culvert to provide base drainage for the culvert wall backfill.

Seepage Control: Seepage control measures should be considered at the inlet and outlet ends of the culvert to cutoff or reduce seepage beneath and around the culvert to reduce the potential for piping and/or erosion. A number of seepage control features could be used including an inlet end wall extending into the stiff silty clay foundation soils, wing walls, and/or low permeability soil seepage barriers on the upstream face of adjacent approach fill materials. Approach fill soils placed directly against the culvert sidewalls should be free draining sand and gravel meeting the quality and gradation requirements of MaineDOT Specification 703.06 (b) Type D. Approach fill soil slopes exposed to stream flows should be surfaced with riprap for erosion control and a soil filter or geotextile filter should be placed between the riprap layer and the approach fill soils to prevent piping or erosion of culvert wall backfill.

Lateral Earth Pressures: Lateral earth pressures will be imposed on the box culvert sidewalls from the approach embankment fill for the trail and possibly from the adjacent section of the reconstructed embankment fill supporting the railroad track (if the new culvert is extended below the track). Assuming the embankment fills consist of compacted free draining sand and gravel we recommend the following parameters be used to evaluate design earth pressures: at-rest earth pressure coefficient of 0.43; total soil unit weight of 135 pounds per cubic foot (pcf) acting above the line of saturation; submerged unit weight of 73 pcf acting below the line of saturation plus the unit weight of water (62.4 pcf).

4.2.2 Unnamed Stream at Sta 1467+40 (Cattle Pass)

The proposed trail design also includes a new stream culvert crossing at Sta 1467+40, which will carry an unnamed stream beneath the new trail adjacent to an existing 13 ft high by 9 ft wide stone box culvert/cattle pass located under the railroad tracks. TTR's design drawings indicate the new culvert will be two 36 inch diameter culvert sections with an invert at about Elevation 117 ft. Boring B-2 drilled at the base grade of the stream channel near the proposed culvert location encountered 2 ft of soft silty clay overlying 2 ft of medium stiff silty clay overlying stiff to very stiff silty clay. The bedrock surface is interpreted to be about 10.4 ft bgs (about Elevation 108 ft) in this area.

The surficial layer of soft silty clay in the stream channel is not suitable for support of the new culvert and should be excavated and removed. The underlying layer of medium stiff silty clay encountered at about Elevation 116 ft has a nominal allowable bearing capacity of about 1,000 psf and could experience some post construction settlement depending on the loads imposed by the culvert and trail fill and the quality of the subgrade preparation work completed by the contractor. We would need additional information from TTR concerning culvert loads and fill configurations to assess possible culvert settlements if supported on the medium stiff silty clay layer. The underlying stiff to very stiff silty clay layer encountered at about

Elevation 114.5 ft offers the most desirable foundation subgrade for the new culvert due to high strength and negligible settlement.

Subgrade preparation should be performed in a manner to maintain undisturbed subgrade soil conditions similar to that discussed above for the Davis Brook culvert, i.e.: temporary subgrade dewatering; excavation with a smooth edged backhoe bucket; placement of a stabilization geotextile over the undisturbed native subgrade; and covering the geotextile with a crushed stone working pad (at least 1 ft thick if placed on the medium stiff silty clay layer). Seepage control can be provided with inlet and outlet end walls extending into the stiff silty clay layer.

4.3 Catch Basins

The current design includes two catch basins at approximate Sta 1429+15 20 LT and Sta 1431+90 20 LT, installed within 10 ft of the current grade. Golder advanced two rock probes (P-2 and P-3) to a depth of 10 ft near these locations, at Sta 1429+20.3 17.5 LT and Sta 1431+90.9 24.2 LT, respectively. At P-2, weathered bedrock was encountered at 9.5 ft, and at P-3, no bedrock was encountered. The solid stem auger of the drill was able to penetrate 0.5 ft into the weathered bedrock at P-2. As shown on the profile included in Appendix A at Sta 1429+00, the weathered bedrock surface at P-2 lies just below the proposed base of the catch basin structure. During excavation, the bedrock surface may be encountered near the bottom of the excavation. However, the surficial 0.5 ft of bedrock at probe P-2 consists of weathered schist which is likely to be "rippable", i.e., can be removed via mechanical excavation equipment.

4.4 Trench Drains

The current design includes two trench drains to be installed on the northeast (i.e., LT) side of the proposed trail. According to the design drawings one trench drain will extend from Sta 1427+00 at the northwest end of the project to Sta 1440+00 (Segment 1), and the other will lie between about Sta 1456+00 and Sta 1463+00 (Segment 2). The base of the trench drain will generally be within 4 ft of current grade. Golder drilled rock probes P-1 through P-6 in Segment 1, and rock probes P-7 and P-8 in Segment 2.

In Segment 1, probes P-5 and P-6 encountered weathered bedrock at depths of 1.5 and 3.3 ft, respectively, and auger refusal occurred at depths of 3.3 and 4.75 ft, respectively. Golder also observed bedrock outcrop or a large boulder at the ground surface at Sta 1436+00 LT. Based on these data, the excavation for the trench drain will encounter weathered bedrock from about Sta 1436+00 to about Sta 1444+00. As the probes encountered refusal between 3.3 and 4.75 ft, not all the bedrock may be rippable, and rock excavation via means other than mechanical excavation may be necessary, such as with a rock breaker/hoe-ram or with controlled blasting.

In Segment 2, probe P-7 encountered refusal on boulders and/or bedrock at 0.5 ft, and P-8 encountered weathered bedrock at 2.0 ft, with refusal at 2.8 ft. Golder also observed large boulders (roughly 5 ft or greater in diameter) at the ground surface between Sta 1455+60 LT and Sta 1456+50 LT; boulders and/or bedrock between Sta 1457+70 LT/RT and Sta 1459+60 LT/RT; and boulders at Sta 1463+10 RT and Sta 1463+70 LT. As boulders and/or bedrock exist in much of the ground surface in this segment, and based on probe data, the weathered bedrock lies within 2 ft of the ground surface in other areas, rock excavation will be required to construct the trench drain. As the exploration program indicates the weathered bedrock interval is likely thin to nonexistent, rock excavation via means other than mechanical excavation may be necessary, such as with a rock breaker/hoe ram or with controlled blasting.

4.5 Bedrock Surface Grades at Selected Trail Segments

Golder conducted probes P-9 through P-20 to determine the presence and extent of bedrock during excavation for the southeastern portion of the proposed trail. As shown on the surface mapping, sections and profiles of Appendix A, most of these probes encountered boulders, bedrock or refusal at depths below the proposed excavation grade; however based on probe data and surface mapping, bedrock and/or boulders will likely be encountered in several areas during excavation for trail construction. These areas include Sta 1472+00 LT, where probe P-10 encountered refusal at a depth of 0.2 ft. Golder also observed boulders and/or suspected bedrock at the ground surface between stations 1469+20 to 1470+10 LT; 1472+40 to 1474+10 LT; 1475+55 LT; 1480+45 to 1480+90 LT; 1485+10 to 1485+35; 1486+40 to 1486+55; 1487+35 LT; and 1488+10 to 1489+60 LT. During excavation, large boulders and/or bedrock encountered near these areas may need to be excavated via ripping or mechanical means, or via controlled blasting.

The trail design includes a fence on the southwest (i.e., RT) side of the trail. The fence will include posts installed about 3.5 ft below final grade. The explorations indicate bedrock may be encountered during drilling of the fence posts, and percussive drilling may be needed to drill through bedrock or boulders.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 General

The primary purpose of this section is to comment on items related to excavation, lateral support, dewatering, foundation construction, earthwork and related geotechnical aspects of the proposed construction. It is written primarily for the engineer having responsibility for preparation of plans and specifications. Since it identifies construction issues related to foundations and earthwork, it will also aid personnel who monitor construction activity.

Prospective contractors for this project should be required to read this report. However contractors must evaluate potential construction problems on the basis of their own knowledge and experience in the project area, and on the basis of similar projects in other localities, taking into account their own proposed construction methods and procedures.

5.2 Excavation

Excavations for the project will encounter artificial fill, alluvium, glacial till and bedrock. Depending on the season during construction, the excavations may extend below the groundwater surface. The excavation required to expose the Davis Brook culvert foundation subgrade is expected to extend at least 10 ft below the adjacent rail grade for the railroad track. The type and consistency of the railroad track embankment soils and any subgrade soils between the base of the embankment fill and the surface of the underlying native stiff silty clay strata is unknown. Accordingly, care should be taken in making open cut excavations at permissible slope angles, or installing proper shoring and bracing, conforming to OSHA requirements. Safe temporary excavation and fill slopes are the responsibility of the contractor and should be based on actual conditions encountered during construction. Care should be taken for excavations located in close proximity to the existing railroad tracks (e.g., at the stream crossing culverts) to avoid undermining the track ballast support materials, and if necessary, to provide tight bracing for wall support under live loads from railroad cars. Bracing should be designed by the contractor's engineer for no more than one inch lateral movement and monitored for deflection during construction.

The contractor should be prepared to remove bedrock and boulders via ripping, mechanical means (i.e., rock breaker/hoe-ram), and via controlled blasting. Areas that will likely include rock excavation are described in Section 4.0 above. We recommend the project specifications include provisions for rock blasting as a means of rock excavation. The specifications should include provisions for limiting vibrations at nearby structures, the use of blasting mats to contain potential flyrock, and for limiting the potential environmental effects of explosive use. The specifications should direct the contractor to submit a blasting plan for review and approval prior to starting controlled blasting work.

5.3 Dewatering During Construction

The contractor should be required to control surface and groundwater as necessary to permit all work to be conducted in-the-dry. Surface runoff should be directed away from the structures and excavation areas. Rainfall accumulation should be promptly removed from the catch basin and culvert excavations. Disturbance of previously accepted subgrade soils by construction activities after wetting could soften and result in unacceptable subgrade conditions.

We expect foundation excavation for the culverts will be below groundwater levels. The contractor should be required to control groundwater to permit all work (excavation, placement of fill, and culvert construction) to be conducted in-the-dry, and preserve the undisturbed state of subgrade soils. Thus the contractor should implement groundwater control measures, and should be required to maintain the groundwater level a minimum of 2 ft below all final excavation levels.

While the actual dewatering method utilized should be left up to the contractor, a dewatering system consisting of pumping from shallow sumps in the bottom of the excavation should not be accepted unless combined with an upstream cutoff, possible temporary diversion of stream flows, and an assessment of bottom heave of foundation subgrade soils. Uncontrolled lateral and upward flow of water through the foundation soils will result in subgrade disturbance.

5.4 Construction Observation

The recommendations contained herein are based on the known and predictable behavior of properly engineered and constructed foundations for the trail facilities. We recommend monitoring of the facility installations to enable the design engineer to verify that the procedures and techniques used during construction are in accordance with the recommendations contained herein and the contract documents. A qualified geotechnical engineer should be present during the following construction activities:

- Rock removal (e.g., blasting) operations.
- Observation of proof rolling beneath pavements.
- Subgrade preparation operations in site areas overlain with engineered fill.
- Assessment of the suitability of excavated soils for reuse as engineered fill.
- Placement, compaction and testing of engineered fill.
- Preparation of subgrades for culverts.
- Trench drainage installations.

6.0 LIMITATIONS

This report was prepared for the exclusive use of MaineDOT for specific application to the proposed project in accordance with generally accepted soil and foundation engineering practices. In the event that any changes in the nature, design, or location of the proposed project are planned, Golder should be notified to review the appropriateness of our conclusions and recommendations and to modify the recommendations as appropriate to reflect the changes in design. Further, our analyses, and recommendations are based in part on the subsurface explorations completed. Golder should be notified if actual conditions encountered vary from those described in this report so that we may re-evaluate, and if necessary, revise the recommendations made in this report. We also recommend that we be provided the opportunity for a review of final design drawings and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

The professional services provided by Golder for this project include only the geotechnical aspects of the subsurface conditions at this site. The presence or implications of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this report and have not been investigated or addressed.

7.0 CLOSING

We trust this report contains the geotechnical information that MaineDOT presently requires to proceed with the design of the proposed trail and associated structures. If there is any point which requires further clarification, or if we can be of additional assistance, please contact us.

TABLES

TABLE 1
SUBSURFACE EXPLORATION SUMMARY
RAIL TRAIL DESIGN SUPPORT, DOWNEAST TRAIL, PIN 9636.00
ELLSWORTH, MAINE

Exploration ID	Station [ft](1)	Offset [ft](1)	Elevation [ft](1)	Type	Completed Date [mm/dd/yr](2)	Planned Depth [ft bgs](3)	Completed or Refusal Depth [ft bgs](4)	Exploration Method(5)	Design Purpose	Comments
P-1	1427+99.3	10.8 LT	123.8	Probe	08/19/09	5	5	SSA	Trench drain - check for bedrock	No bedrock
P-2	1429+20.3	17.5 LT	123.9	Probe	08/19/09	10	10	SSA	Catch Basin - check for bedrock	Weathered bedrock at 9.5 ft bgs
P-3	1431+90.9	24.2 LT	126.2	Probe	08/19/09	10	10	SSA	Catch Basin - check for bedrock	Oil or coal odor noted; no bedrock
P-4	1434+00.2	22.4 LT	128.5	Probe	08/19/09	5	5	SSA	Trench drain - check for bedrock	No bedrock
P-5	1436+95.8	25.9 LT	131.6	Probe	08/19/09	5	3.33	SSA	Trench drain - check for bedrock	Weathered bedrock at 1.5 ft bgs
P-6	1440+04.3	25.5 LT	132.9	Probe	08/19/09	5	4.75	SSA	Trench drain - check for bedrock	Weathered bedrock at 3.5 ft bgs
B-1	1447+01.8	12.4 LT	120.9	Boring	08/21/09	10	6.92	Continuous SPT	Culvert - foundation design	
B-1A	1446+92.0	20.9 RT	121.1	Boring	08/21/09	10	6.21	Continuous SPT	Culvert - foundation design	
P-7	1456+00.9	23.6 LT	133.5	Probe	08/19/09	5	0.5	Manual Probe	Trench drain - check for bedrock	
P-8	1463+00.6	18.0 LT	133.0	Probe	08/19/09	5	2.8	SSA	Trench drain - check for bedrock	Weathered bedrock at 2 ft bgs
B-2	1467+30.1	34.7 LT	118.3	Boring	08/19/09	10	10.42	SSA w/ SPT	Culvert - foundation design	
P-9	1468+98.6	23.8 LT	129.2	Probe	08/19/09	5	2.5	Manual Probe	Path section - check for bedrock	
P-10	1471+94.6	22.5 LT	132.5	Probe	08/20/09	10	0.17	Test Pit	Path section - check for bedrock	
P-11	1474+01.9	22.6 LT	131.6	Probe	08/20/09	5	5	Test Pit	Path section - check for bedrock	Refusal at 5 ft bgs due to boulders
P-12	1476+27.2	19.0 LT	128.9	Probe	08/20/09	5	4.83	Test Pit	Path section - check for bedrock	Refusal at 4.83 ft bgs due to boulders
P-13	1480+40.3	23.8 LT	138.9	Probe	08/20/09	10	2.58	Test Pit	Path section - check for bedrock	
P-14	1482+33.5	22.3 LT	141.1	Probe	08/20/09	5	5	Test Pit	Path section - check for bedrock	Olive clay at 2.5 ft bgs
P-15	1484+87.1	19.7 LT	138.0	Probe	08/20/09	5	2.67	Test Pit	Path section - check for bedrock	
P-16	1486+91.2	21.7 LT	137.7	Probe	08/20/09	5	5.42	Test Pit	Path section - check for bedrock	
P-17	1488+01.7	21.4 LT	137.4	Probe	08/20/09	5	3.17	Test Pit	Path section - check for bedrock	
P-18	1488+91.0	19.6 LT	137.7	Probe	08/20/09	5	3.58	Test Pit	Path section - check for bedrock	
P-19	1490+05.1	17.7 LT	131.8	Probe	08/20/09	5	4	Test Pit	Path section - check for bedrock	
P-20	1490+84.2	18.3 LT	129.9	Probe	08/20/09	5	2	Test Pit	Path section - check for bedrock	

Notes:

(1) As-drilled stationing, offsets and elevations from MaineDOT (surveyed 0826-27/09), referenced to centerline of existing rail and defined by railroad monuments located along centerline of existing rail. Elevation datum is referenced to elevations of railroad monuments per MaineDOT survey. Offsets: LT = left, RT = right, looking up-station.

(2) mm/dd/yr = month/day/year

(3) ft bgs = feet below ground surface

(4) Refusal is defined as inability to advance the drilling tools deeper in the borehole or test pit using solid stem auger (SSA), standard penetration test (SPT) splt spoon, manual probe or compact excavator bucket. Unless indicated differently, refusal is interpreted to be sound bedrock.

(5) Exploration Methods:

SSA = 4" diameter Solid Stem Auger advanced using a Mobile B-53 track mounted drill rig

Continuous SPT = Continuous Standard Penetration Testing advanced using a tripod drill rig with no casing or powered auger

Manual Probe = 4 ft long steel probe driven into the ground by hand

Test Pit = Test pit excavated by compact excavator to requested depth or bedrock refusal

Prepared by: JDL
Checked by: JRS
Reviewed by: MSP

TABLE 2
GEOTECHNICAL LABORATORY TESTING SUMMARY
RAIL TRAIL DESIGN SUPPORT, DOWNEAST TRAIL, PIN 9636.00
ELLSWORTH, MAINE

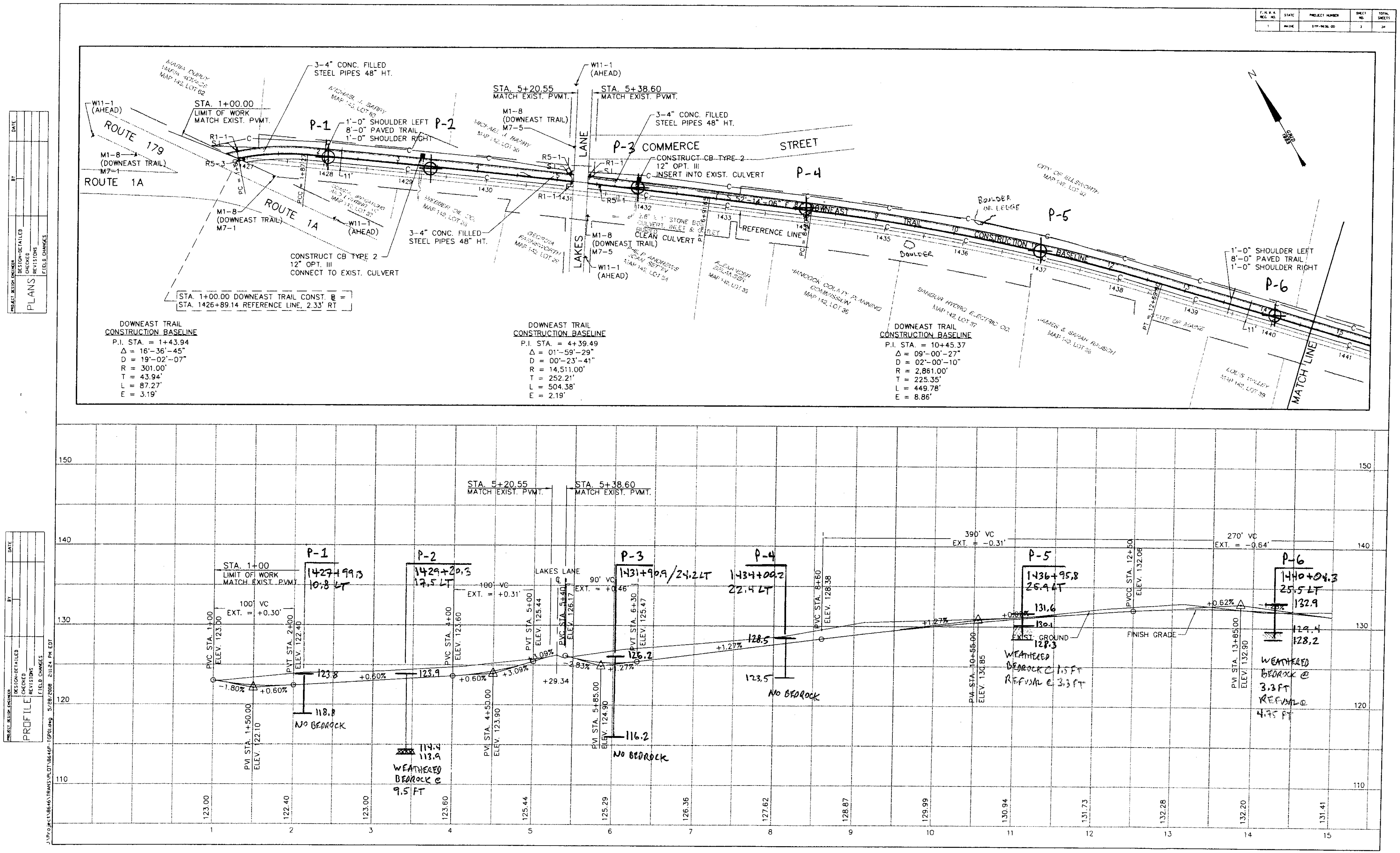
Sample Identification		Sample Type	Sample Depth [ft]	Soil Classification [USCS]	As Received Moisture [%]	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability [cm/sec]	Additional Tests Conducted [see notes]
Borehole ID	Sample ID					LL	PL	PI	LI	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density [lb/ft3]	Optimum Moisture %		Moisture %	Dry [lb/ft3]		
B-1	1D	Jar	0.0-2.0	(CL)	23.9	-	-	-	-	98.8	87.8	-	-	-	-	-	-	-	-
B-1	2DB	Jar	2.0-4.0	(CL)	23.1	38	21	17	0.10	-	-	-	-	-	-	-	-	-	-
B-1A	1D	Jar	0.0-2.0	-	48.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B-1A	2DB	Jar	2.0-4.0	(CL)	25.1	37	22	15	0.19	-	-	-	-	-	-	-	-	-	-
B-2	1D	Jar	0.0-2.0	(CL)	38.0	-	-	-	-	85.2	61.7	-	-	-	-	-	-	-	-
B-2	2D	Jar	2.0-4.0	(CL)	21.1	-	-	-	-	99.5	73.9	-	-	-	-	-	-	-	-
B-2	3D	Jar	4.0-6.0	(CL)	28.0	43	23	20	0.27	-	-	-	-	-	-	-	-	-	-

Abbreviations:
LL = liquid limit
PL = plastic limit
PI = plasticity index
LI = liquidity index
Gs = specific gravity
Mc = moisture content
USCS = Unified Soil Classification System
lbs/ft3 = pounds per cubic foot
mm = millimeter

Notes:
T = triaxial test
U = unconfined compression test
C = consolidation test
DS = direct shear test
O = organic content text
P = pH
* = one point proctor

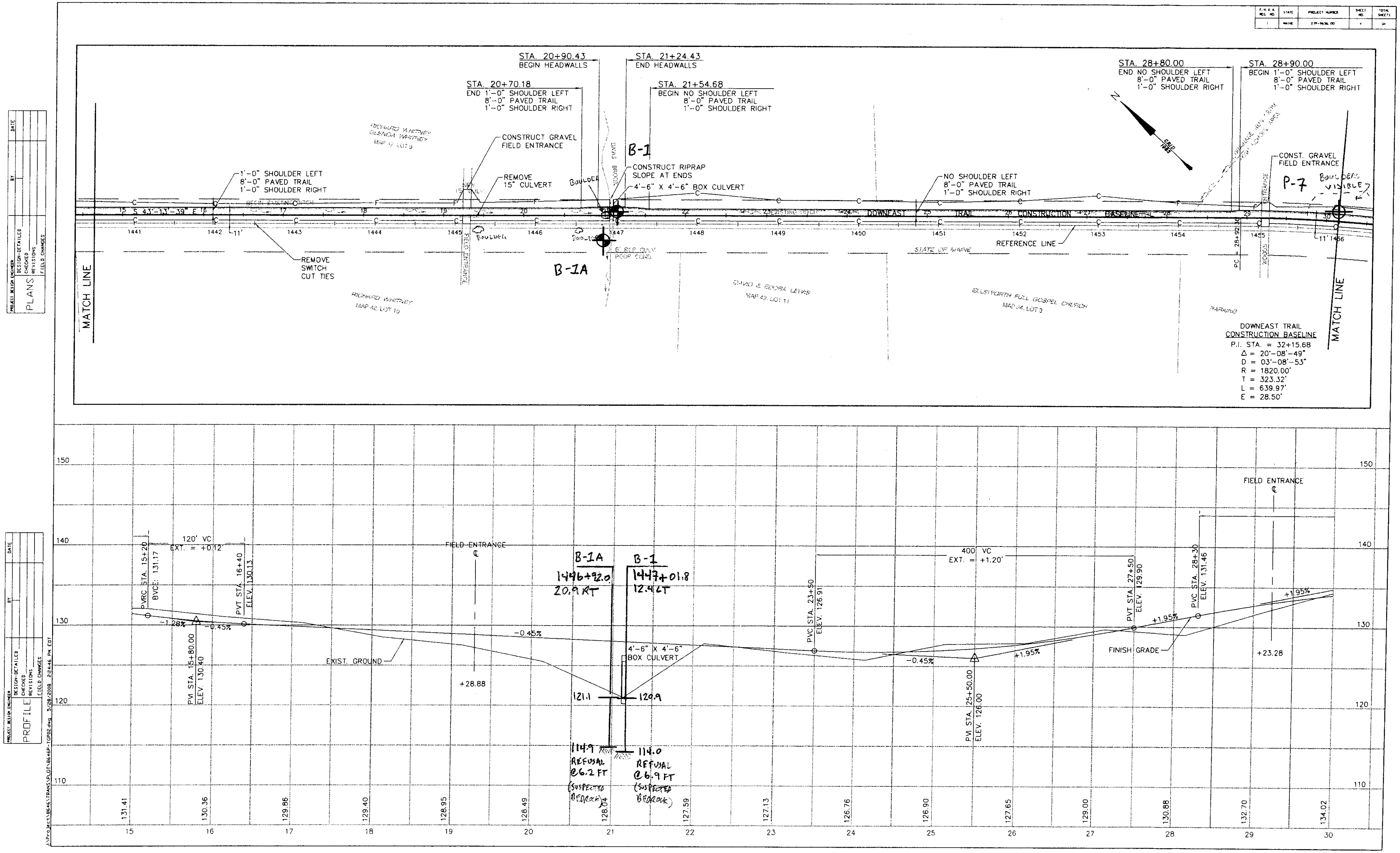
Prepared by: JDL
Checked by: JRS
Reviewed by: MSP

APPENDIX A
ANNOTATED DESIGN DRAWINGS

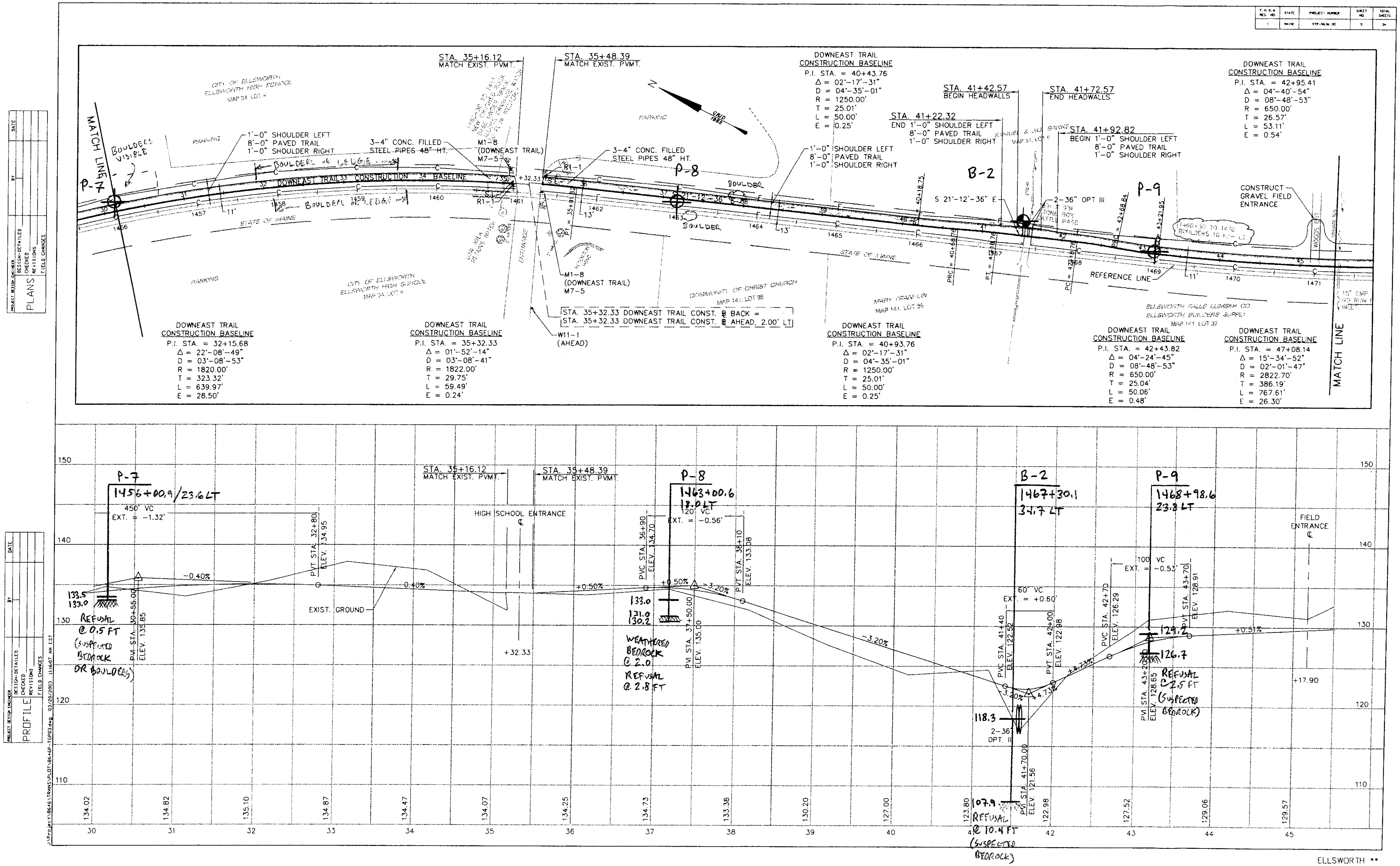


PLANS
PROFILE
ROUTE 179
ROUTE 1A
COMMERCE STREET
LAKES LANE
DOWNEAST TRAIL CONSTRUCTION BASELINE
REFERENCE LINE
MATCH LINE
W11-1 (AHEAD)
STA. 1+00.00 LIMIT OF WORK MATCH EXIST. PVMT.
3-4" CONC. FILLED STEEL PIPES 48" HT.
1'-0" SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
M1-8 (DOWNEAST TRAIL)
M7-1
M7-5
STA. 5+20.55 MATCH EXIST. PVMT.
STA. 5+38.60 MATCH EXIST. PVMT.
CONSTRUCT CB TYPE 2 12" OPT. III INSERT INTO EXIST. CULVERT
CONSTRUCT CB TYPE 2 12" OPT. III CONNECT TO EXIST. CULVERT
CLEAN CULVERT
STA. 1+00.00 DOWNEAST TRAIL CONST. ℄ = STA. 1426+89.14 REFERENCE LINE, 2.33' RT
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 1+43.94
Δ = 16°-36'-45"
D = 19°-02'-07"
R = 301.00'
T = 43.94'
L = 87.27'
E = 3.19'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 4+39.49
Δ = 01°-59'-29"
D = 00°-23'-41"
R = 14,511.00'
T = 252.21'
L = 504.38'
E = 2.19'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 10+45.37
Δ = 09°-00'-27"
D = 02°-00'-10"
R = 2,861.00'
T = 225.35'
L = 449.78'
E = 8.86'
P-1
P-2
P-3
P-4
P-5
P-6
BOULDER OR LEDGE
BOULDER
STA. 1+00 LIMIT OF WORK MATCH EXIST. PVMT.
100' VC EXT. = +0.30'
100' VC EXT. = +0.31'
90' VC EXT. = +0.46'
390' VC EXT. = -0.31'
270' VC EXT. = -0.64'
LAKES LANE ℄
P-1 1427+99.13 10.8 LT 123.8 118.8 NO BEDROCK
P-2 1429+20.3 17.5 LT 123.9 114.4 113.9 WEATHERED BEDROCK @ 9.5 FT
P-3 1431+90.9/24.2 LT 126.2 116.2 NO BEDROCK
P-4 1434+00.2 22.4 LT 128.5 123.5 NO BEDROCK
P-5 1436+95.8 25.9 LT 131.6 130.1 128.3 WEATHERED BEDROCK @ 1.5 FT REFUSAL @ 3.3 FT
P-6 1440+08.3 25.5 LT 132.9 129.4 128.2 WEATHERED BEDROCK @ 3.3 FT REFUSAL @ 4.75 FT
PVC STA. 1+00 ELEV. 123.00
PVI STA. 1+50.00 ELEV. 122.10
PVT STA. 2+00 ELEV. 122.40
PVC STA. 4+00 ELEV. 123.60
PVI STA. 4+50.00 ELEV. 123.90
PVT STA. 5+00 ELEV. 125.44
PVC STA. 5+40 ELEV. 126.17
PVI STA. 5+85.00 ELEV. 124.90
PVT STA. 6+30 ELEV. 125.47
PVC STA. 8+60 ELEV. 128.38
PVI STA. 10+55.00 ELEV. 130.85
PVCC STA. 12+50 ELEV. 132.06
PVI STA. 13+85.00 ELEV. 132.90
-1.80%
+0.60%
+3.09%
-2.83%
+1.27%
+0.62%
EXIST. GROUND
FINISH GRADE
150
140
130
120
110
123.00
122.40
123.00
123.60
125.44
125.29
126.36
127.62
128.87
129.99
130.94
131.73
132.28
132.20
131.41
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

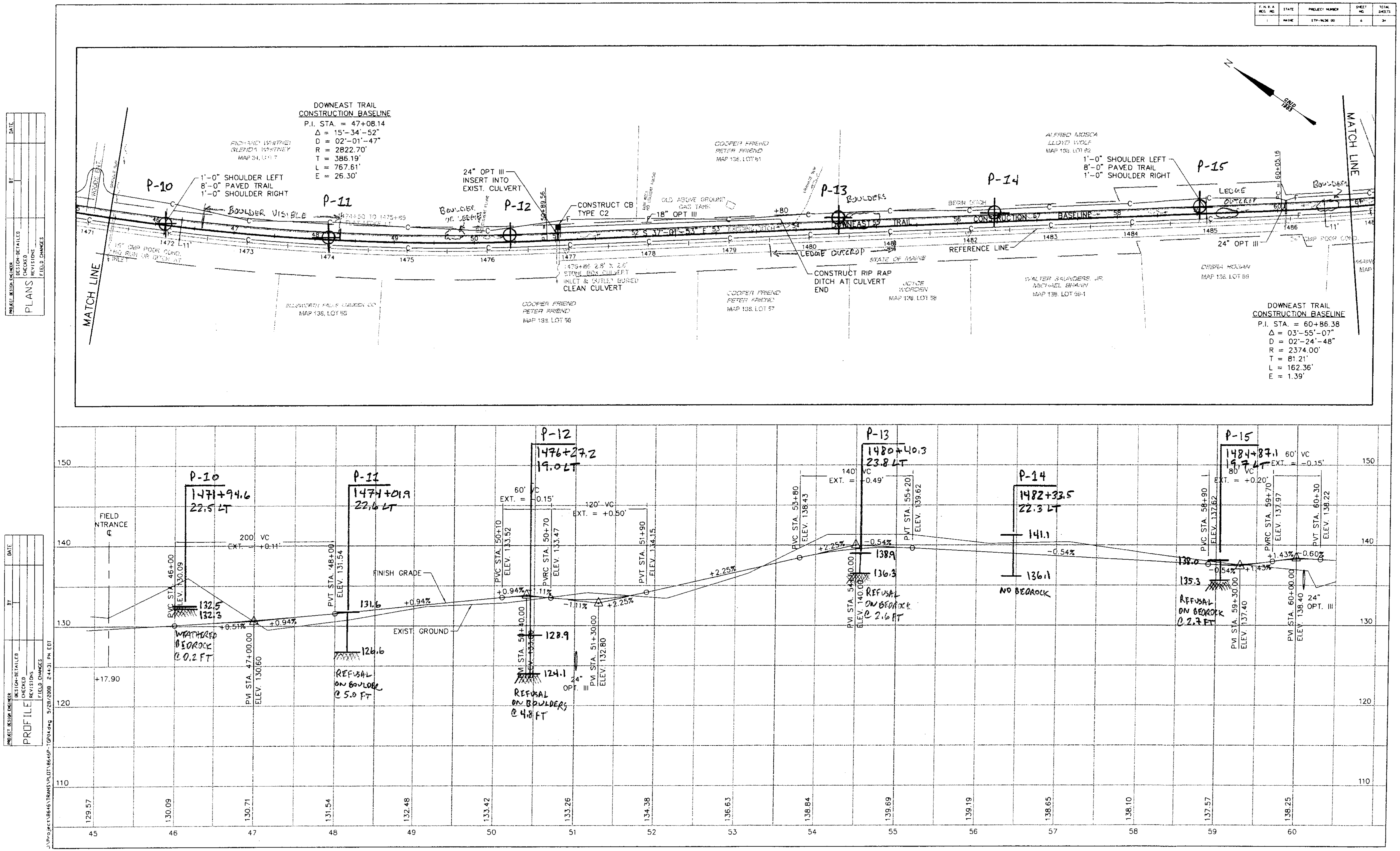
ELLSWORTH **


STA. 20+90.43
BEGIN HEADWALLS
STA. 21+24.43
END HEADWALLS
STA. 20+70.18
END 1'-0" SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
STA. 21+54.68
BEGIN NO SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
STA. 28+80.00
END NO SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
STA. 28+90.00
BEGIN 1'-0" SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
CONSTRUCT GRAVEL FIELD ENTRANCE
B-1
CONSTRUCT RIPRAP SLOPE AT ENDS
4'-6" X 4'-6" BOX CULVERT
REMOVE 15" CULVERT
1'-0" SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
NO SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
CONST. GRAVEL FIELD ENTRANCE
P-7
BOULDERS VISIBLE
DOWNEAST TRAIL CONSTRUCTION BASELINE
REFERENCE LINE
REMOVE SWITCH CUT TIES
B-1A
MATCH LINE
RICHARD WHITNEY MAP 42 LOT 10
DAVID & EDORA LEWIS MAP 42 LOT 11
ELLSWORTH FULL GOSPEL CHURCH MAP 34 LOT 3
STATE OF MAINE
PARKING
DOWNEAST TRAIL
CONSTRUCTION BASELINE
P.I. STA. = 32+15.68
Δ = 20°-08'-49"
D = 03°-08'-53"
R = 1820.00'
T = 323.32'
L = 639.97'
E = 28.50'
PLANS
PROFILE
120' VC
EXT. = +0.12'
PVRC STA. 15+20
BVCE: 131.17
PVT STA. 16+40
ELEV. 130.13
PVI STA. 15+80.00
ELEV. 130.40
-1.28%
-0.45%
FIELD ENTRANCE
+28.88
EXIST. GROUND
B-1A
1446+92.0
20.9 RT
B-1
1447+01.8
12.4 LT
4'-6" X 4'-6" BOX CULVERT
121.1
120.9
114.9
REFUSAL @6.2 FT
(SUSPECTED BEDROCK)
114.0
REFUSAL @6.9 FT
(SUSPECTED BEDROCK)
400' VC
EXT. = +1.20'
PVC STA. 23+50
ELEV. 126.91
PVI STA. 25+50.00
ELEV. 126.00
+1.95%
PVT STA. 27+50
ELEV. 129.90
PVC STA. 28+30
ELEV. 131.46
FINISH GRADE
+23.28
150
140
130
120
110
131.41
130.36
129.86
129.40
128.95
128.49
128.04
127.59
127.13
126.76
126.90
127.65
129.00
130.88
132.70
134.02
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

ELLSWORTH



PLANS
PROFILE
MATCH LINE
STA. 35+16.12 MATCH EXIST. PVMT.
STA. 35+48.39 MATCH EXIST. PVMT.
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 32+15.68
Δ = 22°-08'-49"
D = 03°-08'-53"
R = 1820.00'
T = 323.32'
L = 639.97'
E = 28.50'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 35+32.33
Δ = 01°-52'-14"
D = 03°-08'-41"
R = 1822.00'
T = 29.75'
L = 59.49'
E = 0.24'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 40+43.76
Δ = 02°-17'-31"
D = 04°-35'-01"
R = 1250.00'
T = 25.01'
L = 50.00'
E = 0.25'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 40+93.76
Δ = 02°-17'-31"
D = 04°-35'-01"
R = 1250.00'
T = 25.01'
L = 50.00'
E = 0.25'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 42+43.82
Δ = 04°-24'-45"
D = 08°-48'-53"
R = 650.00'
T = 25.04'
L = 50.06'
E = 0.48'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 42+95.41
Δ = 04°-40'-54"
D = 08°-48'-53"
R = 650.00'
T = 26.57'
L = 53.11'
E = 0.54'
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 47+08.14
Δ = 15°-34'-52"
D = 02°-01'-47"
R = 2822.70'
T = 386.19'
L = 767.61'
E = 26.30'
1'-0" SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
3-4" CONC. FILLED STEEL PIPES 48" HT.
M1-8 (DOWNEAST TRAIL)
M7-5
W11-1 (AHEAD)
STA. 35+32.33 DOWNEAST TRAIL CONST. ℄ BACK =
STA. 35+32.33 DOWNEAST TRAIL CONST. ℄ AHEAD, 2.00' LT
STA. 41+22.32 END 1'-0" SHOULDER LEFT 8'-0" PAVED TRAIL 1'-0" SHOULDER RIGHT
STA. 41+42.57 BEGIN HEADWALLS
STA. 41+72.57 END HEADWALLS
STA. 41+92.82 BEGIN 1'-0" SHOULDER LEFT 8'-0" PAVED TRAIL 1'-0" SHOULDER RIGHT
2-36" OPT III
S 21°-12'-36" E
CONSTRUCT GRAVEL FIELD ENTRANCE
REFERENCE LINE
DOWNEAST TRAIL CONSTRUCTION BASELINE
CITY OF ELLSWORTH ELLSWORTH HIGH SCHOOL
STATE OF MAINE
PARKING
ENTRANCE
P-7
P-8
B-2
P-9
BOULDERS VISIBLE
BOULDER
P-7 1456+00.9/23.6 LT
133.5 133.0 REFUSAL @ 0.5 FT (SUSPECTED BEDROCK OR BOULDERS)
P-8 1463+00.6 18.2 LT
133.0 131.0 130.2 WEATHERED BEDROCK @ 2.0 REFUSAL @ 2.8 FT
B-2 1467+30.1 34.7 LT
118.3 107.9 REFUSAL @ 10.4 FT (SUSPECTED BEDROCK)
P-9 1468+98.6 23.8 LT
129.2 126.7 REFUSAL @ 2.5 FT (SUSPECTED BEDROCK)
450' VC EXT. = -1.32'
120' VC EXT. = -0.56'
60' VC EXT. = +0.60'
100' VC EXT. = -0.53'
-0.40%
+0.50%
-3.20%
+4.73%
+0.51%
HIGH SCHOOL ENTRANCE ℄
FIELD ENTRANCE ℄
EXIST. GROUND
+32.33
+17.90
2-36" OPT. III
PVI STA. 30+56.00 ELEV. 135.85
PVT STA. 32+80 ELEV. 134.95
PVC STA. 36+90 ELEV. 134.70
PVI STA. 37+50.00 ELEV. 135.00
PVT STA. 38+10 ELEV. 133.08
PVC STA. 41+40 ELEV. 122.52
PVI STA. 41+70.00 ELEV. 121.56
PVT STA. 42+00 ELEV. 122.98
PVC STA. 42+70 ELEV. 126.29
PVI STA. 43+20.00 ELEV. 128.65
PVT STA. 43+70 ELEV. 128.91
150
140
130
120
110
134.02 134.82 135.10 134.87 134.47 134.07 134.25 134.73 133.38 130.20 127.00 123.80 122.98 127.52 129.06 129.57
30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45



PLANS
PROFILE
MATCH LINE
DOWNEAST TRAIL
CONSTRUCTION BASELINE
P.I. STA. = 47+08.14
Δ = 15'-34'-52"
D = 02'-01'-47"
R = 2822.70'
T = 386.19'
L = 767.61'
E = 26.30'
1'-0" SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
P-10
P-11
P-12
P-13
P-14
P-15
BOULDER VISIBLE
BOULDERS
24" OPT III
INSERT INTO
EXIST. CULVERT
CONSTRUCT CB
TYPE C2
18" OPT III
OLD ABOVE GROUND
GAS TANK
COOPER FRIEND
PETER FRIEND
MAP 138, LOT 61
ALFRED MOSCA
LLOYD WOLF
LEDGE OUTCROP
LEDGE
REFERENCE LINE
BASELINE
CONSTRUCTION
DOWNEAST TRAIL
CONSTRUCT RIP RAP
DITCH AT CULVERT
END
STATE OF MAINE
CLEAN CULVERT
ELLSWORTH FALLS
MAP 138, LOT 55
COOPER FRIEND
PETER FRIEND
MAP 138, LOT 56
MAP 138, LOT 57
JOYCE
WORDEN
MAP 138, LOT 58
WALTER SAUNDERS, JR.
MICHAEL BRANN
MAP 138, LOT 59-1
DEBRA HOGAN
MAP 138, LOT 59
DOWNEAST TRAIL
CONSTRUCTION BASELINE
P.I. STA. = 60+86.38
Δ = 03'-55'-07"
D = 02'-24'-48"
R = 2374.00'
T = 81.21'
L = 162.36'
E = 1.39'
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
FIELD
ENTRANCE
℄
+17.90
200' VC
EXT. = +0.11'
P-10
1471+94.6
22.5 LT
132.5
132.3
WEATHERED
BEDROCK
@ 0.2 FT
PVC STA. 46+00
ELEV. 130.09
+0.51%
+0.94%
PVI STA. 47+00.00
ELEV. 130.60
P-11
1474+01.9
22.6 LT
PVT STA. 48+00
ELEV. 131.54
131.6
126.6
REFUSAL
ON BOULDER
@ 5.0 FT
FINISH GRADE
EXIST. GROUND
+0.94%
60' VC
EXT. = +0.15'
PVC STA. 50+10
ELEV. 133.52
PVRC STA. 50+70
ELEV. 133.47
P-12
1476+27.2
19.0 LT
128.9
124.1
REFUSAL
ON BOULDERS
@ 4.8 FT
PVI STA. 50+40.00
-1.11%
120' VC
EXT. = +0.50'
PVT STA. 51+90
ELEV. 134.15
PVI STA. 51+30.00
ELEV. 132.80
24" OPT. III
+2.25%
140' VC
EXT. = -0.49'
PVC STA. 53+80
ELEV. 138.43
P-13
1480+40.3
23.8 LT
-0.54%
138.9
136.3
REFUSAL
ON BEDROCK
@ 2.6 FT
PVI STA. 54+50.00
ELEV. 140.00
PVT STA. 55+20
ELEV. 139.62
P-14
1482+33.5
22.3 LT
141.1
136.1
NO BEDROCK
-0.54%
P-15
1484+87.1
19.7 LT
80' VC
EXT. = +0.20'
60' VC
EXT. = -0.15'
PVC STA. 58+90
ELEV. 137.62
138.0
135.3
REFUSAL
ON BEDROCK
@ 2.7 FT
PVI STA. 59+30.00
ELEV. 137.40
+1.43%
PVRC STA. 59+70
ELEV. 137.97
0.60%
PVT STA. 60+30
ELEV. 138.22
PVI STA. 60+00.00
ELEV. 138.40
24" OPT. III
150
140
130
120
110
129.57
130.09
130.71
131.54
132.48
133.42
133.26
134.38
136.63
138.84
139.69
139.19
138.65
138.10
137.57
138.25
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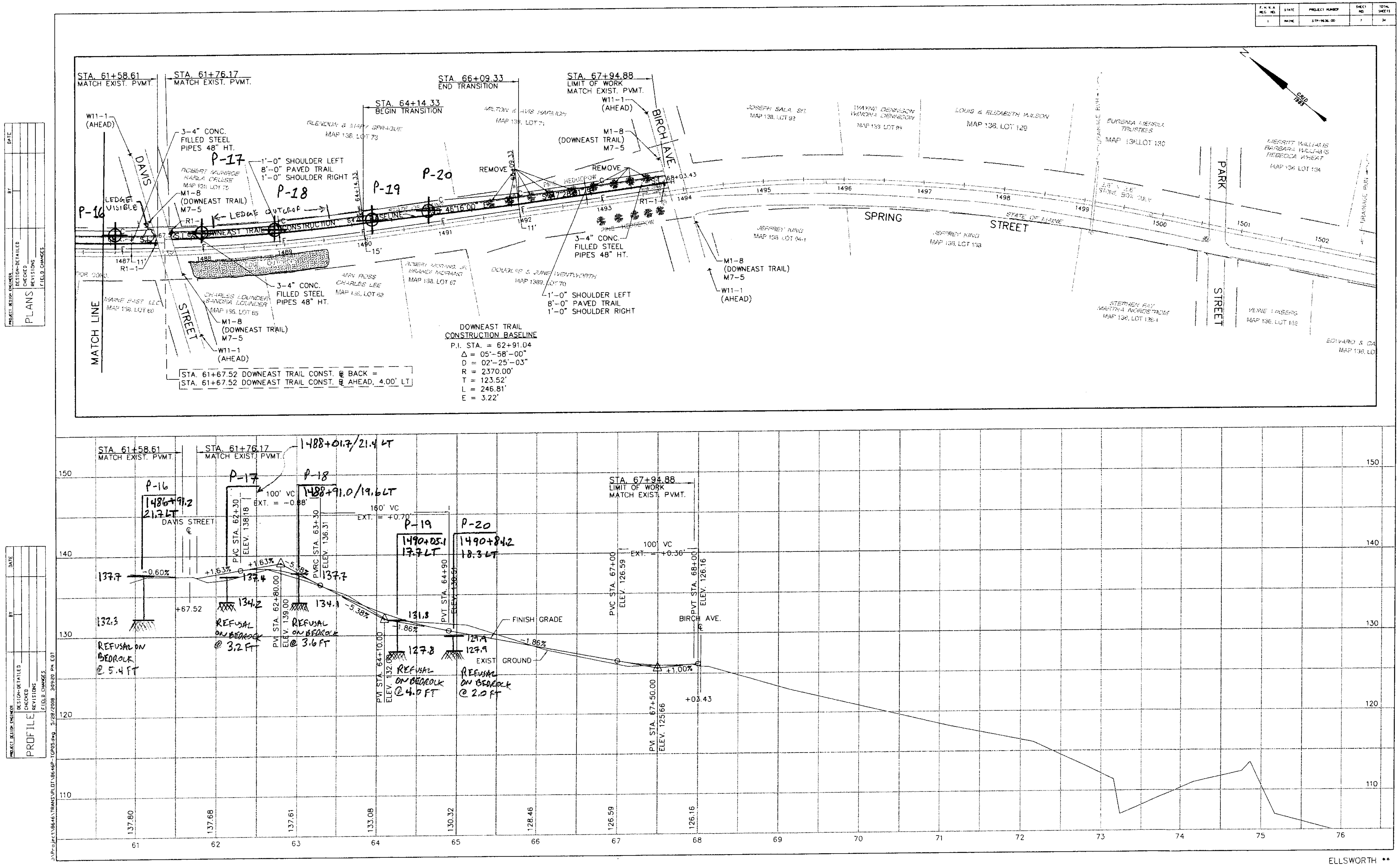
60

ELLSWORTH **


PLANS
PROFILE
STA. 61+58.61 MATCH EXIST. PVMT.
STA. 61+76.17 MATCH EXIST. PVMT.
STA. 64+14.33 BEGIN TRANSITION
STA. 66+09.33 END TRANSITION
STA. 67+94.88 LIMIT OF WORK MATCH EXIST. PVMT.
W11-1 (AHEAD)
3-4" CONC. FILLED STEEL PIPES 48" HT.
1'-0" SHOULDER LEFT
8'-0" PAVED TRAIL
1'-0" SHOULDER RIGHT
M1-8 (DOWNEAST TRAIL) M7-5
R1-1
LEDGE VISIBLE
LEDGE OUTCROP
P-16
P-17
P-18
P-19
P-20
REMOVE
DAVIS STREET
BIRCH AVE.
SPRING STREET
PARK STREET
MATCH LINE
CONSTRUCTION BASELINE
DOWNEAST TRAIL
STA. 61+67.52 DOWNEAST TRAIL CONST. ℄ BACK =
STA. 61+67.52 DOWNEAST TRAIL CONST. ℄ AHEAD, 4.00' LT
DOWNEAST TRAIL CONSTRUCTION BASELINE
P.I. STA. = 62+91.04
Δ = 05°-58'-00"
D = 02°-25'-03"
R = 2370.00'
T = 123.52'
L = 246.81'
E = 3.22'
JEFFREY KING MAP 138, LOT 133
LOUIS & ELIZABETH WILSON MAP 138, LOT 129
MAP 138, LOT 130
MAP 138, LOT 134
1488+01.7/21.4 LT
1486+91.2 21.7 LT
1488+91.0/19.6 LT
1490+05.1 17.7 LT
1490+84.2 18.3 LT
100' VC EXT. = -0.88'
160' VC EXT. = +0.70'
100' VC EXT. = +0.36'
PVC STA. 62+30 ELEV. 138.18
PVI STA. 62+80.00 ELEV. 139.00
PVRC STA. 63+30 ELEV. 136.31
PVI STA. 64+10.00 ELEV. 132.00
PVT STA. 64+90 ELEV. 130.51
PVC STA. 67+00 ELEV. 126.59
PVI STA. 67+50.00 ELEV. 125.66
PVT STA. 68+00 ELEV. 126.16
-0.60%
+1.63%
-5.38%
-1.86%
+1.00%
+67.52
+03.43
FINISH GRADE
EXIST. GROUND
137.7
132.3
REFUSAL ON BEDROCK @ 5.4 FT
137.4
134.2
REFUSAL ON BEDROCK @ 3.2 FT
137.7
134.1
REFUSAL ON BEDROCK @ 3.6 FT
131.8
127.8
REFUSAL ON BEDROCK @ 4.0 FT
129.9
127.9
REFUSAL ON BEDROCK @ 2.0 FT
150
140
130
120
110
137.80
137.68
137.61
133.08
130.32
128.46
126.59
126.16
61
62
63
64
65
66
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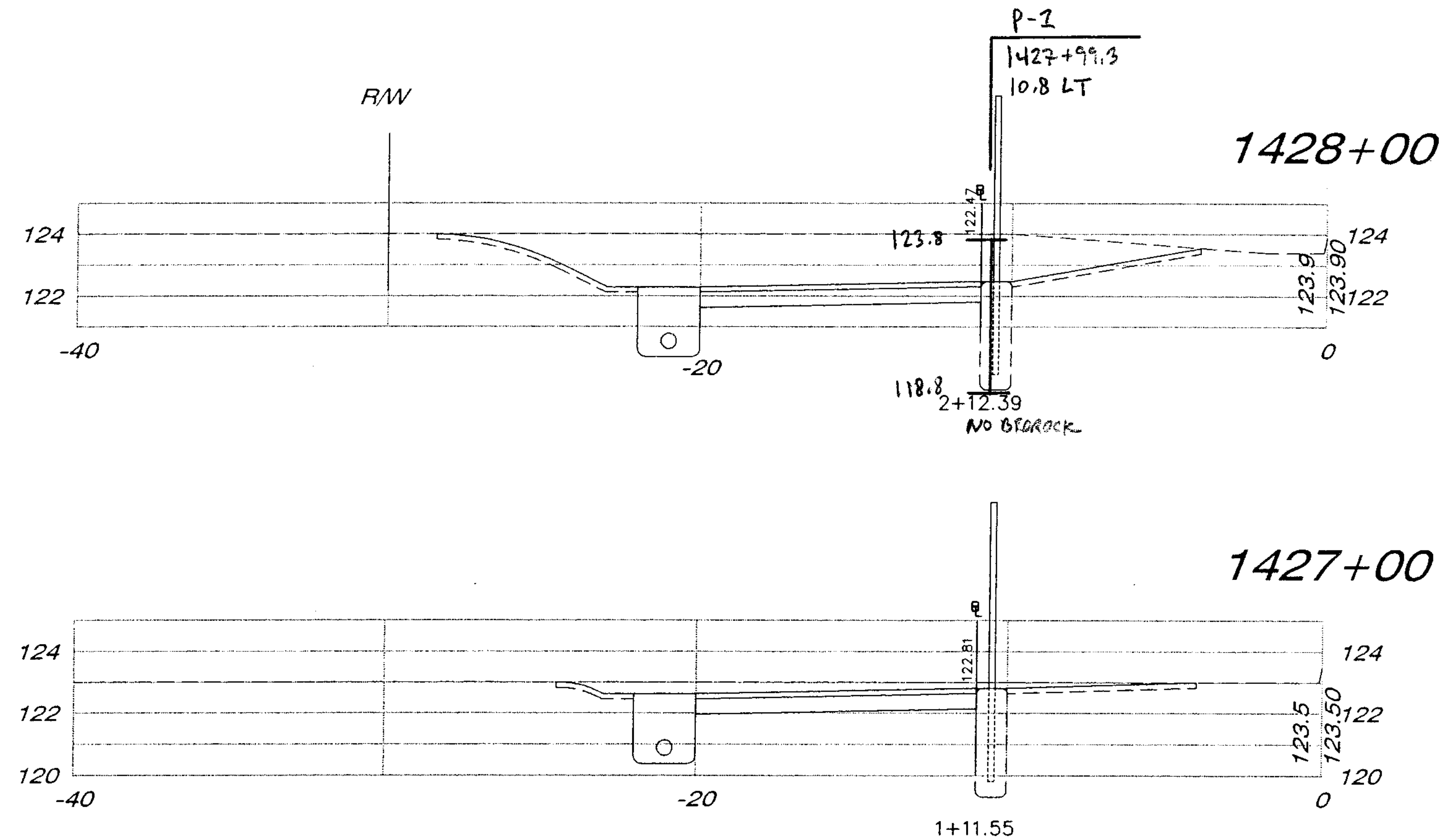
ELLSWORTH **

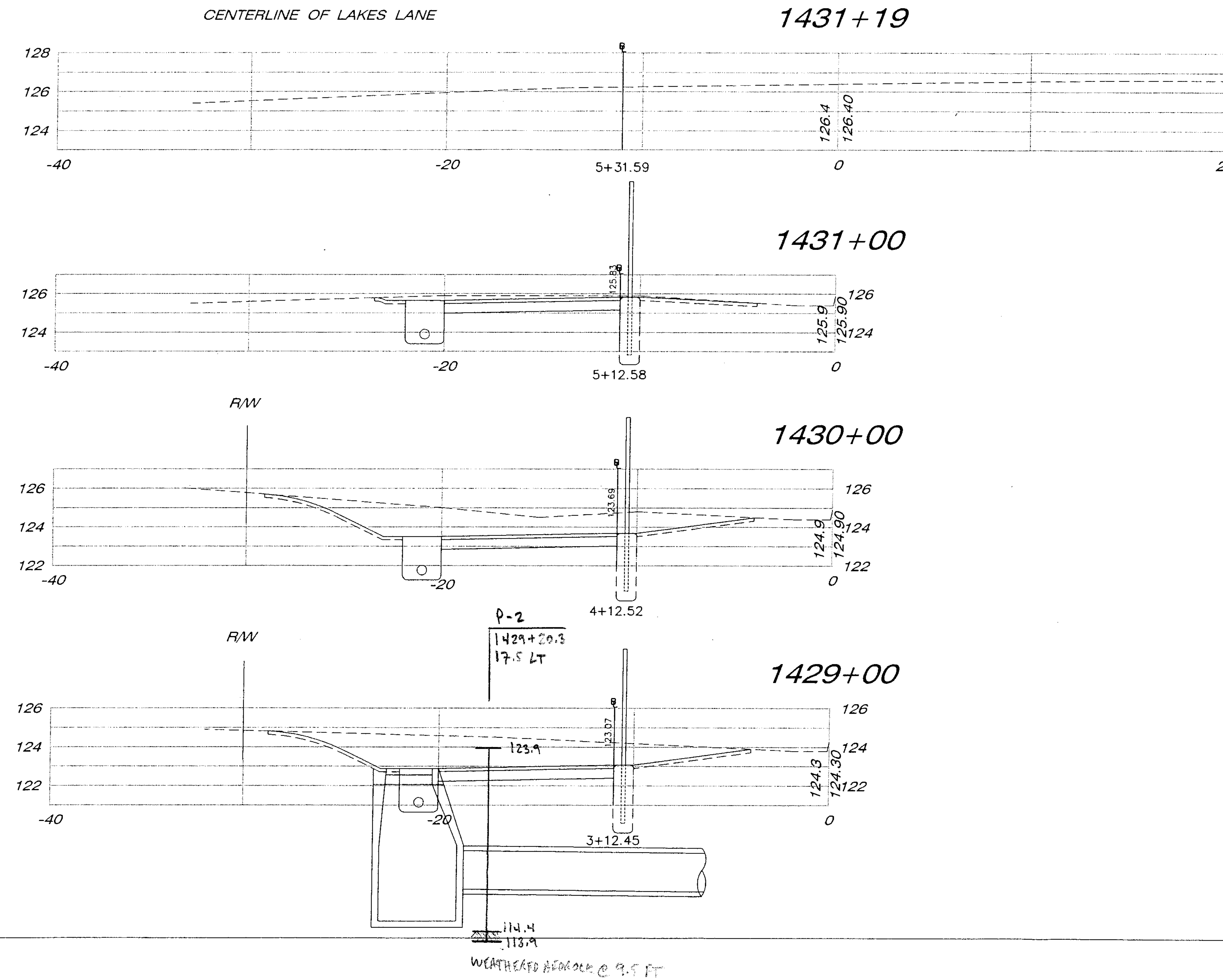
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	8	34

ELLSWORTH
PIN 9636.00



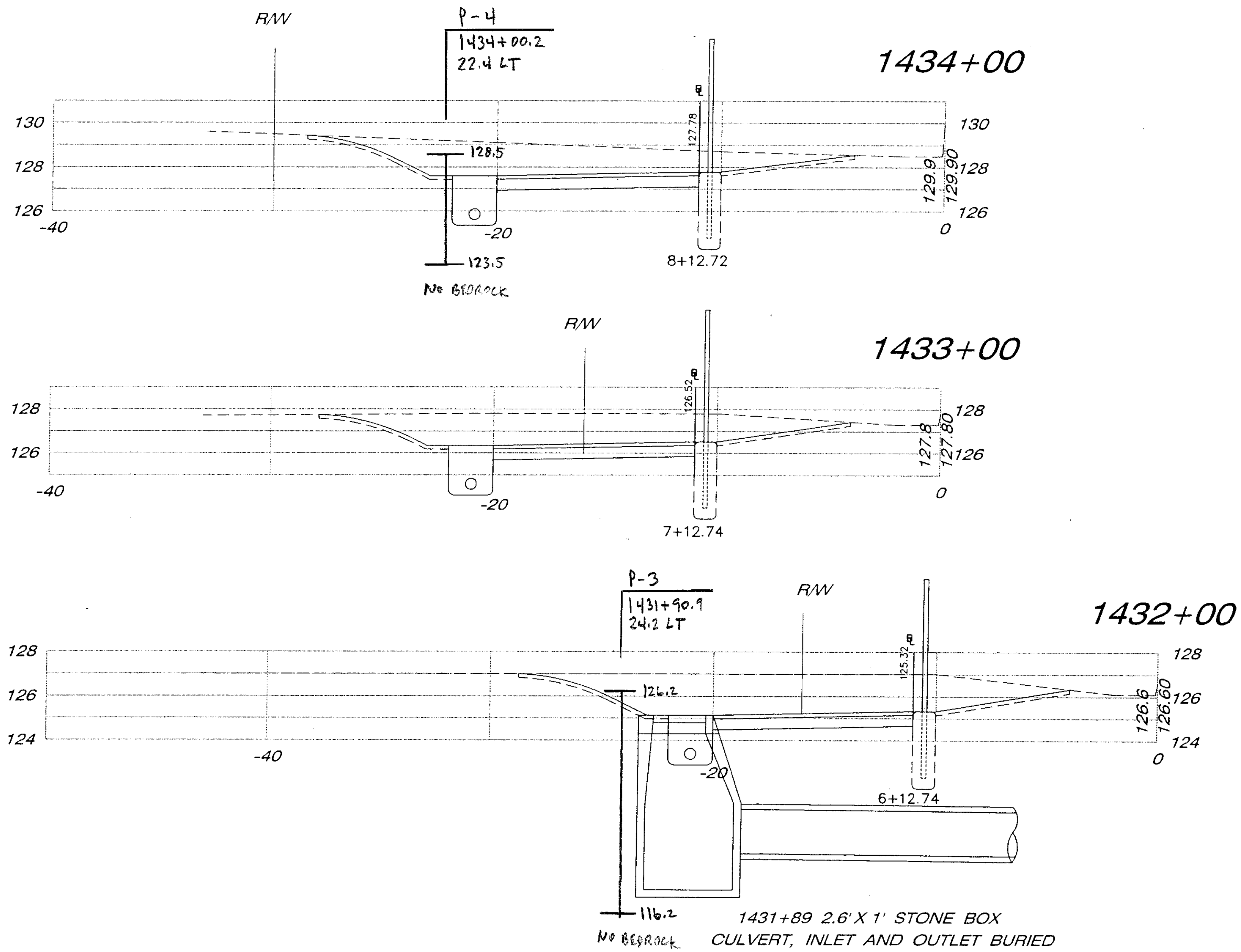
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	9	34

ELLSWORTH
PIN 9636.00



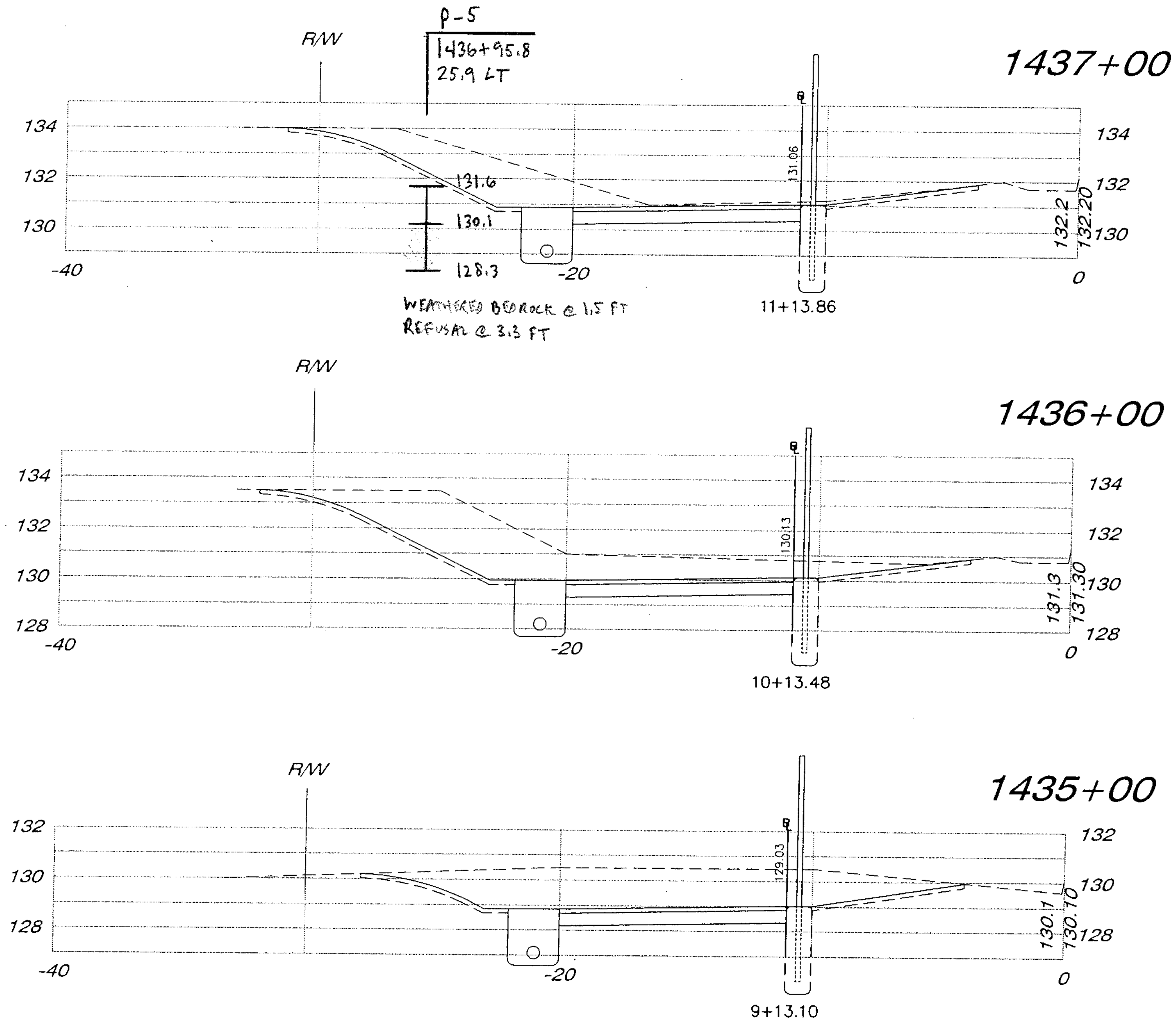
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	10	34

ELLSWORTH
PIN 9636.00



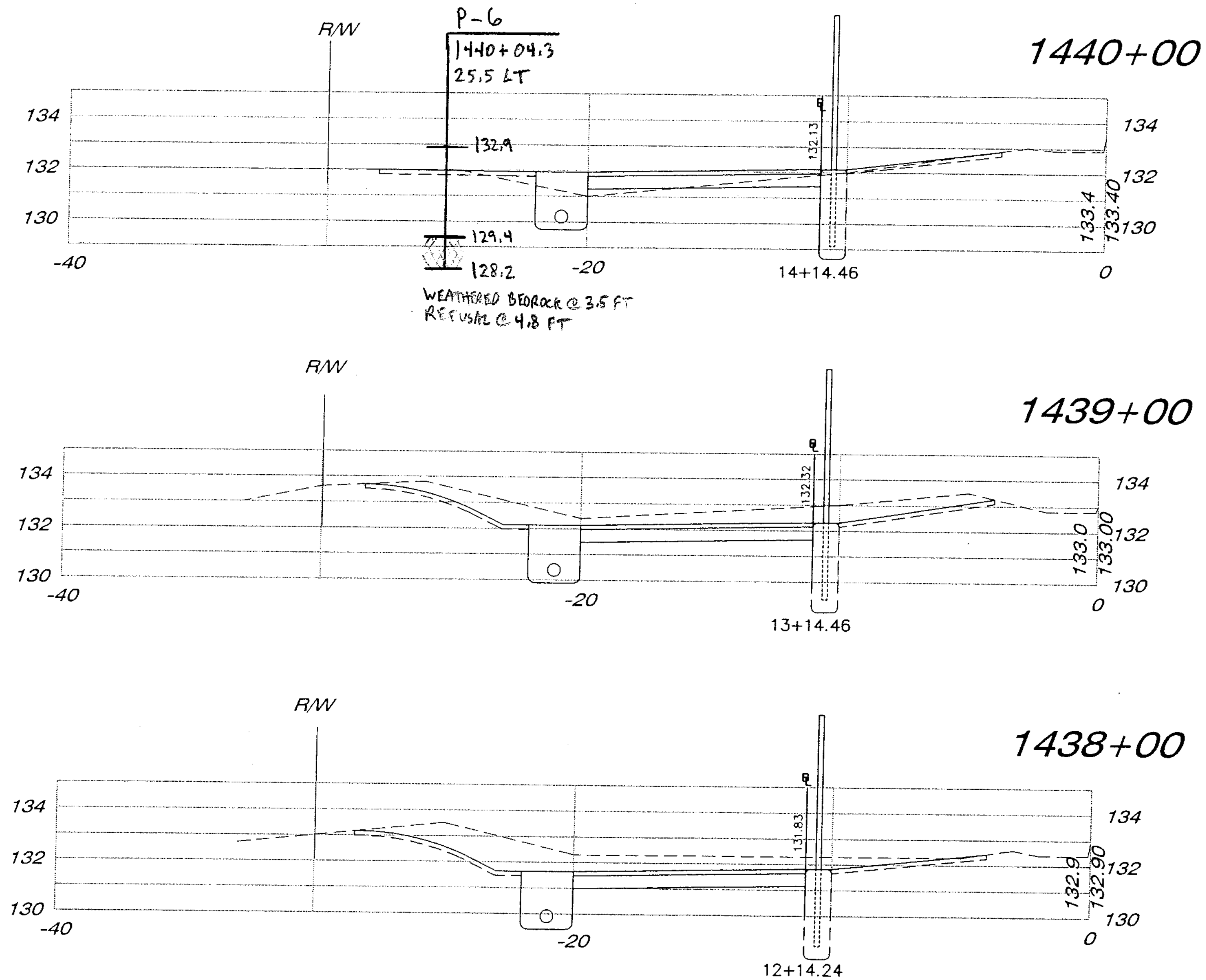
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	11	34

ELLSWORTH
PIN 9636.00



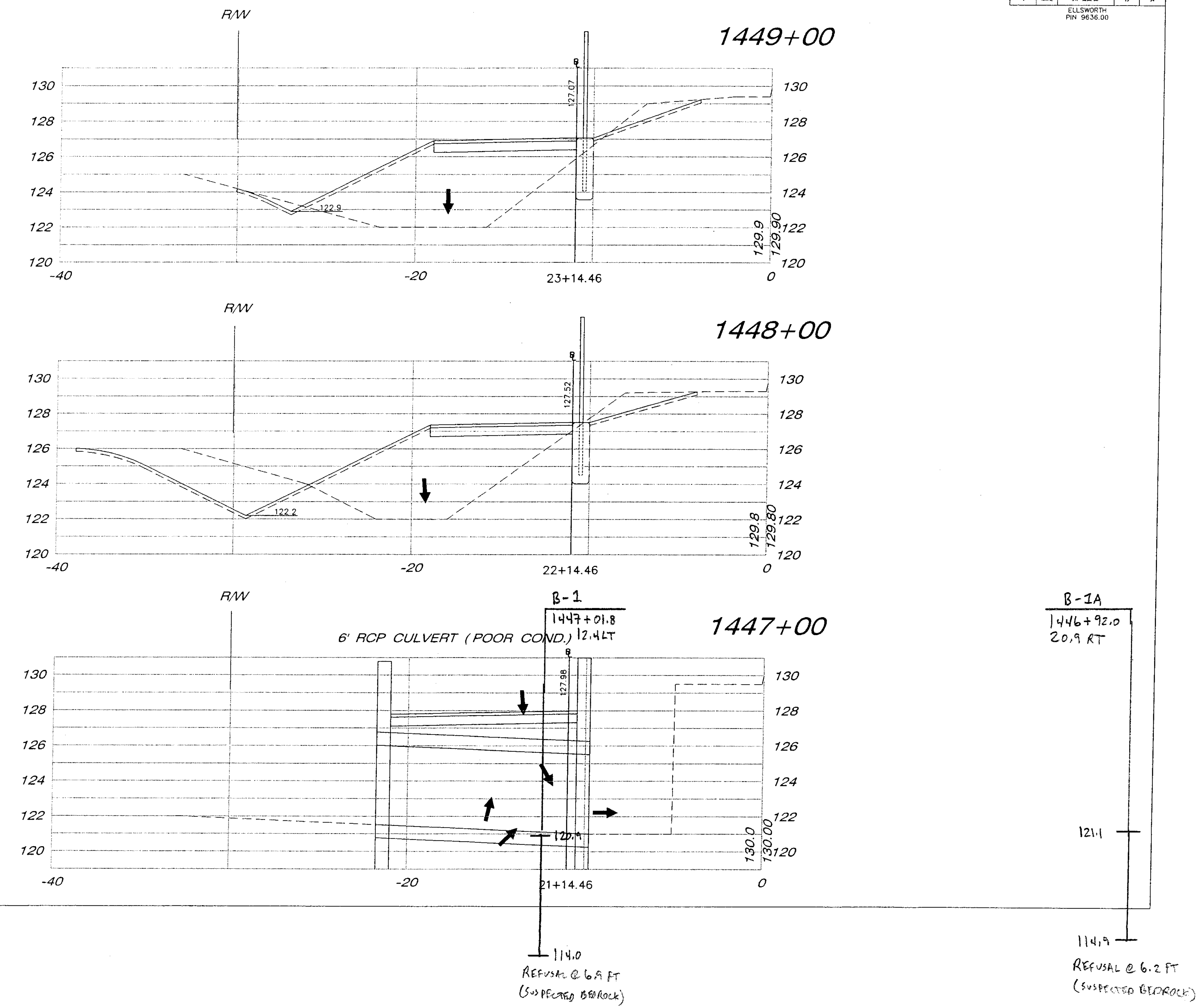
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	12	34

ELLSWORTH
PIN 9636.00



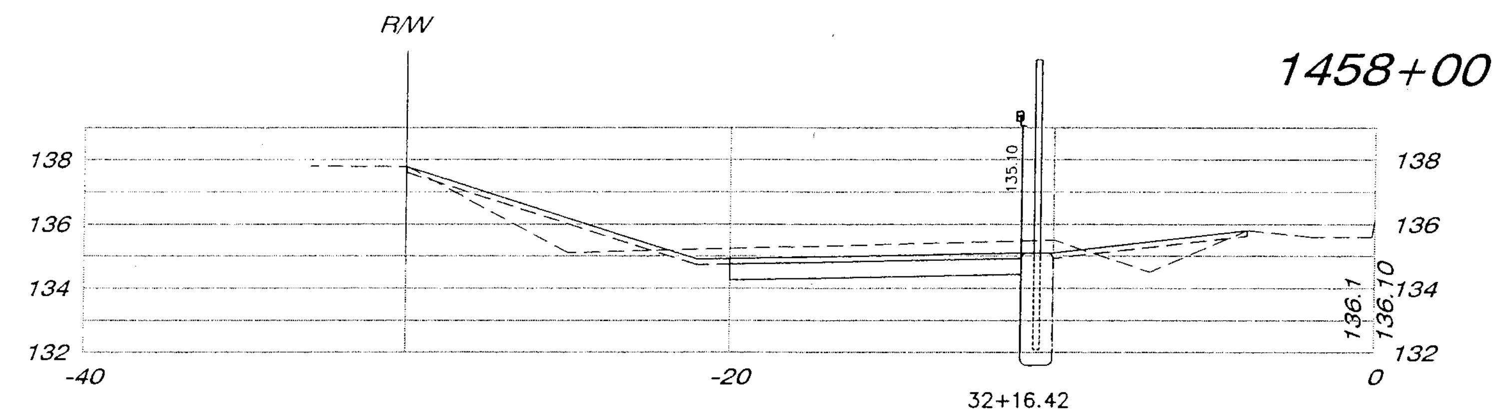
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	15	34

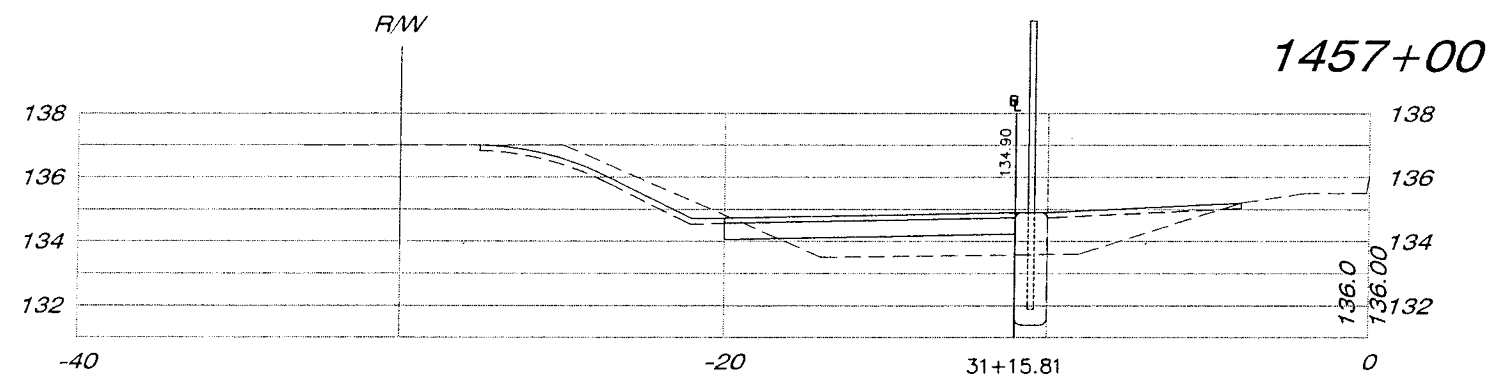
ELLSWORTH
PIN 9636.00

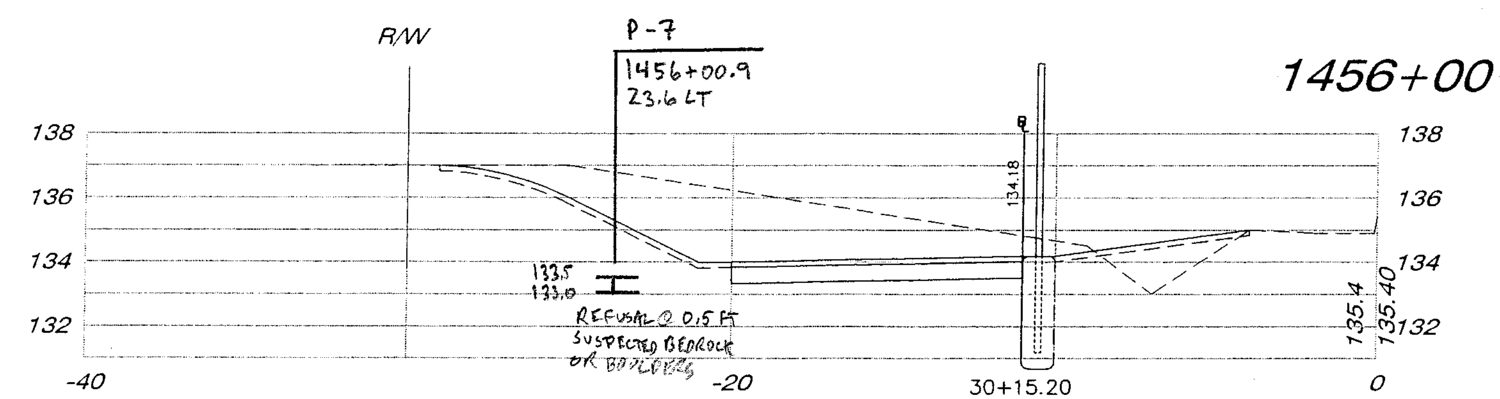


F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	18	34

ELLSWORTH
PIN 9636.00

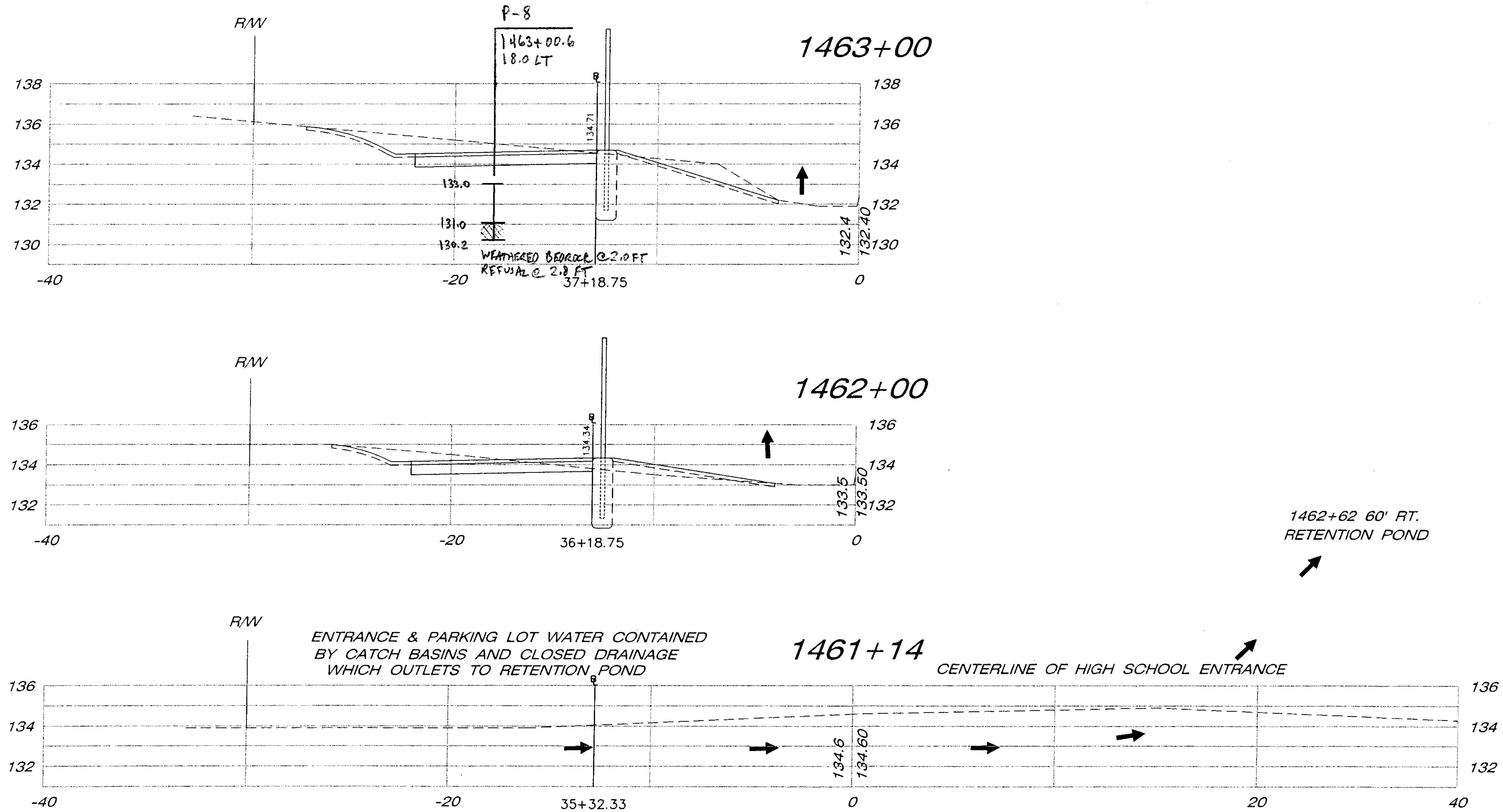




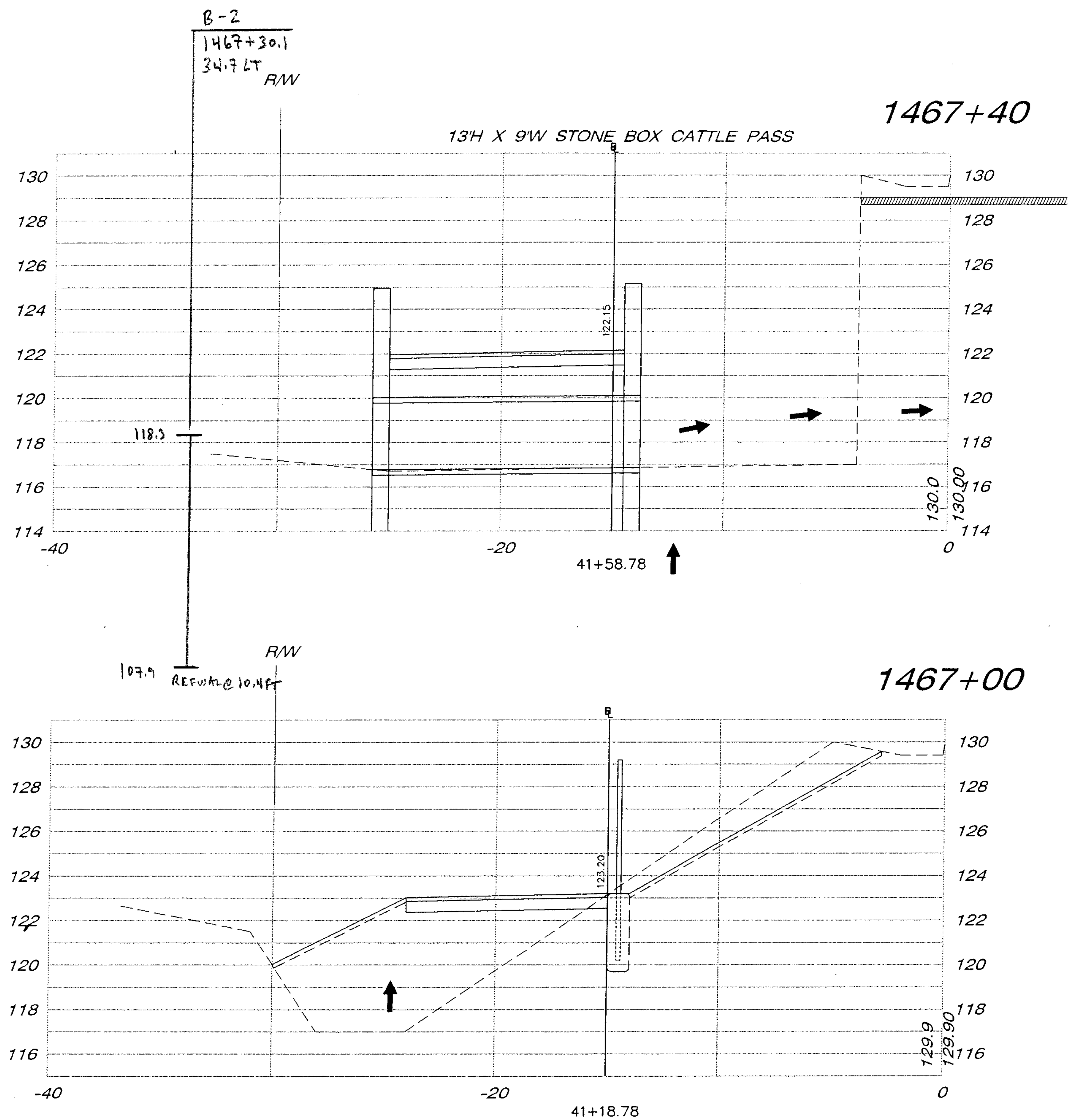


F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	20	34

ELLSWORTH
PIN 9636.00



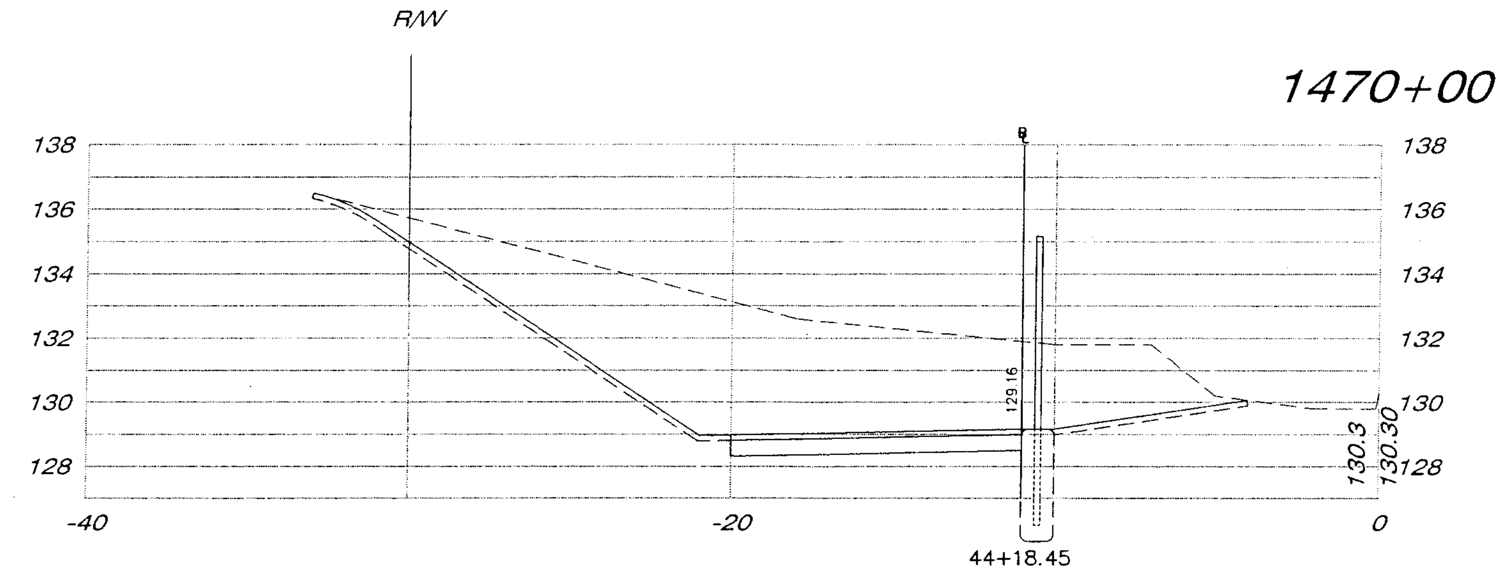
ELLSWORTH
PIN 9636.00



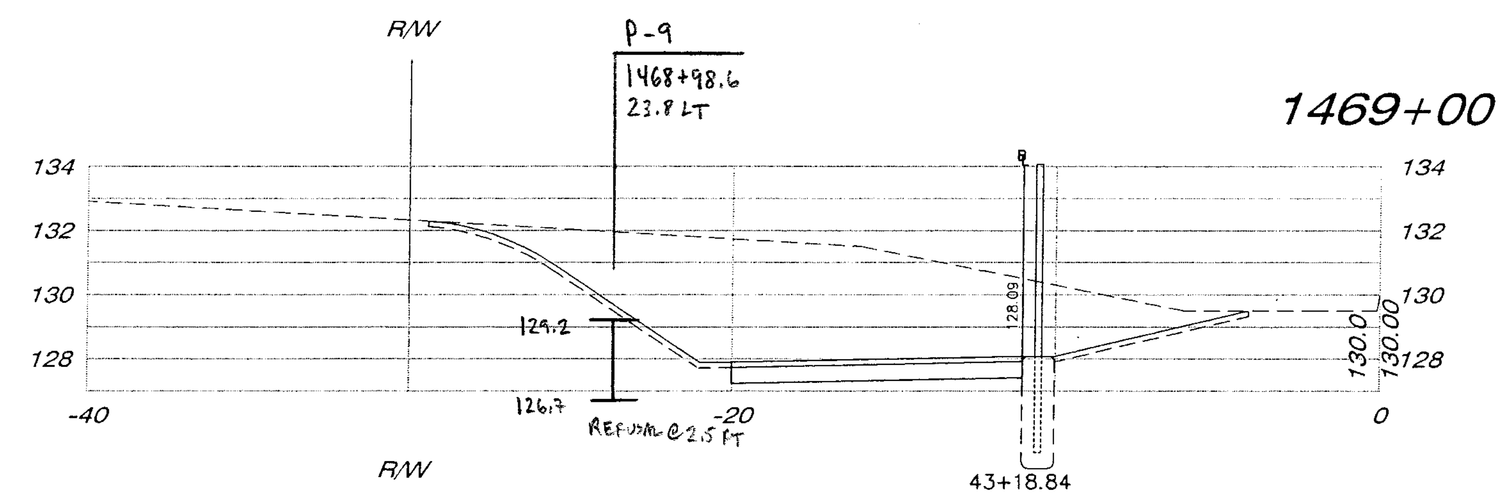
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	83	94

ELLSWORTH
PIN 9636.00

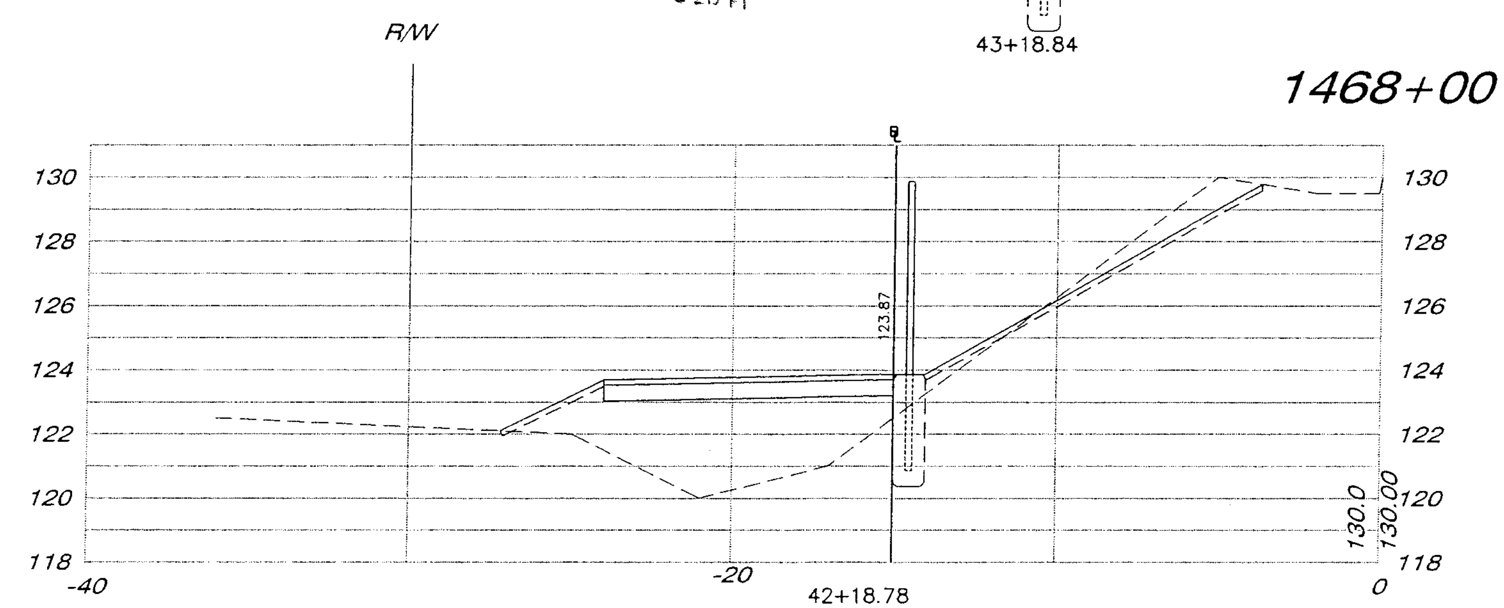
1470+00



1469+00



1468+00



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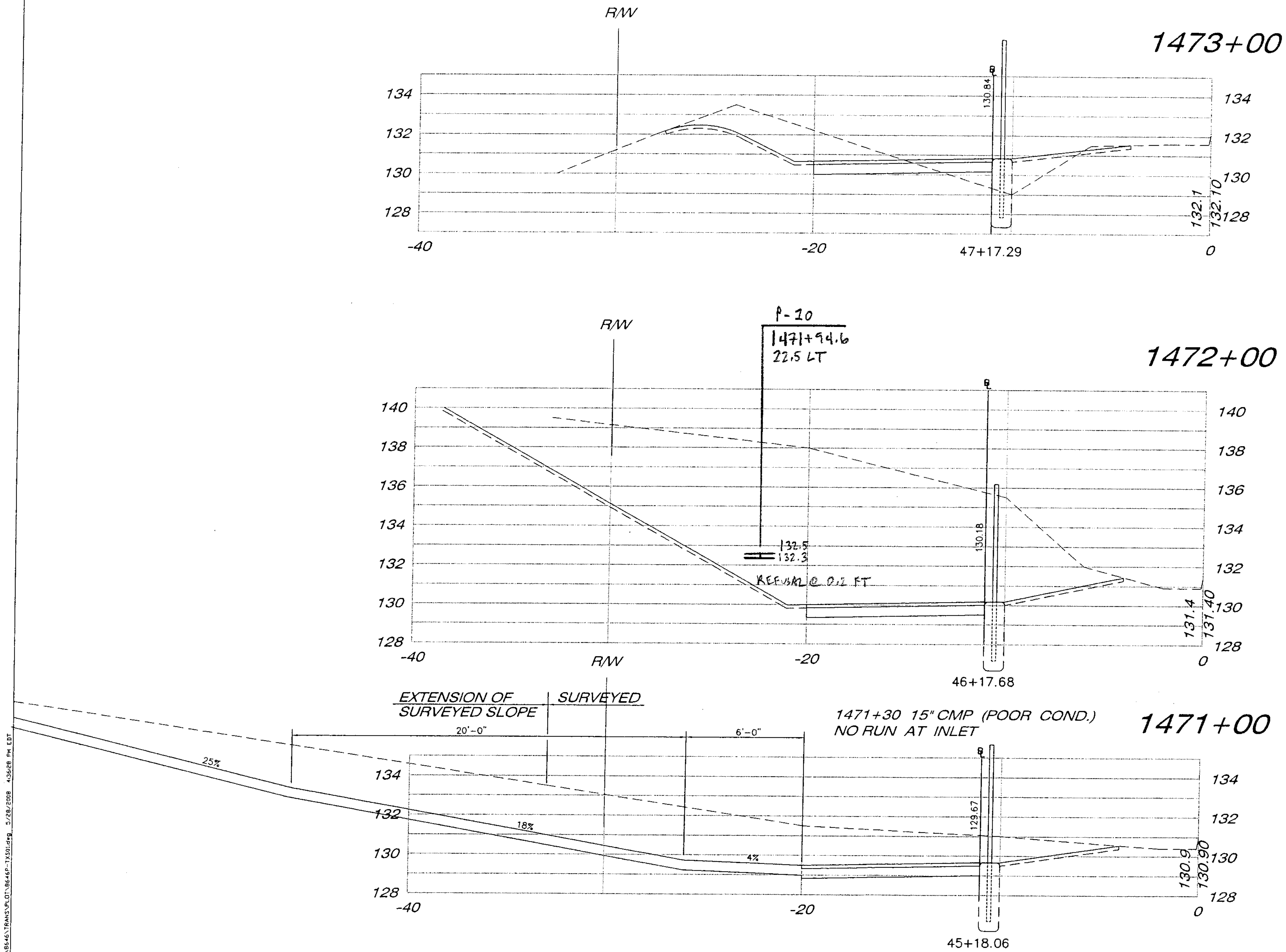
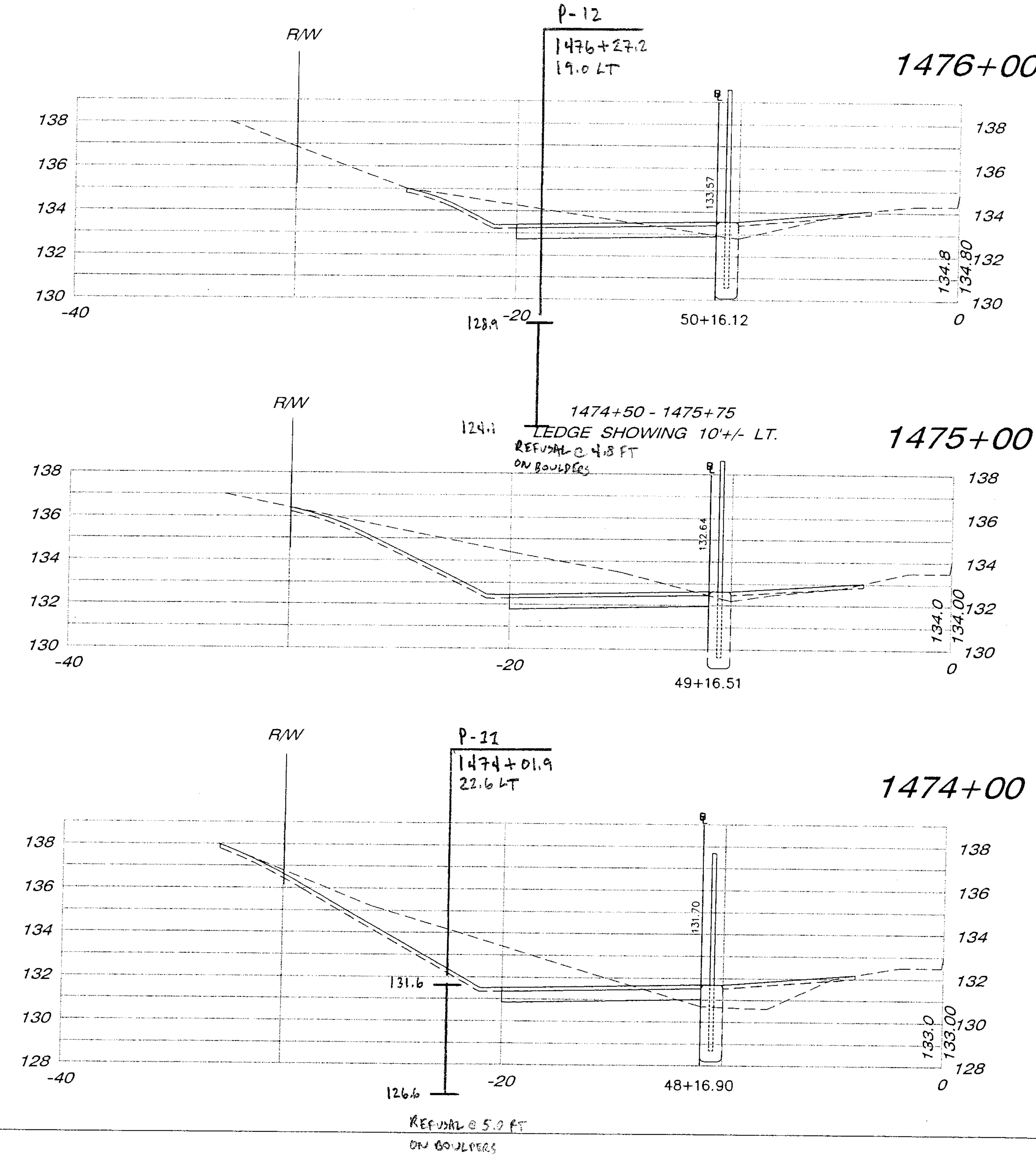
F.H.W.A REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	24	34

ELLSWORTH
PIN 9636.00



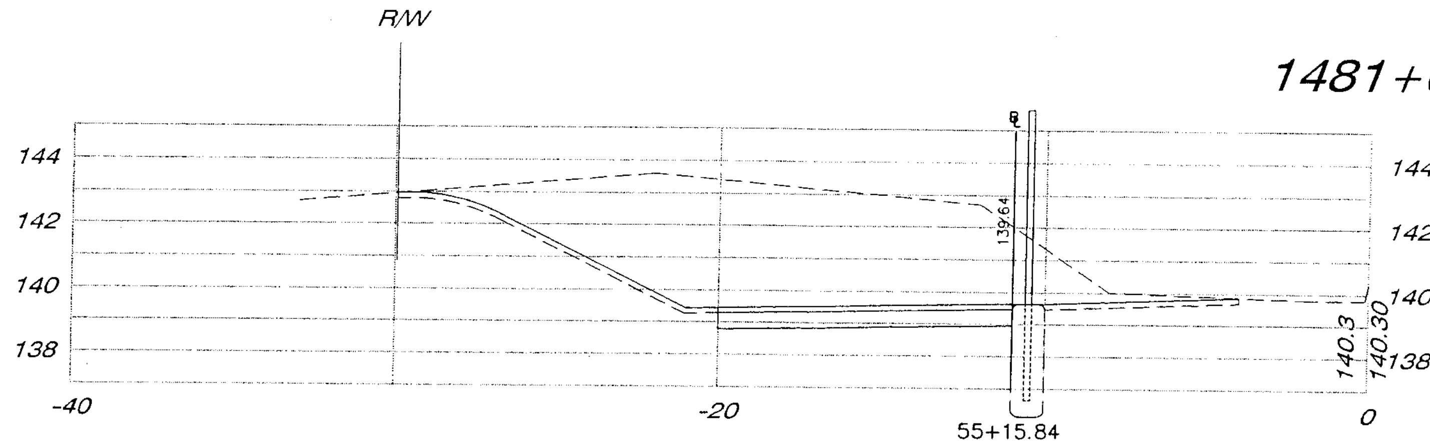
ELLSWORTH
PIN 9636.00



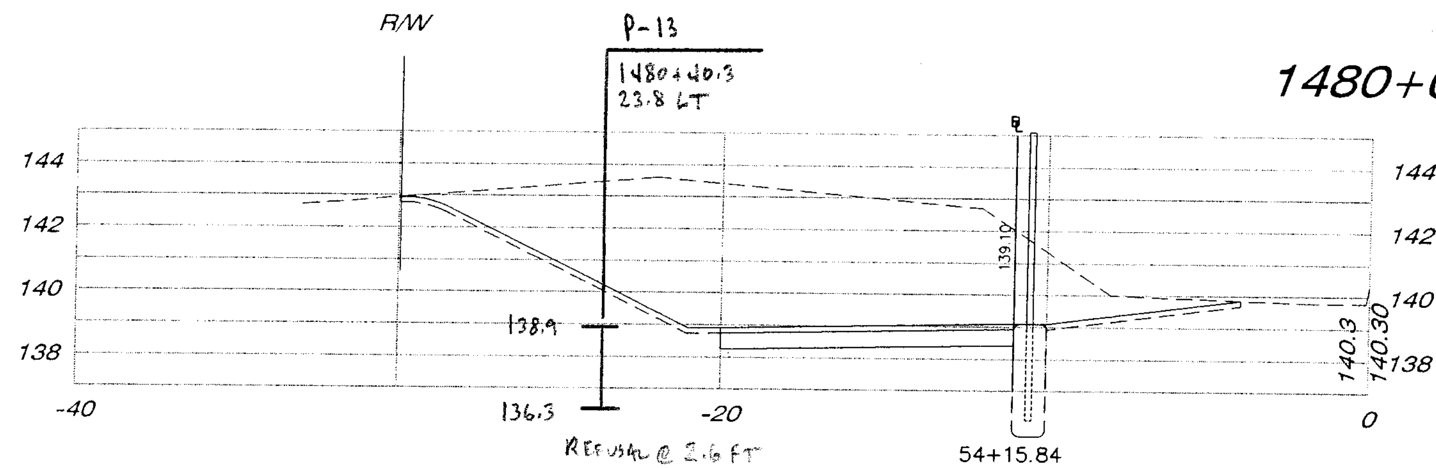
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	27	34

ELLSWORTH
PIN 9636.00

1481+00

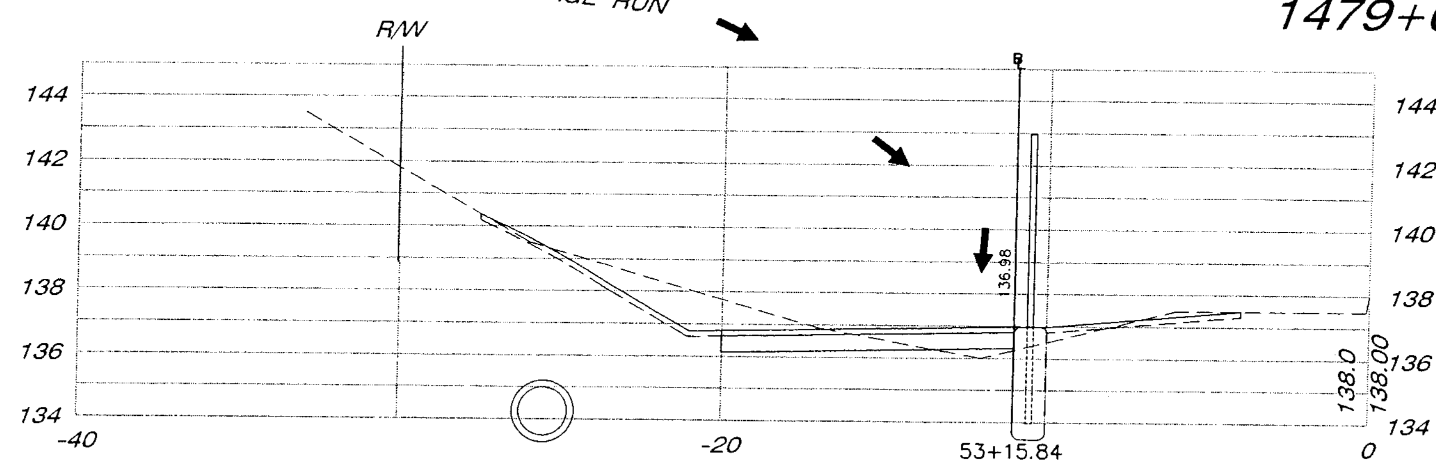


1480+00



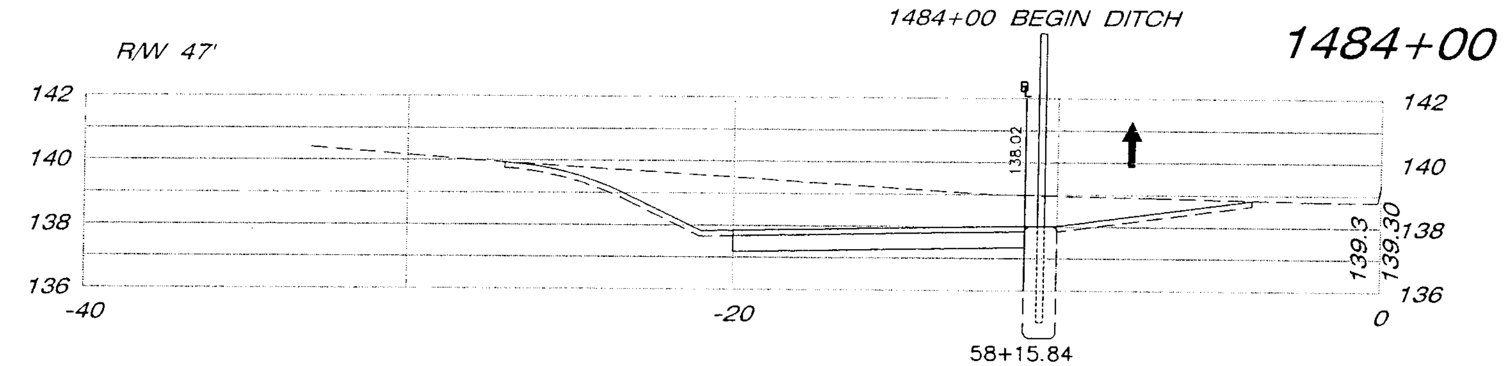
1479+80 DRAINAGE RUN

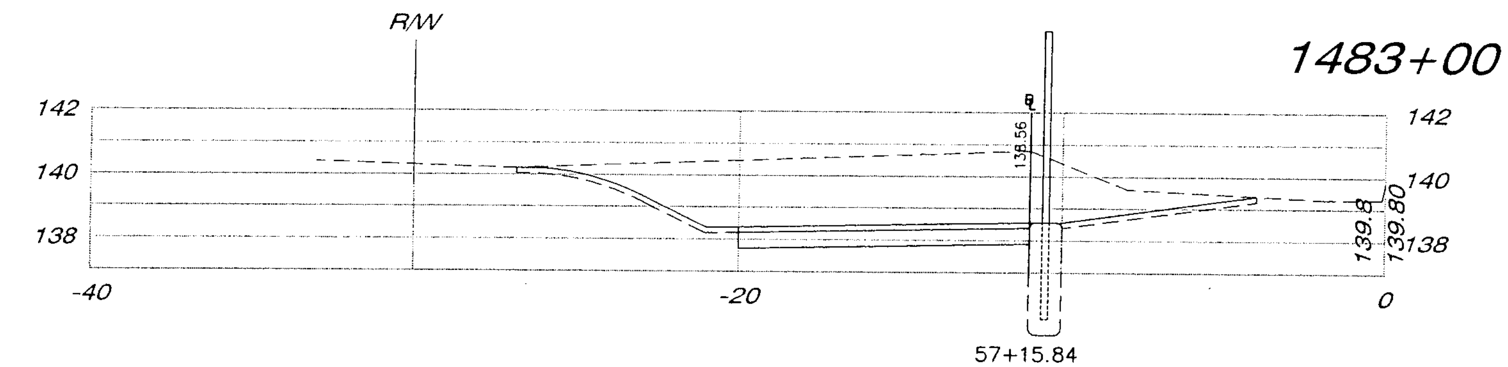
1479+00

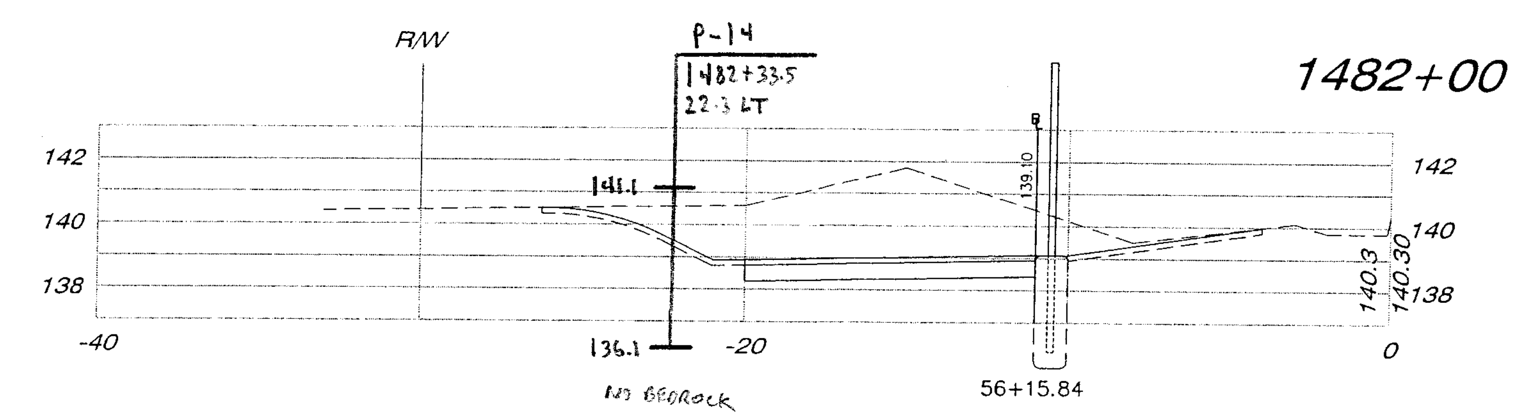


F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	29	34

ELLSWORTH
PIN 9636.00







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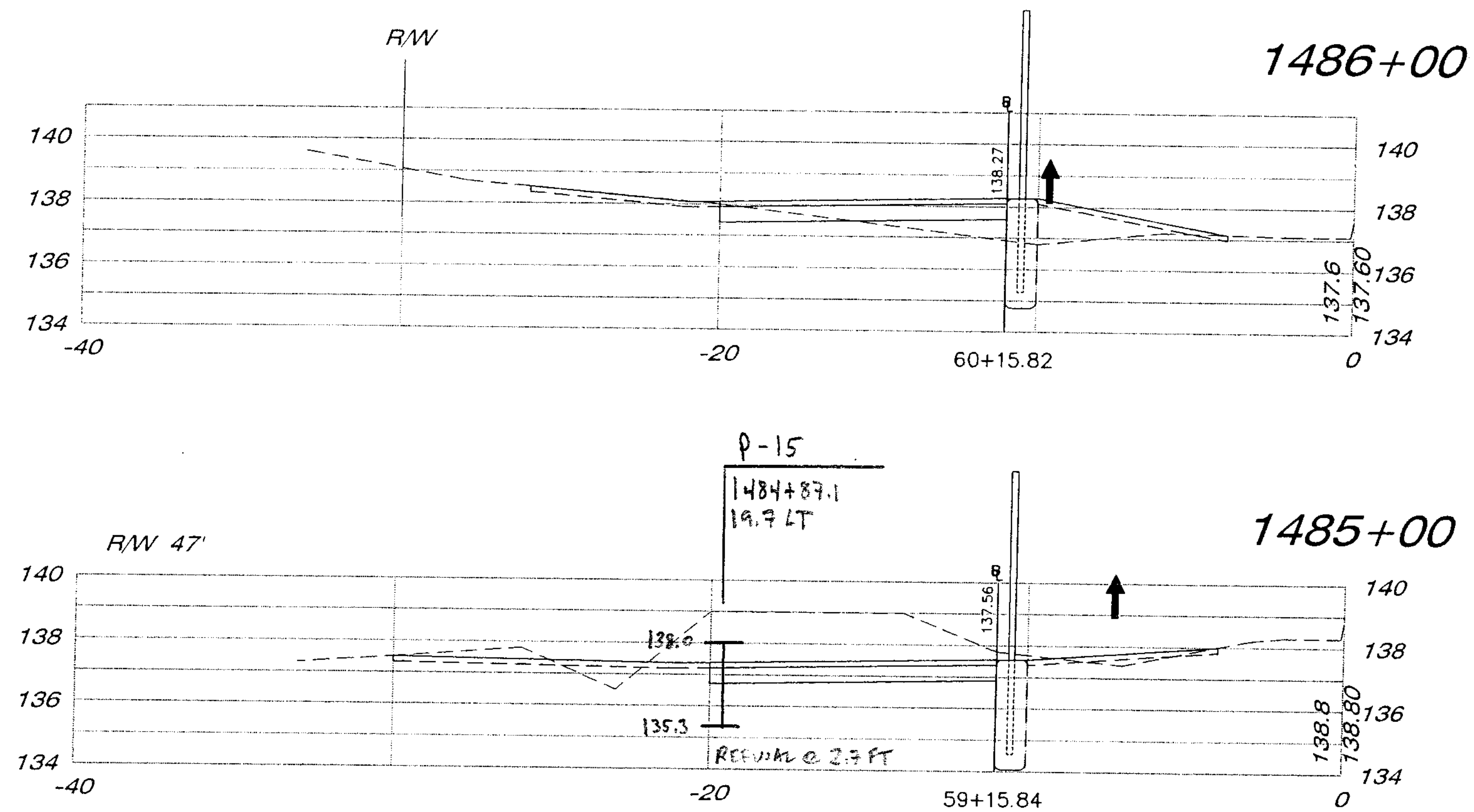
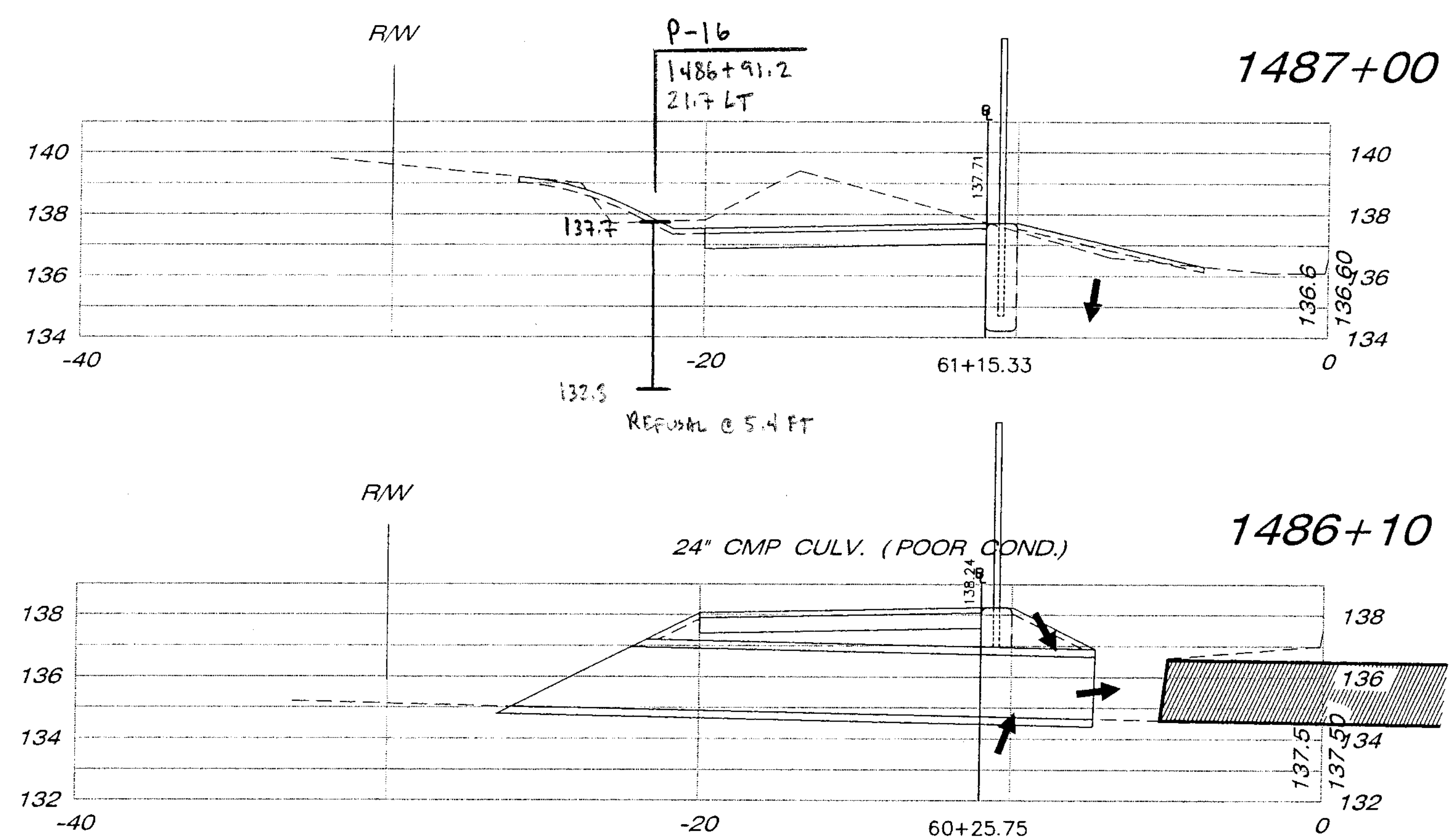
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	27	34

ELLSWORTH
PIN 9636.00



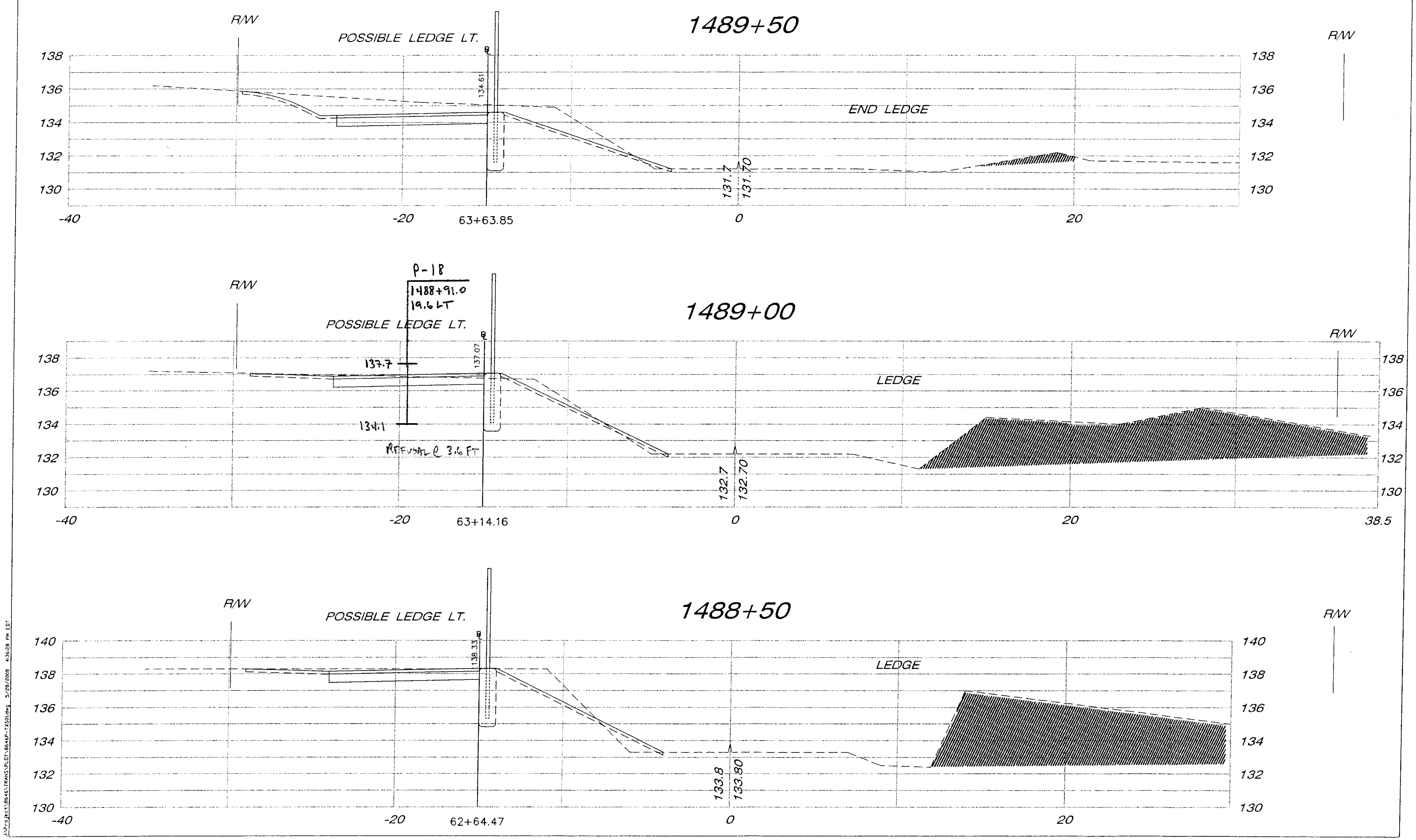
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	30	34

ELLSWORTH
PIN 9636.00



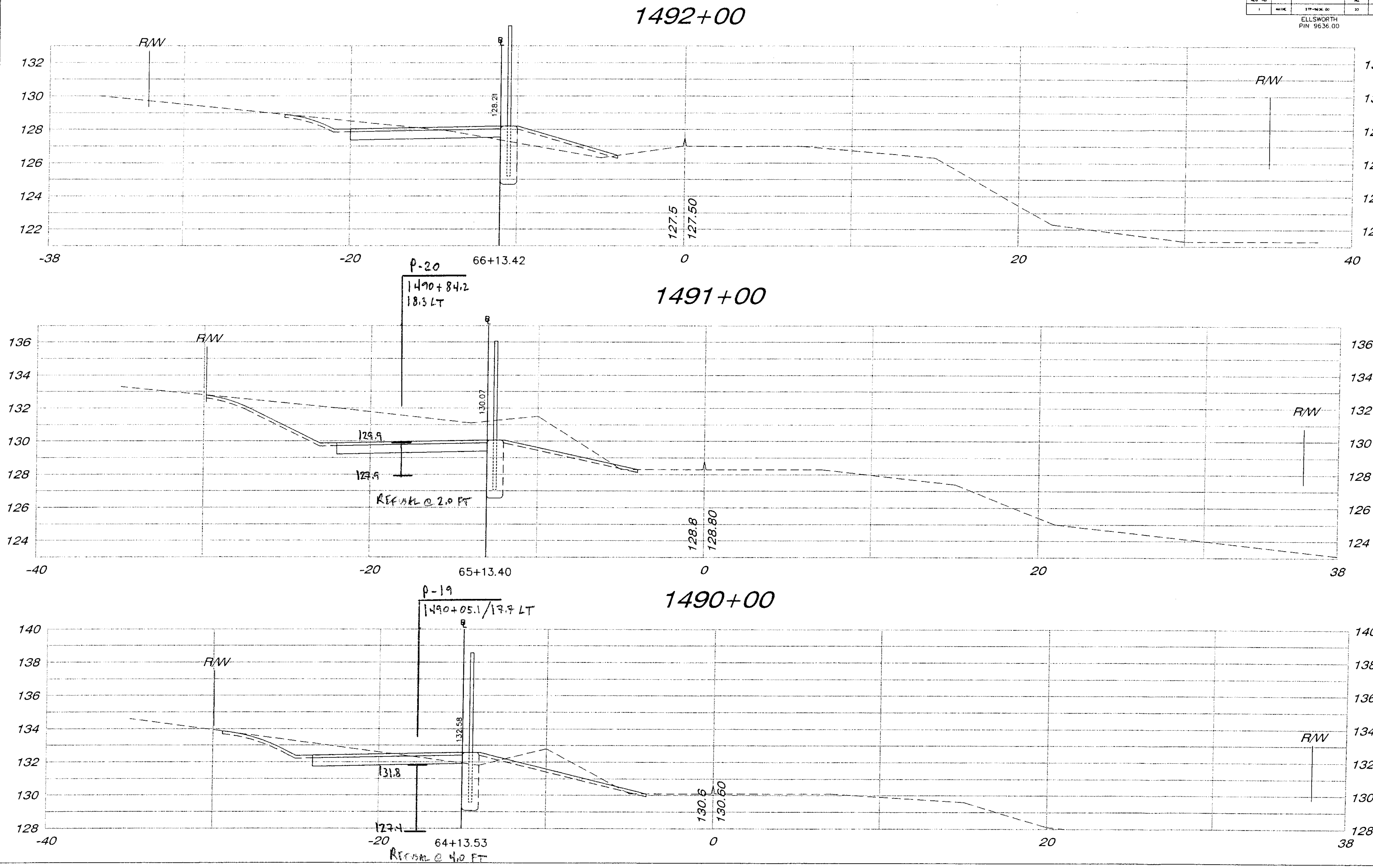
F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	32	34

ELLSWORTH
PIN 9636.00



F.H.W.A. REG. NO.	STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
1	MAINE	STP-9636.00	33	34

ELLSWORTH
PIN 9636.00



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Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	**Project:** Downeast Rail Trail **Location:** Ellsworth, Maine	**Boring No.:** B-1 **PIN:** 9636.00

Driller:	Maine Test Borings	**Elevation (ft.)**	120.9	**Auger ID/OD:**	-
Operator:	R. Leonard	**Datum:**	NAVD 88	**Sampler:**	Split Spoon 1.375 in. ID
Logged By:	J. Lloyd	**Rig Type:**	Tripod	**Hammer Wt./Fall:**	140/30"
Date Start/Finish:	8/21/09	**Drilling Method:**	Drive	**Core Barrel:**	-
Boring Location:	1447+01.8 / 12.4 LT	**Casing ID/OD:**	-	**Water Level*:**	0 ft
Hammer Efficiency Factor:	0.4	**Hammer Type:**	Automatic ☐ Hydraulic ☐ Rope & Cathead ☒		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample Information: Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0								120.85		Gray, wet, coarse to fine SAND (SW). 0.05	
	1D	24/6	0.00 - 2.00	6/6/6/10	12	8	Open			Dark greenish gray (5GY 4/1), saturated, stiff, mottled silty CLAY, little coarse to fine sand, trace fine gravel (CL). PP=0.75 tsf	MC=23.9% (CL)
2								118.90		2.00 Greenish gray (5GY 5/1), wet, medium dense, coarse to fine SAND, little fine gravel (SW).	
	2Da 2Db	24/24	2.00 - 4.00	8/10/14/29	24	16		118.30		2.60 Olive gray (5Y 5/2), saturated, very stiff, mottled silty CLAY, trace medium to fine sand (CL). T_v=0.4 tsf PP=2.0 tsf	LL=38 PL=21 PI=17 LI=0.10 MC=23.1% (CL)
4	3D	24/21	4.00 - 6.00	19/19/22/22	41	27				Olive gray (5Y 5/2), saturated, very stiff, mottled, silty CLAY, trace medium to fine sand (CL). T_v=0.85 tsf PP=2.5 tsf	
								115.80		5.10 Gray, saturated, medium dense, clayey coarse to fine SAND, trace fine gravel (SW).	
								115.65		5.25 Olive gray (5Y 5/2), saturated, very stiff, mottled, silty CLAY, trace medium to fine sand (CL).	
6	4D	9/9	6.00 - 6.75	12/60(5")				114.90		6.00 Dark greenish gray (5GY 4/1), saturated, very stiff, silty CLAY with coarse to fine sand (CL).	
								114.70		6.20 Dark greenish gray (5GY 4/1), saturated, very stiff, silty CLAY, trace coarse to fine sand (CL). Refusal at 6.92 ft. T_v=0.55 tsf PP=1.5 tsf	
								113.98		6.92 **Bottom of Exploration at 6.92 feet below ground surface.**	
8											
10											
12											

Remarks:

Boring Location is referenced to the railroad centerline
PP = Pocket Penetrometer Unconfined Compressive Strength (psf)

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation

Soil/Rock Exploration Log
US CUSTOMARY UNITS

Project: Downeast Rail Trail				Boring No.:	B-1A
Location: Ellsworth, Maine				PIN:	9636.00
Driller:	Maine Test Borings	Elevation (ft.)	121.1	Auger ID/OD:	-
Operator:	R. Leonard	Datum:	NAVD 88	Sampler:	Split Spoon 1.375 in. ID
Logged By:	J. Lloyd	Rig Type:	Tripod	Hammer Wt./Fall:	140/30"
Date Start/Finish:	8/21/09	Drilling Method:	Drive	Core Barrel:	-
Boring Location:	1446+92 / 20.9 RT	Casing ID/OD:	-	Water Level*:	1 ft
Hammer Efficiency Factor:	0.4	Hammer Type:	Automatic ☐ Hydraulic ☐ Rope & Cathead ☒		

Definitions:
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
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WOH = weight of 140lb. hammer
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S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/6	0.00 - 2.00	3/3/5/8	8	5	Open			Black (7.5YR 2.5/1), moist, loose, medium to fine SAND and silt, some coal, little organics, 2" piece of wood in sample (GM).	MC=48.6% (CL)
2	2DA 2DB	24/16	2.00 - 4.00	10/14/21/51	35	23		119.10 118.80		2.00 Dark olive gray (5Y 3/2), wet, medium dense, coarse to fine SAND, some fine gravel, some mottled silty clay, trace organics (GC). 2.30 Olive gray (5Y 5/2), saturated, hard, mottled, silty CLAY, trace medium to fine sand (CL). T_v=0.75 tsf PP=3.5 tsf	LL=37 PL=22 PI=15 LI=0.19 MC=25.1% (CL)
4	3D	24/14	4.00 - 6.00	15/22/56/65	78	52				Olive gray (5Y 5/2), saturated, hard, mottled, silty CLAY, trace medium to fine sand (CL). PP=1.75 tsf	
6	4D	2.5/2.5	6.00 - 6.21	100(2.5")				115.00 114.89		Olive gray (5Y 5/2), saturated, hard, mottled, silty CLAY, trace medium to fine sand (CL). 6.10 Dark olive gray (5Y 3/2), wet, dense, gravelly coarse to fine SAND, little clay (SC). Refusal at 6.21 ft. 6.21 **Bottom of Exploration at 6.21 feet below ground surface.**	
8											
10											
12											

Remarks:

Boring Location is referenced to the railroad centerline
PP = Pocket Penetrometer Unconfined Compressive Strength (psf)

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: Downeast Rail Trail Location: Ellsworth, Maine	Boring No.: B-2 PIN: 9636.00

Driller:	Maine Test Borings	Elevation (ft.)	118.3	Auger ID/OD:	4"
Operator:	R. Leonard	Datum:	NAVD 88	Sampler:	Split Spoon 1.375 in. ID
Logged By:	J. Lloyd	Rig Type:	Mobile B-53 Track Rig	Hammer Wt./Fall:	140/30"
Date Start/Finish:	8/19/09	Drilling Method:	SSA	Core Barrel:	-
Boring Location:	1467+30.1 / 34.7 LT	Casing ID/OD:	-	Water Level*:	1 ft
Hammer Efficiency Factor:	0.6	Hammer Type:	Automatic ☐ Hydraulic ☐ Rope & Cathead ☒		

Definitions
D = Split Spoon Sample
MD = Unsuccessful Split Spoon Sample attempt
U = Thin Wall Tube Sample
MU = Unsuccessful Thin Wall Tube Sample attempt
V = Insitu Vane Shear Test, PP = Pocket Penetrometer
MV = Unsuccessful Insitu Vane Shear Test attempt
R = Rock Core Sample
SSA = Solid Stem Auger
HSA = Hollow Stem Auger
RC = Roller Cone
WOH = weight of 140lb. hammer
WOR/C = weight of rods or casing
WO1P = Weight of one person
S_u = Insitu Field Vane Shear Strength (psf)
T_v = Pocket Torvane Shear Strength (psf)
q_p = Unconfined Compressive Strength (ksf)
N-uncorrected = Raw field SPT N-value
Hammer Efficiency Factor = Annual Calibration Value
N_{60} = SPT N-uncorrected corrected for hammer efficiency
N_{60} = (Hammer Efficiency Factor/60%)*N-uncorrected
$S_{u(lab)}$ = Lab Vane Shear Strength (psf)
WC = water content, percent
LL = Liquid Limit
PL = Plastic Limit
PI = Plasticity Index
G = Grain Size Analysis
C = Consolidation Test

Depth (ft.)	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (/6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N_{60}	Casing Blows	Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
0	1D	24/19	0.00 - 2.00	WOH/2/1/1	3	3	SSA			Very dark grayish brown (2.5Y 3/2), moist, soft, silty CLAY, some coarse to fine sand, some fine gravel, trace organics (CL).	MC=38.0% (CL)
2	2D	24/13	2.00 - 4.00	1/2/3/8	5	5		116.30		2.00 Light olive brown (2.5Y 5/3), saturated, medium stiff, mottled silty CLAY, some medium to fine sand, trace fine gravel (CL).	MC=21.1% (CL)
4	3D	24/18	4.00 - 6.00	3/5/7/8	12	12		114.30		4.00 Olive (5Y 5/3), saturated, stiff, silty CLAY, trace medium to fine sand (CL). T_v=0.55 tsf PP=2.25 tsf	LL=43 PL=23 PI=20 LI=0.27 MC=28.0% (CL)
6	4D	24/14	6.00 - 8.00	7/7/12/50(0")	19	19				Olive (5Y 5/3), saturated, very stiff, silty CLAY, trace medium to fine sand (CL). T_v=0.8 tsf PP=1.75 tsf	
								110.80		7.50	
8	-				-					Drilled through cobbles. Driller reported breaking through at 10 ft.	
10	5D	5/5	10.00 - 10.42	20(5")	-			108.30		10.00 Light olive gray (5Y 6/2), wet, dense, fine gravelly coarse to fine SAND, some silt, little clay (GM). Refusal at 10.42 ft.	
								107.88		10.42 **Bottom of Exploration at 10.42 feet below ground surface.**	
12											

Remarks:

Boring Location is referenced to the railroad centerline
PP = Pocket Penetrometer Unconfined Compressive Strength (psf)

Stratification lines represent approximate boundaries between soil types; transitions may be gradual.

* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.

APPENDIX C

GEOTECHNICAL LABORATORY TESTING RESULTS

MEDOT/ELLSWORTH RAIL TRAIL/ME
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
B-1	1D	Jar	0.0-2.0'	(CL)	23.9	-	-	-	-	98.8	87.8	-	-	-	-	-	-	-	-
B-1	2DB	Jar	2.0-4.0'	(CL)	23.1	38	21	17	0.10	-	-	-	-	-	-	-	-	-	-
B-1A	1D	Jar	0.0-2.0'	-	48.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B-1A	2DB	Jar	2.0-4.0'	(CL)	25.1	37	22	15	0.19	-	-	-	-	-	-	-	-	-	-
B-2	1D	Jar	0.0-2.0'	(CL)	38.0	-	-	-	-	85.2	61.7	-	-	-	-	-	-	-	-
B-2	2D	Jar	2.0-4.0'	(CL)	21.1	-	-	-	-	99.5	73.9	-	-	-	-	-	-	-	-
B-2	3D	Jar	4.0-6.0'	(CL)	28.0	43	23	20	0.27	-	-	-	-	-	-	-	-	-	-

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH
* = one point proctor

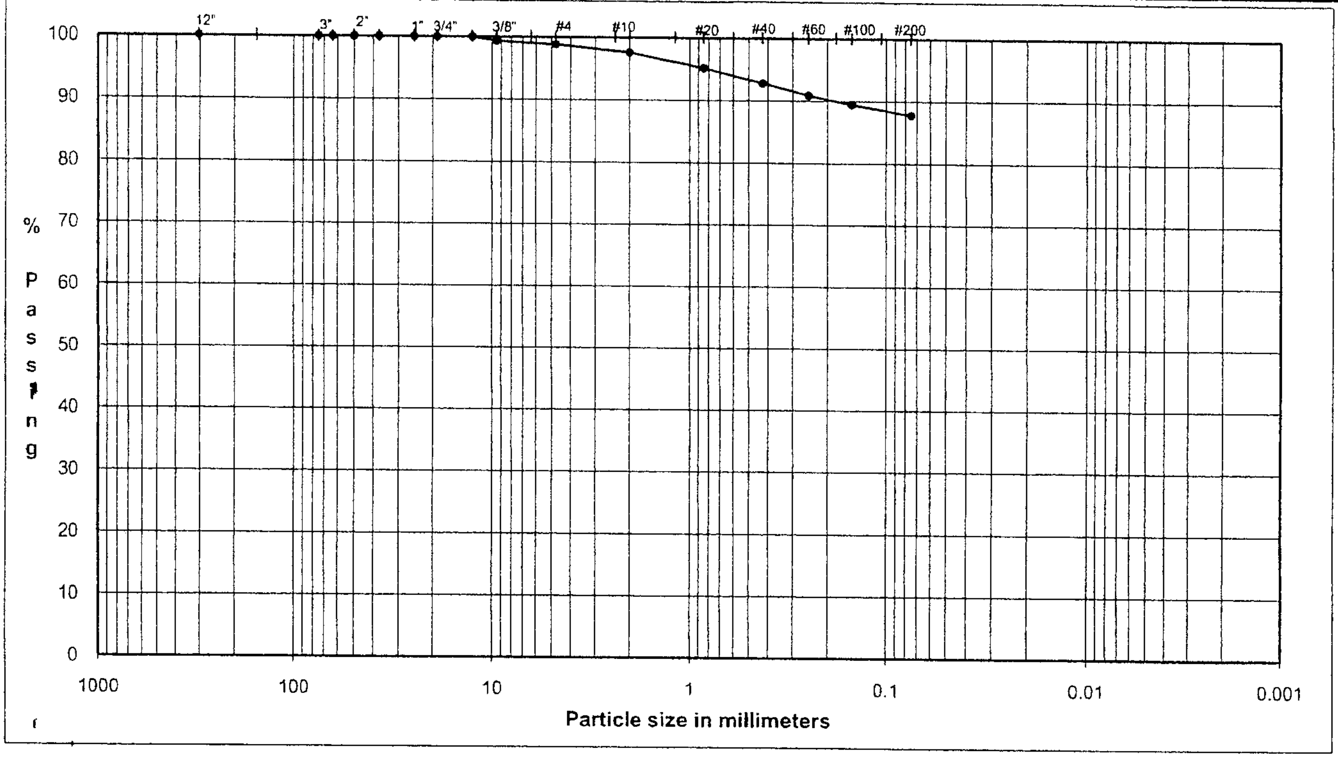
AUGUST 2009

093-87156

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

PROJECT NAME: MEDOT/ELLSWORTH RAIL TRAIL/ME
SAMPLE ID: B-1 1D Depth: 0.0-2.0'
TYPE: Jar

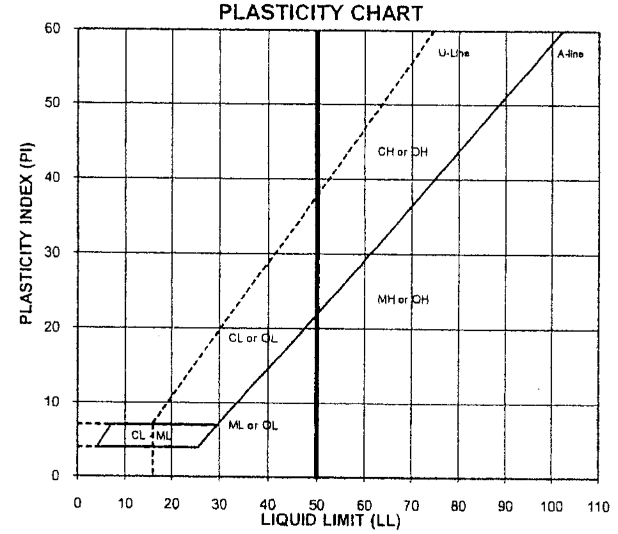


	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.00
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.00
0.50"	12.7	100.0		
0.375"	9.5	99.3		
#4	4.8	98.8	Fine Gravel	1.22
#10	2.00	97.6	Coarse Sand	1.19
#20	0.85	95.2		
#40	0.43	92.8	Medium Sand	4.79
#60	0.25	90.9		
#100	0.15	89.5		
#200	0.075	87.8	Fine Sand	4.96
			Fines	87.84

PLASTICITY CHART



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
23.9				

DESCRIPTION: Grayish Brown, SILTY CLAY, little coarse to fine sand, trace fine gravel.

USCS: (CL)

LL (oven-dried)
< 0.75 = ORGANIC (OL/OH)

TECH	TJ
DATE	8/27/09
CHECK	DA
REVIEW	PWM

NOTE: Insufficient sample received to perform in accordance with ASTM Standards

Golder Associates Inc.

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME:	MEDOT/ELLSWORTH RAIL TRAIL/ME		
PROJECT NUMBER:	093-87156		
SAMPLE ID:	B-1	2DB	SAMPLE DEPTH: 2.0-4.0'
SAMPLE TYPE:	Jar		

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION			TRIAL 1	TRIAL 2	NATURAL MOISTURE
Number of Blows				23	23				
Weight of Wet Soil & Tare (gm)	24.59	24.43	24.23	23.51	24.06				91.53
Weight of Dry Soil & Tare (gm)	22.33	22.19	22.06	18.16	18.53				84.05
Weight of Tare (gm)	11.78	11.76	11.90	4.29	4.30	BLOWS:	23	23	51.70
Weight of Water (gm)	2.26	2.24	2.17	5.35	5.53				7.48
Weight of Dry Soil (gm)	10.55	10.43	10.16	13.87	14.23	K VALUE:	0.99	0.99	32.35
Water Content %	21.42	21.48	21.36	38.57	38.86				23.12

PLASTIC LIMIT (PL): 21

LIQUID LIMIT (LL): 38

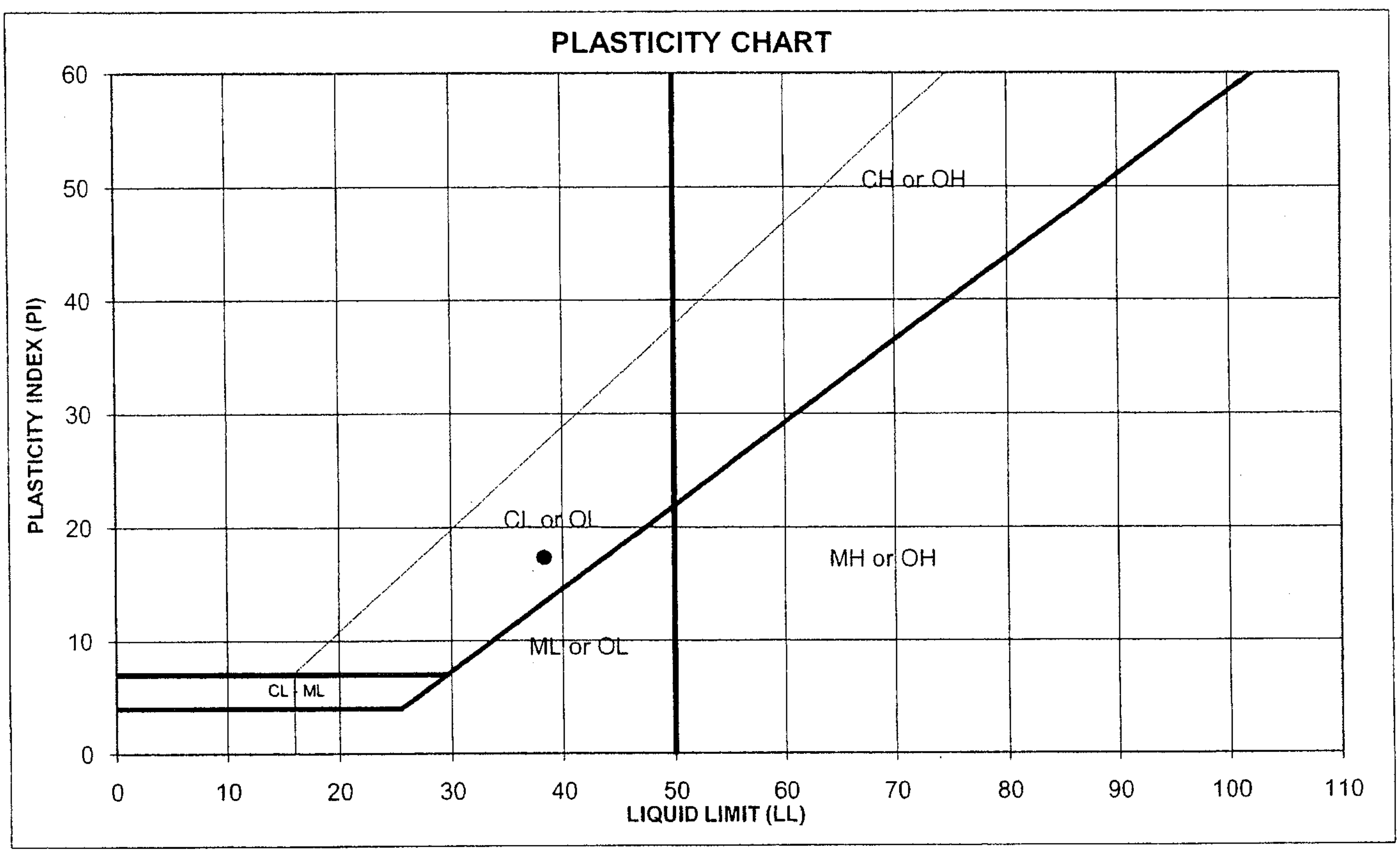
PLASTICITY INDEX (PI): 17

LIQUIDITY INDEX (LI): 0.10

NOTE:

DESCRIPTION: Olive Brown and Gray, SILTY CLAY, little coarse to fine sand.

USCS: (CL)



TECH	TJ
DATE	8/27/09
CHECK	DA
REVIEW	[signature]

Golder Associates Inc.

WATER CONTENT DETERMINATION
ASTM D 2216

PROJECT TITLE	MEDOT/ELLSWORTH RAIL TRAIL/ME
PROJECT NUMBER	093-87156
REMARKS	

Sample Type	Jar				
Borehole Number	B-1A	-	-	-	-
Sample Number	1D	-	-	-	-
Depth of Sample (ft)	0.0-2.0'	-	-	-	-
Tare Number	-	-	-	-	-
Weight of Wet Soil + Tare (gm)	107.25				
Weight of Dry Soil + Tare (gm)	74.87				
Weight of Tare (gm)	8.26				
Weight of Water (gm)	32.38				
Weight of Dry Soil (gm)	66.61				
Water Content (%)	48.61				

Sample Type					
Borehole Number					
Sample Number					
Depth of Sample (ft)					
Tare Number					
Weight of Wet Soil + Tare (gm)					
Weight of Dry Soil + Tare (gm)					
Weight of Tare (gm)					
Weight of Water (gm)					
Weight of Dry Soil (gm)					
Water Content (%)					

Sample Type					
Borehole Number					
Sample Number					
Depth of Sample (ft)					
Tare Number					
Weight of Wet Soil + Tare (gm)					
Weight of Dry Soil + Tare (gm)					
Weight of Tare (gm)					
Weight of Water (gm)					
Weight of Dry Soil (gm)					
Water Content (%)					

TECH	TJ
DATE	8/27/09
CHECK	DA
REVIEW	[illegible]

ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: MEDOT/ELLSWORTH RAIL TRAIL/ME
PROJECT NUMBER: 093-87156
SAMPLE ID: B-1A 2DB SAMPLE DEPTH: 2.0-4.0'
SAMPLE TYPE: Jar

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION		NATURAL MOISTURE
Number of Blows				22	22	
Weight of Wet Soil & Tare (gm)	22.84	22.55	22.92	22.92	22.46	100.35
Weight of Dry Soil & Tare (gm)	20.81	20.62	20.90	17.84	17.47	90.64
Weight of Tare (gm)	11.75	11.89	11.87	4.27	4.32	52.01
Weight of Water (gm)	2.03	1.93	2.02	5.08	4.99	9.71
Weight of Dry Soil (gm)	9.06	8.73	9.03	13.57	13.15	38.63
Water Content %	22.41	22.11	22.37	37.44	37.95	25.14

	TRIAL 1	TRIAL 2
BLOWS:	22	22
K VALUE:	0.985	0.985

PLASTIC LIMIT (PL): 22

LIQUID LIMIT (LL): 37

PLASTICITY INDEX (PI): 15

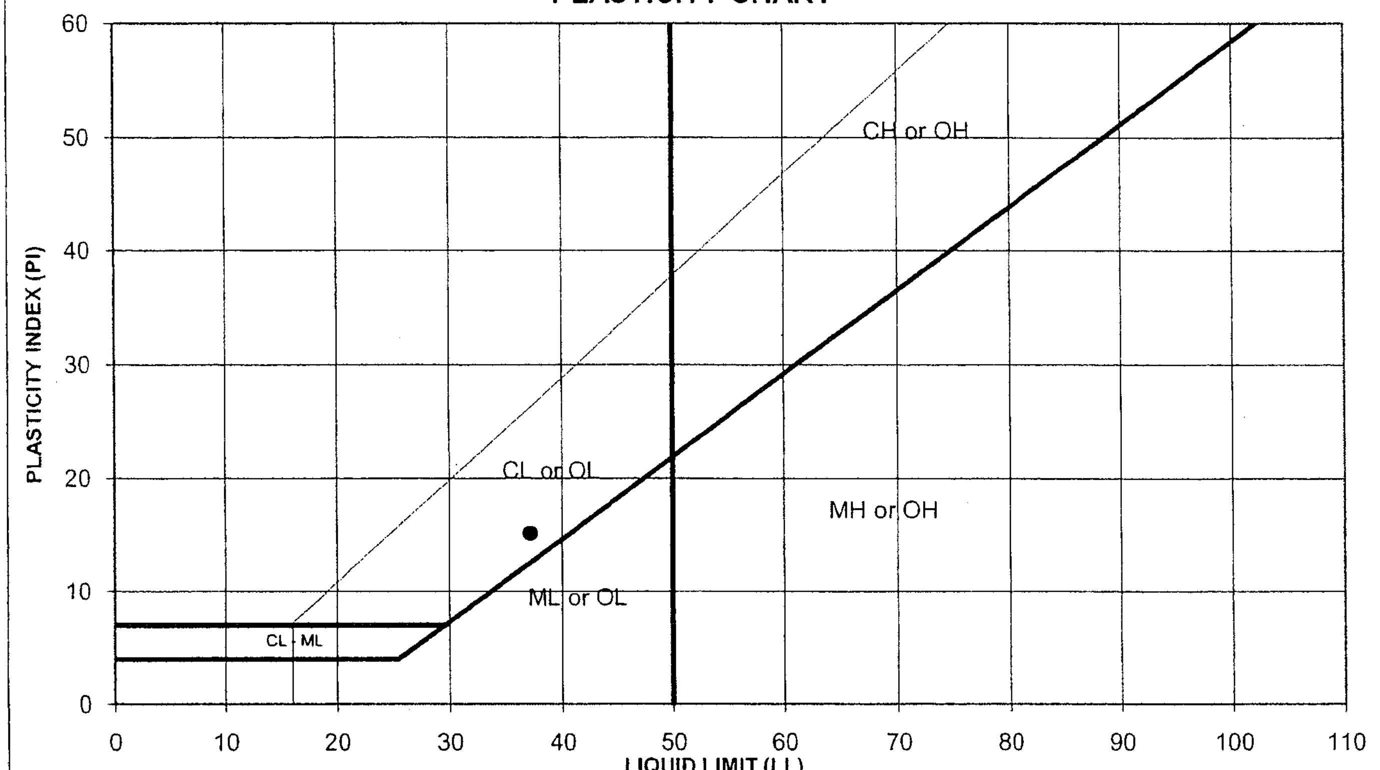
LIQUIDITY INDEX (LI): 0.19

NOTE:

DESCRIPTION: Brownish Gray, SILTY CLAY, little coarse to fine sand.

USCS: (CL)

PLASTICITY CHART



TECH	TJ
DATE	8/27/09
CHECK	DA
REVIEW	

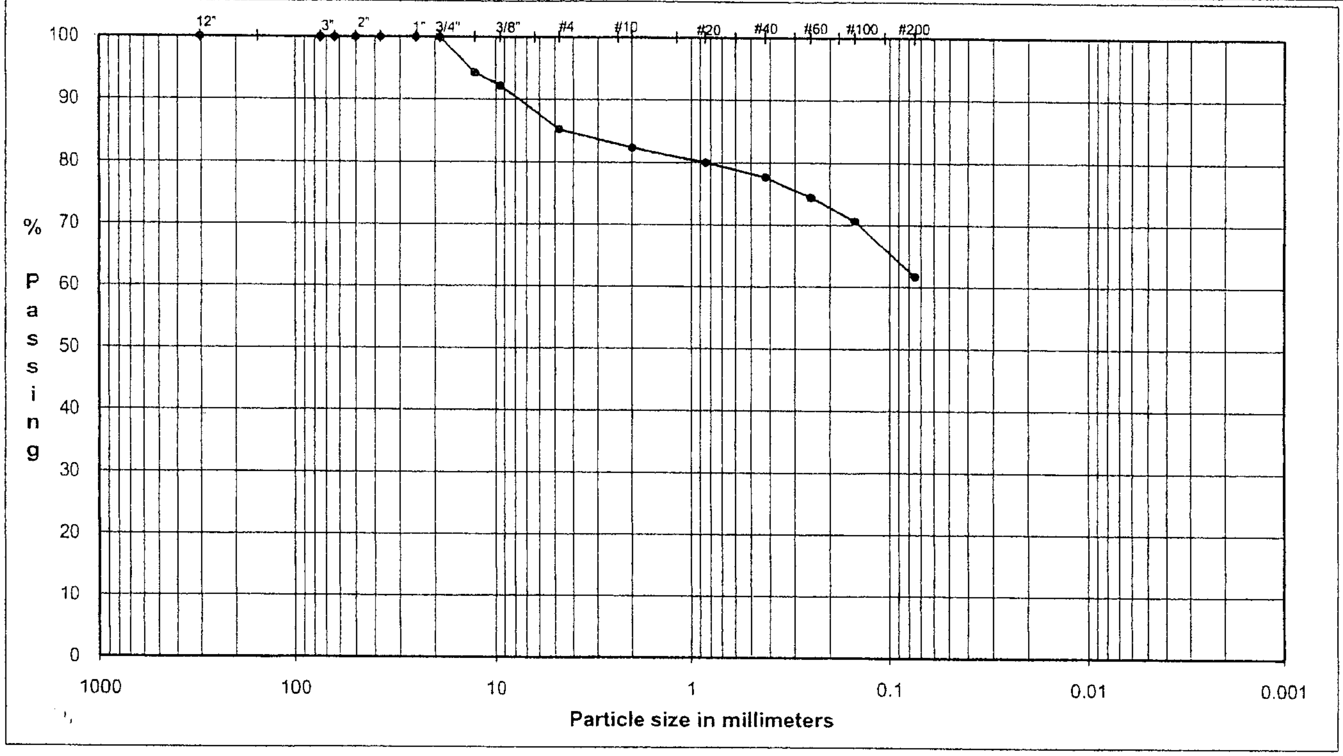
Golder Associates Inc.

AUGUST 2009 093-87156

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

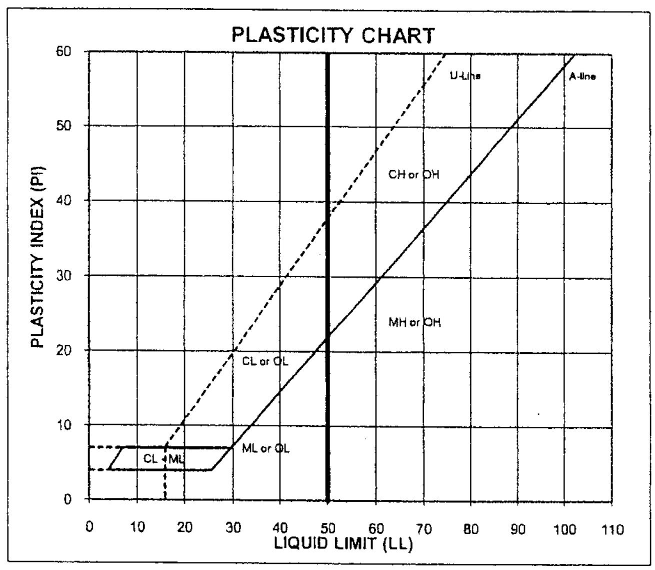
PROJECT NAME: MEDOT/ELLSWORTH RAIL TRAIL/ME
SAMPLE ID: B-2 1D Depth: 0.0-2.0'
TYPE: Jar



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.00
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.00
0.50"	12.7	94.3		
0.375"	9.5	92.2		
#4	4.8	85.2	Fine Gravel	14.77
#10	2.00	82.3	Coarse Sand	2.90
#20	0.85	80.1		
#40	0.43	77.7	Medium Sand	4.64
#60	0.25	74.5		
#100	0.15	70.6		
#200	0.075	61.7	Fine Sand	16.02
			Fines	61.67



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
38.0				

DESCRIPTION: Grayish Brown, SILTY CLAY, some coarse to fine sand, some fine gravel.

USCS: (CL)

LL (oven-dried):
<0.75 = ORGANIC (OL/OH):

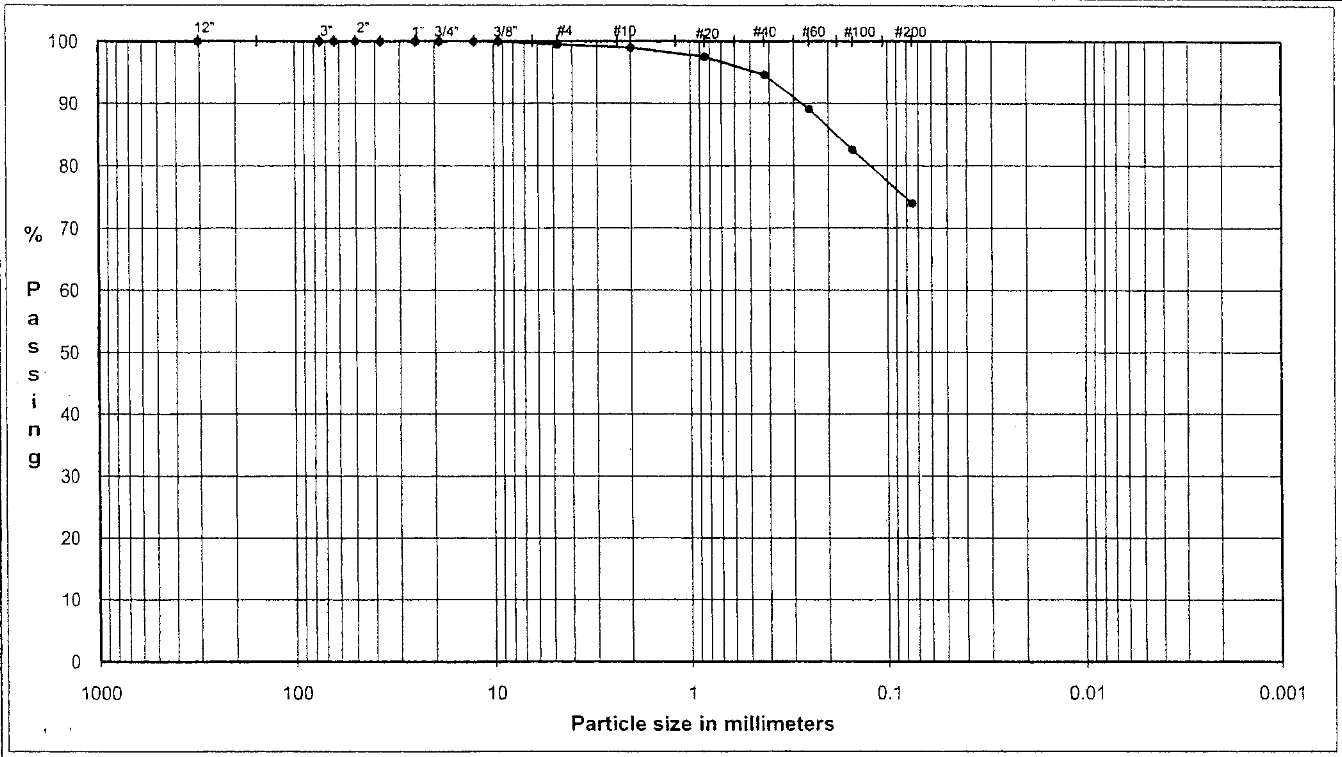
TECH	TJ
DATE	8/27/09
CHECK	DA
REVIEW	[signature]

NOTE: Insufficient sample received to perform in accordance with ASTM Standards

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

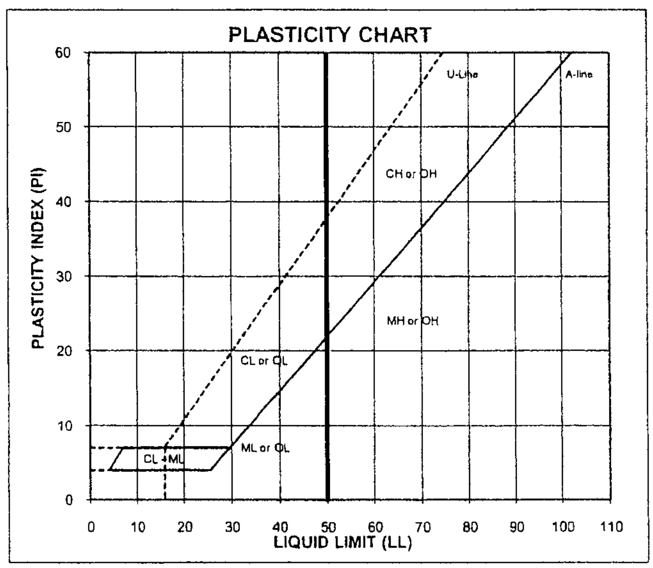
PROJECT NAME: MEDOT/ELLSWORTH RAIL TRAIL/ME
SAMPLE ID: B-2 2D Depth: 2.0-4.0'
TYPE: Jar



	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.00
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.00
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	99.5	Fine Gravel	0.52
#10	2.00	99.0	Coarse Sand	0.49
#20	0.85	97.6		
#40	0.43	94.6	Medium Sand	4.35
#60	0.25	89.1		
#100	0.15	82.5		
#200	0.075	73.9	Fine Sand	20.70
			Fines	73.95



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
21.1				

DESCRIPTION: Grayish Brown, SILTY CLAY, some medium to fine sand, trace fine gravel.

USCS: (CL)

LL (oven-dried)
< 0.75 = ORGANIC (OL/OH)

TECH	TJ
DATE	8/27/09
CHECK	JA
REVIEW	[signature]

ATTERBERG LIMITS

ASTM D 4318

PROJECT NAME: MEDOT/ELLSWORTH RAIL TRAIL/ME
PROJECT NUMBER: 093-87156
SAMPLE ID: B-2 3D SAMPLE DEPTH: 4.0-6.0'
SAMPLE TYPE: Jar

SAMPLE PREPARATION

Wet or Dry: Dry

Minus #40 Sieve: Yes

	PLASTIC LIMIT DETERMINATION			LIQUID LIMIT DETERMINATION	
Number of Blows				22	22
Weight of Wet Soil & Tare (gm)	23.81	23.62	23.48	24.70	24.80
Weight of Dry Soil & Tare (gm)	21.51	21.35	21.24	19.24	19.32
Weight of Tare (gm)	11.41	11.43	11.37	6.69	6.60
Weight of Water (gm)	2.30	2.27	2.24	5.46	5.48
Weight of Dry Soil (gm)	10.10	9.92	9.87	12.55	12.72
Water Content %	22.77	22.88	22.70	43.51	43.08

	TRIAL 1	TRIAL 2
BLOWS:	22	22
K VALUE:	0.985	0.985

NATURAL MOISTURE
85.77
76.03
41.30
9.74
34.73
28.04

PLASTIC LIMIT (PL): 23

LIQUID LIMIT (LL): 43

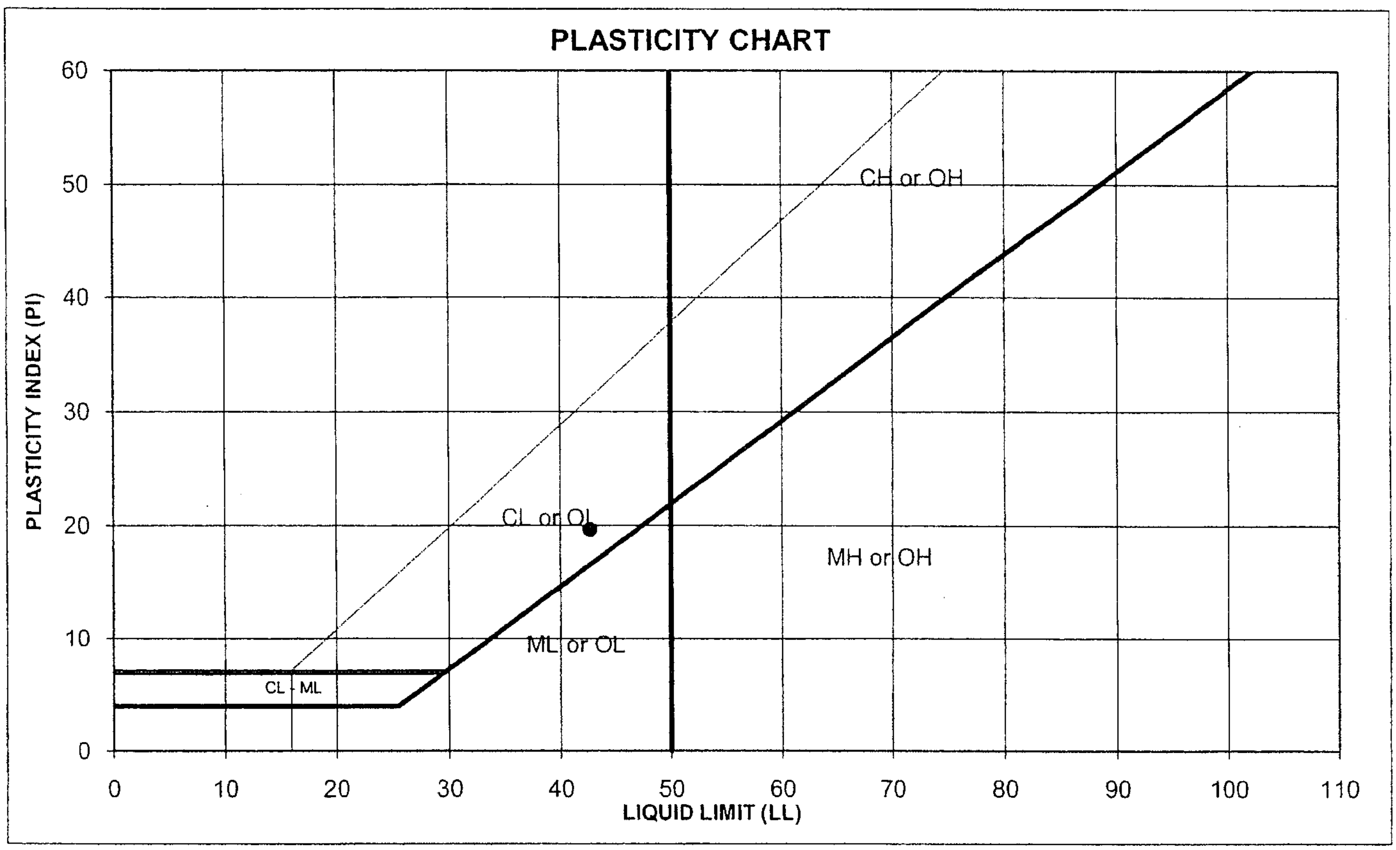
PLASTICITY INDEX (PI): 20

LIQUIDITY INDEX (LI): 0.27

NOTE:

DESCRIPTION: Grayish Brown, SILTY CLAY, some coarse to fine sand.

USCS: (CL)



TECH	TJ
DATE	8/27/09
CHECK	DA
REVIEW	[illegible]