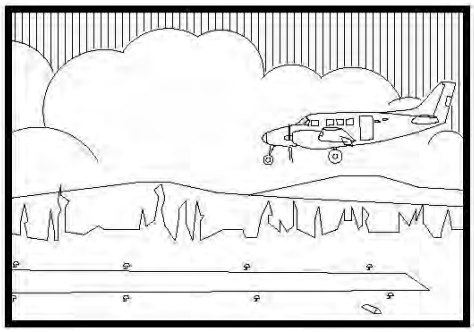
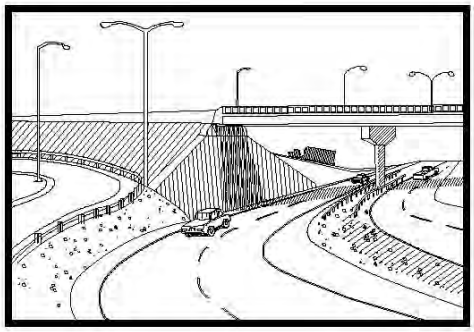
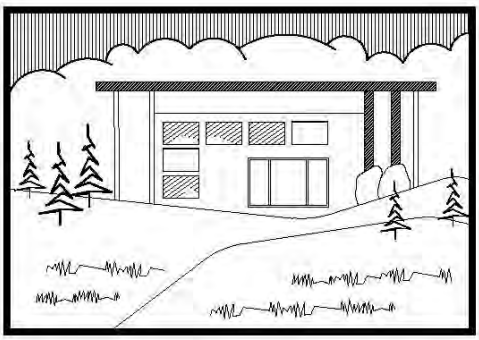
DESIGN STUDY REPORT

Old Nenana / Ester Hill Rehabilitation

Z604550000/0002257







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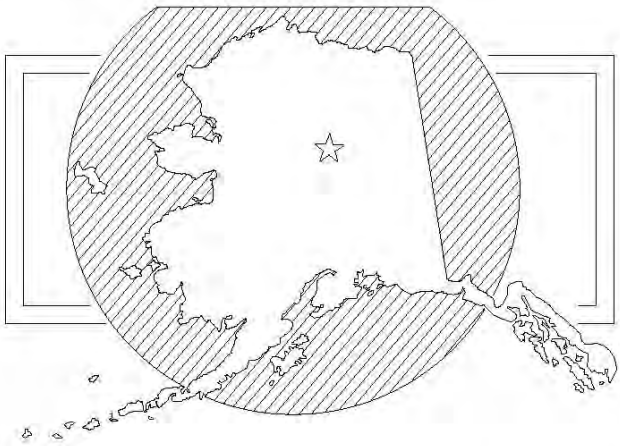
Department of Transportation and Public Facilities



NORTHERN REGION

December 2015

DESIGN APPROVAL

OLD NENANA / ESTER HILL REHABILITATION

PROJECT NO. Z604550000/0002257

Requested by:

12/29/2015

Lauren M. Little, P.E.
Engineering Manager
Northern Region

Date

Design Approval Granted:

1/6/2016

Ryan F. Anderson, P.E.
Preconstruction Engineer
Northern Region

Date

Distribution: DSR Distribution Memo Recipients
Michael Cain, Northern Region Area Engineer, FHWA
Senator John Coghill
Representative David Guttenberg
Mayor Karl Kassel, Fairbanks North Star Borough
Kellen Spillman, FNSB Planner, Fairbanks North Star Borough

DESIGN STUDY REPORT
FOR

OLD NENANA / ESTER HILL REHABILITATION

PROJECT NO. Z604550000/0002257

PREPARED BY: Jeffrey M. Fuglestad, P.E.

ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
NORTHERN REGION DESIGN AND ENGINEERING SERVICES
DECEMBER, 2015

OLD NENANA / ESTER HILL REHABILITATION
PROJECT NO. Z604550000/0002257

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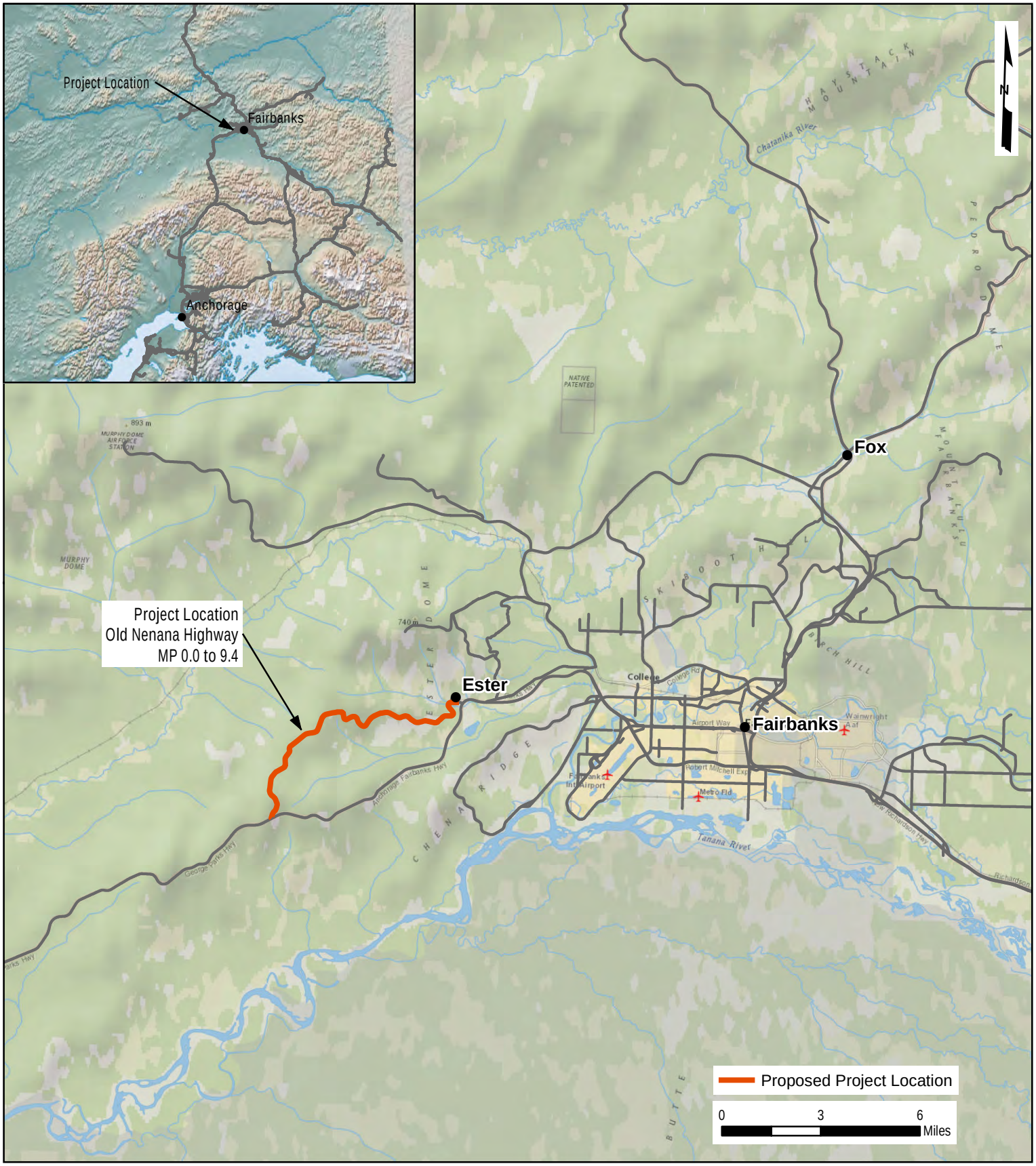
INTRODUCTION/HISTORY

The Alaska Department of Transportation and Public Facilities (DOT&PF), in cooperation with the Alaska Division of Federal Highway Administration (FHWA), has identified approximately 9.4 miles of the Old Nenana Highway as a Resurfacing, Restoration, and Rehabilitation (3R) priority that needs improvements in order to adequately accommodate increased traffic volumes, reduce maintenance costs, and improve safety of the facility.

The project begins at milepoint 0.0 (Old Nenana Highway/Parks Highway intersection) and ends at milepoint 9.47 (Ester Community Park approach) near Ester, Alaska. The existing roadway was originally constructed in 1956, as a portion of the Parks Highway system between Anchorage and Fairbanks. After the realignment of the Parks Highway in 1973, the Old Nenana Highway continued to serve local use as a rural minor/major collector. See Figure 1 - Location and Vicinity Map.

The project corridor has remained largely unimproved since the original construction. The existing paved surface, roadside ditches, and drainage culverts are in poor or failing condition, requiring extensive annual maintenance. In addition, narrow or non-existent shoulders within the project corridor are a safety concern for bicyclists and pedestrians.



Sections 9,10, 11, 12, 16, 17, 20, 29, 32, and Tract B, T. 1S, R 3W, Sections 7 and 8, T 1S, R 2W, Fairbanks Meridian
USGS Quadrangle Fairbanks D3

Old Nenana/Ester Hill Rehabilitation
Project No.: 60455/STP-0002(257)
Alaska Department of Transportation & Public Facilities

Figure 1
Location and Vicinity Map

PROJECT DESCRIPTION

The Old Nenana Highway primarily serves local traffic and commuters. The highway is classified as a Minor Collector from the beginning of the project at milepoint 0.0 to the intersection with Ester Creek Drive at milepoint 8.944, and continues on as a Major Collector to the intersection with the Parks Highway at milepoint 9.47. The posted speed limit is 55 miles per hour (mph) from milepoint 0.0 to milepoint 5.735, and 45 mph from milepoint 5.735 to milepoint 9.47. There are reduced speed warning signs at some of the sharper horizontal curves. The terrain is generally mountainous with grades ranging from +/-0.2% to +/-7.5%.

The original highway embankment was constructed in 1956 under project F-037(16) as a two-lane roadway. The existing paved surface is generally 24 feet wide with 11-foot lanes and 1-foot shoulders, with some segments having 12-foot lanes and 0-foot shoulders. The existing embankment fill slopes vary from 1.5H:1V to 3H:1V, with ditch backslopes varying from 1H:1V to 2H:1V. The steeper fill slopes generally occur at high embankment fill locations and are mostly un-shielded. Slope shielding is provided by existing guardrail at a separated turnout near milepoint 5.5 and at the inside of a curve at Ester Creek Drive.

Drainage is provided by roadside ditches along the highway with driveway culverts located at approaches and crossing culverts located at natural low points. The existing ditches are mostly in-filled with long-term sediment deposits and are performing poorly, or are non-functioning. Many of the existing driveway and crossing culverts are in poor condition, have crushed ends, or are filled with debris. The highway crosses one named stream at Ester Creek, near Ester Creek Drive.

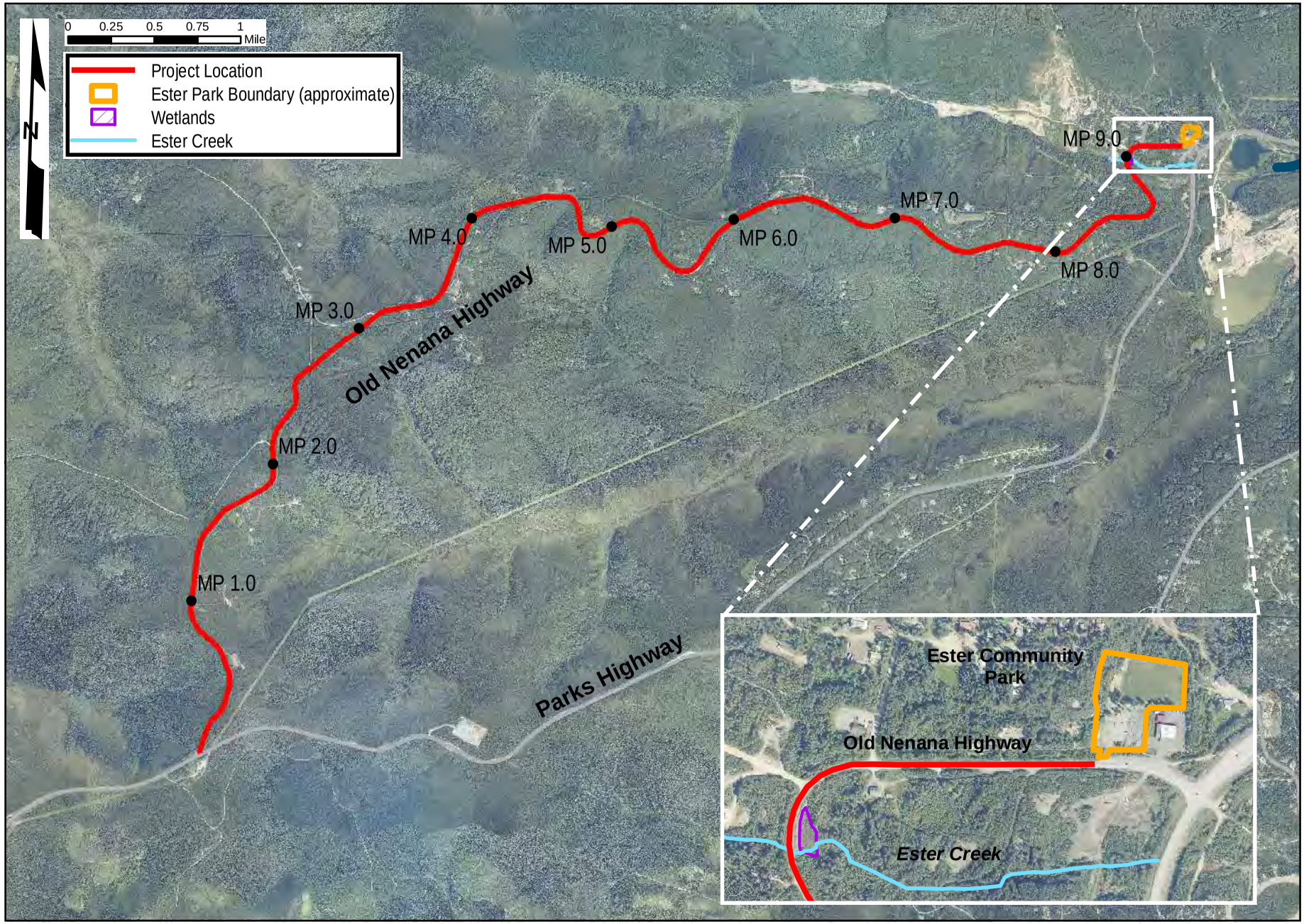
There are 71 residential and public approaches that provide access to the adjacent properties and subdivisions. All access is at-grade and is stop/yield controlled. The adjacent land use is primarily rural residential. Many of the residential and public approaches do not meet current design standards for new construction.

The purpose of this project is to restore the structural integrity and extend the service life of the existing roadway, improve roadway safety, and reduce maintenance costs.

Project improvements include:

- Repaving, including rebuilding the embankment in failing sections
- Shoulder widening
- Reconstructing and paving approaches
- Replacing/updating guardrail and end terminals
- Tree and brush clearing for the new embankment slopes and where needed to remove sight distance restrictions
- Rehabilitating and reconstructing drainage ditches
- Replacing, repairing, and adding culverts
- Upgrading mailboxes, signing, and striping
- Extending existing pathway from Ester Community Park approach to Village Road

The total project length is 9.47 miles. See Figure 2 - Proposed Project.



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Old Nenana/ Ester Hill Rehabilitation
Project No. (State/Federal): 60455/STP-0002(257)
Alaska Department of Transportation & Public Facilities

Figure 2
Proposed Project

DESIGN STANDARDS

The design standards followed for this project are:

- *A Policy on the Geometric Design of Highways and Streets* (PGDHS), 2001, American Association of State Highway and Transportation Officials (AASHTO)
- *Alaska DOT&PF Highway Preconstruction Manual* (PCM), 2005, updated November 2013, State of Alaska, Department of Transportation and Public Facilities
- *Alaska Flexible Pavement Design Manual,* 2004, ADOT&PF, and associated software
- *Alaska Traffic Manual* (ATM), 2012, ADOT&PF
- *Roadside Design Guide,* 3rd edition, 2002, AASHTO

The design designations and design criteria for this project are provided in Appendix A.

DESIGN EXCEPTIONS AND DESIGN WAIVERS

No design exceptions or design waivers are requested.

DESIGN ALTERNATIVES

There are no alternatives since the environmental document.

PREFERRED DESIGN ALTERNATIVE

The preferred design alternative consists of improvements to the existing roadway as recommended from the 3R analysis and the incorporation of 2H:1V fill slopes outside of the clear zone where feasible.

3R ANALYSIS

A Resurfacing, Restoration and Rehabilitation (3R) analysis was completed for the Old Nenana/Ester Hill project corridor. A historical accident period from 2008-2012 was examined to identify related roadway deficiencies. No accident clusters were noted.

Lane and shoulder widths, sideslopes and clear zones, general alignment, (horizontal/vertical), and safety improvements (intersection, driveway, and passing related accidents) were analyzed in accordance with the PCM. The analysis resulted in the following recommendations:

- Improve the radius of one horizontal curve (Station 25+54) to new construction standards
- Improve superelevation rates to new construction standards
- Improve superelevation transition lengths to new construction standards where feasible
- Improve sag curves to new construction standards where feasible
- Pave all shoulders to eliminate pavement edge drop
- Provide additional clearing or other geometric improvements at approaches to improve sight distance
- Improve intersection and driveway geometry to new construction standards where feasible

- Optimize placement of existing regulatory speed and curve advisory signs to help mitigate sight distance limitations at the intersection of Ester Creek Drive

Cost-effective analyses were performed for three horizontal curves where accidents related to insufficient curve radii or sight distance had occurred. Based on the results of these analyses, radius improvement was recommended at one curve (Station 25+54). Improving the radii and/or sight distance for the other two curves (Station 112+76 and Station 488+56) was not found to be cost-effective. The complete 3R analysis is included in Appendix D.

Lane and shoulder widths did not warrant improvement based on the 3R analysis, however they are being modified to accommodate bicycles based on the results of public involvement. Clear zone will be constructed where feasible due to the widening to improve constructability.

Full discussion of horizontal and vertical alignment elements is included in the Horizontal/Vertical Alignment section.

TRAFFIC ANALYSIS

The Old Nenana Highway is an important transportation link that primarily serves local traffic and commuters. The highway is classified as a Minor Collector from the beginning of the project at milepoint 0.0 to the intersection with Ester Creek Drive at milepoint 8.944, and continues on as a Major Collector to the intersection with the Parks Highway at milepoint 9.47. The present year (2015) Average Annual Daily Traffic (AADT) for the Minor Collector segment is 450 vehicles per day, and is projected to be 650 vehicles per day in the design year (2040). For the Major Collector segment, the present year AADT is 1,489 vehicles per day, and is projected to be 2,150 vehicles per day in the design year.

A preliminary speed study was performed that identified the locations of the existing speed limit signs, the speed each existing curve is designed for, and a field measurement study. The preliminary speed study indicated that the posted speeds generally matched the 85th percentile. The study is included in Appendix C.

A traffic report was not prepared for this project. Based on the AADT's, the two-lane facility with widened shoulders should provide adequate capacity and safety. No additional lanes or signals will be added.

HORIZONTAL/VERTICAL ALIGNMENT

Horizontal Alignment

There are 45 horizontal curves on the roadway. The existing horizontal alignment information pertaining to this analysis and aerial views of the project corridor are provided in the 3R Analysis, Appendix D. The horizontal alignment was reviewed for all 3R geometric design standards in accordance with PCM 1160.3.3.

Twenty-eight of the 45 curves have radii less than the minimum required for new construction. Two of these curves occur in a segment of the project between Station 12+75 and Station 313+00, where the current northbound posted speed is 55 mph. At this speed, these curves

require radius improvement consideration according to PCM 1160.3.3. As a part of the 3R analysis, the cost effectiveness of improving the current radii of these curves to new construction standards was analyzed. Based on the results of this analysis, the horizontal curve radius at Station 25+54 should be improved. For the horizontal curve at Station 112+76, geometric improvements are not cost effective and therefore other safety improvement measures should be considered. It is recommended that curve advisory signs with supplemental speed plaques be installed in this location. At a reduced speed, the existing radii meet the standard for new construction and require no other improvements.

There are 34 horizontal curves with lengths that do not meet the current standards for new construction, five of which have associated accidents. Since curve length generally controls driver comfort and roadway appearance rather than safety, the existing curve lengths may remain. All existing horizontal curves that do not meet the current minimum design requirements for new construction are listed in the table below.

HORIZONTAL CURVES

PI STA	Existing Radius (ft)	Posted Speed (mph)	New Const. Radius	Meets New Const. Radius	Existing Length	New Const. Length	Meets New Const. Length
11+24	191	55	1,065	NO	112.9	825.0	NO
19+66	917	55	1,065	NO	401.4	825.0	NO
25+54	996	55	1,065	NO	455.8	825.0	NO
33+42	918	55	1,065	NO	137.1	825.0	NO
35+33	481	55	1,065	NO	241.7	825.0	NO
45+43	996	55	1,065	NO	521.5	825.0	NO
57+45	1,027	55	1,065	NO	1,020.5	825.0	YES
81+76	1,002	55	1,065	NO	550.0	825.0	NO
93+41	996	55	1,065	NO	391.3	825.0	NO
108+74	533	55	1,065	NO	229.7	825.0	NO
110+82	449	55	1,065	NO	187.1	825.0	NO
112+76	819	55	1,065	NO	202.5	825.0	NO
120+81	3,820	55	1,065	YES	212.2	825.0	NO
125+24	996	55	1,065	NO	650.9	825.0	NO
135+27	637	55	1,065	NO	238.1	825.0	NO
137+77	477	55	1,065	NO	258.3	825.0	NO
143+33	509	55	1,065	NO	578.3	825.0	NO
175+29	1,910	55	1,065	YES	249.1	825.0	NO
178+33	955	55	1,065	NO	354.5	825.0	NO
195+17	819	55	1,065	NO	868.6	825.0	YES
223+34	1,034	55	1,065	NO	1,051.6	825.0	YES
244+54	1,146	55	1,065	YES	221.2	525.0	NO
254+45	370	55	1,065	NO	531.7	525.0	YES
267+43	364	55	1,065	NO	691.3	525.0	YES
284+95	643	55	1,065	NO	1,131.8	600.0	YES
292+95	1,348	55	1,065	YES	565.5	600.0	NO
299+09	1,470	55	1,065	YES	545.0	600.0	NO
306+53	511	55	1,065	NO	765.4	600.0	YES
319+57	1,910	45	660	YES	533.5	675.0	NO
326+66	1,677	45	660	YES	513.5	675.0	NO
339+48	1,432	45	660	YES	400.1	675.0	NO
339+48	1,432	45	660	YES	657.7	675.0	NO
378+51	1,513	45	660	YES	162.9	675.0	NO
392+46	2,062	45	660	YES	623.2	675.0	NO
417+15	917	45	660	YES	428.8	675.0	NO
435+59	637	45	660	NO	623.2	675.0	NO

451+52	756	45	660	YES	576.9	675.0	NO
470+86	402	45	660	NO	914.2	525.0	YES
480+42	1,146	45	660	YES	294.5	525.0	NO
483+06	559	45	660	NO	232.8	525.0	NO
488+56	395	45	660	NO	633.5	675.0	NO
507+10	603	45	660	NO	363.9	675.0	NO

Vertical Alignment

The existing vertical alignment generally follows the surrounding terrain. A best fit vertical alignment was created for the existing profile based on surveyed topography. There are 48 vertical curves and 9 grade breaks between 0% and 5.1% along the roadway. Of those vertical curves, 24 are crest curves and 24 are sag curves. The vertical alignment was reviewed for the all 3R geometric design standards in accordance with PCM 1160.3.4 and 1160.3.11.

A review of the 24 crest vertical curves revealed that 11 crest curves do not meet the current standards for new construction. Under the 3R analysis procedure, existing crest vertical curvature may remain if the actual number of accidents on the crest curve for the previous 3 to 5 years is less than the number of predicted accidents. Of the 11 curves which do not meet current standards, none have related accidents within the five year historical accident period. Two crest curves have related accidents, but already meet new construction standards and therefore no improvements are required. All existing crest vertical curves that do not meet the current minimum design requirements for new construction are listed in the table below.

PVI Station	Existing A (%)	Existing Curve Type	Existing Length (ft)	Existing K Value	New Const. K value	Meets New Const. K Value
54+75	-5.41	CREST	400	74	114	NO
69+25	-3.97	CREST	400	101	114	NO
85+25	-5.03	CREST	300	60	115	NO
99+25	-4.20	CREST	400	95	114	NO
149+50	-8.33	CREST	600	72	114	NO
184+00	-4.80	CREST	400	83	114	NO
190+00	-3.56	CREST	400	112	114	NO
200+75	-7.07	CREST	500	71	114	NO
235+50	-6.87	CREST	500	73	114	NO
279+00	-4.32	CREST	400	93	114	NO
308+00	-9.34	CREST	700	75	114	NO

Based on the results of the 3R analysis, the preferred alternative does not include significant alignment alterations. One horizontal curve radius will be improved to meet new construction standards. Improvements for all other horizontal curves with associated accidents were not found to be cost-effective under the 3R analysis. No deficient vertical crest curves were found to have related accidents. Minor improvements will be made wherever feasible to improve the horizontal and vertical geometry. Minor centerline shifts were utilized to optimize cut/fill quantities and reduce the project footprint. Preliminary plan and profile sheets are included in Appendix F:

TYPICAL SECTION(S)

The preferred alternative for Old Nenana Highway will consist of two 11-foot lanes, one lane in each direction, with 4-foot shoulders. The increase in shoulder widths will provide safer conditions for bicycle and pedestrian traffic along the roadway. Foreslopes from the shoulders to the edge of the clear zone will be 4H:1V. The clear zone extends 16 feet beyond the edge of

pavement in either direction (20 feet from the edge of traveled way), to meet current new construction standards. Typical fill slopes outside the clear zone will be 2H:1V. See Figure 3.

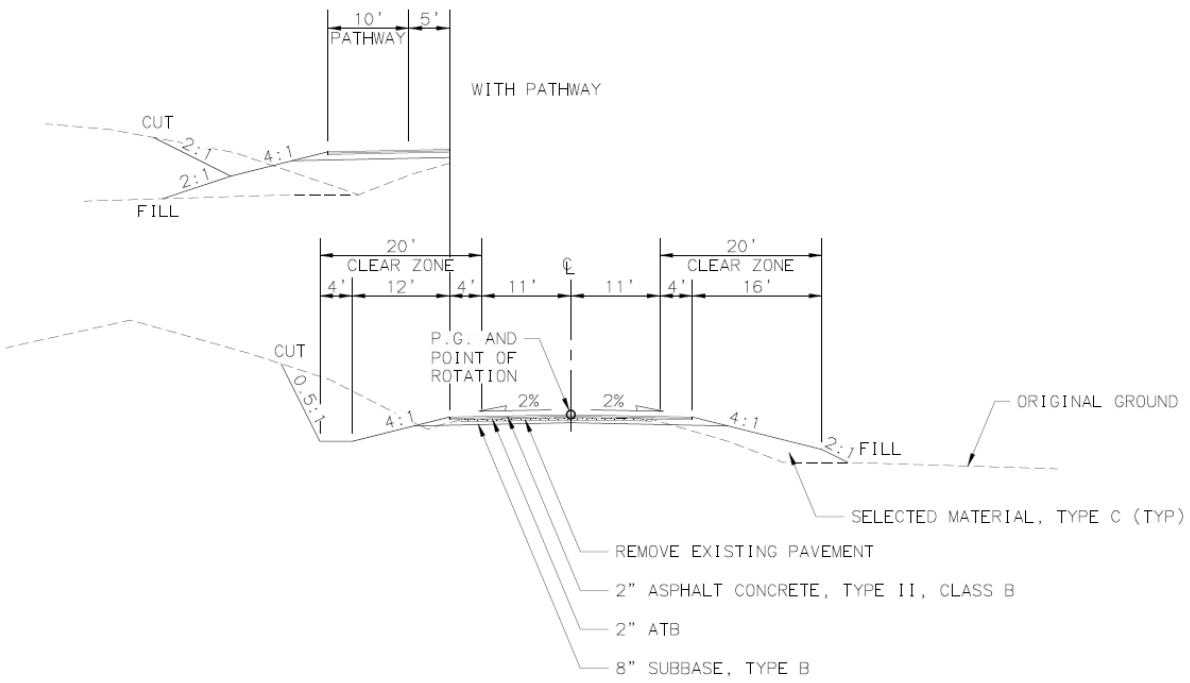


Figure 3. Old Nenana Highway Typical Section

PAVEMENT DESIGN

The selected pavement design was generated using the Alaska Flexible Pavement Manual and associated software. The design life of the pavement is 20 years. The recommended pavement design is composed of 2 inches of hot mix asphalt concrete, 2 inches of asphalt-treated base, and 8 inches of subbase. See Appendix E for the pavement design and engineering calculations.

PRELIMINARY BRIDGE LAYOUT

Not applicable. There are no bridges within the project limits.

RIGHT-OF-WAY REQUIREMENTS

The proposed improvements are contained within the existing DOT&PF right-of-way (ROW). Permanent ROW acquisition is not anticipated for this project. Temporary Construction Permits will be obtained for driveway reconstruction where applicable.

MAINTENANCE CONSIDERATIONS

A site visit with DOT&PF Maintenance & Operations (M&O) was conducted during the initial project evaluation. The existing paved surface, roadside ditches, and drainage culverts are in

poor or failing condition. M&O expressed concerns regarding the lack of snow storage due to the existing drainage ditches being in-filled with long-term sediment deposits throughout the majority of the project corridor. The roadway has historically required significant annual patching to maintain grade. Restoring the structural integrity of the roadway embankment and reconstructing the roadside drainage ditches will significantly reduce the annual maintenance costs due to the poor condition of the existing paved surface and roadside drainage.

There is an existing separated turnout near milepoint 5.5 where M&O routinely clears snow. The turnout width varies from 36 feet to 60 feet. M&O requested that the width be minimized to reduce the cost of the snow removal effort through the turnout. Turnout configuration will be addressed during detailed design.

The estimated existing lane-miles of paved surface (including paved approaches) within the project limit is 20.0 miles. The additional pavement width of the preferred alternative will increase the paved surface (including paved approaches and extended pathway) to an estimated 24.5 lane-miles, and the additional pavement area may increase some routine maintenance costs. However, the embankment reconstruction, pavement rehabilitation, drainage, and snow storage improvements should decrease overall maintenance costs, and provide better performance of the roadway.

MATERIAL SOURCES

The majority of borrow (Selected Material, Type C) for the project will be generated from the excavated material. Subbase material and paving products will likely come from commercial sources in the area.

UTILITY RELOCATION & COORDINATION

Existing utilities consist of overhead electrical and telephone along the corridor. The feed for both utilities starts at the end of the project and feeds to the beginning of the project. The facilities parallel the highway starting at approximate station 62+00 RT, in a separate corridor separated by a swath of trees. The electrical and telephone facilities cross the corridor in 15 locations. One of these crossings does not meet the minimum permitting requirement per 17 ACC 15.201 of 18 feet, and will require adjustment. Four additional crossings will be impacted by changes in the vertical profile and will require adjustment. If the vertical profile is revised as the design develops, other crossings may be impacted. A draft Utility Conflict Report is included in Appendix G.

ACCESS CONTROL FEATURES

No access control features are included. The Old Nenana Highway is not an access controlled facility.

PEDESTRIAN/BICYCLE (ADA) PROVISIONS

Pedestrians and bicycles currently use the existing road shoulder, which varies from 2 feet to 0 feet throughout the corridor depending on fog-line striping. The preferred alternative includes consistent 4-foot shoulders throughout the project corridor to accommodate bicycle and

pedestrian traffic. There is an existing separated (gore striped) multi-use pathway from approximately milepoint 9.42 (Ester Community Park approach) to milepoint 9.47 (Parks Highway intersection). This pathway will be extended down station to approximately milepoint 9.11 (Village Road).

SAFETY IMPROVEMENTS

This project involves the following safety improvements:

- Upgrade a sub-standard horizontal curve at Station 25+54
- Improve shoulder widths for bicycle and pedestrian traffic
- Improve driveway skew and grade where feasible
- Improve approach sight distances where feasible
- Replace/update guardrail and end terminals
- Provide clear zone where feasible

The widening of lane and shoulder widths and improvement of roadway and approach geometry where feasible will improve safety and operations throughout the project corridor. In addition, a formal paved turnout would improve safety for the area near Calypso Farm and Ecology Center, where school buses stop to load and unload passengers. Mailboxes will be evaluated along the corridor and pullouts will be considered where there are large clusters of mailboxes.

INTELLIGENT TRANSPORTATION SYSTEM FEATURES

Not applicable. There are no intelligent transportation system features within the project limits.

DRAINAGE

The Old Nenana Highway cross-slope sheds water to vegetated ditches, where the water infiltrates the ground or flows to the natural low points. The overall drainage is generally from the east to the west from milepoint 0.0 to milepoint 4.0, and from north to south from milepoint 4.0 to milepoint 9.4. Proposed improvements for this project are not anticipated to change the existing general drainage patterns.

Vegetation and long-term sediment deposits have reduced the depth and effectiveness of the ditches. Ditches will be reconstructed or re-graded to improve drainage and snow storage. Crossing, driveway, and sidestreet culverts will be extended or replaced as necessary. Additional culverts will be added where needed. End sections will be installed on each culvert. Areas of public concern which have experienced historic flooding, such as the Calypso Farm and Ecology Center, will be addressed and improved. M&O reported no icing issues with the existing culverts and confirmed that they naturally thaw out each spring.

Two culverts are expected to exceed 36-inch diameter. These culverts are located at Station 488+94 of the Old Nenana Highway, and at Ester Creek Drive. The geometry of the two existing large diameter culverts is depicted in the table below.

Road	Station	Dia (ft)	Type	Inlet Invert El (ft)	Outlet Invert El (ft)	Length (ft)	Notes
Old Nenana Highway	488+94	5.0	CMP	633.79	630.80	127.3	Good condition
Ester Creek Drive	na	4.0	CMP	638.86	637.39	54.6	Poor Condition

SOIL CONDITIONS

A geotechnical report was completed by DOT&PF in February of 2015. The geotechnical investigation was conducted between July and September of 2013. In general, soils encountered in the area consist of sands and silt fill with varying proportions of gravel. Generally, the proportion of gravel increased along the eastern end of the Old Nenana Highway. The fill was reported to be of a soft schist origin that breaks down easily when subject to wear. Highly weathered muscovite schist bedrock was reported to be present beneath the fill along much of the alignment. The fill was reported to be highly frost susceptible, leading to frost heave and strength loss during thawing. Permafrost was not encountered during the geotechnical analysis and is not anticipated in the area.

Freezing and thawing indices are provided in the table below. Data is from the Western Regional Climate Center website using the NOAA Cooperative Stations for the 1981 to 2010 time period.

Nearest Town	Freezing Index (°F-days)	Thawing Index (°F-days)	Average length of freezing season (days)	Average length of thawing season (days)
Fairbanks Int. Airport	5057	3604	191	174

EROSION AND SEDIMENT CONTROL

The area of ground disturbance for this project will be approximately 122 acres not including materials sites. A Storm Water Pollution Prevention Plan (SWPPP) will be required. The project will be constructed primarily in uplands, with some wetland involvement at Ester Creek. Vegetation in the project area varies from spruce and aspen forest to willows and alders in the ditches and on existing slopes. The existing soils are generally well drained.

The proposed Old Nenana Highway embankment will require temporary and permanent erosion and sediment control measures. Throughout the project, ground disturbance will be minimized as practical to prevent erosion. Existing vegetation will be preserved wherever it is practical.

Temporary erosion control measures may include, but are not limited to: temporary seeding, erosion control mats, watering and/or chemical stabilization for dust control, velocity control Best Management Practices (BMP), and perimeter controls. Perimeter controls may be installed at the toe of slope to prevent excessive sedimentation to down-slope vegetation and water bodies. The preferred perimeter protection method in the project area will be vegetative buffer, with positive protection devices, such as straw wattles, at the edge of water bodies.

Seeding of finished slopes may be difficult due to the low fines and tall, steep slopes used in the project area. Use of organic overburden from the materials sites and grubbing may be used as topsoil to help establish grass where needed.

All disturbed ground will be vegetated or covered with low erodible soil (e.g. Type A borrow, riprap, ditch lining) for permanent stabilization.

The Contractor will provide a SWPPP prior to construction that follows the guidelines for the Erosion and Sediment Control Plan (ESCP).

ENVIRONMENTAL COMMITMENTS

The following environmental commitments are from the project Categorical Exclusion signed June 2, 2015.

- Complete all brush/tree clearing activities prior to May 1st to render areas unsuitable for breeding birds in order to facilitate construction during the breeding season without impacts to birds. Otherwise work may be completed after the breeding window closes around July 15th.
- Bald and/or Golden Eagle nests are not currently known to exist within the vicinity of the project. If a nest is discovered within a half mile of the project, then contact USF&WS for further assistance.
- Avoid unnecessary ground disturbance and maintain native vegetation where practicable through the use of BMPs and DOT&PF review of proposed SWPPP.
- Minimize traffic delays to the most practicable extent, and to DOT&PF approved traffic and safety plan.

The total disturbed area for this project is approximately 195 acres. The environmental document is included in Appendix B.

WORK ZONE TRAFFIC CONTROL

This project is not considered significant for traffic control per DOT&PF's Policy and Procedure 05.05.15. The Old Nenana Highway is not in a Transportation Management Area, the AADT is less than 30,000 vehicles per day, and work is not expected to fully close the highway for more than one hour at a time.

During construction of the project, traffic will be maintained on the existing highway corridor. Some portions of the work may require intermittent lane closures and/or reduction of traveled way widths. The Contractor will develop traffic control plans for the work that will be submitted to DOT&PF for approval prior to implementation.

VALUE ENGINEERING

Not applicable. This 3R project has a total value that is less than $25,000,000.

COST ESTIMATE

An itemized construction cost estimate was developed using the assumed pavement design sections and 2015 unit prices for major construction items. The cost estimate can be made available to internal DOT&PF staff. Per DOT&PF Policy & Procedure 10.02.040, detailed construction cost estimates may not be made available to the public or other interested parties.

The estimated costs for this project are as follows:

Design	$1,250,000
Utilities	$75,000
Right-of-Way	$0
Construction (Includes 15% Engineering)	$12,874,000
Total Cost of Project	$14,199,000

APPENDIX A

DESIGN CRITERIA
AND
DESIGN DESIGNATION

ALASKA DOT&PF PRECONSTRUCTION MANUAL
Chapter 11 - Design
PROJECT DESIGN CRITERIA

Project Name:	Old Nenana/Ester Hill Rehabilitation			
☐ New Construction/Reconstruction	☑ 3R	☐ PM	☐ Other:	
Project Number:	60455/0002257		☐ NHS	☑ Non NHS
Functional Classification:	Rural Minor Collector (Milepoint 0.000 - 5.735)			
Design Year:	2040	**Present ADT:**		450 (2015)
Design Year ADT:	650	**Mid Design Period ADT:**		560 (2030)
DHV:	12%	**Directional Split:**		45/55
Percent Trucks:	7%	**Equivalent Axle Loading:**		330,992
Pavement Design Year:	2036, 20-year life	**Design Vehicle:**		AASHTO WB-50
Terrain:	Mountainous	**Number of Roadways:**		1
Design Speed:	55 MPH			
Width of Traveled Way:	22-ft			
Width of Shoulders:	**Outside:**	4-ft	**Inside:**	0-ft
Cross Slope:	2%			
Superelevation Rate:	6% max.			
Minimum Radius of Curvature:	1065-ft, e=6%			
Min. K-Value for Vert. Curves:	**Sag:**	115	**Crest:**	114
Maximum Allowable Grade:	9.00%			
Minimum Allowable Grade:	0.5%			
Stopping Sight Distance:	495-ft			
Lateral Offset to Obstruction:	1.5-ft			
Vertical Clearance:	**20.5-ft Minimum Overhead Utilities**			
Bridge Width:	**Not applicable.**			
Bridge Structural Capacity:	**Not applicable.**			
Passing Sight Distance:	**1985-ft**			
Surface Treatment:	**T/W:**	**Asphalt Concrete**	**Shoulders:**	**Asphalt Concrete**
Side Slope Ratios:	**Foreslopes:**	**Varies 2:1 - 4:1**	**Backslopes:**	**Varies 0.5:1 to 6:1**
Degree of Access Control:	**Driveway/entrance regulations**			
Median Treatment:	Not applicable.			
Illumination:	Not applicable.			
Curb Usage and Type:	Not applicable.			
Bicycle Provisions:	Shoulders			
Pedestrian Provisions:	Shoulders			
Misc. Criteria:	None.			

Proposed - Designer/Consultant: _____ **Date:** 12/29/15

Endorsed - Engineering Manager: _____ **Date:** 12/29/2015

Approved - Preconstruction Engineer: _____ **Date:** 1/6/2016

Shaded criteria are commonly referred to as the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criteria marked with a "#" do not meet minimums and must have a Design Exception(s) and/or Design Waiver(s) approved. See the Design Study Report for Design Exception/Design Waiver approval(s) and approved design criteria values

ALASKA DOT&PF PRECONSTRUCTION MANUAL
Chapter 11 - Design
PROJECT DESIGN CRITERIA

Project Name:	Old Nenana/Ester Hill Rehabilitation			
☐ New Construction/Reconstruction	☑ 3R	☐ PM	☐ Other:	
Project Number:	60455/0002257		☐ NHS	☑ Non NHS
Functional Classification:	Rural Minor Collector (Milepoint 5.735 - 8.944)			
Design Year:	2040	**Present ADT:**	450 (2015)	
Design Year ADT:	650	**Mid Design Period ADT:**	560 (2030)	
DHV:	12%	**Directional Split:**	45/55	
Percent Trucks:	7%	**Equivalent Axle Loading:**	330,992	
Pavement Design Year:	2036, 20-year life	**Design Vehicle:**	AASHTO WB-50	
Terrain:	Mountainous	**Number of Roadways:**	1	
Design Speed:	45 MPH			
Width of Traveled Way:	22-ft			
Width of Shoulders:	**Outside:**	4-ft	**Inside:**	0-ft
Cross Slope:	2%			
Superelevation Rate:	6% max.			
Minimum Radius of Curvature:	660-ft, e=6%			
Min. K-Value for Vert. Curves:	**Sag:**	79	**Crest:**	61
Maximum Allowable Grade:	10.00%			
Minimum Allowable Grade:	0.5%			
Stopping Sight Distance:	360-ft			
Lateral Offset to Obstruction:	1.5-ft			
Vertical Clearance:	**20.5-ft Minimum Overhead Utilities**			
Bridge Width:	**Not applicable.**			
Bridge Structural Capacity:	**Not applicable.**			
Passing Sight Distance:	**1625-ft**			
Surface Treatment:	**T/W:**	**Asphalt Concrete**	**Shoulders:**	**Asphalt Concrete**
Side Slope Ratios:	**Foreslopes:**	**Varies 2:1 - 4:1**	**Backslopes:**	**Varies 0.5:1 to 6:1**
Degree of Access Control:	**Driveway/entrance regulations**			
Median Treatment:	Not applicable.			
Illumination:	Not applicable.			
Curb Usage and Type:	Not applicable.			
Bicycle Provisions:	Shoulders			
Pedestrian Provisions:	Shoulders			
Misc. Criteria:	None.			

Proposed - Designer/Consultant: _____ **Date:** 12/29/15

Endorsed - Engineering Manager: _____ **Date:** 12/29/2015

Approved - Preconstruction Engineer: _____ **Date:** 1/6/2016

Shaded criteria are commonly referred to as the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criteria marked with a "# " do not meet minimums and must have a Design Exception(s) and/or Design Waiver(s) approved. See the Design Study Report for Design Exception/Design Waiver approval(s) and approved design criteria values

ALASKA DOT&PF PRECONSTRUCTION MANUAL
Chapter 11 - Design
PROJECT DESIGN CRITERIA

Project Name:	Old Nenana/Ester Hill Rehabilitation			
☐ New Construction/Reconstruction	☑ 3R ☐ PM ☐ Other:			
Project Number:	60455/0002257		☐ NHS	☑ Non NHS
Functional Classification:	Rural Major Collector (Milepoint 8.944 - 9.470)			
Design Year:	2040	**Present ADT:**	1,489 (2015)	
Design Year ADT:	2,150	**Mid Design Period ADT:**	1,876 (2030)	
DHV:	12%	**Directional Split:**	45/55	
Percent Trucks:	7%	**Equivalent Axle Loading:**	330,992	
Pavement Design Year:	2036, 20-year life	**Design Vehicle:**	AASHTO WB-50	
Terrain:	Mountainous	**Number of Roadways:**	1	
Design Speed:	45 MPH			
Width of Traveled Way:	**24-ft**			
Width of Shoulders:	**Outside:**	**4-ft**	**Inside:**	**0-ft**
Cross Slope:	2%			
Superelevation Rate:	6% max.			
Minimum Radius of Curvature:	660-ft, e=6%			
Min. K-Value for Vert. Curves:	**Sag:**	**79**	**Crest:**	**61**
Maximum Allowable Grade:	10.00%			
Minimum Allowable Grade:	0.5%			
Stopping Sight Distance:	360-ft			
Lateral Offset to Obstruction:	1.5-ft			
Vertical Clearance:	**20.5-ft Minimum Overhead Utilities**			
Bridge Width:	**Not applicable.**			
Bridge Structural Capacity:	**Not applicable.**			
Passing Sight Distance:	**1625-ft**			
Surface Treatment:	**T/W:**	**Asphalt Concrete**	**Shoulders:**	**Asphalt Concrete**
Side Slope Ratios:	**Foreslopes:**	**Varies 2:1 - 4:1**	**Backslopes:**	**Varies 0.5:1 to 6:1**
Degree of Access Control:	**Driveway/entrance regulations**			
Median Treatment:	Not applicable.			
Illumination:	Not applicable.			
Curb Usage and Type:	Not applicable.			
Bicycle Provisions:	Shoulders			
Pedestrian Provisions:	Shoulders			
Misc. Criteria:	None.			

Proposed - Designer/Consultant: _____ Date: 12/29/15

Endorsed - Engineering Manager: _____ Date: 12/29/2015

Approved - Preconstruction Engineer: _____ Date: 1/6/2016

Shaded criteria are commonly referred to as the *FWHA 13 controlling criteria*. For NHS routes only, these criteria must meet the minimums established in the Green Book (*AASHTO A Policy on Geometric Design of Highways and Streets*). For all other routes, these criteria must meet the minimums established in the *Alaska Highway Preconstruction Manual*. Otherwise a Design Exception must be approved.

Design Criteria marked with a " # " do not meet minimums and must have a Design Exception(s) and/or Design Waiver(s) approved. See the Design Study Report for Design Exception/Design Waiver approval(s) and approved design criteria values

MEMORANDUM

State of Alaska

Department of Transportation & Public Facilities

TO: Longin Krol, P.E.,
Preconstruction Engineer
Northern Region

DATE: July 3, 2012

FILE NO: I:\Traffic Data\DESIGN\2012\OldNenana_60455.doc

TELEPHONE NO: 451-5150

FROM: Ethan Birkholz
Chief, Planning and Support
Northern Region

SUBJECT: Old Nenana/Ester Hill Rehab.
STP-0002(257)/60455
Design Designation

Please approve the attached updated design designation by signing the endorsement below which enables your staff to proceed.

Any questions should be directed to Jennifer Anderson at 451-2257.

Longin Krol, P.E., Preconstruction Engineer — Date 7/13/12

JCA/sgv

cc: Albert Beck, P.E., Engineering Manager, Northern Region
Jennifer Anderson, Traffic Data Manager, Northern Region

Attachment

Please circulate and return to Traffic Data & Forecasting Manager	
Planning Manager	
Planning Chief	
FMATS **urban only**	✓
Traffic & Safety	PLG
Any changes, additions, or questions, Please write on this sheet	

DESIGN DESIGNATION

Northern Region Planning

Traffic Data & Forecasting

ROUTE NAME: Old Nenana Hwy
STATE ROUTE NO: 174800
CDS MILEAGE: 0.000-8.944
FUNCTIONAL CLASS: Rural Minor Collector

	YEAR	ADT	%	
ADT	2010 2030 2040	425 560 650		
DHV	2030 2040	65 80	12.0%	
DS				45-55
T			**7%** 4.50 1.75 0.50 0.25 0.00 0.00	**Total** Class 5 Class 6 Class 8 Class 9 Class 10 Class 13
ESAL'S (Design Lane)	To Be Provided by Design			

DESIGN DESIGNATION

Northern Region Planning

Traffic Data & Forecasting

ROUTE NAME: Old Nenana Hwy
STATE ROUTE NO: 174800
CDS MILEAGE: 8.944-9.470
FUNCTIONAL CLASS: Rural Major Collector

	YEAR	ADT	%	
ADT	2010 2030 2040	1400 1850 2150		
DHV	2030 2040	225 260	12.0%	
DS				45-55
T			**7%** 4.50 1.75 0.50 0.25 0.00 0.00	**Total** Class 5 Class 6 Class 8 Class 9 Class 10 Class 13
ESAL'S (Design Lane)	To Be Provided by Design			

MEMORANDUM

State of Alaska

Department of Transportation & Public Facilities
Northern Region Preconstruction

TO: Ethan Brikholz
Planning Chief
Northern Region

DATE: June 25, 2012

FILE NO: V:\Hwy\60455 Old Nenana\01 Clerical\Design Designation Memo.doc

THRU: Longin Krol, P.E.
Preconstruction Engineer
Northern Region

TELEPHONE NO: 451-5359
FAX NUMBER: 451-5126

FROM: Albert M.L. Beck, P.E.
Engineering Manager
Northern Region

SUBJECT: Old Nenana/Ester Hill Rehab.
STP-0002(257)/60455
Design Designation

Please provide a Design Designation for the **Old Nenana/Ester Hill Rehabilitation.**

- ☒ Present AADT
- ☒ Design Year AADT (**2040**)
- ☒ Mid-Design Period AADT (**2030**)
- ☒ Design Hourly Volume
- ☒ Directional Split
- ☒ Percent Trucks
- ☒ Design Functional Classification
- ☐ Intersection Turning Movement Counts at (**List Intersections**)
- ☐ Other (**Specify**) example: **Special Count for Special Events**

RECEIVED
JUN 28 2012

Rehabilitate the Old Nenana Highway. Work may include widening the road, realigning horizontal curves, repaving, clearing, cleaning existing culverts, replacing failing culverts, replacing signs, and striping. The project is scheduled for construction in FY2015.

Please complete the attached Traffic Data Request Form.

Attachment: As stated

Traffic Data Request Form

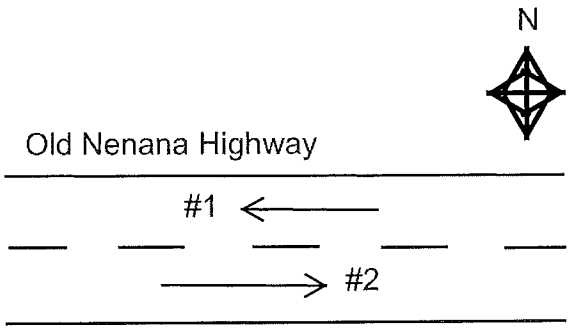
TDR Form-1-10/20/03

Alaska Department of Transportation & Public Facilities

Requested By: Albert M.L. Beck, P.E.	**Design Project Number:** STP-0002(257)/60455	**Date Requested:** 6/25/12
Base Year: ~~2012~~ 2011 **Base Year Total AADT:** 425/1400 **AADT Growth Rate** **Forward (%/yr):** 1,5 **End Year:** 2040 **Back Cast (%/yr):** **Begin Year:** 2012	**Common Route Name:** Old Nenana Highway **Functional Class:** Minor Collector / Urban/Rural / Major Collector **Historic M.P. Interval:**	**CDS Route Name:** 174800 **CDS M.P. Interval:** 0.000 to 9.470

Truck Category	Load Factor (ESALs per Truck)	% of Total AADT in Truck Category
2-axle		
3-axle	See	
4-axle	attached	
5-axle		
≥ 6-axle		

Lane Configuration Sketch:
(Designer: Provide sketch of lane layout. Number each lane and show directions.)



Percent of Base Year Total AADT for Each Numbered Lane in Configuration Sketch:

Lane # 1	% 45
Lane # 2	% 55
Lane #	%
Lane #	%
Lane #	%
Lane #	%

Comments:

Data Provided By:	Provider's Signature:	Date Provided:
Scott Mackeroth		7/2/12

Figure 6-1. Traffic Data Request (TDR) Form

Highway Log Report

CDS Route: 174800 Old Nenana Hwy * FNSB NW (Internal Dup # 0)

Milepoint: 0.000 **to** 9.470

General Direction: Northeast

Features Selected:

Cross Streets | Mileposts | Bridges/Culverts | Railroads Crossings | Buildings/Landmarks

Attributes Selected

Functional Classification: Rural Minor Collector

Milepoint	Side	Feature CDS	Feature
0.000	Left	170000	Parks Highway
0.000	Right	170000	Parks Highway
0.473	-	-	Road Continues
1.127	Right	-	Blake Road
1.699	Right	-	Elaine Way
2.056	Left	-	Standard Creek Road
2.647	Left	174805	Deraco Lane
3.120	Left	174806	Old Ridge Trail
3.324	Right	174708	Siegrist Drive
3.737	-	-	Road Continues
4.462	Left	-	Calypso Farm Ecology Ctr
4.728	-	-	Road Continues
5.507	Right	-	Turn Out
5.668	Right	-	Turn Out
6.471	Left	174812	Vista Way
6.856	Left	174820	Old Wood Road
7.150	Left	174821	Krogstie Lane
7.644	Right	174822	Stella Maris Avenue
8.037	Right	174823	Blind Moses Road
8.313	Right	174824	Garner Drive
8.370	Left	174820	Old Wood Road

Highway Log Report

CDS Route: 174800 Old Nenana Hwy * FNSB NW (Internal Dup # 0)

Milepoint: 0.000 **to** 9.470

General Direction: Northeast

Features Selected:

Cross Streets | Mileposts | Bridges/Culverts | Railroads Crossings | Buildings/Landmarks

Milepoint	Side	Feature CDS	Feature
8.634	-	-	Road Continues
8.838	Left	174828	Gold Lode Road
8.838	Ahead	-	Ester Creek Br# 0818 Begin Deck
8.944	-	-	Road Continues

Attribute Description	Changed From	Changed To	Milepoint
Functional Classification:	Rural Minor Collector	Rural Major Collector	9.038

Milepoint	Side	Feature CDS	Feature
9.038	Left	174810	Ester Creek Drive
9.113	Left	174829	Village Road
9.418	Left	-	Ester Fire Department
9.470	Left	170000	Parks Highway
9.470	Right	170000	Parks Highway

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND
PUBLIC FACILITIES

Computations

For Old Nenana / Ester Hill Rehab Design Designation # 60455

Item No. _____
DATE 7/3/12
Project No. 60455
Project Name Old Nenana Rehab
Calc. by Scot V.
Checked by _____

Year	ADT MP 0-8.9	ADT MP 8.9-9.47
2011	425	1400
2030	560	1850
2040	650	2150

ADT's obtained from 3 coverage counts along Old Nenana Hwy
1.5% growth rate used per traffic patterns

19 yr factor: 1.32
29 yr factor: 1.54

DHV: 12.0

	MP 0-8.9	MP 8.9-9.47
2030:	65	225
2040:	80	260

Directional Split: 45:55

% Trucks: 7% From class count on Old Nenana Hwy

Class	# Axles	%	Load Factor
5	2	41.5	0.50
6	3	1.75	0.85
7	4	/	/
8	4	0.5	1.20
9	5	0.25	1.55
10	6	0.0	2.24
11	6	/	/
12	6	/	/
13	7+	0.9	2.24

ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES TWVRM13

07/02/12 **SUMMARY DATA - ADT** 15:03:19.7

STATION ID **36040000 NORTH-SOUTH** ROUTE **174800** MILEPOINT **0.059**

OLD NENANA HWY NORTH OF PARKS HIGHWAY (FAR END)

		--------- PERCENT OF ANNUAL AVERAGE DAILY TRAFFIC ---------						
YEAR	AADT	MON	TUE	WED	THR	FRI	SAT	SUN
2006	81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	165	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	84	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PF1 - INQUIRY PF2 - HELP PF3 - QUIT PF4 - TDS MENU

PF5 - SELECTION PF10-NEXT STATION

ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES TWVRM13
07/02/12 **SUMMARY DATA - ADT** 15:03:26.1

STATION ID **31181000 EAST-WEST** ROUTE **174800** MILEPOINT **9.038**
OLD NENANA HWY WEST OF ESTER CREEK DRIVE

		--------- PERCENT OF ANNUAL AVERAGE DAILY TRAFFIC ---------						
YEAR	AADT	MON	TUE	WED	THR	FRI	SAT	SUN
2006	677	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2007	752	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	732	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	800	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2010	788	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2011	762	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PF1 - INQUIRY PF2 - HELP PF3 - QUIT PF4 - TDS MENU
PF5 - SELECTION PF10-NEXT STATION

ALASKA DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES TWVRM13

07/02/12 **SUMMARY DATA - ADT** 15:03:30.4

STATION ID **31179000 EAST-WEST** ROUTE **174800** MILEPOINT **9.417**

OLD NENANA HWY WEST OF PARKS HWY

		--------- PERCENT OF ANNUAL AVERAGE DAILY TRAFFIC ---------						
YEAR	AADT	MON	TUE	WED	THR	FRI	SAT	SUN
2006	1615	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2008	1358	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2009	1406	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PF1 - INQUIRY PF2 - HELP PF3 - QUIT PF4 - TDS MENU

PF5 - SELECTION PF10-NEXT STATION

APPENDIX B

ENVIRONMENTAL DOCUMENT

State of Alaska
Department of Transportation & Public Facilities

CATEGORICAL EXCLUSION DOCUMENTATION FORM
FOR FEDERAL HIGHWAY ADMINISTRATION PROJECTS

Project Name: Old Nenana/ Ester Hill Rehabilitation
Project Number (state/federal):60455/0002257
Date: May 22, 2015
CE Designation: 23 CFR 771.117(c)(26)
23 CFR 771.117( )( )
List of Attachments:
Appendix A - Figures
Appendix B - Class of Action Consultation
Appendix C - Section 106 Consultation
Appendix D - U.S. Fish & Wildlife Service Consultation
Appendix E - Section 4(f) Consultation
Appendix F - Agency & Public Scoping Documentation

I. Project Purpose and Need

The Alaska Department of Transportation & Public Facilities (ADOT&PF), in cooperation with the Alaska Division of the Federal Highway Administration (FHWA), is proposing to rehabilitate the Old Nenana Highway from the Ester Community Park approach (milepoint [MP] 9.4) to the route beginning at the Parks Highway intersection (MP 0) in Ester, AK.

The purpose of the proposed project is to improve safety and reduce maintenance costs on the Old Nenana Highway. The proposed project is located in U.S. Geological Survey Quadrangle Fairbanks D3; Sections 9,10, 11, 12, 16, 17, 20, 29, 32, and Tract B, Township 1 South, Range 3 West, Sections 7 and 8, Township 1 South, Range 2 West, Fairbanks Meridian (Figures 1 & 2).

II. Project Description

The proposed project will rehabilitate the Old Nenana Highway from Ester Community Park approach (MP 9.4) to the route beginning at the Parks Highway (MP 0.0) in Ester, AK. Project improvements consist of:

- Repaving, including rebuilding the embankment in failing sections
- Shoulder widening
- Reconstructing and paving approaches
- Replacing/updating guardrail and end terminals
- Tree and brush clearing for the new embankment slopes and where needed to remove sight distance obstructions
- Rehabilitating and reconstructing drainage ditches
- Replacing, repairing, and adding culverts
- Upgrading mailboxes, signing, and striping
- Extending bike path from Ester Community Park approach to Village Road

On April 20, 2015 ADOT&PF Statewide environmental confirmed the project to be: 1) a categorical exclusion under Code of Federal Regulations 23 CFR 771.117(c)(26) and 2) a state-assignable project per the 6004 Memorandum of Understanding. A copy of the Class of Action statewide concurrence is in Appendix B.

III. Environmental Consequences

- For each yes, summarize the activity evaluated and the magnitude of the impact.
- For any consequence category with an asterisk (*), additional information must be attached such as an alternatives analysis, agency coordination or consultation, avoidance measures, public notices, or mitigation statement.
- Include direct and indirect impacts in each analysis.

A. Right-of-Way Impacts	N/A	YES	NO
1. Additional right-of-way required.		☐	☒
• Permanent easements required.	☒	☐	☐
• Estimated number of parcels: 0			
• Full or partial property acquisition required.	☒	☐	☐
• Estimated number of full parcels: 0			
• Estimated number of partial parcels: 0			
• Property transfer from state or federal agency required. *If yes, list agency in No. 4 below.*	☒	☐	☐
• Business or residential relocations required. *If yes, summarize the findings of the conceptual stage relocation study in No. 4 below and attach the conceptual stage relocation study.*	☒	☐*	☐
• Number of relocations: 0			
• Type of relocation: Residential: ☐ Business: ☐ Residential (Indicate number: _____) Business (Indicate number: _____)			
• Last-resort housing required.	☒	☐	☐
2. Will the project or activity have disproportionately high and adverse human health or environmental effects on minority populations and low-income populations as defined in E.O. 12898 (DOT Order 6640.23, December 1998)?		☐	☒
3. The project will involve use of ANILCA land that requires an ANILCA Title XI approval. *If yes, the project is not assigned to the State per the 6004 MOU and the CE must be processed by FHWA.*		☐	☒

4. Summarize the right-of-way impacts, if any:

The proposed project limits fall within ADOT&PF owned right-of-way (ROW) and on previously disturbed ground. Permanent ROW acquisition is not anticipated for this project.

B. Social and Cultural Impacts	N/A	YES	NO
1. The project will affect neighborhoods or community cohesion.		☐	☒
The project will affect travel patterns and accessibility (e.g. vehicular, commuter, bicycle, or pedestrian).		☐	☒
The project will affect school boundaries, recreation areas, churches, businesses, police and fire protection, etc.		☐	☒
The project will affect the elderly, handicapped, nondrivers, transit-dependent, minority and ethnic groups, or the economically disadvantaged.		☐	☒
There are unresolved project issues or concerns of a federally-recognized Indian Tribe [as defined in 36 CFR 800.16(m)]. *If yes, the project is not assigned to the State per the 6004 MOU and the CE must be processed by FHWA.*		☐	☒

Summarize the social and cultural impacts, if any:

The project is expected to have beneficial long-term impacts by improving roadway conditions as well as providing widened shoulders for pedestrians and cyclists. The proposed project would not permanently affect current traffic patterns, access, or capacity within the area. The project would enhance bicycle and pedestrian access with the addition of shoulders. No adverse impacts to neighborhoods, community cohesion, disadvantaged social groups, businesses, or fire protection are anticipated from the proposed project.

C. Economic Impacts	N/A	YES	NO
1. The project will have adverse economic impacts on the regional and/or local economy, such as effects on development, tax revenues and public expenditures, employment opportunities, accessibility, and retail sales.		☐	☒
The project will adversely affect established businesses or business districts.		☐	☒

Summarize the economic impacts, if any:

Adverse economic impacts are not anticipated as a result of the proposed project. The proposed project would improve economic potential by providing safer routes for those using alternative modes of transportation within the Ester area.

D. Land Use and Transportation Plans	N/A	YES	NO
1. Project is consistent with land use plan(s).	☐	☒	☐
a. Identify the land use plan(s) and date Fairbanks North Star Borough Regional Comprehensive Plan; September 13, 2005			
Project is consistent with transportation plan(s).	☐	☒	☐
a. Identify the transportation plan(s) and date. Fairbanks North Star Borough Comprehensive Road Plan; July 11, 1991			
Project would induce adverse indirect and cumulative effects on land use or transportation. *If yes, attach analysis.*		☐	☒

Summarize how the project is consistent or inconsistent with the land use plan(s) and transportation plan(s):

The project is consistent with both the Fairbanks North Star Borough's Regional

Comprehensive Plan as well as the Comprehensive Road Plan. Proposed improvements are to an existing roadway and will not promote changes to land use. The project proposes to repair the surface of the roadway which shows increasing signs of stress such as ruts, surface cracking, potholing, and failing drainage. The purpose of the project is to improve safety, reduce maintenance costs and extend the service life of the roadway. The goals that are consistent with the proposed project are outlined in the table below.

Plan Name	Plan Goal/Policy/Need	How Proposed Project is Consistent
Fairbanks North Star Borough Regional Comprehensive Plan (September 2005)	Land Use Goal : 3 To have a variety of land uses that fit the diverse need of the community.	Improves the movement of people and goods through the local area; therefore improves the diverse need of the community.
Fairbanks North Star Borough Regional Comprehensive Plan (September 2005)	Transportation & Infrastructure Goal : 1 To have a safe, efficient, multi-modal transportation system that anticipates community growth.	Improves access for local residents and improves safety.
Fairbanks North Star Borough Comprehensive Road Plan (July 1991)	Title: Community Impact Policy: Select alignments of transportation improvements to minimize cost and displacement of residences and businesses, improve development potential, and to define neighborhoods.	Will reduce maintenance costs and improve travel within the community.
Fairbanks North Star Borough Comprehensive Road Plan (July 1991)	Title : Safety Policy: Traffic analysis and roadway improvements should ensure safe and adequate pedestrian circulation in downtown areas, activity centers, and neighborhoods.	Shoulder widening will increase pedestrian safety and improve vehicular line of site.

E. Impacts to Historic Properties

	N/A	YES	NO
1. Does the project involve a road that is included on the "List of Roads Treated as Eligible" in the Alaska Historic Roads PA? *If yes, follow the Interim Guidance for Addressing Alaska Historic Roads.*		☐	☒
2. Does the project qualify as a listed activity that has no potential to cause effects to historic properties? *If yes, attach concurrence from the FHWA Area Engineer (non-assigned projects) or Statewide NEPA Manager for 6004-assigned projects.*		☒*	☐
a. Indicate the appropriate policy directive or memo that identifies the project as an action with no potential to cause effects to historic properties: The project meets all of the Tier 2 Allowances General Conditions (1-7) as outlined in the Programmatic Agreement Appendix B, September 2014.			
3. Is a National Register of Historic Places listed or eligible property in the Area of Potential Effect?	☐	☐	☒

4. Date Consultation/Initiation Letters sent N/A *Attach copies to this form.*

E. Impacts to Historic Properties

	N/A	YES	NO

a. List consulting parties N/A

b. If no letters were sent, explain why not. *Attach "Section 106 Proceed Directly to Findings Worksheet", if applicable*

Consultation/Initiation Letters were not sent for the following reasons:

- The project involves an existing transportation facility.

- The APE is not within a National Historic Landmark.

- The project is not within or adjacent to a Historic District (FAI-00231 Ester Historic District is 200 meters outside of the APE).

- There are no standing buildings or structures within the APE that are more than 45 years of age.

- The APE has a low probability for in-situ archaeological remains.

- The project has no known tribal concerns or public controversy related to historic preservation.

- The project does not include activities requiring consultation on effects to a TE road.

Authorization that the project qualifies for processing as a Programmatic Allowance by Northern Region DOT&PF PQI is dated April 30, 2015 (Appendix C).

Date "Finding of Effect" Letters sent N/A *Attach copies to this form*

a. State any changes to consulting parties N/A

List responding consulting parties, comment date, and summarize:

N/A

Are there any unresolved issues with consulting parties?	☐	☐	☒

a. If yes, list N/A

Date SHPO concurred with "Finding of Effect" N/A *Attach copy to this form.*

Will there be an adverse effect on a historic property? *If yes, attach correspondence (including response from ACHP) and signed MOA. If yes, Programmatic Agreements (PCEs) do not apply.*	☐	☐	☒

Summarize any effects to historic properties. *List affected sites (by AHRS number only) and any commitments or mitigative measures. Include any commitments or mitigative measures in Section VI.*

Impacts to historic properties are not anticipated, as outlined in the Section 106 Programmatic Agreement Streamlined Project Review Screening Record (Appendix C).

F. **Wetland Impacts**	N/A	YES	NO
1. Project affects wetlands as defined by the U.S. Army Corps of Engineers (USACE). *If yes, document public and agency coordination required per E.O. 11990, Protection of Wetlands.*		☒*	☐
2. Are the wetlands delineated in accordance with the *"Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Alaska Region (Version 2.0) Sept. 2007"?*	☐	☒	☐
3. Estimated area of wetland involvement (acres): 1,150 square feet/0.03 acre			
4. Estimated fill quantities (cubic yards): 340 cubic yards			
5. Estimated dredge quantities (cubic yards): 170 cubic yards			
6. Is a USACE authorization anticipated? *If yes, identify type*: NWP ☒ Individual ☐ General Permit ☐ Other ☐	☐	☒	☐
7. Wetlands Finding *Attach the following supporting documentation as appropriate:* • *Avoidance and Minimization Checklist, and Mitigation Statement* • *Wetlands Delineation.* • *Jurisdictional Determination.* • *Copies of public and resource agency letters received in response to the request for comments.*			
a. Are there practicable alternatives to the proposed construction in wetlands? *If yes, the project cannot be approved as proposed.*	☐	☐	☒
b. Does the project include all practicable measures to minimize harm to wetlands? *If no, the project cannot be approved as proposed.*	☐	☒	☐
c. Only practicable alternative: Based on the evaluation of avoidance and minimization alternatives, there are no practicable alternatives that would avoid the project's impacts on wetlands. The project includes all practicable measures to minimize harm to the affected wetlands as a result of construction. *If no, the project cannot be approved as proposed.*	☐	☒	☐

8. Summarize the wetlands impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

ABR, Inc. conducted a wetlands delineation and functional assessment in September 2012. Results identified one shrub scrub wetland complex approximately 0.42 acres in size within the study area and Ester Creek, a waters of the U.S. (described in more detail in Section G) (Figure 2). Impacts to wetlands and waters of the U.S. have been quantified based on preliminary design and will be further refined during the permitting process - closer to final design:

- Approximately 0.03 acre of wetlands will be impacted.
- Approximately 340 cubic yards of fill will be placed within wetlands.
- Approximately 170 cubic yards of material will be dredged.

G. **Water Body Involvement**	N/A	YES	NO
1. Project affects a water body.		☒	☐
Project affects a navigable water body as defined by USCG, (i.e. Section 9).	☐	☐*	☒
Project affects Waters of the U.S. as defined by the USACE, Section 404.	☐	☒*	☐

G. Water Body Involvement

	N/A	YES	NO
Project affects Navigable Waters of the U.S. as defined by the USACE (Section 10)	☐	☐*	☒
Project affects fish passage across a stream frequented by salmon or other fish (i.e. Title 16.05.841)	☐	☐	☒
Project affects a cataloged anadromous fish stream, river or lake (i.e. Title 16.05.871).	☐	☐*	☒
Project affects a designated Wild and Scenic River or land adjacent to a Wild and Scenic River. *If yes, the Regional Environmental Manager should consult with the Statewide NEPA Manager (assigned CEs) or FHWA Area Engineer and FHWA Environmental Program Manager (non-assigned CEs) to determine applicability of Section 4(f).*		☐	☒
Proposed water body involvement: Bridge ☐ Culvert ☒ Embankment Fill ☐ Relocation ☐ Diversion ☐ Temporary ☐ Permanent ☐ Other ☐	☐		
Type of stream or river habitat impacted: Spawning ☐ Rearing ☐ Pool ☐ Riffle ☐ Undercut bank ☐ Other ☒	☐		

Amount of fill below (cubic yards): OHW 35 cubic yards MHW 0 HTL 0

11. Summarize the water body impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

Potential receiving water bodies identified within the project area include Emma Creek and Ester Creek. Emma creek connects to the Chena River which flows into the Tanana River via a series of intermediate creeks. Ester Creek, an intermittent stream, connects to Chena River via ground water, wetlands, and intermediate creeks. Due to their downstream connectivity to Chena River both creeks are considered waters of the U.S.

Ester Creek will be directly impacted since the proposed project involves a culvert replacement and approximately 35 cubic yards of fill below OHW. Impacts are expected to be temporary and will improve the overall drainage of the area.

Indirect impacts to water quality during construction activities could occur at both creeks. Impacts due to construction activities are further addressed in Section P.

H. Fish and Wildlife

	N/A	YES	NO
1. Anadromous and resident fish habitat. *Any activity or project that is conducted below the ordinary high water mark of an anadromous stream, river, or lake requires a Fish Habitat Permit.*			
a. Database name(s) and date(s) queried: ADF&G, Fish Resource Monitor; February 13, 2015			
b. Anadromous fish habitat present in project area.		☐*	☒
c. Resident fish habitat present in project area		☐*	☒
d. Adverse effect on spawning habitat.	☒	☐*	☐
e. Adverse effect on rearing habitat.	☒	☐*	☐
f. Adverse effect on migration corridors.	☒	☐*	☐
g. Adverse effect on subsistence species.	☒	☐*	☐

Essential Fish Habitat (EFH). *EFH includes any anadromous stream used by any of the five species of Pacific salmon for migration, spawning or rearing, as well as other coastal, nearshore and offshore areas as designated by NMFS.*

H. **Fish and Wildlife**	N/A	YES	NO
a. Database name(s) and date(s) queried: ADF&G, Fish Resource Monitor; February 13, 2015;			
b. EFH present in project area		☐	☒
c. Project proposes construction in EFH. *If yes, describe EFH impacts in H.6.*	☒	☐	☐
d. Project may adversely affect EFH. *If yes, attach EFH Assessment.*	☒	☐*	☐
e. Project includes conservation recommendations proposed by NMFS. *If NMFS conservation recommendations are not adopted, formal notification must be made to NMFS. Summarize the final conservation measures in H.6 and list in Section VI.*	☒	☐	☐
Wildlife Resources:			
a. Project is in area of high wildlife/vehicle accidents.		☐	☒
b. Project would bisect migration corridors.		☐	☒
c. Project would segment habitat.		☐	☒
Bald and Golden Eagle Protection Act. *If yes to any below, consult with USFWS and attach documentation of consultation.*			
a. Eagle data source(s) and date(s) : U.S. Fish and Wildlife (USFWS) Information Planning and Conservation (IPaC) System decision support tool, February 13, 2015			
b. Project visible from an eagle nesting tree?		☐*	☒
c. Project within 330 feet of an eagle nesting tree?		☐*	☒
d. Project within 660 feet of an eagle nesting tree?		☐*	☒
e. Will the project require blasting or other activities that produce extreme loud noises within 1/2 a mile from an active nest?		☐*	☒
f. Is an eagle permit required?		☐*	☒
5. Is the project consistent with the Migratory Bird Treaty Act?		☒	☐

6. Summarize fish and wildlife impacts and mitigation, including timing windows, if any. *Include any commitments or mitigative measures in Section VI.*

Migratory Birds

Adverse impacts to migratory birds and other species of concern are not anticipated. The USFWS recommends that land disturbing activities (e.g., clearing of vegetation or grubbing of stumps, stockpiling, or placing of fill) occur prior to May 1 or after July 15 to avoid impacts to breeding migratory birds. If this is not possible then other measures to avoid impacts to breeeding migratory birds should be initiated.

Bald and Golden Eagles

The USFWS maintains a raptor-nest database which indicates there are eagle nests located more than 5.5 miles from the site. Impacts to these nests are not anticipated. However, should construction be necessary within 330 feet or 660 feet (the primary and secondary zones, respectively) of an active eagle nest, such work would cease and USFWS would be consulted for guidance on how to proceed.

Consultation with USFWS, on both migratory bird regulations, as well as the Bald and Golden Eagle Protection Act can be found in Appendix D.

I. Threatened and Endangered Species (T&E)	N/A	YES	NO
1. Database name(s) and date(s) queried: USFWS IPaC database; February 13, 2015			
2. Listed threatened or endangered species present in the project area.		☐*	☒
Threatened or endangered species migrate through the project area.		☐*	☒
Designated critical habitat in the project area.		☐*	☒
Proposed species present in project area.		☐*	☒
Candidate species present in project area.		☐*	☒
What is the effect determination for the project? *Select one.*			
a. Project has no effect on listed or proposed T&E species or designated critical habitat.		☒	
b. Project is not likely to adversely affect a listed or proposed T&E species or designated critical habitat. *Informal Section 7 consultation is required. Attach consultation documentation, including concurrence from the Federal agency, to this form.*		☐	
c. Project is likely to adversely affect a listed or proposed T&E species or designated critical habitat. *If yes, consult the FHWA Area Engineer (non-assigned projects) or Statewide NEPA Manager for 6004-assigned projects.*		☐	

3. Summarize the findings of the consultation, conferencing, biological evaluation, or biological assessment and the opinion of the agency with jurisdiction, or state why no coordination was conducted. *Include any commitments or mitigative measures in Section VI.*

   The USFWS responded to ADOT&PF's Agency Scoping request (on September 11, 2012) stating that the USFWS does not object to this project as proposed (Appendix D). There are no threatened or endangered species in the project area, thus the USFWS does not expect project-related activities to adversely impact listed species. Preparation of a Biological Assessment or further consultation regarding this project is not necessary at this time.

J. Invasive Species	N/A	YES	NO
1. Database name(s) and date(s) queried: Alaska Exotic Plant Information Clearinghouse (AKEPIC); February 16, 2015.			
Does the project include all practicable measures to minimize the introduction or spread invasive species, making the project consistent with E.O. 13112 (Invasive Species)? *If yes, list measures in J.3.*		☒	☐

Summarize invasive species impacts and minimization measures, if any. *Include any commitments or mitigative measures in Section VI.*

A search of the AKEPIC clearinghouse noted the following invasive species occur in or adjacent to the project area. Invasive species found within the project area include:

- Bird Vetch (*Vicia cracca)*
- Yellow Sweetclover (*Melilotus officinalis*)
- White Clover (*Trifolium repens*)

- Quackgrass (*Elymus repens*)
- Common Dandelion (*Taraxacum officinale*)
- Narrowleaf Hawksbeard (*Crepis tectorum*)

  Lambsquarters (*Chenopodium album*)

The majority of species reported in the project area reproduce by creeping along the ground, the remainder spread by seed. Measures used to avoid the introduction and spread of invasive species, found in ADOT&PF's Integrated Vegetation Management Plan (IVMP), include:

- establishing low maintenance plants, such as grasses, during road construction or rehabilitation; or
- using native soils for backfill, where possible, from "weed free" sources during road construction.

K. Hazardous Waste	N/A	YES	NO
1. Database name(s) and date(s) queried: Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program; February 16, 2015			
2. There are potentially contaminated sites within or adjacent to the existing and/or proposed ROW.		☐	☒
There are identified contaminated sites within or adjacent to the existing and/or proposed ROW.		☐	☒
Extensive excavation is proposed adjacent to, or within, a known hazardous waste site, or the potential for encountering hazardous waste during construction is high. *If yes, attach the hazardous waste investigation report and approved ADEC Corrective Action Plan.*		☐*	☒

Summarize the hazardous waste impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

A search of the ADEC contaminated sites database indicated there are no known contaminated sites, spills, or leaking underground storage tanks within or adjacent to the proposed project area.

L. Air Quality (Conformity)	N/A	YES	NO
1. The project is located in an air quality maintenance area or nonattainment area (CO or PM-10 or PM-2.5). *If yes, indicate CO* ☐ *or PM-10* ☐ *or PM-2.5* ☐*, and complete the remainder of this section.*		☐	☒
The project is included in a conforming Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP).	☒	☐	☐
a. List dates of FHWA/FTA conformity determination: _____			
The project is exempt from an air quality analysis per 40 CFR 93.126 (Table 2 and Exempt Projects). *If no, a project-level air quality conformity determination is required for CO nonattainment and maintenance areas, and a qualitative project-level analysis is required for both PM-2.5 and PM-10 nonattainment and maintenance areas.*	☒	☐	☐
4. Have there been a significant change in the scope or the design concept as described in the most recent conforming TIP and LRTP? *If yes, describe changes in L.8. In addition, the project must satisfy the conformity rule's requirements for projects not from a plan and TIP, or the plan and TIP must be modified to incorporate the revised project (including a new conformity analysis).*	☒	☐	☐

L. **Air Quality (Conformity)**	N/A	YES	NO
5. A CO project-level analysis was completed meeting the requirements of Section 93.123 of the conformity rule. The results satisfy the requirements of Section 93.116(a) for all areas or 93.116(b) for nonattainment areas. *Attach a copy of the analysis.*	☒	☐*	☐
6. A PM-2.5 project-level air quality analysis was completed meeting the requirements of Section 93.123 of the conformity rule. The results satisfy the requirements of Section 93.116. *Attach a copy of the analysis.*	☒	☐*	☐
7. A PM-10 project-level air quality analysis was completed meeting the requirements of Section 93.123 of the conformity rule. The results satisfy the requirements of Section 93.116. *Attach a copy of the analysis.*	☒	☐*	☐

8. Summarize air quality impacts, mitigation, and agency coordination, if any. *Include any commitments or mitigative measures in Section VI.*

The City of Fairbanks is both a maintenance area for CO and nonattainment area for PM-2.5. However the project is located outside the boundaries for both and is exempt from an air quality analysis per 40 CFR 93.126.

Air quality would be maintained through the use of BMPs such as watering, sweeping, stabilizing construction entrances/exits, and use of equipment emission control devises.

M. **Floodplain Impacts (23 CFR 650, Subpart A)**	N/A	YES	NO
1. Project encroaches into the base (100 year) flood plain in fresh or marine waters. Identify floodplain map source and date : Federal Emergency M anagement Agency (FEMA) Flood Insurance Rate Map Community Panel Number 0250090200F, 02090C4305J, 02090C4310J ; March 17, 2014.		☐*	☒
If yes, attach documentation of public involvement conducted per E.O. 11988 and 23 CFR 650.109. Consult with the regional or Statewide Hydraulics/Hydrology expert. Attach the required location hydraulic study developed per 23 CFR 650.111. Answer questions M.1.a through d.			
If no, skip to M.2.			
a. Is there a longitudinal encroachment into the 100-year floodplain?	☒	☐*	☐
b. Is there significant encroachment as defined by 23 CFR 650.105(q)? *If yes, the project cannot be approved as proposed without a finding that the proposed action is the "Only Practicable Alternative" as defined in 23 CFR 650.113. Attach the finding for approval.*	☒	☐*	☐
c. Project encroaches into a regulatory floodway.	☒	☐*	☐
d. The proposed action would increase the base flood elevation one-foot or greater.	☒	☐*	☐
2. Project conforms to local flood hazard requirements.	☒	☐	☐
3. Project is consistent with E.O. 11988 (Floodplain Protection). *If no, the project cannot be approved as proposed.*		☐	☐

4. Summarize floodplain impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*

The proposed project does not encroach into a FEMA mapped floodplain.

N. Noise Impacts (23 CFR 772)	N/A	YES	NO
1. Does the project involve any of the following? *If yes, complete N.1.a.*		☐	☒

If no, a noise analysis is not required. Skip to section O.

- Construction of highway on a new location.
- Substantial alteration in vertical or horizontal alignment as defined in 23 CFR 772.5.
- An increase in the number of through lanes.
- Addition of an auxiliary lane (except a turn lane).
- Addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange.
- Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane.
- Addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

a. Identify below which category of land uses are adjacent: *A noise analysis is required if any lands in Categories A through E are identified, and the response to N.1 is 'yes'.*

Category A: Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.	☒	☐	☐
Category B: Residential. *This includes undeveloped lands permitted for this category.*	☒	☐	☐
Category C (exterior): Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. *This includes undeveloped lands permitted for this category.*	☒	☐	☐
Category D (interior): Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.	☒	☐	☐
Category E: Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not listed above. *This includes undeveloped lands permitted for this category.*	☒	☐	☐

2. Does the noise analysis identify a noise impact? *If yes, explain in N.3*		☐	☒

3. Summarize the findings of the attached noise analysis and noise abatement worksheet, if applicable:

The proposed project does not require a noise analysis in accordance with 23 CFR 772. The proposed project meets the criteria listed in under 23 CFR 772.5 as a Type III project and is exempt.

O. Water Quality Impacts	N/A	YES	NO
1. Project would involve a public or private drinking water source. *If yes, explain in O.7*		☐	☒
2. Project would result in a discharge of storm water to a Water of the U.S. (per 40 CFR 230.3(s))		☒	☐
3. Project would discharge storm water into or affect an ADEC designated Impaired Waterbody. *If any of the Impaired Waterbodies have an approved or established Total Maximum Daily Load, describe project impacts in O.7*		☐	☒
a. List name(s), location(s), and pollutant(s) causing impairment: N/A			
4. Estimate the acreage of ground-disturbing activities that will result from the project? 121 acres			
5. Is there a municipal separate storm sewer system (MS4) APDES permit, or will runoff be mixed with discharges from an APDES permitted industrial facility?		☐	☒
a. If yes, list APDES permit number and type: N/A			
6. Would the project discharge storm water to a water body within a national park or state park; a national or state wildlife refuge? *If yes and Alaska Construction General Permit applies to the project, consultation with ADEC is required at least 30 days prior to planned start of construction activities.*		☐	☒
7. Summarize the water quality impacts and mitigation, if any. *Include any commitments or mitigative measures in Section VI.*			

There are no permanent water quality impacts associated with this project.

P. Construction Impacts	N/A	YES	NO
1. There will be temporary degradation of water quality.		☒	☐
2. There will be a temporary stream diversion.		☐	☒
3. There will be temporary degradation of air quality.		☒	☐
4. There will be temporary delays and detours of traffic.		☒	☐
5. There will be temporary impacts on businesses.		☒	☐
6. There will be temporary noise impacts.		☒	☐
7. There will be other construction impacts.		☐	☒
8. Summarize construction impacts and mitigation for each 'yes' above. *Include any commitments or mitigative measures in Section VI.*			

Water Quality

The proposed project may cause temporary deterioration of water quality due to ground disturbing activities and sedimentation of storm water runoff. An Erosion and Sediment Plan (ESCP) and SWPPP would be prepared for the proposed project. Both would include BMPs to be used during construction to stabilize slopes and prevent sedimentation and would comply with the APDES CGP required for this project.

Air Quality

The operation of construction equipment may lead to a temporary decrease in air quality because of increased airborne dust and emission-related particulate matter.

However, changes in air quality are expected to be temporary and minor and would be abated through watering disturbed surface areas and ensuring that construction equipment receives regular maintenance.

Traffic and Business Impacts

Temporary traffic impacts may include delays or detours. These impacts will be mitigated by providing advance notice to the public and creation of a traffic control plan.

Temporary business impacts may include changes to access and delays. Calypso Farm and Ecology Center is located in Ester and is accessed off the Old Nenana Highway. There is a school bus pullout located off the highway, adjacent to the drivaway accessing the center. Roadway widening may cause slight modification or relocation of the existing school bus pullout.

Access to Ester Park, a Section 4(f) resource, will be maintained during construction as required by Section 643 of the ADOT&PF Standard Specifications for Highway Construction.

Noise Impacts

Temporary noise impacts to residences may result from the operation of heavy equipment, the presence of construction crews, and other associated construction activities. The proposed project is not anticipated to result in any permanent noise impacts. Noise from construction equipment can be minimized by maintaining noise control devices.

Q. Section 4(f)/6(f)	N/A	YES	NO
1. Section 4(f) (23 CFR 774)			
a. Does a Section 4(f) resource exist within the project area; or is the project adjacent to a Section 4(f) resource? *If yes, attach consultation with the Statewide NEPA Manager (assigned CEs) or FHWA Environmental Program Manager (non-assigned CEs) to determine applicability of Section 4(f)*		☒	☐
b. Does an exception listed in 23 CFR 774.13 apply to this project? *If yes, attach consultation with the Statewide NEPA Manager (assigned CEs) or FHWA Environmental Program Manager (non-assigned CEs), and documentation from the official with jurisdiction, if required.*	☐	☐	☒
c. Does the project result in the "use" of a Section 4(f) property? *"Use" includes a permanent incorporation of land, adverse temporary occupancy, or constructive use.*	☐	☐	☒
d. Has a *de minimis* impact finding been prepared for the project? *If yes, attach the finding.*	☐	☐	☒
e. Has a Programmatic Section 4(f) Evaluation been prepared for the project? *If yes, attach the evaluation.*	☐	☐	☒

Q. Section 4(f)/6(f)	N/A	YES	NO
f. Does the project require an Individual Section 4(f) Evaluation? *If yes, the project is not assigned to the State per the 6004 MOU and the CE must be processed by FHWA. Attach the evaluation.*	☐	☐	☒
2. Section 6(f) (36 CFR 59)			
a. Were funds from the Land and Water Conservation Fund Act (LWCFA) used for improvement to a property that will be affected by this project?	☐	☐	☒
b. Is the use of the property receiving LWCFA funds a "conversion of use" per Section 6(f) of the LWCFA? *Attach the correspondence received from the ADNR 6(f) Grants Administrator.*	☐	☐	☒

3. Summarize Section 4(f)/6(f) involvement, if any:

On June 20, 2013, the ADOT&PF's National Environmental Policy Act (NEPA) manager concurred that the proposed project will not impact Ester Park, a Section 4(f) resource (Appendix E). Ester Park exists at the beginning of the project near MP 9.4. The project does not propose to acquire or use property associated with the Park. Rehabilitation pertains to the roadway and neighboring embankments and ends just short of the park's entrance. Adverse impacts to the park or its access are not anticipated.

IV. Permits and Authorizations	N/A	YES	NO
1. USACE, Section 404/10 *Includes Abbreviated Permit Process, Nationwide Permit, and General Permit*		☒	☐
2. Coast Guard, Section 9		☐	☒
3. ADF&G Fish Habitat Permit (Title 16.05.871 and Title 16.05.841)		☐	☒
4. Flood Hazard		☐	☒
5. ADEC Non-domestic Wastewater Plan Approval		☐	☒
6. ADEC 401		☒	☐
7. ADEC APDES		☒	☐
8. Noise		☐	☒
9. Eagle Permit		☐	☒
10. Other. *If yes, list below.*		☐	☒

V. Comments and Coordination	N/A	YES	NO
1. Public/agency involvement for project. *Required if protected resources are involved.*		☒	☐
2. Public Meetings. Date(s): March 18, 2015		☒	☐
3. Newspaper ads. *Attach certified affidavit of publication as an appendix.* Name of newspaper and date: Fairbanks Daily News-Miner March 8, 15, 17, and 18, 2015		☒	☐
4. Agency scoping letters. Date sent: August 27, 2012		☒	☐
5. Agency scoping meeting. Date of meeting: N/A		☐	☒
6. Field review. Date: N/A		☐	☒

7. Summarize comments and coordination efforts for this project. Discuss pertinent issues raised. *Attach correspondence that demonstrates coordination and that there are no unresolved issues.*

Agency Scoping

A request for early coordination and comments from agencies was distributed via email on August 27, 2012, with written comments requested by October 5, 2012. The USFWS was the only agency to provide feedback. Although the USFWS did not have any objections to the proposed project they did recommended consideration be given to migratory birds, eagles, and invasive species (Appendix F).

Public Scoping

A variety of public outreach documents have been drafted to aid in the public scoping process. These documents include a project specific website (http://dot.alaska.gov/nreg/old-nenana-rehab/), interactive map, fact sheet, and comment sheet.

A public open house was held on March 18, 2015, with 42 participants signing in. The majority of comments received included the need for improved pedestrian and cycling safety along the highway, safe access to Ester Community Park, drainage issues, driveway approaches and access to the highway, and concerns about ROW clearing (both for and against). Copies of all public comments are located in Appendix F.

VI. Environmental Commitments and Mitigation Measures

List all environmental commitments and mitigation measures included in the project.

Standard environment commitments and mitigation measures are outlined within each section above. Additionally, there are no environmental commitments or mitigation measures that are unique to this project.

VII. Environmental Documentation Approval

	N/A	YES	NO
1. Do any unusual circumstances exist, as described in 23 C.F.R. 771.117 (b)? *If yes, the CE Documentation form cannot be approved.*		☐	☒
2. Does this 6004 Program approval statement apply? "The State has determined that this project has no significant impact(s) on the environment and that there are no unusual circumstances as described in 23 CFR 771.117(b). As such, the project is categorically excluded from the requirements to prepare an environmental assessment or environmental impact statement under the National Environmental Policy Act. The State has been assigned, and hereby certifies that it has carried out, the responsibility to make this determination pursuant to Chapter 3 of title 23, United States Code, Section 326 and a Memorandum of Understanding dated September 20, 2012, executed between the FHWA and the State." *If no, the CE must be approved by FHWA.*		☒	☐

VII. Environmental Documentation Approval

	N/A	YES	NO
3. **For 6004 projects:** The project meets the criteria of the DOT&PF Programmatic Approval 2 authorized in the November 6, 2012 "CE Directive – Delegation of Approval Authority for Certain CEs under 6004 MOU". *If yes, the CE may be approved by the Regional Environmental. If no, the CE may be approved by a Statewide NEPA Manager.*	☐	☒	☐
4. **For non-assigned projects:** The project meets the criteria of the April 13, 2012 "Programmatic Categorical Exclusion for Use on Federal-Aid Highway Projects in Alaska" between FHWA and DOT&PF. *If yes, the CE may be approved by the Regional Environmental Manager. If no, the CE may be approved by FHWA Area Engineer.*	☒	☐	☐

VIII. Environmental Documentation Approval Signatures

Prepared by: Kerri L Martin Date: 6/2/15
[Sign] Environmental Impact Analyst

Kerri L. Martin
[Print Name] Environmental Impact Analyst

Reviewed by: [signature] Date: 6/2/2015
[Sign] Engineering Manager

Lauren Little
[Print Name] Engineering Manager

Approved by: Brett D Nelson Date: 6-2-15
[Sign] Regional Environmental Manager

Brett Nelson
[Print Name] Regional Environmental Manager

Assigned CE

Approved by: _____ Date: _____
[Sign] DOT&PF Statewide NEPA Manager

_____
[Print Name] DOT&PF Statewide NEPA Manager

Non-Assigned CE

Approved by: _____ Date: _____
[Sign] FHWA Area Engineer

_____
[Print Name] FHWA Area Engineer

APPENDIX C

SPEED STUDIES

Cavallo, Christopher A (DOT)

From: Golden, Pamela K (DOT)
Sent: Friday, June 14, 2013 2:04 PM
To: Cavallo, Christopher A (DOT)
Subject: RE: Old Nenana Hwy - speed

You only sent the one attachment (from planning), but I would support a 45 mph design speed. We will repost speed with your project (if it survives the chopping block) and if not, we'll add it to our list of potential speed studies.

From: Cavallo, Christopher A (DOT)
Sent: Friday, June 14, 2013 1:47 PM
To: Golden, Pamela K (DOT)
Subject: Old Nenana Hwy - speed

Attached is the most recent data from Planning (taken in 2012).

I added some notes to the spreadsheet… it looks like the pace is between 35 – 45 mph and the 5 mph increment closest to the 85th percentile speed is 45 mph.

Also attached is a drawing showing the speed each curve is designed for as well as the locations of the existing speed limit signs.

Lastly I attached Green Book recommendations for design speed for rural collectors.

What design speed would you recommend? 45 mph?

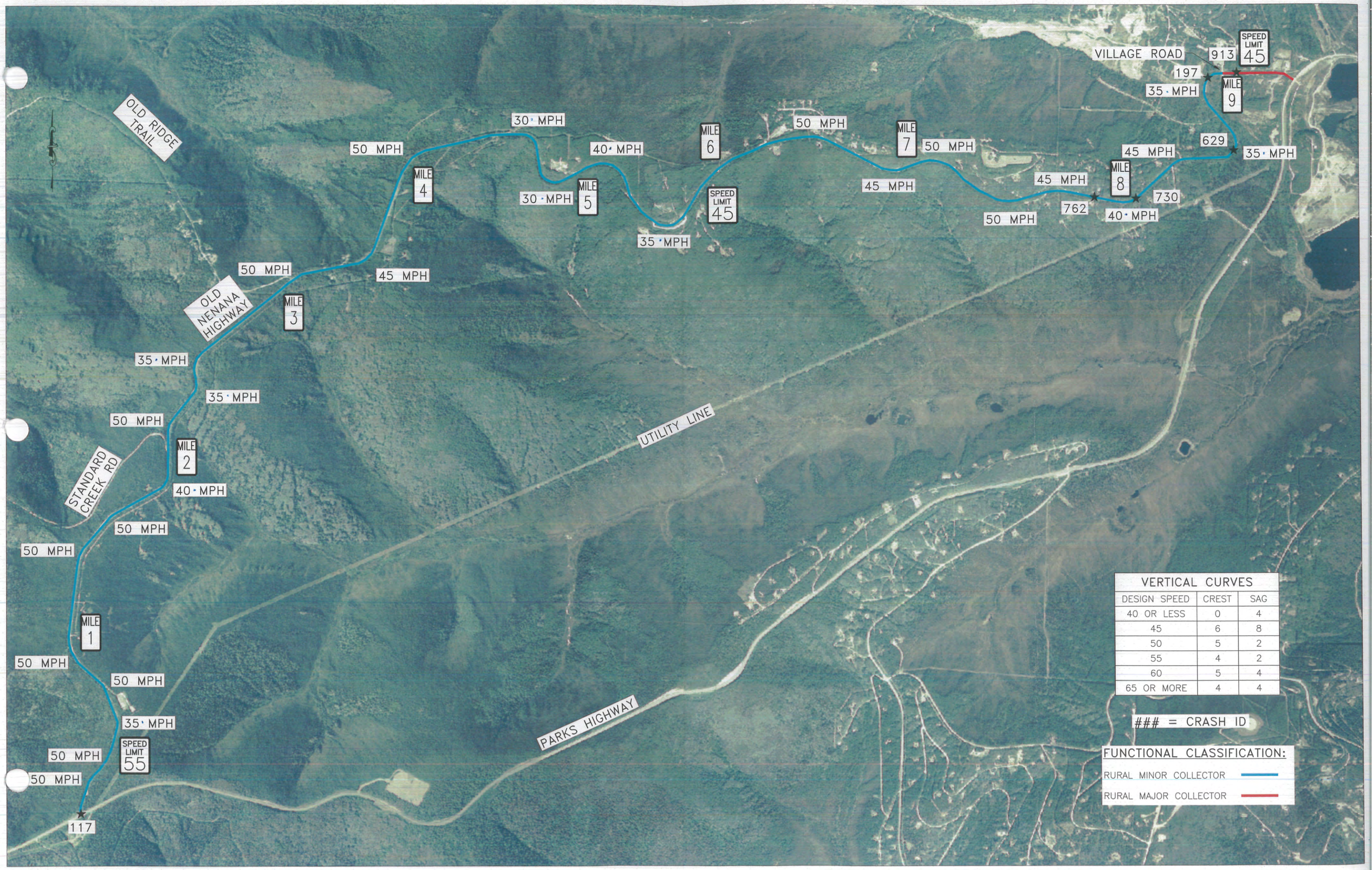
Chris

Station Name:Old Nenana Hwy West of Parks Hwy
Year: 2012

	25 MPH	30 MPH	35 MPH	40 MPH	45 MPH	50 MPH	55 MPH	60 MPH	65 MPH	70 MPH	75 MPH	80 MPH	85 MPH	90 MPH	> 90 MPH	All Speeds
Sat 11 Lane 1 (East)	7	11	69	187	214	114	37	5	2	0	2	0	0	0	0	648
Sun 12 Lane 1 (East)	1	23	66	164	183	103	30	7	3	1	0	0	0	0	0	581
Mon 13 Lane 1 (East)	2	13	67	216	242	118	61	4	3	2	0	0	0	0	0	728
Tue 14 Lane 1 (East)	5	19	84	219	258	103	43	10	1	1	0	0	0	0	0	743
Wed 15 Lane 1 (East)	1	18	74	200	244	137	42	6	3	1	0	0	0	0	0	726
Thu 16 Lane 1 (East)	5	21	77	246	262	112	50	11	1	0	1	0	0	0	0	786
Fri 17 Lane 1 (East)	5	13	82	207	274	119	54	7	4	0	0	0	0	0	1	766
Percentages	1.04%	4.17%	14.12%	31.88%	30.57%	13.01%	4.28%	0.61%	0.21%	0.06%	0.04%	0.00%	0.00%	0.00%	0.02%	100.00%
Totals	104	417	1413	3190	3059	1302	428	61	21	6	4	0	0	0	2	10007
	1.04%	5.21%	19.33%	51.21%	**81.78%**	94.79%	99.07%	99.68%	99.89%	99.95%	99.99%	99.99%	99.99%	99.99%	100.01%	

Pace

Closest to 85th percentile speed



VERTICAL CURVES		
DESIGN SPEED	CREST	SAG
40 OR LESS	0	4
45	6	8
50	5	2
55	4	2
60	5	4
65 OR MORE	4	4

= CRASH ID

FUNCTIONAL CLASSIFICATION:

RURAL MINOR COLLECTOR

RURAL MAJOR COLLECTOR

Type of terrain	Metric: Design speed (km/h) for specified design volume (veh/day)			US Customary: Design speed (mph) for specified design volume (veh/day)		
	0 to 400	400 to 2000	over 2000	0 to 400	400 to 2000	over 2000
Level	60	80	100	40	50	60
Rolling	50	60	80	30	40	50
Mountainous	30	50	60	20	30	40
Note: Where practical, design speeds higher than those shown should be considered.						

Exhibit 6-1. Minimum Design Speeds for Rural Collectors

Metric				US Customary			
Design speed	Design stopping sight distance	Rate of vertical curvature, K[a] (m/%)		Design speed	Design stopping sight distance	Rate of vertical curvature, K[a] (ft/%)	
(km/h)	(m)	Crest	Sag	(mph)	(ft)	Crest	Sag
20	20	1	3	15	80	3	10
30	35	2	6	20	115	7	17
40	50	4	9	25	155	12	26
50	65	7	13	30	200	19	37
60	85	11	18	35	250	29	49
70	105	17	23	40	305	44	64
80	130	26	30	45	360	61	79
90	160	39	38	50	425	84	96
100	185	52	45	55	495	114	115
				60	570	151	136

[a] Rate of vertical curvature, K, is the length of curve per percent algebraic difference in the intersecting grades; i.e., K = L/A (see Chapter 3 for details).

Exhibit 6-2. Design Controls for Stopping Sight Distance and for Crest and Sag Vertical Curves

APPENDIX D

3R ANALYSIS

HATTENBURG DILLEY & LINNELL
Engineering Consultants

MEMORANDUM

DATE: September 8, 2015 [Revised 12/14/15]

TO: Lauren Little, PE, DOT&PF Project Manager

FROM: Jeff Fuglestad, PE, HDL Project Manager, Katherine Lauver, Kelsey Means

RE: Old Nenana/Ester Hill Rehabilitation: 3R Analysis
Project Number (state/federal): 60455/STP-0002(257)

CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING

TRANSPORTATION ENGINEERING

ENVIRONMENTAL SERVICES

PLANNING

SURVEYING

CONSTRUCTION ADMINSTRATION

MATERIAL TESTING

RIGHT-OF-WAY SERVICES

Hattenburg, Dilley, and Linnell (HDL) has reviewed and updated a Resurfacing, Restoration and Rehabilitation (3R) analysis for the Old Nenana/Ester Hill project corridor. Lane and shoulder widths, sideslopes and clear zones, general alignment (horizontal/vertical), and safety improvements (intersection, driveway, and passing related accidents) were analyzed in accordance with the Department of Transportation and Public Facilities (DOT&PF) *Alaska Highway Preconstruction Manual* (PCM) section 1160. Standards for new construction were obtained from the PCM and the American Association of State Highway and Transportation Officials (AASHTO) 2001 publication *A Policy on Geometric Design of Highways and Streets* (PGDHS) where applicable.

The Old Nenana Highway is an important transportation link that primarily serves local traffic and commuters. The highway is classified as a Minor Collector from the beginning of the project at milepoint 0.0 to the intersection with Ester Creek Drive at milepoint 9.0, and continues on as a Major Collector to the intersection with the Parks Highway at milepoint 9.5. This corridor has posted speeds of 55 and 45 mph, with reduced speed warnings at some of the sharper horizontal curves throughout. The 2013 reported Average Annual Daily Traffic (AADT) ranges from 85 vehicles per day along the southern portion to 1,258 vehicles per day at the northern end near the intersection with the Parks Highway. Traffic data for the project was divided into three segments correlating with the segments used to report AADTs in the Northern Region DOT&PF Annual Traffic Volume Reports (ATVR), 2008-2010 and 2010-2012. The volumes for these segments are averaged over the five year historical period between 2008 and 2012. A summary of the reported accidents along the project corridor were provided by the DOT&PF for the same historical accident period and can be found in Attachment A.

The general objectives of the project are to restore the structural integrity and extend the service life of the existing roadway. Other objectives include increasing the safety and capacity of the project and providing bicycle and pedestrian facilities where cost effective.

The following recommendations are based on the results of this 3R analysis provided in Attachment B.

3335 Arctic Boulevard Suite 100 • Anchorage Alaska 99503 • Phone: 907.564.2120 • Fax: 907.564.2122
202 W. Elmwood Avenue • Palmer Alaska 99645 • Phone: 907.746.5230 • Fax: 907.746.5231

1.0 LANE AND SHOULDER WIDTHS

The existing roadway paved top width of 24-feet is less than required by current design standards for new construction. In some segments, the current roadway consists of 11-foot lanes with one foot shoulders, while in other segments, no fog line striping currently exists. The segments where no fog line currently exists were analyzed as 12-foot lanes without shoulders, in order to reflect the actual usage of the roadway.

Under the 3R analysis procedure, lane and shoulder width improvements are selected based on historical accident rates versus a predicted accident rate in accordance with PCM 1160.3.2. A lane and shoulder width analysis was performed and is contained in Attachment B. The analysis indicates that the historical accident rate is not greater than the predicted accident rate and widening the roadway is not required.

Although widening is not warranted from the results of this analysis, it is recommended that the roadway be widened three feet on each side to accommodate Groups A and B/C bicyclists according to the AASHTO *Guide for the Development of Bicycle Facilities* and *FHWA-RD-92-073 Selecting Roadway Design Treatments to Accommodate Bicycles* based on the corridor's posted speed and AADTs taken from the ATVR. Therefore, a top paved width of 30 feet (11-foot lanes and 4-foot shoulders) is recommended.

2.0 SIDESLOPES AND CLEAR ZONES

In some areas along the project, the sideslopes do not extend wide enough to meet the current clear zone design standards for new construction or are non recoverable. According to PCM 1160.3.6, the cross section geometry and obstacles within the clear zone are to be evaluated using the 3R procedures in PCM Table 1160-1. The evaluation showed that the historical accident rate is less than the predicted accident rate, and the existing sideslopes and clear zone may remain. However, to enhance safety and provide better drainage and snow storage, sideslopes and ditches should be designed to meet current standards for new construction where feasible.

3.0 GENERAL ALIGNMENT

3.1 Horizontal Alignment

There are 45 horizontal curves on the roadway. The existing horizontal alignment information pertaining to this analysis is provided in Attachment B, and aerial views of the project corridor are provided in Attachment C. The horizontal alignment was reviewed for the following 3R geometric design standards in accordance with PCM 1160.3.3.

Radius of Curvature: Twenty-eight of the 45 curves have radii less than the minimum required for new construction. Two of these curves occur in a segment of the project between Station 12+75 and Station 313+00, where the current northbound posted speed is 55 mph. At this speed, these curves require radius improvement consideration according to PCM 1160.3.3. A cost-effective technical memo was performed (Attachment D) analyzing

the cost effectiveness of improving the current radii of these curves to new construction standards. Based on the results of this analysis, the horizontal curve radius at Station 25+54 should be improved. For the horizontal curve at Station 112+76, geometric improvements are not cost effective and therefore other safety improvement measures should be considered. It is recommended that curve advisory signs with supplemental speed plaques be installed in this location. At a reduced speed, the existing radii meet the standard for new construction and require no other improvements.

Superelevation: On 3R projects, the superelevation may remain unchanged if there are no related accidents. There are five curves with related accidents, requiring the superelevation to be improved to new construction standards. Since the proposed surface rehabilitation will remove and replace the pavement and base, all superelevation rates are recommended to be improved to meet new construction standards.

Superelevation Transition Length: The existing superelevation transition lengths are unknown. Transition length generally controls driver comfort and roadway appearance rather than safety, therefore existing lengths may remain. Since it is recommended to improve all the superelevation rates, it is also recommended that all transition lengths be modified to meet new construction standards where feasible. For some locations, the distance between two curves is insufficient to meet new construction standards for transition lengths.

Minimum Length of Curve: There are 34 horizontal curves with lengths that do not meet the current standards for new construction, five of which have associated accidents. Since curve length generally controls driver comfort and roadway appearance rather than safety, the existing curve lengths may remain.

3.2 Vertical Alignment

The existing vertical alignment generally follows the surrounding terrain. A best fit vertical alignment was created for the existing profile based on surveyed topography. There are 48 vertical curves and 9 grade breaks between 0% and 5.1% along the roadway. Of those vertical curves, 24 are crest curves and 24 are sag curves. The vertical alignment was reviewed for the following 3R geometric design standards in accordance with PCM 1160.3.4 and 1160.3.11.

Crest Vertical Curves: A review of the 24 crest vertical curves revealed that 11 crest curves do not meet the current standards for new construction. Under the 3R analysis procedure, existing crest vertical curvature may remain if the actual number of accidents on the crest curve for the previous 3 to 5 years is less than the number of predicted accidents. Of the 11 curves which do not meet current standards, none have related accidents within the five year historical accident period. Two crest curves have related accidents, but already meet new construction standards and therefore no improvements are required.

Sag Vertical Curves: A review of the 24 sag vertical curves revealed that 11 do not meet the current standards for new construction. An analytical method is not available to analyze accidents at sag vertical curves. Generally, sag vertical curves that do not meet current

standards for new construction may remain, but should be reviewed for accident anomalies. Of the 11 sag curves that do not meet current standards for new construction, only two have related accidents. Therefore, all 24 sag curves may remain, but should be considered for improvement if feasible.

Grades: All existing grades currently meet the standards for new construction (*PDGHS Exhibit 6-4: Maximum Grades for Rural Collectors*). Three accidents occurred within the historical accident period for which grade may have been a factor, however all three occurred in geographically distinct locations. No accident clusters have been identified, and no improvements are recommended.

4.0 SAFETY IMPROVEMENTS

4.1 Pavement Edge Drop

Abrupt drops at the existing edge of the paved surface were observed along several segments of the project corridor and may pose a safety hazard. In accordance with PCM 1160.3.7, shoulders throughout the project corridor will be paved in order to eliminate all edge drops.

4.2 Intersection Related Accidents

There are 19 public and 6 turnout approaches that intersect the Old Nenana Highway along the project corridor. In accordance with PCM 1160.3.8, the accident history was studied at each intersection to determine whether accidents are caused by a design deficiency or operator error. For the historical accident period considered in this analysis, three accidents occurred at intersections within the project corridor.

One of the intersection related accidents occurred at the north terminus of Old Nenana Highway where it intersects the Parks Highway. This location is outside of the project limits, so no further analysis was performed.

The intersection at Flux Court had one minor injury accident and was determined to be caused by operator error. This intersection has adequate sight distance and no geometric improvements are recommended for this intersection.

The intersection at Ester Creek Drive had one property damage only accident. Inadequate sight distance was determined to be a contributing factor to this accident. A cost-effective analysis was performed for improving the sight distance at this location and is included in a technical memo (Attachment D). Reconstructing geometry at this location to meet current standards is not cost-effective. Optimizing placement of existing regulatory speed and curve advisory signs to help correct sight distance in accordance with PCM 1160.3.8 is recommended. Additionally, overgrown brush should be cleared to increase sight distance.

Sight distance is of primary importance at intersections in order to allow operators sufficient time to observe and react to conflicts. Existing intersection sight distances were checked in the field and a design memorandum documenting the study, results, and recommendations is included in Attachment E.

4.3 Driveway Related Accidents

There are 46 residential driveways that access the Old Nenana Highway along the project corridor. PCM 1160.3.9 states existing driveway geometry may remain unless accident records indicate an anomaly. No accidents were determined to be to be attributed to driveway geometry within the historical accident period considered for this analysis, therefore no improvements are required. However, the skew and grade of some driveways along the project corridor do not meet new construction standards. Driveway geometry should be improved to meet new construction standards where feasible in order to improve function and safety.

Existing residential driveway approach sight distances were checked in the field and a design memorandum documenting the study, results, and recommendations is included in Attachment E.

4.4 Passing Related Accidents

Improvements of passing distances are not required within the context of 3R projects (PCM 1160.3.10) and are not recommended for this project.

ATTACHMENT A

ACCIDENT SUMMARY

Old Nenana Highway/Ester Hill Rehabilitation Accident Summary

HDL No.	Station	Accident Mile Point	Year	Month	Day	Accident Time	Cross Street	Num Veh	Total Inj	Maj Inj	Min Inj	Tot Fatal	Acc Type	Eve Type	Surface Conditions	Intersection
1	27+00	1.00	2010	10	13	1316		2	0	0	0	0	31	VEH - ANGLE	SLUSH	
2	63+50	1.20	2012	12	21	638		1	0	0	0	0	18	MOOSE	OTHER	
3	112+00	1.81	2011	08	28	2200		1	0	0	0	0	40	OVERTURN	DRY	
4	382+00	7.05	2012	02	14	716		1	0	0	0	0	18	MOOSE	SNOW	
5	426+75	1.60	2008	10	05	1821	FLUX COURT	1	1	0	1	0	41	RAN OFF ROAD	ICE	Y
6	437+00	8.08	2009	12	18	1810		1	0	0	0	0	26	TREE	ICE	
7	487+50	9.04	2009	04	06	1236	ESTER CREEK DRIVE	2	0	0	0	0	31	VEH - ANGLE	ICE	Y
8	509+10	9.42	2010	04	13	725	ESTER FIRE DEPARTMENT	1	0	0	0	0	41	RAN OFF ROAD	ICE	
9	510+21	9.47	2008	04	12	1140	PARKS HIGHWAY MP 351.5	2	0	0	0	0	29	VEH - REAR END	ICE	Y

ATTACHMENT B

3R GEOMETRIC ANALYSIS

Old Nenana Highway/Ester Hill Rehabilitation
Lane and Shoulder Width Analysis
Segment 1 Parks Highway Mile Post 343.5 to Vista Way

TYPE	DESCRIPTION	TOTAL NUMBER OF ACCIDENTS	QUALIFYING ACCIDENTS
18	Moose	1	0
26	Tree	0	0
29	Rear End	0	0
31	Vehicle Angle	1	1
40	Overturn	1	1
41	Ran Off Road	0	0
	TOTAL	3	2

Project Segment:	**Old Nenana Highway - Parks Highway Mile Post 343.5 to Vista Road**		
Total Segment Length:		6.5	miles
Analysis Period:		5	years (2008-2012)
Total Accidents:		3	accidents (total)
Qualified Accidents:		2	accidents (qualifying)
Actual Accident Rate (Aa):		0.06	acc/mi/yr
AADT(average of study period)		163	AADT
Exist. lane width, (W):		10.0	feet
Exist. paved shld, (PA):		2.0	feet
Exist. unpaved shld, (UP):		0	feet
Median roadside hzd, (H):		5	[Figures 1160-1 thru 1160-7]
TER1:		0	non-flat terrain
TER2:		0	non-mountainous terrain
Predicted Accident Rate (Ap):		0.11	acc/mi/yr
Actual rate<=Predicted rate:	YES		Top width widening is not required.
Lane/shoulder improvement:		**0**	**feet each side**

where:
Ap = predicted number of non-intersection run-off road, head-on, side-swipe accidents per mile per year
= 0.0019*ADT^0.882 * 0.879^W * 0.919^PA * 0.932^UP * 1.236^H * 0.882^TER1 * 1.322^TER2

Aa = Actual number of non-intersection run-off road, head-on, side-swipe accidents per mile per year

Old Nenana Highway/Ester Hill Rehabilitation
Lane and Shoulder Width Analysis
Segment 2 Vista Way to Village Road

TYPE	DESCRIPTION	TOTAL NUMBER OF ACCIDENTS	QUALIFYING ACCIDENTS
18	Moose	1	0
26	Tree	1	1
29	Rear End	0	0
31	Vehicle Angle	1	0
40	Overturn	0	0
41	Ran Off Road	1	0
	TOTAL	4	1

Project Segment:	**Old Nenana Highway - Vista Way to Village Road**		
Total Segment Length:		2.6	miles
Analysis Period:		5	years (2008-2012)
Total Accidents:		4	accidents (total)
Qualified Accidents:		1	accidents (qualifying)
Actual Accident Rate (Aa):		0.08	acc/mi/yr
AADT(average of study period)		778	AADT
Exist. lane width, (W):		10.0	feet
Exist. paved shld, (PA):		2.0	feet
Exist. unpaved shld, (UP):		0	feet
Median roadside hzd, (H):		5	[Figures 1160-1 thru 1160-7]
TER1:		0	non-flat terrain
TER2:		0	non-mountainous terrain
Predicted Accident Rate (Ap):		0.45	acc/mi/yr
Actual rate<=Predicted rate:	YES		Top width widening is not required.
Lane/shoulder improvement:		**0**	**feet each side**

where:
Ap = predicted number of non-intersection run-off road, head-on, side-swipe accidents per mile per year
= 0.0019*ADT^0.882 * 0.879^W * 0.919^PA * 0.932^UP * 1.236^H * 0.882^TER1 * 1.322^TER2

Aa = Actual number of non-intersection run-off road, head-on, side-swipe accidents per mile per year

Old Nenana Highway/Ester Hill Rehabilitation
Lane and Shoulder Width Analysis
Segment 3 Village Road to Parks Highway Mile Post 351.5

TYPE	DESCRIPTION	TOTAL NUMBER OF ACCIDENTS	QUALIFYING ACCIDENTS
18	Moose	0	0
26	Tree	0	0
29	Rear End	1	0
31	Vehicle Angle	0	0
40	Overturn	0	0
41	Ran Off Road	1	1
	TOTAL	2	1

Project Segment:	**Old Nenana Highway - Village Road to Parks Highway Mile Post 351.5**		
Total Segment Length:		0.4	miles
Analysis Period:		5	years (2008-2012)
Total Accidents:		2	accidents (total)
Qualified Accidents:		1	accidents (qualifying)
Actual Accident Rate (Aa):		0.50	acc/mi/yr
AADT(average of study period)		769	AADT
Exist. lane width, (W):		10.0	feet
Exist. paved shld, (PA):		2.0	feet
Exist. unpaved shld, (UP):		0	feet
Median roadside hzd, (H):		5	[Figures 1160-1 thru 1160-7]
TER1:		0	non-flat terrain
TER2:		0	non-mountainous terrain
Predicted Accident Rate (Ap):		0.45	acc/mi/yr
Actual rate<=Predicted rate:	NO		Widen top width 1' each side for each 10% Aa>Ap
Lane/shoulder improvement:		**1**	**feet each side**

where:

Ap = predicted number of non-intersection run-off road, head-on, side-swipe accidents per mile per year

= 0.0019*ADT^0.882 * 0.879^W * 0.919^PA * 0.932^UP * 1.236^H * 0.882^TER1 * 1.322^TER2

Aa = Actual number of non-intersection run-off road, head-on, side-swipe accidents per mile per year

Old Nenana Highway/Ester Hill Rehabilitation
Horizontal Curve Analysis

Segment 1 Parks Highway Mile Post 343.5 to Vista Way

Curve	PI STA	Existing Radius (ft)	Posted Speed (mph)	New Const. Radius (ft)	Meets New Const. Radius	Actual Accidents	Predicted Accidents (Ah)	Requires Radius Improvement	Existing Length (ft)	New Const. Length (ft)	Meets New Const. Length
1	11+24	191	55	1,065	NO	0	2	NO	112.9	825.0	NO
2	19+66	917	55	1,065	NO	0	1	NO	401.4	825.0	NO
3	25+54	996	55	1,065	NO	1	1	YES	455.8	825.0	NO
4	33+42	918	55	1,065	NO	0	0	NO	137.1	825.0	NO
5	35+33	481	55	1,065	NO	0	1	NO	241.7	825.0	NO
6	45+43	996	55	1,065	NO	0	2	NO	521.5	825.0	NO
7	57+45	1,027	55	1,065	NO	0	3	NO	1,020.5	825.0	YES
8	81+76	1,002	55	1,065	NO	0	2	NO	550.0	825.0	NO
9	93+41	996	55	1,065	NO	0	1	NO	391.3	825.0	NO
10	108+74	533	55	1,065	NO	0	1	NO	229.7	825.0	NO
11	110+82	449	55	1,065	NO	0	1	NO	187.1	825.0	NO
12	112+76	819	55	1,065	NO	1	1	YES	202.5	825.0	NO
13	120+81	3,820	55	1,065	YES	0	0	NO	212.2	825.0	NO
14	125+24	996	55	1,065	NO	0	2	NO	650.9	825.0	NO
15	135+27	637	55	1,065	NO	0	1	NO	238.1	825.0	NO
16	137+77	477	55	1,065	NO	0	1	NO	258.3	825.0	NO
17	143+33	509	55	1,065	NO	0	3	NO	578.3	825.0	NO
18	175+29	1,910	55	1,065	YES	0	0	NO	249.1	825.0	NO
19	178+33	955	55	1,065	NO	0	1	NO	354.5	825.0	NO
20	195+17	819	55	1,065	NO	0	3	NO	868.6	825.0	YES
21	223+34	1,034	55	1,065	NO	0	3	NO	1,051.6	825.0	YES
22	244+54	1,146	55	1,065	YES	0	1	NO	221.2	525.0	NO
23	254+45	370	55	1,065	NO	0	4	NO	531.7	525.0	YES
24	267+43	364	55	1,065	NO	0	5	NO	691.3	525.0	YES
25	284+95	643	55	1,065	NO	0	5	NO	1,131.8	600.0	YES
26	292+95	1,348	55	1,065	YES	0	1	NO	565.5	600.0	NO
27	299+09	1,470	55	1,065	YES	0	1	NO	545.0	600.0	NO
28	306+53	511	55	1,065	NO	0	4	NO	765.4	600.0	YES
29	319+57	1,910	45	660	YES	0	1	NO	533.5	675.0	NO
30	326+66	1,677	45	660	YES	0	1	NO	513.5	675.0	NO
31	339+48	1,432	45	660	YES	0	1	NO	400.1	675.0	NO
31	339+48	1,432	45	660	YES	0	2	NO	657.7	675.0	NO

Analyze only curves which do not meet standards for new construction and have associated qualifying accidents.

ARS= Accident rate on comparable straight segment in accidents per million vehicle miles
ARS = AT/ (adt*365 day/yr*Y*(LH-LC)/1000000

AT (Number of accidents on tangents)
LH (existing highway segment length)
LC (total length of curves)
ADT (mid-accident study period)
Y (accident study period)

Straight Segment Accident Rate ARS=

Ah= Predicted number of accidents on each curve segment
Ah= ARS(L)(V) + (0.0336*D*V)

L (length of segment)
V (total traffic volume)
D (degree of curve)
LC (length of curved component)
L = LC when isolating curve

Old Nenana Highway/Ester Hill Rehabilitation
Horizontal Curve Analysis

Segment 2 Vista Way to Village Road

Curve	PI STA	Existing Radius (ft)	Posted Speed (mph)	New Const. Radius (ft)	Meets New Const. Radius	Actual Accidents	Predicted Accidents (Ah)	Requires Radius Improvement (Cost Effective)	Existing Length (ft)	New Const. Length (ft)	Meets New Const. Length
33	371+45	834	45	660	YES	0	2	NO	726.1	675.0	YES
34	378+51	1,513	45	660	YES	0	0	NO	162.9	675.0	NO
35	384+92	891	45	660	YES	1	3	NO	999.1	675.0	YES
36	392+46	2,062	45	660	YES	0	1	NO	623.2	675.0	NO
37	403+26	919	45	660	YES	0	2	NO	740.2	675.0	YES
38	417+15	917	45	660	YES	0	1	NO	428.8	675.0	NO
39	435+59	637	45	660	NO	1	3	NO	623.2	675.0	NO
40	451+52	756	45	660	YES	0	2	NO	576.9	675.0	NO
41	470+86	402	45	660	NO	0	6	NO	914.2	525.0	YES
42	480+42	1,146	45	660	YES	0	1	NO	294.5	525.0	NO
43	483+06	559	45	660	NO	0	1	NO	232.8	525.0	NO
44	488+56	395	45	660	NO	1	4	NO	633.5	675.0	NO

Segment 3 Village Road to Parks Highway Mile Post 351.5

Curve	PI STA	Existing Radius (ft)	Posted Speed (mph)	New Const. Radius (ft)	Meets New Const. Radius	Actual Accidents	Predicted Accidents (Ah)	Requires Radius Improvement (Cost Effective)	Existing Length (ft)	New Const. Length (ft)	Meets New Const. Length
45	507+10	603	45	660	NO	0	2	NO	363.9	675.0	NO

Analyze only curves which do not meet standards for new construction and have associated qualifying accidents.

ARS= Accident rate on comparable straight segment in accidents per million vehicle miles
ARS = AT/ (adt*365 day/yr*Y*(LH-LC)/1000000

AT (Number of accidents on tangents)
LH (existing highway segment length)
LC (total length of curves)
ADT (mid-accident study period)
Y (accident study period)

Straight Segment Accident Rate ARS=

Ah= Predicted number of accidents on each curve segment
Ah= ARS(L)(V) + (0.0336*D*V)

L (length of segment)
V (total traffic volume)
D (degree of curve)
LC (length of curved component)
L = LC when isolating curve

Old Nenana Highway/Ester Hill Rehabilitation
Vertical Curve Analysis

Curve	PVI Station	Existing A (%)	Existing Curve Type	Existing Length (ft)	Existing K Value (Note 1)	New Const. K Value	Meets New Const. K value	Actual Qualifying Accidents	Predicted Accidents (Nc)	Recommendations
1	10+00	-0.48	GRD BRK							OK
2	11+54	2.62	GRD BRK							OK
3	12+51	3.16	GRD BRK							OK
4	15+48	1.21	SAG	200	165	115	YES			OK
5	20+50	-2.20	CREST	500	227	114	YES			OK
6	29+50	-3.91	CREST	500	128	114	YES	1		OK
7	42+00	-5.94	CREST	900	152	114	YES			OK
8	49+75	4.77	SAG	400	84	115	NO	0	N/A	OK
9	54+75	-5.41	CREST	400	74	114	NO	0		OK
10	63+50	3.95	SAG	400	101	115	NO	1	N/A	OK
11	69+25	-3.97	CREST	400	101	114	NO	0		OK
12	81+00	5.53	SAG	400	72	115	NO	0	N/A	OK
13	85+25	-5.03	CREST	300	60	115	NO	0		OK
14	92+00	4.42	SAG	400	90	115	NO	0	N/A	OK
15	99+25	-4.20	CREST	400	95	114	NO	0		OK
16	104+00	4.56	SAG	400	88	115	NO	0	N/A	OK
17	113+25	-5.33	CREST	800	150	114	YES	1		OK
18	127+25	12.30	SAG	600	49	115	NO	0	N/A	OK
19	149+50	-8.33	CREST	600	72	114	NO	0		OK
20	157+00	4.33	SAG	400	92	115	NO	0	N/A	OK
21	170+25	3.05	SAG	400	131	115	YES			OK
22	184+00	-4.80	CREST	400	83	114	NO	0		OK
23	190+00	-3.56	CREST	400	112	114	NO	0		OK
24	194+50	5.13	SAG	400	78	115	NO	0	N/A	OK
25	200+75	-7.07	CREST	500	71	114	NO	0		OK
26	215+50	11.22	SAG	900	80	115	NO	0	N/A	OK
27	235+50	-6.87	CREST	500	73	114	NO	0		OK
28	243+00	2.77	SAG	400	144	115	YES			OK
29	250+25	-4.98	CREST	1,000	201	114	YES			OK
30	259+00	2.65	SAG	400	151	115	YES			OK
31	269+00	4.20	SAG	400	95	115	NO	0	N/A	OK
32	279+00	-4.32	CREST	400	93	114	NO	0		OK
33	290+00	0.88	SAG	600	682	115	YES			OK
34	301+00	2.60	SAG	400	154	115	YES			OK
35	308+00	-9.34	CREST	700	75	114	NO	0		OK
36	316+00	5.62	SAG	400	71	79	NO	0	N/A	OK
37	322+50	-2.39	CREST	400	167	61	YES			OK
38	333+00	3.37	SAG	400	119	79	YES			OK
39	338+50	-2.46	CREST	400	163	61	YES			OK
40	351+25	-3.33	CREST	400	120	61	YES			OK
41	361+00	2.45	SAG	400	163	79	YES			OK
42	370+00	-3.96	CREST	600	152	61	YES			OK
43	391+75	4.28	SAG	400	93	79	YES			OK
44	398+00	-2.26	CREST	400	177	61	YES			OK
45	405+00	2.35	SAG	400	170	79	YES			OK
46	412+50	-4.11	CREST	600	146	61	YES			OK

Old Nenana Highway/Ester Hill Rehabilitation
Vertical Curve Analysis

Curve	PVI Station	Existing A (%)	Existing Curve Type	Existing Length (ft)	Existing K Value (Note 1)	New Const. K Value	Meets New Const. K value	Actual Qualifying Accidents	Predicted Accidents (Nc)	Recommendations
47	429+00	0.37	GRD BRK							OK
48	446+00	-0.43	GRD BRK							OK
49	455+00	0.46	GRD BRK							OK
50	466+00	5.02	SAG	500	100	79	YES			OK
51	472+50	-6.09	CREST	500	82	61	YES			OK
52	486+25	7.00	SAG	900	129	79	YES	1	N/A	OK
53	495+00	-2.52	CREST	500	198	61	YES			OK
54	505+00	1.12	SAG	300	268	79	YES			OK
55	509+00	-0.04	GRD BRK							OK
56	509+95	-3.13	GRD BRK							OK
57	510+21	5.07	GRD BRK							OK

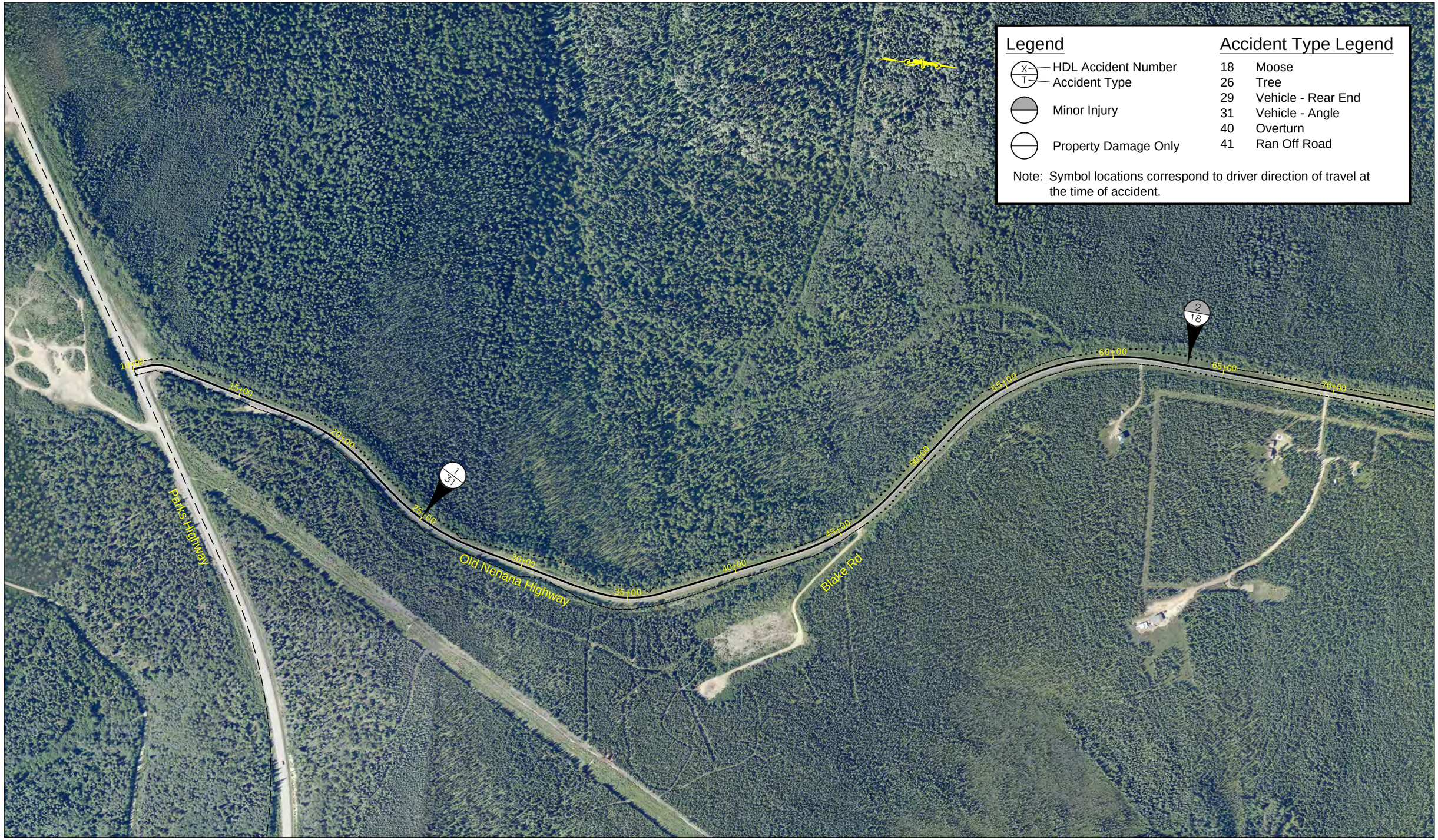
Notes: **1.** **The K-value is calculated using the equation K = L/A**

Old Nenana Highway/Ester Hill Rehabilitation
Grade Analysis

Segment	Begin Segment	End Segment	Exising Grade (%)	Existing Length (ft)	Terrain	Posted Speed	Max. Allowable Grade (%)	Grade Requires Improvement	Crashes Present	Recommendations
1	10+00.0	11+53.5	-0.48	153.5	Mountainous	55	9	No		OK
2	11+53.5	12+51.3	2.14	97.8	Mountainous	55	9	No		OK
3	12+51.3	15+47.7	5.30	296.4	Mountainous	55	9	No		OK
4	15+47.7	20+50.0	6.51	502.3	Mountainous	55	9	No		OK
5	20+50.0	29+50.0	4.31	900.0	Mountainous	55	9	No	1	OK
6	29+50.0	42+00.0	0.40	1,250.0	Mountainous	55	9	No		OK
7	42+00.0	49+75.0	-5.54	775.0	Mountainous	55	9	No		OK
8	49+75.0	54+75.0	-0.77	500.0	Mountainous	55	9	No		OK
9	54+75.0	63+50.0	-6.18	875.0	Mountainous	55	9	No		OK
10	63+50.0	69+25.0	-2.23	575.0	Mountainous	55	9	No		OK
11	69+25.0	81+00.0	-6.20	1,175.0	Mountainous	55	9	No		OK
12	81+00.0	85+25.0	-0.67	425.0	Mountainous	55	9	No		OK
13	85+25.0	92+00.0	-5.70	675.0	Mountainous	55	9	No		OK
14	92+00.0	99+25.0	-1.28	725.0	Mountainous	55	9	No		OK
15	99+25.0	104+00.0	-5.48	475.0	Mountainous	55	9	No		OK
16	104+00.0	113+25.0	-0.92	925.0	Mountainous	55	9	No	1	OK
17	113+25.0	127+25.0	-6.25	1,400.0	Mountainous	55	9	No		OK
18	127+25.0	149+50.0	6.05	2,225.0	Mountainous	55	9	No		OK
19	149+50.0	157+00.0	-2.28	750.0	Mountainous	55	9	No		OK
20	157+00.0	170+25.0	2.05	1,325.0	Mountainous	55	9	No		OK
21	170+25.0	184+00.0	5.10	1,375.0	Mountainous	55	9	No		OK
22	184+00.0	190+00.0	0.30	600.0	Mountainous	55	9	No		OK
23	190+00.0	194+50.0	-3.26	450.0	Mountainous	55	9	No		OK
24	194+50.0	200+75.0	1.87	625.0	Mountainous	55	9	No		OK
25	200+75.0	215+50.0	-5.20	1,475.0	Mountainous	55	9	No		OK
26	215+50.0	235+50.0	6.02	2,000.0	Mountainous	55	9	No		OK
27	235+50.0	243+00.0	-0.85	750.0	Mountainous	55	9	No		OK
28	243+00.0	250+25.0	1.92	725.0	Mountainous	55	9	No		OK
29	250+25.0	259+00.0	-3.06	875.0	Mountainous	55	9	No		OK
30	259+00.0	269+00.0	-0.41	1,000.0	Mountainous	55	9	No		OK
31	269+00.0	279+00.0	3.79	1,000.0	Mountainous	55	9	No		OK
32	279+00.0	290+00.0	-0.53	1,100.0	Mountainous	55	9	No		OK
33	290+00.0	301+00.0	0.35	1,100.0	Mountainous	55	9	No		OK
34	301+00.0	308+00.0	2.95	700.0	Mountainous	55	9	No		OK
35	308+00.0	316+00.0	-6.39	800.0	Mountainous	55	9	No		OK
36	316+00.0	322+50.0	-0.77	650.0	Mountainous	45	10	No		OK
37	322+50.0	333+00.0	-3.16	1,050.0	Mountainous	45	10	No		OK
38	333+00.0	338+50.0	0.21	550.0	Mountainous	45	10	No		OK
39	338+50.0	351+25.0	-2.25	1,275.0	Mountainous	45	10	No		OK
40	351+25.0	361+00.0	-5.58	975.0	Mountainous	45	10	No		OK
41	361+00.0	370+00.0	-3.13	900.0	Mountainous	45	10	No		OK
42	370+00.0	391+75.0	-7.09	2,175.0	Mountainous	45	10	No		OK
43	391+75.0	398+00.0	-2.81	625.0	Mountainous	45	10	No		OK
44	398+00.0	405+00.0	-5.07	700.0	Mountainous	45	10	No		OK
45	405+00.0	412+50.0	-2.72	750.0	Mountainous	45	10	No		OK
46	412+50.0	429+00.0	-6.83	1,650.0	Mountainous	45	10	No	1	OK
47	429+00.0	446+00.0	-6.46	1,700.0	Mountainous	45	10	No	1	OK
48	446+00.0	455+00.0	-6.89	900.0	Mountainous	45	10	No		OK
49	455+00.0	466+00.0	-6.43	1,100.0	Mountainous	45	10	No		OK
50	466+00.0	472+50.0	-1.41	650.0	Mountainous	45	10	No		OK
51	472+50.0	486+25.0	-7.50	1,375.0	Mountainous	45	10	No		OK
52	486+25.0	495+00.0	-0.50	875.0	Mountainous	45	10	No	1	OK
53	495+00.0	505+00.0	-3.02	1,000.0	Mountainous	45	10	No		OK
54	505+00.0	509+00.0	-1.90	400.0	Mountainous	45	10	No		OK
55	509+00.0	509+94.6	-1.94	94.6	Mountainous	45	10	No	1	OK
56	509+94.6	510+20.8	-5.07	26.2	Mountainous	45	10	No	1	OK

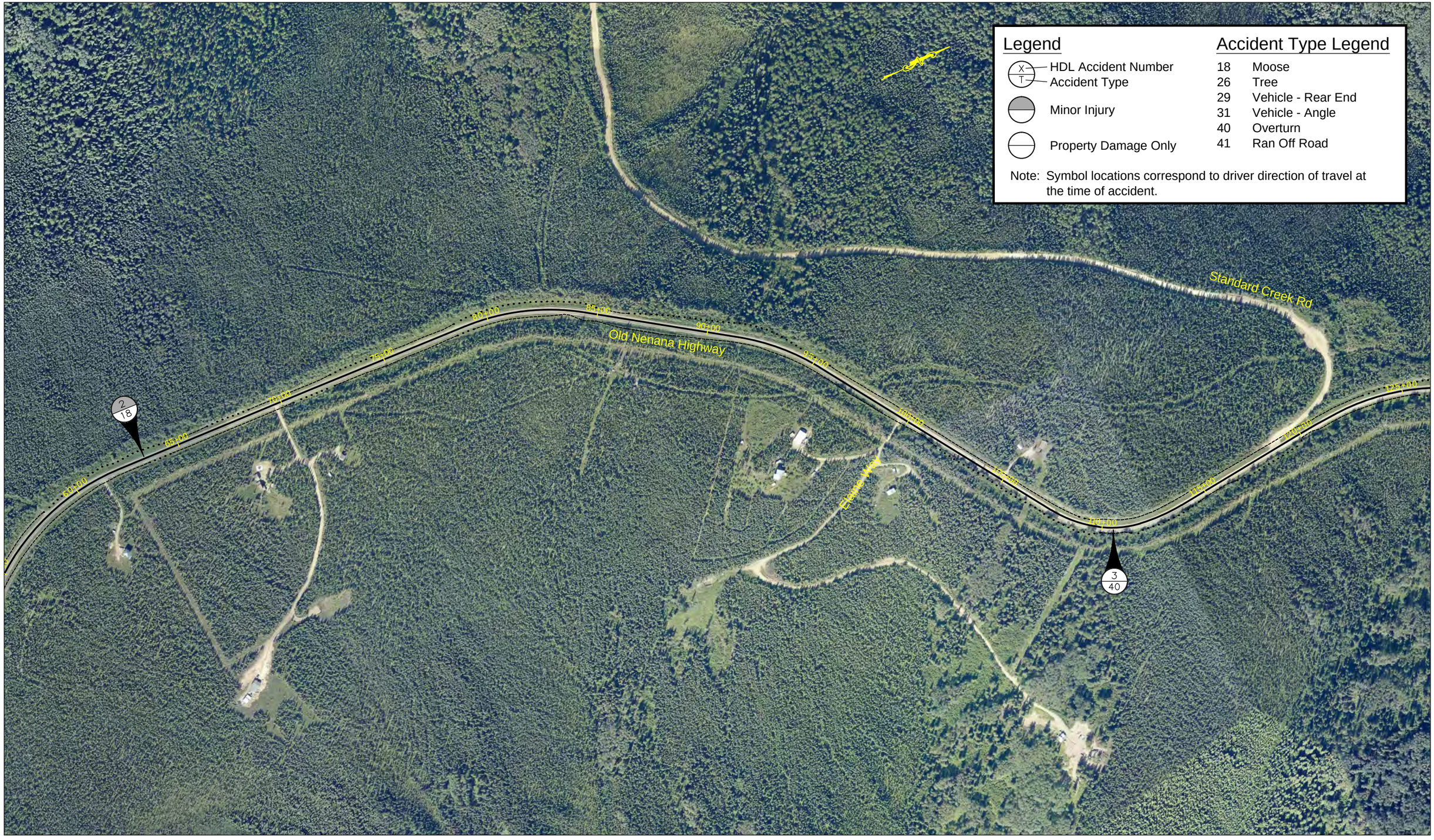
ATTACHMENT C

ACCIDENT LOCATION FIGURES



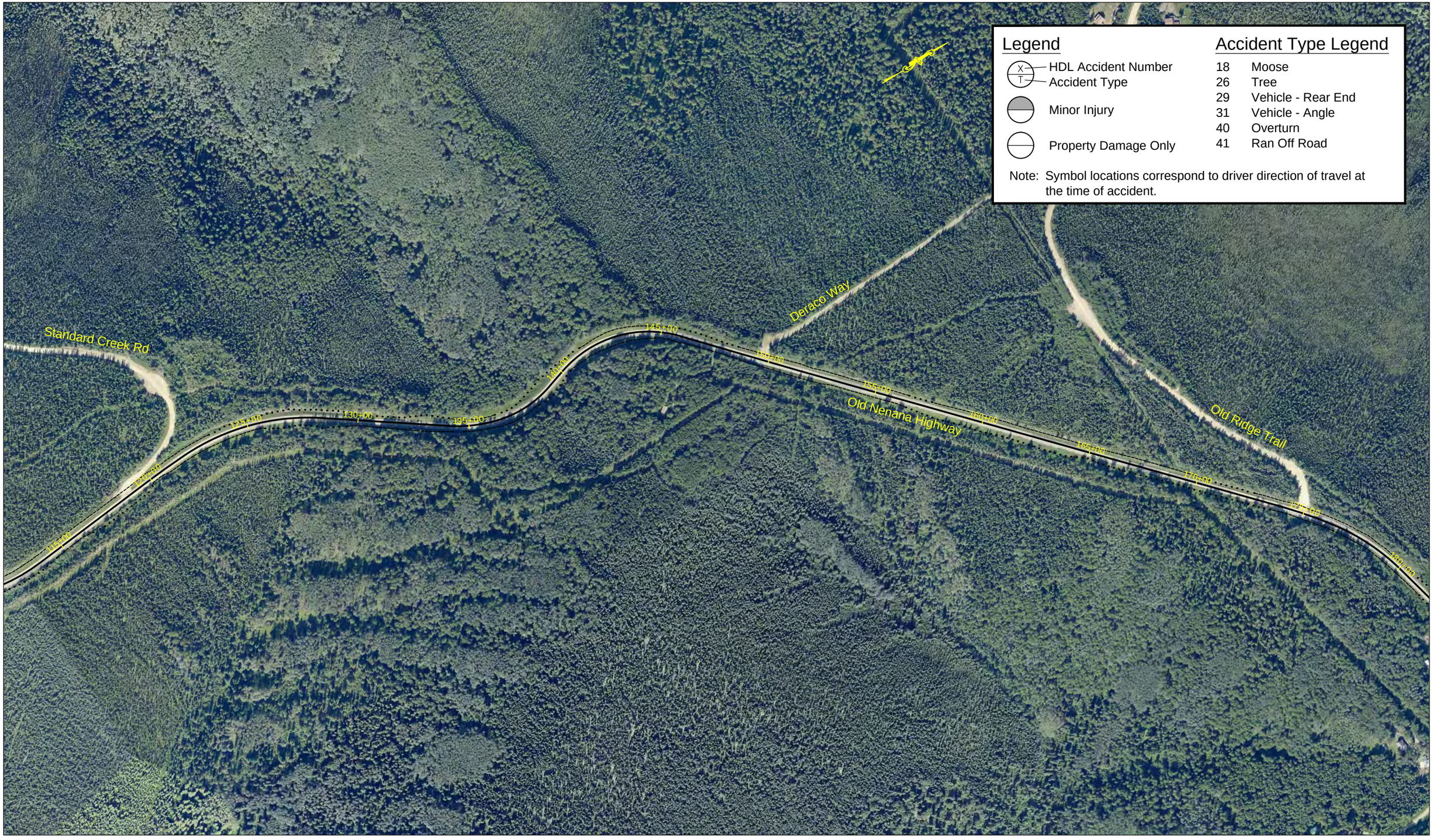
Old Nenana Highway/
Ester Hill Rehabilitation

Figure 1
Accident Locations



Old Nenana Highway/
Ester Hill Rehabilitation

Figure 2
Accident Locations



Legend

- HDL Accident Number / Accident Type
- Minor Injury
- Property Damage Only

Note: Symbol locations correspond to driver direction of travel at the time of accident.

Accident Type Legend

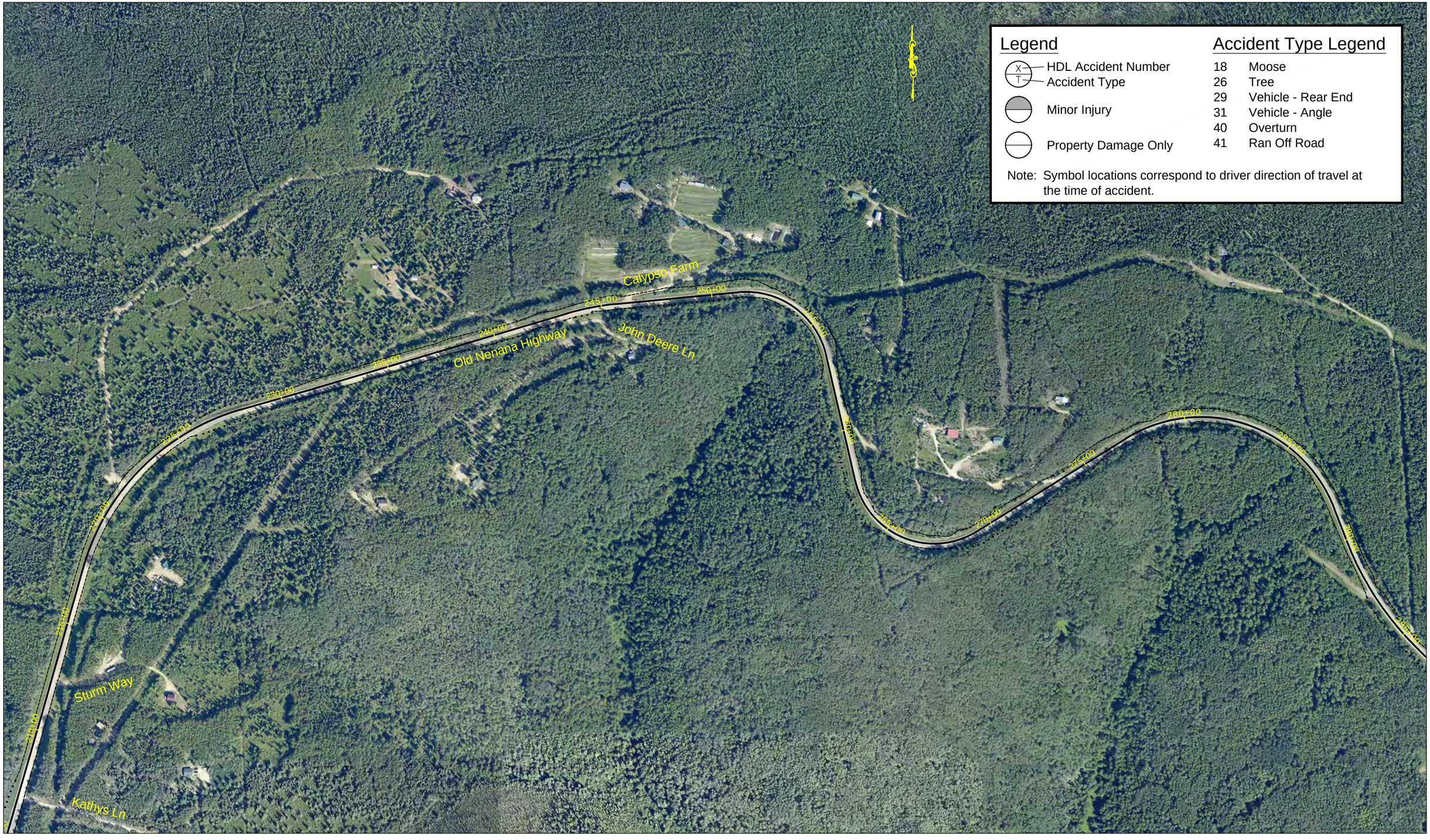
18	Moose
26	Tree
29	Vehicle - Rear End
31	Vehicle - Angle
40	Overturn
41	Ran Off Road

Old Nenana Highway/
Ester Hill Rehabilitation

Figure 3
Accident Locations

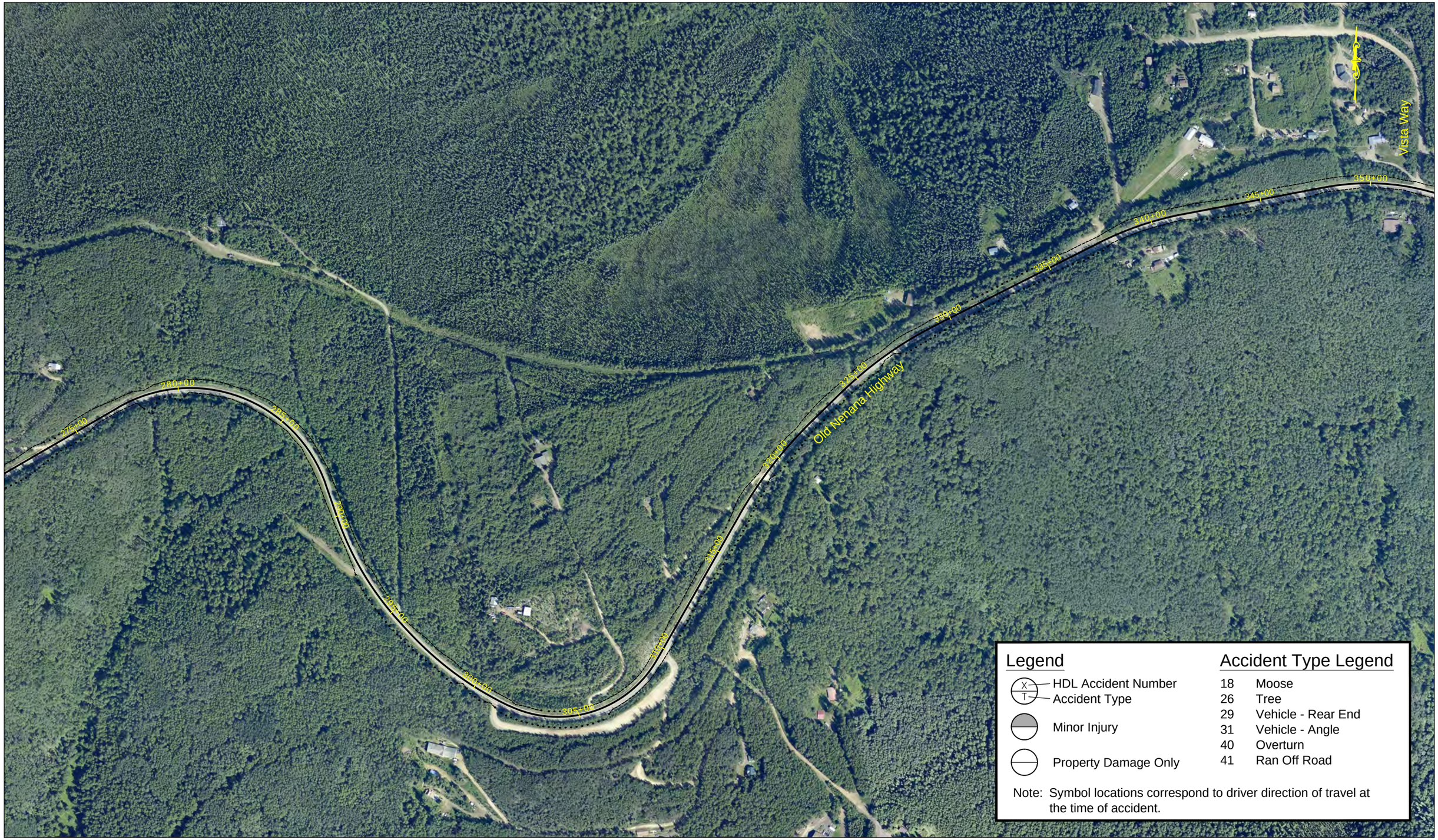
Old Nenana Highway/
Ester Hill Rehabilitation

Figure 4
Accident Locations



Old Nenana Highway/
Ester Hill Rehabilitation

Figure 5
Accident Locations



Legend

- HDL Accident Number / Accident Type
- Minor Injury
- Property Damage Only

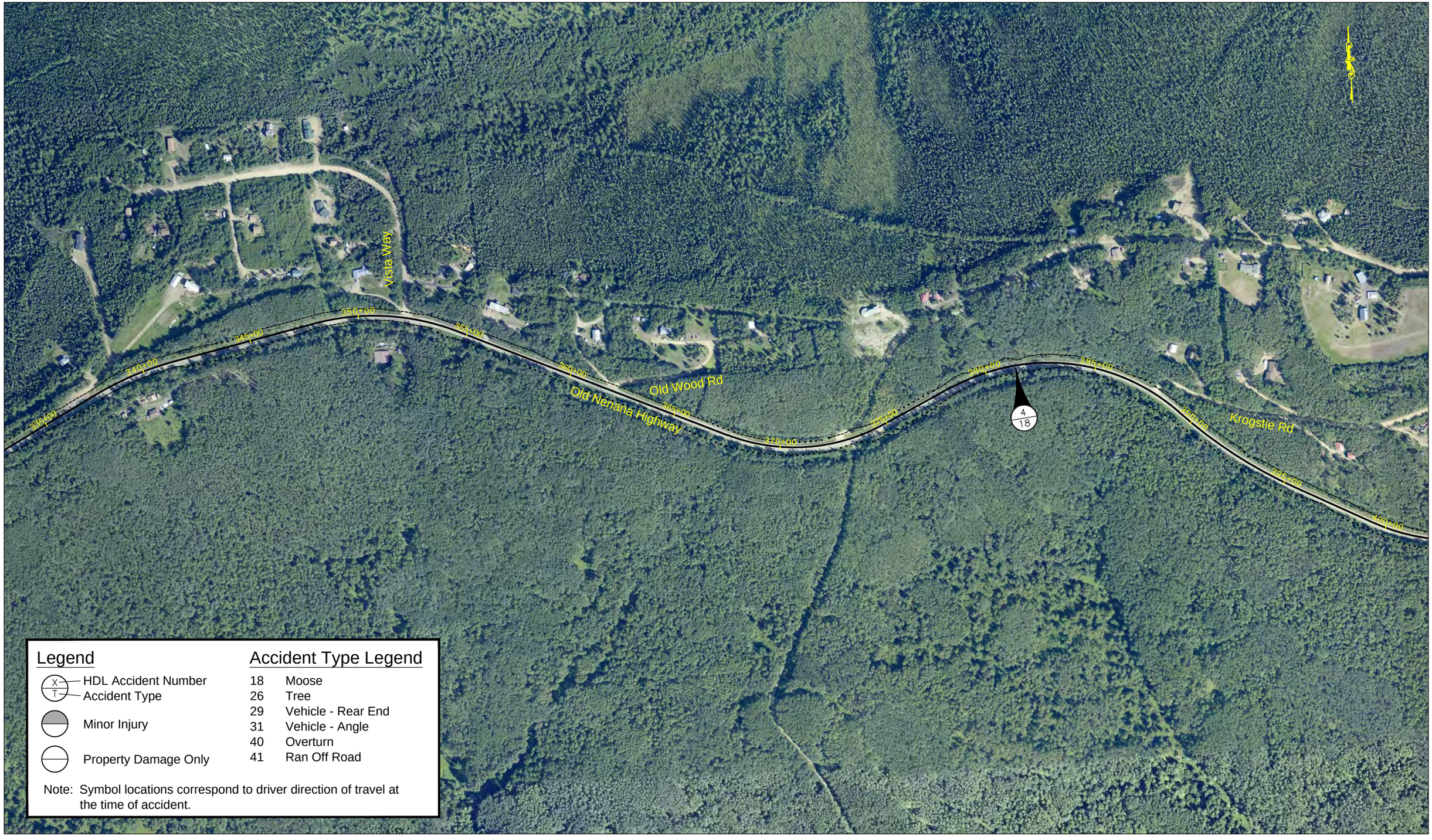
Accident Type Legend

18	Moose
26	Tree
29	Vehicle - Rear End
31	Vehicle - Angle
40	Overturn
41	Ran Off Road

Note: Symbol locations correspond to driver direction of travel at the time of accident.

Old Nenana Highway/
Ester Hill Rehabilitation

Figure 6
Accident Locations



Legend

- HDL Accident Number / Accident Type
- Minor Injury
- Property Damage Only

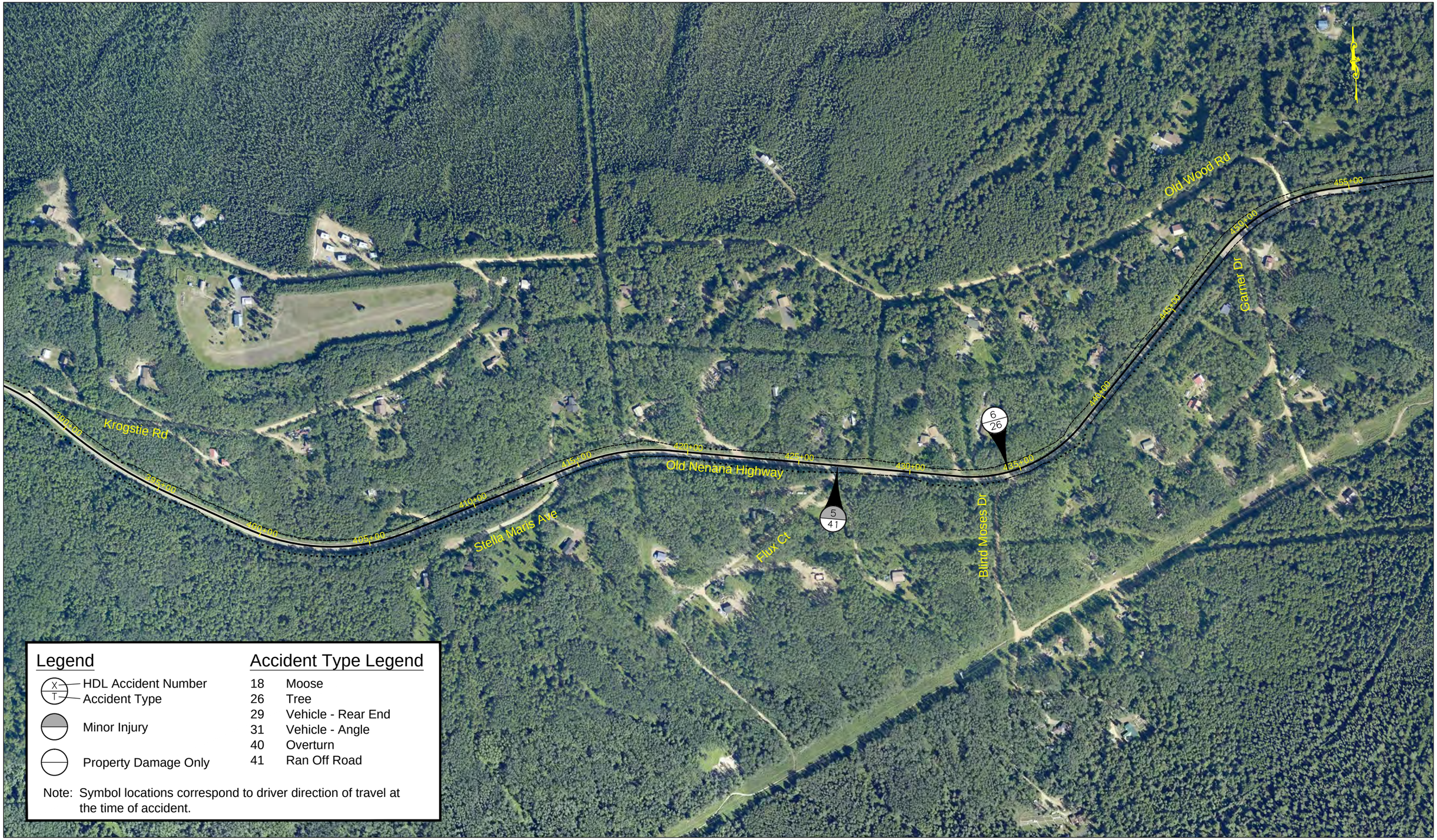
Accident Type Legend

18	Moose
26	Tree
29	Vehicle - Rear End
31	Vehicle - Angle
40	Overturn
41	Ran Off Road

Note: Symbol locations correspond to driver direction of travel at the time of accident.

Old Nenana Highway/
Ester Hill Rehabilitation

Figure 7
Accident Locations



Legend

- HDL Accident Number / Accident Type
- Minor Injury
- Property Damage Only

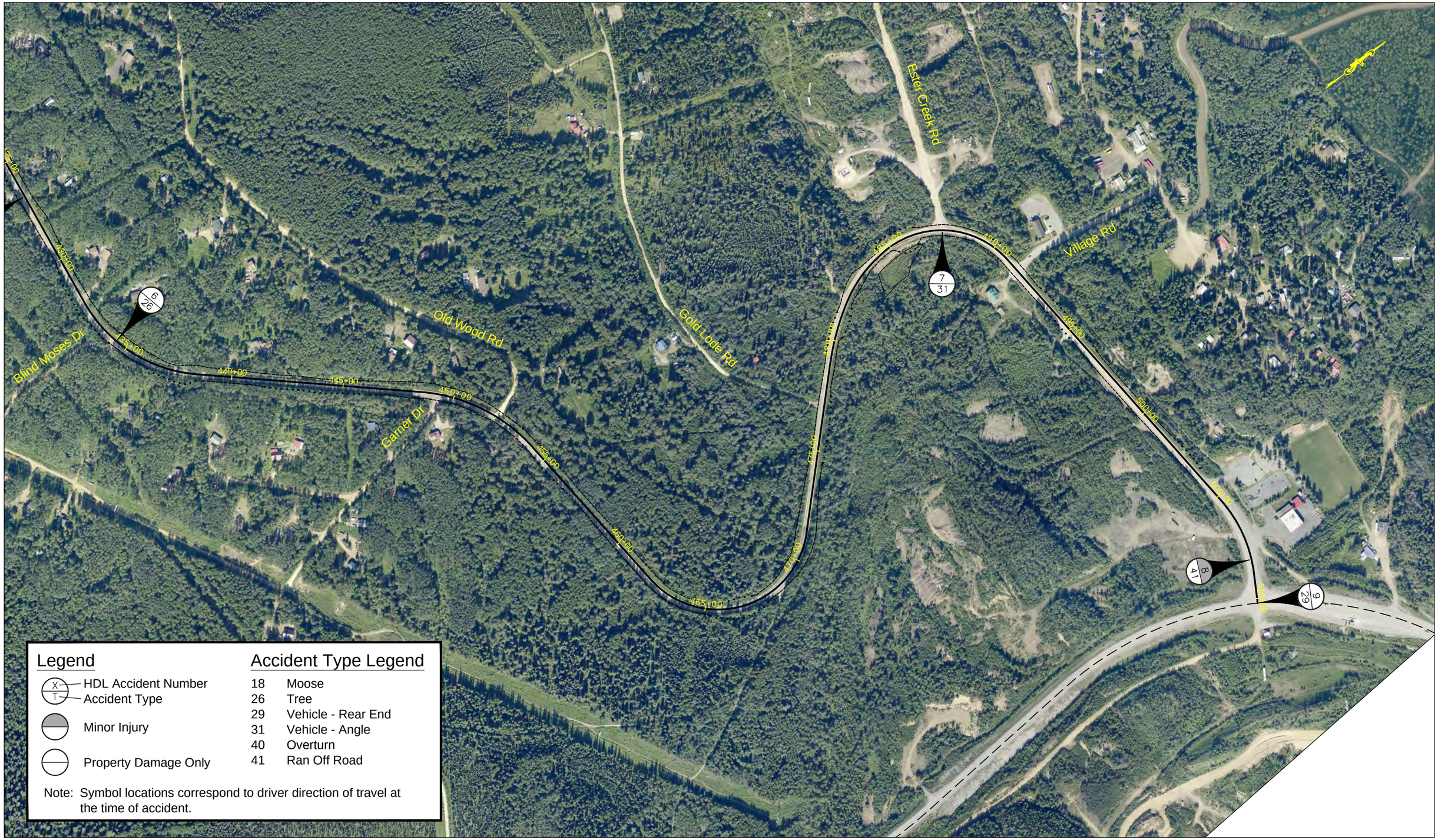
Accident Type Legend

18	Moose
26	Tree
29	Vehicle - Rear End
31	Vehicle - Angle
40	Overturn
41	Ran Off Road

Note: Symbol locations correspond to driver direction of travel at the time of accident.

Old Nenana Highway/
Ester Hill Rehabilitation

Figure 8
Accident Locations



Legend

- HDL Accident Number / Accident Type
- Minor Injury
- Property Damage Only

Accident Type Legend

18	Moose
26	Tree
29	Vehicle - Rear End
31	Vehicle - Angle
40	Overturn
41	Ran Off Road

Note: Symbol locations correspond to driver direction of travel at the time of accident.

Old Nenana Highway/
Ester Hill Rehabilitation

Figure 9
Accident Locations

ATTACHMENT D

COST-EFFECTIVE ANALYSIS: RADIUS OF CURVATURE

HATTENBURG DILLEY & LINNELL
Engineering Consultants

MEMORANDUM

DATE: September 4, 2015

TO: Lauren Little, PE, DOT&PF Project Manager

FROM: Jeff Fuglestad, PE, HDL Project Manager, Kelsey Means

RE: Old Nenana/Ester Hill Rehabilitation: Radii improvement cost-effective analysis. Project Number (state/federal): 60455/STP-0002(257)

CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING

TRANSPORTATION ENGINEERING

ENVIRONMENTAL SERVICES

PLANNING

SURVEYING

CONSTRUCTION ADMINSTRATION

MATERIAL TESTING

RIGHT-OF-WAY SERVICES

Hattenburg, Dilley, and Linnell (HDL) has completed a cost-effective analysis for radius of curvature improvements for the two horizontal curves identified for improvement consideration in the 3R Accident Analysis. Radius improvement was also considered and analyzed for cost-effectiveness for a third horizontal curve with sight distance related accidents. The cost-effective analysis was performed in accordance with the *Alaska Highway Preconstruction Manual* (PCM) section 1160.3.3 methodology.

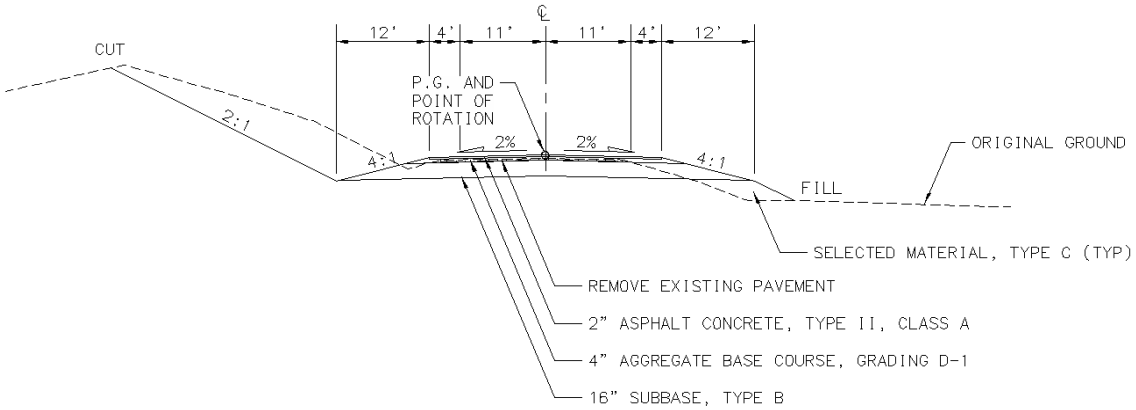
The curves identified for radius improvement consideration in the 3R analysis are located at Station 25+54 and Station 112+76. Both of these curves have radii less than the minimum for new construction, and had the actual number of accidents greater than or equal to the predicted number of accidents (see attached Horizontal Curve Analysis).

The curve identified for radius improvement consideration in order to correct an intersection sight distance deficiency is located at the Old Nenana Highway intersection with Ester Creek Drive. One accident within the historical period was determined to be related to this intersection, and attributed to insufficient sight distance for the northbound approaching vehicles.

Using the procedure outlined in the PCM Example 1160-4, and the current (2015) KABCO values provided by DOT&PF, the annual first cost of radii improvements were calculated and compared against the annual accident costs. While the PCM further recommends that the annual accident cost savings should be determined as the product of the accident reduction factor produced by the improvement, and the historical annual accident cost over study period, the cost-effective screening provided by PCM Example 1160-4 is useful to initially screen for non cost-effectiveness. If an improvement is not cost-effective under PCM Example 1160-4, then it will also not be cost-effective under the methodology utilizing accident reduction factors.

3335 Arctic Boulevard Suite 100 • Anchorage Alaska 99503 • Phone: 907.564.2120 • Fax: 907.564.2122
202 W. Elmwood Avenue • Palmer Alaska 99645 • Phone: 907.746.5230 • Fax: 907.746.5231

The assumed typical section for the cost estimates is shown below.



For the curve located at Station 25+54, the total cost of the radius improvement is essentially equal to the reconstruction cost of roadway with the existing curve radius, therefore the radius improvement to new construction standards is recommended at this location.

For the curve located at Station 112+17, the annual first cost was found to be greater than the annual accident cost, therefore radius improvement to new construction standards are not recommended at this location.

For the curve located at the Ester Creek Drive intersection (Station 488+56), the minimum intersection sight distance for northbound approaching vehicles is 392 feet (adjusted for grade), resulting in a new curve radius of 850 feet. The annual first cost was found to be greater than the annual accident cost, therefore radius improvement for sight distance deficiency is not recommended at this location.

Old Nenana Highway/Ester Hill Rehabilitation
Horizontal Curve Analysis

Segment 1 Parks Highway Mile Post 343.5 to Vista Way

Curve	PI STA	Existing Radius (ft)	Posted Speed (mph)	New Const. Radius (ft)	Meets New Const. Radius	Actual Accidents	Predicted Accidents (Ah)	Requires Radius Improvement	Existing Length (ft)	New Const. Length (ft)	Meets New Const. Length
1	11+24	191	55	1,065	NO	0	2	NO	112.9	825.0	NO
2	19+66	917	55	1,065	NO	0	1	NO	401.4	825.0	NO
3	25+54	996	55	1,065	NO	1	1	YES	455.8	825.0	NO
4	33+42	918	55	1,065	NO	0	0	NO	137.1	825.0	NO
5	35+33	481	55	1,065	NO	0	1	NO	241.7	825.0	NO
6	45+43	996	55	1,065	NO	0	2	NO	521.5	825.0	NO
7	57+45	1,027	55	1,065	NO	0	3	NO	1,020.5	825.0	YES
8	81+76	1,002	55	1,065	NO	0	2	NO	550.0	825.0	NO
9	93+41	996	55	1,065	NO	0	1	NO	391.3	825.0	NO
10	108+74	533	55	1,065	NO	0	1	NO	229.7	825.0	NO
11	110+82	449	55	1,065	NO	0	1	NO	187.1	825.0	NO
12	112+76	819	55	1,065	NO	1	1	YES	202.5	825.0	NO
13	120+81	3,820	55	1,065	YES	0	0	NO	212.2	825.0	NO
14	125+24	996	55	1,065	NO	0	2	NO	650.9	825.0	NO
15	135+27	637	55	1,065	NO	0	1	NO	238.1	825.0	NO
16	137+77	477	55	1,065	NO	0	1	NO	258.3	825.0	NO
17	143+33	509	55	1,065	NO	0	3	NO	578.3	825.0	NO
18	175+29	1,910	55	1,065	YES	0	0	NO	249.1	825.0	NO
19	178+33	955	55	1,065	NO	0	1	NO	354.5	825.0	NO
20	195+17	819	55	1,065	NO	0	3	NO	868.6	825.0	YES
21	223+34	1,034	55	1,065	NO	0	3	NO	1,051.6	825.0	YES
22	244+54	1,146	55	1,065	YES	0	1	NO	221.2	525.0	NO
23	254+45	370	55	1,065	NO	0	4	NO	531.7	525.0	YES
24	267+43	364	55	1,065	NO	0	5	NO	691.3	525.0	YES
25	284+95	643	55	1,065	NO	0	5	NO	1,131.8	600.0	YES
26	292+95	1,348	55	1,065	YES	0	1	NO	565.5	600.0	NO
27	299+09	1,470	55	1,065	YES	0	1	NO	545.0	600.0	NO
28	306+53	511	55	1,065	NO	0	4	NO	765.4	600.0	YES
29	319+57	1,910	45	660	YES	0	1	NO	533.5	675.0	NO
30	326+66	1,677	45	660	YES	0	1	NO	513.5	675.0	NO
31	339+48	1,432	45	660	YES	0	1	NO	400.1	675.0	NO
31	339+48	1,432	45	660	YES	0	2	NO	657.7	675.0	NO

Analyze only curves which do not meet standards for new construction and have associated qualifying accidents.

ARS= Accident rate on comparable straight segment in accidents per million vehicle miles
ARS = AT/ (adt*365 day/yr*Y*(LH-LC)/1000000

AT (Number of accidents on tangents)
LH (existing highway segment length)
LC (total length of curves)
ADT (mid-accident study period)
Y (accident study period)

Straight Segment Accident Rate ARS=

Ah= Predicted number of accidents on each curve segment
Ah= ARS(L)(V) + (0.0336*D*V)

L (length of segment)
V (total traffic volume)
D (degree of curve)
LC (length of curved component)
L = LC when isolating curve

Old Nenana Highway/Ester Hill Rehabilitation
Horizontal Curve Analysis

Segment 2 Vista Way to Village Road

Curve	PI STA	Existing Radius (ft)	Posted Speed (mph)	New Const. Radius (ft)	Meets New Const. Radius	Actual Accidents	Predicted Accidents (Ah)	Requires Radius Improvement (Cost Effective)	Existing Length (ft)	New Const. Length (ft)	Meets New Const. Length
33	371+45	834	45	660	YES	0	2	NO	726.1	675.0	YES
34	378+51	1,513	45	660	YES	0	0	NO	162.9	675.0	NO
35	384+92	891	45	660	YES	1	3	NO	999.1	675.0	YES
36	392+46	2,062	45	660	YES	0	1	NO	623.2	675.0	NO
37	403+26	919	45	660	YES	0	2	NO	740.2	675.0	YES
38	417+15	917	45	660	YES	0	1	NO	428.8	675.0	NO
39	435+59	637	45	660	NO	1	3	NO	623.2	675.0	NO
40	451+52	756	45	660	YES	0	2	NO	576.9	675.0	NO
41	470+86	402	45	660	NO	0	6	NO	914.2	525.0	YES
42	480+42	1,146	45	660	YES	0	1	NO	294.5	525.0	NO
43	483+06	559	45	660	NO	0	1	NO	232.8	525.0	NO
44	488+56	395	45	660	NO	1	4	NO	633.5	675.0	NO

Segment 3 Village Road to Parks Highway Mile Post 351.5

Curve	PI STA	Existing Radius (ft)	Posted Speed (mph)	New Const. Radius (ft)	Meets New Const. Radius	Actual Accidents	Predicted Accidents (Ah)	Requires Radius Improvement (Cost Effective)	Existing Length (ft)	New Const. Length (ft)	Meets New Const. Length
45	507+10	603	45	660	NO	0	2	NO	363.9	675.0	NO

Analyze only curves which do not meet standards for new construction and have associated qualifying accidents.

ARS= Accident rate on comparable straight segment in accidents per million vehicle miles
ARS = AT/ (adt*365 day/yr*Y*(LH-LC)/1000000

AT (Number of accidents on tangents)
LH (existing highway segment length)
LC (total length of curves)
ADT (mid-accident study period)
Y (accident study period)

Straight Segment Accident Rate ARS=

Ah= Predicted number of accidents on each curve segment
Ah= ARS(L)(V) + (0.0336*D*V)

L (length of segment)
V (total traffic volume)
D (degree of curve)
LC (length of curved component)
L = LC when isolating curve

Old Nenana Highway/Ester Hill Rehabilitation
Cost-Effective Analysis: Horizontal Curve Radius Improvement

Curve at Sta 25+54

Alternative/Cost	Base (ton)	Cut Volume (cu yd)	Fill Volume (ton)	AC (Ton)	Sub Base (Ton)
Bid Item	D-1	Excavation	Type C	HMA	Subbase, Grading B
Existing Curve (R=996 ft)	771	7,996	6,389	366	3,711
New Construction (R=1065 ft)	780	7,504	6,611	370	3,750
Quantity Difference	-8	492	-222	-4	-40
Unit Price	$25.00	$9.50	$10.00	$100.00	$17.00
Existing curve reconstruction cost (R=996 ft)	$19,286	$75,961	$63,887	$36,554	$63,083
New curve construction cost (R=1,060 ft)	$19,494	$71,290	$66,106	$36,950	$63,758

Total existing curve reconstruction cost = $258,772

Total new curve construction cost = $257,599

Total cost difference = ($1,173)

Accidents (5 year study period):	Number of Accidents	KABCO 2015 Cost	Accident Cost
Fatality	0	$9,400,000	$0
Incapacitating injury	0	$650,000	$0
Non-incapacitating injury	0	$130,000	$0
Possible injury	0	$69,000	$0
Property damage only	1	$7,200	$7,200
	==========		==========
	1		$7,200

From PCM Example 1160-4:

Capital Recovery Factor $$CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

Where:

Compound Growth Factor (i) = 7.00%

Design Life (n) = 20

CRF= 0.0944

Annual First Cost= CRF X Total cost difference = **($111)**

Total accident cost = $7,200

Annual Accident Cost = $1,440

Annual First Cost < Annual Accident Cost =>> Improvements are cost effective.

The assumed typical section is:

2" Hot Mix Asphalt, Type II, Class A

4" Crushed Aggregate Base Course, Grading D-1

16" Subbase, Grading B

Old Nenana Highway/Ester Hill Rehabilitation
Cost-Effective Analysis: Horizontal Curve Radius Improvement

Curve at Sta 112+76

Alternative/Cost	Base (ton)	Cut Volume (cu yd)	Fill Volume (ton)	AC (ton)	Sub Base (Ton)
Bid Item	D-1	Excavation	Type C	HMA	Subbase, Grading B
Existing Curve (R=819 ft)	1,959	10,615	1,511	928	9,436
New Construction (R=1,065 ft)	1,904	29,206	805	902	9,162
Quantity Difference	55	-18,590	706	25	274
Unit Price	$25.00	$9.50	$10.00	$100.00	$17.00
Existing curve reconstruction cost (R=819 ft)	$48,979	$100,846	$15,112	$92,750	$160,416
New curve construction cost (R=1,060 ft)	$47,602	$277,455	$8,048	$90,202	$155,752

Total existing curve reconstruction cost = $418,103

Total new curve construction cost = $579,059

Total cost difference = $160,956

Accidents (5 year study period):	Number of Accidents	KABCO 2015 Cost	Accident Cost
Fatality	0	$9,400,000	$0
Incapacitating injury	0	$650,000	$0
Non-incapacitating injury	0	$130,000	$0
Possible injury	0	$69,000	$0
Property damage only	1	$7,200	$7,200
	1		$7,200

From PCM Example 1160-4:

Capital Recovery Factor $$CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

Where:

Compound Growth Factor (i) = 7.00%

Design Life (n) = 20

CRF= 0.0944

Annual First Cost= CRF X Total cost difference = **$15,193**

Total accident cost = $7,200

Annual Accident Cost = $1,440

Annual First Cost > Annual Accident Cost =>> Improvements are not cost effective.

The assumed typical section is:

2" Hot Mix Asphalt, Type II, Class A

4" Crushed Aggregate Base Course, Grading D-1

16" Subbase, Grading B

Old Nenana Highway/Ester Hill Rehabilitation
Cost-Effective Analysis: Horizontal Curve Radius Improvement for Sight Distance

Ester Creek Drive, Station 488+56

Alternative/Cost	Base (ton)	Cut Volume (cu yd)	Fill Volume (ton)	AC (Ton)	Sub Base (Ton)
Bid Item	D-1	Excavation	Type C	HMA	Subbase, Grading B
Existing Curve (R=395 ft)	2,726	12,002	15,174	1,289	13,161
New Construction (R=850 ft)	2,086	6,212	1,000,711	986	10,072
Quantity Difference	640	5,790	-985,537	303	3,089
Unit Price	$25.00	$9.50	$10.00	$100.00	$17.00
Existing curve reconstruction cost (R=395 ft)	$68,153	$114,019	$151,738	$128,878	$223,743
New curve construction cost (R=850 ft)	$52,155	$59,013	$10,007,105	$98,625	$171,223

Total existing curve reconstruction cost = $686,531

Total new curve construction cost = $10,388,121

Total cost difference = $9,701,590

Accidents (5 year study period):	Number of Accidents	KABCO 2015 Cost	Accident Cost
Fatality	0	$9,400,000	$0
Incapacitating injury	0	$650,000	$0
Non-incapacitating injury	0	$130,000	$0
Possible injury	0	$69,000	$0
Property damage only	1	$7,200	$7,200
	==========		==========
	1		$7,200

From PCM Example 1160-4:

Capital Recovery Factor $$CRF = \frac{i(1+i)^n}{(1+i)^n - 1}$$

Where:

Compound Growth Factor (i) = 7.00%

Design Life (n) = 20

CRF= 0.0944

Annual First Cost= CRF X Total cost difference = **$915,761**

Total accident cost = $7,200

Annual Accident Cost = $1,440

Annual First Cost > Annual Accident Cost =>> Improvements are not cost effective.

The assumed typical section is:

2" Hot Mix Asphalt, Type II, Class A

4" Crushed Aggregate Base Course, Grading D-1

16" Subbase, Grading B

ATTACHMENT E

EXISTING APPROACH SIGHT DISTANCE STUDY

HATTENBURG DILLEY & LINNELL
Engineering Consultants

MEMORANDUM

DATE: September 4, 2015

TO: File

FROM: Kelsey Means / Jeff Fuglestad, P.E.

RE: Old Nenana Highway/Ester Hill Rehabilitation, Driveway and Public Approach Sight Distance Study

CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING

TRANSPORTATION ENGINEERING

ENVIRONMENTAL SERVICES

PLANNING

SURVEYING

CONSTRUCTION ADMINSTRATION

MATERIAL TESTING

RIGHT-OF-WAY SERVICES

Hattenburg, Dilley, & Linnell (HDL) has completed an approach sight distance study at all of the public approaches, driveways, and pullouts within the project limits. The study was performed when the weather was not a factor to visibility.

The study used a TruPulse 200 rangefinder from Laser Technology Incorporated, a handheld device that measures distances up to 3,280 feet with an accuracy of +/- 1 to 3 feet. At each approach, unobstructed sight distance was measured in both northbound and southbound directions.

The posted speed and unobstructed sight distance in both northbound and southbound directions were recorded and are attached. The speeds listed are either the posted regulatory speeds, or the posted advisory speeds where applicable.

Minimum approach sight distances are based on the stopping sight distance which is the length of roadway adequate for a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. This length includes (1) the distance a vehicle travels from when the driver sees the object to when the driver applies the break and (2) the distance needed to stop the vehicle once the brakes are applied.

The recommended minimum STOPPING sight distances on level terrain, per the American Association of State Highway and Transportation Officials (AASHTO) are as follows:

Speed	Sight Distance
65 mph	645 ft
60 mph	570 ft
55 mph	495 ft
50 mph	425 ft
45 mph	360 ft
40 mph	305 ft
35 mph	250 ft
30 mph	200 ft
25 mph	155 ft

The above stopping sight distances should be adjusted for when grades exceed -3% and +3%.

There are 26 existing approaches that have sight distances in at least one direction of approaching vehicle travel, that are less than the recommended minimums. Additional

clearing, cut slope flattening, or other geometric improvements should be considered to improve sight distances at these locations if feasible.

Old Nenana Highway - Ester Hill Rehabilitation
Approach Sight Distance Study

Public Approach or Driveway Station	Offset	Posted Speed Limit (Main Rd.) MPH	Measured Sight Distance NB	Average % Grade NB	Min Sight Dist NB - Grade Adjusted*	Meets Min SD NB	Measured Sight Distance SB	Average % Grade SB	Min Sight Dist SB - Grade Adjusted*	Meets Min SD SB	Remarks	DW	SS	PULLOUT
16+00	RT	55	407	3.7%	462	N	486	-6.1%	552	N				X
45+75	RT	55	965	-3.3%	519	Y	585	4.5%	456	Y		X		
61+25	RT	55	878	-6.0%	552	Y	333	4.0%	462	N	NB - VC, SB - BC	X		
69+70	RT	55	1164	-2.9%	519	Y	1063	6.0%	449	Y	SB - BC	X		
99+50	RT	55	965	-2.0%	510	Y	468	4.4%	462	Y	Elaine Way		X	
105+00	LT	55	361	-4.3%	530	N	782	1.4%	484	Y	SB - VC	X		
118+75	LT	55	580	-5.4%	541	Y	526	6.4%	449	Y	Standard Creek Road, SB - VC		X	
147+50	RT	55	386	5.6%	449	N	400	-1.2%	501	N	NB - VC	X		
149+50	LT	55	390	4.4%	462	N	489	1.2%	484	Y	Deraco Way, NB - VC		X	
175+00	LT	55	521	4.7%	456	Y	>1000	-5.1%	541	Y	Old Ridge Tr		X	
183+50	LT	55	580	4.6%	456	Y	592	-1.3%	501	Y	NB - VC	X		
185+50	RT	55	546	3.5%	462	Y	602	0.1%	492	Y	Siegrist Dr, NB - VC		X	
188+00	LT	55	386	1.7%	476	N	392	1.7%	476	N	NB - VC	X		
196+75	RT	55	423	-1.0%	501	N	557	-0.2%	492	Y	Driveway not surveyed, NB - VC	X		
207+00	RT	55	>1000	-4.9%	541	Y	583	5.1%	456	Y	Kathys Ln, SB - VC		X	
212+25	RT	55	788	-4.9%	541	Y	945	0.5%	484	Y	Sturm Wy		X	
221+75	LT	55	537	4.6%	456	Y	707	-6.1%	552	Y	SB - Vision obscured by trees	X		
241+00	LT	55	783	-0.2%	492	Y	504	-0.7%	501	Y	SB - VC	X		
243+25	RT	55	280	-0.5%	492	N	702	-1.3%	501	Y	John Deere Ln, SB, BC		X	
246+25	LT	55	691	0.9%	484	Y	>1000	-0.2%	492	Y	Calypso Farm	X		
259+25	LT	55	340	-2.1%	510	N	441	1.2%	484	N		X		
273+50	LT	55	564	3.0%	469	Y	539	-3.7%	530	Y		X		
292+50	RT	55	579	-0.4%	492	Y	541	-0.3%	492	Y		X		
295+25	LT	55	443	0.0%	492	N	456	-0.6%	501	N		X		
301+25	RT	55	318	0.7%	484	N	602	-2.4%	510	Y	Turnout			X
305+50	LT	55	230	2.4%	476	N	278	1.8%	476	N	NB - BC	X		
309+75	RT	55	996	2.1%	476	Y	342	6.8%	443	N	Turnout			X
319+00	LT	45	576	-2.0%	371	Y	>1000	1.2%	354	Y		X		
319+00	RT	45	288	-2.0%	371	N	>1000	1.2%	354	Y		X		
330+00	LT	45	>1000	-3.2%	378	Y	475	2.4%	349	Y		X		
336+50	LT	45	456	0.0%	359	Y	>1000	1.3%	354	Y	NB - BC	X		
338+00	RT	45	420	0.0%	359	Y	>1000	1.7%	349	Y	NB - BC	X		
342+50	RT	45	815	-1.9%	371	Y	457	2.3%	349	Y		X		
352+00	LT	45	>1000	-3.3%	378	Y	375	5.4%	335	Y	Vista Way		X	
352+50	RT	45	>1000	-3.8%	385	Y	408	5.5%	331	Y	SB - Mailboxes partially obscure vision	X		
355+75	LT	45	>1000	-5.4%	392	Y	589	5.6%	331	Y		X		
359+00	LT	45									Driveway surveyed, not a driveway in field	X		
359+50	LT	45									Driveway surveyed, not a driveway in field	X		
362+00	LT	45	724	-4.8%	392	Y	>1000	3.2%	344	Y		X		
372+75	LT	45	816	-5.9%	400	Y	274	6.9%	327	N	Old Wood Rd		X	
373+25	RT	45	719	-6.2%	400	Y	382	6.9%	327	Y		X		
387+75	LT	45	699	-7.1%	408	Y	427	6.7%	327	Y	Krogstie Rd		X	
407+75	LT	45	577	-3.1%	378	Y	454	3.1%	344	Y	NB - VC	X		
412+50	LT	45	434	-3.6%	385	Y	688	5.8%	331	Y	SB - VC	X		
414+00	RT	45	678	-4.5%	385	Y	476	6.5%	327	Y	Stella Maris Ave		X	
419+25	LT	45	>1000	-7.0%	408	Y	459	7.0%	327	Y		X		
422+25	LT	45	>1000	-7.1%	408	Y	525	6.7%	327	Y		X		
425+00	LT	45	750	-6.9%	408	Y	791	6.6%	327	Y		X		
426+75	RT	45	650	-6.7%	408	Y	870	6.6%	327	Y	Flux Ct		X	
429+00	RT	45	465	-6.6%	408	Y	>1000	6.6%	327	Y		X		X
432+00	LT	45	265	-6.6%	408	N	>1000	6.6%	327	Y		X		
434+50	RT	45	367	-6.6%	408	N	>1000	6.4%	331	Y	Blind Moses Dr		X	
439+00	RT	45	991	-6.4%	400	Y	441	6.5%	331	Y		X		
439+75	LT	45	>1000	-6.4%	400	Y	354	6.4%	331	Y		X		
442+50	LT	45	824	-6.5%	400	Y	501	6.3%	331	Y		X		
449+25	RT	45	267	-6.9%	408	N	610	7.0%	327	Y	Garner Dr		X	
452+25	LT	45	>1000	-7.0%	408	Y	410	6.6%	327	Y	Old Wood Rd		X	
452+25	RT	45	486	-7.0%	408	Y	226	6.6%	327	N		X		
453+50	RT	45	943	-6.9%	408	Y	180	6.5%	331	N		X		

Old Nenana Highway - Ester Hill Rehabilitation
Approach Sight Distance Study

Public Approach or Driveway Station	Offset	Posted Speed Limit (Main Rd.) MPH	Measured Sight Distance NB	Average % Grade NB	Min Sight Dist NB - Grade Adjusted*	Meets Min SD NB	Measured Sight Distance SB	Average % Grade SB	Min Sight Dist SB - Grade Adjusted*	Meets Min SD SB	Remarks	DW	SS	PULLOUT
468+50	RT	45	250	-3.4%	378	N	335	2.0%	349	N	Driveway /snow machine trail, NB/SB - BC	X		X
468+50	LT	45	191	-3.4%	378	N	262	2.0%	349	N	Snow machine trail, NB/SB - BC			X
477+00	LT	45	533	-7.0%	408	Y	565	7.7%	323	Y	Gold Lode Rd, SB - VC		X	
482+00	LT	45	321	-7.5%	408	N	868	6.2%	331	Y		X		
487+50	LT	45	300	-4.8%	392	N	440	1.5%	354	Y	Ester Creek Dr		X	
491+50	LT	45	958	-1.3%	365	Y	334	1.2%	354	N	Village Rd		X	
491+50	RT	45	822	-1.3%	365	Y	224	1.2%	354	N		X		
495+25	RT	45	>1000	-1.3%	365	Y	523	2.5%	349	Y		X		
498+75	LT	45	893	-2.4%	371	Y	824	3.1%	344	Y		X		
502+50	LT	45	597	-3.1%	378	Y	903	2.5%	344	Y		X		
						19				15		46	19	6

W - Advisory Speed
VC - Vertical curve obscuring vision.
BC - Brush obscuring vision before car disappears around horizontal curve. Clearing brush would lengthen sight distance.

DW - Driveway
SS = Public Approach
Turnout=Public Approach

* PGDHS Equation 3.3

APPENDIX E

PAVEMENT DESIGN

Project Name:	Old Nenana/ Ester Hill Rehabilitation	Designer	J. Dvorak
Project Number:	15-016	Date:	8/25/15

Traffic Data for Design and Historic ESALs

Design Data Input

Design Construction Year:	2016
Design Length in Years:	20
Base Year:	2011
Base Year Total AADT:	1400
Growth Rate % per Year:	1.5

% of Base Year AADT for Each Lane	
Lane	%
1	45
2	55
3	0
4	0
5	0
6	0

Truck Category	Load Factor (ESALs per Truck)	% AADT in Truck Category
2-Axle	0.5	4.5
3-Axle	0.85	1.75
4-Axle	1.2	0.5
5-Axle	1.55	0.25
>=6-Axle	2.24	0

TOTAL DESIGN ESALs: **330,992**

Historic Data Input

Historic Construction Year:	
Backcast % per Year:	

% of Base Year AADT for Each Lane	
Lane	%
1	
2	
3	
4	
5	
6	

Truck Category	Load Factor (ESALs per Truck)	% AADT in Truck Category
2-Axle	0.5	
3-Axle	0.85	
4-Axle	1.2	
5-Axle	1.55	
>=6-Axle	2.24	

TOTAL HISTORIC ESALs: **-**

Construction Year ESAL Calculations

Truck Category	Design Lane AADT	% AADT in Truck Category	Load Factor for Truck Category	Construction Year ESALs
2-Axle	830	4.5	0.5	6,816
3-Axle	830	1.75	0.85	4,506
4-Axle	830	0.5	1.2	1,818
5-Axle	830	0.25	1.55	1,174
>=6-Axle	830	0	2.24	0
			Total Construction Year ESALs:	14,314

Historic Construction Year ESAL Calculations

Truck Category	Design Lane AADT	% AADT in Truck Category	Load Factor for Truck Category	Historic Construction Year ESALs
2-Axle		0	0.5	0
3-Axle		0	0.85	0
4-Axle		0	1.2	0
5-Axle		0	1.55	0
>=6-Axle		0	2.24	0
			Total Historic Construction Year ESALs:	0

CLICK HERE FOR MORE INFORMATION ON ESAL CALCULATIONS

Old Nenana/Ester Hill Rehabilitation
HDL Job #15-016

AKPAVE: Mechanistic Design Results

Created By: J. Dvorak
Checked By: D. Simon
09/08/2015

Alternative 4:

Project: Old Nenana Proj No.: 15-016										New Construction by:D. Simon 9/8/2015 7:29:14 AM	
AADT = 2,031	Past Loadings	Future Loadings						X/Y Load Locations (in): Load = 4500 (lbs) Tire Pressure = 110 (psi)	0 0	13.5 0
10% Spring 40% Summer 10% Fall 40% Winter ——— Total:	———	33099 132397 33099 132397 ——— 330,992						X/Y Evaluation Points (in):	6.75 0	0 0
Layer	Critical Z Coordinate	Asphalt Properties	Season	Modulus (ksi)	Poisson's Ratio	Tensile Critical Micro Strain	Critical Compressive Stress (psi)	Million Cycles to Failure		Future Damage %	Total Damage %
2(in) Asphalt_Concrete	1.99	3% Air 5.5% Asph 152 pcf	Spring	755	0.3	155		10.63		0.31	0.31%
			Summer	510	0.3	119		35.45		0.37	0.37%
			Fall	510	0.3	119		35.45		0.09	0.09%
			Winter	1,500	0.3	101		24.20		0.55	0.55%
								Total Damage:		1.33	1.33
2(in) 3-4% Asph.Tr.Base	3.99	6% Air 4.5% Asph 150 pcf	Spring	200	0.35	423		0.17		19.09	19.09%
			Summer	200	0.35	378		0.25		52.74	52.74%
			Fall	200	0.35	378		0.25		13.18	13.18%
			Winter	200	0.35	177		3.05		4.34	4.34%
								Total Damage:		89.36	89.36
8(in) Subbase, Grading B	4.01		Spring	25	0.4		24.30	0.43		7.65	7.65%
			Summer	35	0.4		30.40	0.62		21.19	21.19%
			Fall	35	0.4		30.40	0.62		5.30	5.30%
			Winter	90	0.4		33.30	10.09		1.31	1.31%
								Total Damage:		35.45	35.45
S-Infinite Subgrade_P200>30%	12.01		Spring	10	0.45		7.73	0.59		5.62	5.62%
			Summer	10	0.45		7.43	0.67		19.76	19.76%
			Fall	10	0.45		7.43	0.67		4.94	4.94%
			Winter	10	0.45		4.78	2.82		4.69	4.69%
								Total Damage:		35.01	35.01

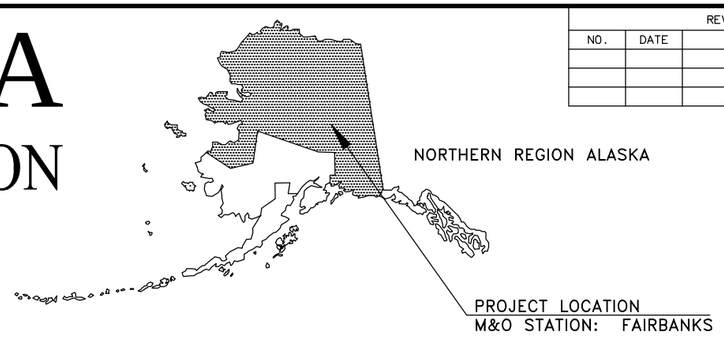
OK
12-29-15

APPENDIX F

PRELIMINARY PLAN AND PROFILE SHEETS

STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES



REVISIONS		
NO.	DATE	DESCRIPTION

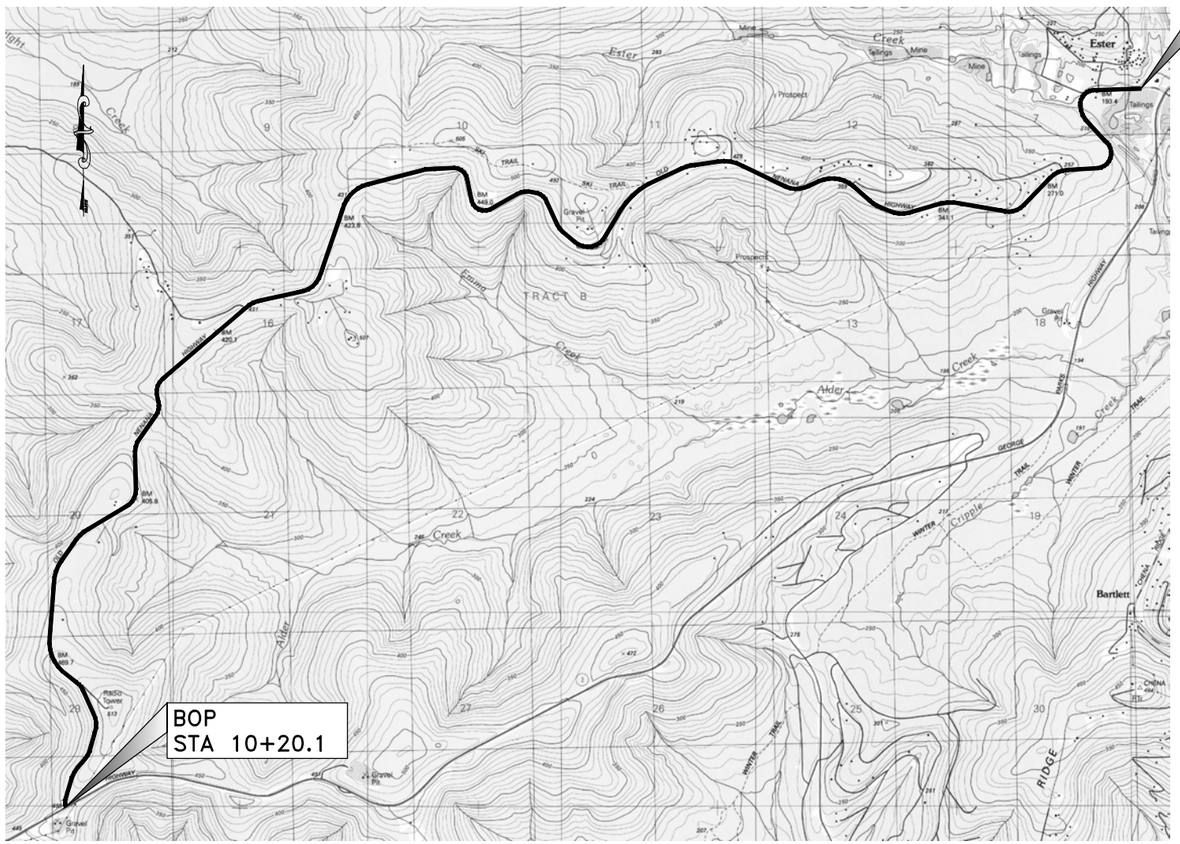
STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL "A" SHEETS
ALASKA	60455 STP-0002(257)	2017	A1	A-
			PLAN SET TOTAL	###

CDS ROUTE: 174800	MILEPOINT: 0.00 TO 9.36
LATITUDE: 62.613386	LONGITUDE: -138.1551298

PROPOSED HIGHWAY PROJECT

OLD NENANA/ESTER HILL REHABILITATION
PROJECT NO. 60455/STP-0002(257)

GRADING, DRAINAGE, PAVING, SIGNING, & STRIPING



PROJECT SUMMARY	
OLD NENANA HIGHWAY	
WIDTH OF PAVEMENT	30 FT
LENGTH OF GRADING	9.36 MILES
LENGTH OF PAVING	9.36 MILES
LENGTH OF PROJECT	9.36 MILES

DESIGN DESIGNATIONS			
STATION RANGE	BOP TO 312+80	312+80 TO 487+00	487+00 TO EOP
FUNCTIONAL CLASS	MINOR COLLECTOR	MINOR COLLECTOR	MAJOR COLLECTOR
ADT (2015)	450	450	1,489
ADT (2040)	650	650	2,150
DHV (12%) EXISTING YEAR	54	54	179
DHV (12%) DESIGN YEAR	78	78	258
PERCENT TRUCKS (T)	7%	7%	7%
DIRECTIONAL SPLIT (D)	45/55	45/55	45/55
DESIGN SPEED (V)	55 MPH	45 MPH	45 MPH
DESIGN EAL'S (?? YEARS)			

USE THESE PLANS IN CONJUNCTION WITH THE STATE OF ALASKA STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, 2015 EDITION AND THE PROJECT SPECIAL PROVISIONS.

PLANS DEVELOPED BY: HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION & PUBLIC FACILITIES

WORK IN PROGRESS
This document represents current concepts as of ___ (See date @ left border)

APPROVED:

REGIONAL PRECONSTRUCTION ENGINEER DATE

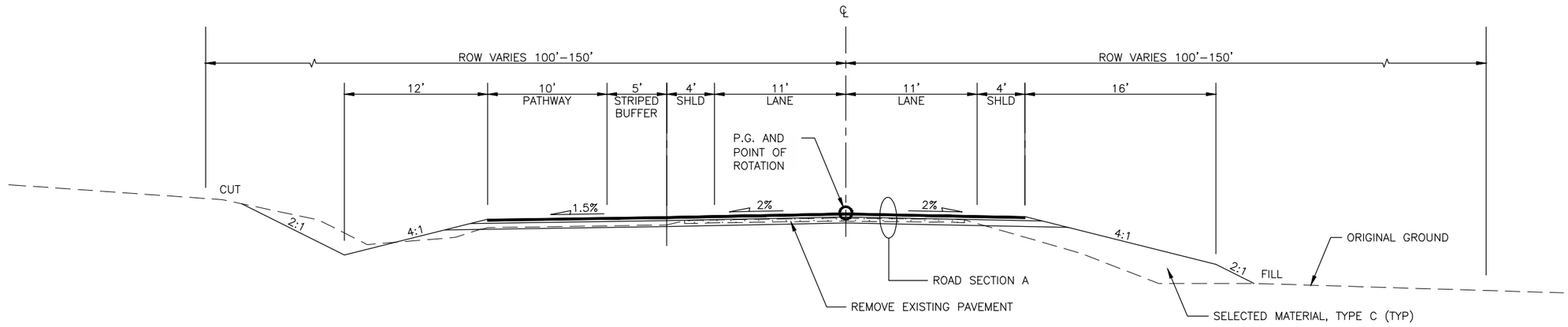
CONCUR:

DIRECTOR, DESIGN & CONSTRUCTION DATE

CERTIFIED TRUE & CORRECT AS-BUILT OF ACTUAL FIELD CONDITION:

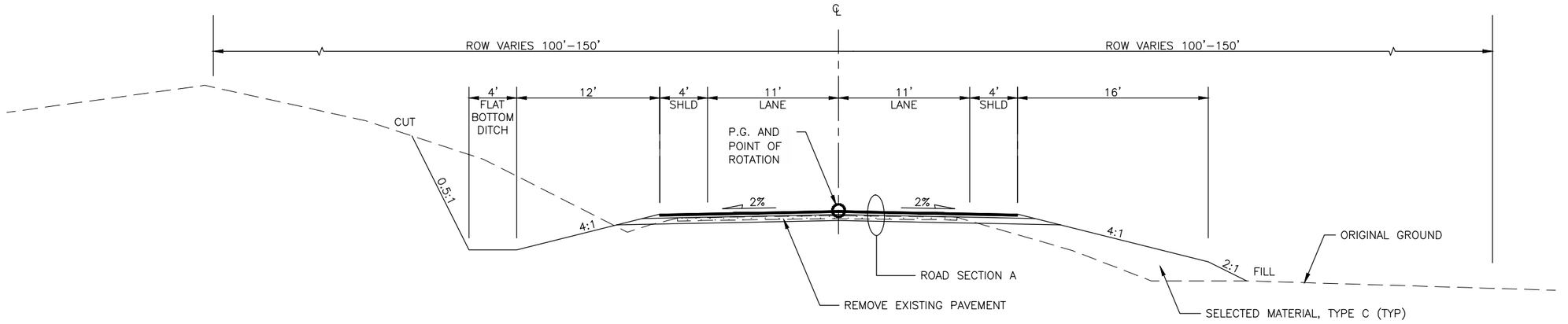
CONSTRUCTION PROJECT MANAGER DATE

NO.	DATE	REVISION	STATE	PROJECT DESIGNATION	YEAR	SHEET NO.	TOTAL SHEETS
			ALASKA	60455/STP-0002(257)	2017	B1	B1



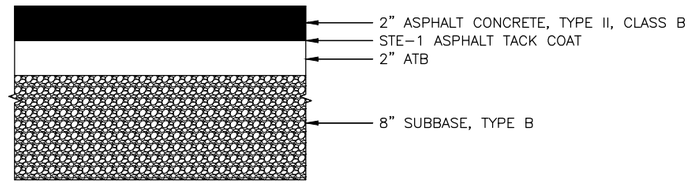
OLD NENANA HIGHWAY WITH ATTACHED PATHWAY

491+50.0 TO 504+12.0



OLD NENANA HIGHWAY

10+20.1 TO 491+50.0



ROAD SECTION A

NTS

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STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

TYPICAL SECTION

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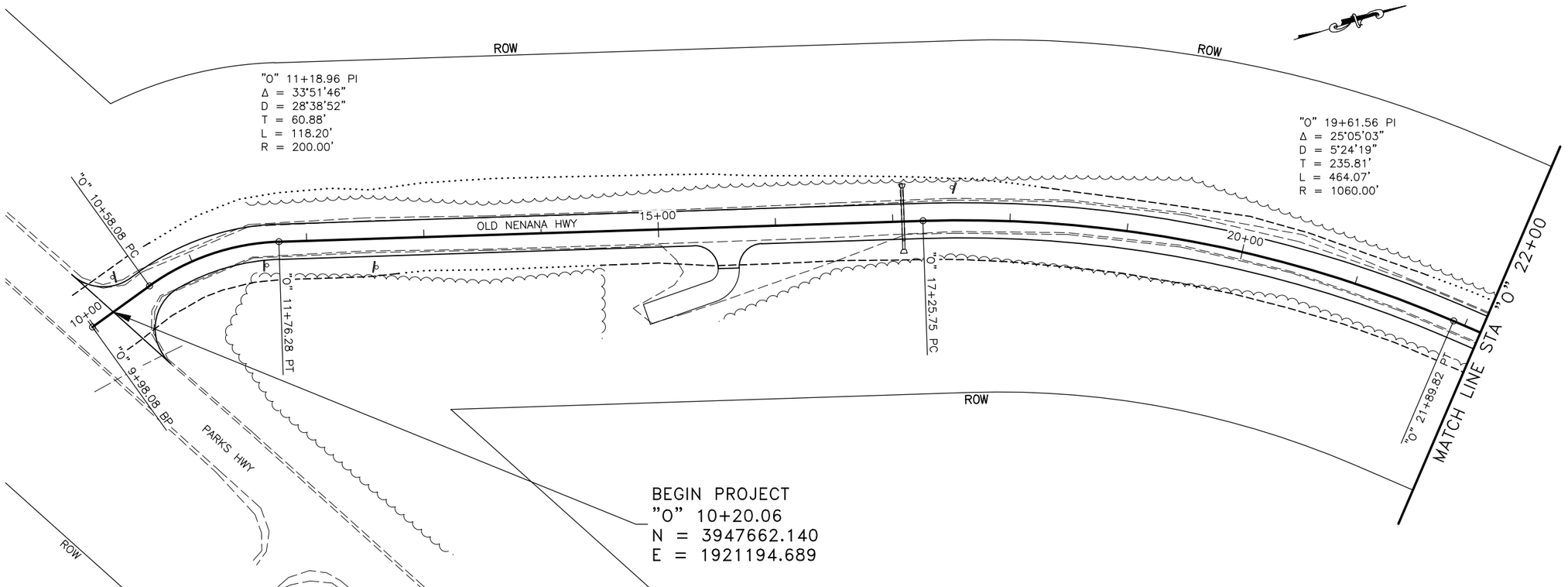

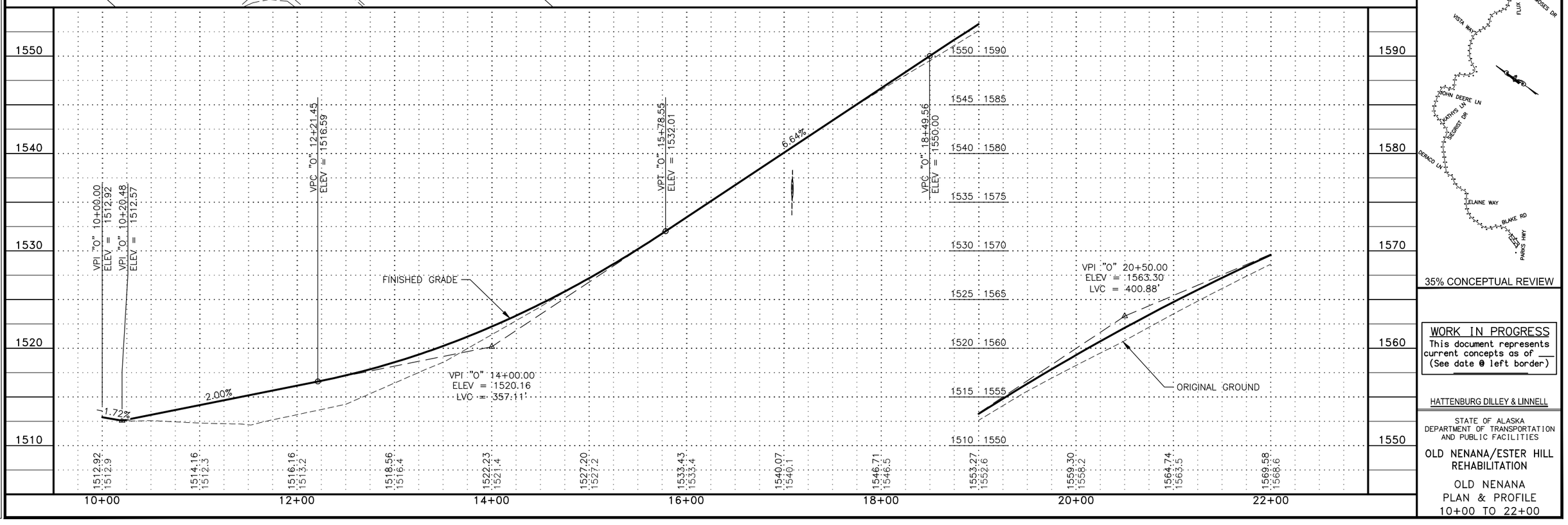

SHEET NO.	TOTAL SHEETS
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STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION

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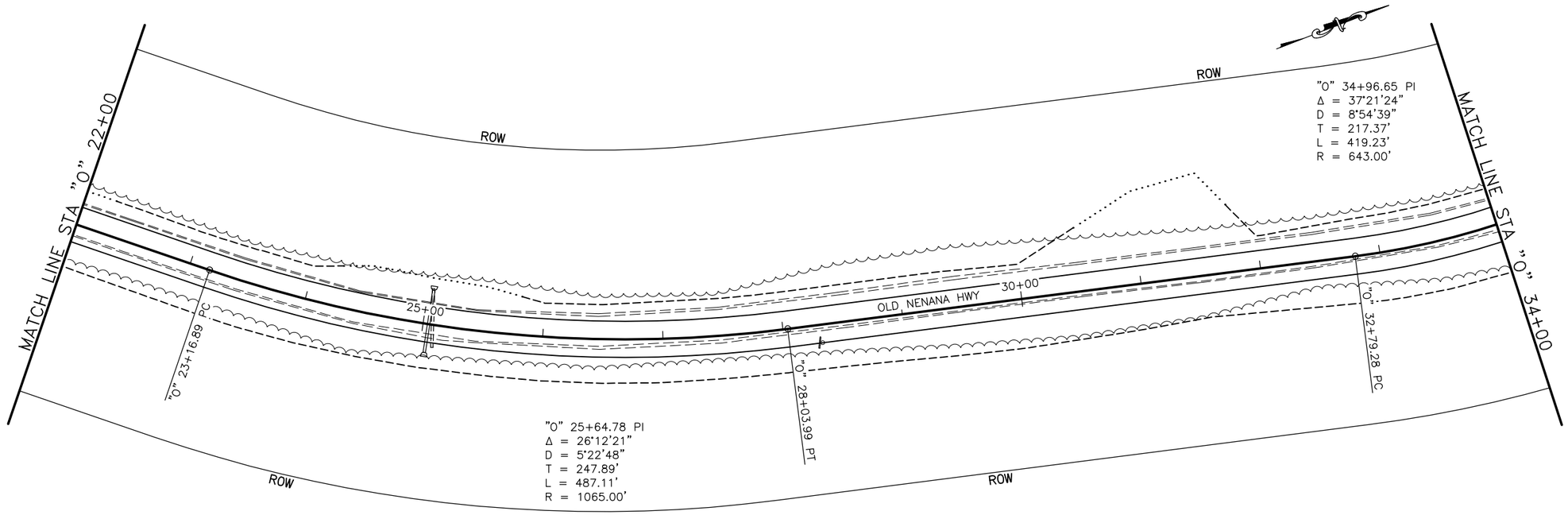
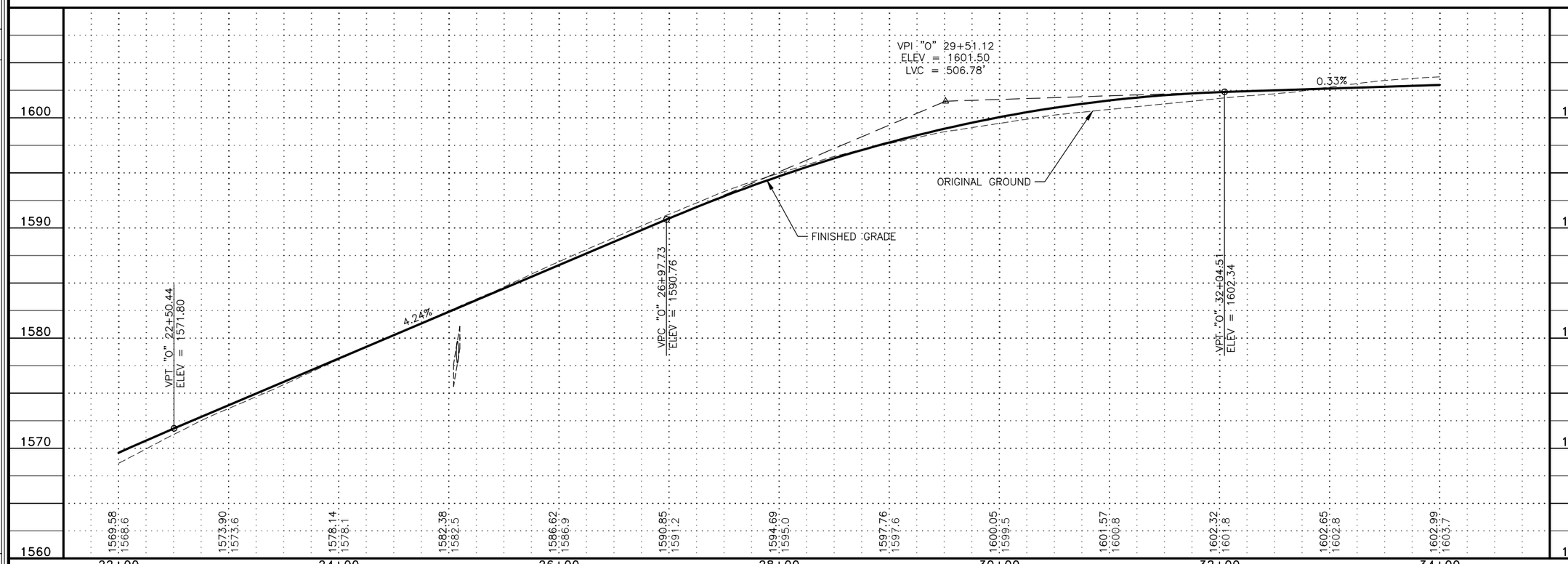
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
10+00 TO 22+00





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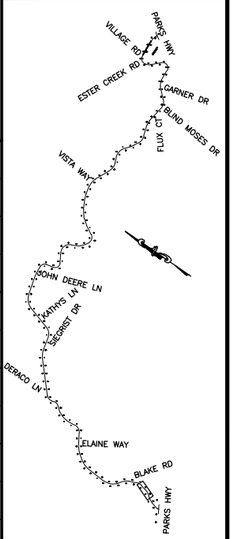
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
22+00 TO 34+00

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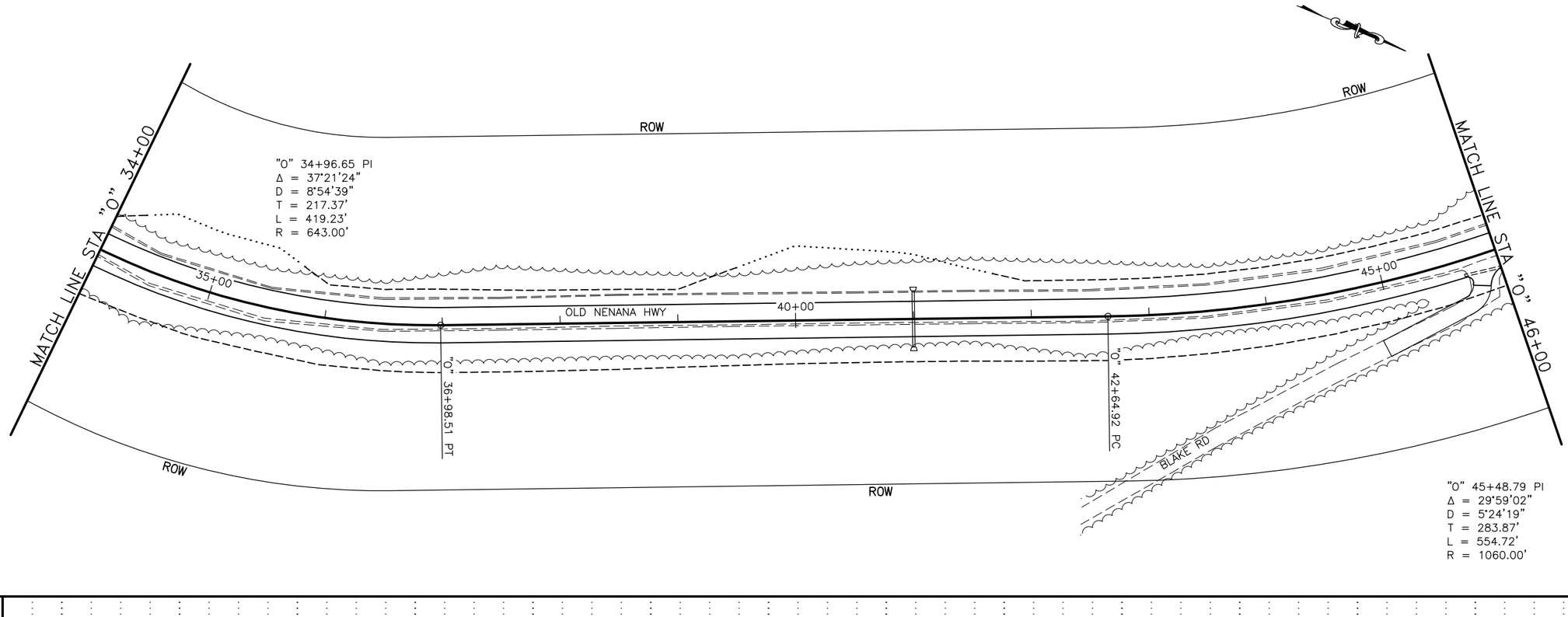

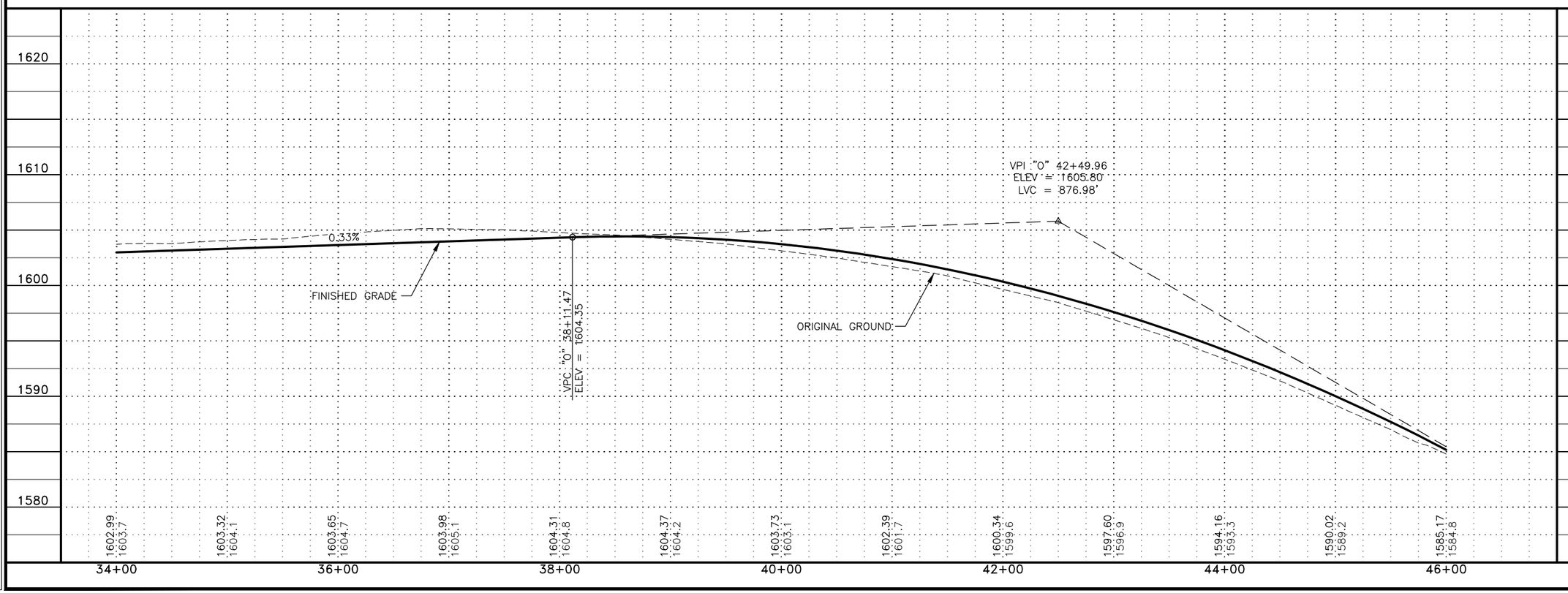

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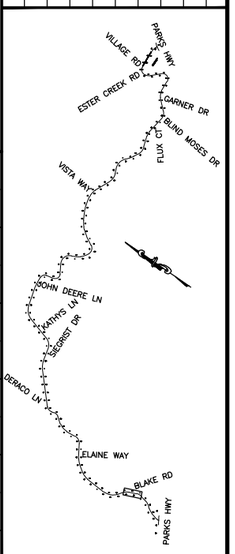
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

REVISION | DATE | NO.



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DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
34+00 TO 46+00

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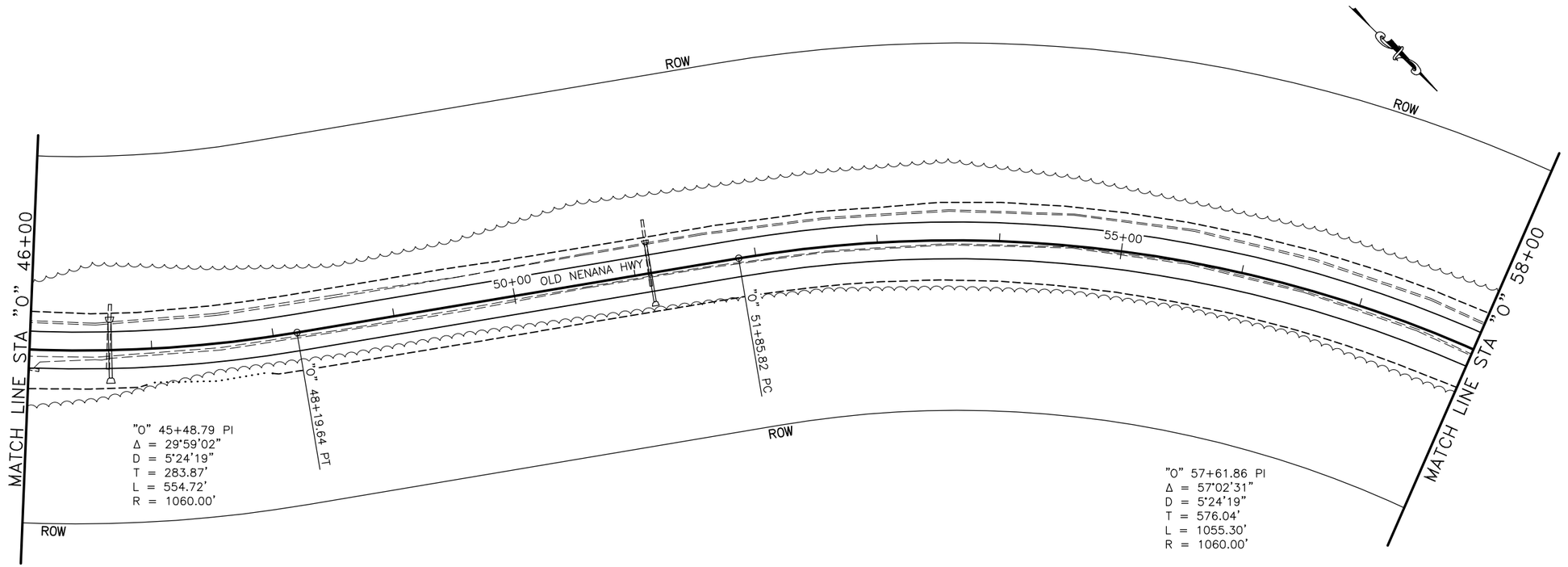

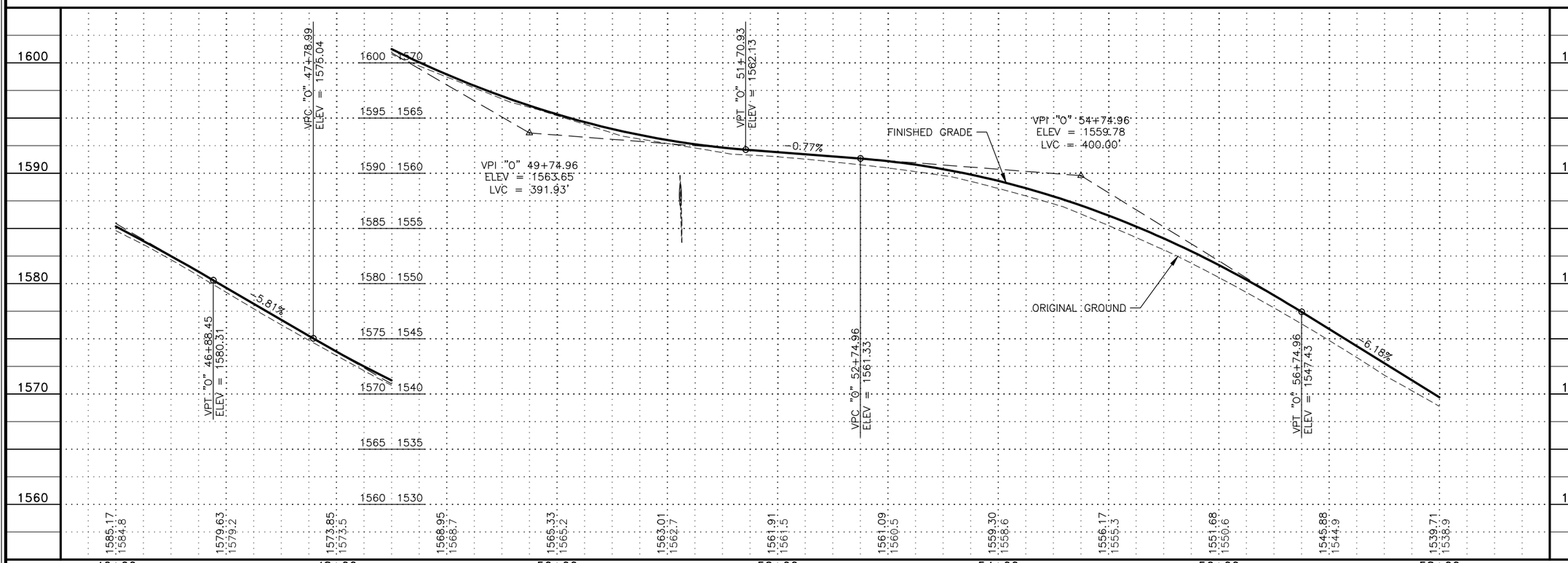

SHEET NO.	TOTAL SHEETS
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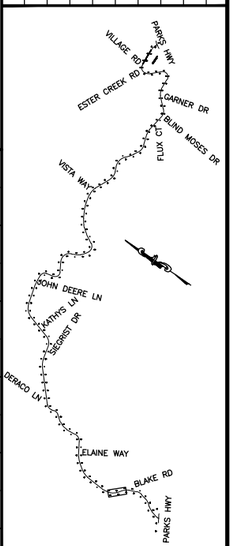
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
46+00 TO 58+00

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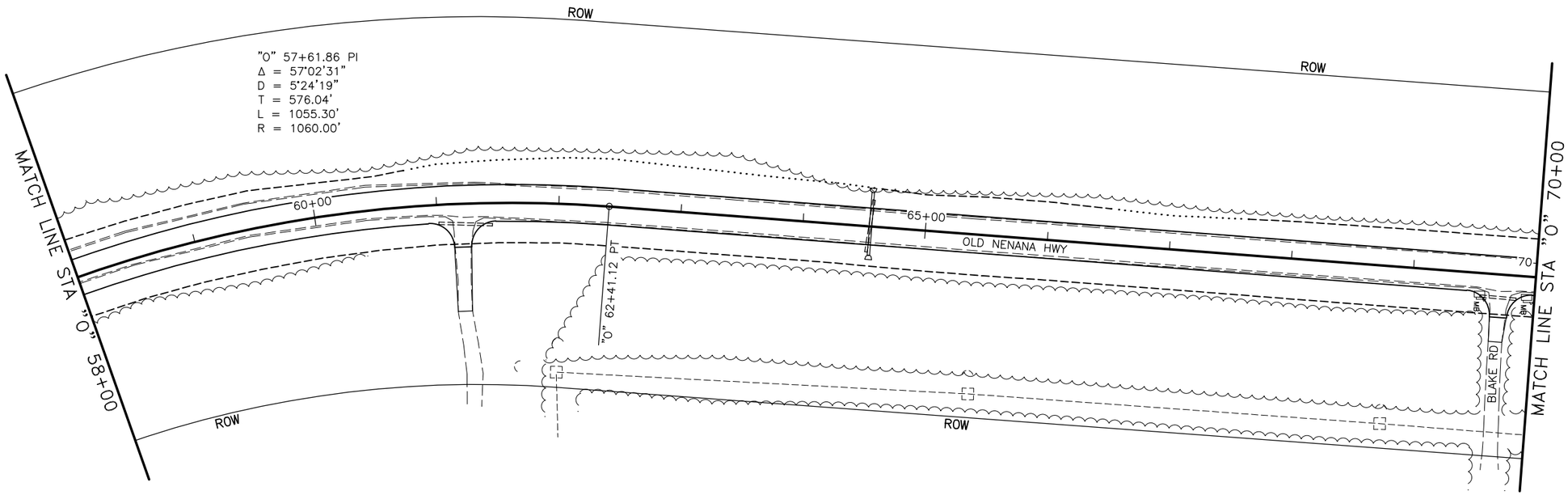

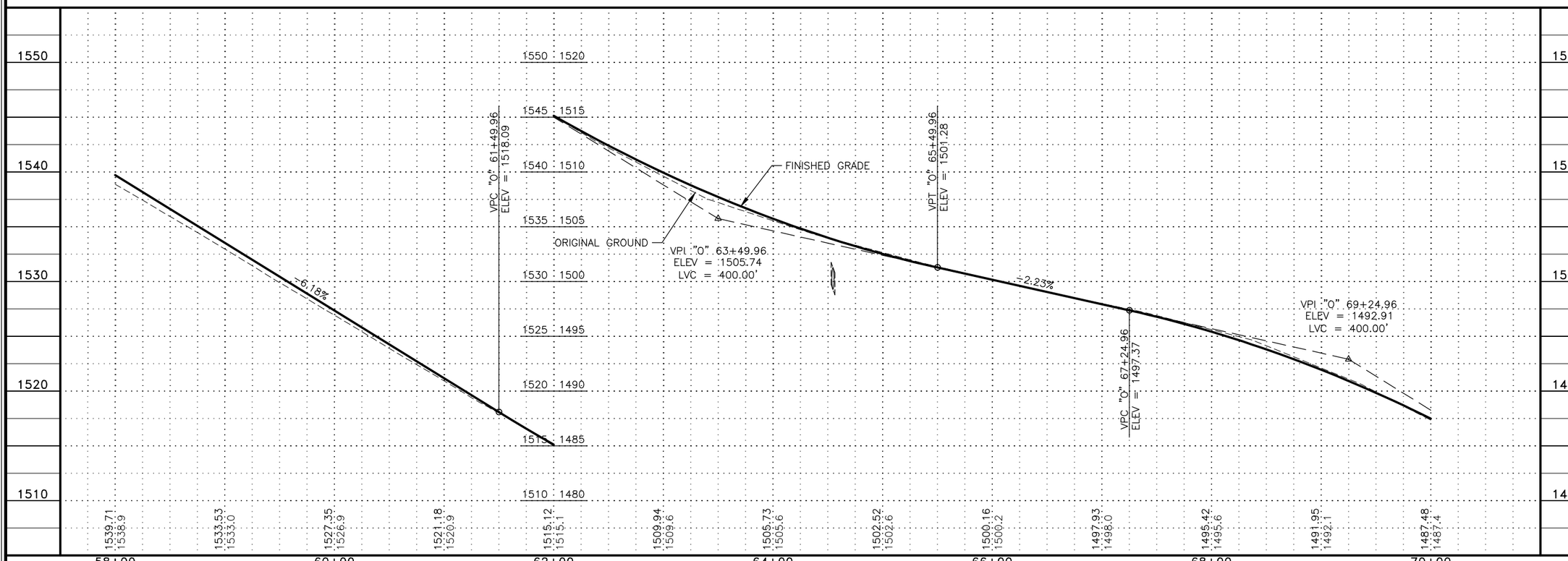

SHEET NO.	TOTAL SHEETS
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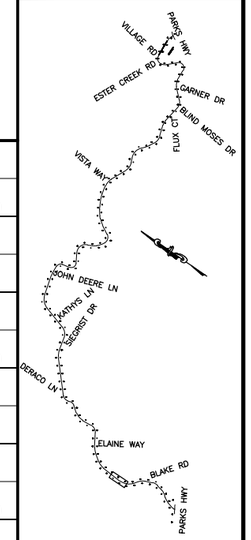
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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WORK IN PROGRESS
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STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
58+00 TO 70+00

FILE	LAYOUT	DESIGNED	DESIGNED	CHECKED	CHECKED	DRAFTED	DRAFTED
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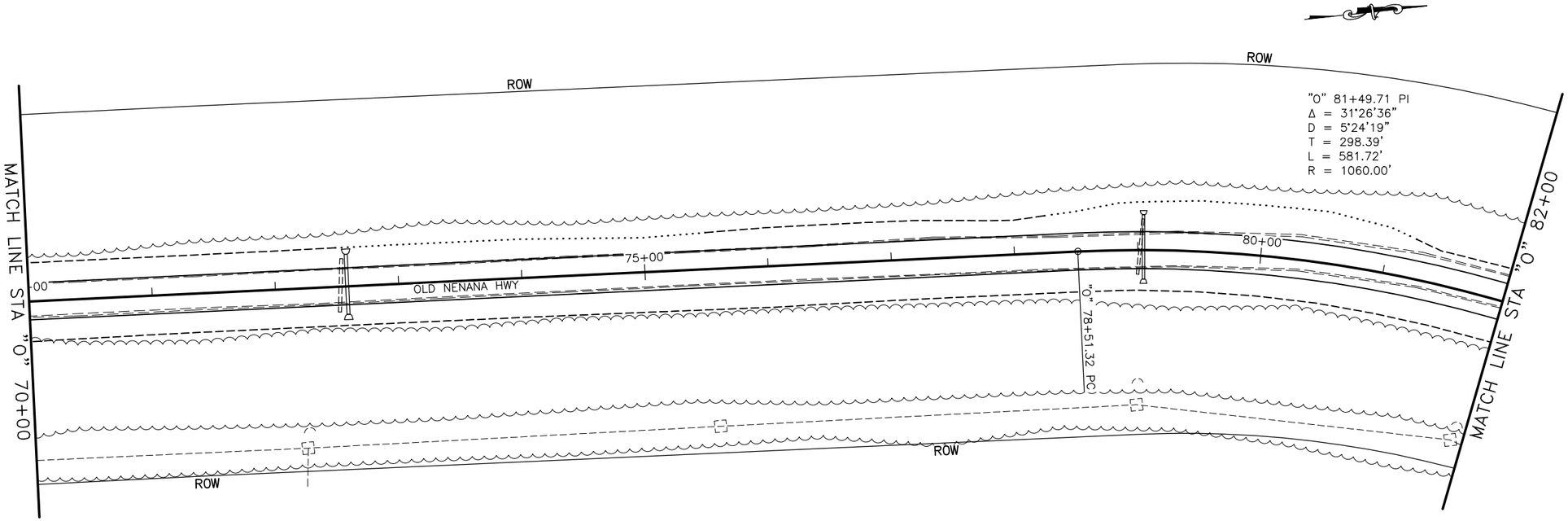
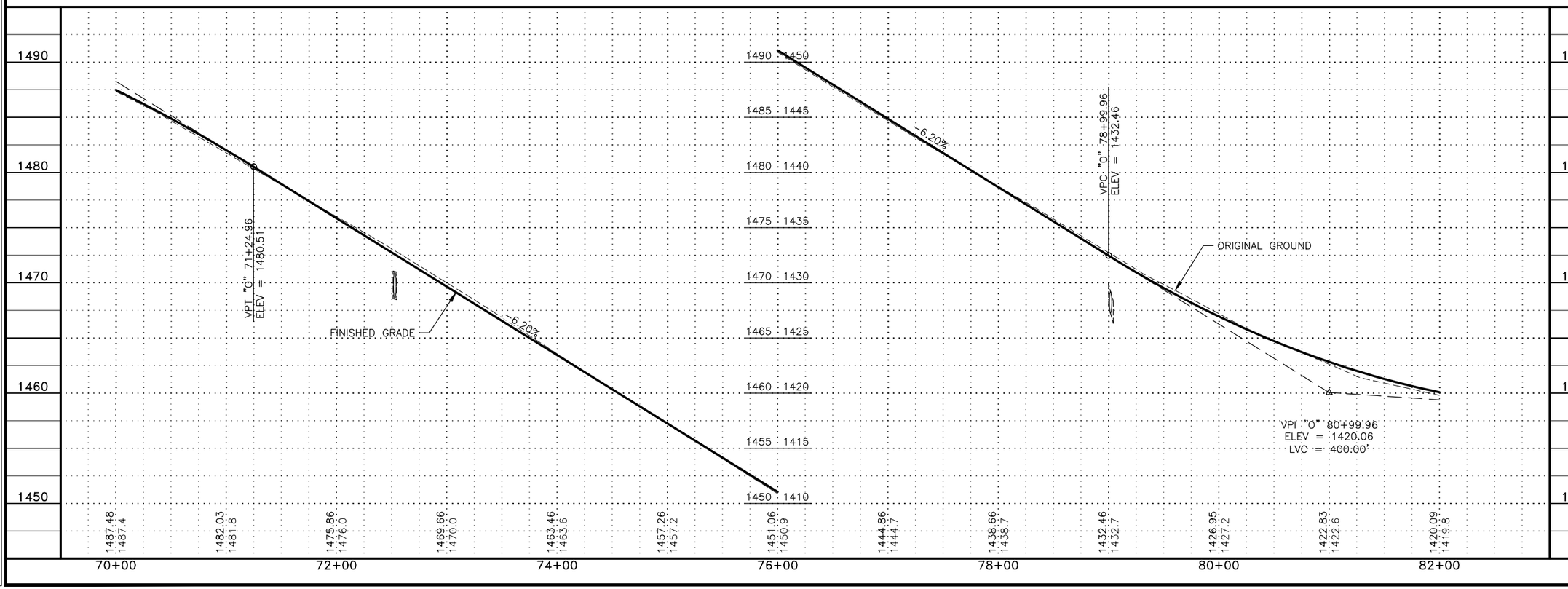
DATE 12/8/2015 17:13





SHEET NO.	TOTAL SHEETS
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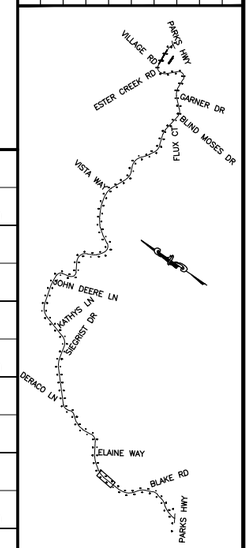
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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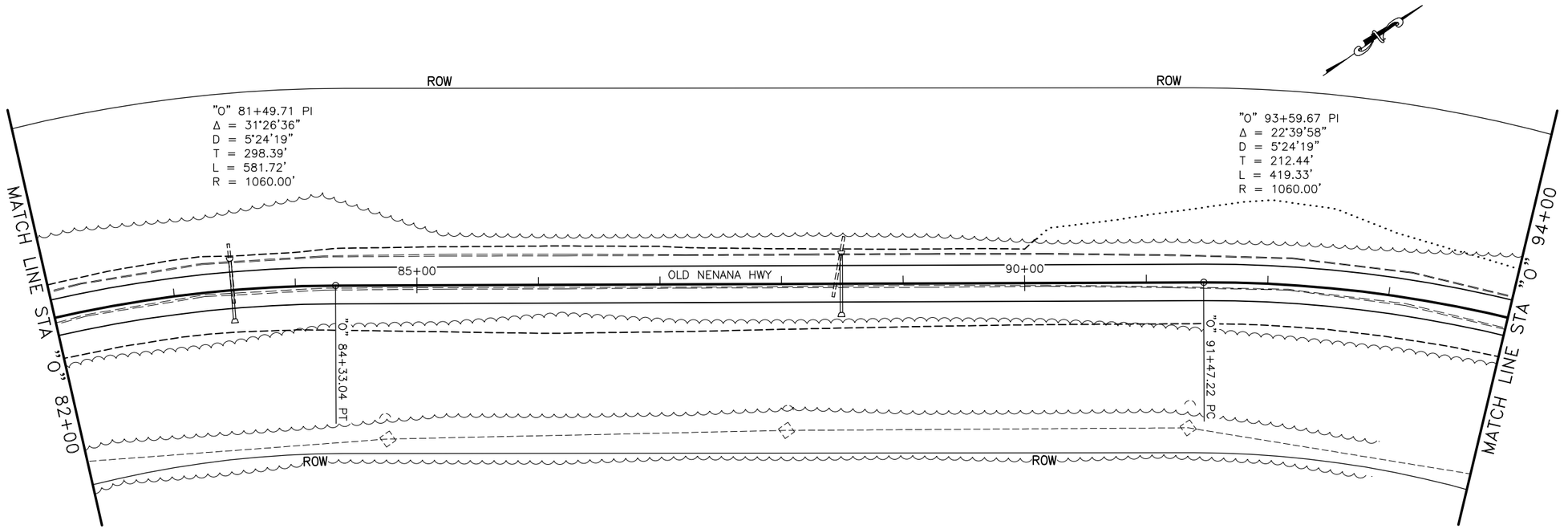
(See date @ left border)

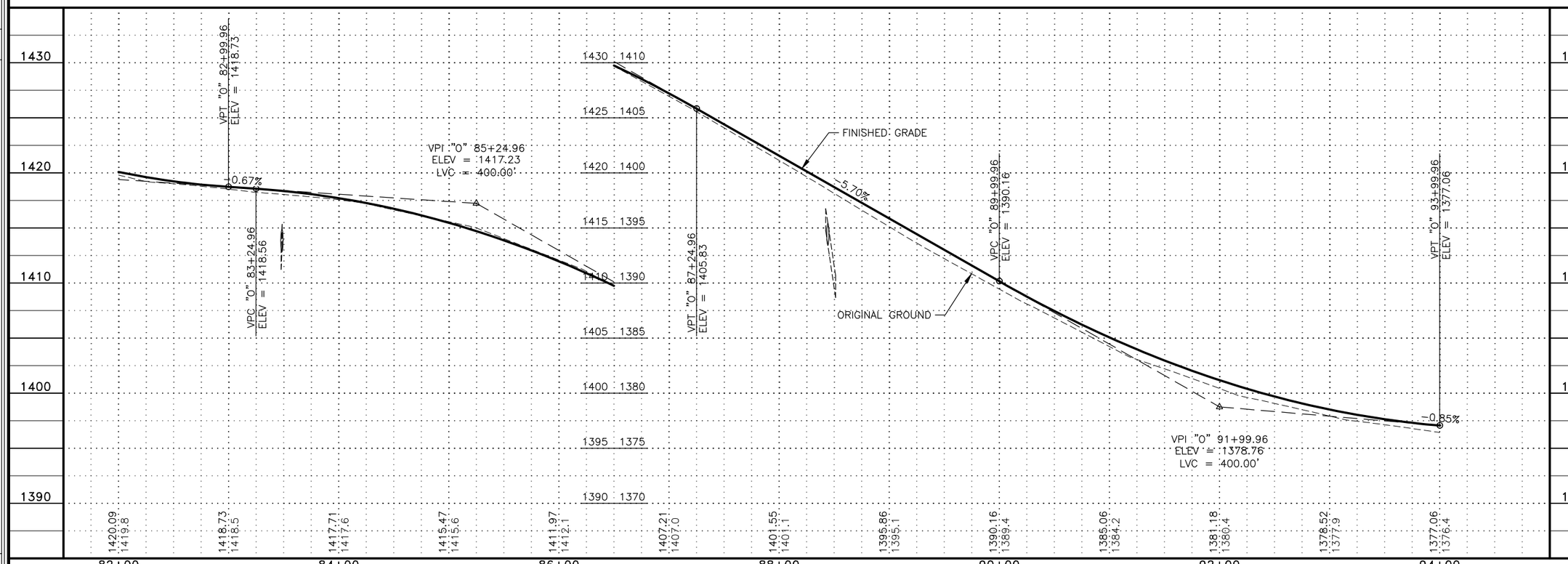
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
70+00 TO 82+00





SHEET NO.	TOTAL SHEETS
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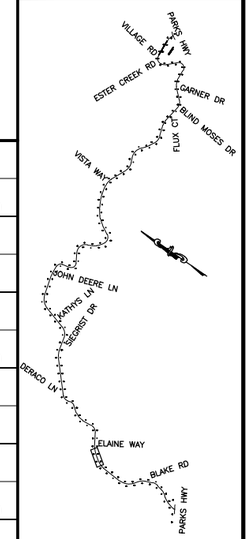
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
82+00 TO 94+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn 12/8/2015 17:13 | LAYOUT F1-F42 | DESIGNED | DESIGNED | CHECKED | CHECKED | DRAFTED | DRAFTED

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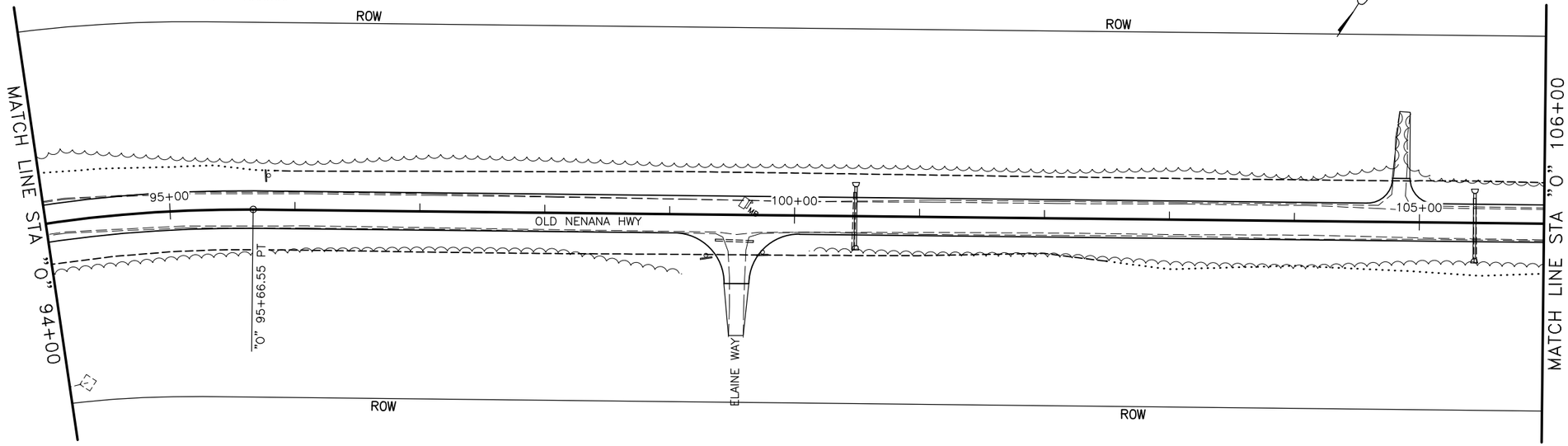
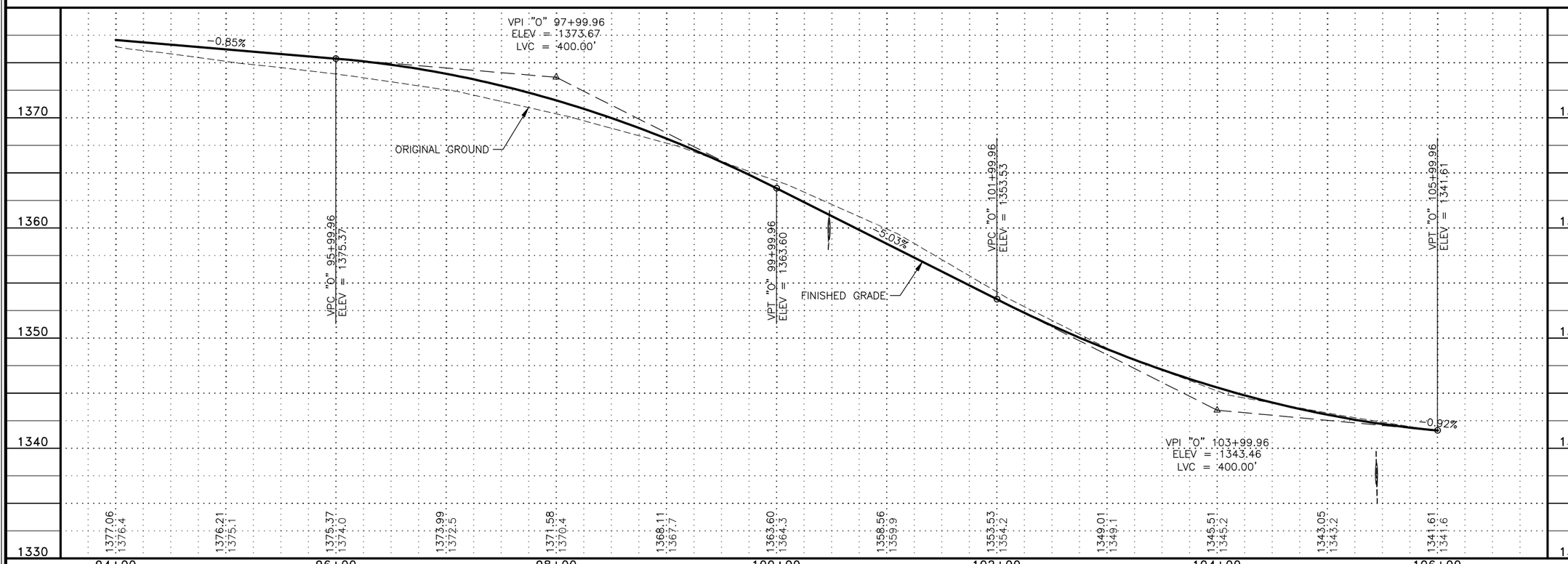
D = 5°24'19"
T = 212.44'
L = 419.33'
R = 1060.00'

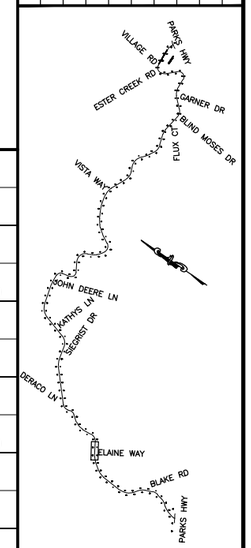




SHEET NO.	TOTAL SHEETS
F8	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION
60455
STP-0002(257)

NO.	DATE	REVISION



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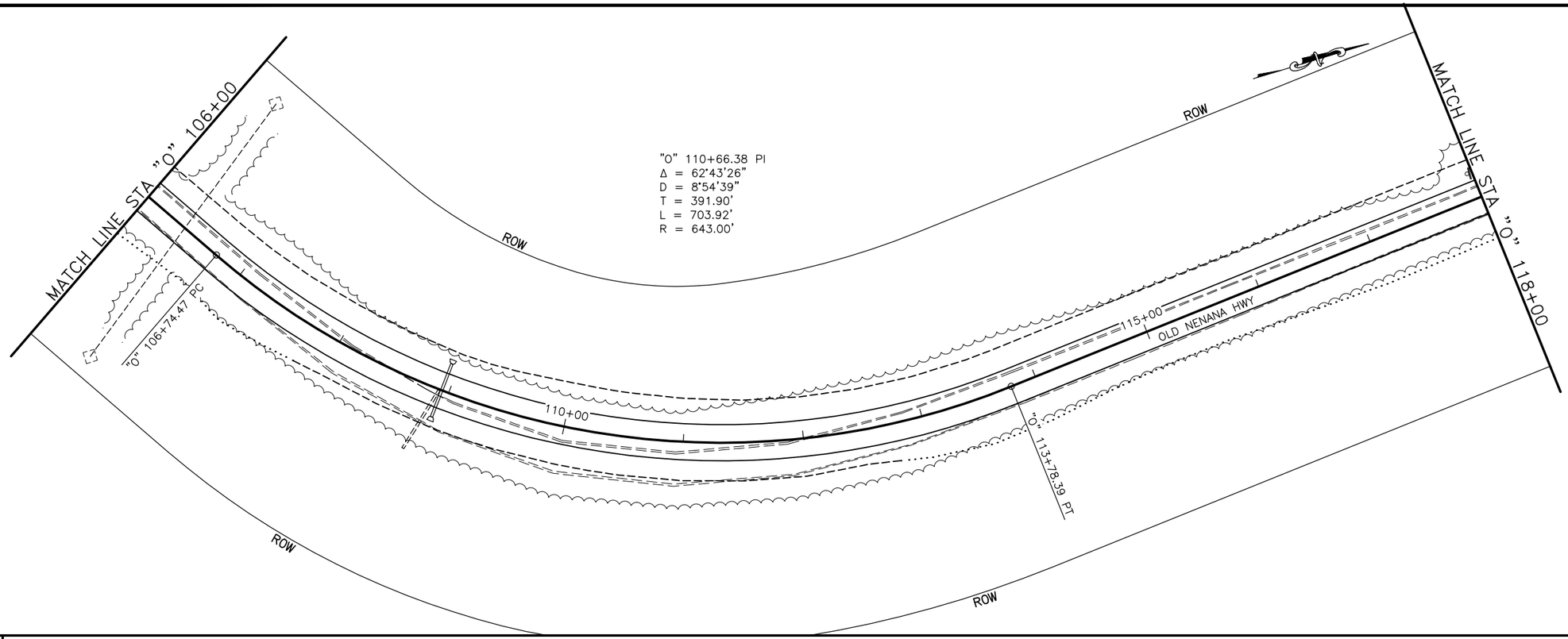
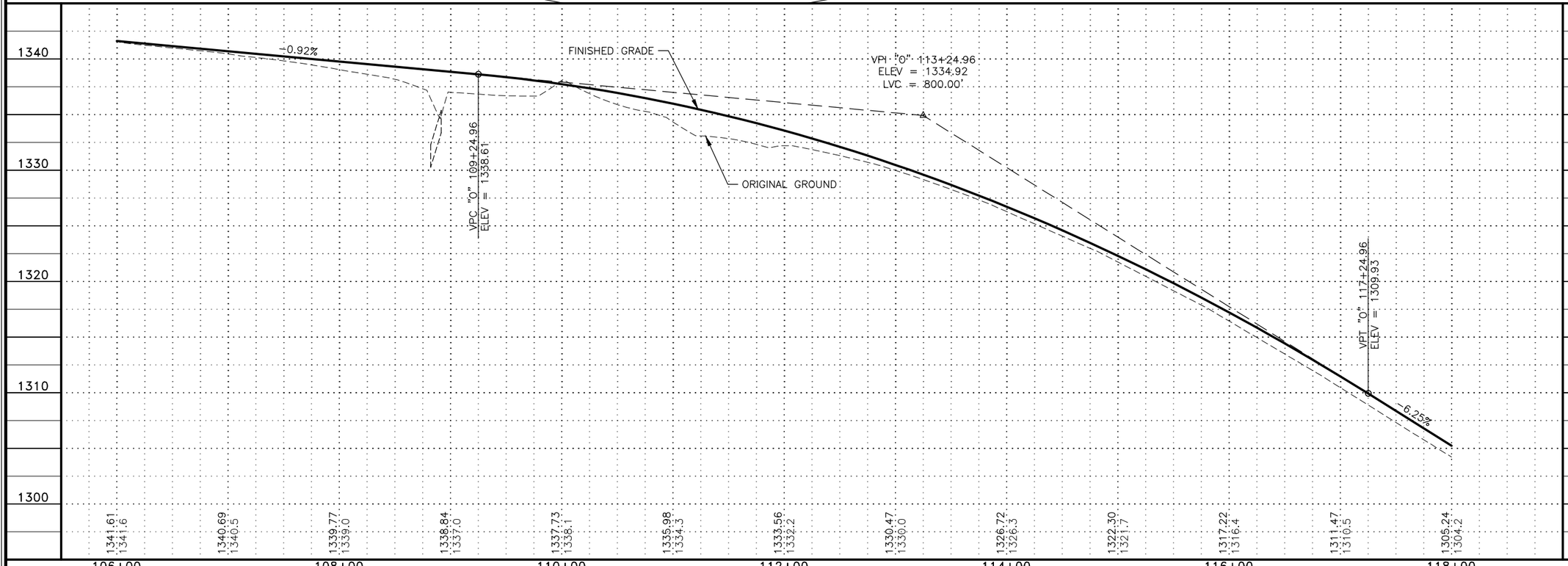
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

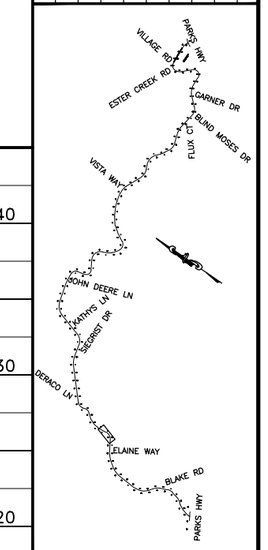
OLD NENANA
PLAN & PROFILE
94+00 TO 106+00





SHEET NO.	TOTAL SHEETS
F9	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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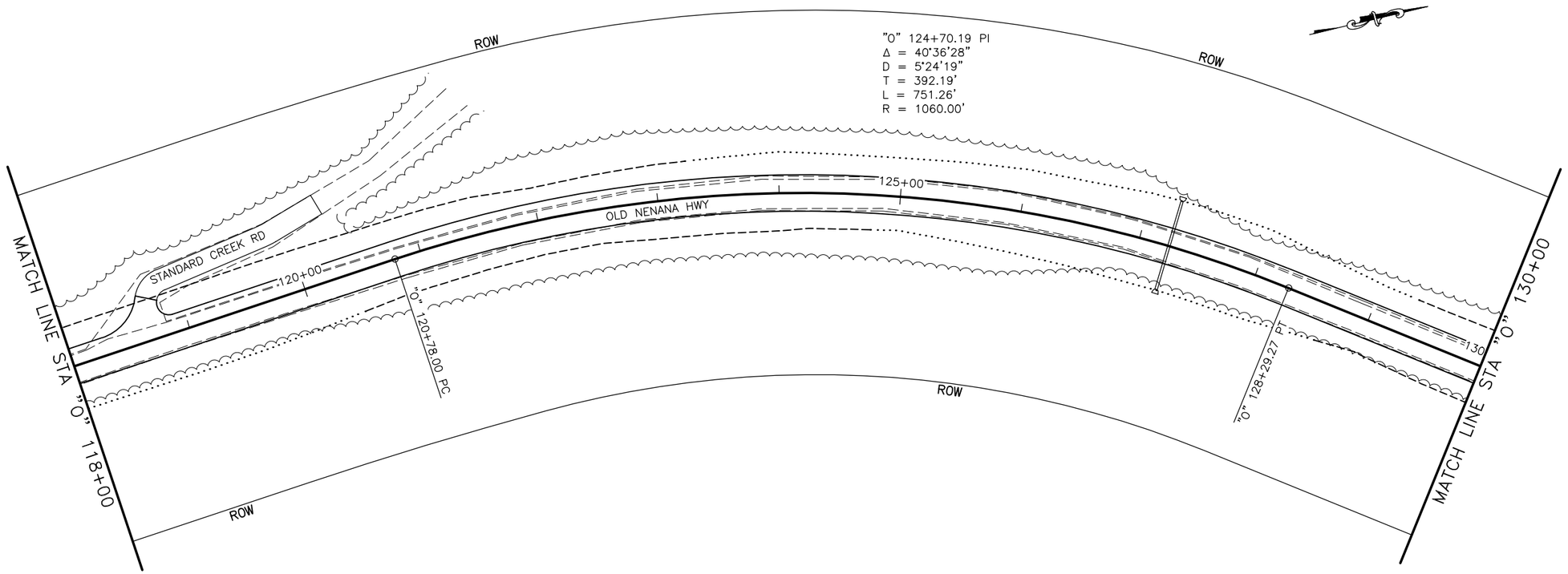
HATTENBURG DILLEY & LINNELL

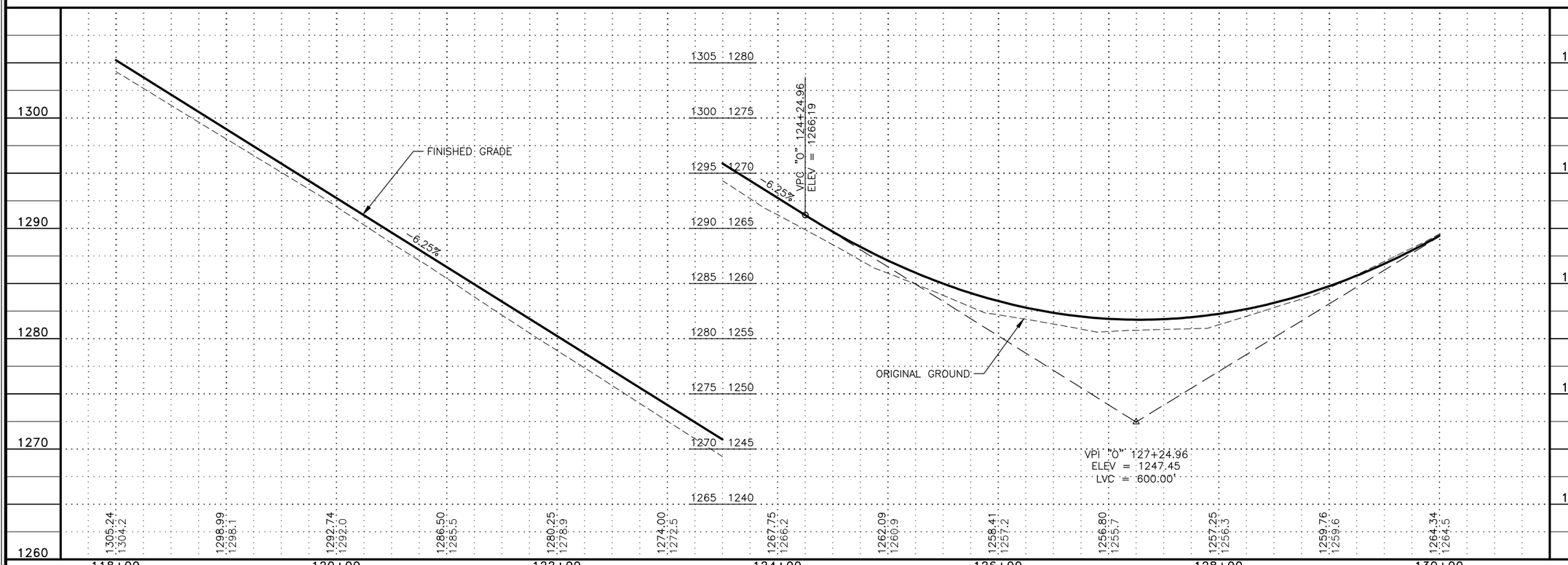
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
106+00 TO 118+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\150160_04_F01 DATE 9/2/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED DRAFTED





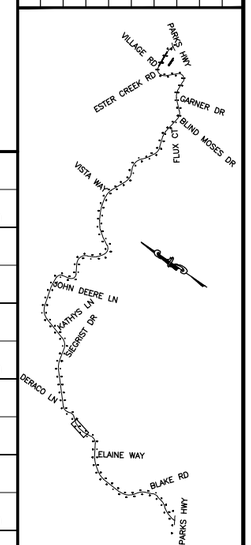
SHEET NO.	TOTAL SHEETS
F10	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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HATTENBURG DILLEY & LINNELL

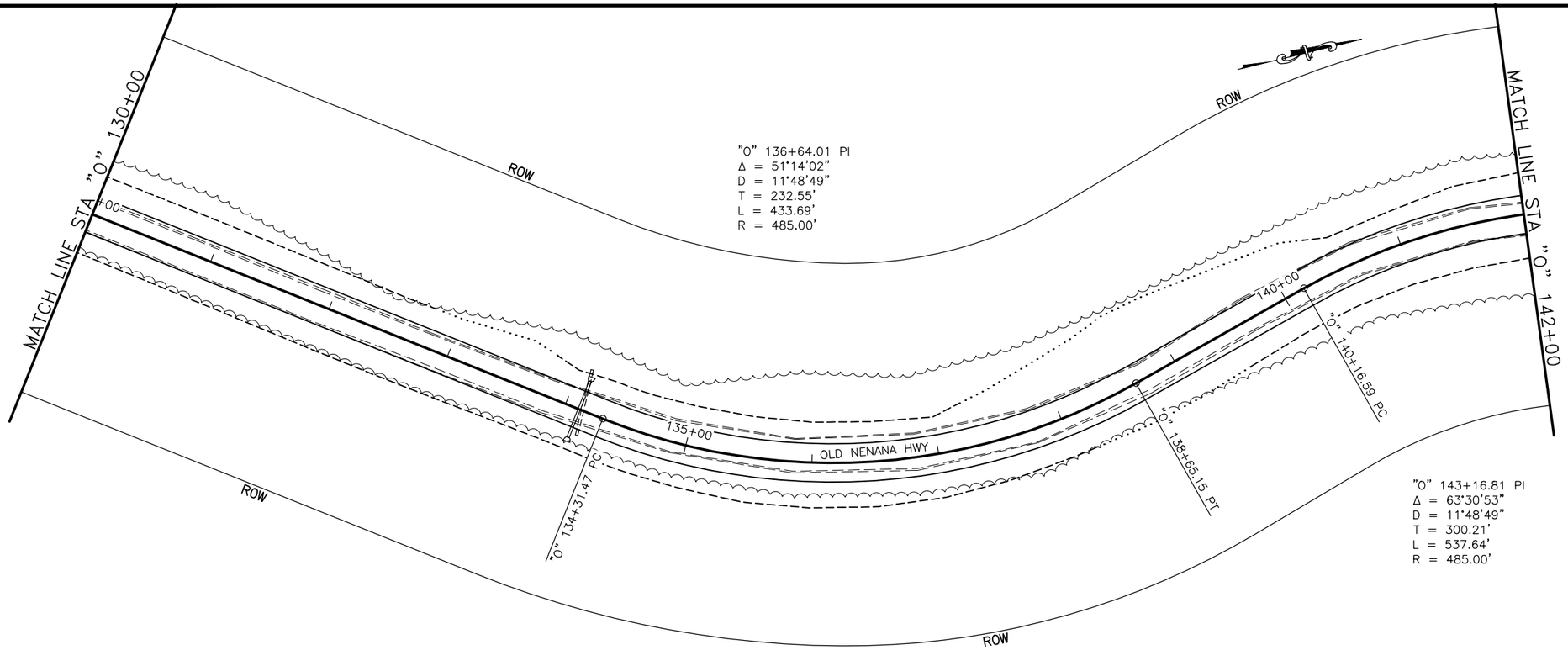
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

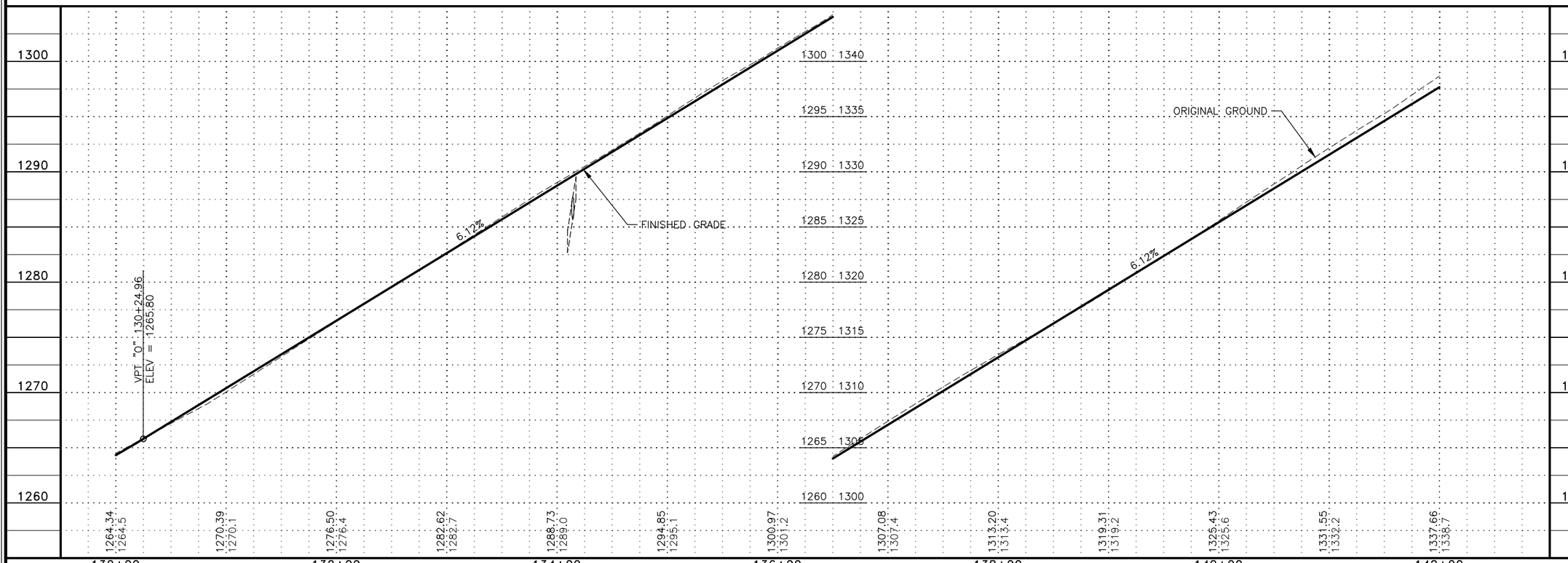
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
118+00 TO 130+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED

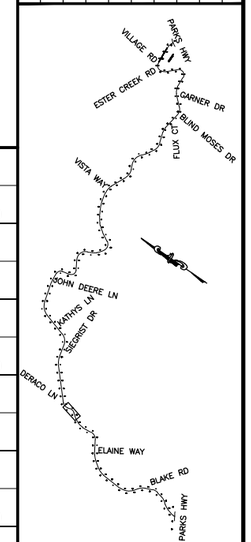
FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn 12/8/2015 17:13 | LAYOUT F1-F42 | DESIGNED | DESIGNED | DESIGNED | CHECKED | CHECKED | DRAFTED | DRAFTED | DRAFTED | DATE





SHEET NO.	TOTAL SHEETS
F11	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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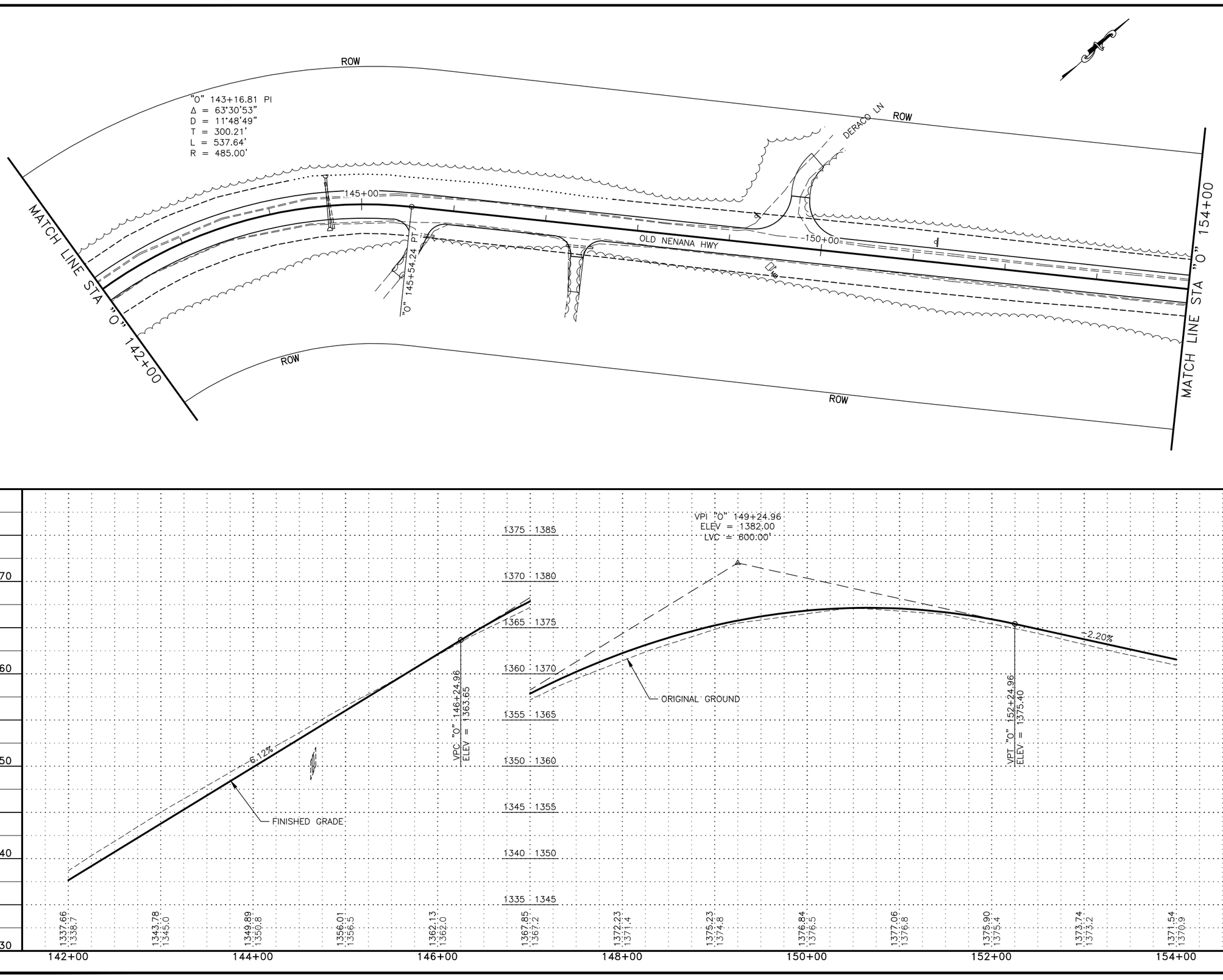
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
130+00 TO 142+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn 12/8/2015 17:13 | LAYOUT F1-F42 | DESIGNED | DESIGNED | CHECKED | CHECKED | DRAFTED | DRAFTED
DATE



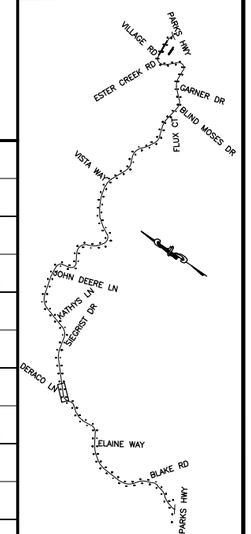
SHEET NO.	TOTAL SHEETS
F12	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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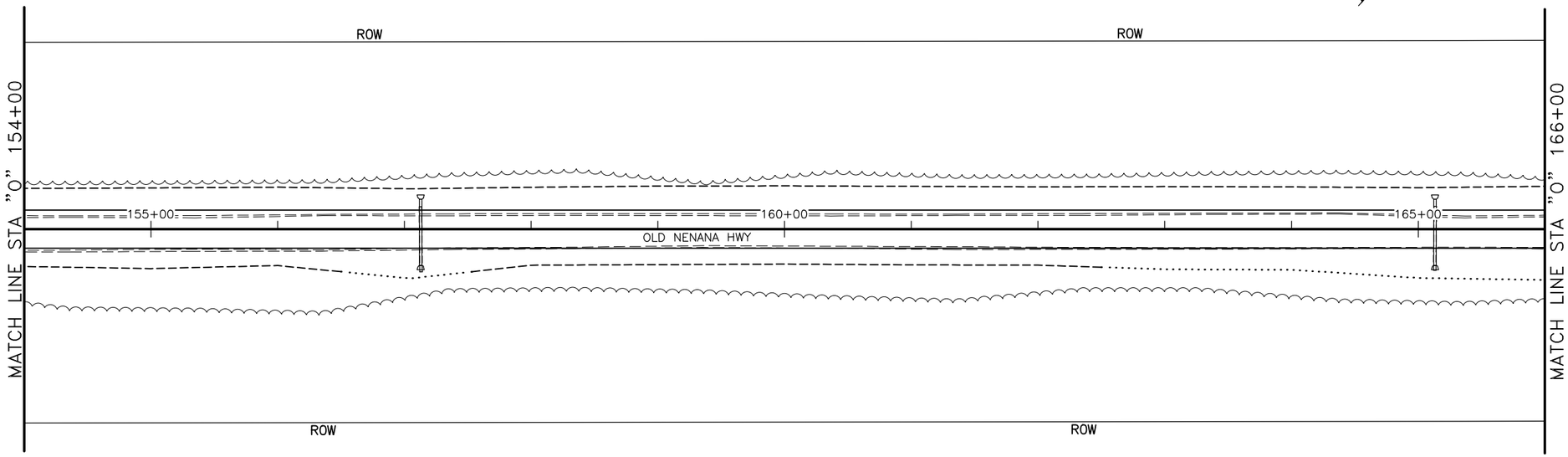
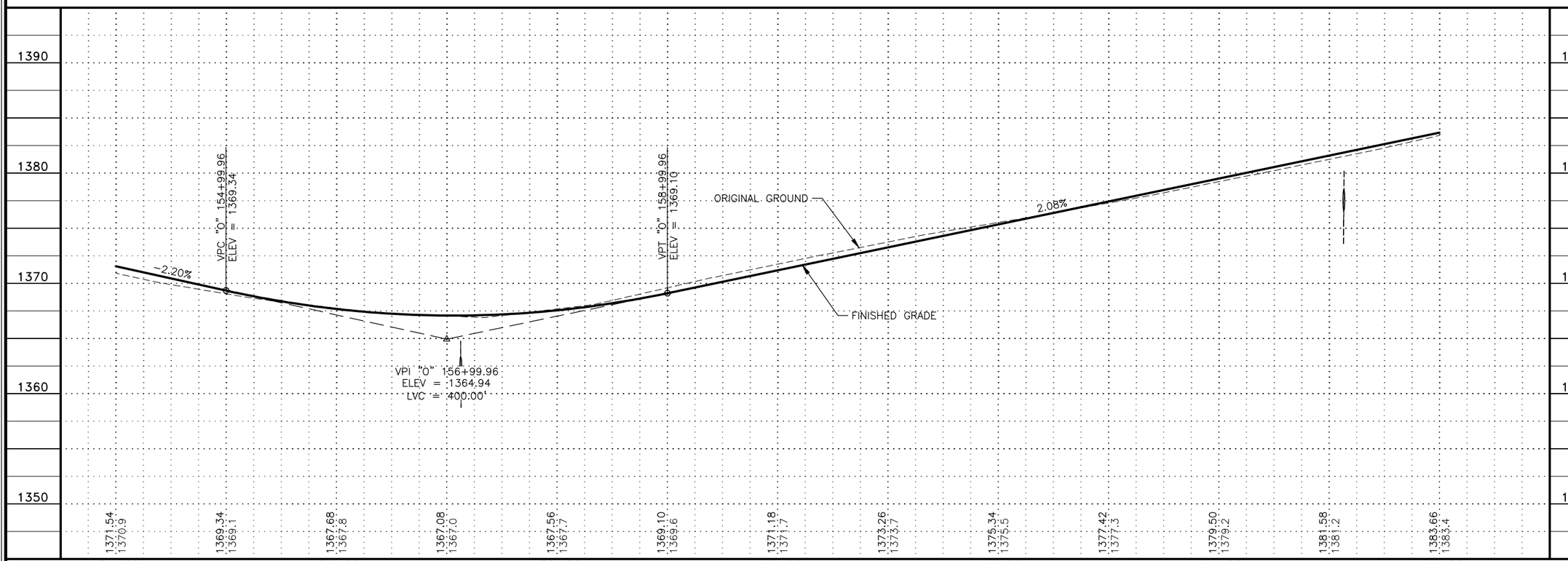
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
142+00 TO 154+00





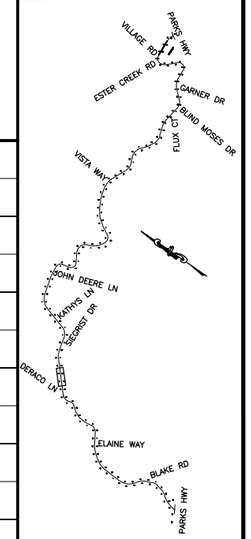
SHEET NO.	TOTAL SHEETS
F13	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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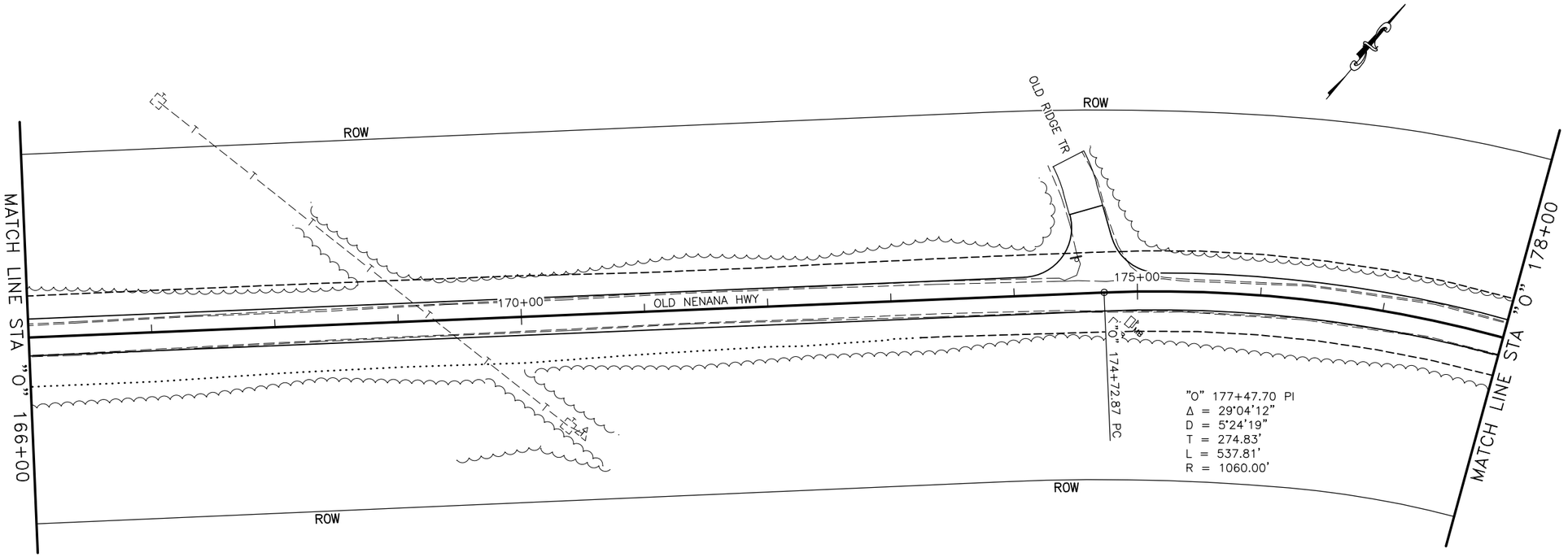
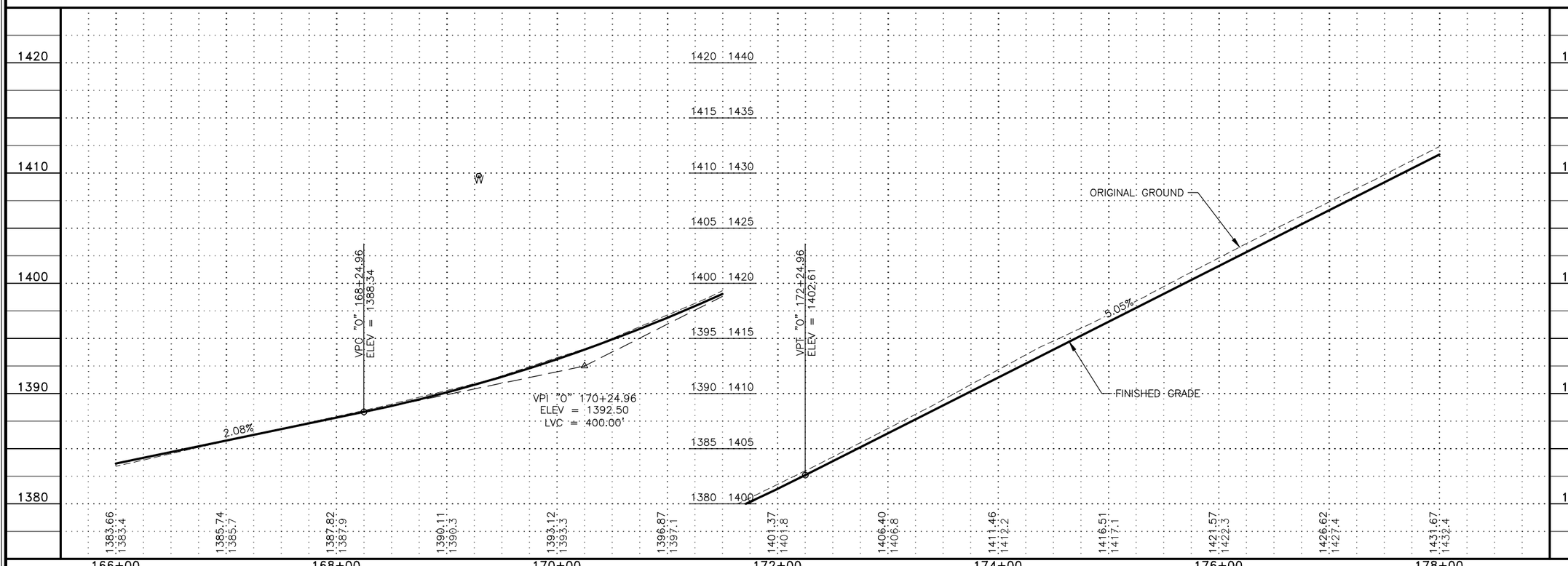
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
154+00 TO 166+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





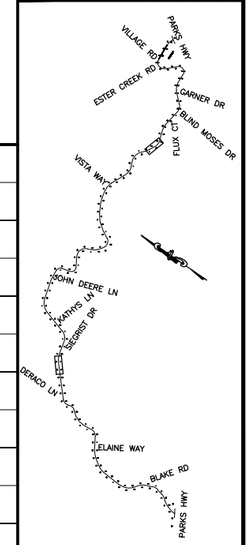
SHEET NO.	TOTAL SHEETS
F14	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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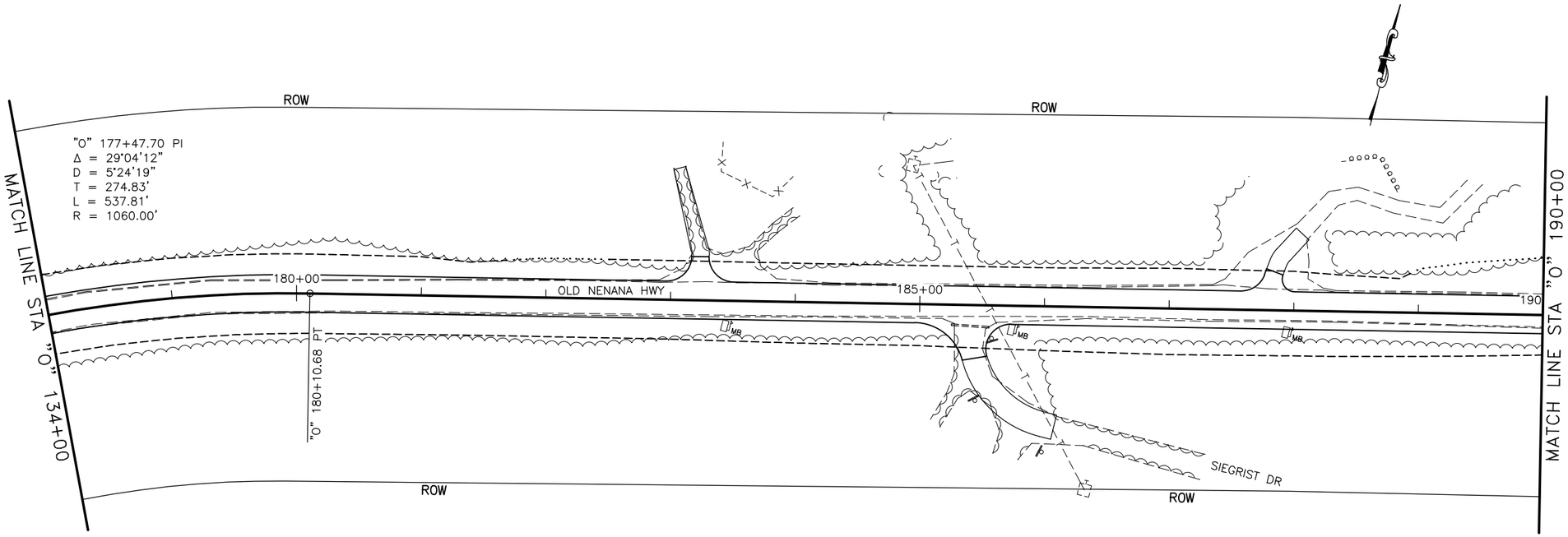
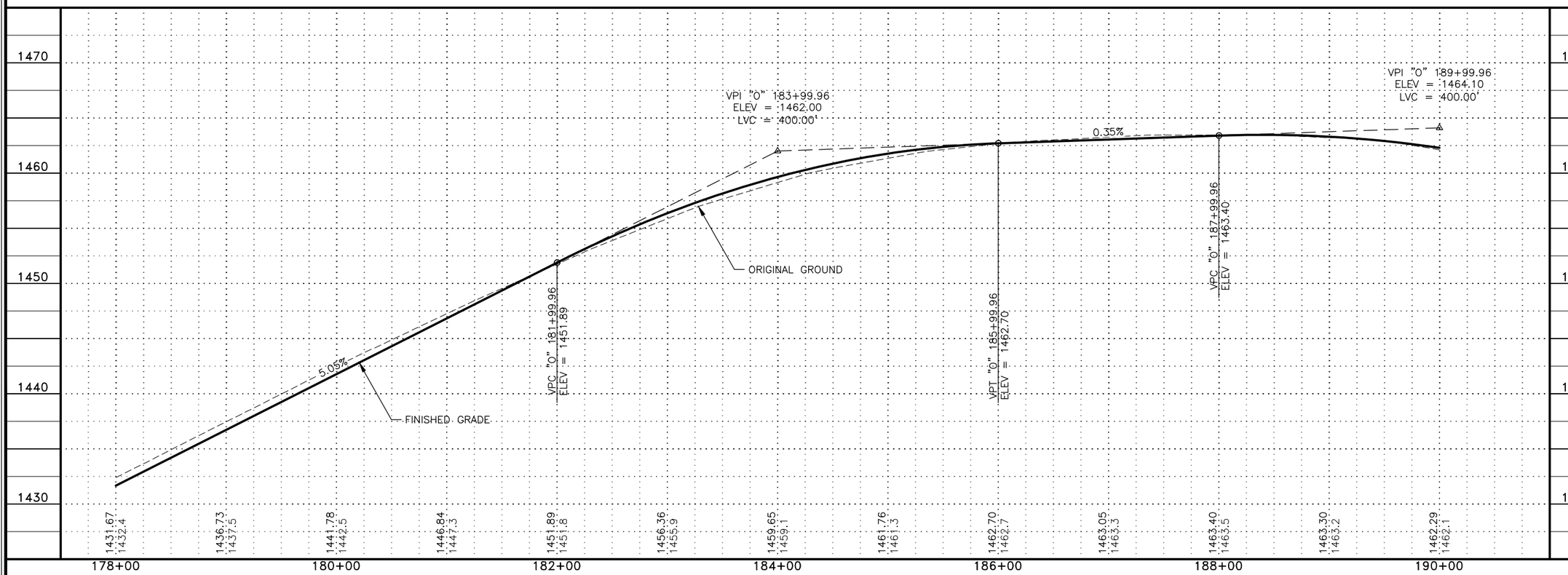
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
166+00 TO 178+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





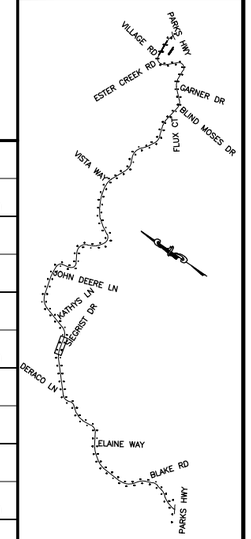
SHEET NO.	TOTAL SHEETS
F15	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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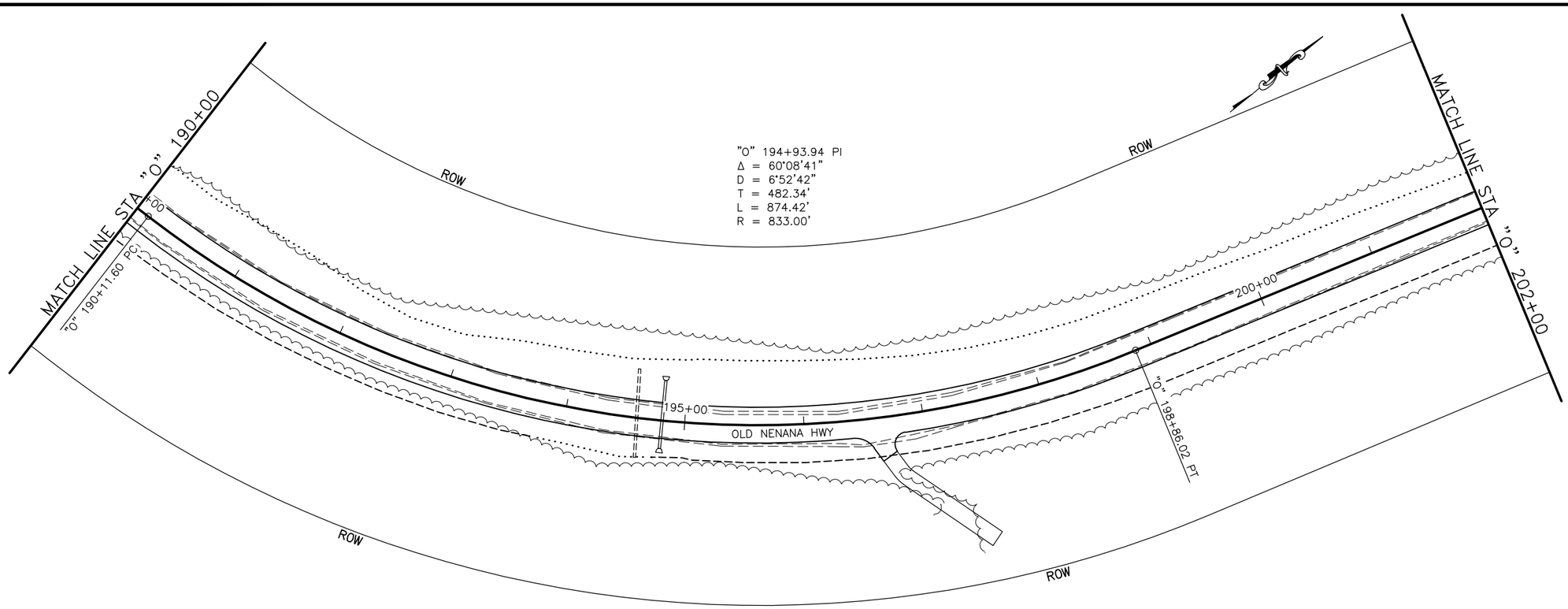
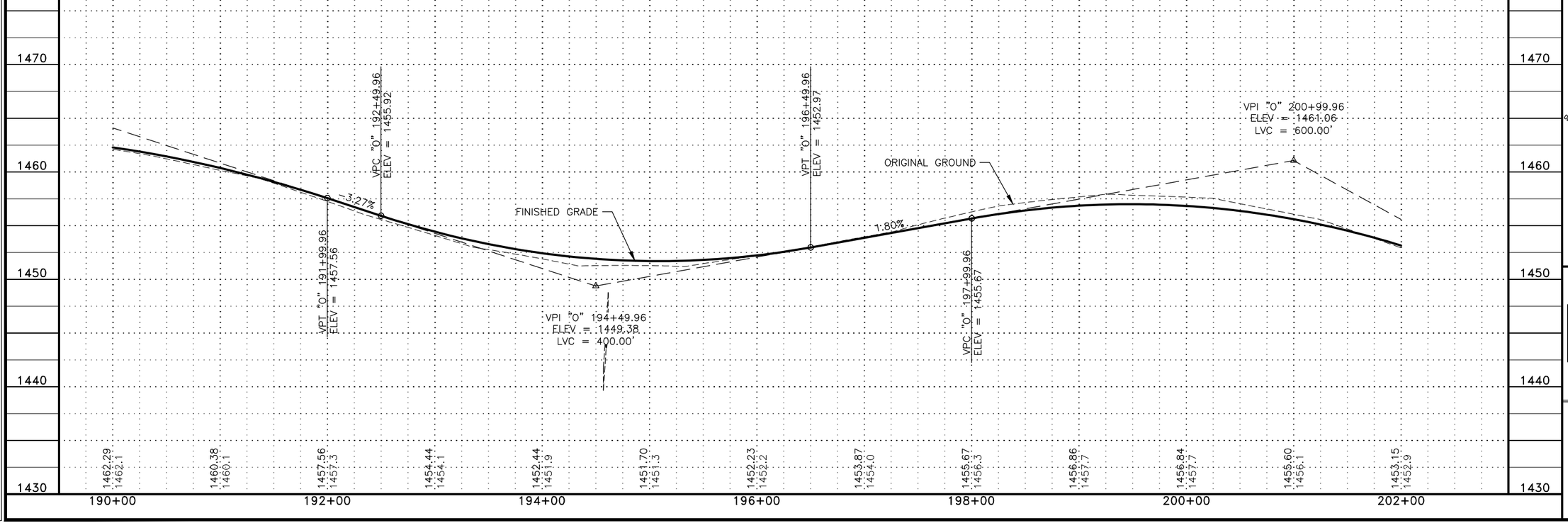
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
178+00 TO 190+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





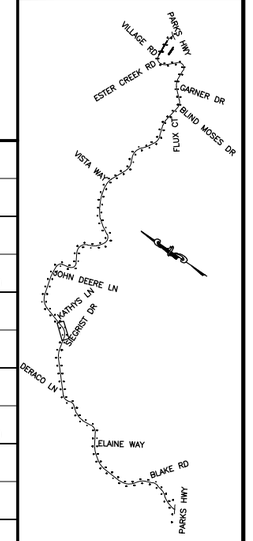
SHEET NO.	TOTAL SHEETS
F16	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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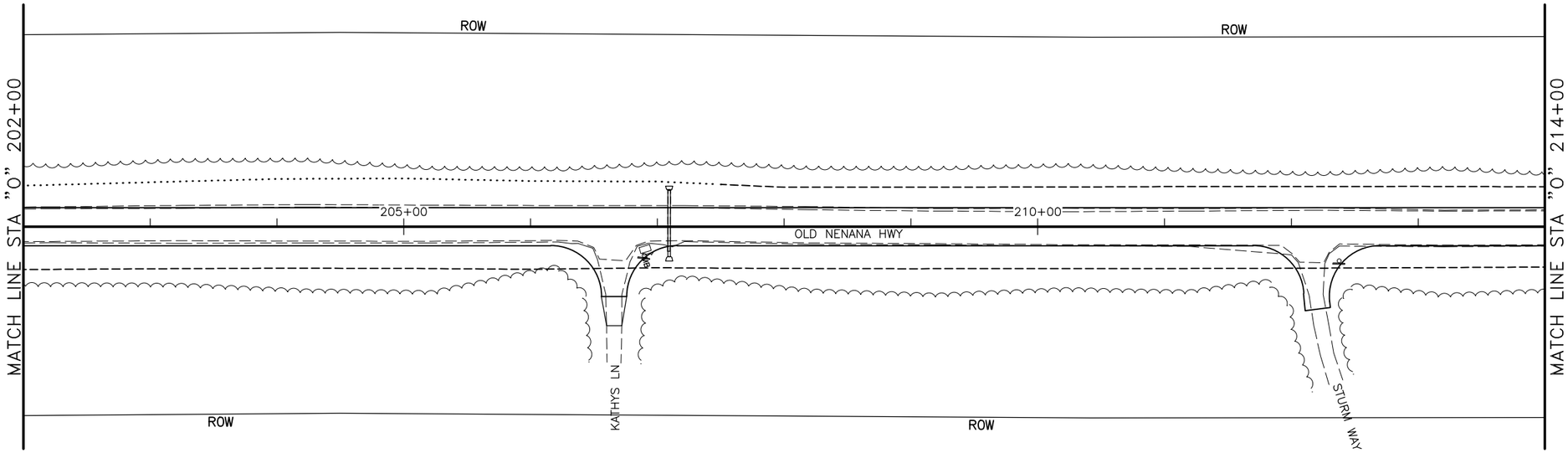
HATTENBURG DILLEY & LINNELL

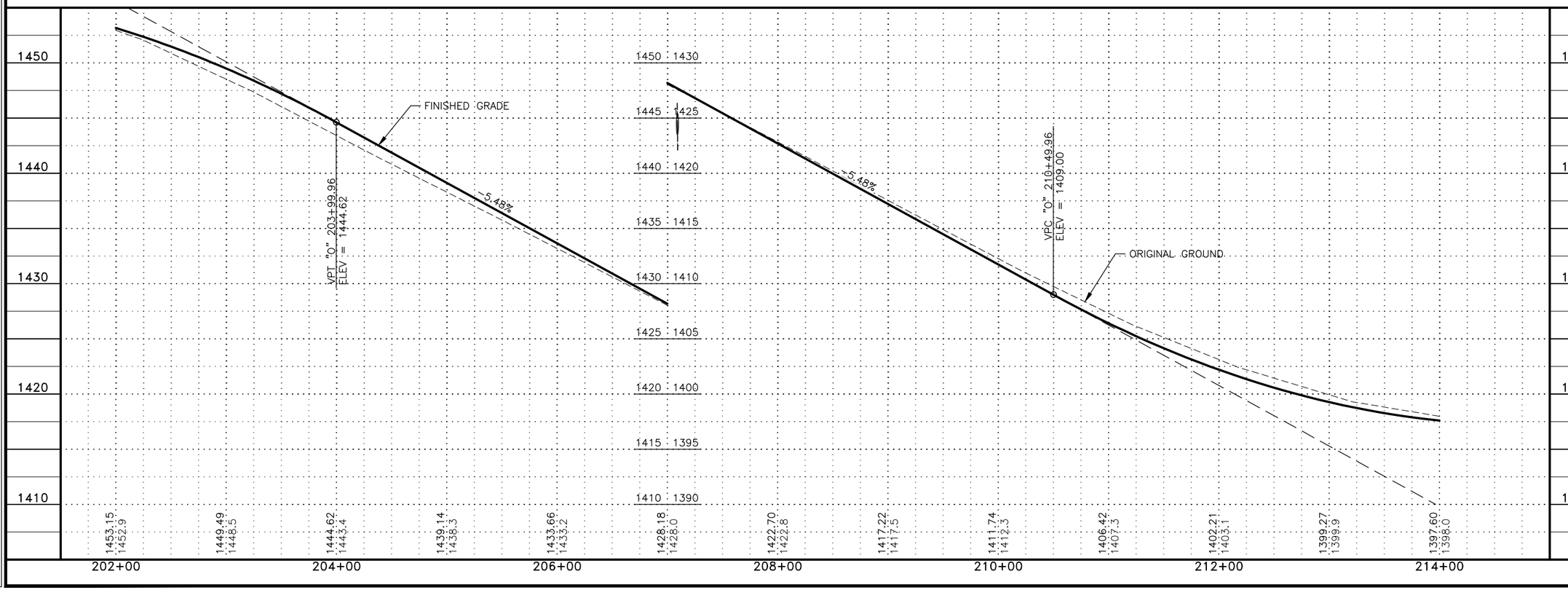
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
190+00 TO 202+00

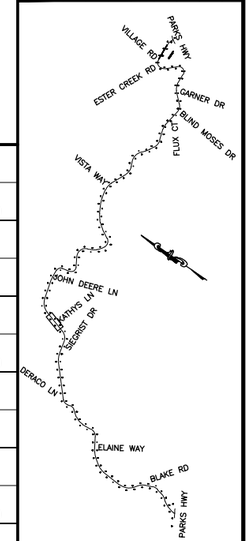
FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01 DATE 9/28/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





SHEET NO.	TOTAL SHEETS
F17	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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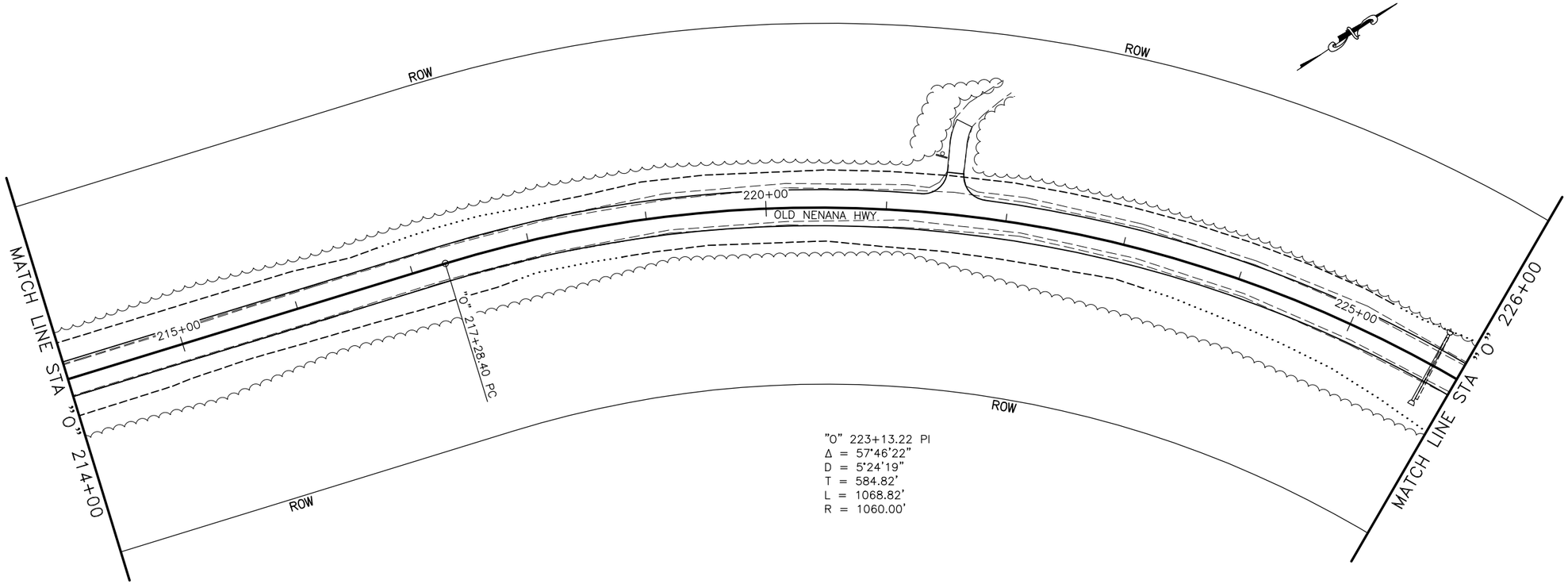
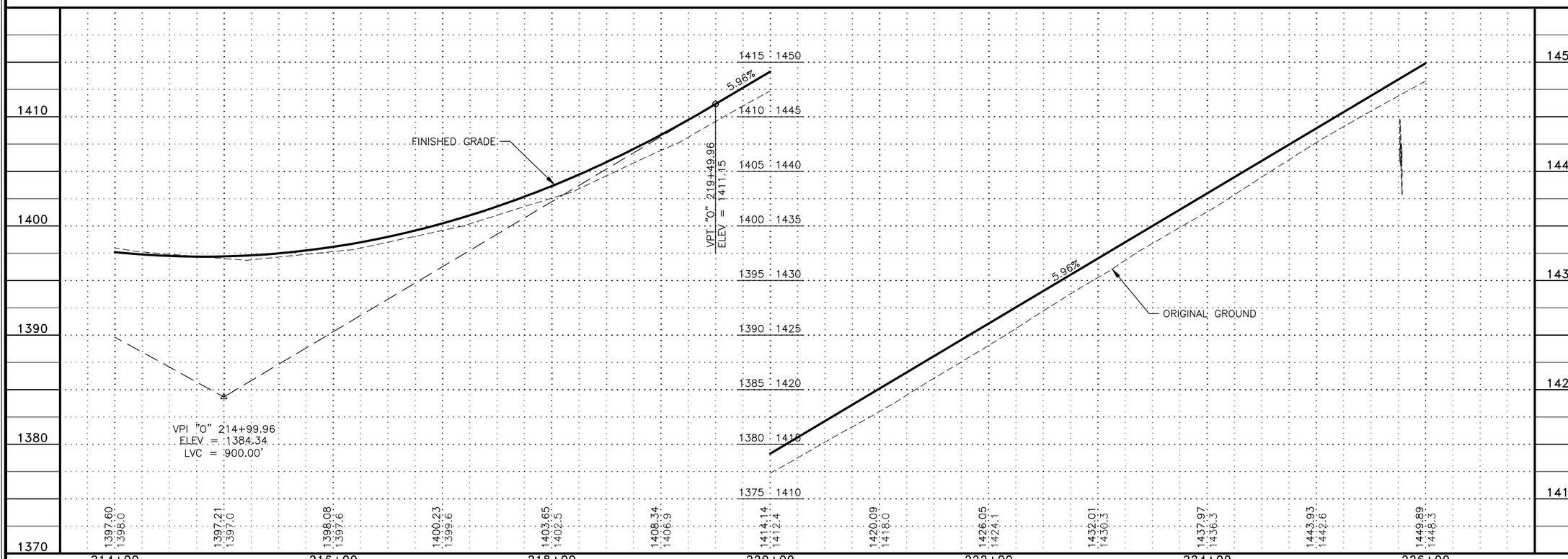
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
202+00 TO 214+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





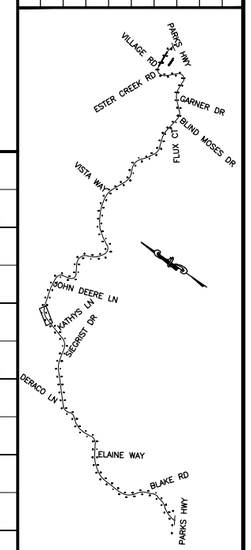
SHEET NO.	TOTAL SHEETS
F18	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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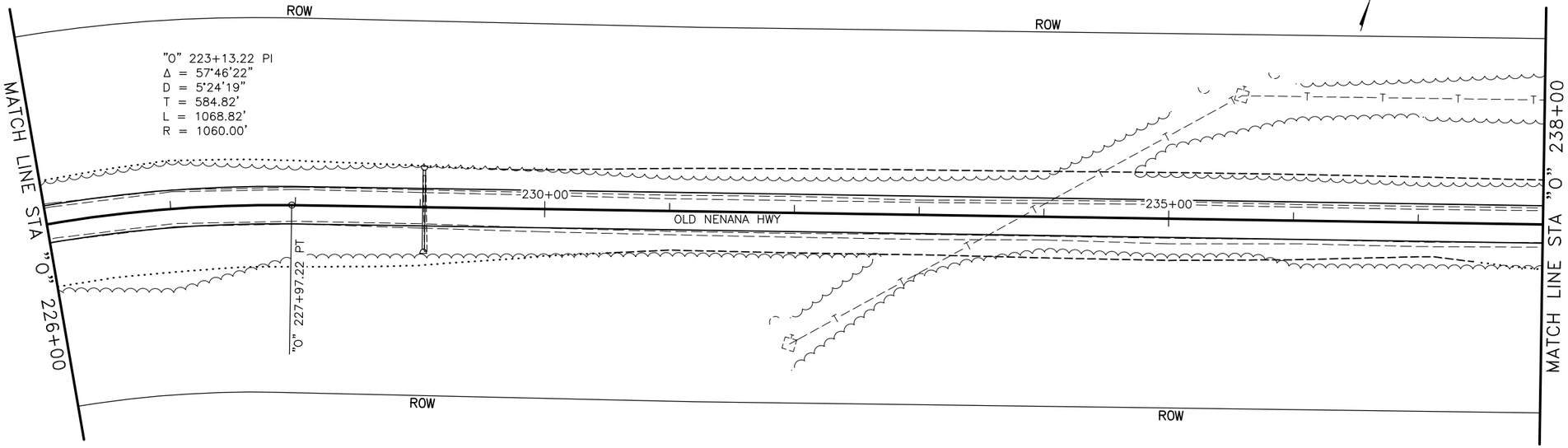
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

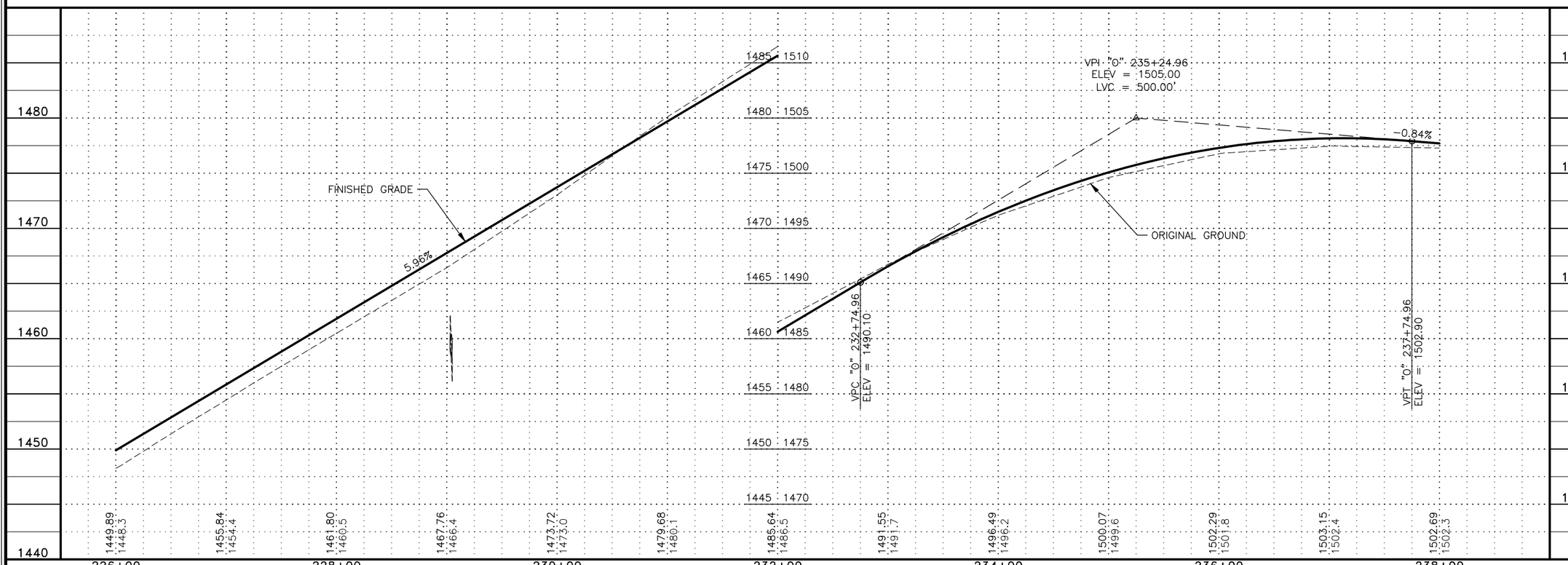
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
214+00 TO 226+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED

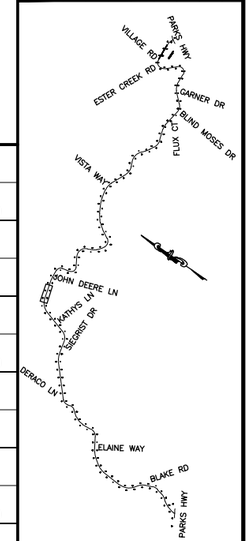
FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED
DATE





SHEET NO.	TOTAL SHEETS
F19	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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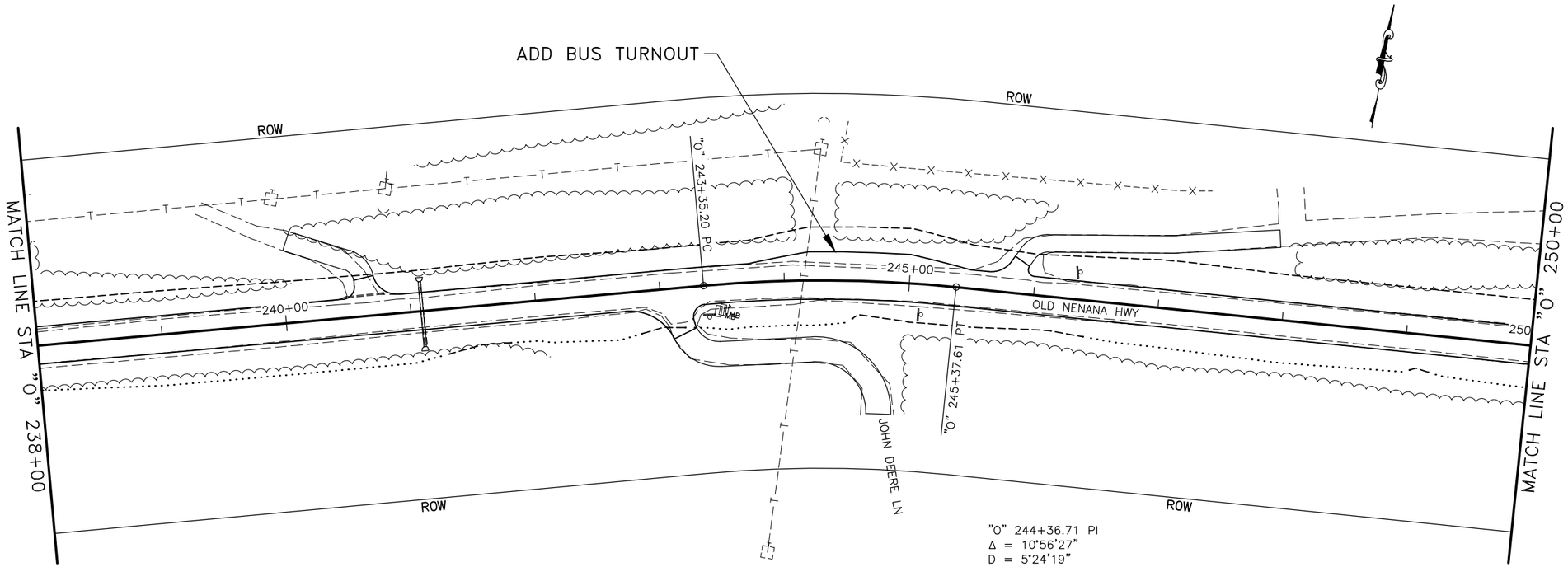
HATTENBURG DILLEY & LINNELL

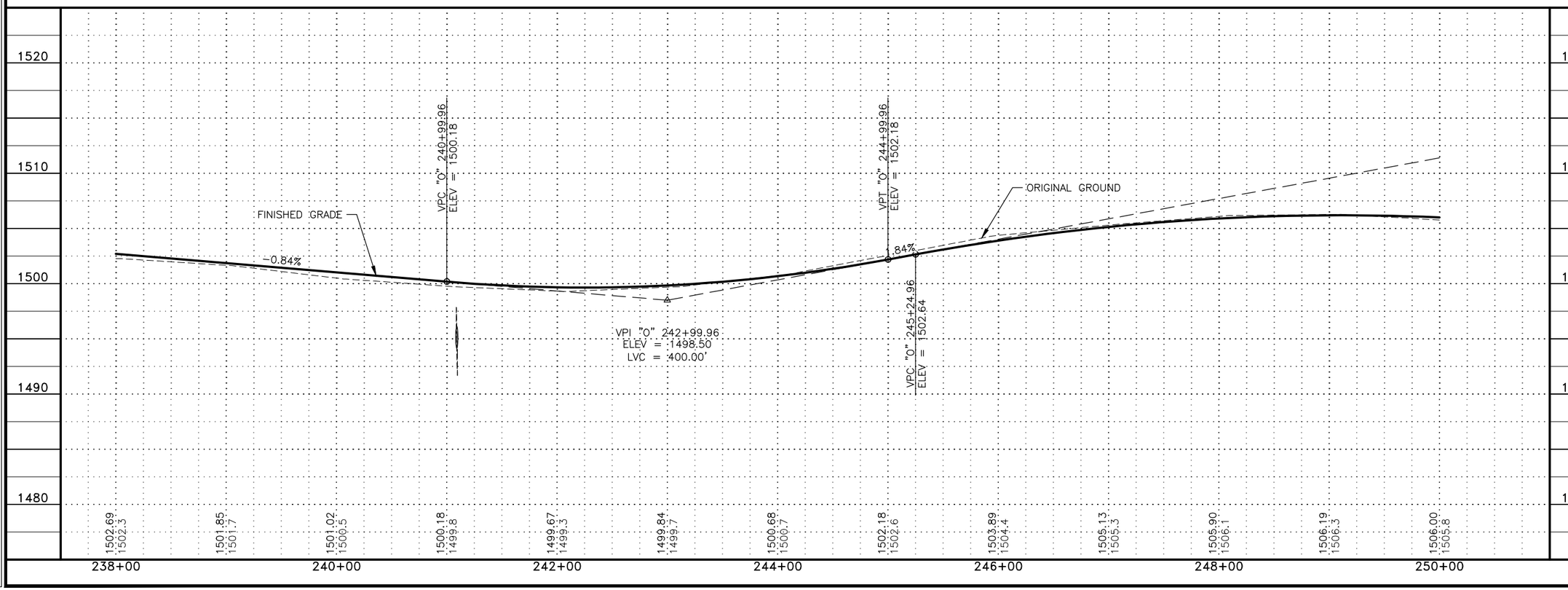
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA PLAN & PROFILE 226+00 TO 238+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn 12/8/2015 17:13 | LAYOUT F1-F42 | DESIGNED | DESIGNED | CHECKED | CHECKED | DRAFTED | DRAFTED | DATE





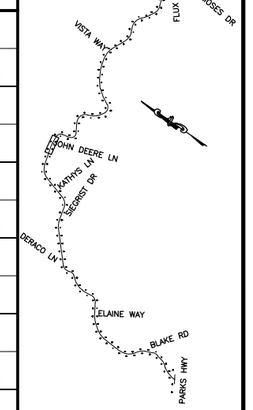
SHEET NO.	TOTAL SHEETS
F20	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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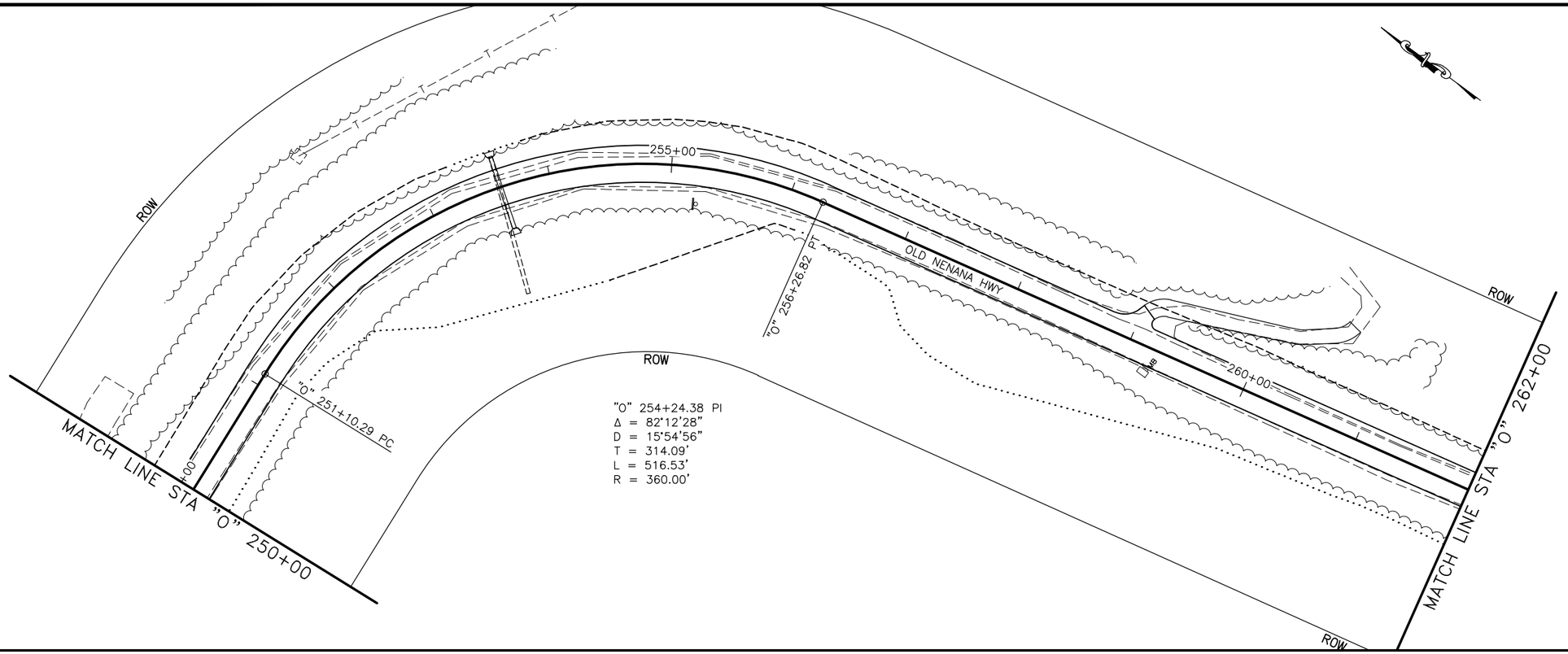
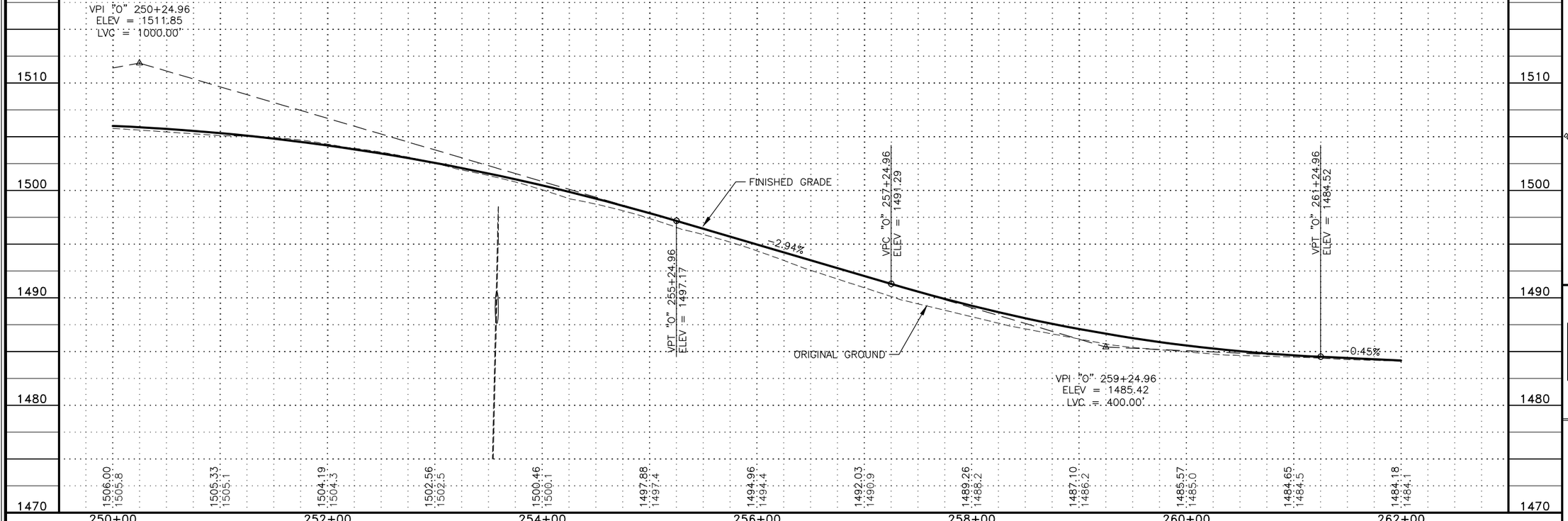
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
238+00 TO 250+00





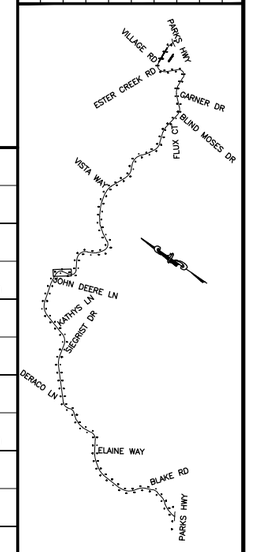
SHEET NO.	TOTAL SHEETS
F21	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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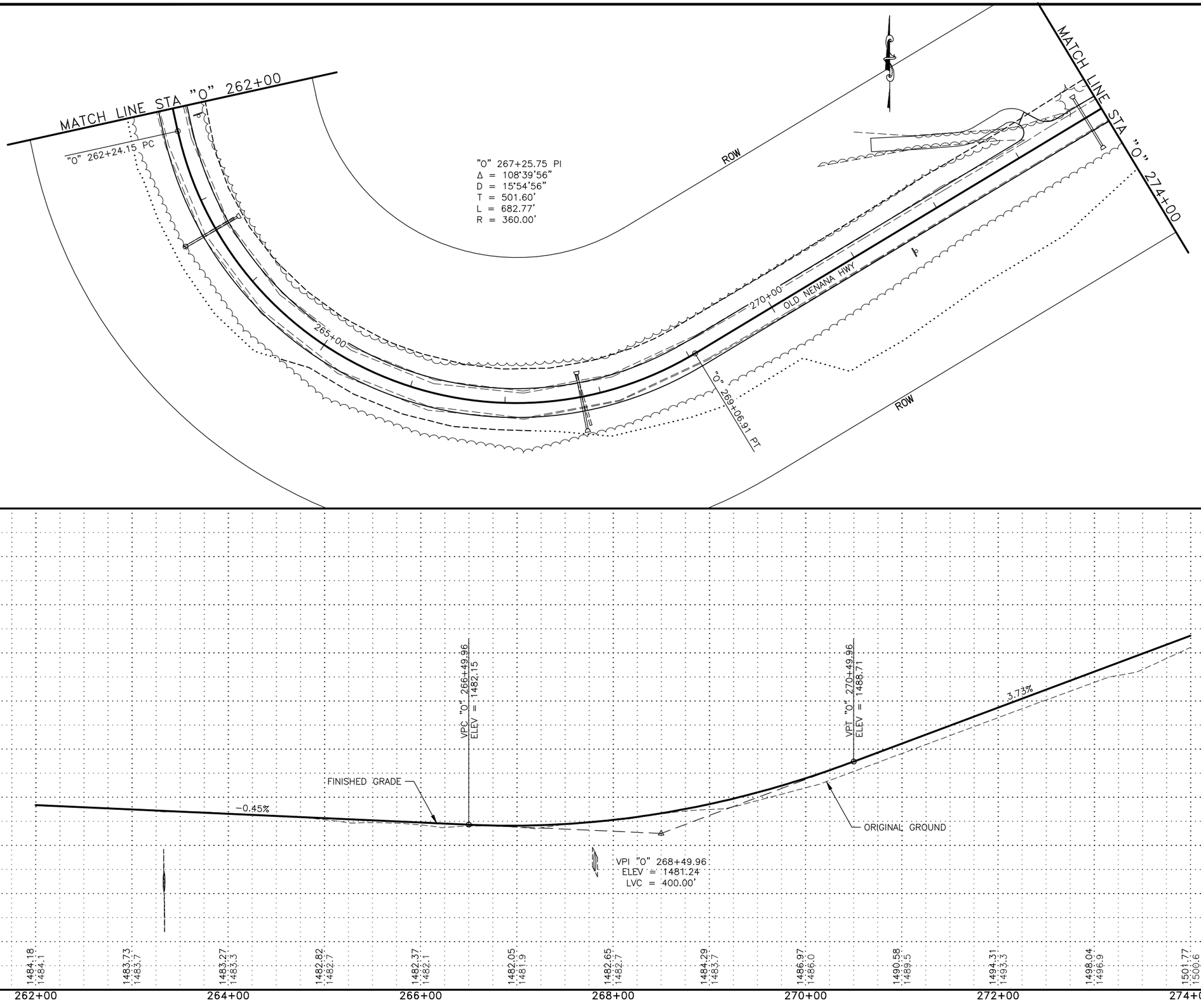
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

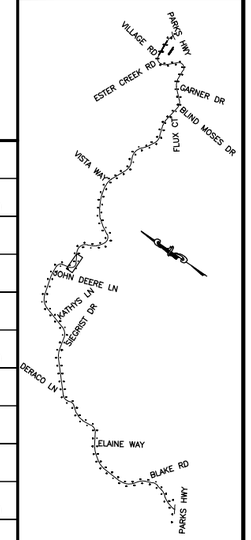
OLD NENANA
PLAN & PROFILE
250+00 TO 262+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01 | DATE 9/2/2015 17:13 | LAYOUT F1-F42 | DESIGNED | DESIGNED | CHECKED | CHECKED | DRAFTED | DRAFTED | DRAFTED



SHEET NO.	TOTAL SHEETS
F22	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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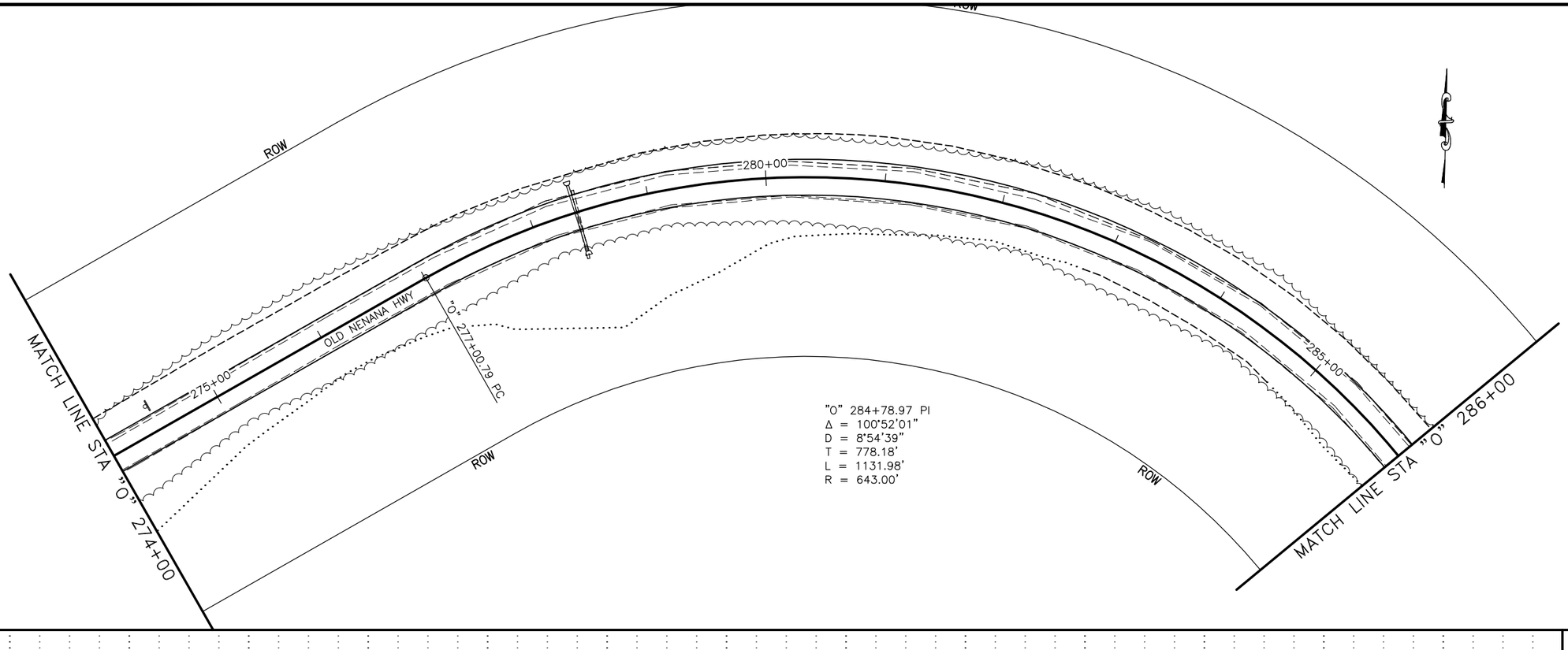
HATTENBURG DILLEY & LINNELL

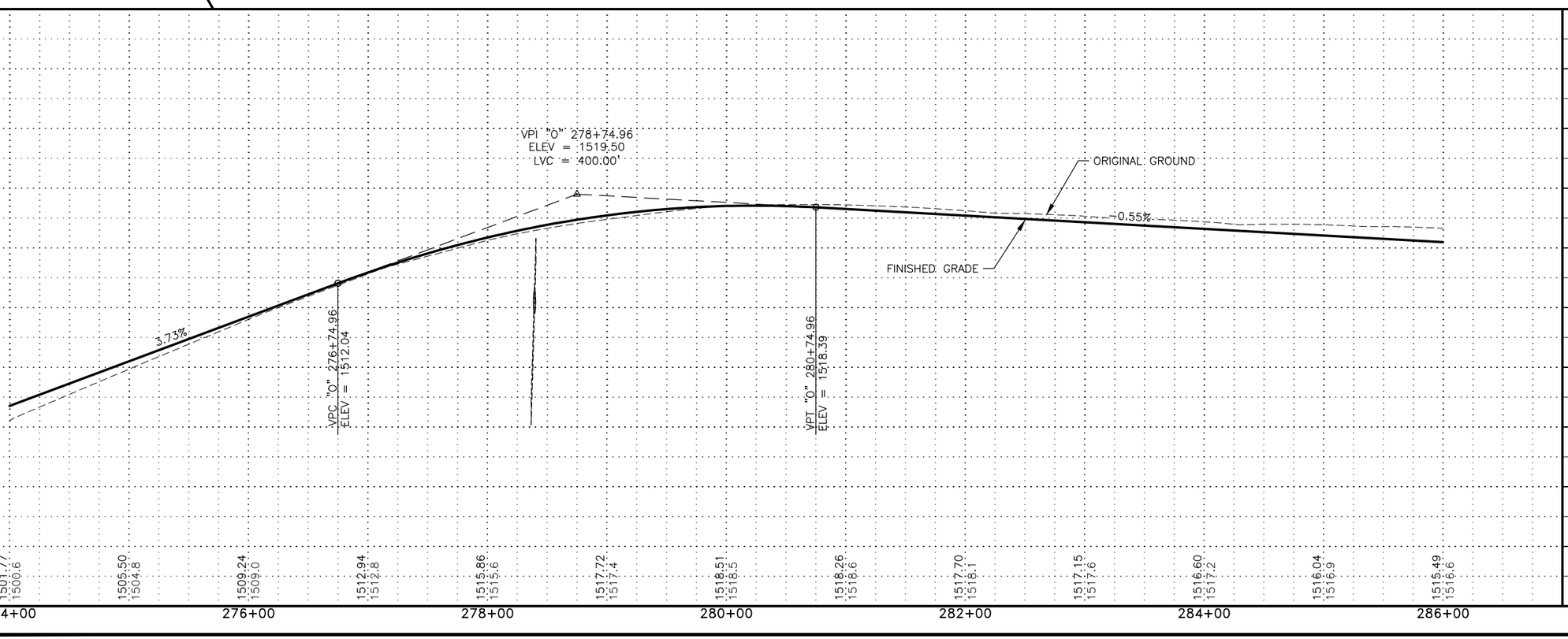
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
262+00 TO 274+00

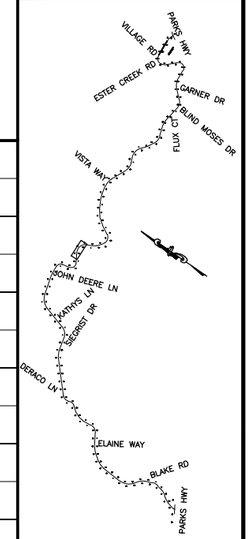
FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





SHEET NO.	TOTAL SHEETS
F23	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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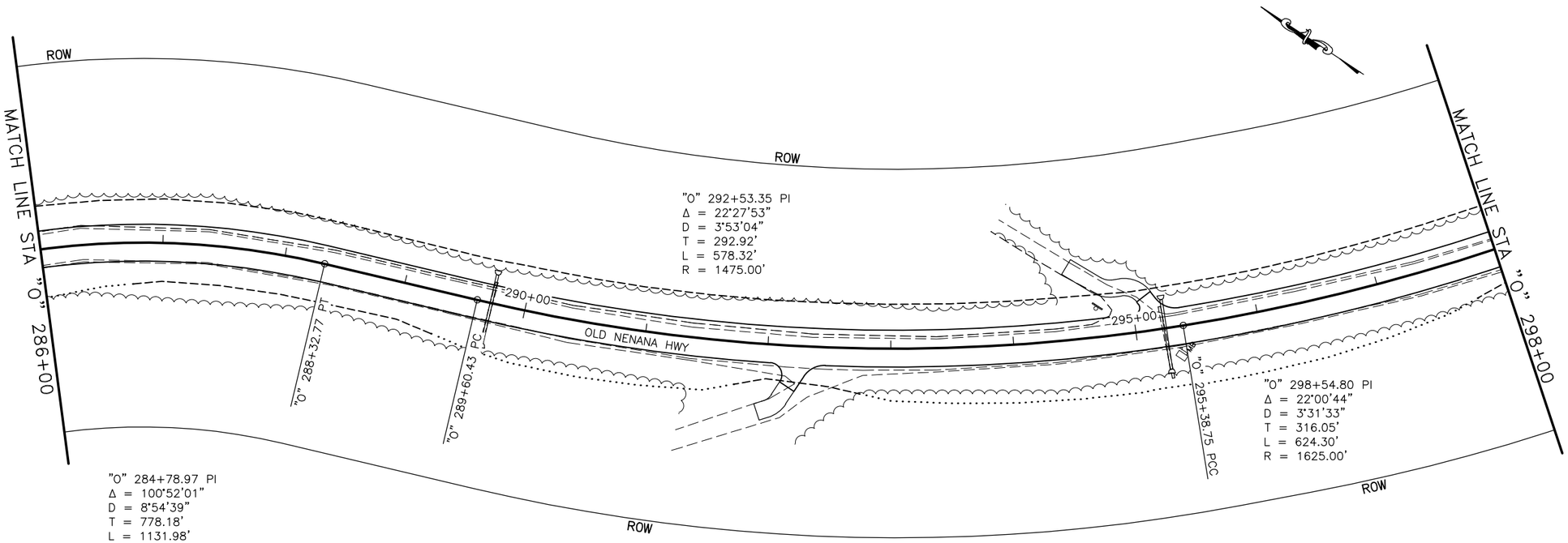
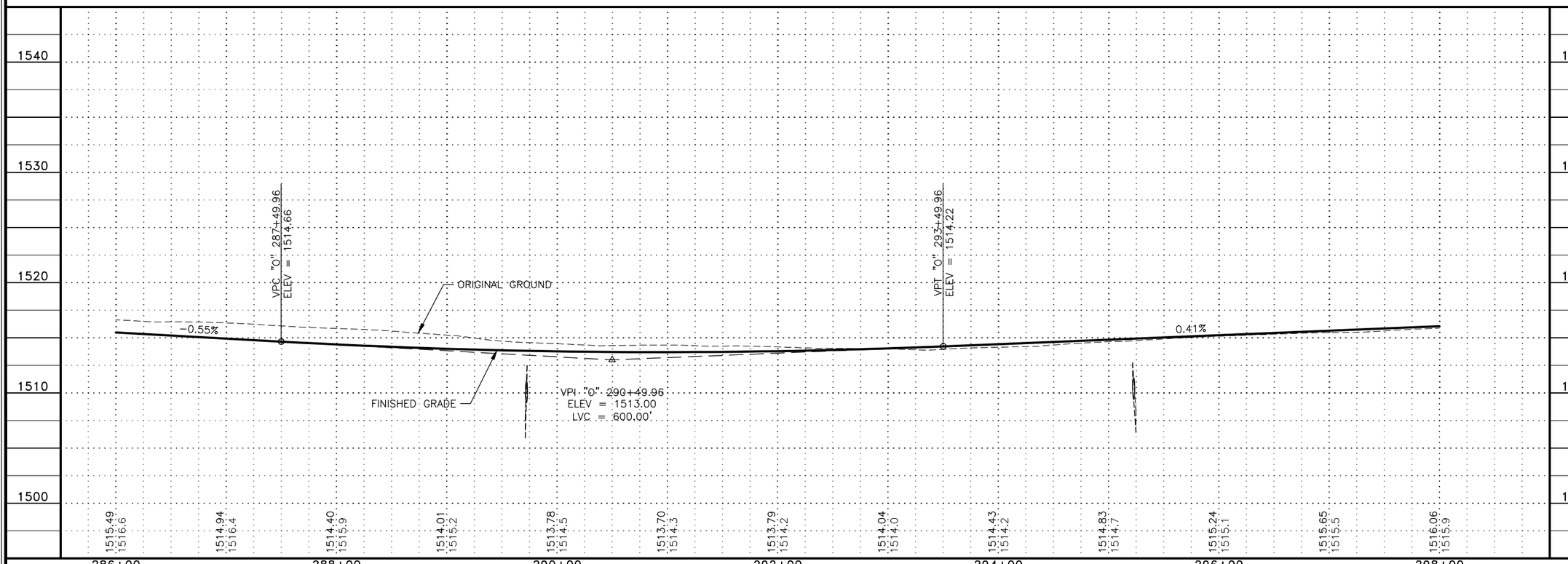
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
274+00 TO 286+00

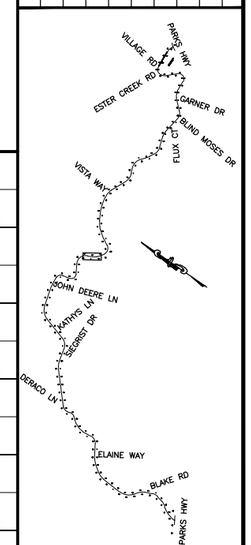
FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED CHECKED DRAFTED





SHEET NO.	TOTAL SHEETS
F24	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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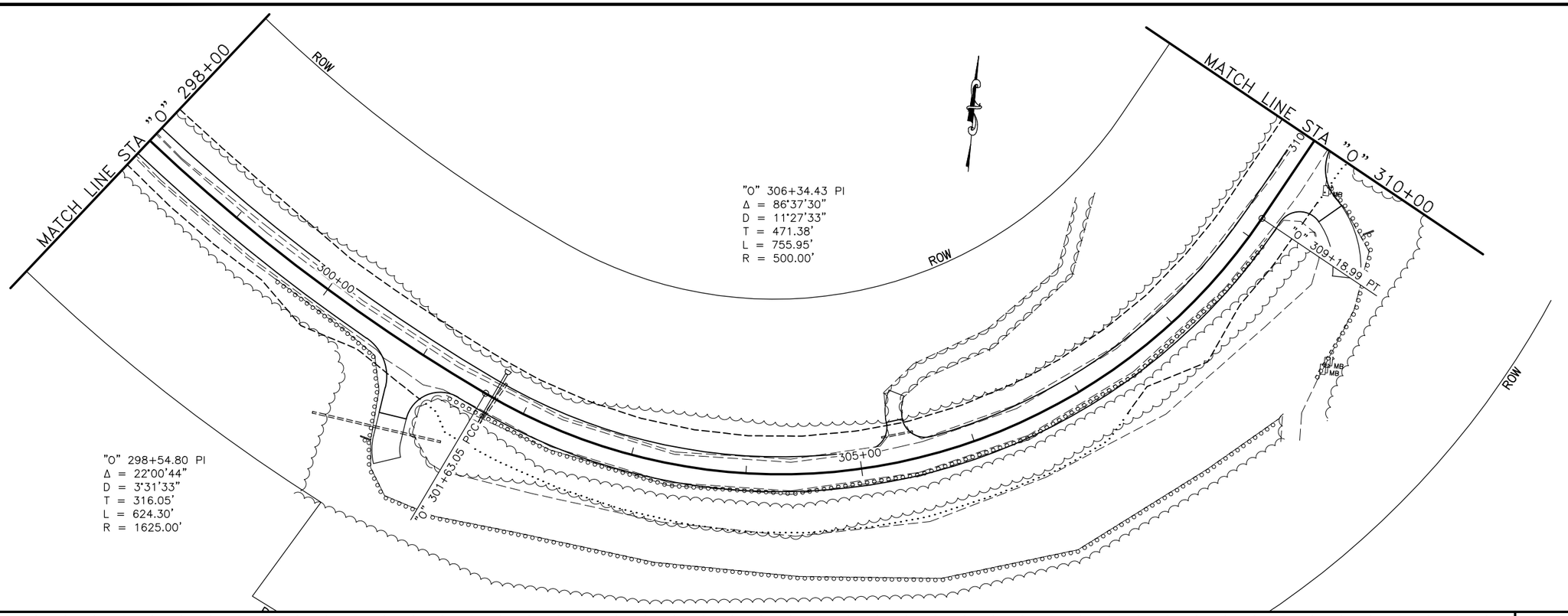
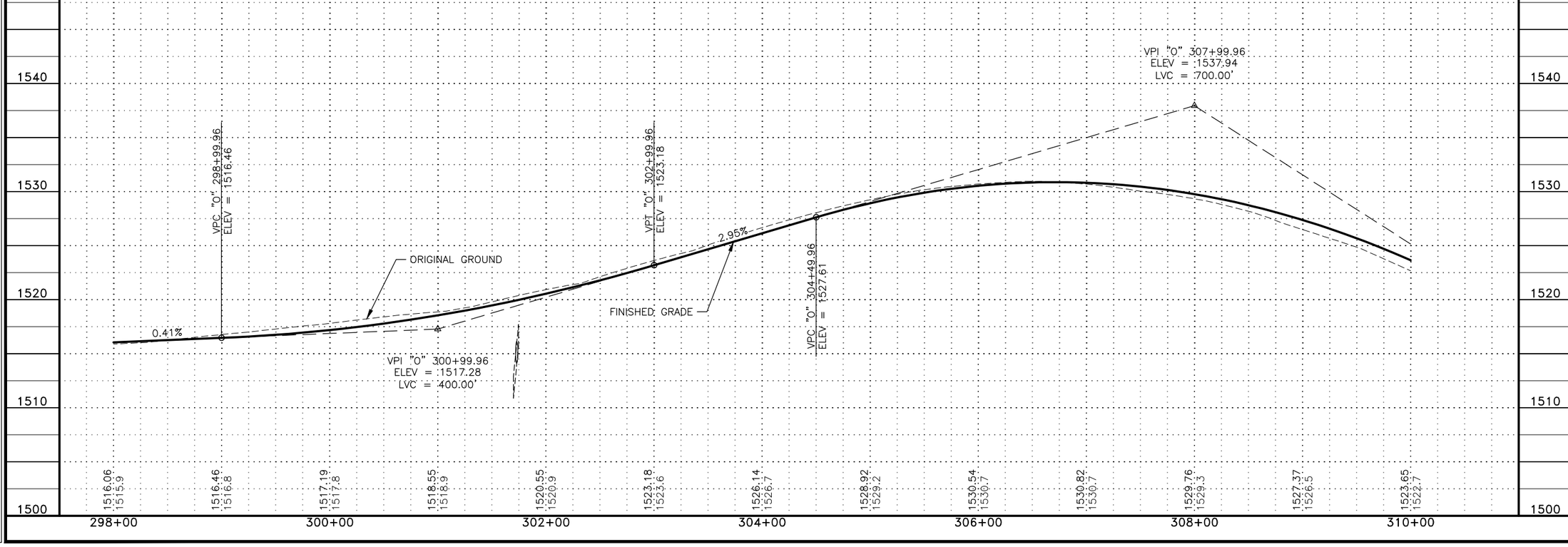
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
286+00 TO 298+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED CHECKED DRAFTED





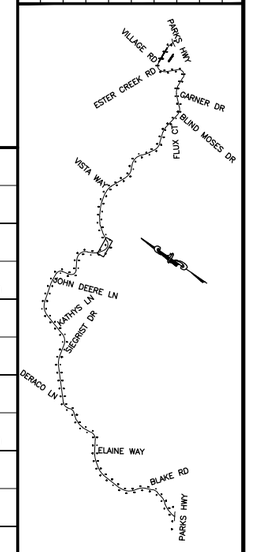
SHEET NO.	TOTAL SHEETS
F25	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

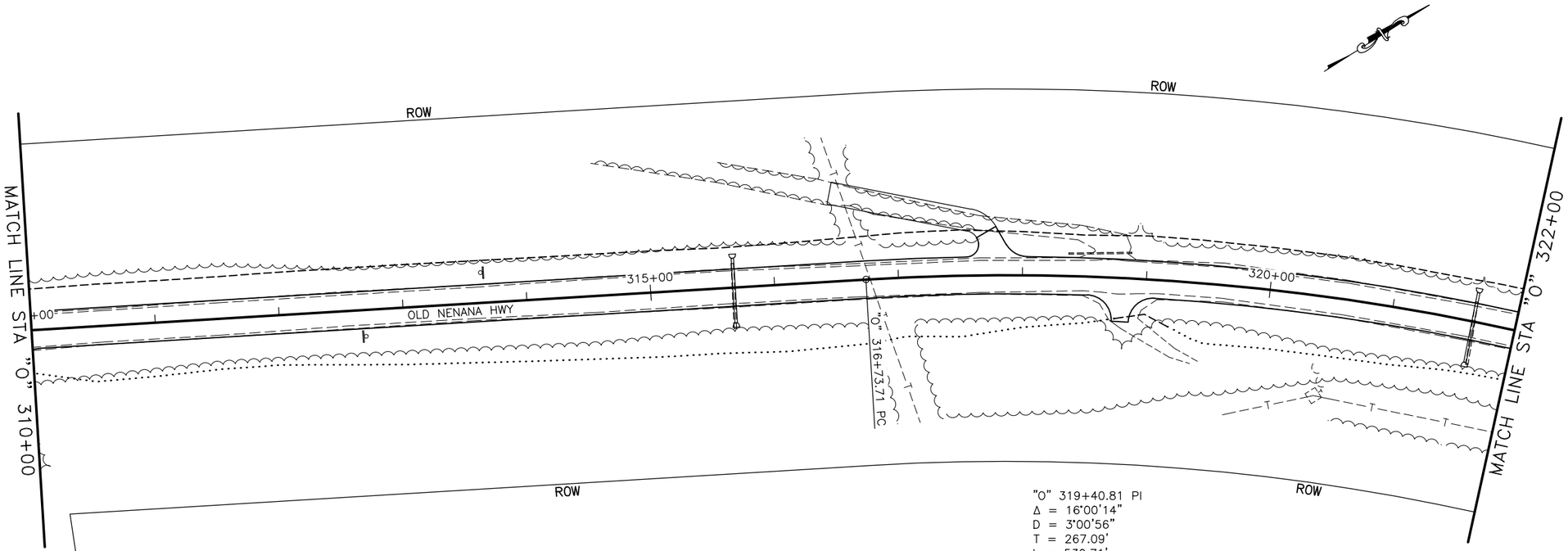
OLD NENANA/ESTER HILL REHABILITATION

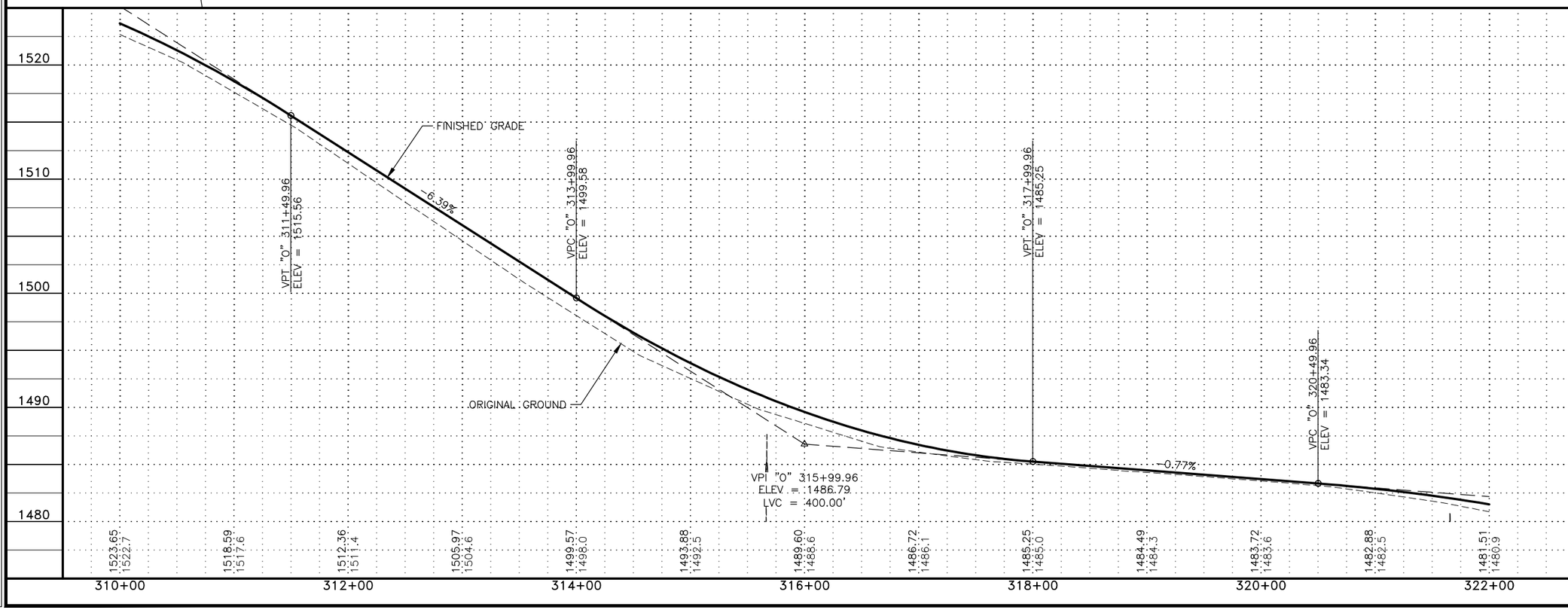
OLD NENANA
PLAN & PROFILE
298+00 TO 310+00

DRAFTED	DRAFTED	CHECKED	CHECKED	DESIGNED	DESIGNED	LAYOUT	F1-F42

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01 DATE 9/2/8/2015 17:13

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn 12/8/2015 17:13 | LAYOUT F1-F42 | DESIGNED | DESIGNED | CHECKED | CHECKED | DRAFTED | DRAFTED | DATE





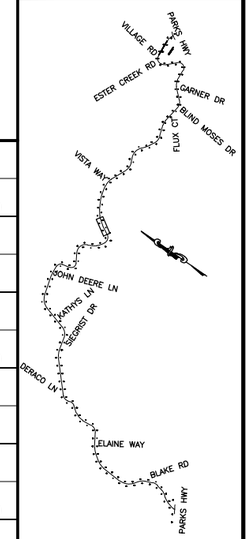
SHEET NO.	TOTAL SHEETS
F26	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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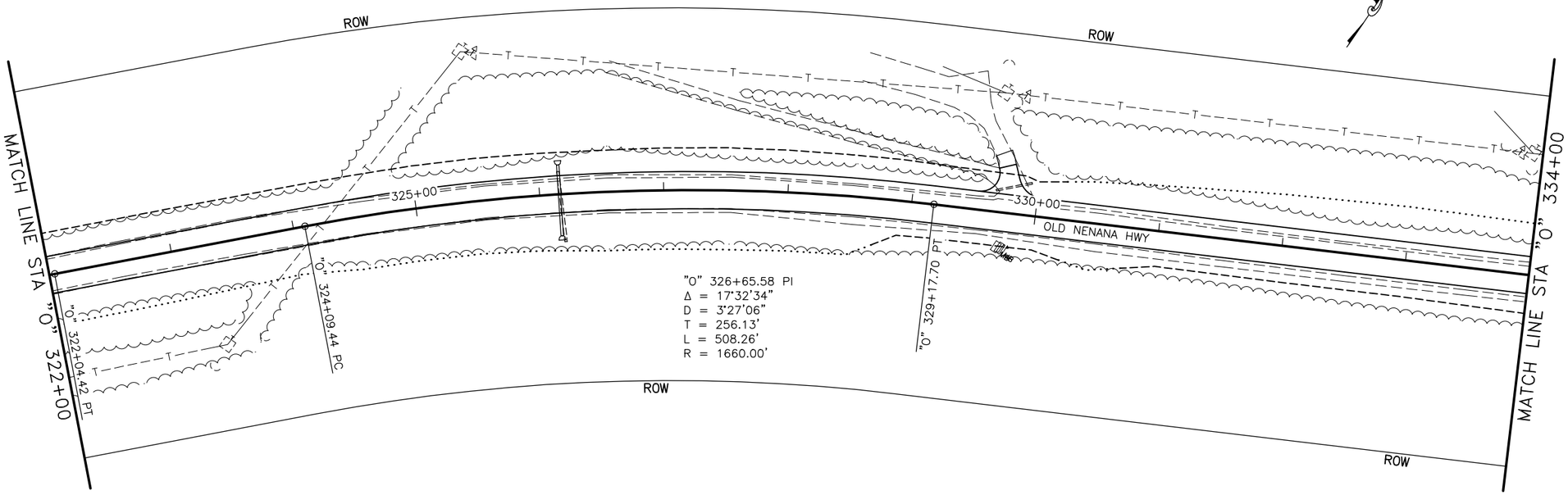
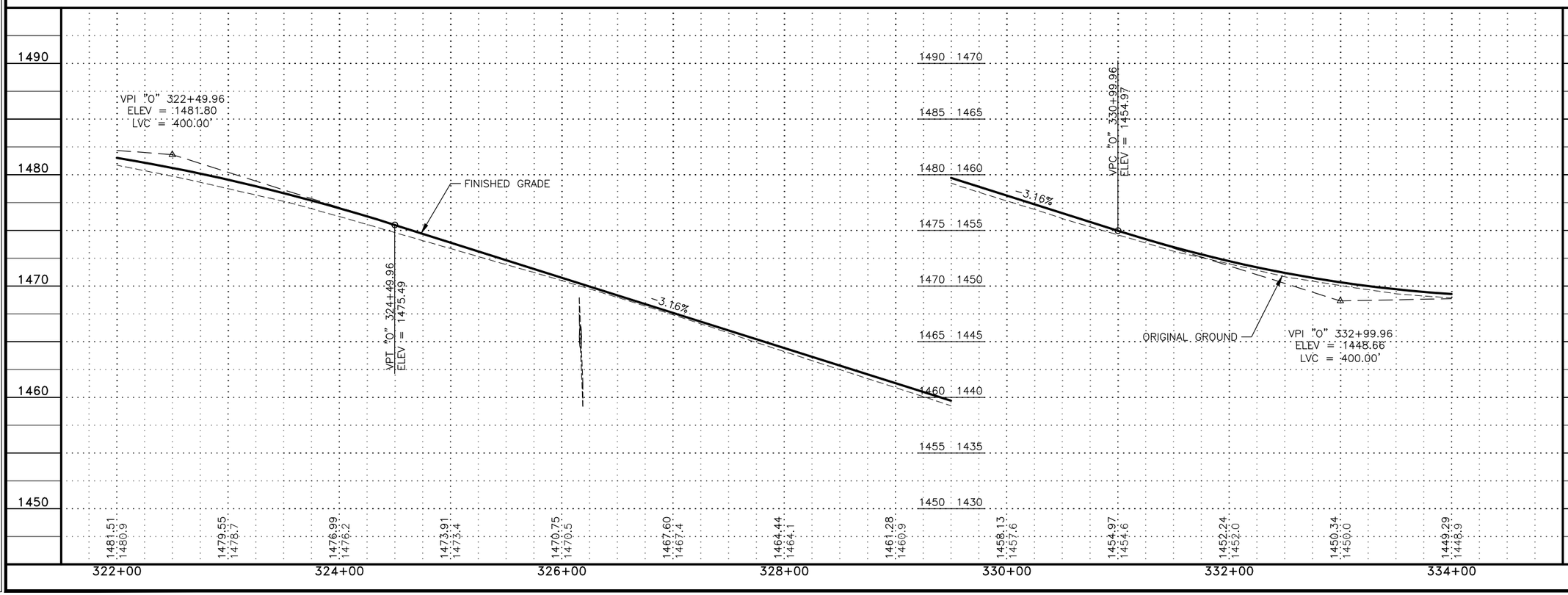
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
310+00 TO 322+00





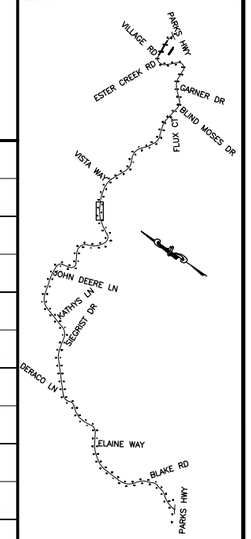
SHEET NO.	TOTAL SHEETS
F27	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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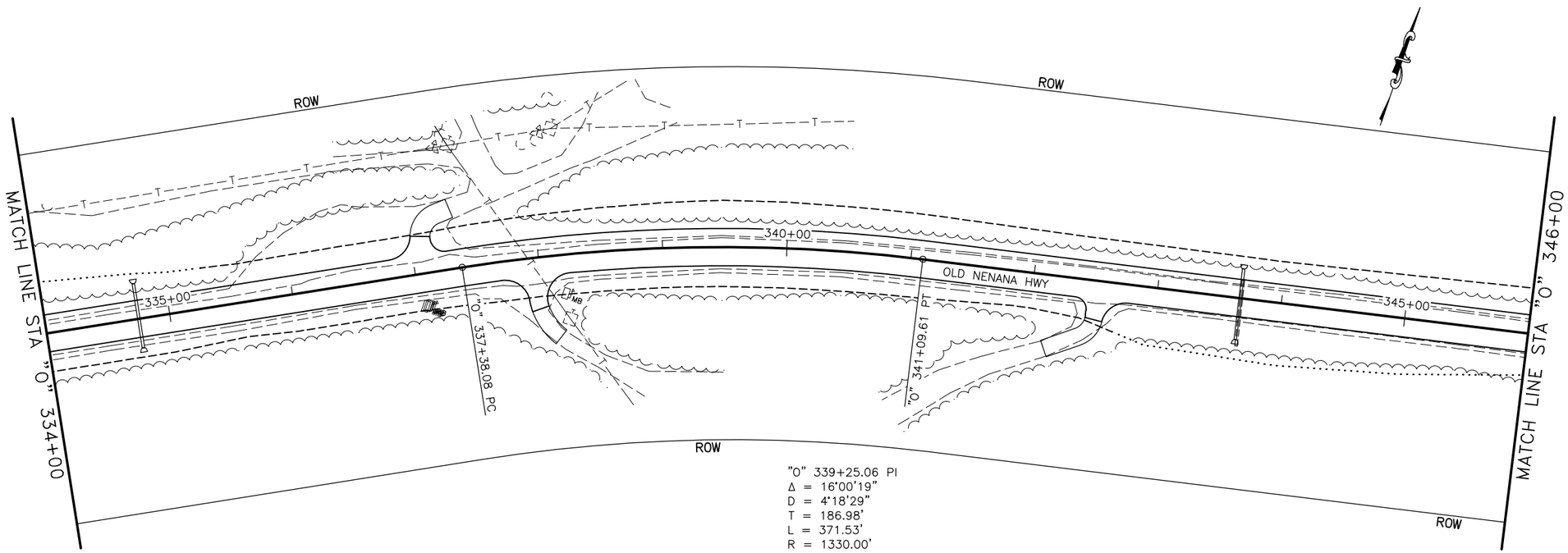
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
322+00 TO 334+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED



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D = 4°18'29"
T = 186.98'
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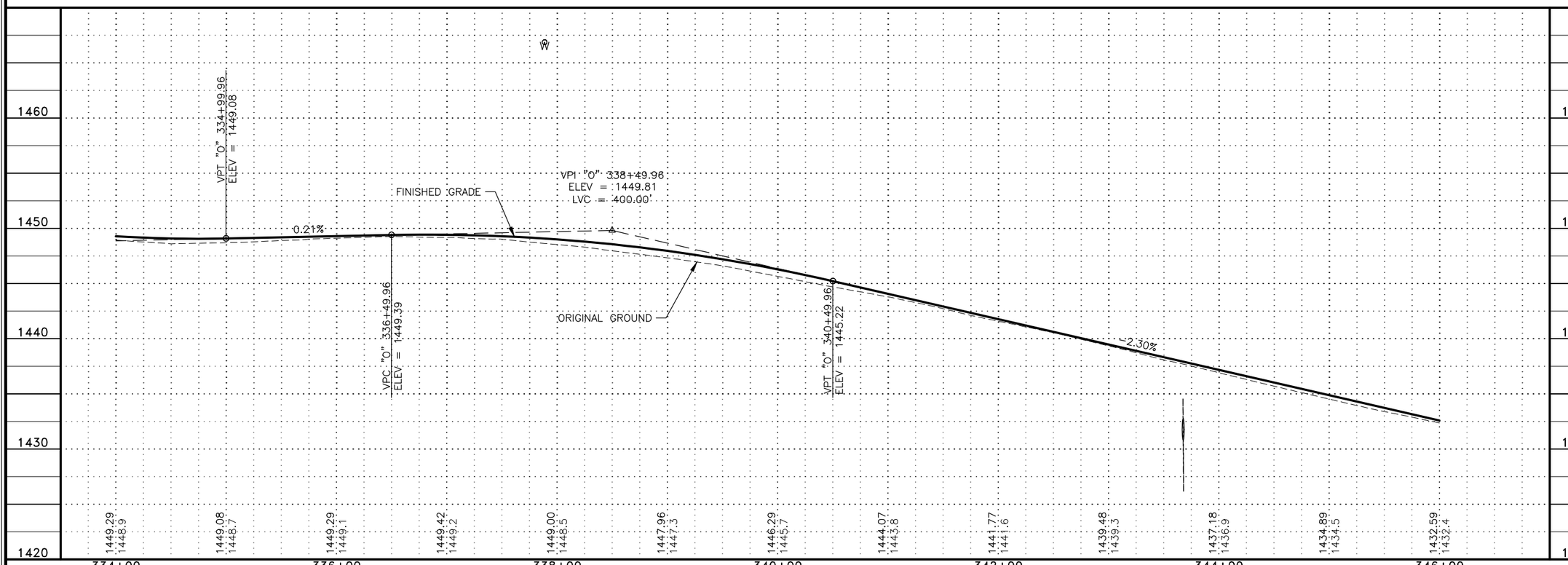
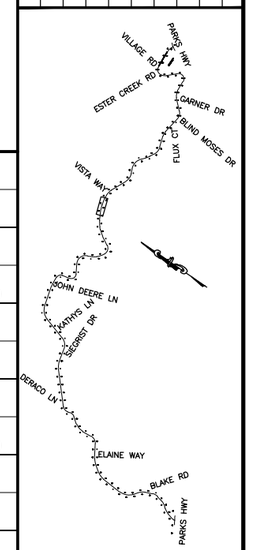
R = 1330.00'



SHEET NO.	TOTAL SHEETS
F28	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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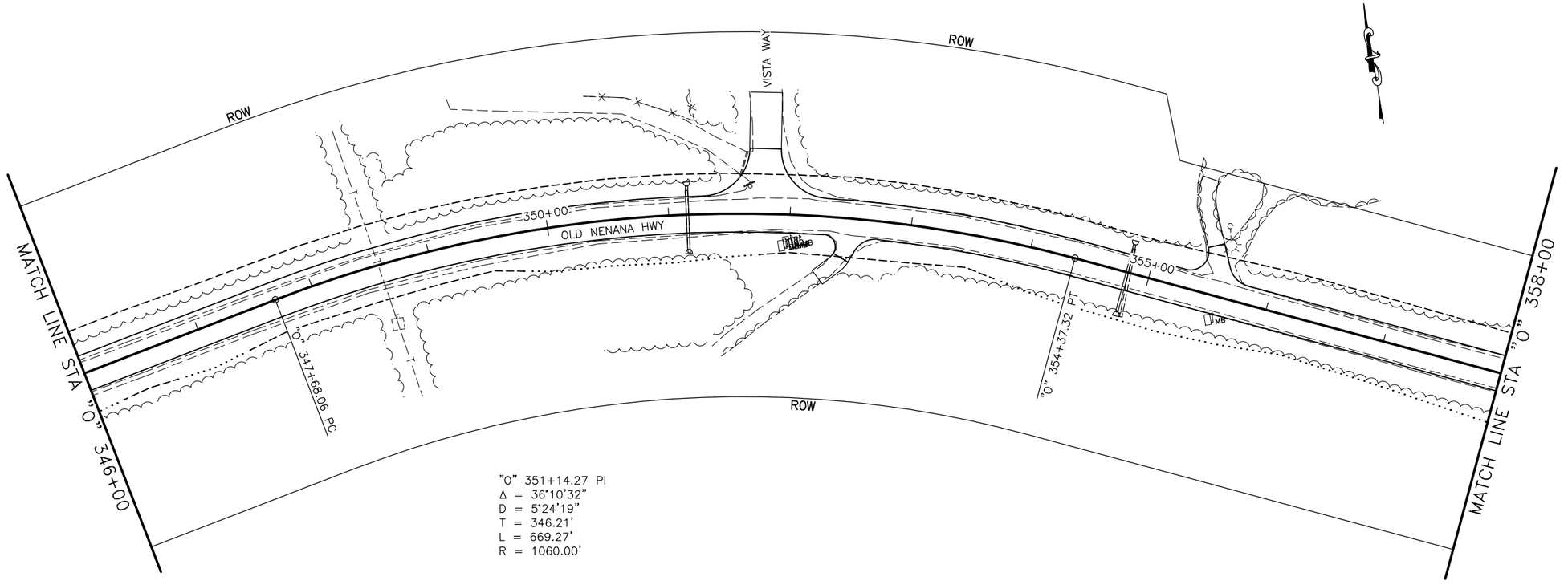
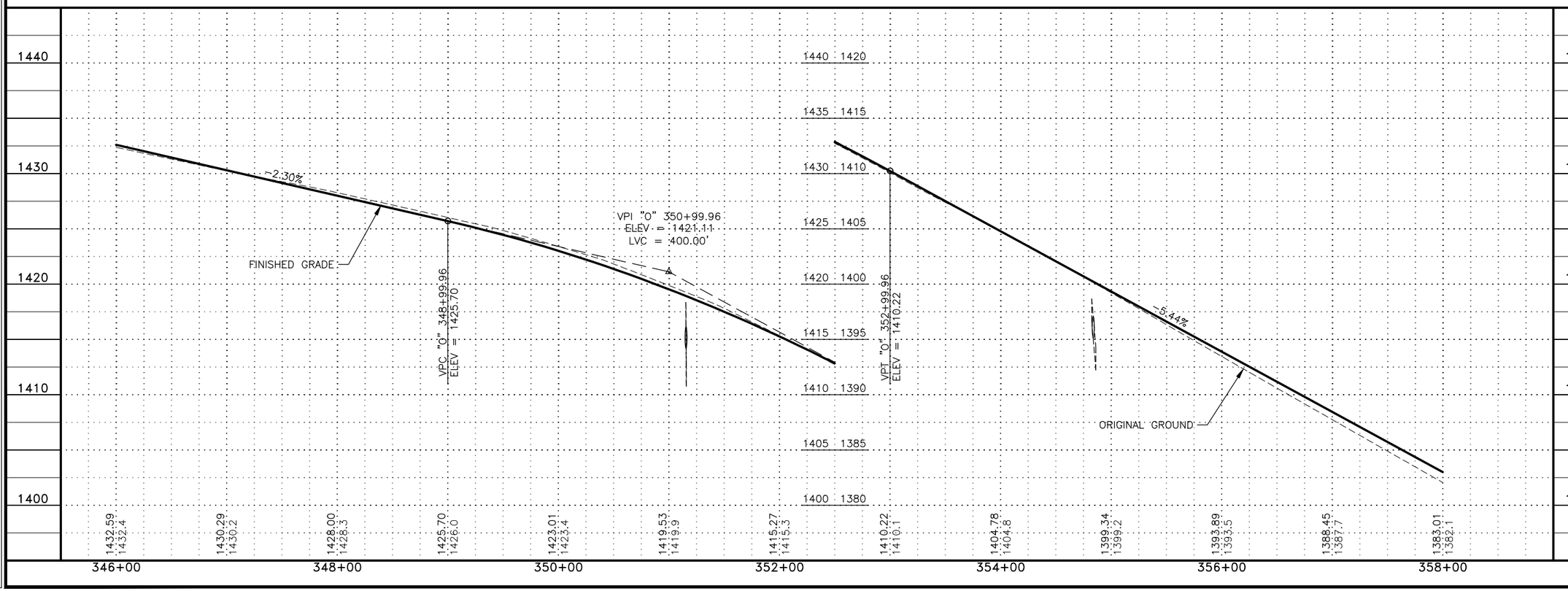
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

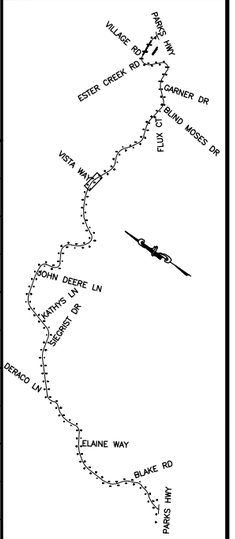
OLD NENANA
PLAN & PROFILE
334+00 TO 346+00





SHEET NO.	TOTAL SHEETS
F29	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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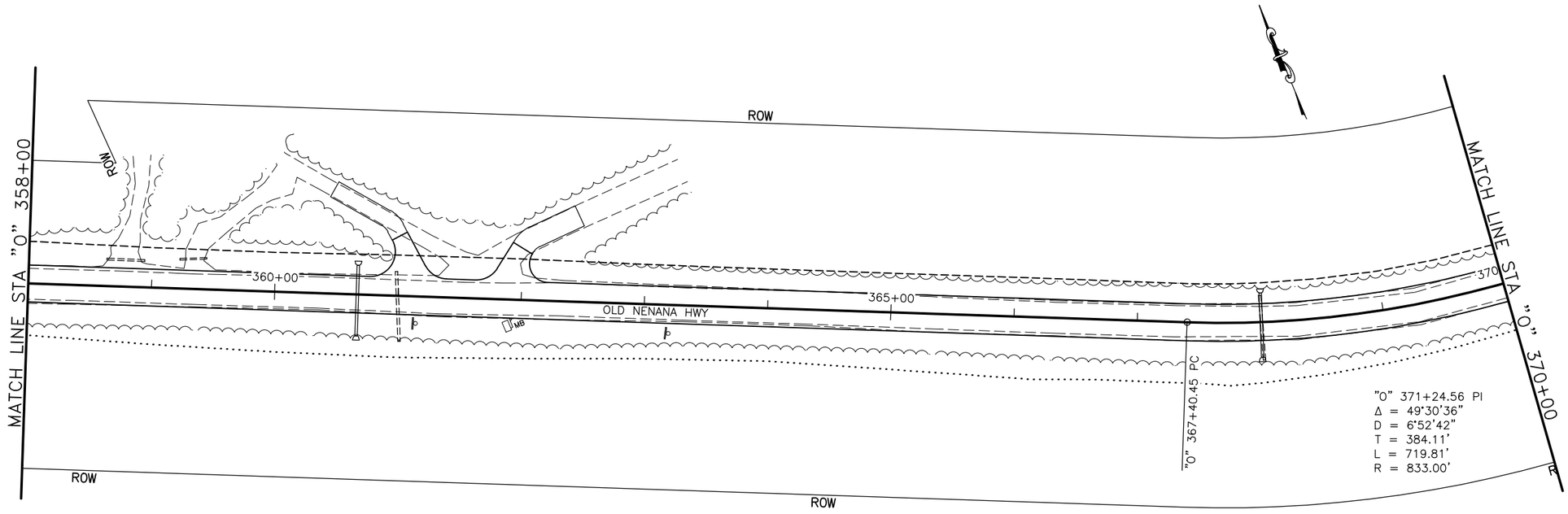
HATTENBURG DILLEY & LINNELL

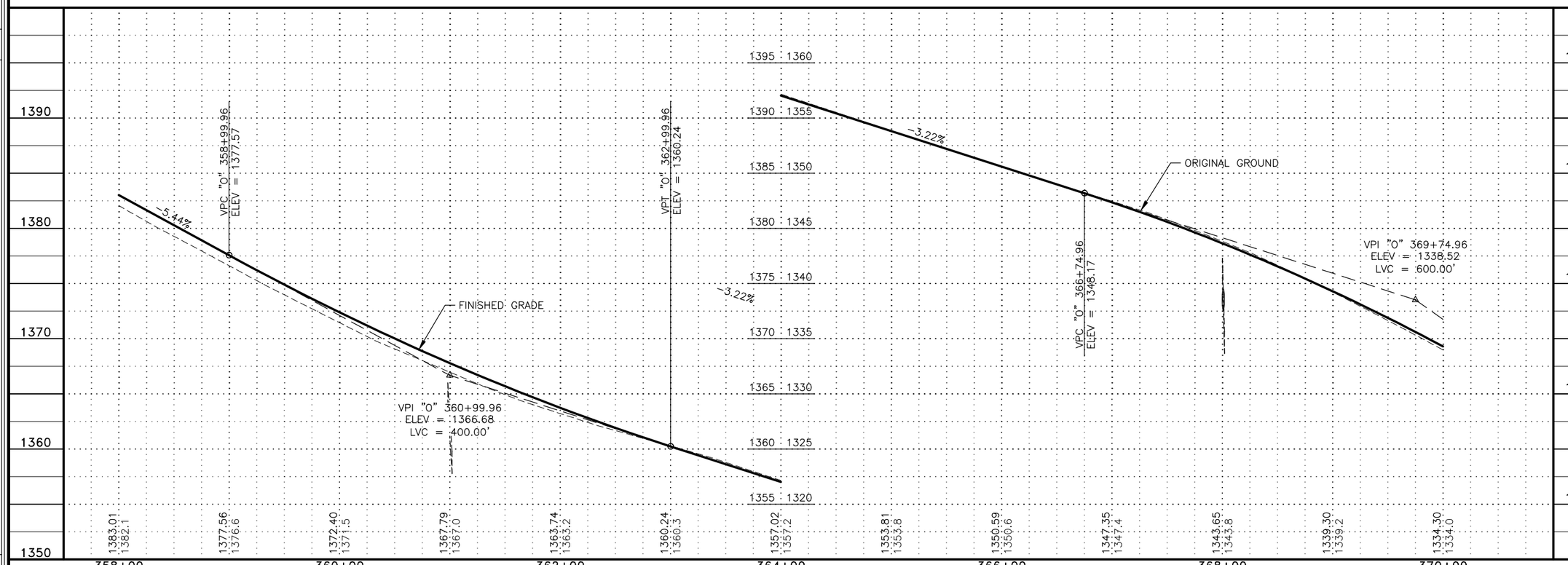
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
346+00 TO 358+00

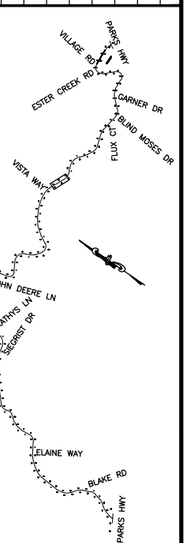
FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED DESIGNED CHECKED CHECKED CHECKED DRAFTED DRAFTED DRAFTED





SHEET NO.	TOTAL SHEETS
F30	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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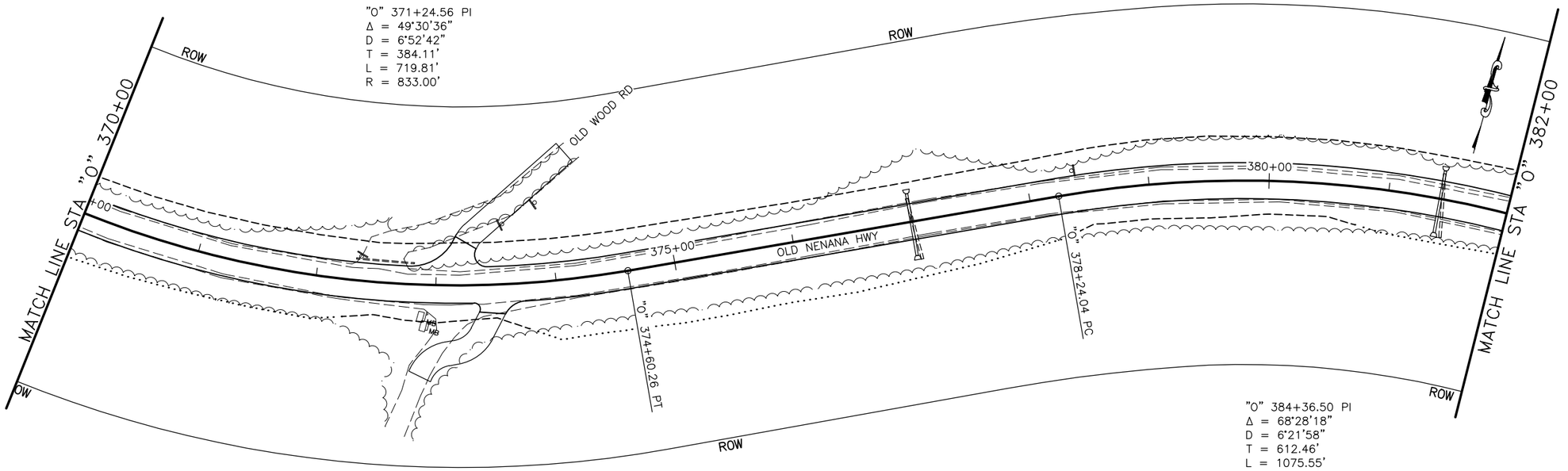
STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

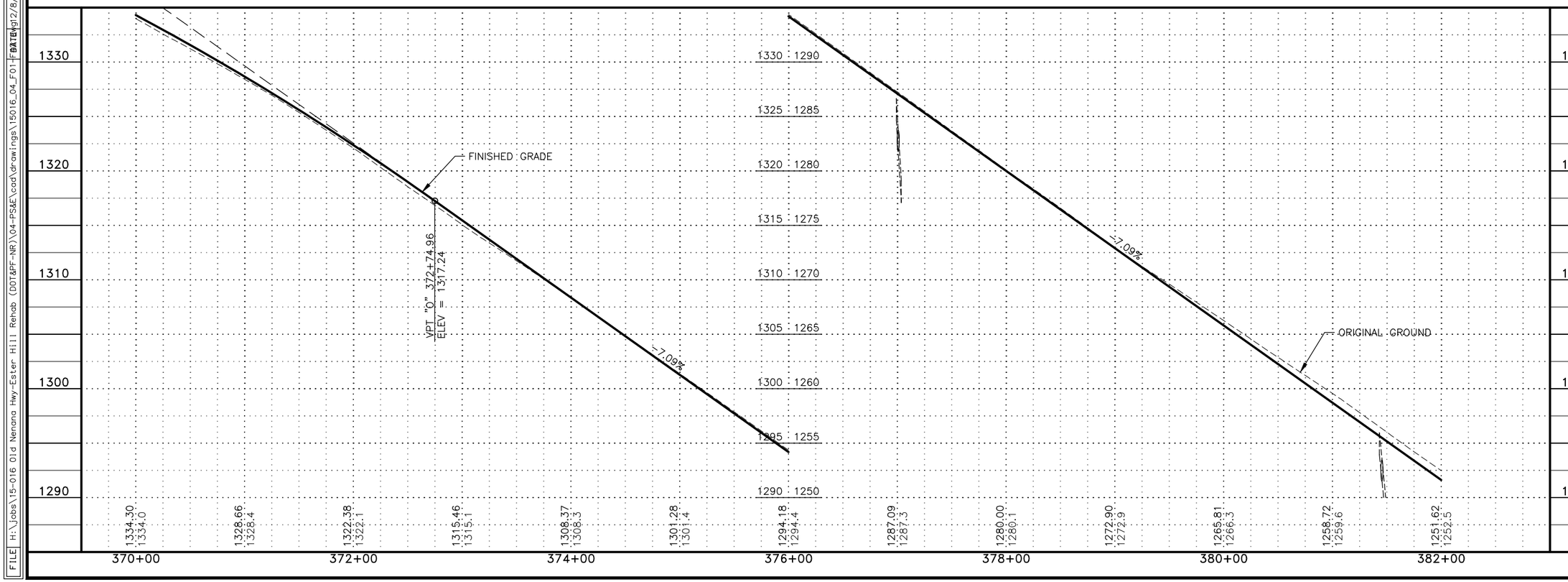
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
358+00 TO 370+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED

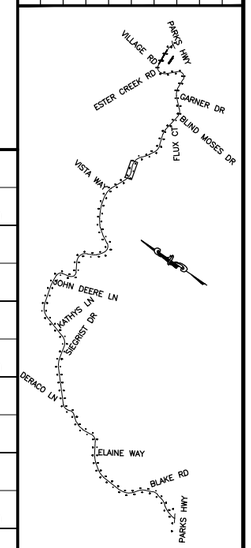
FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





SHEET NO.	TOTAL SHEETS
F31	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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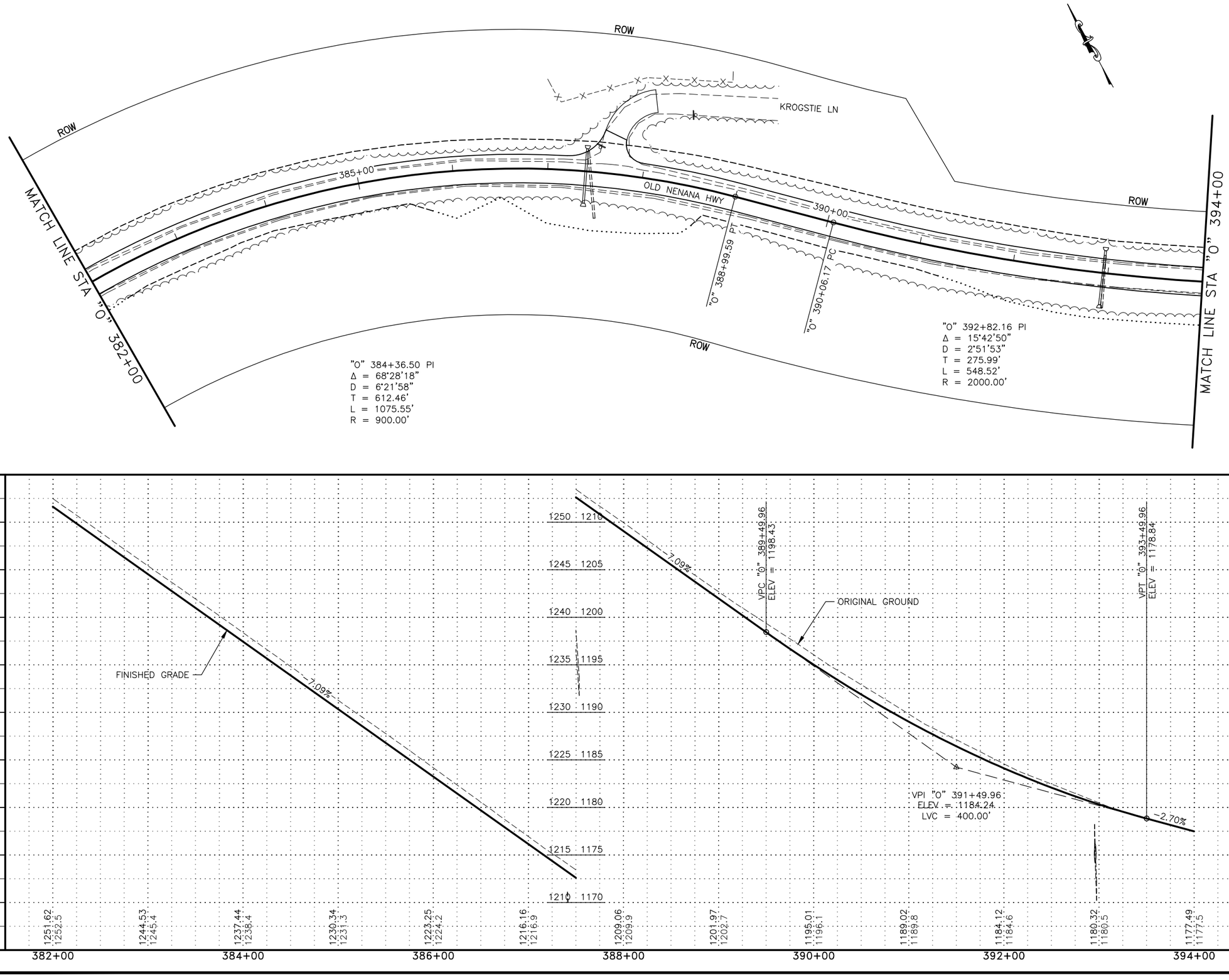
HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

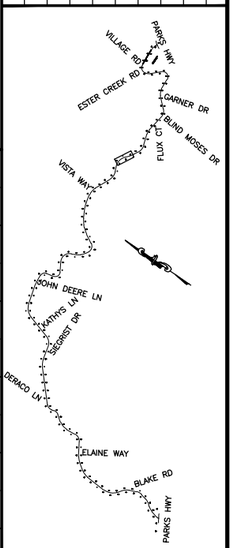
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
370+00 TO 382+00



SHEET NO.	TOTAL SHEETS
F32	F42
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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HATTENBURG DILLEY & LINNELL

STATE OF ALASKA
DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
382+00 TO 394+00

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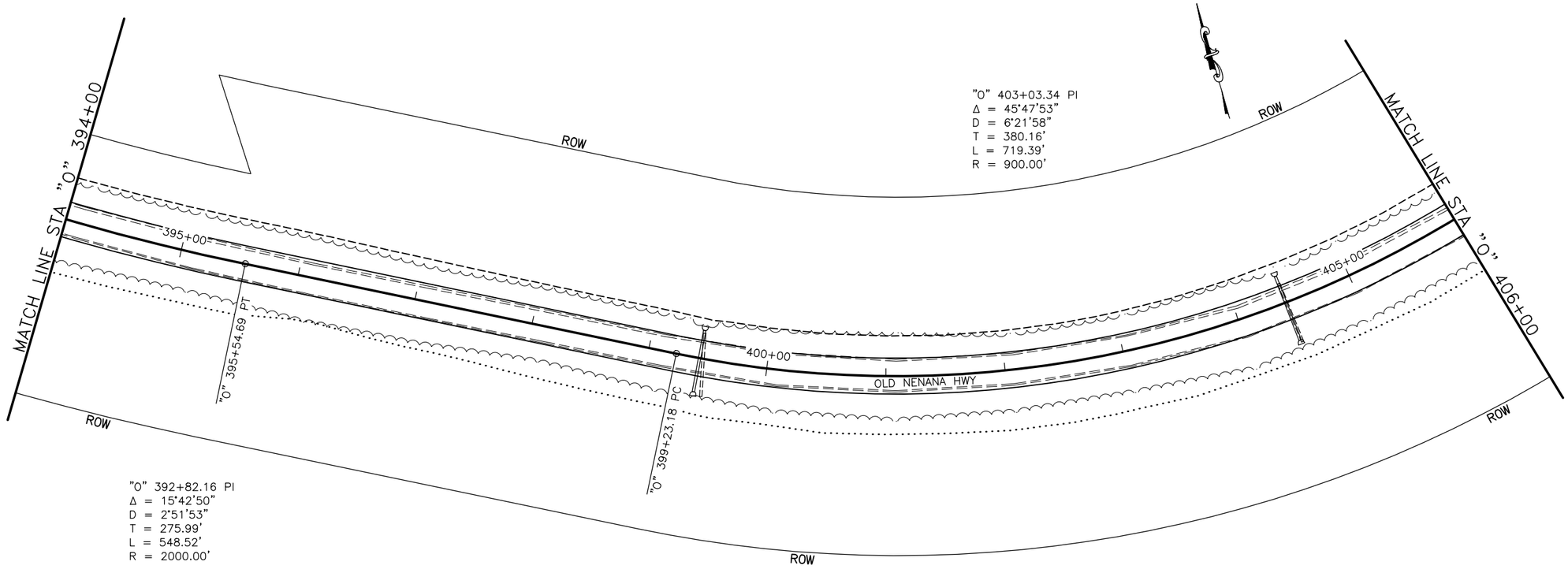

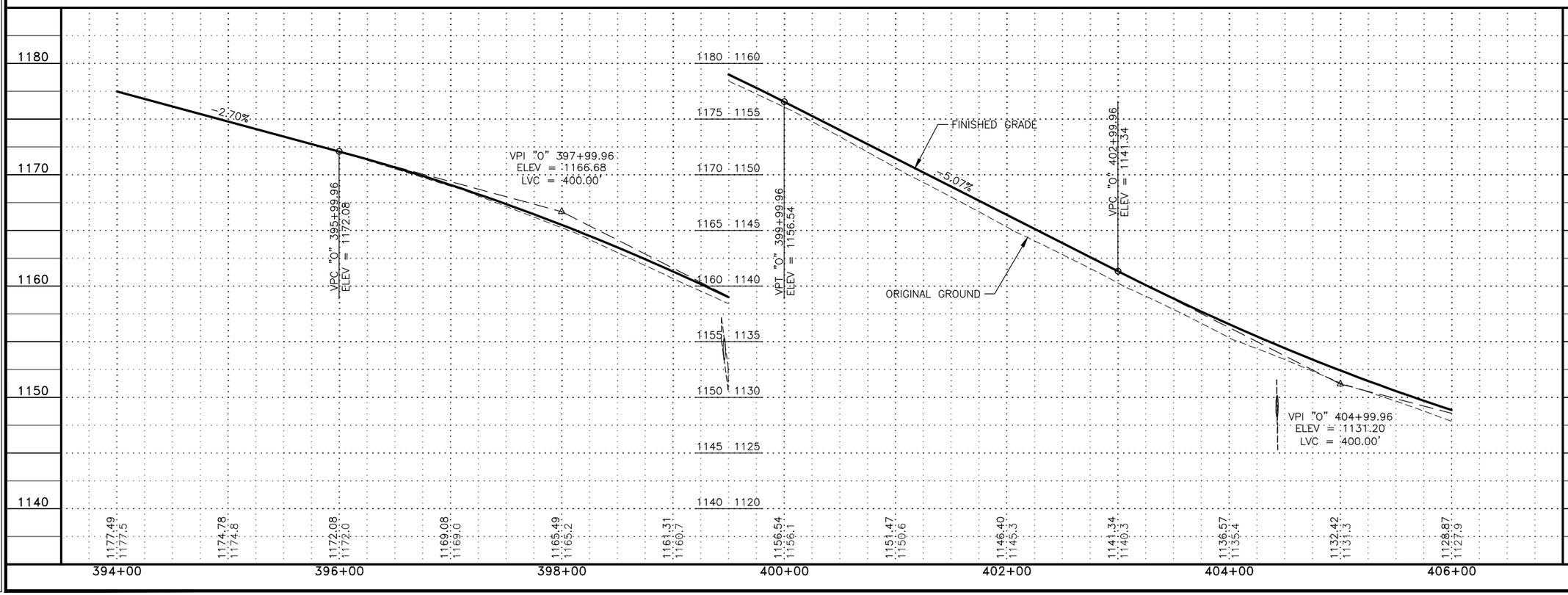

SHEET NO.	TOTAL SHEETS
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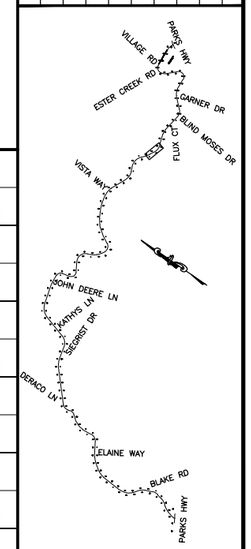
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
394+00 TO 406+00

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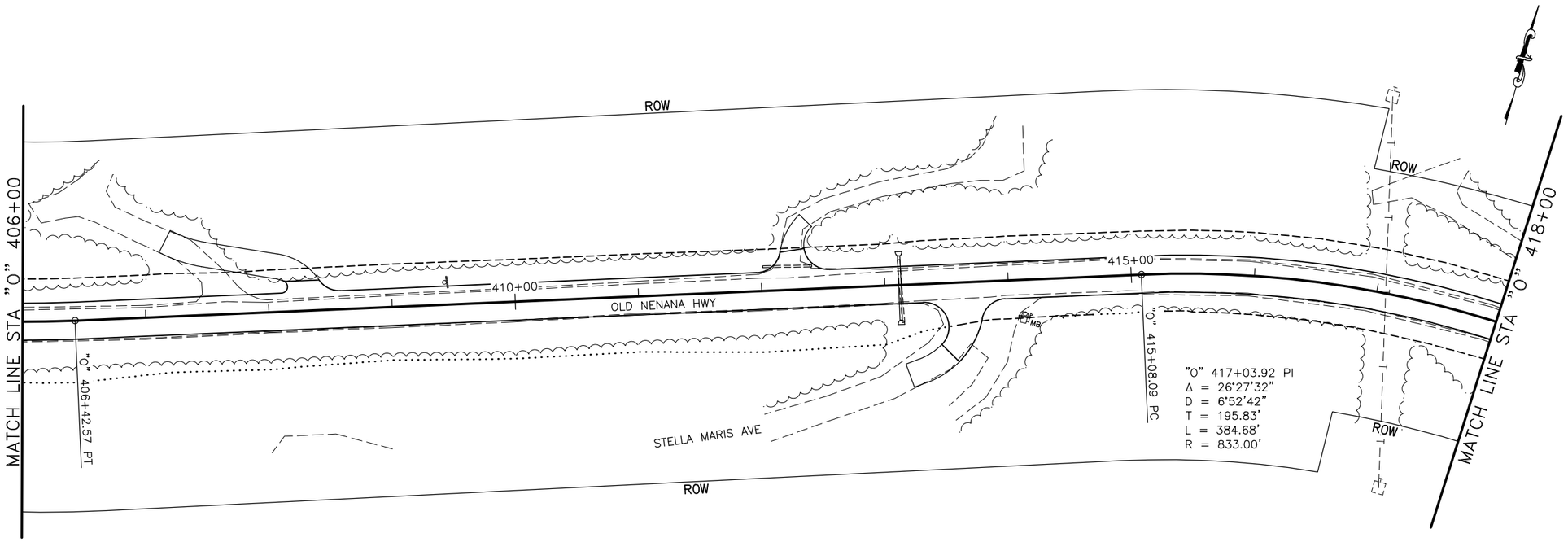

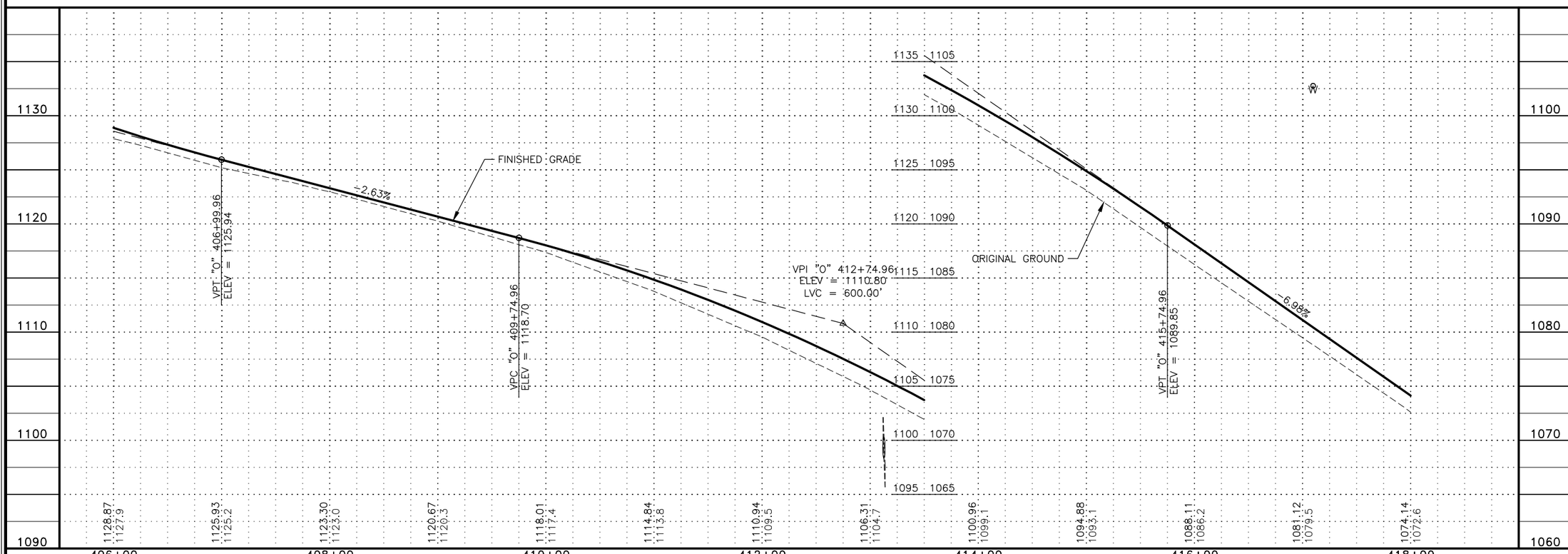

SHEET NO.	TOTAL SHEETS
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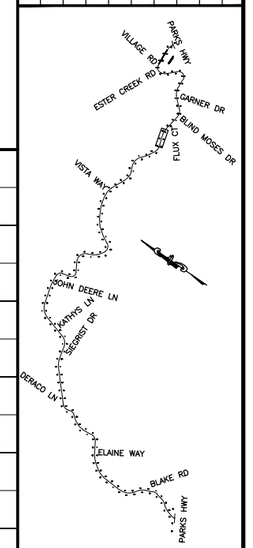
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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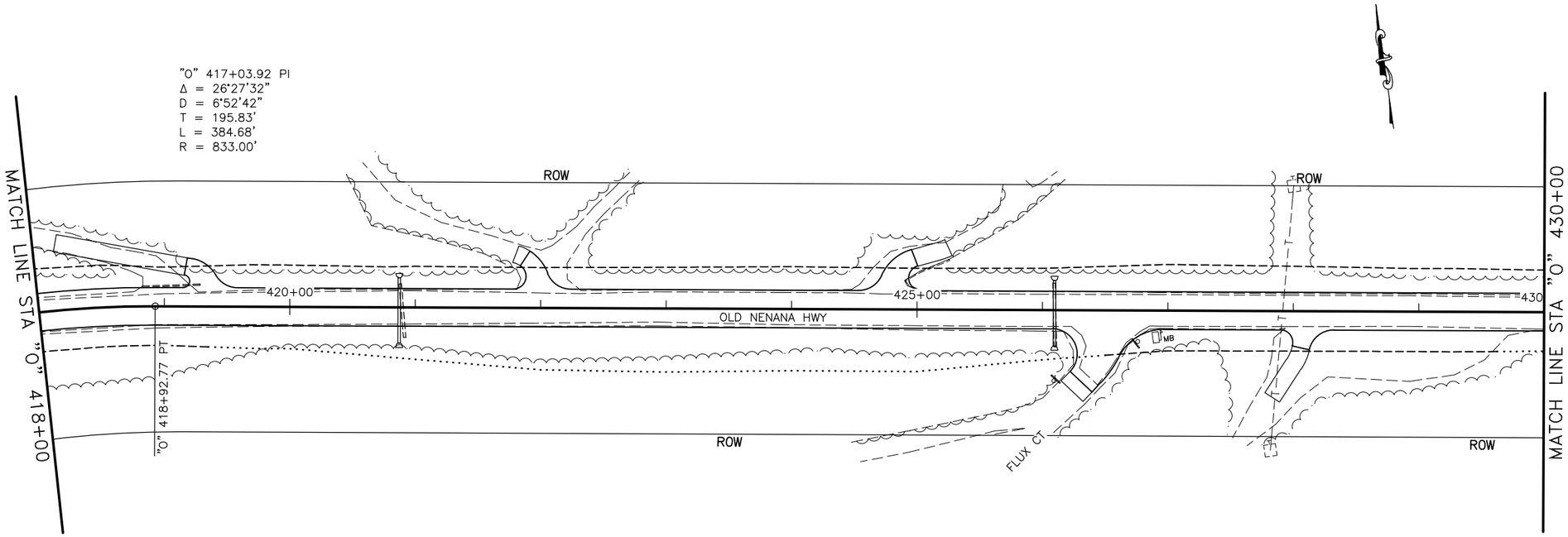
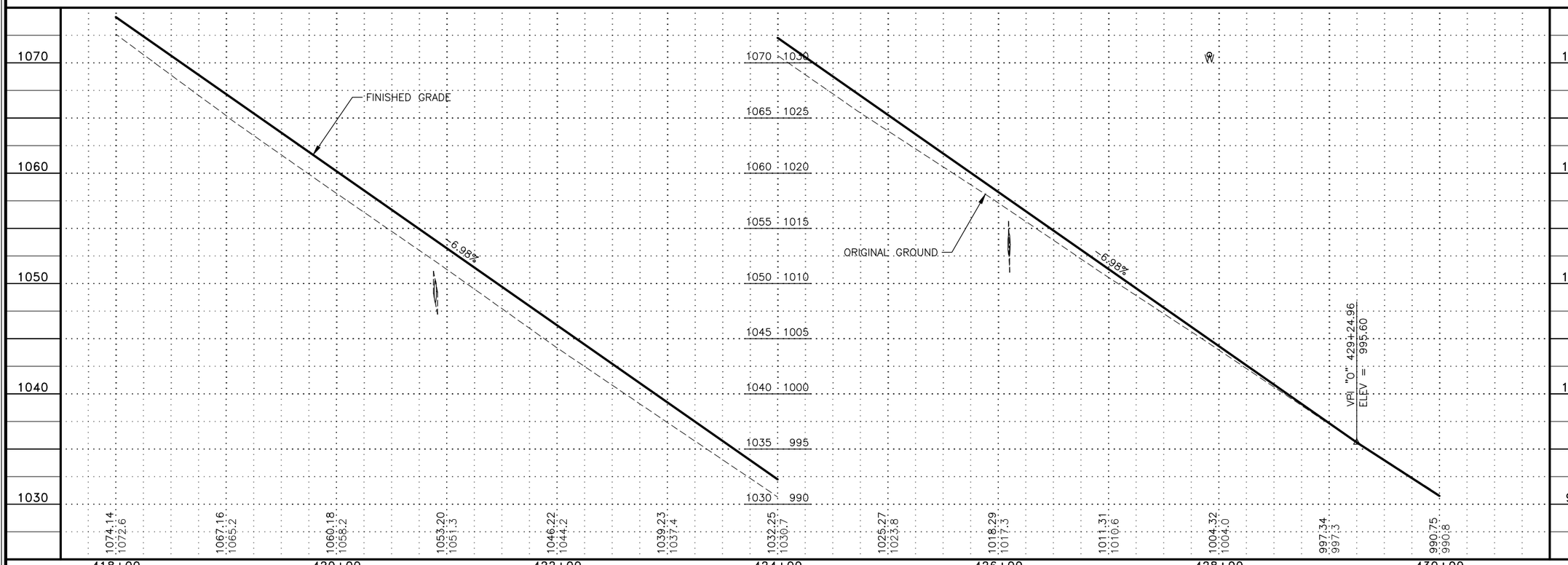
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
406+00 TO 418+00





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STATE	YEAR
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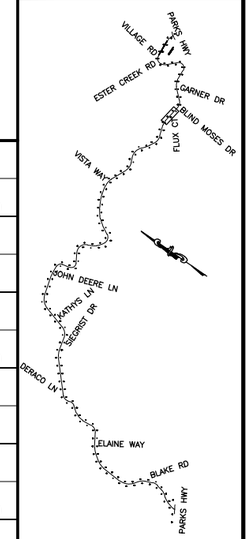
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
418+00 TO 430+00

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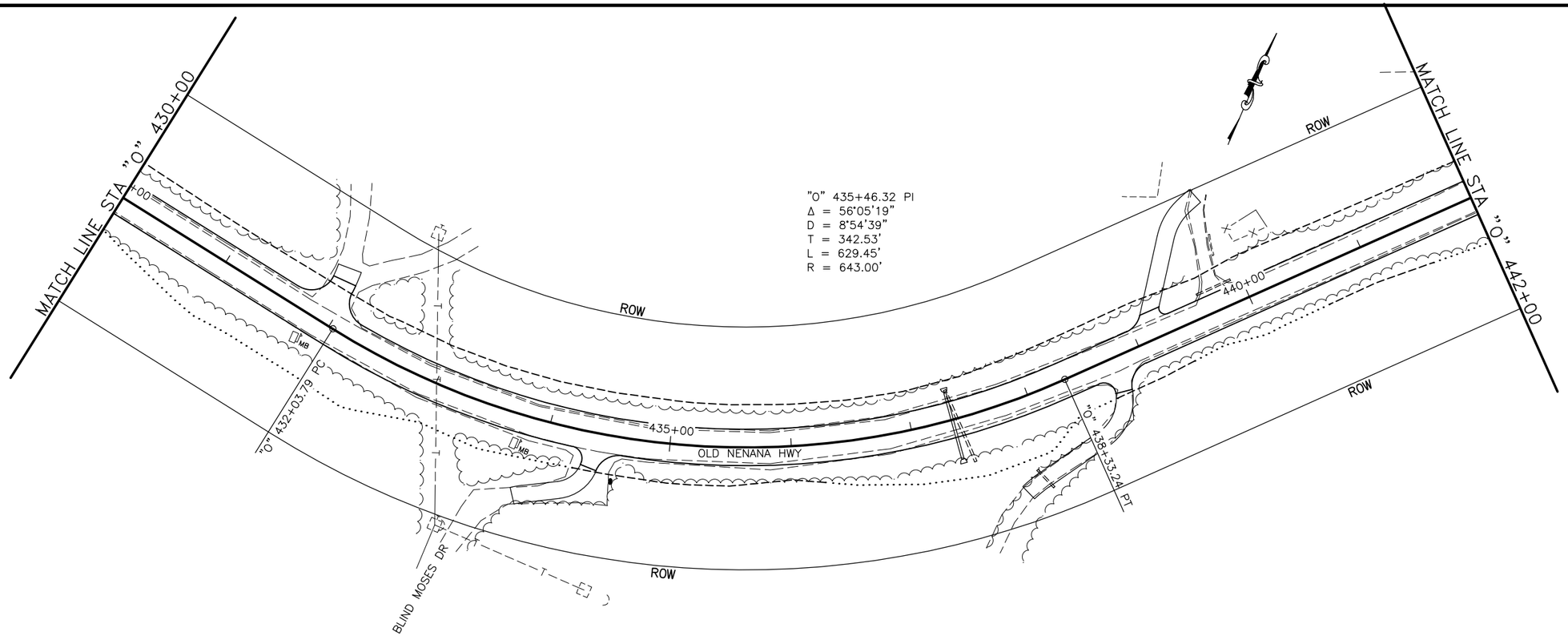


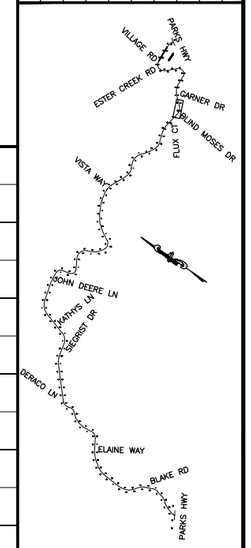
SHEET NO.	TOTAL SHEETS
F36	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
430+00 TO 442+00

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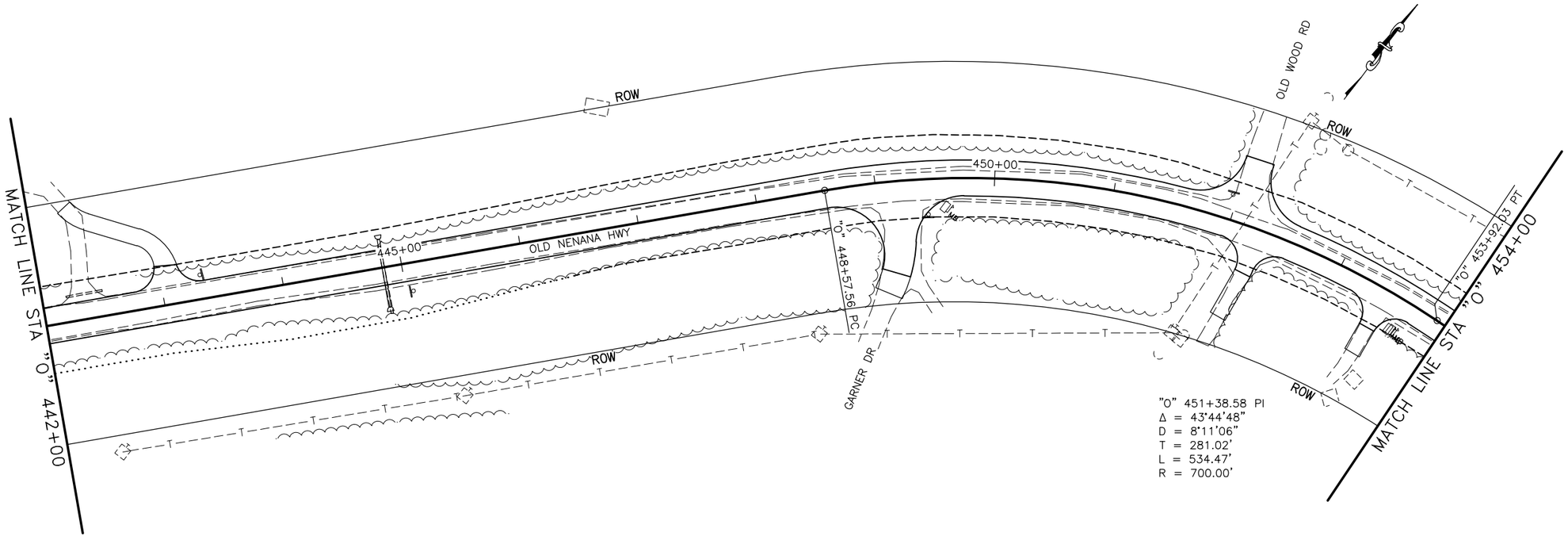

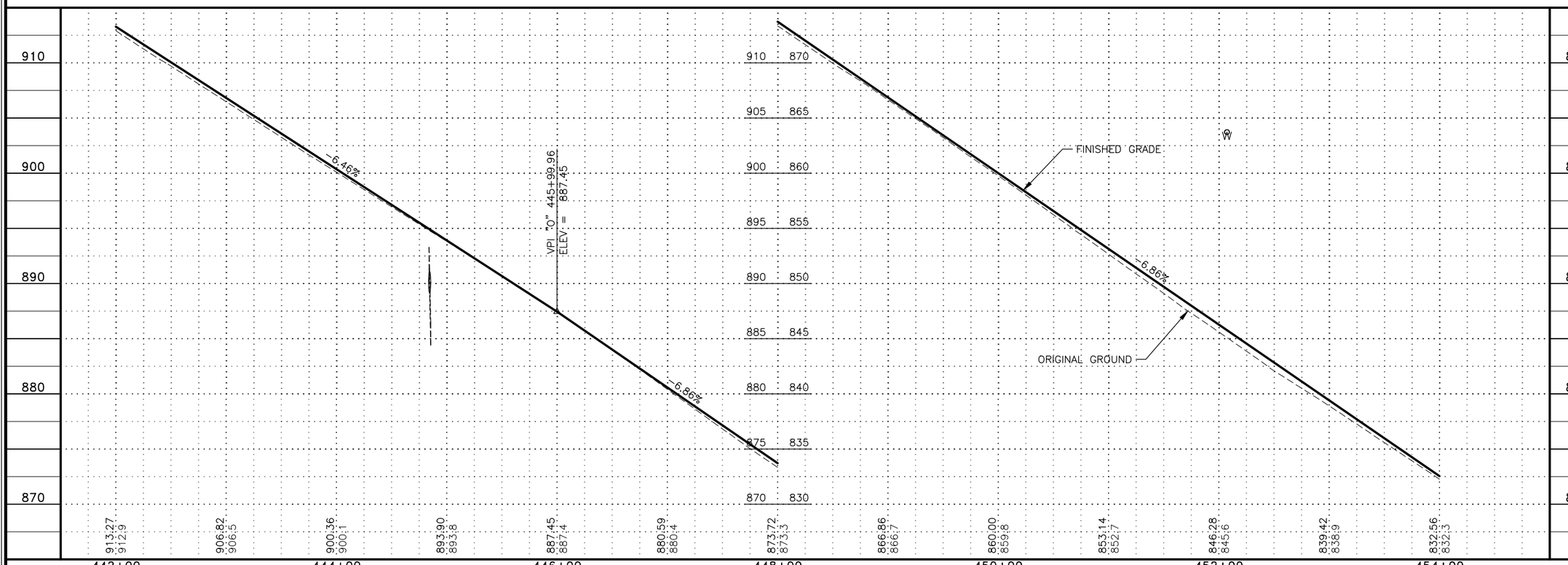

SHEET NO.	TOTAL SHEETS
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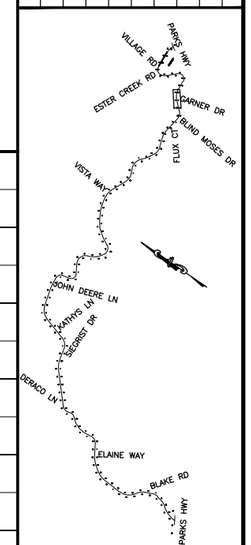
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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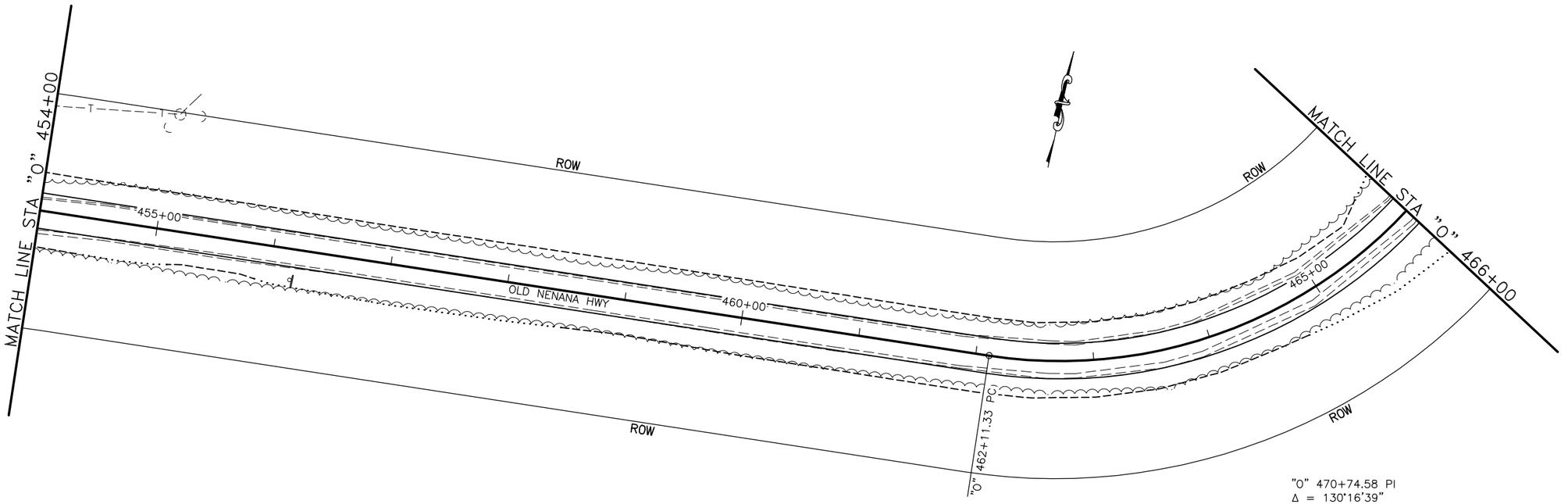
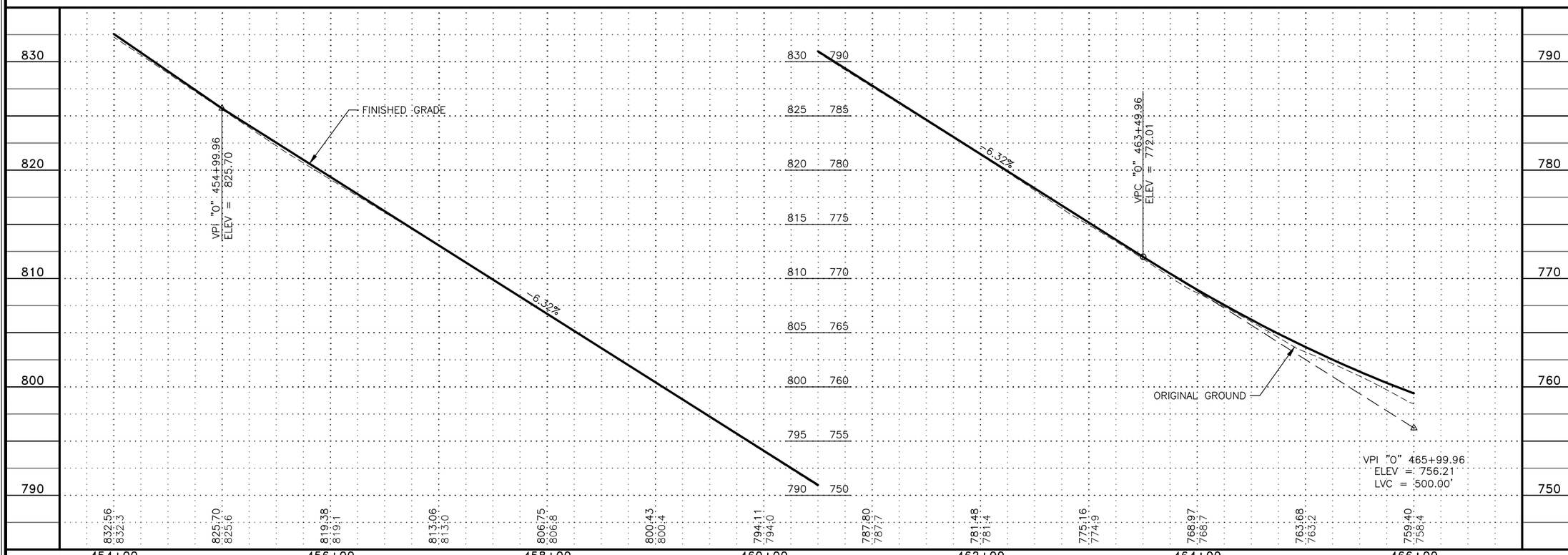
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
442+00 TO 454+00





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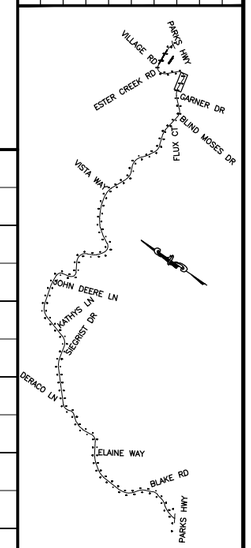
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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DEPARTMENT OF TRANSPORTATION
AND PUBLIC FACILITIES

OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
454+00 TO 466+00

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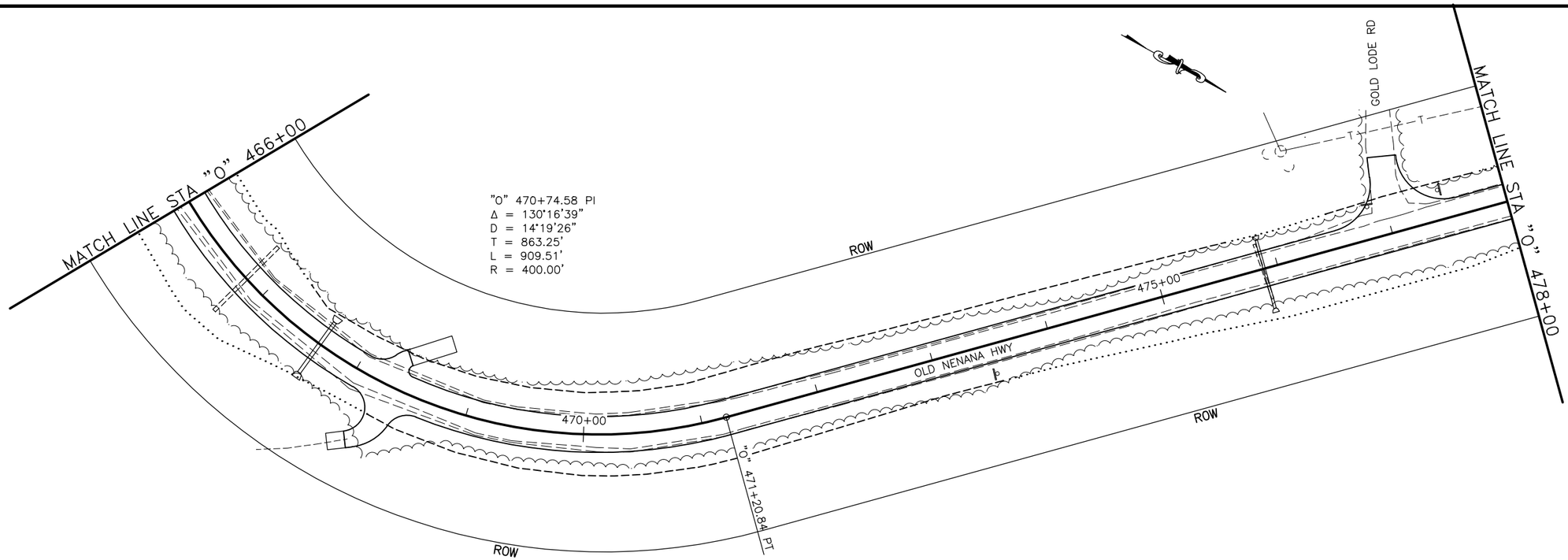

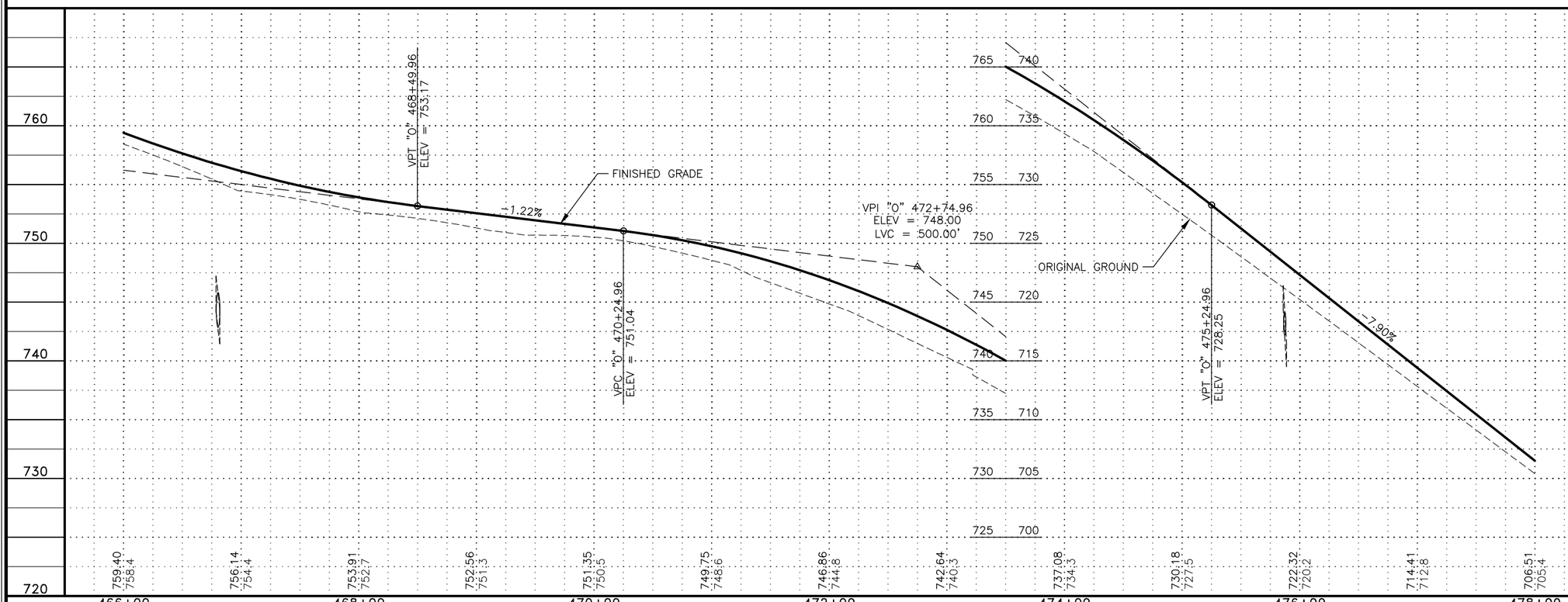

SHEET NO.	TOTAL SHEETS
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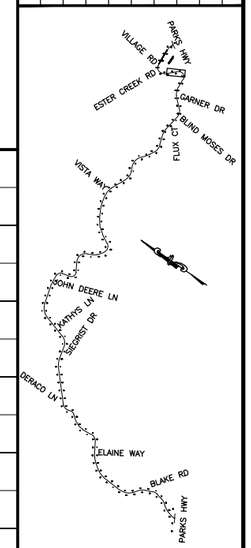
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

60455

STP-0002(257)

NO.	DATE	REVISION



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OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
466+00 TO 478+00

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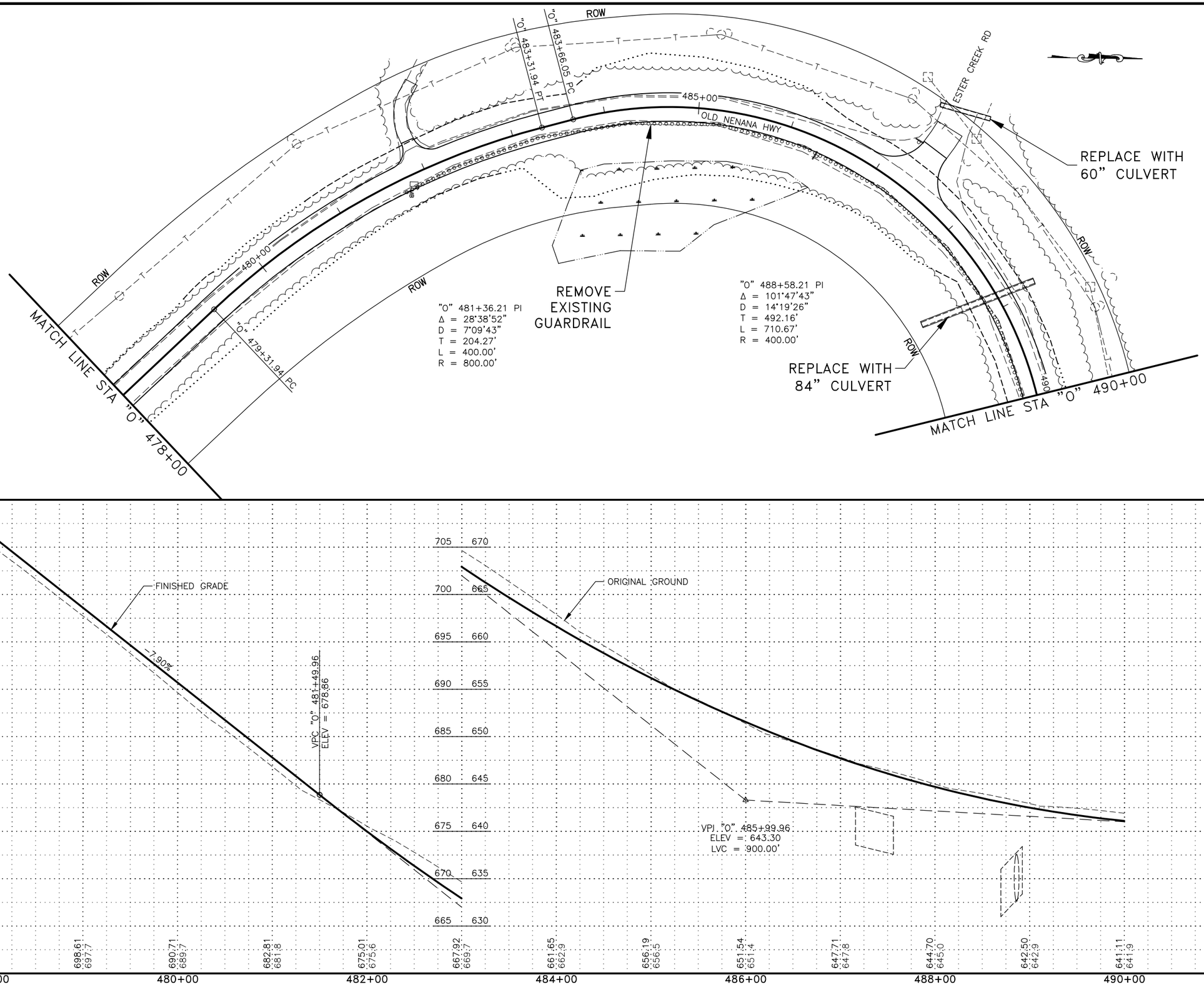

SHEET NO.	TOTAL SHEETS
F40	F42
STATE	YEAR
ALASKA	2017

PROJECT DESIGNATION

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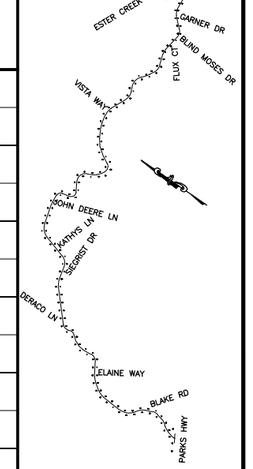
STP-0002(257)

NO.	DATE	REVISION



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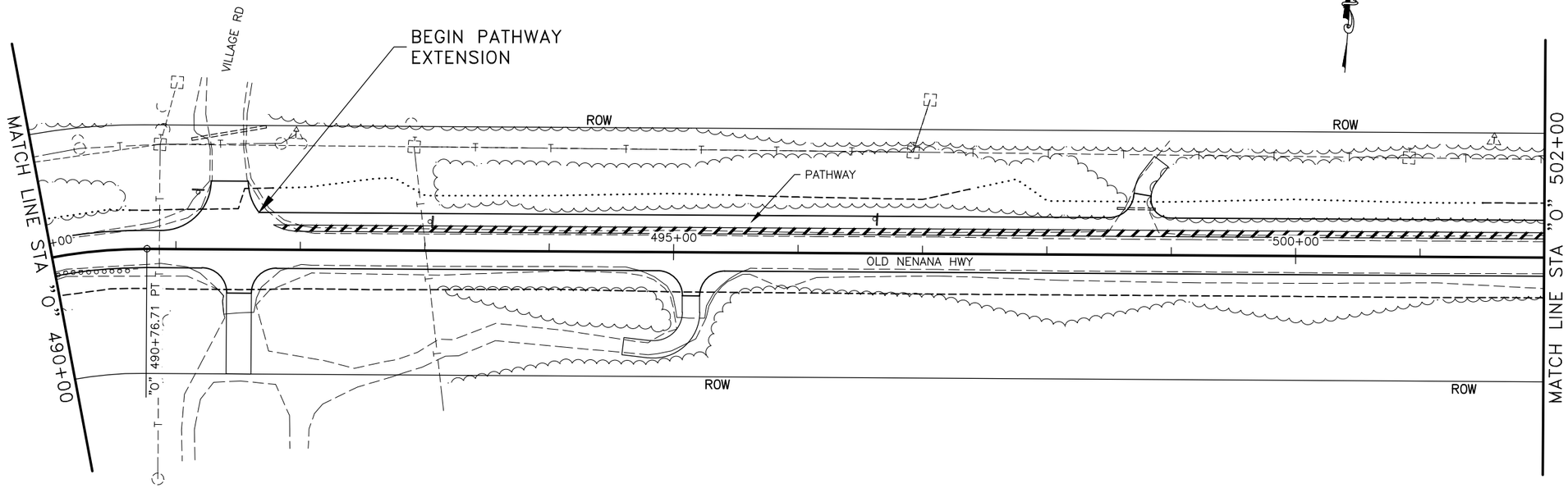
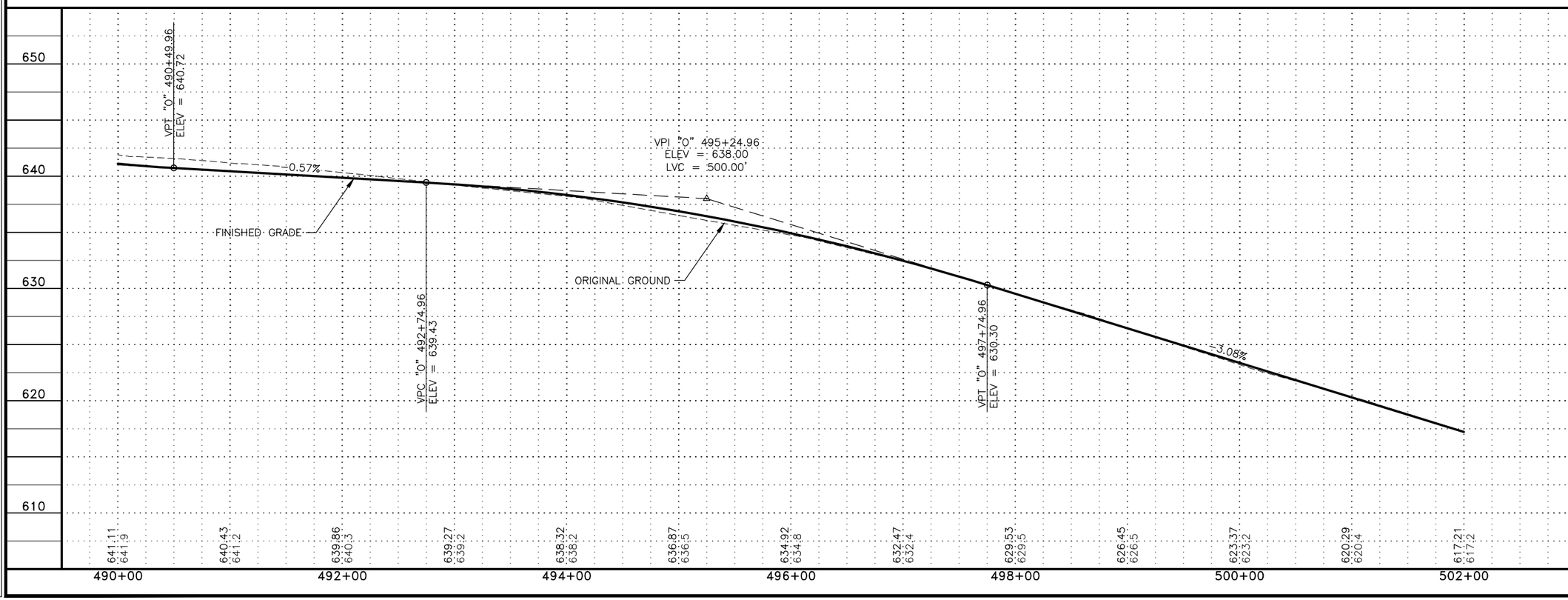
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
478+00 TO 490+00





SHEET NO.	TOTAL SHEETS
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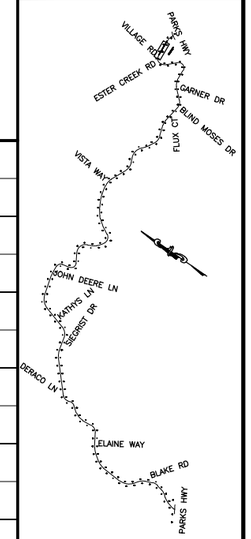
60455	
STP-0002(257)	

NO.	DATE	REVISION



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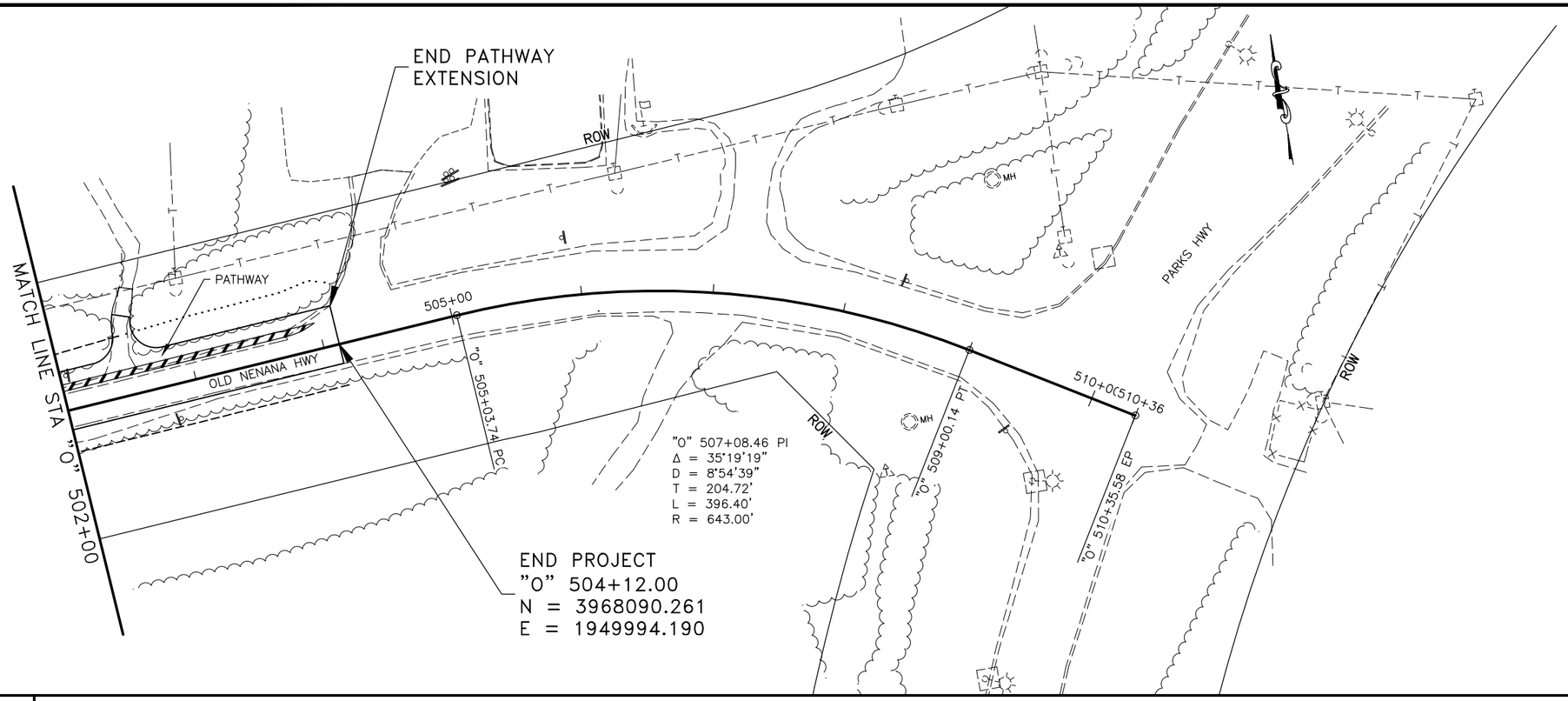
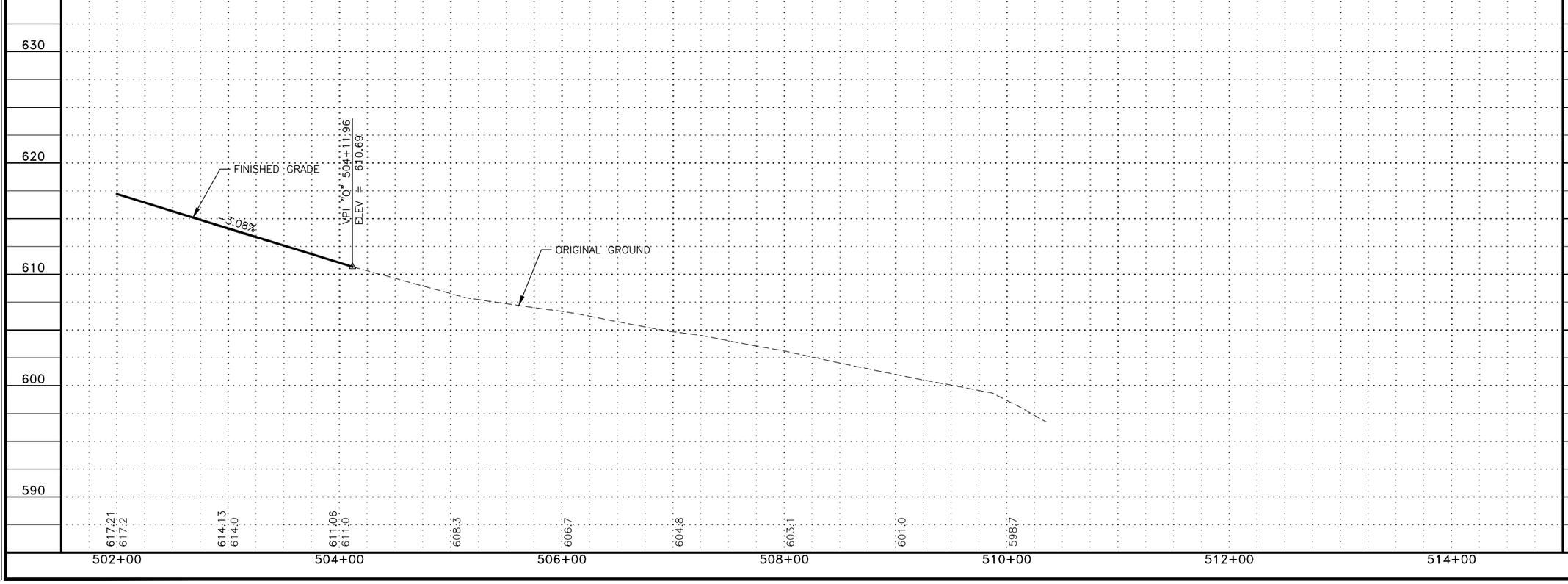
OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
490+00 TO 502+00

FILE H:\Jobs\15-016 Old Nenana Hwy-Ester Hill Rehab (DOT&PF-NR)\04-PS&E\cad\drawings\15016_04_F01-F42.dgn DATE 12/8/2015 17:13 LAYOUT F1-F42 DESIGNED DESIGNED CHECKED CHECKED DRAFTED DRAFTED





SHEET NO.	TOTAL SHEETS
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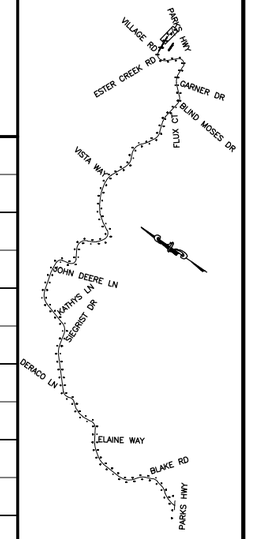
STATE	YEAR
ALASKA	2017
PROJECT DESIGNATION	
60455	
STP-0002(257)	

NO.	DATE	REVISION



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OLD NENANA/ESTER HILL REHABILITATION

OLD NENANA
PLAN & PROFILE
502+00 TO 510+36.1

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APPENDIX G

UTILITY CONFLICT REPORT

MEMORANDUM

DATE: August 31, 2015 [Revised 12/14/15]

TO: File

FROM: Mike Stewart.

RE: Old Nenana Highway/Ester Hill Rehabilitation, Preliminary Utilities Report

Existing utilities consist of overhead electrical and telephone along the corridor. The feed for both starts at the end of the project and feed to the beginning of the project. The facilities parallel the highway starting at approximate station 62+00 RT, in a separate corridor separated by a swath of trees. The electrical and telephone facilities cross the corridor at several locations, 15 total, below is a table of the existing facilities and the heights:

Crossing Station	Facility	Height (Existing)	Height (Proposed)
106+45	1Ø OH Electrical	27.97	27.94
169+50	1Ø OH Electrical		
	OH Telephone	18.79	18.50
185+50	1Ø OH Electrical		
	OH Telephone (2)	Elev. N/A	Elev. N/A
234+50	1Ø OH Electrical		
	OH Telephone	21.20	21.01
244+50	1Ø OH Electrical		
	OH Telephone	18.13	17.59
316.90	1Ø OH Electrical		
	OH Telephone	14.87	14.01
324+50	1Ø OH Electrical		
	OH Telephone	22.04	21.29
338+10	1Ø OH Electrical		
	OH Telephone	18.11	17.80
348+70	1Ø OH Electrical		
	OH Telephone	22.15	21.81
417+30	3Ø OH Electrical		
	OH Telephone	24.64	22.32
428+05	1Ø OH Electrical		
	OH Telephone	26.26	25.82
433+10	1Ø OH Electrical		
	OH Telephone	21.22	21.55
452+50	1Ø OH Electrical		
	OH Telephone	19.64	17.95
490+95	OH Telephone	19.36	19.61
493+10	1Ø OH Electrical	25.94	25.64

The existing telephone crossing at station 316+90 is a substandard crossing as it does not meet minimum permitting requirements per 17 ACC 15.201 of 18 feet. Four additional

crossings will be impacted by changes in the vertical profile and will require adjustment. If the vertical profile is revised as the design develops, other crossings may be impacted.