APPENDIX 5:

Screening Report

NINEPIPE CORRIDOR 93 FEASIBILITY STUDY

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Screening Report

Technical Memorandum

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Montana Department of Transportation

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Acronyms and Abbreviations

BCR	Benefit-Cost Ratio
BIL	Bipartisan Infrastructure Law
CSKT	Confederated Salish and Kootenai Tribes
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FIIP	Flathead Indian Irrigation Project
LOS	Level of Service
MDEQ	Montana Department of Environmental Quality
MDT	Montana Department of Transportation
MEGA	National Infrastructure Project Assistance Program
MFWP	Montana Fish, Wildlife and Parks
MOA	Memorandum of Agreement
MWAM	Montana Wetland Assessment Method
NHPP	National Highway Performance Program
NHS	National Highway System
NSFLTP	National Significant Federal Lands and Tribal Projects
NWR	National Wildlife Refuge
RAISE	Rebuilding American Infrastructure with Sustainability and Equity
RP	Reference Point
SEIS	Supplemental Environmental Impact Statement
SHPO	State Historic Preservation Office
SUP	Shared Use Path
TPO	Tribal Preservation Office
US 93	US Highway 93
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service
WMA	Wildlife Management Area
WPA	Waterfowl Production Area
WVC	Wildlife-Vehicle Collision

Screening Report

1.0. INTRODUCTION

The intent of the *US 93 Ninepipe Corridor Feasibility Study* is to analyze the feasibility of the preferred alternative previously identified in the 2008 Supplemental Environmental Impact Statement (SEIS)[1]. The purpose of the action proposed in the SEIS was to improve traffic operations and the connectivity and safety of the transportation system. The preferred alternative was determined to best meet the purpose and need of the proposed action while minimizing costs and impacts to the area's natural resources.

The purpose of this report is to document the process used to evaluate the SEIS preferred alternative and other modified reconstruction options to determine which options would be feasible to implement and to understand the tradeoffs between resource impacts, overall benefits, and project costs. The screening process was developed to identify a preferred corridor option comprising the most feasible, beneficial, and cost-effective improvements for the corridor.

1.1. Development of Reconstruction Options

During development of the SEIS, the project proponents and stakeholders agreed that protection of the sensitive natural resources within the Ninepipe segment was paramount. It was determined that increasing the capacity of the Ninepipe corridor would adversely impact the natural resources in the corridor, whereas the preferred alternative, a two-lane configuration with widened shoulders, would not result in significant impacts to natural resources, with implementation of proposed mitigation. In addition, the project proponents endorsed adding a separated bicycle and pedestrian path to the project. The *Memorandum of Agreement (MOA) US 93 Evaro to Polson,*[2] referred to as the US 93 Corridor MOA, states that MDT, CSKT, and FHWA collectively agreed to prepare an SEIS to evaluate alternatives for the Ninepipe/Ronan segment and continue to work cooperatively to achieve physical construction of the improvements identified in the 1996 *Final Environmental Impact Statement (FEIS) and Section 4(f) Evaluation*[3] and subsequent SEIS.

Due to constructability challenges encountered in other segments of the US 93 Evaro to Polson corridor and the length of time elapsed since completion of the SEIS, MDT initiated this feasibility study to evaluate if the SEIS preferred alternative identified is viable in terms of impacts, costs, and constructability considerations. The first phase of this evaluation resulted in the *Summary of Relevant Conditions*[4] memorandum which included a comprehensive review of background documentation, field conditions, and site constraints. This information helped MDT determine what conditions had changed since the SEIS was completed and identify barriers and challenges to implementing the preferred alternative. This evaluation was also an opportunity to investigate site-specific field conditions at a much more granular level than the evaluations performed in 2008, which looked at a larger segment of US 93.

By completing an in-depth analysis of site-specific conditions, it was determined that no insurmountable barriers to implementation are anticipated in the corridor and that the SEIS preferred alternative is generally feasible to implement with adequate funding. Through this evaluation, it was discovered that the availability of wildlife tracking data is much more abundant, and research on wildlife accommodations is much more advanced than what was available when the SEIS was completed. Some changes to hydraulic conditions, wetland location and function, and geotechnical conditions were also discovered. These changed conditions prompted a desire to investigate the feasibility of modified reconstruction options which may reduce impacts and better serve the needs of the corridor in a manner that is potentially more cost effective and easier to implement.

Given the agreement in the US 93 Corridor MOA to complete construction of identified improvements and the finding that the SEIS preferred alternative is likely feasible to implement, it was determined that choosing not to reconstruct the corridor would contradict the MOA. For these reasons, the SEIS preferred alternative

was established as the baseline configuration to compare to all modified reconstruction options in terms of feasibility and impacts. Similarly, it was determined that the roadway configuration (two 12-foot lanes with widened 8-foot shoulders) and the provision of a shared use path (SUP) would be incorporated in any modified reconstruction options.

1.2. Evaluation Process

Development and evaluation of modified reconstruction options involved a multi-step process. The first step involved an analysis of typical section and SUP options to establish initial assumptions for reconstruction of the corridor. The typical section options maintained the roadway configuration identified in the SEIS but incorporated changes to the inslopes and fill slopes to reduce impacts to natural resources. The SUP options maintained the provision of a SUP throughout the corridor, as dictated by the SEIS, but considered alternate alignments and crossing locations. A qualitative evaluation was conducted to assess two typical sections and three SUP options. The evaluation considered the relative benefits and disadvantages of each option in five categories:

- Transportation: Operations and safety for vehicles and non-motorists.
- Ecological Environment: Impacts to wetlands and surface waters.
- Fish and Wildlife: Accommodations and habitat impacts for fish and wildlife.
- Human Environment: Impacts to adjacent properties, cultural resources, and recreational areas.
- Constructability: Ease of construction and geotechnical feasibility.

Based on the comparative performance of each option, preferred configurations were selected for further evaluation. The typical section and SUP evaluations are provided in **Sections 2.0** and **3.0**, respectively.

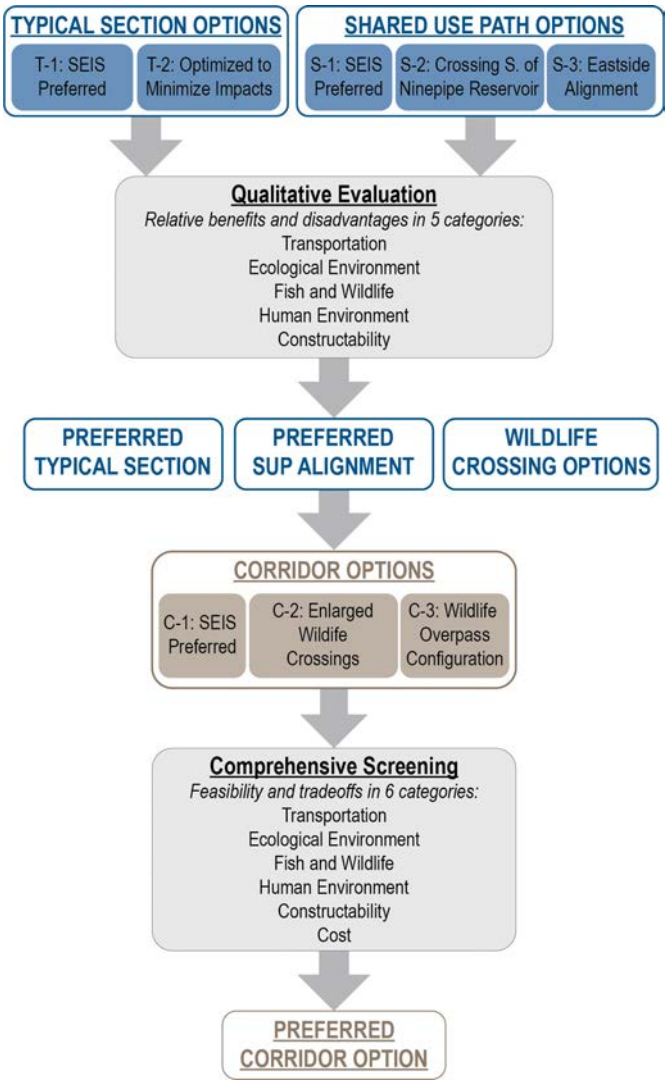

Figure 1: Evaluation Process

The next step included development of corridor-wide options to comprehensively address the combination of roadway typical section, SUP alignment, and wildlife crossings. In addition to the baseline option, two modified corridor options were developed for consideration based on newly available information. All three options were then evaluated through a comprehensive screening process to determine overall feasibility and understand the tradeoffs and benefits between each option.

The corridor options and corridor screening process are described in **Section 4.0**. The screening categories for this process included the five categories listed above as well as a cost category. A more detailed description of how the screening categories were applied and analyzed is contained in **Section 4.2**.

2.0. TYPICAL SECTION OPTIONS

Two typical section options were identified for the corridor. The options included travel lane configurations, shoulder widths, slopes, and rumble strips. Each option consisted of an undivided two-lane roadway with one travel lane in each direction. Option T-1 consisted of the preferred typical section presented in the SEIS. Option T-2 was developed to minimize impacts to adjacent resources and consisted of steeper fill slopes throughout the corridor. Both options included channelization and left-turn lanes at the Olson Road/Gunlock Road, Eagle Pass Trail, MT 212/Kicking Horse Road, Mollman Pass Trail, Beaverhead Lane, and Brooke Lane intersections, as described in the SEIS. **Figure 2** shows an example typical section illustrating cross sectional elements.

- T-1: SEIS Preferred: Two 12-foot lanes with widened 8-foot shoulders, standard inslopes (6:1) and fill slopes (variable, MDT standard) with clear zone requirements met within the shoulder and inslope widths, standard ditch slopes (20:1), and centerline/shoulder rumble strips.
- T-2: Optimized to Minimize Impacts: Two 12-foot lanes with widened 8-foot shoulders, standard inslopes (6:1) with clear zone requirements met within the shoulder and inslope widths, steepened 3:1 fill slopes generally throughout the corridor, 2:1 inslopes and guardrail and/or retaining walls in select locations to minimize resource impacts, standard ditch slopes (20:1), and centerline/shoulder rumble strips.

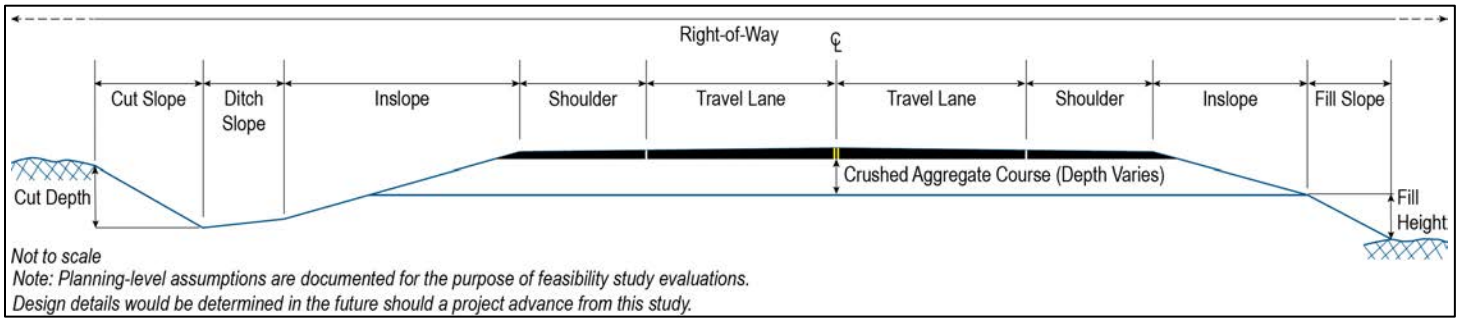

Figure 2: Example Typical Section

2.1. Typical Section Evaluation and Recommendation

A qualitative evaluation was conducted to assess the typical section options according to the five screening categories. Evaluation results are discussed below.

- Transportation: Both typical sections would provide two 12-foot lanes and all would operate at Level of Service (LOS) D to E under projected conditions. Both options would also include widened 8-foot shoulders and shoulder/centerline rumble strips, which would provide additional recovery area and potentially reduce head-on, run-off-the-road, and rollover crash types compared to the existing roadway. In combination with the widened shoulder, standard 6:1 surfacing inslopes included with both options would provide the required clear zone width. There is likely to be no measurable difference to transportation conditions between the two options.
- Ecological Environment: Under Options T-1 and T-2, widened shoulders and standard surfacing inslopes would impact wetlands adjacent to the roadway, with fewer impacts resulting from Option T-2 due to steepened fill slopes. Both construction options would result in increased sediment delivery and turbidity in streams from construction activities and additional impervious roadway area, increasing the surface area for pollutants to be deposited and potentially impacting water quality. Overall, option T-2 would have slightly lower impacts to the ecological environment due to the narrower typical section.
- Fish and Wildlife: Under Options T-1 and T-2, wider typical sections would create a slightly longer crossing distance for wildlife and increased paved area compared to existing conditions, thereby reducing wildlife habitat. However fewer adverse impacts would result from Option T-2 due to steepened fill slopes.

- Human Environment: Option T-1 would impact a greater area due to the widened typical section and standard fill slopes. T-2 would have a narrower footprint due to steepened fill slopes.
- Constructability: Options T-1 and T-2 would both be feasible to construct, although they may require some retaining walls or slope stabilization to accommodate steeper slopes and reduce erosion.

Typical Section T-1 was retained for evaluation of the SEIS preferred alternative as part of the corridor evaluation discussed in **Section 4.0**. Typical Section T-2 was selected as a baseline assumption for all other corridor options because it would incorporate the safety benefits of widened shoulders while also minimizing impacts to the ecological and human environment including adjacent wetlands, habitat, and right-of-way acquisition.

3.0. SHARED USE PATH OPTIONS

Three SUP options were evaluated for the Ninepipe segment. Option S-1 represents the SEIS preferred alternative where the path would be on an independent alignment within the highway right-of-way. The path was originally proposed to be located on the west side of US 93 from south of the Ninepipe Reservoir to approximately Kettle Pond 2 where a crossing was proposed; on the east side until Ronan; and finally on the west side to the end of the Ninepipe/Ronan project corridor, as defined in the SEIS. The highway crossings in S-1 were proposed to be achieved with undercrossing structures at locations where topography and highway vertical alignment provide sufficient clearances. Option S-2 would shift the crossing within the Ninepipe segment to just south of Ninepipe Reservoir where the grade is favorable for an underpass. This shift would allow the east side path alignment to follow the old roadbed right-of-way to minimize wetland and right-of-way impacts around the kettle ponds and Mission Mountains Viewpoint. A pedestrian crossing at Eagle Pass Trail could be considered to enable access to the Ninepipes Picnic Pullout and Interpretive Nature Trail west of US 93. Option S-3 proposes construction of the path entirely on the east side of US 93 to avoid impacts within the core pothole area and reduce the need for an underpass structure. Option S-3 would only be appropriate if the SUP alignment in the MDT US 93-Post Creek project were to be modified. Images of each of the SUP configurations are provided in **Figure 3**.

- S-1: SEIS Preferred: Westside SUP alignment south of Kettle Pond 2, pedestrian underpass at Kettle Pond 2, and SUP continuing on the east side of US 93 north of Kettle Pond 2.
- S-2: Crossing South of Ninepipe Reservoir: Westside SUP alignment south of Ninepipe Reservoir, pedestrian underpass at Ninepipe Reservoir, and SUP continuing on the east side of US 93 north of Ninepipe Reservoir, with consideration for pedestrian crossing at Eagle Pass Trail
- S-3: Eastside Alignment: Eastside SUP alignment throughout corridor with no underpass (assuming eastside alignment incorporated at the north end of the MDT US 93-Post Creek project).

3.1. Shared Use Path Evaluation and Recommendation

A qualitative evaluation was conducted to assess the three SUP options according to the five screening categories. Evaluation results are discussed below.

- Transportation: Options S-1, S-2, and S-3 would all provide a new SUP adjacent to the highway. Options S-2 and S-3 would offer increased separation from the highway at the kettle ponds and the Mission Mountains Viewpoint compared to Option S-1. Grade-separated highway crossings would be incorporated in Options S-1 and S-2. Overall, Options S-2 and S-3 would offer the greatest pedestrian and bicyclist comfort due to increased separation from the highway.
- Ecological Environment: Construction of Options S-1, S-2, and S-3 would impact wetlands adjacent to the roadway, with a negligible difference in impacts between options.
- Fish and Wildlife: Under Options S-1, S-2, and S-3, the proximity of the SUP and non-motorists to wetland and habitat areas could adversely impact nesting birds and other wildlife. Routing the SUP around the kettle ponds in Options S-2 and S-3 may increase human-wildlife conflicts and may introduce a new barrier if fencing is extended around the path. Option S-1 would minimize adverse effects to wildlife.

- Human Environment: Construction of Options S-1, S-2, and S-3 may require some right-of-way acquisition, however portions of the S-2 and S-3 alignments around the kettle ponds and Mission Mountains Viewpoint would generally fall within existing right-of-way. Potential effects to the historic stagecoach route resulting from Options S-2 and S-3 would require additional evaluation in future environmental documentation.
- Constructability: Options S-1, S-2, and S-3 would all be feasible to construct, although the geotechnical feasibility of underpasses and associated groundwater levels would need to be evaluated during project development. Coordination would be needed with the MDT US 93-Post Creek project which currently has incorporated a westside SUP alignment extending approximately to Gunlock Road.

SUP Option S-1 was retained for evaluation of the SEIS preferred alternative. SUP Option S-2 was selected as a baseline assumption for all other corridor options because it would provide the greatest pedestrian and bicycle comfort while minimizing impacts and offering a logical connection to the SUP alignment currently defined for the MDT US 93-Post Creek project. SUP Option S-3 was eliminated based on its failure to connect to the MDT US 93-Post Creek project.

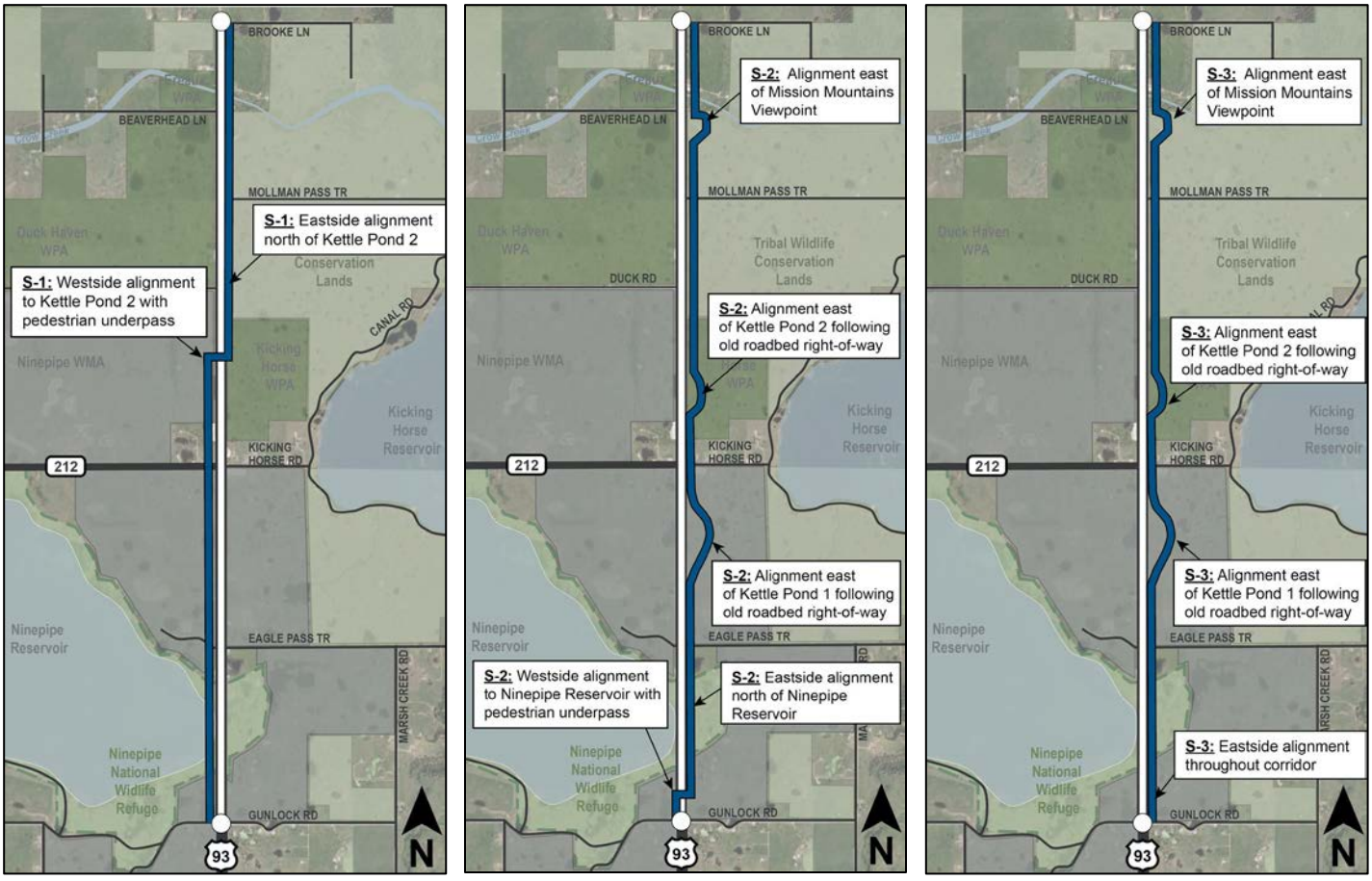

Figure 3: SUP Configurations (S-1, S-2, S-3)

4.0. CORRIDOR OPTIONS AND SCREENING

Three corridor-wide options were evaluated to comprehensively address the combination of roadway typical section, SUP alignment, and wildlife crossings. Planning-level alignments and roadway profiles were developed for each of the proposed configurations to assist with preparation of preliminary cost estimates and identification and quantification of benefits and impacts. Typical sections and plan/profile sheets are provided in **Appendices A** and **B**. General wildlife crossing locations are illustrated in **Figure 4**.

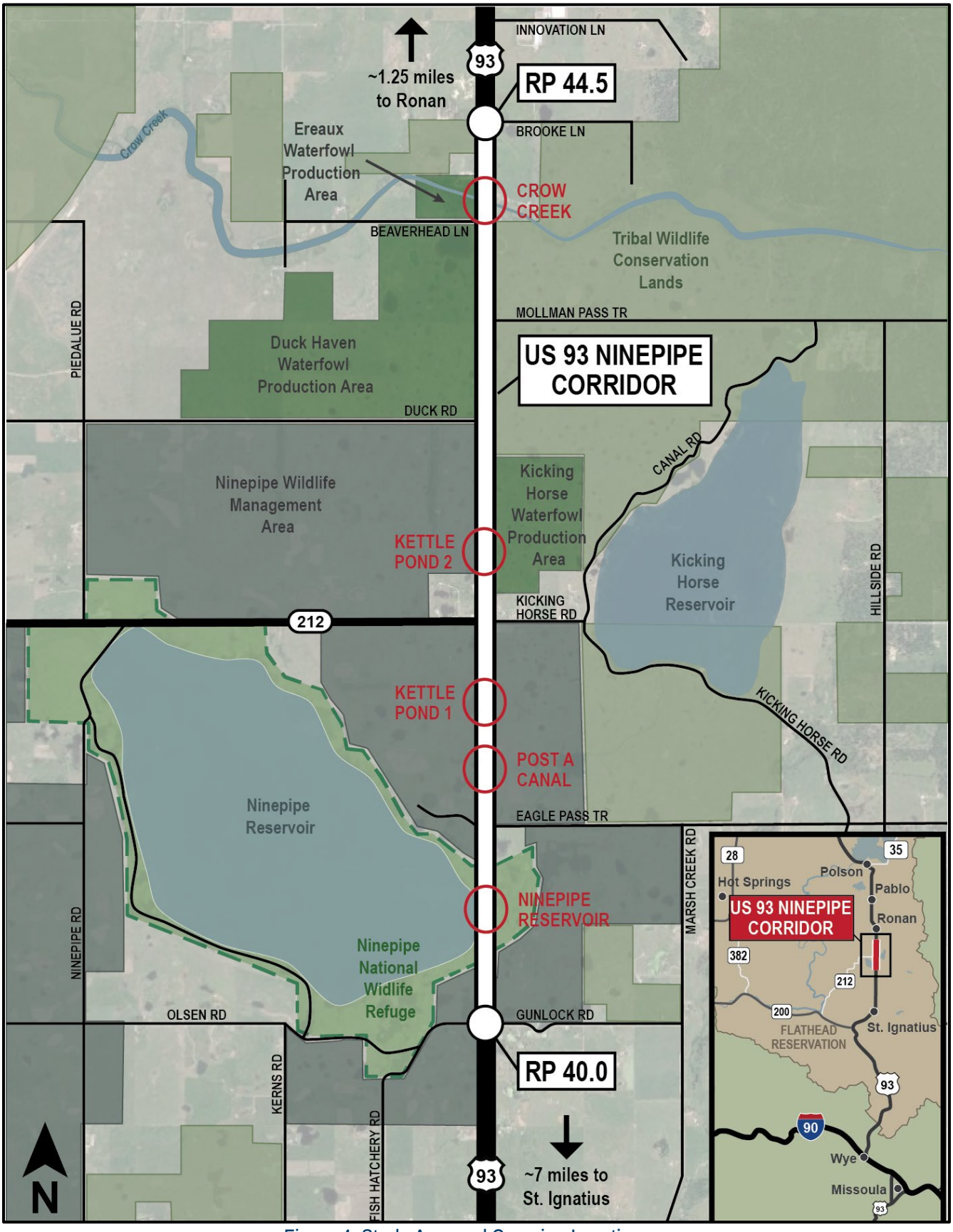

Figure 4: Study Area and Crossing Locations

4.1. Corridor Options

Option C-1 includes the typical section (T-1), SUP (S-1), and structures recommended in the SEIS preferred alternative. Options C-2 and C-3 were developed for this feasibility study to improve transportation system performance and improve wildlife accommodations. Both options include typical section and SUP options identified previously (T-2 and S-2). Option C-2 generally includes a single, longer bridge structure spanning the entire water body at each crossing location, compared to the SEIS preferred alternative that would use multiple structures to convey stream channels. To encourage greater use by wildlife, the longer structures also assumed 15 feet of vertical clearance. Option C-3 assumed that if a wildlife overpass were to be constructed in the corridor, smaller structures may be acceptable at other nearby crossing locations. In addition to the provision of an overpass, Option C-3 generally provides the minimum bridge length needed to satisfy hydraulic and wildlife crossing requirements at each location. The minimum bridge dimensions were identified to minimize impacts at each location while still providing adequate hydraulic conveyance and wildlife passage. At some locations, deviations from the minimum hydraulic conveyance configurations were pursued due to specific wildlife crossing needs. Additional information about structure evaluation is provided in the *Structures and Hydraulic Feasibility Report.*[5] Key features associated with each of the three corridor options are listed below and illustrated in **Figure 5**.

- **C-1: SEIS Preferred**:
  - Typical Section: Standard 6:1 inslopes with standard fill slopes
  - Shared Use Path: SUP with crossing north of Kettle Pond 2
  - Ninepipe Reservoir: Single 660-foot bridge with 10 to 12 feet of vertical clearance, two 12x22-foot culverts, and two 10x12-foot culverts
  - Kettle Pond 1: Two 60-foot bridges with 10 to 12 feet of vertical clearance and two 4x6-foot culverts
  - Kettle Pond 2: Two 60-foot bridges with 10 to 12 feet of vertical clearance and two 4x6-foot culverts
  - Crow Creek: Two bridges (120-foot and 150-foot) with 10 to 12 feet of vertical clearance
- **C-2: Enlarged Wildlife Crossing Structures:**
  - Typical Section: Standard 6:1 inslopes with steepened 3:1 fill slopes throughout the corridor and 2:1 fill slopes in sensitive areas
  - Shared Use Path: SUP with crossing south of Ninepipe Reservoir
  - Ninepipe Reservoir: Single 660-foot bridge with 15 feet of vertical clearance, two 12x22-foot culverts, and two 10x12-foot culverts
  - Kettle Pond 1: Single 800-foot bridge with 15 feet of vertical clearance
  - Kettle Pond 2: Single 800-foot bridge with 15 feet of vertical clearance
  - Crow Creek: Single 500-foot bridge with 15 feet of vertical clearance
- **C-3: Wildlife Overpass Configuration:**
  - Typical Section: Standard 6:1 inslopes with steepened 3:1 fill slopes throughout the corridor and 2:1 fill slopes in sensitive areas
  - Shared Use Path: SUP with crossing south of Ninepipe Reservoir
  - Ninepipe Reservoir: Single 300-foot bridge with 15 feet of vertical clearance, two 12x22-foot culverts, and two 10x12-foot culverts
  - Post A Canal: Wildlife overpass
  - Kettle Pond 1: Single 110-foot bridge with 10 to 12 feet of vertical clearance and two 4x6-foot culverts
  - Kettle Pond 2: Single 110-foot bridge with 10 to 12 feet of vertical clearance and two 4x6-foot culverts
  - Crow Creek: Single 500-foot bridge with 15 feet of vertical clearance

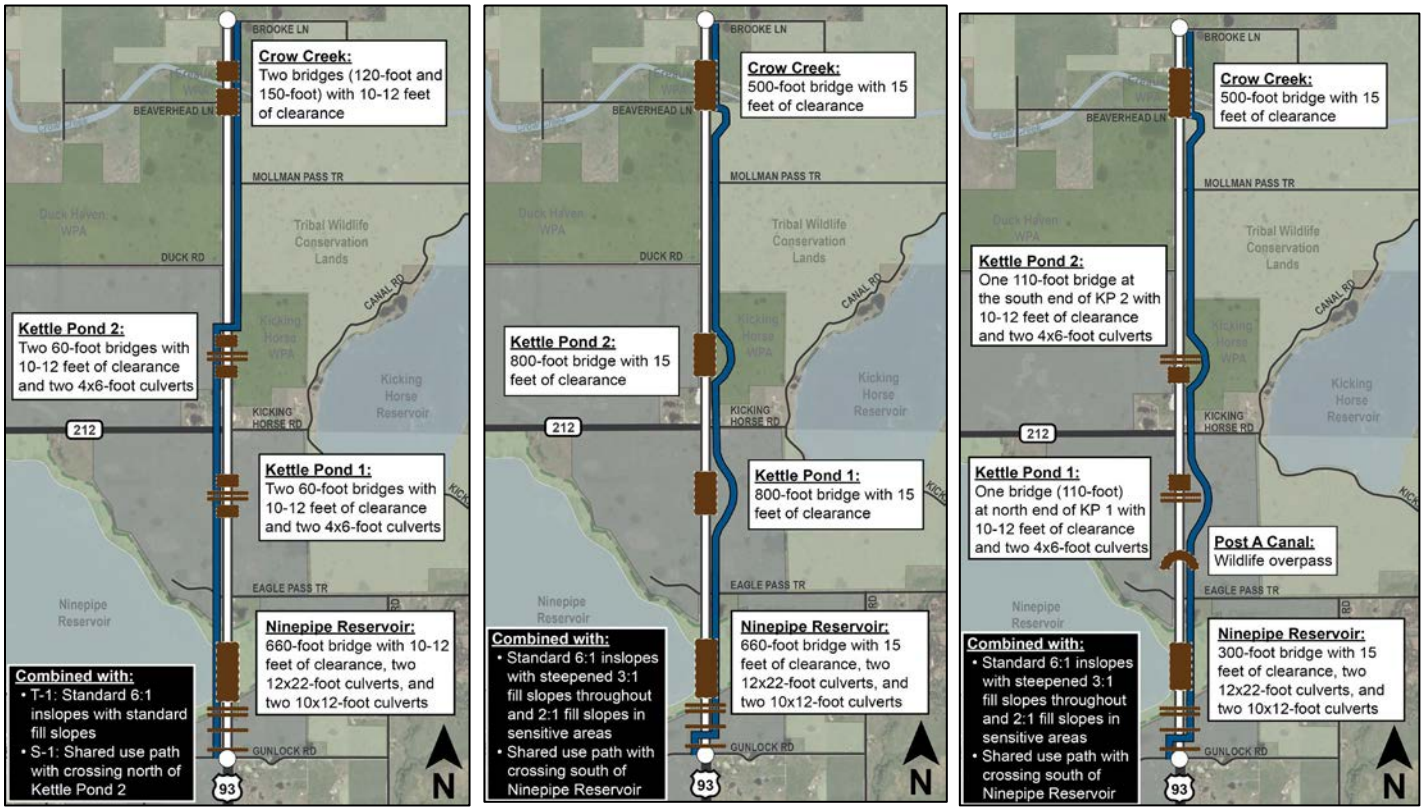

Figure 5: Corridor Option Configurations (C-1, C-2, C-3)

4.2. Corridor Screening Process

A screening process was used to determine which corridor options would be feasible to implement and to understand the tradeoffs between resource impacts, overall benefits, and project costs. Corridor options include typical section and SUP configurations with varying wildlife crossing treatments. These options were evaluated numerically according to their performance under six screening criteria. Starting from the five general categories considered for the initial evaluation, the screening criteria were developed in more detail with the addition of a cost category. A numeric rating system was used to provide a comparison of options. The rating scale ranged from one to five, where a score of one (①) indicates very poor performance and/or the greatest negative impacts and a score of five (⑤) indicates very good performance and/or the greatest overall benefits. A total of 20 subcategories were defined under the six screening criteria, with a total of 5 possible points per subcategory and a total possible score of 100 for each option. Ultimately, the goal was to identify a preferred corridor option comprising the most feasible, beneficial, and cost-effective improvements for the corridor.

4.2.1. Screening Criteria

All previously completed work was used to update known conditions and determine primary project influencers. Based on this information, the following screening criteria represent key factors with the largest influence on the feasibility and reasonableness of proposed options. The options were evaluated based on the six screening criteria and associated qualitative and quantitative components listed in **Table 1**. The criteria are described in greater detail in subsequent sections.

Table 1: Screening Criteria

Screening Criteria		Description/Components		
1	Transportation	1a.	Operations	• Roadway Level of Service (LOS) • Non-Motorized Accommodations and Connectivity
		1b.	Safety	• Roadside Clear Zones and Recoverable Area • Crash Trends and Contributing Factors • Non-Motorist Safety
2	Ecological Environment	2a.	Hydraulic Performance	• Conveyance Capacity of Water Features • Hydrologic Connectivity
		2b.	Wetlands	• Preliminary Jurisdictional Review of Impacted Wetlands • Functional Classification of Impacted Wetlands • Total Wetland Impact Area
		2c.	Surface Water Resources	• Floodplain Impacts • Stream Channel Impacts • Water Quality
3	Fish and Wildlife	3a.	Aquatic Accommodations	• Fish-Bearing Resource Impacts • Aquatic Species Mortality
		3b.	Terrestrial Accommodations	• Crossing Structure Availability • Crossing Structure Attractiveness to Wildlife • Wildlife Mortality
		3c.	Habitat	• Temporary Fish and Wildlife Habitat Impacts During Construction • Permanent Fish and Wildlife Habitat Impacts • Fish and Wildlife Habitat Connectivity
		3d.	Threatened and Endangered Species	• Threatened and Endangered Species Mortality • Threatened and Endangered Species Accommodations • Threatened and Endangered Species Habitat Connectivity
4	Human Environment	4a.	Cultural and Recreational Resources	• Vernacular Resource Impacts • Ethnographic Resources Impacts • Section 4(f) Property Impacts
		4b.	Visual Quality	• Landscape Character Impacts • Roadway Corridor Impacts
		4c.	Adjacent Properties	• Adjacent Property Access • Adjacent Business Impacts • Permanent Right-of-Way Acquisition
5	Constructability	5a.	Geotechnical Feasibility	• Potential for Liquefaction/Seismic Risk • Groundwater Conditions • Soil Conditions
		5b.	Construction Feasibility	• Construction Ease • Specialized Equipment/Material Needs
		5c.	Construction Impacts	• Traffic Control Needs • Detours During Construction • Duration of Construction
		5d.	Construction Requirements	• Temporary Right-of-Way/Easements • Permitting/Mitigation Requirements
6	Cost	6a.	Cost of Improvements	• Capital Costs (Design, Construction, Materials)
		6b.	Maintenance Needs/Cost	• Anticipated Maintenance Needs • Anticipated Maintenance Costs
		6c.	Cost-Effectiveness	• Benefits of Improvements Compared to Costs
		6d.	Fundability	• Competitiveness for Discretionary Program Funding • Opportunities for Funding Partnerships

4.2.2. Screening Criterion 1: Transportation

The SEIS determined reconstruction of the corridor is needed to improve safety, provide multimodal accommodations, and to ensure that the corridor can operate efficiently under current and projected traffic conditions. The following sections summarize the screening methodology applied for the transportation sub-criteria.

1A. OPERATIONS

From a vehicular standpoint, this criterion assessed transportation operations within the corridor based on LOS calculations. From a non-motorized standpoint, this category assessed the operations of non-motorized facilities based on the facility type and connectivity to other facilities. Connectivity of the facilities to other existing and planned non-motorized facilities in the area as well as connectivity and accessibility to high use destinations was also considered.

Findings and Support

Since all corridor options provide the same vehicular capacity, each option is anticipated to operate at the same LOS under projected traffic conditions. All options (C-1 through C-3) are anticipated to provide marginally better operations since dedicated turn lanes would be constructed at intersections where feasible along the corridor.

Although minimal non-motorized activity has been documented within the corridor due to a lack of dedicated facilities, provision of dedicated facilities may encourage greater use of the corridor by pedestrians and bicyclists. All reconstruction options provide a SUP for the use of non-motorists. In terms of connectivity, the SUPs provided in all options begin on the west side of the roadway and end on the east side of the roadway. This configuration best connects to existing and planned non-motorized facilities outside of the Ninepipe segment. The C-2 and C-3 options may provide enhanced connectivity to public lands, such as the Kicking Horse Waterfowl Protection Area (WPA) or Tribal lands, if the SUP is constructed along the historic stagecoach route.

1B. SAFETY

This screening category assessed the safety of the corridor options. The analysis evaluated the options' ability to address historic crash trends and contributing factors (such as fixed object, run-off-the-road, and serious injury crashes) based on the provision of proven safety countermeasures (such as rumble strips), roadside clear zones, and recoverable area adjacent to the roadway. The comfort and safety of non-motorized facilities was assessed based on the type of pedestrian and bicycle facilities provided, proximity of the facilities to traffic, and roadway crossing requirements/treatments.

Findings and Support

All three corridor options incorporate varying degrees of safety measures. All options include centerline and shoulder rumble strips which could help reduce head on and run-off-the-road crashes. While all options meet minimum clear zone requirements, the SEIS preferred option (C-1) incorporates standard, recoverable inslopes and fill slopes compared to C-2 and C-3 which use steepened, non-recoverable slopes in sensitive areas. Guardrail or retaining walls would be placed as barriers in front of areas with 2:1 inslopes, both improving safety while also presenting an additional roadside barrier for drivers. Options C-2 and C-3 are anticipated to best accommodate the crossing needs of wildlife and therefore implementation of these options is expected to result in the greatest reduction in Wildlife-Vehicle Collisions (WVCs).

In terms of non-motorist safety, all three options would provide a dedicated SUP, and would be inherently safer than the existing facility. The C-2 and C-3 options are marginally more comfortable and potentially safer due to the routing of the SUP around the kettle ponds and Mission Mountains Viewpoint, providing greater separation between vehicles and non-motorists in these locations.

SCREENING CRITERION 1 – SCORING AND JUSTIFICATION

Table 2 provides a summary of the findings and support discussed for each corridor option under each of the transportation sub-criteria. Scores for each sub-criteria as well as a subtotal score for the transportation screening criteria are also provided.

Table 2: Screening Criterion 1: Transportation – Scoring Results

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
1A. Operations	Marginally improved LOS due to turn bays at intersections. SUP improves non-motorist mobility. SUP alignment connects to planned facilities north and south of corridor.	Same as C-1 except SUP alignment may provide better connections to public lands.	Same as C-2.
Score *(Out of 5)*	③	④	④
1B. Safety	Increased shoulder width with rumble strips and flattened slopes help address historic crash trends and provide adequate clear zone and recoverable area. Dedicated SUP improves non-motorist safety. Lower use of wildlife crossing structures expected so less potential for reduction in WVCs.	Same as C-1 but steeper 2:1 fill slopes in sensitive areas are non-recoverable. Introduction of guardrail presents an additional roadside barrier. Improved non-motorist safety and comfort due to greater separation from roadway. Improved wildlife crossing options, greater potential for reduction in WVCs.	Same as C-2 except more frequent and desirable wildlife crossing options have the potential to further reduce WVCs.
Score *(Out of 5)*	③	③	④
SUBTOTAL	6	7	8

4.2.3. Screening Criterion 2: Ecological Environment

US 93 crosses several wetlands, streams, irrigation systems, other surface waters, and their associated floodplains throughout the Ninepipe segment. The most prominent water resources crossed by US 93 include Ninepipe Reservoir, Kettle Pond 1, Kettle Pond 2, and Crow Creek. The following sections summarize the ecological environment considerations and the screening methodology applied for each of the sub-criterion.

2A. HYDRAULIC PERFORMANCE

This criterion assessed the ability of each option to accommodate high water flows by evaluating susceptibility to flooding and conveyance capacity based on factors such as structure size, openings, type, and configuration. Also considered was the options' ability to reconnect water features that have been separated by the existing highway roadbed.

Findings and Support

Information for this evaluation was drawn from the 2008 *US 93 Ninepipe/Ronan Improvement Project SEIS*. In general, bridges that clear span the waterbody channel were anticipated to demonstrate better hydraulic performance and reduce backwater elevations. However, implementation of larger structures may cause channel alterations such as substrate re-distribution and areas of local scour and erosion. It is also desirable to minimize or eliminate the number of piers or foundations within the waterbody channel to improve hydraulic performance and reduce impacts. In general, larger, multi-span bridges require a greater number of piers to support the structure, increasing the probability that a pier could be needed in the existing waterbody channel.

Under existing conditions, the Crow Creek crossing does not provide adequate conveyance capacity during storms and is susceptible to flooding. All other existing crossings provide adequate conveyance capacity and there are no other known flooding concerns. Constructing larger structures at each of the crossing locations in all corridor options (C-1 through C-3) is anticipated to improve overall hydraulic performance but may increase the risk of scour or erosion around piers constructed within the waterbody channel.

All Ninepipe Reservoir crossings would provide openings wider than the waterbody channel, but longer bridges with more spans have a greater probability of requiring piers or foundations within the channel. All build options would restore some connectivity to the kettle pond water features, with C-2 spanning the entirety of each waterbody. C-1 would have the smallest structure opening due to the amount of fill needed to accommodate 2:1 abutments on either side for the structures. However, longer bridges, like those in C-2 and C-3, would likely require piers within the kettle ponds to support the spans. Scour and erosion are unlikely around these piers due to the kettle ponds being standing bodies of water. While longer structures at the Crow Creek crossing may require more spans, the longer structures are also necessary to ensure adequate wildlife passage as well as conveyance capacity during storm events.

Table 3 provides a summary of potential bridge layouts for each of the crossings in C-1 through C-3 based on the beam type selected. The data in this table help determine whether bridges span the waterbody channel and the number of spans required. With a greater number of spans required, the probability of piers being constructed within the waterbody increases. However, during design it is assumed that all efforts would be made to mitigate the need for in-stream piers. Avoiding in-stream piers is beneficial as it reduces environmental impacts, reduces permitting requirements, and improves hydraulic performance. Generally, if piers are needed, MDT attempts to adjust span lengths so piers can be constructed on the outer edges of the waterbody, thereby reducing impacts. Additional supporting information for this analysis is included in the *Structures and Hydraulic Feasibility Report*.

Table 3: Bridge Layout Assumptions

Crossing Location	Structure Length (ft)	Structure Opening (ft)	Waterbody Channel (ft)	Number of Spans Required		
				Shallow Beam	Deep Beam	Steel Girder
C-1: SEIS Preferred						
Ninepipe Reservoir	660	~615	~50	9-13	5-7	3-4
Kettle Pond 1	60 / 60	~10 each	~700	1 each	--	--
Kettle Pond 2	60 / 60	~10 each	~700	1 each	--	--
Crow Creek*	120 / 150	~70 / ~100	~350	2 each	1 each	1 each
C-2: Enlarged Wildlife Crossing Structures						
Ninepipe Reservoir	660	~560	~50	9-13	5-7	3-4
Kettle Pond 1	800	~700	~700	11-16	6-8	4-5
Kettle Pond 2	800	~700	~700	11-16	6-8	4-5
Crow Creek*	500	~400	~350	7-10	4-5	2-3
C-3: Wildlife Overpass Configuration						
Ninepipe Reservoir	300	~200	~50	4-6	2-4	2
Kettle Pond 1	~110	~20	~700	2	1	--
Kettle Pond 2	~110	~20	~700	2	1	--
Crow Creek*	500	~400	~350	7-10	4-5	2-3

*The Crow Creek waterbody channel is approximately 35 feet wide. When including the small tributary that parts from the creek (which has an approximately 40-foot-wide channel) the waterbody spans approximately 350 feet at the US 93 crossing.
Source: RPA, *Structures and Hydraulic Feasibility Report*, 2022.

2B. WETLANDS

This criterion quantitatively assessed the impacts to adjacent wetlands caused by improvements identified in each option. The assessment considered preliminary review of US Army Corps of Engineers (USACE) jurisdiction and functional classification of the wetlands based on the Montana Wetland Assessment Method (MWAM), with wetlands rates from Category I (highest rating) to Category IV (lowest rating). In addition, the total acreage of wetland area impacted was considered. A preliminary roadway design was developed to assess the impact of the proposed improvements on the adjacent wetlands. Impact areas, presented in **Table 4**, were calculated based on the location of anticipated construction limits in relation to delineated wetland boundaries. Information from the 2008 *US 93 Ninepipe/Ronan Improvement Project SEIS*, *Analysis*

of Relevant Conditions for Wetlands,[6] and *Wetland Impacts and Mitigation*[7] memos supported the evaluation.

Findings and Support

All proposed structures and culverts would benefit wetlands by improving hydrologic and ecological connectivity of these systems with larger structures providing the greatest long-term benefit. The Ninepipe Reservoir and Crow Creek are both category II wetlands with a preliminary review status of jurisdictional, which will need to be determined by USACE. The kettle ponds are also category II wetlands but are considered non-jurisdictional based on preliminary review. Regardless of USACE jurisdictional status, the CSKT may require mitigation for all impacted wetlands within the Flathead Reservation, in accordance with the Aquatic Lands Conservation Ordinance (ALCO) and Wetland Conservation Plan. Temporary impacts on wetlands during construction may result from increased deposition of eroded sediments when removing large amounts of fill, which may affect water quality and vegetation growth. Even without directly placing fill in the wetland, roadway encroachment at the edge of a wetland boundary may alter wetland function and hydrology. If small areas of fill are deposited at the edges of wetlands, the impacts would likely be modest and no changes in the functional rating would occur. Large areas of fill placed in small wetlands would have the greatest effect, likely contributing to a lower functional rating for the system. Where wetlands are completely filled, the entire function and value of that system would be lost.

In general, as the approach roadway grade increases to accommodate taller structures with greater vertical clearance, the likelihood of impacts to wetlands also increases due to the need for wider fill slopes. Additionally, using two separate bridges (as in C-1) with an elevated roadway between bridges results in more wetland impacts than a single, longer bridge (as in C-2) which would only require roadway approaches on each end of the waterbody channel where the likelihood of wetlands being present is lower.

Longer construction periods, required for longer wildlife crossing structures, like those in C-2 and C-3, increase the length of time before exposed soil is stabilized, which could increase deposition of eroded sediments in wetlands. Longer construction periods also increase the risk for potential accidental spills to wetlands during construction.

Removing fill at wildlife crossing structures may create opportunities to restore category II wetlands. For other wetlands with reduced functions, improving connectivity or removing fill may yield an increase in functions at that site.

Overall, C-2 impacts the fewest number of wetlands because the crossing structures span the full area of the surface waters and steeper fill slopes avoid sensitive wetlands. However, short-term wetland impacts may be higher due to longer construction times required for the longer bridges. Option C-1 impacts the greatest acreage of wetlands due to wider fill slopes and is unlikely to restore wetland function at the kettle ponds and Crow Creek due to the smaller structure openings at each location. Option C-3 results in more impacts than C-2 but less than C-1 and provides the opportunity to restore wetland area at the Ninepipe Reservoir and Crow Creek.

All options would yield benefits to wetlands at the Ninepipe Reservoir because they would span the full floodplain (Option C-3 nearly spans the full floodplain) and restore some wetland area. Option C-2 would yield the greatest benefit to wetlands at the kettle ponds because the structures would span the greatest area of the surface water and restore the most wetland area. At Crow Creek, Options C-2 and C-3 would impact the fewest wetlands, restore the most wetland area, and span the largest area of floodplain.

Table 4: Anticipated Wetland Impacts

Option	Wetland Impact Area (acres)					
	Preliminary Jurisdictional Review		Functional Class.			Total
	Jurisdictional	Non-Jurisdictional	II	III	IV	
C-1: SEIS Preferred	7.22	8.13	12.25	1.55	1.55	15.35
C-2: Enlarged Wildlife Crossing Structures	5.51	3.33	5.78	1.63	1.43	8.84

C-3: Wildlife Overpass Configuration	6.72	4.48	8.06	1.71	1.43	11.20

Source: RPA, 2022.

2C. SURFACE WATER RESOURCES

Floodplain impacts, including floodplain spanned by structures and floodplain storage availability, were included in this criterion. Any anticipated stream channel and water quality impacts were also considered in the analysis. Although a design level detail, the ability for each option to incorporate stormwater mitigation measures to improve water quality and reduce the impact of roadway runoff pollutants on sensitive receiving waters was also considered. Information from the *Structures and Hydraulic Feasibility Report* provided the following supporting information for this analysis.

Findings and Support

Based on 2013 floodplain mapping, the only floodplains within the corridor are associated with the Ninepipe Reservoir and Crow Creek. The anticipated floodplain impacts caused by each corridor option are tabulated in **Table 5**. In general, increasing hydraulic openings would increase channel capacity for high flow events. Any fill placed within the fringes of the 100-year floodplain due to roadway widening or increased vertical clearance would reduce overall flood storage.

Options C-1, C-2, and C-3 are all anticipated to have the greatest beneficial impact on the aquatic resources associated with the Ninepipe Reservoir floodplain. For the Crow Creek Crossing, Options C-2 and C-3 are anticipated to provide the greatest stream and floodplain opening. All build options demonstrate an improvement to floodplain function by a greater percentage of the floodplain compared to the existing structures (55% at Ninepipe Reservoir and 4% at Crow Creek).

In general, construction of longer, multi-span bridges (such as the bridges in C-2) would require removal of the greatest amount of existing roadway fill thereby increasing the risk and duration of sedimentation and turbidity in streams. In Options C-2 and C-3, which provide 15 feet of vertical clearance at some or all crossings, the approach roadway grade increases considerably to accommodate taller structures, requiring placement of more fill which can also contribute to increased sedimentation. The likelihood of impacts to floodplain storage also increases in C-2 and C-3 due to the need for placement of more fill.

During the development of the final designs for any of the reconstruction options, measures to reduce the impact of increased stormwater flows would be implemented on portions of the highway that drain directly to sensitive receiving waters (category I and II wetlands and associated streams). To meet this standard, stormwater retention systems and detention systems (such as ponds) may be used. Stormwater facilities would also be designed to reduce the long-term impact of roadway runoff pollutants on sensitive receiving waters.

Table 5: Floodplain Impacts

Bridge Layout	Approximate Floodplain Width (ft)[a]	Total Crossing Structure Length (ft)[b]	Percentage of Floodplain Spanned (structure length / floodplain width)[c]
Ninepipe Reservoir			
C-1: SEIS Preferred	140	660	>100%
C-2: Enlarged Wildlife Crossing Structures	140	660	>100%
C-3: Wildlife Overpass Configuration	140	300	>100%
Crow Creek			
C-1: SEIS Preferred	645	120/150	42%
C-2: Enlarged Wildlife Crossing Structures	645	500	78%
C-3: Wildlife Overpass Configuration	645	500	78%

[a] *Source: FEMA 2013*

[b] *Comprises total length of all wildlife crossing structures identified at each location.*

[c] *Calculated by dividing the total crossing structure length by the approximate floodplain width. Where the total structure length exceeds the floodplain width, the percentage is stated as >100%. Note: bridge piers may be required within the floodplain.*

SCREENING CRITERION 2 – SCORING AND JUSTIFICATION

Table 6 provides a summary of the findings and support discussed for each corridor option under each of the ecological environment sub-criteria. Scores for each sub-criteria as well as a subtotal score for the ecological environment screening criteria are also provided.

Table 6: Screening Criterion 2: Ecological Environment – Scoring Results

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
2A. Hydraulic Performance	All structures improve connectivity and conveyance capacity. 60-ft kettle pond structures may be too small for adequate hydraulic performance. Two smaller structures at Crow Creek are adequate but not as effective as longer bridges for connectivity and capacity.	Structures spanning entire kettle ponds require a greater number of piers in the waterbody but restore full connectivity of ponds. Large, multi-span bridges throughout with higher probability of scour/erosion at in-stream piers.	Structures designed to meet minimum hydraulic requirements. Smaller structures at kettle ponds do not restore full connectivity. Fewer bridge spans required, reduces probability of in-stream piers.
Score *(Out of 5)*	2	4	3
2B. Wetlands	Flatter fill slopes and smaller structure openings result in greatest wetland impacts and least potential for wetland reconnection at crossing locations.	Fewest impacts overall but higher probability of short-term impacts due to larger structures. Greatest benefit at kettle ponds, anticipated wetland reconnection at all crossing locations.	More impacts than C-2, but less than C-1. Opportunity to reconnect wetlands at Ninepipe Reservoir and Crow Creek.
Score *(Out of 5)*	2	4	3
2C. Surface Water Resources	100% span of Ninepipe Reservoir and 42% span of Crow Creek floodplains. Shorter structures require less fill, less risk of adverse stream or water quality impacts. Stormwater mitigation incorporated.	100% span of Ninepipe Reservoir and 78% span of Crow Creek floodplains. Longer structures require more fill and piers in channel, higher risk of adverse stream or water quality impacts. Stormwater mitigation incorporated.	100% span of Ninepipe Reservoir and 78% span of Crow Creek floodplains. Smaller structures in some locations compared to C-2, lower risk of adverse stream or water quality impacts. Stormwater mitigation incorporated.
Score *(Out of 5)*	3	4	4
SUBTOTAL	7	12	10

4.2.4. Screening Criterion 3: Fish and Wildlife

The US 93 Ninepipe corridor provides habitat for numerous wildlife species including a variety of fish, turtles, birds, deer, various small to large mammals, and grizzly bears which are listed as threatened on the endangered species list. The following sections summarize the fish and wildlife considerations and the screening methodology applied for each of sub-criteria.

3A. AQUATIC ACCOMMODATIONS

This criterion assessed the ability of each option to accommodate safe passage of aquatic species as well as the extent that each option risks species mortality either during or after construction.

Findings and Support

The existing roadway configuration restricts the natural hydrologic regime of streams and wetlands within the road corridor due to undersized crossing structures and berms that restrict surface water connectivity. These conditions reduce the functions and values of the waterbodies and their associated wetlands and riparian systems, which affects their ability to provide suitable aquatic habitat.

Passability refers to the ease in which fish and other aquatic organisms can move through a structure. Proper passability helps ensure habitat connectivity, which is critical to the long-term survival of many fish

populations. Characteristics of structures that impede movement of aquatic species include excessive outlet drop heights and velocities, insufficient water depth, and debris traps. Structures best suited for aquatic organism passage are often large culverts embedded into the stream bed or structures with a natural stream morphology constructed within them.[8] Bridges spanning an entire waterbody without in-stream piers are also considered suitable for fish passage as they do not create barriers within the surface water.

The effects of noise and human activity generated from in-stream construction and driven pilings for multi-span bridges is anticipated to have a negative effect on aquatic species, possibly displacing or decreasing species survival. Extensive removal or placement of roadway fill at the proposed crossings would result in increased sedimentation and turbidity in wetlands and streams, also increasing the risk of displacement or mortality for fish and other aquatic organisms.

Opening a greater area of the floodplain would generally enhance fisheries resources and allow previously impacted or uninhabitable areas to be restored. The proposed culvert and bridge replacements in all corridor options would generally improve hydraulic conveyance capacity at stream crossings, improve hydrologic connectivity in streams, and improve fish passage. Longer structures, such as those provided in C-2, would best restore the hydrologic regime of surface waters in the corridor, but at the expense of potential in-stream construction and extensive placement of fill to raise the road grade to accommodate taller structures.

Option C-1 includes placement of the SUP adjacent to the roadway at major crossings, resulting in a wider roadway footprint across waterbodies. Conversely, the SUP alignment in Options C-2 and C-3 would be constructed around sensitive waters, such as the kettle ponds, reducing impacts to these aquatic habitats.

3B. TERRESTRIAL ACCOMMODATIONS

This criterion was evaluated based on the availability of crossing structures and the attractiveness of structure openings (based on siting, height, width, and lighting) for mammals, amphibians, and birds. The likelihood of each structure to reduce wildlife mortality was also considered.

Findings and Support

Although some wildlife successfully cross US 93 in the Ninepipe segment, as traffic levels in the corridor increase, wildlife mortality is expected to increase, and more wildlife are likely to be deterred from the area. The ability of each option to provide desirable crossing accommodations and therefore discourage at-grade wildlife crossings of US 93 was assumed to reduce the potential for wildlife mortality within the corridor. It was recognized that the benefits of all the structures would take time to realize as wildlife become accustomed to using the structures.

An analysis of the use of crossing structures in adjacent areas[9] shows that white-tailed deer are more likely to use bridges, overpasses, and large culverts (approximately 24 feet wide by 13 feet high) but rarely use small culverts. Black bears use a wider variety of structures including bridges as well as large and small culverts. Elk and moose have been known to use the Evaro wildlife overpass south of the study corridor. In general, large mammal use of underpasses is heavily influenced by factors including the location of the structure in relation to the surrounding habitat, wildlife population density, and wildlife movements. New structures are most likely to be used by large mammals if vertical clearance meets or exceeds 15 feet. Structures are also more likely to be used by mammals if there is adequate dry land available on each side of the water bodies for animals to pass. Wildlife use of crossing structures has been shown to increase with width until use levels out at about 50 meters (150 feet).[10] The proposed opening sizes for the crossings in each corridor option are summarized in **Table 7**.

Turtles are known to use 9x9-foot, inundated, partially submerged box culverts; 3-foot cylindrical culverts when wet with earthen substrates; and 6x6-foot dry box culverts. However, painted turtles do not burrow and may show reluctance to enter dark areas, therefore light boxes, oversized culverts, or large open span bridges are recommended.[11]

Wildlife fencing is the most effective and preferred method to help guide wildlife to crossing structures and prevent intrusions onto the right-of-way, thereby reducing the potential for WVCs on the roadway. Studies show that when fencing is used in combination with under or overpasses, WVCs can be reduced by more than 80 percent.[10] However, fencing may adversely impact birds and flying waterfowl by presenting a collision hazard. To reduce hazards to birds, it is recommended that fencing be 8 to 12 feet high and installed at the base of the fill slope of a roadway. This design will still have the desired effect of keeping wildlife out of the roadway right-of-way while helping birds fly at a safe height over traffic. There are also several methods to increase the visibility of fencing to birds to reduce the potential of collisions.[12] It is expected that wildlife fencing would be included with all build options (C-1 through C-3) to maximize effectiveness of wildlife structures. Specific design of the fencing to address these and other concerns would be developed during future design phases.

Wildlife mortality data indicate that white-tailed deer represent most wildlife killed in the Ninepipe segment. Most wildlife crossings are centered around the core pothole area from RP 39.4 to 44.1. Reptiles, primarily represented by turtles, followed by birds were reportedly the most commonly struck species during development of the SEIS. Black bear collisions are rare in the Ninepipe segment.

All reconstruction options are anticipated to provide an improvement to terrestrial crossing accommodations compared to the existing configuration. Option C-2 provides the largest crossing accommodations, however, structures over 150 feet in length may not provide additional benefits. The structures with at least 15 feet of vertical clearance (as in C-2 and C-3) are more likely to be used by large mammals. The kettle pond structures and smaller culverts are most likely to be used by turtles, and larger structures are unlikely to encourage greater use by mammals since the ponds and culverts would provide wet crossings. An overpass structure, included in C-3, is most likely to be used by larger mammals. The crossing structures in all options are anticipated to reduce wildlife mortality, especially when used in combination with wildlife fencing. Special considerations during design will be necessary to avoid adverse effects to bird species with implementation of fencing.

Table 7: Crossing Opening Sizes

Crossing Location	Structure Opening (ft)	Vertical Clearance (ft)	Total Opening (sq ft)
C-1: SEIS Preferred			
Ninepipe Reservoir	~615	10 - 12	6,150 – 7,380
Kettle Pond 1	~10 each	10 - 12	100 – 120 each
Kettle Pond 2	~10 each	10 - 12	100 – 120 each
Crow Creek	~70 / ~100	10 – 12	700 – 1,000 / 840 – 1,200
C-2: Enlarged Wildlife Crossing Structures			
Ninepipe Reservoir	~560	15	8,400
Kettle Pond 1	~700	15	10,500
Kettle Pond 2	~700	15	10,500
Crow Creek	~400	15	6,000
C-3: Wildlife Overpass Configuration			
Ninepipe Reservoir	~200	15	3,000
Kettle Pond 1	~20	10 - 12	200 – 240
Kettle Pond 2	~20	10 - 12	200 – 240
Crow Creek	~400	15	6,000

Source: RPA, *Structures and Hydraulic Feasibility Report*, 2022.
**Total Opening = Structure Opening * Vertical Clearance, does not account for bridge piers. Additional wet crossing opportunities would be provided by culverts.*

3C. HABITAT

This screening category assessed the temporary and permanent impacts to fish and wildlife habitat caused by implementation of improvements. This criterion also assessed the options' ability to reduce

fragmentation of adjoining habitats within the corridor and the ability to provide suitable crossings which restore habitat connectivity. Information for this evaluation was drawn from the 2008 *US 93 Ninepipe/Ronan Improvement Project SEIS.*

Findings and Support

In its current condition, the existing US 93 corridor displaces wildlife from habitats near the roadway. The paved surface occupies several acres of habitat that is no longer available to wildlife. Although the right-of-way and adjoining lands may support wildlife use, its value is compromised by its proximity to the roadway.

While all reconstruction options (C-1 through C-3) would benefit fish and wildlife in the long-term, noise, increased human activity, and vegetation removal during construction would result in the displacement or elimination of fish and wildlife within the project corridor and adjacent suitable habitats. However, fish and wildlife inhabiting the area are generally expected to return after construction is complete. Options that can be completed more quickly are expected to have fewer lasting impacts on fish and wildlife. Options requiring in-stream construction would result in greater temporary, and potentially permanent, impacts to aquatic organisms. Options requiring extensive removal of fill for roadway expansion or bridge construction would increase deposition of sediment and increase turbidity in streams and wetlands, displacing nesting habitat, aquatic species, and decreasing amphibian and reptile survival during construction. Options that require construction of temporary detours adjacent to the existing alignment may require culvert placement or extension in wetlands and streams which would temporarily alter aquatic and wetland habitats. Revegetation of temporary construction areas would help restore the habitat post-construction.

Permanent impacts to fish and wildlife habitat resulting from construction and operation of all build options include direct loss of wetland or wildlife habitat and reduced function and value of wetland and upland habitat. Impacts to habitat are greater for options requiring wider footprints, such as those with larger, taller structures and those with flatter fill slopes. Changes in hydrology and conversion of wetland areas would also reduce the functions and values of wetland habitat. However, habitat may also be gained by improving connectivity of waterbodies or previously compromised habitat. Generally, wider bridge openings in locations with formerly undersized structures can help restore the hydrologic regime of streams and wetlands. This type of improvement helps provide greater vegetative cover for aquatic species and helps improve connectivity and passage for fish and other aquatic organisms.

The existing corridor does not provide adequate crossing opportunities for wildlife, and existing traffic levels create a barrier to most wildlife attempting to cross. Because of this, most wildlife and some aquatic species (such as those in the kettle ponds) are limited to one side of the roadway and are unable to access the diverse habitat types and protected lands on both sides of the roadway in the Ninepipe area. It is expected that options that provide suitable fish and wildlife crossings would reduce fragmentation of upland, wetland, and aquatic habitats and enhance overall habitat connectivity so long as the crossings provided are designed appropriately and accompanied by appropriate fencing to maximize use by the species inhabiting adjoining areas. Furthermore, larger crossings providing suitable habitat elements, such as both dry and wet areas under bridges or vegetation on overpasses, would help enhance habitat connectivity and fish and wildlife mobility.

3D. THREATENED AND ENDANGERED SPECIES

Improvements that provide crossing accommodations likely to be used by listed threatened and endangered species in the corridor were factored into the assessment of this criterion. This criterion also considered mortality of threatened and endangered species as well as connectivity of habitat specific to these species.

Findings and Support

The only listed species known to be present in the corridor is the grizzly bear. Based on tracking data, grizzly bears are most likely to cross US 93 in the vicinity of Post A Canal stretching south to Ninepipe Reservoir and north to Kettle Pond 1. Grizzly bears are also known to cross near Crow Creek, which provides high-quality habitat for the species.

Grizzly bears prefer larger and more open structures with good visibility such as landscape bridges, wildlife overpasses, viaducts, and other large open-span bridges or underpasses. Open-span bridges and underpasses, such as those proposed in the build options are a type of crossing structure preferred by single grizzly bears and somewhat by family groups. The *Wildlife Crossing Structure Handbook*[13] recommends that underpasses designed for use by grizzly bears be a minimum of 40 feet wide and provide 15 feet of vertical clearance. For underpasses that span water features, maintaining at least 40 feet of dry ground for passage during all seasons is also recommended to encourage use by grizzly bears.

Compared to a viaduct, underpass structures are generally smaller and the ability to restore natural habitat in the crossing post construction can be limited. Open designs that provide ample natural lighting will encourage greater development of native vegetation. Where habitat loss occurs, it is encouraged that all trees, large logs, and root wads be reserved for use adjacent to and within underpasses to maintain habitat connectivity. Underpasses are most effective when constructed within cross-highway habitat linkage zones, such as the Ninepipe Reservoir, Post A Canal, and Crow Creek within the Ninepipe segment.

Solitary grizzly bears and family groups are three and five times, respectively, more likely to use overpasses (as in C-3) compared to underpasses when correctly designed.[14] However, research suggests that round, steep structures like the Evaro overpass, are unlikely to be used by grizzly bears, particularly family groups. Instead, crossings with flattened tops that provide adequate sight lines across the structure are more likely to be used. If designed and integrated correctly, a vegetated overpass can restore habitat connectivity.

Wildlife fencing in combination with underpasses or overpasses can reduce WVCs by 87 percent. Large species that cannot easily climb or otherwise cross wildlife fencing, such as grizzly bears, are likely to have substantially fewer road killed individuals with implementation of wildlife fencing. However, without under or overpasses installed in combination, fencing can create a barrier effect which limits grizzly bear movement. Based on the suitability of wildlife underpasses and overpasses for large, or threatened and endangered species in Montana, the implementation of wildlife fencing in combination with underpasses and overpasses is preferred over the implementation of wildlife fencing with only underpasses or wildlife fencing with only overpasses.[10]

Only C-2 and C-3 provide structures with the minimum dimensions for grizzly bear use. In C-2 all bridge spans would meet these recommendations while in C-3 only the Ninepipe Reservoir and Crow Creek structure would meet the criteria. However, C-3 also provides an overpass which is the most likely structure to be used by grizzly bears. None of the provided structures in C-1 would provide appropriately sized structures for grizzly bear use. Since the crossings at Kettle Ponds 1 and 2 in all corridor options are wet crossings, grizzly bear usage would be low. However, grizzly bears are also not known to regularly cross in the vicinity of Kettle Ponds 1 and 2.

SCREENING CRITERION 3 – SCORING AND JUSTIFICATION

Table 8 provides a summary of the findings and support discussed for each corridor option under each of the fish and wildlife sub-criteria. Scores for each sub-criteria as well as a subtotal score for the fish and wildlife screening criteria are also provided.

Table 8: Screening Criterion 3: Fish and Wildlife – Scoring Results

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
3A. Aquatic Accommodations	Improvement to passability at hydraulic crossings. Some in-stream construction required, potential risk of fish mortality. SUP adjacent to roadway at major crossings results in wider footprint across waterbodies.	Longer structures best restore the hydrologic regime, but at the expense of potential in-stream construction and extensive placement of fill to raise the road grade to accommodate taller structures. Risk to fish mortality during construction. SUP constructed around sensitive waters.	Same as C-2 but potentially less disruption to species in kettle ponds due to smaller structures.

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
Score *(Out of 5)*	③	③	④
3B. Terrestrial Accommodations	Crossings may not be sized appropriately (low clearance, small openings in some locations) for use by larger mammals. Some reduction in wildlife mortality anticipated.	Option provides the largest openings at all crossings to meet the wide range of wildlife needs, however, structures over 150 feet may not provide additional benefits. Reduction in wildlife mortality anticipated.	Most crossing opportunities, overpass is most attractive to large mammals. Crossings strategically sized to serve the needs of wildlife anticipated to use each crossing. Greatest potential for reduced wildlife mortality.
Score *(Out of 5)*	②	④	⑤
3C. Habitat	Permanent habitat impacts due to increased roadway width and SUP. Temporary habitat impacts due to in-stream construction and general construction. Improved connectivity at hydraulic crossings.	Similar to C-1 but SUP alignment around kettle ponds avoids aquatic habitat while potentially introducing a new barrier if fencing is extended around path. Larger structures provide greater ability to restore habitat connectivity.	Similar to C-2 but overpass provides best habitat connectivity for mammals. Smaller kettle pond structures provide less aquatic habitat connectivity but assumed to be adequate for anticipated use.
Score *(Out of 5)*	②	③	④
3D. Threatened and Endangered Species	Underpasses not tall enough to be attractive for grizzly bear crossings, low use anticipated. Bears won't use wet crossings. Minimal improvement to habitat connectivity. Minimal reduction in mortality expected.	Larger crossings at Ninepipe Reservoir and Crow Creek provide most attractive grizzly bear crossings and ability to connect habitat. Reduction in mortality anticipated.	Overpass combined with appropriately sized underpasses expected to be most effective for grizzly bear passage and reduced mortality. Overpass provides best grizzly bear habitat connectivity.
Score *(Out of 5)*	②	④	⑤
SUBTOTAL	9	14	18

4.2.5. Screening Criterion 4: Human Environment

The US 93 Ninepipe segment traverses a primarily rural area dominated by low density residential, cultural, and agricultural uses, although the Ninepipe National Wildlife Refuge (NWR), multiple wildlife management areas (WMAs), waterfowl production areas (WPAs), and some highway/tourist-oriented commercial properties are also located in the corridor. The following sections summarize the human environment considerations and the screening methodology applied for each of the sub-criterion.

4A. CULTURAL AND RECREATIONAL RESOURCES

The extent to which options impact the vernacular, ethnographic, and Section 4(f) resources within the corridor were assessed under this criterion. The cultural, historical, and recreational value of these resources were also considered. Physical impacts to these properties were assessed using preliminary roadway profiles while impacts to the values of the resources were derived from various conversations with tribal members and resource agencies throughout the feasibility study. Ultimately, however, the Salish and Kootenai Cultural Committees and the CSKT Tribal Preservation Office (TPO) are the authoritative voice on the cultural significance of all these resources. Formal coordination with these entities would need to occur if a project is advanced from this study. Information from the *Historical and Cultural Resources Project History Summary Report*[15] supported this evaluation, which considered potential impacts to vernacular and ethnographic cultural resources within the study area.

Findings and Support

The Ninepipe Cultural Property encompasses the entire Ninepipe segment adjacent to US 93, and includes the landscape setting, natural resources, and sites used for ceremonial, spiritual, and recreational purposes. In particular, wildlife and wetlands are highly valued by the Tribes from a cultural perspective,

and Tribal elders voiced support during cultural coordination for options returning the area to a more natural condition before the highway was constructed. Options C-1, C-2, and C-3 would all result in potential impacts to this resource due to roadway widening and the construction of new, larger structures at the Ninepipe Reservoir, kettle ponds, and Crow Creek, with the degree of impact varying based on each option's footprint and visual impact. Additionally, Option C-3 would result in impacts from a new wildlife overpass at Post A Canal. However, offsetting potential impacts, Option C-2 would fully reconnect the kettle ponds through the construction of 800-foot bridges spanning the entire water bodies, returning them to a similar condition before the US 93 highway was built. Additionally, Option C-3 would provide an overpass structure to accommodate wildlife movements, restoring historic wildlife access and topography in a cut section of the highway. All options would improve wildlife crossing accommodations and habitat connectivity, with Options C-2 and C-3 providing the greatest benefit to wildlife in support of Tribal cultural values.

The historic stagecoach route roughly follows the US 93 corridor through the Mission Valley. Correspondence documented in the SEIS between MDT and the CSKT Preservation Officer indicated there would be No Effect on the historic route under the preferred alternative (Option C-1). However, the new eastern SUP alignment around the kettle ponds under Options C-2 and C-3 may follow a portion of the historic stagecoach route, potentially resulting in impacts. Construction of a pedestrian and bicycle facility along or near the route may offer an opportunity for interpretive markers to enhance awareness of the historic property. Further consultation would be needed at the time a project is developed to determine if interpretive mitigation could be used to offset any potential impacts that may result from a path following the historic stagecoach route alignment.

Under Option C-3, the proposed overpass would be located in the vicinity of Post A Canal, which is part of the Mission unit of the Flathead Indian Irrigation Project (FIIP). The footprint of the overpass would be situated north of the canal, and direct impacts would be unlikely. Under an MOA developed in 2004, a mitigation plan was agreed upon for project impacts to the site within the Ninepipe segment. The agreement called for a comprehensive study of the FIIP to be undertaken by the TPO that was to be partially funded by MDT. As further mitigation, MDT also committed to the construction of a turn-out historical interpretive marker along the Ninepipe segment describing the development and significance of the FIIP. According to the agreement, the text for the interpretive marker would be provided by the TPO. Further consultation would be needed at the time a project is developed to address mitigation requirements for any impacts to the FIIP from any build options.

Section 4(f) of the U.S. Department of Transportation Act of 1966 requires consideration of park and recreation lands, wildlife and waterfowl refuges, and historic sites during transportation project development. In addition to the historic sites noted above, the Ninepipe NWR and the Kicking Horse, Duck Haven, and Ereaux WPAs managed by US Fish and Wildlife Service (USFWS), as well as the surrounding Ninepipe WMA managed by Montana Fish, Wildlife and Parks (MFWP), were considered protected Section 4(f) resources in the SEIS. With the NWR and WMA extending across US 93 through the southern half of the Ninepipe segment, and the WMA and WPAs immediately adjacent to US 93 in the northern portion of the corridor, Options C-1, C-2, and C-3 would all result in impacts due to roadway widening within these areas, although most impacts would occur within existing MDT right-of-way. Options C-2 and C-3 propose to limit impacts with the use of steepened 3:1 fill slopes and 2:1 inslopes with guardrail and/or retaining walls in sensitive locations such as the Ninepipe Reservoir bridge within the NWR. Option C-3 proposes a wildlife overpass, with the embankment footprint extending beyond MDT right-of-way into the adjacent Ninepipe WMA. While this would cause a permanent physical impact within the footprint of the overpass, it would improve habitat connectivity across the highway, benefiting many of the species served by the WMA. If a project is advanced, changed impacts to Section 4(f) properties would need to be considered.

4B. VISUAL QUALITY

Analysis of visual resources considered the relationship of the highway with the surrounding visual environment. The aesthetic quality of a resource was determined by the visual character and visual quality of the landscape. Visual character consists of elements such as form, color, line, and texture as well as

relationships such as dominance, scale, diversity, and continuity. Visual quality was evaluated by vividness, intactness, and unity. When assessing the proposed roadway improvements, the visual quality was considered from the perspective of the road users with a view from the road and the perspective of other occupants of the landscape with views of the road. Information for this evaluation was drawn from the 2008 *US 93 Ninepipe/Ronan Improvement Project SEIS* and the *Historical and Cultural Resources Project History Summary Report* memo.

Findings and Support

Historical and cultural research conducted for the feasibility study referenced the "spirit of place" within the US 93 corridor, encompassing a broad environmental continuum including the surrounding mountains, plains, hills, forest, valley, and sky, and the paths of waters, glaciers, winds, plants, animals, and native peoples. This spirit of place is reflected in the landscape and natural and cultural values of the CSKT and is affected by the visual prominence of the highway within the landscape.

With all options, construction activity would result in temporary visual effects due to the presence of construction equipment and disturbed areas as well as the general increase in activity along the road. Permanent visual effects would result from the widened roadway and the elevated roadway grade accommodating new structures. Prominent new visual features would include wildlife fencing and the wildlife overpass, potentially blocking views.

All options would result in a widened roadway, resulting in equivalent increases to the visual prominence of the paved corridor. Options C-1 and C-3 would involve a moderate raise in roadway grade, whereas Options C-2 would result in the greatest overall raise in grade due to the combination of the largest structures. The grade raises would result in increased visual prominence of the roadway when viewed from adjacent properties and approaches and may block views of natural features. Wildlife fencing would be installed with all options, however it would be more visually pronounced when placed on the elevated grades of Options C-2 and C-3. Although fencing would be somewhat transparent allowing views through the fencing material, it would distract from previously unobstructed views of natural features from the roadway and adjacent properties. Option C-3 would introduce a new wildlife overpass structure, which would be distinctly visible both from the roadway and from adjacent properties and approaches. While vegetative cover could be used to obscure structural elements and blend with the natural environment, views from all angles would be permanently altered.

The SEIS identified potential measures to mitigate visual impacts from reconstruction of the US 93 corridor. These included providing interpretive elements including pull-offs at viewpoints, recreational resources, and culturally important sites; placing name signs and other interpretive signs where practicable; considering selective decommissioning of adjoining roads in the Ninepipe segment to restore the visual quality of the natural landscape character of the Ninepipe Area and core pothole area; and replacing vegetative screening removed through construction between the road and any residences where possible. Further consideration of these measures would need to occur during future project development activities.

4C. ADJACENT PROPERTIES

Right-of-way acquisition, changes to access, adverse economic impacts during construction, and otherwise negative impacts to adjacent properties (both public and private) were assessed in this criterion. Permanent, tangible impacts to adjacent properties, including land acquisition and modifications to access, were assessed at a planning level based on preliminary roadway profiles.

Findings and Support

The anticipated right-of-way, building, and access impacts resulting from each corridor option are presented in **Table 9**.

To accommodate longer structures with greater vertical clearance, the roadbed will need to be raised, resulting in a wider roadway footprint. At the north end of the corridor just south of Creekside Lane, the fill slope footprint under Option C-1 would directly impact one building. Due to steeper fill slopes, Options C-2

and C-3 would not directly impact the building, and a right-of-way adjustment could be pursued to limit impacts in this location.

Modifications to driveways and adjacent approaches will also be necessary to accommodate the change in grade. All options would directly impact the parking area in front of the Ninepipes Lodge/Museum. Additionally, access to the Ninepipes Lodge/Museum would be impacted due to a grade raise in this location. Alternate access would need to be provided, possibly via Eagle Pass Trail from the north.

Access to the Mission Mountains Viewpoint would be impacted due to a substantial grade raise under all options. The Viewpoint may need to be relocated, or a new access would need to be constructed. Access to the residence east of Beaverhead Drive would also need to be reconstructed. Approximately 600 to 800 feet of Beaverhead Drive would need to be reconstructed to meet the newly elevated grade, which would range from an increase of 16 feet under C-1 to 20 feet under C-2 and C-3 from the existing grade. Similarly, a portion of Creekside Lane would need to be reconstructed to meet the new US 93 grade. Reconstructed access to US 93 in this area may involve frontage roads parallel to the elevated US 93, retaining walls, or other mechanisms to address the elevation differential between adjacent properties and the highway.

Changes in access during construction due to detours or other work zone adjustments may have a negative economic impact on adjacent commercial properties which rely on tourism and highway traffic for business. During construction, temporary delays and changes in or loss of access to adjacent businesses may also occur which could have short-term economic effects. During construction, the local economy would benefit from an infusion of construction dollars and increased demand for goods and services by construction workers. These economic benefits are expected to end shortly after construction is complete when the demand for construction materials subsides and workers move on to other jobs.

Long-term economic effects from implementation of any of the build options (C-1 through C-3) are expected to be minor because the project would not generate employment, result in significant increases in traffic, or have a substantial effect on tourism.

Table 9: Property Impacts

Option	Acquisition Area (acres)	Impacted Buildings	Anticipated Changes in Access
C-1: SEIS Preferred	31.6	One building within construction limit footprint; fill slope adjustments could be pursued to avoid impacts	All options would impact access to Ninepipes Lodge/Museum, Mission Mountains Viewpoint, Beaverhead Drive and Creekside Lane, and residences east of Beaverhead Drive and south of Creekside Lane.
C-2: Enlarged Wildlife Crossing Structures	34.7	One building within right-of-way limits; right-of-way adjustment could be pursued to avoid impacts	
C-3: Wildlife Overpass Configuration	35.7[1]	One building within right-of-way limits; right-of-way adjustment could be pursued to avoid impacts	

[1]*The wildlife overpass would impact an additional area outside of MDT right-of-way and would require coordination and partnership with the adjacent landowner (MFWP).*

SCREENING CRITERION 4 – SCORING AND JUSTIFICATION

Table 10 provides a summary of the findings and support discussed for each corridor option under each of the human environment sub-criteria. Scores for each sub-criteria as well as a subtotal score for the human environment screening criteria are also provided.

Table 10: Screening Criterion 4: Human Environment – Scoring Results

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
4A. Cultural and Recreational Resources	Potential impacts to Ninepipe Cultural Property and potential Section 4(f) impacts to Ninepipe NWR, WMA, and WPAs,	Potential impacts to Ninepipe Cultural Property, potential Section 4(f) impacts to Ninepipe NWR, WMA, and WPAs, and	Potential impacts to Ninepipe Cultural Property, potential Section 4(f) impacts to Ninepipe NWR, WMA, and WPAs, and

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
	moderately offset by enhancements to wildlife accommodations and improved wetland connectivity, which are culturally valued.	potential impacts to stagecoach route substantially offset by enhancements to wildlife accommodations and improved wetland connectivity, which are culturally valued.	potential impacts to stagecoach route substantially offset by enhancements to wildlife accommodations and improved wetland connectivity, which are culturally valued.
Score *(Out of 5)*	3	4	4
4B. Visual Quality	Temporary construction impacts, permanent impacts due to roadway grade raise and wildlife fencing.	Temporary construction impacts, permanent impacts from wildlife fencing and greatest roadway grade raise compared to C-1 and C-3.	Temporary construction impacts, permanent impacts due to roadway grade raise and wildlife fencing, new overpass structure.
Score *(Out of 5)*	3	2	2
4C. Adjacent Properties	One directly impacted building and access impacts south of Creekside Lane. Impacts to Ninepipes Lodge/Museum parking lot and access. Access impacts to Mission Mountain Viewpoint and residence. Reconstruction of Beaverhead Drive required. Approximately 31.6 acres would need to be acquired.	One indirectly impacted building and access impacts south of Creekside Lane. Impacts to Ninepipes Lodge/Museum parking lot and access. Access impacts to Mission Mountain Viewpoint and residence. Reconstruction of Beaverhead Drive required. Approximately 34.7 acres would need to be acquired.	One indirectly impacted building and access impacts south of Creekside Lane. Impacts to Ninepipes Lodge/Museum parking lot and access. Access impacts to Mission Mountain Viewpoint and residence. Reconstruction of Beaverhead Drive required. Approximately 35.7 acres would need to be acquired.
Score *(Out of 5)*	1	2	2
SUBTOTAL	7	8	8

4.2.6. Screening Criterion 5: Constructability

Improvements to US 93 within the Ninepipe segment will need to consider geotechnical and general construction feasibility, impacts to the traveling public during construction, as well as regulatory construction requirements. The following sections summarize the constructability considerations and the screening methodology applied for each of the sub-criterion.

5A. GEOTECHNICAL CONSIDERATIONS

This criterion assessed the geotechnical feasibility of each option based on slope stability, liquefaction and seismic concerns, groundwater conditions, and general soil conditions relating to potential settlement or bearing failure. The analysis used information contained in the *Preliminary Geotechnical Analysis Memorandum*[16] to assess pile capacity, pile lengths, sub excavation, surcharge, and foundations required to accommodate the structure(s) in each of the proposed options.

Findings and Support

Based on cone penetrometer testing performed to evaluate the general strength and compressibility of the soils in the Ninepipe segment, dense bearing layers were generally encountered at depths ranging from 50 to 80 feet, with the depth increasing as the project extends north towards Crow Creek. However, in one testing location at Crow Creek, a dense bearing stratum was not encountered to the testing termination depth of 160 feet. For all build options, the Crow Creek area presents increased geotechnical challenges due to the lack of dense bearing material.

Minor liquefaction can be expected at all structure locations. Liquefaction mitigation will likely be required for the Ninepipe Reservoir bridge and the structures in the Crow Creek area. Mitigation may also be needed at the kettle pond structures to reduce slope instability. Greater total settlement can be expected at the Ninepipe Reservoir and Crow Creek bridges, with less settlement expected at the kettle pond locations. It

will likely be necessary to surcharge the embankments at the Ninepipe Reservoir and Crow Creek locations, with the surcharge needing to remain in place for about 3 to 9 months.

In general, longer structures and steeper slopes present greater geotechnical challenges compared to shorter structures and flatter slopes. Option C-1 would present moderate geotechnical challenges due to the 660-foot bridge at the Ninepipe Reservoir and the 120-foot and 150-foot bridges at Crow Creek. Option C-2 would present the most geotechnical challenges due to the combination of a 660-foot bridge at the Ninepipe Reservoir, 800-foot bridges at each of the kettle ponds, a 500-foot bridge at Crow Creek, and steepened fill slopes throughout the corridor. Option C-3 would present moderate geotechnical challenges, with the shorter 300-foot Ninepipe Reservoir bridge and single 110-foot bridges at the kettle ponds offset by the 500-foot Crow Creek bridge and steepened 3:1 fill slopes.

While the roadway and associated structures can be designed to mitigate risks from geotechnical factors, mitigation can be costly, inefficient, or difficult to construct. During design it will be necessary to maintain close coordination with geotechnical engineers and the bridge design team to ensure span lengths and required foundations can be supported by the existing soils. For this planning-level structural analysis, it was assumed that the existing soils can withstand the loads of the proposed structures, although larger foundations or deeper pipe piles are anticipated for longer span bridges to withstand seismic events and provide adequate support. A full geotechnical analysis will be required during future design phases to verify planning-level assumptions. Additional geotechnical analyses will be needed to confirm the feasibility of the proposed SUP crossings and to confirm soil stability and foundation type and size needed for the overpass. Unaddressed geotechnical issues could cause problems during construction and reduce the service life of the structures.

5B. CONSTRUCTION FEASIBILITY

This criterion assessed the constructability of each option based on overall ease of construction, including the potential need for specialized equipment or materials.

Findings and Support

In general, specialized equipment is typically needed to erect longer, multi-span structures. For example, deeper and heavier beams required for longer bridges require a larger crane compared to shorter, lighter, and shallower beams. Larger spans also require larger foundations, so larger pile driving equipment may be necessary to drive larger diameter piles deeper compared with a shorter bridge with a comparatively reduced load placed on the foundations. Transporting larger equipment and construction materials also becomes more challenging. The need for specialized equipment and increased material makes longer, multi-span structures more costly to construct. In terms of constructability, all proposed bridges can be constructed using typical construction methods.

Constructability of a wildlife overpass north of the Post A Canal is generally favorable. Since the structure would most likely be constructed with a prefabricated arch, structural design of the arch would be completed by the supplier. However, the holistic design of the structure to appropriately accommodate wildlife including width, ramp design, and vegetation would need to be coordinated with wildlife experts to ensure maximum functionality. Construction of the overpass and associated elements is unlikely to require special equipment or expertise and can be completed relatively quickly.

Option C-1 would be moderately challenging to construct due to the 660-foot bridge at the Ninepipe Reservoir. Option C-2 would be the most challenging to construct due to the combination of a 660-foot bridge at the Ninepipe Reservoir, 800-foot bridges at each of the kettle ponds, and a 500-foot bridge at Crow Creek, with steepened fill slopes throughout the corridor. Option C-3 is expected to be moderately challenging to construct due to the shorter 300-foot Ninepipe Reservoir bridge, favorable conditions for construction of an overpass, and single 110-foot bridges at the kettle ponds offset by the 500-foot Crow Creek bridge and steepened fill slopes, which would add construction challenges.

5C. CONSTRUCTION IMPACTS

This criterion evaluated the expected impacts to the traveling public during construction based on the amount of temporary right-of-way or easements required, detour requirements, and anticipated duration of construction. Impacts during construction were assessed on a qualitative basis using the preliminary roadway designs prepared for each option, past construction experience, and engineering judgment.

Findings and Support

During construction, temporary detours and access modifications would likely be required to move traffic through the project area. Construction of new bridges would likely involve building temporary structures and parallel detours adjacent to US 93 during construction, and roadway widening would likely involve maintenance of traffic parallel to active work areas. The duration of construction may vary depending on a variety of factors including structure size and length, resource mitigation requirements, land acquisition needs, or unknown site conditions. In general, longer bridge structures would likely require construction of longer parallel detour routes around surface waters. Longer structures take more time to construct, increasing travel time impacts and delays for travelers. For all options, one lane of traffic in each direction at reduced travel speeds would likely be maintained most of the time to minimize delays and travel time impacts. Short periods of stopped traffic may be required to allow trucks and equipment to enter and exit construction zones and to facilitate other construction operations. Due to the elevated roadway grades required to provide adequate vertical clearance for new structures, multiple accesses throughout the corridor would be impacted as described under Criterion 4C. Temporary access during construction would need to be provided for the Ninepipes Lodge/Museum, Beaverhead Drive, Creekside Lane, and multiples residences/businesses adjacent to the highway.

Option C-1 would result in moderate construction impacts due to the 660-foot bridge at the Ninepipe Reservoir coupled with shorter structures at the kettle ponds and Crow Creek. Option C-2 would result in the greatest construction impacts due to the longest combination of bridges, including the 660-foot bridge at the Ninepipe Reservoir, 800-foot bridges at each of the kettle ponds, and a 500-foot bridge at Crow Creek. Detours would be provided around the kettle ponds to allow traffic to continue moving through the work zone. The detour routes could be reclaimed for construction of the SUP. Option C-3 is expected to be the least impactful during construction due to the shorter 300-foot Ninepipe Reservoir bridge, favorable conditions for construction of an overpass, and single 110-foot bridges at the kettle ponds (although the 500-foot Crow Creek bridge would increase construction impacts). For all options, travel would likely be maintained within the construction limits, with active work zones parallel to detour routes.

5D. CONSTRUCTION REQUIREMENTS

This criterion was scored based on anticipated permitting needs and environmental mitigation requirements for each option. This criterion also assessed temporary construction impacts such as easements or temporary right-of-way which may be needed to accommodate detours through work zones or other impacts during construction.

Findings and Support

The MDT standard specifications place numerous restrictions on contractor activities to avoid and minimize impacts on adjacent natural resources. Compensation for unavoidable permanent impacts on wetlands would involve mitigation to offset the impacts to satisfy CSKT, USACE, USFWS, MFWP, and Montana Department of Environmental Quality (MDEQ) mitigation requirements. Wetland mitigation strategies and estimates of wetland mitigation credits would be determined in cooperation with these agencies. Depending on any special circumstances, above and beyond typical project requirements, permitting and mitigation can add to project costs and delay implementation.

All build options would impact wetlands and therefore would require wetland permitting and mitigation. Due to the steepened fill slopes, Options C-2 and C-3 would result in fewer wetland impacts compared to Option C-1, resulting in reduced mitigation requirements. MDT maintains separate crediting ledgers for USACE and CSKT to meet mitigation requirements. These requirements and compensation ratios are generally

described in the *Wetland Impacts and Mitigation* memo. If projects advance from the feasibility study, specific compensatory wetland mitigation strategies would be determined during a future design phase.

All options are anticipated to require permits, as outlined in Section 1.7.2 of the SEIS, for modification of irrigation canal crossings, discharge or fill in waters or wetlands, disturbance to streams, sediment discharge during construction, floodplain encroachment, and development of materials source sites. Additionally, all options would require consultation with the CSKT, USFWS, and MFWP regarding the design of wildlife accommodations and mitigation for impacts to threatened and endangered and special status species. Additional environmental documentation would also be needed to satisfy National Environmental Policy Act requirements.

No temporary right-of-way or easements are anticipated due to the likelihood that the total construction footprint should be able to accommodate parallel detours adjacent to the primary work zones. Areas used for construction detours around the kettle ponds would be permanently acquired for the SUP alignment.

SCREENING CRITERION 5 – SCORING AND JUSTIFICATION

Table 11 provides a summary of the findings and support discussed for each corridor option under each of the constructability sub-criteria. Scores for each sub-criteria as well as a subtotal score for the constructability criteria are also provided.

Table 11: Screening Criterion 5: Constructability – Scoring Results

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
5A. Geotechnical Considerations	Moderate geotechnical challenges due to 660-ft bridge at Ninepipe Reservoir and 120-ft/150-ft bridges at Crow Creek.	Most geotechnical challenges due to 660-ft bridge at Ninepipe Reservoir, 800-ft bridges at kettle ponds, 500-ft bridge at Crow Creek, and steepened fill slopes throughout corridor.	Moderate geotechnical challenges due to 300-ft bridge at Ninepipe Reservoir, 110-ft bridges at kettle ponds, 500-ft bridge at Crow Creek, and steepened fill slopes throughout corridor.
Score *(Out of 5)*	4	2	3
5B. Construction Feasibility	Moderate construction challenges due to 660-ft bridge at Ninepipe Reservoir.	Most challenging to construct due to 660-ft bridge at Ninepipe Reservoir, 800-ft bridges at kettle ponds, 500-ft bridge at Crow Creek, and steepened fill slopes.	Moderate construction challenges due to 300-ft bridge at Ninepipe Reservoir, 110-ft bridges at kettle ponds, 500-ft bridge at Crow Creek, and steepened fill slopes.
Score *(Out of 5)*	3	2	3
5C. Construction Impacts	Moderate construction impacts, with travel likely maintained on routes parallel to US 93 within construction limits. Some travel delays expected due to reduced speeds in work zones.	Greatest construction impacts due to largest structures. Some travel delays expected due to reduced speeds in work zones. Adjacent detours needed around kettle ponds.	Moderate construction impacts, with travel likely maintained on routes parallel to US 93 within construction limits. Some travel delays expected due to reduced speeds in work zones. Adjacent detours needed around kettle ponds.
Score *(Out of 5)*	3	2	3
5D. Construction Requirements	Permitting, additional environmental documentation, and mitigation would be required.	Permitting and additional environmental documentation would be required. Reduced wetland mitigation compared to C-1.	Permitting and additional environmental documentation would be required. Reduced wetland mitigation compared to C-1.
Score *(Out of 5)*	2	3	3
SUBTOTAL	12	9	12

4.2.7. Screening Criterion 6: Cost

Funding for improvements within the Ninepipe segment may come from a variety of sources including federal, state, or local sources. The following sections summarize the cost considerations and the screening methodology applied for each of the sub-criterion.

6A. COST OF IMPROVEMENTS

Planning-level cost estimates prepared for each of the options based on the preliminary roadway profile and structure configurations were used for assessment of this criterion. The cost is inclusive of design, construction, utilities, drainage, right-of-way acquisition, and mitigation costs. Contingencies were added to account for unknown factors at the planning-level stage, however actual costs may vary due to changed conditions at the time of future construction. Additional cost information is provided in **Appendix C**.

Findings and Support

Table 12 provides estimated project costs in 2022, 2027, and 2032 dollars to illustrate inflated costs depending on the year of expenditure. Unit pricing reflects MDT 2021 average bid prices. For 2027 and 2032 estimates, 3% annual inflation was assumed.

Option C-1 is moderately costly, given the 660-foot structure at the Ninepipe Reservoir and the two structures at each of the kettle ponds and at Crow Creek. Option C-2 is the costliest option due to long structures in all locations. In addition to greater amounts of material, the need for specialized equipment and long detours makes longer, multi-span structures more costly to construct. Additionally, removing all the material underneath the 800-foot structures under Option C-2 would be more costly compared to removing one or two smaller sections of embankment to construct a single bridge at each of the kettle pond locations under Options C-1 and C-3. Option C-3 is the least costly option. Although the introduction of a wildlife overpass adds cost, it is offset by the shorter bridge at the Ninepipe Reservoir and the single bridge at each of the kettle ponds.

Table 12: Estimated Cost of Improvements

Option	Estimated Cost of Improvements		
	2022$	2027$	2032$
C-1: SEIS Preferred	$90.2 Million	$104.7 Million	$121.3 Million
C-2: Enlarged Wildlife Crossing Structures	$138.0 Million	$160.0 Million	$185.5 Million
C-3: Wildlife Overpass Configuration	$86.2 Million	$100.0 Million	$115.9 Million

Source: RPA, MDT 2021 average bid prices. Assumes 3% inflation per year for future costs.

6B. MAINTENANCE NEEDS/COST

Assessment of this criterion included a qualitative analysis of maintenance needs and evaluation of ongoing long-term costs for each option. Maintenance responsibility for the new SUP was also considered.

Findings and Support

Long-term road maintenance activities necessary to maintain the newly reconstructed US 93 corridor include weed control, snow and ice removal, storm drain, culvert and bridge repair/cleaning, striping, and asphalt repair. These maintenance activities are already conducted in the corridor and are not expected to increase substantially with the new roadway configuration, with the possible exception of increased maintenance for new and larger wildlife crossing structures. Slightly more maintenance may be required for Options C-2 and C-3 due to the retaining walls and guardrails needed where 2:1 fill slopes are constructed.

Option C-2 would require the most structural maintenance, with more than 130,000 ft^2 of total bridge deck compared to approximately 50,000 ft^2 of bridge deck for Options C-1 and C-2. Maintenance of the new overpass structure in Option C-3 is expected to be minimal, requiring regular structural inspection and possible irrigation of vegetation on the structure depending on the landscape design, maturity of vegetation,

and rainfall conditions. Maintenance responsibility could possibly be shared with or provided by another entity.

All options would construct a new SUP, which would require winter maintenance to remove snow and ice, as well as general maintenance to preserve the surfacing. SUP route length would be slightly longer under Options C-2 and C-3 due to the eastern alignment around the kettle ponds and Mission Mountains Viewpoint.

Extended construction periods associated with longer structures would require detours and temporary structures to be in service for longer periods, requiring lengthier periods of maintenance.

6C. COST EFFECTIVENESS

This criterion assessed the cost-effectiveness of each option based on an analysis of the benefits of improvements compared to costs, using the screening results for the previous criteria as justification. While some options may provide significant benefits, the associated costs may be much higher. Although sometimes difficult to quantify benefits over the life of the project, it is desirable for benefits to exceed costs to deliver a cost-effective project. While the planning-level cost only considered capital costs, a high-level determination of on-going maintenance costs and economic impacts was also considered in this analysis. Overall project cost may be considered as a potentially prohibitive factor when applicable.

Findings and Support

In terms of transportation, the three build options have little, if any, variation in cost-effectiveness. The options may experience marginally improved operations with the inclusion of turn lanes at intersections, however, the benefits of the turn lanes compared to the cost of added roadway width in these locations is difficult to quantify. For safety, all build options include widened shoulders as well as centerline and shoulder rumble strips which are all expected to improve safety in a similar manner. The inclusion of 2:1 fill slopes in C-3 could potentially increase fixed object crashes with guardrail and increase costs due to installation of guardrail and retaining walls, though the impact is expected to be minimal. Inclusion of a SUP in C-1, C-2, and C-3 is anticipated to provide a significant benefit to the safety and comfort of non-motorists. The cost-effectiveness of the path would increase with more use.

While inclusion of wildlife mitigation measures in reconstruction projects can be costly, the cost of WVCs is also substantial to the lives of humans and wildlife. A cost-benefit analysis performed for the wildlife mitigation measures on US 93 south of the Ninepipe segment found that the mitigation measures did not generate monetary benefits in excess of their costs, based on human safety parameters alone.[8] A cost-benefit analysis researching wildlife safety parameters (specifically deer mortality) concluded that wildlife fencing with underpasses yielded a benefit-cost ratio (BCR) of 6.1, fencing with overpasses yielded a BCR of 1.3, and fences with a combination of under and overpasses yielded a BCR of 4.7.[10] This research notes that benefits associated with enhanced habitat connectivity for large under and overpasses was difficult to monetize and was therefore not included in the analysis. Grizzly bear specific research was also not conducted, so additional monetary benefits could be realized from these mitigation measures given the size and threatened status of the species and the anticipated reduction in WVCs involving grizzly bears.

While difficult to monetize costs of environmental impacts, options with fewer acres of impacted wetlands (see Screening Criterion 2b) are expected to be more cost-effective. Reduced impacts are not only beneficial for the value and function of wetlands, but also reduce potential wetland mitigation costs. Similarly, options with reduced right-of-way impacts (see Screening Criteria 5d and 6a) are anticipated to be more cost-effective due to lower right-of-way acquisition costs and reduced impacts to adjacent properties.

Although regular maintenance is an additional expense, maintenance is needed for all highway projects to ensure continued operations and safety. All build options are expected to require similar levels of maintenance for the general roadway and SUP. Slightly more maintenance may be required for Options C-2 and C-3 due to the retaining walls and guardrails needed where 2:1 fill slopes are constructed. In general, large underpass structures are expected to be more costly for maintenance due to their size and the time

required to inspect the structures. Any structures with in-stream piers will also require more regular maintenance. Minimal maintenance would be required for the new overpass structure in Option C-3, with the possibility of shared maintenance with MFWP.

During construction of any of the build options, the local economy would benefit from an infusion of construction dollars and increased demand for goods and services by construction workers. These economic benefits are expected to end shortly after construction is complete when the demand for construction materials subsides and workers move on to other jobs. During construction, temporary delays and changes in or loss of access to adjacent businesses may also occur which could have short-term economic effects. Long-term economic effects from implementation of any of the build options (C-1 through C-3) are expected to be minor because the project would not generate employment, result in significant increases in traffic, or have a substantial effect on tourism. Some modifications to access for the properties north of Beaverhead Lane are anticipated to accommodate the raise in roadway grade for the structures at Crow Creek in all build options, however economic impacts are not anticipated.

6D. FUNDABILITY

This criterion assessed the overall fundability of the options. The ability to advance recommendations from this study and develop projects on US 93 depends on the availability of future funding.

Findings and Support

As a National Highway System (NHS) Non-Interstate route, improvements to US 93 would qualify for multiple federal sources. Federal-aid highway funds apportioned to Montana are allocated across the state typically based on system performance. MDT generally uses National Highway Performance Program (NHPP) funds to support highway construction of NHS routes. However, program funding is greatly outpaced by need. In the Missoula District, it will currently take through at least 2035 to fund all of the already programmed projects. New projects that haven't been programmed will take many years before they can be funded.

Improvements to the corridor may be eligible under a variety of federal discretionary programs aimed at funding significant transportation safety and operational improvement projects. The *Bipartisan Infrastructure Law* (BIL) signed into law on November 15, 2021, funded a variety of new and existing competitive grant funding programs. Additional information is provided in *A Guidebook to the Bipartisan Infrastructure Law for State, Local, Tribal, and Territorial Governments, and Other Partners*[17].

- *Rebuilding American Infrastructure with Sustainability and Equity (RAISE)*: Provides grants for surface transportation infrastructure projects that will have a significant local or regional impact.
- *National Infrastructure Project Assistance Program (MEGA)*: Provides grants to surface transportation infrastructure that are too large or complex for traditional funding programs that will have a significant national or regional impact.
- *Rural Surface Transportation Grant Program*: Provides grants for projects to improve and expand the surface transportation infrastructure in rural areas to increase connectivity, improve the safety and reliability of the movement of people and freight, and generate regional economic growth and improve quality of life.
- *Bridge Investment Program*: Provides grants for projects to improve the condition of bridges and culverts and the safety, efficiency, and reliability of the movement of people and freight over bridges.
- *Tribal High Priority Projects Program*: Provides grants to Tribes or a governmental subdivision of a Tribe whose annual allocation of funding received under the Tribal Transportation Program is insufficient to complete the highest priority project of the Tribe, or to any Tribe that has an emergency or disaster occur on a Tribal transportation facility that renders the facility impassible or unusable.
- *Nationally Significant Federal Lands and Tribal Projects (NSFLTP)*: Provides grants to Tribes and Federal land management agencies to complete projects that will provide substantial benefits to their communities or parklands.

- *Wildlife Crossings Pilot Program*: Provides grants to support projects that seek to reduce the number of WVCs, and in carrying out that purpose, improve habitat connectivity for terrestrial and aquatic species.

Generally, high-cost projects may take a longer time (10 to 20 years) to implement, depending on availability of funding, while lower-cost improvements are generally easier to implement in the short term (0 to 10 years). Projects that provide ample benefits while minimizing environmental impacts are generally more favorable to receive funding from limited sources, including discretionary federal programs. Options that are favorable for discretionary funding sources were scored higher. Currently, no funding has been identified by MDT to complete any of the improvement options identified in this study.

It may be possible to pursue partnerships, grants, and other innovative funding opportunities for projects overlapping between MDT right-of-way and adjacent tribal, state, and federal lands. Specifically, the overpass proposed under Option C-3 would offer an opportunity for MDT to partner with MFWP and CSKT for the design, construction, long-term maintenance, and wildlife usage monitoring. Improvements that are favorable for partnerships or other innovative funding sources were scored higher.

SCREENING CRITERION 6 – SCORING AND JUSTIFICATION

Table 13 provides a summary of the findings and support discussed for each corridor option under each of the cost sub-criteria. Scores for each sub-criteria as well as a subtotal score for the cost screening criteria are also provided.

Table 13: Screening Criterion 6: Cost – Scoring Results

Sub-Criteria	C-1: SEIS	C-2: Enlarged Crossings	C-3: Wildlife Overpass
6A. Cost of Improvements	Lower cost compared to C-2.	Highest capital costs.	Lower cost compared to C-2.
Score *(Out of 5)*	③	①	③
6B. Maintenance Needs/Costs	Maintenance for SUP and new structures.	Maintenance for SUP and new structures (longer than C-1).	Maintenance for SUP and new structures, minimal maintenance for overpass, opportunity for shared responsibility.
Score *(Out of 5)*	③	②	③
6C. Cost Effectiveness	Similar cost to C-3 but with fewer benefits and more impacts.	Moderate impacts, moderate environmental benefits, 1.5 times the cost of C-3.	Greatest wildlife accommodation benefits, moderate environmental benefits, moderate impacts, lowest capital costs.
Score *(Out of 5)*	②	②	④
6D. Fundability	Somewhat more likely to be funded compared to C-2 due to higher BCR. Low potential for partnerships.	Lower likelihood of funding due to low BCR.	BCR favors funding. Potential partnership opportunity with MFWP for overpass.
Score *(Out of 5)*	③	②	④
SUBTOTAL	11	7	14

5.0. SCREENING SUMMARY

Table 14 provides a summary of the scores allocated to each corridor option. A more detailed description of each of the sub-criteria as well as findings and support for each score were provided in **Section 4.2**. As shown in the table below, Option C-3 received the highest overall score (70 out of 100 points) and also scored the highest or tied for the highest score in all screening categories except ecological environment. Options C-1 and C-2 scored similarly (52 and 57 points out of 100, respectively) with C-2 scoring slightly higher due to superior operational, ecological, and fish and wildlife elements.

Table 14: Corridor Option Screening Summary

Screening Criteria		Sub-Criteria		Total Possible Points	C-1: SEIS	C-2 Enlarged Crossings	C-3: Wildlife Overpass
1	Transportation	1a.	Operations	5	3	4	4
		1b.	Safety	5	3	3	4
			Transportation Subtotal	10	6	7	8
2	Ecological Environment	2a.	Hydraulic Performance	5	2	4	3
		2b.	Wetlands	5	2	4	3
		2c.	Surface Water Resources	5	3	4	4
			Ecological Environment Subtotal	15	7	12	10
3	Fish and Wildlife	3a.	Aquatic Accommodations	5	3	3	4
		3b.	Terrestrial Accommodations	5	2	4	5
		3c.	Habitat	5	2	3	4
		3d.	Threatened and Endangered Species	5	2	4	5
			Fish and Wildlife Subtotal	20	9	14	18
4	Human Environment	4a.	Cultural and Recreational Resources	5	3	4	4
		4b.	Visual Quality	5	3	2	2
		4c.	Adjacent Properties	5	1	2	2
			Human Environment Subtotal	15	7	8	8
5	Constructability	5a.	Geotechnical Considerations	5	4	2	3
		5b.	Construction Feasibility	5	3	2	3
		5c.	Construction Impacts	5	3	2	3
		5d.	Construction Requirements	5	2	3	3
			Constructability Subtotal	20	12	9	12
6	Cost	6a.	Cost of Improvements	5	3	1	3
		6b.	Maintenance Needs/Cost	5	3	2	3
		6c.	Cost-Effectiveness	5	2	2	4
		6d.	Fundability	5	3	2	4
			Cost Subtotal	20	11	7	14
			Total Score	100	52	57	70

5.1. Feasibility Determination and Recommendation

All three options are likely feasible to implement. There are no known conditions that would prohibit construction of any of these options including proposed bridge structures given adequate funding availability. A summary of the tradeoffs between benefits and disadvantages is provided below.

- Option C-1, the SEIS preferred option, primarily received scores of '3' in each of the sub-criterion, demonstrating a relative balance of benefits and disadvantages. This supports the findings of the SEIS. A score of 1 was awarded under Criterion 4C due to the location of a building within the

construction footprint for standard 6:1 fill slopes, although a slope adjustment could be pursued if this option were advanced.

- Option C-2 was developed to better accommodate wildlife passage by incorporating longer bridges with more vertical clearance and reduce impacts to natural resources by incorporating steepened slopes in sensitive areas. C-2 scored higher than C-1 in screening criteria 1 through 3 but scored lower in criteria 4 through 6. This confirms that C-2 provides better fish and wildlife accommodations, reduces impacts to sensitive resources, and provides additional benefits to non-motorists. However, C-2 is more impactful to the human environment due to the larger structures and is likely to be more challenging to fund and construct.
- To develop Option C-3, modifications to C-2 were strategically made to provide wildlife accommodations that would attract greater use, further reduce impacts, improve constructability, and reduce cost. These changes are reflected in the scores for Option C-3. The option scored the same or higher than Options C-1 and C-2 in all categories except screening category 2, ecological environment, due to greater wetland impacts and reduced hydraulic connectivity compared to C-2, and category 4, human environment, due to visual impacts caused by construction of a wildlife overpass and impacts to adjacent properties due to the sizes of the other wildlife crossing structures. Overall, Option C-3 was determined to be the most cost-effective option with the greatest potential for funding due to likely increased competitiveness for discretionary grant programs.

While all options are feasible to implement, Option C-2 is anticipated to be most challenging to construct with a potentially prohibitive cost. While the SEIS preferred option is expected to be feasible in terms of impacts, costs, and constructability considerations, C-3 presents a less impactful option with more benefits and a lower cost. Based on this evaluation, Option C-3 was identified as the preferred option to advance for future project development.

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[14] Ford, A., Barrueto, and Clevenger, Road Mitigation Is a Demographic Filter for Grizzly Bears, Wildlife Society Bulletin; DOI: 10.1002/wsb.828, Accepted June 12, 2017.

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[16] SK Geotechnical, US 93 Ninepipe Corridor Feasibility, Preliminary Geotechnical Analysis, January 4, 2022.

[17] The White House, A Guidebook to the Bipartisan Infrastructure Law for State, Local, Tribal, and Territorial Governments, and Other Partners, undated. Accessed September 2022 at BUILDING-A-BETTER-AMERICA_FINAL.pdf (whitehouse.gov).

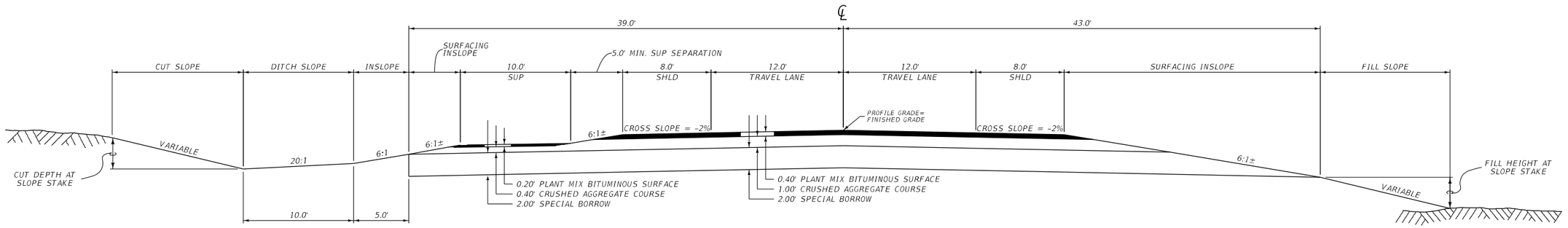
NINEPIPE CORRIDOR 93 FEASIBILITY STUDY

APPENDIX A:

Typical Sections

TYPICAL SECTION NO. 1 - SEIS BASELINE

SUP ADJACENT TO ROADWAY OVER STRUCTURES (REVERSE DIMENSIONS FOR SUP ON RIGHT)



* FILL SLOPES	
0' - 10'	6:1
10' - 20'	4:1
20' - 30'	3:1
OVER 30'	2:1

* BACK SLOPES	
0' - 5'	5:1
5' - 10'	4:1
10' - 15'	3:1
15' - 20'	2:1
OVER 20'	1.5:1

* SEE CROSS SECTIONS FOR DEVIATIONS

NOTE:

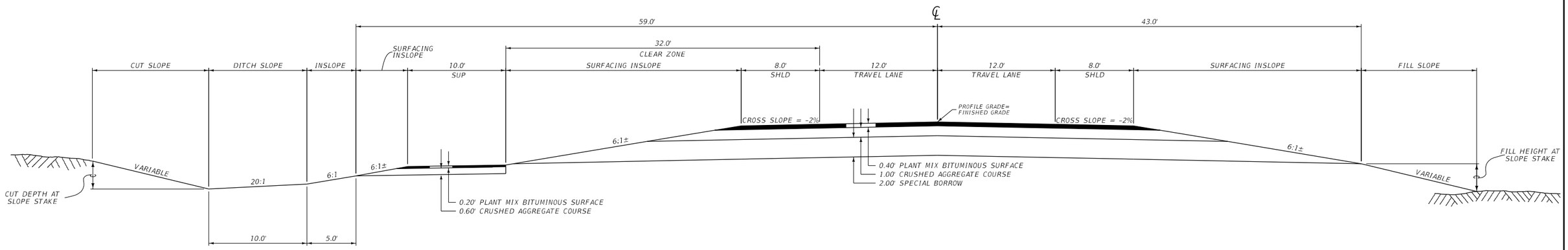
REPRESENTATIVE TYPICAL SECTIONS FOR PLANNING PURPOSES ONLY. ACTUAL TYPICAL SECTIONS MAY VARY. DIMENSIONS ARE APPROXIMATE.

SEPARATION BETWEEN SHOULDER AND SUP MAY INCLUDE BARRIER FOR BRIDGE CROSSINGS.

SUP IS LOCATED ON LEFT (WEST) SIDE FROM 105+00 TO 246+00, AND ON RIGHT (EAST) SIDE FROM 246+00 TO 352+50

TYPICAL SECTION NO. 2 - SEIS BASELINE

SUP LOCATED AT EDGE OF CLEAR ZONE (REVERSE DIMENSIONS FOR SUP ON RIGHT)



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TYPICAL SECTION NO. 3 - STEEPENED FILL SLOPES

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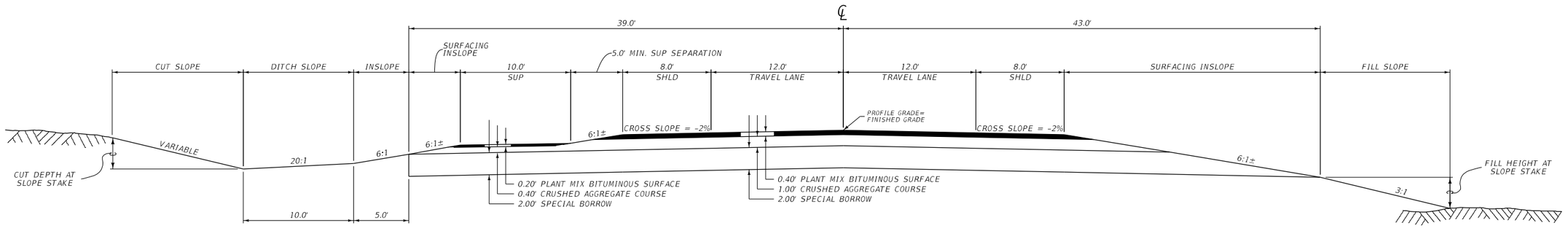

NOTE:

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SEPARATION BETWEEN SHOULDER AND SUP MAY INCLUDE BARRIER FOR BRIDGE CROSSINGS.

TYPICAL SECTION NO. 4 - STEEPENED FILL SLOPES

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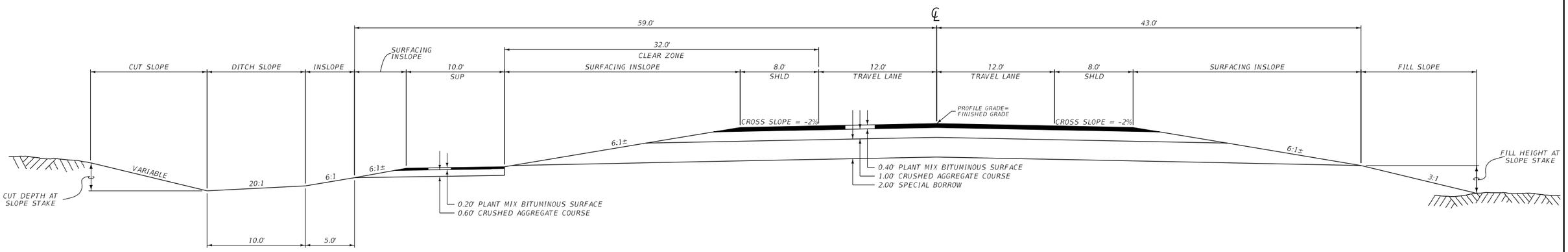

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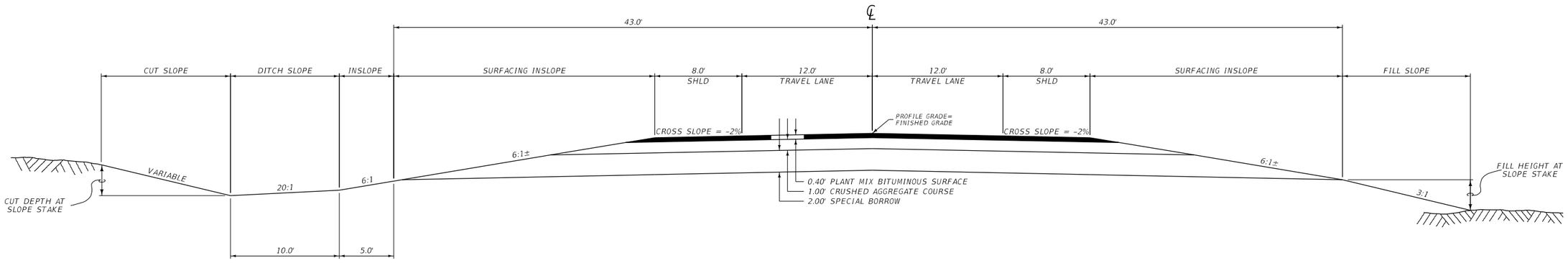
TYPICAL SECTION NO. 5 - SUP ON SEPARATE ALIGNMENT



NOTE:

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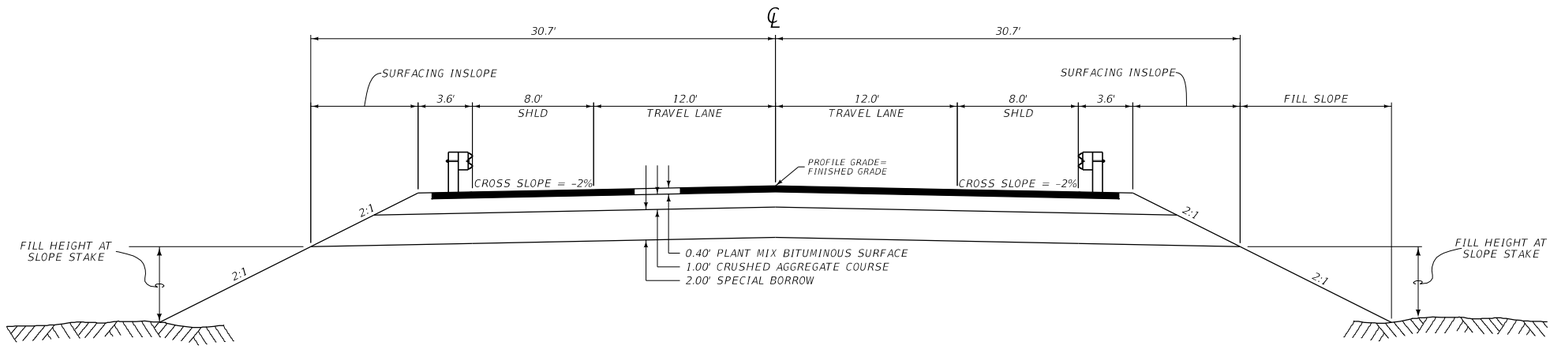
TYPICAL SECTION NO. 6 - GUARDRAIL AT STRUCTURES/SENSITIVE AREAS



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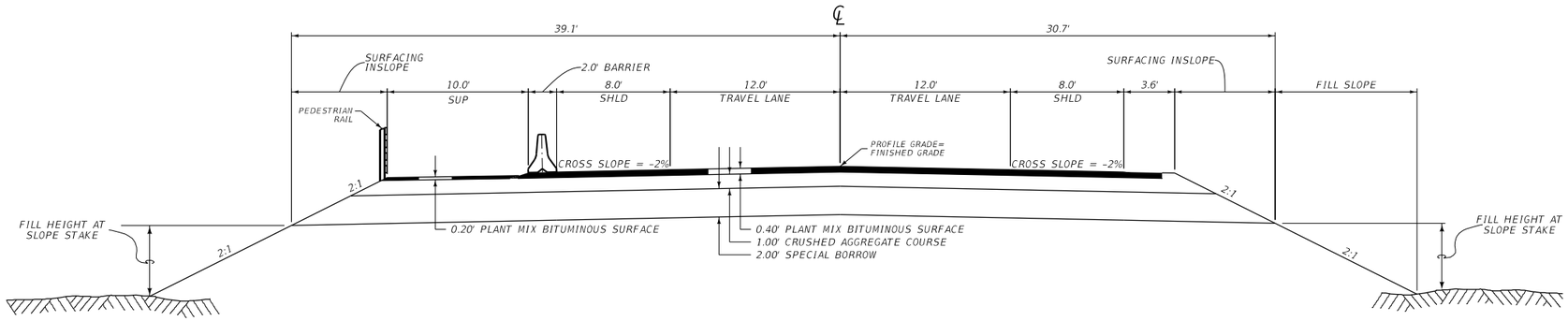
TYPICAL SECTION NO. 7 - GUARDRAIL AT STRUCTURES/SENSITIVE AREAS WITH SUP



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NINEPIPE CORRIDOR 93 FEASIBILITY STUDY

APPENDIX B:
Plan and Profile Sheets for Corridor Options

NINEPIPE CORRIDOR 93 FEASIBILITY STUDY

C-1: SEIS Preferred

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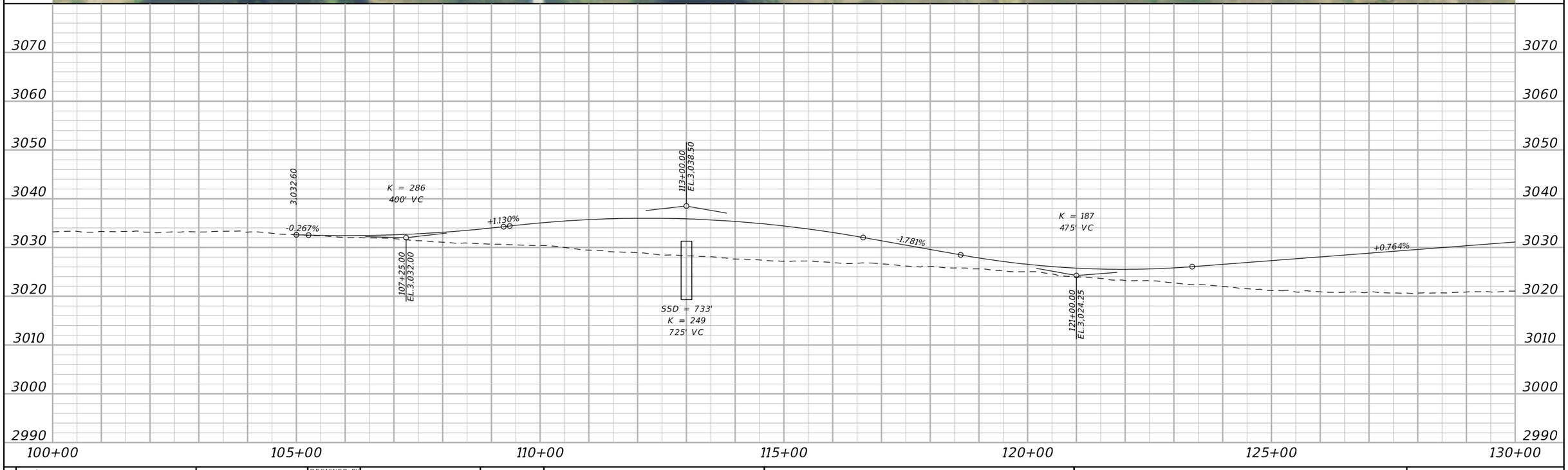

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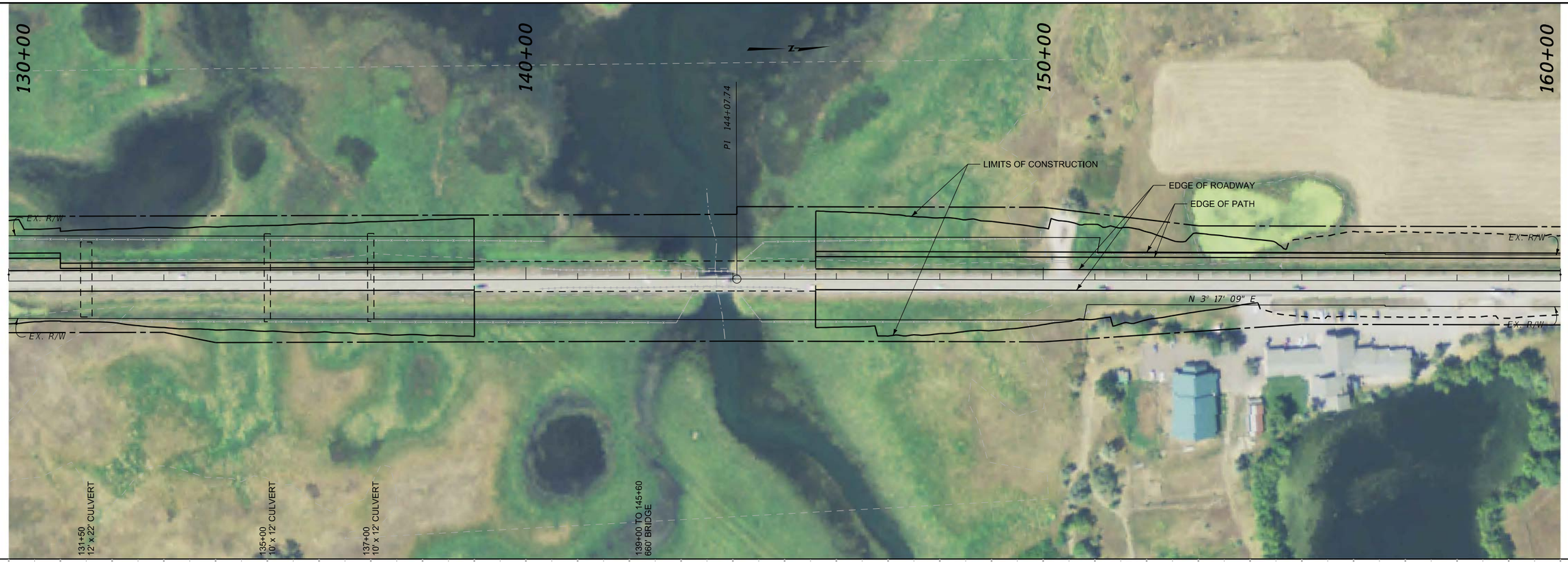

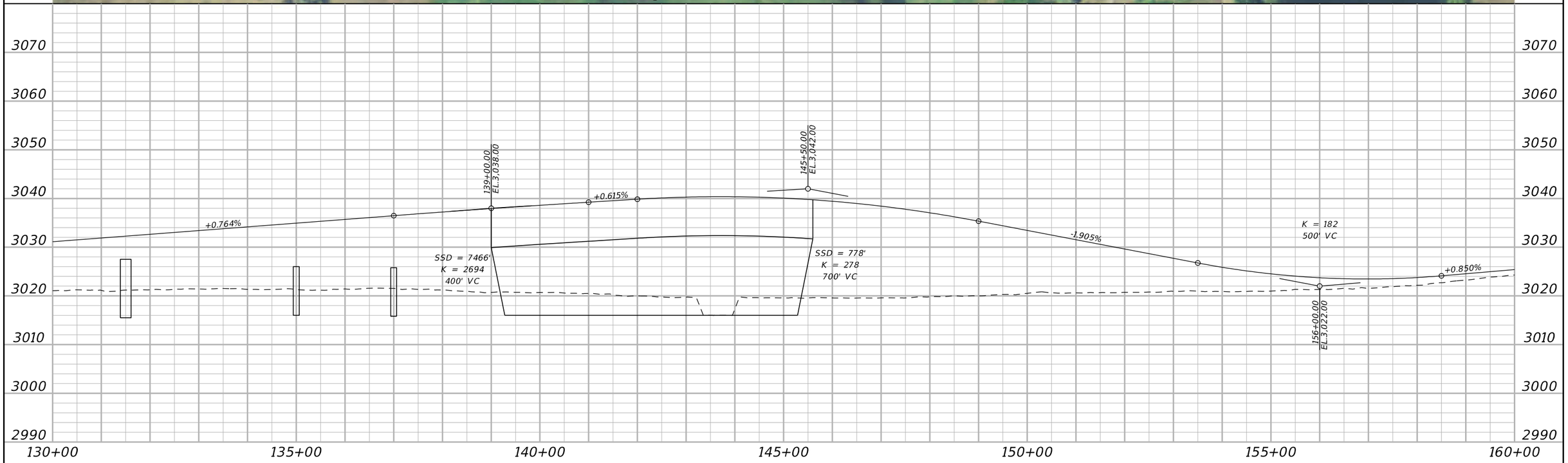

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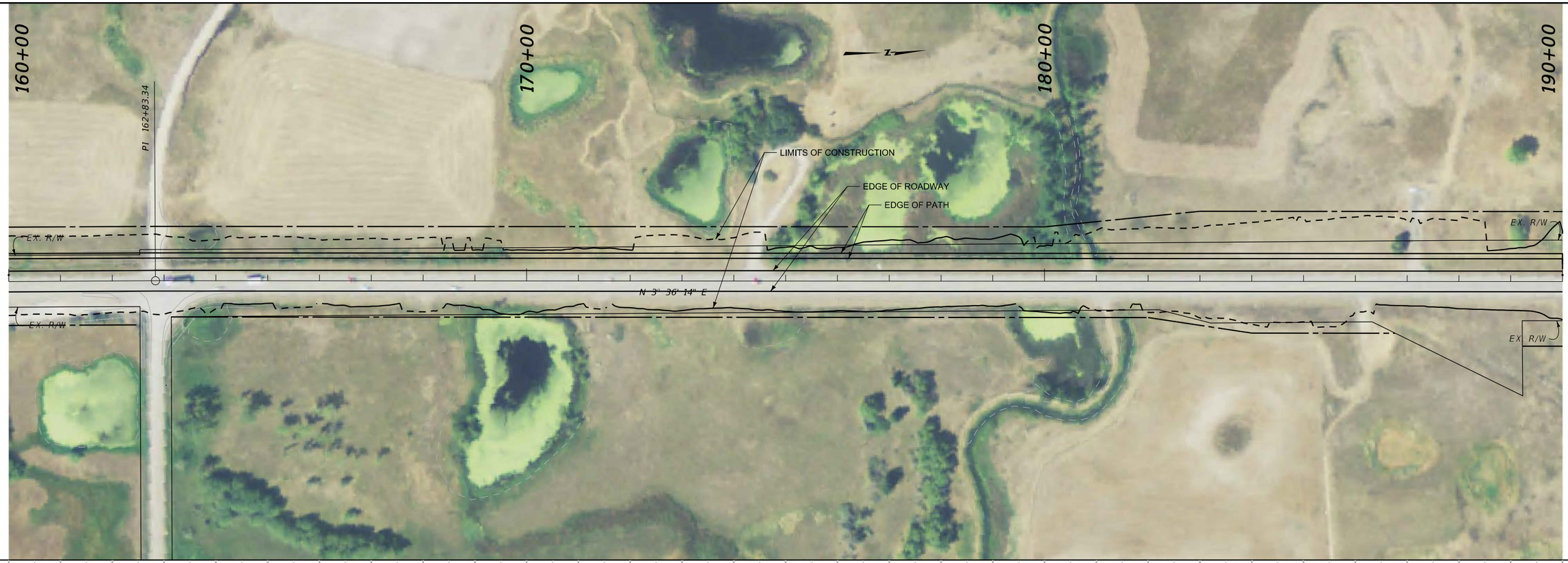

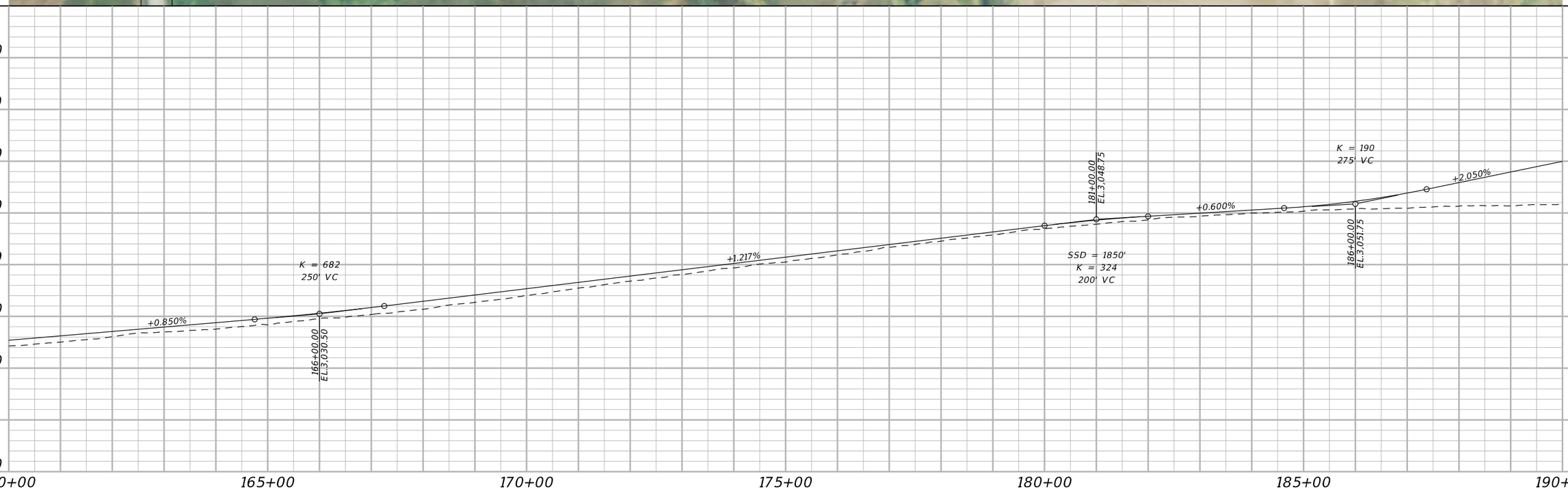

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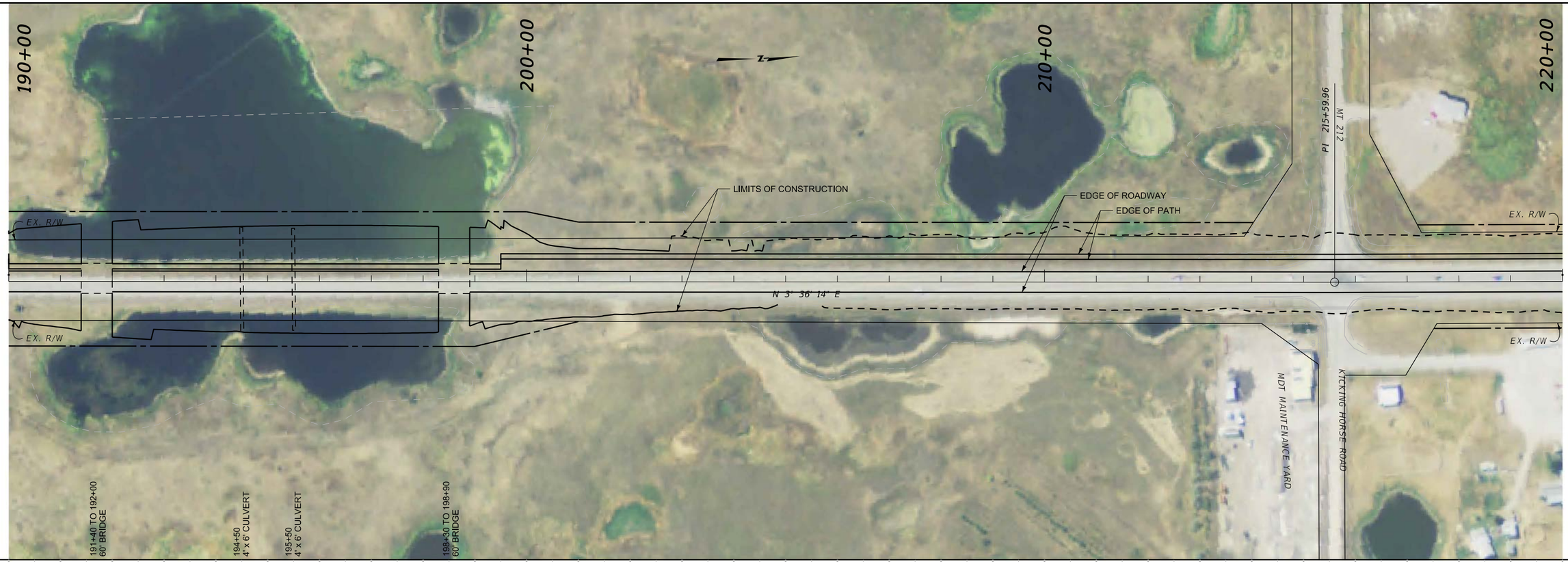

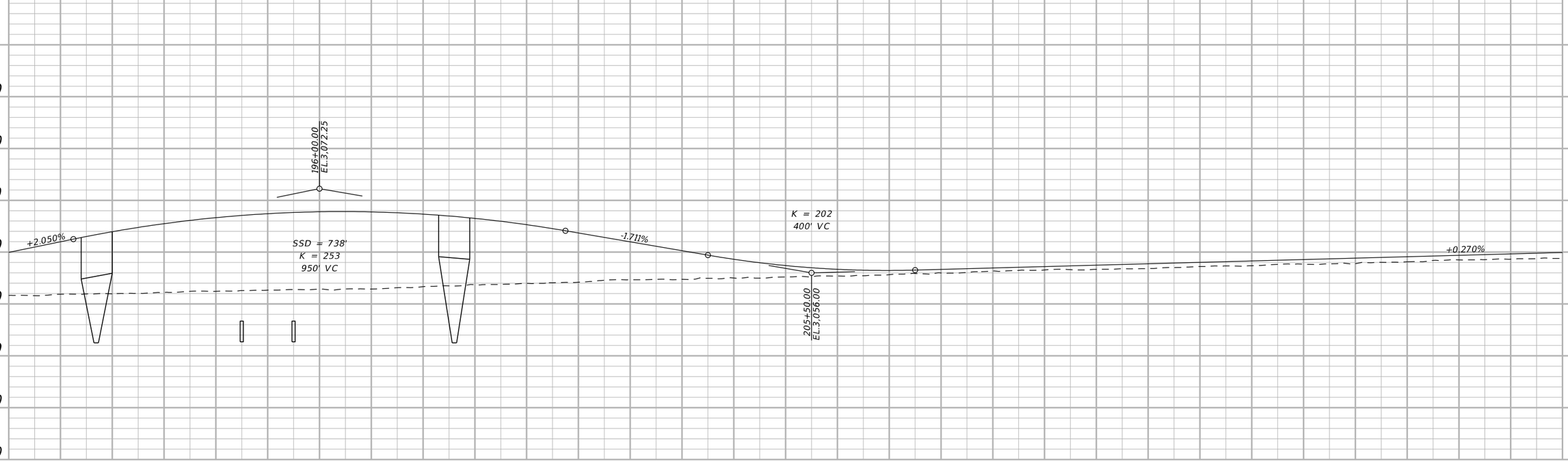

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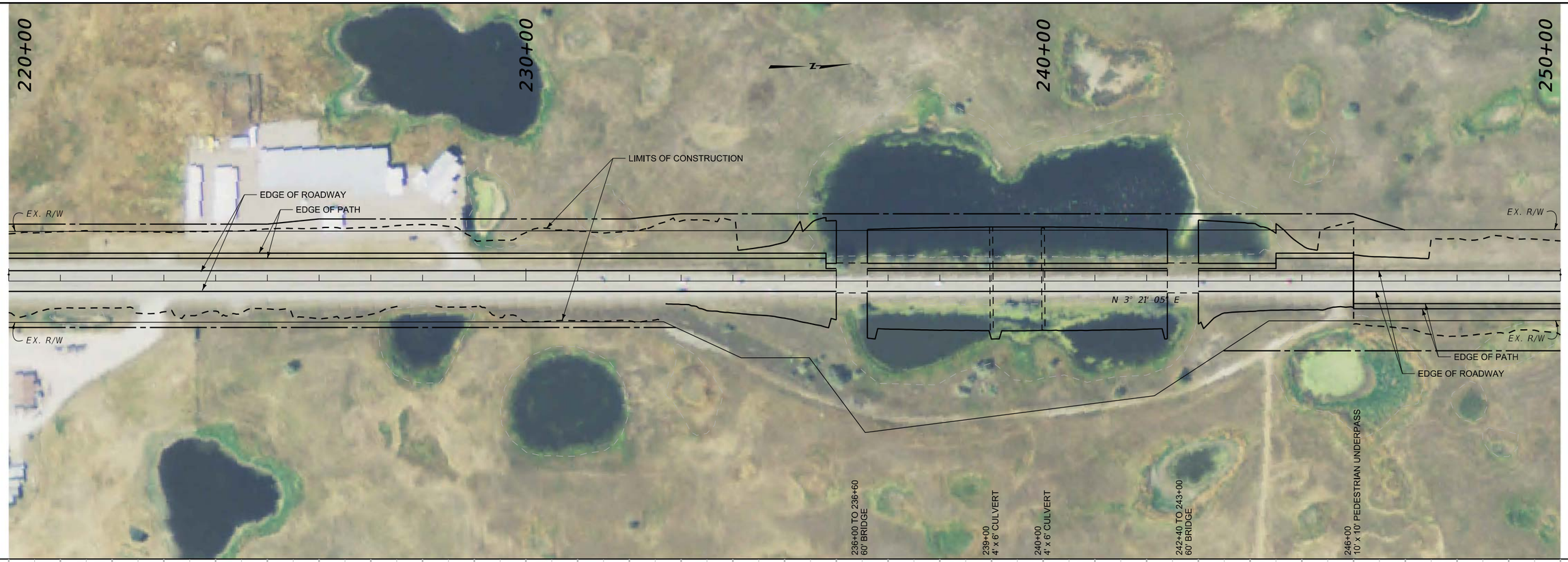

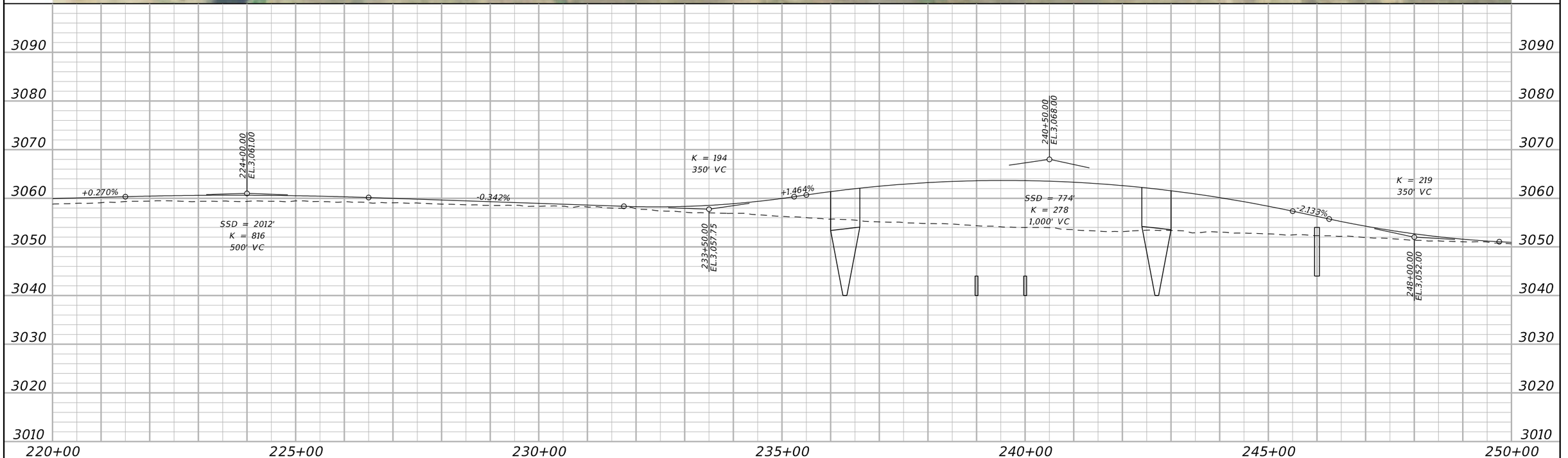

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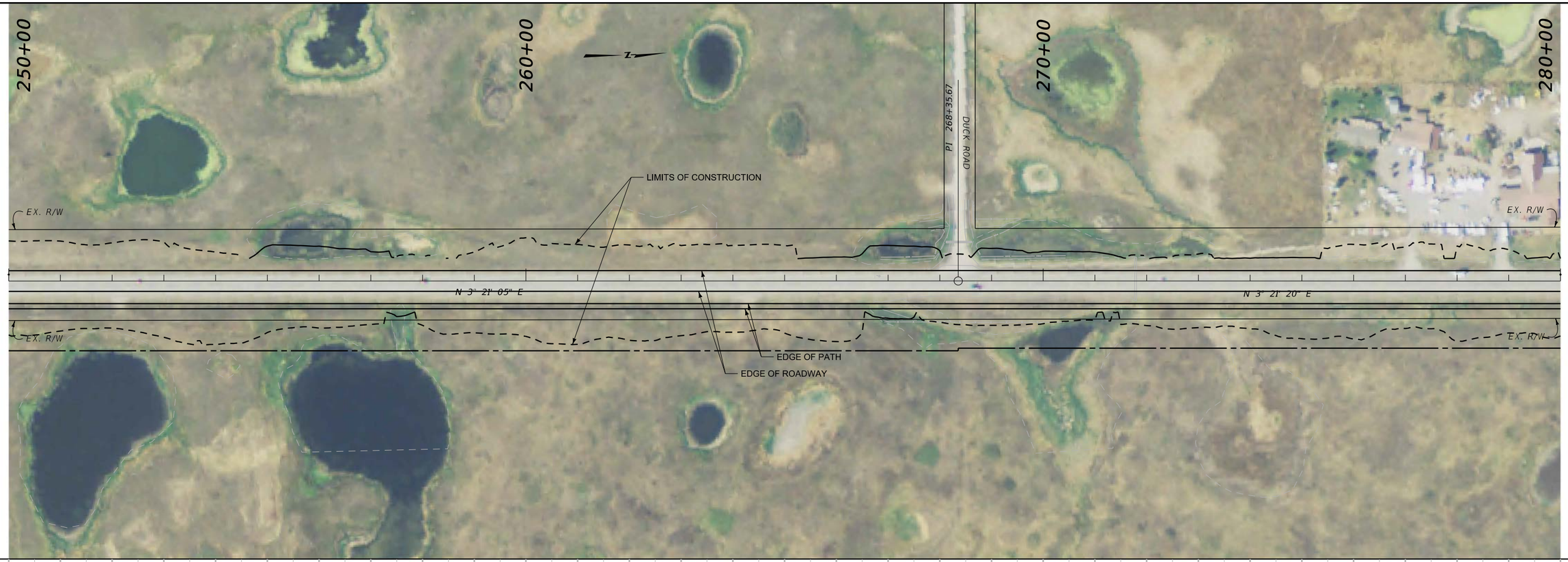

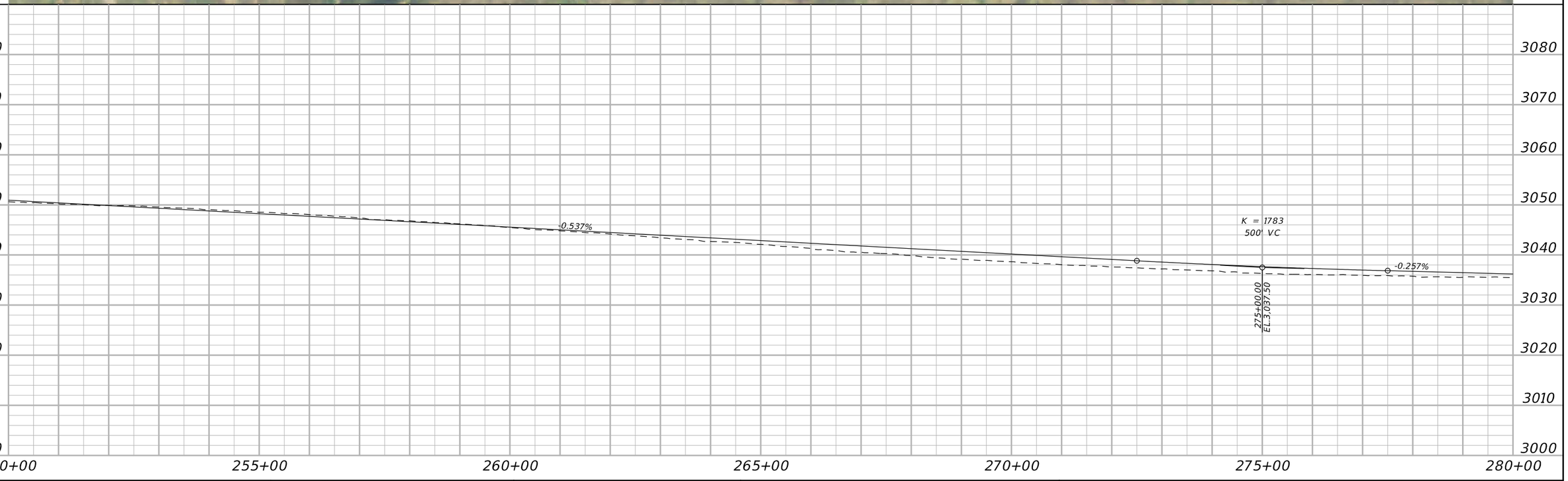

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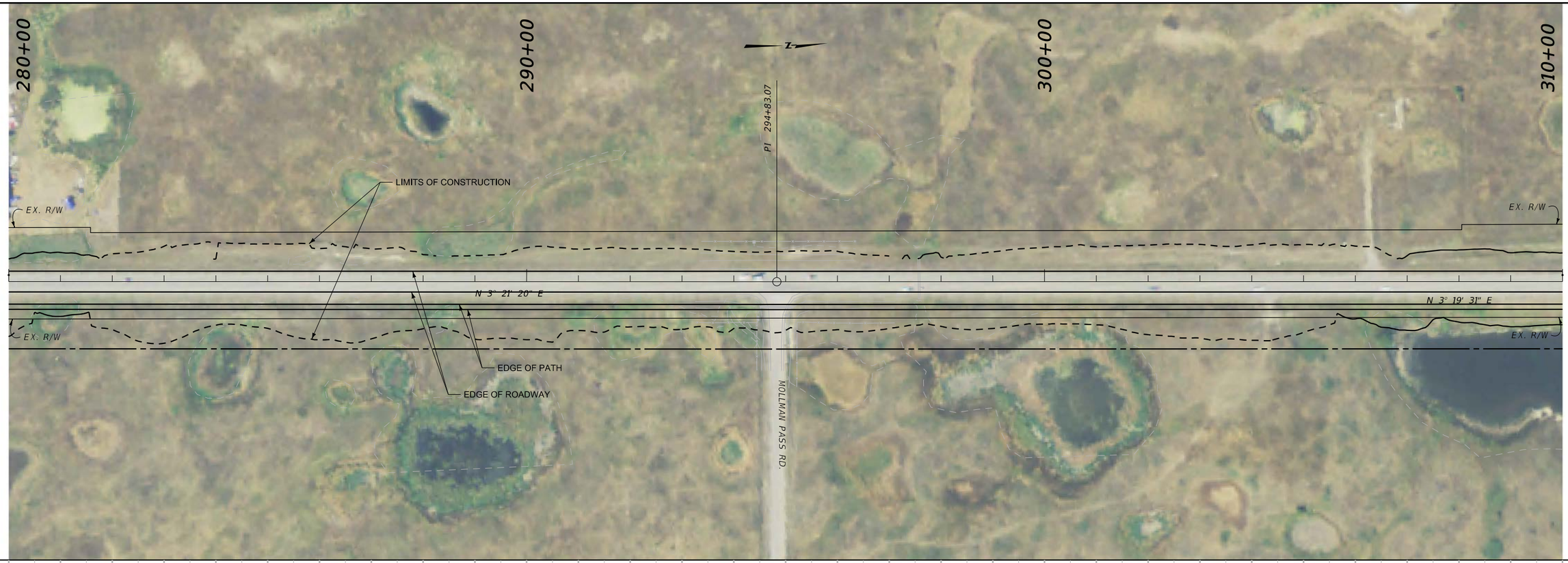

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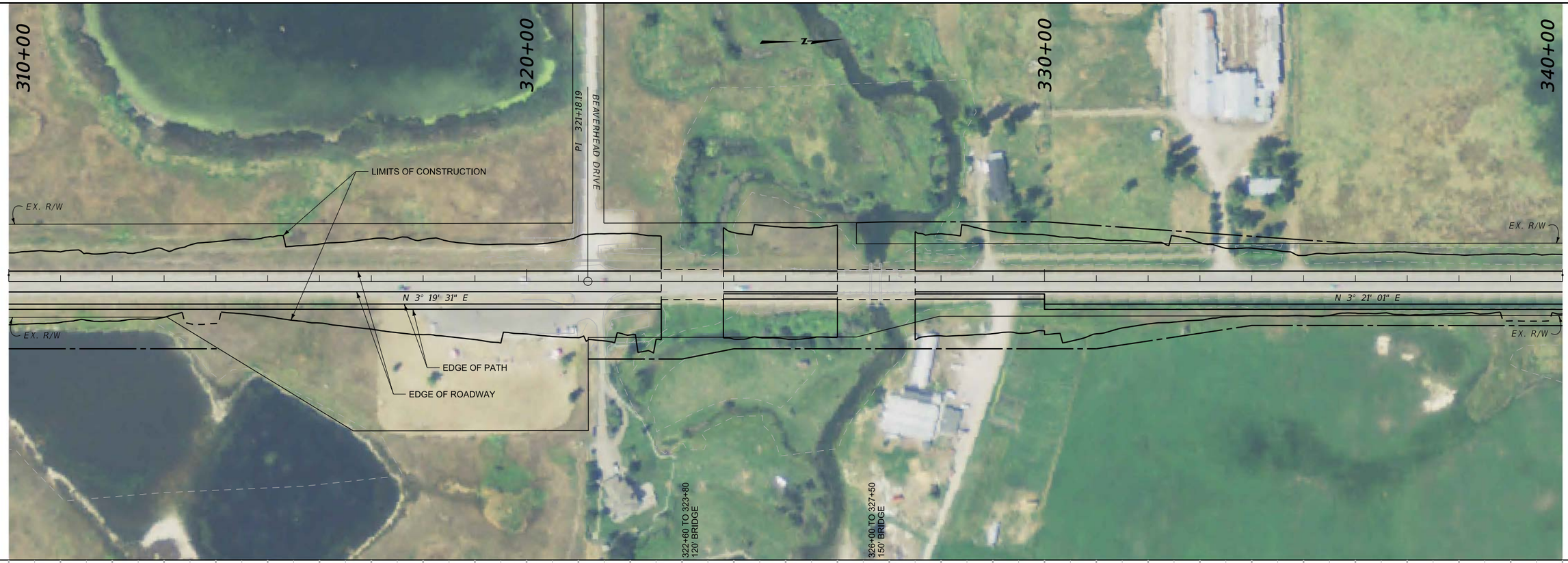

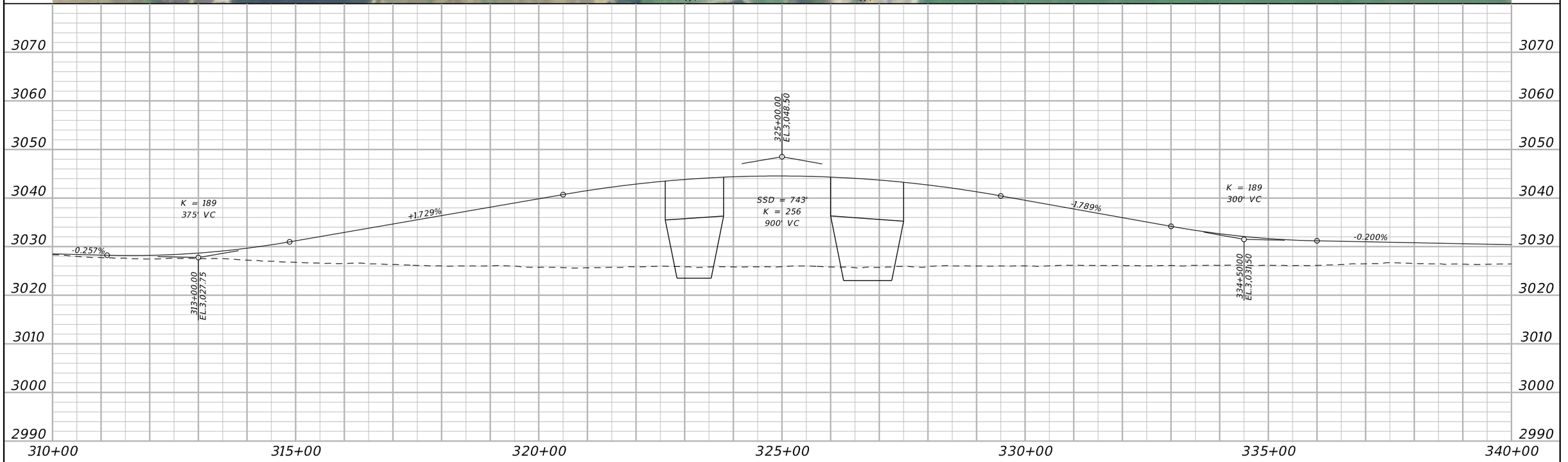

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340+00

350+00

N

POE 358+71.55

LIMITS OF CONSTRUCTION

EX. R/W

EX. R/W

N 3° 21' 01" E

EX. R/W

EX. R/W

EDGE OF PATH

EDGE OF ROADWAY

3060
3050
3040
3030
3020
3010
3000
2990
2980

K = 225
150' VC

3,028.90

-0.200%

+0.467%

351+00.00
EL.3,028.20

340+00
345+00
350+00
355+00

2	MONTANA Department of Transportation	6102RDPLPZ03_C-1.DGN	DESIGNED BY			ROAD PLANS	PRELIMINARY	US 93 NINEPIPE CORRIDOR FEASIBILITY STUDY	
1		11/11/2022	REVIEWED BY						
		1:54:47 PM bradt	CHECKED BY			LAKE COUNTY			

NINEPIPE CORRIDOR 93 FEASIBILITY STUDY

C-2: Enlarged Wildlife Crossings

ROBERT PECCIA & ASSOCIATES
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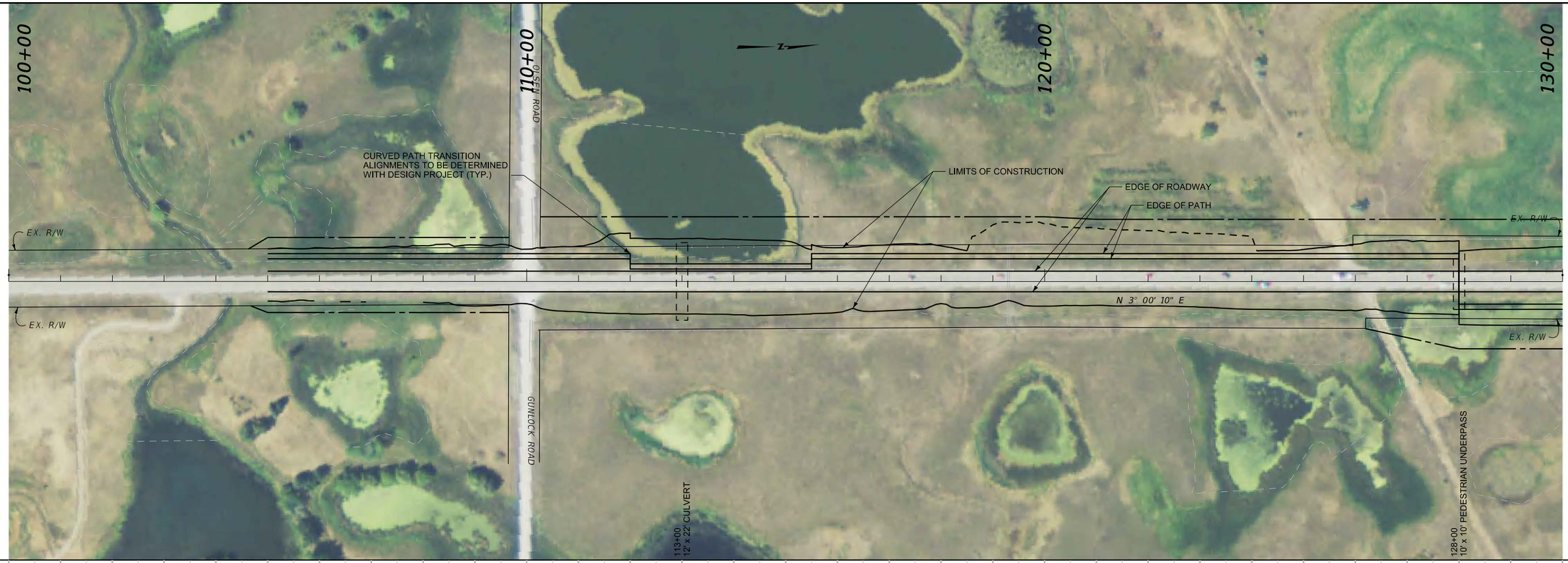

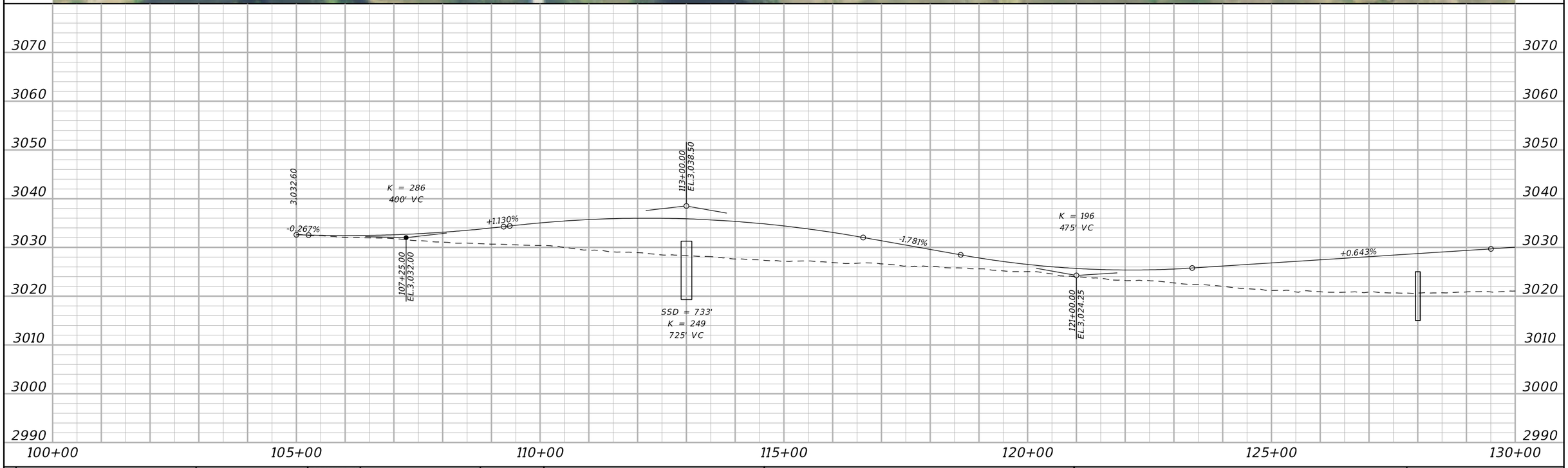

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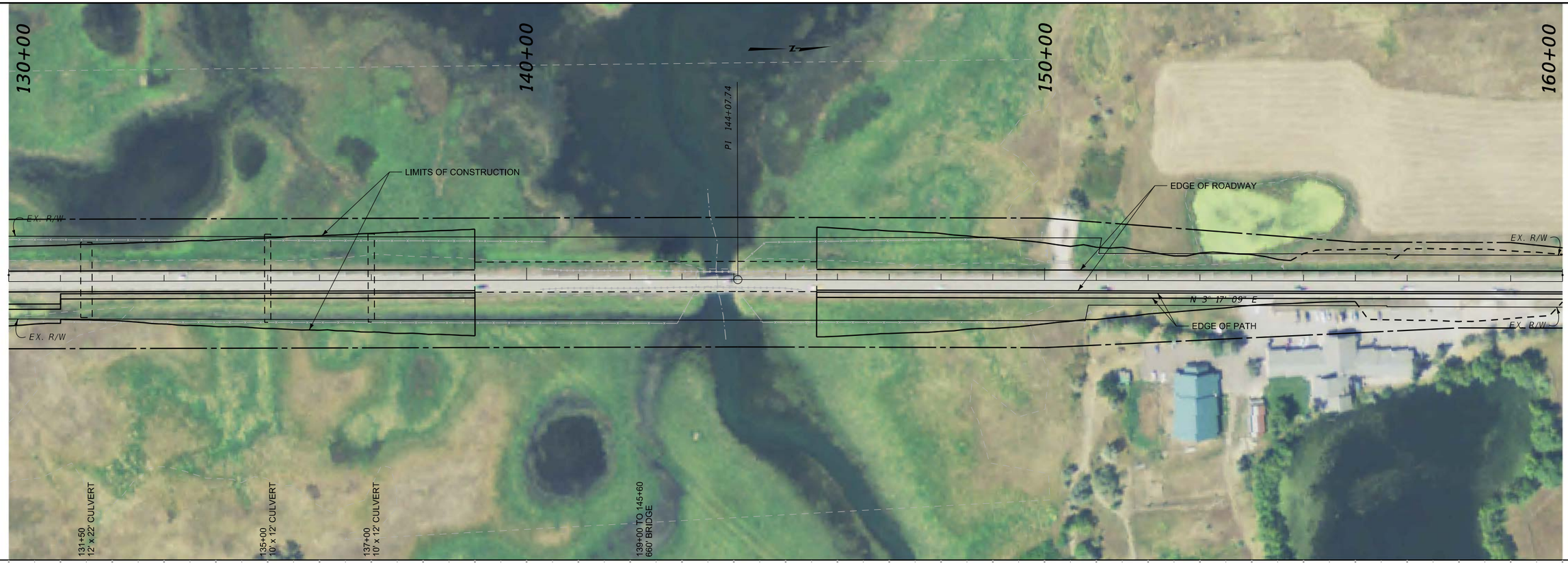
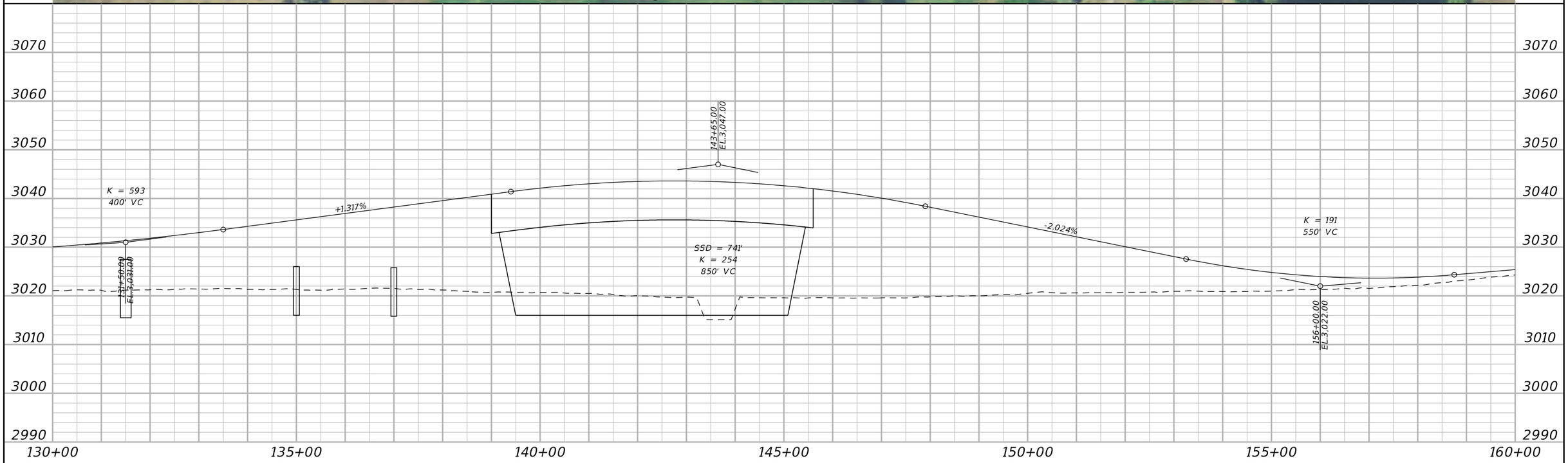
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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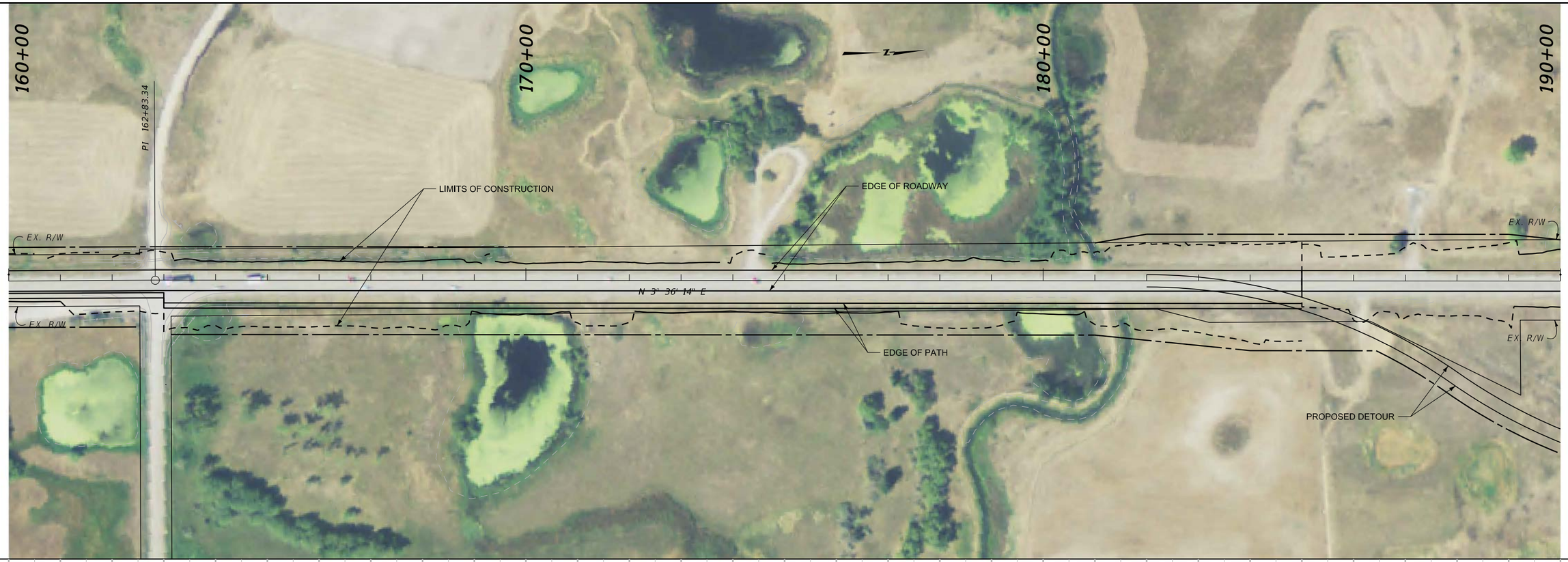
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING



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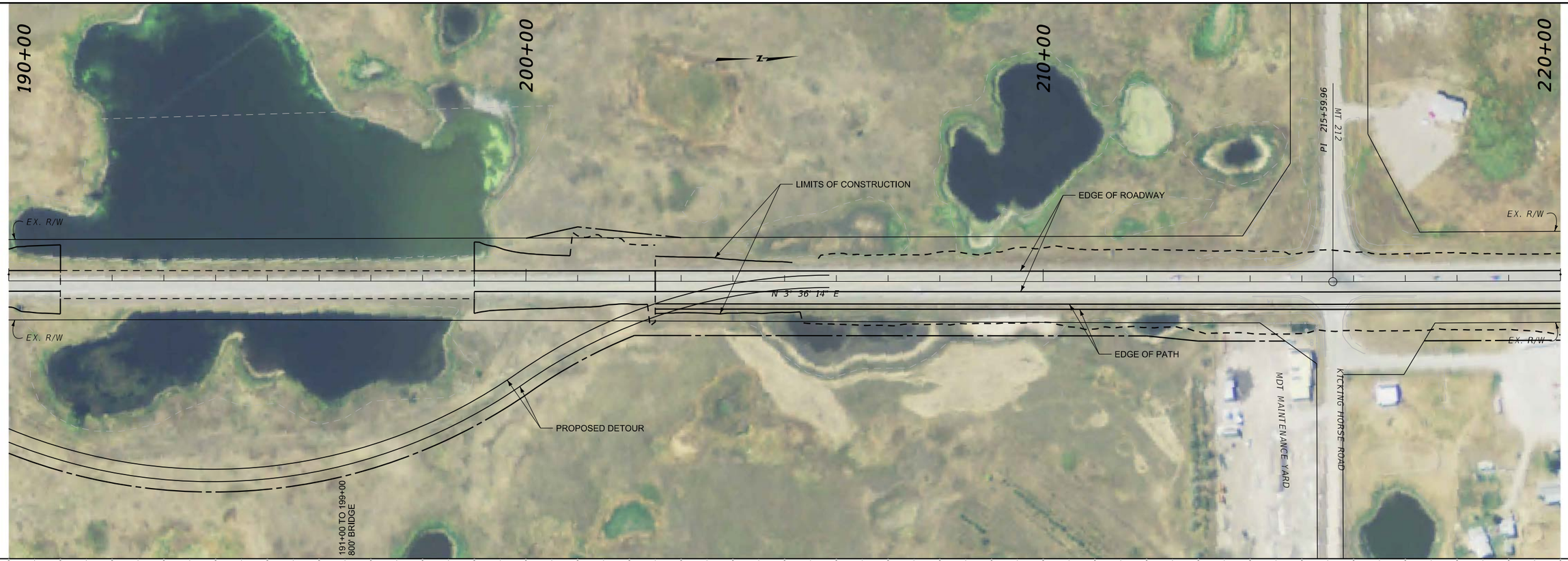
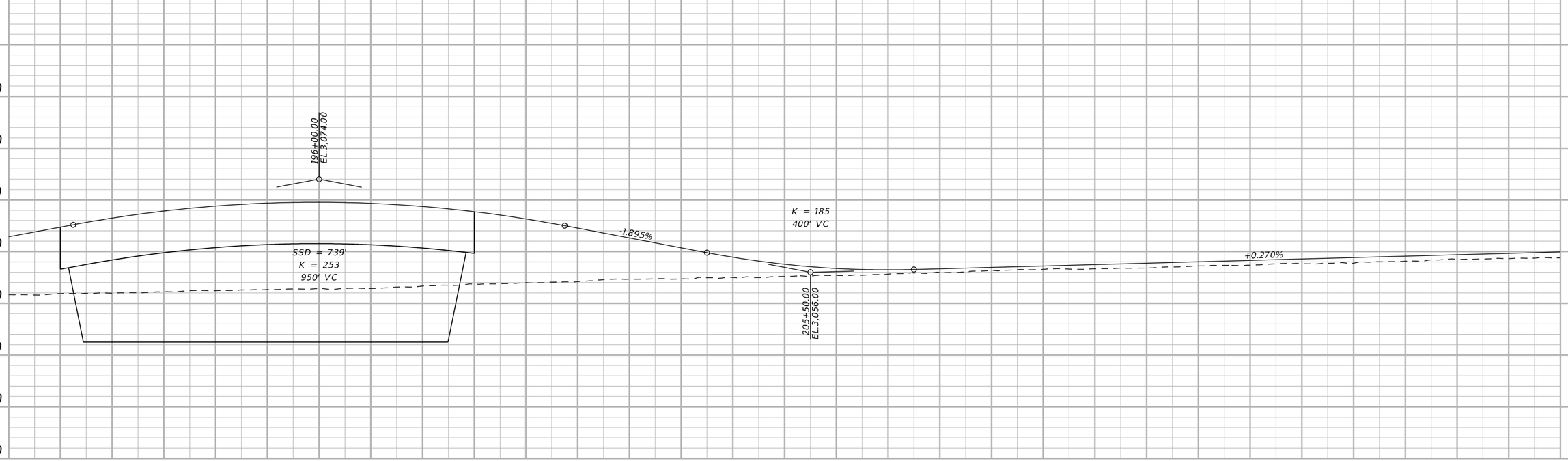
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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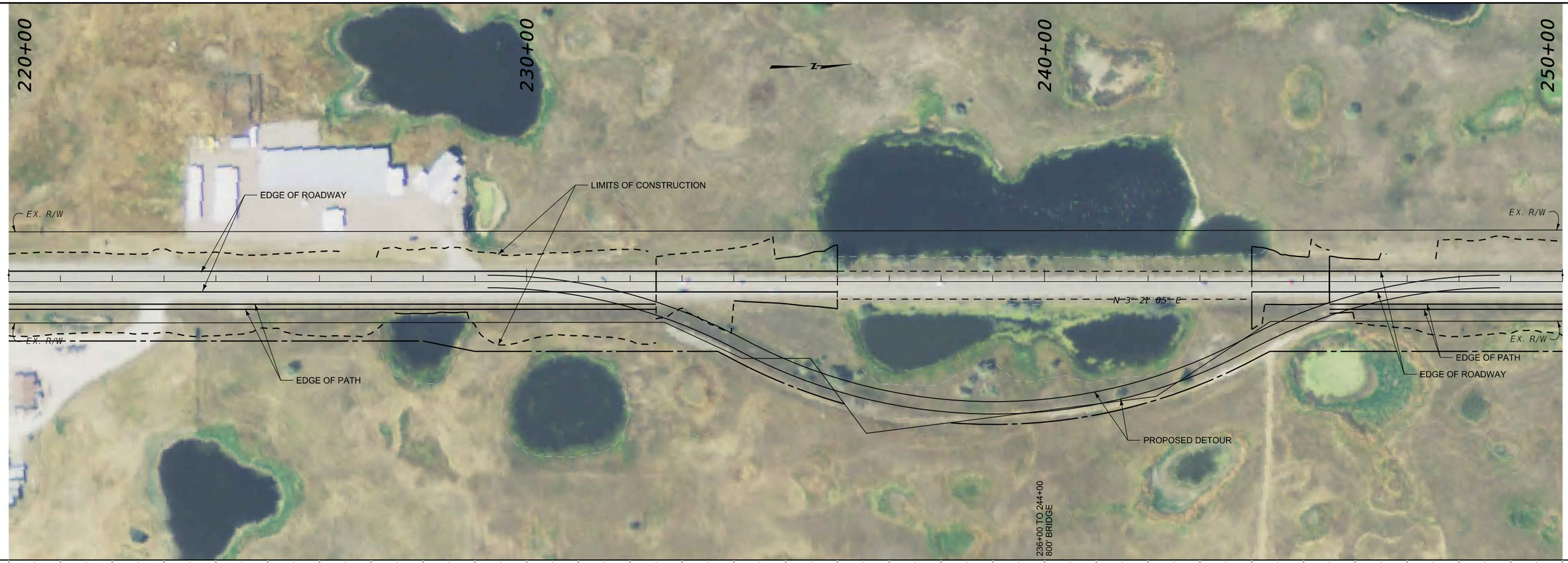

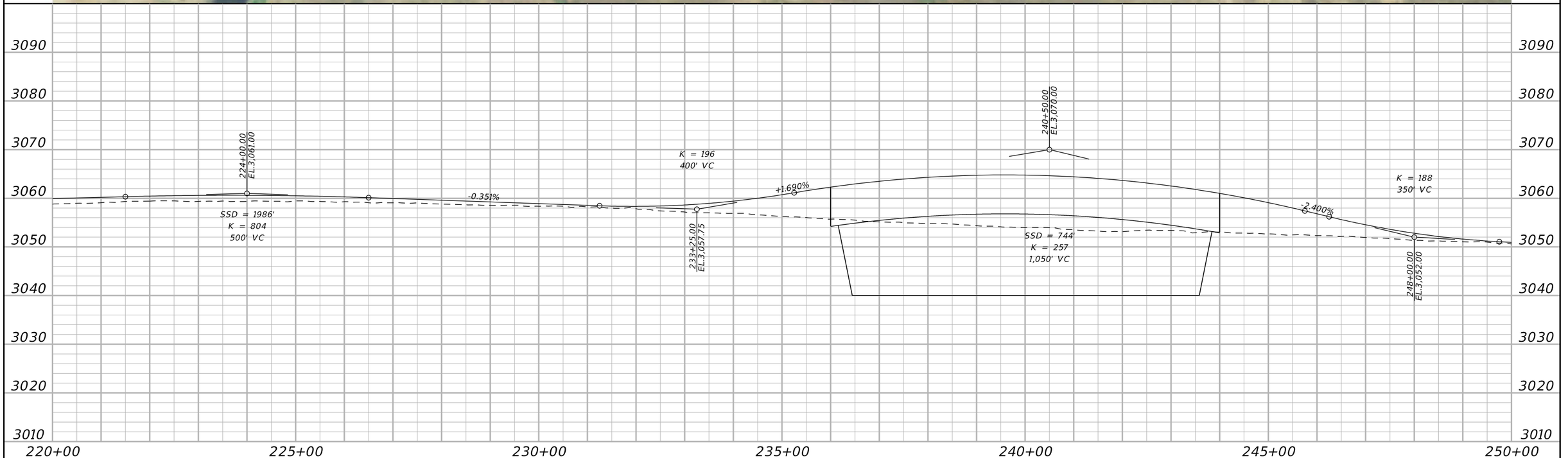

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ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING

250+00 260+00 270+00 280+00

PI 268+35.67

DUCK ROAD

LIMITS OF CONSTRUCTION

EX. R/W

EX. R/W

EX. R/W

EX. R/W

N 3° 21' 05" E

N 3° 21' 20" E

EDGE OF PATH

EDGE OF ROADWAY

-0.537%

K = 1783
500' VC

275+00.00
EL.3,037.50

3080 3070 3060 3050 3040 3030 3020 3010 3000

250+00 255+00 260+00 265+00 270+00 275+00 280+00

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1		11/11/2022	REVIEWED BY			LAKE COUNTY			
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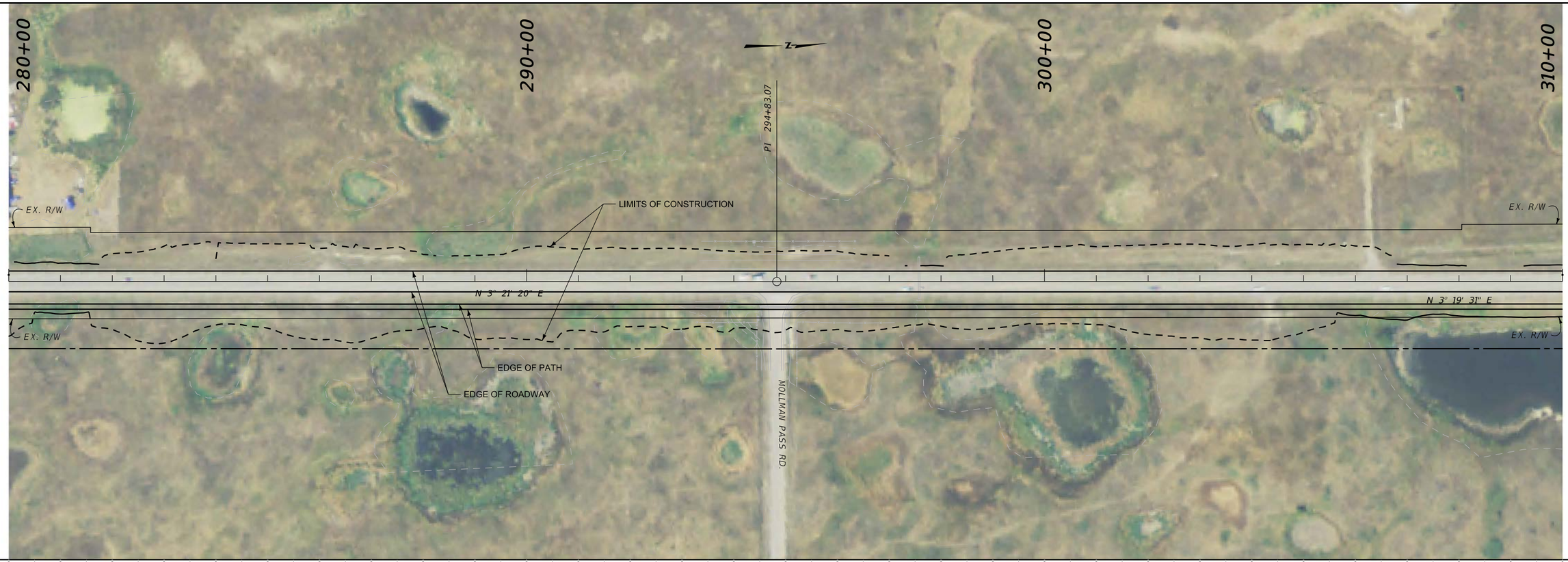
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING



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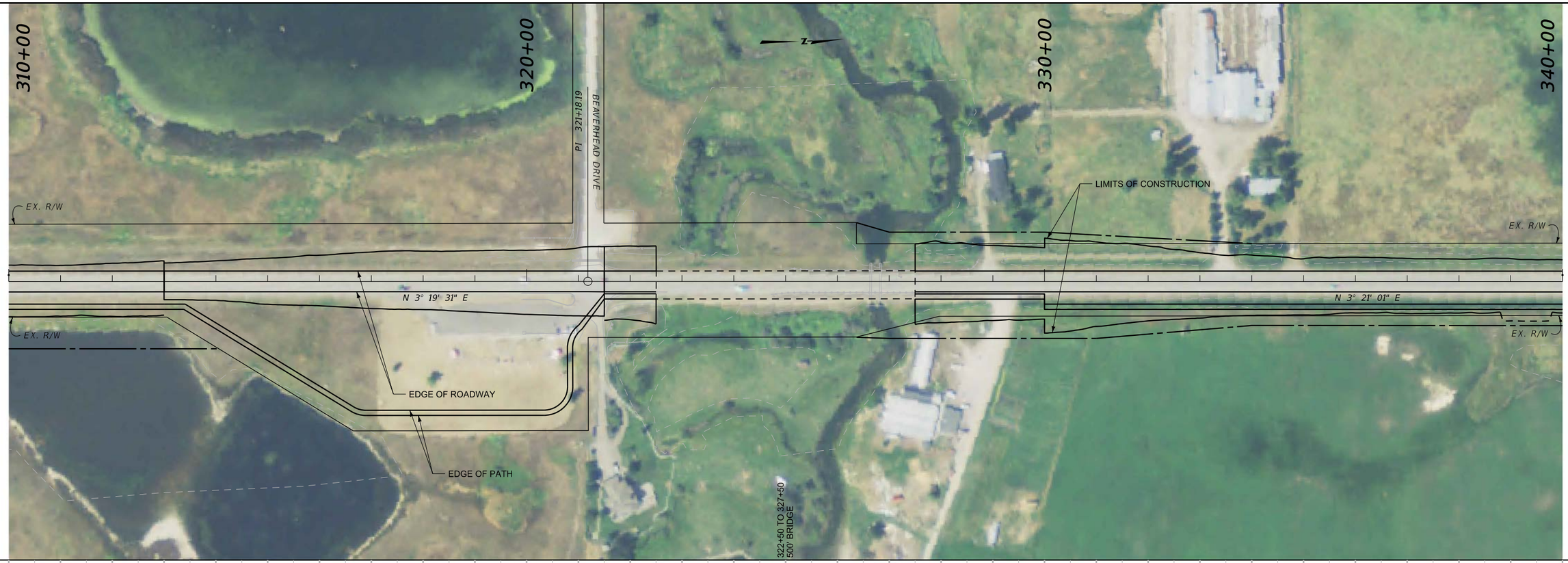
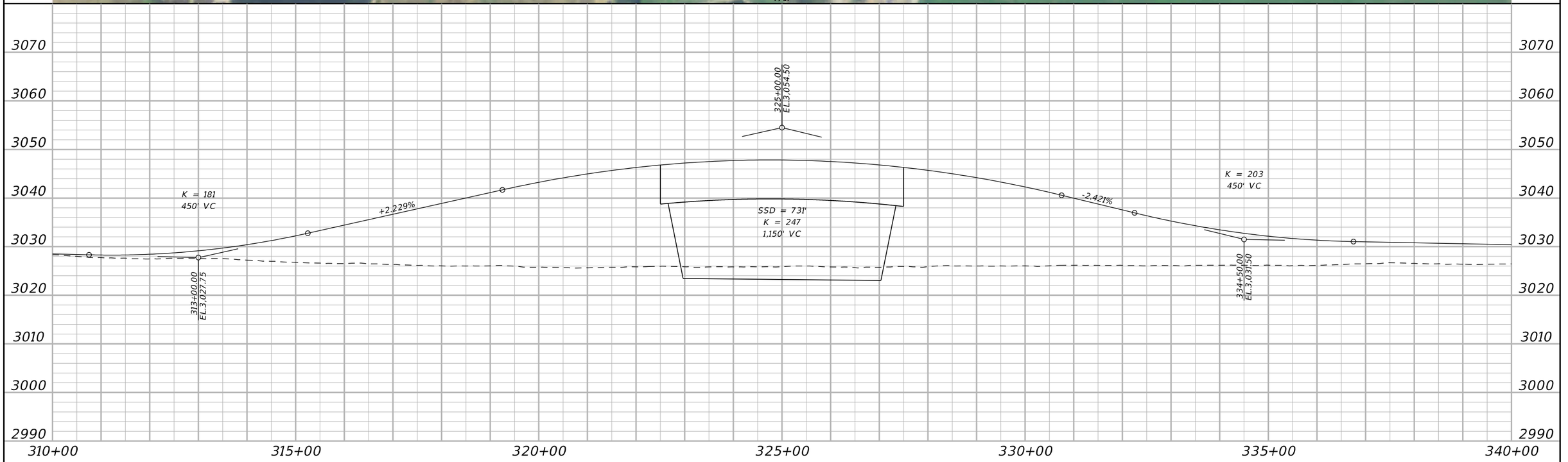
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING

340+00

350+00

N

POE 358+71.55

LIMITS OF CONSTRUCTION

EX. R/W

EX. R/W

N 3° 21' 01" E

EX. R/W

EX. R/W

EDGE OF PATH

EDGE OF ROADWAY

3060
3050
3040
3030
3020
3010
3000
2990
2980

-0.200%

K = 225
150' VC

3,028.90

+0.467%

351+00.00
EL.3,028.20

340+00
345+00
350+00
355+00

2	MONTANA Department of Transportation	6102RDPLPZ03_C-2.DGN	DESIGNED BY			ROAD PLANS	PRELIMINARY	US 93 NINEPIPE CORRIDOR FEASIBILITY STUDY	
1		11/11/2022	REVIEWED BY			LAKE COUNTY			
		2:14:14 PM bradt	CHECKED BY						

NINEPIPE CORRIDOR 93 FEASIBILITY STUDY

C-3: Wildlife Overpass Configuration

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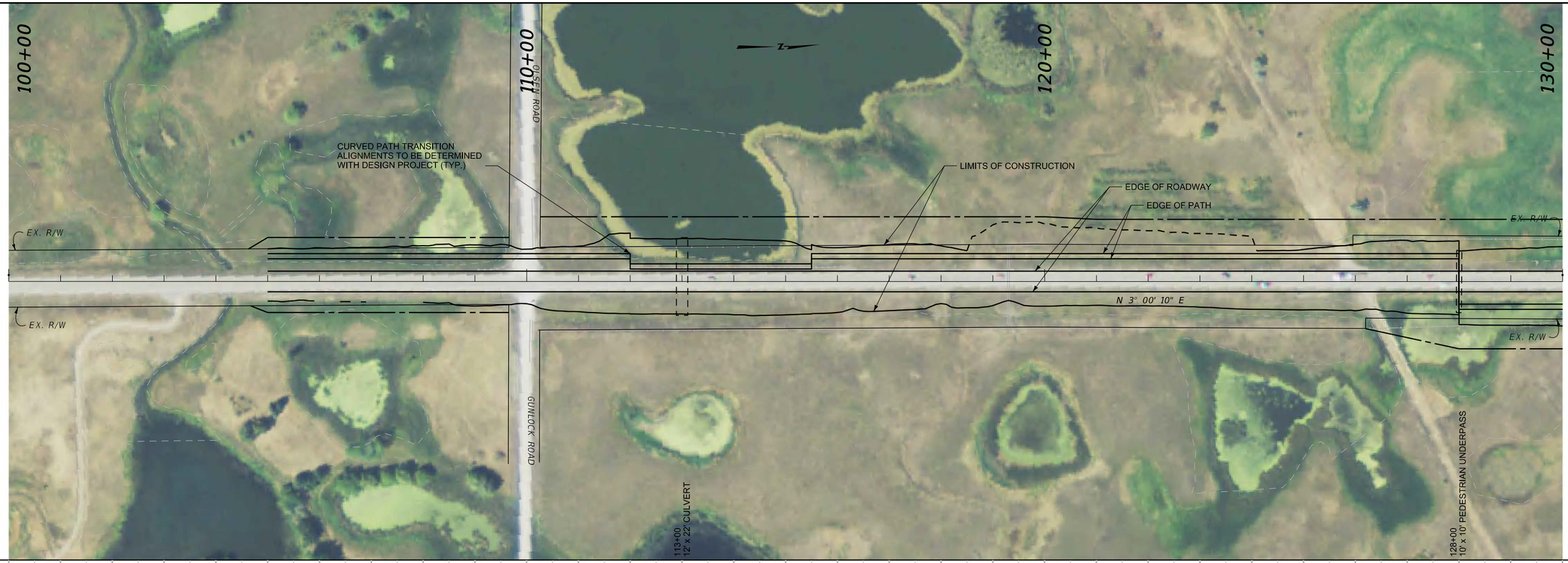
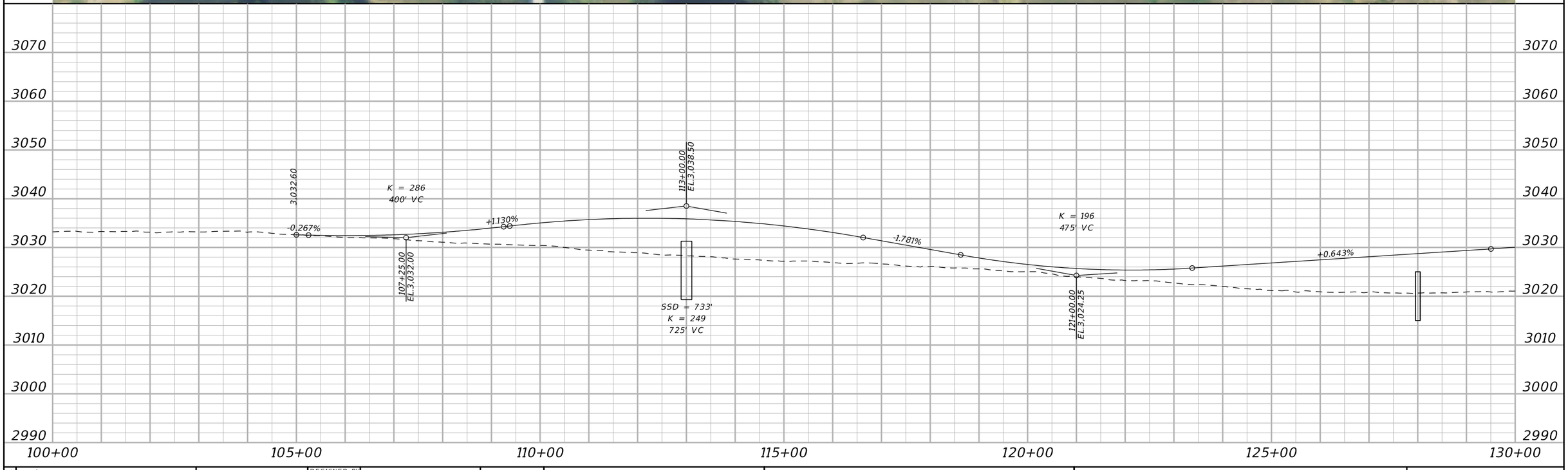
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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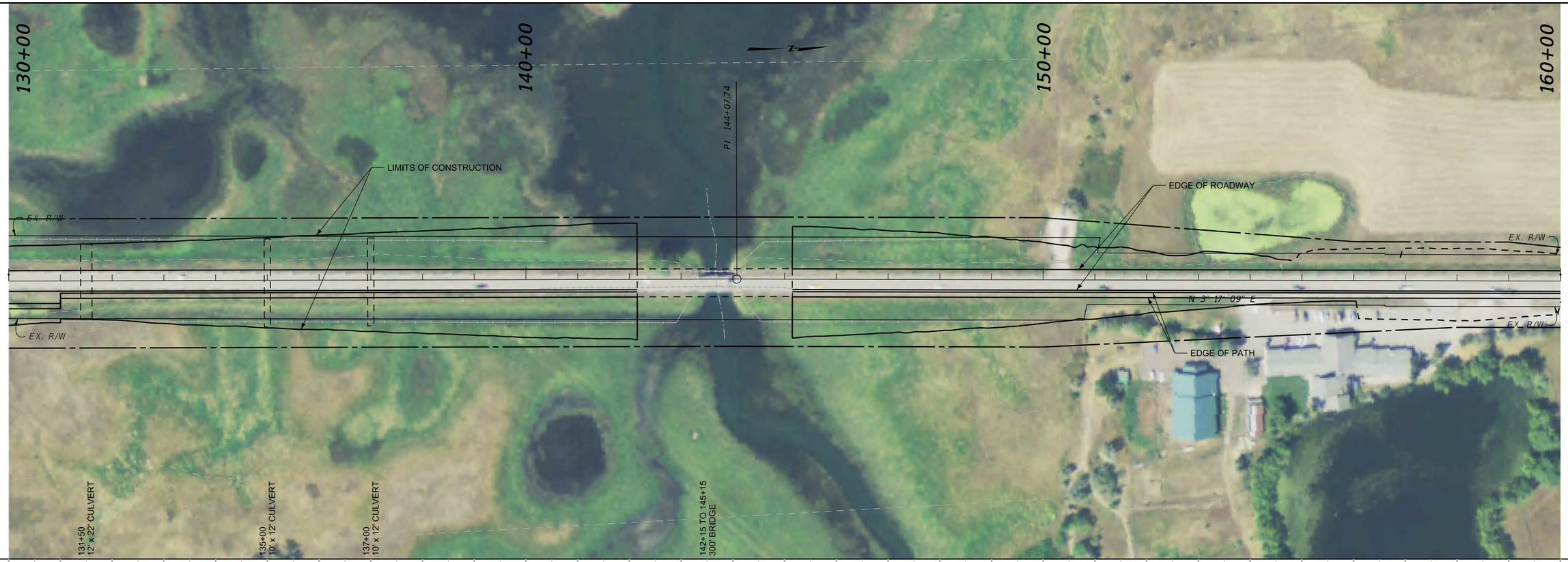
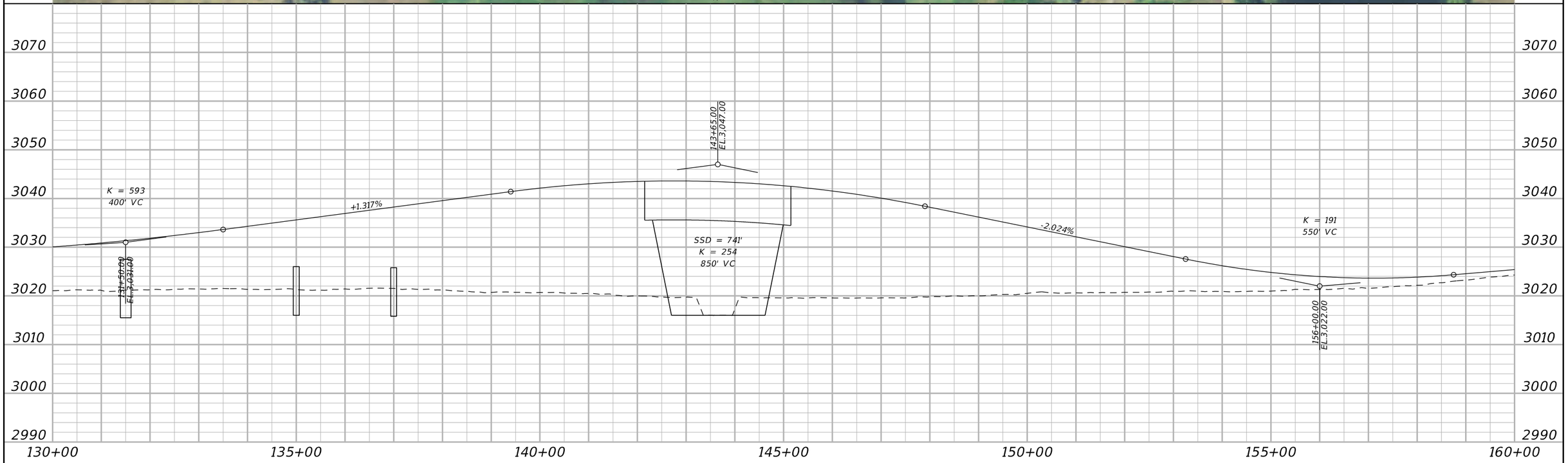
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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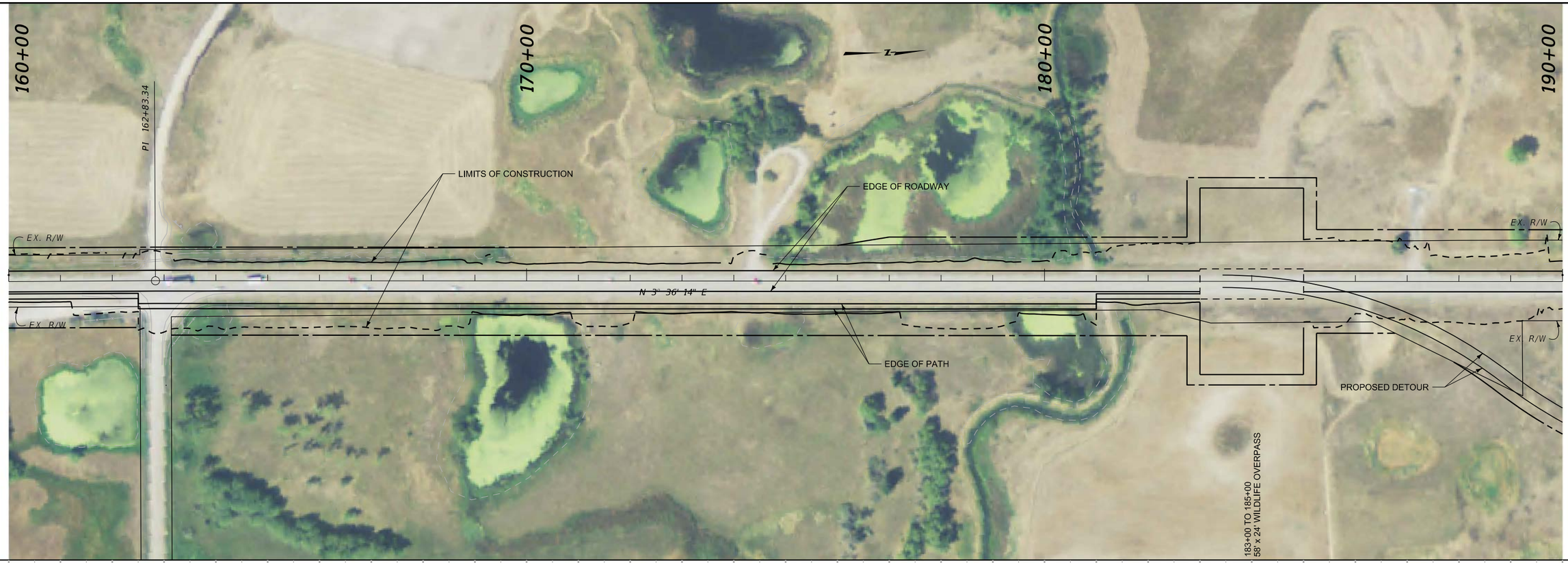
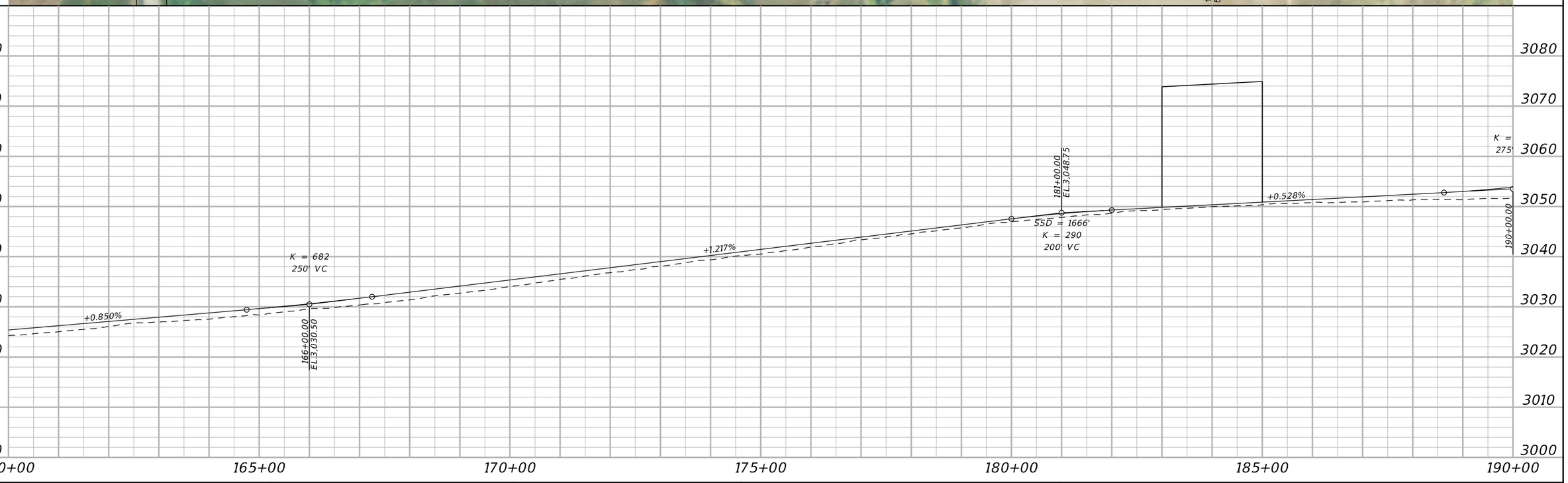
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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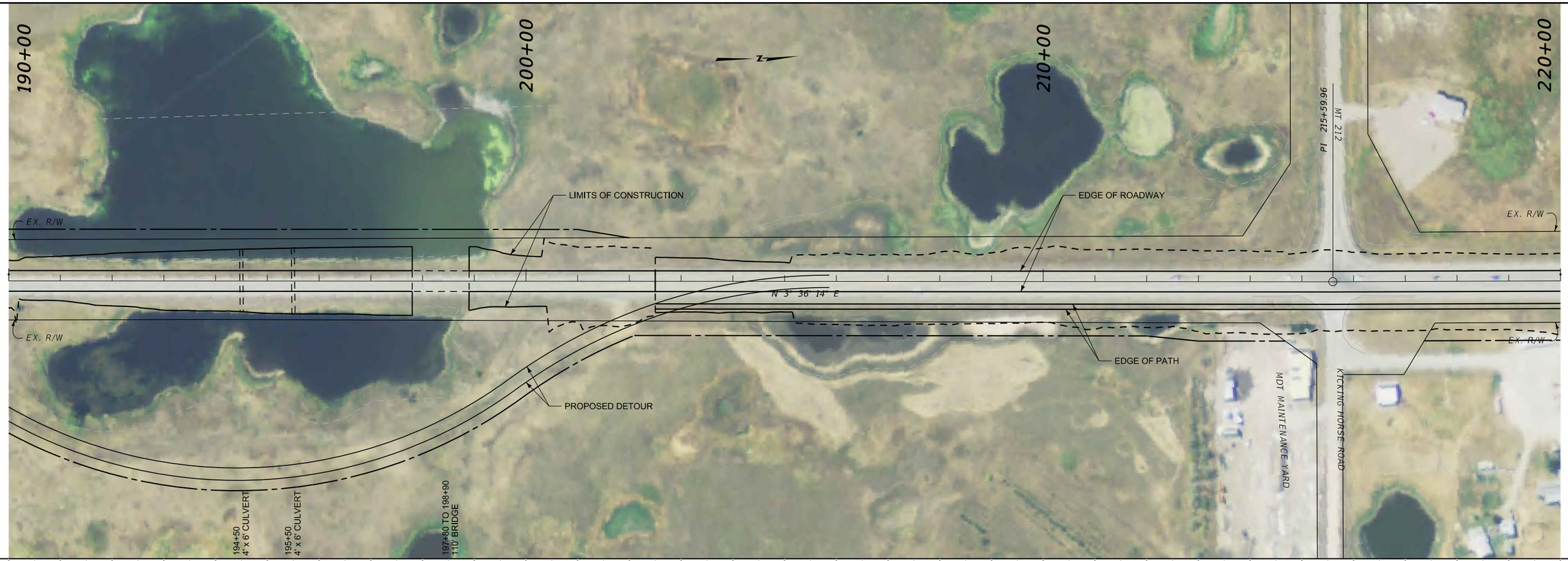
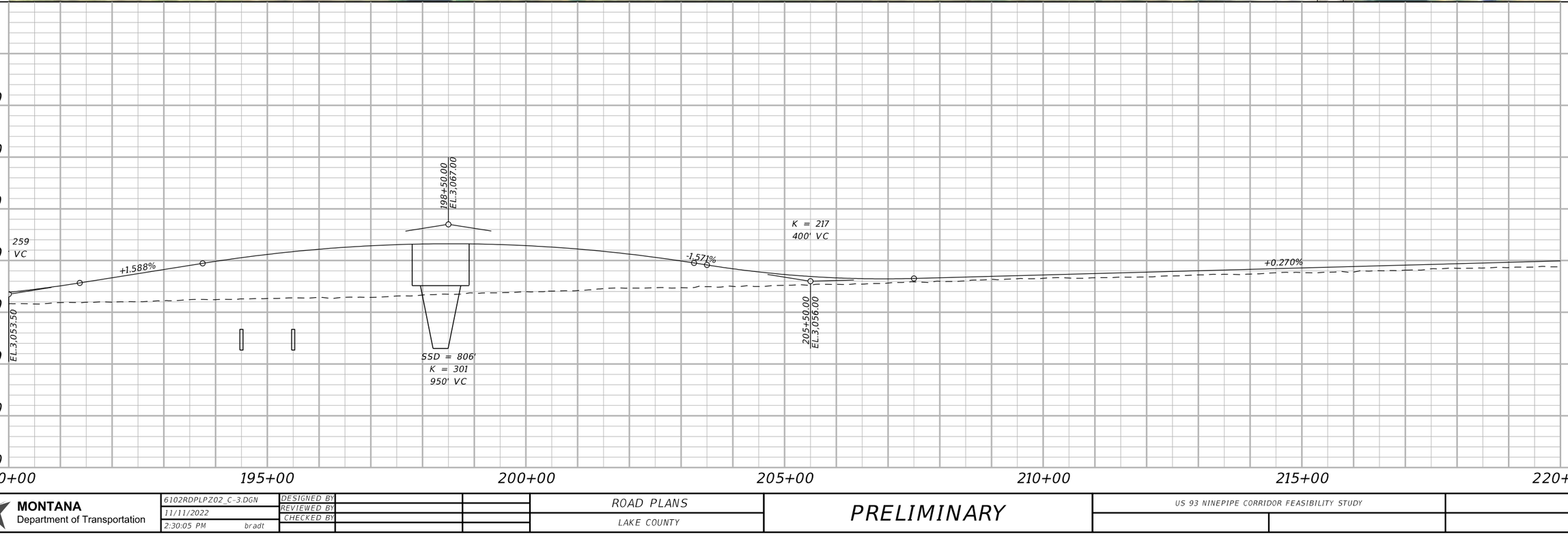
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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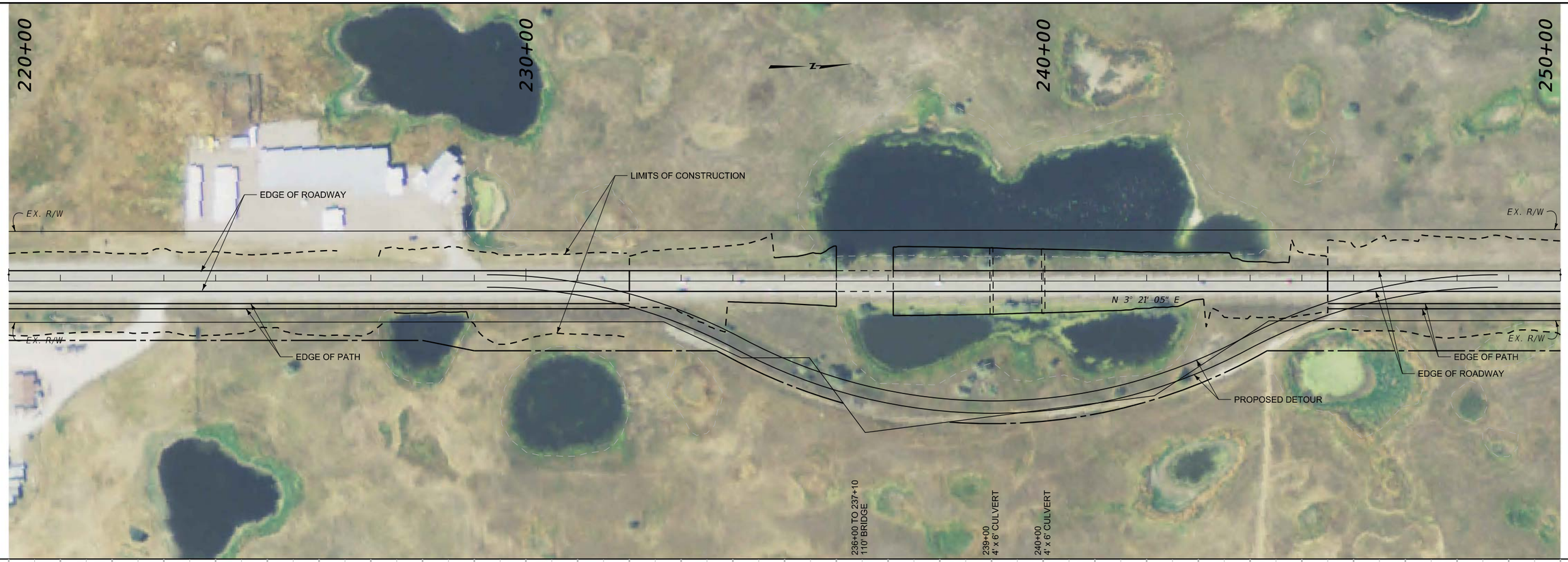
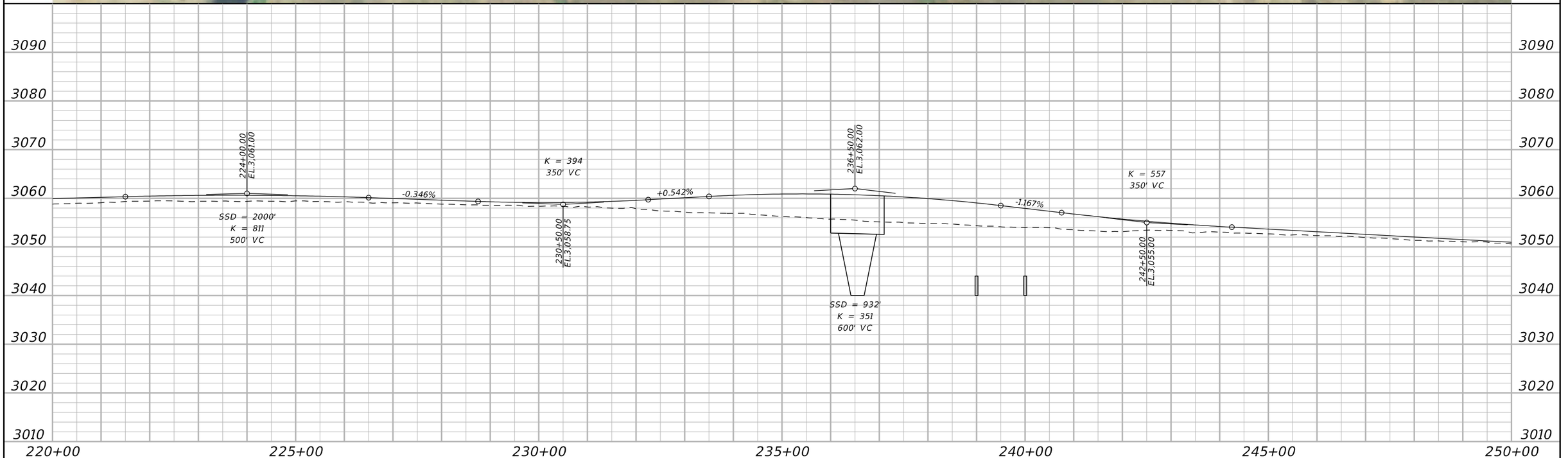
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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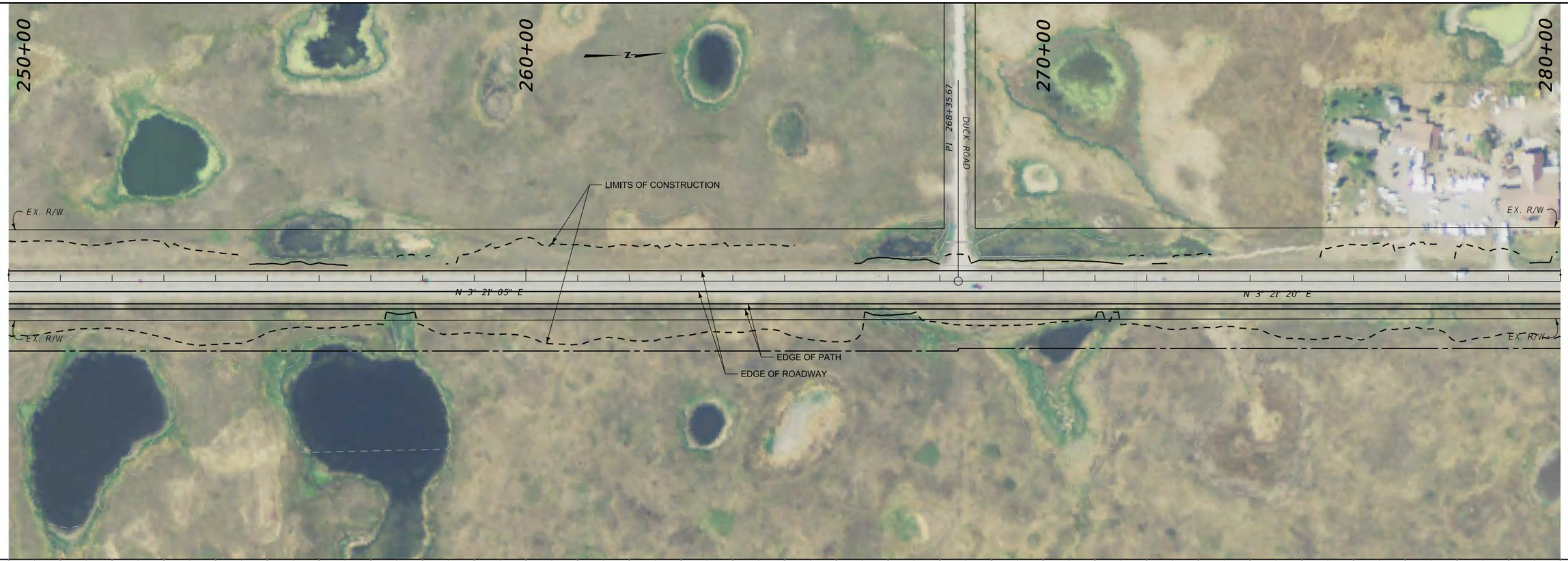

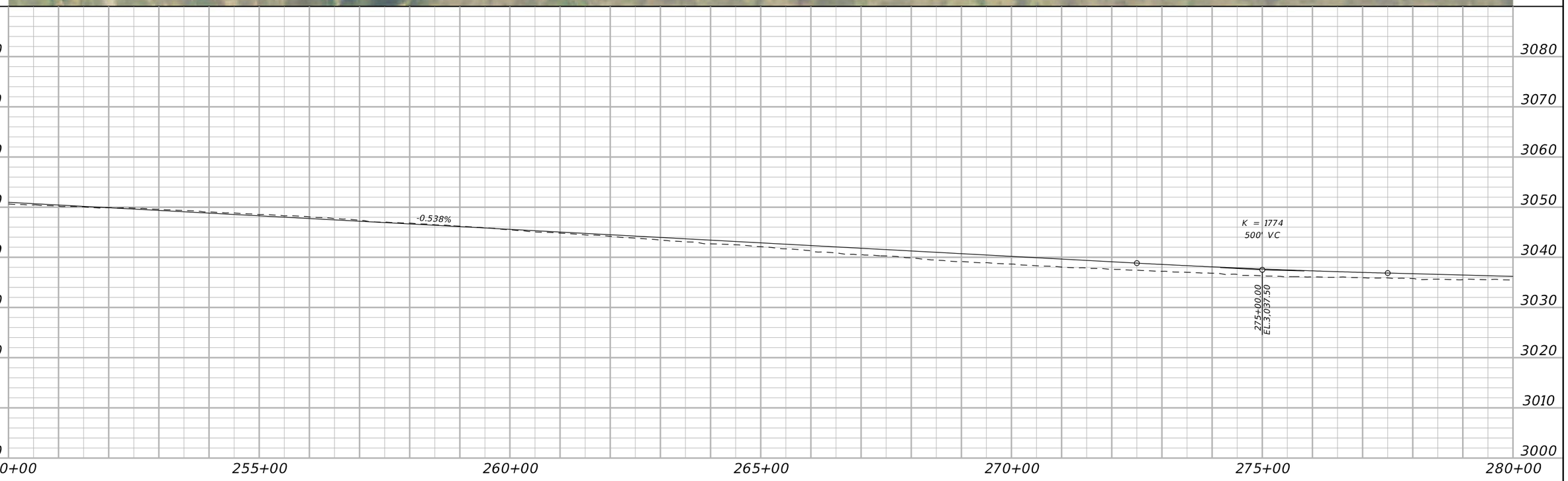

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CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING

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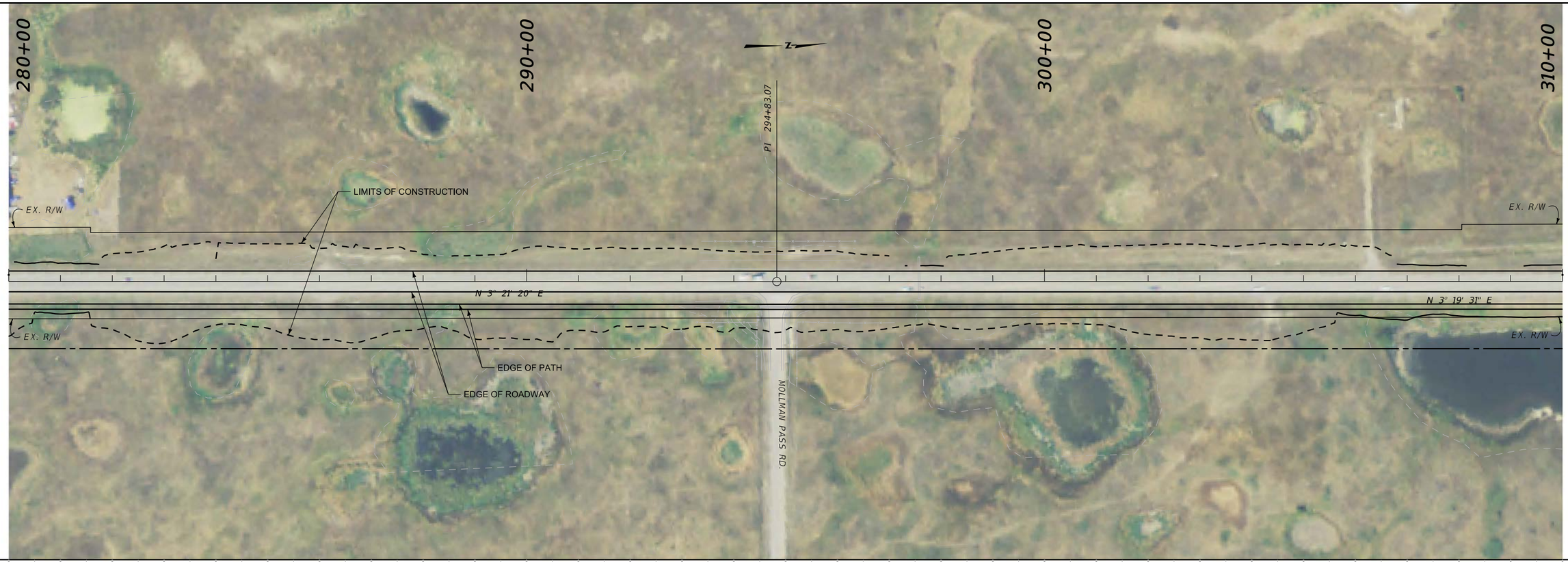
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING



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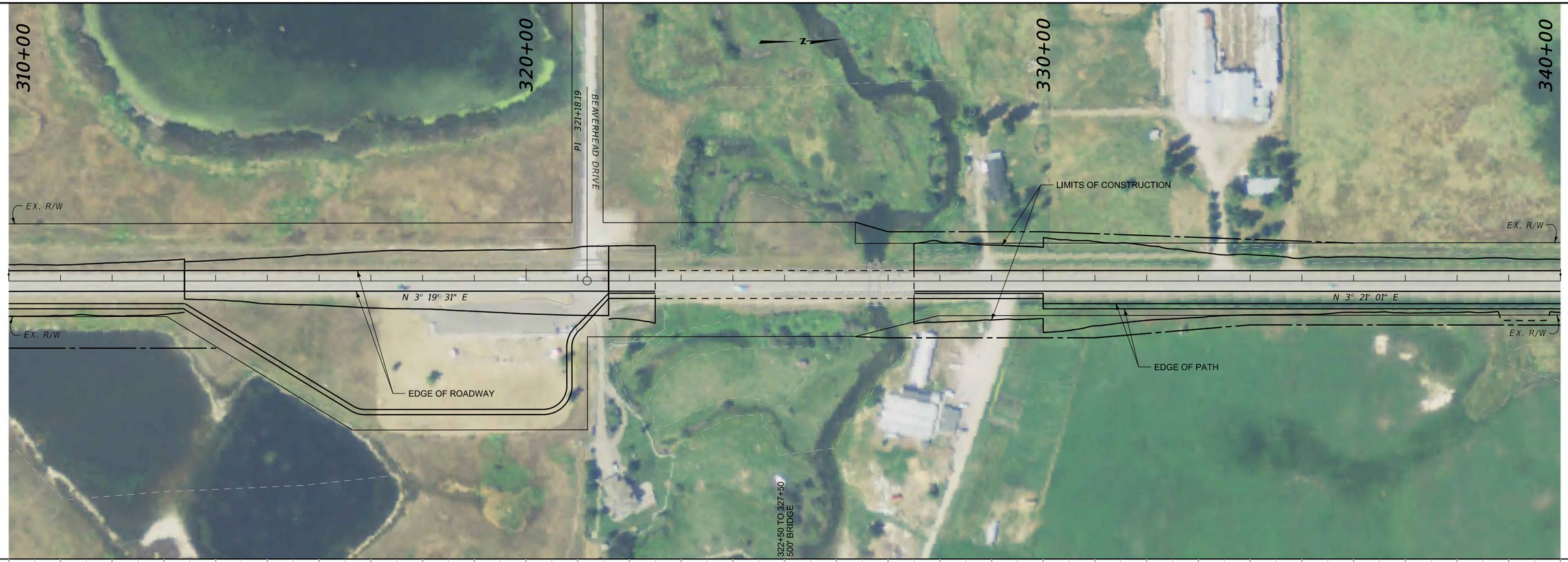
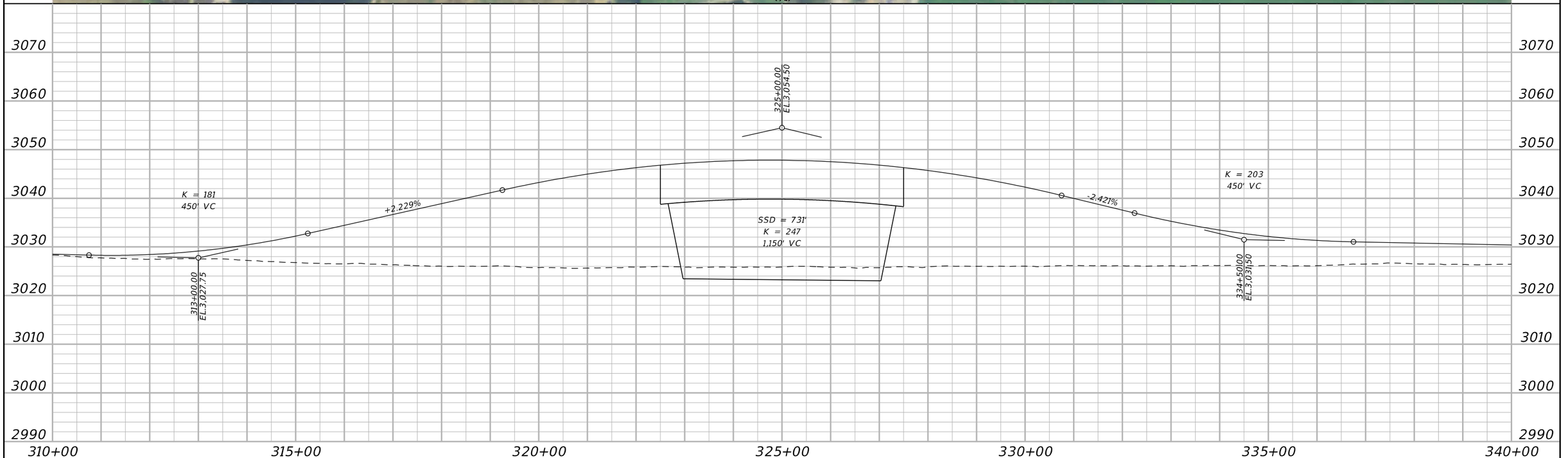
ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING





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ROBERT PECCIA & ASSOCIATES
CIVIL ENGINEERING | TRANSPORTATION | PLANNING | SURVEYING

340+00

350+00

N

POE 358+71.55

LIMITS OF CONSTRUCTION

EX. R/W

EX. R/W

N 3° 21' 01" E

EX. R/W

EX. R/W

EDGE OF PATH

EDGE OF ROADWAY

3060
3050
3040
3030
3020
3010
3000
2990
2980

K = 225
150' VC

3,028.90

-0.200%

+0.467%

351+00.00
EL.3,028.20

340+00
345+00
350+00
355+00

2	MONTANA Department of Transportation	6102RDPLPZ03_C-3.DGN	DESIGNED BY			ROAD PLANS	PRELIMINARY	US 93 NINEPIPE CORRIDOR FEASIBILITY STUDY	
1		11/11/2022	REVIEWED BY						
		2:34:02 PM bradt	CHECKED BY			LAKE COUNTY			

NINEPIPE CORRIDOR 93 FEASIBILITY STUDY

APPENDIX C:
Planning Level Cost Estimates

APPENDIX C

Planning Level Cost Estimates

Planning-level costs were developed for each improvement option in accordance with procedures outlined by the MDT Cost Estimation Procedure for Highway Design Projects (Nov 2016). Costs include estimates for construction, engineering, drainage, and indirect costs. Construction cost estimates were based on unit quantity estimates and price information determined from the MDT Preliminary Estimating Tool (PET) and MDT Average Prices Catalog (2021).

NOTES:

Miscellaneous items include unknown factors such as topsoil, slope treatments, ditch or channel excavation, temporary striping, erosion control, and public relations.
An inflationary factor of three percent per year was applied to the planning level costs to account for an estimated year of expenditure.

C-1 SEIS Preferred

TYPE	UNITS	QUANTITY	UNIT PRICE	COST
EXCAVATION-UNCLASSIFIED (STANDARD)	CUYD	110000.0	$ 6.25	$ 687,500
SPECIAL BORROW-NEAT LINE	CUYD	128000.0	$ 13.56	$ 1,735,680
EMBANKMENT IN PLACE	CUYD	282000.0	$ 14.26	$ 4,021,320
CRUSHED AGGREGATE COURSE	CUYD	53000.0	$ 29.96	$ 1,587,880
COVER - TYPE 1	SQYD	105000.0	$ 0.68	$ 71,400
PLANT MIX BIT SURF GR S-3/4 IN	TON	33000.0	$ 43.01	$ 1,419,330
ASPHALT CEMENT PG 64-28	TON	1600.0	$ 606.09	$ 969,744
EMULS ASPHALT CRS-2P	TON	190.0	$ 590.18	$ 112,134
HYDRATED LIME	TON	475.0	$ 214.28	$ 101,783
AGGREGATE TREATMENT	SQYD	158000.0	$ 0.43	$ 67,940
EMULSIFIED ASPHALT-TACK COAT	GAL	16000.0	$ 2.20	$ 35,200
12' X 22' WILDLIFE STRUCTURE	LNFT	300.0	$ 8,000.00	$ 2,400,000
12' X 10' WILDLIFE STRUCTURE	LNFT	340.0	$ 2,500.00	$ 850,000
4' X 6' WILDLIFE STRUCTURE	LNFT	800.0	$ 1,000.00	$ 800,000
SIGNS - RURAL	MILE	4.7	$ 8,000.00	$ 37,600
STRIPING & PAVEMENT MARKINGS - RURAL	MILE	4.7	$ 8,000.00	$ 37,600
DRAINAGE PIPE - RURAL	MILE	4.7	$ 82,000.00	$ 385,400
BRIDGES (SHORT SPAN)	SQFT	25500.0	$ 250.00	$ 6,375,000
BRIDGES (LONG SPAN)	SQFT	33000.0	$ 300.00	$ 9,900,000
MISCELLANEOUS ITEMS			25%	$ 7,898,878
Subtotal 1				$ 39,494,389
TRAFFIC CONTROL			5%	$ 1,974,719
Subtotal 2				$ 41,469,108
MOBILIZATION			9%	$ 3,732,220
Subtotal 3				$ 45,201,328
CONTINGENCY (MEDIUM-HIGH RISK)			50%	$ 22,600,664
Subtotal 4				$ 67,801,992
CONSTRUCTION ENGINEERING (CE)			10%	$ 6,780,199
PRELIMINARY ENGINEERING (PE)			10%	$ 6,780,199
Subtotal 6				$ 81,362,391
INDIRECT COSTS (IDC)			10.91%	$ 8,876,637
TOTAL				**$ 90,239,028**
INFLATION (MID-TERM)	% PER YEAR	5.0	3%	$ 14,372,738
2027 TOTAL				**$ 104,611,765**
				$ 104,700,000
INFLATION (MID-TERM)	% PER YEAR	5.0	3%	$ 16,661,942
2032 TOTAL				**$ 121,273,707**
				$ 121,300,000

C-2 Enlarged Wildlife Crossing Structures

TYPE	UNITS	QUANTITY	UNIT PRICE	COST
EXCAVATION-UNCLASSIFIED (STANDARD)	CUYD	97000.0	$ 6.25	$ 606,250
SPECIAL BORROW-NEAT LINE	CUYD	120000.0	$ 13.56	$ 1,627,200
EMBANKMENT IN PLACE	CUYD	123000.0	$ 14.26	$ 1,753,980
CRUSHED AGGREGATE COURSE	CUYD	49000.0	$ 29.96	$ 1,468,040

COVER - TYPE 1		SQYD	98000.0	$	0.68	$ 66,640
PLANT MIX BIT SURF GR S-3/4 IN		TON	30000.0	$	43.01	$ 1,290,300
ASPHALT CEMENT PG 64-28		TON	1475.0	$	606.09	$ 893,983
EMULS ASPHALT CRS-2P		TON	175.0	$	590.18	$ 103,282
HYDRATED LIME		TON	440.0	$	214.28	$ 94,283
AGGREGATE TREATMENT		SQYD	148000.0	$	0.43	$ 63,640
EMULSIFIED ASPHALT-TACK COAT		GAL	15000.0	$	2.20	$ 33,000
12' X 22' WILDLIFE STRUCTURE		LNFT	300.0	$	8,000.00	$ 2,400,000
12' X 10' WILDLIFE STRUCTURE		LNFT	340.0	$	2,500.00	$ 850,000
SIGNS - RURAL		MILE	4.7	$	8,000.00	$ 37,600
STRIPING & PAVEMENT MARKINGS - RURAL		MILE	4.7	$	8,000.00	$ 37,600
DRAINAGE PIPE - RURAL		MILE	4.7	$	82,000.00	$ 385,400
BRIDGES (LONG SPAN)		SQFT	122000.0	$	300.00	$ 36,600,000
MISCELLANEOUS ITEMS					25%	$ 12,077,799
	Subtotal 1					$ 60,388,997
TRAFFIC CONTROL					5%	$ 3,019,450
	Subtotal 2					$ 63,408,447
MOBILIZATION					9%	$ 5,706,760
	Subtotal 3					$ 69,115,207
CONTINGENCY (MEDIUM-HIGH RISK)					50%	$ 34,557,603
	Subtotal 4					$ 103,672,810
CONSTRUCTION ENGINEERING (CE)					10%	$ 10,367,281
PRELIMINARY ENGINEERING (PE)					10%	$ 10,367,281
	Subtotal 6					$ 124,407,372
INDIRECT COSTS (IDC)					10.91%	$ 13,572,844
	TOTAL					**$ 137,980,217**
INFLATION (MID-TERM)		% PER YEAR	5.0		3%	$ 21,976,671
	2027 TOTAL					**$ 159,956,888**
						$ 160,000,000
INFLATION (MID-TERM)		% PER YEAR	5.0		3%	$ 25,476,985
	2032 TOTAL					**$ 185,433,873**
						$ 185,500,000

C-3 Wildlife Overpass Configuration

TYPE	UNITS	QUANTITY		UNIT PRICE		COST
EXCAVATION-UNCLASSIFIED (STANDARD)	CUYD	98000.0	$	6.25	$	612,500
SPECIAL BORROW-NEAT LINE	CUYD	129000.0	$	13.56	$	1,749,240
EMBANKMENT IN PLACE	CUYD	177000.0	$	14.26	$	2,524,020
CRUSHED AGGREGATE COURSE	CUYD	52000.0	$	29.96	$	1,557,920
COVER - TYPE 1	SQYD	106000.0	$	0.68	$	72,080
PLANT MIX BIT SURF GR S-3/4 IN	TON	32000.0	$	43.01	$	1,376,320
ASPHALT CEMENT PG 64-28	TON	1600.0	$	606.09	$	969,744
EMULS ASPHALT CRS-2P	TON	190.0	$	590.18	$	112,134
HYDRATED LIME	TON	470.0	$	214.28	$	100,712
AGGREGATE TREATMENT	SQYD	160000.0	$	0.43	$	68,800
EMULSIFIED ASPHALT-TACK COAT	GAL	16000.0	$	2.20	$	35,200
12' X 22' WILDLIFE STRUCTURE	LNFT	300.0	$	8,000.00	$	2,400,000
12' X 10' WILDLIFE STRUCTURE	LNFT	340.0	$	2,500.00	$	850,000
4' X 6' WILDLIFE STRUCTURE	LNFT	505.0	$	1,000.00	$	505,000
WILDLIFE OVERPASS	LPSM	1.0	$	2,600,000.00	$	2,600,000
SIGNS - RURAL	MILE	4.7	$	8,000.00	$	37,600
STRIPING & PAVEMENT MARKINGS - RURAL	MILE	4.7	$	8,000.00	$	37,600
DRAINAGE PIPE - RURAL	MILE	4.7	$	82,000.00	$	385,400
BRIDGES (SHORT SPAN)	SQFT	8800.0	$	250.00	$	2,200,000
BRIDGES (LONG SPAN)	SQFT	40000.0	$	300.00	$	12,000,000
MISCELLANEOUS ITEMS				25%	$	7,548,567
Subtotal 1					$	37,742,837
TRAFFIC CONTROL				5%	$	1,887,142
Subtotal 2					$	39,629,979
MOBILIZATION				9%	$	3,566,698
Subtotal 3					$	43,196,677
CONTINGENCY (MEDIUM-HIGH RISK)				50%	$	21,598,339
Subtotal 4					$	64,795,016
CONSTRUCTION ENGINEERING (CE)				10%	$	6,479,502
PRELIMINARY ENGINEERING (PE)				10%	$	6,479,502

	Subtotal 6			$	77,754,019
INDIRECT COSTS (IDC)			10.91%	$	8,482,963
	TOTAL			**$**	**86,236,982**
INFLATION (MID-TERM)	% PER YEAR	5.0	3%	$	13,735,316
	2027 TOTAL			**$**	**99,972,298**
				$	**100,000,000**
INFLATION (MID-TERM)	% PER YEAR	5.0	3%	$	15,922,995
	2032 TOTAL			**$**	**115,895,293**
				$	**115,900,000**