Cooper Creek Bridge

2019.03-Project Review

UAA Civil Engineering Capstone

NOMAD ENGINEERING

Project Team

Client

- David Story
- Lia Slemons

Nomad Engineering

- Whitley Mattern, EIT
- Ryane Schrank, EIT
- Aaron Murph, EIT
- Jacob Kinder, EIT

Professional Mentors

- Jesse Escamilla III, PE
- Trevor Straight, PE
- Rori Van Nortwick, PE
- Nicholas Conway, PE
- Rys Miranda, PE

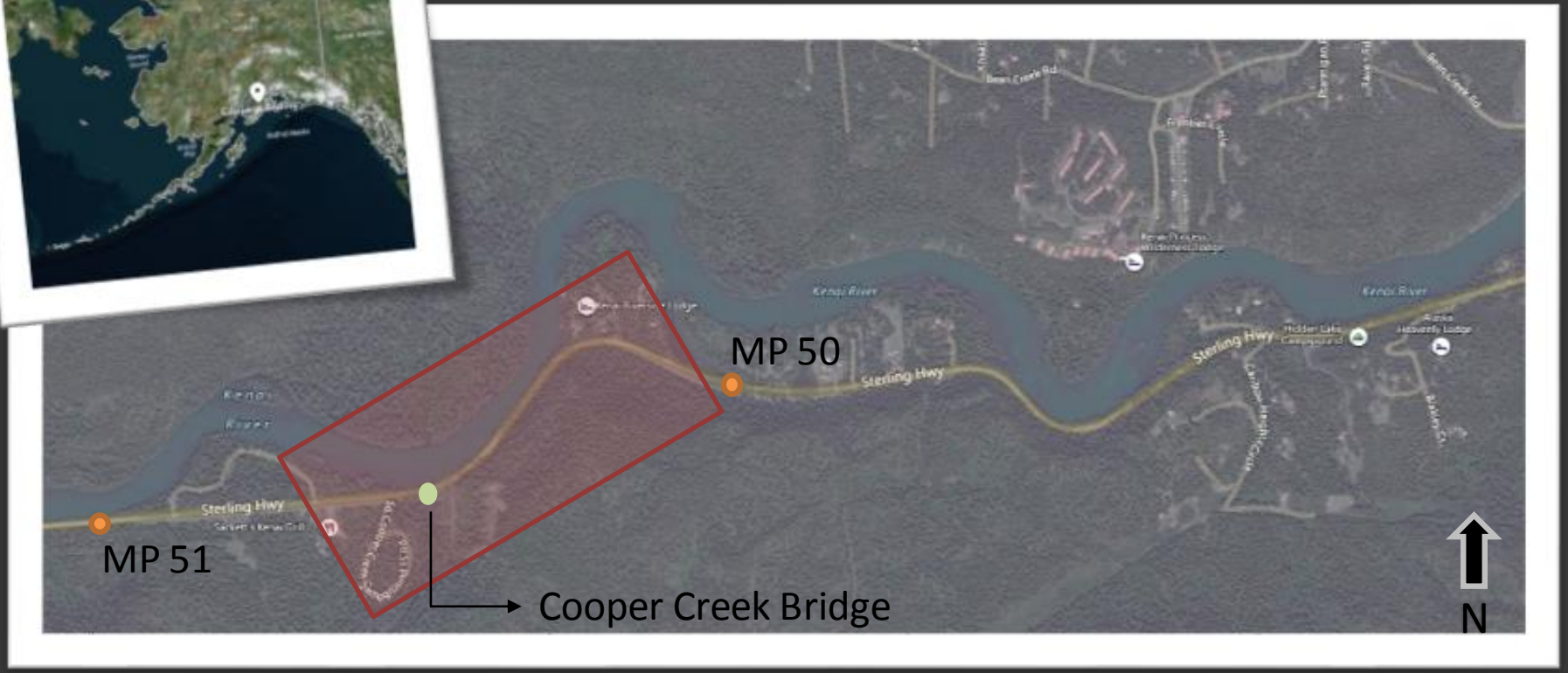
Faculty Advisor

- Scott Hamel, PE, PhD

Overview

- Project Background
- Objective and Project Goals
- Explored Alternatives
  - Horizontal Alignment
  - Typical Sections
- Preferred Alternative
  - Horizontal and Vertical Alignment
  - Typical Sections
  - Signing and Striping
  - Cost Estimate

Project Background



Existing Conditions

Unsafe Travel Conditions

- Non-existent shoulders
- Narrow and tight curves
- No space for pedestrians to cross bridge

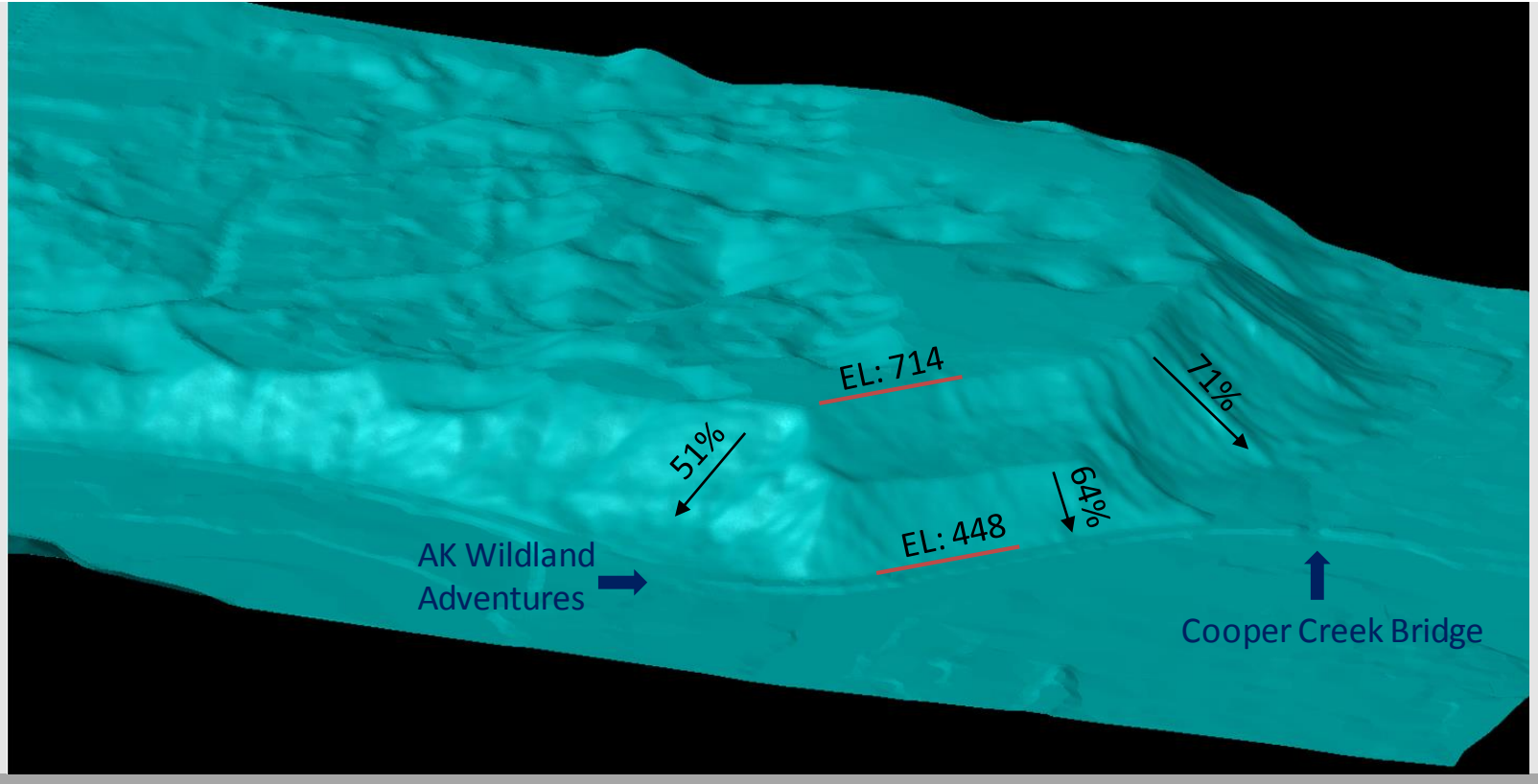
Lack of Connectivity

- No paths for pedestrians and bikers
- Unsafe conditions
- Discourages active modes of travel

Environmental Constraints

- Unstable and steep backslopes
- Silty soils
- Anadromous stream habitat

Existing Conditions



Objectives

Provide a safe east-west connection across Cooper Creek for active travelers.

Improve upon the existing trail system within Cooper Landing.

Walkable Community Project
COOPER LANDING

Project Goals/ Scope

Develop east-west connection across bridge

Analyze three design alternatives

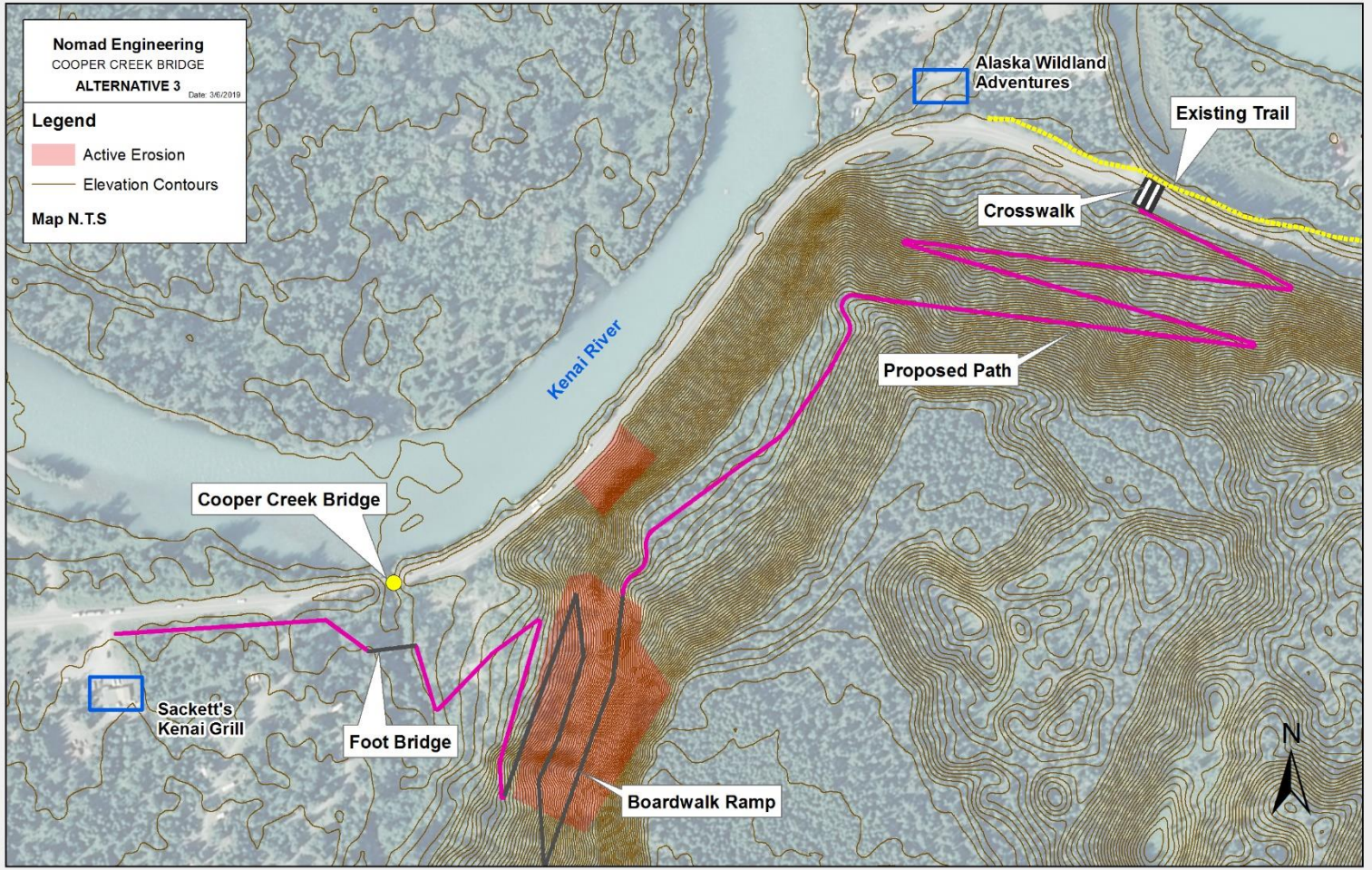
- Provide safe passage for active modes of travel
- Ensure the anadromous stream is unaffected
- Connect to existing trail system

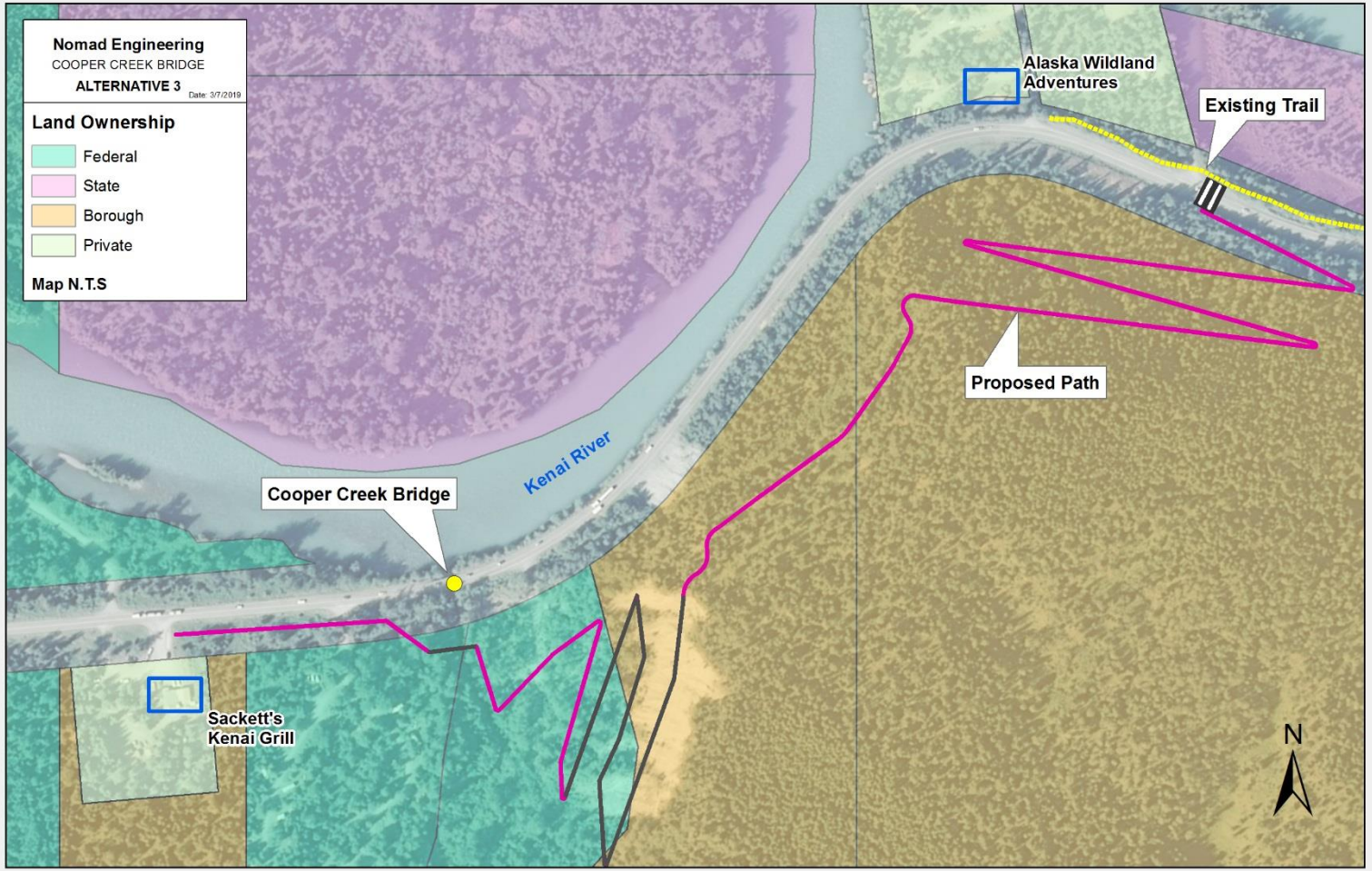
Deliverables

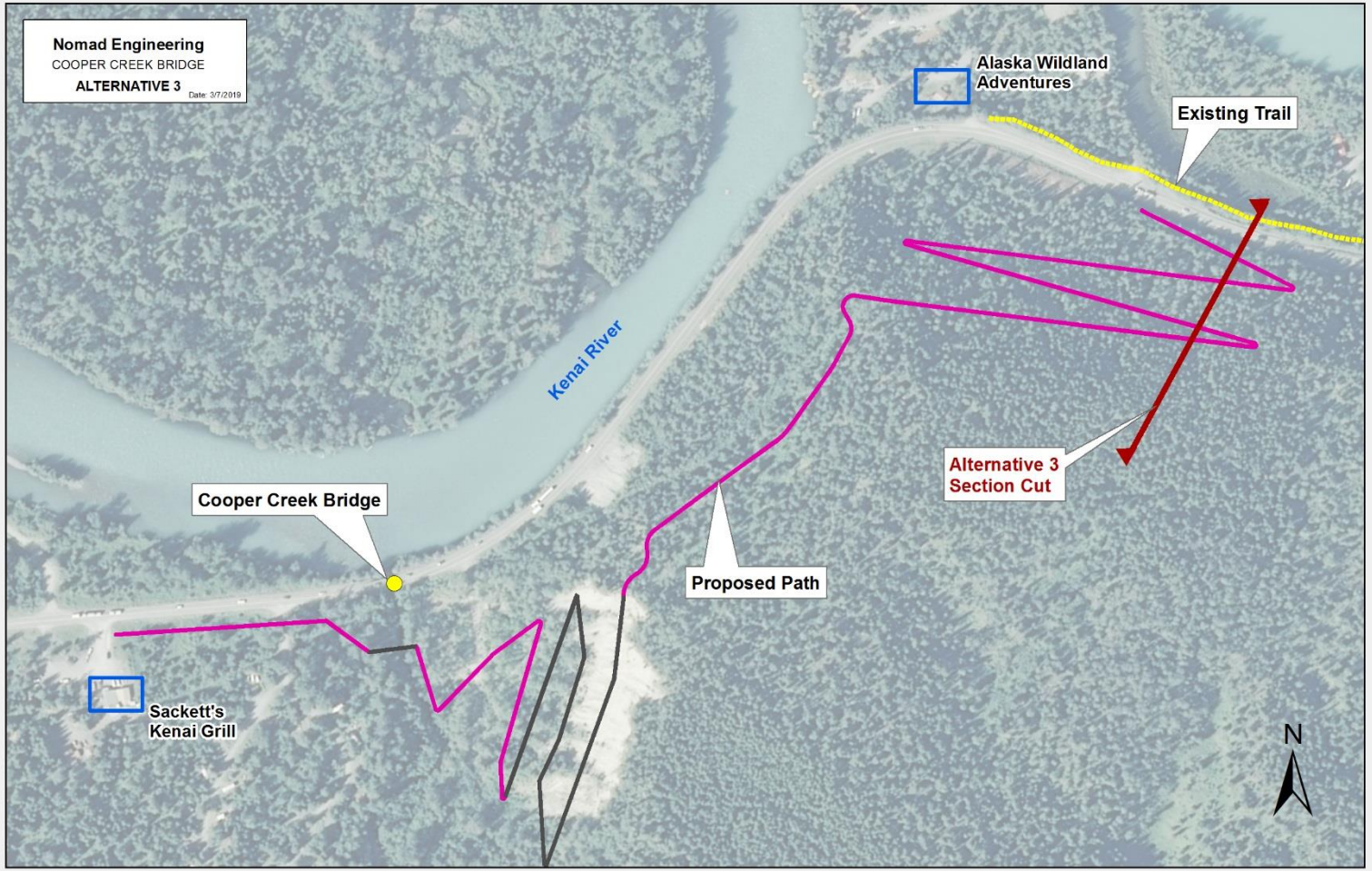
Alternatives Analysis Report

35% Design Plan Set and Final Report

Alternative 3

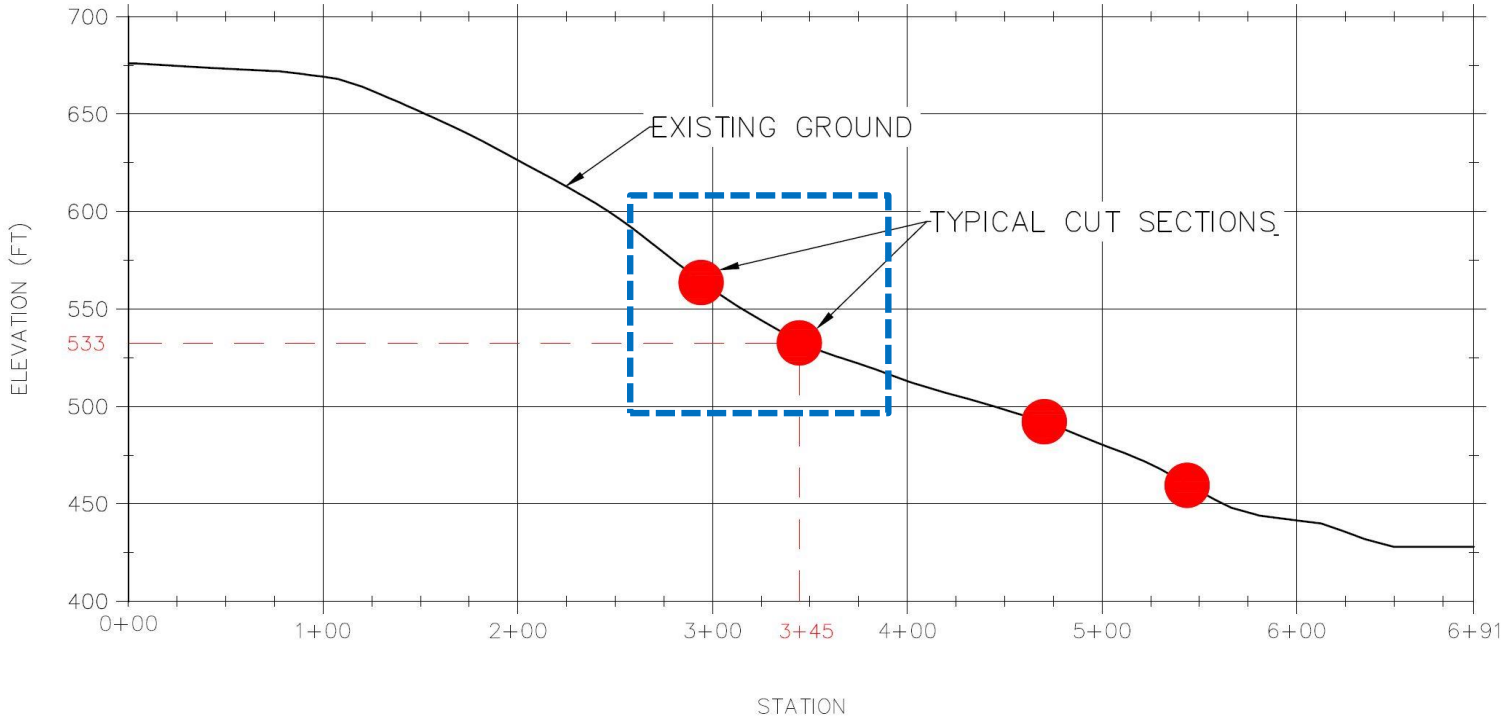

Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 3
Date: 3/6/2019
Legend
Active Erosion
Elevation Contours
Map N.T.S
Alaska Wildland Adventures
Existing Trail
Crosswalk
Kenai River
Proposed Path
Cooper Creek Bridge
Sackett's Kenai Grill
Foot Bridge
Boardwalk Ramp
N

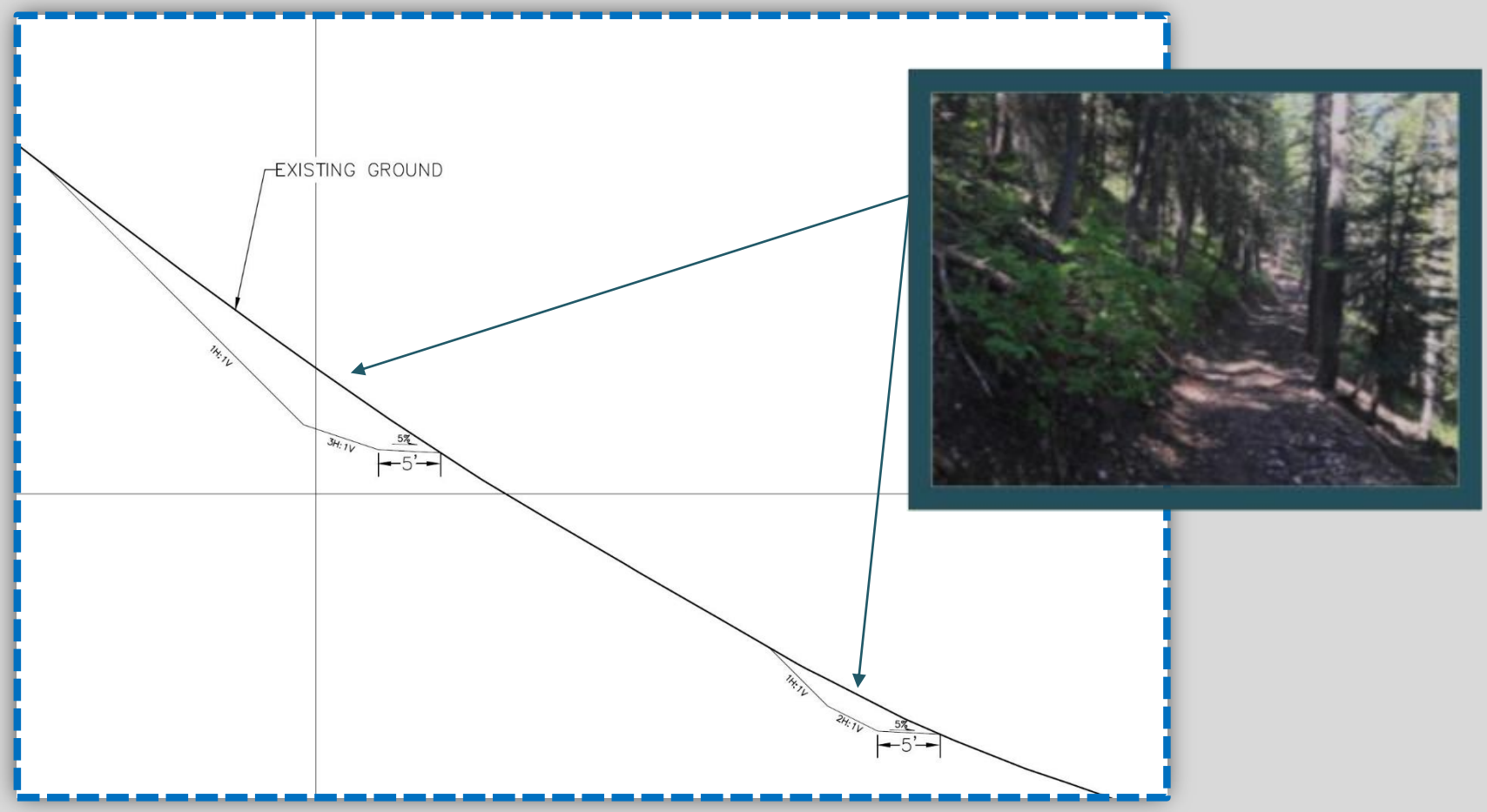

Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 3
Date: 3/7/2019
Land Ownership
Federal
State
Borough
Private
Map N.T.S
Alaska Wildland Adventures
Existing Trail
Proposed Path
Kenai River
Cooper Creek Bridge
Sackett's Kenai Grill
N


Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 3
Date: 3/7/2019
Alaska Wildland Adventures
Existing Trail
Kenai River
Alternative 3 Section Cut
Cooper Creek Bridge
Proposed Path
Sackett's Kenai Grill
N

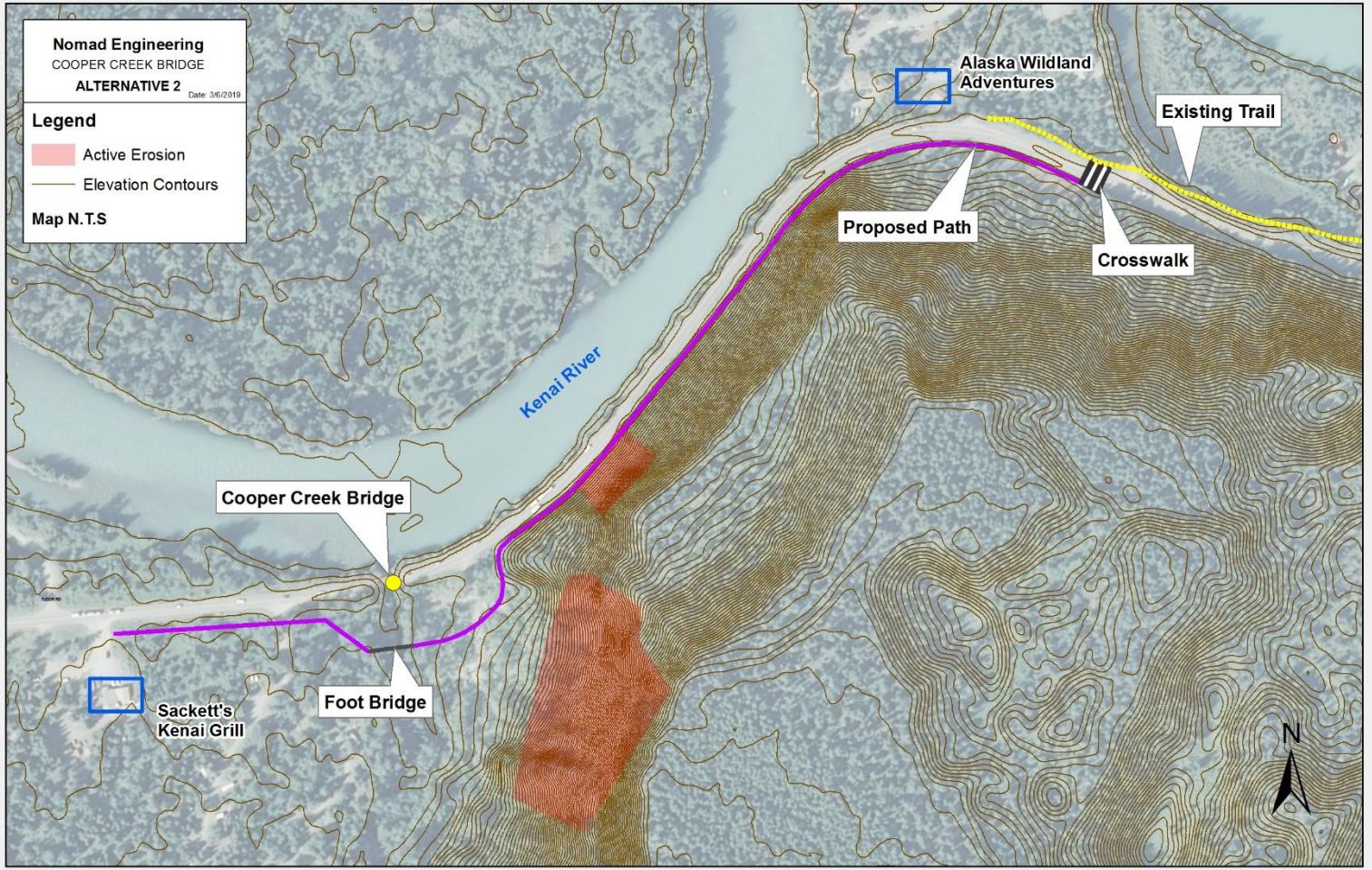
ALTERNATIVE 3

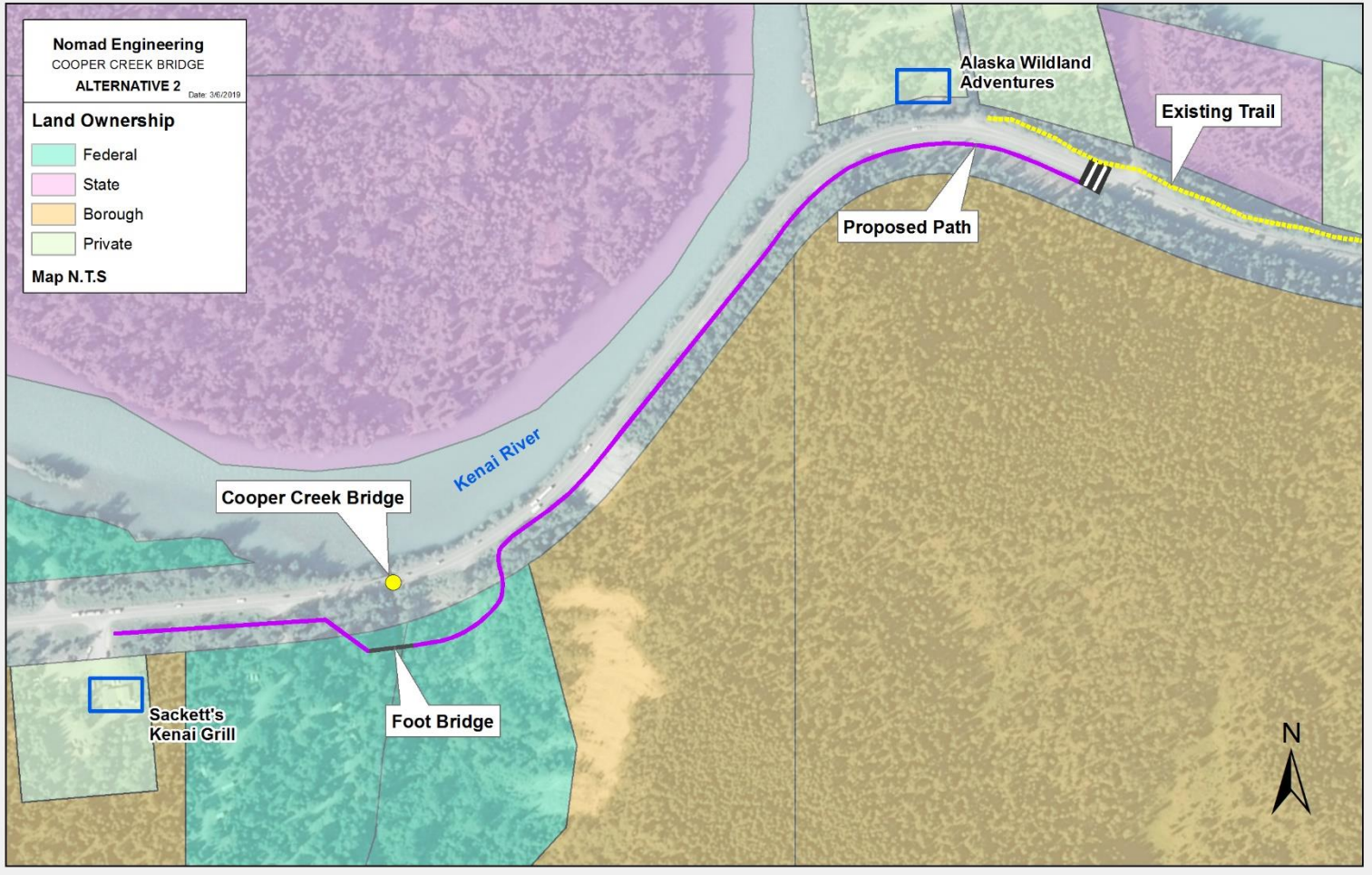
SECTION VIEW

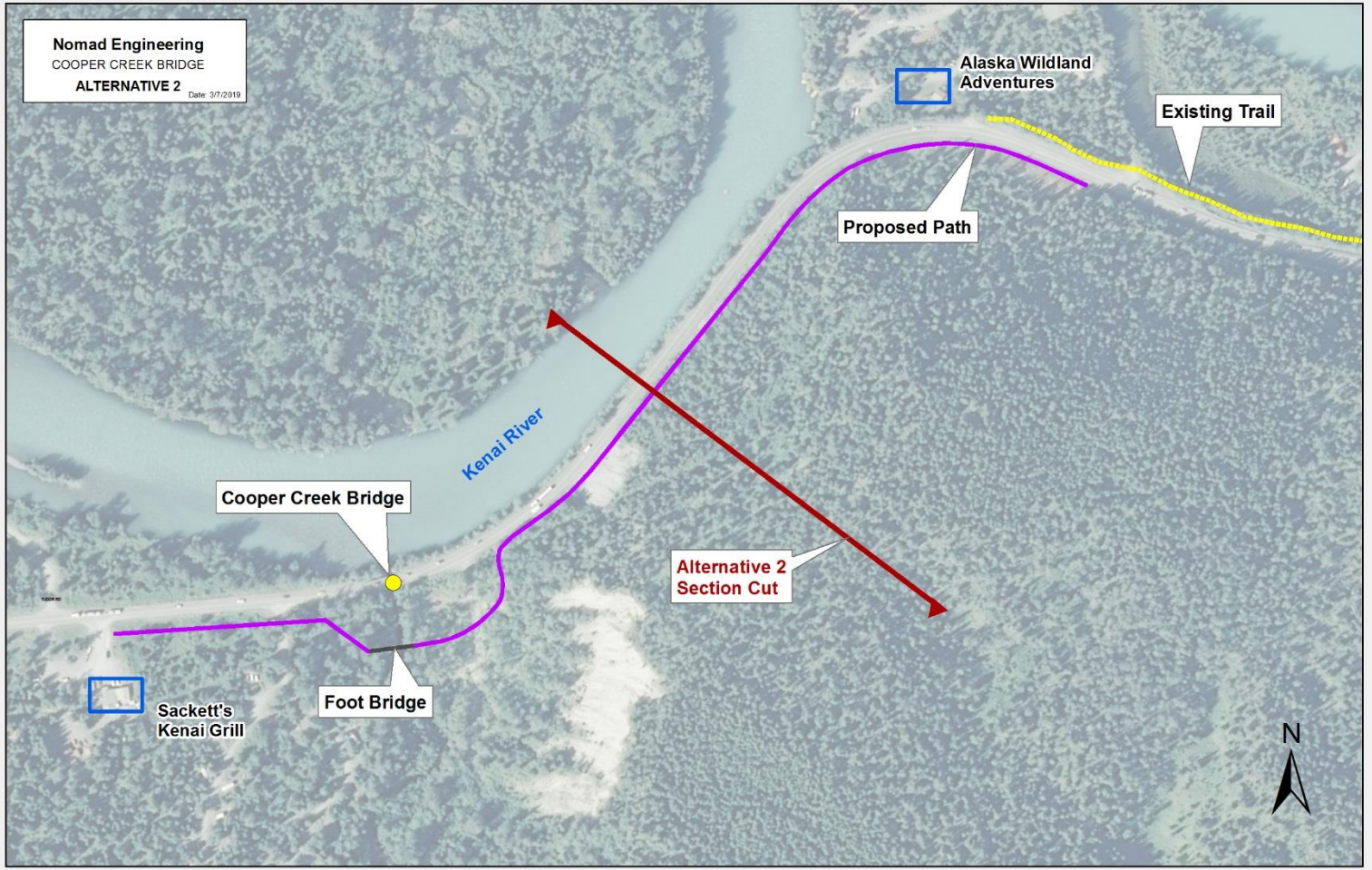



EXISTING GROUND
1H:1V
3H:1V
5%
5'
1H:1V
2H:1V
5%
5'

Alternative 2

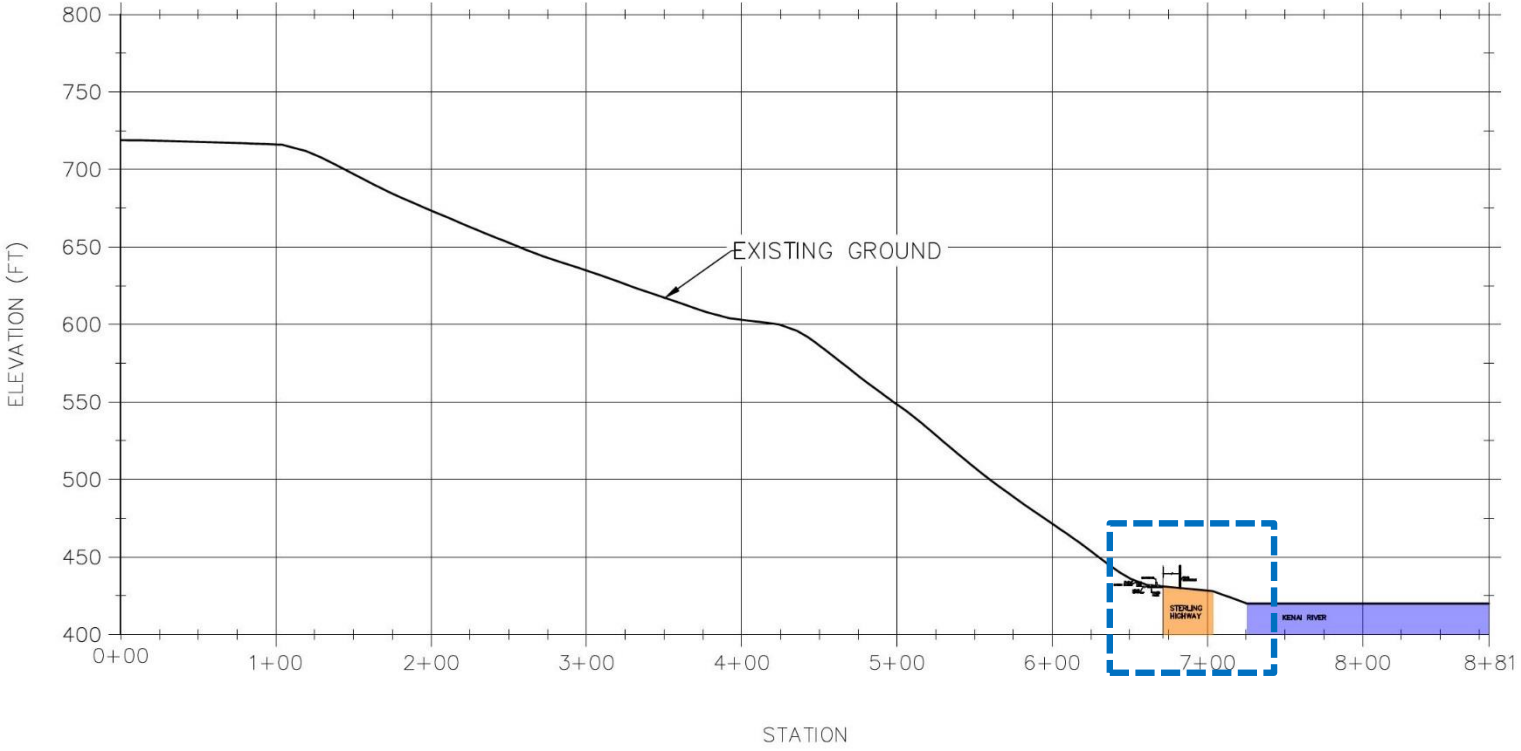

Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 2
Date: 3/6/2019
Legend
Active Erosion
Elevation Contours
Map N.T.S
Alaska Wildland Adventures
Existing Trail
Proposed Path
Crosswalk
Kenai River
Cooper Creek Bridge
Foot Bridge
Sackett's Kenai Grill
N

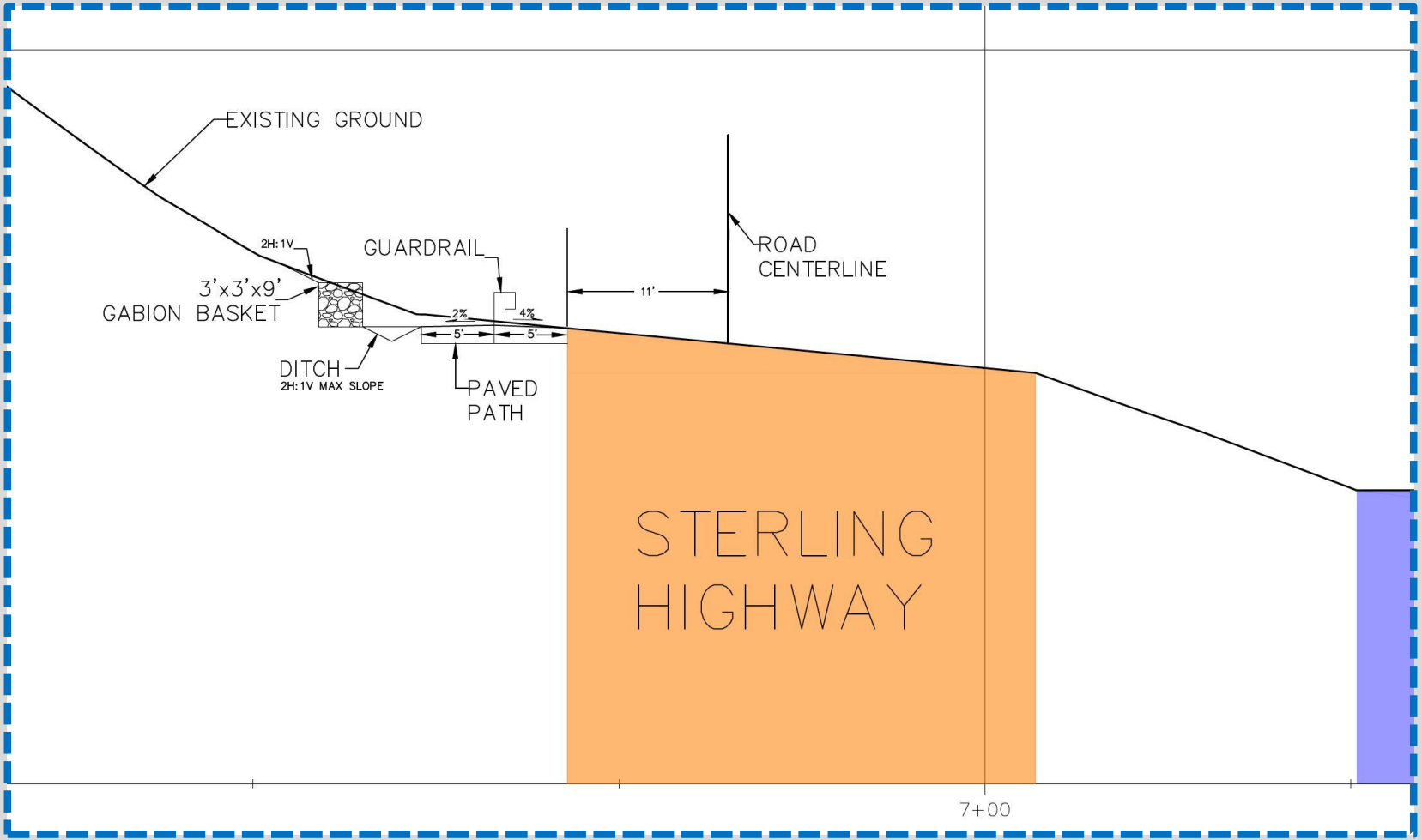

Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 2
Date: 3/6/2019
Land Ownership
Federal
State
Borough
Private
Map N.T.S
Alaska Wildland Adventures
Existing Trail
Proposed Path
Kenai River
Cooper Creek Bridge
Foot Bridge
Sackett's Kenai Grill
N


Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 2
Date: 3/7/2019
Alaska Wildland Adventures
Existing Trail
Proposed Path
Kenai River
Cooper Creek Bridge
Alternative 2 Section Cut
Foot Bridge
Sackett's Kenai Grill
N

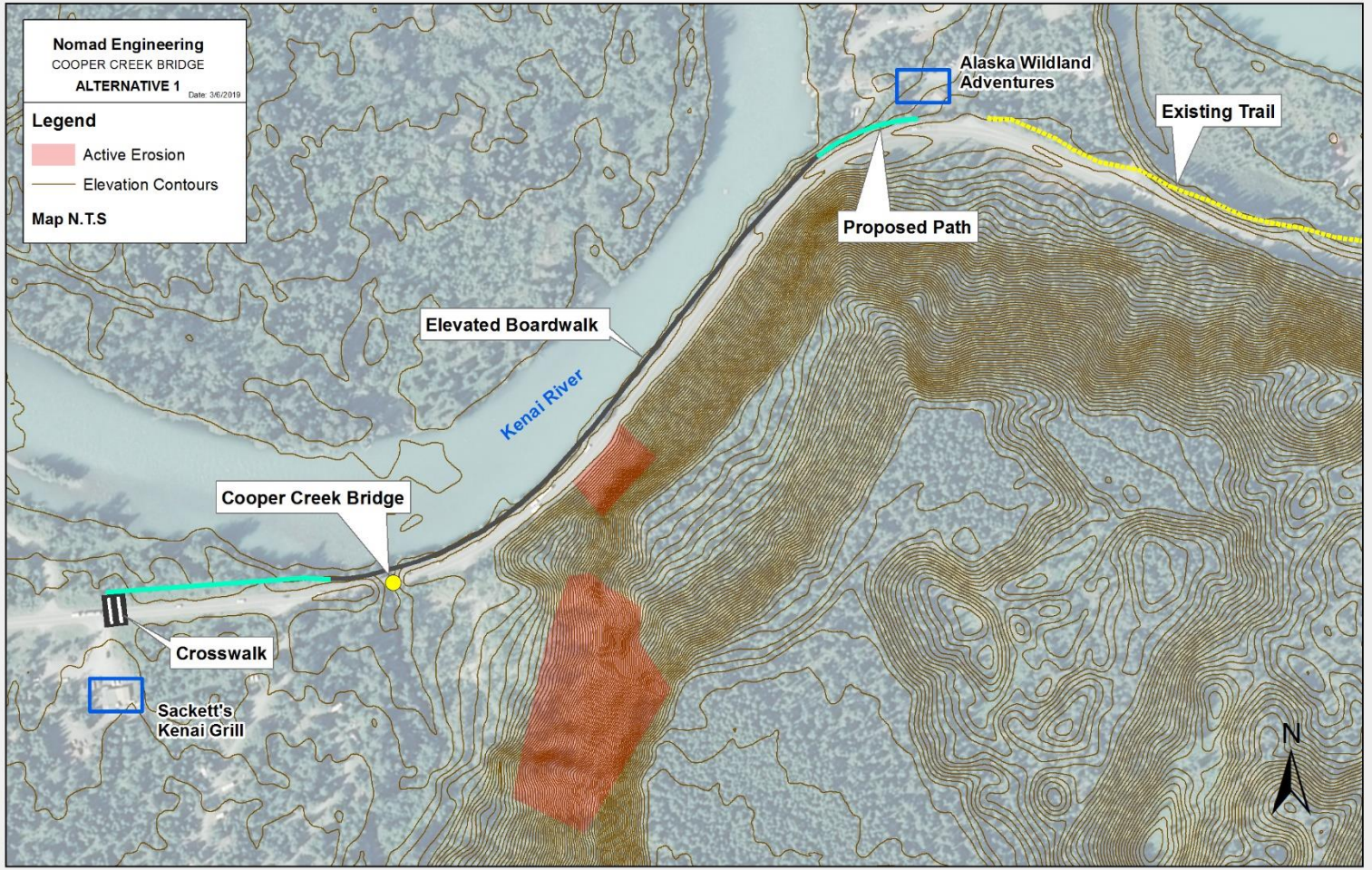
ALTERNATIVE 2

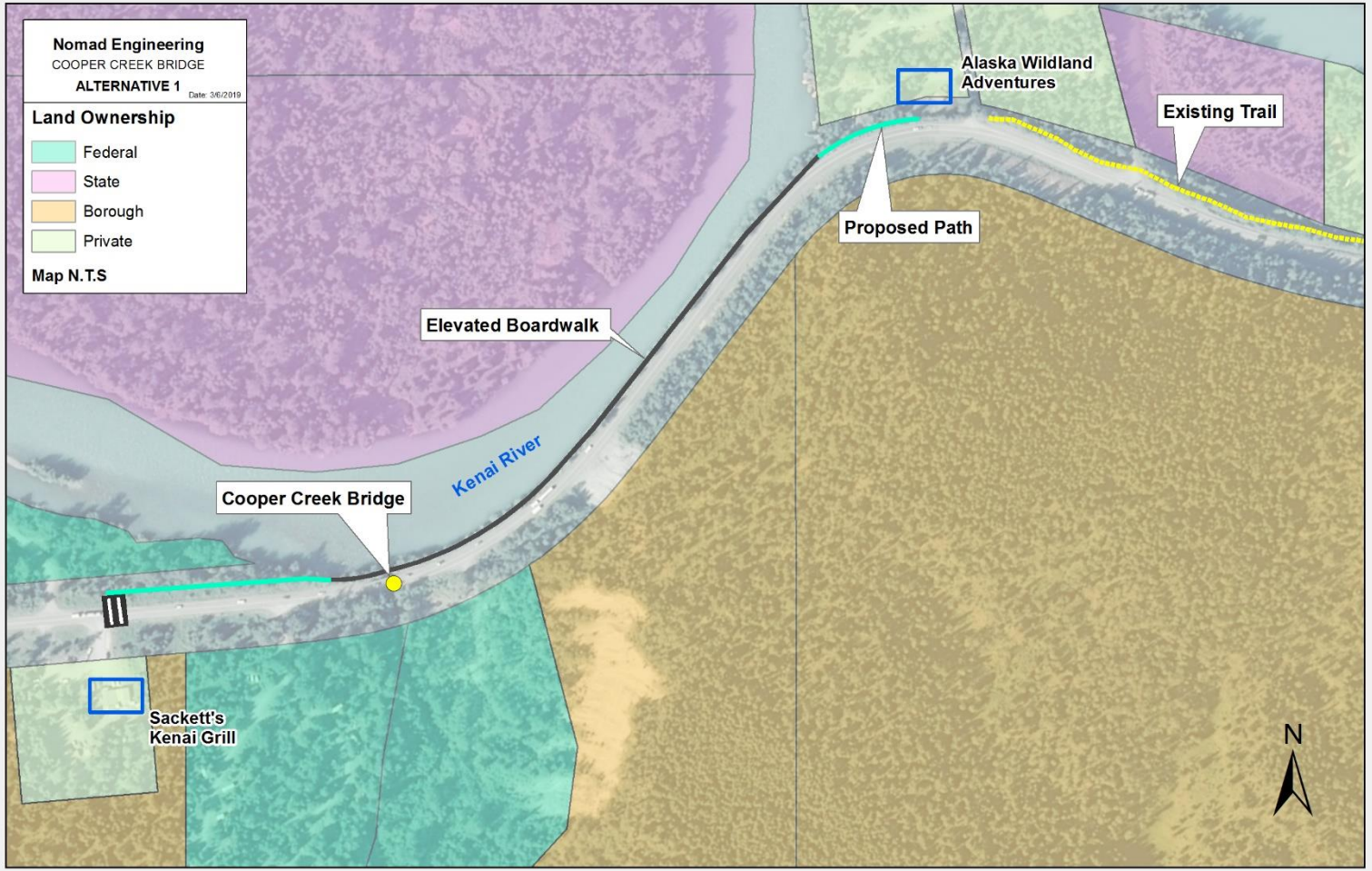
SECTION VIEW

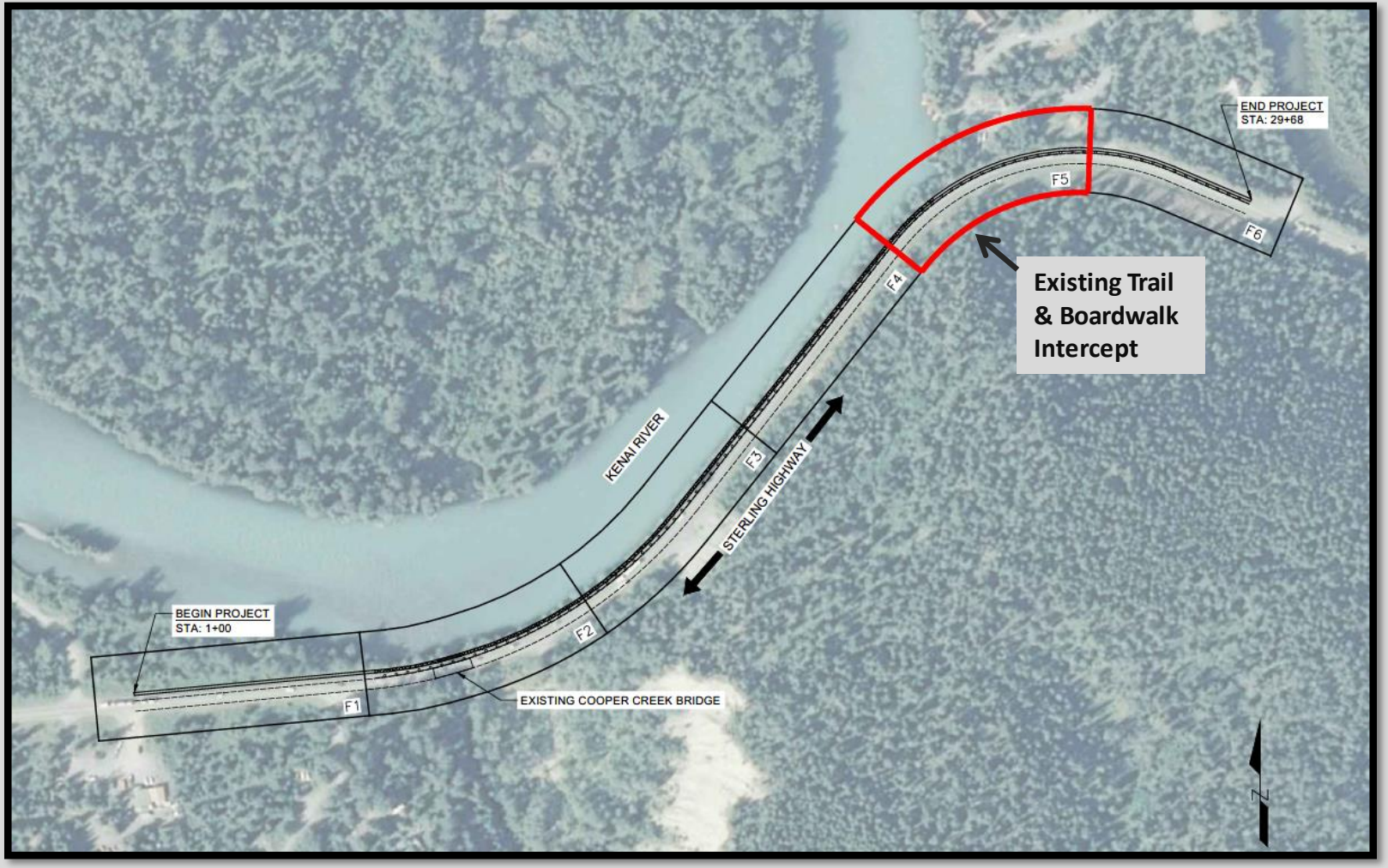


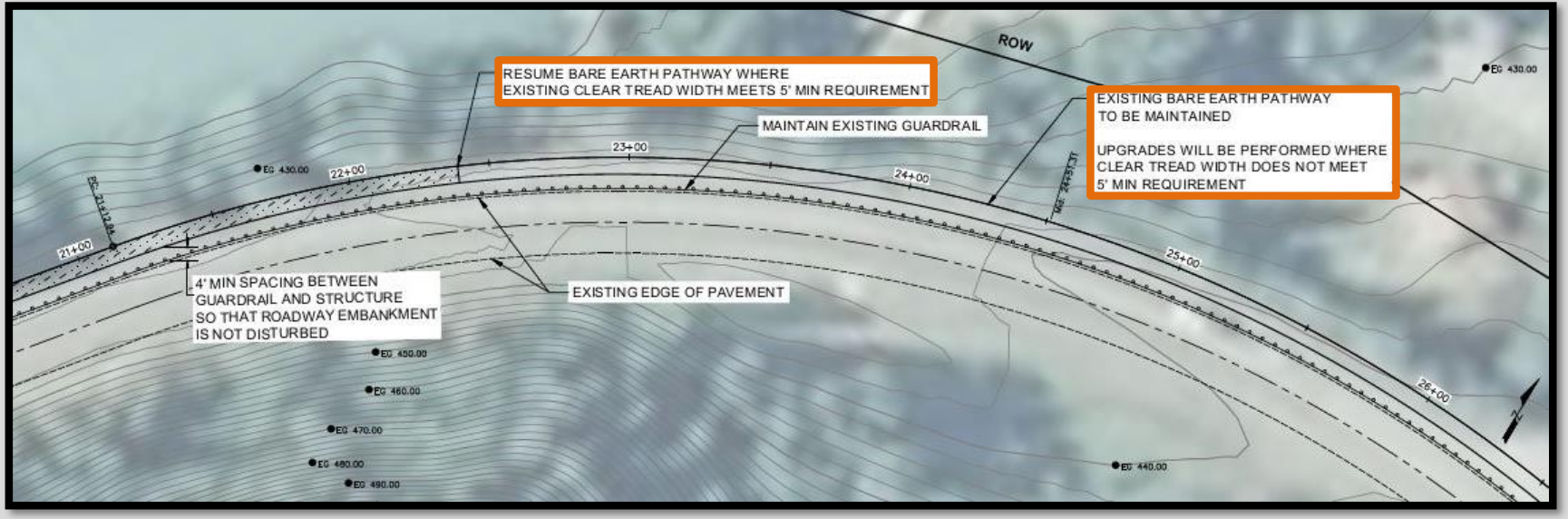

EXISTING GROUND
2H:1V
GUARDRAIL
ROAD
CENTERLINE
3'x3'x9'
GABION BASKET
11'
2%
4%
5'
5'
DITCH
2H:1V MAX SLOPE
PAVED
PATH
STERLING
HIGHWAY
7+00

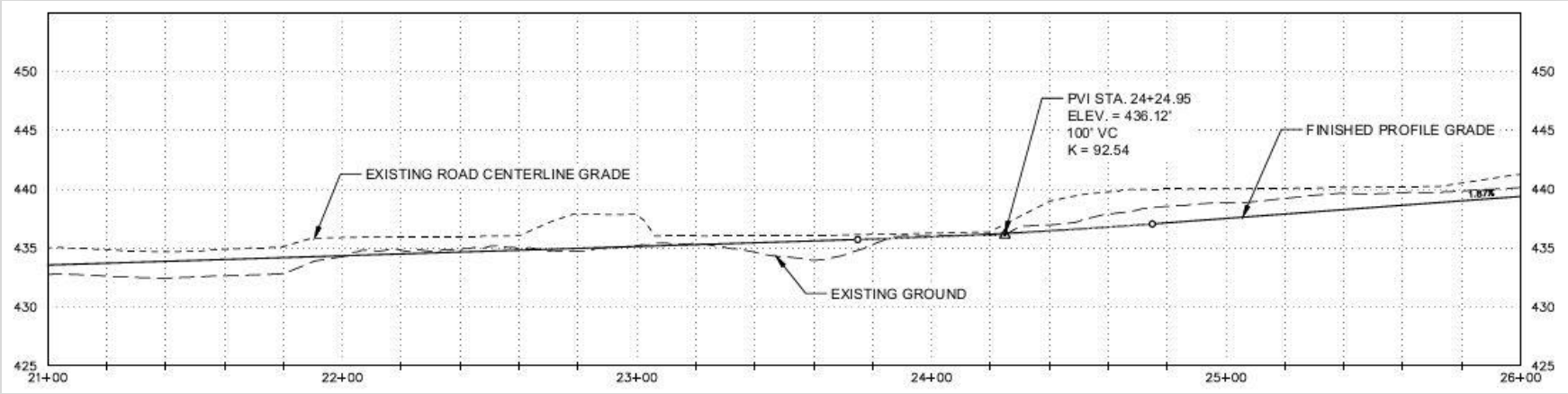
Alternative 1


Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 1
Date: 3/6/2019
Legend
Active Erosion
Elevation Contours
Map N.T.S
Alaska Wildland Adventures
Existing Trail
Proposed Path
Elevated Boardwalk
Kenai River
Cooper Creek Bridge
Crosswalk
Sackett's Kenai Grill
N


Nomad Engineering
COOPER CREEK BRIDGE
ALTERNATIVE 1
Date: 3/6/2019
Land Ownership
Federal
State
Borough
Private
Map N.T.S
Alaska Wildland Adventures
Existing Trail
Proposed Path
Elevated Boardwalk
Kenai River
Cooper Creek Bridge
Sackett's Kenai Grill
N

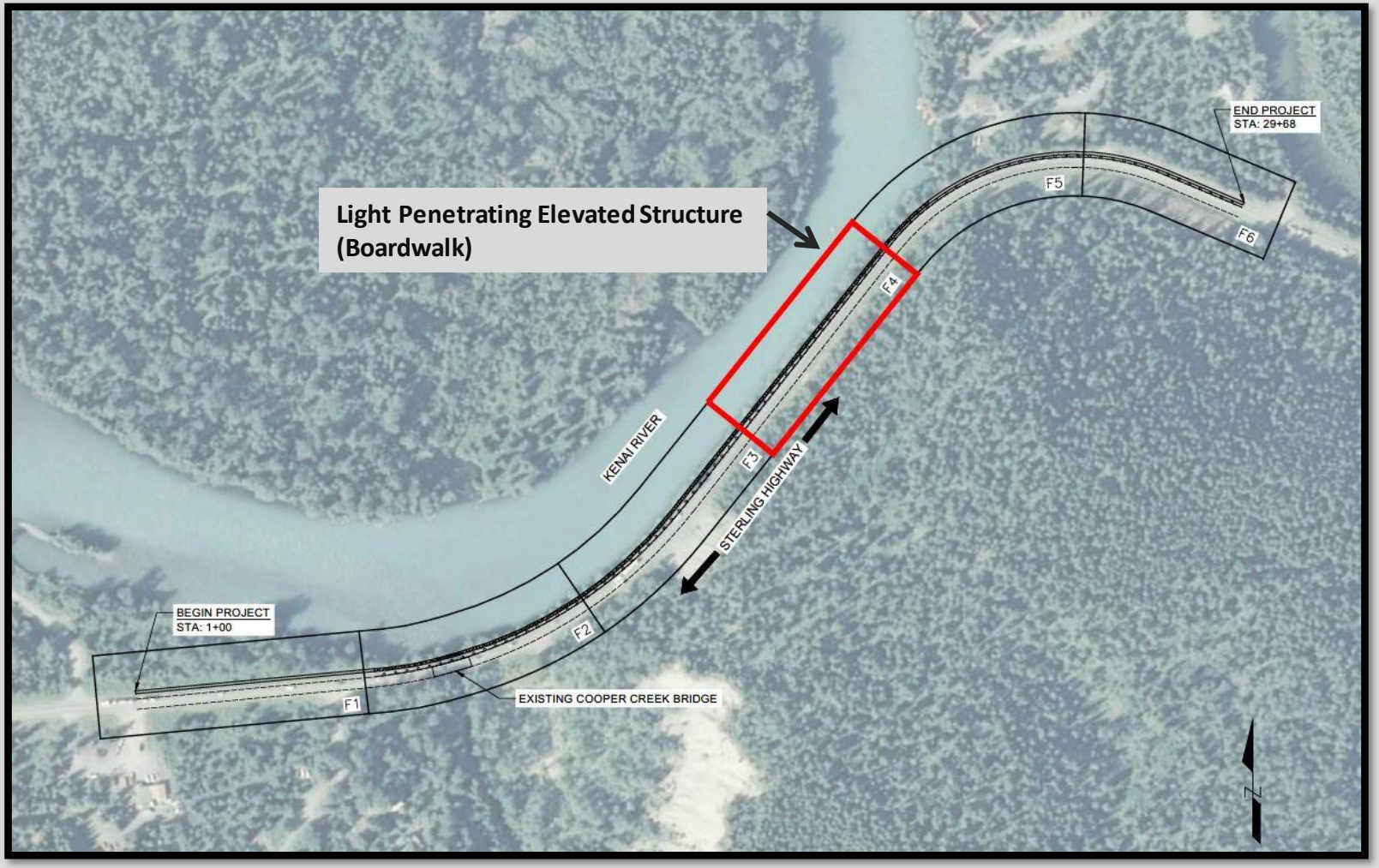

END PROJECT
STA: 29+68
F5
F6
F4
Existing Trail
& Boardwalk
Intercept
KENAI RIVER
F3
STERLING HIGHWAY
BEGIN PROJECT
STA: 1+00
F2
F1
EXISTING COOPER CREEK BRIDGE
N

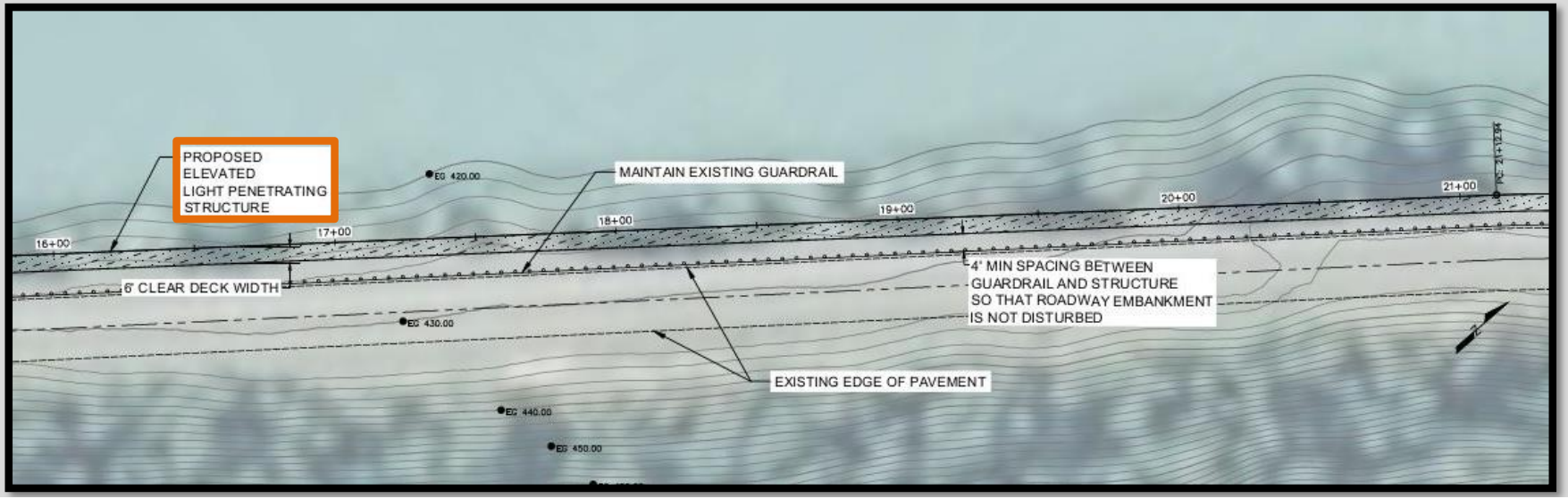

ROW
RESUME BARE EARTH PATHWAY WHERE
EXISTING CLEAR TREAD WIDTH MEETS 5' MIN REQUIREMENT
MAINTAIN EXISTING GUARDRAIL
EXISTING BARE EARTH PATHWAY
TO BE MAINTAINED
UPGRADES WILL BE PERFORMED WHERE
CLEAR TREAD WIDTH DOES NOT MEET
5' MIN REQUIREMENT
4' MIN SPACING BETWEEN
GUARDRAIL AND STRUCTURE
SO THAT ROADWAY EMBANKMENT
IS NOT DISTURBED
EXISTING EDGE OF PAVEMENT
EG 430.00
EG 440.00
EG 450.00
EG 460.00
EG 470.00
EG 480.00
EG 490.00
21+00
22+00
23+00
24+00
25+00
26+00

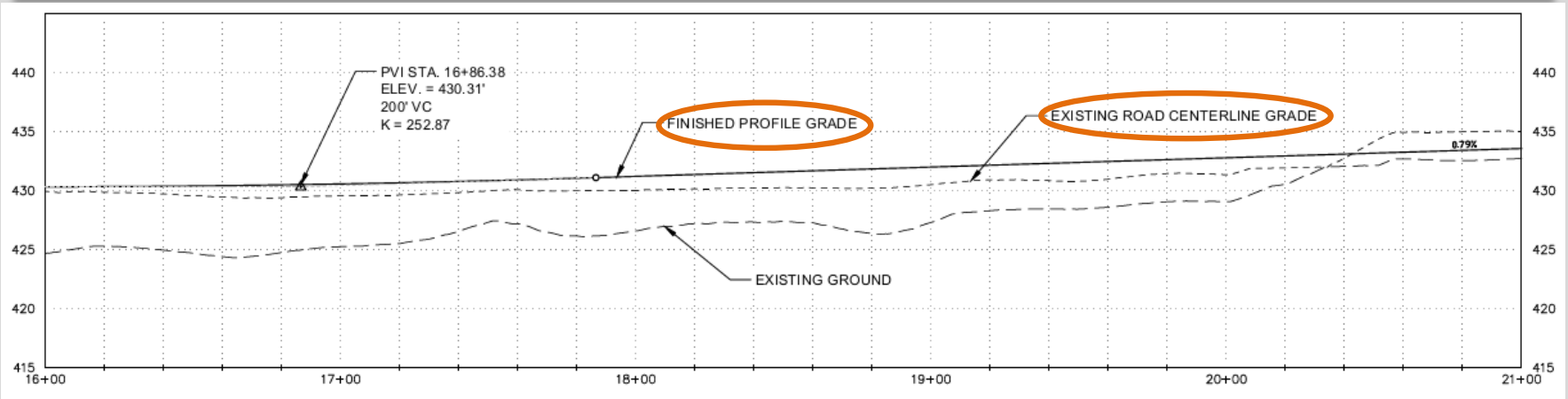

450
445
440
435
430
425
EXISTING ROAD CENTERLINE GRADE
PVI STA. 24+24.95
ELEV. = 436.12'
100' VC
K = 92.54
FINISHED PROFILE GRADE
EXISTING GROUND
1.67%
21+00
22+00
23+00
24+00
25+00
26+00

- Meets 5’ min clear width requirement
- Compacted and level ground
- Clear of vegetation

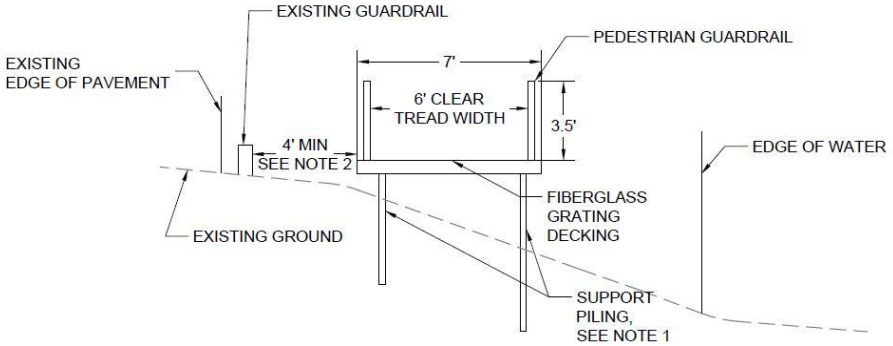
- Insufficient tread width for travelers
- Unlevel and unstable ground
- Vegetation growth during the summer


Light Penetrating Elevated Structure (Boardwalk)
END PROJECT
STA: 29+68
F5
F6
F4
KENAI RIVER
F3
STERLING HIGHWAY
BEGIN PROJECT
STA: 1+00
F2
F1
EXISTING COOPER CREEK BRIDGE
N


PROPOSED
ELEVATED
LIGHT PENETRATING
STRUCTURE
MAINTAIN EXISTING GUARDRAIL
6' CLEAR DECK WIDTH
4' MIN SPACING BETWEEN
GUARDRAIL AND STRUCTURE
SO THAT ROADWAY EMBANKMENT
IS NOT DISTURBED
EXISTING EDGE OF PAVEMENT
16+00
17+00
18+00
19+00
20+00
21+00
EG 420.00
EG 430.00
EG 440.00
EG 450.00


PVI STA. 16+86.38
ELEV. = 430.31'
200' VC
K = 252.87
FINISHED PROFILE GRADE
EXISTING ROAD CENTERLINE GRADE
EXISTING GROUND
0.79%
440
435
430
425
420
415
16+00
17+00
18+00
19+00
20+00
21+00

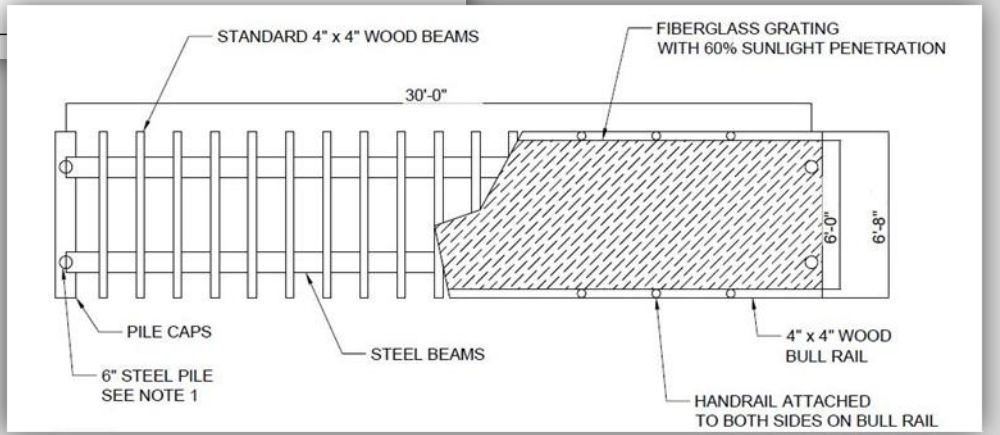
Boardwalk Details



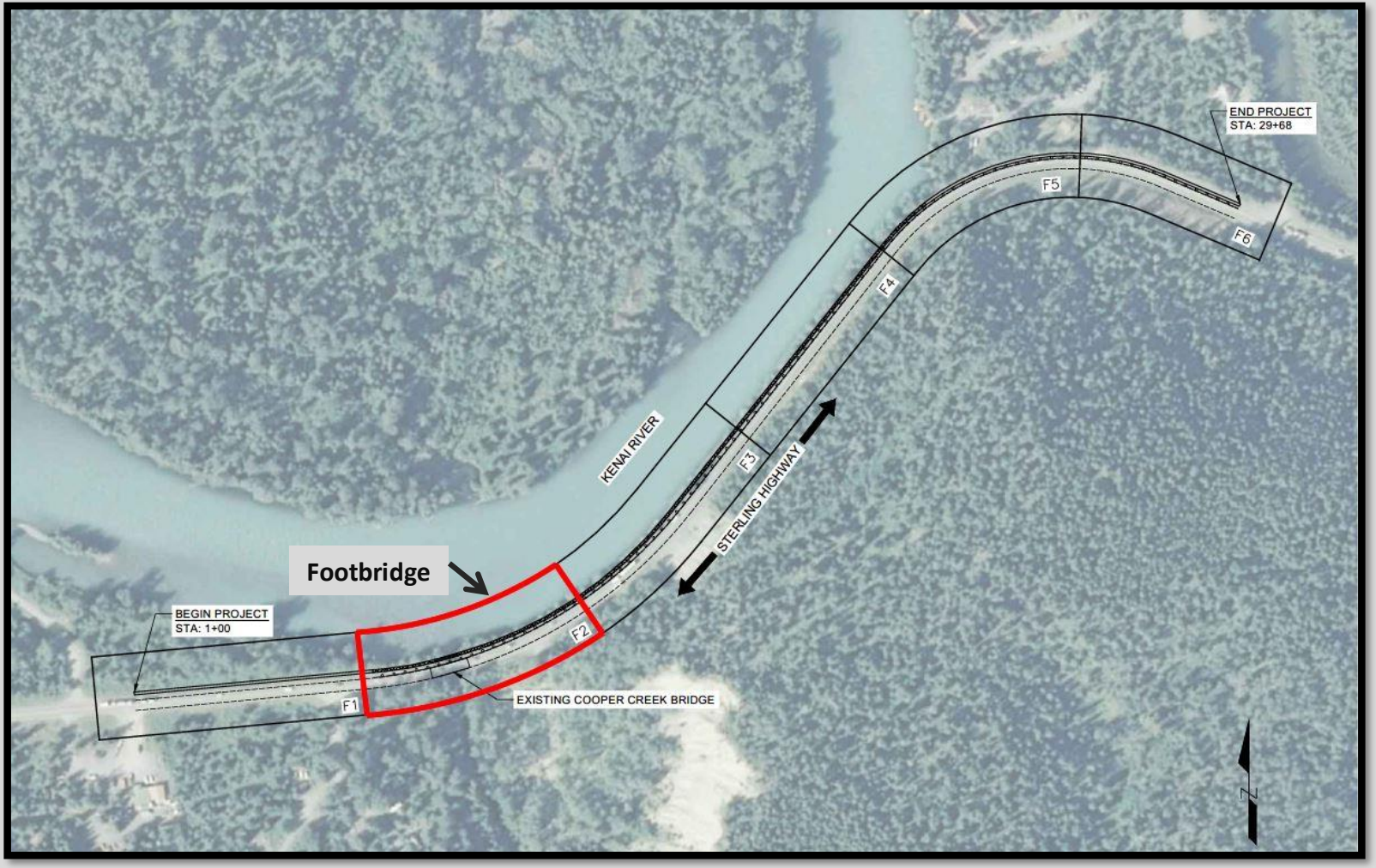
NOTES

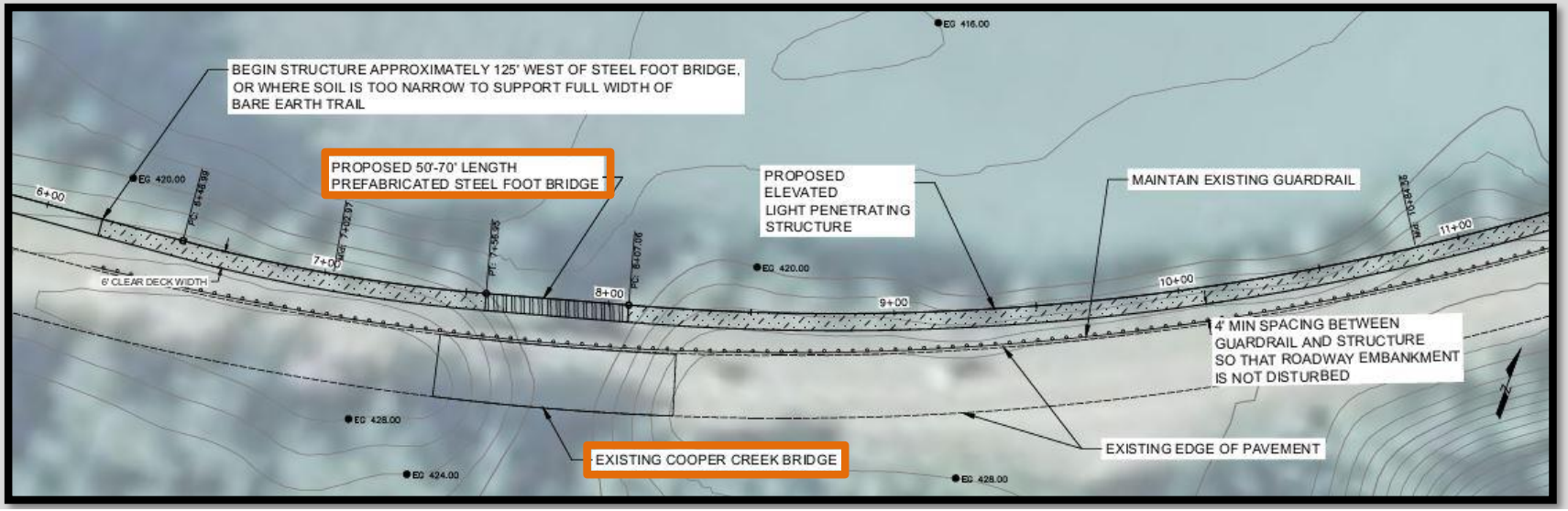
1. GEOTECHNICAL DATA NEEDS TO BE COLLECTED TO ACCURATELY CALCULATE PILE DEPTH AND PILE DIAMETER.
2. 4' MIN OR LARGER SPACING NEEDS TO BE MAINTAINED BETWEEN ROAD GUARDRAIL AND STRUCTURE SO THAT ROADWAY EMBANKMENT IS NOT SIGNIFICANTLY DISTURBED.

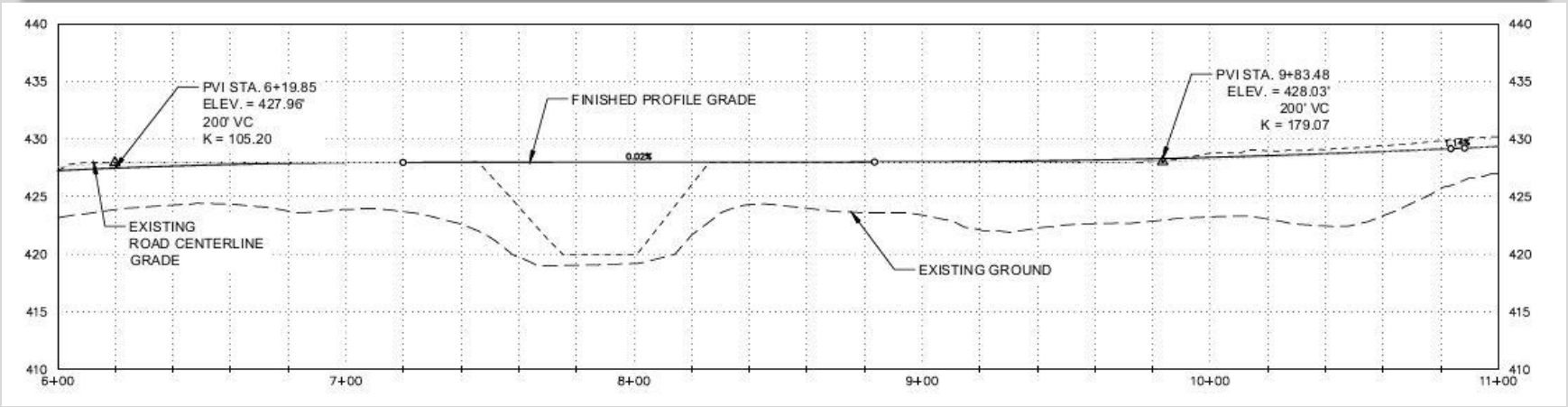
2 / B1 ELEVATED LIGHT PENETRATING STRUCTURE TYPICAL SECTION
NTS



Boardwalk Sketch

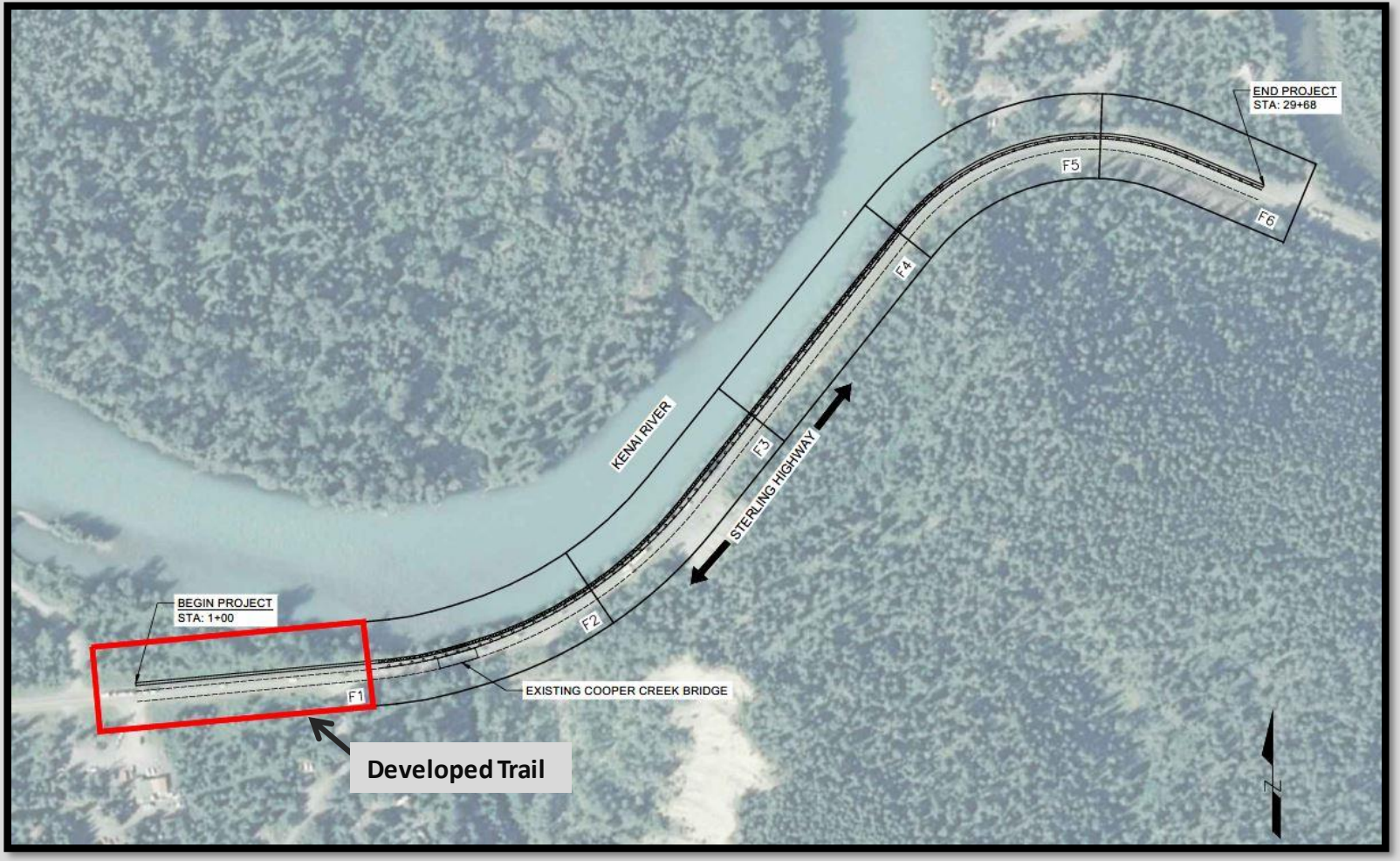

END PROJECT
STA: 29+68
F5
F6
F4
KENAI RIVER
F3
STERLING HIGHWAY
Footbridge
BEGIN PROJECT
STA: 1+00
F2
F1
EXISTING COOPER CREEK BRIDGE
N

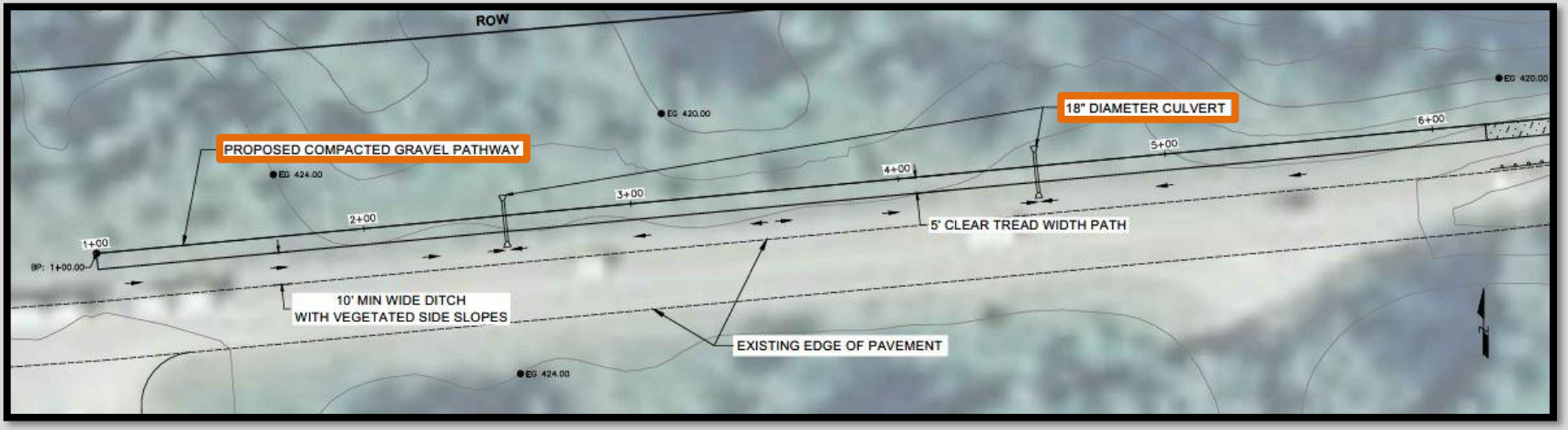

BEGIN STRUCTURE APPROXIMATELY 125' WEST OF STEEL FOOT BRIDGE, OR WHERE SOIL IS TOO NARROW TO SUPPORT FULL WIDTH OF BARE EARTH TRAIL
PROPOSED 50'-70' LENGTH PREFABRICATED STEEL FOOT BRIDGE
PROPOSED ELEVATED LIGHT PENETRATING STRUCTURE
MAINTAIN EXISTING GUARDRAIL
6' CLEAR DECK WIDTH
4' MIN SPACING BETWEEN GUARDRAIL AND STRUCTURE SO THAT ROADWAY EMBANKMENT IS NOT DISTURBED
EXISTING COOPER CREEK BRIDGE
EXISTING EDGE OF PAVEMENT
EG 416.00
EG 420.00
EG 428.00
EG 424.00
6+00
7+00
8+00
9+00
10+00
11+00

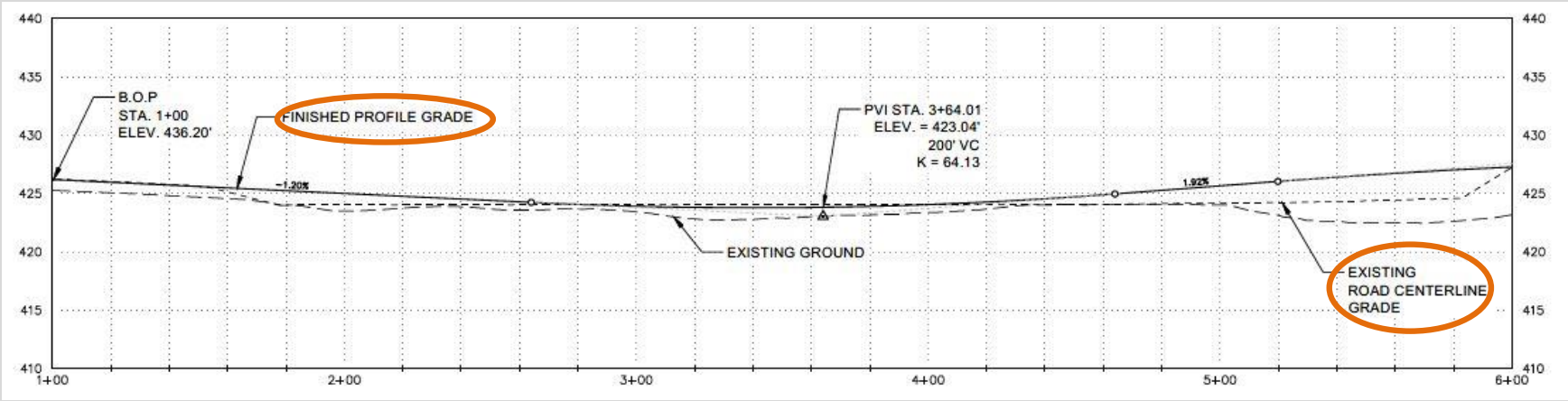

PVI STA. 6+19.85
ELEV. = 427.96'
200' VC
K = 105.20
FINISHED PROFILE GRADE
PVI STA. 9+83.48
ELEV. = 428.03'
200' VC
K = 179.07
EXISTING ROAD CENTERLINE GRADE
EXISTING GROUND
440
435
430
425
420
415
410
6+00
7+00
8+00
9+00
10+00
11+00

Bridge

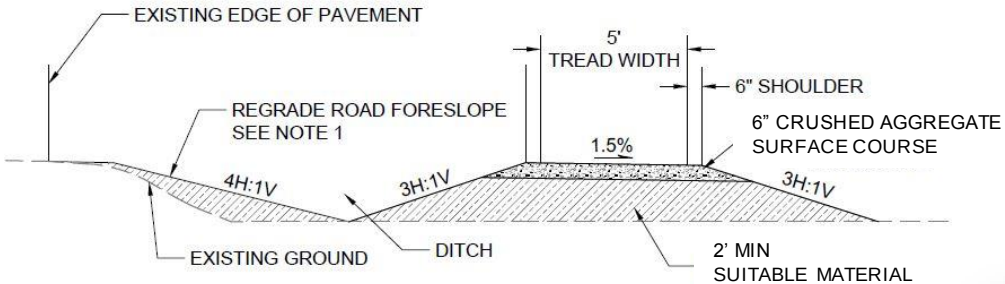
*Images taken from Bridge Brothers' product pamphlet


END PROJECT
STA: 29+68
F5
F6
F4
KENAI RIVER
F3
STERLING HIGHWAY
BEGIN PROJECT
STA: 1+00
F2
F1
EXISTING COOPER CREEK BRIDGE
Developed Trail
N


ROW
PROPOSED COMPACTED GRAVEL PATHWAY
18" DIAMETER CULVERT
5' CLEAR TREAD WIDTH PATH
10' MIN WIDE DITCH
WITH VEGETATED SIDE SLOPES
EXISTING EDGE OF PAVEMENT
EG 420.00
EG 424.00
BP: 1+00.00
1+00
2+00
3+00
4+00
5+00
6+00


B.O.P
STA. 1+00
ELEV. 436.20'
FINISHED PROFILE GRADE
PVI STA. 3+64.01
ELEV. = 423.04'
200' VC
K = 64.13
-1.20%
1.92%
EXISTING GROUND
EXISTING
ROAD CENTERLINE
GRADE
440
435
430
425
420
415
410
1+00
2+00
3+00
4+00
5+00
6+00

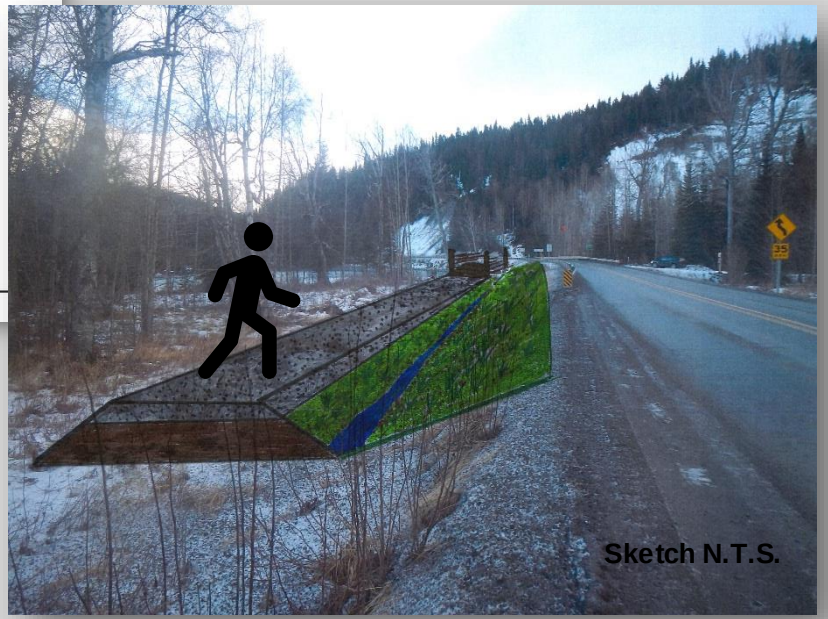
Trail Section



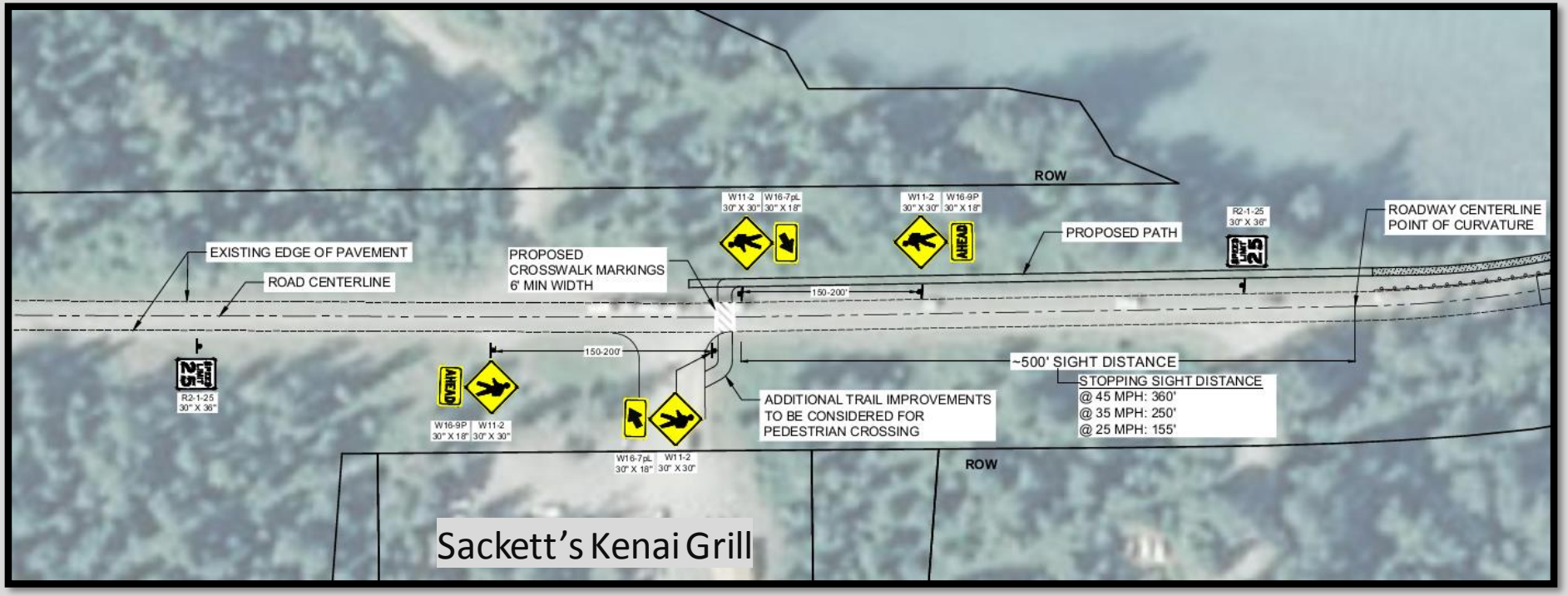
NOTES

1. AFTER REGRADING, DITCH SLOPES WILL BE STABILIZED AND SEEDED.
2. BASE COURSE DEPTH WILL BE ADJUSTED SO THAT A 3H:1V SLOPE IS MAINTAINED ON BOTH SIDES OF TRAIL EMBANKMENT WHICH WILL STOP UPON MEETING THE EXISTING GROUND SURFACE.

1 / B1 TRAIL TYPICAL SECTION
NTS



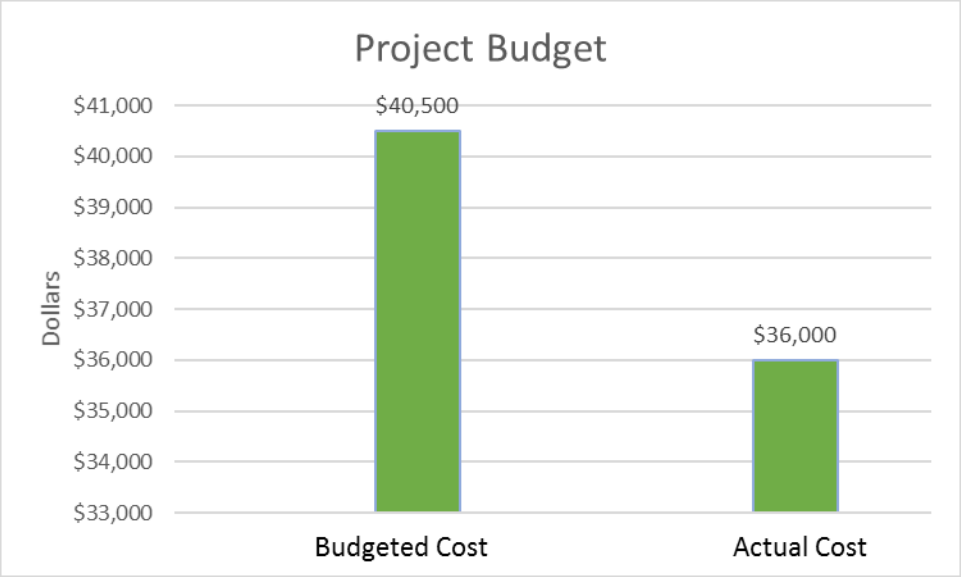
Signing and Striping



Alternative 1
Cost Estimate

Pathway Materials	$30,000
Prefabricated Bridge	$130,000
Boardwalk Structure	$752,000
Other (Construction/ Materials)	$188,000
Total Cost	$1,100,00

Cooper Creek Bridge
Billed Hours



Budgeted Hours	540 hours
Budgeted Cost	$40,500
Actual Hours	480 hours
Actual Cost	$36,000
Project Savings	$4,500


Thank You