



MEMORANDUM
(Form QAP 17.2.3, Rev. 2)

TO: Brian Lindamood, P.E. - ARRC

DATE: 12-July-10

FROM: Michael Pochop, P.E.

SUBJECT: PMRE – Options for Trail Grade Separation
Hanson # 08R0114

Three options have been looked at for the Trail Grade Crossing:

OPTION 1 – 10-ft Diameter Corrugated Metal Pipe (CMP)

This option was looked at with the assumption that the flow line of the culvert would be the same as our ideal flat plane terrain. A cover height of 3'-0" was used over the top of the culvert (1' of ballast, 1' of subballast, 1' of subgrade) to meet minimum requirements of AREMA and to account for some variability to the rail slope over the culvert due to a vertical curve. A drawing of the option is depicted in Attachment A – 10-ft Diameter CMP.

OPTION 2 - 3 Span Bridge w/ 10-ft Vertical Clearance

This option was developed with the idea of providing a 10-ft clearance over the ideal flat plane terrain. The bridge is composed of Alaska Railroad Standard elements for 28-ft spans. A drawing of the option is depicted in Attachment B – 3 Span Bridge w/ 10-ft Vertical Clearance.

OPTION 3 – 3 Span Bridge w/ 15-ft Vertical Clearance

This option was developed with the idea of providing a 15-ft clearance over the ideal flat plane terrain. The bridge is composed of Alaska Railroad Standard elements for 28-ft spans. A drawing of the option is depicted in Attachment C – 3 Span Bridge w/ 15-ft Vertical Clearance.

Opinion of Probable Construction Costs

An estimate has been prepared based on rough quantities and unit pricing from a review of similar projects. The lengths of piles have been estimated and will vary depending on the exact location of the structures. Please see Attachment D – Opinion of Probable Construction Costs.



Attachments

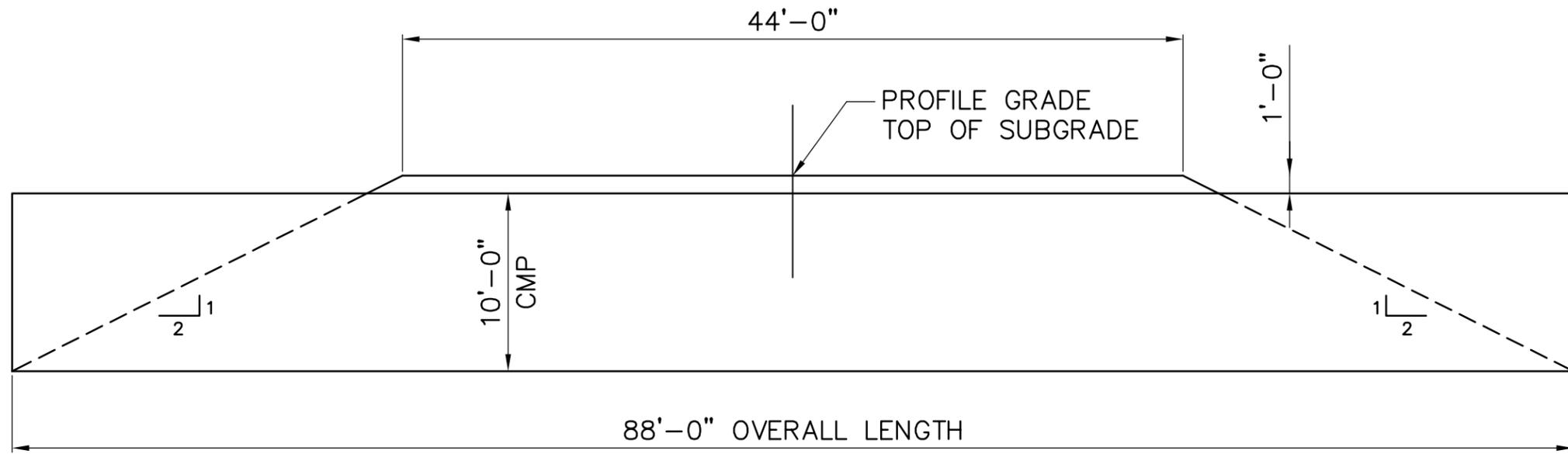
Attachment A – 10-ft Diameter CMP

Attachment B – 3 Span Bridge w/ 10-ft Vertical Clearance

Attachment C – 3 Span Bridge w/ 15-ft Vertical Clearance

Attachment D – Opinion of Probable Construction Costs

Attachment E – Calculation Package, Differential Embankment and Footprint for Grade Separations for Trails



ELEVATION
(LOOKING RY SOUTH)
SCALE: 1/8" = 1'-0"

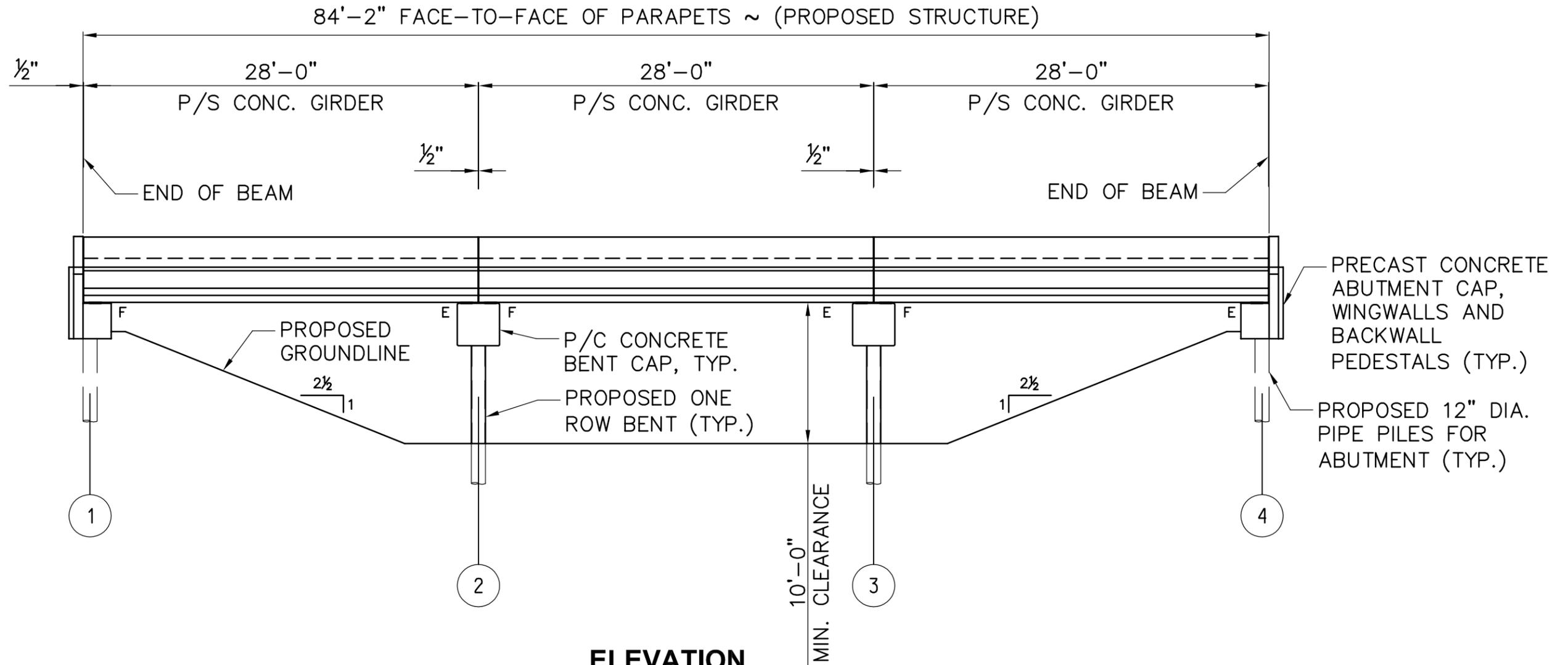
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**CONCEPTUAL PLANS
NOT FOR CONSTRUCTION**



REV.	DATE	BY	REVISION

<p align="center">PORT MACKENZIE MAC EAST ALIGNMENT</p>	
<p align="center">TITLE: TRAIL GRADE SEPARATION - OPTION #1 10 FT. DIAMETER CMP</p>	
DESIGNED BY: JEC	SCALE: H: AS NOTED V: AS NOTED
DRAWN BY: GTJ	DATE: 07/12/10
CHECKED BY: -	APPROVED BY: -
AFE NO.:	ACAD FILE:
DWG NO.:	OF

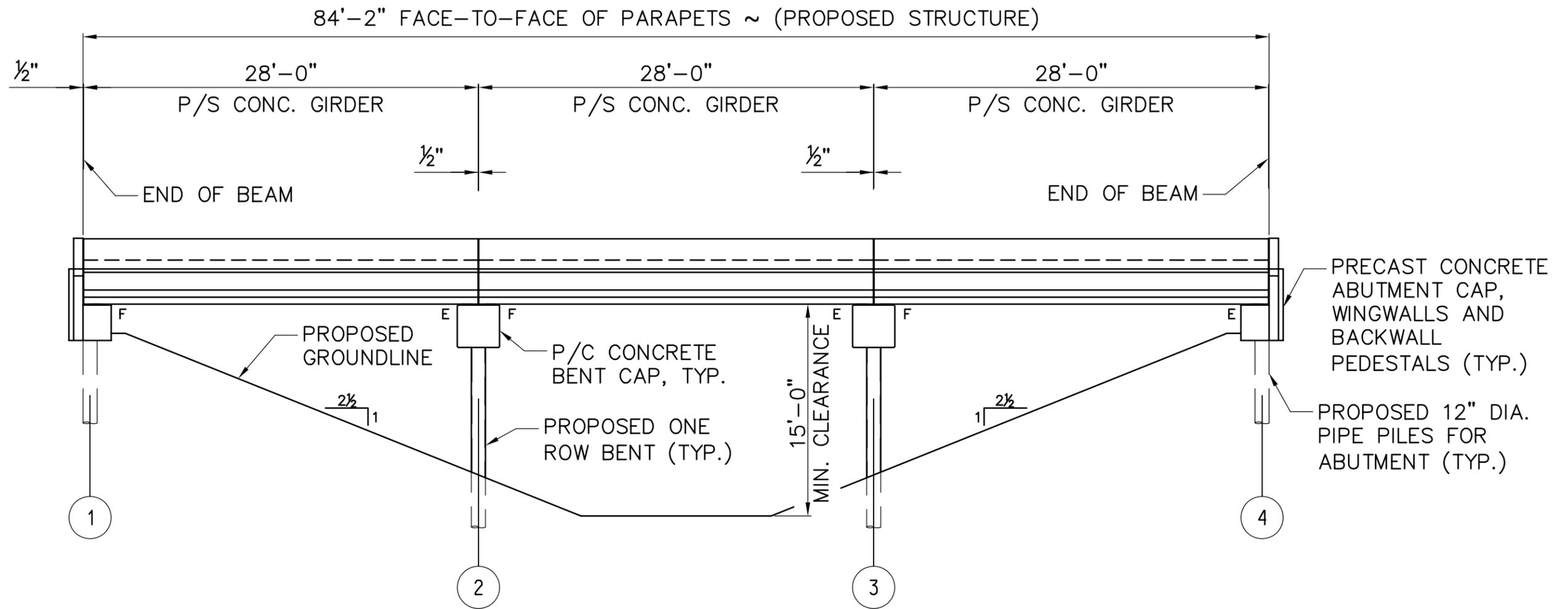


ELEVATION
 (LOOKING RY SOUTH)
 SCALE: 1/8" = 1'-0"

CONCEPTUAL PLANS NOT FOR CONSTRUCTION									
		REV.	DATE	BY	REVISION				

PORT MACKENZIE MAC EAST ALIGNMENT	
TITLE: TRAIL GRADE SEPARATION- OPTION #2 3 SPAN BRIDGE w/ 10 FT. VERTICAL CLEARANCE	
DESIGNED BY: JEC DRAWN BY: GTJ CHECKED BY: APPROVED BY: -	SCALE: H: AS NOTED V: AS NOTED DATE: 07/12/10
AFE NO.: ACAD FILE: DWG NO.:	_____ OF _____

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ELEVATION
 (LOOKING RY SOUTH)
 SCALE: 1/8" = 1'-0"

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CONCEPTUAL PLANS NOT FOR CONSTRUCTION									
		REV.	DATE	BY	REVISION				

PORT MACKENZIE MAC EAST ALIGNMENT	
TITLE: TRAIL GRADE SEPARATION- OPTION #3 3 SPAN BRIDGE w/ 15 FT. VERTICAL CLEARANCE	
DESIGNED BY: JEC	SCALE: H: AS NOTED V: AS NOTED
DRAWN BY: GTJ	DATE: 07/12/10
CHECKED BY: _____	APPROVED BY: _____
AFE NO.:	ACAD FILE:
DWG NO.:	_____ OF _____

Calc. By: MAF
 Date: 7/12/2010
 Check By: MAP
 Date: 7/12/2010



File No.: _____
 Location: _____
 Project: 08R0114
 Sheet No.: 1 of 1

OPINION OF PROBABLE CONSTRUCTION COSTS

OPTION 1 - 10-FT DIAMETER CMP					
Item No.	Description	Quantity	Units	Unit Price	SUBTOTAL Amount
1	Embankment (Additional Volume)	40000	C.Y.	\$ 10.00	\$ 400,000.00
2	10ft Dia. CMP	88	L.F.	\$ 1,000.00	\$ 88,000.00
3	ARRC Std. Bridge, 28' Precast Spans	0	L.F.	\$ 13,000.00	\$ -
Subtotal					\$ 488,000.00
10% Contingency					\$ 48,800.00
Total					\$ 536,800.00
4	Wetland Mitigation Cost (in some areas)	1.5	AC.	\$ 33,000.00	\$ 49,500.00
Total with Wetland Mitigation					\$ 586,300.00

OPTION 2 - 3 SPAN BRIDGE w/ 10-FT VERTICAL CLEARANCE					
Item No.	Description	Quantity	Units	Unit Price	SUBTOTAL Amount
1	Embankment (Additional Volume)	57000	C.Y.	\$ 10.00	\$ 570,000.00
2	10ft Dia. CMP	0	L.F.	\$ 1,000.00	\$ -
3	ARRC Std. Bridge, 28' Precast Spans	84	L.F.	\$ 13,000.00	\$ 1,092,000.00
Subtotal					\$ 1,662,000.00
10% Contingency					\$ 166,200.00
Total					\$ 1,828,200.00
4	Wetland Mitigation Cost (in some areas)	2.1	AC.	\$ 33,000.00	\$ 69,300.00
Total with Wetland Mitigation					\$ 1,897,500.00

OPTION 3 - 3 SPAN BRIDGE w/ 15-FT VERTICAL CLEARANCE					
Item No.	Description	Quantity	Units	Unit Price	SUBTOTAL Amount
1	Embankment (Additional Volume)	112000	C.Y.	\$ 10.00	\$ 1,120,000.00
2	10ft Dia. CMP	0	L.F.	\$ 1,000.00	\$ -
3	ARRC Std. Bridge, 28' Precast Spans	84	L.F.	\$ 13,000.00	\$ 1,092,000.00
Subtotal					\$ 2,212,000.00
10% Contingency					\$ 221,200.00
Total					\$ 2,433,200.00
4	Wetland Mitigation Cost (in some areas)	3.6	AC.	\$ 33,000.00	\$ 118,800.00
Total with Wetland Mitigation					\$ 2,552,000.00

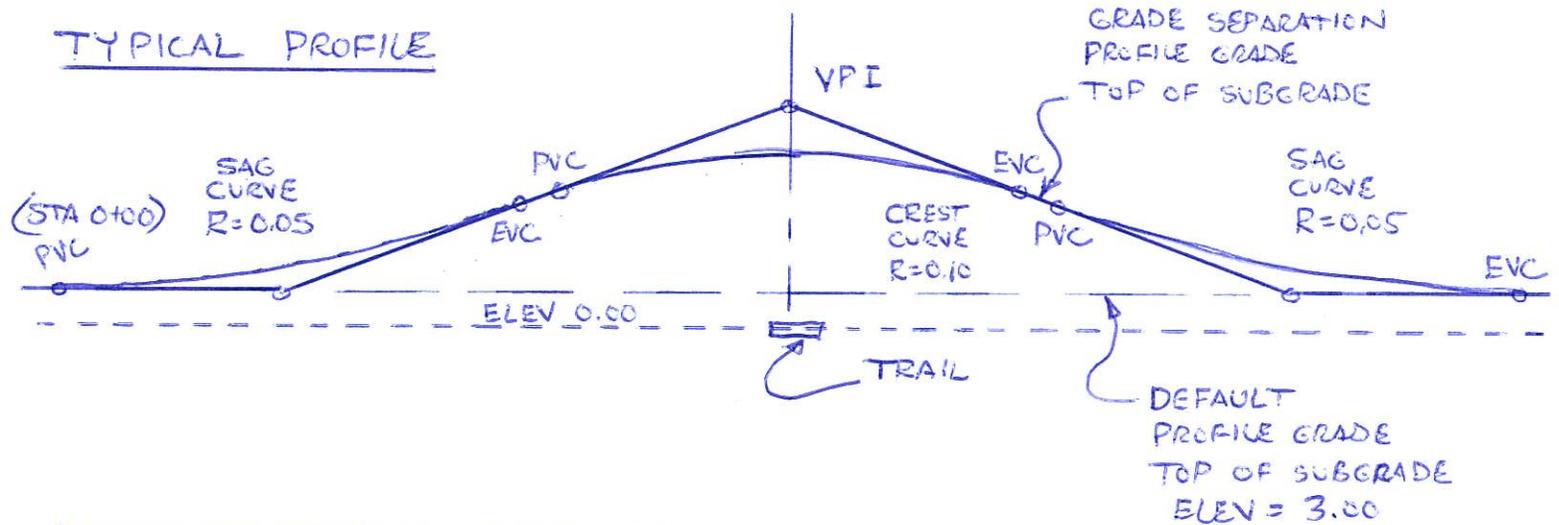
By: Pochop Date: 7/12/10
 Checked by: _____ Date: _____



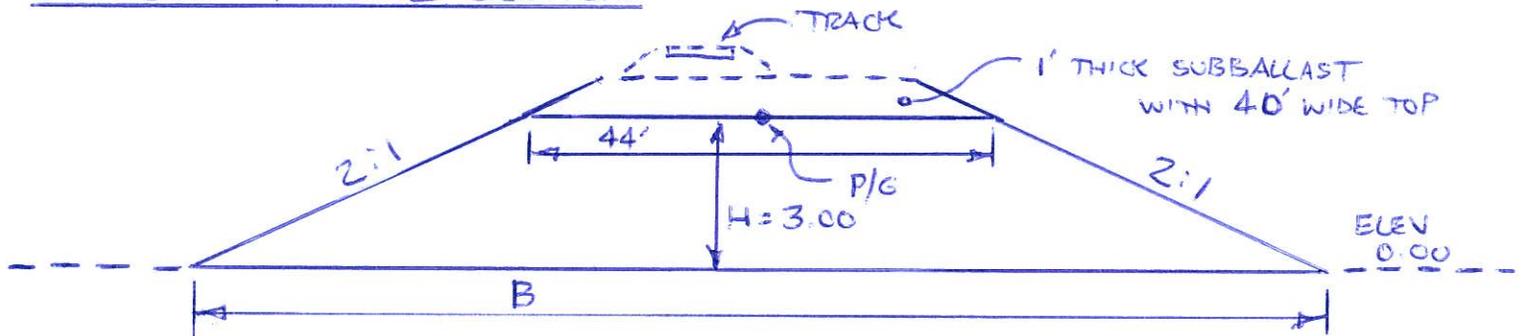
Sheet No.: 1 of: 7
 Project No.: 08R0114

DIFFERENTIAL EMBANKMENT AND FOOTPRINT FOR GRADE SEPARATION FOR TRAIL

TYPICAL PROFILE



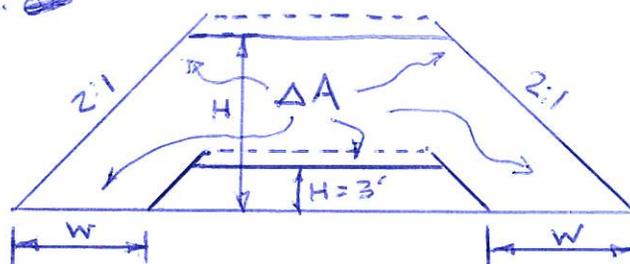
DEFAULT TYPICAL SECTION



GRADE SEPARATION TYPICAL SECTION

— SAME TOP DIMENSION AS DEFAULT SECTION, H VARIES WITH PROFILE GRADE FOR GRADE SEPARATION, B VARIES WITH H .

COMPARISONS:



ΔA = ~~DIFFERENCE IN~~ ADDITIONAL SUBGRADE END AREA

W = ADDITIONAL FOOTPRINT WIDTH

Calc. By: M. Pochop, P.E.
 Date: 7/12/2010
 Check By: C. Chambers, P.E.
 Date: 7/12/2010



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Earthwork Volume Calculation

	Station	Default Subgrade		Subgrade for Grade Separation				Additional Volume CY	Additional Footprint AC
		End Area SF	Volume CY	H FT	B FT	End Area SF	Volume CY		
PVC	0+00.00	150		3.00	56	150			
Sag VPI	6+00.00	150	3,333	3.90	59.6	202	3,911	578	0.02
EVC	12+00.00	150	3,333	6.60	70.4	378	6,444	3,111	0.12
PVC	16+33.33	150	2,407	9.20	80.8	574	7,640	5,233	0.19
Crest VPI	22+33.33	150	3,333	11.00	88	726	14,444	11,111	0.39
EVC	28+33.33	150	3,333	9.20	80.8	574	14,444	11,111	0.39
PVC	32+66.67	150	2,407	6.60	70.4	378	7,640	5,233	0.19
Sag VPI	38+66.67	150	3,333	3.90	59.6	202	6,444	3,111	0.12
EVC	44+66.67	150	3,333	3.00	56	150	3,911	578	0.02
Totals			24,812				64,878	40,066	1.44

Calc. By: M. Pochop, P.E.
 Date: 7/12/2010
 Check By: C. Chambers, P.E.
 Date: 7/12/2010



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Earthwork Volume Calculation

	Station	Default Subgrade		Subgrade for Grade Separation				Additional Volume CY	Additional Footprint AC
		End Area SF	Volume CY	H FT	B FT	End Area SF	Volume CY		
PVC	0+00.00	150		3.00	56	150			
Sag VPI	7+00.00	150	3,889	4.23	60.9	222	4,822	933	0.04
EVC	14+00.00	150	3,889	7.90	75.6	472	8,996	5,107	0.20
PVC	16+42.86	150	1,349	10.30	85.2	665	5,113	3,764	0.14
Crest VPI	24+42.86	150	4,444	12.75	95	886	22,978	18,534	0.63
EVC	32+42.86	150	4,444	10.30	85.2	665	22,978	18,534	0.63
PVC	34+85.71	150	1,349	7.90	75.6	472	5,113	3,764	0.14
Sag VPI	41+85.71	150	3,889	4.23	60.9	222	8,996	5,107	0.20
EVC	48+85.71	150	3,889	3.00	56	150	4,822	933	0.04
Totals			27,142				83,818	56,676	2.02

Calc. By: M. Pochop, P.E.
 Date: 7/12/2010
 Check By: C. Chambers, P.E.
 Date: 7/12/2010



File No.: _____
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Earthwork Volume Calculation									
	Station	Default Subgrade		Subgrade for Grade Separation				Additional Volume CY	Additional Footprint AC
		End Area SF	Volume CY	H FT	B FT	End Area SF	Volume CY		
PVC	0+00.00	150		3.00	56	150			
Sag VPI	9+00.00	150	5,000	5.03	64.1	272	7,033	2,033	0.08
EVC	18+00.00	150	5,000	11.10	88.4	735	16,783	11,783	0.42
PVC	20+88.89	150	1,605	13.70	98.8	978	9,164	7,559	0.25
Crest VPI	29+88.89	150	5,000	17.75	115	1411	39,817	34,817	1.05
EVC	38+88.89	150	5,000	13.70	98.8	978	39,817	34,817	1.05
PVC	41+77.78	150	1,605	11.10	88.4	735	9,164	7,559	0.25
Sag VPI	50+77.78	150	5,000	5.03	64.1	272	16,783	11,783	0.42
EVC	59+77.78	150	5,000	3.00	56	150	7,033	2,033	0.08
Totals			33,210				145,594	112,384	3.60