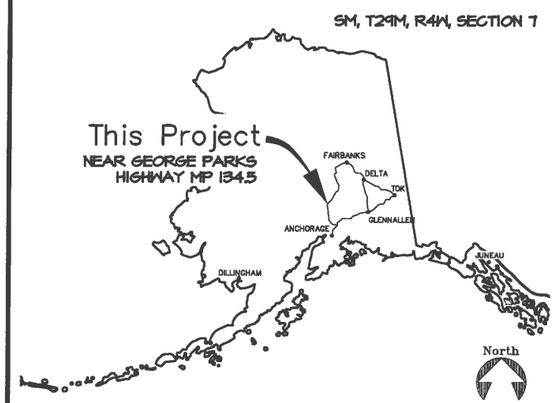
STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF PARKS AND OUTDOOR RECREATION

DSP: VISITOR CENTER COMPLEX TRAIL CONSTRUCTION

PROJECT NO. 74034-4

Vicinity Map



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10. TRAIL A STA. 15+00 TO STA. 20+00
11. TRAIL A STA. 20+00 TO STA. 23+70.98
12. TRAIL B STA. 30+00 TO STA. 35+00
13. TRAIL B STA. 35+00 TO STA. 39+79.03
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15. TRAIL C STA. 54+00 TO STA. 57+00
16. TRAIL C STA. 57+00 TO STA. 60+00
17. TRAIL C STA. 60+00 TO STA. 63+75.54
18. TRAIL D STA. 80+00 TO STA. 83+50
19. TRAIL D STA. 83+50 TO STA. 86+57.64

The following Division of Parks & Outdoor Rec. standard drawings apply to this project: P-5
The following D.O.T.(Highways) standard drawings apply to this project: D-01.02, D-04.21

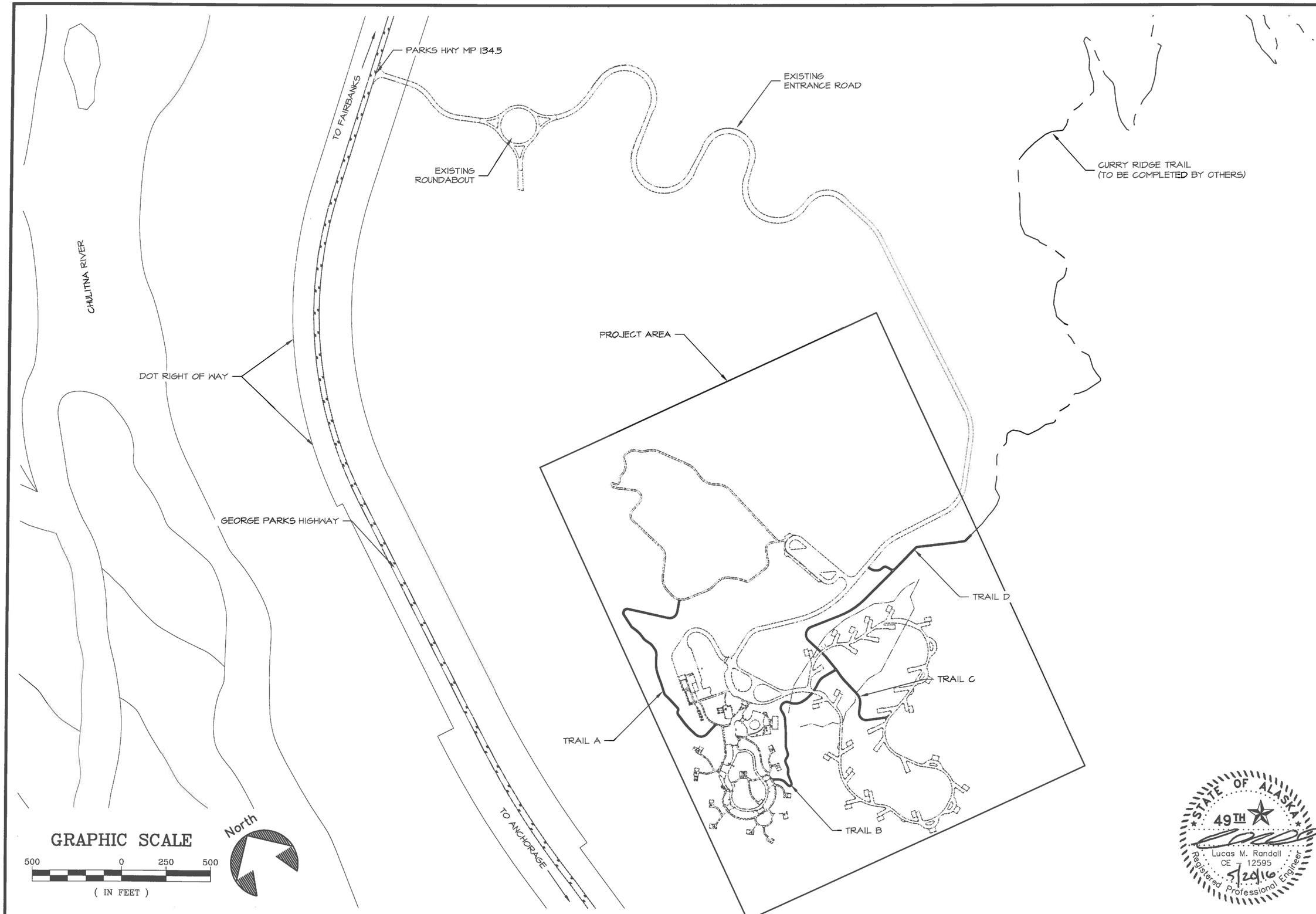
STATE OF ALASKA
Department of Natural Resources
Division of Parks & Outdoor Recreation

Recommended:

Ryan Miranda, P.E.
Chief, Design and Construction
5/20/16
Date

Approved:

Ben Ellis
Director, Alaska State Parks
5/20/2016
Date



STATE OF ALASKA
49TH
Lucas M. Randall
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Registered Professional Engineer

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

VICINITY MAP

ALASKA STATE PARKS

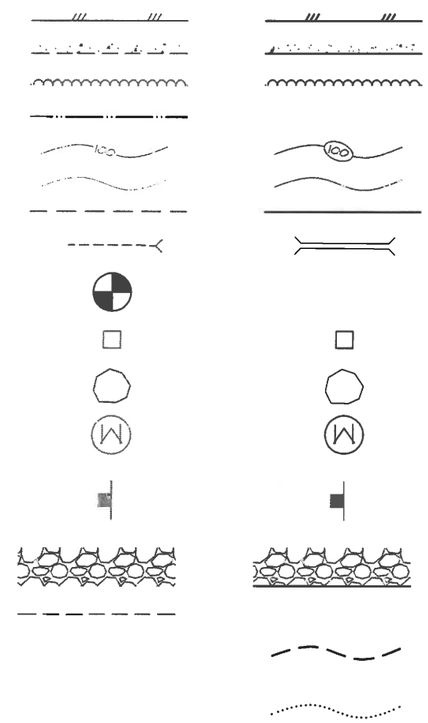
PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 2 OF 19 SHEETS

ESTIMATE OF QUANTITIES

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY
201(3A)	CLEARING AND GRUBBING	ACRE	1.35
203(3)	UNCLASSIFIED EXCAVATION	C.Y.	890
203(5A)	SELECTED MATERIAL, TYPE A	C.Y.	2,000
301(5)	RECYCLED ASPHALT MATERIAL	TON	660
530(1)	CONCRETE BLOCK WALL	S.F.	1,448
603(1-12)	12 INCH CSP	L.F.	15
603(1-24)	24 INCH CSP	L.F.	120
603(3-24)	END SECTION FOR 24 INCH CSP	EACH	16
611(2)	RIPRAP, CLASS I	TON	30
618(2)	SEEDING	POUND	25
620(1)	TOPSOIL	S.Y.	2,990
640(1)	MOBILIZATION AND DEMOBILIZATION	L.S.	ALL REQ'D
641(1)	EROSION, SEDIMENT, AND POLLUTION CONTROL ADMINISTRATION	L.S.	ALL REQ'D
641(2)	TEMPORARY EROSION, SEDIMENT, AND POLLUTION CONTROL	C.S.	ALL REQ'D
641(6)	WITHHOLDING	C.S.	ALL REQ'D
642(1)	CONSTRUCTION SURVEYING	L.S.	ALL REQ'D
642(3)	THREE PERSON SURVEY PARTY	HOUR	10
643(2)	TRAFFIC MAINTENANCE	L.S.	ALL REQ'D
646(1)	CPM SCHEDULING	L.S.	ALL REQ'D
647(2)	TRAIL DOZER, 62 HP MINIMUM	HOUR	10
647(6)	HYDRAULIC EXCAVATOR, 110 HP MINIMUM	HOUR	10
650(20)	REMOVABLE BARRIER POST	EACH	6

LEGEND



EDGE OF AC PAVEMENT
EDGE OF PCC PAVEMENT
EDGE OF VEGETATION
EDGE OF WATER
MAJOR CONTOUR LINE
MINOR CONTOUR LINE
EDGE OF GRAVEL ROAD/PARKING
CULVERT
SURVEY CONTROL MONUMENT
WOODEN BARRIER POST
BARRIER ROCK
WATER WELL
SIGN
RIPRAP
LIMITS OF CUT SLOPE
LIMITS OF FILL SLOPE

ABBREVIATIONS

ϕ	DIAMETER
℄	CENTERLINE
AC	ASPHALT CONCRETE
C.S.	CONTINGENT SUM
E	EAST
ELEV.	ELEVATION
F.A.	FINISH GRADE
INV	INVERT
L.S.	LUMP SUM
LB/LBS	POUND/POUNDS
MP	MILEPOST
N.	NORTH
NE	NORTHEAST
NO.	NUMBER
NW	NORTHWEST
OC	ON CENTER
OHW	ORDINARY HIGH WATER
PCC	PORTLAND CEMENT CONCRETE
PVI	PROFILE VERTICAL CURVE INTERSECTION
REQ'D	REQUIRED
SE	SOUTHEAST
S.F.	SQUARE FOOT
SRA	STATE RECREATIONAL AREA
SW	SOUTHWEST
SWPPP	STORM WATER POLLUTION PREVENTION PLAN
S.Y.	SQUARE YARD
TYP	TYPICAL
W	WEST

ITEMS NO. 603 (1-12) 12 INCH CSP & ITEM NO. 603 (1-24) 24 INCH CSP

PIPE NAME	LOCATION	ϕ SIZE	LENGTH	INLET AND OUTLET NOTES
CULVERT NO. 1	STA. 17+35	12"	15'	RIP RAP, CLASS I
CULVERT NO. 2	STA. 35+36	24"	15'	RIP RAP, CLASS I
CULVERT NO. 3	STA. 37+75	24"	15'	END SECTION FOR 24 INCH CSP
CULVERT NO. 4	STA. 38+12	24"	15'	END SECTION FOR 24 INCH CSP
CULVERT NO. 5	STA. 50+67	24"	15'	END SECTION FOR 24 INCH CSP
CULVERT NO. 6	STA. 51+78	24"	15'	END SECTION FOR 24 INCH CSP
CULVERT NO. 7	STA. 55+88	24"	15'	END SECTION FOR 24 INCH CSP
CULVERT NO. 8	STA. 56+19	24"	15'	END SECTION FOR 24 INCH CSP
CULVERT NO. 9	STA. 80+05	24"	15'	END SECTION FOR 24 INCH CSP

TABLE OF ESTIMATING FACTORS

ITEM NO.	ITEM DESCRIPTION	EST. FACTOR
203(6A)	SELECTED MATERIAL, TYPE A	1.42 LB./C.F
301(6)	RECYCLED ASPHALT MATERIAL	1.48 LB./C.F.
611(2)	RIP RAP, CLASS I	1.35 LB./C.F
618(2)	SEEDING	1.0 LBS/1,000 S.F.

STATE OF ALASKA 49TH Lucas M. Randall CE - 12595 5/20/16 Registered Professional Engineer

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

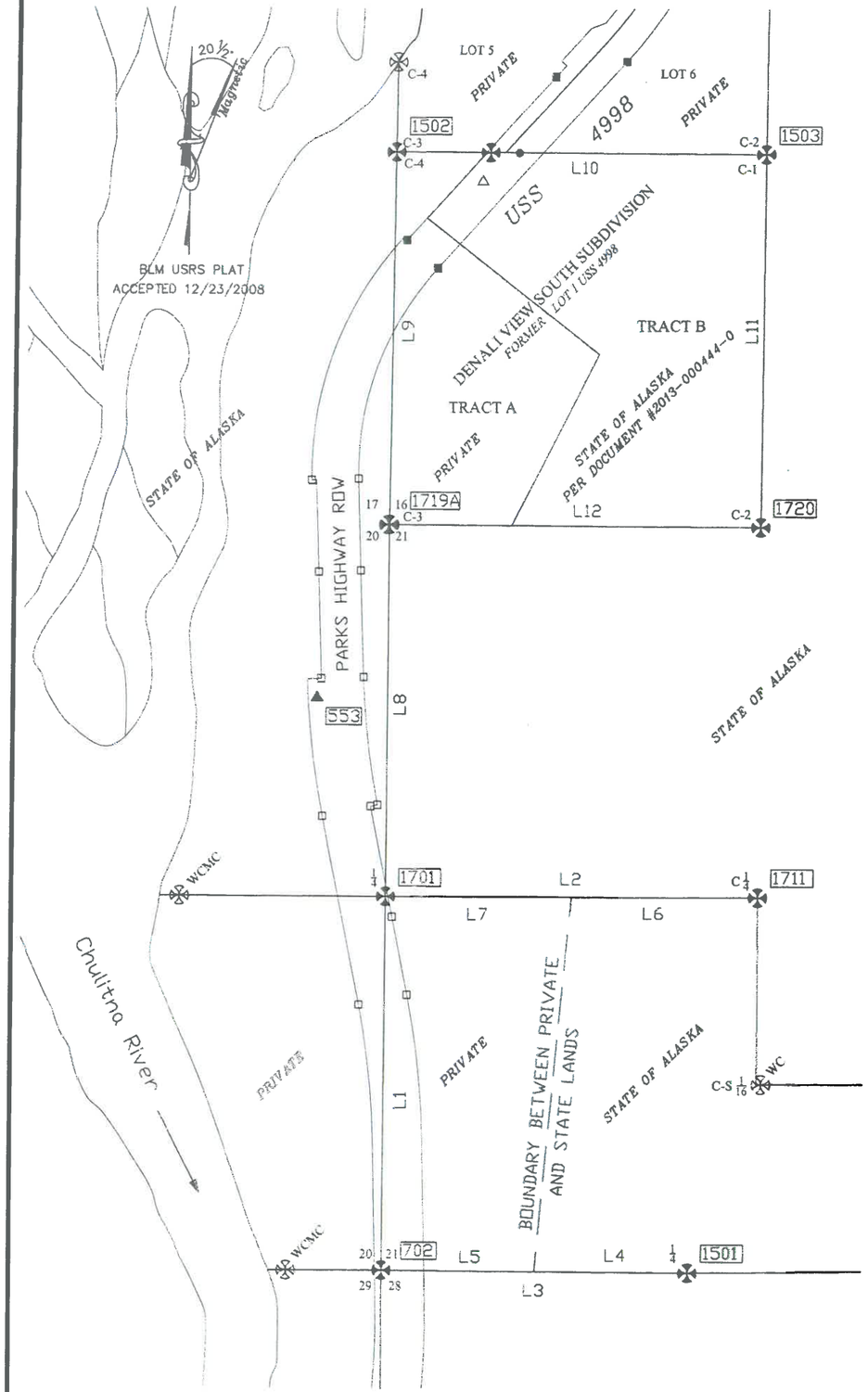
DSP: VISITOR CENTER COMPLEX TRAIL CONSTRUCTION PROJECT No. 74034-4

ESTIMATE OF QUANTITIES, LEGEND, ABBREVIATIONS, AND TABLE OF ESTIMATING FACTORS

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 3 OF 19 SHEETS



SURVEY CONTROL NOTES:

HORIZONTAL CONTROL
ALL COORDINATES ARE NAD 83 (CORS96) (EPOCH: 2003.0000), ALASKA STATE PLANE ZONE 4, BASED ON AN AERO-METRIC. ANCHORAGE LIDAR SURVEY CONDUCTED IN JUNE 2008. THE PUBLISHED STATE PLANE VALUES LISTED IN THE OPUS SOLUTION REPORT FOR AERO-METRIC'S POINT 100 (POINT 553 THIS SURVEY) IN THE "DENALI OVERLOOK LIDAR SURVEY QUALITY CONTROL SURVEY REPORT" WERE CONVERTED TO US SURVEY FEET AND HELD FOR THIS SURVEY. ALL OTHER COORDINATES WERE DETERMINED BY GPS OBSERVATIONS.

VERTICAL CONTROL
ALL ELEVATIONS ARE NAVD 88 (COMPUTED USING GEOID06) AND ARE BASED ON AN AERO-METRIC, ANCHORAGE LIDAR SURVEY CONDUCTED IN JUNE 2008. THE PUBLISHED ORTHOMETRIC HEIGHT LISTED IN THE OPUS SOLUTION REPORT FOR AERO-METRIC'S POINT 100 (POINT 553 THIS SURVEY) IN THE "DENALI OVERLOOK LIDAR SURVEY QUALITY CONTROL SURVEY REPORT" WAS CONVERTED TO US SURVEY FEET AND HELD FOR THIS SURVEY. ALL OTHER ELEVATIONS WERE DETERMINED BY GPS OBSERVATIONS.

METRIC TO FOOT CONVERSIONS ARE BASED ON THE U.S. SURVEY FOOT (1 METER = 39.37 INCHES EXACTLY)

GENERAL NOTES:

ALL MEASURED DATA ARE ALASKA STATE PLANE ZONE 4 BEARINGS AND DISTANCES. ALL RECORD "(R)" DATA IS BLM MEAN BEARINGS AND GROUND DISTANCES REDUCED TO THEIR HORIZONTAL EQUIVALENT.

ALL MONUMENTS, PROPERTY MARKERS (WITH EXCEPTION OF "PLEast"), OR PROPERTY CORNERS AND THEIR ACCESSORIES, WHICH WILL BE DISTURBED OR BURIED SHALL BE REFERENCED AND REESTABLISHED IN THEIR ORIGINAL POSITION IN ACCORDANCE WITH A.S. 34.65.040(b).

THE 5/8" REBAR AND CAP SET AT "PLEast" WAS SET ONLY FOR THE PURPOSE OF IDENTIFYING THE SPECIFIC LOCATION OF THE NORTH BOUNDARY OF LOT 1, USS 4998 IN THE IMMEDIATE VICINITY OF THE PROJECT AREA . IT IS NOT TO BE MISTAKEN FOR, OR USED AS A PROPERTY CORNER.

THIS SURVEY, CONDUCTED ON OCTOBER 5 & 6, 2011, REPRESENTS A SURVEY OF LOT 1, USS 4998; THE 1/4 CORNER OF SECTIONS 20 & 21; THE CENTER 1/4 CORNER OF SECTION 21; THE SECTION CORNER OF SECTIONS 20, 21, 28, & 29; AND THE 1/4 CORNER OF SECTIONS 21 & 28.

THIS SURVEY DOES NOT CONSTITUTE A SUBDIVISION AS DEFINED BY A.S. 40.15.900(5).

SURVEY CONTROL POINTS:

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
553	3139719.63'	1600219.87'	657.04'	Aero-Metric Pt 100 Spike
702	3135668.17'	1600718.40'	615.20'	BLM Brass Cap Monument
1501	3135653.76'	1602886.65'	1194.97'	BLM Brass Cap Monument
1502	3143580.05'	1600740.22'	572.44'	BLM Brass Cap Monument
1503	3143566.68'	1603379.09'	713.07'	BLM Brass Cap Monument
1601	3142755.02'	1601043.44'	687.26'	ROW Monument
1603	3144221.61'	1602383.78'	613.60'	ROW Monument
1605	3142957.15'	1600822.00'	690.14'	ROW Monument
1701	3138307.89'	1600720.05'	662.65'	BLM Brass Cap Monument
1711	3138305.29'	1603359.86'	972.67'	BLM Brass Cap Monument
1719	3140940.78'	1600711.78'	726.86'	BLM Brass Cap Monument
1719A	3140940.93'	1600720.49'	730.37'	BLM Brass Cap Monument
1720	3140927.36'	1603360.86'	907.58'	BLM Brass Cap Monument
BOP	3143371.64'	1601363.07'	689.57'	Mag Nail
PLEast	3143575.60'	1601624.23'	683.91'	1 1/2" Alcap Set This Survey
PLWest	3143576.68'	1601417.00'	686.06'	BLM Brass Cap Monument
ROW?	3144112.24'	1601877.41'	671.06'	ROW Monument

STANDARD LEGEND:

- 3 1/4" BLM BRASS CAP ON 2 1/2" STAINLESS STEEL POST RECOVERED THIS SURVEY
- BLM MONUMENT OF RECORD (NOT RECOVERED THIS SURVEY)
- △ MAG NAIL RECOVERED THIS SURVEY (w/Blue Flagging & Lath Mk'd "BOP STA. 501+17.39)
- ▲ AERO-METRIC SPIKE RECOVERED THIS SURVEY (AERO-METRIC POINT 100)
- ■ 6" x 6" YELLOW CONCRETE DOT&PF ROW POST RECOVERED THIS SURVEY
- □ 6" x 6" CONCRETE DOT&PF ROW POST RECOVERED BY OTHERS
- ● 5/8" x 30" REBAR w/ 1 1/2" ALUMINUM CAP SET THIS SURVEY
- 1502 SURVEY CONTROL POINT
- (R) RECORD PER BLM
- ——— SURVEYED
- — — — UNSURVEYED

GRAPHIC SCALE

0 500 1000 2000 3000 FEET

STATE OF ALASKA
49 TH
George C. Horton
No.10396
2/20/15
REGISTERED PROFESSIONAL LAND SURVEYOR

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

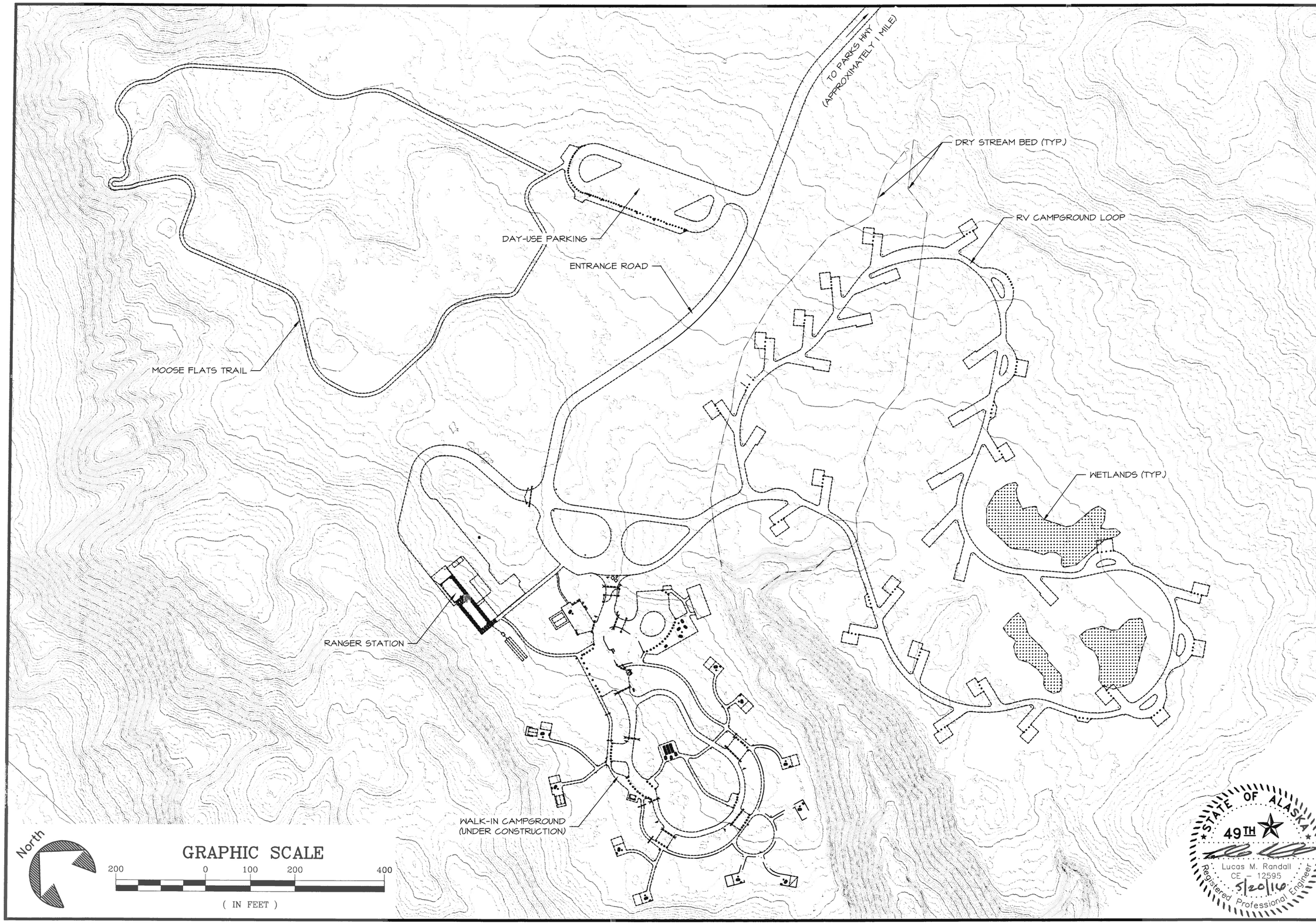
DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74094-4

SURVEY CONTROL

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 4 OF 19 SHEETS



STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

EXISTING CONDITIONS

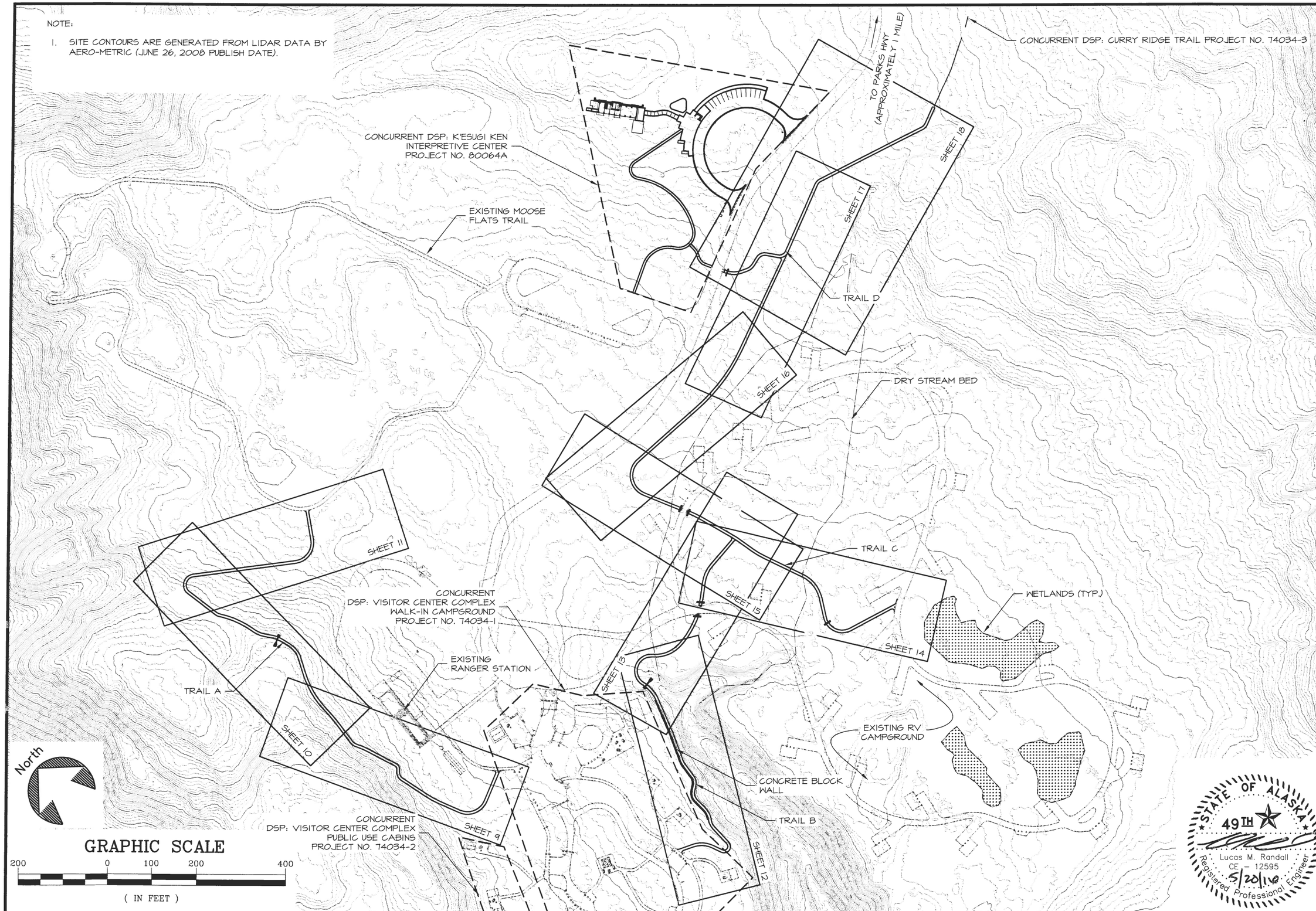
ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 5 OF 19 SHEETS

NOTE:

1. SITE CONTOURS ARE GENERATED FROM LIDAR DATA BY AERO-METRIC (JUNE 26, 2008 PUBLISH DATE).



STATE OF ALASKA
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Lucas M. Randall
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STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

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SITE PLAN OVERVIEW

ALASKA STATE PARKS

PREPARED: RCS
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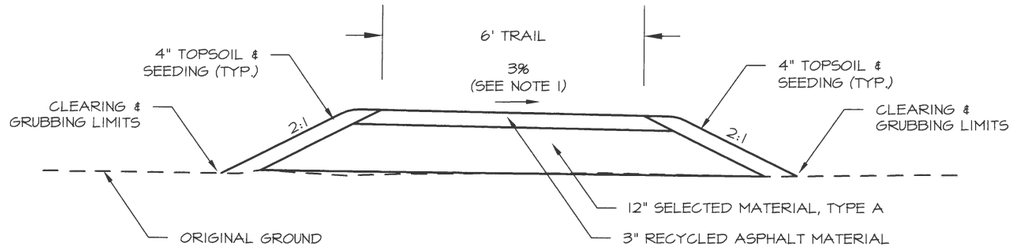
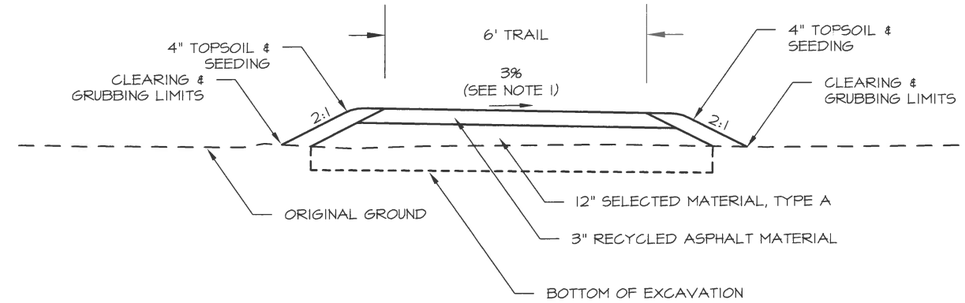
REVIEWED: LMR
DATE: MAR. 2016

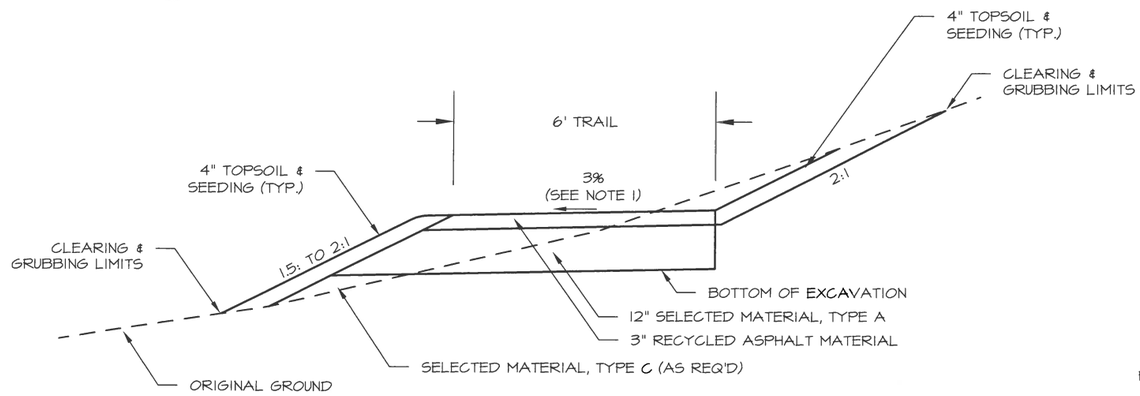
SHEET 6 OF 19 SHEETS



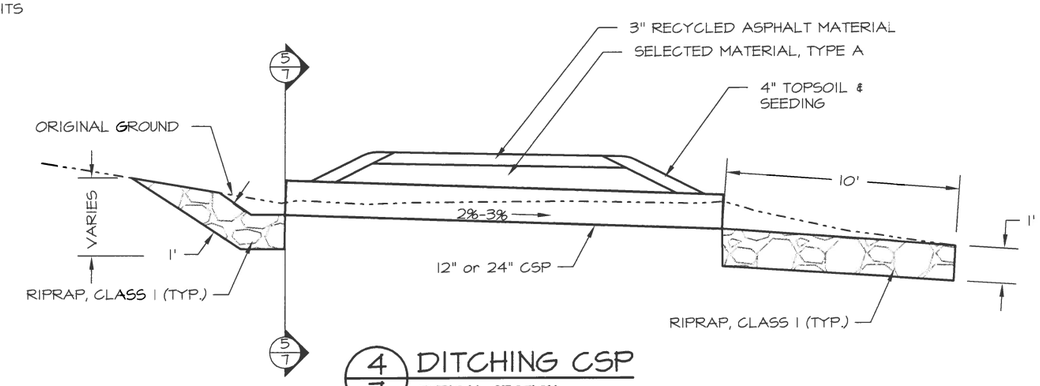
1/7 TRAIL TYPICAL SECTION - FILL BOTH SIDES



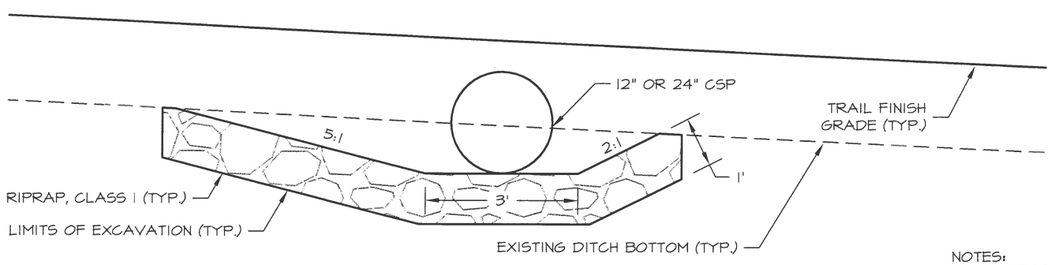
2/7 TRAIL TYPICAL SECTION - CUT BOTH SIDES



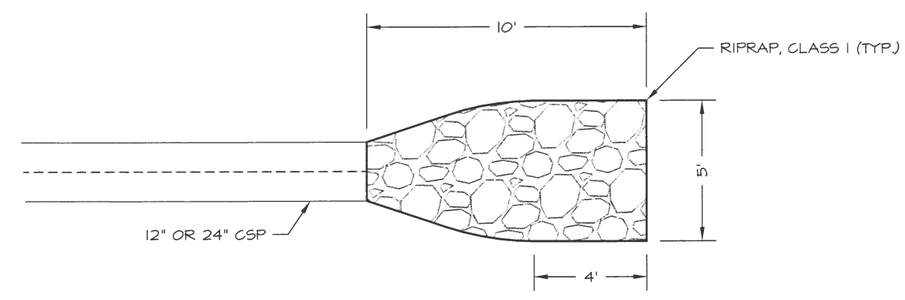
3/7 TRAIL TYPICAL SECTION - BENCH CUT & FILL



4/7 DITCHING CSP
TYPICAL SECTION



5/7 CSP INLET & DITCH TRANSITION
TYPICAL SECTION



6/7 CSP OUTLET
PLAN VIEW

NOTES:

1. THE CROSS SLOPE OF THE TRAIL WILL CHANGE BASED ON THE ORIGINAL GROUND. ALWAYS SLOPE TO DIRECT DRAINAGE DOWNSLOPE.
2. RIPRAP PLACEMENT AND CSP LOCATIONS ARE APPROXIMATE AND WILL BE FIELD VERIFIED BY THE ENGINEER. CSP INVERT ELEVATIONS WILL BE DICTATED BY EXISTING GRADE OF THE ROAD AND PIPE COVERAGE REQUIREMENTS.
3. RIPRAP IS INTENDED TO STABILIZE ALL AREAS DISTURBED IN DITCHES AND NEAR CULVERTS. SHAPE OF AREA SHOWN ON SITE PLANS IS GRAPHICAL AND WILL VARY IN THE FIELD.

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

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TRAIL TYPICAL SECTIONS

ALASKA STATE PARKS

PREPARED: RCS
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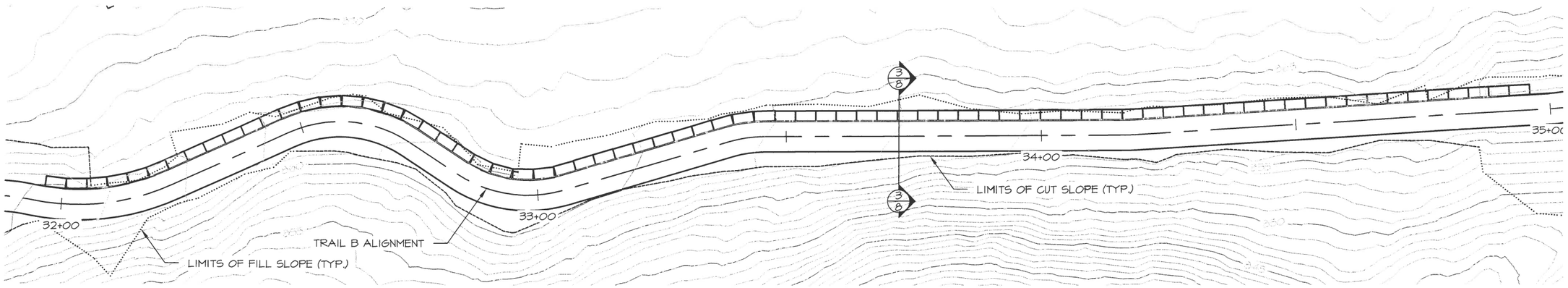
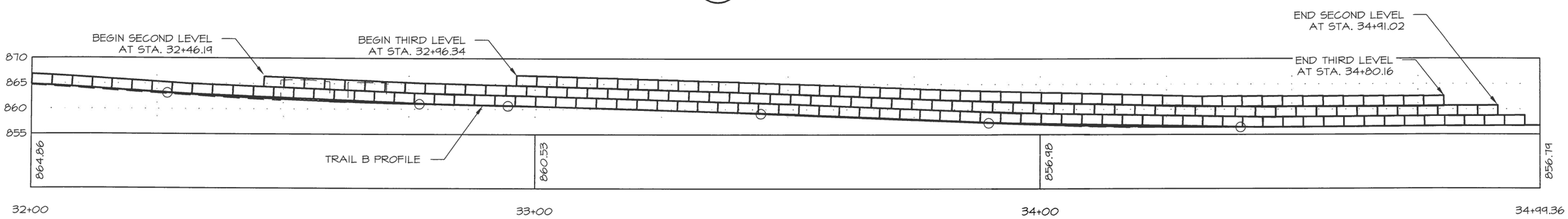
REVIEWED: LMR
DATE: MAR. 2016

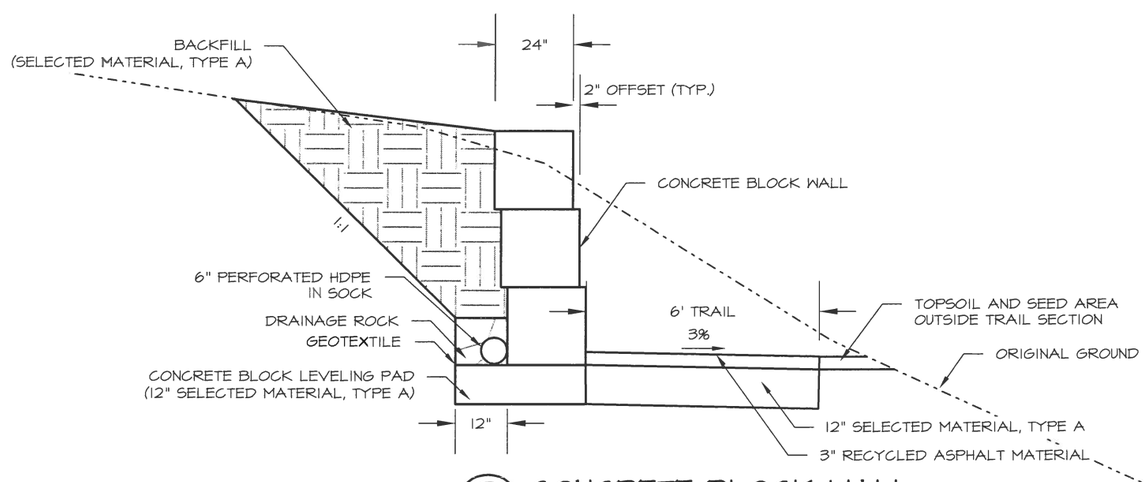
SHEET 7 OF 19 SHEETS



1/8 CONCRETE BLOCK WALL
PLAN VIEW



2/8 CONCRETE BLOCK WALL
PROFILE VIEW



3/8 CONCRETE BLOCK WALL
SECTION VIEW

NOTE:
1. 6" PERFORATED PIPE TO BE INSTALLED IN LENGTHS NO GREATER THAN 100'. DAYLIGHT CORRUGATED PIPE TO OUTFALL IN THE DOWN SLOPE SIDE OF THE TRAIL.

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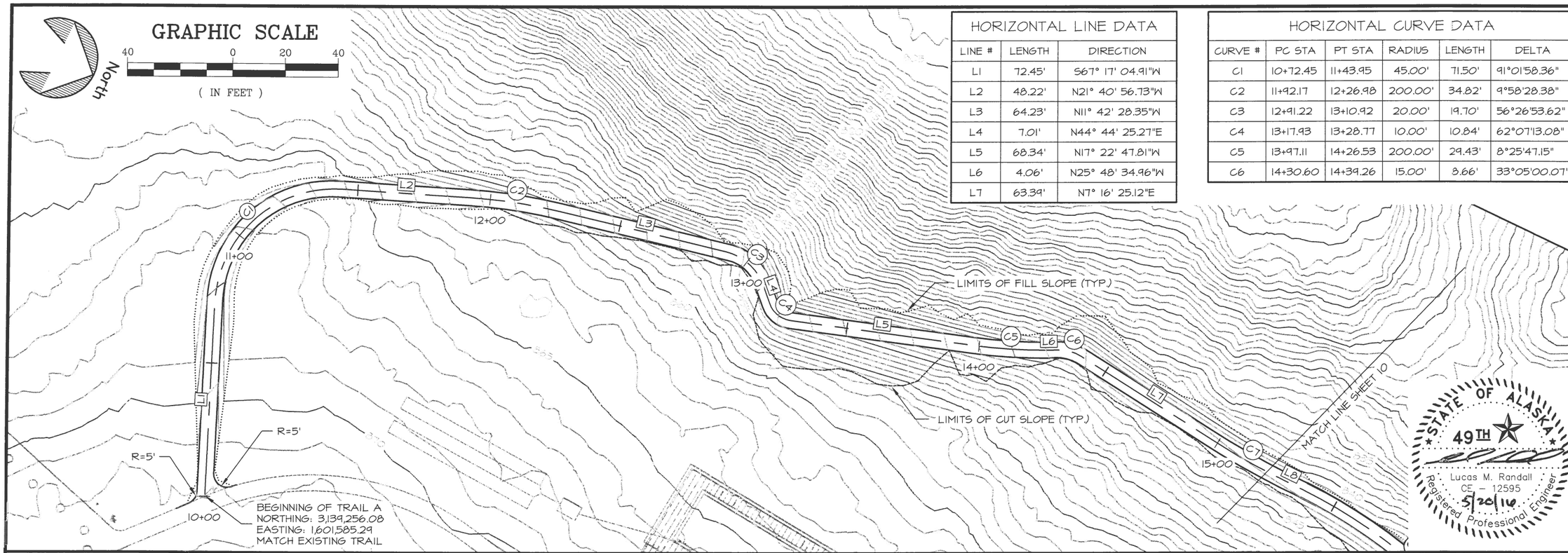
CONCRETE BLOCK WALL

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 8 OF 19 SHEETS



HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L1	72.45'	S67° 17' 04.91"W
L2	48.22'	N21° 40' 56.73"W
L3	64.23'	N11° 42' 28.35"W
L4	7.01'	N44° 44' 25.27"E
L5	68.34'	N17° 22' 47.81"W
L6	4.06'	N25° 48' 34.96"W
L7	63.39'	N7° 16' 25.12"E

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C1	10+72.45	11+43.95	45.00'	71.50'	91°01'58.36"
C2	11+92.17	12+26.98	200.00'	34.82'	9°58'28.38"
C3	12+91.22	13+10.92	20.00'	19.70'	56°26'53.62"
C4	13+17.93	13+28.77	10.00'	10.84'	62°07'13.08"
C5	13+97.11	14+26.53	200.00'	29.43'	8°25'47.15"
C6	14+30.60	14+39.26	15.00'	8.66'	33°05'00.07"

STATE OF ALASKA
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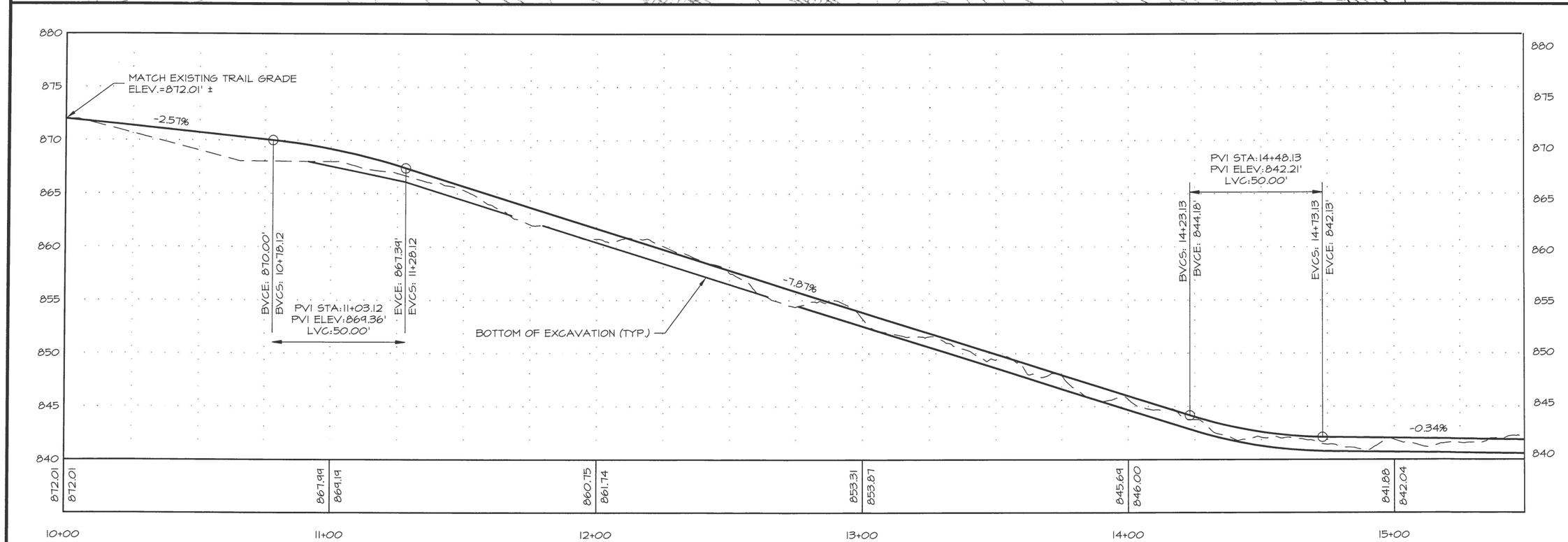


STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION PROJECT
No. 74034-4

TRAIL A
STA. 10+00 TO STA. 15+00

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 9 OF 19 SHEETS

GRAPHIC SCALE

40 0 20 40

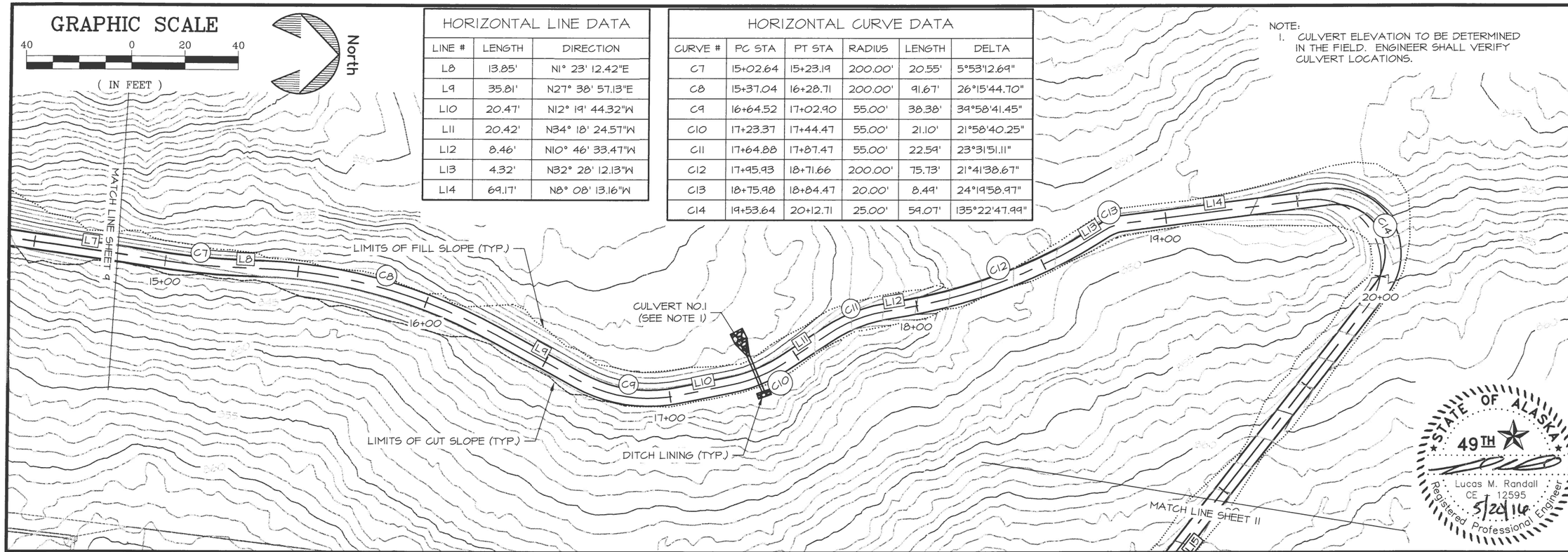
(IN FEET)

North

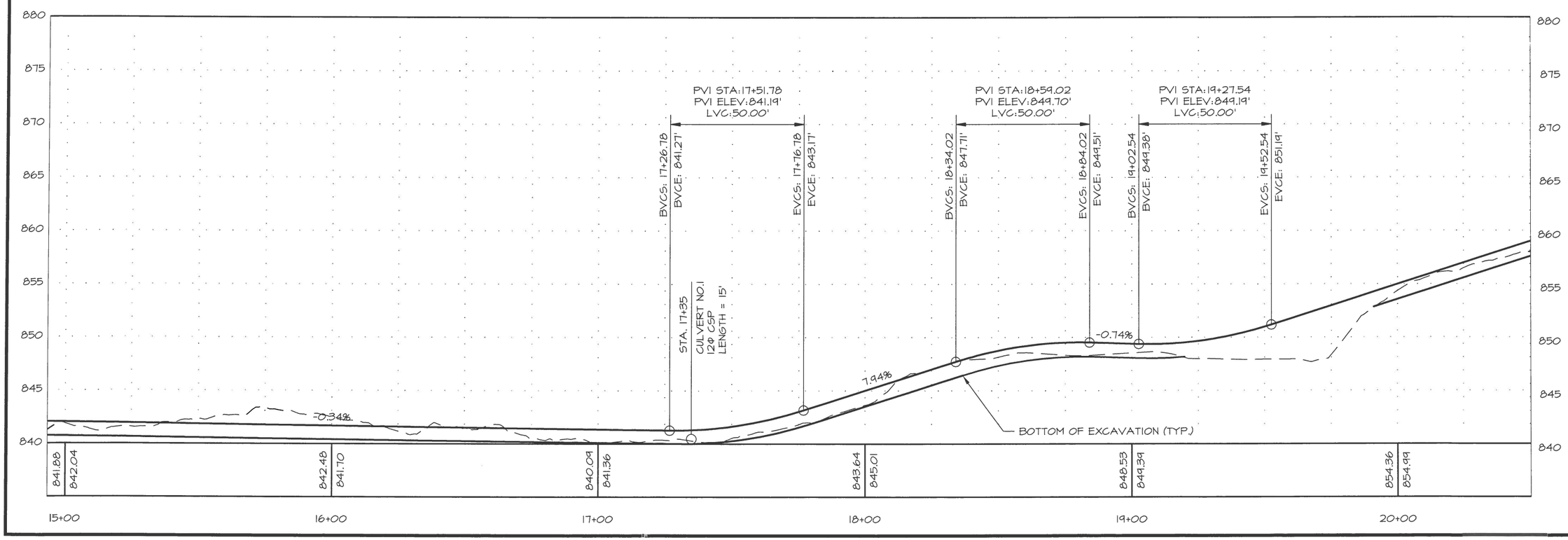
HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L8	13.85'	N1° 23' 12.42"E
L9	35.81'	N27° 38' 57.13"E
L10	20.47'	N12° 19' 44.32"W
L11	20.42'	N34° 18' 24.57"W
L12	8.46'	N10° 46' 33.47"W
L13	4.32'	N32° 28' 12.13"W
L14	69.17'	N8° 08' 13.16"W

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C7	15+02.64	15+23.19	200.00'	20.55'	5°53'12.69"
C8	15+37.04	16+28.71	200.00'	91.67'	26°15'44.70"
C9	16+64.52	17+02.90	55.00'	38.38'	39°58'41.45"
C10	17+23.37	17+44.47	55.00'	21.10'	21°58'40.25"
C11	17+64.88	17+87.47	55.00'	22.59'	23°31'51.11"
C12	17+95.93	18+71.66	200.00'	75.73'	21°41'38.67"
C13	18+75.98	18+84.47	20.00'	8.49'	24°19'58.97"
C14	19+53.64	20+12.71	25.00'	59.07'	135°22'47.99"

NOTE:
1. CULVERT ELEVATION TO BE DETERMINED IN THE FIELD. ENGINEER SHALL VERIFY CULVERT LOCATIONS.



STATE OF ALASKA
49TH
Lucas M. Randall
CE 12595
5/20/16
Registered Professional Engineer



STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

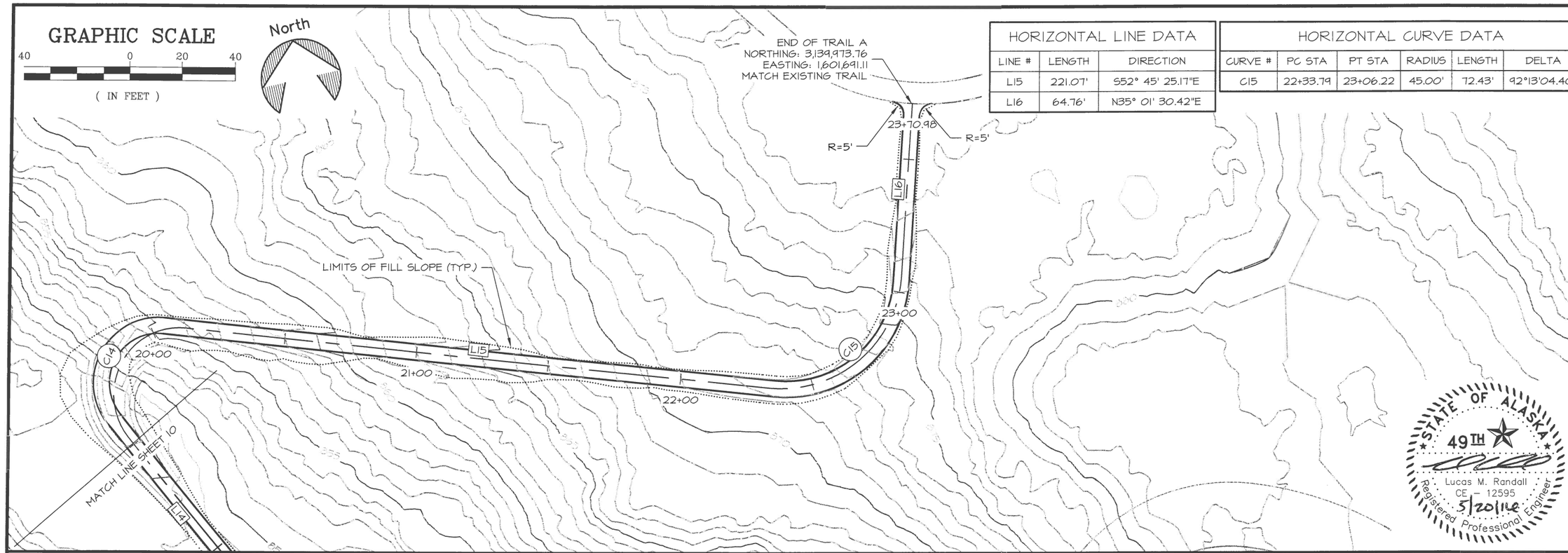
DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

TRAIL A
STA. 15+00 TO STA. 20+00

ALASKA STATE PARKS

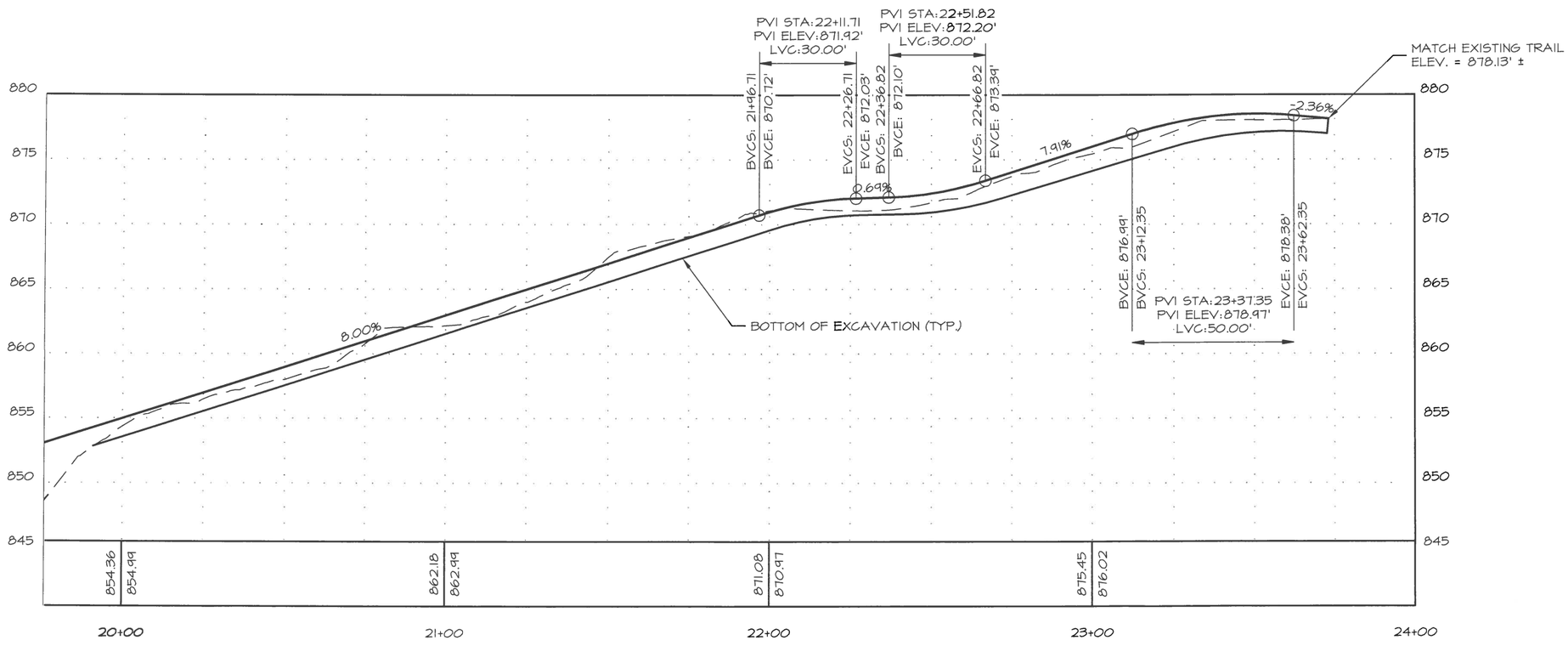
PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET ___ OF 19 SHEETS



HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L15	221.07'	S52° 45' 25.17"E
L16	64.76'	N35° 01' 30.42"E

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C15	22+33.79	23+06.22	45.00'	72.43'	92°13'04.40"



STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

TRAIL A
STA. 20+00 TO STA. 23+70.98

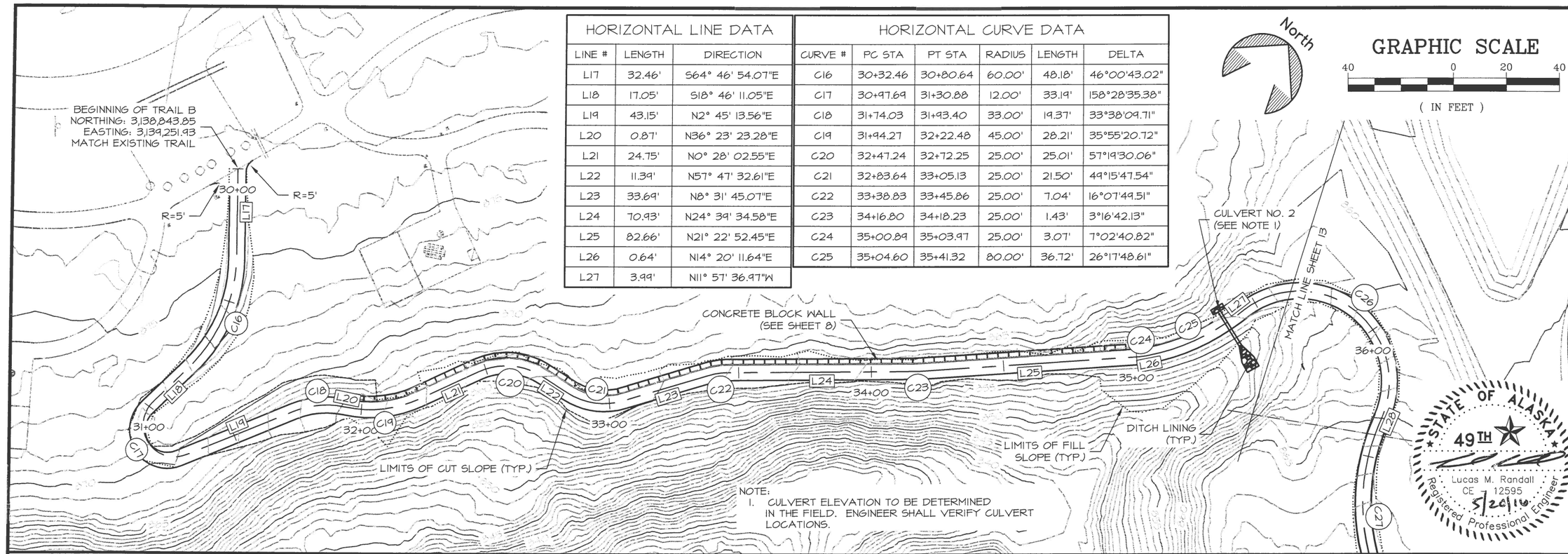
ALASKA STATE PARKS

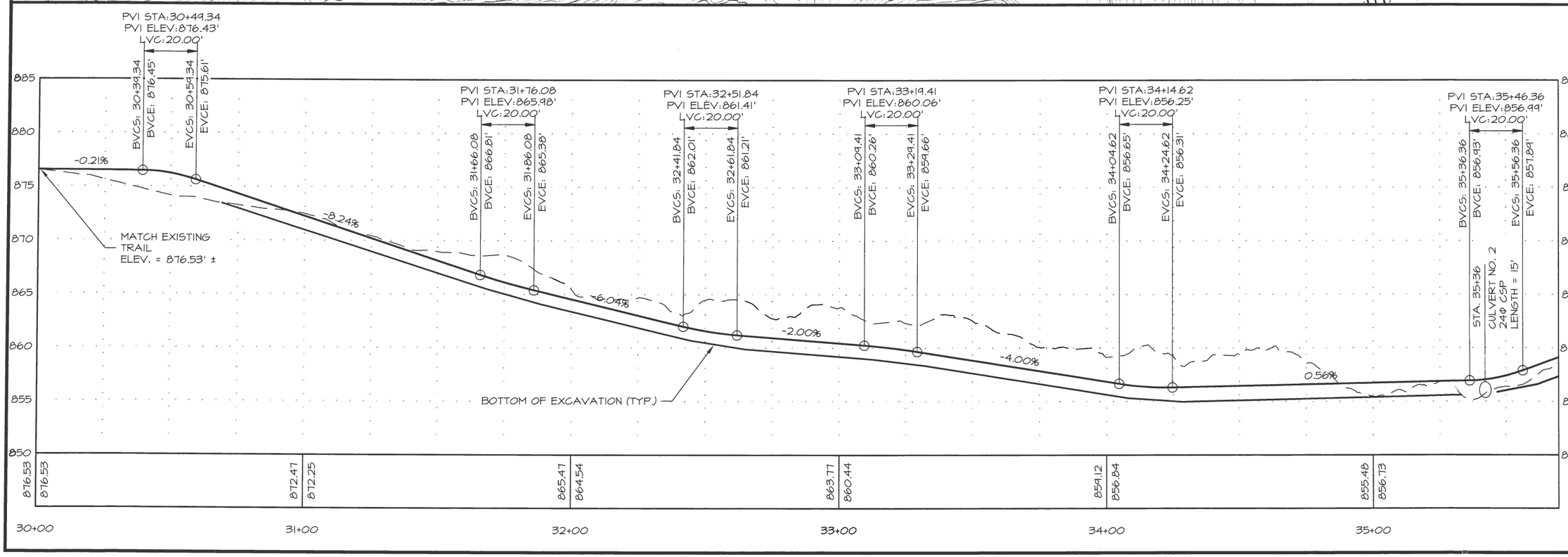
PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET
OF 19 SHEETS

HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L17	32.46'	S64° 46' 54.07"E
L18	17.05'	S18° 46' 11.05"E
L19	43.15'	N2° 45' 13.56"E
L20	0.87'	N36° 23' 23.28"E
L21	24.75'	N0° 28' 02.55"E
L22	11.39'	N57° 47' 32.61"E
L23	33.69'	N8° 31' 45.07"E
L24	70.93'	N24° 39' 34.58"E
L25	82.66'	N21° 22' 52.45"E
L26	0.64'	N14° 20' 11.64"E
L27	3.99'	N11° 57' 36.97"W

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C16	30+32.46	30+80.64	60.00'	48.18'	46°00'43.02"
C17	30+97.69	31+30.88	12.00'	33.19'	158°28'35.38"
C18	31+74.03	31+93.40	33.00'	19.37'	33°38'09.71"
C19	31+94.27	32+22.48	45.00'	28.21'	35°55'20.72"
C20	32+47.24	32+72.25	25.00'	25.01'	57°19'30.06"
C21	32+83.64	33+05.13	25.00'	21.50'	49°15'47.54"
C22	33+38.83	33+45.86	25.00'	7.04'	16°07'49.51"
C23	34+16.80	34+18.23	25.00'	1.43'	3°16'42.13"
C24	35+00.89	35+03.97	25.00'	3.07'	7°02'40.82"
C25	35+04.60	35+41.32	80.00'	36.72'	26°17'48.61"





STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

TRAIL B
STA. 30+00 TO STA. 35+00

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 12 OF 19 SHEETS

GRAPHIC SCALE

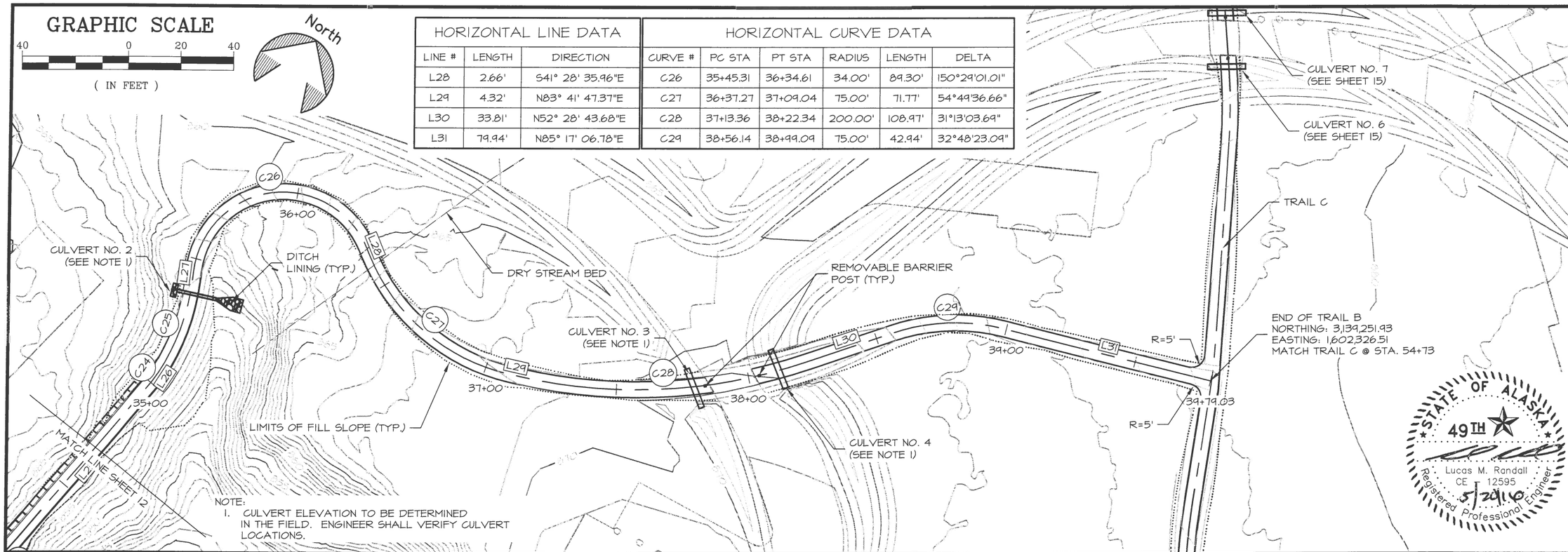
40 0 20 40

(IN FEET)

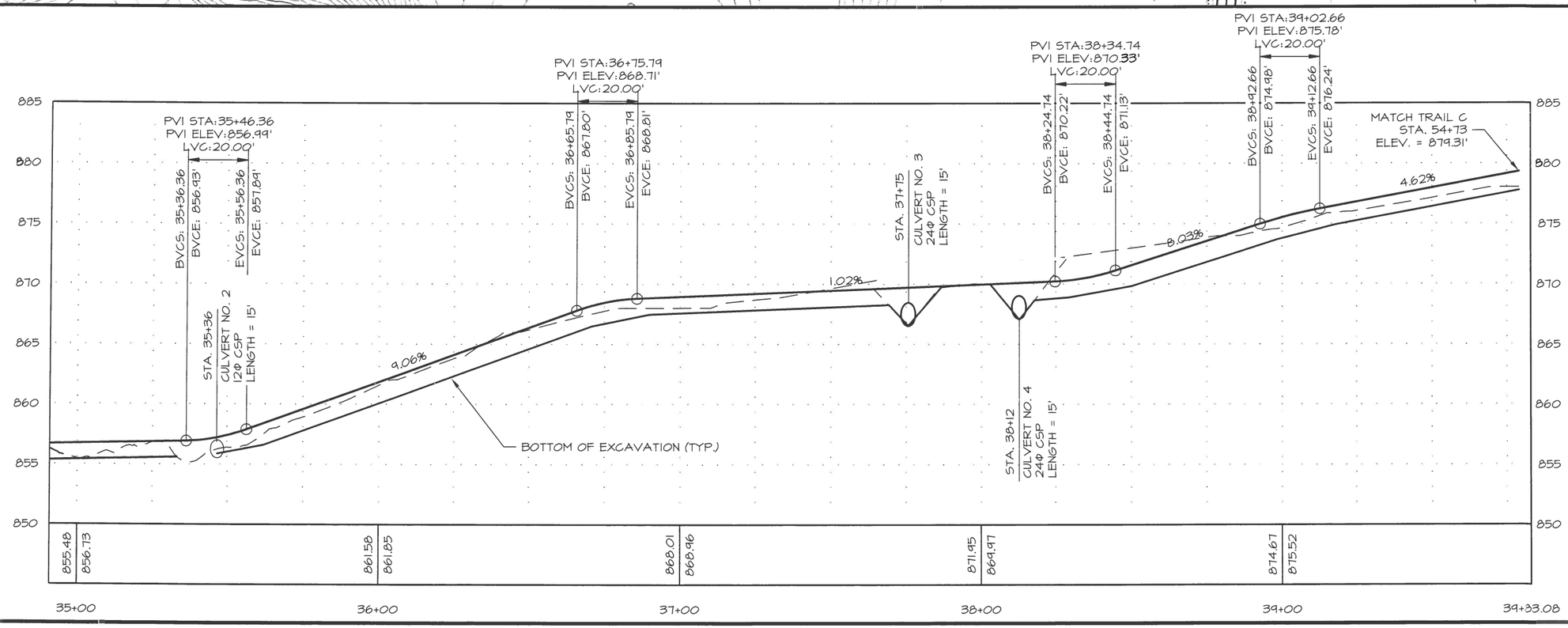
North

HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L28	2.66'	S41° 28' 35.96"E
L29	4.32'	N83° 41' 47.37"E
L30	33.81'	N52° 28' 43.68"E
L31	79.94'	N85° 17' 06.78"E

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C26	35+45.31	36+34.61	34.00'	89.30'	150°29'01.01"
C27	36+37.27	37+09.04	75.00'	71.77'	54°49'36.66"
C28	37+13.36	38+22.34	200.00'	108.97'	31°13'03.69"
C29	38+56.14	38+99.09	75.00'	42.94'	32°48'23.09"



NOTE:
1. CULVERT ELEVATION TO BE DETERMINED IN THE FIELD. ENGINEER SHALL VERIFY CULVERT LOCATIONS.



STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

TRAIL B
STA. 35+00 TO 39+79.03

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 13 OF 19 SHEETS

GRAPHIC SCALE

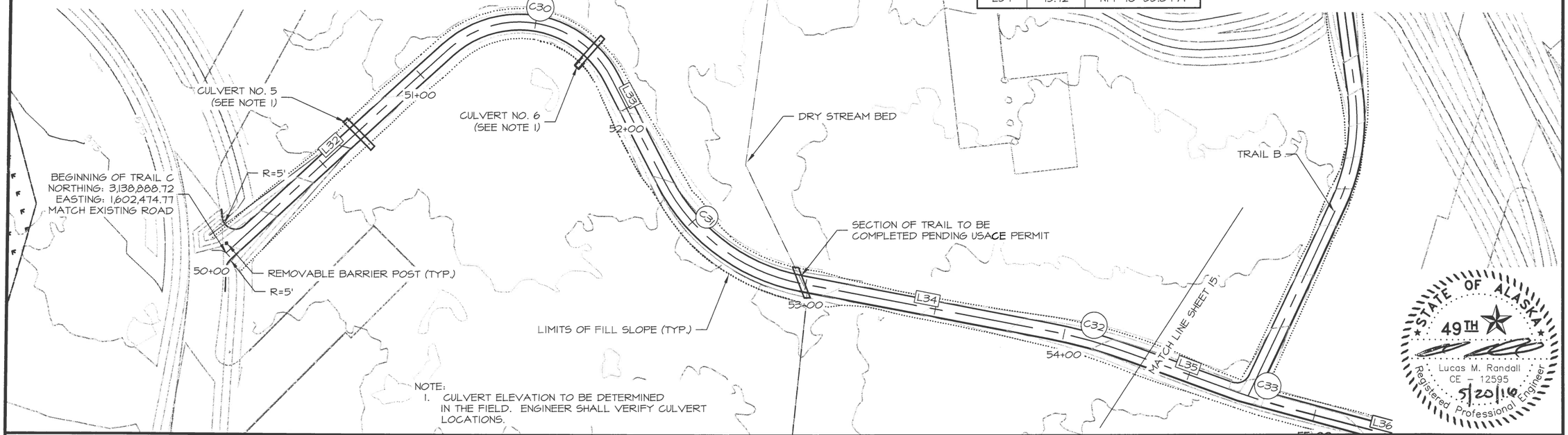
40 0 20 40

(IN FEET)

NORTH

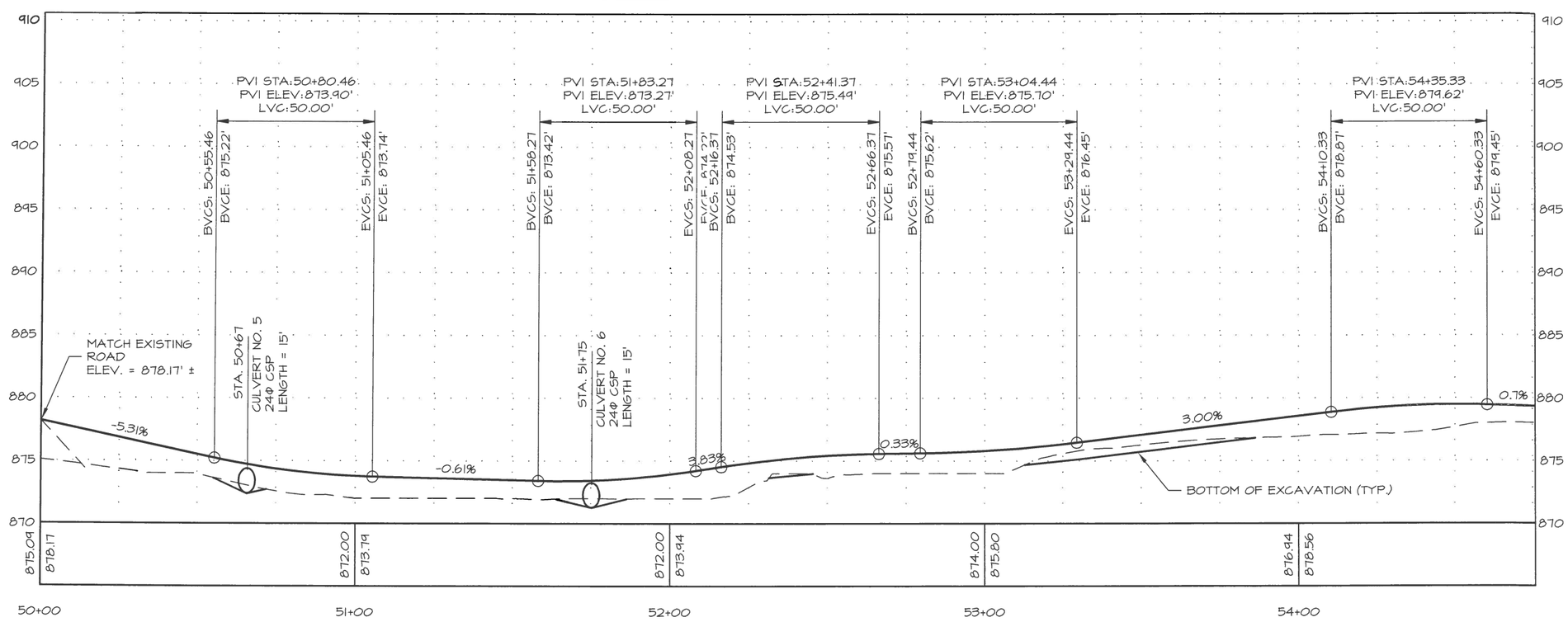
HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L32	113.97'	N72° 47' 18.44"W
L33	43.71'	N32° 16' 37.83"E
L34	95.72'	N19° 10' 33.89"W

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C30	51+13.97	51+87.32	40.00'	73.35'	105°03'56.27"
C31	52+31.03	52+98.38	75.00'	67.35'	51°27'11.72"



NOTE:
1. CULVERT ELEVATION TO BE DETERMINED IN THE FIELD. ENGINEER SHALL VERIFY CULVERT LOCATIONS.

STATE OF ALASKA 49TH
Lucas M. Randall
CE - 12595
5/20/16
Registered Professional Engineer



STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

TRAIL C
STA. 50+00 TO STA. 54+00

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 14 OF 19 SHEETS

GRAPHIC SCALE

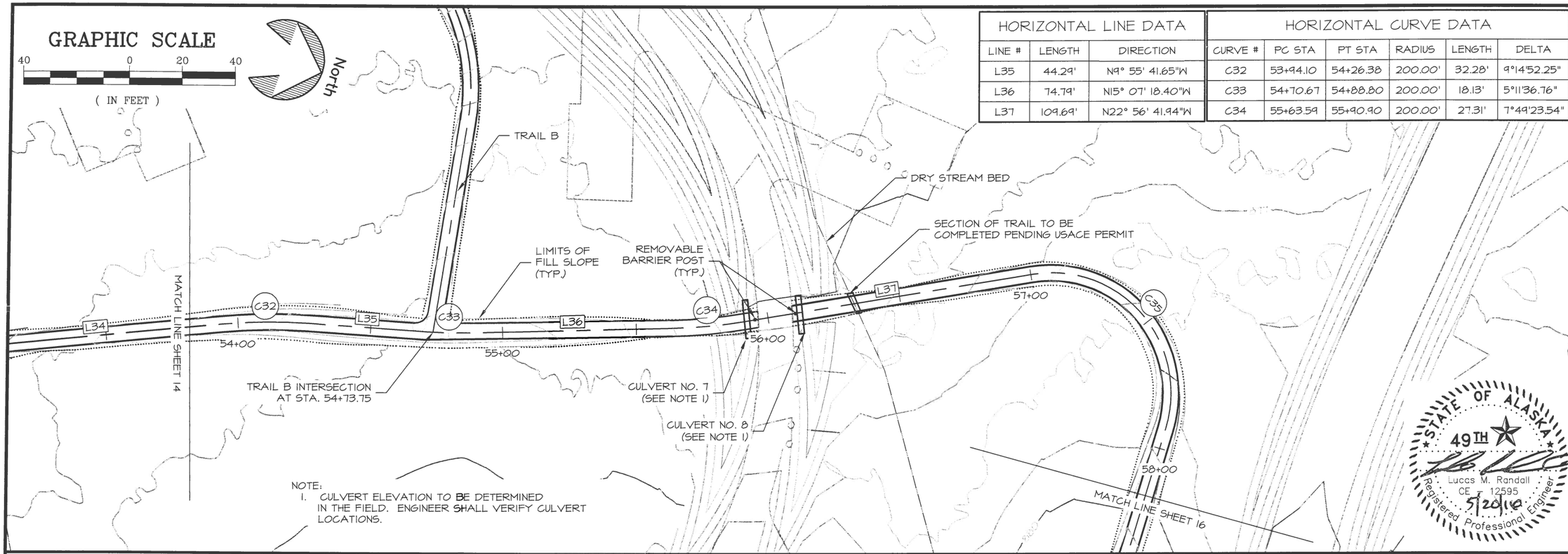
40 0 20 40

(IN FEET)

North

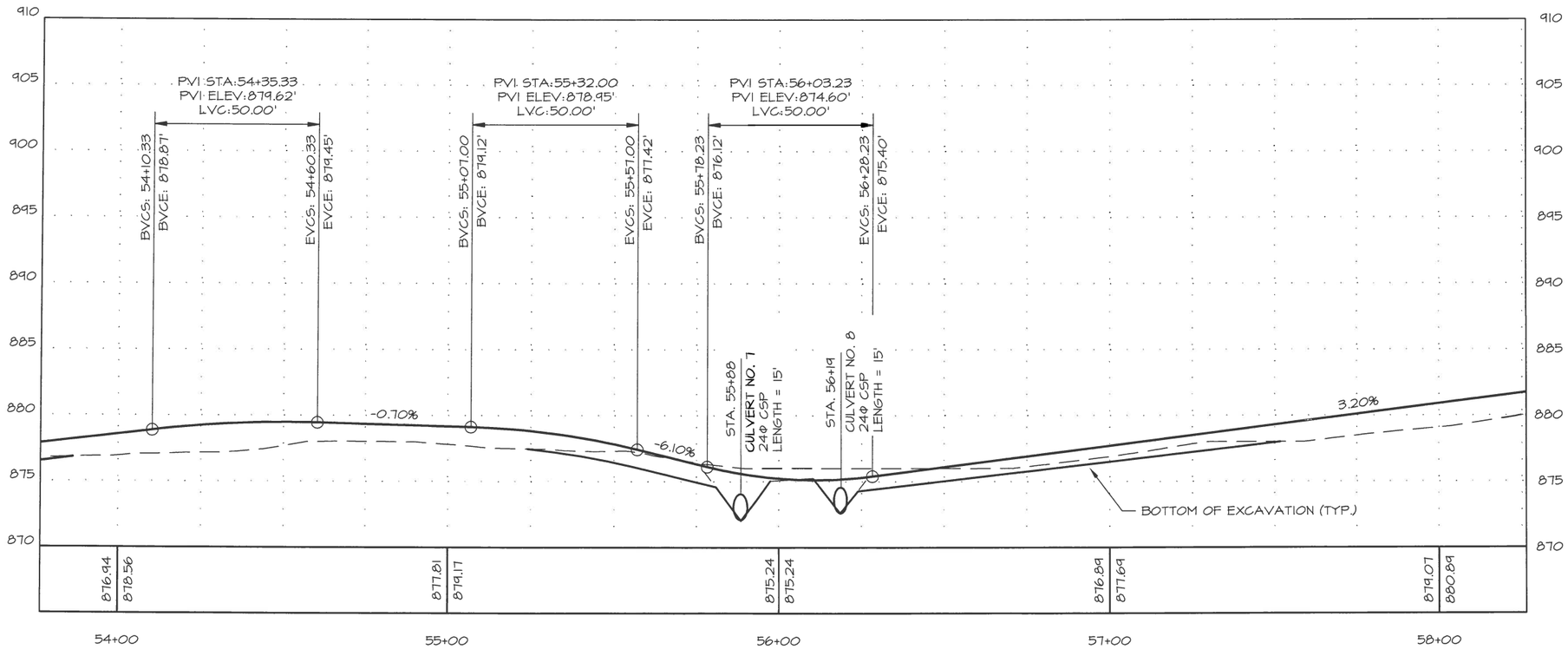
HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L35	44.29'	N9° 55' 41.65"W
L36	74.79'	N15° 07' 18.40"W
L37	109.69'	N22° 56' 41.94"W

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C32	53+94.10	54+26.38	200.00'	32.28'	9°14'52.25"
C33	54+70.67	54+88.80	200.00'	18.13'	5°11'36.76"
C34	55+63.59	55+90.90	200.00'	27.31'	7°49'23.54"



NOTE:
1. CULVERT ELEVATION TO BE DETERMINED IN THE FIELD. ENGINEER SHALL VERIFY CULVERT LOCATIONS.

STATE OF ALASKA 49TH
Lucas M. Randall
CE 12595
5/20/16
Registered Professional Engineer



STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

TRAIL C
STA. 54+00 TO STA. 57+00

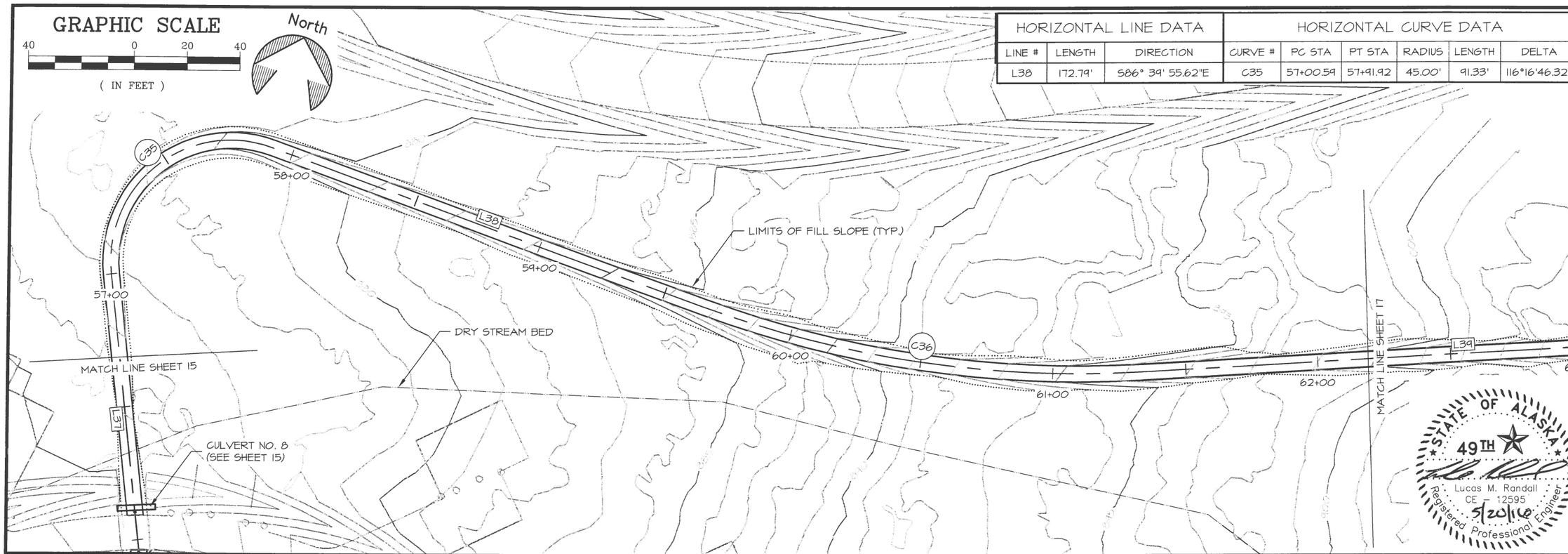
DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

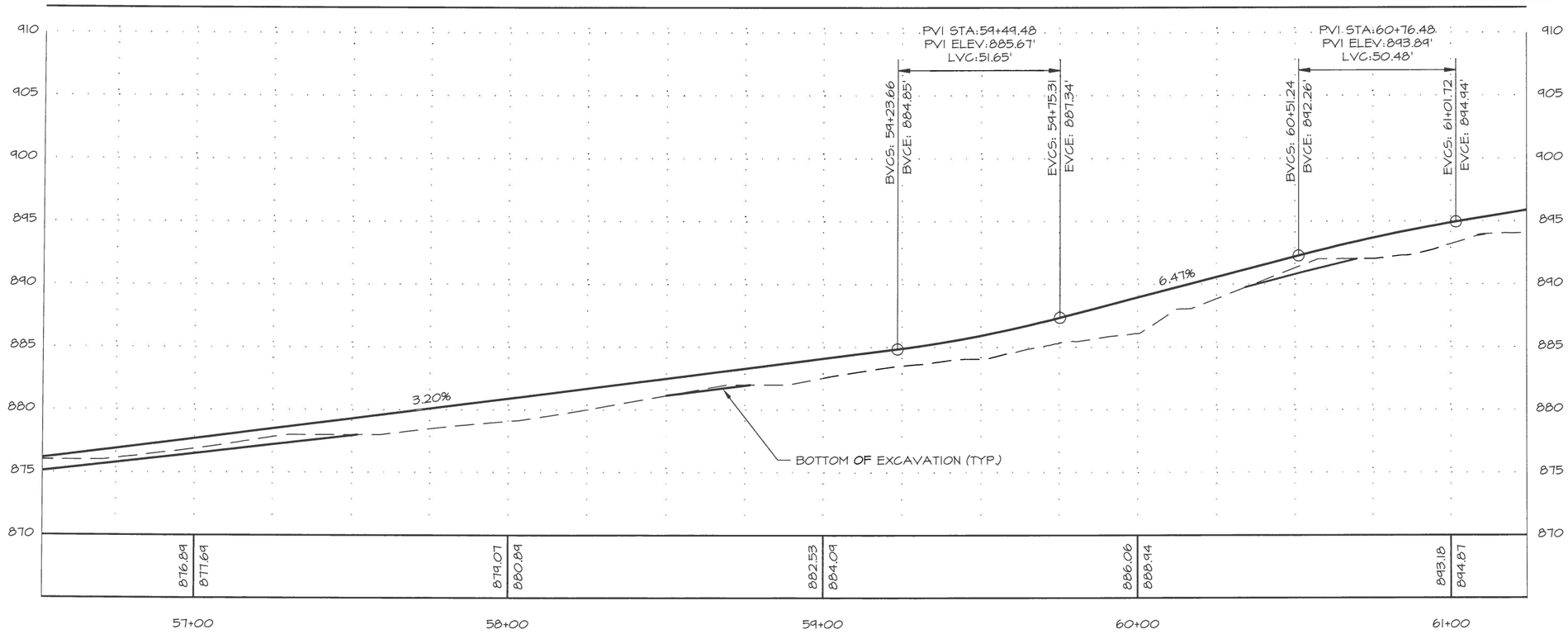
ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 15 OF 19 SHEETS

HORIZONTAL LINE DATA			HORIZONTAL CURVE DATA					
LINE #	LENGTH	DIRECTION	CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
L38	172.79'	S86° 39' 55.62"E	C35	57+00.59	57+91.92	45.00'	91.33'	116°16'46.32"





STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

TRAIL C
STA. 57+00 TO STA. 60+00

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 16 OF 19 SHEETS

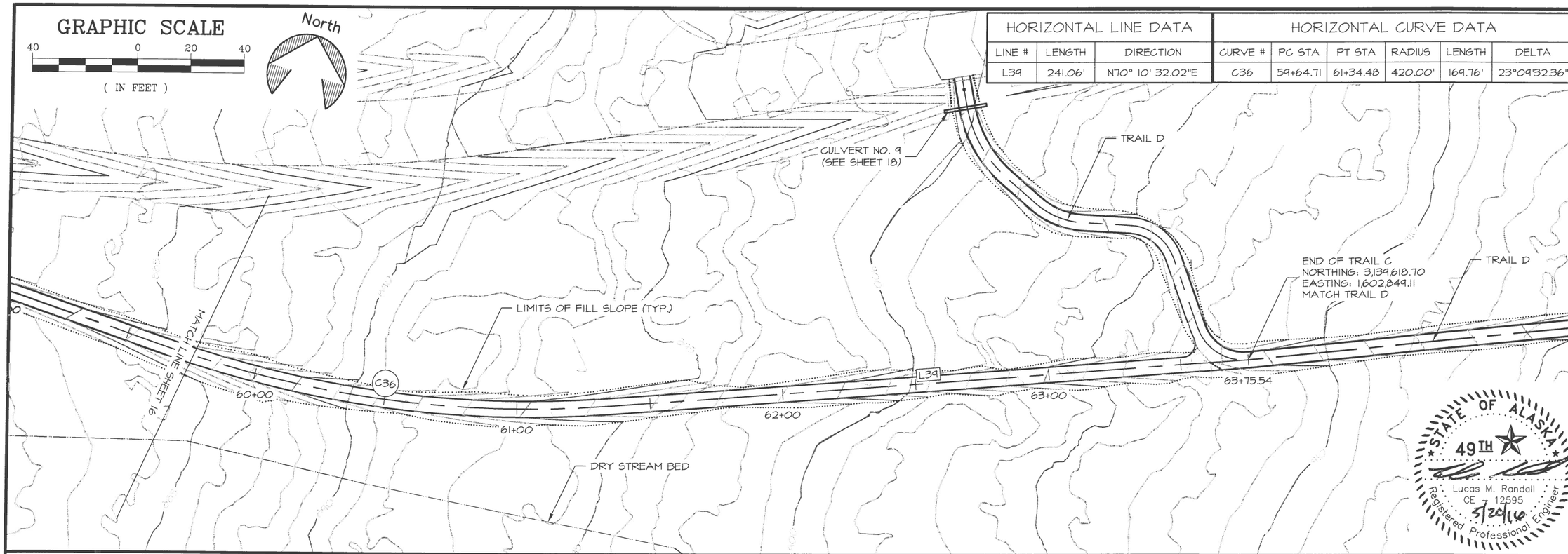
GRAPHIC SCALE

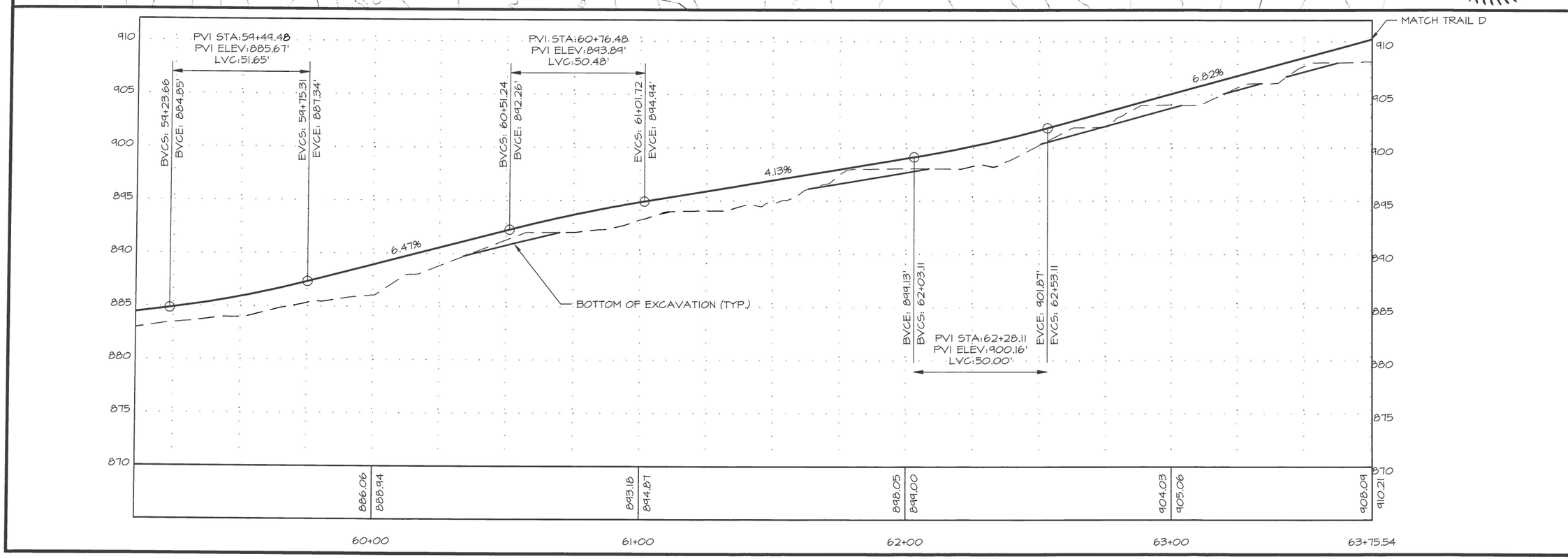
40 0 20 40

(IN FEET)

North

HORIZONTAL LINE DATA			HORIZONTAL CURVE DATA					
LINE #	LENGTH	DIRECTION	CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
L39	241.06'	N70° 10' 32.02"E	C36	59+64.71	61+34.48	420.00'	169.76'	23°09'32.36"





STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

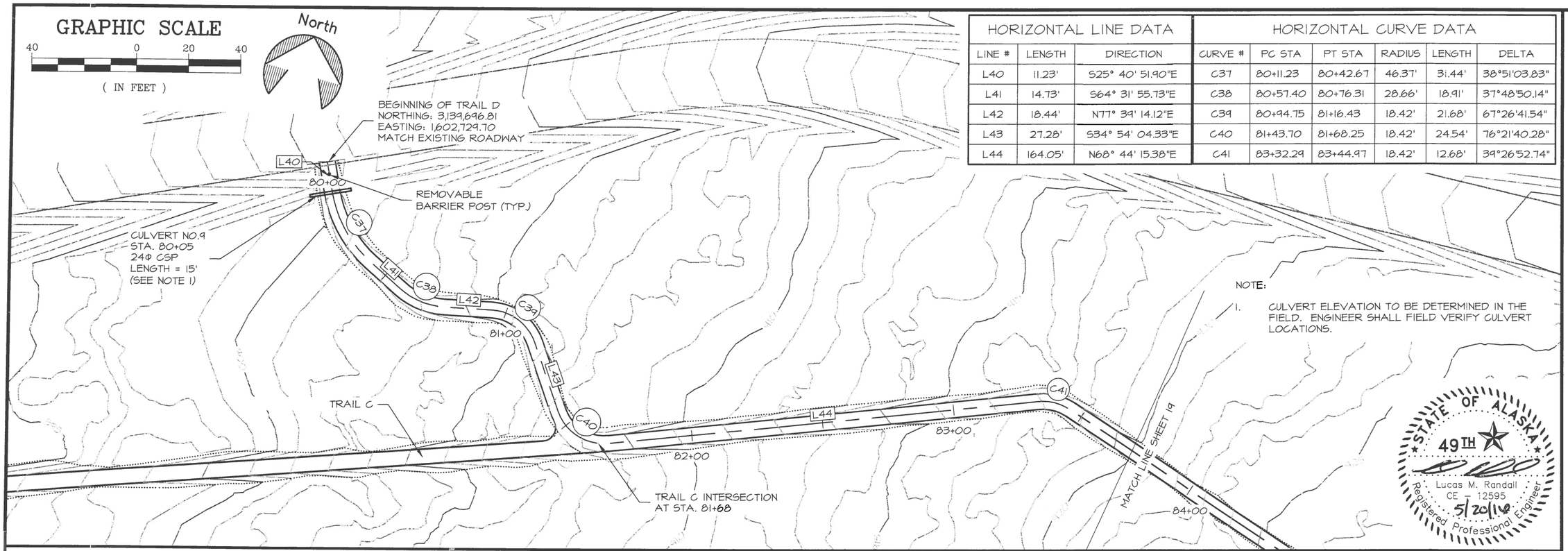
TRAIL C
STA. 60+00 TO STA. 63+75.54

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 17 OF 19 SHEETS



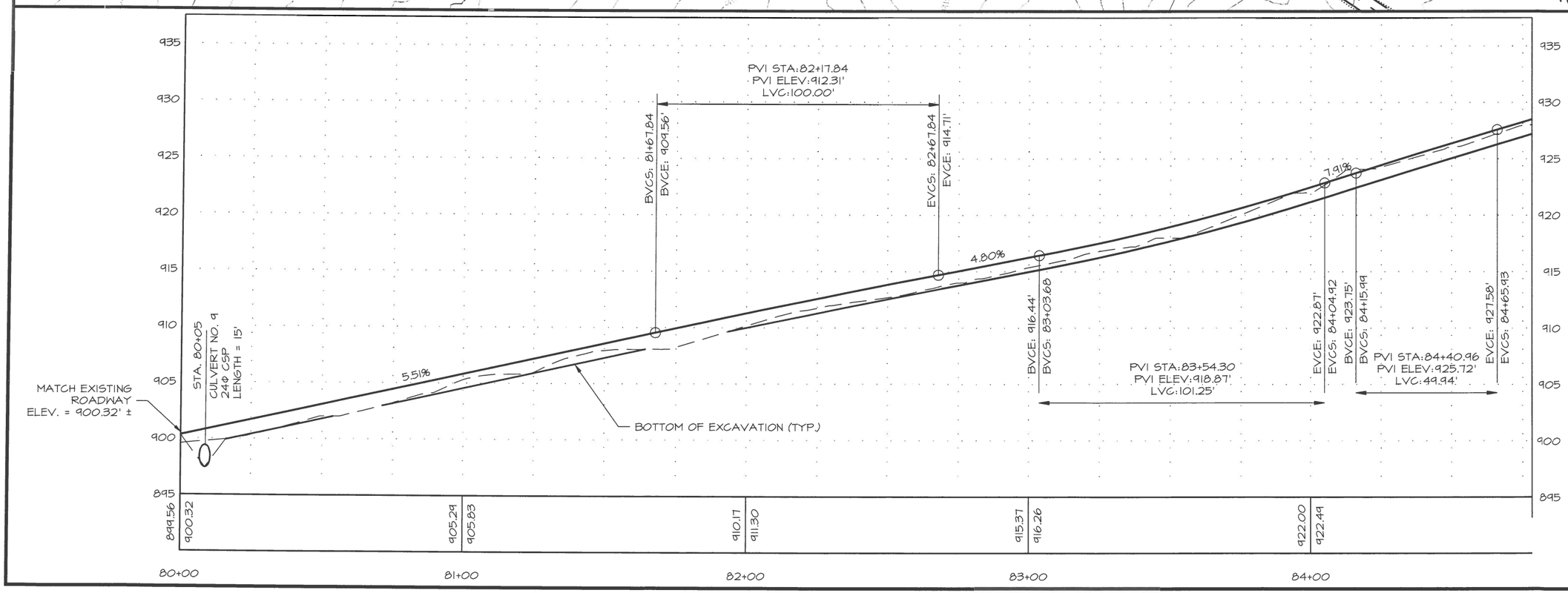
HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L40	11.23'	S25° 40' 51.90"E
L41	14.73'	S64° 31' 55.73"E
L42	18.44'	N77° 39' 14.12"E
L43	27.28'	S34° 54' 04.33"E
L44	164.05'	N68° 44' 15.38"E

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C37	80+11.23	80+42.67	46.37'	31.44'	38°51'03.83"
C38	80+57.40	80+76.31	28.66'	18.91'	37°48'50.14"
C39	80+94.75	81+16.43	18.42'	21.68'	67°26'41.54"
C40	81+43.70	81+68.25	18.42'	24.54'	76°21'40.28"
C41	83+32.29	83+44.97	18.42'	12.68'	39°26'52.74"

NOTE:

1. CULVERT ELEVATION TO BE DETERMINED IN THE FIELD. ENGINEER SHALL FIELD VERIFY CULVERT LOCATIONS.

STATE OF ALASKA 49TH
Lucas M. Randall
CE - 12595
5/20/16
Registered Professional Engineer



STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

TRAIL D
STA. 80+00 TO STA. 83+50

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

SHEET 18 OF 19 SHEETS

GRAPHIC SCALE

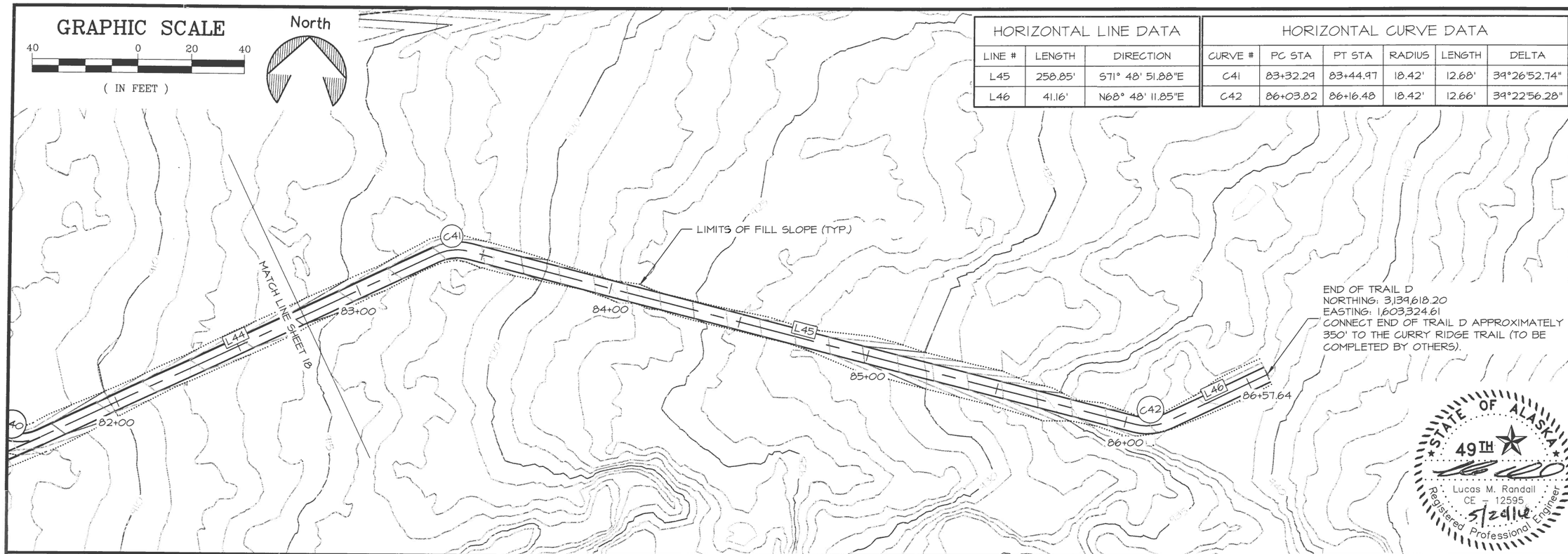
40 0 20 40

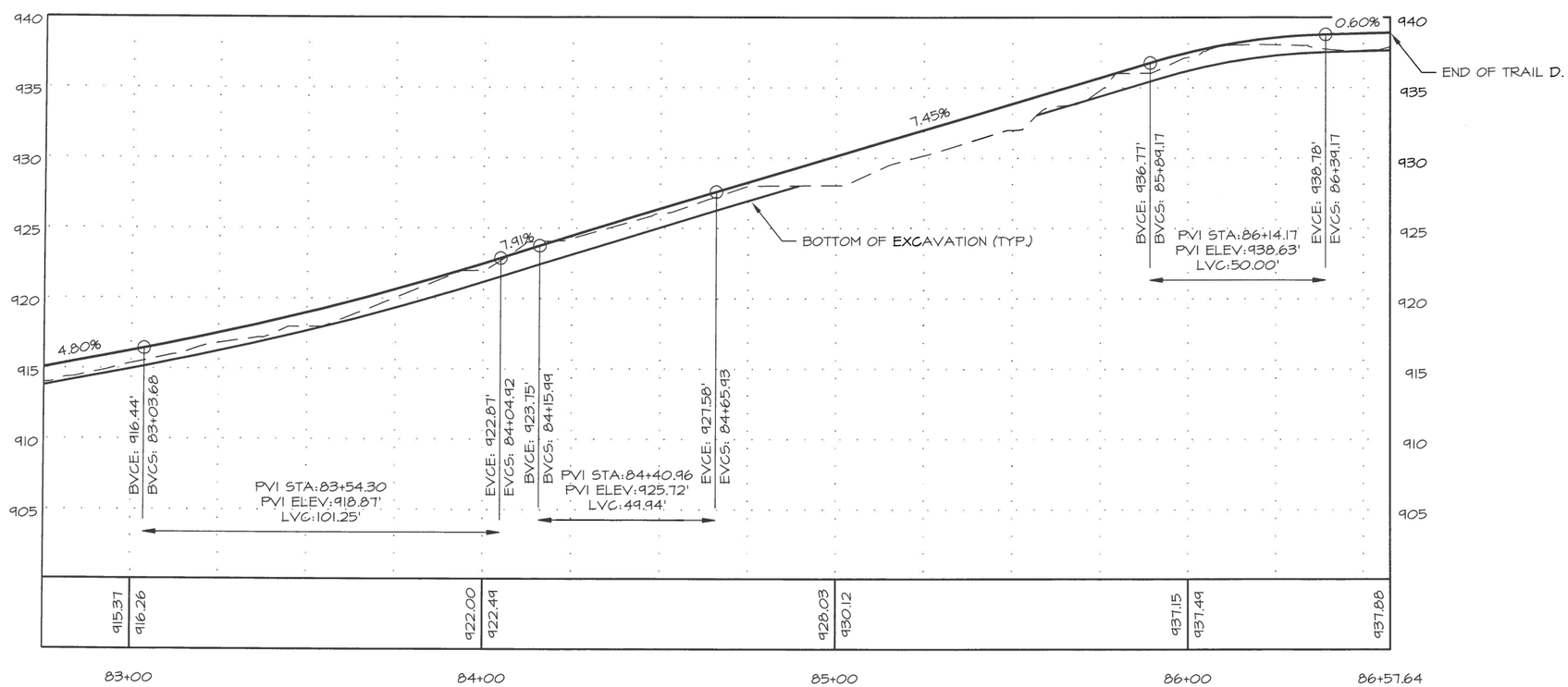
(IN FEET)

North

HORIZONTAL LINE DATA		
LINE #	LENGTH	DIRECTION
L45	258.85'	S71° 48' 51.88"E
L46	41.16'	N68° 48' 11.85"E

HORIZONTAL CURVE DATA					
CURVE #	PC STA	PT STA	RADIUS	LENGTH	DELTA
C41	83+32.29	83+44.97	18.42'	12.68'	39°26'52.74"
C42	86+03.82	86+16.48	18.42'	12.66'	39°22'56.28"





STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

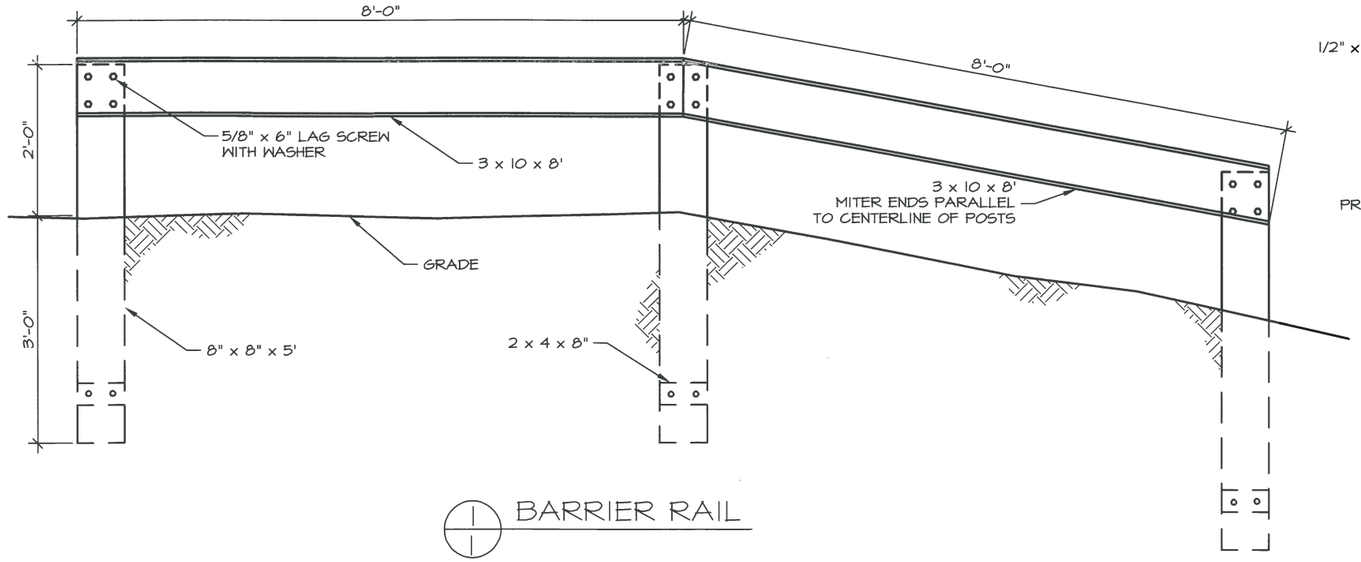
TRAIL D
STA. 83+50 TO STA. 86+57.64

DSP: VISITOR CENTER COMPLEX
TRAIL CONSTRUCTION
PROJECT No. 74034-4

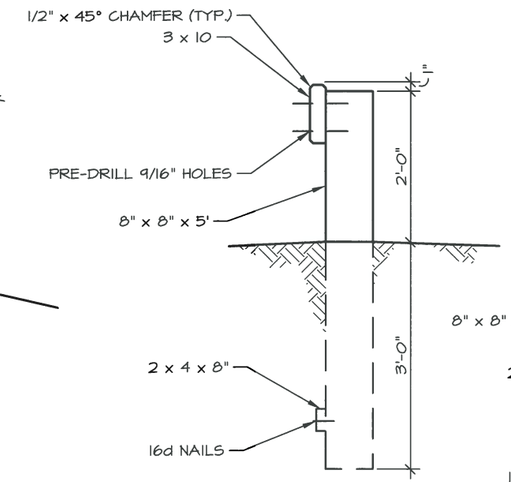
ALASKA STATE PARKS

PREPARED: RCS
DRAWN: RCS
REVIEWED: LMR
DATE: MAR. 2016

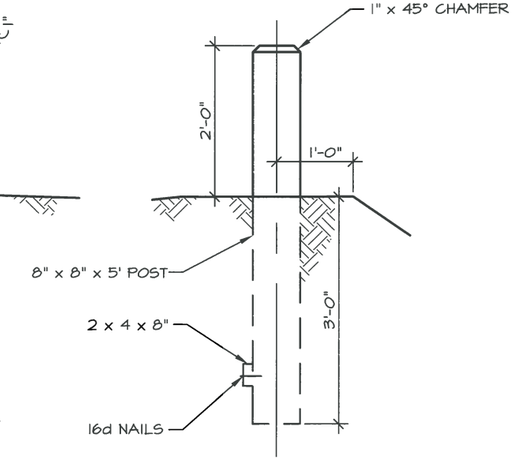
SHEET 19 OF 19 SHEETS



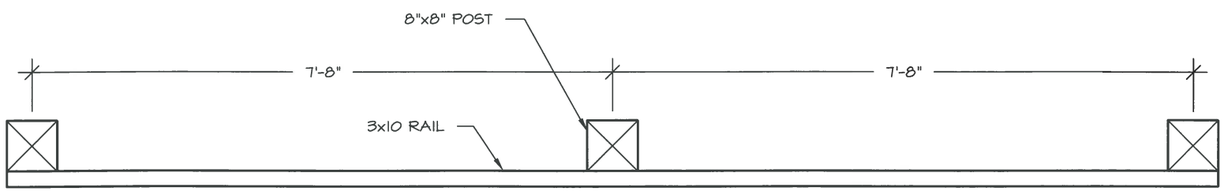
1/1 BARRIER RAIL



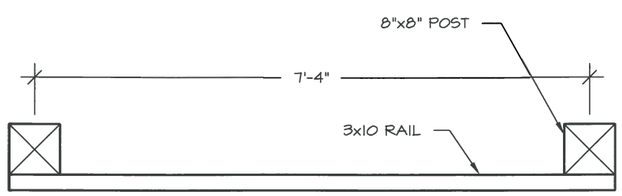
2/1 BARRIER RAIL
SIDE ELEVATION



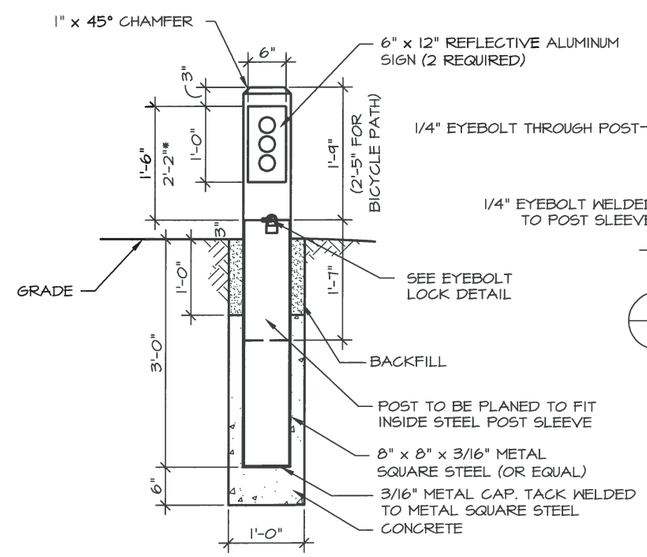
3/1 BARRIER POST



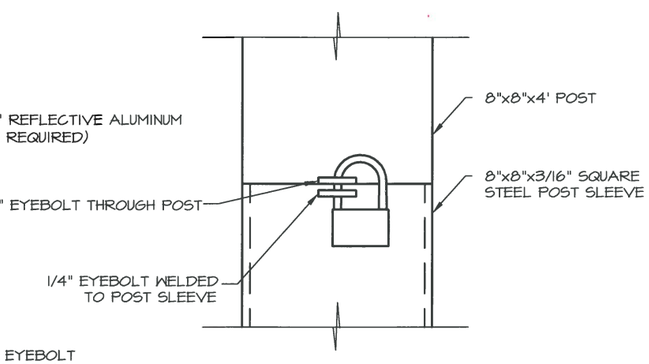
4/1 BARRIER RAIL POST SPACING
FOR 16' OVERALL RAIL LENGTH



5/1 BARRIER RAIL POST SPACING
FOR 8' OVERALL RAIL LENGTH



6/1 REMOVABLE BARRIER POST



7/1 EYEBOLT LOCK
DETAIL

NOTES:

1. ALL WOOD SHALL BE TREATED .
2. ALL POSTS WILL BE SET PLUMB INTO HAND DUG OR AUGERED HOLES, OR DRIVEN PLUMB. DELETE 2X4 CLEAT ON DRIVEN POSTS

STATE OF ALASKA 49TH Rys B. Miranda CE 11010 2/26/14 Registered Professional Engineer

NO.	REVISION	DATE	APPROVED
14	REPLACED STAMP	12/13	RBM
13	CHANGED ALUMINUM SIGN TO BE REFLECTIVE	12/10	MPS
12	CHANGED STATE PARK LOGO	04/10	MPS
11	CHANGED TITLE BLOCK	12/07	MPS
10	DELETED NOTE ON POST SPACING / ADDED PLAN DRAWING	12/04	MPS
9	MODIFIED TREATED WOOD NOTE	12/04	MPS
8	ADDED END CAP TO REMOVABLE BARRIER POST.	4/04	MPS
7	CHANGED TIMBER POSTS TO ROUGH CUT.	4/04	MPS

STATE OF ALASKA DEPARTMENT OF NATURAL RESOURCES

DESIGN & CONSTRUCTION SECTION

BARRIER RAIL
BARRIER POST REMOVABLE
BARRIER POST

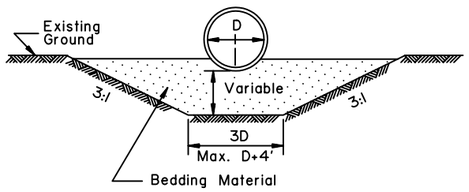
ALASKA STATE PARKS

PREPARED: tlc
DRAWN: tlc
REVIEWED: DH
DATE: 1 MAY 94

SHEET 1
P-5
OF 1 SHEETS

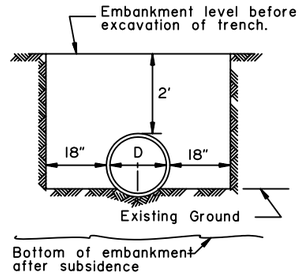
D-01.02

SHEET 1 of 1

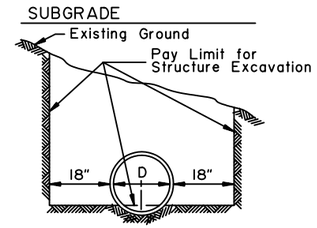


TYPE "A"
FOUNDATION STABILIZATION

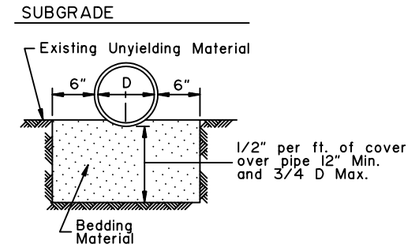
To be used in unstable areas as directed by the Engineer.



TYPE "B"



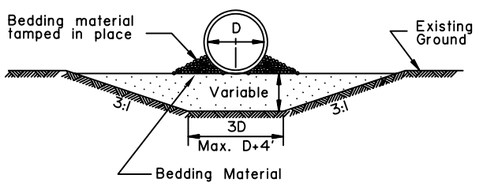
TYPE "C"



TYPE "D"
ROCK OR UNYIELDING MATERIAL

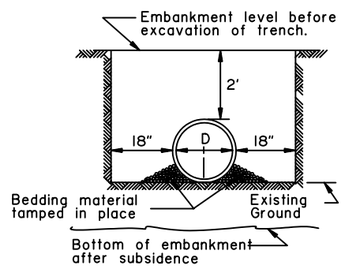
GENERAL NOTES:

1. Sidefill shall be placed and compacted with care under haunches of pipe and shall be brought up evenly and simultaneously on both sides of pipe to 1 foot above the top of the full length of the pipe.
2. Alternate installation methods may only be used when specified or approved by the Engineer.

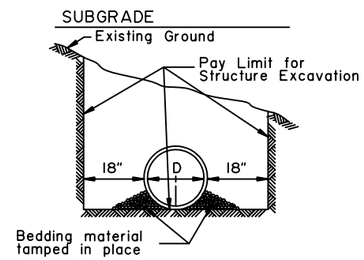


'ALTERNATE'
TYPE "A"
FOUNDATION STABILIZATION

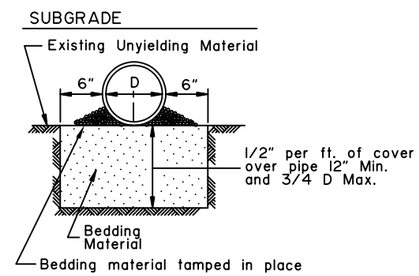
To be used in unstable areas as directed by the Engineer.



'ALTERNATE'
TYPE "B"

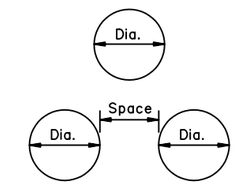


'ALTERNATE'
TYPE "C"



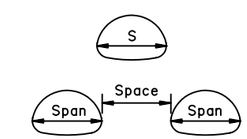
'ALTERNATE' TYPE "D"
ROCK OR UNYIELDING MATERIAL

D = Nominal Pipe Diameter



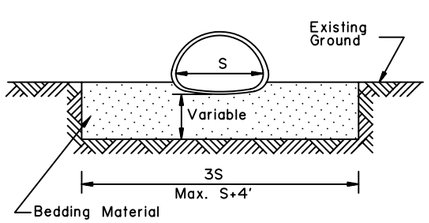
MULTIPLE INSTALLATIONS	
Dia.	Minimum Space Between Pipes
0" - 42"	24"
48" & Over	1/2 Dia. of pipe or 3', whichever is less.

S = Nominal Pipe Arch Span



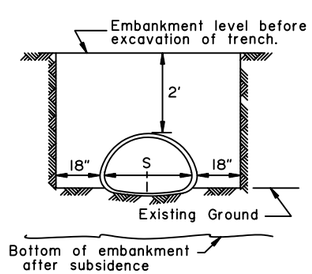
MULTIPLE INSTALLATIONS	
Dia.	Minimum Space Between Pipes
0" - 42"	24"
48" & Over	1/2 Span of pipe arch or 3', whichever is less.

CULVERT PIPE

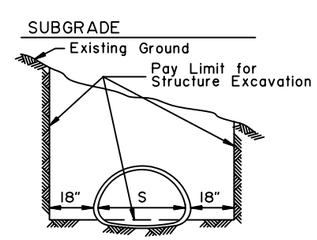


TYPE "A"
FOUNDATION STABILIZATION

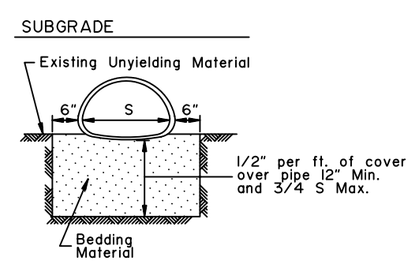
To be used in unstable areas as directed by the Engineer.



TYPE "B"



TYPE "C"



TYPE "D"
ROCK OR UNYIELDING MATERIAL

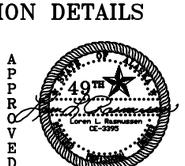
ARCH

REVISIONS		
Date	Description	By
12/1/87	Delete ref. to Specs.	Gdo
4/1/93	Delete Alt. Arch	Gdo

State of Alaska
Department of Transportation
& Public Facilities

CULVERT PIPE & ARCH INSTALLATION DETAILS

APPROVED



Date 7/15/82

D-01.02

D-04.21

CORRUGATED CIRCULAR ALUMINUM PIPE

Minimum & Maximum Cover For 2 2/3" x 1/2" Aluminum Pipe

GAGE	0.060"		0.075"		0.105"		0.135"		0.164"	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
12	12	100+	12	100+	12	100+	12	100+	12	100+
15	12	94	12	100+	12	100+	12	100+	12	100+
18	12	75	12	94	12	100+	12	100+	12	100+
21	12	65	12	82	12	100+	12	100+	12	100+
24	12	56	12	71	12	99	12	100+	12	100+
27	12	48	12	63	12	89	12	100+	12	100+
30			12	56	12	79	12	100+	12	100+
36			12	47	12	66	12	85	12	100+
42			12	55	12	56	12	73	12	100+
48			12	47	12	49	12	63	12	78
54					15	43	15	56	15	69
60							15	50	15	62
66							18	44	18	56
72									18	45

Minimum & Maximum Cover For 3" x 1" Aluminum Pipe

GAGE	0.060"		0.075"		0.105"		0.135"		0.164"	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
30	12	52	12	65						
36	12	43	12	54	12	100+	12	100+	12	100+
42	12	36	12	46	12	65	12	100+	12	100+
48	12	32	12	40	12	57	12	73	12	100+
54	15	28	15	35	15	50	12	65	12	100+
60	15	25	15	32	15	45	15	58	15	72
66	18	23	18	28	18	41	18	53	18	65
72	18	21	18	26	18	37	18	48	18	59
78			21	24	21	34	21	44	21	55
84					21	31	21	41	21	57
90					24	29	24	38	21	47
96					24	27	24	36	24	44
102							24	33	24	41
108							24	31	24	39
114									24	37
120									24	35

Minimum & Maximum Cover For 9" x 2 1/2" Aluminum Structural Plate Pipe *

GAGE	0.100"		0.125"		0.150"		0.175"		0.200"		0.225"		0.250"	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
60	12	29 31	12	38 45	12	49 60	12	58 70	12	58 81	12	58 92	12	58 100+
66	12	26 28	12	35 41	12	44 54	12	53 64	12	53 74	12	53 84	12	53 94
72	13	24 25	12	32 37	12	41 50	12	48 58	12	48 67	12	48 77	12	48 86
78	14	22 23	12	29 35	12	37 46	12	45 54	12	45 62	12	45 71	12	45 79
84	15	20 22	13	27 32	12	35 42	12	41 50	12	41 58	12	41 66	12	41 73
90	16	19 20	14	25 30	13	32 40	12	39 47	12	39 54	12	39 61	12	39 68
96	17	18 19	15	24 28	14	30 37	13	36 44	12	36 50	12	36 57	12	36 64
102	18	17 18	16	22 26	15	29 35	14	34 41	13	34 47	13	34 54	13	34 60
108	19	16 17	17	21 25	16	27 33	14	32 39	14	32 45	14	32 51	14	32 57
114	20	15 16	18	20 23	16	25 31	15	30 37	15	30 42	15	30 48	15	30 54
120	21	14 15	19	19 22	17	24 30	16	29 35	15	29 40	15	29 46	15	29 51
126	22	13 14	20	18 21	18	23 28	17	27 33	16	27 38	16	27 44	16	27 49
132	23	13 14	21	17 20	19	22 27	18	26 32	17	26 37	17	26 42	17	26 47
138	24	12 13	22	16 19	20	21 26	18	25 30	18	25 35	18	25 40	18	25 44
144	25	12 12	22	16 18	21	20 25	19	24 29	18	24 33	18	24 38	18	24 43
150			23	15 18	21	19 24	20	23 28	19	23 32	19	23 36	19	23 41
156			24	14 17	22	18 23	21	22 27	20	22 31	20	22 35	20	22 39
162					23	18 22	21	21 26	21	21 30	21	21 34	21	21 38
168					24	17 21	22	20 25	21	20 29	21	20 33	21	20 36
174					25	17 20	23	20 24	22	20 28	22	20 31	22	20 35
180							24	19 23	23	19 27	23	19 30	23	19 34

*Longitudinal seams use (5 1/3) 3/4" dia. bolts per foot.

58
100+

Upper figure for pipe with aluminum bolts.
(FOR TABLE ABOVE ONLY.)
Lower figure for pipe with galvanized steel bolts.

CORRUGATED ALUMINUM PIPE-ARCH

Minimum & Maximum Cover For 2 2/3" x 1/2" Aluminum Pipe-Arch

Span x Rise (In. x In.)	Corner Radius (In)	Minimum Gage (In)	Min. Cover (In)	Max. Cover (Ft): 2 Tons Corner Bearing Pressure	Max. Cover (Ft): 3 Tons Corner Bearing Pressure @
17 x 13	3	0.060	12	13	20
21 x 15	3	0.060	12	12	19
24 x 18	3	0.060	12	11	16
28 x 20	3	0.075	12	10	16
35 x 24	3	0.075	12	9	14
42 x 29	3 1/2	0.105	12	7	13
49 x 33	4	0.105	15	6	12
57 x 38	5	0.135	15	6	12
64 x 43	6	0.135	18	6	12
71 x 47	7	0.164	18	6	12

Minimum & Maximum Cover For 3" x 1" Aluminum Pipe-Arch

Span x Rise (In. x In.)	Corner Radius (In)	Minimum Gage (In)	Min. Cover (In)	Max. Cover (Ft): 2 Tons Corner Bearing Pressure	Max. Cover (Ft): 3 Tons Corner Bearing Pressure @
40 x 31	5	0.075	30	8	12
46 x 36	6	0.075	24	8	13
53 x 41	7	0.075	24	8	13
60 x 46	8	0.075	24	13	20
66 x 51	9	0.075	18	13	20
73 x 55	12	0.075	18	16	24
81 x 59	14	0.105	18	14	22
87 x 63	14	0.105	18	13	20
95 x 67	16	0.105	18	12	18
103 x 71	16	0.135	24	11	17
112 x 75	18	0.164	24	10	16
117 x 79	18	0.164	24	10	15

Minimum & Maximum Cover For 9" x 2 1/2" Aluminum Structural Plate Pipe-Arch*

Span x Rise (Ft-In x Ft-In)	Corner Radius (In)	Minimum Gage (In)	Min. Cover (ft)	Max. Cover in Feet For Soil Bearing Capacity of: 2 Tons/ft²	Max. Cover in Feet For Soil Bearing Capacity of: 3 Tons/ft²
5 - 11 x 5 - 5	31.8	0.100	2	24**	24**
6 - 11 x 5 - 9	31.8	0.100	2	22**	22**
7 - 3 x 5 - 11	31.8	0.100	2	20**	20**
7 - 9 x 6 - 0	31.8	0.100	2	28**	18 **
8 - 5 x 6 - 3	31.8	0.100	2	17 **	17 **
9 - 3 x 6 - 5	31.8	0.100	2	15 **	15 **
10 - 3 x 6 - 9	31.8	0.100	2	14 **	14 **
10 - 9 x 6 - 10	31.8	0.100	2	13 **	13 **
11 - 5 x 7 - 1	31.8	0.100	2	12 **	12 **
12 - 7 x 7 - 5	31.8	0.125	2	14	16 **
12 - 11 x 7 - 6	31.8	0.150	2	13	14 **
13 - 1 x 8 - 2	31.8	0.150	2	13	18 **
13 - 11 x 8 - 5	31.8	0.150	2	12	17 **
14 - 8 x 9 - 8	31.8	0.175	2	12	18
15 - 4 x 10 - 0	31.8	0.175	2	11	17
16 - 1 x 10 - 4	31.8	0.200	2	10	16
16 - 9 x 10 - 8	31.8	0.200	2.17	10	15
17 - 3 x 11 - 0	31.8	0.225	2.25	10	15
18 - 0 x 11 - 4	31.8	0.255	2.25	9	14
18 - 8 x 11 - 8	31.8	0.250	2.33	9	14

*Longitudinal seams use (5 1/3) 3/4" dia. bolts per foot.

**Fill limited by the seam strength of the bolts. 3/4" dia. bolts per foot.

METAL THICKNESSES & GAGES

ALUMINUM	GAGE NO. (For Info Only)
0.060	16
0.075	14
0.105	12
0.135	10
0.164	8

@ This column shall not be used unless specified on the plans or approved by the Regional Geotechnical Engineer.

GENERAL NOTES:

1. All material and workmanship shall be in accordance with the State of Alaska, Standard Specifications for Highway Construction.
2. The contractor shall select only pipes that meet specific height of cover criteria shown on the plans or in the special provisions.
3. No more than one type of pipe may be used on any single installation or installation grouping.
4. All structural plate pipes shall be placed on a pre-shaped foundation conforming to the depth of the bottom plates with clearance for assembling to the adjacent plates allowed.
5. See Standard Drawing "Culvert Pipe & Arch Installation Details" for foundation and structural backfill details.
6. Minimum cover shall be measured from the top of pipe to the top of rigid pavement or to the top of flexible pavement subgrade. In all cases, the minimum cover shall not be less than 12". Minimum cover during construction shall be that required to protect the pipe from damage or deflecton.
7. These tables have been developed for an H-20 live load and for compacted soil weighing 120 lbs. per cubic foot or less. If compacted soil cover exceeds 120 lbs. per cubic foot, the contractor shall use the depth of cover shown in the plans for the specific pipe. Where compacted soil cover exceeds 120 lbs. per cubic foot and no specific cover requirements are provided in the plans, the contractor shall determine the required minimum pipe cover in accordance with Section 12 of the 2000 AASHTO "LRFD Bridge Design Specifications".

REVISIONS		
Date	Description	By
8/10/00	Pipe Tables & G. Notes.	DFD
10/31/03	Pipe Table Updates &	LRG
	New Sheet 4	

Sheet 1 of 4

State of Alaska
Department of Transportation
& Public Facilities

PIPE AND ARCH TABLES

APPROVED

STATE OF ALASKA 49TH Lars R. Gregovich CE-8065 REGISTERED PROFESSIONAL ENGINEER

Date 10/31/03

D-04.21

D-04.21

CORRUGATED CIRCULAR STEEL PIPE

Minimum & Maximum Cover For 2 2/3" x 1/2" Steel Pipe

GAGE	0.064"		0.079"		0.109"		0.138"		0.168"	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
12	12	100+	12	100+	12	100+	12	100+	12	100+
15	12	100+	12	100+	12	100+	12	100+	12	100+
18	12	100+	12	100+	12	100+	12	100+	12	100+
21	12	100+	12	100+	12	100+	12	100+	12	100+
24	12	100+	12	100+	12	100+	12	100+	12	100+
27	12	100+	12	100+	12	100+	12	100+	12	100+
30	12	99	12	100+	12	100+	12	100+	12	100+
36	12	83	12	100+	12	100+	12	100+	12	100+
42	12	71	12	88	12	100+	12	100+	12	100+
48	12	62	12	77	12	100+	12	100+	12	100+
54			12	66	12	93	12	100+	12	100+
60					12	79	12	100+	12	100+
66					12	68	12	88	12	100+
72							12	75	12	93
78									12	79
84									12	66

Minimum & Maximum Cover For 3" x 1" Steel Pipe

GAGE	0.064"		0.079"		0.109"		0.138"		0.168"	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
36	12		12		12	100+	12	100+	12	100+
42	12		12		12	100+	12	100+	12	100+
48	12		12	76	12	100+	12	100+	12	100+
54	12	63	12	79	12	100+	12	100+	12	100+
60	12	56	12	71	12	99	12	100+	12	100+
66	12	52	12	64	12	90	12	100+	12	100+
72	12	47	12	59	12	82	12	100+	12	100+
78	12	44	12	54	12	77	12	98	12	100+
84	12	41	12	51	12	71	12	92	12	100+
90	12	37	12	47	12	67	12	86	12	100+
96	12	35	12	44	12	62	12	80	12	98
102	18	33	18	42	18	59	18	76	18	93
108			18	40	18	55	18	71	18	87
114			18	36	18	51	18	66	18	80
120			18	34	18	46	18	61	18	75
126					18	44	18	56	18	70
132					18	41	18	53	18	64
138					18	37	18	49	18	60
144							18	44	18	55
150									18	52

Minimum & Maximum Cover For 5" x 1" Steel Pipe*

GAGE	0.064"		0.079"		0.109"		0.138"		0.168"	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
36	12	81	12	90	12	100+	12	100+	12	100+
42	12	71	12	77	12	100+	12	100+	12	100+
48	12	62	12	68	12	100+	12	100+	12	100+
54	12	56	12	70	12	98	12	100+	12	100+
60	12	50	12	63	12	88	12	100+	12	100+
66	12	46	12	57	12	80	12	100+	12	100+
72	12	42	12	52	12	73	12	95	12	100+
78	12	39	12	48	12	68	12	87	12	100+
84	12	36	12	45	12	63	12	81	12	99
90	12	33	12	42	12	59	12	76	12	93
96	12	31	12	39	12	55	12	71	12	87
102	18	29	18	37	18	52	18	67	18	82
108			18	35	18	49	18	63	18	77
114			18	32	18	45	18	58	18	71
120			18	30	18	41	18	54	18	66
126					18	39	18	50	18	62
132					18	36	18	47	18	57
138					18	33	18	43	18	53
144							18	39	18	49
150									19	47

*Table for pipe with helical lockseams or helical welded seams ONLY.

Minimum & Maximum Cover For 6" x 2" Steel Structural Plate Pipe**

GAGE	ALL	0.111"	0.140"	0.170"	0.188"	0.218"	0.249"	0.280"
Dia. (In)	Min. (In)	Max. (Ft)	Max. (Ft)	Max. (Ft)	Max. (Ft)	Max. (Ft)	Max. (Ft)	Max. (Ft)
60	12	46	68	90	100+	100+	100+	100+
66	12	42	62	81	93	100+	100+	100+
72	12	38	57	75	86	100+	100+	100+
78	12	35	52	69	79	95	100+	100+
84	12	33	49	64	73	88	100+	100+
90	12	31	45	60	68	82	97	100+
96	12	29	43	56	64	77	91	100+
102	18	27	40	52	60	73	86	94
108	18	25	38	50	57	69	81	88
114	18	24	36	47	54	65	77	84
120	18	23	34	45	51	62	73	80
126	18	22	32	42	49	59	69	76
132	18	21	31	40	46	56	66	72
138	18	20	29	39	44	54	63	69
144	18	19	28	37	43	51	61	66
150	24	18	27	36	41	49	58	64
156	24	17	26	34	39	47	56	61
162	24	17	25	33	38	46	54	59
168	24	16	24	32	36	44	52	57
174	24	16	23	31	35	42	50	55
180	24	15	22	30	34	41	48	53
186	24	15	22	29	33	40	47	51
192	24		21	28	32	38	45	50
198	30		20	27	31	37	44	48
204	30		20	26	30	36	43	47
210	30		19	25	29	35	41	45
216	30			25	28	34	40	44
222	30			24	27	33	39	43
228	30			23	27	32	38	42
234	30			23	26	31	37	41
240	30				25	31	36	40
246	36				25	30	35	39
252	36					29	34	38
258	36					28	34	37
264	36					28	33	36
270	36					27	32	35
276	36						31	34
282	36						31	34
288	42						30	33
294	42							32
300	42							32
306	42							31
312	42							30

**Longitudinal seams use (4) 3/4" dia. bolts per foot.

GENERAL NOTES

1. All material and workmanship shall be in accordance with the State of Alaska, Standard Specifications for Highway Construction.
2. The contractor shall select only pipes that meet specific height of cover criteria shown on the plans or in the special provisions.
3. No more than one type of pipe may be used on any single installation or installation grouping.
4. All structural plate pipes shall be placed on a pre-shaped foundation conforming to the depth of the bottom plates with clearance for assembling to the adjacent plates allowed.
5. See Standard Drawing "Culvert Pipe & Arch Installation Details" for foundation and structural backfill details.
6. Minimum cover shall be measured from the top of pipe to the top of rigid pavement or to the top of flexible pavement subgrade. In all cases, the minimum cover shall not be less than 12". Minimum cover during construction shall be that required to protect the pipe from damage or deflecton.
7. These tables have been developed for an H-20 live load and for compacted soil weighing 120 lbs. per cubic foot or less. If compacted soil cover exceeds 120 lbs. per cubic foot, the contractor shall use the depth of cover shown in the plans for the specific pipe. Where compacted soil cover exceeds 120 lbs. per cubic foot and no specific cover requirements are provided in the plans, the contractor shall determine the required minimum pipe cover in accordance with Section 12 of the 2000 AASHTO "LRFD Bridge Design Specifications".

CORRUGATED STEEL PIPE-ARCH

Minimum & Maximum Cover For 2 2/3" x 1/2" Steel Pipe-Arch

Span x Rise (In. x In.)	Corner Radius (In)	Minimum Gage (In)	Min. Cover (In)	Max. Cover (Ft) 2 Tons Corner Bearing Pressure	Max. Cover (Ft) 3 Tons Corner Bearing Pressure @
17 x 13	3	0.064	12	16	18
21 x 15	3	0.064	12	15	14
24 x 18	3	0.064	12	15	13
28 x 20	3	0.064	12	15	11
35 x 24	3	0.064	12	15	7
42 x 29	3 1/2	0.064	12	15	7
49 x 33	4	0.079	12	15	6
57 x 38	5	0.109	12	15	8
64 x 43	6	0.109	12	15	9
71 x 47	7	0.138	12	15	10
77 x 52	8	0.168	12	15	10
83 x 57	9	0.168	12	15	10

Minimum & Maximum Cover For 3" x 1" Steel Pipe-Arch

Span x Rise (In. x In.)	Corner Radius (In)	Minimum Gage (In)	Min. Cover (In)	Max. Cover (Ft) 2 Tons Corner Bearing Pressure	Max. Cover (Ft) 3 Tons Corner Bearing Pressure @
40 x 31	5	0.079	12	25	12
46 x 36	6	0.079	12	25	13
53 x 41	7	0.079	12	25	13
60 x 46	8	0.079	15	25	13
66 x 51	9	0.079	15	25	13
73 x 55	12	0.079	18	24	16
81 x 59	14	0.079	18	21	17
87 x 63	14	0.079	18	20	16
95 x 67	16	0.079	18	20	17
103 x 71	16	0.079	18	20	15
112 x 75	18	0.079	21	20	16
117 x 79	18	0.109	21	19	15
128 x 83	18	0.138	24	19	14
137 x 87	18	0.138	24	19	13
142 x 91	18	0.138	24	19	12
150 x 96	18	0.138	30	19	
157 x 96	18	0.138	30	19	
164 x 105	18	0.138	30	19	
171 x 110	18	0.138	30	19	

Minimum & Maximum Cover For 5" x 1" Steel Pipe-Arch

Span x Rise (In. x In.)	Corner Radius (In)	Minimum Gage (In)	Min. Cover (In)	Max. Cover (Ft) 2 Tons Corner Bearing Pressure	Max. Cover (Ft) 3 Tons Corner Bearing Pressure @
40 x 31	5	0.109	12	25	12
46 x 36	6	0.109	15	25	13
53 x 41	7	0.109	15	25	13
60 x 46	8	0.109	18	25	13
66 x 51	9	0.109	18	25	13
73 x 55	12	0.109	18	24	16
81 x 59	14	0.109	18	21	17
87 x 63	14	0.109	18	20	16
95 x 67	16	0.109	18	20	17
103 x 71	16	0.109	18	20	15
112 x 75	18	0.109	21	20	16
117 x 79	18	0.109	21	19	15
128 x 83	18	0.109	24	19	14
137 x 87	18	0.109	24	19	13
142 x 91	18	0.109	24	19	12
150 x 96	18	0.138	30	19	
157 x 96	18	0.138	30	19	
164 x 105	18	0.138	30	19	
171 x 110	18	0.138	30	19	

Minimum & Maximum Cover For 6" x 2" Steel Structural Plate Pipe-Arch**

Span x Rise (Ft-In x Ft-In)	Corner Radius (In)	Minimum Gage (In)	2 Tons Corner Bearing Pressure @ Min. Cover (In)	2 Tons Corner Bearing Pressure @ Max. Cover (Ft)	3 Tons Corner Bearing Pressure @ Min. Cover (In)	3 Tons Corner Bearing Pressure @ Max. Cover (Ft)
6-1 x 4-7	18	0.111	18	16	12	24
7-0 x 5-1	18	0.111	18	14	12	21
7-11 x 5-7	18	0.111	18	13	12	19
8-10 x 6-1	18	0.111	24	11	18	17
9-9 x 6-7	18	0.111	24	10	18	15
10-11 x 7-1	18	0.111	24	9	18	14
11-10 x 7-7	18	0.111	24	7	18	13
12-10 x 8-4	18	0.111	30	6	24	12
14-1 x 8-9	18	0.111	30	5	24	11
15-4 x 9-3	18	0.111	NS	NS	24	10
15-10 x 9-10	18	0.111	NS	NS	24	9
16-7 x 10-1	18	0.111	NS	NS	24	9
13-3 x 9-4	31	0.111	24	13	24	17
14-2 x 9-10	31	0.111	24	12	24	16
15-4 x 10-4	31	0.111	24	11	24	15
16-3 x 10-10	31	0.111	24	11	24	14
17-2 x 11-4	31	0.111	30	10	30	13
18-1 x 11-10	31	0.111	30	10	30	12
19-3 x 12-4	31	0.111	30	9	30	13
19-11 x 12-10	31	0.140	30	9	30	13
20-7 x 13-2	31	0.140	36	7	36	13

NS = Not Suitable

@ This column shall not be used unless specified on the plans or approved by the Region Geotechnical Engineer.

**Longitudinal seams use (4) 3/4" dia. bolts per foot.

METAL THICKNESSES & GAGES

STEEL		
ZINC COATED	UNCOATED	GAGE NO. (For Info Only)
0.064	0.0598	16
0.079	0.0747	14
0.109	0.1047	12
0.138	0.1345	10
0.168	0.1644	8
0.188	0.1838	7
0.218	0.2145	5
0.249	0.2451	3
0.280	0.2758	1

REVISIONS		
Date	Description	By
8/10/00	Pipe Tables & G. Notes.	DFD
10/31/03	Pipe Table Updates & New Sheet 4.	LRG

Sheet 2 of 4

State of Alaska
Department of Transportation & Public Facilities

PIPE AND ARCH TABLES

APPROVED

STATE OF ALASKA 49TH
Lars R. Gregovich
CE-8065
Registered Professional Engineer

Date 10/31/03

D-04.21

Maximum Cover for Type S Corrugated Polyethelene Pipe	
Size (in.)	Max. Cover (ft.)
12	30.0
15	30.0
18	30.0
24	30.0
30	30.0
36	30.0
40	20.0
48	20.0

GENERAL NOTES

1. All materials and workmanship shall be in accordance with the State of Alaska Standard Specifications for Highway Construction.
2. For foundation and structural backfill details see Standard Drawing "Culvert Pipe & Arch Installation Details".
3. Pipe cover height is measured from top of the pipe to top of rigid pavement, or to the top of subgrade for flexible pavement. In all cases the minimum cover shall be no less than 2 ft. Where loads traverse the culvert during construction minimum cover shall be no less than 4 ft.

REVISIONS		
Date	Description	By
10/31/03	New Sheet 4	LRG

Sheet 3 of 4

State of Alaska
Department of Transportation
& Public Facilities

PIPE AND ARCH TABLES

APPROVED

STATE OF ALASKA 49TH Lars R. Gregovich CE-8065 PROFESSIONAL ENGINEER

Date 10/31/03

D-04.21

ALUMINUM SPIRAL RIB PIPE

Minimum & Maximum Cover For Aluminum Spiral Rib Circular Pipe*								
GAGE	0.060"		0.075"		0.105"		0.135"	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
12	24	35	24	50				
18	24	34	24	49				
24	24	25	24	36	24	63	24	82
30	24	19	24	28	24	50	24	65
36	24	15	24	24	24	41	24	54
42			24	19	24	35	24	46
48			24	17	24	30	24	40
54			24	14	24	27	24	35
60			24	12	24	24	24	30

*¾ x ¾ x 7½ in. or ¾ x 1 x 11½ in. Corrugations

Minimum & Maximum Cover For Aluminum Spiral Rib Pipe-Arch*				
		Soil Corner Bearing Capacity of 2 Tons/ s.f.		
		0.060"	0.075"	0.105"
Span x Rise (In. x In.)	Min. Cover (In.)	Max. Cover (ft.)	Max. Cover (ft.)	Max. Cover (ft.)
20 x 16	12	13		
23 x 19	12	14		
27 x 21	12	13		
33 x 26	12	13		
40 x 31	12	13		
46 x 36	12	14		
53 x 41	18		13	
60 x 46	18		20	
66 x 51	18		21	
73 x 55	18			21
81 x 59	18			17
87 x 63	18			17
95 x 67	18			17

*¾ x ¾ x 7½ in. or ¾ x 1 x 11½ in. Corrugations

STEEL SPIRAL RIB PIPE

Minimum & Maximum Cover For Steel and Aluminized Steel Spiral Rib Circular Pipe*								
GAGE	0.064"		0.079"		0.109"		0.138"**	
Dia. (In)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)	Min. (In)	Max. (Ft)
18	12							
24	12	51	12	72	12	121		
30	12	41	12	58	12	97		
36	12	34	12	48	12	81		
42	12	29	12	41	12	69		
48	12	26	12	36	12	61		
54	18	23	18	32	18	54		
60	18	21	18	29	18	49	18	73
66	18	19	18	26	18	44	18	65
72			18	24	18	40	18	59
78			24	22	24	37	24	55
84			24	21	24	35	24	52
90					24	32	24	47
96					24	30	24	44
102					30	29	30	43
108					30	27	30	41

*¾ x ¾ x 7½ in. or ¾ x 1 x 11½ in. Corrugations

**¾ x ¾ x 7½ in. Corrugations Only.

Minimum & Maximum Cover For Steel Spiral Rib Arch-Pipe*				
		Soil Corner Bearing Capacity of 2 Tons/ s.f.		
		0.064"	0.079"	0.109"
Span x Rise (In. x In.)	Min. Cover (In.)	Max. Cover (ft.)	Max. Cover (ft.)	Max. Cover (ft.)
20 x 16	12	13		
23 x 19	12	14		
27 x 21	12	13		
33 x 26	12	13		
40 x 31	12	13		
46 x 36	12	14		
53 x 41	18		13	
60 x 46	18		20	
66 x 51	18		21	
73 x 55	18			21
81 x 59	18			17
87 x 63	18			17
95 x 67	18			17

*¾ x ¾ x 7½ in. or ¾ x 1 x 11½ in. Corrugations

GENERAL NOTES

1. All material and workmanship shall be in accordance with the State of Alaska, Standard Specifications for Highway Construction.

2. The contractor shall select only pipes that meet specific height of cover criteria shown on the plans or in the special provisions.

3. No more than one type of pipe may be used on any single installation or installation grouping.

4. All structural plate pipes shall be placed on a pre-shaped foundation conforming to the depth of the bottom plates with clearance for assembling to the adjacent plates allowed.

5. See Standard Drawing "Culvert Pipe & Arch Installation Details" for foundation and structural backfill details.

6. Minimum cover shall be measured from the top of pipe to the top of rigid pavement or to the top of flexible pavement subgrade. In all cases, the minimum cover shall not be less than 12". Minimum cover during construction shall be that required to protect the pipe from damage or deflecton.

7. These tables have been developed for an H-20 live load and for compacted soil weighing 120 lbs. per cubic foot or less. If compacted soil cover exceeds 120 lbs. per cubic foot, the contractor shall use the depth of cover shown in the plans for the specific pipe. Where compacted soil cover exceeds 120 lbs. per cubic foot and no specific cover requirements are provided in the plans, the contractor shall determine the required minimum pipe cover in accordance with Section 12 of the 2000 AASHTO "LRFD Bridge Design Specifications".

REVISIONS		
Date	Description	By
8/10/00	Pipe Tables & G. Notes.	DFD
10/31/03	New Sheet 4.	LRG

Sheet 4 of 4

State of Alaska
Department of Transportation
& Public Facilities

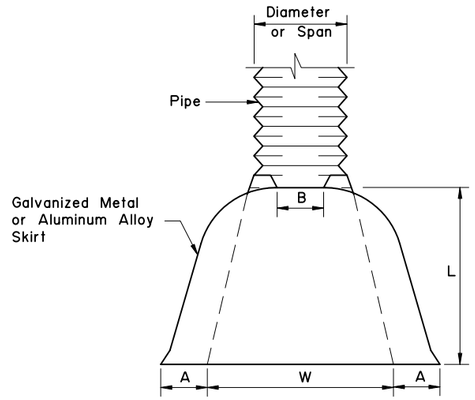
PIPE AND ARCH TABLES

APPROVED

Date 10/31/03

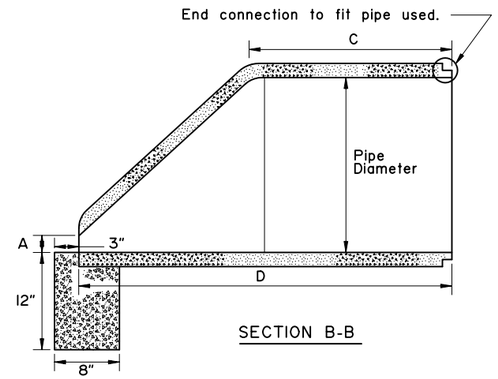
D-04.21

D-06.10



PLAN

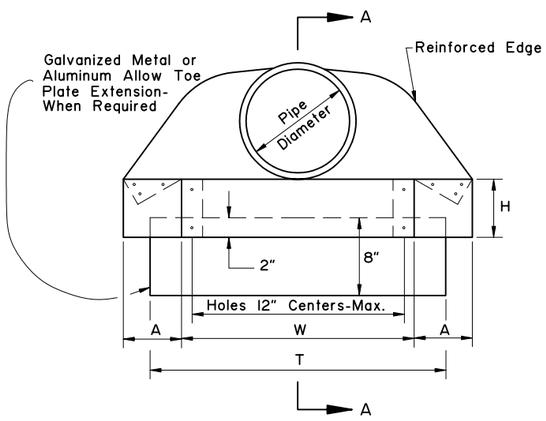
ROUND AND PIPE ARCH



SECTION B-B

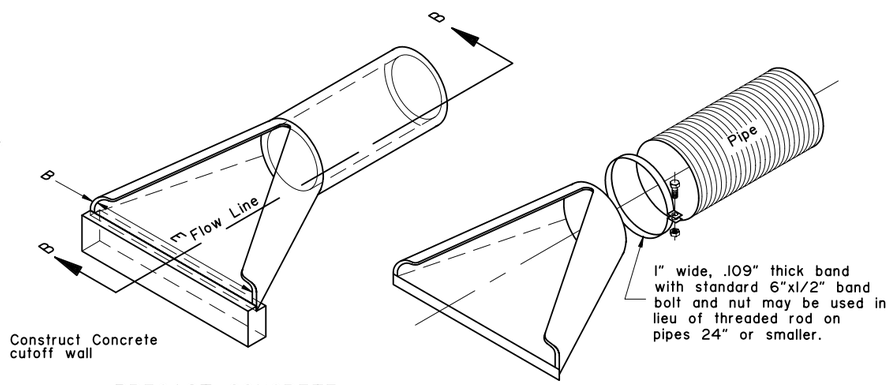
MINIMUM DIMENSIONS					
Pipe Diameter	A	B	C	D	E
12"	4"	1 3/4"	24"	46"	24"
18"	9"	2"	25"	50"	36"
24"	9 1/2"	2 1/2"	30"	72"	48"
30"	12"	3"	20"	73"	60"
36"	15"	3 3/8"	35"	97"	72"
42"	21"	3 3/4"	35"	98"	78"
48"	24"	4 1/4"	26"	98"	84"
54"	27"	4 5/8"	33"	99"	82"

ROUND PIPE										
Pipe Diam. Inches	Thickness For Aluminum	Thk. for Galv. Metal	Dimension Inches						Skirt	Approx. Slope
			A 1" Tol.	B Max.	H 1" Tol.	L 1 1/2" Tol.	W 2" Tol.	T 2" Tol.		
12"	0.060	0.064	6"	6"	6"	21"	24"	34"	1 Pc.	2 1/2
15"	0.060	0.064	7"	8"	6"	26"	30"	40"	1 Pc.	2 1/2
18"	0.060	0.064	8"	10"	6"	31"	36"	46"	1 Pc.	2 1/2
21"	0.060	0.064	9"	12"	6"	36"	42"	52"	1 Pc.	2 1/2
24"	0.075	0.064	10"	13"	6"	41"	48"	58"	1 Pc.	2 1/2
30"	0.075	0.079	12"	16"	8"	51"	60"	70"	1 Pc.	2 1/2
36"	0.105	0.079	14"	19"	9"	60"	72"	94"	2 Pc.	2 1/2
42"	0.105	0.109	16"	22"	11"	69"	84"	106"	2 Pc.	2 1/2
48"	0.105	0.109	18"	27"	12"	78"	90"	112"	2 Pc.	2 1/4
54"	0.105	0.109	18"	30"	12"	84"	102"	122"	2 Pc.	2 1/4
60"	0.135	0.109	18"	33"	12"	87"	114"	134"	3 Pc.	2 1/4
66"	0.135	0.109	18"	36"	12"	87"	120"	142"	3 Pc.	2 1/4
72"	0.135	0.109	18"	39"	12"	87"	126"	146"	3 Pc.	2 1/4
78"	— —	0.109	18"	42"	12"	87"	132"	152"	3 Pc.	1 1/4
84"	— —	0.109	18"	45"	12"	87"	138"	158"	3 Pc.	1 1/6



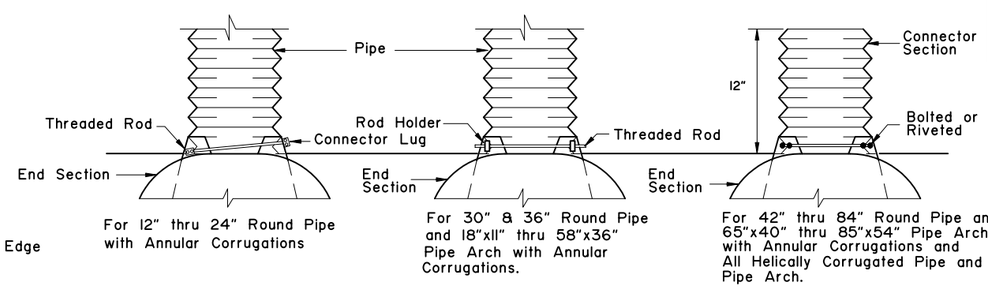
ELEVATION

ROUND PIPE

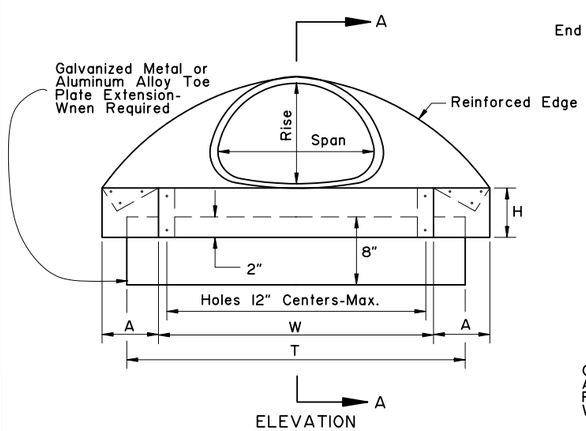


PRECAST CONCRETE END SECTION

PIPE-ARCH										
Pipe-Arch Dimension Inches		Thickness for Aluminum	Thk. for Galv. Metal	Dimension Inches					Skirt	Approx. Slope
Span	Rise			A 1" Tol.	B Max.	H 1" Tol.	L 1 1/2" Tol.	W 2" Tol.	T 2" Tol.	
17"	13"	0.060	0.064	7"	9"	6"	19"	30"	40"	1 Pc.	2 1/2
21"	15"	0.060	0.064	7"	10"	6"	23"	36"	46"	1 Pc.	2 1/2
24"	18"	0.060	0.064	8"	12"	6"	28"	42"	52"	1 Pc.	2 1/2
28"	20"	0.075	0.064	9"	14"	6"	32"	48"	58"	1 Pc.	2 1/2
35"	24"	0.075	0.079	10"	16"	6"	39"	60"	70"	1 Pc.	2 1/2
42"	29"	0.105	0.079	12"	18"	8"	46"	75"	85"	1 Pc.	2 1/2
49"	33"	0.105	0.109	13"	21"	9"	53"	85"	103"	2 Pc.	2 1/2
57"	38"	0.105	0.109	18"	26"	12"	63"	90"	114"	2 Pc.	2 1/2
64"	43"	0.105	0.109	18"	30"	12"	70"	102"	130"	2 Pc.	2 1/4
71"	47"	0.135	0.109	18"	33"	12"	77"	114"	144"	3 Pc.	2 1/4
77"	52"	0.135	0.109	18"	36"	12"	84"	120"	158"	3 Pc.	2 1/4
83"	57"	0.135	0.109	18"	39"	12"	90"	126"	170"	3 Pc.	2 1/4

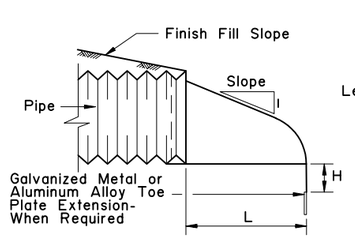


DESIGN A

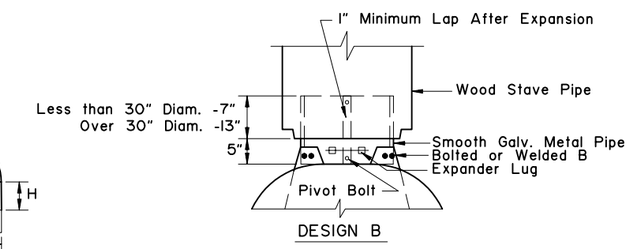


ELEVATION

PIPE ARCH



SECTION A-A



DESIGN B

METAL END SECTION CONNECTED TO WOOD STAVE PIPE

GENERAL NOTES:

1. Toe plate extensions will be required only when provided for on the plans. When required, the toe plate extensions shall be punched with holes to match those in lip of skirt and fastened with 3/8 inch or larger galvanized nuts and bolts and shall be the same gage as the end section.
2. Galvanized Metal or Aluminum Alloy End Sections may be used on Wood Stave and Plastic Pipe.
3. All 3 piece bodies shall have 12 gage sides and 10 gage center panels. Multiple panel bodies shall have lap seams which are to be tightly joined by 3/8" galvanized rivets or bolts.

REVISIONS		
Date	Description	By
3/1/83	Arch Dimensions	WJF/HK
8/10/00	Note 2	DFD

Sheet 1 of 3

State of Alaska
Department of Transportation
& Public Facilities

CULVERT END SECTIONS

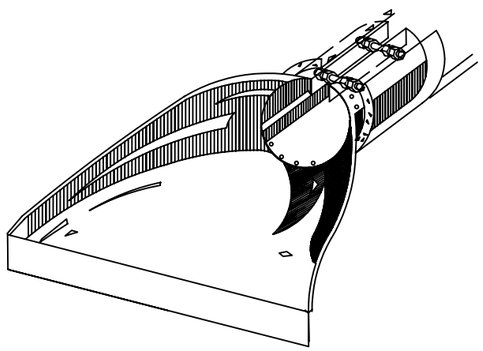
APPROVED

Date 7/15/82

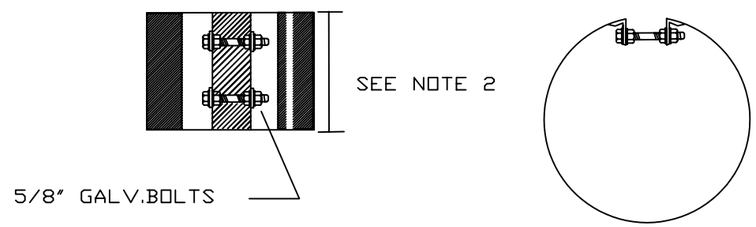
D-06.10

GENERAL NOTES

1. See general notes on sheet 1 of 3.
2. See sheet 1 of 3 for metal end section dimensions.
3. Insert bolts, washers and rivets shall be galvanized. Insert thickness is the same as the end section.
4. Use culvert inserts only at inlet.



FOR CONNECTING CONCRETE PIPE OR CORRUGATED POLYETHYLENE PIPE TO METAL END SECTION.



METAL INSERTS FOR USE WITH CORRUGATED PLASTIC PIPE AND METAL END SECTIONS

REVISIONS		
Date	Description	By

Sheet 2 of 3

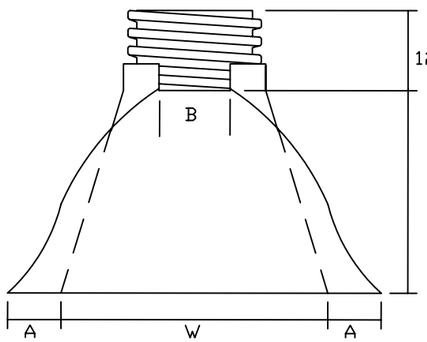
State of Alaska
Department of Transportation
& Public Facilities

CULVERT END SECTIONS

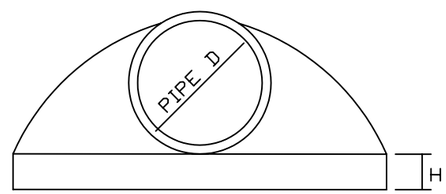
APPROVED

Date 5/15/01

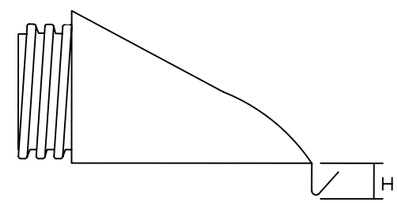
D-06.10



TOP VIEW



END VIEW



SIDE VIEW

PIPE DIAMETER	DIMENSIONS IN MILLIMETERS				
	A(1"±)	B MAX	H(1"±)	L(1/2"±)	W(2"±)
12" and 15"	6 1/2"	10"	6 1/2"	25"	29"
18"	7 1/2"	15"	6 1/2"	32"	35"
24"	7 1/2"	18"	6 1/2"	36"	45"
30"	10 1/2"	N/A	7"	53"	68"
36"	10 1/2"	N/A	7"	53"	68"

GENERAL NOTES

1. Plastic flared end sections may be used with HDPE corrugated culvert pipes where noted in project plans or approved by project engineer.
2. Consult manufacturer's recommendations for proper sizing and coupling devices. Recommended fasteners may include connecting bands or cinch ties. Fittings across dimension B may include threaded rods with wing nuts or bolts and washers. plastic welds may be recommended.
3. Align coupling to accomodate pipe corrugations.
4. Metal components e.g. bolts or washers must be galvanized.
5. Attachment of end section should preserve culvert alignment and not impair pipe function. Use end sections only on culvert inlet.
6. Toe plate extensions will be required only when designated on the plans.
7. End sections will not be used on HDPE culvert pipes larger than 36" unless indicated by project plans or approved by the Engineer.

PLASTIC END SECTION FOR CORRUGATED PLASTIC PIPE

REVISIONS		
Date	Description	By

Sheet 3 of 3

State of Alaska
Department of Transportation
& Public Facilities

CULVERT END SECTIONS

APPROVED

Date 5/15/01

D-06.10