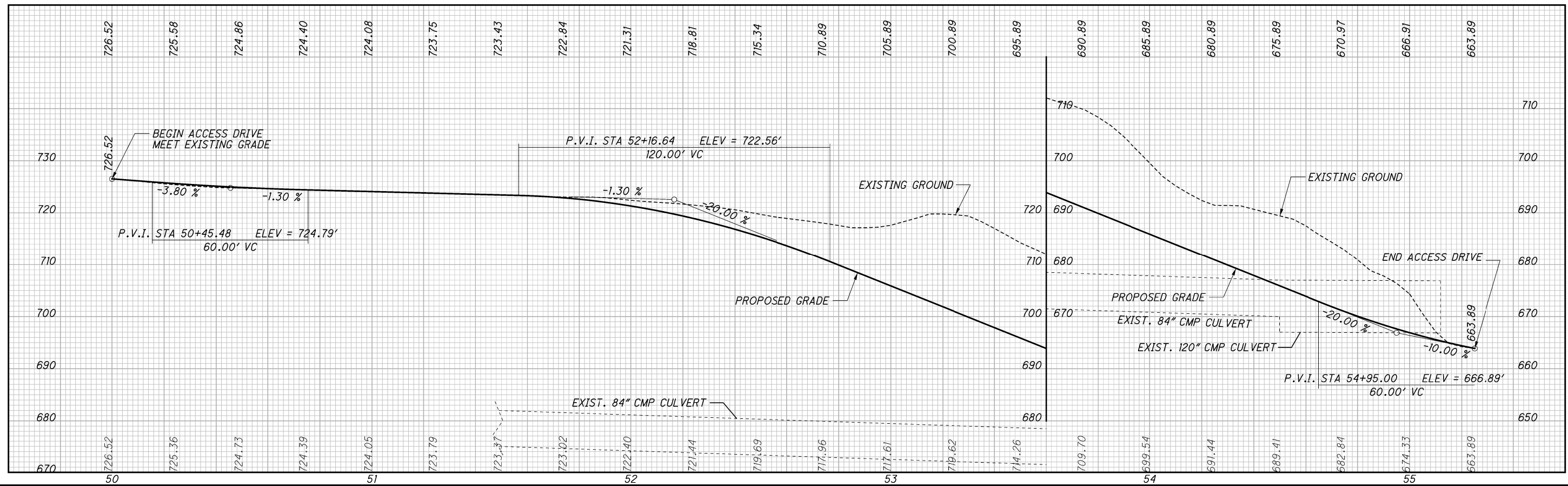
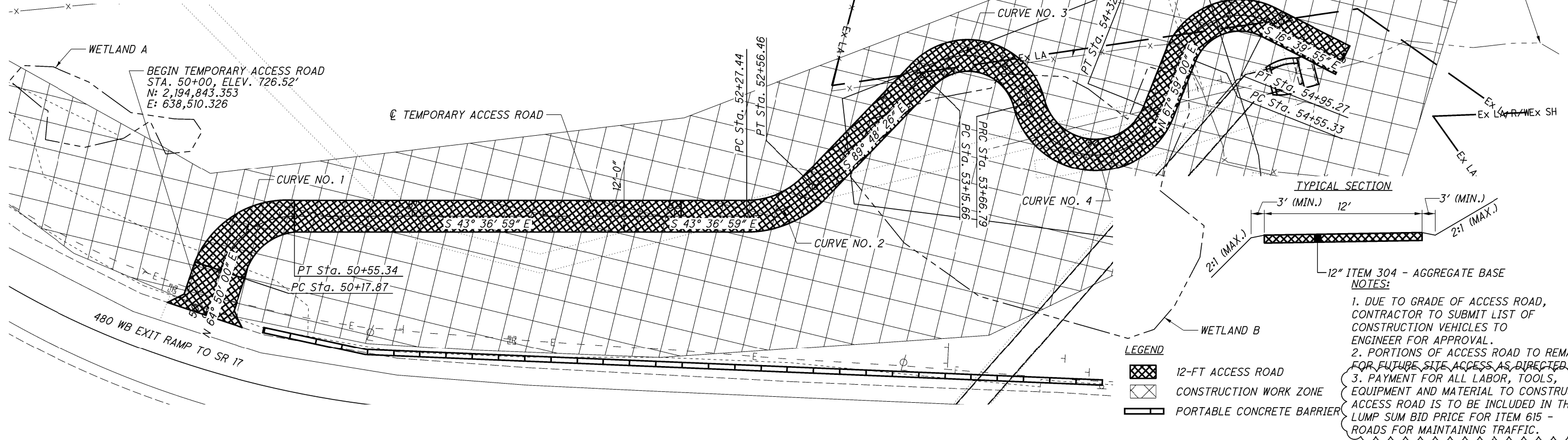


CURVE NO. 1	CURVE NO. 2	CURVE NO. 3	CURVE NO. 4	CURVE NO. 5
P.I. Sta. 50+39.49	P.I. Sta. 52+42.79	P.I. Sta. 53+59.02	P.I. Sta. 54+47.49	P.I. Sta. 54+81.68
$\Delta = 71^\circ 33' 01''$ (RT)	$\Delta = 46^\circ 11' 27''$ (LT)	$\Delta = 122^\circ 04' 20''$ (RT)	$\Delta = 144^\circ 16' 54''$ (LT)	$\Delta = 95^\circ 21' 05''$ (RT)
$Dc = 190^\circ 09' 09''$	$Dc = 159^\circ 09' 18''$	$Dc = 238^\circ 43' 57''$	$Dc = 220^\circ 22' 06''$	$Dc = 238^\circ 43' 57''$
$R = 30.00'$	$R = 36.00'$	$R = 24.00'$	$R = 26.00'$	$R = 24.00'$
$T = 21.62'$	$T = 15.35'$	$T = 43.36'$	$T = 80.69'$	$T = 26.35'$
$L = 37.46'$	$L = 29.02'$	$L = 51.13'$	$L = 65.47'$	$L = 39.94'$
$E = 6.98'$	$E = 3.14'$	$E = 25.56'$	$E = 58.78'$	$E = 11.64'$
$C = 35.08'$	$C = 28.24'$	$C = 42.00'$	$C = 49.49'$	$C = 35.49'$
C.B. = S $79^\circ 23' 29''$ E	C.B. = S $66^\circ 42' 42''$ E	C.B. = S $28^\circ 46' 16''$ E	C.B. = S $39^\circ 52' 33''$ E	C.B. = S $64^\circ 20' 27''$ E



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**ITEM 837 - BACKFILL FOR LINER PIPE, AS PER PLAN**

THE BACKFILL FOR THE LINER PIPE, HENCEFORTH REFERRED TO AS GROUT, IS FOR FILLING THE ANNULAR SPACE BETWEEN THE EXISTING STRUCTURE AND PROPOSED LINER. AFTER INSTALLATION OF THE LINER, BUT PRIOR TO GROUTING, BULKHEADING AND VENTING SHALL BE CONSTRUCTED. A WATERTIGHT, CEMENTITIOUS BULKHEAD (OR COLLAR) SHALL BE FORMED BETWEEN THE HOST STRUCTURE AND THE ARCH LINER AT EACH END OF THE ARCH AND SHALL PROVIDE LONG TERM DURABILITY. BULKHEAD DESIGNS SHALL BE SUFFICIENT TO RESIST GROUT PRESSURES OR HYDROSTATIC WATER PRESSURE WITHIN THE ANNULAR SPACE.

THE GROUT SHALL BE PLACED IN CONTROLLED LIFTS IN ACCORDANCE WITH THE SUBMITTED STAGED GROUTING PLAN. EACH LIFT SHALL BE ALLOWED TO ACHIEVE INITIAL SET BEFORE THE SUBSEQUENT LIFT CAN BE PLACED. ADDITIONALLY, THE CONTRACTOR TOGETHER WITH THE ENGINEER SHALL SOUND THE AREA OF EACH LIFT ONCE IT HAS ACHIEVED INITIAL SET TO ENSURE THAT THE GAP BETWEEN THE EXISTING STRUCTURE AND PROPOSED ARCH HAS BEEN COMPLETELY FILLED. ANY VOIDS DETECTED BY THE SOUNDING SHALL BE CORRECTED BY PLACING ADDITIONAL GROUT BEFORE PROCEEDING WITH PLACEMENT OF THE SUBSEQUENT LIFT.

IF PORTS ARE USED TO PUMP GROUT THROUGH THE STEEL LINER PIPE, THEY SHALL BE SHOP INSTALLED. IF FIELD-INSTALLED PORTS ARE REQUIRED, THEY SHALL BE PER THE MANUFACTURER'S RECOMMENDATIONS AND SHALL NOT COMPROMISE THE STRUCTURAL CAPACITY OF THE LINER.

IF ANY PORTION OF THE EXISTING STRUCTURE SLAB IS REMOVED FOR CONTRACTOR ACCESS, THE GROUT SHALL BE FILLED TO THE ORIGINAL SLAB TOP ELEVATION.

THE MATERIALS SHALL BE MIXED IN EQUIPMENT OF SUFFICIENT SIZE AND CAPACITY TO PROVIDE THE DESIRED AMOUNT OF GROUT MATERIAL FOR EACH GROUTING STAGE. THE EQUIPMENT SHALL BE CAPABLE OF MIXING THE GROUT AT DENSITIES REQUIRED FOR THE APPROVED PROCEDURE AND SHALL ALSO BE CAPABLE OF CHANGING DENSITY AS DICTATED BY FIELD CONDITIONS ANY TIME DURING THE GROUTING OPERATION.

THE MIX DESIGN(S) SHALL BE DEVELOPED TO COMPLETELY FILL THE ANNULAR SPACE, AND SHALL ADDRESS THE FOLLOWING CONSIDERATIONS: SIZE OF ANNULAR VOID, VOIDS (BASED ON SIZE AND ACCESS) IN THE SURROUNDING STRUCTURE ENVELOPE, ABSENCE OR PRESENCE OF GROUNDWATER, SUFFICIENT STRENGTH AND DURABILITY TO PREVENT MOVEMENT OF THE LINER PLATE, PROVISIONS FOR ADEQUATE RETARDATION AND SHRINKAGE OF LESS THAN 1 PERCENT BY VOLUME. GROUT SHALL BE MIXED IN SMALL QUANTITIES AS NEEDED, AND SHALL NOT BE RE-TEMPERED OR USED AFTER IT HAS BEGUN TO SET.

THE GAUGED PUMPING PRESSURE SHALL NOT EXCEED THE ARCH LINER MANUFACTURER'S APPROVED RECOMMENDATIONS. PUMPING EQUIPMENT SHALL BE OF SIZE SUFFICIENT TO INJECT GROUT AT VELOCITY AND PRESSURE RELATIVE TO THE SIZE OF THE ANNULAR SPACE. GAUGES TO MONITOR GROUT PRESSURE SHALL BE ATTACHED IMMEDIATELY ADJACENT TO EACH INJECTION PORT. THE GAUGE SHALL CONFORM TO AN ACCURACY OF NOT MORE THAN ONE-HALF PERCENT ERROR OVER THE FULL RANGE OF THE GAUGE. THE RANGE OF THE GAUGE SHALL BE NOT MORE THAN 100 PERCENT GREATER THAN THE DESIGN GROUT PRESSURE. PRESSURE GAUGES SHALL BE INSTRUMENT OIL FILLED AND ATTACHED TO A SADDLE TYPE DIAPHRAGM SEAL (GAUGE SAVER) TO PREVENT CLOGGING WITH GROUT. ALL GAUGES SHALL BE CERTIFIED AND CALIBRATED IN ACCORDANCE WITH ANSI B40 GRADE 2A.

**PRE-CONSTRUCTION MEETING:**

THE ARCH LINER MANUFACTURER MUST PROVIDE A REPRESENTATIVE TO CONDUCT A PRE-CONSTRUCTION MEETING THAT COVERS ALL ASPECTS OF THE LINING AND GROUTING PROCESS AND SAID PERSON MUST BE A REGISTERED PROFESSION ENGINEER. HE OR SHE MUST ALSO BE ON SITE DURING GROUTING OPERATIONS.

**EXPERIENCE:**

THE ARCH LINER MANUFACTURER SHALL SHOW EXTERNAL PROOF THAT THEIR EMPLOYEE WHO WILL CONDUCT THE PRE-CONSTRUCTION MEETING SHALL HAVE PARTICIPATED IN THE SUCCESSFUL RELINE OF AT LEAST 10 STRUCTURES OF THIS TYPE AND SIZE ON PREVIOUS PROJECTS.

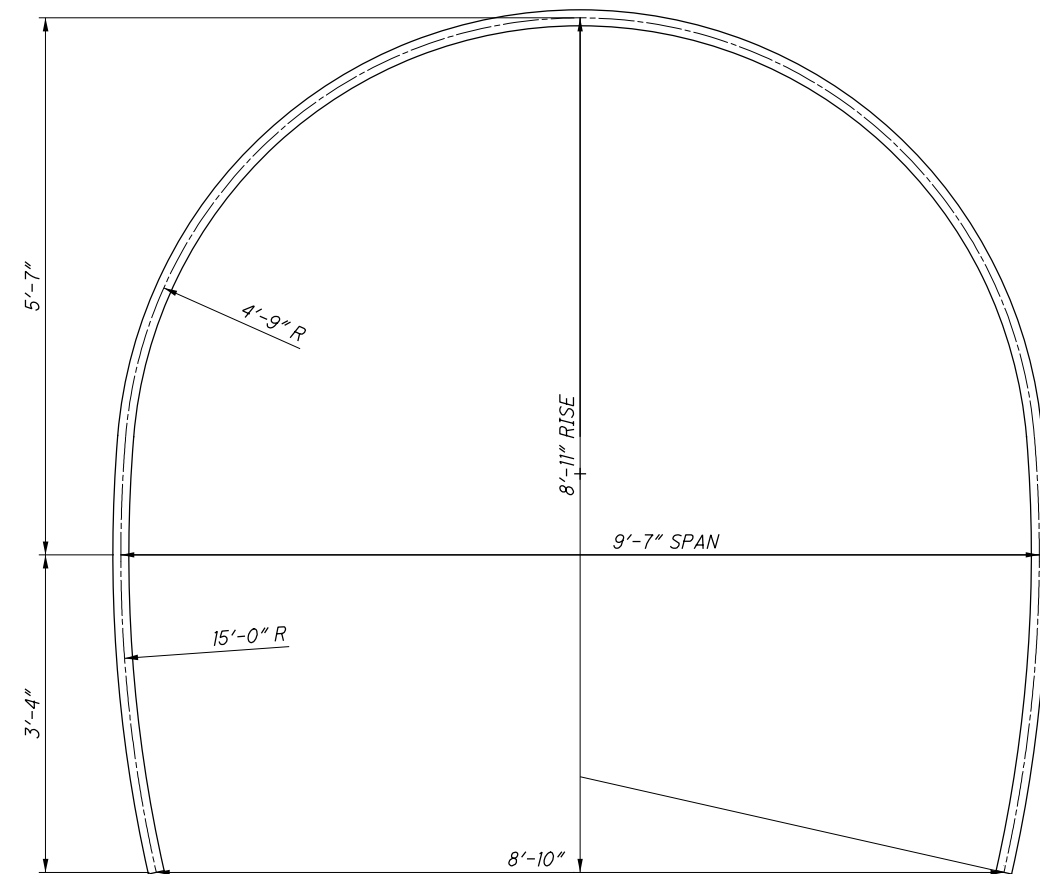
**SUBMITTALS REQUIREMENTS:**

THE CONTRACTOR SHALL SUBMIT THE FOLLOWING TO THE ENGINEER AT LEAST TEN (10) WORKING DAYS PRIOR TO COMMENCING THE LINER PIPE INSTALLATION:

STRUCTURAL DESIGN CALCULATIONS FOR THE LINER PIPE FOLLOWING SECTION 12 OF THE AASHTO STANDARD SPECIFICATION FOR HIGHWAY BRIDGES USING THE LRFD METHOD VERIFYING CAPACITY SIGNED BY A LICENSED PROFESSIONAL ENGINEER. THESE CALCULATIONS SHALL ASSUME THE EXISTING STRUCTURE HAS FAILED AND CONTRIBUTES NO STRENGTH TO THE PROPOSED LINER.

WRITTEN VERIFICATION BY THE LINER MANUFACTURER THAT THE LINING AND GROUTING PLAN CONFORMS WITH ALL PROVISIONS, CAUTIONS, AND RESTRICTIONS OF THESE SPECIFICATIONS, CONTRACT PLANS, AND MANUFACTURER REQUIREMENTS.

THE COSTS OF ALL ABOVE MENTIONED ITEMS, BYPASS PUMPING, COFFERDAMS, TEMPORARY FORMS/BULKHEADS, AND TEMPORARY SUPPORTS REQUIRED TO CONSTRUCT THE LINER BACKFILL AS DETAILED IN THESE PLANS SHALL BE INCLUDED FOR PAYMENT OF THIS ITEM.



NOTE: ALL DIMENSIONS SHOWN TO NEUTRAL AXIS OF CORRUGATIONS. DEPTH OF CORRUGATIONS SHALL NOT EXCEED 2".

LINER GEOMETRY

CALC:	RAP	DATE:	8/12/2020
CHECKED:	RY	DATE:	8/13/2020

**ESTIMATED QUANTITIES (GEA-044-0916)**

ITEM	EXTENSION	TOTAL	UNIT	DESCRIPTION	ABUT.	PIERS	SUPER.	GEN.	SEE SHEET
202	11201	LS		PORTIONS OF STRUCTURE REMOVED, AS PER PLAN				LS	2/8
503	11100	LS		COFFERDAMS AND EXCAVATION BRACING				LS	
503	21104	42	CY	UNCLASSIFIED EXCAVATION, INCLUDING ROCK				42	
509	10000	5266	LB	EPOXY COATED REINFORCING STEEL				5266	
510	10000	42	EACH	DOWEL HOLES WITH NONSHRINK, NONMETALLIC GROUT				42	
511	46510	41	CY	CLASS QC1 CONCRETE, FOOTING				41	
511	46610	8	CY	CLASS QC1 CONCRETE, HEADWALL				8	
512	10100	33	SY	SEALING OF CONCRETE SURFACES (EPOXY-URETHANE)				33	
516	25000	54	SF	NYLON REINFORCED NEOPRENE SHEETING				54	
837	21001	99	FT	BACKFILL FOR LINER PIPE, AS PER PLAN				99	2/8
837	21001	99	FT	BACKFILL FOR LINER PIPE, AS PER PLAN				99	3/8

**STRUCTURE NOTES 2**  
 SITE 5 - BRIDGE NO. GEA-44-0916  
 BRIDGE OVER UNNAMED STREAM NORTH OF S.R. 87  
 DESIGN AGENCY: **KS** KS Associates Inc.  
 260 BURNS ROAD, ELYRIA, OHIO 44035  
 REVIEWED: HVH DATE: 09/18/20  
 DRAWN: RAP DATE: 09/18/20  
 DESIGNED: RAP CHECKED: RY STRUCTURE FILE NUMBER: 2800241  
**CUY-90-18.22 / VAR**  
 PID No. 92069  
 3/8  
 58/63