SCI-823-0.00

PID No. 77366

S.R. 823 over Webster Street (S.R. 140)

Preliminary Design Report Submittal

Prepared for:

Ohio Department of Transportation
District 9
650 Eastern Ave.
Chillicothe, Ohio 45601

January 14, 2008

Prepared by:

TranSystems®

TranSystems

5747 Perimeter Drive
Suite 240
Columbus, Ohio 43017
Tel 614 336 8480
Fax 614 336 8540

www.transystems.com

January 14, 2008

Mr. Jawdat Siddiqi, PE
Office of Structural Engineering
Ohio Department of Transportation
1980 W. Broad Street
Columbus, Ohio 43223

SUBJECT: **Preliminary Design Report Submittal**
SR 823 over Webster Street (SR 140)
SCI-823-0.00 Portsmouth Bypass
PID#77366

Dear Mr. Siddiqi:

Submitted for review and comment is the Preliminary Design Report for SR 823 over Webster Street (SR 140). Included are The TS&L drawings and the Final Geotechnical Report by DLZ, Ohio, dated January 11, 2007. Please find below our disposition to the July 10, 2006 comments by Reza Zandi regarding the STS submittal.

Please verify the bridge limits stationing shown in the title block of site plan.

The limits have been revised in the attached plans.

Please don't hesitate to call me or Dr. Michael Lenett (513 621 1981) if there are any questions.

Sincerely,

Michael D. Weeks by RP

Michael D. Weeks, P.E., P.S.
Project Manager

Cc: T. Barnitz, P.E.

TABLE OF CONTENTS

TranSystems

PRELIMINARY DESIGN REPORT

1. Introduction

TranSystems Corporation is providing engineering services to the Ohio Department of Transportation for the design of new left and right overpass structures that will carry the proposed S.R. 823 bypass over existing Webster Street (SR 140). As requested by the Scope of Services, a Preliminary Design Report is to be submitted as part of Step 8 of the Major PDP process. The purpose of this report is to summarize the structure type selected for final design. A revised Type Study was submitted on 5/12/06 to incorporate the updated roadway geometry. Comments were received from ODOT on 5/26/06. As a result of the comments a culvert was added in front of the MSE wall to convey the drainage under the bridge. The revised site plan and updated cost analysis were submitted on 6/2/06. Additional comments were received 6/15/06 and addressed on 6/27/06. Final comments on the Type Study were received July 10, 2006 and are incorporated into this submittal.

2. Design Criteria

The proposed structure will be designed according to the most current version of the Ohio Department of Transportation Bridge Design Manual and the 2002 AASHTO Standard Specifications for Highway Bridges, 17th Edition. Horizontal clearances (clear zone width and horizontal sight distance) are based on the Ohio Department of Transportation Location and Design Manual, Volume One – Roadway Design.

3. Subsurface Conditions and Foundation Recommendation

DLZ Ohio, Inc. performed the subsurface exploration for the proposed bridge and prepared the Final Bridge Foundation Recommendations dated January 11, 2007.

In summary, six test borings (B-15, B-16, B-17, TR-43, TR-44 and TR-45) were drilled and all encountered bedrock. The depth to bedrock varied across the site from 3' to 11' below existing ground. All borings encountered cohesive and granular soil deposits from stiff clay (A-7-6) to dense sandy silt (A-4a).

DLZ recommends spread footings, cast in place pile or drilled shafts to support the proposed abutments. The cast in place piles will be prebored 5' in to competent bedrock and grouted in place before the construction of the MSE walls. Driven H-piles are not recommended due to the depth of overburden/fill that needs to be placed on the existing rock cuts – the resulting depth of fill would provide insufficient lateral stability for driven H-piles.

The MSE walls were evaluated with respect to bearing capacity, sliding, overturning, global stability and settlement. The evaluations reveal that MSE walls can be used at the rear and forward abutment locations. At the rear abutment DLZ anticipates that the MSE wall will be founded on rock. At the forward abutment DLZ recommends the naturally occurring soils beneath the proposed MSE walls be overexcavated to top of rock and replaced with compacted, granular fill. MSE wall global stability safety factors are in excess of 1.5 therefore spread footings are acceptable at this location. As an alternative to undercutting the MSE walls the walls could be constructed in two stages up to 22'. DLZ's analysis indicates that a strap length of 0.95H was required to use the 22' stage height and maintain adequate stability factors for use with a spread footing.

4. Roadway

The purpose of this project is to construct a new bypass state route around the town of Portsmouth, Ohio. The proposed alignment will carry two lanes of traffic, 15 plus miles in either direction, from an interchange with US 52 just east of Portsmouth to another interchange with US 23, located north of Portsmouth in Valley Township.

The proposed structures are at the southern terminus of the proposed bypass, just north of the interchange with US 52. Due to their proximity to the terminus of the bypass, only a single ramp lane will cross over SR 140 in each direction. The section widens to 2~12'-0" lanes to the north, where the ramps for SR 140 join the mainline. The left and right structures are similar and will consist of a 16'-0" travel lane with 6'-0" median shoulders and 8'-0" outside shoulders. 1" opening centered about the centerline of construction and survey SR 823 will be positioned between the left and right bridges. A 4'-9" tall inside median barrier with a width of 1'-5 ½" and a 1'-6" wide outside straight faced deflector parapet (standard drawing SBR-1-99) yield a deck width of 32'-11 ½" out-to-out. This horizontal bridge layout maintains consistency with the proposed, and ODOT accepted roadway geometry and prevents alteration of the outside roadway edges. Horizontal and vertical sight distances, in accordance with the design standards, have been provided over the proposed bridge.

Vertical and Horizontal Clearances – Since the proposed vertical alignment for all overpass structures on this project was dictated by the overall design of the new bypass profile, vertical clearance was not a critical design issue for each alternative proposed herein. For this report, more than 17'-0" of preferred vertical clearance could be provided for each structure's alternatives considered. In accordance with the ODOT L&D manual, Volume 1, for the twin structures at Webster Street, a minimum horizontal clear zone width of 19'-0" from edge of traveled way to face of obstruction is required. The information input into Figure 600-1E is as follows:

1. *the design speed is 45 mph;*
2. from June 2, 2005 OTS memo, the design ADT for SR 140 is 20600;
3. maximum slopes of 6*:1 foreslopes and 4:1 backslopes* and maintain the drainage below the bridge on the left side of SR 140.

wow!

Alignment & Profile: The proposed mainline horizontal geometry is tangent along entire length of both the left and right structures. The cross section has a crown at the profile grade line with a break at the median shoulder in accordance with the BDM. The proposed mainline profile grade line is located on the inside edge of pavement for both bridges and is in a 1600' sag vertical curve, PVI= 66+50, El. 583.33, G1 = -0.5% and G2 = 5.0%. Embankment slopes will be a maximum of 2:1 in order to minimize right-of-way impacts.

The proposed alignment of SR 140 is tangent below the structures. East and west of the structures there are horizontal curves to the right however a normal crown is still able to be used. The proposed profile grade for SR 140 is in a 300' vertical curve, PVI= 11+00, El. 556.68, G1 = 0.42% and G2 = 3.12%. SR 140 will be widened to a three lane section with 10 foot shoulders on each side. The cross section will Guardrail along an existing ditch will be removed.

Pavement Drainage - The collection of storm water runoff will be addressed off of the bridge, thus scuppers will not be required. Pavement drainage systems have been designed and are shown in the accompanying site plans and general plan. Particular attention has been paid to the control of drainage around the MSE walls.

Utilities - No utilities will be placed on the bridge. However, lighting and ITS conduits will be provided as necessary. An existing waterline runs parallel to SR 140 approximately at the existing north edge of

pavement. A gas line also runs parallel to SR 140 on the north side, approximately 15'-0" off the existing edge of pavement. The gas line is approximately 10'-0" in front of the nearest MSE wall and under the proposed pavement. There is an existing aerial electric line also on the north side of SR 140 that will need to be relocated. There are no other utilities known at this point in time.

Maintenance of Traffic - While the new bridges are under construction, traffic will be maintained on existing Webster Street. It is anticipated that there will be limited closures during construction for beam setting.

5. Proposed Structure Configuration

Span Configuration: The proposed structure is comprised of a single span structure with span a length of 108'-0". The abutments are oriented parallel with the proposed tangent section of SR 140 giving a 21°35'48" right forward skew. Embankment slopes are supported by MSE walls approximately 20'-25' in height at both abutments. The forward MSE wall is set at the clear zone for SR 140 of 19'-0". The MSE wall at the rear abutment was set allow 2'-6" clearance to the 60" storm in front of the wall.

Substructure:

Abutments: The abutments will be semi-integral type supported on spread footings. The details of the abutments will follow ODOT Standard Construction drawings. Spread footing width was estimated from preliminary design reactions and used 4ksf as the allowable bearing pressure per BDM section 204.6.2.1. Drilled shaft and/or cast in place pile foundations were considered but eliminated as options due to the high construction costs. Driven piles were not recommended by the geotechnical engineer, as previously noted.

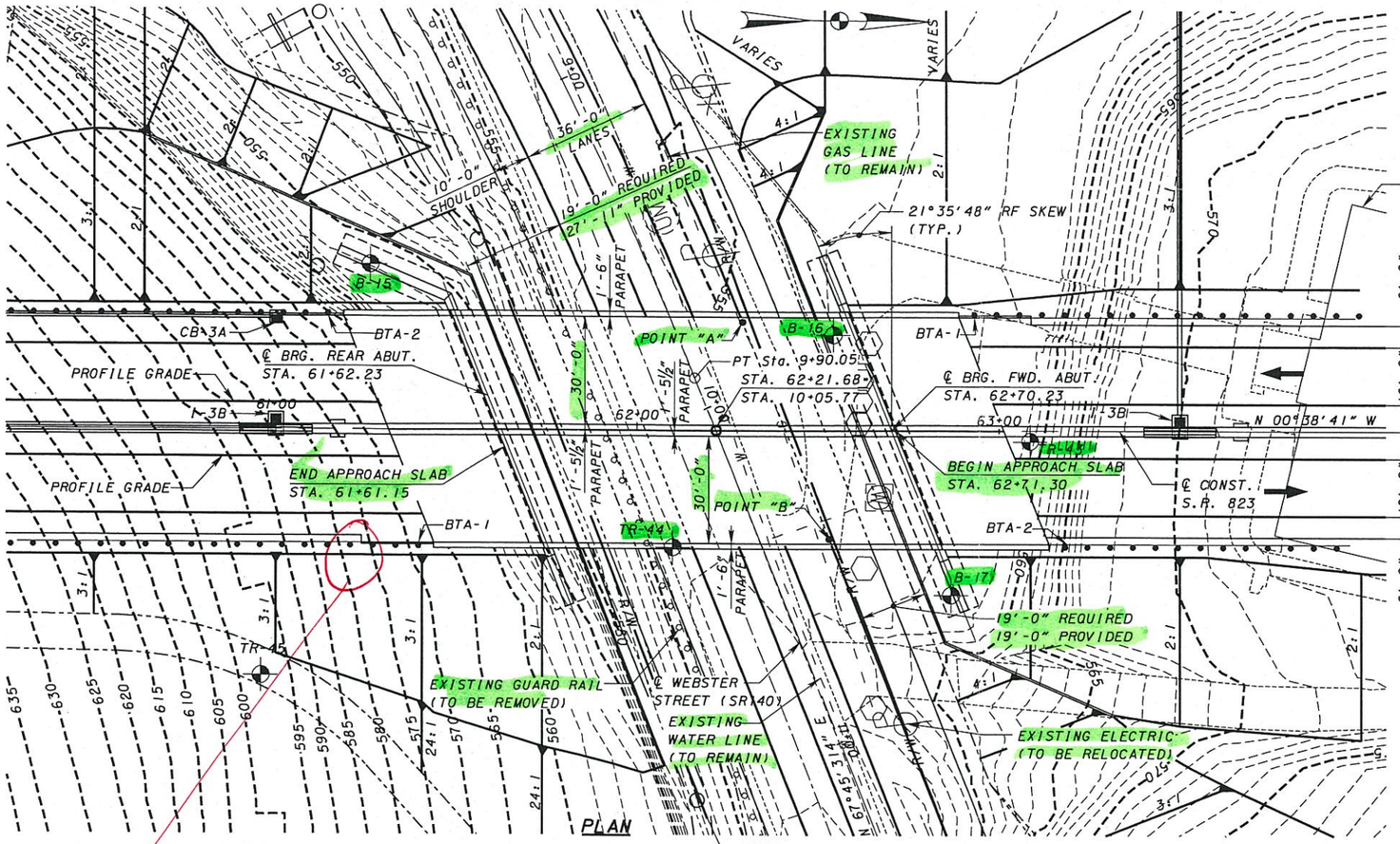
Superstructure:

The preliminary design of this alternative consists of are 4 - 72" AASHTO Type 4 Modified prestressed beams, spaced at 8'-8" with 3'-5 3/4" overhangs. The design loading applied was HS-25 with Alternate Military Loading and a future wearing surface of 60 psf. Details of the beams will follow ODOT standard construction drawings using standard 7000psi (final) concrete. Both the left and right bridge width will be 30'-0" from toe to toe of parapets with an overall bridge deck width of 33'-11 1/2". Deck thickness, including a 1" monolithic wearing surface, is 8 1/2".

APPENDIX A

Structure Plans

TranSystems



FIRST GUARDRAIL POST OFF BRIDGE LOCATIONS	
LOCATION	STATION
REAR ABUT. (NB)	61+39.47
REAR ABUT. (SB)	61+14.43
FWD. ABUT. (NB)	63+18.02
FWD. ABUT. (SB)	62+92.98

BENCHMARK 1	BENCHMARK 2
(TO BE PROVIDED LATER)	(TO BE PROVIDED LATER)

TRAFFIC DATA

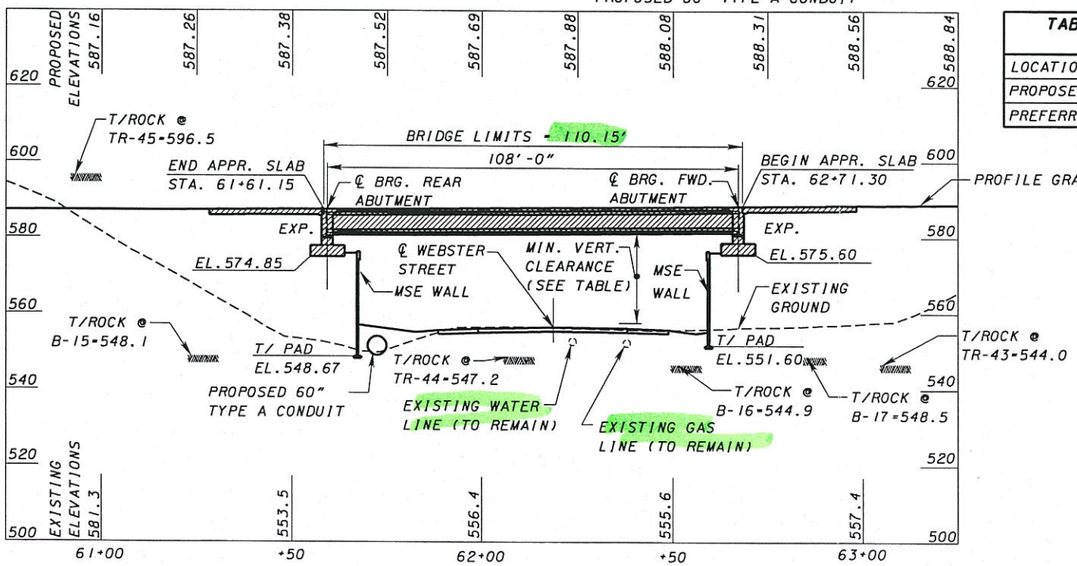
(S.R. 823)
CURRENT YEAR ADT (2010) - 13,400
DESIGN YEAR ADT (2030) - 21,000
CURRENT YEAR ADTT (2010) - 1,876
DESIGN YEAR ADTT (2030) - 2,940

NOTES:

1. ALL SHEETS WITH PLAN DIMENSIONS ARE SHOWN HORIZONTAL.
2. EARTHWORK LIMITS SHOWN ARE APPROXIMATE. ACTUAL SLOPES SHALL CONFORM TO PLAN CROSS SECTIONS.
3. THE PROPOSED PROFILE GRADE IS WITHIN BRIDGE LIMITS. SEE ROADWAY PLANS FOR PAVEMENT ELEVATIONS BEYOND BRIDGE LIMITS.
4. FOR CULVERT DETAILS SEE SHEET ☐☐.

LEGEND

BTA-1 - BRIDGE TERMINAL ASSEMBLY TYPE 1
BTA-2 - BRIDGE TERMINAL ASSEMBLY TYPE 2
⊕ - BORING LOCATION



PROFILE ALONG PROFILE GRADE S.R. 823 LEFT BRIDGE

TABLE OF VERTICAL CLEARANCES		
LOCATION	"A"	"B"
PROPOSED	24.09'	23.66'
PREFERRED	17.0'	17.0'

1600' VERT. CURVE DATA

P.V.I. STA. = 66+50.00
P.V.I. EL. = 583.33
G_1 = -0.50%
G_2 = 5.00%

PROPOSED STRUCTURE

TYPE: SINGLE SPAN 72" MODIFIED AASHTO TYPE 4 PRESTRESSED CONCRETE I-BEAMS WITH COMPSITE REINFORCED CONCRETE DECK ON SEMI-INTEGRAL ABUTMENTS AND MSE WALL SUPPORTED EMBANKMENTS.

SPANS: 108'-0" C/C BEARING

ROADWAY: 2 - 30'-0" T/T PARAPETS

LOADING: HS-25 AND ALTERNATE MILITARY LOADING, FWS-60 PSF

SKEW: 21°35'48" RF

CROWN: 0.016 FT/FT

ALIGNMENT: TANGENT

WEARING SURFACE: MONOLITHIC CONCRETE

APPROACH SLABS: AS-1-81 (30'-0" LONG)

LATITUDE: 82° 52' 23" N

LONGITUDE: 38° 45' 14" W

Drainage

DESIGN AGENCY: TranSystems, 300 PINNACLE DRIVE, SUITE 210, MT. LAUREL, NEW JERSEY 08054
DESIGNED PJP | DRAWN CAS | CHECKED MSL | REVISED MTN | REVIEWED MSL | DATE 6/11/07
STRUCTURE FILE NUMBER 7306296
SCIOTO COUNTY
STA. 61+61.15
STA. 62+71.30

SITE PLAN
BRIDGE NO. SCI-823-0117 L
S.R. 823 OVER WEBSTER STREET (SR 140)

SCI-823-0.00
PID 77366

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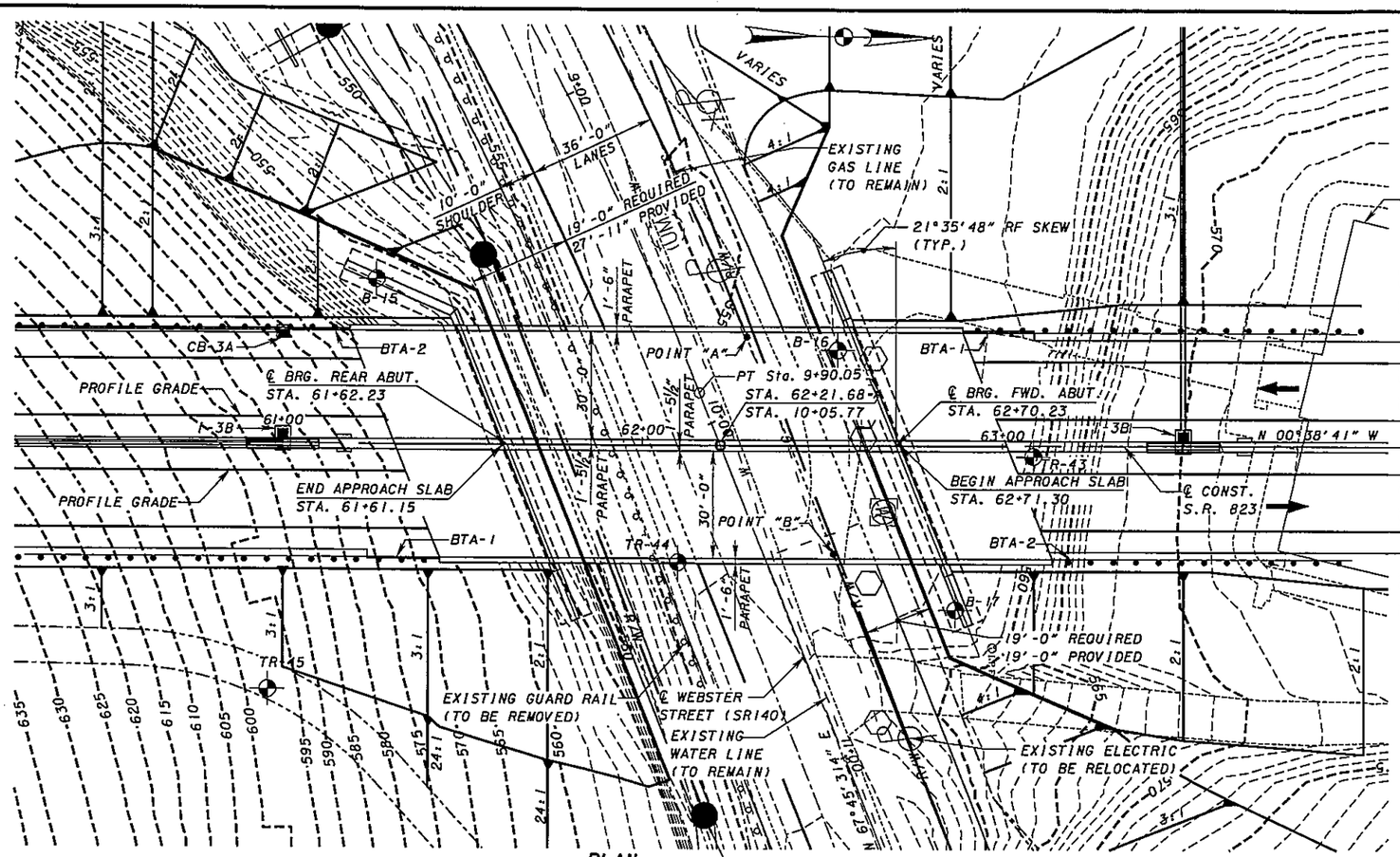
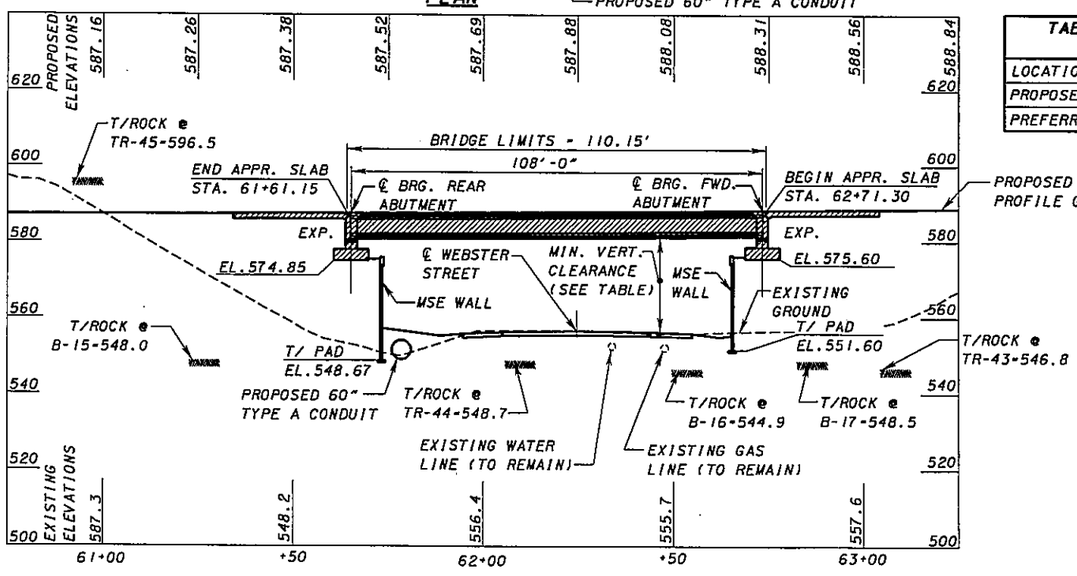


PLAN



PROFILE ALONG PROFILE GRADE S.R. 823 RIGHT BRIDGE

TABLE OF VERTICAL CLEARANCES		
LOCATION	"A"	"B"
PROPOSED	24.09'	23.66'
PREFERRED	17.0'	17.0'

1600' VERT. CURVE DATA

P.V.I. STA. = 66+50.00
P.V.I. EL. = 583.33
G_1 = -0.50%
G_2 = 5.00%

FIRST GUARDRAIL POST OFF BRIDGE LOCATIONS	
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BENCHMARK 1	BENCHMARK 2
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(S.R. 823)
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LEGEND

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BTA-2 - BRIDGE TERMINAL ASSEMBLY TYPE 2
⊕ - BORING LOCATION

PROPOSED STRUCTURE

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ROADWAY: 2 - 30'-0" T/T PARAPETS
LOADING: HS-25 AND ALTERNATE MILITARY LOADING, FWS-60 PSF
SKEW: 21°35'48" RF
CROWN: NORMAL, 0.016 FT/FT
ALIGNMENT: TANGENT
WEARING SURFACE: MONOLITHIC CONCRETE
APPROACH SLABS: AS-1-81 (30'-0" LONG)
LATITUDE: 82° 52' 23" N
LONGITUDE: 38° 45' 14" W

DESIGN AGENT: T&H Systems, 5747 PERIMETER DRIVE, SUITE 210, DUBLIN, OHIO 43017

DESIGNED	DRAWN	REVIEWED	DATE
PJP	CAS	MSL	6/11/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MSL	MTN	7306318	

SCIOTO COUNTY
STA. 61+61.15
STA. 62+71.30

SITE PLAN
BRIDGE NO. SCI-823-0117 R
S.R. 823 OVER WEBSTER STREET (SR 140)

SCI-823-0.00
PID 77366

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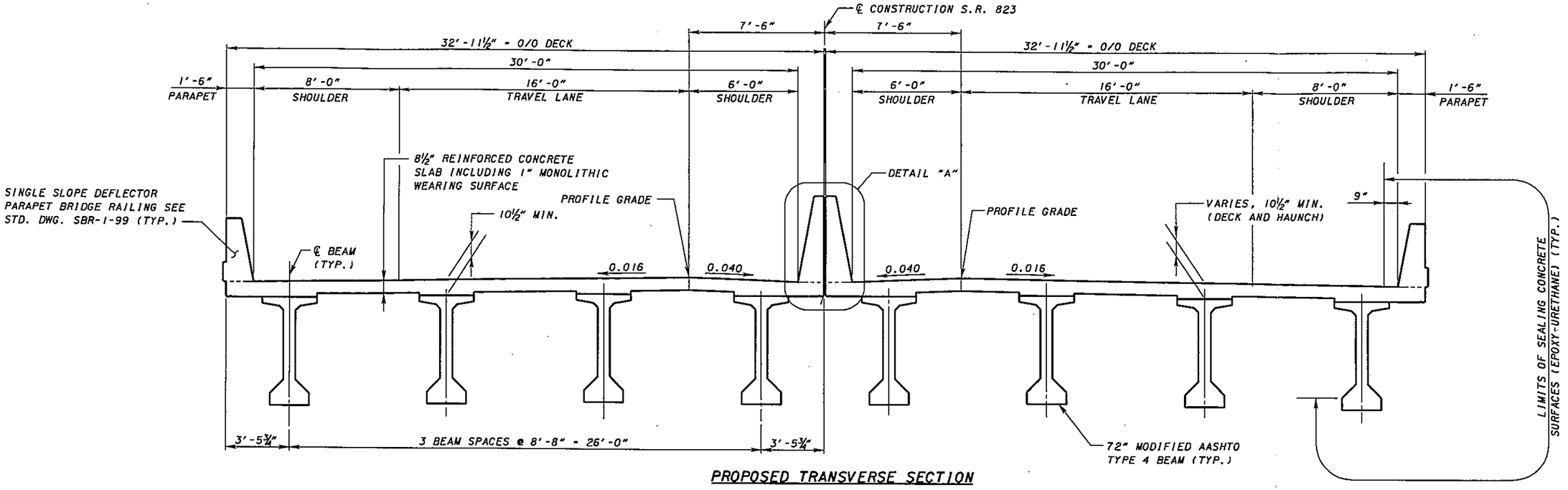
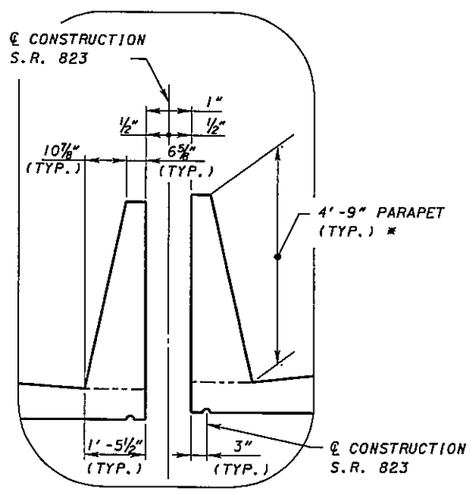


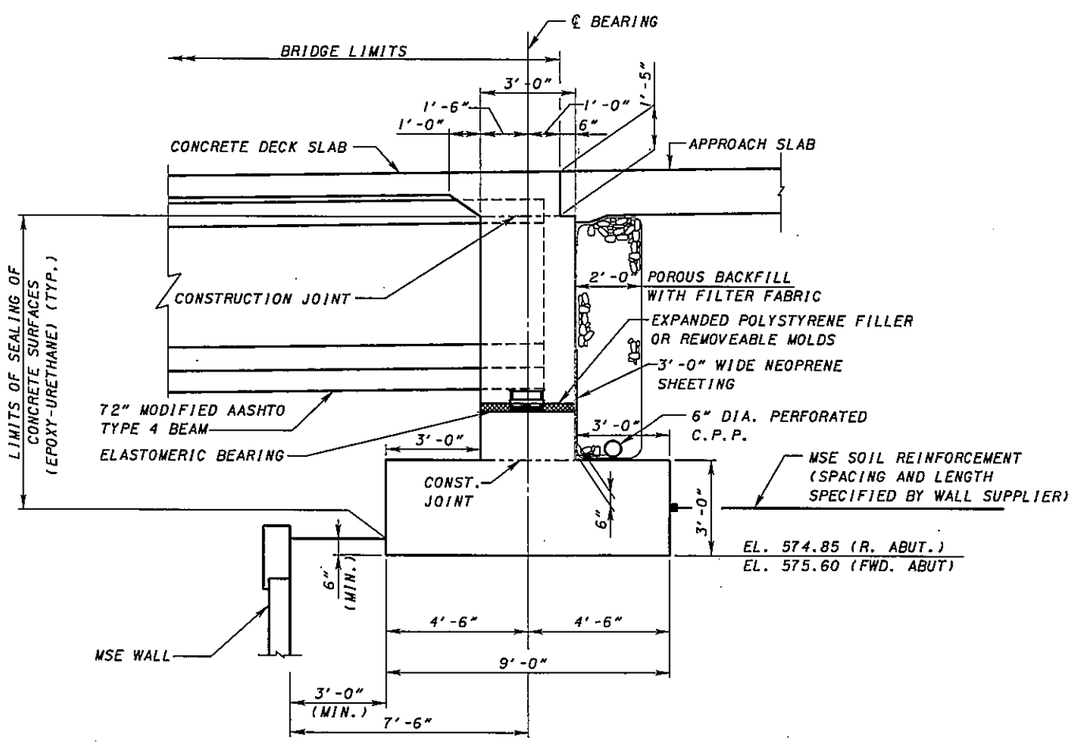
PROPOSED TRANSVERSE SECTION

SUPERSTRUCTURE DEPTH	
ITEM	72" MODIFIED AASHTO TYPE 4 I-BEAM
SLAB (INCLUDING WEARING SURFACE)	8½"
HAUNCH (BOTTOM OF SLAB TO TOP OF FLANGE)	2"
GIRDER DEPTH	72"
TOP OF WEARING SURFACE TO BOTTOM OF GIRDER FLANGE (INCH)	82.5"
TOP OF WEARING SURFACE TO BOTTOM OF GIRDER FLANGE (FEET)	6.875'



DETAIL "A"
(NOT SHOWN TO SCALE)

* PARAPETS ARE SIMILAR TO ROADWAY CONCRETE MEDIAN BARRIER



PROPOSED ABUTMENT SECTION

DESIGN AGENCY: Trans Systems, 5151 KELLENBURG DRIVE, SUITE 300, DUBLIN, OHIO 43017

DESIGNED	DRAWN	REVIEWED	DATE
PJP	CAS	MSL	6/11/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
MSL		7306296L, 7306318R	

TYPICAL TRANSVERSE & ABUTMENT SECTIONS
BRIDGE NO. SCI-823-0117 L&R
S.R. 823 OVER WEBSTER STREET (SR 140)

SCI-823-0.00
PID 77366

3 / 7

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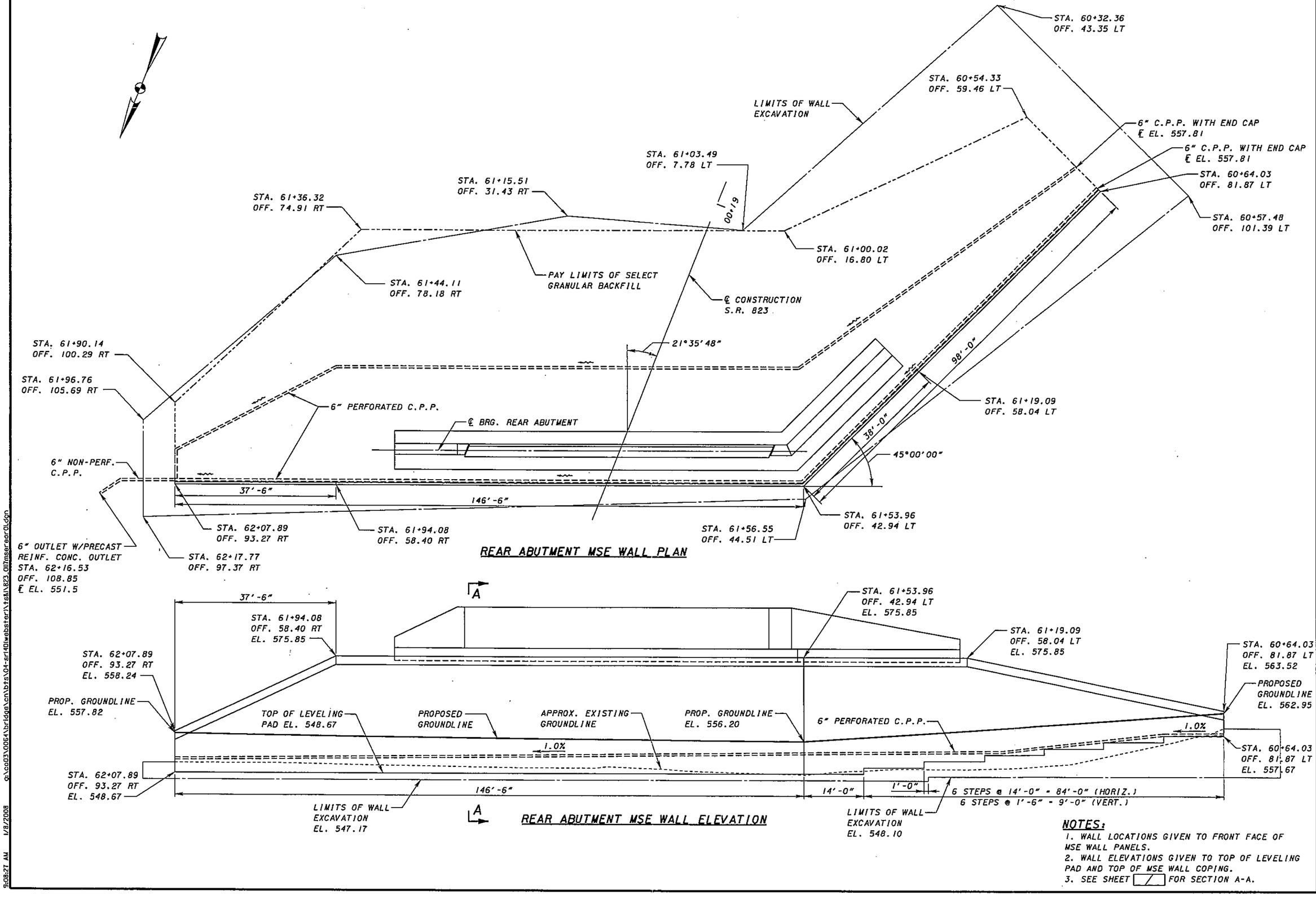

NOTES:

1. WALL LOCATIONS GIVEN TO FRONT FACE OF MSE WALL PANELS.
2. WALL ELEVATIONS GIVEN TO TOP OF LEVELING PAD AND TOP OF MSE WALL COPING.
3. SEE SHEET [/] FOR SECTION A-A.

DESIGN AGENCY: Tram Systems, 510 FRANKLIN BLVD., SUITE 310, DUBLIN, OHIO 43017

DESIGNED	DRAWN	REVIEWED	DATE
MTN	MTN	MSL	6/11/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
PJP		7306296L, 7306318R	

REAR ABUT. MSE WALL PLAN & ELEVATION
BRIDGE NO. SCI-823-0117 L&R
S.R. 823 OVER WEBSTER STREET (SR 140)

SCI-823-0.00
PID 77366

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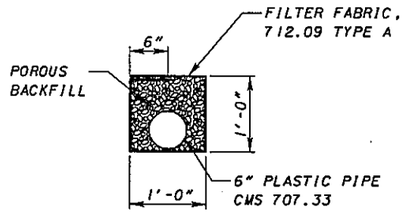
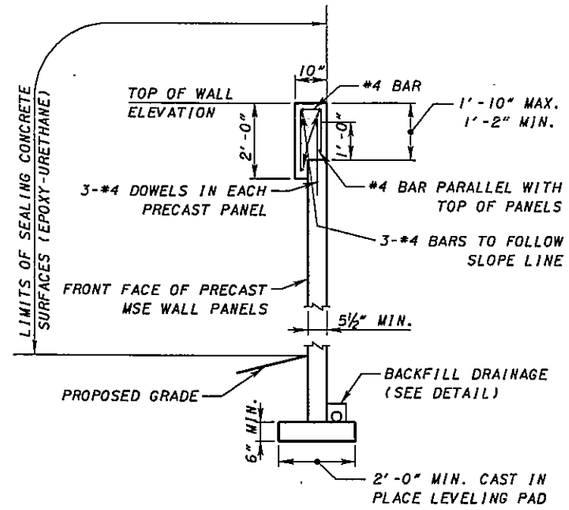
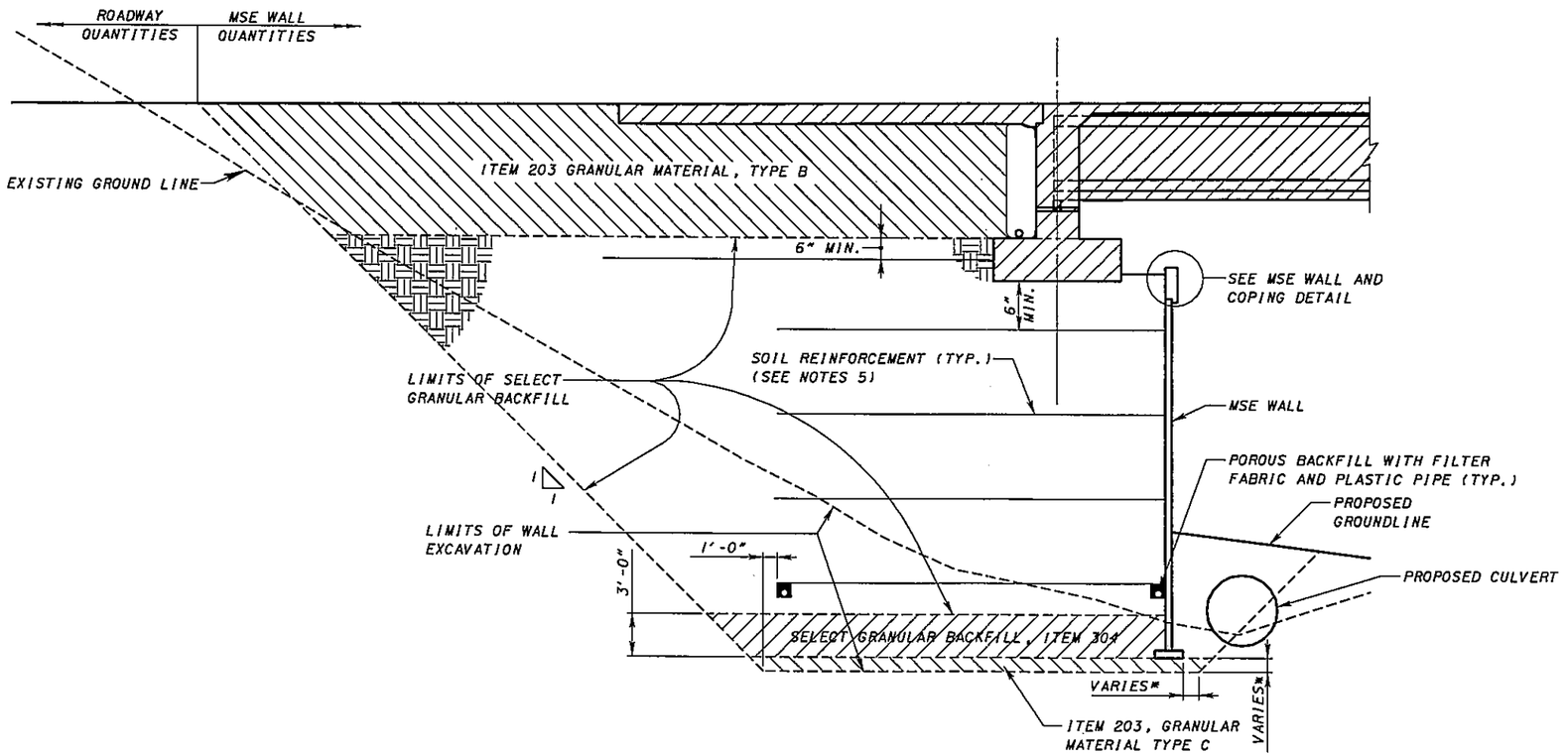


BACKFILL DRAINAGE DETAIL



MSE WALL AND COPING DETAIL



SECTION A-A

* SEE MSE WALL ELEVATION FOR ELEVATION OF EXCAVATION LIMIT

NOTES:

1. SEE SITE PLAN DRAWING FOR BORING LOCATIONS AND APPROX. TOP OF ROCK ELEVATIONS.
2. THE SLOPING LINE WHICH DEFINES THE LIMIT OF THE SELECT GRANULAR BACKFILL IS NOT AN ALLOWABLE SLOPE FOR EXCAVATION. CUT THE SIDES OF ALL EXCAVATIONS TO PREVENT CAVING OR PROTECT THE EXCAVATIONS FROM CAVING.
3. ALL REINFORCING STEEL TO BE EPOXY COATED.
4. WALL EXCAVATION SHALL EXTEND TO A LEVEL BEDROCK SURFACE. THE DEPARTMENT WILL APPROVE WALL EXCAVATION PRIOR TO FOUNDATION PREPARATION.
5. PROPRIETARY RETAINING WALL DATA:
   THE PROPRIETARY WALL SUPPLIER SHALL DESIGN THE INTERNAL STABILITY OF A MECHANICALLY STABALIZED EARTH (MSE) WALL IN ACCORDANCE WITH THE SPECIAL PROVISIONS TO SUPPORT THE ABUTMENT. THE DESIGN FOR INTERNAL STABILITY SHALL INCLUDE AN UNFACTORED HORIZONTAL STRIP LOAD FROM THE SUPERSTRUCTURE OF _____ K/FT APPLIED PERPENDICULAR TO THE FACE OF WALL AT THE BASE OF THE CONCRETE FOOTING.

DESIGN AGENCY: Tran Systems, 720 EAST PETE ROSE WAY, SUITE 340, CINCINNATI, OHIO 45202

DESIGNED MTN	DRAWN DJR	REVISED	REVISED MSL	DATE 6/11/07
CHECKED PJP			STRUCTURE FILE NUMBER 7306296L, 7306316R	

REAR ABUT. MSE WALL DETAILS
BRIDGE NO. SCI-823-0117 L&R
S.R. 823 OVER WEBSTER STREET (SR 140)

SCI-823-0.00
PID 77366

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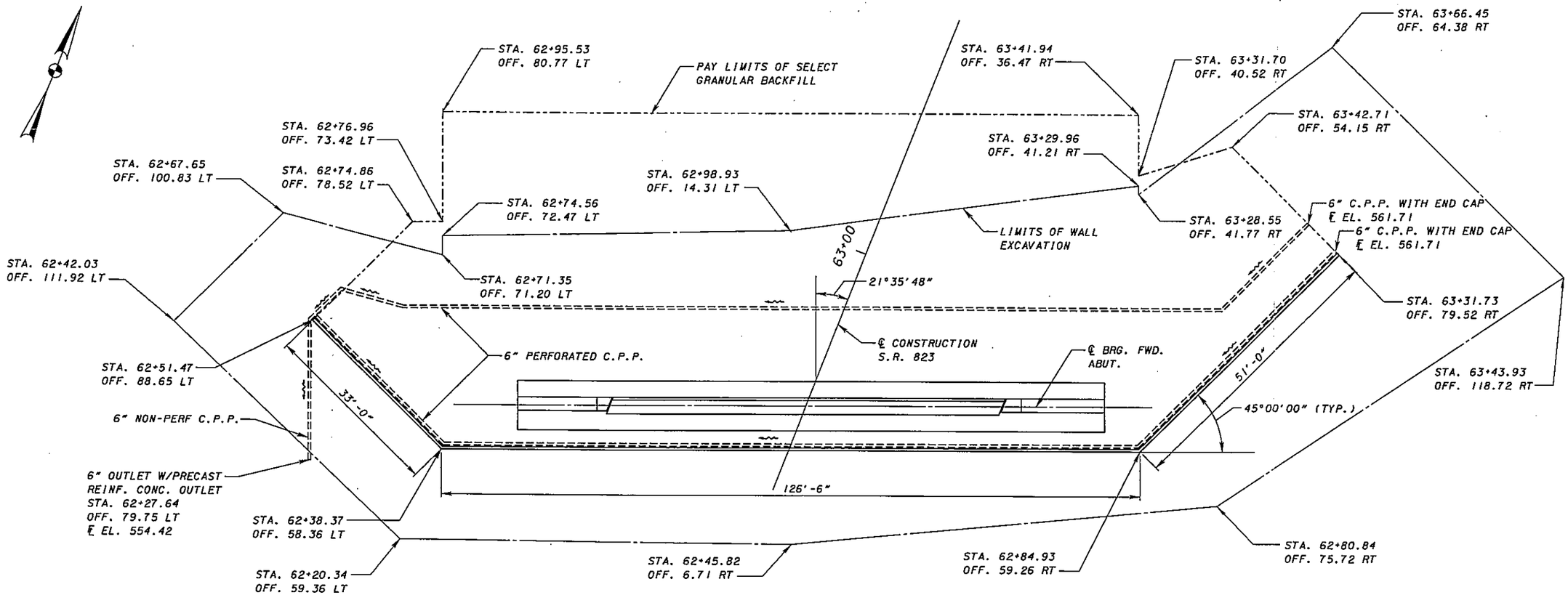
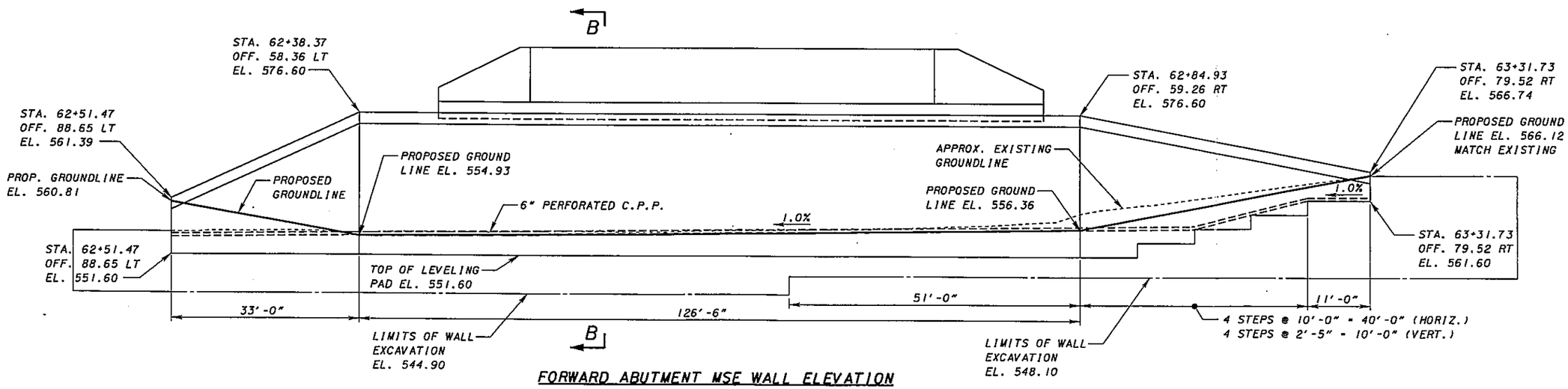


FORWARD ABUTMENT MSE WALL PLAN



FORWARD ABUTMENT MSE WALL ELEVATION

NOTES:

1. WALL LOCATIONS GIVEN TO FRONT FACE OF MSE WALL PANELS.
2. WALL ELEVATIONS GIVEN TO TOP OF LEVELING PAD AND TOP OF MSE WALL COPING.
3. SEE SHEET [/] FOR SECTION B-B.

DESIGN AGENT: Trans Systems, 511 POWDER MILL, SUITE 100, AUSTIN, OHIO 43017

DESIGNED MTN	DRAWN MTN	REVIEWED MSL	DATE 6/11/07
CHECKED PJP	REVISED		STRUCTURE FILE NUMBER 7306296L, 7306310R

FORWARD ABUT. MSE WALL PLAN & ELEVATION
BRIDGE NO. SCI-823-0117 L&R
S.R. 823 OVER WEBSTER STREET (SR 140)

SCI-823-0.00
PID 77366

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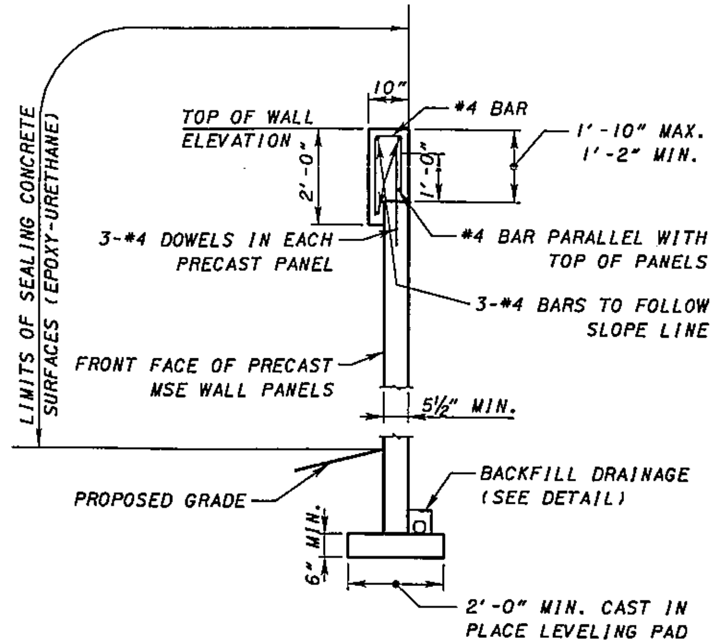
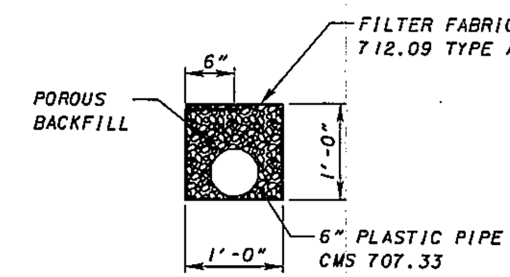
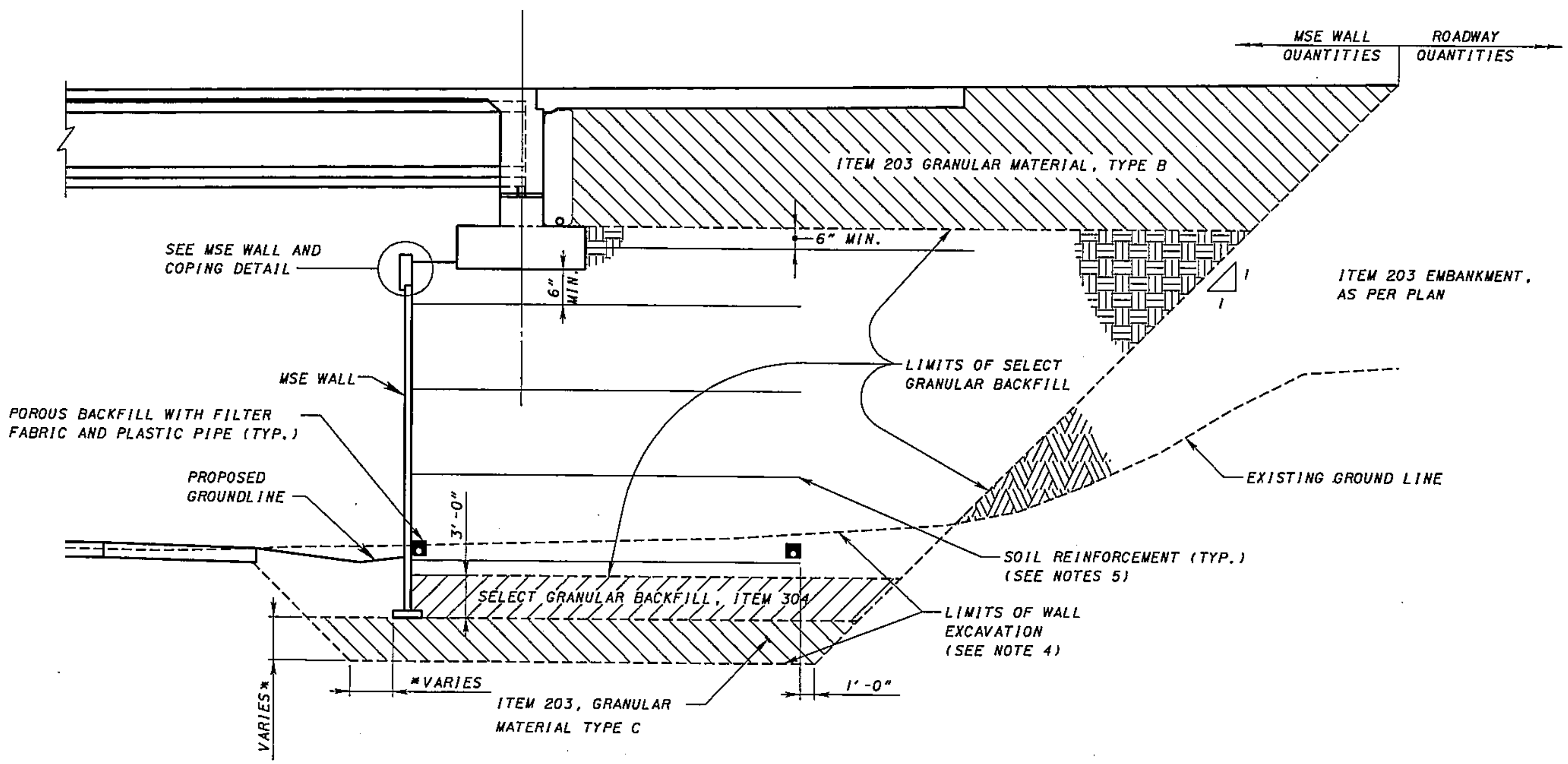


MSE WALL AND COPING DETAIL



BACKFILL DRAINAGE DETAIL



SECTION B-B

* SEE MSE WALL ELEVATION FOR ELEVATION OF EXCAVATION LIMIT

NOTES:

1. SEE SITE PLAN DRAWING FOR BORING LOCATIONS AND APPROX. TOP OF ROCK ELEVATIONS.

2. THE SLOPING LINE WHICH DEFINES THE LIMIT OF THE SELECT GRANULAR BACKFILL IS NOT AN ALLOWABLE SLOPE FOR EXCAVATION. CUT THE SIDES OF ALL EXCAVATIONS TO PREVENT CAVING OR PROTECT THE EXCAVATIONS FROM CAVING.

3. ALL REINFORCING STEEL TO BE EPOXY COATED.

4. WALL EXCAVATION SHALL EXTEND TO A LEVEL BEDROCK SURFACE. THE DEPARTMENT WILL APPROVE WALL EXCAVATION PRIOR TO FOUNDATION PREPARATION.

5. PROPRIETARY RETAINING WALL DATA:
THE PROPRIETARY WALL SUPPLIER SHALL DESIGN THE INTERNAL STABILITY OF A MECHANICALLY STABALIZED EARTH (MSE) WALL IN ACCORDANCE WITH THE SPECIAL PROVISIONS TO SUPPORT THE ABUTMENT. THE DESIGN FOR INTERNAL STABILITY SHALL INCLUDE AN UNFACTORED HORIZONTAL STRIP LOAD FROM THE SUPERSTRUCTURE OF ______ K/FT APPLIED PERPENDICULAR TO THE FACE OF WALL AT THE BASE OF THE CONCRETE FOOTING.

DESIGN AGENCY: TranSystems

DESIGNED	DRAWN	REVIEWED	DATE
MTN	DJR	MSL	6/11/07
CHECKED	REVISED	STRUCTURE FILE NUMBER	
PJP		7306296L, 7306318R	

FORWARD ABUT. MSE WALL DETAILS
BRIDGE NO. SCI-823-0117 L&R
S.R. 823 OVER WEBSTER STREET (SR 140)

SCI-823-0.00
PID 77366

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APPENDIX B

Structure Cost Estimate

TranSystems

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Webster Street (S.R. 140) L&R

STRUCTURE TYPE STUDY

By: PJP
Checked: MSL

Date: 6/11/2007
Date:

ALTERNATIVE COST SUMMARY

Alternative No.	Span Arrangement No. Spans	Span Arrangement Lengths	Total Span Length (ft.)	Framing Alternative	Proposed Stringer Section	Subtotal Superstructure Cost	Subtotal Substructure Cost	Structure Incidental Cost (16%)	Structure Contingency Cost (20%)	Total Alternative Const. Cost	Life Cycle Maintenance Cost	Total Relative Ownership Cost
1	1	108'-0"	108.00	4 Prestressed Concrete Girders /per BRIDGE	AASHTO Type 4 Modified (72")	**$707,000**	**$858,000**	**$250,400**	**$0**	**$1,820,000**	**$0**	**$1,820,000**

NOTES:

1. Structure incidental cost allowance includes provision for structure excavation, porous backfill, sealing of concrete surfaces, bearings, and crushed aggregate slope protection costs.

2. Estimated construction cost does not include existing structure removal (if any), which should be quantified seperately, if required.

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Webster Street (S.R. 140) L&R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 1 - SUPERSTRUCTURE

By: PJP
Checked: MSL

Date: 6/11/2007
Date: 1/0/1900

SUPERSTRUCTURE

Alternative No.	Span Arrangement No. Spans	Lengths	Total Span Length (ft.)	Deck Length (ft.)	Deck Volume (cu. yd.)	Deck Concrete Cost	Deck Reinforcing Cost	Approach Slab Cost	Approach Roadway Cost	Framing Alternative	Proposed Girder Section	Prestressed Concrete Cost	Subtotal Superstructure Cost
1	1	108'-0"	108.00	110.00	379	$204,300	$96,200	$86,200	$0	4 Prestressed Concrete Girders /per BRIDGE	AASHTO Type 4 Modified (72")	$320,280	**$707,000**

COST SUPPORT CALCULATIONS

Deck Cross-Sectional Area:

Parapets:	No.	Individual Area (sq. ft.)	Parapet Area (sq. ft.)
Parapets	1	4.77	4.77
Parapets	1	4.26	4.26

Slab:	T (ft.)	W (ft.)	Slab Area	Haunch & Overhang Area	Total Concrete Area (sq. ft.)
Left Bridge	0.71	33.00	23.4	2.3	34.7
Right Bridge	0.71	33.00	23.4	2.3	34.7

Note: Deck width is out to out
10% of deck area allowed for haunches and overhangs.

QC/QA Concrete, Class QSC2
Unit Cost ($/cu. yd):

	Year 2005	Annual Escalation	Year 2007
Deck	$525.00	5.0%	$579.00
Parapets	$385.00	5.0%	$424.00
Weighted Average =			$539.00

Based on parapet and slab percentages of total concrete area

Epoxy Coated Reinforcing Steel
Unit Cost ($/lb):
Assume 285 lbs of reinforcing steel per cubic yard of deck concrete

	Year 2005	Annual Escalation	Year 2007
Deck Reinforcing	$0.81	5.0%	$0.89

Prestressed Concrete Girders
Unit Costs:

	Year 2005		Annual Escalation	Year 2007		No. Required	
AASHTO Type IV Beams							
Pier Diaphragms	$1,800	ea.	5.0%	$1,980	ea.	0	$0
Abutment Diaphragms	$1,200	ea.	5.0%	$1,320	ea.	0	$0
Intermediate Diaphragms	$905	ea.	5.0%	$1,000	ea.	18	$18,000
Modified Type 4 I-Beams (72")	$300	per ft.	5.0%	$330	ea.	916	$302,280
							$320,280

Construction Complexity Factor
Percent of Superstructure = 0% Due to Deck forming, Screed and Varying Girder Spaces

Reinforced Concrete Approach Slabs (T=17")
Unit Cost ($/sq. yd.):
Length = 30 ft. Width = 66 ft
Area = 440 sq. yd.

	Year 2005	Annual Escalation	Year 2007
Approach Slabs	$178.00	5.0%	$196.00

Approach Roadway

		Year 2005	Annual Escalation	Year 2007
Embankment fill	0.00 cu.yd.	$4.00	5.0%	$4.41
Roadway incl. base	0.00 sq.yd.	$26.00	5.0%	$28.67
Barrier (single faced)	0 ft.	$50.00	5.0%	$55.13
Barrier (dble faced)	0 ft.	$80.00	5.0%	$88.20

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Webster Street (S.R. 140) L&R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 1 - SUBSTRUCTURE

By: PJP
Checked: MSL

Date: 6/11/2007
Date: 1/0/1900

SUBSTRUCTURE

Alternative No.	Span Arrangement No. Spans	Lengths	Framing Alternative	Proposed Stringer Section	Pier Concrete Cost	Pier Reinforcing Cost	Abutment Concrete Cost	Abutment Reinforcing Cost	Pile Foundation Cost	MSE Wall Cost	Additional Crane Cost	Subtotal Substructure Cost
1	1	108'-0"	4 Steel Girders /per BRIDGE	AASHTO Type 4 Modified (72")	$0	$0	$143,100	$24,800	$0	$614,900	$75,000	**$858,000**

COST SUPPORT CALCULATIONS

Pier QC/QA Concrete, Class QSC1 Cost: (Spread Footing)

Component	Volume (cu. yd.)	Year 2005	Annual Escalation	Year 2007	Total Cost
Cap	0	$575.00	5.0%	$634.00	$0
Stem	0	$575.00	5.0%	$634.00	$0
Footings	0	$300.00	5.0%	$331.00	$0
Total	0				$0

Pier QC/QA Concrete, Class QSC1 Cost: (Drilled Shaft)

Component	Volume (cu. yd.)	Year 2005	Annual Escalation	Year 2007	Total Cost
Cap	0	$575.00	5.0%	$634.00	$0
Columns	0	$575.00	5.0%	$634.00	$0
Footings	0	$300.00	5.0%	$331.00	$0
Total					$0

Abutment QC/QA Concrete, Class QSC1 Cost:

Component	Volume (cu. yd.)	Year 2005	Annual Escalation	Year 2007	Total Cost
Abutment	309	$420.00	5.0%	$463.00	$143,100
Including Wingwalls		$420.00	5.0%	$463.00	$0

Epoxy Coated Reinforcing Steel Unit Cost ($/lb):

Assume 125 lbs of reinforcing steel per cubic yard of pier concrete.
Assume 90 lbs of reinforcing steel per cubic yard of abutment concrete.

	Year 2005	Annual Escalation	Year 2007
Pier	$0.81	5.0%	$0.89
Abutment	$0.81	5.0%	$0.89

MSE Abutment Unit Cost ($/sq. ft.):

	Total Area (sq. ft.)	Year 2005 Unit Cost	Annual Escalation	Year 2007
Alt. 1	10,005	$50.00	5.0%	$55.10

MSE Abutment Undercut Cost:

Alternative No.	Total Area (sq. ft.)	Depth (ft.)	Volume (cu. yd.)	Year 2005 Unit Cost	Annual Escalation	Year 2007
1	8,764	3.25	1050	$55.00	5.0%	$60.60

Pile Foundation Unit Cost ($/ft.): *HP 12X53 Piles, Furnished & Driven*

Number of Piles		Total Pile Length
0	SEE QUANTITY CALCULATIONS	0

Pile Foundation Unit Cost ($/ft.):

	2005 Unit Cost	Annual Escalation	Year 2007
Furnished	$26.47	5.0%	$29.20
Driven	$9.62	5.0%	$10.60
Total			$39.80

Shaft Foundation Unit Cost ($/ft.): 36" Drilled Shaft

	Number of Shafts		Total Shaft Length
Alt. 1	0	SEE QUANTITY CALCULATIONS	0

Shaft Foundation Unit Cost ($/ft.):

Unit Cost	Escalation	2007
$125.00	5.0%	$145.00

Cost of Shafts: $ -

Temporary Shoring and Support Unit Costs ($/sq. ft.):

	Temp. Shoring Area (sq. ft.)	Temp. Girder Support (lump sum)
Alt. 1	0	$ -

	Year 2004 Unit Cost	Annual Escalation	Year 2007
Temporary Shoring	$22.50	5.0%	$26.00
Cofferdam	$32.00	5.0%	$37.00

Additional Crane Cost

$ 75,000

SCI-823-0.00 - PORTSMOUTH BYPASS

S.R. 823 over Webster Street (S.R. 140) L&R

STRUCTURE TYPE STUDY - PRESTRESSED CONCRETE GIRDER ALTERNATIVE 1 - QUANTITY CALCULATIONS

By: PJP
Checked: MSL

Date: 6/11/2007
Date: 1/0/1900

Pier Quantities

Pier Location	Length	Cap				Stem				Footing				Total Volume
		Width	*Depth*	*Area*	*Volume*	*Width*	*Height*	*Length*	*Volume*	*Width*	*Depth*	*Length*	*Volume*	
Pier 1 (Spr Ftg)	0	0	0	0.00	0	0	0	0.00	0	0	0	0.00	0	0
Pier 2														
Pier 3														0
Pier 4														0
Pier 5														0
Pier 6														0
Pier 7														0
Total (Cu.Ft.)					**0**				**0**				**0**	**0**
Total (Cu.Yd.)					**0**				**0**				**0**	**0**
			Qty x 2 (L/R)		**0**				**0**				**0**	**0**

Pile Quantities

Location	Load/girder (Kips)	# Girders	Total Girder Load	Subst Wt (kips)	Pile Cap.(Kips)	No. Piles	Increase Factor	Total Piles	Top Elev.	Bot Elev.	Pile Length	Total Pile Length (Feet)
Rear Abut.	0	0	0	0	140	0	1	0	575.3	550.0	25.0	0
Pier 1	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 2	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 3	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 4	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 5	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 6	0	0	0	0	140	0	1	0	0	0	0.0	0
Pier 7	0	0	0	0	140	0	1	0	0	0	0.0	0
Fwd. Abut.	0	0	0	0	140	0	1	0	576.1	550	30.0	0
Total								**0**				**0**
							Qty x 2 (L/R)	**0**				**0**

Abutment Quantities *

Abut Location	Length (feet)	Backwall				Beam Seat				Footing						Total Volume
		Width	*Depth*	*Area*	*Volume*	*Width*	*Height*	*Area*	*Volume*	*Width*	*Depth*	*Area*	*# Footi*	*Volume*		
Rear Abut	0	0	0	0.00	0	0	1.5	0.00	0	0	3	0	1	0		0
Fwd. Abut	0	0	0	0.00	0	0	1.5	0.00	0	0	3	0	1	0		0
Total (Cu.Ft.)					**0**				**0**					**0**		**0**
Total (Cu.Yd.)					**0**				**0**					**0**		**0**
			Qty x 2 (L/R)		**0**				**0**					**0**		**309**

*** Includes Wingwalls**

36" Drilled Shafts

Location	Load/girder (Kips)	# Girders	Total Load	Subst Wt (kips)	Pile Cap.(Kips)	No. Piles	Increase Factor	Total Shafts	Top Elev.	Bot Elev.	Pile Length	Total Shaft Length (Feet)
Rear Abut.	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 1	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 2	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 3	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 4	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 5	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 6	0	0	0	0	0	0	1	0	0	0	0.0	0
Pier 7	0	0	0	0	0	0	1	0	0	0	0.0	0
Fwd. Abut.	0	10	0	0	0	0	1	0	0	0	0.0	0
Total								**0**				**0**

MSE Abutment Wall Quantities

Abut Location		Wall			
		Height	*Length*	*Area*	*Volume*
Rear Abut		0	0	0	
RA Wing (L)		0	0	0	
RA Wing (R)		0	0	0	
Fwd Abut		0	0	0	
FA Wing (L)		0	0	0	
FA Wing (R)		0	0	0	
Total (Sq.Ft.)				**10005**	

Superstructure P/S Concrete Quantities

Location	Type of girder	# Girders	Span Length	Total	Spacing Int. diaphragm	No. of Int in span	Number of Int Diap. 1 location	Total No. in Span
Span 1	MOD TYPE 4 72	8	108.0	864	27.00	6	3	18
Span 2		0	0.0	0	0.00			0
Span 3		0	0.0	0	0.00			0
Span 4		0	0.0	0	0.00			0
Span 5		0	0.0	0	0.00			0
Span 6		0	0.0	0	0.00			0
Span 7		0	0.0	0	0.00			0
Span 8		0	0.0	0	0.00			0
Span 9		0	0.0	0	**Total**			18
Total	**MOD TYPE 4 72**	**8**		**880**				