

State of Delaware
Department of Transportation
Maintenance and Operations
Plans and Specifications for
Contract Number T2017-877-01
Guardrail Repair, Canal District, Open End, FY 17 - FY 19



Recommended:

9/30/16

Canal District Maintenance Engineer

Date

Recommended:

9-30-16

Canal District Contracts Engineer

Date



Approved:

10/3/2016

Canal District Engineer

Date

STATE OF DELAWARE DEPARTMENT OF TRANSPORTATION

CONTRACT No. T2017-877-01

FY17 through FY19

Canal District – Guardrail Repair – Open End

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Contract Description

This is an open-end contract to repair and replace damaged impact attenuators, attenuator components, damaged guardrail, guardrail components and end treatments as required for all state-maintained roads in the Canal District (maps of the District are shown on pages 11 and 12). The work shall include, but not be limited to Maintenance of Traffic, removal of damaged impact attenuators and components, removal of damaged guardrail, components and end treatments, repair/replacement of damaged guardrail, topsoil, seeding and mulching and borrow placement as required or directed by the Engineer or Representative.

The work sites and specific work are not listed herein, but will be assigned by work order as received by Canal District Maintenance.

This is a working day contract that will end three years (1,095 calendar days) from issuance of Notice To Proceed.

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PROJECT NOTES

1. Construction of this contract shall conform to Delaware Department of Transportation Standard Specifications dated August 2001, as amended by the Supplemental Specifications, the Special Provisions and these Plans.
2. Depending on fund availability, the department reserves the right to increase or decrease the quantities of the items specified in this contract. Such additions or deletions shall not be cause for an increase or decrease in any contract unit bid prices. When total alterations involve an increase or decrease of more than 50 percent in the quantity of any contract item, either party to the contract shall be entitled to demand a Supplemental Agreement on that portion of the work.
3. The Contractor and all subcontractors shall perform all work in a manner that will ensure the least practical obstruction to the traveling public, and shall conform to the requirements of the latest version of the manual entitled "Delaware Traffic Controls for Street and Highway Construction, Maintenance, Utility and Emergency Operations", herein referred to as the "Manual on Uniform Traffic Control Devices (MUTCD)", in effect at the time of advertisement for bids.
4. The purpose of this contract is to replace and/or reset, Impact Attenuator and Guardrail Elements in the department's Canal District. Subsection 104.05 will not apply to this contract. There will be no winter shut down.
5. No utility relocation involvement is anticipated. Should any conflicts be encountered during construction requiring adjustment and/or relocation of the agencies' existing facilities, the necessary relocation work shall be accomplished by the respective agencies' forces, as directed by the District Engineer. Any adjustments and/or relocations on municipally owned facilities shall be done by the State's contractor in accordance with the respective agencies' standard specifications as directed by the District Engineer.
6. No environmental permits are required for this work provided no jurisdictional wetlands or waters are impacted. If there is a question as to whether or not a water or wetland is jurisdictional, contact the DeDOT Environmental Section at 302-760-2264.
7. It is anticipated that all work will occur within DeDOT's existing right of way or easement areas. Should the need occur to trespass onto private property; it will be the responsibility of the project manager to secure such trespass needs.
8. It is anticipated that all work will occur within DeDOT's right of way. Should the need occur to trespass onto railroad property, including the highway-rail crossing; it will be the responsibility of the project manager to contact the railroad chief engineer and obtain written authorization before entering.

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9. The Contractor shall not trespass on private property unless the department has acquired a "Temporary Trespass Agreement" from the property owner. If the work is within a permanent easement, the work shall not begin until the adjacent property owners have been notified. Prior to starting work on private property, the Contractor shall notify affected property owners of proposed work dates.
10. The Project Manager shall be responsible for coordinating with the Traffic Section relating to any impacts to Traffic Section facilities (including but not limited to traffic loops, junction wells, etc.) at least four weeks in advance of the start of the construction activity. Prior to initiating any work on this contract (or sites), the Project Manager shall be responsible for preparing and submitting for approval of the Safety Section, a Maintenance of Traffic Plan. Sufficient time shall be provided for the review and approval of the plan. The Maintenance of Traffic Plan shall include proposed time restrictions on the closure of travel lanes subject to the approval of the Safety Section. Typically, the work shall be done using Typical Application 10 of the Manual on Uniform Traffic Control Devices (MUTCD). Restricted working hours will be included on the work orders and will be in effect on state numbered roads as dictated by traffic volumes. For locations requiring a flagging operation, the flagger will be paid the fixed hourly rate per Item 743050.

If a road closure is required, the Contractor shall be required to submit the proposed detour route to the Traffic Engineer for approval. The Contractor shall coordinate the closure with the Engineer. The detour route must be approved by the Engineer prior to closure. Typically, the detour set-up shall follow Typical Application 20 of the Manual on Uniform Traffic Control Devices (MUTCD). All Traffic Control Devices shall be compliant as per NCHRP Report 350. The Contractor shall be responsible for furnishing and maintaining the Maintenance of Traffic apparatus at the closure (i.e. Type III Barricade, Road Closed signs, etc) and all advance warning signs. The Contractor shall be responsible for placement of detour trailblazers. If necessary, the Engineer will assign the detour route.

Retro-reflective drums will be required in work areas where completion time will extend beyond one daylight operation as outlined in Section 6F.67 and Section 6G.02 of the Manual on Uniform Traffic Control Devices (MUTCD).

All open excavations shall be secured with plastic drums with fluorescent sheeting and orange, plastic snow fence. If the construction activity results in a vertical difference or drop-off along, adjacent to or across a travel way, the Contractor shall eliminate or remedy this hazard by the methods detailed in Section 6G.20 of the Manual on Uniform Traffic Control Devices (MUTCD) as directed by the Engineer. The snow fence, tie wire, etc shall be incidental to the work it protects.

11. The Contractor, with the Engineer or Engineer's representative, shall inventory all traffic signs on all roadways subject to improvements. Necessary signs shall be maintained in operation during construction, and any other signs shall be properly stored with the Contractor, who shall be responsible for loss or damage. Immediately prior to final

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inspection, the Contractor and Engineer shall again inventory the traffic signs and account for any lost or damaged signs.

12. The Project Manager is responsible for ensuring any required documents and analysis as part of the adopted Work Zone Safety and Mobility Procedures and Guidelines has been completed prior to any work starting on this contract.
13. Work located in Municipalities requires Town Agreements. Work in these locations cannot commence before obtaining them. To obtain a Town Agreement, the contractor must work with DeIDOT's TEAM Support at (302) 760-2251.
14. No work near or within railroad Right-of-Way is anticipated. If any railroad property or facilities are near or within the proposed limits of work or if the proposed work encroaches upon the railroad's Right-of-Way, the contractor shall be responsible for obtaining the required clearances and insurances for each involved railroad in accordance with the appropriate DeIDOT Maintenance of Railroad Traffic item. DeIDOT's Railroad Section Manager must be contacted at (302) 760-2183 to coordinate the execution of the appropriate agreements and authorizations required from any railroad company involved, including coordination for railroad flagging, if necessary.
15. For the purpose of this contract, the replacement guardrail type and location shall be identical to the damaged guardrail, except in the instances when an upgrade to the current standard of guardrail is deemed necessary, or when otherwise directed by the department. The department shall determine what, if any, guardrail elements shall be reused on each project. Any guardrail elements not to be reused become the property of the Contractor. Removal and legal disposal of the unused elements, including, but not limited to, rails, posts, end attachments, and anchors are the Contractor's responsibility. Removal of damaged rail, post, blocks shall be incidental to the repair bid item.
16. The replacement impact attenuator type and location shall be identical to the damaged impact attenuator, except in the instances when an upgrade to the current standard of impact attenuators is deemed necessary, or when otherwise directed by the Engineer. The Engineer shall determine with the Contractor what, if any, impact attenuator elements shall be reused on each project. Any impact attenuator elements not to be reused become the property of the Contractor. Removal and legal disposal of the unused elements, including, but not limited to rails, plastic noses, type I and II cartridges, fender assemblies, diaphragm assemblies, backups, posts, end attachments, and anchors are the Contractor's responsibility.
17. Backfill of holes created by post removal, in compacted lifts, providing and installing rail backup plates, bolts, nuts, washers, and guardrail reflectors, providing and setting up traffic cones and/or patterns are incidental to the Bid Items. Cost for the placement of twelve (12) cubic feet of Portland Cement Concrete around the base of unstable posts, is incidental to the unit price bid for *Item 720007*, Galvanized Steel Post. Cost for excavating and disposing of material and/or grading (up to a 6-inch depth) to meet the

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manufacturer's slope requirements is incidental to the unit price bid for *Items 720585, 720586, or 720588.*

18. Item 720050, Galvanized Steel Beam Guardrail, Type 1-31 shall be utilized in cases where new installs will be placed in Canal District as directed by the Engineer as deemed necessary by Traffic Safety.
19. Underground utilities may be present at all locations. Therefore, all standard practices and procedures regarding utilities shall be followed. Contractor is required to make Miss Utility calls to have utilities marked-out prior to starting each work order.
20. All flaggers utilized by the contractor for this project shall meet the certification requirements outlined in the Delaware Department of Transportation Standard Specifications dated August 2001, as amended by the Supplemental Specifications Section 743.10. Flaggers shall wear high visibility safety apparel that meets the requirements outlined in the Manual on Uniform Traffic Control Devices (MUTCD) Section 6E.02.
21. All construction and Contractor vehicles and self-propelled equipment shall be equipped with an operating roof mounted amber flashing light.
22. All additional work shall be performed by contract unit prices. In the case where contract prices are not available, prices are to be negotiated or performed by force account.
23. Items paid under Item 720041, Reflectorized Washers, shall be fabricated from steel sheet plates conforming to the requirements of ASTM A-6, galvanized to ASTM A153. Reflectorized sheeting shall be AR-1000 (Type V) Abrasive resistant and shall be applied in accordance with Subsection 720.03 of the Supplemental Specifications.
24. In case of an emergency situation, the department or representative will notify the Contractor, by telephone of the extent of work, in which case the repair work shall begin within thirty-six (36) hours of the telephone contact.
25. Performance and progress of work:

Work to be performed under this contract will be disseminated to Contractor via work orders issued by Canal District Maintenance. Up to six (6) work orders will be issued at a time and geographically grouped.

Execution of issued work is to begin within four (4) days of issuance, unless required materials are not available, and work shall be completed within four (4) working days. For example, work associated with a work order group issued on a Monday shall begin on Friday and be completed by the following Wednesday. Non-availability of material shall be verified by at least three (3) different sources, with the verification formally presented in writing by the Contractor to the Department within four (4) working days.

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Contractor shall present shipping tickets, which upon verification, by the District, will establish the date of material availability for *Items 720585, 720586, and 720588*, and for any other previously unavailable items. For the purpose of this contract, Saturdays and Sundays are not considered working days.

The department will assign work orders to keep the distance between job order locations to a minimum and in logical sequence.

Failure to complete a work group in the specified time shall constitute "failure to pursue the work" and subjects the Contractor to Liquidated Damages as outlined in Subsection 108.08 of the Standard Specifications. Each work order group is to be completed within four (4) working days. Additional Items and/or working days may be added to any work order as needed, at the discretion of the Engineer. If work on a specific work order group is not completed within the allotted time, Liquidated Damages will be assessed in accordance with Subsection 108.09 based on the total value of that work order group.

26. Each work order shall be considered a separate unit of work. The Engineer will make payment monthly for the completed invoices as outlined in Section 109.07.

Upon the substantial completion of the work at an individual location, the Engineer will stop time at that location and perform a semi-final inspection for the work order location in accordance with Subsection 105.20. If the work is satisfactorily completed, the Engineer will release the Contractor from maintenance responsibility for that location. The Engineer reserves the right to require the Contractor to add work or make repairs to completed locations at the department's expense until such a location has been accepted by the department. The Contractor must repair all defects in the work caused by poor workmanship or materials at their own expense until the department accepts the contract after the final inspection.

A final inspection will be completed on an annual basis for work orders completed in a calendar year. Upon satisfactory completion of the final punchlist, the department will accept the location and release the Contractor from responsibility for the work at that location. If a work order is sufficiently large and complex as determined by the Engineer, a final inspection may be held upon the completion of that work order.

27. The Contractor and their agents guarantee the specific locations listed in this contract against the failure of the guardrail for three (3) years from the date of acceptance. This is a good faith guarantee, which will not be cause for the department to retain the completion security, but failure to comply will affect future bidding.

28. GUARDRAIL/END TREATMENT, TYPE I

All bolts, washers and nuts shall be incidental to repairs.

- a) LEVEL I REPAIR

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When the Attenuator is damaged up to, but not past the third post, the following Items shall be reused or replaced at the discretion of the Engineer or representative:

A Level I Repair shall consist of the following:

Guardrail Extruder	(Reuse)
Bearing Plate	(Reuse)
Assembly Cable	(Reuse)
Strut	(Reuse)
Cable Anchor	(Reuse)
Deep Beam Guardrail	(Replace)
Wood Post	(Replace)
Impact Head	(Reuse)
Ground Strut	(Reuse)
W-Beam Guardrail End	(Replace)

b) LEVEL II REPAIR

When the Attenuator is damaged up to but not past the fifth post, the following Items shall be replaced unless otherwise directed by the Engineer or representative:

All Items specified in Level I Repair plus the following:

Wood Block	(Replace)
------------	-----------

c) LEVEL III REPAIR

Complete replacement of unit.

29. GUARDRAIL/END TREATMENT, TYPE II

All bolts, washers and nuts shall be incidental to repairs.

a) LEVEL I REPAIR

When the Attenuator is damaged to but not past the second post, the following Item shall be replaced, unless otherwise directed by the Engineer:

- Barrier (Terminal)
- Strut Assembly
- Cable
- Cable Anchor Bracket
- Back up Plate
- Post
- Bearing Plate
- Pipe

Guardrail

b) LEVEL II REPAIR

When the Attenuator is damaged to but not past the third post, the following Item shall be replaced, unless otherwise directed by the Engineer:

Posts
Block
Back up Plate
Guardrail

c) LEVEL III REPAIR

Complete replacement of the damaged unit.

NOTE: If damage to 5' tube sleeve occurs this will be considered a LEVEL II Repair, Soil Plate may also need to be replaced.

30. GUARDRAIL/END TREATMENT, TYPE III

All bolts, washers and nuts shall be incidental to repairs.

a) LEVEL I REPAIR

When the Attenuator is damaged to but not past the second post, the following Item shall be replaced, unless otherwise directed by the Engineer:

Nose Plate/Rolled
Channel Strut
Side Plate
Bearing Plate
Pipe Sleeve
Cable Assembly
Bent Plate Sleeve
Wood Post
Wood Block

b) LEVEL II REPAIR

When the Attenuator is damaged to but not past the third post, the following Item shall be replaced, unless otherwise directed by the Engineer:

All Items in Level I plus the following:

Spacer Channel
Guardrail

- Wood Block
- Pipe
- * Wood Post
- Tube Sleeve
- Soil Plate

*Note: Tube sleeve and soil plate may need to be replaced in this level if damaged.

c) LEVEL III REPAIR - will be the complete replacement of the unit.

31. The following standard construction detail sheets are part of the contract documents:

B-L, B-2, B-3, B-4, B-5, B7-1, B8-1, B8-2, B9, B10, B11-1, B11-2, B12 and B13-1

32. IMPACT ATTENUATOR, TYPE I

All bolts, washers, brackets, screws, and nuts shall be incidental to repairs.

a) LEVEL I REPAIR

When the Attenuator is damaged up to, but not past the first bay, the following items shall be reused or replaced at the discretion of the Engineer or representative:

A Level I Repair shall consist of the following:

- | | |
|----------------|-----------|
| Nose | (Replace) |
| Cartridge | (Replace) |
| Diaphragm | (Replace) |
| Fender Panel | (Replace) |
| Monorail | (Reuse) |
| Backup | (Reuse) |
| Bearing Plate | (Reuse) |
| Assembly Cable | (Reuse) |
| Strut | (Reuse) |
| Cable Anchor | (Reuse) |
| Ground Strut | (Reuse) |

b) LEVEL II REPAIR

When the Attenuator is damaged up to but not past the fourth bay, the following items shall be replaced unless otherwise directed by the Engineer or representative:

A Level II Repair shall consist of the following:

- | | |
|-----------|-----------|
| Nose | (Replace) |
| Cartridge | (Replace) |

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Diaphragm	(Replace)
Fender Panel	(Replace)
Monorail	(Reuse)
Backup	(Reuse)
Bearing Plate	(Reuse)
Assembly Cable	(Reuse)
Strut	(Reuse)
Cable Anchor	(Reuse)
Ground Strut	(Reuse)

c) LEVEL III REPAIR

When the Attenuator is damaged past the fourth bay, the following Items shall be replaced unless otherwise directed by the Engineer or representative:

A Level II Repair shall consist of the following:

Nose	(Replace)
Cartridge	(Replace)
Diaphragm	(Replace)
Fender Panel	(Replace)
Monorail	(Replace)
Backup	(Replace)
Bearing Plate	(Replace)
Assembly Cable	(Reuse)
Strut	(Reuse)
Cable Anchor	(Reuse)
Ground Strut	(Reuse)

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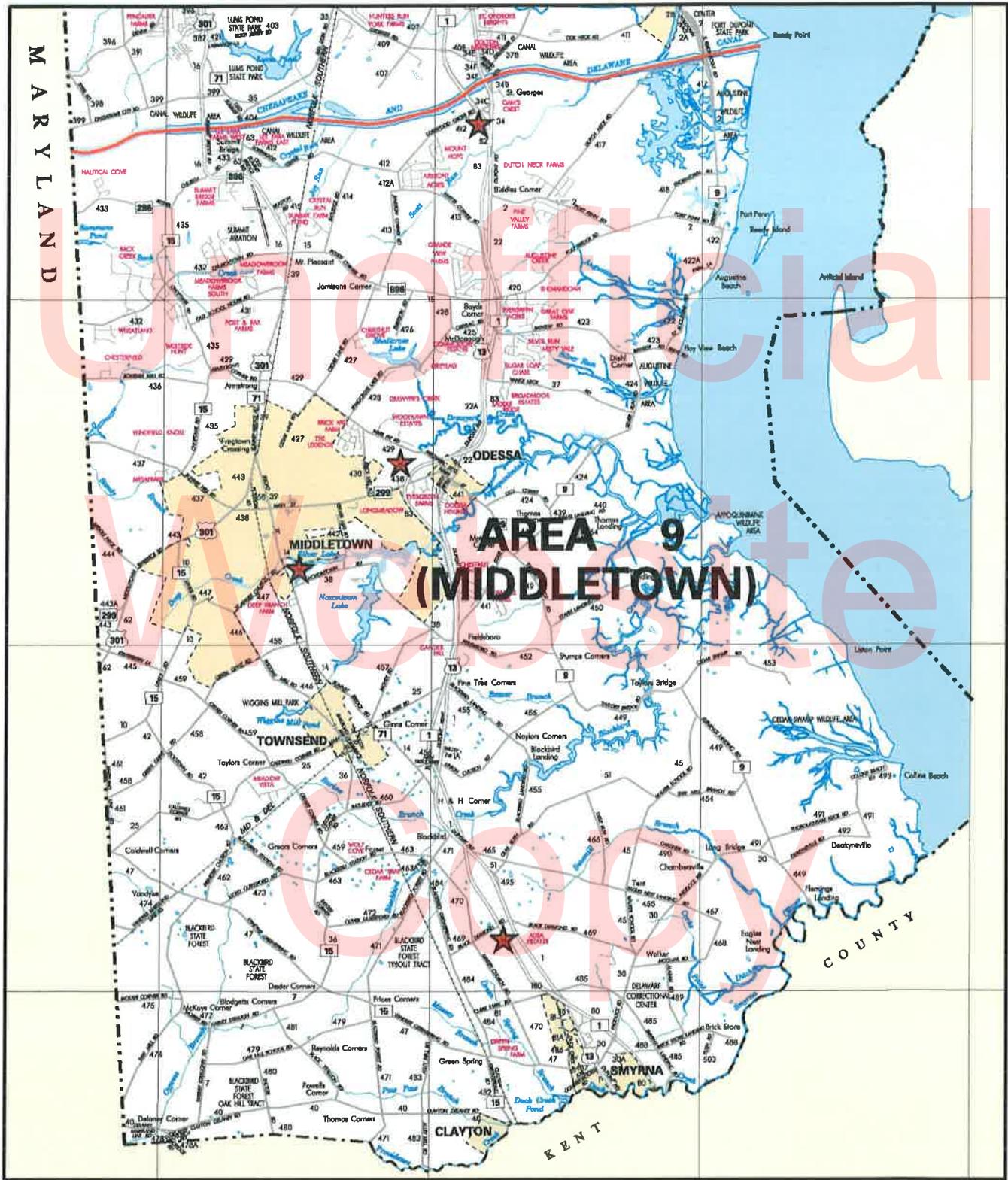
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QUANTITY SUMMARY SHEET

Item #	Description	Unit	Quantity
202000	Excavation and Embankment	CY	10
209006	Borrow, Type F	CY	5
720005	Steel Rail Element, Straight	L.F	11000
720006	Steel Rail Element, Curved	L.F	500
720007	Galvanized Steel Posts	EACH	500
720010	Treated Wood Block	EACH	1000
720013	End Section, Rounded	EACH	10
720032	Galvanized Steel Post, 8"	EACH	5
720041	Reflectorized Washers	EACH	500
720050	Galvanized Steel Beam Guardrail, Type 1-31	L.F	350
720517	Impact Attenuator, Type I	EACH	12
720554	Impact Attenuator, Type III	EACH	12
720585	GR End Treatment Attenuator, Type 1-31	EACH	60
720586	GR End Treatment Attenuator, Type 2-31	EACH	5
720588	GR End Treatment Attenuator, Type 3-31	EACH	10
720595	GR End Treatment Attenuator, Type 1, Level I Repair	EACH	50
720596	GR End Treatment Attenuator, Type 1, Level II Repair	EACH	50
720597	GR End Treatment Attenuator, Type 2, Level I Repair	EACH	10
720598	GR End Treatment Attenuator, Type 2, Level II Repair	EACH	5
720599	GR End Treatment Attenuator, Type 3, Level I Repair	EACH	5
720600	GR End Treatment Attenuator, Type 3, Level II Repair	EACH	5
720608	Impact Attenuator, Type 1, Level I Repair	EACH	12
720609	Impact Attenuator, Type 1, Level II Repair	EACH	12
720614	Impact Attenuator, Type 1, Level III Repair	EACH	12
720663	Guardrail End Treatment Attenuator, Minor Repair	EACH	10
725002	GR to Barrier Connection, Approach Type 1-31	EACH	5
726001	End Anchorage 31	EACH	20
743003	Arrowpanels, Type C	EA-DAY	100
743006	Plastic Drums	EA-DAY	200
743010	Furnish and Maintain Truck-Mounted Attenuator, Type II	EA-DAY	100
743024	Temporary Warning Signs and Plaques	EA-DAY	600
743050	Flagger, New Castle County, State	HOUR	175
743062	Flagger, New Castle County, State, Overtime	HOUR	20
763000	Initial Expense	L.S	1
763507	Emergency Mobilization	EACH	5
908004	Topsoil (6 inch Depth)	SY	50
908014	Permanent Seeding, Dry Ground	SF	50



AREA 9

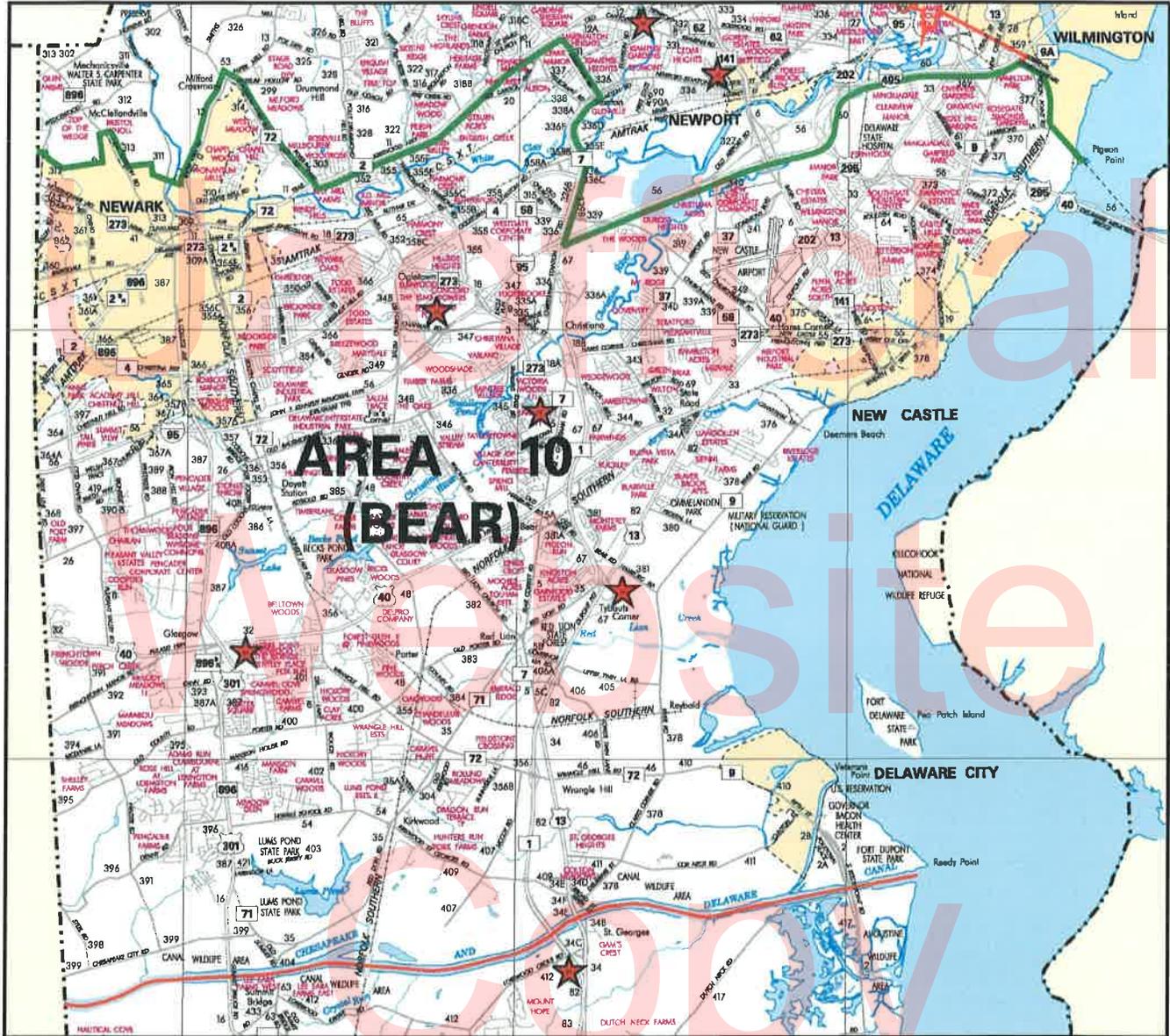
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AREA 10

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LIST OF LOCATIONS*

Inventory Number	ADC Map	Road	Location	System
28	11-K9	SR 1	South bound at exit mall	5 Bay Quad
29	11-K9	SR 1	North bound at exit mall	5 Bay Quad
30	16-B6	SR 1	Median at Tybouts Comer	5 Bay Quad
31	19-A10	SR 1	South bound at Biddles Toll Plaza	5 Bay Quad
32	19-A10	SR 1	North bound at Biddles Toll Plaza	5 Bay Quad
33	11-D8	SR 4	Median at 273 east side of 1 st bridge	6 Bay 69" Quad
34	11-D8	SR 4	Median at 273 west side of 1 st bridge	6 Bay 69" Quad
35	11-D8	SR 4	Median at 273 east side of 2 nd bridge	6 Bay 69" Quad
36	11-D8	SR 4	Median at 273 west side of 2 nd bridge	6 Bay 69" Quad
37	11-H6	SR 4	Median south of Delaware Park, south side of wall	5 Bay Quad
38	11-H6	SR 4	Median south of Delaware Park, north side of wall	5 Bay Quad
39	12-A3	SR 4	Median at Bridge 262, south side of bridge	5 Bay Quad
40	12-A3	SR 4	Median at Bridge 262, north side of bridge	5 Bay Quad
41	12-A4	SR 4	Median at Bridge 264, south side of bridge	5 Bay Quad
42	12-A4	SR 4	Median at Bridge 264, north side of bridge	5 Bay Quad
43	12-G12	US 13	Median north of US 40 split, north of 5 th Ave	6 Bay 69" Quad
44	12-G12	US 13	Median north of US 40 split, south of 5 th Ave	6 Bay 69" Quad
45	12-F13	US 13	Shoulder north of US 40 split @ Hollywood Hotel	6 Bay 69" Quad
46	12-F12	US 13	Median north of US 40 split, Wilson Dr, north side	6 Bay 69" Quad
47	12-F12	US 13	Median north of US 40 split, Wilson Dr, south side	6 Bay 69" Quad
48	12-F12	US 13	Shoulder southbound @ Carmen Ford	6 Bay 69" Quad
49	12-F13	US 13	Median @ US 40 split, south side	6 Bay 69" Quad
50	12-F13	US 13	Median @ US 40 split, north side	6 Bay 69" Quad
51	12-F13	US 13	South bound @ US 40 split	6 Bay Quad
52	12-F13	US 40	Median at US 13 split	5 Bay Quad
53	17-H7	SR 896	Summit Bridge north side	6 Bay Quad
54	17-H8	SR 896	Summit Bridge south side	6 Bay Quad
55	16-B6	US 13	Median at Tybouts Comer	7 Bay Quad
56	11-G10	SR 273	South Newark ramp	5 Bay Quad

*Additional locations may be added as recently completed construction projects will be accepted into the State Responsibility.

Unofficial

Manufacturer's Drawings (Appendix A)

Reference the following:

1. Energy Absorption System's Installation Manual for QuadGuard System

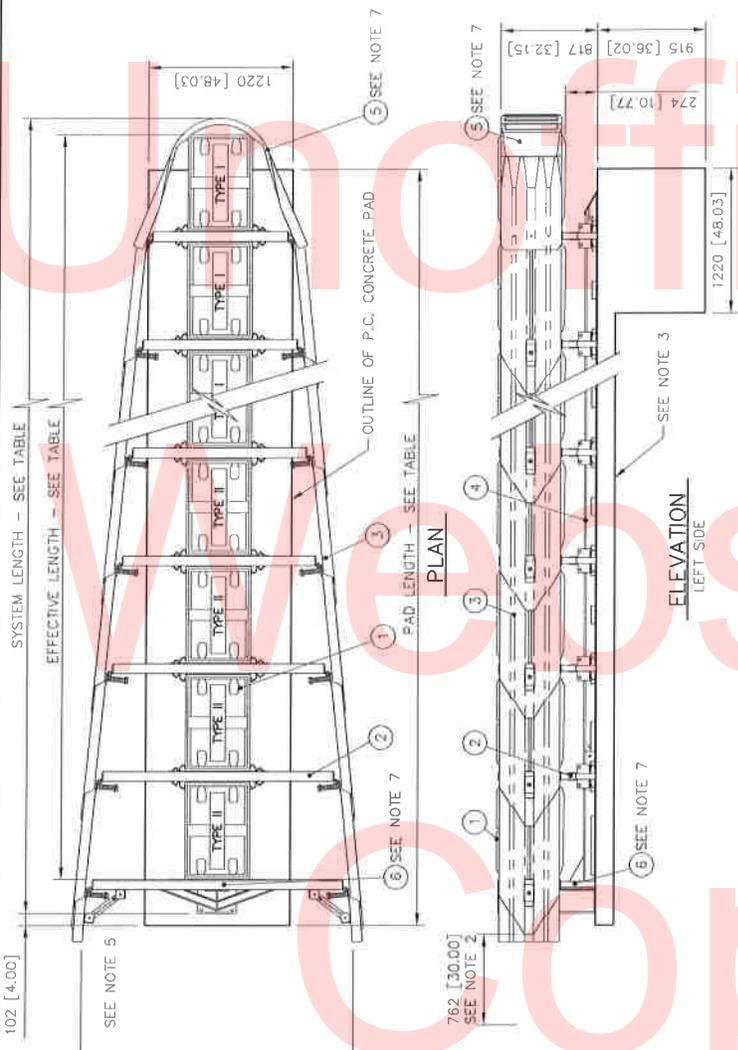
(E-Copies available for all of the above-mentioned manuals)

Website

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SYSTEM LENGTH - SEE TABLE

EFFECTIVE LENGTH - SEE TABLE



- NOTES:
- IN COMPLIANCE WITH THE AASHTO 2011 ROADSIDE DESIGN GUIDE.
 - MANUFACTURER RECOMMENDS REMOVAL OF ALL CURBS AND ISLANDS TO ENSURE PROPER IMPACT PERFORMANCE.
 - PROVISION SHALL BE MADE FOR REAR FENDER PANELS TO SLIDE REARWARD UPON IMPACT 762 [30.00] MIN.
 - 150 [6.00] MIN. REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE PAD OR 200 [8.00] MIN. NON-REINFORCED 28 MPa [4000 PSI] P.C. CONCRETE ROADWAY, MEASURING AT LEAST 3.66 m [12'-0"] WIDE BY 15.24 m [50'-0"] LONG.
 - SEE THE "QUADGUARD SYSTEM PRODUCT MANUAL" FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (888) 333-5374.
 - TRANSITION FROM THE QUADGUARD SYSTEM TO THE OBJECT BEING SHIELDED.
 - UNIDIRECTIONAL

UNITS OF MEASUREMENT ARE MILLIMETERS (INCHES), UNLESS OTHERWISE NOTED.

BACKUP - WHEEL DEFLECTOR AND NOSE ASSEMBLIES NOT INCLUDED IN MODEL NUMBER, ORDER SEPARATELY. WHEEL DEFLECTORS ARE ACCESSORY ITEMS.

THE NUMBER OF BAYS INDICATED IN THE TABLE IS BASED ON A STANDARD BAY LENGTH OF 12.19 M [40'-0"].

TO DISAPPEAR THE LONGITUDINAL IMPACT ENERGY OF A 2000 kg VEHICLE TRAVELING AT THE SPEED INDICATED.

THE SIX BAY SYSTEM HAS BEEN FULLY TESTED AT 100 km/h UNDER THE FULL B TEST MATRIX OF NCHRP 350 TL-3. SYSTEMS LONGER THAN SIX BAYS SHALL ALSO BE CAPABLE OF MEETING THE OCCUPANT RISK CRITERIA AS RECOMMENDED IN NCHRP 350 FOR VEHICLES WEIGHING 2000 kg IMPACTING HEAD ON AT THE SPEED INDICATED IN THE TABLE.

WHEEL DEFLECTORS REQUIRED IN ORDER TO PREVENT WHEEL SNAGGING.

REFERENCES

DESCRIPTION	DATE	BY	APP.
DIAPHRAGM ASSY.	6/17/97	J. ESPINOZA	
NOSE ASSY.	7/10/97	J. MACHADO	
FENDER PANEL ASSY.	6/24/97	SPT	
BACKUP ASSY.	7/17/97	J. MACHADO	
MONORAIL ASSY.	35-40-06		
CONCRETE PAD	35-40-11		
TRANSITION ASSY.	N/A		
WHEEL DEFLECTOR ASSY.	N/A		

QUADGUARD SYSTEM

69° OR 90° SYSTEM W/ TENSION STRUT BACKUP

SCALE 1 = 40

DATE 7/10/97

PROJECT QFTSCVR-U

BY K

QUADGUARD SYSTEM

ENGINEERING AND RESEARCH DEPARTMENT

69° OR 90° SYSTEM W/ TENSION STRUT BACKUP

SCALE 1 = 40

DATE 7/10/97

PROJECT QFTSCVR-U

BY K

REFERENCES

DESCRIPTION	DATE	BY	APP.
DIAPHRAGM ASSY.	6/17/97	J. ESPINOZA	
NOSE ASSY.	7/10/97	J. MACHADO	
FENDER PANEL ASSY.	6/24/97	SPT	
BACKUP ASSY.	7/17/97	J. MACHADO	
MONORAIL ASSY.	35-40-06		
CONCRETE PAD	35-40-11		
TRANSITION ASSY.	N/A		
WHEEL DEFLECTOR ASSY.	N/A		

QUADGUARD CARTRIDGE

DATE	REV.	BY	CHK.	APP.
11/25/02	J	SDC	SIT	ACF
12/07/04	K	RCC	SIT	ACF
12/14/02	I	DDW	SIT	SPT

NOSE ASSEMBLY

BACKUP

NOSE ORDER#

EH PROJECT#

DESIGN SPEED

NOSE COLOR

NUMBER OF UNITS

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