Examples of Temporary Traffic Control Plans

TYPE A

MOT PLAN FOR TASK WORK ORDER 045-D9-09007821
RTE-29 SB LANE 1 & 2 (38.85037, -77.34458)

CREATED
6/13/2006

SPEED LIMIT
45

NOTES:
ADVANCE WARNING
SIGN SPACING: ~300'

RWA SIGN ON RIDGE TOP RD.
RWA SIGN ON FOREST HILL DR.

SHOULDER TAPER: N/A

TAPER 1: 500' (STARTS AT INTERSECTION)

BUFFER: INSUFFICIENT SPACE FOR A BUFFER

END TAPER: 100'

TOTAL NUMBER OF LANES: 3

TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 2

TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 1

VWAP REFERENCE: 12.0, 13.0 & 14.0

NIGHT / DAY

VSP REQUIRED: YES / NO

DESIGNED BY: David Newman

REVIEW BY: Jon Cope

Field deviations shall be documented and included with final inspection package!

SCALE IS APPROXIMATE

VDOT REVIEW COMPLETED BY: _____
VDOT COMMENTS:

MOT PLAN FOR TASK WORK ORDER 045-D9-09007821
RTE-29 SB LANE 3 (38.85037, -77.34458)

CREATED
6/13/2006

SPEED LIMIT
45

NOTES:
ADVANCE WARNING
SIGN SPACING: ~300'

RWA SIGN ON RIDGE TOP RD.
RWA SIGN ON FOREST HILL DR.

SHOULDER TAPER: N/A

TAPER 1: 500' (STARTS AT INTERSECTION)

BUFFER: INSUFFICIENT SPACE FOR A BUFFER

END TAPER: 100'

TOTAL NUMBER OF LANES: 3

TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 1

TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 2

VWAP REFERENCE: 12.0, 13.0 & 14.0

NIGHT / DAY

VSP REQUIRED: YES / NO

DESIGNED BY: David Newman

REVIEW BY: Jon Cope

Field deviations shall be documented and included with final inspection package!

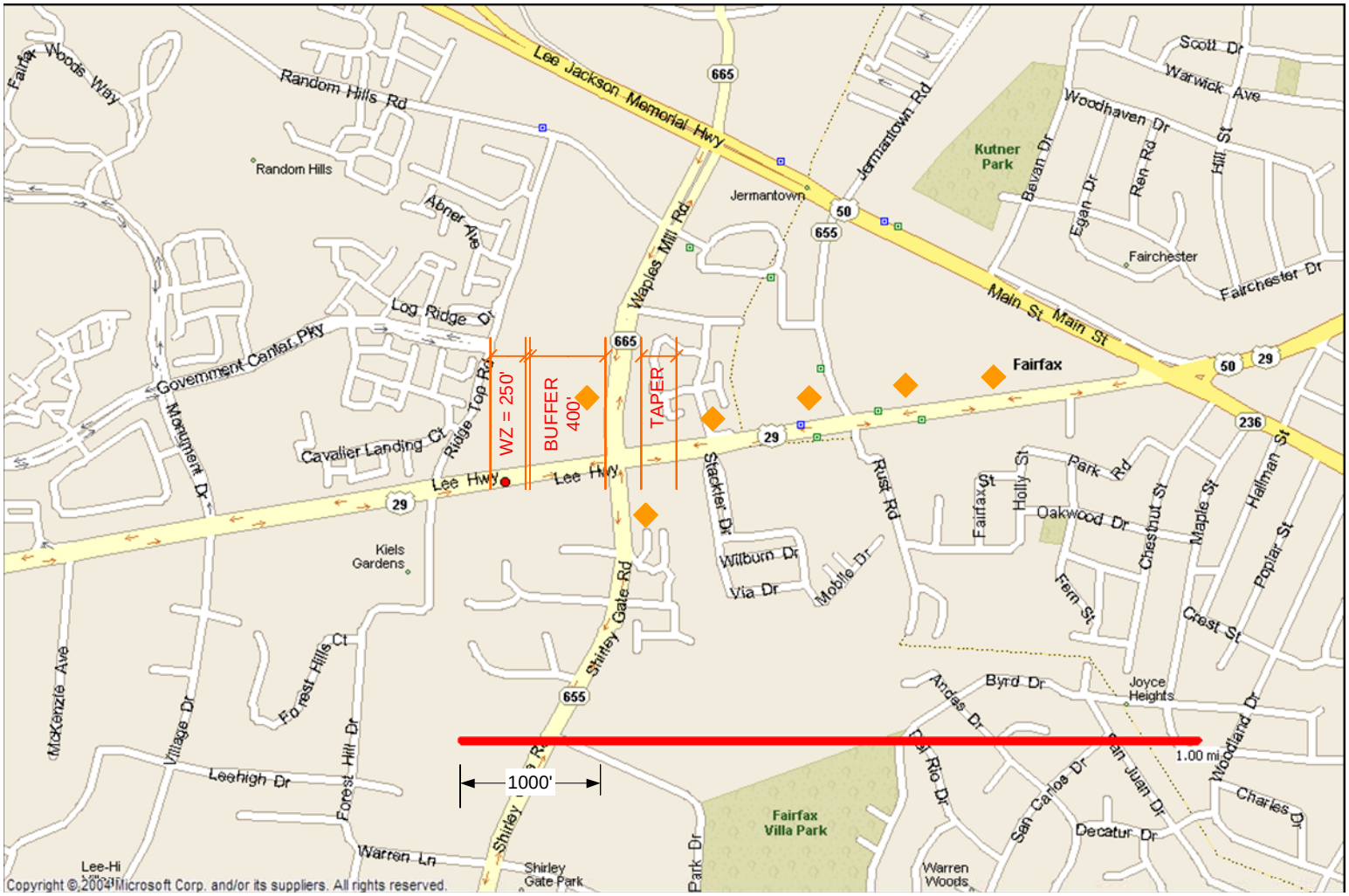
SCALE IS APPROXIMATE

VDOT REVIEW COMPLETED BY: _____
VDOT COMMENTS:

MOT PLAN FOR TASK WORK ORDER 045-D9-09007821-8
RTE-29 S.B. Lanes(38.85028,-77.3444)

CREATED
6/23/2006

SPEED LIMIT
35



NOTES:

ADVANCE WARNING
L& R SIGN SPACING: 350'-500'

SHOULDER TAPER: N/A

TAPER 1: 250'
TAPER 2- 125'
Taper will be before intersection and will include (2). One before left turn lane and one past point where left turn lane starts to allow turning vehicles to access turn lane.

BUFFER: 400'-600'

END TAPER: 100'

TOTAL NUMBER OF LANES: 3

TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 2

TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 1

VWAP REFERENCE: 12.0 & 13.0&21.0

NIGHT / **DAY**

VSP REQUIRED: YES / **NO**

DESIGNED BY: Pete Landreth

REVIEW BY: Jon Cope

Field deviations shall be documented and included with final inspection package!

SCALE IS APPROXIMATE

VDOT REVIEW COMPLETED BY: _____
VDOT COMMENTS:

Examples of Temporary Traffic Control Plans

TYPE B

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	FHWA REGION	STATE	FEDERAL AND PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	15

Traffic Control General Notes / Transportation Management Plan

Allowable Hours for Lane Closures

Sunday	10:00 PM	to	5:00 AM
Monday	10:00 PM	to	5:00 AM
Tuesday	10:00 PM	to	5:00 AM
Wednesday	10:00 PM	to	5:00 AM
Thursday	10:00 PM	to	5:00 AM
Friday	No Lane Closures Allowed		
Saturday	No Lane Closures Allowed		

Lane Closures will not be permitted for the following events / holidays:

* New Years Day to include the day preceeding and day following
* Easter Sunday to include the preceeding Friday and following Monday
* Memorial Day to include the preceeding Friday and following Tuesday
* Independence Day to include the day preceeding and day following
* Labor Day to include the preceeding Friday and following Tuesday
* Thanksgiving Day to include the preceeding Wednesday and following Friday and Monday
* Christmas Day to include the day preceeding and day following
* Radford University Graduation Day
* Virginia Tech Graduation Day
* All Virginia Tech Home Football Games
* "Move In" Day at Radford University
* "Move In" Day at Virginia Tech

VDOT
Traffic Enginnering
Southwest Regional Operations

General Notes

1. Temporary lane widths shall not be less than 11 feet.
2. All entrance and exit ramps at the Exit 128 Interchange shall remain open at all times.
3. Work operations which will restrict lane widths shall not be initiated until the DMV has been notified of the work operation and location in order for wideloads to be notified of the impending lane restrictions.
4. Measures shall be taken to ensure adequate sight distances during construction operations. Traffic Control Devices, signs, construction equipment, material storage or any other obstacle will not be allowed to interfere with sight distances at entrance ramps for this project.
5. Equipment and/or materials shall not be stored within the established Clear Zone of either the North or Southbound lanes, and/or the deflection zone of physical barriers.
6. All traffic control devices and signs necessary for the maintenance of traffic are to be installed, maintained and removed by the Contractor.
7. All traffic control device locations shall be marked by the Contractor and reviewed by the Engineer prior to installation.
8. All sketches and drawings are not to scale and shall be used for reference only.
9. All work shall be accomplished in accordance with the May 2005 Virginia Work Area Protection Manual
10. The travel lane and approaches for each Stage of construction shall not be milled until traffic has been switched to the following phase.
11. All conflicting pavement markings and raised snowplowable pavement markers shall be covered using Construction Pavement Marking Type E 6"
12. Guardrail shall be installed to current standards prior to change of traffic patterns for the next stage of work.

SUPERVISED BY: C.D.McDonald,P.E.
DESIGNED BY: Gary A.Orvell
CADD OPERATOR:
REVISED BY:

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STRUCTURES AND BRIDGES

PLAN NO.	PROJECT	FILE NO.	SHEET NO.
A			15

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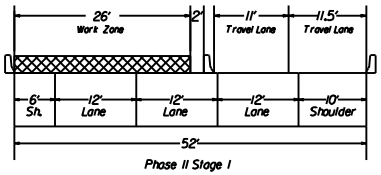
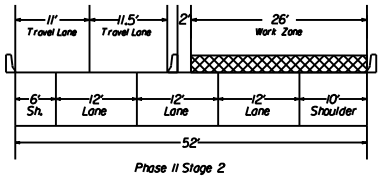
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	16

MAINTENANCE OF TRAFFIC TYPICAL SECTIONS
NBL STRUCTURE NO.2006



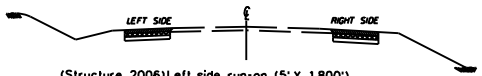
Phase II Stage 1



Phase II Stage 2

TYPICAL SECTION
SHOULDER IMPROVEMENT

Asphalt Conc. Ty. SM-9.5D (1½")
Asphalt Conc. Ty. BM-25A (6")
Agg. Base Mat'l. Ty. No. 21B (8")



(Structure 2006)Left side run-on (5' X 1,800')
Left side run-off (5' X 1,100')
Right side run-on (10.67' X 1,800')
Right side run-off (11.42' X 1,100')

NOTE: The unit cost for asphalt material used for shoulder build-up shall be full compensation for materials, any necessary excavation, tools, equipment and incidentals necessary to complete the work

MAINTENANCE OF TRAFFIC
SUMMARY OF ESTIMATED QUANTITIES (STRUCTURE 2006)

ITEM	UNIT	QUANTITY	REMARKS
Guardrail Terminal GR-6 (NCHRP 350)	LF	13	
Guardrail Terminal GR-7 (NCHRP 350)	Each	1	
Guardrail Terminal GR-11	Each	1	
Guardrail GR-2	LF	5300	
Guardrail Terminal Site Preparation	Each	1	
Fixed Object Attachment GR-FOA-1, Type I	Each	2	
Fixed Object Attachment GR-FOA-1, Type II	Each	2	
Traf. Bar. Serv. Conc. Single Face Parapet	LF	700	MB-10A
Impact Attenuator Service Type I	Each	2	TL-3, > 45 MPH
Construction Signs	Sq. Ft.	800	
Truck Mounted Attenuator	Hour	300	
Group 2 Channelizing Devices	Day	3100	
Portable Changeable Message Sign	HR	600	
Electronic Arrow	HR	300	
Warning Light Type B	Day	160	
Traf. Bar. Serv. Conc. Double Face	LF	400	MB-7D
Type B Class IV Pavement Line Marking 6"	LF	900	
Temporary Pavement Marker One-Way	Each	230	
NS Pavment Marking (Type D, Class I) 6"	LF	12000	
Construction Pavement Marking (Type E) 6"	LF	10020	
Construction Pave. Mark. (Type D, Class I) 8"	LF	13800	
Construction Pave. Mark. (Ty. D, Cl. I) 24"	LF	30	

SHOULDER WIDENING
SUMMARY OF ESTIMATED QUANTITIES (STRUCTURE 2006)

ITEM	UNIT	QUANTITY	REMARKS
Aggr. Base Mat'l Ty. 1, No. 21B	Ton	2460	
Asphalt Concrete Base Ty. BM-25.0A	Ton	1760	
Asphalt Concrete Ty. SM-9.5D	Ton	480	

SUPERVISED BY C.O. McDonald, P.E.
DESIGNED BY Gary A. Orvell
CADD OPERATOR
REVISED BY

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STRUCTURES AND BRIDGES

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Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED. NO.	SHEET NO.
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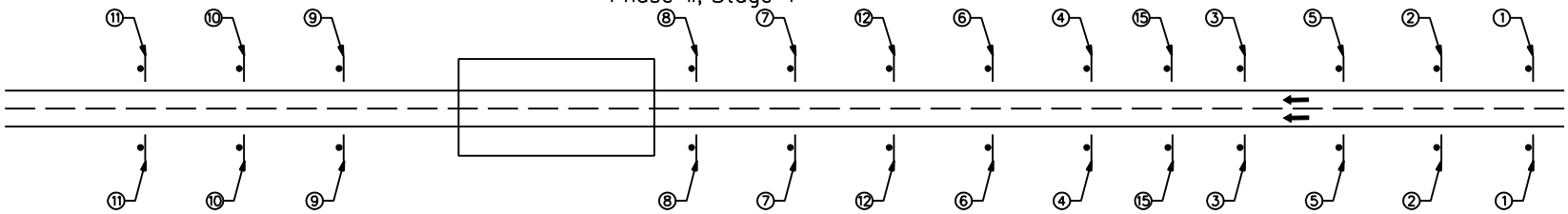
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

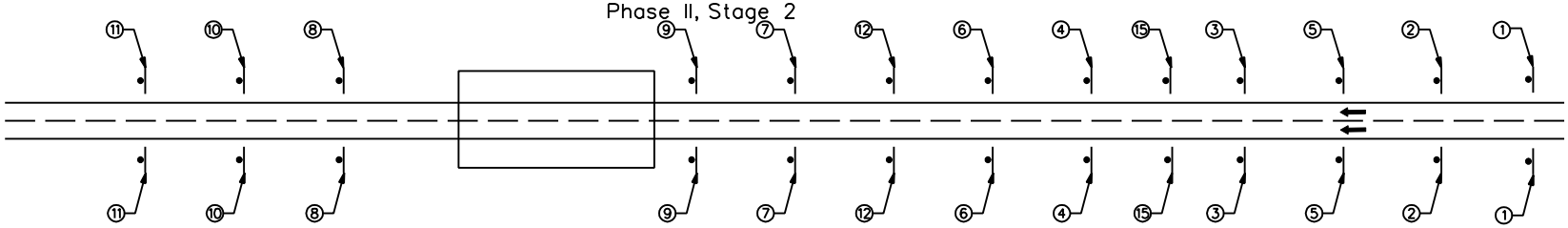
REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	17

Construction Sign Layout
I-81 Northbound Lane

Phase II, Stage 1



Phase II, Stage 2



W1-4bL

① ROAD UNDER CONSTRUCTION — VG- 60" X 24"

② ROAD WORK AHEAD — W20-1 48" X 48"

③ SPEED LIMIT 55 — W3-5 48" X 48"
W/ Type B Warning Light

④ WORK ZONE / SPEED LIMIT 55 — SPECIAL 48" X 12" / R2-1 48" X 60"
W/ Type B Warning Light

⑤ TRUCKS USE RIGHT LANE / NEXT X MILES — R4-5 48" X 60" / SPECIAL 12" X 48"

⑥ EXIT 128 TRAFFIC USE RIGHT LANE — SPECIAL 60" X 36"

⑦ STAY IN LANE — R4-9 48" X 60"

⑧ W1-4bR 48" X 48" / XX M.P.H. W13-1 24" X 24"
Advisory Speed to be determined by the Engineer

⑨ W1-4bL 48" X 48" / XX M.P.H. W13-1 24" X 24"
Advisory Speed to be determined by the Engineer

⑩ END ROAD WORK — G20-2a 48" X 24"

⑪ SPEED LIMIT 65 — R2-1 48" X 60"

⑫ NORTH 81 — VM3-1 30" X 42"
NOTICE / RESTRICTED WIDTH ROUTE / XX FT X IN — VR25-1 108" X 72"
W/ Type B Warning Light

⑮ NOTICE / FINES UP TO $500 FOR EXCEEDING SPEED LIMIT IN WORK ZONE — 108" X 54"
Orange 6"E, Solid Bar 1", 6"D, Margin Width 1½", Border Width 1", Corner Radius 4"

* Signs spacing shall be 1300 LF - 1500LF or as directed by the Engineer.

SUPERVISED BY: C.D. McDonough, P.E.
DESIGNED BY:
CADD OPERATOR: Gary A. Duvall
REVISED BY:

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PLAN NO.	PROJECT	FED. NO.	SHEET NO.
A			17

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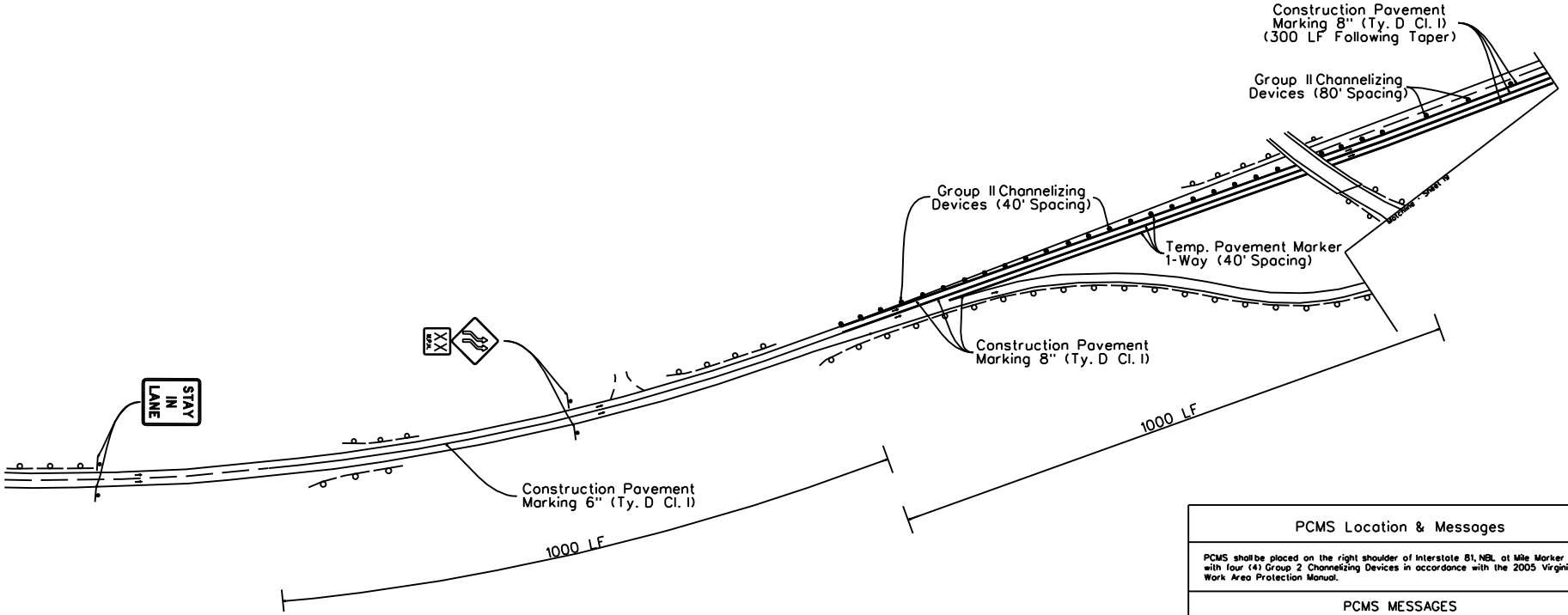
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage I

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	18



SUPERVISED BY: C.O. McDonald, P.E.
DESIGNED BY: Gary Lovell
CADD OPERATOR:
REVISED BY:

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VDOT
Traffic Enginnering
Southwest Regional Operations

PCMS Location & Messages

PCMS shall be placed on the right shoulder of Interstate 81, NBL at Mile Marker 116.00 with four (4) Group 2 Channelizing Devices in accordance with the 2005 Virginia Work Area Protection Manual.

PCMS MESSAGES

Panel 1 Message	Panel 2 Message	Panel 3 Message
ROAD WORK AHEAD	MILE POST 128.0	EXPECT DELAYS

PLAN NO.	PROJECT	FED. NO.	SHEET NO.
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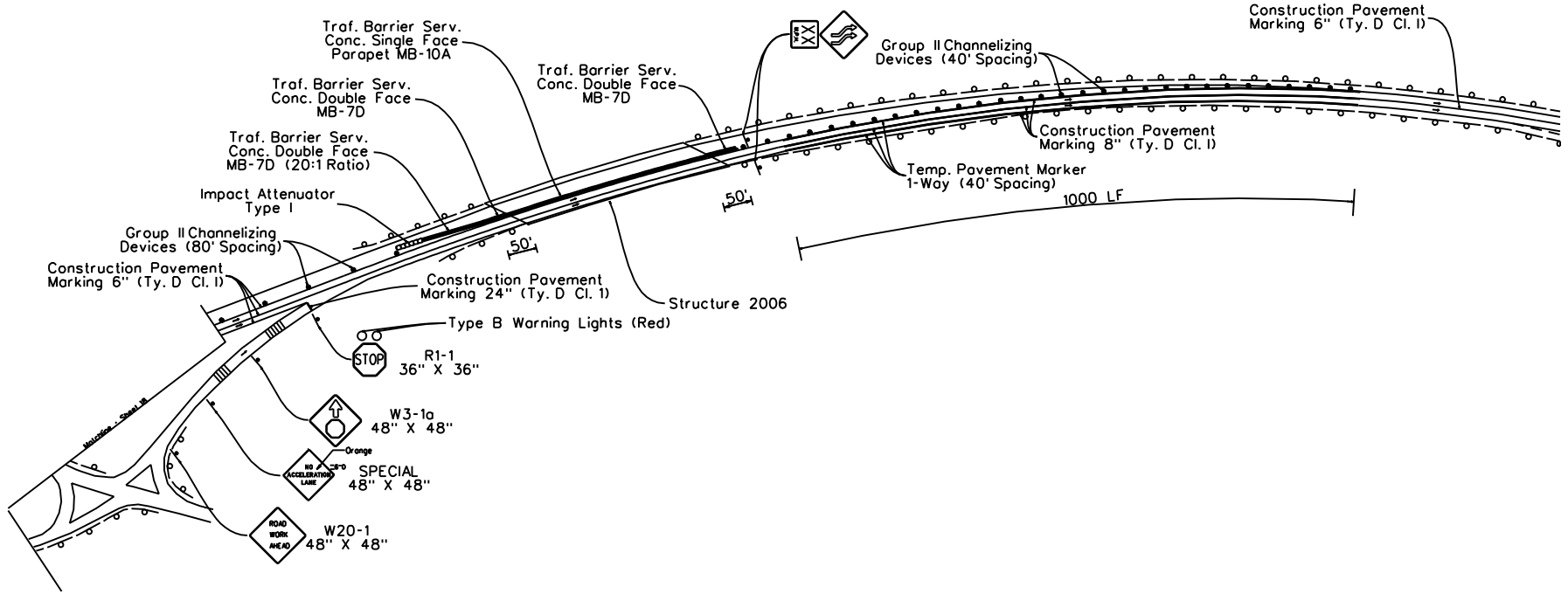
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage I

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	19



SUPERVISED BY: C.D. McDonald, P.E.
DESIGNED BY: Gary E. Orrell
CADD OPERATOR:
REVISED BY:

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Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED NO.	SHEET NO.
A			19

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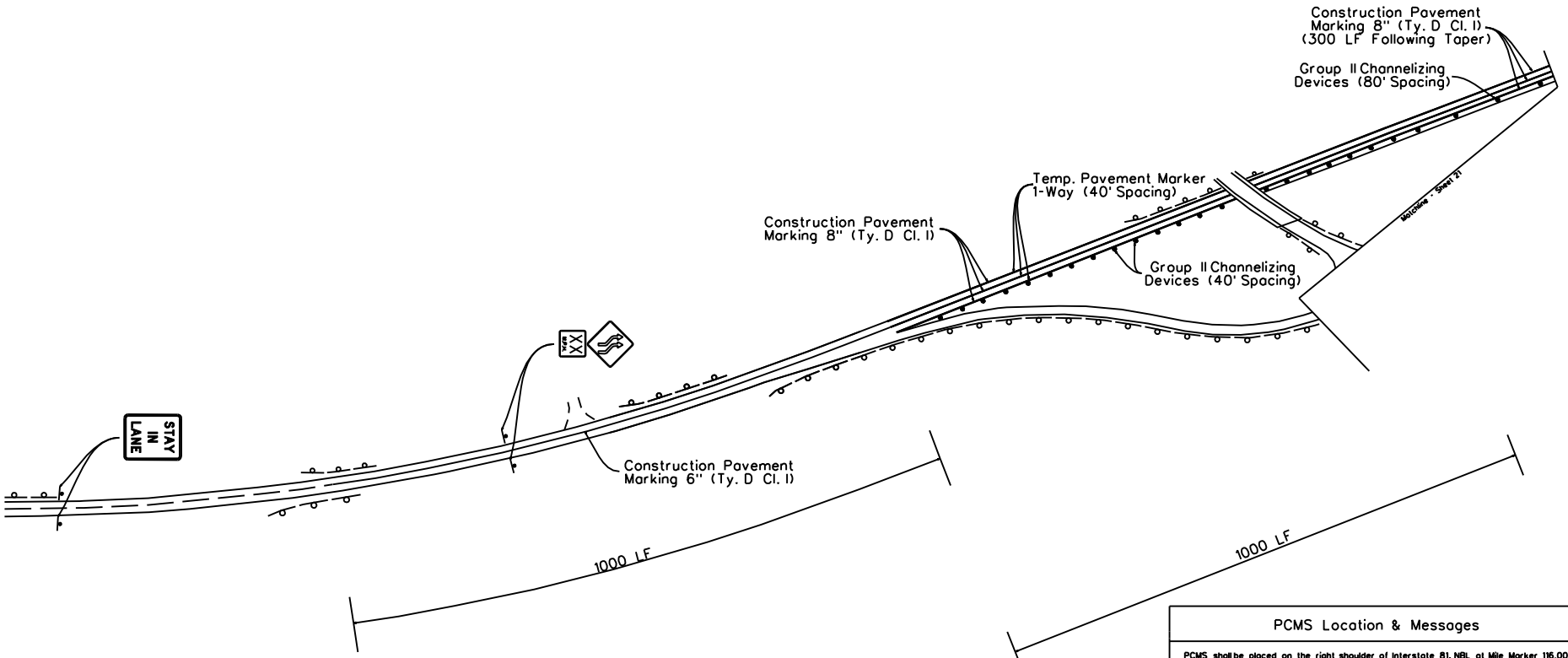
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage 2

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	20



SUPERVISED BY: C.D. McDonald, P.E.
DESIGNED BY: Gary Lovell
CADD OPERATOR:
REVISED BY:

PLAN
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VDOT
Traffic Enginnering
Southwest Regional Operations

PCMS Location & Messages

PCMS shall be placed on the right shoulder of Interstate 81, NBL at Mile Marker 116.00 with four (4) Group 2 Channelizing Devices in accordance with the 2005 Virginia Work Area Protection Manual.

PCMS MESSAGES

Panel 1 Message	Panel 2 Message	Panel 3 Message
ROAD WORK AHEAD	MILE POST 128.0	EXPECT DELAYS

PLAN NO.	PROJECT	FED NO.	SHEET NO.
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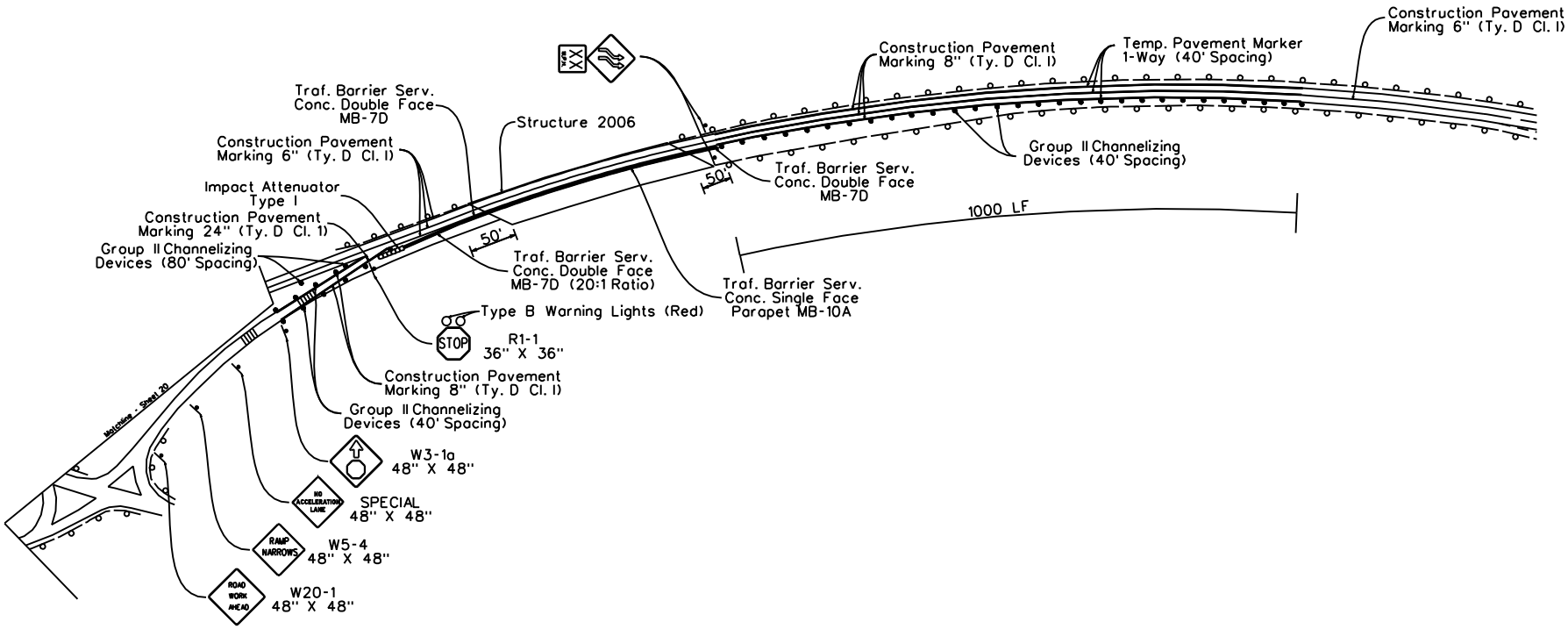
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage 2

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	21



SUPERVISED BY: C.D. McDonald, P.E.
DESIGNED BY: Gary A. Orndl
CADD OPERATOR:
REVISED BY:

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STRUCTURES AND BRIDGES

VDOT
Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED. NO.	SHEET NO.
A			21

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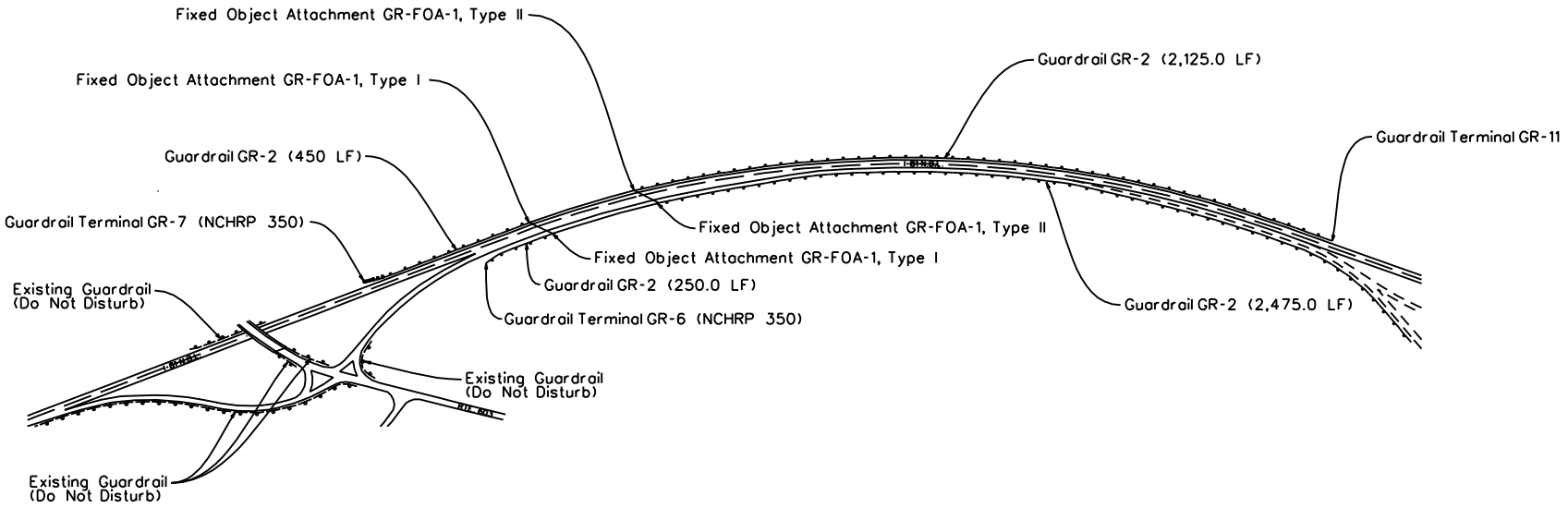
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	22

Guardrail Installation Plan
I-81 Northbound Lane



SUPERVISED BY: C.D.McDonald,P.E.
DESIGNED BY: Gary A.Orvell
CADD OPERATOR:
REVISED BY:

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STRAIGHT AHEAD

VDOT
Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED NO.	SHEET NO.
A			22

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Central Region Operations Traffic Engineering

Transportation Management Plan Recommendations Document

Project Development Stage: Preliminary Field Inspection

Project: 0033-042-107, C501 (Intersection of Route 33 & 54) **UPC#** 18948

The role of Traffic Engineering in developing the Transportation Management Plan (TMP) is to provide the Design Team with a Traffic Data and an Accident Data Analysis at PFI, to provide input pertaining to the *safe* and *efficient* management of traffic during construction, and to review the plans throughout the Concurrent Engineering process to ensure that traffic management and traffic safety have been sufficiently addressed in the TMP plan.

Traffic and Crash Data Analysis:

Results from Traffic Data Analysis:

For the year 2006, the AM Peak Hour heaviest traffic movement at the intersection of Route 54 & 33 is on Route 33 coming from the West and turning onto Eastbound Route 33 with 387 right turns per hour. In the PM Peak the heaviest movement is on Route 33 coming from the East turning onto Westbound Route 33 with 425 left turns per hour. The majority of the traffic through this project consists of commuters, residents and truckers. From our analysis we conclude that feasible **Off-Site detours** are not available and recommend the following:.

- From the Regional Operations Lane Closure Analysis – lane closures **will be allowed** between the hours of 9am to 3pm, and between the hours of 6:30pm to 5:30am for one-lane two-way operations.
- Follow the Holiday Restrictions outlined in the 2002 Road & Bridge Specifications
- Temporary Lane Widths should not be less than 11' wide.
- Traffic on Route 657, which carries 520 Vehicles per day in the year 2006 and expected to carry 710 VPD in the year 2016, will be impacted by the project. However, due to the relatively low traffic volumes, no specific actions are recommended
- Both existing left-turn lanes on Route 33 must be maintained during construction.
- After traffic is shifted to the proposed Routes 33 and 54, traffic must not be allowed to cut through along existing Route 54. The plan must effectively address this issue.

Results from Crash Data Analysis

In total there have been 16 accidents within 1000' and 1700' of the intersection (Rte. 54 & 33) over the past 3-year period. There have been 7 angle accidents within the operational area of the intersection. There have been 3 accidents at the east entrance of the Fast-Mart that can also be considered to be within the operational area of the intersection. There have been 3 angle accidents on Route 33 at the intersection of Route 657. As a result of these findings we make the following recommendations, some of which may need to be addressed with specific notes incorporated into the plans.

- Measures must be taken to ensure adequate sight distances during construction. Neither traffic control devices, nor signs, construction equipment, material storage, nor any other

obstacle can be allowed to interfere with **sight distances at entrances and intersections** on the project.

- It must be ensured that there is room within the right-of-way for storage of equipment and materials without creating a sight distance problem or introducing a fixed-object hazard to motorists.
- If during construction there is an existing sight distance obstruction at any entrance that can be easily removed, i.e. shrubs or signs that will be relocated anyway, etc, it must be removed as soon as possible.

Recommended Temporary Traffic Management Strategies

The following recommendations are based on a **Category II Project Complexity**. These recommendations should be incorporated into the plans by Public Hearing Stage.

A Well-thought-out Narrative for Sequence of Construction:

- The narrative for the *sequence* of construction must be clearly conveyed with each step numbered in a logical order so that whenever a step requires traffic to be shifted or affected in any way, all the steps necessary to make this effectual have been listed previous to this step in the sequence.

Plan-View Illustrations:

- In order to ensure that traffic can be maintained as proposed, the plan view illustrations must be to a standard scale, they must be neat and uncluttered, and must clearly illustrate the **sequence of the construction process**. Once the proposed design is shown in a phase, no existing design should be shown for those portions of the project in any subsequent phase, so as to clearly illustrate the process of construction and save time and errors in interpreting the plan. Only those items constructed in a previous phase, and those being constructed in the current phase should be shown as constructed in the current phase.

- In addition to what is required by IIM-LD-241, TED-343 for a category II complexity project, the plan-view for this project must also clearly illustrate the following:

    - Turning radii can be sufficiently maintained for the existing traffic.
    - Temporary pavement markings and markers of proper type and class in each location on the plans.
    - Turn Lane dimensions
    - Rather than place the **temporary signs** on the plans, the TTC number for the correct Traffic Control Typical Sections, see Work Area Protection Manual (WAPM), can be shown on the plans where appropriate.
    - All temporary signs that are not specifically addressed in the WAPM must be shown on the plans in the appropriate location.
    - Any unusual situations that are not covered in a standard must be illustrated in a detail or typical to clearly show how traffic is to be maintained at entrances, intersections, etc.
    - When denoting a work area on the plans, denote it all the way to the construction limits.
- Temporary Drainage - Must be addressed to prevent water-build-up in the travel-way.

- Permanent Drainage - The contractor will most likely want to install all drainage related items first (i.e. pipes, drop inlets, curb and gutter, etc.) Drop inlet, and curb and gutter installations must not be allowed to interfere with the safe and efficient flow of traffic.
- Cross-cuts for installation of drainage pipe - The plan must address how cross-cuts in the roadway will be covered after installation, i.e. asphalt, gravel, etc. Given the amount of traffic, we recommend asphalt.
- The proposed travel-way must not conflict with Utility installations.
- On-site detours must be designed with minimum 6 degree curves and superelevation must be addressed where necessary.
- Excavation – Excavation next to the edge of pavement should be treated with a 6:1 wedge (typical general note) whenever feasible, or otherwise protected.
- If traffic barrier service is deemed necessary to protect a hazard, ensure that it can be placed properly and that all blunt ends are protected.
- Attention must be give to efficiently maintaining convenient access to all commercial entrances.
- It must be ensured that any temporary grades are traversable.
- Pedestrians must not be prevented from passing through the work zone.

Phased Cross-Sections

- Cross-Sections for each phase of construction must be provided for **each tie-in**, **and for the Route 33 section of roadway construction** (where traffic is being shifted to the east and west). The cross-sections must show proof that the lane and shoulder widths, etc, can in fact be maintained as proposed throughout these sections of roadway and within the limits of right-of-way. The following must be **illustrated on the cross-sections**. (see example attached):
    - Travel-way
    - Travel Direction Arrows
    - Dimensions of travel-way and shoulder width
    - Traffic Control Device Placement
    - Work Area
    - Temporary Pavement
    - Legend
    - Shorten the distance between cross cuts in critical areas to ensure that no hazard or obstruction will be overlooked between cross-cuts.
    - Ensure that where slopes tie in that there is no encroachment upon the travel-way.

Informative Traffic Management Notes:

- The **Work Zone Clear Zone** (different from Design Clear Zone) must be clearly stated in the Traffic Management Notes to bring attention to its importance throughout construction.
- If lane widths have been reduced throughout the entire project it must be noted in the notes. If widths have only been reduced along portions of the project, a list of the affected stations must be provided.
- All applicable Traffic Management General Notes pertaining to the safe and efficient flow of traffic must be incorporated into the plan and must not contradict any instructions detailed elsewhere in the plan.

Estimate Appropriate Use of Temporary Traffic Control Pay Items:

- Ensure that all necessary construction pay items relative to traffic and safety are included on the summary sheet.
- Eradication: A Quantity for all necessary eradication of existing pavement markings must be included on the summary sheet
- Flagger Hours – This project will most likely require at least 3 flaggers at some point. The number of **hours required** should be discussed with the constructability team.

Transportation Operations Strategies

This plan is required *if* the work zone will be greater than ½ mile in length and/or has reduced-width travel lanes. Development of this plan must be coordinated by the Project Manager. See IIM-LD-241, TED-343 for guidance. A procedure should be developed for notifying the Project Manager and Regional Operations Manager of any traffic delays caused by work **outside the allowable hours for lane-closures**

Public Communications Strategies:

We recommend the following relative to this part of the plan:

- The public should be notified of the expected start date for this project and informed of the potential for back-ups during the hours between 9am to 3pm, and between the hours of 6:30pm to5:30am.

MOT PLAN FOR TASK WORK ORDER 045-D9-09007821
RTE-29 SB LANE 1 & 2 (38.85037, -77.34458)

CREATED
6/13/2006

SPEED LIMIT
45

NOTES:
ADVANCE WARNING
SIGN SPACING: ~300'

RWA SIGN ON RIDGE TOP RD.
RWA SIGN ON FOREST HILL DR.

SHOULDER TAPER: N/A

TAPER 1: 500' (STARTS AT INTERSECTION)

BUFFER: INSUFFICIENT SPACE FOR A BUFFER

END TAPER: 100'

TOTAL NUMBER OF LANES: 3

TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 2

TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 1

VWAP REFERENCE: 12.0, 13.0 & 14.0

NIGHT / DAY

VSP REQUIRED: YES / NO

DESIGNED BY: David Newman

REVIEW BY: Jon Cope

Field deviations shall be documented and included with final inspection package!

SCALE IS APPROXIMATE

VDOT REVIEW COMPLETED BY: _____
VDOT COMMENTS:

MOT PLAN FOR TASK WORK ORDER 045-D9-09007821
RTE-29 SB LANE 3 (38.85037, -77.34458)

CREATED
6/13/2006

SPEED LIMIT
45

NOTES:
ADVANCE WARNING
SIGN SPACING: ~300'

RWA SIGN ON RIDGE TOP RD.
RWA SIGN ON FOREST HILL DR.

SHOULDER TAPER: N/A

TAPER 1: 500' (STARTS AT INTERSECTION)

BUFFER: INSUFFICIENT SPACE FOR A BUFFER

END TAPER: 100'

TOTAL NUMBER OF LANES: 3

TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 1

TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 2

VWAP REFERENCE: 12.0, 13.0 & 14.0

NIGHT / DAY

VSP REQUIRED: YES / NO

DESIGNED BY: David Newman

REVIEW BY: Jon Cope

Field deviations shall be documented and included with final inspection package!

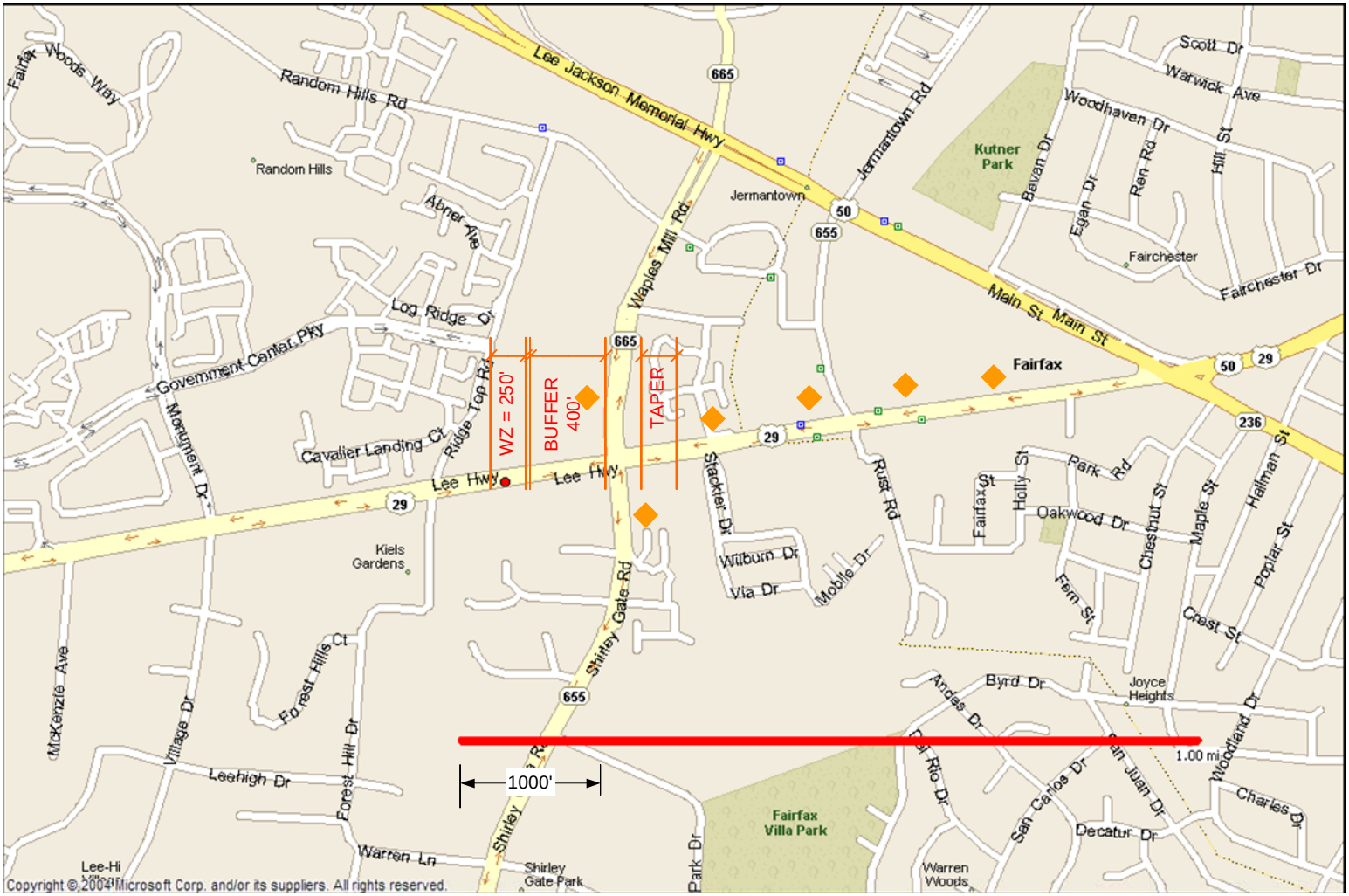
SCALE IS APPROXIMATE

VDOT REVIEW COMPLETED BY: _____
VDOT COMMENTS:

MOT PLAN FOR TASK WORK ORDER 045-D9-09007821-8
RTE-29 S.B. Lanes(38.85028,-77.3444)

CREATED
6/23/2006

SPEED LIMIT
35



NOTES:

ADVANCE WARNING
L& R SIGN SPACING: 350'-500'

SHOULDER TAPER: N/A

TAPER 1: 250'
TAPER 2- 125'
Taper will be before intersection and will include (2). One before left turn lane and one past point where left turn lane starts to allow turning vehicles to access turn lane.

BUFFER: 400'-600'

END TAPER: 100'

TOTAL NUMBER OF LANES: 3

TOTAL NUMBER OF LANES CLOSED TO TRAFFIC: 2

TOTAL NUMBER OF LANES OPEN TO TRAFFIC: 1

VWAP REFERENCE: 12.0 & 13.0&21.0

NIGHT / **DAY**

VSP REQUIRED: YES / **NO**

DESIGNED BY: Pete Landreth

REVIEW BY: Jon Cope

Field deviations shall be documented and included with final inspection package!

SCALE IS APPROXIMATE

VDOT REVIEW COMPLETED BY: _____
VDOT COMMENTS:

Examples of Temporary Traffic Control Plans

TYPE B

DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	FHWA REGION	STATE	FEDERAL AND PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	15

Traffic Control General Notes / Transportation Management Plan

Allowable Hours for Lane Closures

Sunday	10:00 PM	to	5:00 AM
Monday	10:00 PM	to	5:00 AM
Tuesday	10:00 PM	to	5:00 AM
Wednesday	10:00 PM	to	5:00 AM
Thursday	10:00 PM	to	5:00 AM
Friday	No Lane Closures Allowed		
Saturday	No Lane Closures Allowed		

Lane Closures will not be permitted for the following events / holidays:

* New Years Day to include the day preceeding and day following
* Easter Sunday to include the preceeding Friday and following Monday
* Memorial Day to include the preceeding Friday and following Tuesday
* Independence Day to include the day preceeding and day following
* Labor Day to include the preceeding Friday and following Tuesday
* Thanksgiving Day to include the preceeding Wednesday and following Friday and Monday
* Christmas Day to include the day preceeding and day following
* Radford University Graduation Day
* Virginia Tech Graduation Day
* All Virginia Tech Home Football Games
* "Move In" Day at Radford University
* "Move In" Day at Virginia Tech

VDOT
Traffic Enginnering
Southwest Regional Operations

General Notes

1. Temporary lane widths shall not be less than 11 feet.
2. All entrance and exit ramps at the Exit 128 Interchange shall remain open at all times.
3. Work operations which will restrict lane widths shall not be initiated until the DMV has been notified of the work operation and location in order for wideloads to be notified of the impending lane restrictions.
4. Measures shall be taken to ensure adequate sight distances during construction operations. Traffic Control Devices, signs, construction equipment, material storage or any other obstacle will not be allowed to interfere with sight distances at entrance ramps for this project.
5. Equipment and/or materials shall not be stored within the established Clear Zone of either the North or Southbound lanes, and/or the deflection zone of physical barriers.
6. All traffic control devices and signs necessary for the maintenance of traffic are to be installed, maintained and removed by the Contractor.
7. All traffic control device locations shall be marked by the Contractor and reviewed by the Engineer prior to installation.
8. All sketches and drawings are not to scale and shall be used for reference only.
9. All work shall be accomplished in accordance with the May 2005 Virginia Work Area Protection Manual
10. The travel lane and approaches for each Stage of construction shall not be milled until traffic has been switched to the following phase.
11. All conflicting pavement markings and raised snowplowable pavement markers shall be covered using Construction Pavement Marking Type E 6"
12. Guardrail shall be installed to current standards prior to change of traffic patterns for the next stage of work.

SUPERVISED BY: C.D.McDonald,P.E.
DESIGNED BY: Gary A.Orvell
CADD OPERATOR:
REVISED BY:

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STRUCTURES AND BRIDGES

PLAN NO.	PROJECT	FILE NO.	SHEET NO.
A			15

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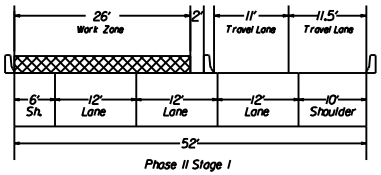
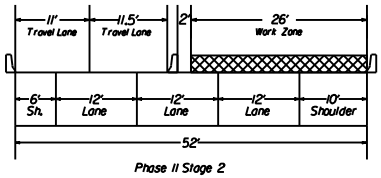
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	16

MAINTENANCE OF TRAFFIC TYPICAL SECTIONS
NBL STRUCTURE NO.2006



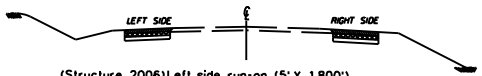
Phase II Stage 1



Phase II Stage 2

TYPICAL SECTION
SHOULDER IMPROVEMENT

Asphalt Conc. Ty. SM-9.5D (1½")
Asphalt Conc. Ty. BM-25A (6")
Agg. Base Mat'l. Ty. No. 21B (8")



(Structure 2006)Left side run-on (5' X 1,800')
Left side run-off (5' X 1,100')
Right side run-on (10.67' X 1,800')
Right side run-off (11.42' X 1,100')

NOTE: The unit cost for asphalt material used for shoulder build-up shall be full compensation for materials, any necessary excavation, tools, equipment and incidentals necessary to complete the work

MAINTENANCE OF TRAFFIC
SUMMARY OF ESTIMATED QUANTITIES (STRUCTURE 2006)

ITEM	UNIT	QUANTITY	REMARKS
Guardrail Terminal GR-6 (NCHRP 350)	LF	13	
Guardrail Terminal GR-7 (NCHRP 350)	Each	1	
Guardrail Terminal GR-11	Each	1	
Guardrail GR-2	LF	5300	
Guardrail Terminal Site Preparation	Each	1	
Fixed Object Attachment GR-FOA-1, Type I	Each	2	
Fixed Object Attachment GR-FOA-1, Type II	Each	2	
Traf. Bar. Serv. Conc. Single Face Parapet	LF	700	MB-10A
Impact Attenuator Service Type I	Each	2	TL-3, > 45 MPH
Construction Signs	Sq. Ft.	800	
Truck Mounted Attenuator	Hour	300	
Group 2 Channelizing Devices	Day	3100	
Portable Changeable Message Sign	HR	600	
Electronic Arrow	HR	300	
Warning Light Type B	Day	160	
Traf. Bar. Serv. Conc. Double Face	LF	400	MB-7D
Type B Class IV Pavement Line Marking 6"	LF	900	
Temporary Pavement Marker One-Way	Each	230	
NS Pavment Marking (Type D, Class I) 6"	LF	12000	
Construction Pavement Marking (Type E) 6"	LF	10020	
Construction Pave. Mark. (Type D, Class I) 8"	LF	13800	
Construction Pave. Mark. (Ty. D, Cl. I) 24"	LF	30	

SHOULDER WIDENING
SUMMARY OF ESTIMATED QUANTITIES (STRUCTURE 2006)

ITEM	UNIT	QUANTITY	REMARKS
Aggr. Base Mat'l Ty. 1, No. 21B	Ton	2460	
Asphalt Concrete Base Ty. BM-25.0A	Ton	1760	
Asphalt Concrete Ty. SM-9.5D	Ton	480	

SUPERVISED BY C.O. McDonald, P.E.
DESIGNED BY Gary A. Orvell
CADD OPERATOR
REVISED BY

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STRUCTURES AND BRIDGES

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Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED. NO.	SHEET NO.
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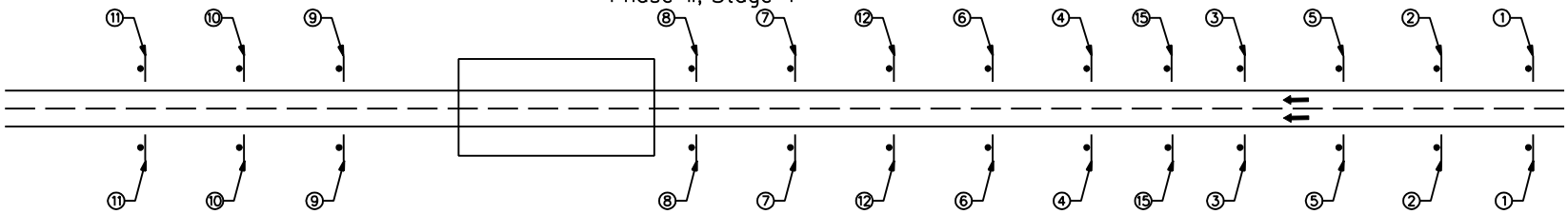
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

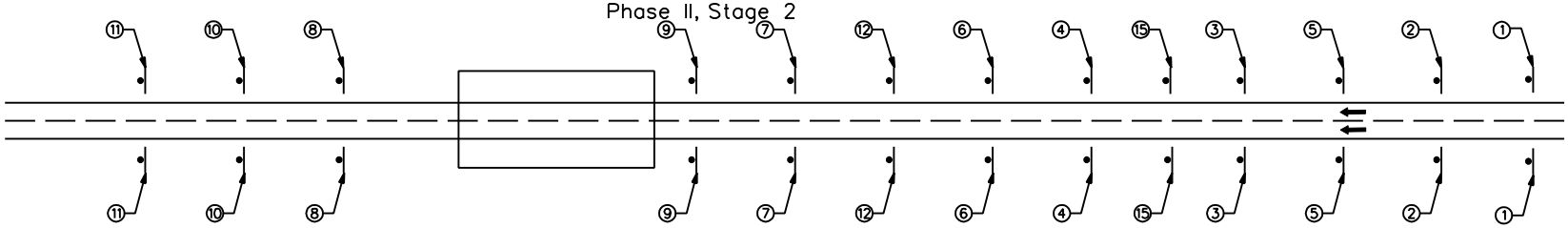
REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	17

Construction Sign Layout
I-81 Northbound Lane

Phase II, Stage 1



Phase II, Stage 2



W1-4bL

① ROAD UNDER CONSTRUCTION — VG- 60" X 24"

② ROAD WORK AHEAD — W20-1 48" X 48"

③ SPEED LIMIT 55 — W3-5 48" X 48"
W/ Type B Warning Light

④ WORK ZONE / SPEED LIMIT 55 — SPECIAL 48" X 12" / R2-1 48" X 60"
W/ Type B Warning Light

⑤ TRUCKS USE RIGHT LANE / NEXT X MILES — R4-5 48" X 60" / SPECIAL 12" X 48"

⑥ EXIT 128 TRAFFIC USE RIGHT LANE — SPECIAL 60" X 36"

⑦ STAY IN LANE — R4-9 48" X 60"

⑧ W1-4bR 48" X 48" / XX M.P.H. W13-1 24" X 24"
Advisory Speed to be determined by the Engineer

⑨ W1-4bL 48" X 48" / XX M.P.H. W13-1 24" X 24"
Advisory Speed to be determined by the Engineer

⑩ END ROAD WORK — G20-2a 48" X 24"

⑪ SPEED LIMIT 65 — R2-1 48" X 60"

⑫ NORTH 81 — VM3-1 30" X 42"
NOTICE / RESTRICTED WIDTH ROUTE / XX FT X IN — VR25-1 108" X 72"
W/ Type B Warning Light

⑮ NOTICE / FINES UP TO $500 FOR EXCEEDING SPEED LIMIT IN WORK ZONE — 108" X 54"
Orange 6"E, Solid Bar 1", 6"D, Margin Width 1½", Border Width 1", Corner Radius 4"

* Signs spacing shall be 1300 LF - 1500LF or as directed by the Engineer.

SUPERVISED BY: C.D. McDonough, P.E.
DESIGNED BY:
CADD OPERATOR: Gary A. Duvall
REVISED BY:

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PLAN NO.	PROJECT	FED. NO.	SHEET NO.
A			17

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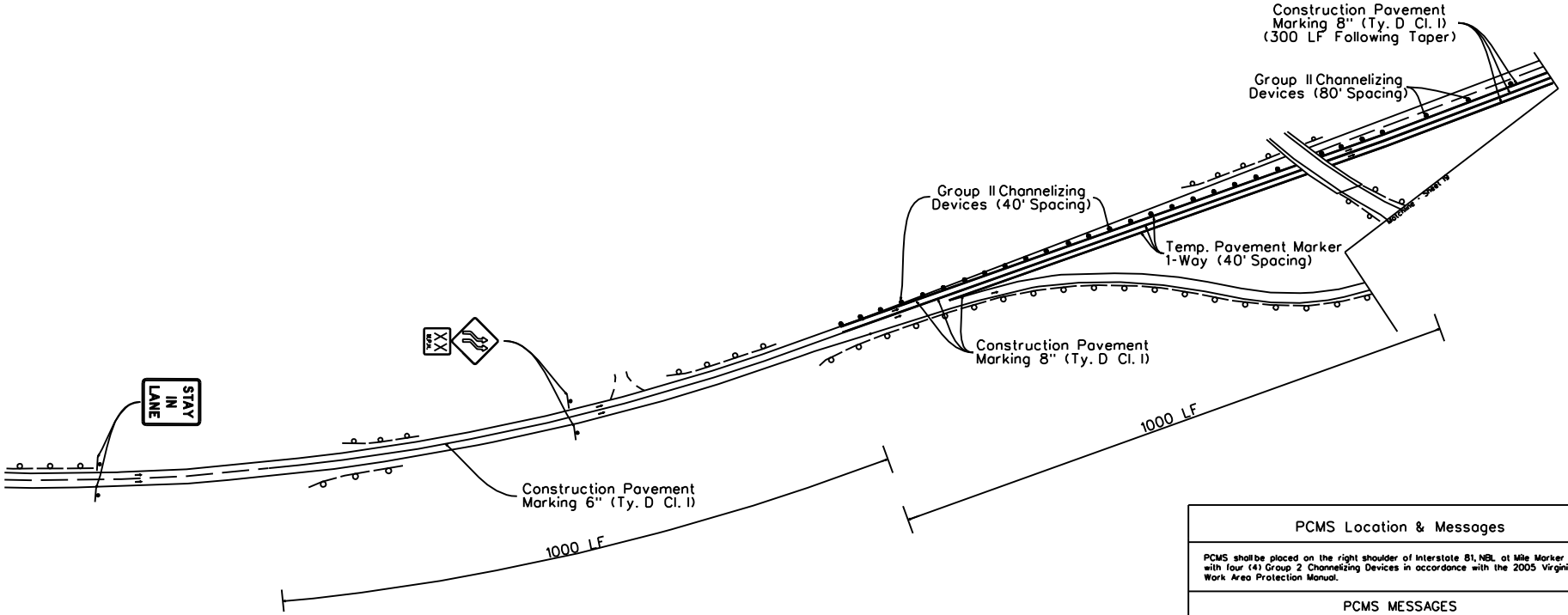
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage I

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	18



SUPERVISED BY: C.O. McDonald, P.E.
DESIGNED BY: Gary Lovell
CADD OPERATOR:
REVISED BY:

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Traffic Enginnering
Southwest Regional Operations

PCMS Location & Messages

PCMS shall be placed on the right shoulder of Interstate 81, NBL at Mile Marker 116.00 with four (4) Group 2 Channelizing Devices in accordance with the 2005 Virginia Work Area Protection Manual.

PCMS MESSAGES

Panel 1 Message	Panel 2 Message	Panel 3 Message
ROAD WORK AHEAD	MILE POST 128.0	EXPECT DELAYS

PLAN NO.	PROJECT	FED. NO.	SHEET NO.
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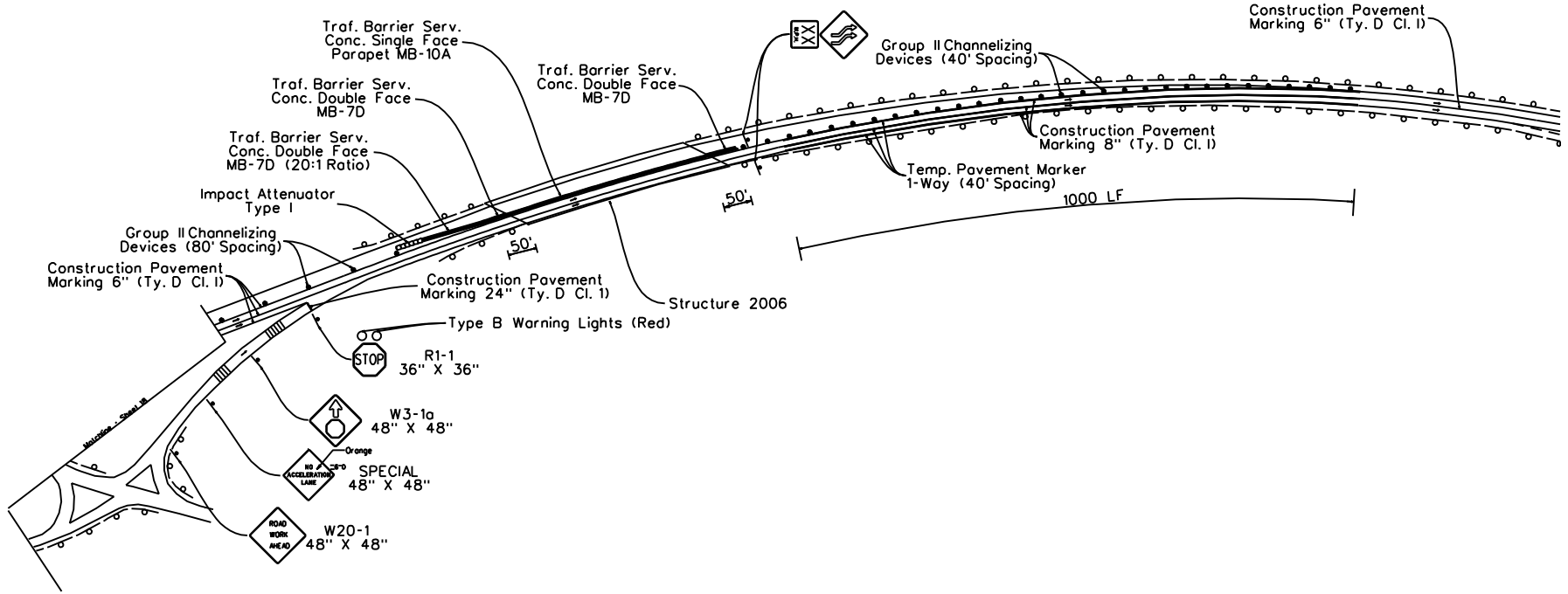
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage I

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	19



SUPERVISED BY: C.D. McDonald, P.E.
DESIGNED BY: Gary E. Orrell
CADD OPERATOR:
REVISED BY:

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Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED NO.	SHEET NO.
A			19

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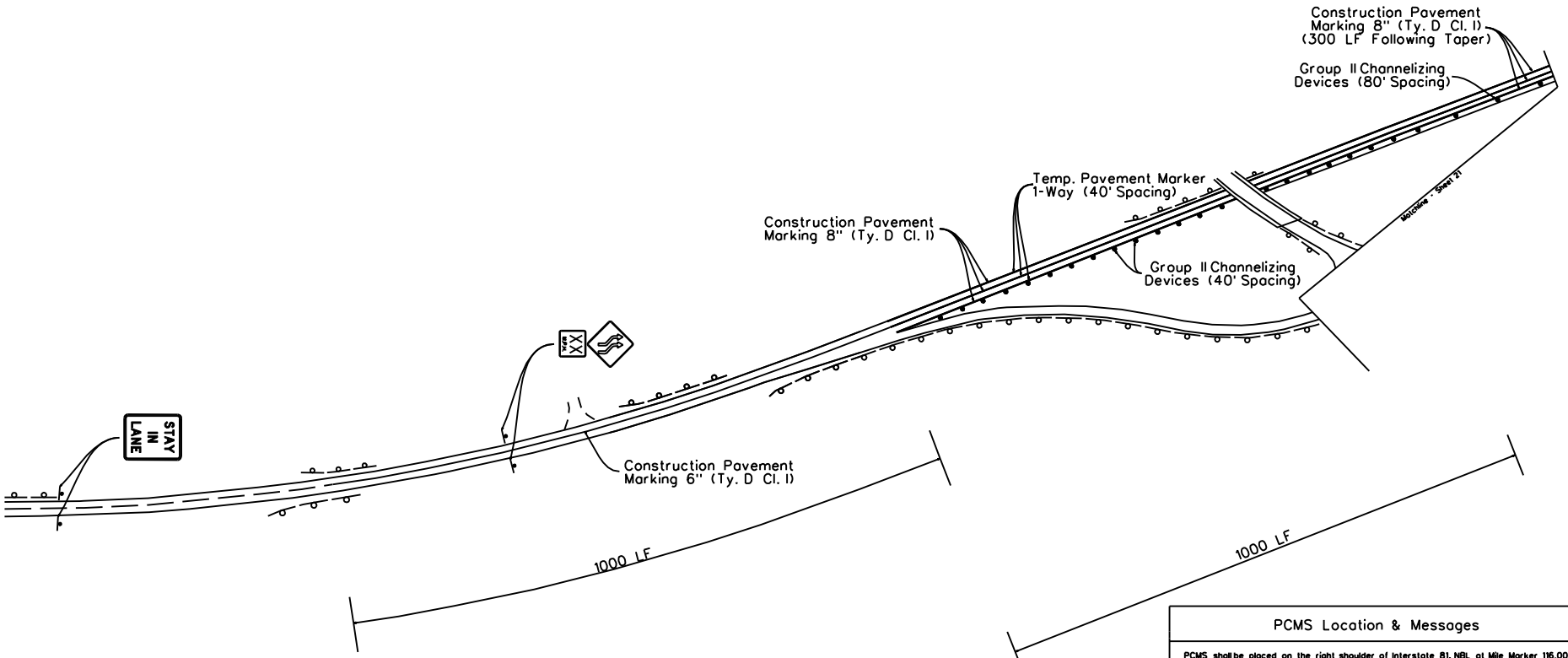
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage 2

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	20



SUPERVISED BY: C.D. McDonald, P.E.
DESIGNED BY: Gary Lovell
CADD OPERATOR:
REVISED BY:

PLAN
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VDOT
Traffic Enginnering
Southwest Regional Operations

PCMS Location & Messages

PCMS shall be placed on the right shoulder of Interstate 81, NBL at Mile Marker 116.00 with four (4) Group 2 Channelizing Devices in accordance with the 2005 Virginia Work Area Protection Manual.

PCMS MESSAGES

Panel 1 Message	Panel 2 Message	Panel 3 Message
ROAD WORK AHEAD	MILE POST 128.0	EXPECT DELAYS

PLAN NO.	PROJECT	FED NO.	SHEET NO.
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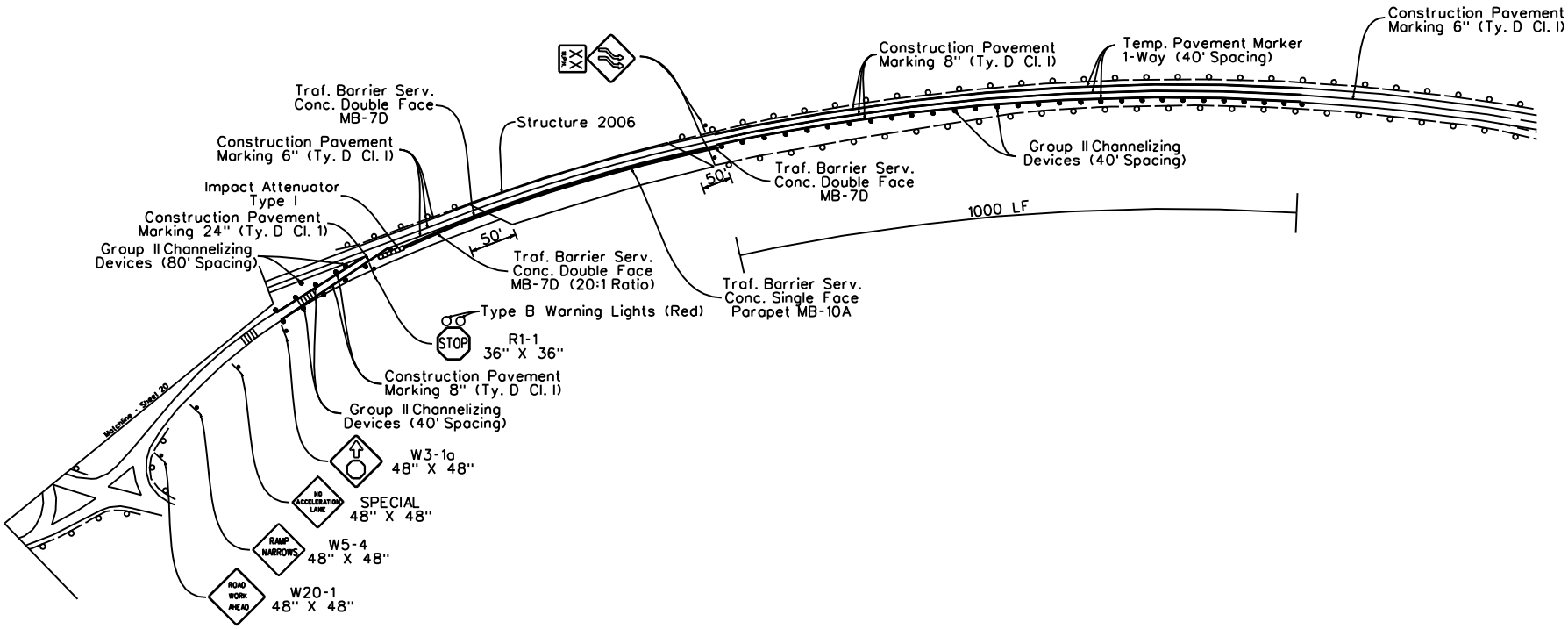
Temporary Traffic Control Plan
I-81 Northbound Lane
Phase II, Stage 2

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	21



SUPERVISED BY: C.D. McDonald, P.E.
DESIGNED BY: Gary A. Orndl
CADD OPERATOR:
REVISED BY:

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STRUCTURES AND BRIDGES

VDOT
Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED. NO.	SHEET NO.
A			21

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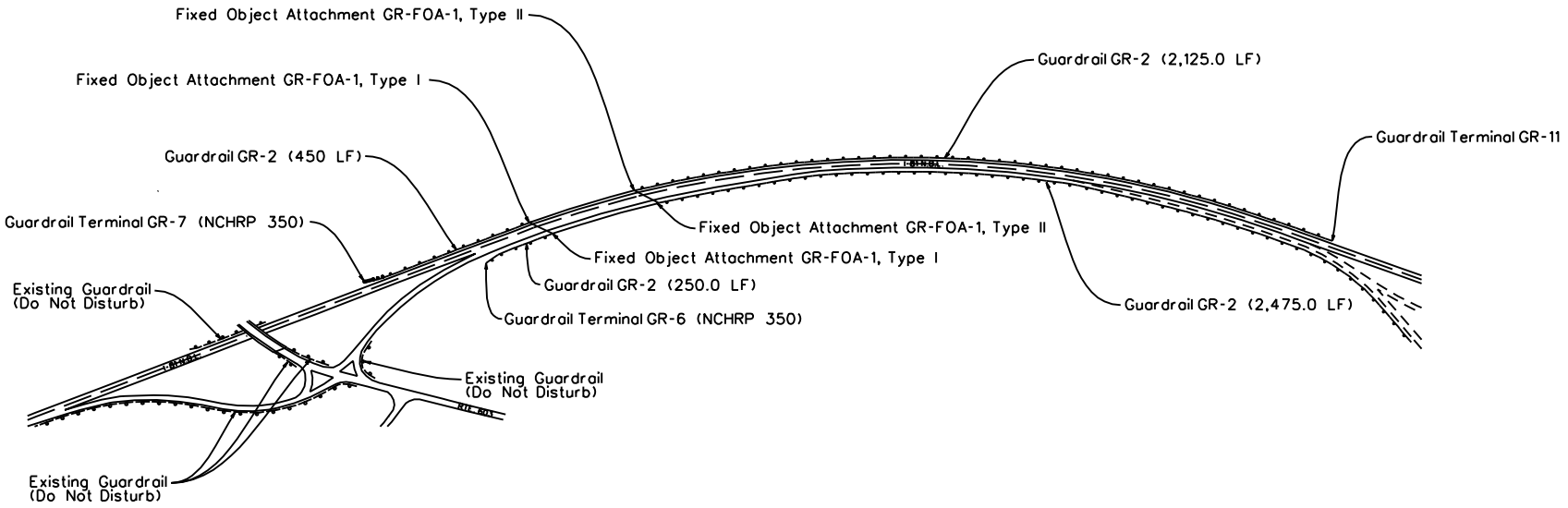
DESIGN FEATURES RELATING TO CONSTRUCTION OR TO REGULATION AND CONTROL OF TRAFFIC MAY BE SUBJECT TO CHANGE AS DEEMED NECESSARY BY THE DEPARTMENT

REVISED	FHWA REGION	STATE	FEDERAL AID PROJECT	STATE ROUTE	STATE PROJECT	SHEET NO.
	3	VA.		81	BR06-060-114	22

Guardrail Installation Plan
I-81 Northbound Lane



SUPERVISED BY: C.D.McDonald,P.E.
DESIGNED BY: Gary A.Orvell
CADD OPERATOR:
REVISED BY:

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STRAIGHT AHEAD

VDOT
Traffic Enginnering
Southwest Regional Operations

PLAN NO.	PROJECT	FED NO.	SHEET NO.
A			22

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Central Region Operations Traffic Engineering

Transportation Management Plan Recommendations Document

Project Development Stage: Preliminary Field Inspection

Project: 0033-042-107, C501 (Intersection of Route 33 & 54) **UPC#** 18948

The role of Traffic Engineering in developing the Transportation Management Plan (TMP) is to provide the Design Team with a Traffic Data and an Accident Data Analysis at PFI, to provide input pertaining to the *safe* and *efficient* management of traffic during construction, and to review the plans throughout the Concurrent Engineering process to ensure that traffic management and traffic safety have been sufficiently addressed in the TMP plan.

Traffic and Crash Data Analysis:

Results from Traffic Data Analysis:

For the year 2006, the AM Peak Hour heaviest traffic movement at the intersection of Route 54 & 33 is on Route 33 coming from the West and turning onto Eastbound Route 33 with 387 right turns per hour. In the PM Peak the heaviest movement is on Route 33 coming from the East turning onto Westbound Route 33 with 425 left turns per hour. The majority of the traffic through this project consists of commuters, residents and truckers. From our analysis we conclude that feasible **Off-Site detours** are not available and recommend the following:.

- From the Regional Operations Lane Closure Analysis – lane closures **will be allowed** between the hours of 9am to 3pm, and between the hours of 6:30pm to 5:30am for one-lane two-way operations.
- Follow the Holiday Restrictions outlined in the 2002 Road & Bridge Specifications
- Temporary Lane Widths should not be less than 11' wide.
- Traffic on Route 657, which carries 520 Vehicles per day in the year 2006 and expected to carry 710 VPD in the year 2016, will be impacted by the project. However, due to the relatively low traffic volumes, no specific actions are recommended
- Both existing left-turn lanes on Route 33 must be maintained during construction.
- After traffic is shifted to the proposed Routes 33 and 54, traffic must not be allowed to cut through along existing Route 54. The plan must effectively address this issue.

Results from Crash Data Analysis

In total there have been 16 accidents within 1000' and 1700' of the intersection (Rte. 54 & 33) over the past 3-year period. There have been 7 angel accidents within the operational area of the intersection. There have been 3 accidents at the east entrance of the Fast-Mart that can also be considered to be within the operational area of the intersection. There have been 3 angle accidents on Route 33 at the intersection of Route 657. As a result of these findings we make the following recommendations, some of which may need to be addressed with specific notes incorporated into the plans.

- Measures must be taken to ensure adequate sight distances during construction. Neither traffic control devices, nor signs, construction equipment, material storage, nor any other

obstacle can be allowed to interfere with **sight distances at entrances and intersections** on the project.

- It must be ensured that there is room within the right-of-way for storage of equipment and materials without creating a sight distance problem or introducing a fixed-object hazard to motorists.
- If during construction there is an existing sight distance obstruction at any entrance that can be easily removed, i.e. shrubs or signs that will be relocated anyway, etc, it must be removed as soon as possible.

Recommended Temporary Traffic Management Strategies

The following recommendations are based on a **Category II Project Complexity**. These recommendations should be incorporated into the plans by Public Hearing Stage.

A Well-thought-out Narrative for Sequence of Construction:

- The narrative for the *sequence* of construction must be clearly conveyed with each step numbered in a logical order so that whenever a step requires traffic to be shifted or affected in any way, all the steps necessary to make this effectual have been listed previous to this step in the sequence.

Plan-View Illustrations:

- In order to ensure that traffic can be maintained as proposed, the plan view illustrations must be to a standard scale, they must be neat and uncluttered, and must clearly illustrate the **sequence of the construction process**. Once the proposed design is shown in a phase, no existing design should be shown for those portions of the project in any subsequent phase, so as to clearly illustrate the process of construction and save time and errors in interpreting the plan. Only those items constructed in a previous phase, and those being constructed in the current phase should be shown as constructed in the current phase.

- In addition to what is required by IIM-LD-241, TED-343 for a category II complexity project, the plan-view for this project must also clearly illustrate the following:

    - Turning radii can be sufficiently maintained for the existing traffic.
    - Temporary pavement markings and markers of proper type and class in each location on the plans.
    - Turn Lane dimensions
    - Rather than place the **temporary signs** on the plans, the TTC number for the correct Traffic Control Typical Sections, see Work Area Protection Manual (WAPM), can be shown on the plans where appropriate.
    - All temporary signs that are not specifically addressed in the WAPM must be shown on the plans in the appropriate location.
    - Any unusual situations that are not covered in a standard must be illustrated in a detail or typical to clearly show how traffic is to be maintained at entrances, intersections, etc.
    - When denoting a work area on the plans, denote it all the way to the construction limits.
- Temporary Drainage - Must be addressed to prevent water-build-up in the travel-way.

- Permanent Drainage - The contractor will most likely want to install all drainage related items first (i.e. pipes, drop inlets, curb and gutter, etc.) Drop inlet, and curb and gutter installations must not be allowed to interfere with the safe and efficient flow of traffic.
- Cross-cuts for installation of drainage pipe - The plan must address how cross-cuts in the roadway will be covered after installation, i.e. asphalt, gravel, etc. Given the amount of traffic, we recommend asphalt.
- The proposed travel-way must not conflict with Utility installations.
- On-site detours must be designed with minimum 6 degree curves and superelevation must be addressed where necessary.
- Excavation – Excavation next to the edge of pavement should be treated with a 6:1 wedge (typical general note) whenever feasible, or otherwise protected.
- If traffic barrier service is deemed necessary to protect a hazard, ensure that it can be placed properly and that all blunt ends are protected.
- Attention must be give to efficiently maintaining convenient access to all commercial entrances.
- It must be ensured that any temporary grades are traversable.
- Pedestrians must not be prevented from passing through the work zone.

Phased Cross-Sections

- Cross-Sections for each phase of construction must be provided for **each tie-in**, **and for the Route 33 section of roadway construction** (where traffic is being shifted to the east and west). The cross-sections must show proof that the lane and shoulder widths, etc, can in fact be maintained as proposed throughout these sections of roadway and within the limits of right-of-way. The following must be **illustrated on the cross-sections**. (see example attached):
    - Travel-way
    - Travel Direction Arrows
    - Dimensions of travel-way and shoulder width
    - Traffic Control Device Placement
    - Work Area
    - Temporary Pavement
    - Legend
    - Shorten the distance between cross cuts in critical areas to ensure that no hazard or obstruction will be overlooked between cross-cuts.
    - Ensure that where slopes tie in that there is no encroachment upon the travel-way.

Informative Traffic Management Notes:

- The **Work Zone Clear Zone** (different from Design Clear Zone) must be clearly stated in the Traffic Management Notes to bring attention to its importance throughout construction.
- If lane widths have been reduced throughout the entire project it must be noted in the notes. If widths have only been reduced along portions of the project, a list of the affected stations must be provided.
- All applicable Traffic Management General Notes pertaining to the safe and efficient flow of traffic must be incorporated into the plan and must not contradict any instructions detailed elsewhere in the plan.

Estimate Appropriate Use of Temporary Traffic Control Pay Items:

- Ensure that all necessary construction pay items relative to traffic and safety are included on the summary sheet.
- Eradication: A Quantity for all necessary eradication of existing pavement markings must be included on the summary sheet
- Flagger Hours – This project will most likely require at least 3 flaggers at some point. The number of **hours required** should be discussed with the constructability team.

Transportation Operations Strategies

This plan is required *if* the work zone will be greater than ½ mile in length and/or has reduced-width travel lanes. Development of this plan must be coordinated by the Project Manager. See IIM-LD-241, TED-343 for guidance. A procedure should be developed for notifying the Project Manager and Regional Operations Manager of any traffic delays caused by work **outside the allowable hours for lane-closures**

Public Communications Strategies:

We recommend the following relative to this part of the plan:

- The public should be notified of the expected start date for this project and informed of the potential for back-ups during the hours between 9am to 3pm, and between the hours of 6:30pm to5:30am.

Virginia Department of Transportation
Central Region Operations Traffic Engineering (CRO-TE)

CRO - TE

Date: September 27, 2007

Spring Run Construction Area Transportation Management Plan

CRO-TE Recommendations for

Project: **0622-020 Spring Run Road**

UPC Number: **17177**

Federal Funds – Yes

Preliminary Field Inspection Stage

Category of Project Complexity: Category-Two

Table of Contents:

Glossary of Terms

Maintenance of Traffic Design (MOT) – A Maintenance of Traffic Design refers to a proposed design of an *on-site* temporary roadway alignment, which is limited to the project limits.

Sequence of Construction (SOC) A Sequence of Construction refers to a constructability plan that may be in narrative form, with or without illustrations, describing the proposed sequence in which construction must progress in order to ensure continuity in the process of constructing. The SOC describes the phases of construction with focus on what must take place within one phase before construction can progress to the next phase.

Temporary Traffic Control Device Layout (TTCDL) A Temporary Traffic Control Device Layout refers to the proper application and placement of temporary traffic control devices. The focus is on properly *delineating and highlighting* the proposed temporary roadway alignment design and/or an off-site detour.

Transportation Management Plan (TMP) – A construction Transportation Management Plan refers to a strategy for managing construction-year traffic that is expected to be impacted by the construction of a project. The impact may extend to surrounding roadways, schools, emergency services, businesses, etc. The focus is not limited to the limits of a work zone but rather it involves an area-wide assessment. The scale of the assessment and resulting strategy depends on the overall impact of construction and the volume of pedestrian, bicycle and vehicular traffic involved. A construction TMP may include accident mitigation strategies, congestion management strategies, performance standards, a MOT Design, a SOC strategy, a Temporary Traffic Control Device Layout, a Public Information Plan, an offsite detour, etcetera.

Recommended Strategy

Close the Road as outlined below and set-up an Off-Site Detour Utilizing Bailey's Bridge Road and Deer Run Road based on the following assessment.

Length of Detour – From beginning to end the detour is less than 5 miles long.

From Southern most church entrance to Springford Pkw = 1.3 miles
From Springford Pkw to Norwood Pond (off Spring Run) = 3.5 miles
Total Length of Detour Route **4.9 miles**

Estimated Construction Time with a Detour is **90 days**

Map of Proposed Detour Route

Assessment of Construction Impact

Determining Factors:

- Existing Intersection Sight Distance Deficiencies – The permanent design will require at least a 3-foot cut at the intersection of McEnnally and Spring Run Road. During construction, overall intersection sight distances, which are already deficient, will likely be exacerbated

due to grade cut phases and traffic shifts, and worsened further with the placement of traffic control devices.
- Roadside Hazards – Grade cuts close to the existing travel-way may pose hazards difficult to protect.
- The Work Zone clear Zone would be 15 feet in order to maintain posted speed at 45-MPH, and 8' if reduced to 35-MPH.
- Potential for Traffic Pattern Changes – Temporary pavement widening and various traffic pattern changes may be required in an effort to construct the proposed roadway under traffic.
- Placing Traffic on Stone is not recommended (over 2000 VPD).

Assessment of Off-site Detour Strategy

Determining Factors:
- Inevitable Road and Entrance Closures - Closing McEnnally Road and the northern-most entrance to Swift Creek Baptist Church will most likely be necessary to avoid exacerbating existing sight distances during construction.
- Route Alternatives – There are a number of other routes (off the proposed detour path) that some motorists are likely to take depending on their own specific origin and destination.
- The Lowest Posted Speed along the proposed detour is 35MPH.
- Pavement Marking Exists on all of the routes along the proposed detour.
- Private Entrances – Only two are located within the Work Zone.
- Impact on Traffic Signals at Route 360 – We do not anticipate a significant adverse impact by utilizing the detour for an estimated 90 day construction timeframe.

Advantages to Proposed Off-site Detour and Closing the Road:
- Safety is enhanced for both the motorist and the worker:
  - By eliminating conflicts within the work zone and at an intersection with existing sight distance deficiencies.
  - By reducing the potential for violating expectations with traffic pattern changes.
- Less Inconvenience to Public – Proposed detour reduces estimated construction time by 71 calendar days, bringing it down to 90 days.
- Project Schedule and Completion Date – Without an off-site detour an On-site Maintenance of Traffic Plan must be designed and coordinated with a Sequence of Construction Plan providing illustrations, including cross-section details, to prove that the plan is safe and constructable under traffic. Most of this would not be necessary with an off-site detour, which should allow the project to be designed and advertised sooner, thus addressing the existing sight distance deficiencies sooner.
- Project Cost – With an off-site detour, the design and plan review hours required would be significantly reduced, costing the taxpayer less for the project.

Disadvantages to Off-site Detour and Closing the Road:
- Additional Travel Miles (for some)
- Additional Travel Time (for some)
- Additional Traffic temporarily along the detour route.

- A Uniformed Traffic Controller *might* be needed at some point temporarily at intersections near school zones.

Collaboration Requested *60 days Prior to Public Hearing*

Successful Operation of the Proposal Detour is Dependent upon Collaboration

- Contracts and Scheduling:
  - Construction Timeframe - Request commitment from District Construction Management to a set timeframe.
  - Notice to Proceed – Request commitment from District Construction Management to a date that will secure summer construction, thus decreasing weather related delays and reducing school related travel (buses, students, parents, teachers, etcetera)
  - Fire and Rescue/Emergency Passage - Given the location of area-wide Fire and Rescue facilities, we request that the Sequence of Construction include a maintained *traversable* surface adequate to accommodate emergency type vehicles in an *emergency* situation. Perhaps the Project Manger could get agreement from the church to use their entrances for most of this surface.
- Project Management and Work Zone Coordination:
  - Construction Projects – Request that Project Management provide, for evaluation, a list of all other construction projects expected to be under construction in the area that might adversely affect the operation of the detour.
  - Permit and Maintenance Projects – Request that District Construction Management coordinate permit and maintenance projects so as not to adversely affect the operation of the detour. Perhaps 511 monitoring to prevent conflicts.
  - Future Development – It is requested that the Residency supply the location of any future development (e.g. sub-division, retail, recreation, etc.) in the area that could adversely impact the detour.
  - Additional Traffic Data – If the County is open to a detour, additional Turning Movements must be collected to verify that the traffic impact along the detour route is acceptable. Traffic Engineering will acquire some of this data, while some the main intersections may need to be provided by the Project Manager.
- Temporary Turnaround Design Assessment:
  - Request that the Designer evaluate the project termini, including that on McEnnally Road, for sufficient R/W and terrain to design a temporary turnaround, which may or may not need to accommodate school bus traffic.
- School Bus Pick-up Points:
  - Project Management - Although the goal is to construct the project while school is out of session, school bus pick up points that will be disrupted by the detour must be evaluated to determine how best to delineate the temporary condition. Request that the Project Manager inform us as to how best to go about acquiring this information.

Proposed Road Closures and Estimated Impact

Overall Impact: Impact varies depending on origin and destination. Impact is limited to 90 days.

Road Closed to Thru Traffic on McEnnally Road:

- Other Routes/Intersections Affected – Winterpock and Route 360, which has dual-right and dual-left turn lanes to help accommodate the additional traffic. Even without the proposed detour this Road would most likely need to be closed in order to maintain existing sight distances during construction.
- Side Note - Truck Traffic is Already Prohibited on McEnnally – Posted Speed is 25 MPH

Road Closed to Swift Creek Baptist Church:

- The Northern Most Entrance Closed - The Church has another entrance just south of this main entrance, that entrance will remain open at all times. Impact is limited to certain days of the week. Even without the proposed detour this entrance would most likely need to be closed in order to maintain existing sight distances during construction.
- Sunday Service – 11AM to 6PM

Road Closed on Spring Run Road - just south of Norwood Pond, and just north of the southern most entrance to the Swift Creek Baptist Church:

- Peak Traffic at Main Intersection - The A.M. peak traffic at the intersection of Spring Run Road and McEnnally Road (traveling north and south) is 468 vehicles per day. The P.M. peak traffic is 444 vehicles per day.
  - Other Intersections Impacted - Traffic along Bailey's Bridge Road, Dear Run Road and all of the intersections along the way will be impacted by the additional traffic on these routes. Impact varies depending on origin and destination. Impact is limited to 90 days.

Special Signing - Temporary Traffic Control Layout (TTCL)

Message Boards - In addition to Standard Road Closure and Detour Signing, Message Boards are recommended to be place (specific locations to be determined later), 7 days prior to the start of construction and for a minimum of 3 days after that the start of construction.

Transportation Operations Strategies

Signal Timings – the traffic signal timings affected by the detour will be adjusted if necessary by the Central Region Operations Smart Traffic Center.

Public Communications Strategy

To Reduce Public Inquiry – In addition to advance notification of the detour implementation via Radio and TV, consideration should be given to providing Flyers that include a Map of the Detour and a condensed version of the Determining Factors and the Advantages and Disadvantages of the Detour.

Additional Analysis Information

Posted Speeds on Proposed Detour Route

Dear Run	= 35 MPH
Bailey's Bridge	= 35 MPH
Spring Run	= 45 MPH

Construction-Year (approximate) Peak Hour Turning Movements

Intersection of Spring Run Road & McEnnally Road (Route 702) - Year 2010

A.M. Peak
410 vehicles turning left off of Rte 702
149 vehicles turning right off of Rte. 702
468 vehicles going north on Spring Run
179 vehicles going south on Spring Run

P.M. Peak
120 vehicles turning left off of Rte 702
91 vehicles turning right off of Rte. 702
276 vehicles going north on Spring Run
444 vehicles going south on Spring Run

Results of Project *Traffic Data* Analysis:

For year 2010 traffic is projected to be 8,350 VPD (use this for *construction-year* volumes). This count takes into account that this project is included in the Richmond MPO Area Long-Range Transportation Plan. The traffic through this project consists mainly of local residents. Truck traffic is prohibited on McEnnally Road

For the year 2010 (approximate construction year)

- AM Peak volumes on Spring Run Road are 1080 vehicles
- PM Peak volumes on Spring Run Road are 940 vehicles
- AM peak volumes on McEnnally Road are 610 vehicles
- PM peak volumes on McEnnally Road are 350 vehicles
- AM peak volumes at Church Entrance are 40 vehicles
- PM peak volumes at Church Entrance are 70 vehicles

Results of Project *Crash Data* Analysis:

Evaluated accident data on Spring Run Road from 1000 feet south of McEnnally Road to 1000 feet north of McEnnally Road, and on McEnnally Road 500 feet west of Spring Run Road.

Over a 3-year period between 04/01/04 to 03/31/07 there were *7 accidents* on Spring Run Road and *1 accident* on McEnnally.

- Accidents on Spring Run Road *Within Project Limits*
  5 Fixed-Object Run-off-the-road 2 Non-Collision

- Accidents on McEnnally Road Within Project Limits
  1 Fixed-Object Run-off-the-road

Detour Routes Evaluated and Rejected:

Utilizing Buck Run and Chital Drive:

Buck Run Posted Speed		= 30MPH
Dear Run	"	= 35MPH
Chital Drive	"	= 35mph
Bailey's Bridge Road	"	= 45 MPH

Although shorter in length than the proposed detour this detour route would put additional traffic on a sub-division street (Buck Run), where bicycle and pedestrian traffic are likely at certain times of the day and week. It would introduce a stop condition at Buck Run, plus a left-turn movement at Deer Run and introduce a left-turn movement at Deer Run and Chital Drive.

Utilizing Bailey's Bridge Road, Excluding Deer Run Road
Route the traffic along Bailey's Bridge Road to Route 360.

From the Church entrance to Springford Pkw	= 1.3 miles
From Springford to Norwood Pond along Bailey's Bridge	= 8.5 miles
Total length of Detour	9.8 Miles

Conclusion: This detour route is too long and most likely would not serve the needs of the majority of Spring Run Road motorists.

From Springford Pkw to Hull Street (utilizing Bailey's Bridge Road)	= 4.4 miles
From Springford Pkw to Route 288 (utilizing Bailey's Bridge Road)	= 5.6 miles

If you have any questions pertaining to this document please contact,

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Examples of Temporary Traffic Control Plans

TYPE C

2008 Transportation Management Plan

for the

Woodrow Wilson Bridge Project

Contract VB-2/3/6

I-95 / I-495 / VA 241 (Telegraph Road) Interchange

October 12, 2007

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EXECUTIVE SUMMARY

Construction of the new I-95 / I-495 / Telegraph Rd interchange (VB-2/3/6) will create substantial traffic impacts especially during the early phases of construction when I-95 is reduced from eight to six lanes. Efforts to mitigate these impacts include the use of traffic management technology, proactive reviews, public outreach and enforcement. Variable Speed Limit (VSL) will play a large role in helping to manage construction-related traffic impacts and require additional resources. Implementation of a VSL system will attempt to actively manage speeds approaching and through the work zone as a means of encouraging speed limit compliance and minimizing operating speed differentials. However, VB-2/3/6 is only one of many major projects that will start construction in northern Virginia in 2008. A regional TMP that encompasses the high level emphasis of all mega-projects in the area should be developed to expedite construction while maintaining work zone safety and mobility.

INTRODUCTION

Federal Highway Administration's (FHWA) final rule on Work Zone Safety and Mobility, 23 CFR 630 Subpart J, requires all state and local transportation agencies that receive Federal aid to comply with the guidelines for Transportation Management Plans (TMP) as of October 12, 2007. The Virginia Department of Transportation (VDOT) issued "IIM-LD-241: Transportation Management Plans" on August 16, 2006 as a measure of complying with the final rule requirements. IIM-LD-241 actually expands the stipulation by requiring that all VDOT projects advertised after October 11, 2007 adhere to IIM-LD-241 regardless of the funding source. In this pursuit, the Woodrow Wilson Bridge (WWB) Project contract VB-2/3/6, advertised in August 2007, is provided with this Transportation Management Plan, consistent with the guidelines of IIM-LD-241.

The scope of the VB-2/3/6 contract includes complete reconstruction of I-95 / I-495 from the Eisenhower Ave Connector interchange to a point just east of the VA 241 (Telegraph Rd) interchange. I-95 / I-495 will be widened from an eight-lane roadway to a twelve-lane local and express roadway network. I-95 ramps will provide direct access to Huntington Ave, N. Kings Hwy and Eisenhower Ave. VA 241 (Telegraph Rd) will also be widened one lane in each direction with an additional signal at the intersection of relocated Burgundy Rd / Lenore La. The estimated value of the VB-2/3/6 contract is approximately $185 million. NTP is currently anticipated for March 2008 and construction complete in 2013.

IIM-LD-241 guidelines establish a project's TMP requirements based on the project's level of complexity. These guidelines categorize a project into one of three types of transportation management. Category 1 projects are simple projects of minor roadway widening with usually a single phase of construction such as maintenance, utility or permitted projects that are anticipated to have a

minimal traffic impacts. Category 2 projects are moderately complex projects such as construction of an additional through lane including bridge widening with usually multiple phases of construction that are anticipated to have moderate traffic impacts. Category 3 projects are highly complex projects including corridors of interstate and interchange reconstruction with high traffic volumes, multiple phased construction that are anticipated to have major traffic impacts beyond the project limits. VB-2/3/6 is identified as a Category 3 project.

According to IIM-LD-241, the minimum Category 3 TMP requirements include an extensive Temporary Traffic Control Plan, Public Communication Plan and Transportation Operations Plan. The following sections describe these details that are associated with the VB-2/3/6 contract.

TEMPORARY TRAFFIC CONTROL PLAN

The VB-2/3/6 Temporary Traffic Control Plan (TCP) was recently finalized on June 28, 2007. The TCP includes a detailed sequence of construction, general notes, typical section and special details for implementing over 20 phases of construction. The TCP references that all work shall be conducted in compliance with the Virginia Work Area Protection Manual (VWAPM) and in some cases, references a specific Typical Traffic Control Standard. Entrances, intersection and pedestrian access points are referenced with specific details of how the address access will be modified by the work zone or by the traffic control devices. In some cases, pedestrian access is maintained via detour routes around the work area which are outlined in the TCP.

This TCP was developed to be site specific for all phases of construction including the identification of each work zone location, the length and width of each work zone, and the lanes affected by each phase of construction including the available lane and shoulder widths. Each phase of construction shows the type and location of all traffic control devices per the VWAPM and includes sign design of all temporary, non-standard signs. The type and location of all temporary pavement markings, temporary pavement, temporary barriers and impact attenuators / end treatments / fixed object attachments are detailed in the TCP.

The current contract scope includes major improvements including bridge construction, roadway widening, drainage improvements, etc., all of which require significant work space for construction. During the planning of this contract, efforts were made to expedite construction while minimizing traffic impacts. Among the choices were #1) minimally impact traffic and extend construction duration, #2) increase the level of traffic impacts, mitigate those impacts as best as possible and reduce construction duration, or #3) split I-95 traffic around multiple phases of construction creating relatively small work areas and incur moderate traffic impacts. Splitting traffic creates safety concerns, is inefficient for construction, and not recommended for the high traffic volumes

along this portion of I-95. Thus #2 was selected as the "best value" for motorists and taxpayers as a means of getting the work done as quickly as possible while mitigating traffic impacts.

In the sequence of construction, details are included to specify when new overhead signs and permanent lighting should be operational. Temporary overhead sign overlays and unique traffic control devices (e.g. reboundable curb with flexible delineators) are also detailed. Signal timing adjustments are referenced in the TCP and will be coordinated through the WWB General Engineering Consultant (GEC) to ensure minimal traffic impacts during traffic switches or when detours are implemented. In short, all details, dimensions and explanatory notes required to implement the work zone setup are included in the VB-2/3/6 TCP.

The VB-2/3/6 special provisions outline the hours the work zone will be active and when single and multiple lanes may be temporarily closed. Monetary penalties are also included and may be assessed for late lane closure pickup. The VB-2/3/6 plans also identify staging areas. Since the WWB Project began in 2000, project staff has developed a historic perspective of driver behaviors and the major types of travelers that are anticipated to travel through the VB-2/3/6 work zone. In the infrequent event that a portion of the TCP does not cover a particular piece of work, the special provisions require the contractor to submit a site specific TCP (and traffic analyses, if necessary) for review and acceptance. As a result, all areas of the work zone will follow an accepted site specific TCP which will significantly improve compliance to the VWAPM and the national Manual on Uniform Traffic Control Devices (MUTCD).

When construction begins for VB-2/3/6 in spring 2008, ongoing construction will continue at the US 1 interchange. In fact, the eastern most limit of the VB-2/3/6 project will overlap with the US 1 interchange construction efforts. As a result, project coordination will be required to ensure temporary lane closures and various traffic switches allow both contractors to work with minimal impacts. This type and level of coordination has been ongoing since 2001 when multiple contractors were working in the WWB project corridor in Maryland and Virginia. Several milestone and access release dates are included in the VB-2/3/6 contract to eliminate conflicts between nearby contractors and provide incentives and disincentives for early and late completion of high risk work areas.

The TCP for VB-2/3/6 has two unique aspects that are anticipated to impact traffic operations:

First, in the first phase of work, I-95 / I-495 will be reduced from four, 12 ft wide lanes to three 11 ft wide lanes in each direction throughout the VB-2/3/6 project limits. Although the existing WWB and I-95 / I-495 area through the US 1 interchange only contains three lanes in each direction, extending this lane reduction another three miles will likely generate additional congestion during

peak hours and while temporary lane closures are setup. Mitigation and public outreach strategies are discussed later in this document.

Second, during the first phase of work along I-95 North / I-495 East (Outer Loop), the lane configuration will be significantly different through the Eisenhower Ave Connector interchange. In the three lane configuration, two mainline lanes (lanes 1 and 2) will continue across the bridge over Eisenhower Ave Connector, but one mainline lane (lane 4) will use the off- and on-ramp at the interchange. Also, exiting traffic bound for Eisenhower Ave Connector will be in a new "exit only" condition in between the mainline lanes (lane 3). See attached TCP plan sheet for more details.

The TCP for VB-2/3/6 is available for review at the Wilson Bridge Project Office. Attached are special provisions related to temporary traffic control plans and detours, traffic analysis and the Wilson Bridge Lane Closure Policy. The most recent schedule of VB-2/3/6 construction including phase switch dates is also included as an attachment.

PUBLIC COMMUNICATIONS PLAN

A proactive communications and outreach plan will be deployed to support the traffic management program of the VB-2/3/6 Telegraph Road Contract with the following goals and objectives:

1. Inform local and long-distance travelers about traffic changes and impacts associated with VB-2/3/6, specifically the long-term lane reductions, and to motivate behavior changes (auto trip diversion and mode change)

2. Educate travelers about the project's primary congestion mitigation strategies of managing traffic flow through the Variable Speed Limit (VSL) program and providing real-time traffic conditions and estimated actual travel times through roadway signage and the Internet.

3. Tie-in public awareness campaign and messaging with regional message of major traffic impacts occurring over the next five years throughout Northern Virginia.

Key Messages

Through all communications efforts, several key messages will be emphasized. The overriding project-wide message is that the Woodrow Wilson Bridge Project is 75 percent complete, with substantial completion of the bridge, Maryland and Virginia Route 1 Interchanges expected in late 2008. Eight years into construction and the overall project remains on-time and on-budget. The key messages will emphasize that despite this significant progress, major congestion relief won't occur until the final phase of the project, the Telegraph Road Interchange Project, is complete.

The Telegraph Road Interchange and adjacent local/express lane Beltway in Virginia will require lane reductions on the Beltway/I-95 from late spring 2008 to as late as summer 2010, causing traffic delays during peak, overnight and weekend travel times. The lane reduction initially will extend and later will move the three-lane condition that exists over the Potomac River into Virginia in the vicinity of the Telegraph Road Interchange. While reducing the Beltway to six lanes is expected to have some negative impacts, it eliminates one or two major phases of construction which could have required a longer construction schedule of over one year. Due to these expected traffic impacts, it will be important to emphasize the magnitude and complexity of the I-95 / I-495 / Telegraph Rd Interchange construction contract – it is the largest single construction contract ever advertised by VDOT to date.

Telegraph Road Interchange construction is just one of numerous transportation improvement projects that will be under construction throughout Northern Virginia during the next five years. The key messages will inform motorists that they should expect several years of pain for the gain, and should plan ahead and stay informed on the changing traffic conditions and possible delays. Motorists also will be encouraged to consider ridesharing alternatives to driving during the long-term lane reductions.

VDOT's commitment to keeping traffic moving during construction also will be a key message in the outreach program. The following congestion mitigation strategies, aimed to reduce traffic delays, will be heavily promoted:

- Managing traffic flow to enable maximum possible efficiency through cutting-edge Variable Speed Limit technology.

- Deploying advance signage and Web based information offering up-to-the-minute traffic conditions and real-time travel time estimates throughout the I-95/I-495 corridor.

- Keeping the traveling public informed through a proactive awareness campaign.

- Providing active incident management including a quick-clearance strategy

A final key message will focus on the ultimate benefits that the significantly upgraded Telegraph Road Interchange design will bring, such as delivering much better traffic flow than the original design. It also will be important to educate the public on the construction timeframe, which is not expected to be completed until 2013, as well as the overall estimated budget.

Promoting Variable Speed Limit and Real-Time Information

VDOT's commitment to managing traffic flow during construction will be at the forefront of all communications efforts. Enabling as many vehicles to pass through the corridor safely will be communicated as a top priority.

Specifically, the communications program will work to educate the traveling public on new technologies and techniques that will be deployed to enable as many vehicles to pass as possible. The Variable Speed Limit (VSL) system is one key initiative, as it employs a variable speed limit to boost the efficiency of the Beltway by ensuring approaching traffic is integrated gradually rather than all at once.

The communications program will highlight the following key points about the VSL initiative:

- VSL will be deployed when additional lane reductions are in place.

- Enforcement will be conducted by enhanced Virginia State Police patrols.

- VSL delivers better traffic efficiency under the same premise as rice grains passing through a funnel: Attempting to force all the rice grains through at the same moment will clog the funnel, whereas efficiently regulating the entry of the grains enables them to pass through quickly.

- VSL has been used successfully in other locations; primarily in Europe to date. This will be the first real test of VSL in an urban, congested, interstate setting.

- This VSL effort is a test / pilot effort. The VSL theory and modeling indicate that it will help improve safety and reduce speed differentials during times when temporary lane closures are setup. If this system proves to be beneficial here, it may be considered on other similar type projects – if it doesn't work, removal of the system will be considered. Accident rates will be closely monitored when VSL is first implemented to determine if the system is having an undesirable safety result.

In addition to promoting the VSL system, the communications program will promote the project's efforts to provide real-time traffic information to drivers, so they will be empowered to change their route or shift their time of travel. This real-time travel information will be provided through the deployment of portable variable message signs along I-95/I-495 and information accessed from www.wilsonbridge.com and other means (potentially via mobile units such as Blackberries, etc.). This real-time information will be shared with VDOT's STC in order to update Virginia 511 and permanent DMS as appropriate.

Planning Needs

Prior to developing specific communications deliverables, it is important to complete several planning steps. First and foremost, the team will develop compelling and layperson-friendly visual and textual explanations of why the long-term lane reductions, related to the Telegraph Road Interchange construction, are unavoidably necessary. Through reader-friendly maps, the team will graphically show the phasing and limits of the work.

To reinforce the key messages, it will be important for the team to communicate estimates lengths of backups with current traffic loads for AM, PM and weekend peaks – this information will need to be provided through traffic modeling. This modeling should show estimated backup lengths screened at 2-3 diversion rates.

Additional information regarding ridesharing options information including transit and telecommuting (extending farther into Fairfax County) will be needed for use on the website, newsletter and other collateral materials.

To effectively communicate the VSL system, it is recommended that a new name for VSL be explored, particularly a name that communicates the *benefit* of the program (possible names may include: "*Trip Quicken System", "Similar speeds, smoother ride" or "Travel together, get there together."*) *A l*ayperson-friendly explanation of VSL's goals, implementation date, anticipated hours of operation and experience elsewhere will be developed.

Other congestion mitigation "Keeping You Moving" strategies also will need to be defined, including possible redeployment of organized van- and carpools and transit options.

Timing and Tactics

The following communications tactics and timing is recommended:

- **Late 2007:** News release announcing award of VDOT's largest-ever contract. Utilize contract award as hook to alter current public expectations of major relief in 2008 and to advise of the Telegraph Road contract extension to 2013.

- **December 2007/January 2008:** Media and traffic reporter briefings to introduce VSL and expected start of construction in spring 2008, as well as the extension of the three-lane condition (see detailed plan below).

- **March/April 2008:** Advance briefing for Virginia state and local elected officials is recommended. Doing so will ensure elected officials are informed of the traffic impacts ahead of their constituents, and helps build officials' understanding and support.

- **March/April 2008:** Commence paid advertising and earned media outreach campaign (see detailed plan below) noting start of construction and extension of three-lane condition, as well as other more specific impacts such as the unique lane configuration of OL through Eisenhower Ave Connector Interchange.

- **March/April 2008:** Additional media and traffic reporter briefings to give specific information related to the start of construction.

- **July 2008:** Utilize opening of second Woodrow Wilson Bridge to highlight three lane condition now limited to vicinity of Telegraph Road.

- TBD Beyond

Materials Development

The following collateral materials are recommended to be distributed electronically and in hard copy through mailings, special events and at VDOT information stores:

- Layperson-friendly maps showing impacts, limits and phasing of work. Maps used on website, display boards, fact sheets, newsletters, etc.

- Consider producing animation CDs, as was produced for 2005 and 2006 major traffic events. Feature on wilsonbridge.com, YouTube and Google Video, as well as washingtonpost.com, wtopnews.com and other media websites.

- Fact sheets and news releases for each phase.

- Fact sheet on VSL, including case studies where it has been successful.

- Brochure

- Dedicated website section on VB-2/3/6 impacts, operations, phasing, VSL and "Keeping You Moving" information (e.g. specific lane closure policies & augmented ridesharing information).

Presence at Information Store

To further generate public awareness, it is recommended that display boards and handout materials/information be placed at VDOT's Springfield Interchange Store. This location is particularly appropriate for outreach specific to the Telegraph Road Interchange, as traffic backups at times are expected to extend to the Springfield Interchange area. As major impacts begin, it is recommended that a project representative be present at the store to answer commuters' questions.

Media Campaign for Local Outreach

Paid Media

Drive-time radio remains far and away the most efficient means of reaching the primary target audience of commuters (adults ages 25-54) and other travelers, both making them aware of the changes and motivating changes in their travel routes, modes or timing. An analysis of the media habits of high mileage drivers shows they spend 56 percent of their time with radio and only 10 percent with newspapers. As such, upwards of 80 percent of media buys are recommended for radio.

Complementing traditional media buys is a highly-targeted new approach: Purchasing ads on Trafficland.com and Traffic.com. This approach is inexpensive, reaches an audience that is by definition traffic-interested, and because it is web-based, enables easy tracking of effectiveness.

Radio:

- A mix of radio ads will be produced:
  - One 60-second in English and in Spanish

  - One 30-second in English and in Spanish
  - Two 15-second ads in English and in Spanish

- 15-second ads to provide concise notice that major relief will not come in 2008; Telegraph Road work requires three-lane condition farther into Virginia.

- 60-second spot to provide general information and explain VSL.

- 30-second spot to provide general information.

- Ads will run on radio stations that reach our target audience in the metropolitan area, including stations that skew to African American and Hispanic audiences.

- Ad flights will begin one month prior to implementation and continue one month into initial traffic change.

- Ads will be written and produced to allow refreshed content to be laid in reflecting subsequent phases.

Print:

- Print ads to run in targeted local papers two weeks prior to initial change and two weeks prior to subsequent phases.

- As with radio, the print buy will reach our target audience, including Hispanic and African American audiences.

Online:

- Ads on Trafficland.com will reach a highly targeted audience: Individuals who are proactively seeking out traffic information. The service provides real-time traffic conditions via cameras in dozens of locations in the metro area.

- A buy on Traffic.com will combines Internet exposure with text messages to subscribers with cell phones as well as e-mail alerts. The campaign message would be included in all elements.

Earned Media

The public relations team will spearhead a robust schedule of media outreach activities to generate earned media results. Envisioned executions include:

1. Media briefings

- Host media briefings at Eisenhower Avenue office followed by tour of affected corridor. All local media, especially transportation beat reporters and editors of particularly affected local bureaus, will be pitched.

2. Pre-briefings with Washington Post

    - Specialized attention to key media outlets, such as the Washington Post, is recommended a week before the general media briefing.

    - Further enhances our relationships with the Post, which can provide intangible benefits as the longer-term commuter pain is experienced.

    - Post-specific attention will increase the scope and quality of their coverage, particularly giving the Post's graphic artists' time to illustrate the changes, alternate routes, etc.

    - Key invitees: The Post briefing/tour would include transportation reporter Eric Weiss, transportation editor Steve Ginsberg, Dr. Gridlock columnist Bob Thomson and graphic artist April Umminger.

3. Traffic reporters

    - Travel to Metro Networks and Clear Channel to brief their traffic reporters, thereby directly informing several traffic reporters en masse.

    - Sessions also can produce helpful, practical suggestions from traffic reporters themselves.

4. Media pushes in advance of major phase changes

    - Pitch media and offer tours of construction progress in advance of major phases.

5. Ongoing media relations

    - Write, send and pitch news releases and media advisories on all newsworthy announcements to extensive local media list.

    - Facilitates continued flow of information regarding lane reductions and operations.

Media Campaign for Long-Distance Outreach

As with previous major traffic impacts, extensive efforts will be undertaken to inform long-distance travelers of the Telegraph Road Interchange construction and expected traffic impacts. The key message for the long-distance travelers will be to "Stay Away – Use Diversion Routes" (e.g. Beltway through Montgomery County, US 301). Timed to precede specific traffic impacts, information will be distributed through fact sheets featuring diversion routes, corridor maps showing lane reductions & limits and news releases. This information will be sent electronically to the project's extensive Lane Closure Stakeholder List, particularly targeting the following:

- AAA National
- American Trucking Associations
- Virginia Trucking Association
- Maryland Trucking Association
- National Association of Truck Stop Operators
- Independent Truckers Association (targets MD, PA, VA)
- America's Independent Truckers Association
- VDOT for distribution to Rest Areas in Virginia
- MSHA for distribution to Rest Areas in Maryland
- I-95 Corridor Coalition
- Satellite Radio

To further ensure notification to long-distance travelers, the purchase of advertisement space on highway billboards and/or static signs/kiosks at highway rest areas is recommended. Additional information sources include advance highway signs placed prior to diversion decision locations for travelers on I-95, Highway Advisory Radio (HAR) messages and the use of 511 motorist information system.

TRANSPORTATION OPERATIONS PLAN

WWB Lane Closures and Incident Management Summary

Initiated in 2002, the WWB Lane Closure Policy provides direction for notification to all stakeholders of scheduled and non-scheduled temporary lane closures. This policy will remain in effect throughout construction of the VB-2/3/6. The policy disseminates lane closure information to over 200 stakeholders including media, state and local agencies, first responders and state police. In addition to sending email notifications to the lane closure stakeholders, the WWB also updates their website and 1-877 information telephone line on a daily basis to provide real-time work zone information. VDOT's NOVA Smart Traffic Center (STC) receives all WWB lane closure information and is informed when lane

closures are setup and removed. STC is responsible for placing lane closure information on the 511 system, VOIS and HAR. The WWB Project staff will coordinate with STC regarding all work zones on a daily basis by continually communicating with STC operations staff before and after the lane closures are implemented.

A vigorous Incident Management (IM) Plan was developed early on during WWB construction as a means of minimizing traffic impacts when incidents occur. The IM Plan includes a contact list of all local emergency response agencies and outlines procedures for responding to traffic incidents within the WWB work zone. Procedures are clear in the IM Plan of how to clear the incident and restore normal project traffic operations. For example, additional state police and safety service patrol resources closely monitor the WWB work zone in order to quickly respond to incidents. This effort will continue throughout construction of VB-2/3/6.

The IM Plan identifies additional resources which include the following:

- Two additional Safety Service Patrol (SSP) vehicles provide 24/7 coverage (one tow truck and one regular patrol)
- As needed additional SSP will be provided during major traffic operations
- Funding for five Virginia State Police (VSP) troopers in addition to existing troopers dedicated to provide 24/7 coverage within the WWB project limits
- Provide Nextel phones for SSP and VSP assigned to the WWB Project
- Coverage area includes I-95/495 from WWB to the Springfield Interchange
- Funding available for Alexandria and Fairfax County Police in the event their resources are needed during major traffic operations

When a major incident occurs, procedures are in place to notify project Traffic Engineers, Resident Engineers, Public Affairs and Agency personnel as needed to assess the level of impact and distribute expected delay information to media and traffic reporters as quickly as possible. Proactively broadcasting incident and delay information has proven an effective means of keeping stakeholders (including motorists) informed of significant emergency situations. During major construction activities which will result in major traffic impacts, WWB staff will convene the IM Subcommittee to coordinate and ensure additional IM resources are made available. The WWB IM procedures are available for review.

Through WWB construction, efforts have been made to be proactive in reviewing incidents to determine the primary and secondary causes and if modifications to the current temporary traffic control setup should be considered. For all notable incidents, an accident form is developed by the inspectors and forwarded to the WWB Traffic Staff for review. Each accident form is thoroughly reviewed to assess the frequency and severity of each accident to determine if changes are necessary. Recommendations are made to the appropriate Resident Engineer and changes carried out by the contractors.

WWB Traffic Switches

On a few occasions, major traffic switches have occurred over a weekend and experienced major traffic impacts. When weekend switches such as these are realized, mitigation strategies are initiated to adjust traffic demand during these weekends. For example, during the summers of 2005 and 2006, major traffic switches involved reducing I-95 / I-495 to one lane in each direction for an entire weekend. Due to high traffic volumes on weekends, efforts we made to divert traffic to alternate routes around Washington D.C. In most cases, significant diversion was achieved by diverting an average of 60 to 70% of motorists throughout the weekend. Traffic could have queued for miles but ended up being minimal due to a consistent, widespread, and measurable traffic impact public outreach strategy.

CCTV cameras currently exist to monitor the WWB as well as the US 1 and Telegraph Rd interchanges. Project staff regularly monitors traffic conditions in this area and coordinates with VDOT's Smart Traffic Center (STC) to provide outreach to media and motorists. STC has been available to assist with deploying VMS messages, updating HAR messages, etc. Traffic observations are also made after traffic switches and modifications to traffic control setups are made, if necessary. Project staff observes traffic conditions daily and reports and rectifies problem areas quickly. Regular inspections of all work zone devices are conducted throughout the WWB corridor. Traffic data along I-95 / I-495 in Virginia are also available to Project staff through Mobility Technologies via the internet. Real-time and historical traffic volumes, speeds and density are accessible. Over the years, this data has helped quantifiably assessing traffic impacts during major weekend traffic switches (e.g. diversion rates, queue lengths, etc.).

Northern Virginia Construction

Construction in the vicinity of the I-95 / I-495 / Telegraph Rd interchange will be significant in 2008. Although the Springfield Interchange Improvement Project will be completed in 2007, ongoing work along I-95 / I-495 at the US 1 interchange and the WWB will continue. In July 2008, the second half of the WWB is scheduled to be open and expectations are high that this will bring major relief to motorists. However, it is not until the I-95 express lanes are open from US 1, across the WWB and through the I-295 and MD 210 interchange that traffic operations will begin to improve in the WWB corridor. As mentioned previously, major traffic impacts are scheduled early on in the VB-2/3/6 construction and will likely limit any long term operational improvements. Efforts are already underway with WWB Public Affairs staff to begin preparing a message that will limit expectations until the express lanes are open, currently scheduled for late 2008.

In 2008, High Occupancy Toll (HOT) lane construction is anticipated to begin along I-495 between Springfield and the Dulles Toll Rd as well as along I-395 between Springfield and Washington D.C. Construction of the "4th Lane" along I-95 south of Springfield is also scheduled to begin in 2008. Cooperation between VB-2/3/6 and these and other mega construction projects is essential to avoid lane closure conflicts. One, clear message should be distributed to motorists entering these work zones: Stay away or be prepared for substantial delays.

Variable Speed Limit (VSL) System

One unique traffic management tool within the WWB toolbox that is planned for use during VB-2/3/6 construction is Variable Speed Limit (VSL) technology as a means to minimize the anticipated traffic impacts of the VB-2/3/6 construction contract. Based on recent research, the concept of speed harmonization (encouraging speed compliance and minimizing speed differentials) will be tested and evaluated to determine the effectiveness of its ability to maximize traffic volume throughput. The limits of the VSL system will extend from the Springfield interchange in Virginia to the I-295 interchange in Maryland. Initial traffic analyses indicate that traffic impacts during construction will be severe with estimated queue lengths of three and two miles along I-95 North (Outer Loop) and I-95 South (Inner Loop), respectively.

The objectives of the VSL evaluation include maintaining mobility and minimizing motorist delay along I-95 throughout construction, educating motorists of the intent and benefits of VSL, determining the effectiveness of a VSL system, assessing the applicability of VSL as a traffic management tool for future projects and determining how safety is impacted. Speed limit enforcement and public outreach are essential to the deployment of the system. Furthermore, buy-in from elected officials and judges will be needed to ensure enforcement efforts are confirmed and reinforced in the court system.

ITS equipment will be installed including PCMS, VSL signs, detection stations, CCTV cameras as well as static signs. This equipment will provide real-time traffic conditions and travel times throughout the VSL system to the WWB Operations Center. This information will be made available to VDOT's STC in order to extend the information sharing to Virginia 511 and permanent DMS when and where appropriate. The existing WWB Operations Center will require physical expansion along with additional staff to provide coverage during temporary work zone setups. The conclusion of this evaluation will include several measurements of effectiveness to determine if this WWB VSL pilot deployment was successful in meeting the intended objectives and whether or not VSL has potential use on other projects.

In order to test the speed harmonization theory along I-95 in an urban, congested work zone, VSL will be the primary technology to help maximize traffic flow during temporary lane closure setups when congestions occurs. VSL will only be

implemented during temporary lane closure setups (day or nighttime hours, weekday or weekend). VSL will not be implemented during incident management activities or inclement weather (fog, snow, etc.). Other speed management efforts (police enforcement, incident management response, etc.) will complement the VSL system to minimize traffic impacts due to construction; however, VSL will be the primary technology-based effort.

Allowable temporary lane closure times play a large role in how the VSL system operates. Based on traffic analyses, three lanes of I-95 will remain open during weekday daytime hours (5AM to 10PM), at least two lanes will remain open from 10-11PM and from 4-5AM, and at least one lane will remain open from 11PM to 4AM. Initial traffic analyses indicate that lane closure setups outside of these times will generate queue lengths beyond the anticipated detection zone and reduce the benefits of VSL. However, these times may be adjusted as necessary to accommodate construction activities and queue lengths.

The primary objectives and means of implementing VSL for this major construction contract are:

1. Maintain mobility and minimize motorist delay along I-95 throughout construction of VB-2/3/6

    a. For improved comparison purposes, the VSL component of changing speed limits will occur two to four weeks after the implementation of the first VB-2/3/6 MOT phase in order to generate an appropriate baseline of queues, delays and travel times along I-95 and potentially intersecting arterials.

    b. Once a baseline is established, specific (measurable) goals of queues, delays and travel times will be determined.

2. Educate motorists and court system of the intent and benefits of VSL

    a. Educating motorists on the objectives of the VSL system and the importance of speed compliance to extend non-failing traffic flow conditions is essential.

    b. A major public outreach campaign will be initiated weeks in advance of VSL implementation.

    c. Educate the local judicial court to insure all citations issued will be enforced

3. Determine the effectiveness of a comprehensive VSL system

a. A first of its kind, this VSL system will be unique in an urban, congested, interstate highway work zone.

b. As such, a close evaluation of how the system is operating during temporary lane closure setups only (not during peak hour periods when recurring congestion occurs or during major incidents) will be conducted to include:

    i. Safety

        1. How has the accident rate changed when compared to prior to construction and baseline conditions? With limited documentation of implementing VSL on conditions similar to the I-95 / I-495 corridor, an assessment of how the accident rate changes with VSL is essential. Does VSL in a work zone have a significant impact on safety?

        2. Accident data will be obtained from VDOT and / or Virginia State Police for the 3 years prior to VSL implementation and for the baseline period

        3. The accident rate during VSL will be compared with that during baseline conditions as well prior to construction. An accident threshold or goal will be developed after the baseline period; it is anticipated that the accident rate reduction could be at least 20%

        4. The accident rate will be closely monitored after VSL implementation. If the accident rate increases to an unacceptable level (to be determined after a baseline condition is developed), appropriate actions would be taken immediately

    ii. Traffic Volume Data

        1. Have motorists chosen alternate routes to avoid delays? What is the average diversion rate during various congested periods?

        2. Traffic volumes will be obtained for during weekday daytime, overnight and weekend periods prior to and during the baseline period

        3. After VSL is implemented, volumes will be obtained and compared to the baseline period

4. A specific threshold of traffic volume will not be developed since it is not a critical component of evaluating the VSL system

iii. Speed Limit Compliance

1. With enhanced enforcement, how has speed limit compliance changed with VSL? Has the quantity of speed limit citations changed for this portion of I-95? How has the 85th percentile speed changed?

2. A speed study (using the floating car method and detector stations) will be performed to compare operating speeds before baseline, baseline and with VSL periods

3. It is anticipated that speed limit compliance will improve (with VSL and enhanced enforcement) by at least 20% and that the 85th percentile speed will be reduced by 5 mph

iv. Observations

1. Are motorists adjusting well to periodic changes in the posted speed limit?

2. Periodic peak and non-peak hour field observations will be conducted to assess motorists behavior with the VSL system

3. It is anticipated that motorists will adjust quickly to the VSL system and increased enforcement, and that the number of erratic or aggressive drivers will be reduced

v. Delays, Queues and Travel Times

1. How do motorist delays and queue lengths compare to baseline conditions? Are travel times reduced when VSL is in operation? How can the system be adjusted to maximize traffic flow?

2. During the baseline conditions, an existing level of delays, queue lengths and travel times will be obtained; after the VSL is implemented, delays, queue lengths and travel times will again be assessed and compared to the baseline condition

3. It is anticipated that delays and queues will decrease with VSL; a specific threshold or goal will be developed after the baseline condition is evaluated

vi. Community Feedback

1. What is the response from the public and motorists on the VSL system?

2. Feedback will be obtained via phone or email and will be documented throughout the use of VSL

3. Each comment provided on the system will be evaluated and responded to appropriately

4. Assess the applicability of VSL as a traffic management tool for future projects

a. As VDOT looks for new and innovative ways to manage congestion in work zones, is VSL a viable solution?

b. Should VSL be considered for all major, interstate, congested construction projects in the Washington D.C. region?

c. If VSL is considered on future projects, what are the lessons learned that can be applied to enhance VSL implementation?

Appropriate measurements of effectiveness (MOE) will be the key to assessing the impact and usefulness of the VSL system. MOE including speed limit compliance, credibility of the posted speed limit, safety (using primarily accident rates), traffic flow observations, queue creation and dissipation rates, travel times, and diversion rates will be obtained prior to, during baseline conditions, and after deployment to obtain the effectiveness of the VSL system. Various thresholds may also be incorporated into the system which may require changes throughout deployment.

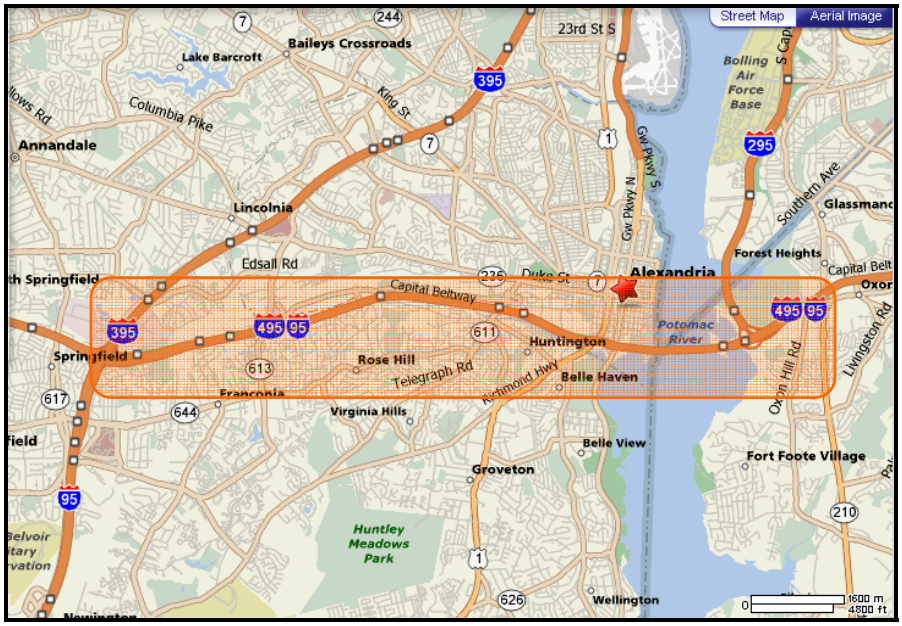
VSL Limits

Currently, traffic conditions along I-95 through the VB-2/3/6 limits (Telegraph Rd and Eisenhower Ave Connector interchanges) are free flowing except when queuing along I-95 north extends from the limited capacity of the Wilson Bridge during the evening peak hours. With the implementation of VB-2/3/6 MOT and the reduction of I-95 to three lanes in each direction, traffic analyses were performed to estimate the maximum queue. Hourly traffic volumes were obtained using a permanent traffic counting station for a typical Friday in August, when the most extreme delays and queues are typically recorded. These volume

counts were extrapolated to 2008 (when construction is expected to begin) and adjusted with other project traffic volume data. The peak hour for the OL and IL are 6,360 (7-8AM) and 6,100 (2-3PM), respectively.

Using QuickZone (an FHWA prepared software program to quickly assess delays and queues in work zones), traffic analyses indicate that the maximum queues along the OL are expected to reach approximately three miles in advance of the work zone to the Springfield interchange. Maximum queues along the IL are expected to reach approximately two miles in advance of the work zone to the midpoint of the WWB. A VISSIM traffic simulation model was also developed to verify the benefits of VSL and provides various MOE's including maximum queue lengths, delay and travel time information. A technical memorandum summary of the VISSIM results is attached.

Research suggests that detection for the VSL system be in place well before the point of maximum queue. As a result, the current limits of the VSL system are shown on the map below and include I-95 / I-495 between the I-395 Interchange in Virginia and the I-295 Interchange in Maryland. All existing speed limit signs will be covered or removed when the VSL system is implemented.



VSL Incident Management and Enforcement

It is anticipated that the existing incident management and enforcement efforts at WWB will continue. VSL implementation will require special emphasis on speed enforcement. Research indicates that active speed enforcement is essential for successful implementation of a VSL system. Emergency pull-off / enforcement areas have been added to the VB-2/3/6 MOT plans approximately every 2,000 ft along I-95. Virginia State Police, Maryland State Police, Virginia Safety Service Patrol, Fairfax County Police, and Alexandria Police will all play a large role in the

success of this system. The incident management component along I-95 will still be handled by VDOT STC with continued coordination by WWB staff. One additional Virginia Safety Service Patrol (24/7) will be added during VSL implementation. Also, an additional Virginia State Police patrolman will be added to provide 24/7 coverage.

VSL Technology

In order to maximize traffic volume throughput, the work zone will be instrumented with additional ITS equipment to monitor and verify traffic flow as well as actively adjust the regulatory posted speed limit. Using off the shelf software to receive data from detectors prior to and through the work zone, monitoring will develop a variable posted speed limit to provide the maximum throughput of traffic, minimize delay through the work zone, and inform motorists in advance of the work zone as to the conditions of the work zone.

A detailed GIS map of all proposed VSL ITS devices is shown in an attachment to this document. Operations staff in the WWB Operations Center will be responsible for monitoring and responding to data and field conditions. The ITS assets required to implement and monitor VSL in the VB-2/3/6 work zone includes the following equipment and software:

1. Portable changeable message signs (PCMS)
2. Work zone, variable speed limit signs (some with flashing lights similar to school flashers when a decreased speed limit is in effect)
3. Vehicle detectors providing speed, volume and density
4. Additional CCTV cameras
5. Static signs (e.g. NOTICE VARIABLE SPEED LIMIT NEXT X MILES, END VARIABLE SPEED LIMIT, etc.)
6. Communications network
7. Additional equipment in the Operations Center
8. TMS Software

The communications network required to communicate to the field devices is the critical link in the development of this system. Communications to the devices must be maintained for accurate and reliable speed prediction through the work zone and to advise the traveling public of the changing work zone conditions. The TMS Software will use the detector data to determine the current throughput rate and adjust the speed limits as volume varies at different times of the day. This system is not meant to provide constant throughput during the changing work zone conditions, but should sustain LOS E longer before demand exceeds capacity (LOS F).

Communications is critical to the performance of this system and shall maintain a 95% (Industry Standard) operational performance. To maintain this capability, the system will be deployed using a communications infrastructure

recommended by the manufacturer of the system. Maintenance of the system will be the responsibility of the supplier with a 4-hour response time during normal operations. On site maintenance personnel may be required during critical work zone setups or traffic switches. Spares for the system will be maintained by the supplier at a location provided at the WWB Operations Center at 2901B Eisenhower Avenue, Alexandria, Virginia.

The VSL algorithm will use historical data provided by previous studies of the impacted area as well as real time input from the field devices to vary the posted speed limit and travel times through the work zone. The operator will have override capability if operator action is required or an incident occurs in the work zone impacting traffic throughput of the work zone. PCMS will be strategically located along I-95, I-395 and I-495 keeping motorists informed of the work zone conditions. PCMS messages will be informative in nature providing current travel times and / or delay through the work zone. When extreme delays exists, PCMS messages will not provide specific alternate routes, yet encourage motorists to seek other routes to avoid delays. CCTV cameras will be deployed with this system to provide visual confirmation of the traffic queues and congestion.

It is anticipated that power for the PCMS, detectors, and CCTV cameras will be solar/battery. VSL signs will require a hardwire power source and may or may not have a backup power source. The majority of equipment outside of the VB-2/3/6 work limits will be pole mounted. Equipment inside the work limits will be trailer mounted to provide portability throughout construction. Detection will be provided every ¾ mile prior to the work zone and one mile within the work zone.

WWB Operations Center

To effectively operate, maintain, monitor and document the usefulness of the VSL system, additional staff and equipment will be needed including the expansion of the current Operations Center. The Operations Center will be operated weekdays and any time critical construction activities occur (including temporary lane closures) during nights and weekends. The Operations Center will be expanded to 176 SF in order to provide additional monitoring and control of the VSL equipment and software. A more detailed description of the Operations Center is outlined in the Concept of Operations document which is an appendix to this document.

VSL Implementation

Implementing the VSL system will be completed in phases. Phase 1 (early 2008) would include deployment of all of the detection points to establish a baseline of traffic data. Obtaining accident data for the affected area would also be obtained for the past three years. Phase 2 (spring 2008) would include deployment of all VSL signing, PCMS and CCTV cameras to begin full operation of the system. In July 2008, the new WWB ILL bridge is expected to open to traffic and will require

the relocation and recalibration of VSL equipment onto the IL approach. In December 2008, the new WWB ILE bridge is expected to be opened to traffic and will require relocation of VSL assets to be installed on this new structure approaching the VB-2/3/6 work area.

Funding for VSL implementation would occur via a maintenance-type contract to PCC for a period of two years with the potential of two, one-year extensions. The contract would include the procurement of all equipment, training and troubleshooting on the software system and complete maintenance of all field devices. It is anticipated that the funding for this contract would utilize the Telegraph Rd Interchange CMS budget. PCC would operate the VSL system from the expanded operations center. Consideration may be given to contract the VSL system as a leased system with the option to purchase the equipment / materials for use by VDOT in the future. The estimated cost of the VSL system described in this memo will be provided at a later time.

While VSL will be a new traffic management tool for the WWB Project, it is not the only tool. Many other efforts (including TDM, communications, incident management, etc.) have been in place for many years and will continue throughout VB-2/3/6 construction. If VSL does not provide the intended results and it is determined that the variable speed limit signs should be replaced with static work zone speed limit signs, much of the VSL system can remain operational and provide benefits to manage traffic. CCTV cameras, PCMS and detectors proposed in the VSL system will still be available to help monitor and manage traffic through the work zone. In fact, these means of managing traffic (using CCTV cameras, PCMS, HAR, etc.) has been ongoing and effective since construction began on the WWB Project over six years ago.

SUMMARY

VB-2/3/6 construction will create substantial traffic impacts along I-95 / I-495, especially during the early phases of construction. Efforts to mitigate these impacts include the use of traffic management technology, proactive reviews, public outreach and enforcement. VSL will play a role in helping to manage construction-related traffic impacts and require additional project resources.

Managing the transportation network during VB-2/3/6 construction will require looking not only in proximity to the project limits, but regionally. VSL and other traffic management strategies will likely impact other nearby construction projects. As a result, this VB-2/3/6 TMP is only one part of the Northern Virginia region traffic management strategy. TMP's for other major construction projects should develop macro and micro traffic management strategies as well. Together, all TMP's should create a regional Transportation Management strategy that allows construction to be completed as quickly as possible, maintains work zone safety, minimizes and manages necessary traffic impacts and maximizes mobility to motorists.

ATTACHMENTS
(Listed in the order shown in the Table of Contents)

SECTION 104.02 – ALTERATION OF QUANTITIES OR CHARACTER OF WORK of the Specifications is amended to include inserting the following after paragraph 13:

Any phase, stage or sequence change to the Maintenance of Traffic (MOT) plans as shown in the contract documents must be submitted with adequate supporting traffic analyses. This includes, but is not limited to: extended or temporary ramp closures, re-sequencing of the MOT plans, changing auxiliary lane lengths (acceleration, deceleration, weaving, etc.), modifying or adding temporary signal phases, reducing lane widths, or combining MOT phases. The analyses should substantiate the proposal and generally maintain the existing travel conditions (summarized by various measures of effectiveness including Level of Service, delay and queues). The extent of analysis and detail required by the Engineer will depend primarily on the level of complexity and impact of the proposed MOT change. A conceptual proposal including the extent of analysis should be submitted to the Engineer for review prior to beginning any analysis work. The Engineer will be the final authority on the level of traffic analyses required for any change to the MOT plans. The Contractor is required to engage the services of a Professional Engineer licensed in Virginia to prepare these traffic analyses. The Contractor shall provide the analyses to the Engineer in a technical memorandum format to include a summary, methodology, supporting data and conclusion/recommendation, at a minimum.

Traffic analysis software package(s) used in a proposal must be endorsed by VDOT (for determining lane use factors, Levels of Service and queuing methodology) and consistent with the analysis software previously used for other traffic analyses associated with the Woodrow Wilson Bridge Project. Acceptable traffic analysis software packages include SYNCHRO© (v 6.0 or later) for signal network analyses and TSIS©/CORSIM© (v 5.1 or later) or Highway Capacity Software (HCS+^{TM}) for freeway and ramp analyses. At the discretion of the Engineer, all three software packages may be necessary to properly evaluate a proposal. Other modeling packages may be acceptable but must be submitted with adequate justification to the Engineer for review and approval prior to their use. All necessary data collection to be used in justifying a proposal is the full responsibility of the Contractor. This may include obtaining traffic volume or classification counts or signal timing. Some existing hourly or peak hour traffic data is already available and will be provided to the Contractor upon request. An “existing” traffic model of the I-495 / I-95 / VA 241 – Telegraph Rd interchange and nearby signal networks are available upon request.

6-5-03 (SPCN)

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SECTION 108—PROSECUTION AND PROGRESS OF WORK

May 17, 2007

108.05—Limitation of Operations is amended as follows:

The Contractor is advised that its general operations may proceed seven days a week, twenty-four (24) hours a day throughout the project duration except as may be modified in the following subsections and the Construction Noise Control Special Provision:

(a) **Shutting Down Traffic Management Equipment:** The Engineer shall be notified at least two working days prior to any operational shutdown of traffic management equipment. The term "operational shutdown" includes interruption of communication or power service between the equipment and the Smart Traffic Center (STC). Thus, work on a cable at one location will often constitute an operational shutdown of equipment at other locations. An operational shutdown may also occur when the central computer in the STC does not have correct information about a particular piece of equipment. Thus, keeping field equipment operational entails revising the central computer's database to reflect changes made in the field.

Each of the Contractor's crews must have a cellular telephone, which can be used to immediately notify the STC staff (703-383-2600) when field equipment is accidentally shutdown in violation of the limitations described here, or when it appears that the STC staff is using equipment scheduled to be shut down.

1. Variable Message Signs may be out of service, but not for longer than 48 consecutive hours, with the written consent of the STC operations supervisor. The Contractor shall not take a sign that is currently displaying a message (other than time and date) out of service without the approval of the STC operations staff. This approval will be granted immediately, except when the sign is deemed essential to resolving a traffic problem.

   Always call the STC staff before taking a sign out of service. Also call the STC staff immediately upon returning a sign back in service.

2. CCTV Cameras may not be out of service for more than twelve (12) consecutive hours.

3. All other equipment may not be continuously out of service for more than one week.

(b) **Roadway Closures:** Lane closures and the maintenance of traffic through restricted areas shall conform to the requirements of *MUTCD* and the Virginia supplement thereof.

Contractors shall submit a written lane and shoulder closure request for approval in accordance with the advance notification requirements for the type of the lane closure being requested. The contractor shall submit the lane closure in a written format provided by the Engineer. Information should consist of location, date and time, nature of work, lanes to be closed, ramp closures, field point of contact and detours. The Contractor shall confirm the need for any scheduled Type 2 or Type 3 closure twenty-four (24) hours in advance. The Contractor shall confirm the need for any scheduled Type 1closure seventy-two (72) hour in advance, and shall include a written reiteration of the proposed tasks and a listing of materials, labor and equipment to be utilized. The Contractor is responsible for providing adequate advance notification via variable message and required static signing for lane closures in accordance with *MUTCD* and the Virginia Work Area Protection Manual. Once a closing is in place, work shall commence immediately and shall progress on a continuous basis to completion or to a designated time, unless unforeseen events (i.e. traffic accident, traffic backups or inclement weather) transpire.

1. **Lane Closure Types**

Type 1 - A lane closure resulting in a significant impact on traffic, such as stopping traffic completely, closing 2 or more lanes, closing an exit or entrance ramp at freeway interchanges or changing traffic patterns. This type of closure would require extensive media and stakeholders notification effort and coordination among various local and state agencies

Type 2 – A lane closure resulting in minor or no impact on the flow of traffic, such as closing one lane on 4-lane freeway during off-peak traffic hours.

Type 3 – A lane closure that would close a shoulder (right or left) on a freeway or ramp.

2. **Advance Notification Requirements**

Lane Closure Type	Minimum Advance Notice	Maximum Advance Notice
1	10 Days	21 Days
2	5 Days	14 Days
3	3 Days	14 Days

The Contractor's working CPM schedule shall identify the activities that require lane and roadway closures. The schedule will be reviewed in detail to assure that the scheduling meets the objectives for expediting the project and minimizing traffic disruptions.

Lane closures or work that restricts traffic flow will not be permitted on Saturdays, Sundays and holidays from noon the day before the holiday until noon the day after the holiday unless approved by the Engineer. When a holiday falls on a Friday, lane closures are not permitted from noon on Thursday to noon on Monday. When a holiday falls on Monday, lane closures are not permitted from noon on Friday to noon on Tuesday.

For the purposes herein the term "holiday" shall apply to New Year's Day, Martin Luther King Jr. Day, President's Day, Easter Weekend, Memorial Day, Independence Day, Labor Day, Columbus Day, Veteran's Day, Thanksgiving Day and Christmas Day.

Failure to restore full traffic capacity within the time specified will result in a disincentive charge being assessed on the next monthly pay estimate in conformance with the following rates. The contractor may be permitted to exceed the time specified with prior approval by the Engineer.

ELAPSED TIME, MINUTES	**DEDUCTION for I-95 and all Ramps**	**DEDUCTION for Telegraph Rd and other all side streets**
1 - 5	$ 8,000.00	$ 2,000.00
Every additional 5 or any portion there of	$ 4,000 (In addition to the Original 5 minutes)	$ 1,000 (In addition to the Original 5 minutes)

Restoration of traffic shall mean the completion of all construction work, the removal of all traffic control devices and signs and removal of all workers, materials and equipment from the roadway.

If the Contractor incurs the assessment of these disincentives for failure to restore traffic within the prescribed closure limitations, the Contractor will not be allowed further lane closures until reasons for such failures are evaluated and the Contractor can provide assurance that the causes have been corrected. If the contractor is granted an exception which allows the contractor implement lane closures on days & times not covered above the disincentive will be

applicable if traffic is not restored within prescribed time limitation on the approved lane closure request.

Lane closures or traffic restrictions shall not be permitted during major sports and special events affecting traffic flow, unless otherwise approved by the Engineer.

The Engineer has the right to direct the Contractor to modify, adjust or remove lane closures based upon traffic and weather conditions. Inclement weather is defined as

In consideration of multiple contractors working within a limited corridor for the Woodrow Wilson Project, it is conceivable that request(s) from the Contractor for lane closure could be in conflict with those from other contractors. In the event of such conflicting lane closures, the Engineer will determine priority of the request(s). Should the Engineer deny a valid lane closure request because of competing requests by multiple contractors, the Contractor may be entitled to an extension of contract time due to delays resulting from such denial in accordance with Section 105.08 Cooperation Between Contractors of the Specifications, if the lane closure request is part of an activity on the critical path activity on the Contractor's accepted baseline CPM schedule.

Each of the Contractor's crews must have a cellular telephone, which can be used to immediately notify the STC staff (703-383-2600) when implementing and removing lane closure which facilitate STC staff in displaying and removing messages from variable message signs utilized to inform motorist of construction activities.

To facilitate construction and minimize inconvenience to the public, the Contractor is advised of the following lane and shoulder closure limitations:

3. Mainline roadways: I-95N, I-95S and associated ramps.

a. **Single lane closures:** One lane of traffic from 9:30 a.m. to 3:30 p.m. (inner Loop I-95S) and 9:30 a.m. to 3:00 p.m. (outer Loop I-95N) from Monday through Thursday and from 9:00 am to 12:00 noon on Friday may be closed at the discretion of the Engineer in roadway section with 4 or more lanes. No single lane closures will be permitted between the hours of 5:00 AM & 10:00 PM in roadway sections with 3 or less lanes. In addition, single lane closures during the nighttime hours of 10:00 pm to 5:00 am of the following morning (Sunday through Thursday) may also be closed at the discretion of the Engineer.

b. **Multiple lane closures:** Multiple lanes of traffic during the nighttime hours of 11:00 PM to 5:00 AM of the following morning (Sunday through Thursday) may also be closed at the discretion of the Engineer.

c. **Complete road closures:** Complete road closures to facilitate the erection or removal of overhead sign panels and structures over Route I-95, or to provide access into the working area for large equipment, may be permitted for 30 minutes maximum between 12:00 midnight and 5:00 a.m. on Sunday through Thursday. Traffic back-ups must dissipate prior to implementing successive closings.

d. Ramp Closures: Ramp closures will be allowed during the nighttime hours of 11:00 PM to 5:00 AM of the following morning (Sunday through Thursday) may also be closed at the discretion of the Engineer. Unless specifically shown in the MOT plans, complete ramp closures will be reviewed on a case by case basis; see SP 104.04(a) Temporary Traffic Control & Detours and SPCN 104.02 Alteration of Quantities or Character of Work

4. Primary Roadways: Telegraph Road and all other side streets.

a. Telegraph Rd: One lane of traffic from 9:30 a.m. to 3:30 p.m. (Northbound) and 9:00

a.m. to 3:00 p.m. (Southbound) from Monday through Thursday and from 9:00 am to 12:00 noon on Friday may be closed at the discretion of the Engineer. In addition, nighttime lane closures during the hours of 9:00 pm to 5:00 am of the following morning (Sunday through Thursday) may also be closed at the discretion of the Engineer.

b. Side Streets: One lane of traffic from 9:00 a.m. to 3:00 p.m. from Monday through Thursday and from 9:00 am to 12:00 noon on Friday may be closed at the discretion of the Engineer. In addition, nighttime lane closures during the hours of 9:00 pm to 5:00 am of the following morning (Sunday through Thursday) may also be closed at the discretion of the Engineer. Complete road closures of any side street will be reviewed on a case by case basis; see SP 104.04(a) Temporary Traffic Control & Detours and SPCN 104.02 Alteration of Quantities or Character of Work..

Local Ordinances: The Contractor is advised that work activities located within certain jurisdictions are governed by local ordinances. Certain work activities, such as pile driving, etc. may be restricted to certain days and times due to local ordinances (i.e. City of Alexandria's Noise Ordinance). The Contractor is fully responsible for being aware of and abiding by all applicable local ordinances with respect to planning and prosecuting all aspects of the work.

VIRGINIA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION FOR
SECTION 104.04(a)—TEMPORARY DETOURS AND TRAFFIC CONTROL

June 29, 2007

SECTION 104 – SCOPE OF WORK is amended as follows:

Section 104.04(a) - Detours is replaced with the following:

Section 104.04(a) – Temporary Traffic Control and Detours

1. **Temporary Traffic Control and Detour Plan Preparation:**

Various temporary traffic control devices (signs, pavement markings, barricades, concrete barrier service, etc.) will be required during the implementation of the MOT plans. Prior to the installation of any such temporary traffic controls, the Contractor shall submit a site specific Traffic Control Plan (TCP) to the Engineer for approval. The Contractor shall include in its TCP all proposed temporary traffic control devices necessary to safely and efficiently construct a particular portion of work. The Contractor shall submit a TCP to the Engineer for review at least 14 calendar days in advance of the time when the Contractor proposes the use of temporary traffic control devices. The Contractor is required to engage the services of a Professional Engineer licensed in Virginia to prepare and seal (stamp) Temporary Traffic Control and Detour Plans.

The TCP shall not simply reference typical drawings, taper tables or illustrations in the Virginia Work Area Protection Manual (VWAPM) or Manual on Uniform Traffic Control Devices (MUTCD). The Contractor shall submit a 1:50 scale drawing on 11" x 17" sheets that includes site specific sign messages, MUTCD sign numbers, sign sizes, sign spacing or reference distances, taper lengths, buffer lengths, barricade or traffic drum spacing, types of barricades, barrier service flare rates, etc. on the TCP drawings. The TCP shall be professionally prepared and not hand drawn. Special coding of signs (other than MUTCD numbers such as R1-1, etc.) will not be accepted. The Contractor must design all non-standard MUTCD signs. Design details required are typical of those shown in the MUTCD supplement Standard Highway Signs. Pavement marking changes must be specific on the TCP with respect to lane widths, edge line widths, stop line widths, lane line widths and locations, color of lines, lengths of solid lines, taper lengths, length of line removals, placement of arrows and ONLY's, and other dimensions necessary to assure the proper installation of the pavement markings. A sample TCP will be made available by the Engineer, if requested.

All Contractor-proposed closures of a road or ramp (for any duration) or for any turning restriction must be carefully reviewed and justified with respect to both the necessity as well as the impact of the closure to the traveling public and adjacent communities. The Contractor must submit its justification for closure or turning restriction, including a detailed analysis of alternatives considered, in writing to the Engineer. This should adhere the Department's Lane Closure Policy. The Contractor must obtain the Engineer's concurrence (in concept) with a proposed road closure prior to the Contractor submitting a Temporary Detour Plan that contains the details of how such a closure would be implemented. Coordination with the WWB Incident Management Coordinator is also required to address potential project-wide impacts due to adjacent contracts' maintenance of traffic or Temporary Detour Plans. The Contractor shall submit a Temporary Detour Plan to the Engineer for review at least 30 calendar days in advance of the time when the Contractor proposes a closure. The level of detail necessary for a Temporary Detour Plan shall be the

same as a site specific TCP as outlined in the preceding paragraph. The Contractor may also need to attend public information meeting(s) to respond to public comments and concerns regarding a road or ramp closure.

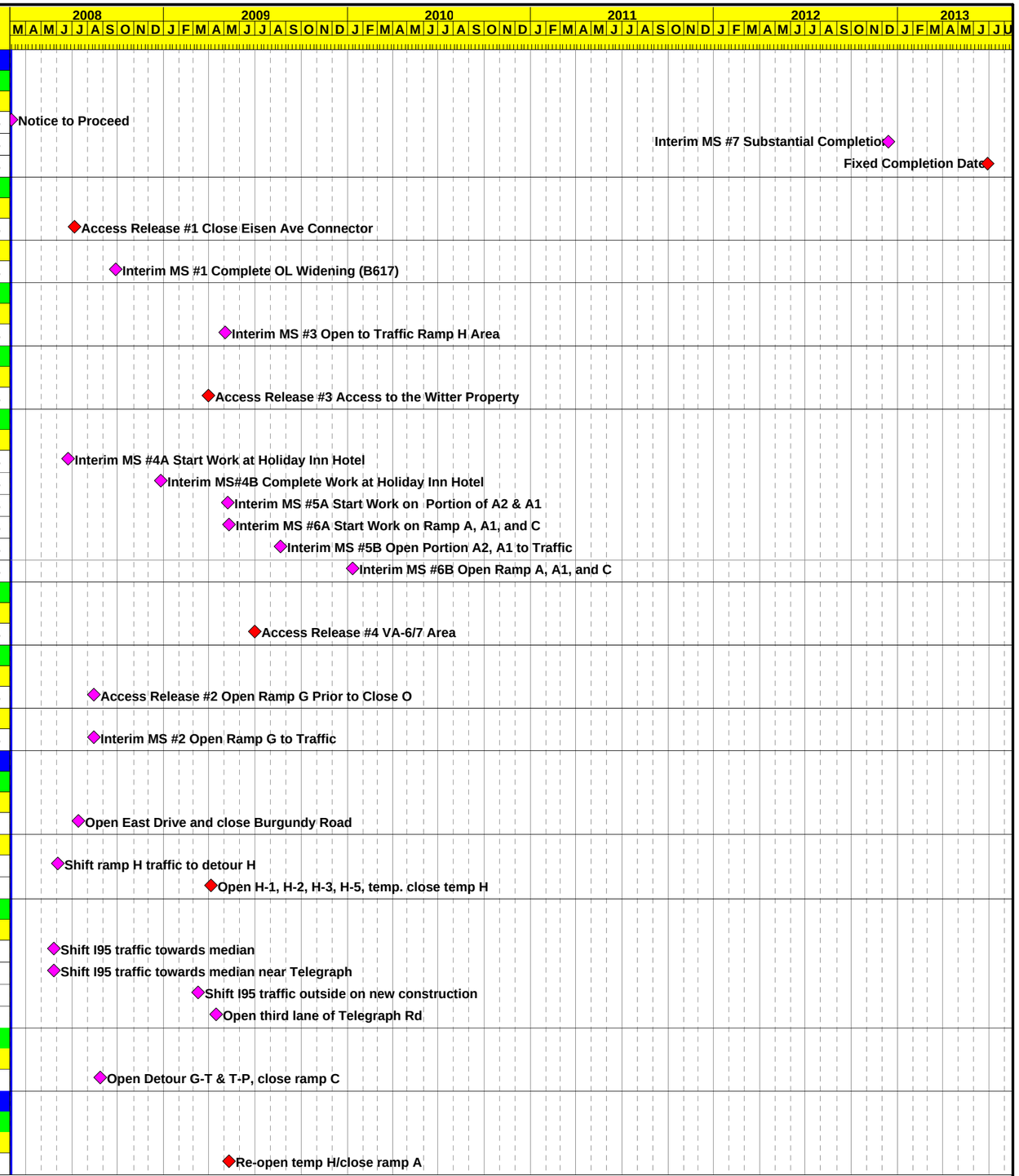
The cost of the design, preparation, submittal, and acceptance of Temporary Traffic Control or Detour Plan(s) is incidental to the other maintenance of traffic items. This may also include attendance at Public information meeting(s) and potential revisions to those plans as a result of comments from Local Agencies, the Public or the Department.

In the event that the contract documents contain a site specific Traffic Control Plan that encompasses the proposed work area and includes all of the necessary temporary traffic control devices, the Contractor will not be required to develop a site specific Traffic Control Plan. However, any changes to Traffic Control Plans must be developed and submitted by the Contractor in writing to the Engineer at least fourteen (14) days in advance of any work. The Contractor shall obtain the Engineer's approval of any changes to the TCP prior to the installation of temporary traffic controls.

2. **Temporary Detour Implementation:** The fabrication and installation of detour signing will be the full responsibility of the Contractor. The Contractor is also responsible for maintaining temporary detour routes (even if outside the work-zone) until such time when the Engineer deems them unnecessary. The provision of temporary detours and marking of alternative routes will not relieve the Contractor of the responsibility for ensuring the safety of the public or from complying with any requirements of these specifications and the Virginia Work Area Protection Manual affecting the right of the public.

   The cost of temporary traffic control and detour implementation including but not limited to required preparation, coordination, review, and acceptance of submittals will not be measured for separate payment but will be included in the unit price bid for various MOT items of the Contract.

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float	STGE
Milestone and Access Release Dates								
Project Wide Activity								
Milestone								
PIM 000	Notice to Proceed	0	03MAR08		05MAR08		2	PROJECT MS
PIM 007	Interim MS #7 Substantial Completion	0	14DEC12		01JUL13		138	PROJECT MS
PIM 100	Fixed Completion Date	0		28JUN13		28JUN13*	0	PROJECT MS
Construction West of Ramp H Exit								
Access Release								
PIM 201	Access Release #1 Close Eisen Ave Connector	0	07JUL08*		07JUL08*		0	PROJECT MS
Milestone								
PIM 001	Interim MS #1 Complete OL Widening (B617)	0	27SEP08		01OCT08*		4	PROJECT MS
H Ramp Construction								
Milestone								
PIM 003	Interim MS #3 Open to Traffic Ramp H Area	0	02MAY09		01AUG09*		89	PROJECT MS
Bridge 622 Construction								
Access Release								
PIM 200	Access Release #3 Access to the Witter Property	0	01APR09*		01APR09*		0	PROJECT MS
A Ramp Construction								
Milestone								
PIM 004A	Interim MS #4A Start Work at Holiday Inn Hotel	0	24JUN08		29JUN13		1,796	PROJECT MS
PIM 004B	Interim MS#4B Complete Work at Holiday Inn Hotel	0		24DEC08		28JUN13	1,146	PROJECT MS
PIM 005A	Interim MS #5A Start Work on Portion of A2 & A1	0	09MAY09		29JUN13		1,483	PROJECT MS
PIM 006A	Interim MS #6A Start Work on Ramp A, A1, and C	0	11MAY09		01JUL13		1,051	PROJECT MS
PIM 005B	Interim MS #5B Open Portion A2, A1 to Traffic	0		21AUG09		28JUN13	978	PROJECT MS
PIM 006B	Interim MS #6B Open Ramp A, A1, and C	0		11JAN10		28JUN13	1,242	PROJECT MS
Mainline Construction								
Access Release								
PIM 221	Access Release #4 VA-6/7 Area	0	30JUN09*		30JUN09*		0	PROJECT MS
Ramp / Bridge Construction North of Beltway								
Access Release								
PIM 211	Access Release #2 Open Ramp G Prior to Close O	0	15AUG08		03SEP10		521	PROJECT MS
Ramp G								
PIM 002	Interim MS #2 Open Ramp G to Traffic	0	15AUG08		30OCT08*		75	PROJECT MS
Period 1								
H Ramp Construction								
East Drive								
MILE 32	Open East Drive and close Burgundy Road	0	14JUL08		22JUL08		6	STAGE 1-1
Milestone								
MILE 3	Shift ramp H traffic to detour H	0	03JUN08		09JUL08		25	STAGE 1-2
MILE 5	Open H-1, H-2, H-3, H-5, temp. close temp H	0		03APR09		03APR09	0	STAGE 1-3
Milestone								
Milestone								
MILE 2	Shift I95 traffic towards median	0	27MAY08		20SEP10		588	STAGE 1-1
MILE 6	Shift I95 traffic towards median near Telegraph	0	27MAY08		22SEP08		82	STAGE 2-1
MILE 4	Shift I95 traffic outside on new construction	0	10MAR09		14JAN11		469	STAGE 1-3
MILE 8	Open third lane of Telegraph Rd	0	15APR09		11MAY09		18	STAGE 2-2
Ramp / Bridge Construction North of Beltway								
Milestone								
MILE 9	Open Detour G-T & T-P, close ramp C	0	27AUG08		11MAY09		178	STAGE 2-2
Period 2								
A Ramp Construction								
Ramp A								
MILE 7	Re-open temp H/close ramp A	0	11MAY09		11MAY09		0	STAGE 2-2



Start Date 01MAR08
Finish Date 28JUN13
Data Date 01MAR08
Run Date 23JUL07 14:41

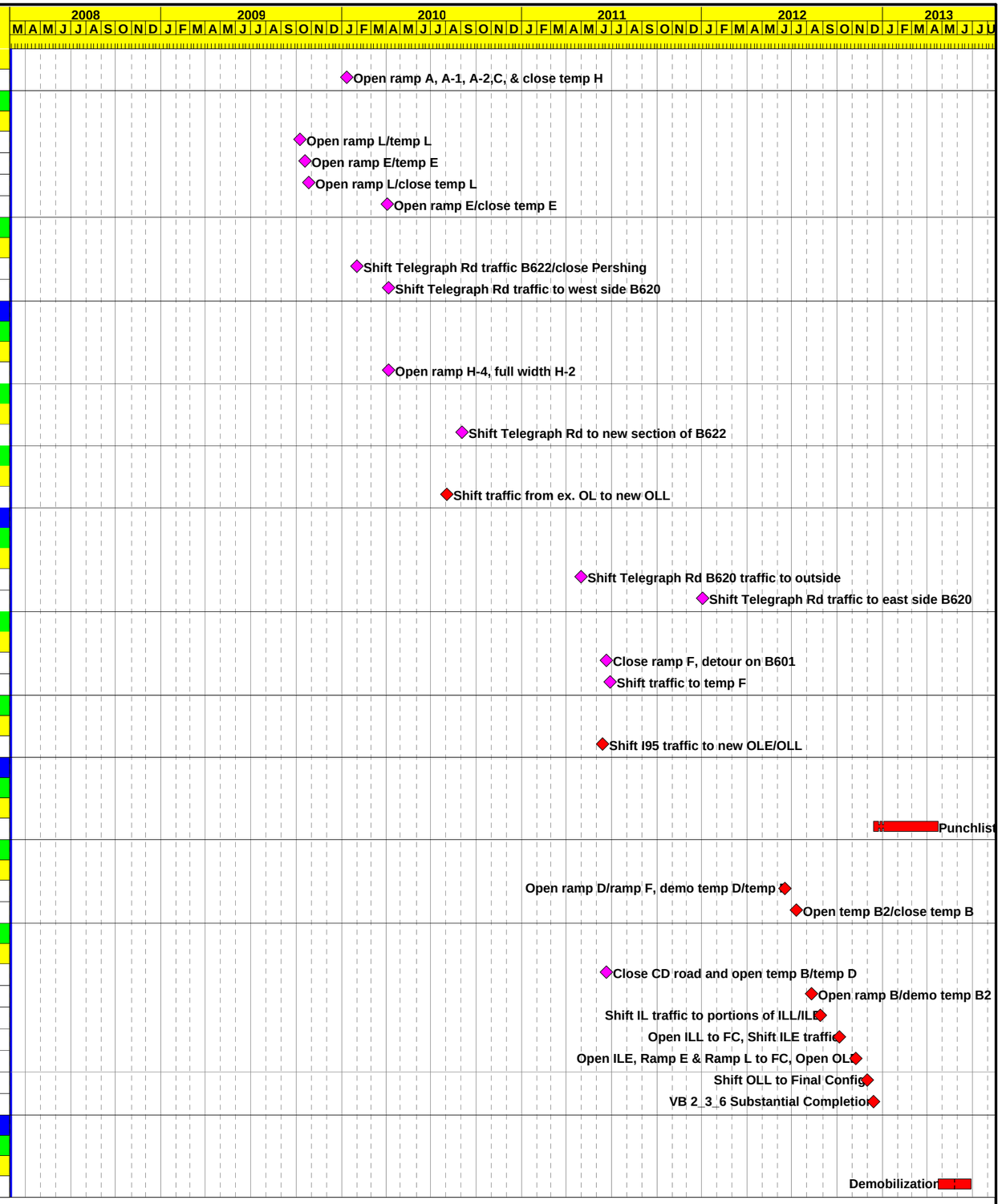
Early Bar
Progress Bar
Critical Activity

I955

Potomac Crossing Consultants
I-95 / Telegraph Road Interchange
VB-2/3/6
Pre-Bid Schedule

Date	Revision	Checked	Approved
23JUL07	Pre-Bid Schedule Based on 100% Drawings		
	issued on May 23, 2007. This Pre-Bid Schedule		
	is provided for information only.		

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish	Late Start	Late Finish	Total Float	STGE
Ramp A								
MILE 10	Open ramp A, A-1, A-2,C, & close temp H	0	12JAN10		13JAN10		1	STAGE 2-3
Ramp B,D,E,F, and L Construction								
Milestone								
MILE 13	Open ramp L/temp L	0	08OCT09		24JUN10		180	STAGE 3-2
MILE 12	Open ramp E/temp E	0	20OCT09		20NOV12		784	STAGE 3-2
MILE 17	Open ramp L/close temp L	0		26OCT09		13JUL10	180	STAGE 3-3
MILE 16	Open ramp E/close temp E	0		02APR10		07DEC12	681	STAGE 3-3
Milestone								
Milestone								
MILE 15	Shift Telegraph Rd traffic B622/close Pershing	0	02FEB10		19JUL11		371	STAGE 3-2
MILE 14	Shift Telegraph Rd traffic to west side B620	0	06APR10		07SEP10		107	STAGE 3-2
Period 3								
H Ramp Construction								
Ramp H-4								
MILE 11	Open ramp H-4, full width H-2	0		05APR10		03SEP10	107	STAGE 2-3
Bridge 622 Construction								
Milestone								
MILE 19	Shift Telegraph Rd to new section of B622	0	02SEP10		29MAR12		398	STAGE 4-1
Milestone								
Milestone								
MILE 18	Shift traffic from ex. OL to new OLL	0	03AUG10		03AUG10		0	STAGE 4-1
Period 4								
Bridge 620 Construction								
B620 - Telegraph Road over Cameron Run								
MILE 20	Shift Telegraph Rd B620 traffic to outside	0	02MAY11		23MAY11		15	STAGE 4-1
MILE 22	Shift Telegraph Rd traffic to east side B620	0	03JAN12		17APR12		75	STAGE 5-1
Ramp B,D,E,F, and L Construction								
Milestone								
MILE 23	Close ramp F, detour on B601	0	21JUN11		29JUL11		27	STAGE 5-1
MILE 25	Shift traffic to temp F	0		29JUN11		09SEP11	50	STAGE 5-1
Milestone								
Milestone								
MILE 21	Shift I95 traffic to new OLE/OLL	0	13JUN11		13JUN11		0	STAGE 5-1
Period 5								
Project Wide Activity								
Milestone								
MILE 46	Punchlist	90	14DEC12	22APR13	14DEC12	22APR13	0	STAGE 6-3
Ramp B,D,E,F, and L Construction								
Milestone								
MILE 26	Open ramp D/ramp F, demo temp D/temp F	0	18JUN12		18JUN12		0	STAGE 5-3
MILE 27	Open temp B2/close temp B	0	11JUL12		11JUL12		0	STAGE 5-3
Milestone								
Milestone								
MILE 24	Close CD road and open temp B/temp D	0	22JUN11		01AUG11		27	STAGE 5-1
MILE 28	Open ramp B/demo temp B2	0		08AUG12		08AUG12	0	STAGE 5-3
MILE 31	Shift IL traffic to portions of ILL/ILE	0	29AUG12		29AUG12		0	STAGE 6-1
MILE 33	Open ILL to FC, Shift ILE traffic	0	05OCT12		05OCT12		0	STAGE 6-2
MILE 34	Open ILE, Ramp E & Ramp L to FC, Open OLE	0	08NOV12		08NOV12		0	STAGE 6-3
MILE 35	Shift OLL to Final Config	0		29NOV12		29NOV12	0	STAGE 6-3
MILE 30	VB 2_3_6 Substantial Completion	0		13DEC12		13DEC12*	0	STAGE 6-3
Period 6								
Project Wide Activity								
Milestone								
MILE 56	Demobilization	48	23APR13	28JUN13	23APR13	28JUN13	0	STAGE 6-3



POTOMAC CROSSING CONSULTANTS

TECHNICAL MEMORANDUM

TO: Nick Nicholson, VDOT

FROM: Xiaorong Lai, PCC
Marcel Klik, PCC

CC: Scott Crumley, PCC

DATE: August 1, 2007
Revised September 10, 2007

SUBJECT: VISSIM Model Results, Variable Speed Limit Implementation For VB-2/3/6 Construction

SUMMARY

As part of the VB-2/3/6 construction of the Woodrow Wilson Bridge project, a portable Variable Speed Limit (VSL) system will be installed in order to manage speeds through the construction zones on the Inner and Outer Loop. During the construction, one lane will be permanently closed to traffic, reducing the total number of available lanes from four to three. During the nighttime and weekends, one or more additional lanes may be closed. Primary goals will be to maintain safety and minimize queue lengths in advance of the workzones.

In order to assess the effectiveness of a VSL system as opposed to implementing static speed limits, PCC was tasked with the development of a sophisticated simulation model, which would incorporate both the variations in traffic flow and the changeable speed limits, based on real-time simulated traffic conditions. The network included all four Woodrow Wilson Bridge Project interchanges in Virginia and Maryland (Telegraph Road, US 1, I-295 and MD 210), as well as the Eisenhower Connector, Van Dorn Street and Springfield interchanges. The Springfield and Van Dorn Street interchange were modeled only in the northbound direction.

The following three scenarios were modeled:

- Mid-day conditions (11:00 AM – 1:00 PM) with three lanes open to traffic
- Weekend conditions (2:00 PM – 4:00 PM) with two lanes open to traffic
- Nighttime conditions (11:00 PM – 1:00 AM) with one lane open to traffic

Each scenario was modeled with eight consecutive actual 15-minute traffic volumes collected during the week of June 13, 2007. All scenarios were modeled assuming implementation of static speed limit signs (MOT 1 Scenario) and Variable Speed Limits (MOT 2 Scenario).

Output obtained from the simulations included the following Measures of Effectiveness (MOEs)

- Total network travel time
- Average number of stops per vehicle
- Average vehicle delay
- Average travel time on Inner and Outer Loop (end-to-end network limits)
- Maximum queue length
- Average Speed Difference between free-flowing and queued traffic (Δ Speed)

A comparison of the results for all scenarios using the MOT 1 and MOT 2 scenarios shows that VSL provides some operational and potential safety benefits during the mid-day and nighttime periods. VSL benefits are limited during the weekend period.

Although the VISSIM simulation did not show improvements in travel times or queue lengths with the implementation of VSL, improvements were noted in the number of stops per vehicle and in the abruptness of change in vehicle speeds approaching the workzone. A more gradual speed reduction has been linked to improved safety of traffic operations, which may reduce the probability of queue-related crashes and incidents.

Greater improvements in travel time and delays might be achieved if the detectors were located downstream of the VSL signs, so that traffic is forced to slow down before it reaches the congested area. Additional benefits may also be possible by allowing the speed limit to increase through the consecutive zones. For example, in the current configuration, the queue is being released just past the merge at the beginning of the workzone. While conditions could permit a higher speed limit, the operating algorithm requires workzone speed limit to be the same (or lower) as the speed in the previous zone, thus forcing an increase in travel time through the project area. Further benefits may be possible if the speed limit were allowed to change more often than every 30 minutes, so that the system can react to quickly changing traffic conditions. Due to time constraints, these options were not evaluated.

Finally, it should be noted that the success of the VSL system depends on enforcement. The VISSIM model assumes that drivers will comply with posted with speed limits, whereas field conditions may be different.

DATA COLLECTION

An extensive data collection effort was part of the study. Machine counts were conducted at the following ramps for a seven-day period between June 14 and June 20, 2007. Data were collected in 15-minute periods so that the short-term fluctuations in traffic flow could be replicated in the simulation model.

- Springfield Interchange
  - NB I-95 to Outer loop (NB I-95)
  - SB I-395 to Outer loop (NB I-95)

- Van Dorn Street Interchange
  - NB I-95 to Van Dorn Street
  - Van Dorn Street to NB I-95 (two redundant ramps)

- Eisenhower Avenue Interchange
  - NB I-95 to Eisenhower Avenue
  - Eisenhower Avenue to NB I-95
  - SB I-95 to Eisenhower Avenue
  - Eisenhower Avenue to SB I-95

- Telegraph Road Interchange
  - NB I-95 to Huntington Avenue
  - NB I-95 to NB VA 241
  - NB VA 241 to NB I-95
  - NB VA 241 to SB I-95
  - SB VA 241 to NB I-95
  - SB VA 241 to SB I-95
  - SB I-95 to NB VA 241
  - SB I-95 to SB VA 241

- US 1 Interchange
  - NB I-95 to NB US 1
  - NB I-95 to SB US 1
  - SB I-95 to NB US 1
  - SB I-95 to SB US 1
  - NB US 1 to NB I-95
  - NB US 1 to SB I-95
  - SB US 1 to NB I-95
  - SB US 1 to SB I-95

- I-295 Interchange
  - SB I-95 to NB I-295
  - SB I-295 to SB I-95

Historic data were used for the MD 210 interchange.

In addition to ramp counts, mainline data were obtained from VDOT permanent count stations available through the traffic.com website. Mainline data were obtained in 15-minute intervals; these data were also used to derive vehicle classification information.

Travel time runs were completed on Tuesday, June 26, 2007 during the mid-day period between the Springfield and MD 210 interchanges to assist in validating the travel times provided by the model.

SIMULATION MODEL

VISSIM simulation software was used to model the VSL operations through the construction zone. VISSIM is a microscopic modeling tool that provides the user with a wide range of options to model and analyze network configurations and traffic control strategies. Using VISSIM's COM interface, data can be collected from the simulation while the simulation is running, and traffic control elements such as speed limits, traffic signals, ramp meters etc. can be adjusted during the simulation run, based on simulated traffic conditions. This makes VISSIM especially useful for modeling VSL operations.

Coding of the VISSIM model was facilitated by previous work completed at the University of Maryland Applied Technology and Traffic Analysis Program (ATTAP), which is a joint program between the Traffic Safety and Operations Laboratory at the University of Maryland and the Maryland State Highway Administration's Office of Traffic and Safety. ATTAP agreed to let PCC use their base model as a starting point for the VSL model.

The VISSIM base model reflects the anticipated lane arrangements in July 2008, just prior to the start of construction of the VB-2/3/6 contract. The base workzone condition at the Eisenhower Connector interchange assumes permanent closure of one lane (reducing the total from four to three lanes), with three adjacent lanes on the Inner Loop, and two adjacent plus one off-ramp to on-ramp lane on the Outer Loop. Under weekend and nighttime conditions, two lanes and one lane will be open to traffic, respectively.

The 18 proposed detectors that will be part of the VSL system were coded at within the network in accordance with the Concept of Operations plan; for presentation purposes, VSL signs were included as well (see image below).

Model Inputs

For each scenario, the actual 15-minute traffic volumes were entered at each input link, in order to reflect the dynamic nature of the traffic flow through the network. Vehicles were routed through the project interchanges based on the Origin-Destination distributions provided in the April 2000 Woodrow Wilson Bridge Traffic Project *Traffic Projections and Operational Analyses* report, prepared by PCC. For interchanges outside the Woodrow Wilson Bridge project area (Springfield, Van Dorn Street, and Eisenhower Connector interchanges), the mainline and ramp volumes were used.

Heavy vehicle percentages were based on average VDOT detector data and set at 14.25 percent at all model entry links.

Validation

The travel time runs were used to validate the base VISSIM model results. Table 1 below shows that the simulated end-to-end travel times are within reasonable range of the actual end-to-end travel times collected in the field. Due to time constraints, a full calibration of the model was not performed.

Table 1: Travel Time Validation Results

		Field Measurement	VISSIM Simulation	Difference
Outer Loop	Travel Time (sec)	537.2	565.6	5.3%
	Speed (mph)	62.8	59.2	5.7%
Inner Loop	Travel Time (sec)	459.6	483.8	5.3%
	Speed (mph)	62.1	59.1	4.8%

In workzones, driver behavior was modified by modifying the vehicle headway parameter in VISSIM car following model (CC1) from 0.9 to 1.68 to provide a capacity of approximately 1,600 vehicles per hour per lane, in accordance with capacity ranges provided in the Highway Capacity Manual. Vehicle headway was adjusted until throughput measured in the construction zone reached 1,600 vehicles per hour.

Scenarios Modeled

Two different Maintenance of Traffic (MOT) scenarios were modeled, for three different time periods. The MOT 1 scenario provides a static speed limit of 50 MPH through the Inner and Outer Loop workzones as well as on the Inner Loop approach to the workzone. A 55 MPH speed limit is posted on the Outer Loop between the Springfield Interchange and Eisenhower Connector interchange. Under the MOT 2 scenario

the VSL system is implemented, with the algorithm described in the next section. This scenario assumes that speed limits will change whenever conditions warrant, subject to the minimum message duration requirements that were established for enforcement purposes.

Time periods modeled were:

- Mid-day conditions (11:00 AM – 1:00 PM) with three lanes open to traffic
- Weekend conditions (2:00 PM – 4:00 PM) with two lanes open to traffic
- Nighttime conditions (11:00 PM – 1:00 AM) with one lane open to traffic

VSL ALGORITHM

The VSL algorithm employed by Renaissance Technologies, Inc. (RTI) . was coded using Microsoft Excel VBA and VISSIM's COM interface. A complete description of the algorithm is beyond the scope of this Memorandum; a brief overview is provided below.

The VSL system will be implemented on both the Inner Loop and Outer Loop of I-95. The 18 detectors are assigned to two Inner Loop and three Outer Loop zones (see attachment A). RTI's algorithm relies on weighting and averaging volume and occupancy data collected from each of the detectors at regular intervals to determine one of three overall "traffic states" for each zone: "normal", "slowing" or "stopped". Based on the state of each zone, the speed limit for the downstream zone is updated.

Several operational rules are incorporated into the algorithm:

1. The maximum speed limit through the actual construction zone is 50 MPH
2. The minimum speed limit through the construction zone is 35 MPH
3. Speed limits between consecutive zones cannot change by more than 10 MPH, and by less than 5 MPH between the construction zone and the immediate upstream zone
4. Speed limits on consecutive zones cannot increase
5. For enforcement purposes, a new speed limit must be maintained for a minimum of 30 minutes

Although in practice the VSL speed limit will be changed manually after review of traffic conditions by an operator, the VISSIM model assumes automatic speed limit updates.

It is important to note that RTI must calibrate a number of threshold values for volume and occupancy for the specific conditions through the Woodrow Wilson Bridge project area. While RTI's TrafAlert software, which runs the VSL system, has certain default values, they must be calibrated in the field for optimal performance. Due to time constraints, only minor adjustments to these factors were made for the VISSIM model.

RESULTS AND DISCUSSION

Results

The following Measures of Effectiveness (MOEs) were obtained from each simulation run:

- *Total network travel time* The total time each vehicle spends in the VISSIM network
- *Average number of stops per vehicle* The average number of times a vehicle is stopped in the queue approaching the workzones. A reduction in the number of stops may indicate improved safety.

- *Average vehicle delay* Average delay encountered by drivers in the VISSIM network (compiled for the entire network, not just for vehicles traveling through the workzones)
- *Average speed* Average speed of all vehicles in the VISSIM network
- *Average Travel Time through the VSL sections (Inner Loop and Outer Loop)* Measured travel time matching the segments for which field travel time data were collected.
- *Maximum Queue Length* Maximum length of the queue approaching the workzone during the simulation. It should be noted the maximum queue may occur on upstream on-ramps. Because the simulation model assumes static vehicle routes through the network, it does not allow vehicles to changes their route through the network if they encounter congestion on a particular link on their chosen route, which may exacerbate queue on on-ramps.
- *Average Speed Difference between free-flowing and queued traffic (∆ Speed)* This MOE provides a measure of the speed differential between the free flow speed of vehicles that have not yet joined the queue and the speed of the vehicles in the queue, and may be considered a measure of the speed at which drivers are approaching the end of the queue. A low speed difference indicates a less abrupt change in traffic conditions, and possibly safer operating conditions. This MOE was compiled by sampling the average link speed at 200-foot intervals traveling upstream from each workzone at five minute intervals in the simulation, and calculating the speed difference between each 200-foot segment.

Mid-Day Results

Table 2 summarizes the simulation results for the mid-day MOT 1 and MOT 2 scenarios.

Table 2: Mid-Day Simulation Results

Scenario	Total Travel Time (s)	Stops/ Veh.	Ave. Delay (s)	Ave. Speed (MPH)	Travel Time (s)		Max Queue (ft)*	∆ Speed (MPH)	
					OL	IL		IL	OL
MOT 1	3,728	0.17	24.2	50.3	722	548	265	N/A	14
MOT 2	3,737	0.16	23.7	50.1	726	548	233	N/A	13

* Outer Loop only; no queuing occurred on the Inner Loop

Examination of Table 2 shows that minor queuing occurs under both MOT scenarios on the Outer Loop. Delays, however, are minimal and the average speed remains near the posted speed limit. The average speed difference (∆ Speed) between the free-flowing and queued traffic is slightly lower under MOT 2 than under MOT 1, indicating slightly improved safety. Exhibit 1 in Attachment B shows a plot of the speed differences in each 200-foot segment for both the MOT 1 and MOT 2 scenarios. The values are color coded to highlight the differences between the two scenarios. A comparison of the plots for MOT 1 and MOT 2 shows that the speed differences between queued and free-flowing traffic tend to be lower under MOT 2, indicating potential safety benefits.

The number of stops per vehicle is minimal under either MOT scenario, indicating little congestion or queuing.

Weekend Conditions

Table 3 summarizes the simulation results for the weekend MOT 1 and MOT 2 scenarios.

Table 3: Weekend Simulation Results

Scenario	Total Travel Time (s)	Stops/ Veh.	Ave. Delay (s)	Ave. Speed (MPH)	Travel Time (s)		Max Queue (ft)*	Δ Speed (MPH)	
					OL	IL		IL	OL
MOT 1	5,345	37.3	346	27.8	919	1081	N/A	23.0	20.8
MOT 2	5,581	37.1	350	26.5	1,038	1,098	N/A	21.4	17.8

* No maximum queue length is given, as queues did not stabilize during the simulation period and extended beyond the network model limits

As shown in Table 3, a reduction to two lanes on the Inner and Outer Loop during weekend conditions is expected to result in severe queuing on both the Inner and Outer Loop. During the simulations, queues reach a maximum length and extended beyond the network limits.

Very small improvements were noted in the MOT 2 scenario in the average number of stops per vehicle and the speed difference between the free-flowing and queued traffic. However, average speeds decreased by 1.3 MPH, and both Inner and Outer Loop delays increased. While VSL did not reduce congestion, results do indicate somewhat smoother traffic flow approaching the workzones and thus possibly safer operating conditions. Similar to mid-day conditions, speed differences for the entire simulation period were plotted (see Attachment B, Exhibit 2). These plots indicate somewhat less abrupt speed changes between the free-flowing and queued traffic.

Nighttime Conditions

Table 4 summarizes the simulation results for the nighttime MOT 1 and MOT 2 scenarios.

Table 4: Nighttime Simulation Results

Scenario	Total Travel Time (s)	Stops/ Veh.	Ave. Delay (s)	Ave. Speed (MPH)	Travel Time (s)		Max Queue (ft)*	Δ Speed (MPH)	
					OL	IL		IL	OL
MOT 1	1,155	3.30	66.6	46.1	847	537	1,385	N/A	23.5
MOT 2	1,230	2.88	65.0	43.4	947	537	1,413	N/A	19.0

* Outer Loop only; no queuing occurred on the Inner Loop

Examination of Table 4 shows that queues are expected to occur on the Outer Loop. Comparison of the MOT 1 and MOT 2 scenarios shows that the average number of stops as well as the average speed difference are expected to decrease with implementation of the VSL system, possibly resulting in safer operating conditions.

The exhibits in Attachment B (Exhibit 3) show queues building up during the first hour of the simulation, which subside during the second hour of the simulation. Comparison of the MOT 1 and MOT 2 scenarios shows that speed differences between free-flowing and queued traffic are slightly reduced with the implementation of VSL, indicating a potential safety benefit.

Sensitivity Analysis

In the second phase of the simulation analyses, additional scenarios were run to determine if relaxing the speed limit rules and shortening the minimum message duration period would yield appreciably different results and provide further improvement in speed differences, delays, or average speeds. For each condition (mid-day, weekend and nighttime), three additional scenarios were run. The first scenario (SA 1) changed the speed limit rules, and allowed speed limits to increase as traffic progresses through the project area. In the second scenario (SA 2), the minimum message duration period was lowered from 30

minutes to 20 minutes. The third scenario (SA 3) combined the first and second scenario. Results are provided in tables 5 through 7. For comparison purposes, the results of the MOT 2 scenario (original algorithm) are provided as well.

Table 5: Mid-Day Simulation Results – Sensitivity Analysis

Scenario	Total Travel Time (s)	Stops/ Veh.	Ave. Delay (s)	Ave. Speed (MPH)	Travel Time (s)		Max Queue (ft)*	Δ Speed (MPH)	
					OL	IL		IL	OL
MOT 2	3,737	0.16	23.7	50.1	726	548	233	N/A	13
SA 1	3,711	0.13	22.0	50.6	711	549	208	N/A	11.8
SA 2	3,749	0.14	22.8	50.0	725	551	209	N/A	10.6
SA 3	3,701	0.11	21.3	50.6	705	550	184	N/A	9.4

* Outer Loop only; no queuing occurred on the Inner Loop

Table 6: Weekend Simulation Results – Sensitivity Analysis

Scenario	Total Travel Time (s)	Stops/ Veh.	Ave. Delay (s)	Ave. Speed (MPH)	Travel Time (s)		Max Queue (ft)*	Δ Speed (MPH)	
					OL	IL		IL	OL
MOT 2	5,581	37.1	350	26.5	1,038	1,098	N/A	21.4	17.8
SA 1	5,476	37.5	350	27.0	957	1,112	N/A	21.5	17.9
SA 2	5,543	37.0	350	26.6	958	1,149	N/A	20.0	17.8
SA 3	5,439	36.9	346	27.2	930	1,111	N/A	20.0	17.8

* No maximum queue length is given, as queues did not stabilize during the simulation period and extended beyond the network model limits

Table 7: Nighttime Simulation Results – Sensitivity Analysis

Scenario	Total Travel Time (s)	Stops/ Veh.	Ave. Delay (s)	Ave. Speed (MPH)	Travel Time (s)		Max Queue (ft)*	Δ Speed (MPH)	
					OL	IL		IL	OL
MOT 2	1,230	2.88	65.0	43.4	947	537	1,413	N/A	19.0
SA 1	1,152	2.61	62.4	46.2	839	537	1,189	N/A	19.0
SA 2	1,161	2.61	58.6	45.9	856	537	1,226	N/A	18.0
SA 3	1,147	2.38	54.5	46.5	838	537	1,131	N/A	17.3

* Outer Loop only; no queuing occurred on the Inner Loop

Examination of Tables 5 through 7 shows that some additional benefits can be achieved by relaxing the speed limit rules and/or allowing a shorter message duration period, depending on conditions.

During mid-day conditions, the speed differences on the Outer Loop are reduced, with slight improvements in average delay, travel speed and speed differences. During weekend conditions, some additional benefits are seen on the Outer Loop, where the travel time decreases and the speed differences are reduced. However, traffic volumes on the Inner Loop exceed capacity, and the simulation showed no benefit resulting from the VSL system. During nighttime conditions, the simulations shows that relaxing the speed limit and message duration rules does provide significant benefits in improved delay, travel time and reduced projected queue lengths on the Outer Loop.

Discussion

Examination of Tables 2 through 7 as well as Exhibits 1 through 3 in Attachment B shows that the benefits of the VSL system are most apparent in its ability to reduce the speed differentials between free-flowing traffic just before it joins the queue and the speed of the traffic in the queue itself. In addition, the number of stops are reduced, indicating an overall reduction in turbulence of traffic. Both factors may reduce the potential for crashes and may result in improved safety in the workzone.

Under the proposed VSL rules (MOT 2), the simulation results do not indicate that VSL leads to a reduction in travel time or queue lengths. This appears to be largely due to the algorithm, which does not allow speed limits to increase between consecutive zones. This means that in the workzone, where the queue is being released, speeds may be posted below that are the free-flow speed, resulting in increases in travel time. The sensitivity analyses confirmed that significant improvements in travel time, average speed, delay, and queue lengths could be obtained under nighttime conditions when speed limit rules were relaxed and the minimum message duration period was shortened from 30 to 20 minutes.

Another factor that may contribute to the limited improvement in network delays and travel times is the current system configuration, which places the detectors upstream of the VSL signs they control. This means that under congested conditions, the posted speed limit is essentially catching up to traffic conditions. While this may enable better management of speeds within the actual construction area, it provides limited opportunity to affect vehicle speeds before they reach the congested area.

Finally, the model appears to be very sensitive to volume and occupancy thresholds; additional field calibration is necessary to optimize performance. Although the VISSIM model was coded to easily change the TrafAlert parameters, time constraints did not allow for extensive adjustment of the volume and occupancy threshold parameters.

In summary, however, the VISSIM model was able to demonstrate potential safety benefits, as the VSL implementation resulted in fewer average stops per vehicle, and smaller speed differences between “normal” and “stopped” traffic conditions.

Queuing remains a concern during weekend lane closures; an aggressive public relations campaign will be necessary encourage drivers to seek alternate routes or change the time during which they choose to travel through the project area.

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ATTACHMENT A

VSL and Detector Locations
Zone Designations

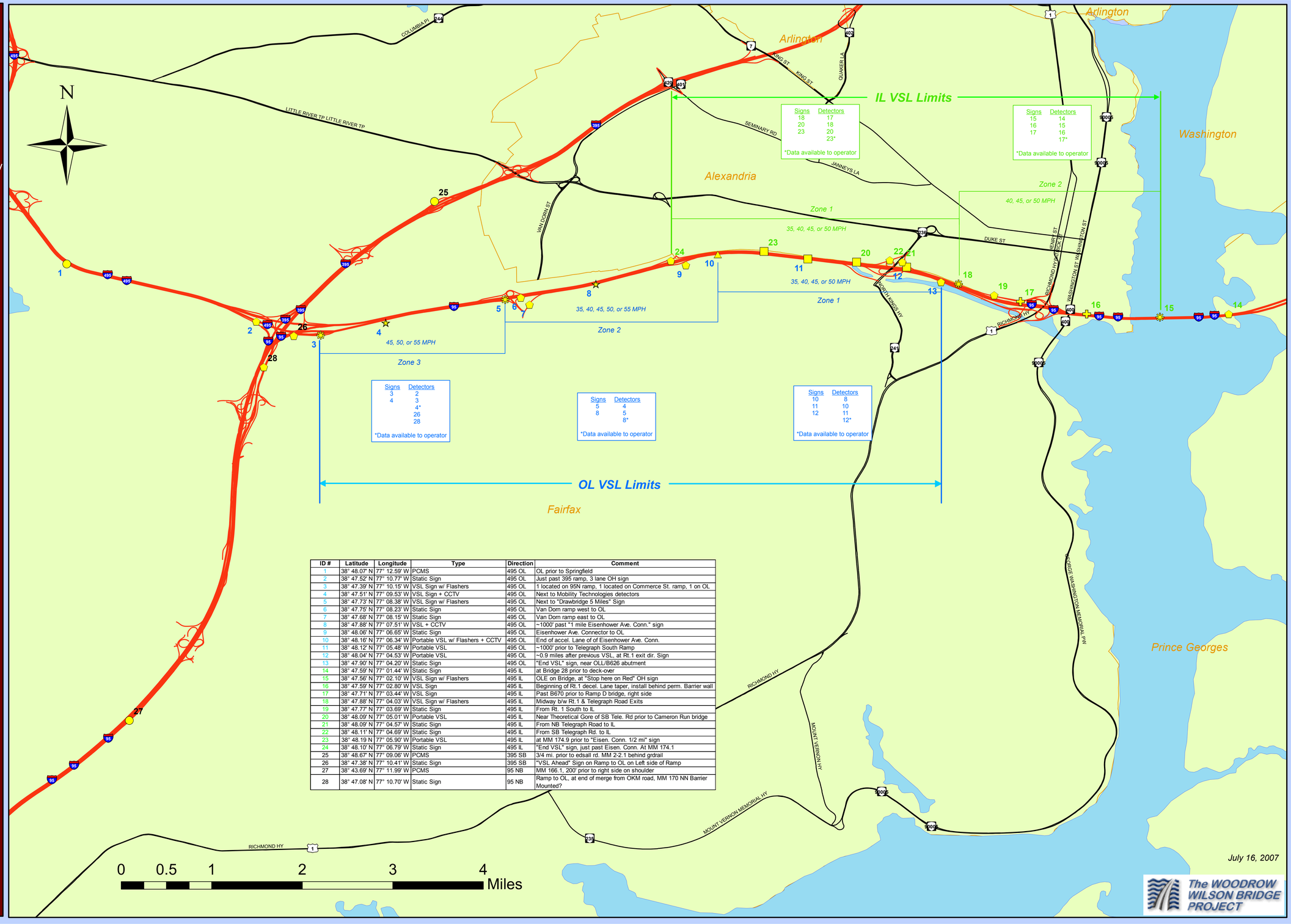
Proposed VSL Locations

Legend

- PCMS
- Portable VSL
- Portable VSL w/ Flashers + CCTV
- Static Sign
- VSL Sign
- VSL Sign + CCTV
- VSL Sign w/ Flashers

** All Portable VSL, VSL Signs, and Static Signs in Springfield and Maryland will have Detectors*

Note: Flashers only flash when speed is changed from normal speed



ID #	Latitude	Longitude	Type	Direction	Comment
1	38° 48.07' N	77° 12.59' W	PCMS	495 OL	OL prior to Springfield
2	38° 47.52' N	77° 10.77' W	Static Sign	495 OL	Just past 395 ramp, 3 lane OH sign
3	38° 47.39' N	77° 10.15' W	VSL Sign w/ Flashers	495 OL	1 located on 95N ramp, 1 located on Commerce St. ramp, 1 on OL
4	38° 47.51' N	77° 09.53' W	VSL Sign + CCTV	495 OL	Next to Mobility Technologies detectors
5	38° 47.73' N	77° 08.38' W	VSL Sign w/ Flashers	495 OL	Next to "Drawbridge 5 Miles" Sign
6	38° 47.75' N	77° 08.23' W	Static Sign	495 OL	Van Dorn ramp west to OL
7	38° 47.68' N	77° 08.15' W	Static Sign	495 OL	Van Dorn ramp east to OL
8	38° 47.88' N	77° 07.51' W	VSL + CCTV	495 OL	~1000' past "1 mile Eisenhower Ave. Conn." sign
9	38° 48.06' N	77° 06.65' W	Static Sign	495 OL	Eisenhower Ave. Connector to OL
10	38° 48.16' N	77° 06.34' W	Portable VSL w/ Flashers + CCTV	495 OL	End of accel. Lane of of Eisenhower Ave. Conn.
11	38° 48.12' N	77° 05.48' W	Portable VSL	495 OL	~1000' prior to Telegraph South Ramp
12	38° 48.04' N	77° 04.53' W	Portable VSL	495 OL	~0.9 miles after previous VSL, at Rt.1 exit dir. Sign
13	38° 47.90' N	77° 04.20' W	Static Sign	495 OL	"End VSL" sign, near OLL/B626 abutment
14	38° 47.59' N	77° 01.44' W	Static Sign	495 IL	at Bridge 28 prior to deck-over
15	38° 47.56' N	77° 02.10' W	VSL Sign w/ Flashers	495 IL	OLE on Bridge, at "Stop here on Red" OH sign
16	38° 47.59' N	77° 02.80' W	VSL Sign	495 IL	Beginning of Rt.1 decel. Lane taper, install behind perm. Barrier wall
17	38° 47.71' N	77° 03.44' W	VSL Sign	495 IL	Past B670 prior to Ramp D bridge, right side
18	38° 47.88' N	77° 04.03' W	VSL Sign w/ Flashers	495 IL	Midway b/w Rt.1 & Telegraph Road Exits
19	38° 47.77' N	77° 03.69' W	Static Sign	495 IL	From Rt. 1 South to IL
20	38° 48.09' N	77° 05.01' W	Portable VSL	495 IL	Near Theoretical Gore of SB Tele. Rd prior to Cameron Run bridge
21	38° 48.09' N	77° 04.57' W	Static Sign	495 IL	From NB Telegraph Road to IL
22	38° 48.11' N	77° 04.69' W	Static Sign	495 IL	From SB Telegraph Rd. to IL
23	38° 48.19 N	77° 05.90' W	Portable VSL	495 IL	at MM 174.9 prior to "Eisen. Conn. 1/2 mi" sign
24	38° 48.10' N	77° 06.79' W	Static Sign	495 IL	"End VSL" sign, just past Eisen. Conn. At MM 174.1
25	38° 48.67' N	77° 09.06' W	PCMS	395 SB	3/4 mi. prior to edsall rd. MM 2-2.1 behind grdrail
26	38° 47.38' N	77° 10.41' W	Static Sign	395 SB	"VSL Ahead" Sign on Ramp to OL on Left side of Ramp
27	38° 43.69' N	77° 11.99' W	PCMS	95 NB	MM 166.1, 200' prior to right side on shoulder
28	38° 47.08' N	77° 10.70' W	Static Sign	95 NB	Ramp to OL, at end of merge from OKM road, MM 170 NN Barrier Mounted?

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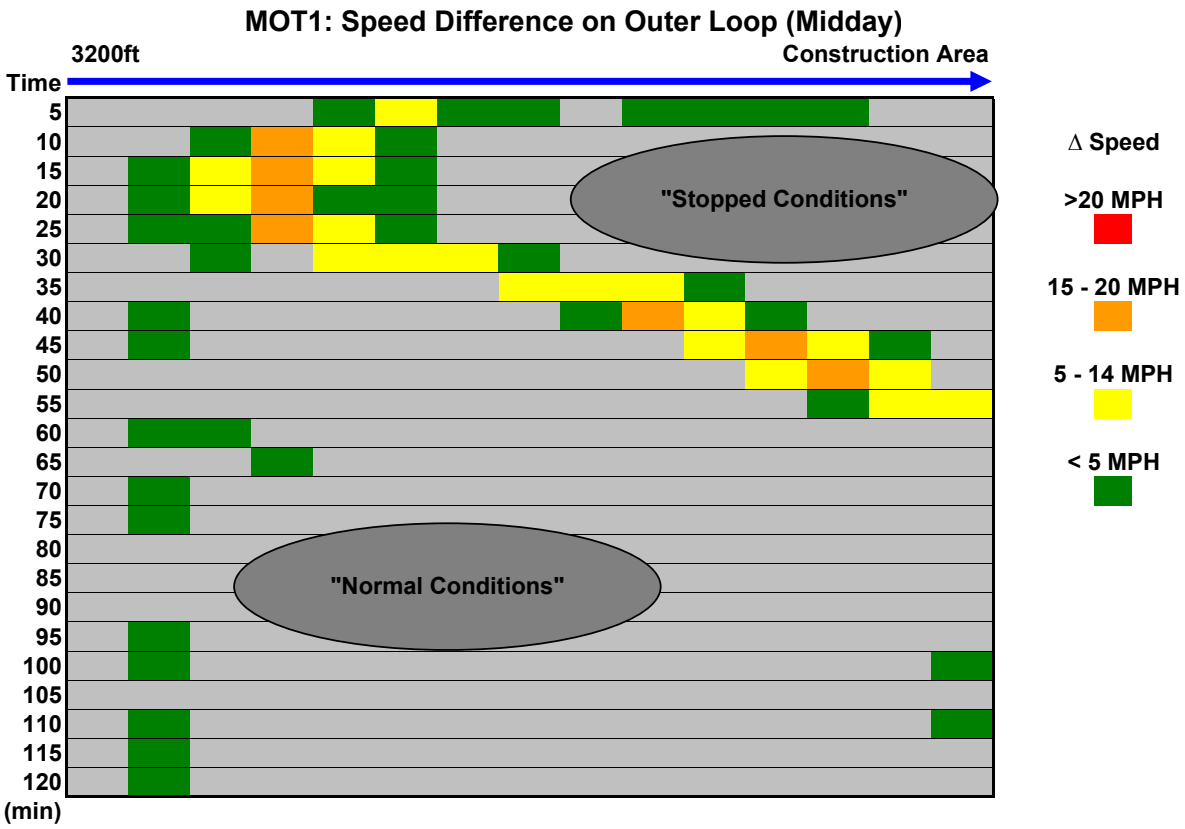
ATTACHMENT B

Speed Profiles

Exhibit 1


MOT1: Speed Difference on Outer Loop (Midday)
3200ft
Construction Area
Time
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
(min)
"Stopped Conditions"
"Normal Conditions"
Δ Speed
>20 MPH
15 - 20 MPH
5 - 14 MPH
< 5 MPH

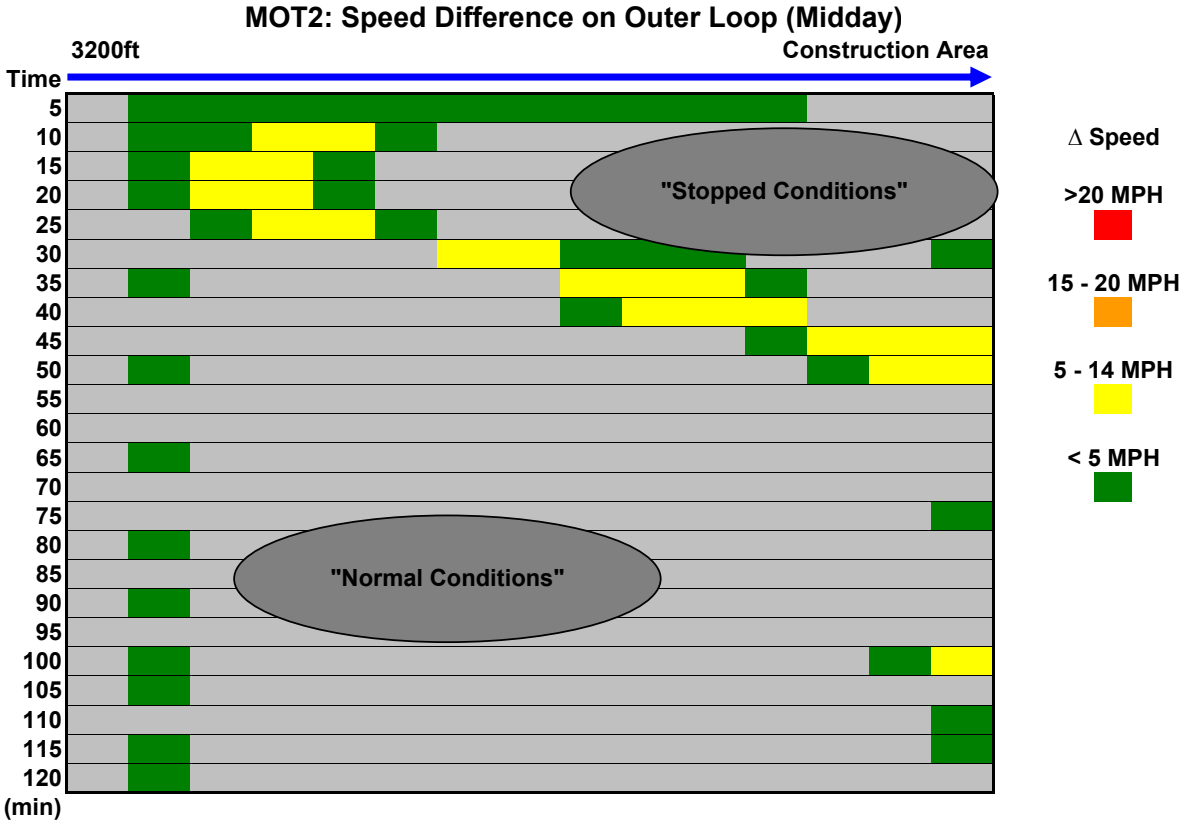
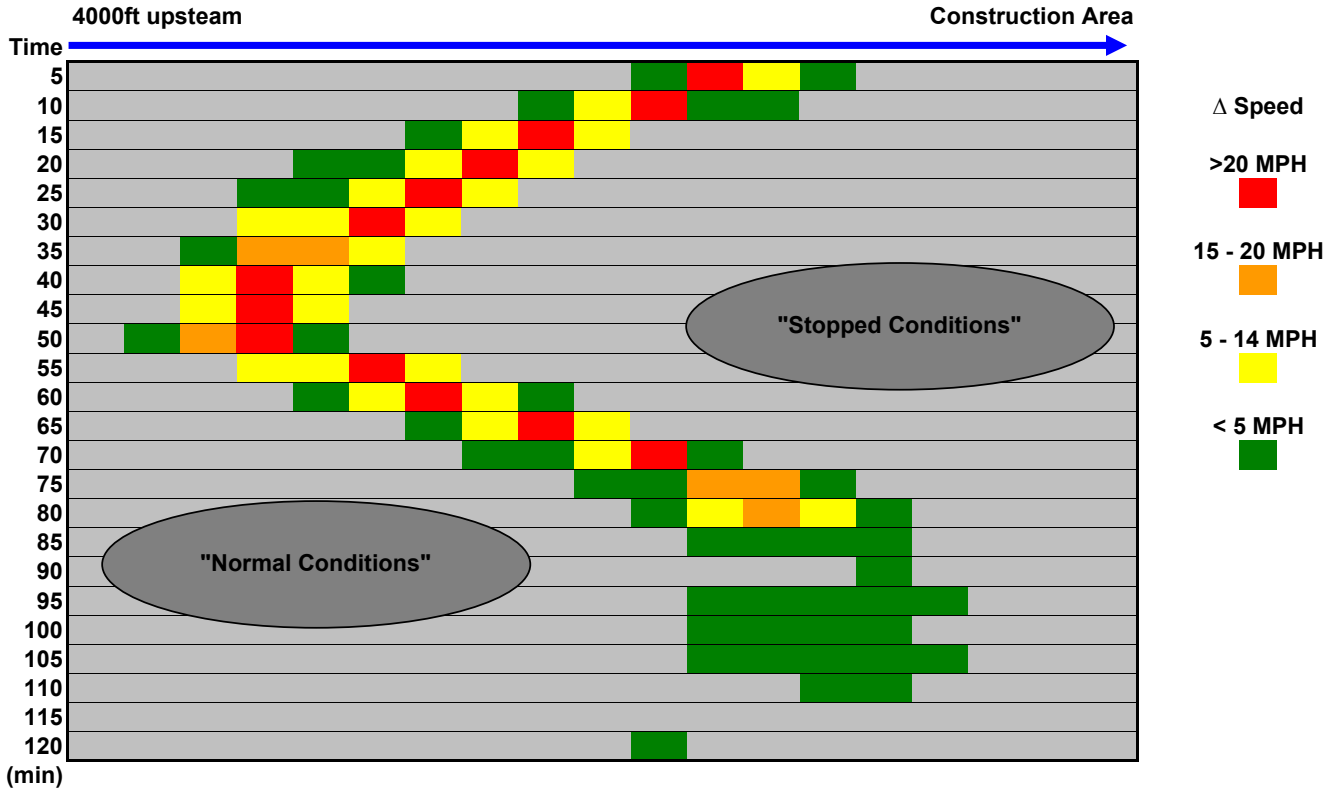

MOT2: Speed Difference on Outer Loop (Midday)
3200ft
Construction Area
Time
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
(min)
"Stopped Conditions"
"Normal Conditions"
Δ Speed
>20 MPH
15 - 20 MPH
5 - 14 MPH
< 5 MPH

Exhibit 3

MOT1: Speed Difference on Outer Loop (Night)



MOT2: Speed Difference on Outer Loop (Night)

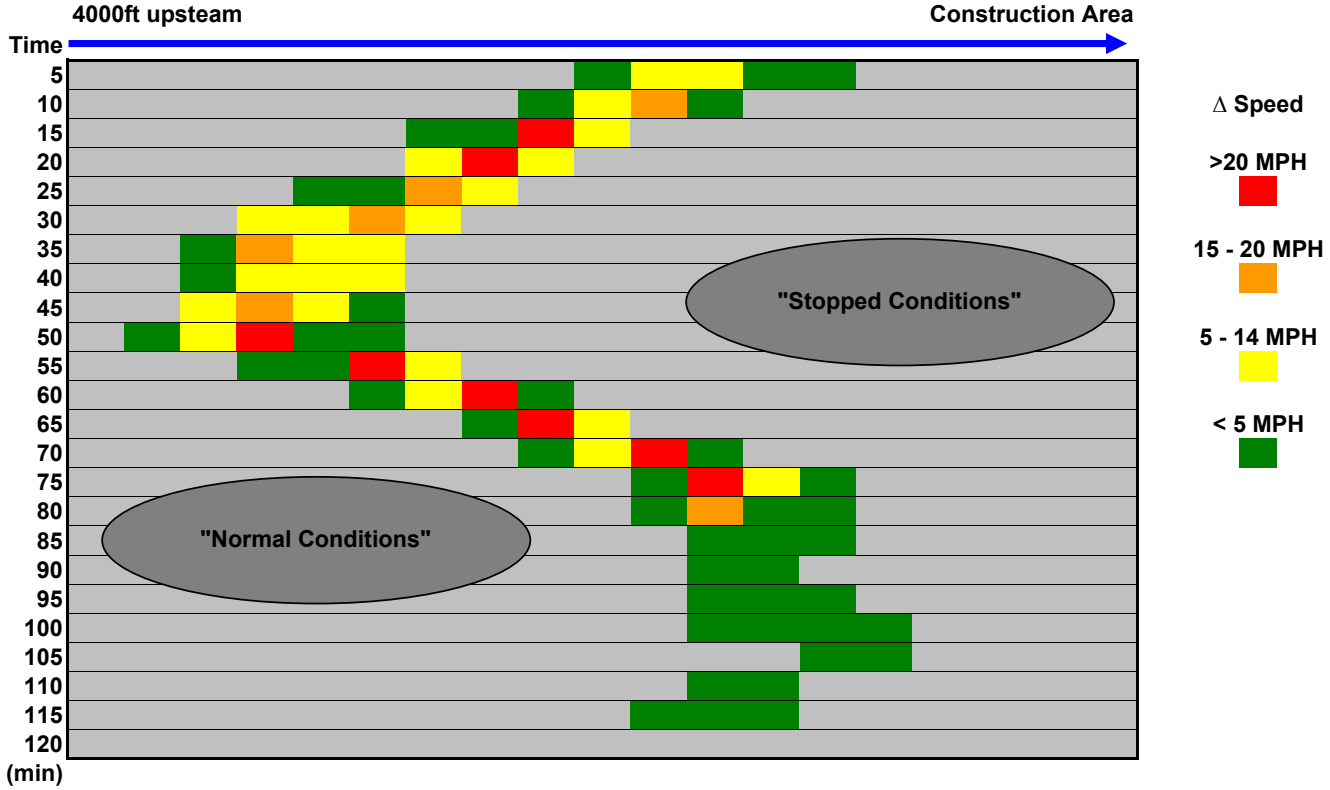


Exhibit 2

MOT1: Speed Difference on Outer Loop (Weekend)

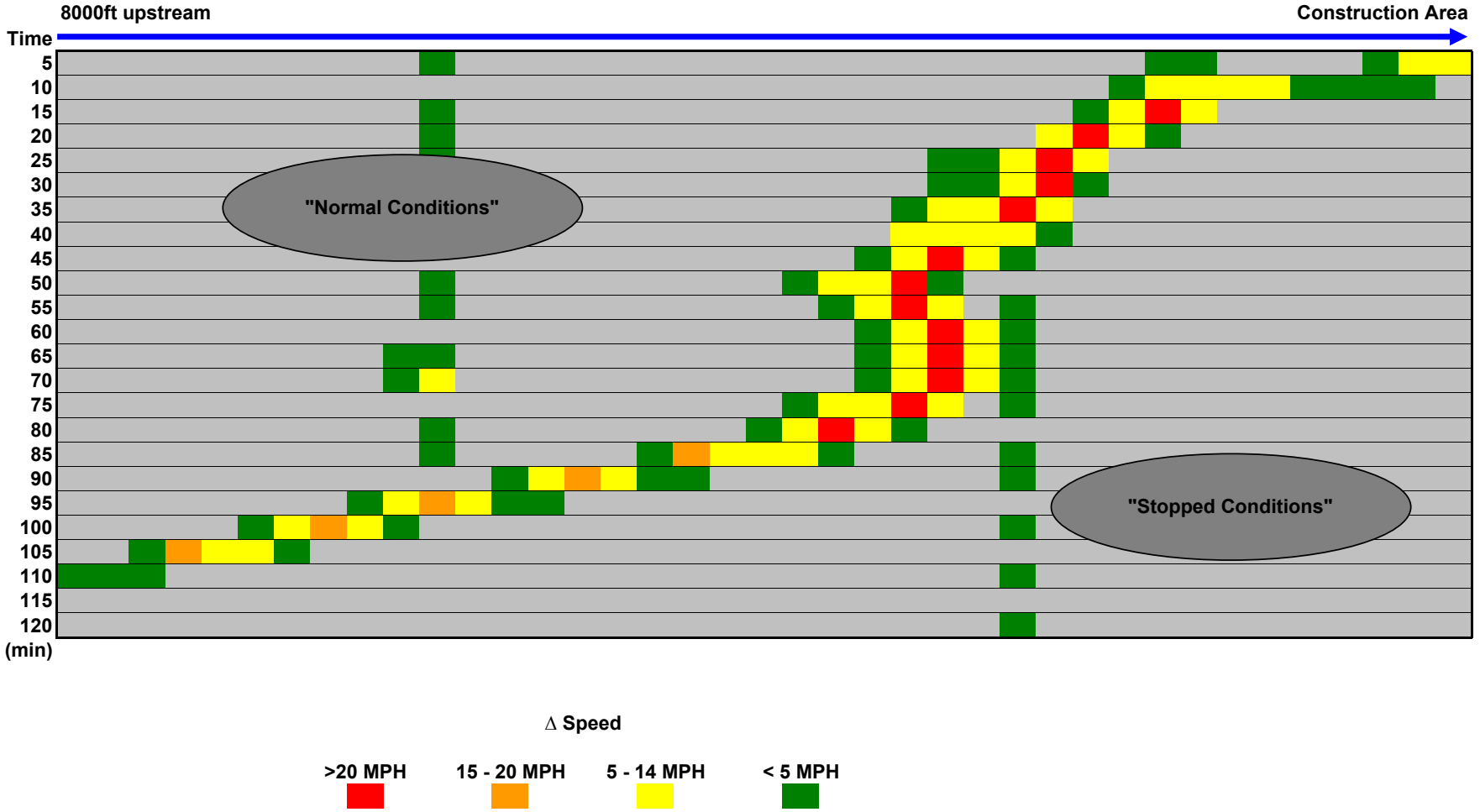


Exhibit 2 (Continued)

MOT2: Speed Difference on Outer Loop (Weekend)

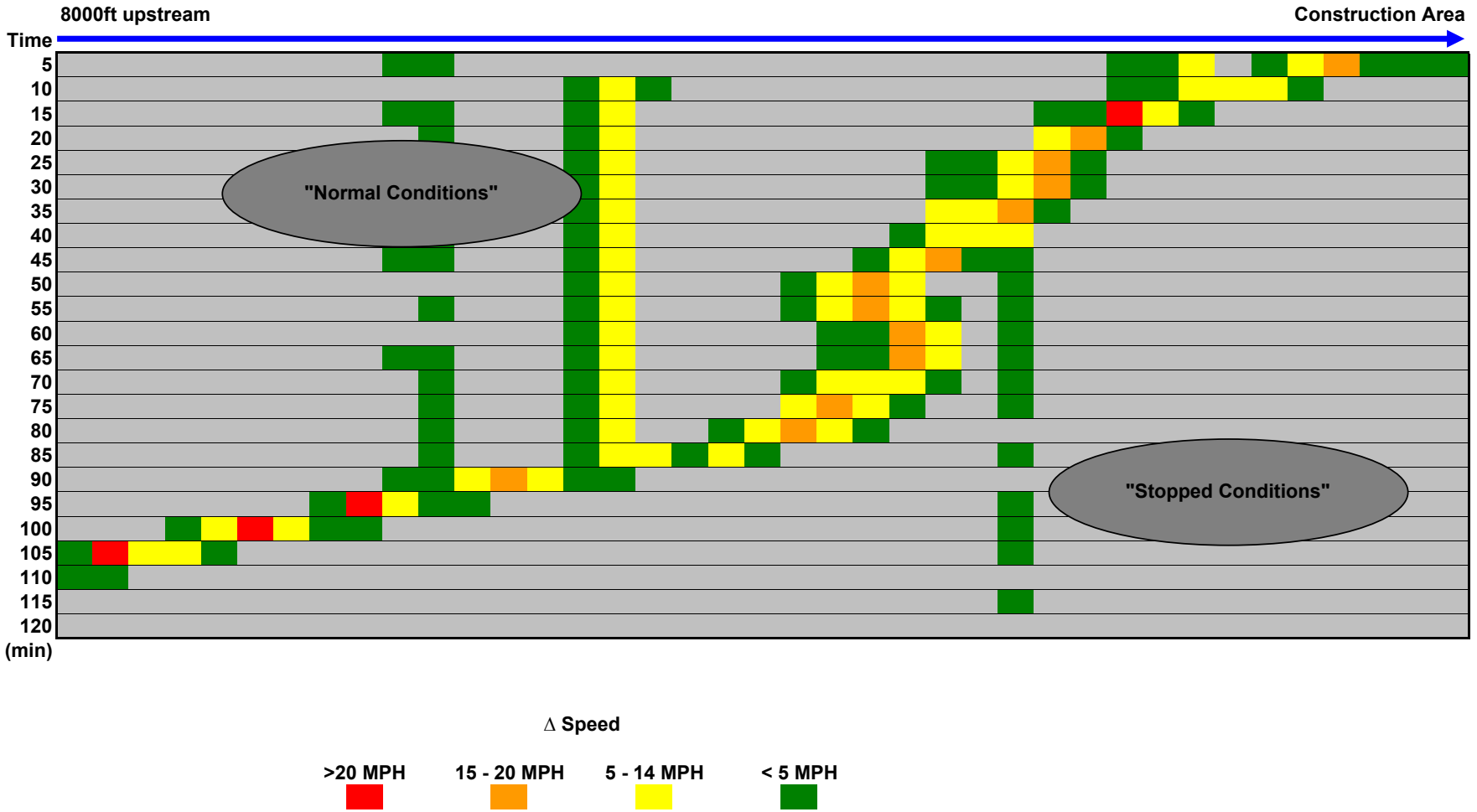


Exhibit 2 (Continued)

MOT1: Speed Difference on Inner Loop (Weekend)

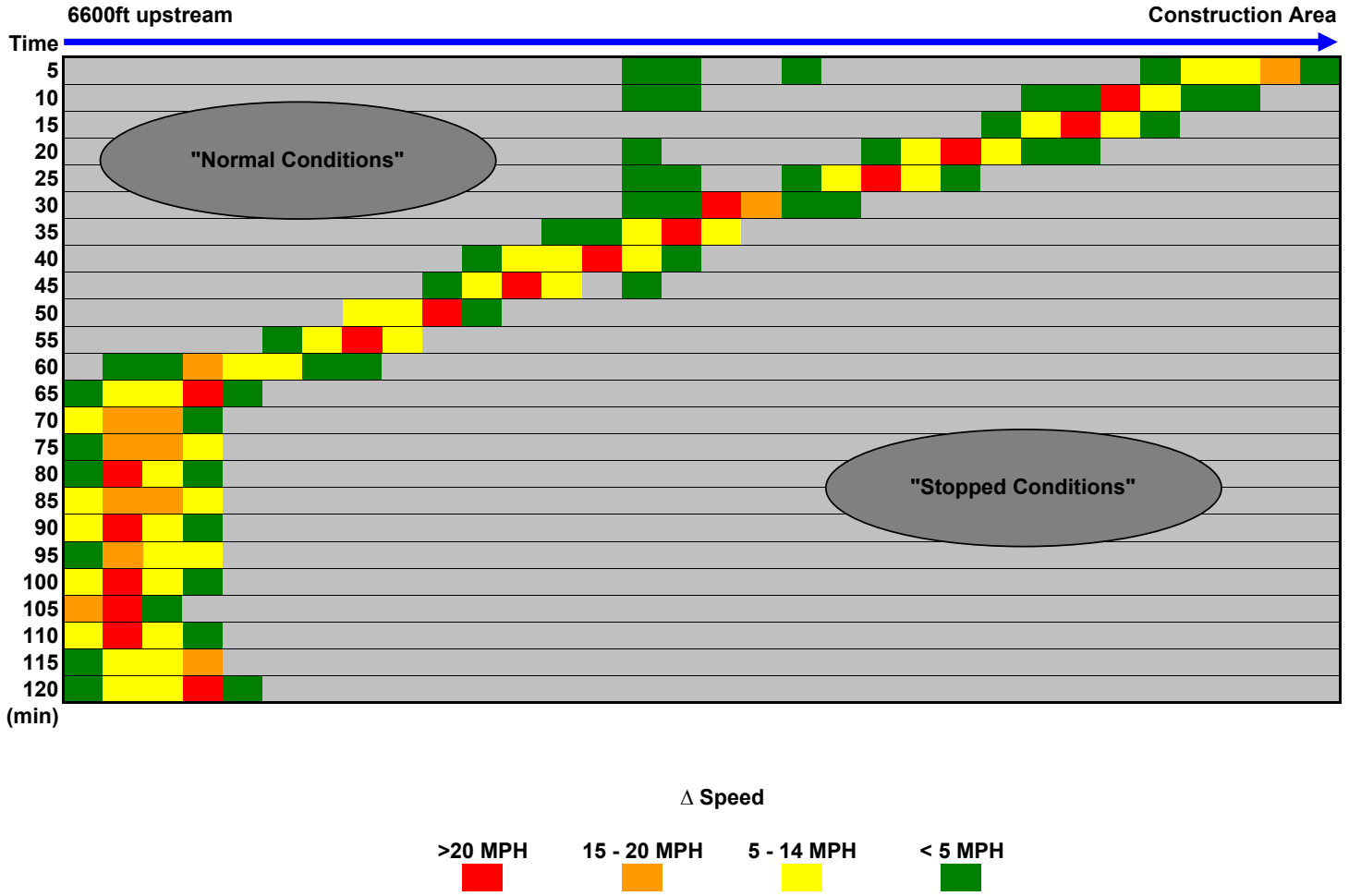
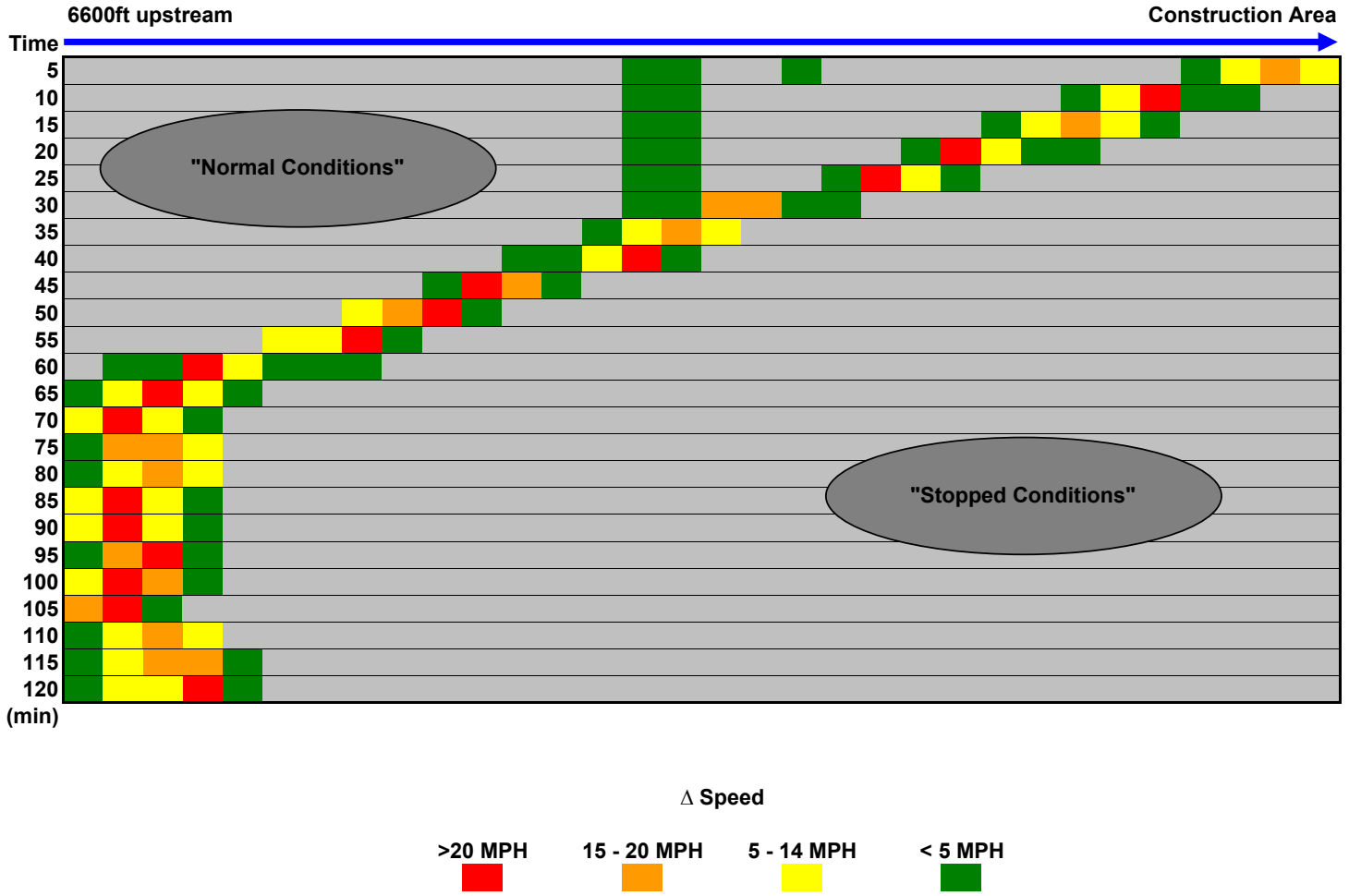
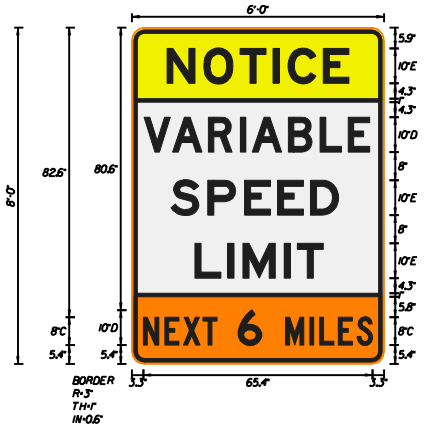


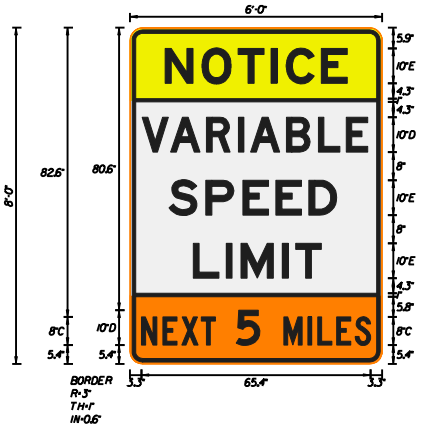
Exhibit 2 (Continued)

MOT2: Speed Difference on Inner Loop (Weekend)

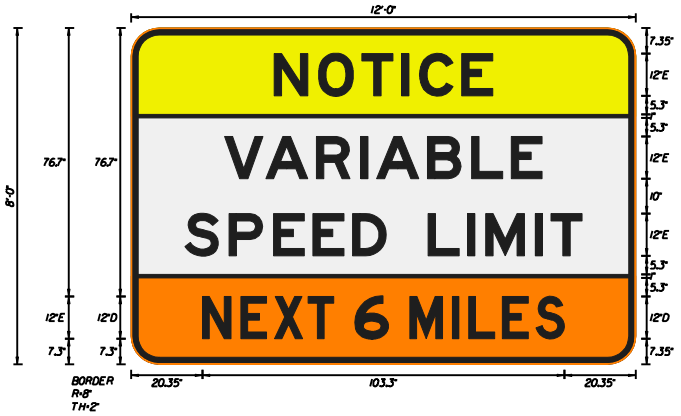




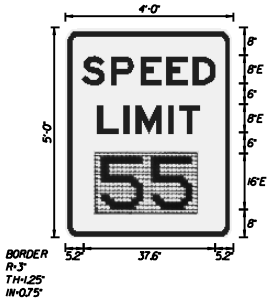
TYPE A
LOCATION: I-95 NB, I-395 SB
QUANTITY: 2



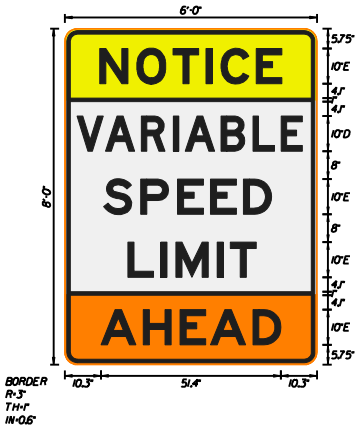
TYPE B
LOCATION: I-495 IL, I-295 SB
QUANTITY: 2



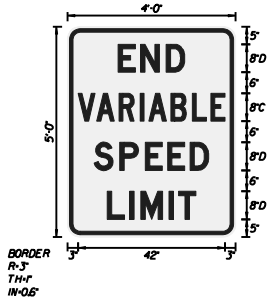
TYPE C
LOCATION: I-495 OL "OH"
QUANTITY: 1



VSL SIGN
LOCATION: SPRINGFIELD / VAN DORN
QUANTITY: 6

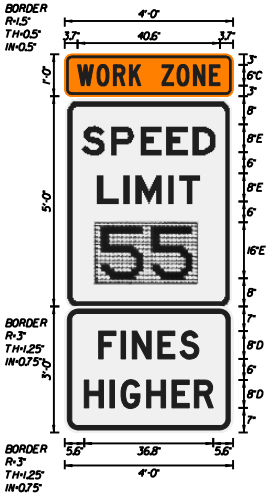


TYPE D
LOCATION: VAN DORN E/W, EISENHOWER, TELEGRAPH N/S, RT.1
QUANTITY: 6



TYPE E
LOCATION: I-495 IL/OL
QUANTITY: 2

TYPE F
LOCATION: ALL PCMS LOCATIONS
QUANTITY: 8



VSL WORK ZONE SIGN
LOCATION: SEE MAP
QUANTITY: 12

NOTE: CONTRACTOR SHALL CONFIRM ALL SIGN DESIGNS WITH PCC PRIOR TO INITIATING FABRICATION.

WOODROW WILSON BRIDGE PROJECT
VSL SIGNS DESIGN
10/05/07
S.U.A.I.