### **Roanoke Valley Area Metropolitan Planning Org** zation (R)

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APPROX I-81 DELAY

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Roanoke Valley-Alleghany Regional Commission June 2007

### I-81 NEPA Tier II Study

### **Background:**

The Federal Highway Administration (FHWA) in cooperation with the Virginia Department of Transportation (VDOT) is allowing for a two-tier approach to the Environmental Impact Statement (EIS) for Interstate 81. According to this approach: *"The Tier 1 DEIS, prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), identifies needs, develops solutions, and evaluates potential impacts associated with conceptual-level improvements along the entire 325-mile I-81 corridor in Virginia, as well as improvements to Norfolk Southern's Shenandoah and Piedmont rail lines in Virginia. The potential impacts of specific improvements would be analyzed in greater detail during Tier 2 if a "Build" concept (or portion of a "Build" concept) is advanced.* "<sup>1</sup>

The Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) is the federally designated Metropolitan Planning Organization for the Roanoke Region. As such, the RVAMPO is responsible for the Regional Constrained Long-Range Transportation Plan (CLRTP) and the Regional Transportation Improvement Program (TIP). These responsibilities require the MPO to have much smaller geographic focus than VDOT's corridor wide Tier 1 approach. Therefore the RVAMPO is very interested in the implications of "specific improvements" that would be analyzed as a part of a Tier II NEPA process.

### **Purpose:**

The purpose of this document is to serve as the RVAMPO's official input into the I-81 Tier II NEPA process. RVAMPO staff feel that certain specific details or alternatives need to be highlighted in the Tier II NEPA process. These alternatives draw on RVAMPO's years of experience in multi modal transportation planning. This document will not discuss alternatives that are out of the RVAMPO's expertise such as: multi-state rail upgrades, specific endangered species or specific biological or ecological impacts. Instead this document will present:

### 1) Air Quality Issues and Potential Mitigations:

- No-Idling Zones
- Truck Stop and Truck Rest Area Electrification

### 2) Operations Management

• Managed Lanes

### 3) Transportation Demand Management (TDM)

• Park and Ride Lots

<sup>&</sup>lt;sup>1</sup> I-81 Corridor Improvement Study – Tier 1 Draft Environmental Impact Statement, January 9, 2006. Page ES-i

### 4) Greenway, Trail and Bicycle Impacts

### 1) Air Quality Issues and Potential Mitigations:

There are two potential air quality issues that will be affected by any upgrades to Interstate 81:

- Ground Level Ozone (8-hour Ozone Standard)
- Fine Particulate Matter PM 2.5 (Both the annual and daily standards)

### Ground Level Ozone:

In the latter half of the 1990s the Roanoke Valley exceeded the newly implemented 8hour average Ozone standards with a design value of 87 parts per billion (ppb) compared to a maximum value of 85 ppb. This put the region in the position of being declared nonattainment for the newly implemented federal standards. Before, this happened, the Ozone Early Action Compact (EAC) and Ozone Early Action Plan (EAP) protocol was developed for the Federal Environmental Protection Agency (EPA). The EAC/EAP protocol allowed regions that would be non-attainment, due to the change from a 1-hour peak standard to the 8-hour average concentration standard, to develop an air-quality plan immediately. In exchange, the non-attainment status of these areas would be deferred until 2007 pending successful completion of plan milestones. If the EAC/EAP area is back under the standard after the 2007 Ozone Season, the area would be back in attainment pending continued compliance with the standard in the future.

In December 2002, the cities of Roanoke and Salem; the counties of Botetourt and Roanoke; and the town of Vinton entered into an Ozone EAC with the Virginia Department of Environmental Quality (VDEQ) and the Federal EPA. The EAC lead to the development and adoption of an Ozone EAP the following year. Currently, air quality data show that the Roanoke Valley is back under the 8-hour average concentration standard. The region must maintain this result through the Summer of 2007 in order for its attainment status to become official. This situation leads to the following principle that should be accepted into the I-81 NEPA Tier II study:

# Principle #1 – I-81 improvements should not jeopardize 8-hour Ozone compliance in the short or long-term horizon.

A summary of recent Ozone trends in the Roanoke Valley follows:

YEAR	# OF EXCEEDANCE	3-YEAR DESIGN VALUE
1998	13	85 Parts Per Billion
1999	6	90 PPB
2000	2	89 PPB
2001	5	86 PPB
2002	5	87 PPB
2003	1	85 PPB
2004	0	79 PPB
2005	0	74 PPB

Data provided by Virginia Department of Environmental Quality (VDEQ) – Summary to Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) – May 26, 2006.

### Fine Particulate Matter – PM 2.5

Fine Particulate Matter (PM 2.5) is composed of microscopic particles that are many times smaller than the width of a human hair. PM 2.5 can come from both vehicle exhaust and coal fired power plant emissions. In recent years, the Roanoke Valley has been hovering dangerously close to the annual standard and the recently changed daily standard. PM 2.5 is evaluated on a three-year average. The annual standard should not exceed an average of 15 micrograms per cubic meter and the daily standard should not exceed a daily average of 35 micrograms per cubic meter.

A summary of recent PM 2.5 trends in the Roanoke Valley follows:

2003	2004	2005	3-year average
Daily Standard (3-y	ear average not to	exceed 35.0)	
32.0	32.2	35.4	33.2
Annual Standard (3	3-year average not	to exceed 15.0)	
13.5	13.5	15.1	$14.1^2$

The Roanoke Valley is right at the threshold of both the "Daily" and "Annual" PM 2.5 standard. So far, the Roanoke Valley is officially still in attainment; however, this situation leads to the following principle that should be accepted into the I-81 NEPA Tier II study:

<sup>&</sup>lt;sup>2</sup> Data provided by Virginia Department of Environmental Quality (VDEQ)

# Principle #2 – I-81 improvements should not increase PM 2.5 emissions in either the short or long-term.

### No Idling Zones:

In order to address Principles #1 and #2, specific recommendations and actions should be incorporated into the I-81 NEPA Tier II document. The I-81 NEPA Tier I document only mentions that the Roanoke Valley is an Ozone EAC/EAP area. This does not do justice to the fact that the area is on the threshold for both Ozone and PM 2.5 nonattainment. Specific actions need to be taken and accounted for in financial aspects of the I-81 proposal to ensure that the Roanoke Valley remains in attainment for both Ozone and PM 2.5. The first of these actions is to establish no-idle zones along I-81.

A computer rendered visual representation of a no-idle zone follows:



Figure 1 – Computer Rendering of Strictly Enforced No Idle Zones Idling should be prohibited and compliance should be strictly enforced on the shoulders of I-81, on ramps, exit ramps, over passes and rest areas.

# **Electrified Truck Rest Stops/ Truck Stops:**

Trucks drivers do not idle in order to be wasteful. They typically idle so that they can run heaters or other appliances in the cab of the truck. Electrified truck rest stops should be provided to offer truck drivers an alternative to idling. These electrified stops should be

provided in conjunction with the no-idling zones. The electrified truck rest stops should be provided at each interchange in the RVAMPO study area.



Figure 2 – Electrified Truck Stop Illustration

Electrified truck rest stops could be combined with the provision of commuter park and ride lots as in the following diagram.



Figure 3 – Combined Park & Ride with Electrified Truck Stop Illustration

Funding for the construction and maintenance of an electrified truck rest stop at each intersection in the RVAMPO study area should be included in the overall financing for

any I-81 upgrade. This item should not be left as a suggestion for someone else to implement.

### 2) Operations Management:

The goal of operations management is to manage transportation infrastructure in the most effective way possible. This is often accomplished by applying computational and telecommunications technology to better manage the operation transportation infrastructure, and is generally referred to as Intelligent Transportation Systems (ITS). By way of analogy, providing transportation infrastructure, such as adding additional lanes, is like a company building a new factory when they receive an increase in orders. On the other hand, operations management is the equivalent of the same company rearranging their assembly process and applying technology to eliminate bottlenecks thereby increasing output from the original factory. Historically, transportation problems have been dealt with by the "build a new factory" approach.

Recent public input meetings concerning Interstate 81 have featured two main constituent groups:

- 1) Those in favor of shifting trucks to rail as a solution
- 2) Those in favor of adding additional highway capacity (i.e. more lanes).

Both groups make valid points, however, each group tends to present its case in "all or nothing" terms (i.e. "Either we shift all future increases to rail or we add two lanes in each direction.") Staff members feel that framing the issue in all or nothing highway vs. rail or rail vs. highway terms leaves out the possibility of operations management as viable component to the solution.

For the remainder of this document staff will assume that both highway expansion (at some level) and increased rail capacity at a multi-state level are needed "together" to solve future transportation needs. The question then shifts to what type of highway expansion is needed. Many highway expansion proponents describe highway expansion in the same manner as historical highway expansion (i.e. just adding lanes). This is akin to building the new factory in the aforementioned analogy. This report advances a different concept of highway expansion that of a "managed lanes." For the purposes of this report "managed lanes" will refer to two additional lanes and the ITS elements that would allow traffic on the lanes to reverse directions depending on conditions and transportation demand. Specifically the following scenarios will be presented:

- 1) Special Event (i.e. Virginia Tech Game Day Scenario);
- 2) Severe Crash Incident Management Scenario;
- 3) Morning Peak Hour Scenario;
- 4) Afternoon Peak Hour Scenario;
- 5) Truck Lanes Scenario; and
- 6) High Occupancy Vehicle High Occupancy Toll Scenario.



### Special Event - Virginia Tech Game Day Scenario:

Figure 4 – Game Day Scenario

Figure 4 depicts two managed lanes in the median of Interstate 81. Operations Management techniques using ITS would allow direct flow along the center lanes from the Roanoke Valley to Exit 118. This would greatly increase capacity for a special event such as a Virginia Tech home football game. The important point is that the two median lanes are not just an additional two lanes, they are actively managed and traffic flow can be safely adapted to the situation. In this case the two managed lanes minimize delay by allowing a total of 4 lanes of traffic flow towards the special event. The following scenarios are intended to demonstrate the adaptability of this concept. The "managed lane" concept was not sufficiently addressed in the "I-81 Corridor Improvement Study -Tier 1 Draft Environmental Impact Statement<sup>"3</sup> The concept of Transportation System Management (TSM) is introduced on pate 3-8 of the Tier 1 Draft Environmental Impact Statement (EIS). As defined the TSM concept includes acceleration/deceleration lanes, truck climbing lanes and similar facilities. Thus, the TSM concept does not capture the increased capacity that a managed lane would bring. Staff members feel that the lack of a robust operations management and ITS component such as managed lanes limits the effectiveness of the Tier I Draft EIS as far as the RVAMPO study area is concerned.

<sup>&</sup>lt;sup>3</sup> I-81 Corridor Improvement Study – Tier 1 Draft Environmental Impact Statement, January 9, 2006. Page 3-8

This report recommends a full evaluation of operation management and managed lanes approaches in VDOTS Tier II Environmental Impact Statement.

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### Severe Crash - Incident Management Scenario:

Figure 5 – Incident Management Scenario

Non-recurring congestion, such as accidents, can play a major role in overall traffic delay. Figure 5 illustrates how repeatable temporary access points can allow traffic to shift around a major accident and allow emergency crews unobstructed access to the scene. This would provide an additional pair of travel lanes so that traffic flow can be maintained at a reasonable level. This scenario further illustrates the adaptability of managed lanes. The main point to remember is that manage lanes can be reconfigured several times a day depending on need. The lands could allow traffic flow in one direction during the morning peak, they could allow flow around an accident during the day and allow flow in the reverse direction during the afternoon peak. It is this versatility that adds capacity when and where it is needed that is unique about managed lanes.

# **Morning Peak Scenario:**



Figure 6 – Morning Peak Hour Illustration

Managed lanes are excellent for accommodating peak hour congestion. In this role the lanes could allow for peak hour directional traffic from Botetourt County to Roanoke, Salem and the New River Valley. The managed lanes could consistently operate in the peak hour direction from 7:00 until 9:30 each morning.

### Afternoon Peak Scenario:



Figure 7 – Afternoon Peak Hour Illustration

Likewise, managed lanes are excellent for accommodating afternoon peak hour congestion. In this role the lanes could allow for peak hour directional traffic from the Cities of Roanoke and Salem to Botetourt County. The managed lanes could consistently operate in the peak hour direction from 4:00 until 6:30 each afternoon.

### **Truck Lanes Scenario:**



Figure 8 – Truck Lane Scenario

The concept of truck only lanes has been proposed by a consortium of companies referred to as "Star Solutions" under Virginia's Public Private Transportation Act (PPTA) procurement procedure. The concept in figure 8 differs from the PPTA concept in that "managed lanes" could serve as truck lanes on a temporary or peak demand basis. Just as the managed lanes could be configured for morning and afternoon peaks (figures 6 and 7), the center lanes could be restricted to through tractor trailers during peak tractor trailer demand. As far as MPO staff can tell, truck lanes in the PPTA concept would be permanently dedicated to tractor trailer traffic twenty-four hours a day and seven days a week.

# High Occupancy Vehicle (HOV)/ High Occupancy Toll (HOT) Scenario:



Figure 9 – HOV/HOT Scenario

This scenario is similar to the morning and afternoon peak scenarios (figures 6 and 7). However, free access to the HOV lanes would be restricted to vehicles with two or more passengers. Single Occupance Vehicles (SOV) could gain access to the center lanes with the payment of a per-mile fee that varies by time of day. The fee would be communicated using variable message signs and the fee would be collected using transponders and wireless technology.

### **Operations Management Summary:**

This report the concepts in figures 4 - 9 as an illustration of the many possibilities of "managed lanes." This report does not recommend any of the scenarios over any others, nor does it necessarily recommend implementation of all of the scenario concepts together. The main point is that if additional highway capacity is to be added to I-81, that capacity should be in a physical form that allows it to be "managed" using operations management techniques, some of which are illustrated in figures 4 - 9. If, as is often stated, I-81 is to be upgraded to address future demand, it should be updated to

accommodate future technologies and traffic flow management techniques.



Figure 10 - Workers laying fiber optic cable near a transportation project 4

An added benefit of the construction of managed lanes is that cable conduits, wireless communications, pavement sensors and other infrastructure can be placed during construction. Additional bandwidth from operations management technology can be leased back to the private sector for an additional revenue source.

### Park and Ride Lots:

In April 2005 RVARC Staff produced the "RIDE Solutions Park-and-Ride Study." RIDE Solutions is the regional ride-matching agency that operates as a service of the Roanoke Valley-Alleghany Regional Commission. The "Park-and-Ride Study" used fieldwork and observations as its primary methodology. A summary of observations follows:

Мар		No. of	Average	2005	2003	Percent
Location	Location	Spaces	Usage	Utilization	Utilization	Change
1	I-81 Exit 118C Route 640 Falling Branch Road	52	18	35%		
2	I-81 Exit 128 Route 603 & Route 635 Pedlar Road	40	5	13%		
3	I-81 Exit 140 Route 1128 & Route 1150 Edge Brook Road	59	48	81%	85%	-4%
4	I-81 Exit 150 Route 220 & Route 816 Tinker Mountain Road	13	37	285%	231%	54%
5	Route 311 Routes 419, 311, 630 Kessler Mill Road	32	26	81%		
6	Route 311 Routes 419, 311, 630 Kessler Mill Road	35	9	26%		

Figure 11 – Park and Ride Utilization<sup>5</sup>

<sup>&</sup>lt;sup>4</sup> Photo courtesy of National Oceanic & Atmospheric Administration – www.boulder.noaa.gov



Figure 12 – Park and Ride Locations for Roanoke and New River Valleys<sup>6</sup>

Figure 11 lists three out of 6 park-and-ride lots at greater than 80% average utilization. One park-and-ride, near Exit 150, is at over 200% average utilization. This is due to cars being parked on grassy areas and side streets around the park-and-ride. This indicates that there is observable demand for park-and-ride lots in the region.

Principle #3 – If Interstate 81 is to be widened, at least one park-and-ride lot should be provided at each intersection. If possible, combine park-and-ride lots with electrified truck rest areas. The costs of providing park-and-ride lots at each intersection should be accounted for in the total project cost.

<sup>&</sup>lt;sup>5</sup> RIDE Solutions Park-and-Ride Study, RVARC April 2005 – Page 5

<sup>&</sup>lt;sup>6</sup> Ibid – Page 3



Figure 13 I-81 Improvement Implications for Greenway, Trail and Bicycle Facilities

### 4) Greenway, Trail and Bicycle Impacts

Figure 13 show Interstate 81 crossings within the Roanoke Valley. There are four Greenway/Trail considerations within the corridor as illustrated by the four top images.

Figure 13 references two documents: <u>*The 2007 Roanoke Valley Area Greenway Plan*</u> and the <u>2006 Roanoke Valley Area Bicycle Plan</u>. Based on the recommendations and proposed projects in these plans and current VDOT policy. The following two principals are suggested.

Principal #4- All I81 intersections with proposed greenway, trail, or bicycle facilities should include improvements to accommodate such facilities as proposed in the Roanoke Valley Area Greenway Plan and the Roanoke Valley Area Bicycle Plan.

Principal #5- Because of the long life-span of bridge facilities, extra consideration and weight should be given to providing an extra four feet of width (for each travel directions) on the four bridges over I-81.



Figure 14-Route 927 (looking east)

Route 927-Glenvar Heights Boulevard-Route 927 goes under I-81 as illustrated in Figure 14. This route is a possible connection for the proposed "Roanoke Valley Perimeter Trail" that is listed in the 2007 Roanoke Valley Greenway Plan. The road also provides an easy link from US460 (in background) to the Roanoke County Center for Industry and Technology, which includes proposed greenways.

<u>Route 603-Kessler Mill Road</u>-The I81 bridge over Route 603 and Masons Creek was rebuilt and widened in 1997. The Hanging Rock Greenway (Hanging Rock Battlefield Trail) passes under this bridge. There is ample room for the existing greenway and any bridge improvements should not be an issue for the greenway.

<u>Hollins University Tunnel</u>- This feature was not identified in the Tier 1 I-81 Study. It is a one lane tunnel, just north of Exit 146 that provides farmer access under I-81. The tunnel links Hollins University owned properties and is identified in the Roanoke Valley Greenway Plan as an important link between the Tinker Creek Greenway and the Carvins Cove Natural Reserve. Any improvements to I-81 should preserve the tunnel access for the planned greenway.



Figure 15-Route 779 and AT

<u>Route 779-Valley Road-</u> Route 779 currently accommodates the Appalachian Trail and the 1976 Bike Route. As seen in Figure 15, there are no facilities for the Appalachian Trail. The crossing also may serve as a link for the proposed "Roanoke Valley Perimeter Trail" as outlined in the Roanoke Valley Greenway Plan. Any improvement of this bridge should include appropriate facilities for the Appalachian Trail. Additional consideration should be given to providing bicycle facilities in both directions.

<u>Route 643-Daugherty Road</u>-Route 643 crosses I-81 between the Exits 132 and 137. The road provides access to Glenvar Schools and Glenvar Library. VDOT design standards call for an additional 4 feet of pavement on each side if urban local bridges are replaced. Because of the longevity of bridges, proximity to schools, library and Richfield Retirement Community, an additional four feet of width (4+4+pavement+4+4) on each side should be considered for bicycle accommodations.

<u>Route 705-Red Lane</u>-The Red Lane bridge crosses the interstate between Exits 137 and 140. VDOT design standards call for an additional 4 feet of pavement on each side if urban local bridges are replaced. Because of the longevity of bridges, the proximity to downtown Salem, Hanging Rock Swim Club, Hanging Rock Golf Course and the Baptist Childeren's Home, an additional four feet of width (4+4+pavement+4+4) on each side should be considered for bicycle accommodations.

<u>Route 419-Exit 141-</u>The Electric Road bridge was recently modified to accommodate an extra turn lane and new traffic signals. Any replacement of the bridge would require 10-12 feet of additional pavement width on each side according to VDOT Urban Principal Arterial Design Standards. The route is also designated as a Priority Bicycle Facility in the Roanoke Valley Area Bicycle Plan. An additional 4 feet of pavement should be considered for each side of this bridge (4+12+pavement+12+4)

<u>Route 115-Exit 146</u>-The Plantation Road bridge currently consists of two lanes with no accommodation for any pedestrian or bicycle facilities. Any replacement of the bridge would require 10-12 feet of additional pavement width on each side according to VDOT Urban Principal Arterial Design Standards. The route is also designated as a Priority Bicycle Facility in the Roanoke Valley Area Bicycle Plan. An additional 4 feet of pavement should be considered for each side of this bridge (4+12+pavement+12+4)

There are other routes listed in the Roanoke Valley Area Bicycle Plan that pass under Interstate 81. They include Wildwood Road at Exit 137, Wildwood Road (north), and Belle Haven Drive. These crossings should also include appropriate accommodations.

This report was prepared by the Roanoke Valley-Alleghany Regional Commission (RVARC) on behalf of the Roanoke Valley Area Metropolitan Planning Organization (MPO) and in cooperation with the U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Virginia Department of Rail and Public Transportation (VDRPT) and the Virginia Department of Transportation (VDOT). The contents of this report reflect the views of the staff of the Roanoke Valley Metropolitan Planning Organization (MPO). The MPO staff is responsible for the facts and accuracy of the data The contents do not necessarily reflect the official presented herein. views or policies of the FHWA, FTA, VDRPT, VDOT, or RVARC. This report does not constitute a standard, specification, or regulation. FHWA or VDOT acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement/approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.