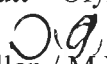


May 5, 2008

TO: J. McNutt – Olympic Region, MS 47447

FROM:  T.M. Allen / M.P. Mulhern
OSC Materials Laboratory MS: 47365
Geotechnical Services Division
Fax (360) 709-5585

SUBJECT: SR 7, MP 24.41 to 24.44 & MP 24.61 to 24.64, XL-3300
State-Wide Risk Reduction Rock Slope Scaling Program
Geotechnical Recommendations

INTRODUCTION

A state-wide risk reduction scaling program was implemented by WSDOT in 2006. The program is meant to reduce rockfall until a permanent slope stabilization project under the P3 Unstable Slope Program can be programmed and constructed. This memorandum presents our findings and mitigation recommendations for the unstable rock slopes located on SR 7 between MP 24.41 and MP 24.44 and between MP 24.61 and MP 24.64, approximately 5 miles south of Eatonville, Washington (Figure 1).

GEOTECHNICAL ASSESSMENT

Our geotechnical site assessment consisted of taking photographs of these slopes, conducting Maintenance interviews, measuring slope heights, lengths, orientations, and detailing risk reduction work which includes tree removal, slope scaling, debris removal, and determining estimated quantities. Project stationing was field located with cloth tape and spray paint.

SITE CONDITIONS

MP 24.41 to 24.44

This unstable slope is approximately 150-feet long and approaches 60-feet high with the existing cutslope angle near-vertical (Figure 2). The ditch is flat-bottomed and about 1- to 2-foot wide, and Maintenance indicates it contains little to no rockfall. Rockfall impacts both lanes of the highway at this location.

The slope is primarily composed of highly fractured, slightly weathered, strong, intrusive andesite. Block sizes range from 1- to 6-feet in dimension. Observed rockfall occurs as planar and wedge-type failures.

No water was observed on the slope during our site visit on March 14, 2007.

MP 24.61 to 24.64

This unstable slope is approximately 125-feet long and approaches 50-feet high with the existing cutslope orientation around 65° (Figure 3). The ditch is flat-bottomed and about 1-foot wide, and Maintenance indicates it contains little to no rockfall. Rockfall primarily impacts the northbound lane of the highway at this location.

The slope is also primarily composed of highly to moderately fractured, slightly weathered, strong, intrusive andesite. Block sizes range from 1- to 2-feet in dimension. Observed rockfall occurs as raveling and toppling-type failures.

No water was observed on the slope during our site visit March 14, 2007.

MITIGATION RECOMMENDATIONS

Mitigation measures that will reduce rockfall at this location consist of vegetation removal and slope scaling with debris removal.

Vegetation Removal

Vegetation removal should include removal of trees on steep, exposed bedrock slopes and where trees have been undermined by erosion and rockfall activity. We estimate that approximately six trees will need to be removed from MP 24.41 to 24.44 and an additional eight trees will need to be removed from MP 24.61 to 24.64 (Figures 4 and 5).

Slope Scaling with Debris Removal

Slope scaling limits and areas of intensive scaling are shown in Figures 4 and 5. Within the slope scaling limits, typical rock scaling operations should be performed. The locations of intense scaling should consist of removing unstable blocks that we observed during our site visits. Attempts should be made to slope round overhung slope brows that have been undermined from rockfall and erosion.

We estimate that 40 crew hours will be required for slope scaling from MP 24.41 to 24.44 and an additional 40 crew hours will be required for slope scaling from MP 24.61 to 24.64. Special Provisions for Slope Scaling are provided in Appendix B. Scaling will likely damage the highway surfacing, so provisions for its repair should be included in the contract.

We also estimate that approximately 100 cubic yards of rock debris will be generated from MP 24.41 to 24.44 and an additional 100 cubic yards of rock debris will be generated from MP 24.61 to 24.64 during scaling operations. A Special Provision for Debris Removal Including Haul is provided in Appendix B.

CONSTRUCTION CONSIDERATIONS

Traffic

Full roadway closures will be required to perform scaling operations. We anticipate that these closures will be accomplished with short-duration work windows on the order of 20 to 30 minutes in length.

Geotechnical Inspection

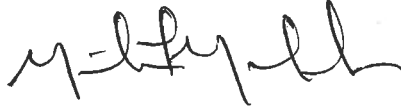
We request that a geotechnical specialist from our office be contacted to assess the slopes prior to the completion of scaling to help the engineer determine whether or not additional scaling is required.

If you have questions regarding the information presented in this memorandum, then please contact Mike Mulhern at (360) 709-5583 or Doug Anderson at (360) 709-5427.

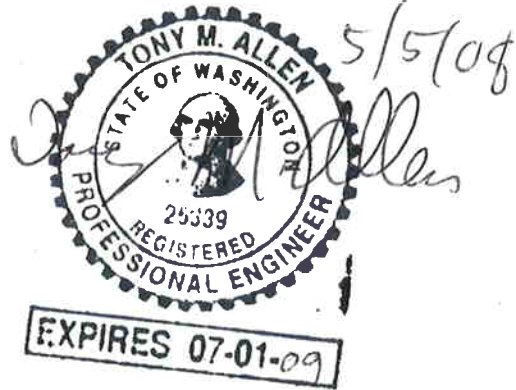
TMA:mpm

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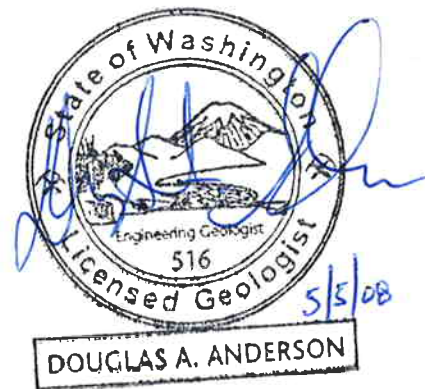
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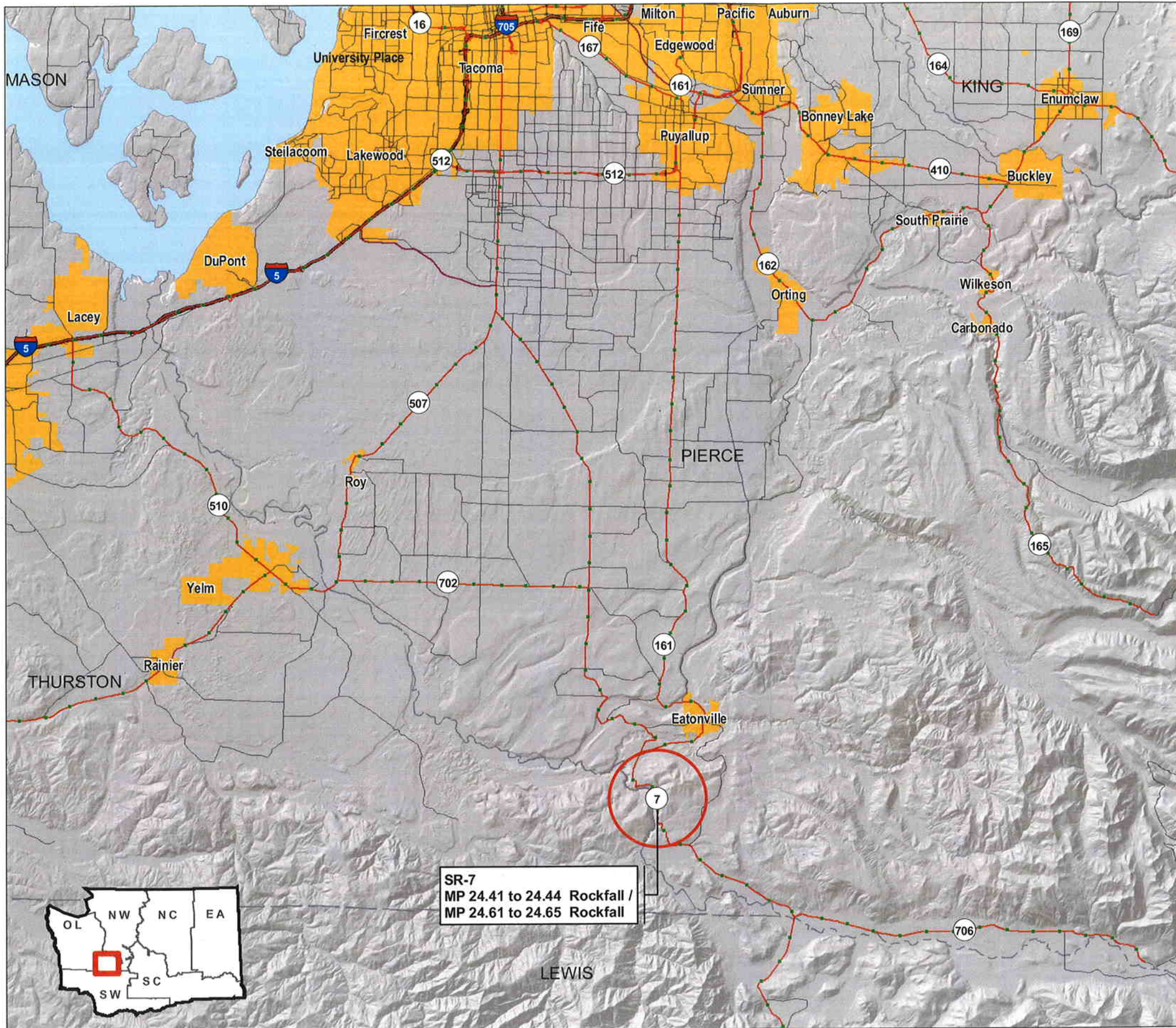


Technical Review By:
Douglas A. Anderson, L.E.G.
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APPENDIX A

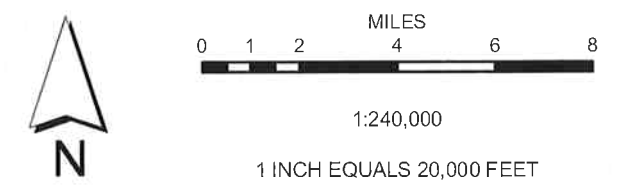
Figures



SR-7
 MP 24.41 to 24.44 Rockfall /
 MP 24.61 to 24.65 Rockfall

FIGURE 1: SITE VICINITY
 SR-7 VICINITY MP 24.42 TO 24.43 ROCKFALL /
 MP 24.61 TO 24.65 ROCKFALL

- LEGEND**
- Risk Reduction Scaling Program Slopes
 - Milepost Markers
- State Routes**
- Interstate
 - US Route
 - State Route
 - Ramps
 - Proposed Route
 - Local Road
 - County Boundary Lines
 - Incorporated Cities



PROJECT MANAGER	MIKE MULHERN
PREPARED BY	ANDY BOHLANDER
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DATE	MARCH 17, 2008

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JOB XL-3300 S.R. 7

SR 7 vicinity MP 24.41 to 24.44
and MP 24.61 to 24.64 Rockfall



WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION

GEOTECHNICAL DIVISION

DATE 4/2008

SCALE N.T.S. VERT. HORIZ.

SHEET OF

DRAWN BY WM

Figure 2. A photograph showing the unstable slope on SR 7 vicinity MP 24.41 to 24.44



JOB XI-3300 S.R. 7

SR 7 vicinity MP 24.41 to 24.44
and MP 24.61 to 24.64 Rockfall



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GEOTECHNICAL DIVISION

DATE 4/2008
SCALE N.T.S.
SHEET 1 OF 1
DRAWN BY WM

Figure 3: A photograph showing the unstable slope on SR 7 vicinity MP 24.61 to 24.64

END ROCK
SCALING LIMITS
~STATION
1+50
↓

~STATION
1+00
↓

~STATION
0+50
↓

BEGIN ROCK
SCALING LIMITS
~STATION
0+00
↓



LEGEND

- Areas of Intense Scaling
- Slope Scaling Limits
- X Tree Removal (6 On This Figure)



WASHINGTON STATE
DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL DIVISION

FIGURE 4: RISK REDUCTION MITIGATION DESIGN

SR 7 MITIGATION MEASURES

SR-7 SRMP 24.41 - 24.44 JOB # XL-3300

NOT TO SCALE

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EMAIL	FISHEJE@WSDOT.WA.GOV
DATE	MAY 6, 2008
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END ROCK
SCALING LIMITS
~STATION
1+25
↓

~STATION
1+00
↓

~STATION
0+50
↓

BEGIN ROCK
SCALING LIMITS
~STATION
0+00
↓



VEGETATION
REMOVAL

LEGEND

- - - Areas of Intense Scaling
- - - Slope Scaling Limits
- X Tree Removal (9 On This Figure)



FIGURE 5: RISK REDUCTION MITIGATION DESIGN

SR 7 MITIGATION MEASURES

SR-7 SRMP 24.61 - 24.65 JOB # XL-3300

NOT TO SCALE

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DATE	MAY 6, 2008

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APPENDIX B

Special Provisions

3/12/08

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SLOPE SCALING

Description

This work shall consist of the manual removal of vegetation and loose rock and soil on the slope at the locations shown in the Plans or as directed by the Engineer. The Contractor shall provide all materials, equipment, and labor necessary to perform this work.

Submittals

Not less than 2 weeks prior to commencing rock scaling, the Contractor shall provide to the Engineer:

- A. The Contractor shall provide written evidence that the rock slope scaling foreman and scalers have performed satisfactory work in similar capabilities for sufficient length of time to be fully qualified to perform their duties. The foreman shall have not less than 1500 hours of demonstrated experience as a scaler. The scalers shall have not less than 1000 hours of demonstrated experience on similar projects.
- B. The Contractor shall submit a detailed work plan for each rock slope to be scaled. The plan shall include:
 1. The proposed construction sequence and schedule.
 2. The type of equipment and tools to be used.
 3. The number of scaling crews to be employed on the project. (A scaling crew is defined as one qualified foreman and two qualified scalers.)
 4. Debris removal and disposal plan generated from the scaling work.
 5. Provisions to protect adjacent facilities.

Work shall not begin until the Engineer has approved the appropriate submittals in writing.

Materials

Slope scaling will be done with the use of scaling bar, portable hydraulic wedges, air pillows, hand drills, splitters, Boulder Buster™ or other mechanical means. Other hand tools in addition to scaling bars may be used provided they have demonstrated effectiveness to perform the required work by approval of the Engineer.

Construction Requirements

All trees and brush within 20 feet of the slope crest shall be flush cut and the root wad left intact.

Work shall proceed according to the work plan and schedule submitted by the Contractor prior to commencement of work. The size of the crew, defined as a foreman and two qualified scalers, shall be maintained at all times.

3/12/08

Slope scaling shall start at the top of the slope and work shall proceed down slope, removing loose rock and soil as the work progresses. Tree and brush removal shall be included as Slope Scaling. Unless otherwise directed by the Engineer, all trees within 20 feet of the slope crest shall be flush cut and the root wad left intact. Tree falling shall be completed prior to performing other scaling work.

The extent of the slope scaling will be determined by the Engineer and/or be specified in the Plans.

All rock, debris, and vegetive material produced by the scaling operation shall be removed by the Contractor and hauled to a site specified in the contract. See Special Provision **DEBRIS REMOVAL INCLUDING HAUL.**

Measurement

Slope scaling will be measured by the crew hour.

Debris removal will be by the cubic yard in the hauling conveyance at the point of removal from the roadway. See Special Provision **DEBRIS REMOVAL INCLUDING HAUL.**

Payment

Payment will be made in accordance with Section 1-04.1, for the following Bid item included in the proposal:

"Slope Scaling", per crew hour.

The unit contract price per crew hour for "Slope Scaling" shall be full pay for performing the work as specified.

3/12/08

(*****)

DEBRIS REMOVAL INCLUDING HAUL

Description

This work consists of removing existing debris from the roadway or material generated from slope scaling, mechanical scaling, and/or trim blasting operations.

Construction Requirements

The Contractor shall remove all existing and slope scaling-, mechanical scaling -, and/or trim blasting-related debris within the project limits and as directed by the Engineer. The Contractor shall also haul and place debris at a specified location.

Measurement

Debris removal will be measured by the cubic yard in the hauling conveyance at the point of removal from the roadway.

Payment

Payment will be made in accordance with Section 1-04.1 for the following bid item that is included in the proposal:

“Debris Removal Including Haul”, per cubic yard.

The unit contract price per cubic yard for “Debris Removal Including Haul” shall be full pay for performing the work described including furnishing the equipment, materials, and labor required to load, haul, and place the debris at the specified location.