

**FEDERAL TRANSIT ADMINISTRATION
PROJECT MANAGEMENT OVERSIGHT PROGRAM**

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**CLIN 0005: Specialized Assessments
PG No. 35A: Project Cost Contingency Baseline Review**

**Grantee: Virginia Department of Rail and Public Transportation
(DRPT)**

**Dulles Corridor Metrorail Project
Extension to Wiehle Avenue**

**Project Cost Contingency Baseline Review
Final - Issued August 20, 2007**

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LIST OF ACRONYMS

DIAAH	Dulles International Airport Access Highway
DRPT	(Virginia) Department of Rail and Public Transportation
DTE	Dulles Transit Engineers, JV
DTP	Dulles Transit Partners, LLC
EA	Environmental Assessment
EIS	Environmental Impact Statement
FAA	Federal Aviation Administration
FD	Final Design
FEIS	Final Environmental Impact Statement
FFGA	Full Funding Grant Agreement
FFP	Firm Fixed Price
FTA	Federal Transit Administration
FY	Fiscal Year (Federal)
GEC	General Engineering Consultant
LONP	Letter of No Prejudice
LPA	Locally Preferred Alternative
MWAA	Metropolitan Washington Airports Authority
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
PE	Preliminary Engineering
PG	Program Guidance
PMO	Project Management Oversight (Contractor)
PMOC	Project Management Oversight Contractor
PPTA	(Virginia) Public-Private Transportation Act
QA/QC	Quality Assurance/Quality Control
ROD	Record of Decision
WMATA	Washington Metropolitan Area Transit Authority
YOES	Year of estimate dollars

Executive Summary

The Metropolitan Washington Airports Authority (MWAA), in cooperation with the Virginia Department of Rail and Public Transportation (DRPT) and Washington Metropolitan Area Transit Authority (WMATA), proposes to implement a 23.1-mile Metrorail extension in the Dulles Corridor of Northern Virginia. The proposed corridor follows the alignment of the Dulles International Airport Access Highway (DIAAH) and the Dulles Toll Road within Fairfax County, and the Dulles Greenway, a private toll road in Loudoun County. Metrorail-like heavy rail was designated the Locally Preferred Alternative (LPA). The alignment of the rapid transit system departs the existing WMATA alignment between East Falls Church Station and West Falls Church Station and follows the highway median for most of the route, deviating to serve the Tysons Corner commercial district and the Dulles International Airport main terminal.

Due to the length of the proposed route, the Dulles Corridor Metrorail Project was divided into two phases. The first phase, known as the Extension to Wiehle Avenue, is the identified Minimum Operable Segment and extends 11.6 miles from the existing WMATA Metrorail Orange Line, just east of the West Falls Church Station, to a station to be constructed in the DIAAH at Wiehle Avenue. Included in this phase are 5 new stations, improvements to the existing WMATA shop and yard at West Falls Church, and 64 additional rail cars. Throughout this report, the Extension to Wiehle Avenue will be referred to as “the Project”. The Project is scheduled to be placed into revenue service by November 2012 and is estimated to carry 62,800 average weekday riders during the first year of operation (2013).

Preliminary Engineering (PE) of the Project is complete and DRPT submitted a Request to Enter into Final Design to the Federal Transit Administration (FTA) on April 28, 2006.

Project delivery is being progressed under the Virginia Public-Private Partnership provisions that began with a Comprehensive Agreement between DRPT and Dulles Transit Partners (DTP) for the preliminary design services with agreement to negotiate a design-build contract at a later date.

On March 27, 2006, the Governor of Virginia announced that the Commonwealth of Virginia had accepted the MWAA proposal to take control of the Dulles Toll Road and the construction of the Dulles Corridor Metrorail Project. Transition of the Project from DRPT to MWAA is scheduled to occur in late 2007. In anticipation of this transition, MWAA took the lead in contract negotiations with DTP and the contract was executed between MWAA and DTP on June 19, 2007.

Dulles Transit Partners (DTP) performed the PE for the Project. The Grantee’s project plan has been and is for DTP to continue on the Project as the Design-Build Contractor.

On March 30, 2007, DRPT/MWAA and DTP agreed to a price of \$1.6 billion for the Design-Build portion of the project. The fixed price portion of the contract is \$1.1 billion and includes roughly half of the estimated project cost.

The project cost was analyzed by the Project Management Oversight Consultant (PMOC) for project risks in accordance with PG-33 guidance. Based upon that review, the PMOC recommends to the FTA that the Baseline Cost Estimate, net of Contingency and Finance Cost, is \$2,363,725,886.

The budgeted actual total contingency as interpreted by the PMOC from information provided by the Grantee is \$302,854,684 (YOES). Based upon the contingency analysis contained in this Spot Report, the PMOC recommends a contingency amount of \$432 million; an increase of \$129 million over the contingency budgeted by the Grantee.

It is the PMOC's opinion, and recommendation to the FTA that the project cost is \$2,825 million.

Project Background

Project Description

MWAA, as Grantee, in cooperation with the DRPT and WMATA, proposes to implement a 23.1-mile Metrorail extension in the Dulles Corridor of Northern Virginia. The proposed corridor follows the alignment of the DIAAH and the Dulles Toll Road within Fairfax County, and the Dulles Greenway, a private toll road in Loudoun County. The alignment of the rapid transit system departs the existing WMATA alignment between East Falls Church Station and West Falls Church Station and follows the highway median for most of the route, deviating to serve the Tysons Corner commercial district and the Dulles International Airport main terminal.

Due to the length of the proposed route, the Dulles Corridor Metrorail Project was divided into two phases. The first phase, known as the Extension to Wiehle Avenue, is the identified Minimum Operable Segment and extends 11.6 miles from the existing WMATA Metrorail Orange Line, just east of the West Falls Church Station, to a station to be constructed in the DIAAH at Wiehle Avenue (See Figure 1). Included in this phase are 5 new stations, improvements to the existing WMATA yard at West Falls Church, and 64 additional rail cars.

Throughout this report, the Extension to Wiehle Avenue will be referred to as “the Project”. The Project is scheduled to be placed into revenue service by November 2012 and is estimated to carry 62,800 average weekday riders during the first year of operation (2013).

Project History

Planning for the Dulles Corridor Metrorail Project began in the late 1990’s resulting in a Major Investment Study completed in 1997. Due to funding considerations, a 1999 supplement to the study resulted in the selection of lower cost Bus Rapid Transit alternatives as an interim step to rail implementation. The FTA approved initiation of PE for National Environmental Policy Act (NEPA) evaluations using the Bus Rapid Transit alternative in March 2000. After public comment on the Draft Environmental Impact Statement (DEIS) published in July 2002, the rail only alternative was chosen as the LPA. The WMATA Board of Directors and Virginia’s Commonwealth Transportation Board formally adopted this alternative in November and December 2002, respectively and the Metropolitan Washington Council of Governments has incorporated the updated capital cost of this alternative into their fiscally constrained long-range plan.

On August 8, 2003, DRPT requested FTA approval to initiate PE for the Extension to Wiehle Avenue; this was approved on June 10, 2004. At that time, the project was estimated to cost \$2.000 billion, based on project completion by 2011, with a \$900 million Federal New Starts share. Through Federal Fiscal Year (FY) 2006, Congress has appropriated \$216.2 million for the Dulles Corridor Rapid Transit Project in Section 5309 New Starts funds.

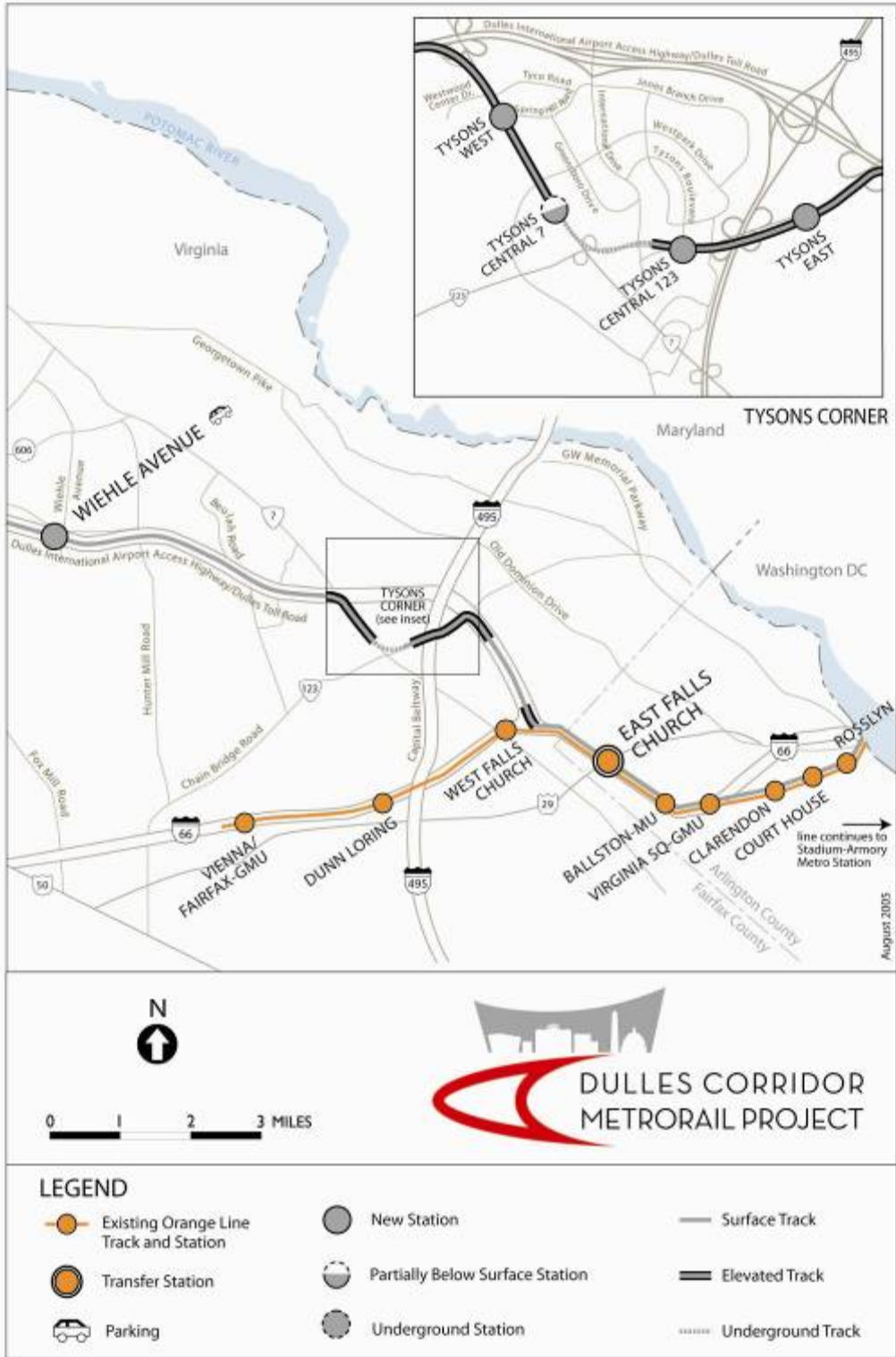


Figure 1 – Extension to Wiehle Avenue

Preliminary Engineering / NEPA

FTA approved the Final Environmental Impact Statement (FEIS) on December 13, 2004. The FTA Record of Decision (ROD) was issued on March 2, 2005. The Federal Aviation Administration, involved due to the Phase 2 portion, initially issued a ROD on April 13, 2005. However, that ROD was revised and replaced with a new ROD issued on July 12, 2005.

The 50% PE cost estimate, including the effects of the alignment change, was provided by DTP on June 24, 2005. The cost estimate presented a project cost range of \$1.7 billion to \$2.4 billion, well in excess of the \$1.5 billion cost estimate developed for the FEIS. The 50% Cost Estimate submitted on June 24, 2005 has undergone a rigorous review by DRPT and WMATA. DRPT's General Engineering Consultant (GEC) submitted a review of the DTP 50% cost estimate with the conclusion that a more realistic cost of the system, as designed, would be \$2.1 billion. A review performed by WMATA based on their historical costs at the time agreed with the \$2.1 billion cost estimate. DRPT considered a variety of changes in the design to further reduce the estimated cost of the project. The GEC initiated a cost estimating effort on July 12, 2005 that was completed on August 24, 2005. The document prepared by the GEC entitled "Trended 50% Preliminary Engineering Independent Capital Cost Estimate Extension to Wiehle Avenue" presents a project cost of \$1,840.1 million. The revised cost estimate included the adopted cost reduction measures and was incorporated into the FTA New Starts submittal for FY 2007.

On August 18, 2006, DRPT submitted its FY 2008 New Starts Report to the FTA. During September/October 2006, the PMOC performed an evaluation of the estimate supporting the \$2,065 million project cost, which was submitted to the FTA for the FY 2008 New Starts Report. The PMOC issued a Spot Report to FTA that concluded that the escalation factor used was inadequate, the contingency (both allocated and unallocated) was too low, and the project's cost and schedule could be seriously impacted due to the many uncertainties identified as a result of the lack of design and/or missing scope in the 100% PE design. The project cost estimate as of June 2007 is \$2,648 million.

Project Organization

The project was originally organized with DRPT being the sponsor of the project and the grantee for Federal funding through FTA. WMATA acted as a technical advisor to DRPT. DTP, a joint venture of Bechtel Infrastructure Corporation and the Washington Group, prepared the Preliminary Engineering documents.

On April 22, 2004, WMATA and DRPT entered into an interagency agreement that defined the roles and responsibilities of the two agencies during the preliminary engineering stage of the project. DRPT has assumed the responsibilities of project manager, Federal grant applicant and recipient, design-build contracting authority and owner of the project.

DRPT contemplated the use of a public/private partnership arrangement to deliver the project utilizing a design-build approach. In May 2002, under the Commonwealth of Virginia's Public-Private Transportation Act (PPTA) of 1995, DTP submitted a detailed proposal to DRPT for the

project implementation including both design and construction. The Commonwealth of Virginia convened a panel to evaluate the proposal in August 2002 that presented its recommendation to the DRPT Executive Director in December 2002. The Executive Director accepted the panel's recommendation and negotiated a contract with DTP. DRPT signed a Comprehensive Agreement with DTP for Preliminary Engineering and Development Services; Notice to Proceed (NTP) was issued to DTP on July 22, 2004. PE was completed in April 2006. It was intended that DTP submit a proposal for the design-build phase of the project in early summer 2006 and preliminary discussions with DTP regarding this proposal began in June 2005.

On December 20, 2005, MWAA announced a proposal to operate the Dulles Toll Road and oversee the construction of the rail line through the Dulles Corridor in Fairfax County to the Dulles International Airport and Loudoun Counties. The proposal included a provision for funding Phase 2 of the project (from Wiehle Avenue to the terminus in Loudoun County) without recourse to Federal funding, but made specific statements relating to MWAA's desire to assume the operation and revenue stream of the Dulles Toll Road. MWAA made a commitment that those funds would be utilized in the corridor for transportation improvements. On March 27, 2006, the Governor of Virginia announced that the Commonwealth had accepted the MWAA proposal to take control of the Dulles Toll Road and to build the Dulles Corridor Metrorail Project. MWAA applied and was approved by FTA as the potential FTA grantee for the project after PE, in lieu of DRPT. The transition to MWAA as grantee is expected to occur with the transfer of both the Dulles Toll Road and the Dulles Corridor Metrorail Project to MWAA. In anticipation of assuming the role of grantee, MWAA took the lead in negotiations with DTP for the Design-Build contract.

Design-Build Contract Negotiations

From the beginning of the project and the signing of the Comprehensive Agreement, it has been the expressed intent of both DRPT and DTP, to construct the project using the design-build contracting approach through a contract to be negotiated after PE.

At the end of PE, DTP provided an engineer's estimate that called for a project budget of \$2.00 billion. However, this estimate did not include several scope items that had been included in the PE drawings and specifications. Restoring these items resulted in an estimate of approximately \$2.37 billion at that time. DRPT obtained a comparative estimate of \$2.06 billion from their GEC.

Discussions concerning Contract Terms and Conditions began in June 2005. The useable draft was completed in October 2006, which enabled DTP to submit their initial cost proposal for construction in December 2006. DTP's most recent cost proposal was submitted on February 28, 2007. On March 30, 2007, DRPT/MWAA announced they had reached agreement with DTP for a \$1.6 billion Design-Build contract consisting of a \$1.1 billion firm fixed price portion and \$0.5 billion in allowances for future subcontracts. An independent cost estimate was also prepared by DRPT for comparison with the DTP estimate. This cost estimate consisted of the estimated direct cost of construction, as provided by the DRPT GEC, adjusted by DRPT and MWAA for expected changes in scope, indirect costs, and profit.

Following the Memorandum of Understanding on March 30, 2007, MWAA and DPT completed negotiations of the Design-Build Contract on May 4, 2007 with the final price certifications received on May 11, 2007. Authority to execute the contract was sought from the MWAA Board and the local funding partners in June 2007. The Design-Build Contract was executed by MWAA and DTP on June 19, 2007.

In addition to the design-build contract portion of the project, MWAA/DPRT prepared a project estimate, including all project scope items, totaling \$2,648 million.

Project Management Oversight Activities

The first Risk Assessment Workshop was held in the DRPT offices April 4-7, 2006. Draft Spot Reports on Scope, Cost, and Schedule were submitted to the FTA in June 2006 with a major recommendation that DRPT provide complete a bottoms-up cost estimate to comply with FTA Circulars 4220 and 5010.

Based on receipt of revised information, including the new cost estimate, the PMOC revised the draft Spot Reports and submitted them to the FTA in October 2006. Acting on one of the PMOC's recommendations, the target project profit to DTP was negotiated and reduced from 10% to 7.5%.

Subsequent to October 2006, DRPT provided additional information related to the Design-Build Contract, Terms & Conditions, Allowances, Open Items, Utility Time and Materials estimate, project costs and other related information. A workshop was held in November 2006 to discuss developments related to scope and schedule and to start the risk assessment process with the development of a risk register. Following review of these additional items, the PMOC provided revised draft Scope and Schedule Spot Reports in March 2007. In May 2007, the PMOC provided a revised draft Cost Review Spot Report. FTA shared these reports with DRPT/MWAA in June 2007. Risk Assessment Workshops were held on June 12-14, 2007 and July 10-12, 2007 at the project offices. Updated information from these workshops was used to develop this Spot Report.

Review and Analysis of Project Contingency

Estimate Background

MWAA's project cost estimate for the Wiehle Avenue Extension is the estimate dated June 1, 2007 prepared by MWAA using the FTA Template and issued in the document Project Cost Estimate dated June 20, 2007. Further breakdowns of the project cost estimate, especially with regard to Allowances in the Design-Build Contract, is also contained in the document Guide to Allowance Values dated June 19, 2007.

Classification

The PMOC worked with the Grantee at a Risk Assessment Workshop held on July 10-12, 2007, to identify latent contingencies in the project budget. The data presented by the Grantee showed the Design-Build Contract total cost of \$1,598,785,938 including contingency of \$113,265,916 within the Firm Fixed Price (FFP) for normal contingencies and as escalation contingency exclusive of commodities escalation. Commodity escalation will be reimbursed as commodity escalation payments by the Grantee and is discussed below.

The Utility Relocation Costs relocation costs are being reimbursed on a time and material basis making the contingency available to the Grantee. Within the project budget estimate there is a contingency line item of \$14,819,462, consisting of \$14,099,564 base contingency and \$719,898 escalation contingency.

There are no apparent latent contingencies in the Allowance Items.

Since the Contract has been executed there is no additional contingency available to the Grantee. The Contractor has assumed design, market, and construction risks for the scope of work in the FFP. However, for those cases when it is desirable to know the entire contingency represented in the project cost estimate, the effective contingencies within the FFP must be estimated.

There are several items of cost which should be estimated as effective contingencies. Based on the language of Article 5 of the Contract, the PMOC considers that the Contractor maintains \$6,000,000 in contingency for unanticipated site conditions. The Engineering and Project Management portions of the estimate in the MWAA project cost estimate were significantly increased from the January 2007 GEC estimate. The resulting level was near that included in the data presented by Grantee for Professional Services in the FFP of the Contract. The PMOC is of the opinion that there is a latent contingency in Professional Services. Using a typical allocated contingency of 15% at the start of final design, this contingency is estimated at \$37,605,397 allocated as \$16,144,704 for Final Design and \$21,460,693 for Construction Management. The reported \$113,265,916 is approximately 15% of the value of construction of the FFP. The total contingency available to the Contractor is therefore \$156,871,313.

Of this \$157 million in contingencies, the only contingency which is effective for the Grantee is the \$6,000,000 match for Differing Site Conditions.

Real Estate Contingency

The Grantee's engineering team has prepared a revised property acquisition cost based on the most up to date right-of-way alignment information and the most recent property cost estimates. In the June 2007 revision, there was a reduction in estimated property acquisition costs of \$3,304,908 which is now represented as the Grantee's contingency in the ROW cost estimate.

The RAP includes an amount labeled "Settlement/Condemnation Increment" which is used according to the VDOT procedures to estimate the amount of funds in excess of the appraised value that will be needed to settle land acquisition issues. For Northern Virginia a factor of 45% is used. It was estimated in the July 2007 workshop that roughly two-thirds of this amount is

likely to be spent. The remaining one-third, \$7,957,264, represents a latent contingency in the budget.

The total contingency in the real estate acquisition budget is \$11,262,172.

Rail Car Acquisition Contingency

The rail car estimate provided to DRPT by WMATA includes a 3% budget contingency factor for change orders during the contract period. This contingency factor is typical of WMATA and industry experience, but will be based on the final bid price. The PMOC accepts this level of contingency for the construction phase of the rail vehicle procurement contract. No separate Allocated Contingency is included. The contingency is estimated at \$4,367,663.

WMATA Project Costs

The WMATA Project Budget has an identified contingency of \$1,068,480, consisting of \$1,024,760 base contingency and \$43,720 for escalation contingency. At a Risk Assessment Workshop held on July 10-12, 2007, WMATA representatives advised that their estimate for in-house project management costs included a contingency factor. It was determined that 3% of the WMATA project management budget of \$59,207,000 should be considered contingency. The total latent contingency in this item is \$1,776,200. The total WMATA engineering and construction contingency is \$2,844,680.

Other MWAA/DRPT/VDOT Costs

One element of the MWAA Costs, which was presented at the July 2007 workshop, was an estimate of \$14 million for electric power to the traction power substations for testing and pre-revenue operations. This amount includes a 20% contingency which represents a latent contingency of \$2,350,000.

An amount of \$8,000,000 is included in this budget item for remediation of hazardous materials for the acquired properties. MWAA anticipates that none of this amount may need to be expended. The site known to need remediation, Merchants Tire, may be eligible to receive funding from a statewide fund for environmental remediation. The PMOC has classified 75% of this fund, or \$6,000,000, as latent contingency.

The breakdown of the Project Budget includes a total Grantee contingency of \$229,800,224 consisting of a \$129,704,687 base contingency, a \$20,095,537 escalation contingency, and an \$80,000,000 unallocated contingency.

Summary of Contingency

Table 1 summarizes the PMOC analysis of all of the contingencies available to the Grantee that were identified in the project documentation, presented in PG 33B- Assessment and Evaluation of Grantee Project Cost Estimates. Table 1 indicates that the actual contingency controlled by MWAA is 10.72% of the Current Budget of \$2,647,708,641 less contingencies and finance costs, which is \$2,363,725,887. Including the PMOC identified latent contingencies; the total contingency becomes \$296,854,683, which is 12.79% of the budget. Inclusion of the effective contingency yields a total contingency of \$302,854,683, which is 13.09%.

Allocation

The contingency for the Dulles Corridor Metrorail Project is categorized as follows into component costs unique to the current status of this Design/Build project.

Table 1 – Contingency Allocation (Patent and Latent)

Project Budget Category	Actual Contingency	Latent Contingency	Effective Contingency	Total Contingency
Firm Fixed Price	\$0	\$0	\$6,000,000	\$6,000,000
Allowance Items	\$0	\$0	\$0	\$0
Utility Relocation	\$14,819,462	\$0	\$0	\$14,819,462
Vehicles	\$4,367,663	\$0	\$0	\$4,367,663
Property Acquisition	\$3,304,908	\$7,957,264	\$0	\$11,262,172
WMATA	\$1,068,480	\$1,776,210	\$0	\$2,844,690
MWAA	\$229,800,224	\$33,760,472	\$0	\$263,560,696
Total	\$253,360,737	\$43,493,946	\$6,000,000	\$302,854,683
Cumulative Contingency	10.72%	12.79%	13.09%	

Analysis

Contingency Calculation by Percentage

The project contingency dollar amounts were reviewed by the PMOC analysis team and minimum values calculated based on the PG 35 guideline percentage values.

Table 2 – Project Timeframe Percentages

Project Timeframe	Percent
Entry into Final Design (FD)	20.0%
FFGA	15.0%
100% Bid	10.0%
50% Construction	8.0%
75% Construction	6.0%
90% Construction	4.0%
Revenue Operating Date (ROD)	3.0%

From these values, contingency hold points were determined for the project values by multiplying the percent recommended by the baseline cost YOES\$ without contingency or financing.

Table 3 – Contingency Values

Project Timeframe	Calculated Hold \$ (1000s)
Entry into Final Design (FD)	\$472,600
FFGA Award	\$354,450
100% Bid	\$236,300
50% Construction	\$189,040
75% Construction	\$141,780
90% Construction	\$94,520
Revenue Operating Date (ROD)	\$70,890

The calculated contingency value of \$473 million at Entry into Final Design is considered a maximum range number by the PMOC because it may not reflect the design/build nature of the project and may not adequately considered those aspects of design that have been advanced beyond PE by way of supplemental engineering. To consider these factors, the project was sorted into major groupings by status (degree of advancement), totaled by status level and assigned contingency factors in accordance with Table 2 above. This process is detailed in Appendix C.

Table 4 – Weighted Contingency Based upon Status of Major Elements

Status	Contingency Basis	Required Percentage	Contingency Required
Preliminary Engineering	\$456,792,050	25%	\$114,198,012
Entry into Final Design	\$888,781,868	20%	\$177,756,374
Ready for Design	\$945,335,972	10%	\$94,533,597
Effective Contingency	-\$6,000,000	0%	\$6,000,000
Paid Costs	\$78,816,000	0%	\$0
Grand Total	\$2,363,725,889	16.6%	\$392,487,983

Based upon this weighted assessment, the PMOC estimates a minimum contingency value of \$392 million. The PMOC recommends an average of the minimum and maximum contingency estimates or \$432 million as the forward pass contingency value.

Backward Pass

A buffer zone will be established above this value at a factor of 1.25 for the early construction period. This will serve as a warning zone that secondary mitigation may be required if the contingency balance falls into this zone.

Subsequent to the August 3, 2007 schedule risk workshop among the FTA, the Grantee and the PMOC, the PMOC performed a "backward pass" contingency analysis. The following is a summary of this process.

1. The PMOC estimated approximately 1.5% (approximately \$35 million) of the construction YOES\$ should be available for claims during project closeout
2. The approximate cost of extended overhead and schedule delays was estimated. The extended overhead ranged for DTP was estimated at \$4million/month and the extended overhead for the Grantee was estimated at \$1million/month. The DTP overhead figure is based on the Contract escalation factor of 4% per year. These costs were discussed with the Grantee during the August workshop but no agreement was reached. Additionally, for the purpose of this analysis, the PMOC reduced the DTP overhead estimated cost at the 90% Construction timeframe from \$4million/month to \$2million/month. This reduced DTP overhead more accurately reflects field overheads and escalation costs for delays that may occur later in the construction process at a time when most work is complete and the contractor's field staff is ramping down.
3. The total duration for the project from entry into FD through ROD was calculated at 63 months (from August 1, 2007 to December 1, 2012).
4. 50% Construction was calculated as 6% of YOES\$. This estimate is considered reasonable because all FD, right of way, utility and tunnel/caisson differing site conditions risks will have passed.

5. 100% Bid was calculated as 10% of YOES\$ per the values in Table 2. This estimate is considered reasonable because all FD, right of way and utility risks will have passed but significant tunnel/caisson differing site conditions and systems risks remain.

The approximate cost of delay was used at a factor of \$3 million per month for 3.5 months (25% delay of 14 months). This totals approximately \$10 Million in potential construction delay costs.

Table 5 – Backwards Pass Values

Project Timeframe	Backward Pass \$(1000s)	Notes
100% Bid	\$235,000	Calculated 10% YOES\$
50% Construction	\$140,000	Calculated 6% of YOES\$
75% Construction	\$95,000	Calculated median
90% Construction	\$50,000	25% of 14 months @ \$3M/mo + \$5M testing changes + below
Revenue Operating Date (ROD)	\$35,000	Approximately 1.5% for claims

Graphically, the backward pass and TCRP contingency values compared with the Grantee's stated values, and the PG-40 model is as follows:

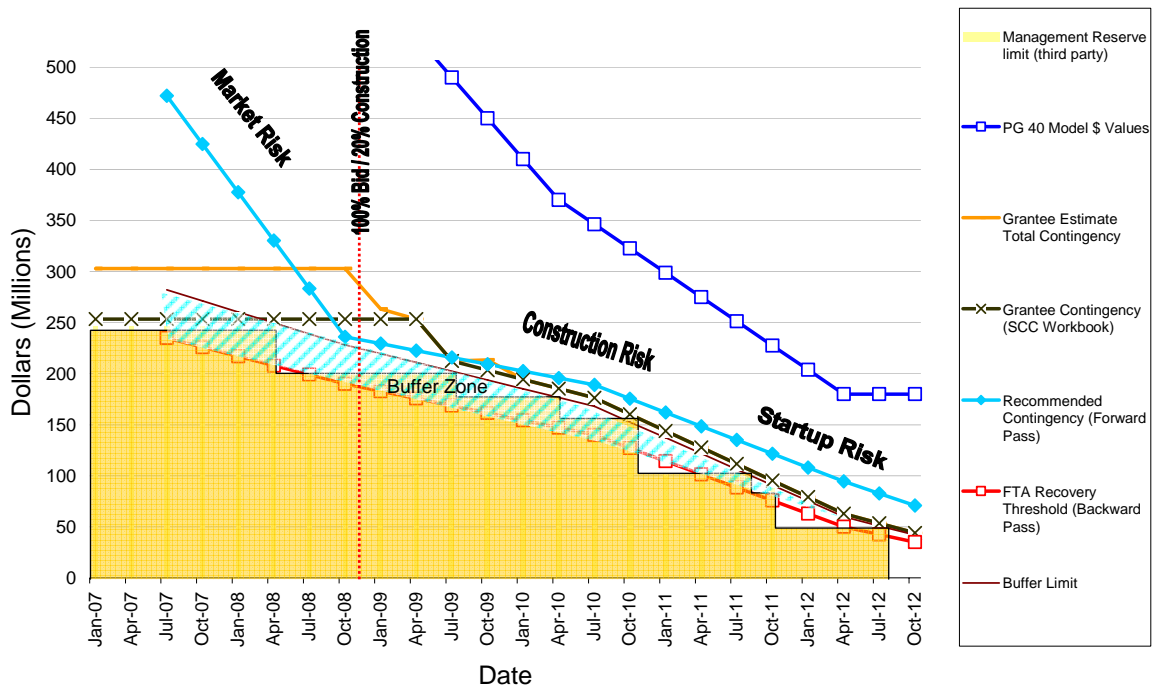


Figure 2 – Contingency Values with Buffer Zone

Conclusions

- The budgeted actual contingency amount is \$253,360,737 YOES; the latent contingency amount is \$43,493,946 YOES; the effective contingency is \$6,000,000; and the total contingency is \$302,854,684 YOES.
- The PMOC recommends to the FTA a contingency amount of \$432 million YOES; an increase of \$129 million over the contingency budgeted by the Grantee.
- The Grantee should explore means to identify cost and schedule mitigation capacity.
- The Grantee should develop and clearly identify its intentions for contingency usage, retention, and the like (that is, Contingency Management Plan).

Appendices

Appendix A – Grantee Project Data

<u>Primary Scope Documentation</u>	<u>Date</u>	<u>Author</u>	<u>Nature – Detail – Quality*</u>
Independent Capital Cost Estimate	April 27, 2006	DRPT	Cost estimate prepared by the DRPT GEC, STV Inc. Refer to the PMOC Spot Report, PG-33A Grantee Project Cost Review, for discussion of detail and quality.
Final Preliminary Engineering Capital Cost Estimate – Extension to Wiehle Avenue	March 21, 2006	DTP and DTE	Design-Build engineer’s project cost estimate at PE. Cost estimate summary excludes certain identified elements. Estimates for excluded items provided.
100% Preliminary Engineering drawings, design reports, and specifications	February 2006	DTP	Preliminary Engineering submittal to grantee. Generally complete and of good quality for PE. However additional detail is needed to coordinate system interfaces, especially between WMATA and the contractor.
Design-Build Contract, Dulles Corridor Metrorail Project - Execution Version and Appendices to Design-Build Contract	May 4, 2007 May 11, 2007	DTP and DRPT	Draft of the Design-Build Contract including Terms and Conditions with Exhibits.
Right of Way Acquisition Plan	April 14, 2006 June 2006 November 2006 February 2007	DTP	The plan has good detail for the properties and easements required. The schedule durations presented are not realistic for workload and statutory requirements.
Federal Aviation Administration Record of Decision	July 12, 2005	FAA	Record of Decision by FAA relative their findings the Final Environmental Impact Assessment.
Federal Transit Administration Record of Decision	March 2, 2005	FTA	Record of Decision by FTA relative their findings the Final Environmental Impact Assessment.
Preliminary Engineering Design Refinements Environmental Assessment	February 2006	DRPT	Revision of FEIS to reflect impact of refinements made after the 50% Preliminary Engineering submittal and after the FTA ROD.
Agreement between DRPT and VDOT	January 10, 2006	DRPT and VDOT	13 page executed agreement for interagency coordination.

Secondary Documentation

Baseline Schedule	December 1, 2006	DTP	Primavera Schedule developed to support construction concept at entry into Final Design. Refer to the PMOC Spot Report, PG-34A Grantee Project Schedule Review, for discussion of detail and quality.
Permitting Plan	April 2006 January 2007	DTP	Preliminary Engineering support document
Utilities Report	December 2005 January 2007	DTP	Thorough and of good quality.
Dulles Corridor Rapid Transit Project Final Environmental Impact Statement and Section 4(f) Evaluation	December 2004	DRPT	FEIS Document accepted by FTA ROD.
Agreement between DRPT and VDOT	January 10, 2006	DRPT and VDOT	13 page executed agreement for interagency coordination.
Revised Cooperative Agreement between DRPT and the County of Fairfax, Virginia	March 28, 2006	DRPT and Fairfax	8 page cooperative agreement and attachments (unsigned copy)
Agreement between DRPT and MWA	March 30, 2006	DRPT and MWA	10 page agreement (unsigned copy)
Agreement between DRPT and the County of Fairfax, Virginia.	April 3, 2006	DRPT and Fairfax	10 page agreement (unsigned copy) relating to project funding.
Environmental Conditions with Limits of Disturbance	March 17, 2006	DTP	
Transit Operations and Maintenance Plan – Dulles Corridor Rapid Transit Project	November 2004	WMATA	Report prepared in support of FEIS. Detail is provided to support assumptions and quality is good.
New Railcar Procurement Assumptions	May 18, 2004	WMATA	Internal worksheets for schedule and cost estimate.

Support PMOC Documentation

PG 32C- Pre Bid Design Scope Review	August 13, 2007	PMOC/ Hill	Product by PMOC based on current drawings, specs and contract terms.
PG 33B- Assessment and Evaluation of Grantee Project Cost Estimates	August 13, 2007	PMOC/ Hill	Product by PMOC based on current PF 32C and current MWA Cost Estimate
PG 34A- Grantee Project Schedule Review	August 13, 2007	PMOC/ Hill	Product by PMOC based on DTP/MWA schedule update data date June 25, 2007
PG 40B- Schedule Risk Analysis	July 30, 2007	PMOC/ Hill	Product of PMOC based on current PG 34A and 32C.

* Statements concerning the detail and quality of a document are based on the professional opinion of the reviewers.

Appendix B – Methodology

The purpose of this section is to describe the PMO contractor’s methodology.

The PMO contractor shall fully identify, describe, and analyze the adequacy of the Grantee’s contingencies using the Contractor data generated from a **CLIN 0005 subtask**.

Sequentially, these forecasts shall be developed similar in manner to that of the “forward” and “backward pass” used in linear programming or scheduling with a third judgmental step added in reconciling the two sets of data in the range of the project just after award of the FFGA to 50% physically complete with Construction.

For PG-35A products, this means three steps:

- Starting the “forward” pass with the following parameters:
 - At Entry into Preliminary Engineering, the working target for total contingency (defined as the aggregate of allocated and unallocated cost contingency, net of allowances and financing) is 30%.
 - At Entry into Final Design, the working target for total contingency is 20%.
 - At the award of a FFGA, the working target for total contingency is 15%.
 - At 90-100% bid for the Grantee, or 90-100% subcontracted for the prime contractor in an alternative project delivery method, the working target for total contingency is 10%.
 - At 50% physically complete for Construction, the working target for total contingency is 5%.
- Starting the “backward pass” the Contractor shall develop estimates of the minimum amount of total cost contingency that is reasonably expected to be necessary at that point in time for the project to be completed within budget and on time with the following parameters and using these procedures and fundamental assumptions and then sequentially steps back along those project milestones identified as part of the PG-40A/E deliverables:
 - Total cost contingency can be considered as being allocated to two objectives, to absorb increases in cost due to scope changes or clarifications within project scope and schedule changes inclusive of delays. The “relative weighting” between scope and schedule varies throughout the project and is a fundamental element of the contractor’s evaluation for the “backward pass”.
 - At the Revenue Operations Date, or ROD, the demand for total cost contingency has been reduced to a minimum requirement for scope changes or clarifications and schedule delays or changes. The Contractor shall evaluate the Grantee’s experience and other New Starts projects to identify an amount sufficient to close out punch list work, additional work orders, etc. The working target for this point is 1-3% total contingency with a relative weighting of 0-1% for schedule delay costs and the remainder for costs.
 - At the point that the project is “substantially complete” (90-100% bid for either prime contracts or 90-100% subcontracted for Alternative Project Delivery Method), the project is exposed to cost changes in the range of 12%. Schedule delays at this point can average 20% of the Construction phase duration, or 4% of project costs, or 16% in aggregate versus 10% as the forward pass working target.¹

¹ The difference is due to the presence of an active PG-40 risk management program that is adequate and integrated into an acceptable project management plan. The secondary mitigation capacity component of PG-40 is often at the 5% level. Combined with the PG-40 forward pass target of 10%, it offers an aggregate capacity of 15% of which 5% can be recaptured (Secondary mitigation recapture). The traditional 15% contingency approach requires the commitment of 50% more liquid resources and offers no incentives to mitigate risk.

- For any delay duration greater than 9 months, the Contractor shall assume 3 months each of demobilization and remobilization with a variable standby period in between.
- Continuing with the “backwards pass”, the Contractor shall then develop an estimate of minimum contingency based upon grantee’s technical capacity, project delivery method management plan, Project Strategy (if any) for the same milestones that were developed as part of the forward pass and/or PG40E milestones.
- The third step then is to reconcile the two sets of data (forward pass and backward pass) in the range of the project schedule just after award of the FFGA to 50% physically complete with Construction to develop contingency minimums for those project milestones.
- The contractor shall then develop a trend line curve(s) and related graphic for use as inputs in a PG-40 project strategy product, or PG-20 PMP scoping document as directed by the WOM.

Appendix C – Contingency Estimation using a Weighted Contingency Requirement

Cost Items	Firm Fixed Price	Allowance Items	Utility Relocation	WMATA	Real Estate Acquisition	Owner/Agency Costs	Total Project Cost
Construction Costs:	\$513,953,247	\$436,795,828	\$77,331,761	\$30,075,000	\$0	\$89,461,871	\$1,147,617,707
Construction Indirects	\$79,630,027	\$101,790,619	\$13,489,974	\$0	\$0	\$0	\$194,910,619
Right-of Way					\$80,256,607		\$80,256,607
Vehicles				\$191,980,337			\$191,980,337
Project Management	\$288,308,040	\$0	\$13,914,611	\$57,430,790	\$0	\$159,027,408	\$518,680,848
Contingency	\$113,265,916	\$0	\$14,819,462	\$7,212,353	\$11,262,171	\$263,560,696	\$296,854,682
Fee	\$79,917,360	\$34,606,340	\$8,490,155	\$0			\$123,013,855
Finance Charges						\$30,609,507	\$30,609,507
Totals	\$1,075,074,590	\$573,192,786	\$128,045,962	\$286,698,480	\$91,518,778	\$542,659,482	\$2,697,190,078

Costs by Project Stage

In Preliminary Engineering	\$86,619,946	\$330,794,498		\$39,377,606		
At Entry into Final Design	\$43,118,672	\$242,398,288	\$113,226,500	\$240,108,522	\$80,256,607	\$169,673,279
At Start of Construction	\$945,335,972					

		Contingency Basis	Contingency Requirement	Contingency
Budget w/o Cont & Finance	\$2,363,725,889	In Preliminary Engineering \$456,792,050	25%	\$114,198,012
Budget w/Cont	\$2,756,213,872	At Entry into Final Design \$888,781,868	20%	\$177,756,374
Budget w/Cont & Finance	\$2,786,823,380	At Start of Construction \$945,335,972	10%	\$94,533,597
Difference from Current Budget	\$139,114,739	Subtotal \$2,290,909,889		\$386,487,983
		Effective Contingency -\$6,000,000		\$6,000,000
		Paid Costs \$78,816,000		\$0
		Grand Total \$2,363,725,889	16.6%	\$392,487,983

Appendix D – Trial Project Budget with PMOC’s Recommended Contingency

MAIN WORKSHEET - BUILD ALTERNATIVE								
Virginia Department of Rail and Public Transportation Dulles Corridor Metrorail Project Phase 1 - Extension to Wiehle Avenue						Today's Date	8/15/07	
						Yr of Base Year \$	2006	
						Yr of Revenue Ops	2012	
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	11.67	509,702	49,271	558,973	\$ 47,912	38%	23%	638,934
10.01 Guideway: At-grade exclusive right-of-way		0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)		0	0	0				0
10.03 Guideway: At-grade in mixed traffic		0	0	0				0
10.04 Guideway: Aerial structure	2.64	237,226	22,932	260,157	\$ 98,723			297,373
10.05 Guideway: Built-up fill	8.51	0	0	0	\$ -			0
10.06 Guideway: Underground cut & cover	0.06	15,865	1,534	17,399	\$ 301,200			19,888
10.07 Guideway: Underground tunnel	0.43	89,738	8,675	98,413	\$ 229,920			112,491
10.08 Guideway: Retained cut or fill	0.03	103,510	10,006	113,516	\$ 3,610,639			129,755
10.09 Track: Direct fixation		21,326	2,062	23,388				26,733
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		34,481	3,333	37,814				43,223
10.12 Track: Special (switches, turnouts)		7,556	730	8,286				9,472
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	5	252,541	24,412	276,953	\$ 55,391	19%	11%	316,596
20.01 At-grade station, stop, shelter, mall, terminal, platform	2	85,910	8,305	94,215	\$ 47,107			107,700
20.02 Aerial station, stop, shelter, mall, terminal, platform	3	104,349	10,087	114,436	\$ 38,145			130,816
20.03 Underground station, stop, shelter, mall, terminal, platform		0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.		0	0	0				0
20.05 Joint development		0	0	0				0
20.06 Automobile parking multi-story structure		28,339	2,739	31,079				35,527
20.07 Elevators, escalators		33,943	3,281	37,224				42,552
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	11.67	47,847	5,013	52,859	\$ 4,531	4%	2%	61,676
30.01 Administration Building: Office, sales, storage, revenue counting		1,458	282	1,740				2,030
30.02 Light Maintenance Facility		28,772	2,781	31,553				36,815
30.03 Heavy Maintenance Facility		1,093	211	1,304				1,522
30.04 Storage or Maintenance of Way Building		0	0	0				0
30.05 Yard and Yard Track		16,524	1,738	18,262				21,308
40 SITEWORK & SPECIAL CONDITIONS	11.67	271,582	40,933	312,515	\$ 26,787	21%	13%	349,978
40.01 Demolition, Clearing, Earthwork		18,793	1,817	20,609				23,080
40.02 Site Utilities, Utility Relocation		145,658	25,025	170,684				191,145
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		8,022	1,551	9,573				10,720
40.05 Site structures including retaining walls, sound walls		8,784	849	9,633				10,788
40.06 Pedestrian / bike access and accommodation, landscaping		12,539	1,357	13,896				15,562
40.07 Automobile, bus, van accessways including roads, parking lots		31,679	4,512	36,191				40,530
40.08 Temporary Facilities and other indirect costs during construction		46,108	5,821	51,929				58,154
50 SYSTEMS	11.67	232,516	24,671	257,187	\$ 22,045	18%	10%	296,182
50.01 Train control and signals		57,578	5,632	63,210				72,794
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		62,537	6,045	68,582				78,981
50.04 Traction power distribution: catenary and third rail		69,105	6,680	75,785				87,275
50.05 Communications		32,674	4,260	36,934				42,534
50.06 Fare collection system and equipment		6,370	1,232	7,602				8,754
50.07 Central Control		4,253	822	5,075				5,845
Construction Subtotal (10 - 50)	11.67	1,314,188	144,299	1,458,488	\$ 125,013	100%	59%	1,663,366
60 ROW, LAND, EXISTING IMPROVEMENTS	11.67	85,747	3,207	88,954	\$ 7,625		4%	96,302
60.01 Purchase or lease of real estate		84,646	2,994	87,640				94,880
60.02 Relocation of existing households and businesses		1,101	213	1,314				1,422
70 VEHICLES (number)	64	163,725	3,831	167,556	\$ 2,618		7%	207,692
70.01 Light Rail		0	0	0				0
70.02 Heavy Rail	64	158,047	3,831	161,878	\$ 2,529			200,654
70.03 Commuter Rail		0	0	0				0
70.04 Bus		0	0	0				0
70.05 Other		641	0	641				794
70.06 Non-revenue vehicles		5,037	0	5,037				6,243
70.07 Spare parts		0	0	0				0
80 PROFESSIONAL SERVICES	11.67	535,949	71,488	607,437	\$ 52,066	42%	25%	680,484
80.01 Preliminary Engineering		78,816	15,238	94,054				105,364
80.02 Final Design		134,984	13,179	148,163				165,980
80.03 Project Management for Design and Construction		111,855	21,625	133,480				149,532
80.04 Construction Administration & Management		198,730	19,210	217,940				244,149
80.05 Insurance		0	0	0				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		0	0	0				0
80.07 Surveys, Testing, Investigation, Inspection		0	0	0				0
80.08 Start up		11,564	2,236	13,800				15,459
Subtotal (10 - 80)	11.67	2,099,609	222,825	2,322,434	\$ 199,066		94%	2,647,843
90 UNALLOCATED CONTINGENCY				128,000			5%	146,306
Subtotal (10 - 90)	11.67			2,450,434	\$ 210,037		99%	2,794,149
100 FINANCE CHARGES				23,726			1%	31,000
Total Project Cost (10 - 100)	11.67			2,474,160	\$ 212,071		100%	2,825,149
Allocated Contingency as % of Base Yr Dollars w/o Cont.				10.61%				
Unallocated Contingency as % of Subtotal (10 - 80)				5.51%				
YOE Construction Cost per Mile (X000)								\$142,574
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$224,353
YOE Total Project Cost per Mile (X000)								\$242,156