

**FEDERAL TRANSIT ADMINISTRATION
PROJECT MANAGEMENT OVERSIGHT PROGRAM**

**Contract No. DTFT60-04-D-00007
Project No. DC-27-5017
Task Order No. 014**

**CLIN 0005: Specialized Assessments
PG No. 33B: Assessment and Evaluation of
Grantee Project Cost Estimates**

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

**Dulles Corridor Metrorail Project
Extension to Wiehle Avenue
Assessment and Evaluation of Grantee
Project Cost Estimate – Final Issued August 20, 2007**

**By: Hill International, Inc.
One Penn Square West
30 South 15th Street, Suite 1300
Philadelphia, PA 19102**

Third Party Disclaimer

This Project Management Oversight Contractor (PMOC) deliverables and all subsidiary reports are prepared solely for the Federal Transit Administration (FTA). This risk-informed evaluation and assessment should not be relied upon by any party, except FTA or the project sponsor, in accordance with the purposes of the evaluation and assessment as described below.

For projects funded through FTA's Major Capital Investment (New Starts) program, FTA and its PMOCs use a risk-informed assessment process to review and validate a project sponsor's budget and schedule. This risk-informed evaluation and assessment process is a tool for analyzing project development and management. Moreover, this process is iterative in nature; any results of an FTA or PMOC risk-informed evaluation and assessment represent a "snapshot in time" for a particular project under the conditions known at that same point in time. The status of any evaluation or assessment may be altered at any time by new information, changes in circumstances, or further developments in the project, including any specific measures a sponsor may take to mitigate the risks to project costs, budget and schedule, or the strategy a sponsor may develop for project execution.

TABLE OF CONTENTS

	Page No.
Executive Summary	1
Project Background	6
Project Description	6
Project History	6
Preliminary Engineering / NEPA	8
Project Organization	8
Design-Build Contract Negotiations.....	9
Project Management Oversight Activities.....	10
Methodology	10
Review Requirements	11
Estimate Review Approach.....	12
Evaluation Team	14
PMOC Evaluation Team.....	14
Grantee Organization.....	15
Review and Analysis of Project Cost.....	16
Characterization of Project Cost Estimate	16
Approach to Project Delivery	17
Classification of Construction Cost Items	18
Design-Build Contract Firm Fixed Price	18
Design-Build Contract Subcontract Allowances	19
Design-Build Contractor Administered Time and Material Items	20
Grantee’s Costs – Non-Design-Build Contract Items.....	20
Contract Pricing Risks	21
Review of Other Program Costs	21
Real Estate Acquisition Cost Estimate	21
Rail Vehicle Cost Estimate	24
Professional Services	25
Unallocated Contingency	26
Finance Charges.....	26
Identified Risks with Possible Cost Impact	26
Risks Identified in the Review of the Project Scope.....	26
Risks Identified in the Review of the Project Schedule.....	27
Review and Analysis of Correlation in Project Quantities	30
Allowance Item Cost Estimate and Adjustments.....	30
Estimation of Allowance Items.....	30
Adjustment of Allowance Items	32
Review and Analysis of Grantee General Conditions Costs	35

Review of DTP Contract.....	35
Terms and Conditions	36
Review and Analysis of Grantee Escalation Factors and Approach.....	39
PMOC Estimate of Cost Escalation Factors	39
Grantee Escalation Factors and Approach.....	39
General Cost Escalation	39
Commodities Escalation	40
Review and Analysis of Grantee Allowances and Identification of Latent Contingency.....	41
Design-Build Contract Construction Contingency Factors	41
Real Estate Contingency	41
Rail Car Acquisition Contingency	42
WMATA Project Costs	42
Summary of Contingency	43
Review and Analysis of Project Cost Estimate Classification	43
Conclusion	44
Appendices.....	47
Appendix A – Grantee Project Data	47
Appendix B – Grantee Project Cost Estimate – March 2007	49
Appendix C– Estimation of Cost Escalation Factors.....	50
Cost Escalation for Construction	50
Material Cost Escalation	53
Rail Vehicle Procurement Cost Escalation.....	54

TABLE OF FIGURES

Figure 1 – Extension to Wiehle Avenue	7
---	---

TABLE OF TABLES

Table 1 – Summary of Project Cost Estimate.....	17
Table 2 – Table of Allowances	19
Table 3 – Deviation of Allowances	31
Table 4 – PMOC Recommended Adjustments to Budget for Allowance Items	34
Table 5 – Deviation of Allowances	35
Table 6 – Material Price Adjustment Indices	40
Table 7 – Contingency Summary	43
Table 8 – Project Budget Summary	44

LIST OF ACRONYMS

ASCE	American Society of Civil Engineers
BCI	Building Cost Index (published by ENR)
BLS	Bureau of Labor Statistics, United States Department of Labor
BRT	Bus Rapid Transit
CER	Cost Estimating Relationship
CNPA	Concurrent Non-Project Activity
CPM	Critical Path Method
DIAAH	Dulles International Airport Access Highway
DEIS	Draft Environmental Impact Statement
DRPT	(Virginia) Department of Rail and Public Transportation
DSC	Differing Site Conditions
DTE	Dulles Transit Engineers, JV
DTP	Dulles Transit Partners, LLC
EA	Environmental Assessment
EIS	Environmental Impact Statement
ENR	Engineering News Record
EPB	Earth Pressure Balance
FAA	Federal Aviation Administration
FD	Final Design
FEIS	Final Environmental Impact Statement
FFGA	Full Funding Grant Agreement
FTA	Federal Transit Administration
FY	Fiscal Year (Federal)
GEC	General Engineering Consultant
LBT	Large Bore Tunnel
LONP	Letter of No Prejudice
LPA	Locally Preferred Alternative
MAI	Master Appraisal Institute
MEP	Mechanical, Electrical and Plumbing
MIS	Major Investment Study
MWAA	Metropolitan Washington Airports Authority
NATM	New Austrian Tunneling Method
NEPA	National Environmental Policy Act
NTP	Notice to Proceed
PE	Preliminary Engineering
PPI	Producer Price Index
PG	Program Guidance

LIST OF ACRONYMS (continued)

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
ROE	Right of Entry
ROW	Right of Way
SCADA	Supervisory Control and Data Acquisition System
SCC	Standard Cost Category
TBM	Tunnel Boring Machine
TIA	Time Impact Analysis
URA	Uniform Relocation Act
VDOT	Virginia Department of Transportation
VE	Value Engineering
W&OD	Washington and Old Dominion
WFC	West Falls Church
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 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.

The Project scope to be analyzed for project risks is the PE design of the Extension to Wiehle Avenue. This spot report was prepared in accordance with FTA’s Program Guidance (PG) Number 32 for Project Scope Review Procedures.

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

The project cost to be analyzed by the Project Management Oversight Consultant (PMOC) for project risks is the estimate prepared by MWAA and DRPT dated March 6, 2007 based on the

scope of the PE design of the Extension to Wiehle Avenue. The PMOC has monitored the development of the DRPT/MWAA estimate from its initial preparation through to the current version of the project estimate. Drafts of this report have responded to the condition of the estimate at its several evolutionary stages and provided commentary on that condition. The earlier drafts of this document also conformed to the requirements of earlier revisions of the PG-33 guidance. The DRPT estimate has evolved and this report has evolved in response.

The estimates prepared at the completion of PE in February and April 2006 required considerable revision to reflect the project's needs and to support negotiations with the Design-Build contractor. The PMOC recommended that the Grantee have a complete bottoms-up estimate performed and that a comprehensive reconciliation be done in order to determine the correct scope and cost. Based on the PMOC's recommendation, DRPT commissioned a bottoms-up cost estimate by a new GEC in October 2006.

In the intervening months, the Terms and Conditions for the Design-Build Contract were negotiated. Engineering was progressed in several areas such as detailed station design, West Falls Church Shop concept, and the Route 7 corridor utility relocations. This engineering work supported the development of estimates for these items. In March 2007, DRPT/MWAA provided a cost estimate that included a detailed estimate of the scope of work for the Design-Build Contractor and also included estimates of scope "Open Items" and other projects costs. In May 2007, DRPT/MWAA provided the negotiated Terms and Conditions for review.

The DRPT/MWAA estimate was found to be mechanically correct and complete and free of any material inaccuracies or incomplete data. The direct construction cost estimate methodology was consistent with industry practices using estimating tools and techniques appropriate for a project of this scope and cost. Estimation of indirect costs and other overhead items was documented and applied to the estimate in a consistent manner. Although the PMOC found discrepancies in early project estimates regarding quantities and scope, efforts were made to correct these deficiencies. The project scope adopted in the Record of Decision is fully captured in the current cost estimate.

However, in their effort to bring negotiations with the Design-Build Contractor to a conclusion, the DRPT/MWAA estimate, although in the FTA format and on the FTA template, does not at this time follow the FTA SCC assignment closely. This fact made the PMOC's evaluation more difficult, as commented upon frequently in this report, since the methodology used by the PMOC does not follow the SCC assignments.

The estimated labor costs followed industry crewing practices and used appropriate productivity. DRPT/MWAA has further adjusted labor costs to cover anticipated needs for premium pay and overtime to attract a suitable labor force. Local rates have been used for equipment rental and labor costs. Costs for fuel and other material costs subject to escalation separate from usual construction costs have been segregated and indexed to government escalation indices.

Local taxes are included in this estimate. WMATA prepared the estimates of force account labor and technical support for the project.

Escalation rates used in the DRPT/MWAA project estimate are less than those suggested by the PMOC in earlier versions of this spot report. However, the escalation rate was chosen to match

the DRPT's estimate of local conditions and was applied to the estimate in a manner consistent with industry practice. However, the PMOC has a concern that the proposed escalation rate for the project is less than recommended and remains a cost risk.

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. This pricing includes escalation for the DTP scope of work. Escalation will not apply to this work; however, some risk remains for DRPT/MWAA price escalation in fuel and materials.

The contract Terms and Conditions allow for the estimated cost of subcontracted work to be included as an Allowance. In the March 30, 2007 agreement this Allowance is \$0.5 billion. DRPT/MWAA will participate with DTP in the subcontractor proposal and negotiations. Although a fixed price is available for most of the Design-Build work and the estimated Allowance pool is agreed and incentivized, risk still remains that qualified subcontractors can be found at prices consistent with the current estimate.

While many project scope, schedule, and cost risks have been addressed by DRPT since receiving the PE design in February 2006, many areas of risk remain and have been identified. The PMOC has developed a summary of risks and several have the potential for a significant cost to the project. Among these are:

- Delays to construction from late grants of rights-of-entry for ROW being acquired
- Delays to construction from design coordination or review by WMATA
- Delays to construction from coordination issues with WMATA for tie-ins and for construction at the Orange Line junction and West Falls Church shop and yard
- Risk to project cost from subcontractor selection exceeding contract Allowance

There are a number of risks which have been described and discussed in spot reports covering the scope, PG-32C Grantee Project Scope Review, and schedule, PG-34A Grantee Project Schedule Review. They are:

1. The ROW plans are acceptable based on the 100% PE plus supplemental design plans. If the ROW acquisition requirements are based on the 100% PE design package including supplemental design revisions, DTP will need to endeavor to stay within those established limits. Reworking of ROW work products due to design changes may adversely impact the project schedule, budget and scope, and thus the PMOC considers this a risk element.
2. The contract contains a significant scope of work, called Allowance Items, that postpone subcontracted work to a later date and leaves the Grantee with risk for these items.
3. There is a schedule risk, which may be significant, arising from the fact that the utility relocation plans have not been completely developed both from a design and a contractual point of view. The coordination of utility work will be an issue that could adversely impact the schedule because of the large number of utility companies that must work concurrently in the same area. The time period for these installations is tight, and that the starts of the utility installations are dependent upon gaining timely Right-of-Entry to properties. In particular, the design of relocations of the gas, sewer, and water lines in the bed of Route 7 had not progressed until recently; therefore, a risk still exists until the design is completed. There is

a schedule and ultimately a cost risk that the schedule is predicated on early partial NTP (based on LONP) for utility construction.

4. There are risks for hazardous material remediation for the parcels being acquired.
5. The level of design for the high voltage (34.5 KV) distribution system is not consistent with what is expected at the completion of the 100% PE phase.
6. Though the design of the WFC Shop expansion is currently being progressed to bring it up to the 100% PE level, there is still a risk since the design has not yet been completed due to the complexity of designing a shop expansion at this location.
7. WMATA has requested a change to the train control and signals criteria to allow for separation of track circuit cables that carry like frequencies for train detection. This is a potential risk to the project.
8. The complexity of the train control and signal system interface to the existing system requires that certain elements of work be performed with significant oversight and support by WMATA forces. There currently is no detailed force account plan for this work. The lack of a preliminary signal test plan, particularly at the interface between the existing system and the Extension at the new Dulles Junction, is part of this risk.
9. There is concern that the design review process and any work restrictions required by the local jurisdictions will cause schedule delay and become a force majeure event as defined by the Terms and Conditions.
10. There is a risk that when details on lead times and durations for equipment and material manufacturing and delivery are added to the schedule that there may be an impact on the installation schedule.
11. Systems integration and testing activities are not accurately coordinated on the schedule. There is a risk that once the systems integration and testing activities, which are on the critical path, are more accurately coordinated in the schedule, that the duration to complete these activities will be extended, thereby extending the ROD.
12. There is a significant risk that the communications and security scope is incomplete – there are no PE design drawings for the WMATA portion of the work.
13. There is a risk that as the communications design progresses through the Final Design stage the project scope could increase, particularly in the area of security system and/or newer technology requirements. There is an “Open Item” related to a request by WMATA to upgrade the planned LAN/WAN network to state of the art capability.
14. There is a significant risk that the Operations Control Center improvements scope is incomplete since there are no PE design drawings for the work and the work will be performed by WMATA forces.
15. There is a cost and schedule risk that the NATM tunnel excavation and initial support may be difficult to construct as designed given the soft ground conditions at Tysons Corner. Since the NATM work is on the critical path, any delay in completing this work will delay the overall completion of the project, thereby extending the Owner/Agency costs.
16. There is a schedule risk that when relationship ties among Work Operation areas are added to account for resource constraints among similar work activities, especially for those activities which require specialist equipment or crews, the planned durations may increase.
17. There is schedule risk that craft resources (manpower) will not be available at the skill level and quantity required to achieve the construction activity durations in the Rev. 7 detailed schedule.
18. There is schedule risk that engineering resources (manpower) will not be available at the skill level and quantity required to achieve the design activity durations in the Rev. 7 detailed schedule

19. There is a schedule risk that the constraint dates used in the schedule are not met. In particular the activity for Entry into Final Design is currently shown to have a Mandatory Start date of August 1, 2007. Removal of this mandatory date results in the project not meeting the Revenue Operations Date shown in the schedule.
20. DRPT is negotiating with DVP to include the cost of the cable, installation and metering equipment costs for the 34.5KV power distribution system as part of the utility rate structure and not as a capital cost. This work has been deleted from the project scope. There is a risk that if these negotiations are not successful, then this scope of work will have to be added back into the project.
21. After a \$12,000,000 allowance figure is exceeded for Differing Site Conditions and Hazardous Materials, the Contractor is entitled to Change Order(s), which is a potential scope and cost risk.
22. There may be potential scope risks associated with NFPA 130 requirements and ADA elements at several stations such as sufficient station exit times, availability of emergency evacuation carts needed in the event of power or mechanical failure, and evacuation of the disabled from "Safe Dispersal Areas".
23. Subsequent to the completion of PE, one substation and one tie breaker station were deleted from the project scope. There is a risk that this equipment may have to be put back in the project scope.
24. There is the risk that absent actual designs, the mechanical elements of the Tysons Central 123 and Tysons East Stations, which are to be based on the Tysons West Station, will be missed in the quantity take-offs and/or miscounted due to the considerable differences in the overall architecture among the three stations.
25. If right-of-way (ROW) acquisition requirements are based on the current 100% PE design plans including supplemental revisions, designers will need to stay within those established limits in developing the Final Design. If Final Design requires additional ROW, the reworking of ROW work products because of design modifications may adversely impact the project schedule, budget and scope.

The PMOC recommends to the FTA that the Baseline Cost Estimate, net of Contingency and Finance Cost, is \$2,363,725,887.

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 (MIS) completed in 1997. Due to funding considerations, a 1999 supplement to the MIS resulted in the selection of lower cost Bus Rapid Transit (BRT) alternatives as an interim step to rail implementation. The FTA approved initiation of PE for NEPA evaluations using the BRT alternatives 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.

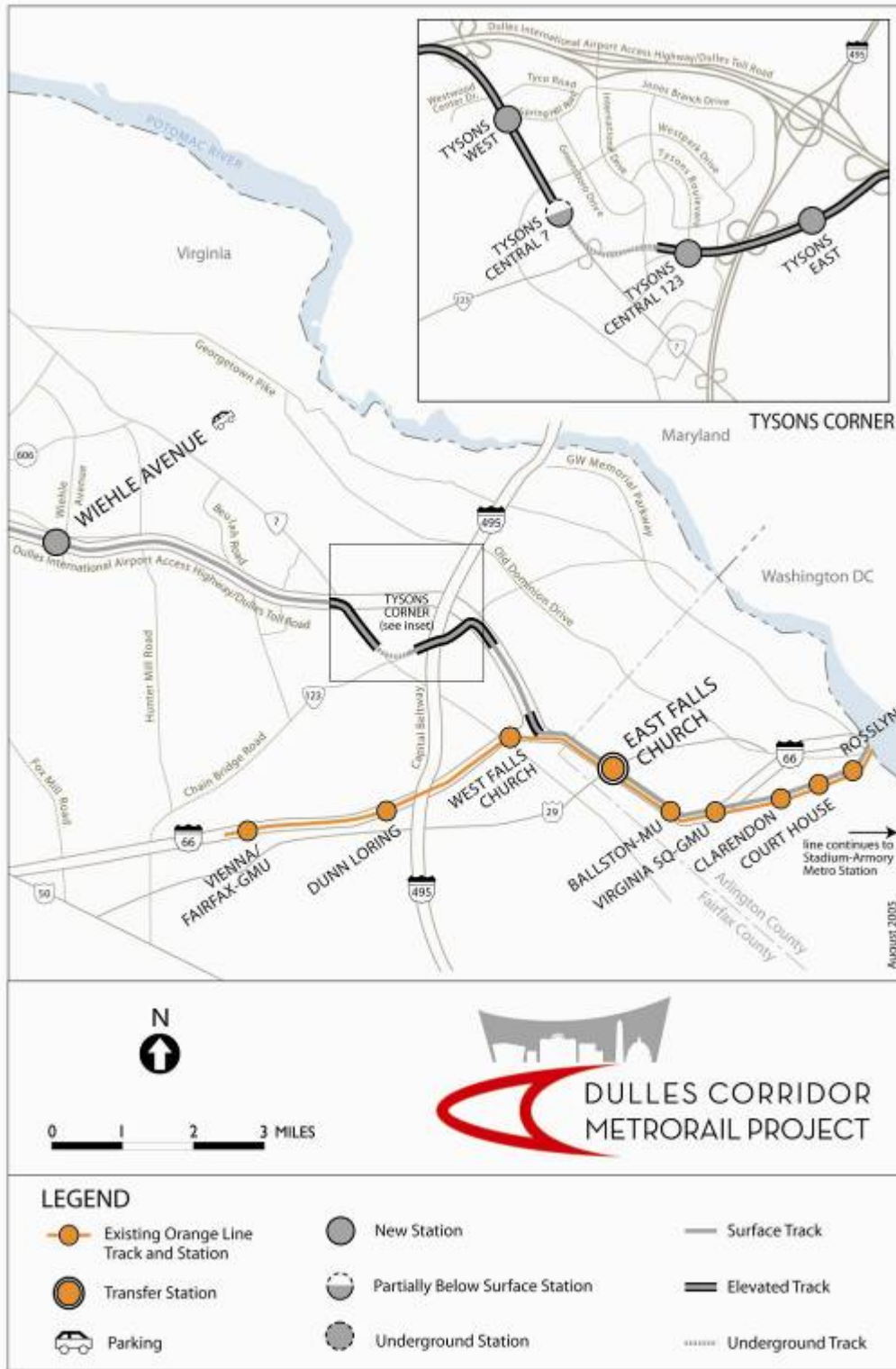


Figure 1 – Extension to Wiehle Avenue

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.

During March 2005, DRPT and DTP completed an alignment study requested by Fairfax County to relocate a portion of the project in the Tysons Corner area to the median of Route 7. This alignment was included in the complete 50% PE design packages.

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.

The adopted cost reduction measures and Route 7 realignment necessitated initiation of an Environmental Assessment (EA). The EA document, entitled Preliminary Engineering Design Refinements Environmental Assessment, was completed in February 2006. In parallel, DTP completed the 100% PE plans and specifications that were submitted at the end of February 2006. The submittal of the PE cost estimate and the delivery of the biddable documents (i.e. the design documents arranged in contract packages suitable for a public offering) was completed in April 2006. DRPT submitted a Request to Enter into Final Design to the FTA on April 28, 2006.

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. Dulles Transit Partners (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 (the Commonwealth) 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; 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 DTP 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.

Methodology

This section describes the methodology used for review and evaluation of the cost estimate. The focus of the evaluation is on the Grantee's project cost estimate as it exists after execution of the Design-Build Contract.

Review Requirements

The cost evaluation contained in this spot report is structured along the lines of and addresses the requirements of FTA PG-33 for Subtask 33B Definitive Project Cost Estimate Reviews. This report was prepared to follow FTA PG-33 as issued March 29, 2007 and does address the requirements of Subtask 33B as outlined in that procedure. Earlier drafts of this spot report were developed to meet earlier PG-33 formats and differed from the format required in this revision of PG-33. The report does follow the outline prescribed by PG-33 but presents a different emphasis than that found in the current revision of PG-33 since the project cost estimate reviewed has been realized for much of the scope of construction following execution of the Design-Build Contract. The most obvious deviation is the use of Contract pricing and Allowance Item estimates in lieu of a Standard Cost Category (SCC) based estimate.

Responding specifically to the requirements of PG-33, the cost review addressed the following items: (The following is excerpted from the guidance document.)

“The PMO contractor shall review and characterize the grantee’s estimate of project cost using the checklist from Appendix A to determine that it is

- (1) mechanically correct and complete,
- (2) free of any material inaccuracies or incomplete data,
- (3) consistent with relevant, identifiable industry or engineering practices,
- (4) uniformly applied by the grantee’s cost estimators and consistent in its method of calculation,
- (5) consistent with the project scope adopted in the Record of Decision.

The contractor shall review grantee cost data and assess/evaluate the degree to which the definition of project scope (inclusive of construction work quantities) in material design deliverables correspond to the quantity data contained or implied in the grantee cost data. Indicators of this consistency are:

- Stationing on drawings is consistent with the project cost estimate

The Contractor shall also assess the integration and traceability of that estimate into the defined scope of the project for the purposes of “baselining” the project estimate as the costs, scope issues, and project become more fully defined and developed through progression of the project definition.

The Contractor shall then characterize the cost estimate to the fourth level as available and the grantee’s Work Breakdown Structure terms for the following purposes:

- Characterize the nature of the data/estimate as being either (1) the product of unit cost and quantity, (2) cost estimating relationship¹”CER”, (3) lump sum (sometimes referred to a “plug number”)
 - Unit pricing as opposed to unit costing are to be classified as CERs (2) and not as unit costs (1).
 - Unit costs (1) are defined as that estimate data were direct and indirect costs components are separately identified.

¹ CERs are basically percentage costs established as a % of another cost. The cross referenced cost, or basis shall be identified.

- Further subdivide (1) and into an estimate of those quantities that are indicated on both the design deliverables and a cost estimate those quantities indicated only in the cost estimate and those quantities indicated only on the designed deliverables
- Characterize the nature of the support for the data element, i.e. how was it derived.
- Characterize those cost elements that are allowances and identify latent contingency elements.

The Contractor shall review grantee cost data and assess/evaluate the degree to which the definition of project scope (inclusive of construction work quantities) in material design deliverables correspond to the quantity data contained or implied in the grantee cost data. The Contractor shall also assess the integration and traceability of that estimate into the defined scope of the project for purposes of “baselining” the project estimate as the costs, scope issues, and project become more fully defined and developed through progression of project definition.

Using the data developed from this analysis of the correlation in quantities between the design deliverables and the cost data, the Contractor shall make adjustments to the grantee cost data/estimate in order to establish an estimate of the over/understatement in the grantee costs estimate.”

“The PMO contractor shall also review and evaluate the general uniformity in the grantee’s escalation of costs from the base year, to the YOES, the escalation factors used to estimate YOES and the soundness of the economic forecasts and escalation factors to be applied in the Project or Grant agreement Budget.”

Estimate Review Approach

Earlier drafts of this spot report reviewed the cost estimate before the negotiation of the Design-Build Contract and used a more conventional approach to evaluation of the project cost estimate. The review was made from two perspectives. The proposed project scope as described in the PE documents and the related cost estimate elements were assessed as to their formulation and completeness with respect to the project. The estimate was also reviewed technically to determine if it was complete, mechanically correct, and sufficiently detailed to be appropriate and useable at the conclusion of the PE stage of project development. Additional commentary is provided regarding evaluation both of the source data and its use in the GEC estimate, especially with regard to estimation of cost estimating relationships (CER) values such cost escalation factors, contingencies, and indirect costs.

As the project was reviewed by technical specialists in each discipline area, the cost elements were also reviewed for accuracy and applicability to the project. Where a concern was raised by the technical specialists relative to either the risk related to the estimated cost or a cost risk associated with the difficulty of the work, the cost risks are identified and characterized. Where in the opinion of the PMOC items of cost risk are identified, the text is italicized for emphasis.

After PMOC review of the project scope, cost estimate, and other supporting data, several areas were identified that which were deemed by the PMOC to warrant further discussion or clarification. Analysis was done to support the identification of risks relating to escalation factors, contingency factors, and the application of other CERs.

The presentation in this spot report provides commentary on the estimate for the relevant Standard Cost Category (SCC) items. Separate sections cover analysis of cost escalation factors, contingency allowances, general conditions, and correlation of project quantities.

With the execution of the Design-Build Contract, the focus is now on the effectiveness of the transfer of risk to the Contractor and quantification of the risks retained by the Grantee. This spot report identifies areas which possess project cost risks and characterizes the risk to the Grantee.

Evaluation Team

PMOC Evaluation Team

PMOC Team Members	Organization / Address	Telephone / Email Office-Cell	Role
Vincent Gallagher	Hill International, Inc. 30 South 15 th St.– Ste. 1300 Philadelphia, PA 19102	O: 215-557-3270 C: 609-970-0949 vincegallagher@hillintl.com	Project Manager Task Order Manager
Keith Buchanan	Hill International, Inc. 1225 I Street NW-Suite 601 Washington, DC 20005	O: 202-408-3043 keithbuchanan@hillintl.com	Cost Estimate Analysis
Alfred DeStephanis	Hill International, Inc. 303 Lippincott Centre Marlton, NJ 08053	O: 856-810-6231 alfreddestephanis@hillintl.com	Contracts
Larry Veit	Hill International, Inc. 30 South 15 th St.– Ste. 1300 Philadelphia, PA 19102	O: 215-557-3274 larryveit@hillintl.com	Contracts, Civil, Structural, Traffic
Edward F. Nicholson	Hill International, Inc. One Penn Plaza– Ste. 3415 New York, NY 10119	O: 212-244-1665 ednicholson@hillintl.com	Systems
Stuart Lacy	Hill International, Inc. 30 South 15 th St.– Ste. 1300 Philadelphia, PA 19102	O: 215-557-3262 stuartlacy@hillintl.com	Stations, Architectural
John Lehman	Hill International, Inc. One Penn Plaza – Ste. 3415 New York, NY 10119	O: 212-244-1152 johnlehman@hillintl.com	Shops and Yards, Track, Vehicles
Teresa Stein	Hill International, Inc. 30 South 15 th St.– Ste. 1300 Philadelphia, PA 19102	O: 215-557-3253 teresastein@hillintl.com	Civil, Programmatic
Mark Cipollini	Hill International, Inc. 30 South 15 th St.– Ste. 1300 Philadelphia, PA 19102	O: 215-557-3276 markcipollini@hillintl.com	Civil, Schedule Analysis
PMOC Sub-consultants			
Richard Moeller	O. R. Colan Associates 2462 Flamingo Road West Palm Beach, FL 33410	O: 561-493-8865 rmoeller@orcolan.com	Real Estate
Dana J. Rogers	Lemley International 604 North 16 th Street Boise, ID 83702	O: 435-285-2233 djrogers@lemleyinternational.com	Mined Tunnel
David Bjork	JBC Associates, Inc. 583 Shoemaker Rd King Of Prussia, PA 19406	O: 610-992-9090 davidb@jbcassociates.com	Schedule Analysis

Grantee Organization

Grantee Team Members	Organization / Address	Telephone / Email	Role
Sam Carnaggio	DRPT 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-288-5900 sam.carnaggio@dullesmetro.com	Project Director
Paul Elman	DRPT 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-288-5925 paul.elman@dullesmetro.com	Deputy Project Director
Jennifer Mitchell	DRPT 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-288-5923 jennifer.mitchell@dullesmetro.com	Deputy Project Director
Frank Holly	MWAA 1 Aviation Circle Washington, DC 20001	O: 703-417-8140 Frank.holly@mwa.com	Vice President for Engineering
Dennis Dayton	MWAA 1 Aviation Circle Washington, DC 20001	O: 703-417-8619 dennis.dayton@mwa.com	Assistant General Counsel
Steven Sabo	Carter & Burgess 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-288-5922 steve.sabo@dullesmetro.com	MWAA Program Management Consultant
Philip Castellana	Lea+Elliott 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-537-7402 pcastell@leae Elliott.com	MWAA Program Management Consultant
Michele Jacobson	Lea+Elliott 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-537-7403 mjacobson@leae Elliott.com	MWAA Program Management Consultant
Lawrence Miller	Lea+Elliott 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-288-5941 larry.miller@dullesmetro.com	MWAA Program Management Consultant
Richard Stevens	Fairfax County 12055 Government Ctr Pkwy Fairfax, VA 22035	O: 703-324-1136 richard.stevens@fairfaxcounty.com	Fairfax County Engineering
Dan Korzym	WMATA 1595 Spring Hill Rd–Ste 600 Vienna, VA 22182	O: 703-288-5926 dkorzym@wmata.com	Senior Project Manager

Review and Analysis of Project Cost

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.

Previous drafts of this spot report addressed the requirements of FTA PG-33 for Subtask 33B, Definitive Project Cost Estimate Reviews. Many aspects of that Subtask are directed toward characterization by Standard Cost Category. That approach was taken in those drafts. The cost evaluation contained in this spot report, which is being done after execution of the Design-Build Contract, addresses the project cost estimate in light of the contract packaging and of the remaining budget items controlled by the Grantee.

Characterization of Project Cost Estimate

It is first necessary to characterize the estimate that was provided by DRPT/MWAA. As part of the deliverables at the end of PE, on March 21, 2006, Dulles Transit Engineers (DTE) provided project cost estimate. In April 2006, DRPT had their GEC provide an independent cost estimate. On April 27, 2006, the GEC produced a cost estimate prepared as a review of the DTE estimate delivered with the 100% PE documentation. This estimate did restore several scope items that had been struck from the DTE estimate. Draft spot reports were prepared by the PMOC on the data available. The PMOC strongly recommended that a complete "bottoms-up" independent estimate. In October 2006, DRPT mobilized their GEC to perform a complete "bottoms-up" estimate. The estimate was developed using the existing 100% PE Design Documents and the Contract Terms and Conditions as of October 31, 2006. In December 2006, the GEC completed an estimate of the Design-Build scope of work which was titled "Independent Cost Estimate for the Design-Build Contract". On January 19, 2007, the GEC provided the project level estimate which was drawn from the December 2006 Design-Build estimate and the document, "WMATA Provided Cost Information" dated January 12, 2007, as well as several special studies for Professional Services and Finance Costs.

On March 6, 2007, DRPT/MWAA provided a project estimate based on a revised estimate of direct construction costs by the GEC, with adjustments to scope, indirect cost, and profit made by MWAA, and also included pricing of "Open Items". Open Items were those scope elements of the Project that were not complete or included in the 100% PE documentation.

During the PMOC's review of scope and cost items it was observed that while the total direct construction cost estimated by the GEC was constant, that the assignment of SCC coding was inconsistent and constantly varying. The reason for the consistency in overall result with such variability stems from the fact that both the Design-Build Contractor and the GEC both used a work break down structure that was oriented along the lines of subcontractor bid packages within the larger design-build contract. That GEC used the same estimating package, HSCC, as the Design-Build Contractor. It was agreed in October 2006 that the GEC and the Design-Build Contractor would coordinate the work breakdown structure to make variance analysis during the negotiation period more straightforward. GEC assigned SCC codes to the bid item structure in

December 2006. In January 2007, the Design-Build Contractor changed the work breakdown structure and the GEC adjusted to follow suit. The GEC again assigned SCC codes to the work breakdown structure, but it was different than the previous estimate received by the PMOC. Documentation received from DRPT/MWAA since March 2007 remains consistent in total direct cost of construction; however, the allocation of the items to SCC codes continues to be variable. The main difficulty that results from this condition is that it is more difficult for the PMOC to verify scope and cost items and is therefore more difficult to create a classification of the cost estimate items under the correct SCC code and properly classified as unit price, CER, or lump sum.

Since both the design-build contractor and the GEC were using the same work breakdown structure, the organization of the estimate was consistent with stationing shown on the drawings.

Negotiations concerning project cost were finalized on the Design-Build Contract with the issuance of the Memorandum of Understanding on March 28, 2006 that included the Contract Price. The final agreement was negotiated through to May 30, 2007 and the contract was executed by both parties on June 19, 2007. Attachment 1 of the Memorandum of Understanding eventually became Exhibit 14.1.1 of the Design-Build Contract and shows the contract price as being a Firm-Fixed Price portion, 17 Allowance Items, an allowance for insurance, and an estimate of the cost of Utility Relocation under the Comprehensive Agreement.

MWAA prepared two documents to explain the project cost estimate after execution of the Design-Build Contract. They are the document Project Cost Estimate dated June 20, 2007 and the document Guide to Allowance Values dated June 19, 2007.

The grantee estimate, as presented in Appendix B, is mechanically correct. The project cost estimate is consistent with the ROD.

Approach to Project Delivery

From the signing of the Comprehensive Agreement in 2002, it was the intention to complete the construction of the Project through a design-build contract to be negotiated at a later date. A contract was negotiated between MWAA and DTP and executed on June 19, 2007.

The scope of work in Design-Build Contract generally includes all engineering final design and construction activity for the project. The value of the DTP Design-Build Contract is \$1.6 billion. During the negotiation, it became apparent that the Contractor would not be able to provide a reliable firm fixed price for several items within the scope of work. A method was devised to separate these scope items from the FFP and to group them as Allowances. The breakdown is FFP at \$1,075 million and Allowances at \$523 million. With the addition of the Utility Relocation work being done under the Comprehensive Agreement estimated at \$128 million, the total value of the combined contracts is \$1,727 million.

In addition to the scope of work under the DTP Contracts, there is other work being progressed by WMATA and others. These items, plus project contingencies, total \$921 million making the total project budget \$2,648 million.

Table 1 – Summary of Project Cost Estimate

Entity		Amount
Design-Build Contract	Firm Fixed Price	\$1,075,074,591
	Commodity Escalation	\$79,422,406
	Subcontract Allowances	\$523,711,347
	Time and Material Items	
	Utility Relocation	\$128,045,963
	Real Estate Support	\$2,142,711
Subtotal		\$1,808,397,018
WMATA	Vehicles, technical support, etc. (per Intergovernmental Agreement)	\$286,698,480
Owner-Agency	Real Estate Acquisition	\$89,376,067
	Project Management	\$159,027,408
	Other (VDOT, etc.)	\$43,799,937
	Finance Charges	\$30,609,507
	Contingency	\$229,800,224
TOTAL		\$2,647,708,641

Classification of Construction Cost Items

With the execution of the Design-Build Contract the level of cost risk to the project has been significantly altered. Whereas during the pre-contract stage all estimate items required contingency and escalation, now a significant part does not. However, there are many aspects of the Contract that continue to expose the Grantee and the project to cost risk. The project costs can be grouped into four classes, each with varying levels of risk to the Grantee. These are described in the following sections.

Design-Build Contract Firm Fixed Price

The Design-Build Contract has a FFP of \$1,075,074,591 for all of the design and construction scope not excepted by the Allowances below. However, there are two mechanisms within the contract that will add cost to the FFP. The first is tied to the NTP into Final Design (FD), which by Contract is to be issued no later than August 1, 2007. The FFP will be escalated by 4.0% per annum for each day after August 1, 2007 that the NTP is delayed. It is already known that the FTA approval to enter into final design, which is a grant requirement, will not be issued by August 1, 2007 making an additional cost a certainty. The rough order of magnitude of this price increase is \$120,000 per day or \$3.6 million per month.

The second mechanism that will increase the price is a material escalation clause in the FFP portion of the agreement. This escalation clause is contained as Exhibit 14.1.3 of the Contract. The intent was that the project cost would be lower if the Grantee would take the risk for material escalation, especially given the recent volatility in the markets. The Grantee has budgeted \$79.422 million for these material escalation payments making the total cost of the FFP portion of the Contract \$1,154.5 million. The section on Escalation in this report discusses the adequacy of the Grantee's current escalation budget in more detail.

Design-Build Contract Subcontract Allowances

The Contract has a provision to defer the award of identified Allowance items until the design and construction process is further progressed in order to be able to gain more competitive pricing for these scopes of Work. As noted above, the estimated value of the seventeen Subcontract Allowance Items totals \$523,711,347. These allowances were established during negotiations with DTP.

The value of each Allowance item was derived by either using DTP's estimated value or MWAA's estimated value. The lesser of these two values was used in hopes that when bids come in on the final design, the bids would not exceed the allowance. The cumulative value of these subcontract values is \$418.6 million and it is MWAA and DTP's expectation that they will award all of these contracts for a total value at or near this value. In table 2 below, the Subcontractor Bid Allowance Price is from Exhibit 14.1.6(a) and the DTP Contract Allowance Price is from Exhibit 14.1.1. Refer to the section on Allowance Item Cost Estimates on page 30.

Table 2 – Table of Allowances

No.	Allowance Item	Subcontractor Bid Allowance Price	DTP Contract Allowance Price
1	Trackwork	\$59,525,680	\$65,779,485
2	Wiehle Parking Garage	\$25,951,149	\$29,007,184
3	Station Finishes and Mechanical-Electrical Plumbing (MEP)	\$87,493,630	\$97,800,960
4	WFCY Sound Box and Platforms	\$4,916,879	\$5,423,019
5	Pedestrian Bridges	\$11,297,310	\$12,488,840
6	Site Development	\$50,909,257	\$56,891,121
7	Installation of Public Art	\$530,774	\$584,288
8	Communications and Security	\$18,881,973	\$21,300,429
9	Fire Suppression	\$2,151,166	\$2,522,744
10	Elevators and Escalators	\$32,005,660	\$34,733,751
11	Spare Parts	\$5,000,000	\$5,371,001
12	WFCY S&I Building	\$33,792,562	\$37,995,660
13	Traction Power Supply	\$47,493,484	\$51,582,734
14	ATC Supply	\$27,547,647	\$30,298,221
15	Cathodic Protection and Corrosion Control System	\$1,424,170	\$1,572,236
16	Contact Rail and Hardware Supply	\$8,290,686	\$8,905,856
17	Wiehle Avenue Replacement Parking	\$1,370,187	\$1,514,247
	Total	\$418,582,214	\$463,771,776
	FFP Insurance and Bonds Allowance		\$59,939,572
	Grand Total		\$523,711,347

For the Allowance items, it is planned that a material escalation scheme, similar to what is detailed in Exhibit 14.1.3(c) for the FFP portion of the Contract, will be negotiated for commodities procured under the Allowance item. The \$79.422 million shown above under the FFP pricing is intended to cover all material escalation payments including those negotiated

under Allowances. This will be discussed in more detail in the section on Commodity Escalation on Page 40.

DTP will mark up the subcontract values for the cost of insurance (workman's compensation and builder's risk), local business revenue tax, and DTP fee. When the subcontract is awarded by DTP, it will become part of the FFP. Table 2 shows the Subcontractor Bid Allowance Price, \$418.6 million, and the estimated Contract price including the DTP additions, \$463.8 million.

The cost of Builder's Insurance and Bonds for the FFP portion of the Contract Price was also given to DTP as an allowance in the amount of \$59,939,572 for a total Allowances cost of \$523,711,347 as shown in Table 1 above.

The PMOC has a concern about the derivation of the Allowance Prices. The concerns are the subcontractor markup used, premium labor costs, and the deviation between the MWAA estimate and the DTP estimate at the proposal. This issue will be discussed in detail in the section on Review and Analysis of Correlation in Project Quantities on Page 30.

Design-Build Contractor Administered Time and Material Items

Utility Relocation and Real Estate Procurement are being managed by DTP on a reimbursement basis. For utility relocation under the Comprehensive Agreement, DTP will design and manage all utility relocation. They will contract with utilities or utility approved contractors to relocate utilities. The costs incurred are to be reimbursed at cost by the Grantee. DTP will also manage ROW and real estate acquisition. The costs of appraisals and other fees incurred in procuring real estate and easements as well as the cost of the property will be passed from DTP to the Grantee. The project cost estimate carries these items at \$128 million for utility relocation, and \$91.5 million for real estate, of which \$2.1 million is DTP real estate support.

Included in the utilities relocation costs is an allowance for an electrical distribution system for the 34.5KV utility power required to supply power to the traction power substations and passenger stations. The scope includes installation of electrical ductbanks and manholes for the power distribution system and the work would be performed by DTP. MWAA/DRPT expects the utility company to install the power cables at the utility company's cost and absorb the cost into the utility power rate.

Grantee's Costs – Non-Design-Build Contract Items

The Grantee is also responsible for the cost of work done under the Intergovernmental Agreements, the most significant of which for project construction is WMATA. WMATA will provide engineering support, perform systems and control center work on their property, furnish and install fare collection equipment, provide support for integration testing, and procure vehicles. There will also be some roadway improvement contracts issued by Virginia Department of Transportation (VDOT) and the municipalities. The Grantee also has its own program management costs.

All costs on the Project will ultimately fall under the four categories shown above. Contingencies and finance costs for the project are held in the project budget until allocated to one of the expense categories above. The Design-Build Contract pricing structure produces the

systemic risks listed below.

Contract Pricing Risks

- *There is a significant contractual commodities escalation cost payment to be added to the FFP. The magnitude of this cost given the volatility of market prices poses is a significant cost risk to the project.*
- *Delays in issuance of various Notices-to-Proceed will result in cost escalation of the FFP.*
- *The number and overall magnitude of the Allowance items presents a continuing market risk to the project. This risk arises from estimating differences, commodities escalation for materials, and regular escalation from the timing of the subcontracting.*
- *Utility relocation and ROW acquisition are being done as reimbursable for Time and Material. The project retains all cost risk from this work.*

To the extent that they are covered under these general contract risks, the section describing scope and schedule later in this report will not separately restate the cost risks retained by DRPT/MWAA as a result of the choice of project delivery method. These risks are present in nearly every functional area.

Review of Other Program Costs

Real Estate Acquisition Cost Estimate

The DTP estimate is for the property acquisitions and easements required to build the project. DTP has defined all properties to be acquired based on the PE Design Plans in adequate detail. Property costs are divided into the following categories;

- Fee taking
- Permanent easement
- Temporary easement
- Utility easement
- Damages
- Relocation Payments
- Administration

The base ROW cost estimate is generally considered acceptable. The Right of Way Acquisition Plan (RAP) was updated in May 2007 and reflects the current DRPT/MWAA ROW project estimate which is \$91.5 million. The PMOC has commented on and requested explanation of certain increases in overhead charges included in the latest ROW estimate revision. There may be an issue of cost duplication between the FFP agreement and the line item in the real estate acquisition cost for DTP management of ROW acquisition.

Based on completed 100% preliminary engineering and supplemental design plans, fee take and/or easement interests are to be acquired from 82 properties. Additionally, 21 property

interests are to be conveyed by Fairfax County including some 13-parcel acquisitions by pending proffer agreements/dedications. MWAA advises that the scope of ROW proffer/dedications will include all compensable interests required for the project and thus no appraisals or additional negotiations will be required as the Uniform Act requirements are not applicable.

Interests in land will have to be conveyed or transferred from VDOT and Dulles Airport with attendant approvals from the Federal funding agencies, namely the FHWA and the FAA. The acquisitions will also include any property interests needed for utility relocations. Final right of way plans for the critical construction segments on Route 7 were received in July 2007.

Seven business displacements in the Route 7 corridor require relocation assistance and benefits. In addition, a storage locker facility is impacted, but not displaced. No residential displacements are anticipated. Personal property moves are anticipated from a self-storage locker operation near Wiehle Avenue Station. In addition to relocations associated with business displacements, 112 personal property moves were identified including 6 businesses on Rt. 7 and the balance in connection with the storage locker operation. DTP has had an excellent outreach program to keep potential displacees informed of the project developments that will affect their displacement.

The property values were developed by individual parcel, and are based on data and historical unit prices for temporary and permanent easements prepared by a local Appraisal Institute (MAI) designated and state certified appraiser. The DRPT/MWAA project estimate was developed using the appropriate ROW acquisition and relocation assistance cost estimation methodology.

The revised estimate in the May 2007 RAP is now stated at \$91,461,000. This is a significant reduction from previous estimates. The reduction results primarily from anticipated reduced costs related to ROW proffer/dedications by property owners (approximately \$11.4 million) to the project and revised ROW needs based on supplemental design changes (\$5+ million). The PMOC concurs with the logic of the changes made for these reasons.

Clarifications were requested previously by the PMOC relative to the cost estimate concerning the valuation and offsetting of special benefits against damages accruing to remaining properties where a partial acquisition has occurred. The February 2007 Right of Way Acquisition Plan indicated that that such benefits may be difficult to estimate and prove convincingly in the context of a condemnation or otherwise and this was the reason for the increase in cost. This has now been clarified in Section 5.1 of the May 2007 RAP and the cost estimate adjusted accordingly.

Earlier there was some uncertainty regarding Fairfax County's decision allowing increased development density adjacent to the project that would benefit properties from which an acquisition has occurred. This issue seems to have been clarified to the effect that the County's planning and zoning affords density bonuses based on a property's proximity to the transit project. Property appraisers valuing ROW for the project are required to appropriately consider the existing zoning as required by the appraisal scope of work in relation to URA requirements at 49 CFR 24.103(b) to disregard increases in property value due to the project.

In previous reviews by the PMOC, there was the unresolved issue with Fairfax County regarding the disposition of density credits related to property acquisitions and also the property that is proffered/dedicated as to who retains and has the benefit of such density credits. The latter issue has been resolved as owners who proffer/dedicate will retain density credits related to such lands. The former issue of density credits related to acquire ROW is being researched by the grantee to determine if there is a benefit to the project, if these credits can be recovered and transferred in accordance with county planning and zoning procedures.

The GEC estimate does not show any allocated contingency; however, there is a line item in the Right of Way Acquisition Plan for a Settlement/Condemnation Increment that is 45% of the estimated cost of land and is included as contingency for this purpose. The most recent version of the Right of Way Acquisition Plan (May 2007) also includes another contingency which is due to a lower ROW cost estimate than the previous revision. Refer to the discussion of ROW contingency in a following section of this report.

In the PMOC's opinion, there is a potential cost risk due to the unpredictability of ROW condemnation costs and the handling of special benefits that may accrue to remaining properties.

Also, as noted in the PMOC Spot Report, PG-32C Grantee Project Scope Review, a risk was identified regarding the potential ROW acquisition requirements. Specifically, if the ROW acquisition requirements are based on PE design plans including supplemental engineering, the final design will need to stay within those established limits so that ROW work products do not have to be redone if design changes occur.

Reworking of ROW work products because of design changes will adversely impact the project schedule, project cost and project scope, and thus the PMOC considers this a risk element.

Several additional items added to the estimate should be explained in Section 5 of the RAP. These added items concern DTP Acquisition Management (beginning May 7, 2007) for \$823,587 and DTP Design Support for \$200,000. There is possible logic and justification for these items, although the PMOC has questions regarding both. The DTP Acquisition Management fee estimate is 41% of the ROW Agent subcontractor's estimated cost for doing the actual ROW production work on the project. This amount seems excessive and further explanation of what it involves should be included in the RAP. Furthermore, the Design Support item should also be discussed in the context of its possible duplicate coverage in the design build contract? The most recent version of the Right of Way Acquisition Plan (May 2007) also includes an owner's contingency of approximately \$3.4 million which is due to a lower ROW cost estimate than the previous revision. This item should be justified as well. Refer to the discussion of ROW contingency in a later section of this report.

Summary of Risks – ROW, Land, and Existing Improvements:

- *There is a potential cost risk due to the unpredictability of ROW condemnation costs, the handling of damages and special benefits that may accrue to remaining properties due to the Project.*
- *There is a risk to the project's budget, as well as the schedule, if additional ROW is needed during Final Design that is beyond the limits established in the current 100% PE design plans, or if the plans for the ROW and utility corridors are not sufficiently complete when the ROW acquisition process begins.*
- *Cost reductions resulting from proffers represent a risk if the owner has not signed a dedication deed.*
- *Items added to the current cost estimate for DTP-ROW Acquisition Management, Design Support and Owner's contingency should be justified.*

Rail Vehicle Cost Estimate

The supporting documentation including the WMATA cost estimate for the heavy rail vehicles was reviewed. It appears to have been derived from the WMATA experience for the 5000 Series and 6000 Series rail car procurements. Differences in the cost of the rail vehicles for the Wiehle Avenue Extension and the previous orders are due to the choice of the cost escalation factor used to arrive at the 2006 base year cost. Spare parts and a contingency for change orders are also included in the estimate and in the SCC 70.02 line item. It should be noted that the rail vehicle procurement cost includes all WMATA project management costs, as required by SCC definition, in addition to the rail car procurement contract.

One cost risk to the rail vehicle procurement is the project development cost of the procurement. The risk to the car builder is less if the total order including options is of sufficient size. The rail vehicle procurement for Phase I is envisioned as 64 car procurement. While both of the previous WMATA orders were roughly the same size for the base order, sizeable options were also part of the proposal, 82 cars and 120 cars for the 5000 Series and 6000 Series respectively. In both of these cases the options were fully exercised. The WMATA experience on these orders was used to estimate the cost of the proposed order and therefore relies on a larger total order than initial procurement. There is a strong possibility that the 7000 Series will be larger than the 64 cars for the Project, such as an option for the 64 cars required for Phase II at a minimum. However, if this approach is not implemented, *there is a risk that the rail vehicle procurement cost will be higher if no options are included.*

The YOES\$ estimate for the rail vehicle procurement is \$187 million, which is adequate in the opinion of the PMOC. The 2006 estimated cost is \$158 million, which in itself is inadequate. The reason for this dichotomy is that the FTA worksheets discount the cash flow of payment, whereas the payment values are fixed at NTP. In the final presentation of a YOES\$ estimate, the rail car cost estimate was observed to be distributed using the cash flow estimate included in the WMATA document reviewed. While this table is reflective of the cash flow needed to finance the project it is not subject to cost escalation. The amount of each payment for the rail car procurement is fixed at NTP and so if car builder has made an estimate of inflation to year of expenditure; it is included in the bid price. Since the procurement price estimate for this project is based on WMATA experience and the payment schedule is similar among all of these procurements, it is reasonable to consider that the basis of estimate also includes historical cost escalation. To the extent that cost escalation is perceived by the car builders to be greater during

this vehicle procurement period than during the period 1998 to 2002, there is a risk of an increase in bid price to account for this perception. However, the experience seen in the cost escalation discussion for rail vehicles in this report is more predictive of the expected cost of the rail vehicle procurement.

WMATA's experience with contract pricing for the 5000 Series and 6000 Series procurements has indicated a stable market. However, demand in the marketplace can have a significant influence on the availability of qualified bidders and their pricing. The PMOC is of the opinion, as stated in the Appendix on cost escalation, that industry capacity will not be a cost escalation issue. *However, the rail car market will remain a cost risk of significant magnitude until the rail vehicle procurement is awarded.*

Using this scheme of escalation to YOES will correctly reflect the actual impact of the rail vehicle procurement on the project budget; without this adjustment, the cost of rail vehicle procurement will be overstated. *The PMOC recommends that the entire cost of the rail vehicle procurement contract be applied as being expended at NTP for the YOES cost estimate.*

The estimate includes costs for a schedule of non-revenue vehicles, support equipment, and tools. This \$6.7 million in YOE cost can, in the opinion of the PMOC, be considered as a budget allowance for WMATA to purchase additional equipment for general maintenance use on Metrorail. None of this equipment is specific to the Wiehle Avenue Extension Project although it will be used on the Project as needed. *Procurement of equipment for these line items can be postponed in some cases until needed to support system integration testing and in most cases until needed for revenue operations.*

Summary of Risks – Vehicles:

- *The rail car market will remain a cost risk of significant magnitude until the rail vehicle procurement is awarded.*

Professional Services

Professional services are the second largest cost category on the Wiehle Avenue Extension Project. It is a compilation of estimates to complete the project provided by DTP for final engineering, DRPT/MWAA, WMATA engineering, WMATA force account, and several other support and miscellaneous functions. The GEC estimate developed cost items for Professional Services based on a review by design management staff at the GEC's firm of the estimated engineering work and program work necessary to support the PE scope. The estimate was on the estimated number of drawings required and the estimated staffing for other functions. MWAA reviewed this estimate and increased selected scopes and estimate values. The March 6, 2007 version of the project estimate included these line items with no allocated contingency. The current budget estimate includes an allocated contingency of 7.7% for the Grantee's project management costs.

The breakdown of Final Design costs and Construction Management costs discussed in previous drafts of this report have been included in the FFP and are fixed for the construction scope of work. However, if changes are required beyond the scope of construction, this work may be the subject of a claim for extra compensation.

MWAA and WMATA have developed an agreement that defines WMATA's role and responsibilities for the Dulles Extension project, however WMATA has not developed a detailed Force Account plan. WMATA has provided the project with a cost estimate for their support. The estimate is based on WMATA's experience on prior projects. The PMOC is concerned that the cost for Force Account work will exceed the allocated budget for this work.

Summary of Risks – Professional Services:

- *The PMOC is concerned that the cost for Force Account work will exceed the allocated budget for this work.*

Unallocated Contingency

DRPT/MWAA continues to maintain an Unallocated Contingency of \$80 million. Refer to the section on Review and Analysis of Grantee Allowances and Identification of Latent Contingency for discussion on this subject.

Finance Charges

The allowance for Finance Charges is to reflect the cost of borrowing to match the cash flow requirements for construction progress payments versus the anticipated flow of funding from the contributing agencies. *The PMOC recommends that DRPT/MWAA reevaluate this item in light of recent increases in the Federal Discount Rate which benchmarks the cost of most borrowing.*

Identified Risks with Possible Cost Impact

Risks Identified in the Review of the Project Scope

Upon review of the project's scope, the PMOC has identified the following potential risks:

1. After a \$12,000,000 allowance figure is exceeded for Differing Site Conditions and Hazardous Materials, the Contractor is entitled to Change Order(s), which is a potential scope, schedule, and cost risk.
2. There is a risk that the NATM tunnel excavation and initial support may be difficult to construct as designed given the soft ground conditions expected at Tysons Corner. This represents a potential scope, schedule and cost risk because the NATM work is on the critical path for the project so added scope will result in a longer schedule, which will, at a minimum, increase the Owner/Agency costs for the project. If the contractor can successfully argue that a differing site condition is present, then there could be an increase in direct costs for this work as well.
3. There may be potential scope risks associated with NFPA 130 requirements and ADA elements at several stations such as sufficient station exit times, availability of emergency evacuation carts needed in the event of power or mechanical failure, and evacuation of the disabled from "Safe Dispersal Areas".

4. There is the risk that absent actual designs, the mechanical elements of the Tysons Central 123 and Tysons East Stations, which are to be based on the Tysons West Station, will be missed in the quantity take-offs and/or miscounted due to the considerable differences in the overall architecture among the three stations.
5. Access and laydown areas are not shown for the Wiehle Avenue parking structure. The site is presently used as a Park & Ride lot. Assuming the lot is kept in operation during construction; the garage site is tight and will present challenges and restrictions during construction.
6. Access and laydown areas for the Tysons West Station are located within the Dulles Access Road interchange. This may be too far from the station to be effective and will create additional traffic issues due to the congestion on Route 7.
7. The design of the expansion of the WFC Shop is progressing, but there is still a risk to scope and budget due to the complexity of designing a shop expansion at this location.
8. The design of necessary utility relocations of gas, sewer, and water lines in the bed of Route 7 had not progressed until recently; therefore, a risk to the project's scope and budget still exists since the design has not yet been completed.
9. The complexity of the train control and signal system interface to the existing system requires that certain elements of work be performed with significant oversight and support by WMATA forces. There currently is no detailed force account plan for this work.
10. The level of design for the high voltage (34.5 KV) distribution system is not consistent with what is expected at the completion of the 100% PE phase.
11. No design has been developed for the Automatic Fare Collection system and is not consistent with what is expected at the completion of 100% PE design.
12. There is a significant risk that the Operations Control Center improvements scope is incomplete, since there are no PE design drawings for the work. The work will be performed by WMATA forces.
13. If right-of-way (ROW) acquisition requirements are based on the current 100% PE design plans including supplemental revisions, designers will need to stay within those established limits in developing the Final Design. If Final Design requires additional ROW or property interests for utility relocations, the reworking of ROW work products because of such design modifications may adversely impact the project schedule, budget and scope.

Risks Identified in the Review of the Project Schedule

1. There is a risk that acquisition of ROW or ROE in Operation Areas 6, 7 and 8 have the potential to cause a schedule delay.

2. If the final design results in changes to the ROW plans, there is a risk that these changes could adversely impact the scope, schedule and budget.
3. The contract contains a significant scope of work, called Allowance Items, that postpone subcontracted work to a later date and leaves the Grantee with risk for these items.
4. There is a schedule risk, which may be significant, arising from the fact that the utility relocation plans have not been completely developed both from a design and a contractual point of view. The coordination of utility work will be an issue that could adversely impact the schedule because of the large number of utility companies that must work concurrently in the same area. The time period for these installations is tight, and that the starts of the utility installations are dependent upon gaining Right-of-Entry to properties. In particular, the design of relocations of the gas, sewer, and water lines in the bed of Route 7 had not progressed until recently; therefore, a risk still exists until the design is completed. There is a schedule risk that the schedule is predicated on early partial NTP (based on LONP) for utility construction.
5. There are risks for hazardous material remediation for the parcels being acquired.
6. The level of design for the high voltage (34.5 KV) distribution system is not consistent with what is expected at the completion of the 100% PE phase.
7. Though the design of the WFC Shop expansion is currently being progressed to bring it up to the 100% PE level, there is still a risk since the design has not yet been completed due to the complexity of designing a shop expansion at this location.
8. WMATA has requested a change to the train control and signals criteria to allow for separation of track circuit cables that carry like frequencies for train detection. This is a potential risk to the project.
9. The complexity of the train control and signal system interface to the existing system requires that certain elements of work be performed with significant oversight and support by WMATA forces. There currently is no detailed force account plan for this work.
10. There is concern that the design review process and any work restrictions required by the local jurisdictions will cause schedule delay and become a force majeure event as defined by the Terms and Conditions.
11. There is a risk that when details on lead times and durations for equipment and material manufacturing and delivery are added to the schedule that there may be an impact on the installation schedule.
12. Systems integration and testing activities are not accurately coordinated on the schedule. There is a risk that once the systems integration and testing activities, which are on the critical path, are more accurately coordinated in the schedule, that the duration to complete these activities will be extended, thereby extending the ROD.

13. There is a risk that systems testing and startup activities, which are on the critical path, do not have a sufficient duration to insure that all software testing and debugging is completed. This could result in extending the Revenue Operations Date.
14. The lack of a preliminary signal test plan, particularly at the interface between the existing system and the Extension at the new Dulles Junction, is a risk to the project.
15. There is a significant risk that the communications and security scope is incomplete – there are no PE design drawings for the WMATA portion of the work.
16. There is a risk that as the communications design progresses through the Final Design stage the project scope could increase, particularly in the area of security system and/or newer technology requirements. There is an “Open Item” related to a request by WMATA to upgrade the planned LAN/WAN network to state of the art capability.
17. There is a significant risk that the Operations Control Center improvements scope is incomplete since there are no PE design drawings for the work and the work will be performed by WMATA forces.
18. Pre-revenue operation following the full functional testing is currently shown as 91 days duration. During the pre-revenue operation it is typical to discover items which need to be coordinated among and rectified by the systems subcontractors. Due to the risk that the allotted time may be insufficient, the PMOC recommends that this critical path activity be increased to a minimum of 150 days.
19. There is a risk that the NATM tunnel excavation and initial support may be difficult to construct as designed given the soft ground conditions at Tysons Corner. Since the NATM work is on the critical path, any delay in completing this work will delay the overall completion of the project. This represents both a cost risk and a schedule risk.
20. There is a risk that the rail vehicles will not be available for the scheduled start of revenue service in November 2012. This risk is from two sources: possible lateness in acceptance of the first car, and a slower than planned rail vehicle production rate.
21. There is risk in using only a few weather calendars in preparation of the schedule. It would seem reasonable to add additional calendars, better representing the differing types of weather sensitive activities.
22. There is a schedule risk that when relationship ties among Work Operation areas are added to account for resource constraints among similar work activities, especially for those activities which require specialist equipment or crews, the planned durations may increase.
23. There is schedule risk that craft resources (manpower) will not be available at the skill level and quantity required to achieve the construction activity durations in the Rev. 7 detailed schedule.

24. There is schedule risk that engineering resources (manpower) will not be available at the skill level and quantity required to achieve the design activity durations in the Rev. 7 detailed schedule.
25. The number of activities is not adequate to track the design/build process for the size of project if the project were under construction. It is recommended additional details be provided. There is a risk that the available float shown in the schedule may be consumed or the schedule impacted once resource loading of specialist equipment or crews is modeled.
26. There is a schedule risk that the constraint dates used in the schedule are not met. In particular the activity for Entry into Final Design is currently shown to have a Mandatory Start date of August 1, 2007. Removal of this mandatory date results in the project not meeting the Revenue Operations Date shown in the schedule.

Review and Analysis of Correlation in Project Quantities

Review and Analysis of Correlation in Project Quantities was provided in previous revisions of this report. Since the majority of these items are included in the scope of the FFP, the responsibility and risk for these items is currently with the Contractor. This section is not included in this report.

Allowance Item Cost Estimate and Adjustments

The PMOC is of the opinion that while the scheme of Allowance Items was introduced to control project cost it also poses the most significant cost risk to the project. Discussion of the Allowance Items cost estimate is included in this section since it relates to several cost elements. The first concern is the effectiveness of the extraction of the Allowance Item from the construction scope of work. The second concern is the application of several cost factors: subcontractor markup, premium labor costs, and escalation to mid-point of construction.

Estimation of Allowance Items

The Recitals of the Design-Build Contract put forward the rationale for the use of Allowance Items. Recital H states as follows:

“H. During the course of such negotiations, the parties agreed that certain Subcontracts are subject to future uncertain price variation due to the level of design as of the Final Fixed Price Proposal Pricing Date, schedule for implementation, and market conditions for such Subcontracts. Consequently, the Contract Price and the Project Schedules include allowances that have been determined by Owner for the price and schedule of such Subcontracts, with such allowances to be reconciled pursuant to this Contract.”

The scope of the Allowance Items is shown in detail in Exhibit 14.1.6(c) of the Design-Build Contract. The cost of the Allowance Items was estimated by removing an estimated cost from the scope of the Firm Fixed Price. Initially, DTP proposed \$530,132,928 for the scope of work contained in the 17 Allowance Items as shown in Table 3. MWAA estimated this cost to be a

lesser amount, \$390,797,867, which is the Exhibit 14.1.6(a) amount less escalation. This number was based on the MWAA estimate and is intended to reflect retention of risk by MWAA and a more favorable bidding climate due to a more complete design.

Table 3 – Deviation of Allowances

No.	Allowance Item	DTP Estimate	MWAA Estimate	Difference
1	Trackwork	\$67,781,102	\$55,946,488	-\$11,834,614
2	Wiehle Parking Garage	\$30,619,128	\$24,446,526	-\$6,172,602
3	Station Finishes and MEP	\$141,394,900	\$81,838,442	-\$59,556,458
4	WFCY Sound and Box Platforms	\$9,407,423	\$4,631,803	-\$4,775,620
5	Pedestrian Bridges	\$10,492,636	\$10,492,636	\$0
6	Site development	\$76,049,488	\$45,668,210	-\$30,381,278
7	Installation of Public Art	\$750,000	\$500,000	-\$250,000
8	Communications and Security	\$30,414,886	\$17,731,985	-\$12,682,901
9	Fire Suppression	\$2,955,477	\$2,032,648	-\$922,829
10	Elevators and Escalators	\$31,664,817	\$29,829,500	-\$1,835,317
11	Spare Parts	\$5,000,000	\$5,000,000	\$0
12	WFCY S&I Building	\$29,780,246	\$29,780,246	\$0
13	Traction Power Supply	\$51,973,444	\$46,589,824	-\$5,383,620
14	ATC Supply	\$30,890,639	\$25,950,461	-\$4,940,178
15	Cathodic Protection and Corrosion Control System	\$1,941,242	\$1,341,598	-\$599,644
16	Contact Rail and Hardware Supply	\$7,810,000	\$7,810,000	\$0
17	Wiehle Avenue Replacement Parking	\$1,207,500	\$1,207,500	\$0
	Total	\$530,132,928	\$390,797,867	-\$139,335,061

There is also some concern that the Allowance cost developed for Automatic Train Control was derived by determining the percentage of material versus the labor as estimated by DTP and prorating the estimated lump sum amount in the MWAA estimate to obtain the expected value of the material supply subcontract. While the subcontract allowance for material only and the installation cost in the FFP is not an unusual approach, the risk lies in the fact that the two original estimated values varied greatly. As an example, if the two estimates are 30% apart and by chance the higher estimate is actually more accurate, using a prorated amount can leave the material purchase 30% allowance low. In an even worse case scenario, if the estimated value that was used for the material and labor is overstating labor and drastically understating material, the allowance amount for material could be greatly below the actual purchase price.

Using an Allowance for station finishes in essence becomes a design-to-budget. The PMOC is unable to determine if this is in fact the agreed upon approach for the stations. If in fact the Design-Build Contractor has agreed to the design-to-budget, the risk for the grantee is greatly diminished. If not, the risk is higher than all of the other allowances since the Design-Build Contractor has no incentive to bring the design in at the allowance value. The exact opposite

holds true; the more the station finishes cost, the more fee the contractor receives when the subcontract is included into the FFP.

Based on the PMOC review of the Design-Build Contract, there is no language in the Contract to compel the Contractor to redesign any part of the Project to lower the cost of the Allowance Item and this may become a claim for extra work by the Contractor.

Adjustment of Allowance Items

Although the PMOC is concerned with the accuracy of predicting the market price of the work scoped in the Allowance Items, the PMOC is of the opinion that adjustments are needed to the estimated cost of the Allowance Items shown in the contract. These adjustments are recommended for several cost factors: premium labor costs, subcontractor markup, escalation to mid-point of construction, and DTP additions and fee.

As discussed in the Grantee workshops and as shown in the March 2007 Project Cost Estimate, DTP is concerned that certain craft positions may be in limited supply for the project and has added a premium to these craft estimates. It is expected that the subcontractors will also need to attract labor from the same pool and that their costs will match those of DTP. The adjustment needed has been estimated as 7% of the labor cost for these crafts. In Table 4, the value of the 7% Labor Premium is shown to result in a \$1,908,900 increase to the total Allowance Item cost.

The PMOC is of the opinion that using a factor of 15% for subcontractor mark-up is understating the potential subcontractor mark-up and poses a cost risk to the project. A value in the 20% range is more likely based on local experience for subcontracted work. In Table 4 the subcontractor mark-up adjusted from 15% to 20% in most cases. The revised mark-up used is shown in Table 4 as General Conditions Percentage and was used to calculate the General Conditions Amount of \$24,059,015. These items together have increased the Revised Base Year Allowance Cost by \$25,967,915.

Escalation had been calculated by DTP as 4% per annum to a mid-point of construction at 3.5 years, which is a multiplication factor of 1.147. The rate of escalation presented in the Guide to Allowances is a factor of 1.100 after removing an expected \$112,127,000 of commodities to be escalated separately. In Table 4 an estimate is made of Escalation using the Revised Base Year Allowance Cost, less commodities, escalated to the Midpoint of Construction. Since many of the Allowance Items cover activities to be done later in the project, the use of midpoint of construction may still be an understatement of the needed escalation. Since, in the opinion of the PMOC, the escalation was understated at \$27,784,347, the adjusted estimate of \$44,089,059 is higher than is due to the adjustment to the Allowance Item Costs from the addition of a labor premium and general conditions. The net adjustment is \$16,304,712.

Exhibit 14.1.6(a) specifies the formulas to be used to calculate the DTP Addition. Applying these formulas to the Adjusted Subcontract Allowance Price is a further increase of \$7,208,809.

The total adjustment to the Allowance Costs recommended by the PMOC is \$49,481,436. The net result is to place the adjusted Allowance Item costs generally between the original DTP estimated cost and the MWAA estimate as shown in Table 5. The DTP estimated cost included assumption of risk by the Contractor.

Table 4 – PMOC Recommended Adjustments to Budget for Allowance Items

No.	Allowance Item	Current Base Year Allowance Cost	7% Labor Premium	General Conditions Percentage	General Conditions Amount	Revised Base Year Allowance Cost	Midpoint of Const. (years)	Escalation	Adjusted Subcontract Allowance Price	DTP Addition (Insurance, Tax, & Fee)	Adjusted Allowance Price
1	Trackwork	\$55,946,488	\$0	35%	\$16,606,271	\$64,052,759	3.5	\$6,705,460	\$70,758,219	\$7,732,615	\$78,490,834
2	Wiehle Parking Garage	\$24,446,526	\$493,500	20%	\$4,251,570	\$26,002,918	3.5	\$3,088,766	\$29,091,684	\$3,531,693	\$32,623,377
3	Station Finishes and MEP	\$81,838,442	\$430,500	20%	\$14,232,773	\$85,827,135	3.5	\$9,763,835	\$95,590,970	\$11,752,404	\$107,343,375
4	WFCY Sound Box and Platforms	\$4,631,803	\$66,500	30%	\$1,208,296	\$5,302,451	3.5	\$780,206	\$6,082,658	\$649,123	\$6,731,781
5	Pedestrian Bridges	\$10,492,636	\$259,000	20%	\$1,824,806	\$11,207,838	3.5	\$1,119,423	\$12,327,260	\$1,378,372	\$13,705,633
6	Site development	\$45,668,210	\$0	25%	\$9,927,872	\$49,639,359	3.5	\$6,296,497	\$55,935,856	\$6,819,489	\$62,755,345
7	Installation of Public Art	\$500,000	\$0	15%	\$65,217	\$500,000	3.5	\$73,570	\$573,570	\$61,967	\$635,537
8	Communications and Security	\$17,731,985	\$304,500	25%	\$3,854,779	\$19,578,397	3.5	\$2,388,740	\$21,967,137	\$2,820,674	\$24,787,811
9	Fire Suppression	\$2,032,648	\$0	20%	\$353,504	\$2,121,024	3.5	\$312,089	\$2,433,113	\$352,583	\$2,785,696
10	Elevators and Escalators	\$29,829,500	\$42,000	20%	\$5,187,739	\$31,168,435	3.5	\$4,046,139	\$35,214,574	\$3,321,312	\$38,535,886
11	Spare Parts	\$5,000,000	\$0	15%	\$652,174	\$5,000,000	0	\$0	\$5,000,000	\$424,458	\$5,424,458
12	WFCY S&I Building	\$29,780,246	\$210,000	20%	\$5,179,173	\$31,285,039	3.5	\$4,214,115	\$35,499,155	\$4,606,661	\$40,105,816
13	Traction Power Supply	\$46,589,824	\$77,000	20%	\$8,102,578	\$48,692,469	3.5	\$1,566,087	\$50,258,556	\$4,797,554	\$55,056,110
14	ATC Supply	\$25,950,461	\$0	15%	\$3,384,843	\$25,950,461	3.5	\$3,261,589	\$29,212,050	\$3,143,641	\$32,355,690
15	Cathodic Protection and Corrosion Control	\$1,341,598	\$25,900	15%	\$174,991	\$1,367,498	3.5	\$104,102	\$1,471,600	\$164,753	\$1,636,353
16	Contact Rail and Hardware Supply	\$7,810,000	\$0	15%	\$1,018,696	\$7,810,000	3.5	\$183,043	\$7,993,043	\$678,542	\$8,671,585
17	Wiehle Avenue Replacement Parking	\$1,207,500	\$0	20%	\$210,000	\$1,260,000	3.5	\$185,397	\$1,445,397	\$162,529	\$1,607,926
	Total	\$390,797,867	\$1,908,900		\$76,235,282	\$416,765,782		\$44,089,059	\$460,854,842	\$52,398,371	\$513,253,212
	Budget Amount	\$390,797,867	\$0		\$52,176,267	\$390,797,867		\$27,784,347	\$418,582,214	\$45,189,562	\$463,771,776
	Differences		\$1,908,900		\$24,059,015	\$25,967,915		\$16,304,712	\$42,272,628	\$7,208,809	\$49,481,436

Table 5 – Deviation of Allowances

No.	Allowance Item	DTP Estimate	Adjusted Allowance Item Cost	MWAA Estimate
1	Trackwork	\$67,781,102	\$78,490,834	\$55,946,488
2	Wiehle Parking Garage	\$30,619,128	\$32,623,377	\$24,446,526
3	Station Finishes and MEP	\$141,394,900	\$107,343,375	\$81,838,442
4	WFCY Sound and Box Platforms	\$9,407,423	\$6,731,781	\$4,631,803
5	Pedestrian Bridges	\$10,492,636	\$13,705,633	\$10,492,636
6	Site development	\$76,049,488	\$62,755,345	\$45,668,210
7	Installation of Public Art	\$750,000	\$635,537	\$500,000
8	Communications and Security	\$30,414,886	\$24,787,811	\$17,731,985
9	Fire Suppression	\$2,955,477	\$2,785,696	\$2,032,648
10	Elevators and Escalators	\$31,664,817	\$38,535,886	\$29,829,500
11	Spare Parts	\$5,000,000	\$5,424,458	\$5,000,000
12	WFCY S&I Building	\$29,780,246	\$40,105,816	\$29,780,246
13	Traction Power Supply	\$51,973,444	\$55,056,110	\$46,589,824
14	ATC Supply	\$30,890,639	\$32,355,690	\$25,950,461
15	Cathodic Protection and Corrosion Control System	\$1,941,242	\$1,636,353	\$1,341,598
16	Contact Rail and Hardware Supply	\$7,810,000	\$8,671,585	\$7,810,000
17	Wiehle Avenue Replacement Parking	\$1,207,500	\$1,607,926	\$1,207,500
	Total	\$530,132,928	\$513,253,212	\$390,797,867

The Design-Build Contract clearly states in several places “the price and schedule allowance for each Allowance Item has been established by Owner”. The Contract indicates that both cost and schedule will be adjusted as appropriate according to Article 14.1.6 (Cost) and Article 13.3.3 (Schedule).

Review and Analysis of Grantee General Conditions Costs

The general conditions clauses used to construct this project were developed jointly by the design-build contractor and the grantee. These General Conditions cover all of side contractors for the entire project since there is only one contract, of the design-build contract. All the other work on the Project, such as WMATA and VDOT, is covered by intergovernmental agreements.

Review of DTP Contract

As noted above, a design-build contract was negotiated between MWAA and DTP and executed on June 19, 2007. This contract noted that the precedent contract (Comprehensive Agreement executed between DTP and the DRPT and now assigned to MWAA as of June 29, 2007)

identified significant benefits of entering into an agreement with DTP, including, among other things: (1) reducing the design, procurement and construction cycle times to shorten the overall Project's duration, thereby enabling the public to benefit from the completed project earlier than would be available under other delivery systems; (2) reducing the likelihood of cost increases associated with change orders; (3) generating Project cost savings through lower costs of capital, lower development costs and lower construction escalation costs; (4) creating a design that reflects innovation by the construction team; and (5) enabling Contractor to provide a firm fixed price and schedule for the Project earlier, and with less preliminary engineering, than under other methods of procurement and before the stakeholders make a commitment to pay.

These benefits are typical of a design-build project delivery system – shortened project duration, potential technology innovation and increased cost certainty.

Furthermore, a mutually negotiated design-build contract can provide for innovative contract risk sharing or liquidating provisions. The traditional rule of contract interpretation (interpretation against the party preparing it) is altered here. The contract is to be construed as a whole and in accordance with its fair meaning and not strictly for or against any party².

The subject contract reviewed is the Design-Build Contract, Dulles Corridor Metrorail Project, Execution Version May 31, 2007.

This portion of the review summarizes the major contract risks agreed to between the negotiating parties and their implementation within the contract and its Exhibits and Appendices.

Terms and Conditions

Major elements of risk in the Terms and Conditions have been identified and include the following:

- Allowance Items
- A Differing Site Conditions Threshold
- A Force Majeure Time Threshold
- Compensable Force Majeure Claims
- WMATA Role
- Liquidation Provisions
- Warranty

Allowance Items: Typically design-build contracts are fixed price contracts. The Owner relies on the experience and capabilities of the design-build entity and the risk of the final contract price is with it. Typically the design builder has significant control over the design, quality and suitability for construction. In this instance DTP also developed the PE documents, giving itself even greater benefit to determine a fixed price.

This final design-build contract contains a substantial portion of cost in allowances. Section 14.1.6, Contract Price indicates over 40% of the contract price is in allowances. This is an unusually high amount for allowances and places the owner at risk for a large part of the contract

² Article 29.9.1

price. The Owner has established the price and schedule allowances. Also part of this risk is contractor's costs related to schedule impact due to allowance subcontractors to which it is entitled under Section 13.3.3(2).

Subsection d of Section 14.1.6 sets the threshold for "No Fee" at about 32% above the Contract Price Schedule (for allowances) in the Pricing Exhibit. The contractor's primary risk is its loss of fee. The Allowance mechanism in this contract shifts risk on price overruns from Design-Builder to Owner except for some loss of fee.

Differing Site Conditions Threshold: In Section 5 – Differing Site Conditions, the clause contains a 50:50 cost sharing of the first \$12 million in DSC Change Orders. The Contractor is thereby assuming the risk of \$6 million should a differing site conditions be encountered and may have included this amount in the proposal price as a hedge against differing site conditions even though none may occur.

The Contractor may have some contingency in its price. On the other hand, avoiding the potential of a major disruption caused by the discovery of a differing site condition may be avoided if the Contractor assumes the risk and cost. Schedule impact would not however be mitigated.

Force Majeure Time Threshold: The Force Majeure definition in Section 13-4 is quite different than traditionally defined. While the definition would still cover the traditional causes, Force Majeure delays are compensable in this Contract but only if the reserve threshold is exceeded. *Although the threshold is 45 days, there is an element of risk here that is not normally present in a traditional clause.* "Force Majeure Events" may include WMATA, VDOT, MWAA or Fairfax County work restrictions. If so, the threshold may be low and the risk of delay costs above this threshold rests with the Owner. This reserve approach also raises the question as to whether the Contractor has added cost for the threshold number of days thereby adding some contingency into the FFP.

Compensable Force Majeure Events: Under Section 13.4.2 Force Majeure events are compensable. This type of clause is becoming more common in design build contracts changing the typical delays from three categories – inexcusable, excusable and compensable to two – compensable and inexcusable. But under Section 13.2, there is a list of events for which the Contractor bears the risk - (a) general market and economic conditions; (b) weather conditions, except as set forth in Section 01322 of Division 1 (unusually severe); (c) strikes, labor disputes, work slowdowns, work stoppages, boycotts or other similar labor disruptions; (d) delays in obtaining or delivery of goods or services from any Subcontractor; (e) delays of common carriers; and (f) bankruptcy or insolvency of a Subcontractor or inability of a Subcontractor to perform.

WMATA Role: The role of WMATA in the Terms and Conditions is not sufficiently defined. WMATA is a significant entity in the design, construction, integration, testing, and ultimate acceptance of the project. Objective testing parameters are not yet specified. This may lead to some issues before the system is finally accepted.

WMATA's Technical Oversight provisions are not a model of clarity, and this may result in issues as work progresses. Appendix 9 specifies a "Division of Responsibility" for key aspects

of the overall project where the actualization of systems results in interaction, dependency and demarcations between MWAA as Owner, WMATA and DTP.

Furthermore, there is an agreement between MWAA (as Owner) and WMATA defining this relationship and some elements of the design-build contract execution. This MWAA-WMATA agreement has been finalized and the WMATA Board approved this agreement at the June 28, 2007 WMATA Board meeting. A significant example of this is in Spare Parts, where WMATA and MWAA agree that, *“the current allowance amount of \$5 million defined in the Design-Build Contract for spare parts and special tools and the 2,000 hours of training are estimates which are below the costs allocated to spare parts of previous WMATA extensions and will be adjusted based upon what is usual and customary in the industry to provide to an operator such as WMATA as the Project design is finalized and the special tools and spare parts are identified. The additional costs of any adjustments in spares/special tools and/or in training shall be the responsibility of MWAA.”*³

Final System Acceptance is also much more defined in this inter-agency agreement than in the design-build contract. This lack of consistent terms should not affect major design-build contract pricing so much because liquidated damages cease as of substantial completion (which is defined consistently) but may affect the Revenue Operations Date.

Liquidation Provisions: This term refers to Sections 2.5 through 2.8 – Limited Notices to Proceed and Preliminary Design Services under the Comprehensive Agreement: Commencement of Final Design Work, Commencement of Utility Relocations, and Commencement of Construction. There are formulas for increasing the contract amount for delays to various limited notices to proceed, such as, design notice to proceed, the start of utility relocations, and commencement of construction. The possibility of delays to the specified NTP dates from outside factors creates a significant cost risk to the project.

Warranty: In Section 11 – Warranties, the warranty provision is written very much as a construction warranty and not a design *and* construction warranty. This approach leaves open all design warranty issues. Also:

- The Owner needs specific reference and attention to a design warranty rights and obligations.
- Partial acceptance warranty is not addressed.
- Subcontractors under Section 14.1.6, Allowance Items (in section 11.3.2) are treated differently than those under 11.3.1. The distinction is not understood. The entire subcontracting services should be treated consistently. The Contractor still retains the Warranty Obligation regarding the work so that the Owner is covered.
- There is no integration warranty provision. The former Section 11.6 has been deleted.

WMATA has a major concern over latent defects as a public agency operating in the Commonwealth of Virginia. Apparently public agencies such as WMATA have no limitation of latent defects. MWAA has established a latent defect reserve (escrow fund) which will be to the benefit of WMATA should they need it. DTP participation is not specified and it will not affect the design-build pricing. It may be a significant cost to MWAA however. There is a five-year limitation on latent defects in the Design-Build Contract. This is typical of a Designer’s

³ Draft MWAA-WMATA IGA Article 7 Condition 5

obligation and not a Contractor's obligation. These issues arise in design-build contracts because there is a combination of roles.

Review and Analysis of Grantee Escalation Factors and Approach

PMOC Estimate of Cost Escalation Factors

The nature of rail transit construction is that its costs are affected by both local cost conditions and national cost escalation. While much of the civil work, guideway, and station construction is primarily affected by local cost escalation rates, the market conditions for railway vehicles and the systems elements is national, even international, in scope. The escalation factors expected for selected national markets are also discussed.

The PMOC prepared estimations of cost escalation factors and presented these in earlier drafts of this spot report. This information is contained in Appendix C. The PMOC recommendation has been to use 4% for project cost escalation. The PMOC review of the project cost estimate and project cost support documentation indicates the use of 4% as the project cost escalation figure for most cost items. Where the cost item uses a higher cost escalation than 4%, the PMOC has accepted the use of the higher cost escalation; this occurs in the estimation of material escalation.

Grantee Escalation Factors and Approach

General Cost Escalation

In accordance with the terms and conditions of the Design-Build Contract, escalation on this project is divided into two categories: 1) Regular or Design-Builder At-risk Escalation, and 2) Commodities Escalation.

The GEC independent estimate recommended escalation of the basic construction items at the rate of 3.15% for 4.5 years to the mid-point of construction for the Design-Build Contract. The Grantee's estimate, Design-Build Contract Cost Estimate, reduces this escalation by applying it over 3.5 years and presenting this has a better representation of the expected midpoint of construction. Although not included in the GEC independent estimate, the Grantee has added escalation for Professional Services.

Review of project documentation indicates that escalation for the Design-Build Contract was calculated at 4% for 3.5 years to a mid-point of construction (1.147). This method was used by both DTP and MWAA. For the other costs, including MWAA, VDOT, and WMATA costs, MWAA used a factor of 3.65%; a rate chosen since there are fewer material costs. Real estate was escalated 11.47% over 2006 prices.

For the final project estimate completed using the FTA Template, the Grantee has used an escalation factor of 3.479% as a composite escalation factor representing both regular escalation and commodities escalation. This escalation factor is the result of working from the expected YOES\$, through an expected cash flow, to the baseline cost estimate. It is an indication that the use of 4% to midpoint of construction slightly underestimates escalation given the proposed cash

flow. In a previous spot report, the escalation used in the FTA Template was reported as 2.538% which makes the use of 3.479% a large improvement. However, the PMOC is concerned that escalation could be understated and remains a cost risk.

Commodities Escalation

Commodities escalation is included in Article 14.1.3 of the Terms and Conditions. A schedule of items with prices and quantities is provided in Exhibit 14.1.3. The indices used will be those published by BLS. The formula for calculation of the Base Value of each index is defined noting that the final index will be established once the final values are published. By the end of June 2007, these indices to be used for the base index were considered “final” by BLS and are shown in Table 6.

Table 6 – Material Price Adjustment Indices

Index in Use	Price Adjustment Item Description	Material Price Index (MPI) PPI Code	Base Index
1	Concrete (ready mix)	WPU133301	203.40
2	Rebar	WPU101704	174.97
3	Precast Concrete	WPU1334	191.60
4	Precast Concrete Pipe	WPU1332	178.67
5	Steel	WPU107405	181.37
6	Asphalt and Paving	WPU05810112	138.77
7	Fuel - Diesel	WPU 057303	193.70
8	Fuel - Gasoline	WPU 0571	168.47

MWAA has identified a total of \$275,359,777 in commodity materials to be escalated using these indices. Exhibit 14.1.3 identifies \$163,232,777 in commodities for the FFP portions of the work. The Allowance Items are estimated to have an additional \$112,127,000 in commodities. MWAA is estimating \$79,422,406 for escalation payments for these commodities.

Based on escalation to midpoint of construction at 3.5 years, this is equivalent to a 7.5% annual escalation rate. This rate is excess of the 4% being recommended for normal construction costs and long-term commodity escalation. However, there is still some cost risk to the project since several material prices have been quite volatile of late, fuel being the prime example.

MWAA and the PMOC reviewed the estimated quantities of materials subject to escalation payments and applied a minimum escalation to each items. Based on that analysis, the minimum expected amount of escalation payments was estimated at \$54,011,934. The PMOC considers the remainder of the \$79,422,406 for escalation payments, \$25,410,472, as latent contingency.

Review and Analysis of Grantee Allowances and Identification of Latent Contingency

This section will discuss not only the Unallocated Contingency but also the contingencies included in the direct cost items, including latent contingencies.

Design-Build Contract Construction Contingency Factors

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 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 a 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

Review of the Capital Cost Estimate reveals a Contingency line item of \$359,191,919 or 13.6% of the Total Project Cost of \$2,647,708,641. This value represents the contingency both in the FFP Contract and in the remainder of the Project. Latent contingencies are not included.

Table 7 summarizes the PMOC analysis of all of the contingencies available to the Grantee that were identified in the project documentation. Table 7 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%. The PMOC's recommendation of the Project Contingency will be provided in a spot report to follow.

Table 7 – Contingency Summary

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%	

Review and Analysis of Project Cost Estimate Classification

This section will review the PMOC recommendation for the Baseline Cost Estimate without Contingencies and Finance costs. The following Project Cost Breakdown is based on the Project Cost Estimate Breakdown for Risk Assessment, dated June 21, 2007, supplied to the PMOC by the Grantee.

The YOES Baseline Cost Estimate, net of Contingencies, \$302,854,683, and Finance Charges, \$30,609,507, and including PMOC Additions of \$49,481,436, is \$2,363,725,887. The breakdown of this amount is detailed in Table 8.

Table 8 – Project Budget Summary

Project Budget Category	Total Cost	Contingencies	PMOC Adjustments	Baseline Cost Estimate
Firm Fixed Price	\$706,849,190	\$6,000,000	\$0	\$700,849,190
Firm Fixed Price - PM	\$288,308,040	\$0	\$0	\$288,308,040
Firm Fixed Price - Fee	\$79,917,360	\$0	\$0	\$79,917,360
Firm Fixed Price - Insurance Allowance	\$59,939,572	\$0	\$0	\$59,939,572
Subcontract Allowance Items	\$418,582,214	\$0	\$42,272,628	\$460,854,842
Allowance Items - Insurance, Taxes, Fee	\$45,189,562	\$0	\$7,208,809	\$52,398,371
Utility Relocation - T&M	\$119,555,807	\$14,819,462	\$0	\$104,736,345
Utility Relocation - Fee	\$8,490,155	\$0	\$0	\$8,490,155
Property Acquisition	\$91,518,778	\$11,262,171	\$0	\$80,256,607
WMATA Construction	\$31,143,480	\$1,068,480	\$0	\$30,075,000
Vehicles	\$196,348,000	\$4,367,663	\$0	\$191,980,337
WMATA Support	\$59,207,000	\$1,776,210	\$0	\$57,430,790
Other Agency/MWAA	\$202,038,344	\$33,760,472	\$0	\$168,277,871
MWAA PM	\$80,211,408	\$0	\$0	\$80,211,408
Contingency	\$229,800,224	\$229,800,224	\$0	\$0
Finance	\$30,609,507	\$0	Not Included	\$0
Total	\$2,647,708,641	\$302,854,683	\$49,481,436	\$2,363,725,887

Conclusion

The PMOC has monitored the development of the DRPT/MWAA estimate from its initial preparation through to the current version of the project estimate. Drafts of this report have responded to the condition of the estimate at its several evolutionary stages and provided commentary on that condition. The earlier drafts of this document also conformed to the requirements of earlier revisions of the PG-33 guidance. The DRPT estimate has evolved and this report has evolved in response.

The estimates prepared at the completion of PE in February and April 2006 required considerable revision to reflect the project's needs and to support negotiations with the Design-Build contractor. The PMOC recommended that the Grantee have a complete bottoms-up estimate performed and that a comprehensive reconciliation be done in order to determine the correct scope and cost. Based on the PMOC's recommendation, DRPT commissioned a bottoms-up cost estimate by a new GEC in October 2006.

In the intervening months, the Terms and Conditions for the Design-Build Contract were negotiated. Engineering was progressed in several areas such as detailed station design, West Falls Church Shop concept, and the Route 7 corridor utility relocations. This engineering work supported the development of estimates for these items. In March 2007, DRPT/MWAA provided a cost estimate that included a detailed estimate of the scope of work for the Design-

Build Contractor and also included estimates of scope “Open Items” and other projects costs. In May 2007, DRPT/MWAA provided the negotiated Terms and Conditions for review.

The DRPT/MWAA March 2007 estimate was found to be mechanically correct and complete and free of any material inaccuracies or incomplete data. The direct construction cost estimate methodology was consistent with industry practices using estimating tools and techniques appropriate for a project of this scope and cost. Estimation of indirect costs and other overhead items was documented and applied to the estimate in a consistent manner. Although the PMOC found discrepancies in early project estimates regarding quantities and scope, efforts were made to correct these deficiencies. The project scope adopted in the Record of Decision is fully captured in this cost estimate.

However, in their effort to bring negotiations with the Design-Build Contractor to a conclusion, the DRPT/MWAA March 2007 estimate, although in the FTA format and on the FTA template, does not at this time follow the FTA SCC assignment closely. This fact made the PMOC’s evaluation more difficult, as commented upon frequently in this report, since the methodology used by the PMOC does not follow the SCC assignments.

The estimated labor costs followed industry crewing practices and used appropriate productivity. DRPT/MWAA has further adjusted labor costs to cover anticipated needs for premium pay and overtime to attract a suitable labor force. Local rates have been used for equipment rental and labor costs. Costs for fuel and other material costs subject to escalation separate from usual construction costs have been segregated and indexed to government escalation indices.

Local taxes are included in this estimate. WMATA prepared the estimates of force account labor and technical support for the project.

Escalation rates used in the DRPT/MWAA project estimate are less than those suggested by the PMOC in earlier versions of this spot report. However, the escalation rate was chosen to match the DRPT’s estimate of local conditions and was applied to the estimate in a manner consistent with industry practice. However, the PMOC has a concern that the proposed escalation rate for the project is less than recommended and remains a cost risk.

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. This pricing includes escalation for the DTP scope of work. Escalation will not apply to this work; however, some risk remains for DRPT/MWAA price escalation in fuel and materials.

The contract Terms and Conditions allow for the estimated cost of subcontracted work to be included as an Allowance. In the March 30, 2007 agreement this Allowance is \$0.5 billion. DRPT/MWAA will participate with DTP in the subcontractor proposal and negotiations. Although a fixed price is available for most of the Design-Build work and the estimated Allowance pool is agreed and incentivized, risk still remains that qualified subcontractors can be found at prices consistent with the current estimate.

While many project scope, schedule, and cost risks have been addressed by DRPT since receiving the PE design in February 2006, many areas of risk remain and have been identified.

The PMOC has identified several risks have the potential for a significant cost to the project. Among these are:

- Delays to construction from late grants of rights-of-entry for ROW being acquired
- Delays to construction from design coordination or review by WMATA
- Delays to construction from coordination issues with WMATA for tie-ins and for construction at the Orange Line junction and West Falls Church shop and yard
- Risk to project cost from subcontractor selection exceeding Allowance

In conclusion, the PMOC recommends to the FTA that the Baseline Cost Estimate, net of Contingency and Finance Cost, is \$2,363,725,887.

Appendices

Appendix A – Grantee Project Data

Primary Scope Documentation	Date	Author	Nature – Detail – Quality*
Independent Capital Cost Estimate	April 27, 2006	DRPT	Cost estimate prepared by the DRPT GEC, STV Inc. Refer to the PMOC Spot Report, <u>PG-33A Grantee Project Cost Review</u> , 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	May 31, 2007 April 14, 2006 June 2006 November 2006 February 2007	DTP	ROW schedule continues to be the most significant risk. The ROW scope is acceptable, with a notation that the contamination/remediation issue may have some impact on ROW acquisition and the project in general. Recent ROW Acquisition Plan comments on cost estimate have recommended explanation of added cost for DTP support and owner’s contingency.
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, <u>PG-34A Grantee Project Schedule Review</u> , 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 MWAA	March 30, 2006	DRPT and MWAA	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 Documentation

Bureau of Labor Statistics Producer Price Indices	Monthly	BLS	Statistics on economic performance – Official publication of the United States Federal government.
Engineering News Record	Weekly	McGraw-Hill	Construction industry trade magazine with wide distribution.

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

Appendix B – Grantee Project Cost Estimate – March 2007

MAIN WORKSHEET - BUILD ALTERNATIVE								(Rev.7, May 18, 2006)
Virginia Department of Rail and Public Transportation							Today's Date	6/1/07
Dulles Corridor Metrorail Project							Yr of Base Year \$	2006
Phase 1 - Extension to Wiehle Avenue							Yr of Revenue Ops	2013
	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)	11.91	517,746	35,234	552,980	\$ 46,439	39%	23%	616,270
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	3.10	244,710	14,770	259,480	\$ 83,703			289,178
10.05 Guideway: Built-up fill		0	0	0				0
10.06 Guideway: Underground cut & cover	0.05	16,424	1,109	17,533	\$ 350,662			19,540
10.07 Guideway: Underground tunnel	0.40	93,006	7,420	100,426	\$ 252,501			111,920
10.08 Guideway: Retained cut or fill	8.36	106,705	6,356	113,062	\$ 13,524			126,002
10.09 Track: Direct fixation		19,151	1,380	20,531				22,881
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		30,964	3,772	34,736				38,712
10.12 Track: Special (switches, turnouts)		6,785	426	7,212				8,037
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	5	253,706	23,938	277,643	\$ 55,529	20%	12%	314,630
20.01 At-grade station, stop, shelter, mall, terminal, platform	2	86,892	7,624	94,516	\$ 47,258			107,107
20.02 Aerial station, stop, shelter, mall, terminal, platform	3	105,119	10,045	115,164	\$ 38,388			130,506
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		27,800	2,750	30,550				34,620
20.07 Elevators, escalators		33,894	3,519	37,413				42,397
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	11.91	47,212	5,829	53,041	\$ 4,454	4%	2%	59,844
30.01 Administration Building: Office, sales, storage, revenue counting		1,458	171	1,629				1,838
30.02 Light Maintenance Facility		0	0	0				0
30.03 Heavy Maintenance Facility		29,267	4,117	33,384				37,666
30.04 Storage or Maintenance of Way Building		0	0	0				0
30.05 Yard and Yard Track		16,487	1,541	18,029				20,341
40 SITEWORK & SPECIAL CONDITIONS	11.91	250,864	24,750	275,613	\$ 23,146	19%	12%	305,349
40.01 Demolition, Clearing, Earthwork		18,472	1,851	20,323				22,515
40.02 Site Utilities, Utility Relocation		125,685	13,261	138,946				153,937
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	618	8,640				9,573
40.05 Site structures including retaining walls, sound walls		9,043	188	9,231				10,227
40.06 Pedestrian / bike access and accommodation, landscaping		12,095	1,916	14,011				15,522
40.07 Automobile, bus, van accessways including roads, parking lots		31,008	3,396	34,404				38,116
40.08 Temporary Facilities and other indirect costs during construction		46,539	3,519	50,058				55,459
50 SYSTEMS	11.91	236,142	19,461	255,602	\$ 21,465	18%	11%	285,375
50.01 Train control and signals		59,662	4,749	64,410				71,913
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		62,683	5,171	67,854				75,757
50.04 Traction power distribution: catenary and third rail		71,675	4,949	76,624				85,549
50.05 Communications		31,499	3,349	34,848				38,907
50.06 Fare collection system and equipment		6,370	746	7,116				7,945
50.07 Central Control		4,253	498	4,751				5,304
Construction Subtotal (10 - 50)	11.91	1,305,668	109,211	1,414,880	\$ 118,820	100%	60%	1,581,467
60 ROW, LAND, EXISTING IMPROVEMENTS	11.91	81,910	238	82,148	\$ 6,899		3%	86,035
60.01 Purchase or lease of real estate		80,809	238	81,047				84,882
60.02 Relocation of existing households and businesses		1,101	0	1,101				1,153
70 VEHICLES (number)	64	163,725	0	163,725	\$ 2,558		7%	192,273
70.01 Light Rail		0	0	0				0
70.02 Heavy Rail	64	158,047	0	158,047	\$ 2,469			185,606
70.03 Commuter Rail		0	0	0				0
70.04 Bus		0	0	0				0
70.05 Other		641	0	641				753
70.06 Non-revenue vehicles		5,037	0	5,037				5,915
70.07 Spare parts		0	0	0				0
80 PROFESSIONAL SERVICES	11.91	570,778	35,437	606,215	\$ 50,909	43%	26%	667,952
80.01 Preliminary Engineering		78,816	0	78,816				86,843
80.02 Final Design		141,029	9,570	150,599				165,936
80.03 Project Management for Design and Construction		111,855	8,623	120,478				132,747
80.04 Construction Administration & Management		203,612	12,907	216,519				238,569
80.05 Insurance		23,858	3,230	27,088				29,847
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		44	216	260				286
80.07 Surveys, Testing, Investigation, Inspection		0	0	0				0
80.08 Start up		11,564	891	12,455				13,724
Subtotal (10 - 80)	11.91	2,122,081	144,886	2,266,967	\$ 190,378		96%	2,527,728
90 UNALLOCATED CONTINGENCY				80,000			3%	89,389
Subtotal (10 - 90)	11.91			2,346,967	\$ 197,096		99%	2,617,116
100 FINANCE CHARGES				24,243			1%	30,610
Total Project Cost (10 - 100)	11.91			2,371,210	\$ 199,132		100%	2,647,726
Allocated Contingency as % of Base Yr Dollars w/o Cont.				6.83%				
Unallocated Contingency as % of Subtotal (10 - 80)				3.53%				
YOE Construction Cost per Mile (X000)								\$132,810
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$206,207
YOE Total Project Cost per Mile (X000)								\$222,354

Appendix C– Estimation of Cost Escalation Factors

Cost Escalation for Construction

There are several sources for statistics on construction cost escalation which can be used to estimate the expected cost escalation behavior for the construction cost of the Wiehle Avenue Extension. Among these are the Engineering News Record (ENR) and the Producer Price Indices published by the Bureau of Labor Statistics (BLS). For the purposes of estimating cost escalation we propose to use the ENR Building Cost Index.

ENR has been publishing construction cost indices since early 1920's and have tracked construction costs in 20 major cities in the United States and published the results in a bi-weekly report. The ENR indices have been an industry standard throughout the years for estimation of construction cost escalation. This index measures movements in price of construction labor (ironworker, carpenter, and mason) and material (steel, cement, and wood). It does not account for changing costs for equipment, plant, and productivity. However, these cost factors should be highly correlated with the base indices and with the project at hand.

The problem with the ENR cost indices is that they do not directly report Washington D.C. costs. As an alternative, the PMOC has considered the closest locations with a reported index, New York City and Philadelphia, and also the average United States index. The following paragraphs analyze the yearly cost trends in the construction industry for New York City, Philadelphia, and the United States average, based on the average of 20 major cities, from December 1979 to January 2006, a 26-year period, using the ENR Building Cost Index.

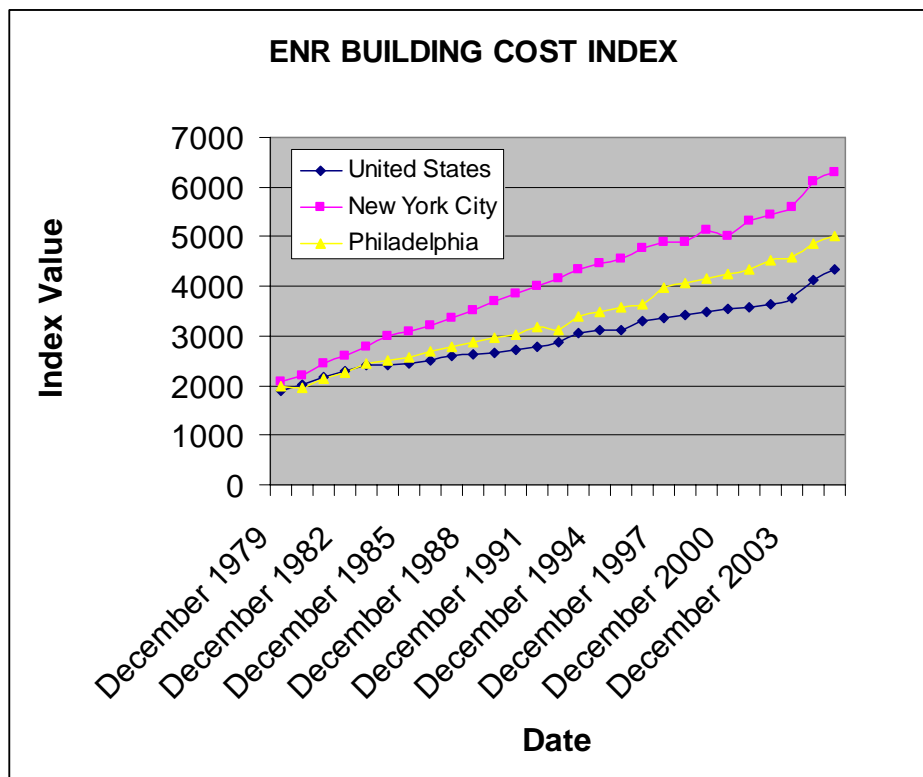


Figure C-1- Building Cost Index for the United States, Philadelphia and New York City, December 1979 - January 2006

Appendix C – Estimation of Cost Escalation Factors (continued)

In Figure C-1 the cost of construction in Philadelphia is shown to be between New York City and the 20-city United States average. According to the ENR BCI, from December 1979 to January 2006, the cost of construction has increased 127% in the United States, 202% in New York City and 154% in Philadelphia. Furthermore, all three curves are observed to have relatively constant increasing slopes in terms of the cumulative percent of change curve.

The 1980s was a decade of high inflation for the construction industry of the United States, especially in New York City. In the 1980s, the cumulative percent of change for the United States was 39.81% with an average of inflation per year of 3.41%. In New York City the cumulative percent of change was 77.44% with an average of inflation per year of 5.90% (see Figure C-2).

The 1990s was a decade of low inflation for the United States. In the United States the cumulative percent of change was 31.02% with an average of inflation per year of 2.74%. In New York City for the same period (1990s) the cumulative percent of change was 38.66% with an average of inflation per year of 3.32% (see Figure C-2).

In the period between 2000 and 2004, the cumulative percent of change for the United States was 17.90% with an average of inflation per year of 3.35%. In New York City the cumulative percent of change was 18.75% with an average of inflation per year of 3.50% (see Figure C-2).

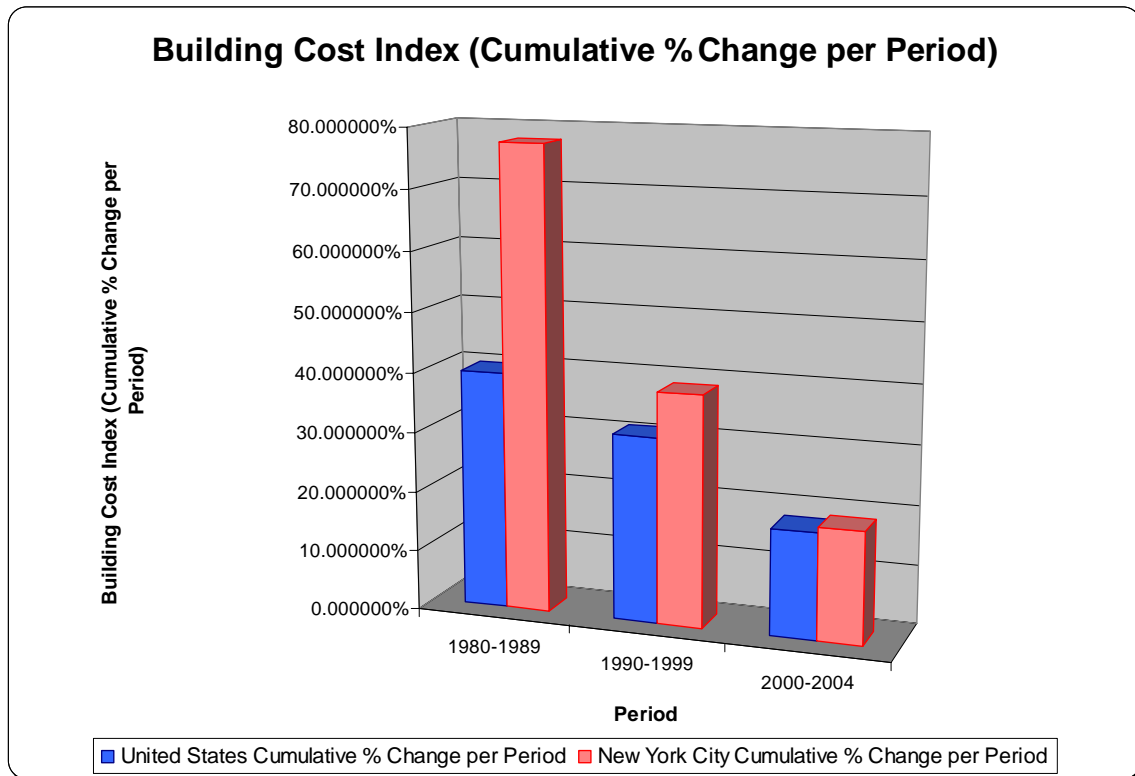


Figure C-2 - Cumulative Percent of Change per Period in the Building Cost Index of the United States and New York City (1980-2004)

Appendix C – Estimation of Cost Escalation Factors (continued)

From December 1979 to January 2006 (26 years), BCI of New York City had an average increase of 4.34% per year with standard deviation of 2.80%. On the other hand, the United States had an average increase of 3.20% per year with standard deviation of 2.42%. Philadelphia had an average increase of 3.66% per year with standard deviation of 2.57%. A comparison of standard deviations implies that New York City’s percent of change between years is more scattered and uncertain than the United States. Figure C-3 shows this variability of annual rate of change in construction costs.

Given the fact that the Dulles Corridor Project is a multi-year project, the PMOC recommends the use of average rate of escalation for the past 26 years for budgeting the average escalation cost. The PMOC is of the opinion that the escalation rate in the project area lies somewhere between the national average and the New York City experience. Using the rate for Philadelphia as a lower bound is a reasonable approach in the PMOC’s opinion. The result of this analysis is that the estimated average rate of escalation for Dulles Project is in the 3.66% to 4% range.

Escalation is a difficult value to project with the current volatile market. The initial Grantee’s estimates included an escalation factor of 3.52% to mid-point of construction. This factor follows ENR BCI for the past 5 years. However, as shown above, this is somewhat less than the escalation factor derived from using a 25 year window. Yet in the most recent project cost estimate an escalation factor of 2.538% was utilized in the FTA template to calculate escalation.

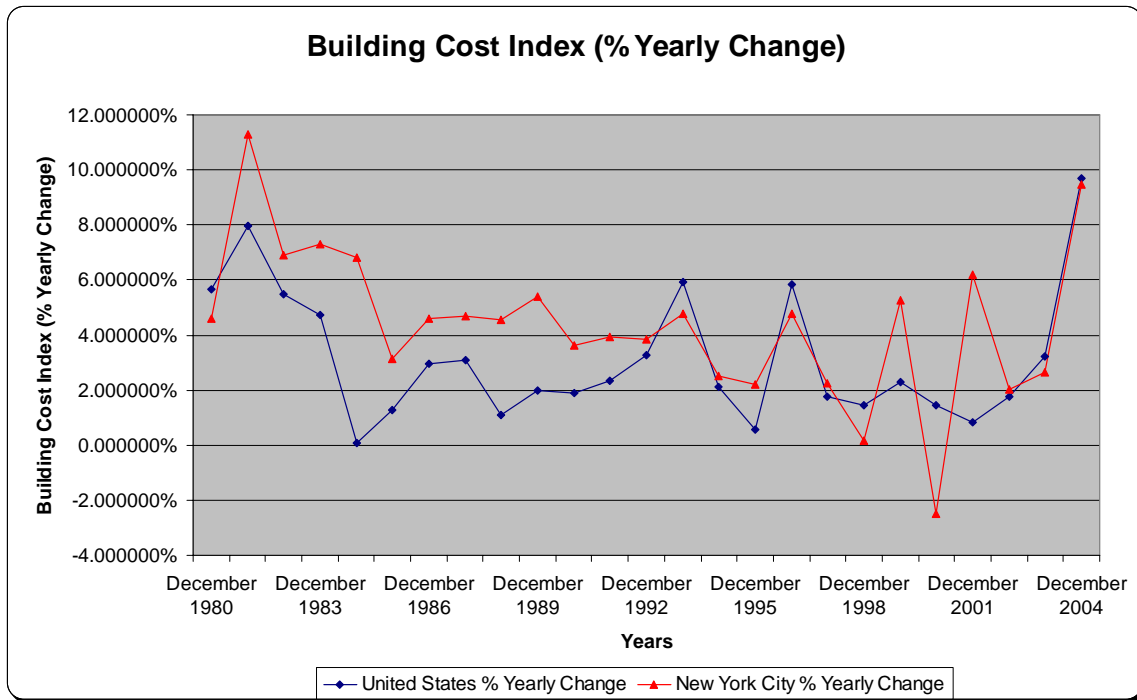


Figure C-3 - Percent of Yearly Change in the Building Cost Index of the United States and New York City (December 1980 - December 2004)

Recent market conditions have indicated that there is additional cost pressure on construction labor and construction material. The recent annual cost increase in the Washington, D.C. region is reported to be on the order of 5.4% as reported by DRPT’s GEC (on October 16, 2006). There has been rapid rise in

Appendix C – Estimation of Cost Escalation Factors (continued)

the cost of steel, which is discussed below. There has also been an increase in fuel costs and the Federal Reserve Bank Discount Rate applies financial pressure to all segments of the construction industry. What this does not take into account is the “Katrina Factor” caused by the Gulf Coast Disasters during the 2005 hurricane season. While this is a market anomaly, it is currently causing above normal inflation in the building industry nationwide. The time frame in which this above normal inflation will require to return to normal inflation can take several years due to the large amount of construction dollars being pumped into the Gulf Coast Region. Locally, labor pressures may moderate with a decrease in housing starts.

Based on consideration of all of these elements and their accuracy of prediction, *the PMOC recommends the use of a cost escalation factor of at least 4.00% for estimating project construction cost escalation.*

Material Cost Escalation

The Bureau of Labor Statistics (BLS) of the United States Department of Labor maintains indices of cost which are useful in understanding cost escalation factors for various materials. One material critical to the Wiehle Avenue Extension is steel. BLS maintains a Producer Price Index (PPI) for rolled steel shapes, series PCU3311117 titled “Steel mills: Hot rolled steel bars, plates, and structural shapes”, which is an indicator of cost escalation factors for both railroad rail and for structural steel for piling or bridge fabrication. The index is shown in Figure C-4 for the years since 1995; the base year is 1982.

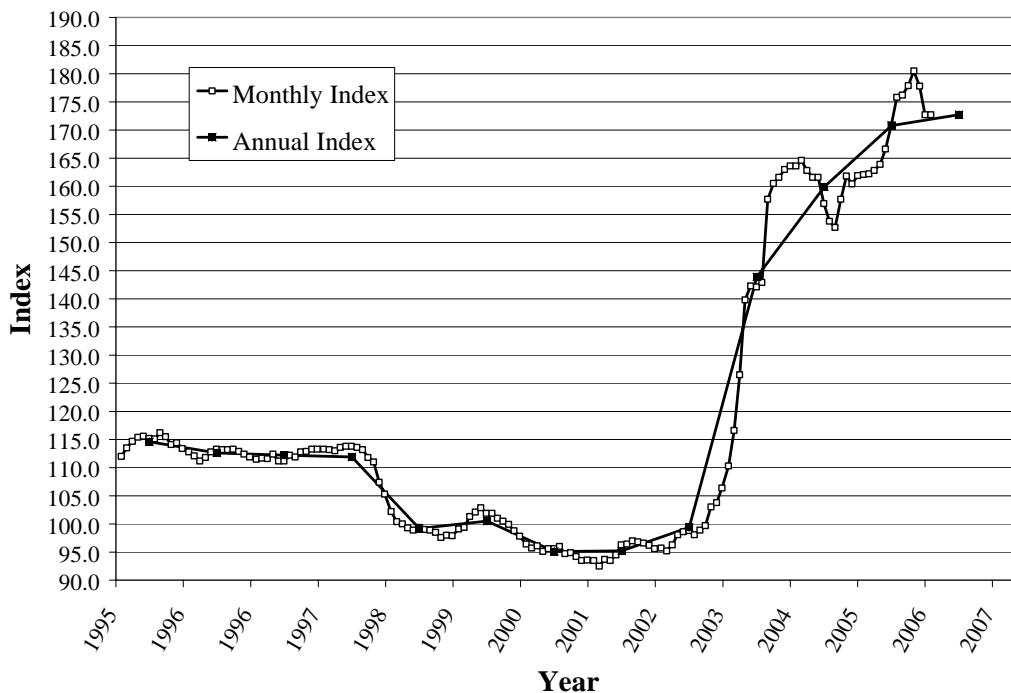


Figure C-4 - Bureau of Labor Statistics Producer Price Index - Rolled Steel Shapes

It is commonly reported that the price of steel has had a dramatically increased in cost since in recent years. The chart in Figure C-4 confirms this observation. But it also shows that steel prices had been

Appendix C – Estimation of Cost Escalation Factors (continued)

depressed below 1982 cost, even with the inflation observed in other sectors since that year. Although the increase in 2004 and 2005 was 60% over those 2 years, there has been only an average annual increase of 2% since the base year of 1982. And so while the cost of steel remains volatile, the experience of 2004-2005 may have been a correction rather than a long term trend. By comparison the cost of copper wire has increased 270% within the last 3 years, half of that within this year. However, as with the experience with steel products, it is unlikely that this cost escalation will be sustained. *For this reason, the PMOC's opinion is that separate cost escalation factors should not be used for commodity materials and that the long term construction cost escalation rate is more appropriate.*

Rail Vehicle Procurement Cost Escalation

The market for rail vehicles is national, even international, in scope. Carshell manufacture will likely be done overseas since no United States car builders manufacture the aluminum carbody, built from aluminum extrusions, preferred by WMATA. Many of the subcomponent systems are based in part on equipment designed and parts supplied from overseas. Deriving a cost escalation factor under these conditions would not be possible.

There was an index of rail transit car cost maintained by the BLS as a PPI through December 2006 when it was discontinued. The index series PCU3365103365103 is titled “Street, subway, trolley, and rapid transit cars, all rebuilt cars, and all parts”. The index is shown in Figure C-5 and has a base year of 1984.

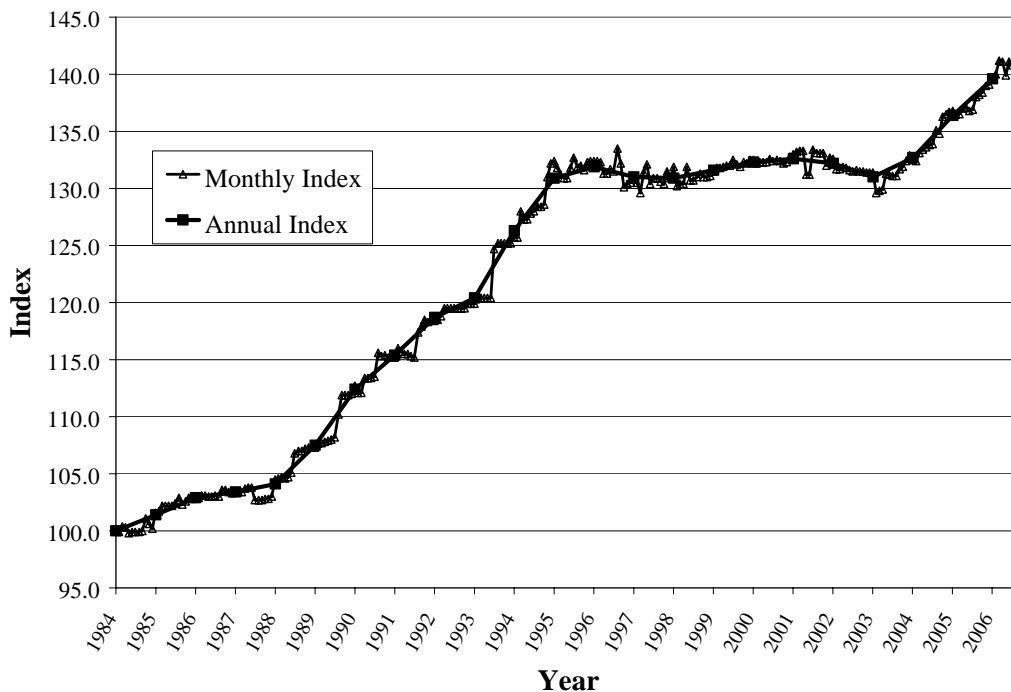


Figure C-5 - Bureau of Labor Statistics Producer Price Index - Rapid Transit Cars

What is observed in this chart is that the cost of rail transit cars rose annually from 1984 through 1995. From 1995 until 2003 the indices vary but are on average constant. Then in 2003, a pattern of annual cost escalation emerges. The rate of escalation for this recent increase is in the range of 2.4% to 2.8%,

Appendix C – Estimation of Cost Escalation Factors (continued)

beginning in the year 2004. Since this index is based on pricing, it is reflective of the escalation to YOES\$ expected by the car builder in their contract pricing at NTP. *The PMOC recommends that a rate of inflation of 2.6% be applied to the rail vehicle procurement.*

The PMOC is of the opinion that industry capacity will not be a cost escalation issue since recent large orders by New York City Transit (660 cars), and Chicago Transit Authority (250 cars), New Jersey Transit (221 cars), and Long Island Rail Road and MetroNorth Railroad (1,128 cars) are either on order or delivered. Relatively fewer large orders would be expected during the time frame for the WMATA rail vehicle procurement for the Dulles Metrorail Extension.