

**Los Angeles County
Metropolitan Transportation Authority
Office of the Inspector General**

**Audit of Westside Purple
Line Extension Section 2 -
Modification No. 52**

Report No. 16-AUD-05

February 11, 2016





Metro

**Los Angeles County
Metropolitan Transportation Authority**

Office of the Inspector General
818 West 7th Street, Suite 500
Los Angeles, CA 90017

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February 11, 2016

Metro Board Members

Re: Report on Westside Purple Line Extension Section 2 Modification 52 (16-AUD-05)

Dear Metro Board Members:

The Metro Board directed the Inspector General to conduct an independent audit of the Westside Purple Line Extension Section 2 Modification 52. The audit included (1) an assessment of total work hours to perform advanced engineering work, (2) an evaluation of the proposed billable rates, (3) identification of management redundancies, and (4) an evaluation of the accuracy and completeness of the design drawings. We prepared a comprehensive RFP scope of work and hired a consultant firm having a team with expertise in engineering and accounting to perform the audit.

The audit found that Metro's construction design firm, Parsons Brinkerhoff ("PB"), had generally performed and delivered within budget and industry standards and delivered design work as agreed in a scope of work for items of the Modification at the different stages of design.

- PB's design fees for Section 2 are approximately \$54,415,323 which is 2.21% of the estimated capital project budget and 3.86% of construction budget. At the completion of Mod 52, PB's design fees for Section 2 will be approximately 38% of the estimated design budget, leaving the remainder (approximately \$89,207,677) for the design portion of the Design/Build contract. These cost percentages appear to fall within typical percentages as reported by Transportation Cooperative Research Program (TCRP) Report 138 (*Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects*).
- Overall the proposed billable rates and overhead rates associated with advanced engineering work in Mod 52 were reasonable and rates in the contract were used to bill for PB and subcontractor services, except that PB's and subcontractor proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro, therefore a complete audit of these amounts should occur and any credit or refund due Metro should be made by PB.
- The review did not disclose any apparent management/staff redundancies between Metro and PB. The core Metro project management team for Section 2 is lean consisting of only four individuals. However an organizational review should occur from time to time to ensure that PB's staffing is lean, not top heavy, and only what is needed.
- Generally, the design drawings reviewed appeared to be accurate and complete. Some were complete beyond the typical 30% for a design build project, but there are some possible reasons for this.

- PB is performing work on a Cost-Plus contract without detailed deliverables for a fixed price/number of hours of work, so it must be closely managed to ensure no overbilling or inefficiency of time to minimize cost.

Major decisions and events that have affected the project's schedule and design costs include:

- Preliminary engineering and advanced preliminary engineering work was well underway when the decision was made to use the Design/Build process for section 2 in January 2015, which was after Mods 36, 43, and 52 were executed. Prior to January 2015 when the project delivery method was unknown, design decisions were probably made to cover both Design/Bid/Build and Design/Build. This is significant since the design level of effort for each contracting method is different. The consultant urges Metro to make a construction delivery choice at the earliest possible time and stick to it to avoid excessive design costs.
- Failure of Measure J to pass in 2012 put into question project funding, and resulted in Mod 43 with limited funding. Based on the scope of work of Mods 43 and 52, it is apparent that Metro was aware that Mod 43 alone would not be sufficient to take Section 2 to the RFP process and obtain FFGA approvals.
- Decision was made to use the Design/Build process for Section 2 in January 2015, which was after Mods 36, 43, and 52 were executed.
- Decision to add the terminus section to Century City/Constellation Station and to coordinate with Westfield Mall required significant redesign of the station.
- Decision to remove the crossover at Wilshire Rodeo Station (Value Engineering decision) required significant redesign of the station.

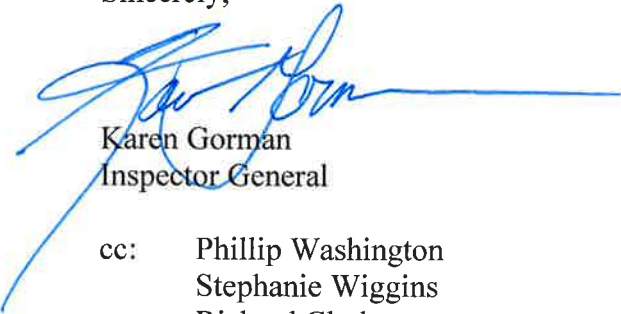
The audit identified opportunities to enhance management, controls, oversight, and accountability over the project. Key improvement areas are:

- Develop a detailed cost loaded work plan for each contract modification that summarizes the current state of the project, clearly describes project objectives, and rational basis for proposed work.
- Utilize a Design Review Committee to provide additional oversight and accountability over the Design Team to ensure that only permissible costs are paid and the contractor is exercising adequate overall cost controls, and the design meets Metro's design criteria and requirements.
- Implement a methodology to ensure adequate oversight and documentation that accounts for exactly what was delivered periodically and at the end of one contract Mod to the next, what was paid for and what was not done, in order to have better control over the contracts.

- Perform an organizational review that aims to streamline management functions and combine roles of PB staff.
- Make the decision on which project delivery method to use in the early stages of project, and no later than the preliminary engineering phase in order to minimize duplication of design effort.
- For future transit construction projects, consider the Design-Risk project delivery method due potential benefits of this method which the consultant describes. Also, designate a committee to evaluate the pros and cons of each delivery project method and select the most appropriate method for the project
- For future Design/Build projects, consider revising and reducing the RFP drawing delivery requirements for disciplines that have detailed standard design criteria such as structures, mechanical, electrical, and signals and train control.
- Perform a detailed review of labor escalation costs billed and determine if any adjustments are required.

Management has only had a brief opportunity to review the report but provided a preliminary response (attached) while they continue to review the report and consider it in greater detail.

Sincerely,



Karen Gorman
Inspector General

cc: Phillip Washington
Stephanie Wiggins
Richard Clark
James Gallagher
Ivan Page
Board Deputies

Attachments: The Westside Purple Line Extension Section 2 Modification 52 Audit Report and Preliminary Management Response



Metro

Interoffice Memo

Date February 11, 2016

To Karen Gorman, Inspector General

From Richard Clarke, Executive Director
Program Management *Richard Clarke*

Subject Westside Purple Line Extension
Section 2 – Modification No. 52 Audit

Staff generally agrees with the summary findings as stated in the audit report summary to the Metro Board dated February 11, 2016.

The audit found that Metro's construction design firm, Parsons Brinckerhoff (PB) had generally performed and delivered within budget and industry standards and delivered design work as agreed in a scope of work for items of the modification at the different stages of design.

The audit includes a number of findings and recommendations for future consideration. Staff is in general agreement with the findings and recommendations, which are being evaluated for further action and, in this regard, a work plan is being developed in parallel.

RC:hs



Metro

Los Angeles County
Metropolitan Transportation Authority

Office of Inspector General

Westside Purple Line
Extension Section 2 -
Modification No. 52

Audit

February 9, 2016



TABLE OF CONTENTS

TABLE OF CONTENTS	i
ACRONYMS AND ABBREVIATIONS	iii
1.0 EXECUTIVE SUMMARY	1
2.0 INTRODUCTION	5
2.1 Purpose of this Audit.....	5
2.2 Project Overview	6
2.3 Project Phase Definitions	7
2.4 Project Timeline	9
2.5 Overview of Contract Mods 21, 36, 43, and 52	12
3.0 OBJECTIVE 1A: SCOPE OF WORK COMPARISON	15
3.1 Scope:.....	15
3.2 Methodology:.....	15
3.3 Findings:	15
3.3.1 Comparison of Mods.....	15
3.3.2 Distribution of Hours in Mod 43	17
3.3.3 Mod 43 Project Deliverables.....	18
3.3.4 Could Have Mods 36, 43 and 52 Been Avoided?	19
4.0 OBJECTIVE 1B: ASSESSMENT OF WORK HOURS.....	21
4.1 Scope:.....	21
4.2 Methodology:.....	21
4.3 Findings:	21
4.3.1 Analysis of Estimated Hours and Hours Spent.....	21
4.3.2 FTA Project Cost Estimates Compared to PB Incurred Costs	24
5.0 OBJECTIVE 2: PROPOSED BILLABLE RATES	27
5.1 Scope:.....	27
5.2 Methodology:.....	27
5.3 Findings:	28
5.3.1– Prime Contractor.....	28

5.3.2 Advantec – Subcontractor.....	32
5.3.3 AMEC – Subcontractor	34
5.3.4 D’Leon – Subcontractor	36
5.3.5 Intueor - Subcontractor	40
6.0 OBJECTIVE 3: MANAGEMENT REDUNDANCIES.....	42
6.1 Scope:.....	42
6.2 Methodology:.....	42
6.3 Findings:	42
6.3.1 Identification of Metro Staff	42
6.3.2 Analysis of PB’s Organizational Chart	44
6.3.3 Cost and Hours-Incurred Analysis	47
7.0 OBJECTIVE 4A: REVIEW OF PROJECT CONTRACT AND DELIVERY METHODS	50
7.1 Cost-Plus Contract: How the Contract Type Affects Costs.....	50
7.2 Project Delivery Methods	51
7.3 Advanced Utility Relocation (AUR) and Hybrid Project Delivery	52
7.4 Importance of Timely Selection of Delivery Method	53
7.5 Alternative Project Delivery Method	54
8.0 OBJECTIVE 4B: REVIEW OF DRAWINGS.....	57
8.1 Scope:.....	57
8.2 Methodology:.....	57
8.3 Findings:	58
9.0 CONCLUSION	61
10.0 LIST OF EXHIBITS.....	63
11.0 LIST OF ATTACHMENTS.....	64

ACRONYMS AND ABBREVIATIONS

AA	Alternative Analysis
ACE	Advanced Conceptual Engineering
AUR	Advanced Utilities Relocation
APE	Advanced Preliminary Engineering
BIM	Building Information Management
BOE	City of Los Angeles Bureau of Engineering
BSL	City of Los Angeles Bureau of Street Lighting
CAD	Computer Aided Design
CATV	Cable Television
CO	Change Order
COBH	City of Beverly Hills
COLA	City of Los Angeles
CPT	Cone Penetration Test
DB	Design/Build
DBB	Design/Bid/Build
DBE	Disadvantaged Business Enterprise
DBIA	Design Build Institute of America
DOT	Department of Transportation
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
FFGA	Full Funding Grant Agreement
FHWA	Federal Highway Administration
FLAC	Fast Lagrangian Analysis of Continua (a finite difference computer program)
FTA	Federal Transit Administration
FTE	Full Time Equivalent
FY	Fiscal Year
GBR	Geotechnical Baseline Report
GDSR	Geotechnical Design Summary Report
GDR	Geotechnical Data Report
GDM	Geotechnical Design Memoranda
GMP	Guaranteed Maximum Price
HDPE	High Density Polyethylene
HO	Home Office
ICR	Indirect Cost Rates
LACTC	Los Angeles County Transportation Commission
LADOT	Los Angeles Department of Transportation
LADWP	Los Angeles Department of Water and Power
LL	Lessons Learned
LOE	Level of Effort
LOP	Life of Project
LOS	Level of Service
LPA	Locally Preferred Alternative
LRTP	Long Range Transportation Plan
Metro	Los Angeles County Metropolitan Transportation Authority
MH	Manhole
Mod	Modification
MTA	Los Angeles County Metropolitan Transportation Authority
MPSR	Monthly Project Status Reports

NEPA	National Environmental Protection Act
NTP	Notice to Proceed
ODC	Other Direct Cost
OCC	Operations Control Center
OIG	Office of Inspector General
PB	Parson Brinkerhoff
PE	Preliminary Engineering
PEER	Permit Engineering Evaluation Report
PIP	Project Implementation Plan
PM	Project Manager
PMOC	Project Management Oversight Contractor
PO	Project Office
P&P	Policy and Procedures
QA	Quality Assurance
QC	Quality Control
RFC	Request for Change
RFP	Request for Proposal
RFQ	Request for Qualifications
ROD	Record of Decision
ROW	Right Of Way
SCC	Standard Cost Category
SCE	Southern California Edison
SCG	Southern California Gas Company
SOE	Support of Excavation
SOV	Schedule of Value
SOW	Scope of Work
SUB	Substitute
TBM	Tunnel Boring Machine
TCRP	Transportation Cooperative Research Program
TIFIA	Transportation Infrastructure Finance and Innovation Act
VA	Veterans Affairs
VE	Value Engineering
WSE	Westside Subway Extension
YOE	Year of Expenditure

1.0 EXECUTIVE SUMMARY

This report details the findings of an audit of the Contract (#PS-4350-2000) Modification (Mod) 52 between the Los Angeles County Metropolitan Transportation Authority (Metro) and Parsons Brinkerhoff (PB) directed by the Metro Board. The audit team led by Owen Group includes Brierley Associates and BCA Watson Rice.

BACKGROUND:

In 2015, Los Angeles County Metropolitan Transportation Authority (Metro) awarded a contract (#PS-4350-2000) Modification 52 (Mod 52) to Parsons Brinckerhoff (PB) for Advanced Preliminary Engineering design for Section 2 of the Westside Purple Line Extension. Concurrent with the contract modification approval, the Metro Board of Directors also approved a motion that directs the Metro Inspector General to conduct an independent audit of Contract No. PS-4350-2000 (Mod 52). Owen Group, with the aid of subcontractors Brierley Associates and BCA Watson Rice, was selected to conduct this audit.

The Metro Westside Purple Line Extension Project (Project) will add approximately nine miles and seven new stations to the existing Purple Line. The Project will extend west from the current line's terminus at Wilshire/Western Station. The Project is subdivided into three sections. The first section is currently under construction.

Contract Modification 52 (Mod 52) is valued at \$20.8 million, is effective from November 2014 to June 2016, and is to provide:

- Continued Advanced Preliminary Engineering
- Design for advanced relocation of utilities
- Engineering support services during the Design/Build solicitation process
- Design support services during construction
- Advanced Preliminary Engineering services to continue planning of construction and third party coordination with the City, County, State, utility companies, and major stakeholders/property owners for Section 2 of the Westside Purple Line Extension Project
- Other tasks to support the FTA New Starts Project approval process
- RFP issuance for the Design/Build Contract in FY16

PB was awarded the original contract for the Westside Purple Line Extension in 2007. The original value of the contract was \$3,681,575. At the end of November 2015, 56 modifications (Mods) have been approved, increasing the total contract value to \$152,503,102, which includes the Alternatives Analysis, Preliminary Engineering, EIS/EIR, Section 1 Advanced Preliminary Engineering, preparation for the Section 1 Design/Build RFP documents, Section 2 Advanced Preliminary Engineering, and Section 2 Design/Build RFP documents.

OBJECTIVES OF THE AUDIT:

The objectives of the audit were to:

- 1A) Perform an assessment and analysis of the scope of work among Mods 21, 36, 43, and 52.
- 1B) Perform an assessment and analysis of the total work hours to perform the proposed Advanced Preliminary Engineering work in Mod 52.
- 2) Evaluate the proposed billable rates associated with the development of Advanced Preliminary Engineering work.
- 3) Identify management redundancies, if any, and recommend cost-saving ideas.
- 4A) Review Project Contract and Delivery Methods.
- 4B) Review and evaluate, for accuracy and completeness, the Preliminary Engineering drawings versus the current Advanced Preliminary Engineering drawings.

AUDIT REVIEW RESULTS:

Our assessment and analysis of Section 2 Mod 52 (including limited review of Mods 21, 36, and 43) found that PB had generally performed and delivered within budget and industry standards and delivered design work as agreed in a scope of work for items of the Mod at the different stages of design. We found:

- PB's design fees for Section 2 are approximately \$54,415,323 which is 2.21% of the estimated capital project budget and 3.86% of construction budget. At the completion of Mod 52, PB's design fees for Section 2 will be approximately 38% of the estimated design budget, leaving the remainder (approximately \$89,207,677) for the design portion of the Design/Build contract. These cost percentages appear to fall within historical values reported by Transportation Cooperative Research Program (TCRP) Report 138 (*Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects*).
- Overall the proposed billable rates and overhead rates associated with advanced engineering work in Mod 52 were reasonable and rates in the contract were used to bill for PB and subcontractor services, except that PB's and subcontractors' proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro. Therefore, a complete audit of these amounts should occur and any credit due Metro should be made by PB.
- The review did not reveal any apparent management/staff redundancies between Metro and PB. The core Metro project management team for Section 2 is lean consisting of only four individuals. However an organizational review should occur from time to time to ensure that PB's staffing is lean, not top heavy, and only what is needed.

- Generally, the design drawings reviewed appeared to be accurate and complete. Some drawings have not been completed yet; however, the period of performance for Mod 52 is through June 2016.
- PB is performing work on a Cost-Plus contract which must be closely managed to minimize cost. The main disadvantages to Metro of using this type of contract are a limited certainty as to what the final cost will be, and there is less incentive for the consultant to be efficient compared to a fixed-price contract.

Major decisions and events that have affected the project's schedule and design costs include:

- Preliminary engineering and advanced preliminary engineering work was well underway when the decision was made to use the Design/Build process for section 2 in January 2015, which was after Mods 36, 43, and 52 were executed. Prior to January 2015 when the project delivery method was unknown, design decisions were probably made to cover both Design/Bid/Build and Design/Build. This is significant since the design level of effort for each contracting method is different.
- Failure of Measure J to pass in 2012 put into question project funding, and resulted in Mod 43 with limited funding. Based on the scope of work of Mods 43 and 52, it is apparent that Metro was aware that Mod 43 alone would not be sufficient to take Section 2 to the RFP process and obtain FFGA approvals.
- Decision to add the terminus section to Century City/Constellation Station and to coordinate with Westfield Mall required significant redesign of the station.
- Decision to remove the crossover at Wilshire Rodeo Station (Value Engineering decision) required significant redesign of the station.

This audit identified opportunities to enhance management, control, oversight, and accountability over the project. Attachment K presents a comprehensive list of findings and recommendations. Key improvement areas are:

- Develop a detailed cost loaded work plan for each contract modification that summarizes the current state of the project, clearly describes project objectives, and rational basis for proposed work.
- Utilize a Design Review Committee to provide additional oversight and accountability over the Design Team to ensure that only permissible costs are paid and the contractor is exercising adequate overall cost controls, and the design meets Metro's design criteria and requirements.
- Implement a methodology to ensure adequate oversight and documentation that accounts for what was delivered at the end of one contract Mod to the next, what was paid for, what was not done, etc. in order to have better control over the contracts.

- Perform an organizational review that aims to streamline management functions and combine roles of PB staff.
- Make the decision on which project delivery method to use in the early stages of project, and no later than the preliminary engineering phase in order to minimize duplication of design effort.
- For future transit construction projects, consider the Design-Risk project delivery method because of the potential benefits of this method. Also, designate a committee to evaluate the pros and cons of each delivery project method and select the most appropriate method for the project
- For future Design/Build projects, consider revising and reducing the RFP drawing delivery requirements for disciplines that have detailed standard design criteria such as structures, mechanical, electrical, and signals and train control.
- Perform a detailed review of labor escalation costs billed and determine if any adjustments are required.

2.0 INTRODUCTION

2.1 Purpose of this Audit

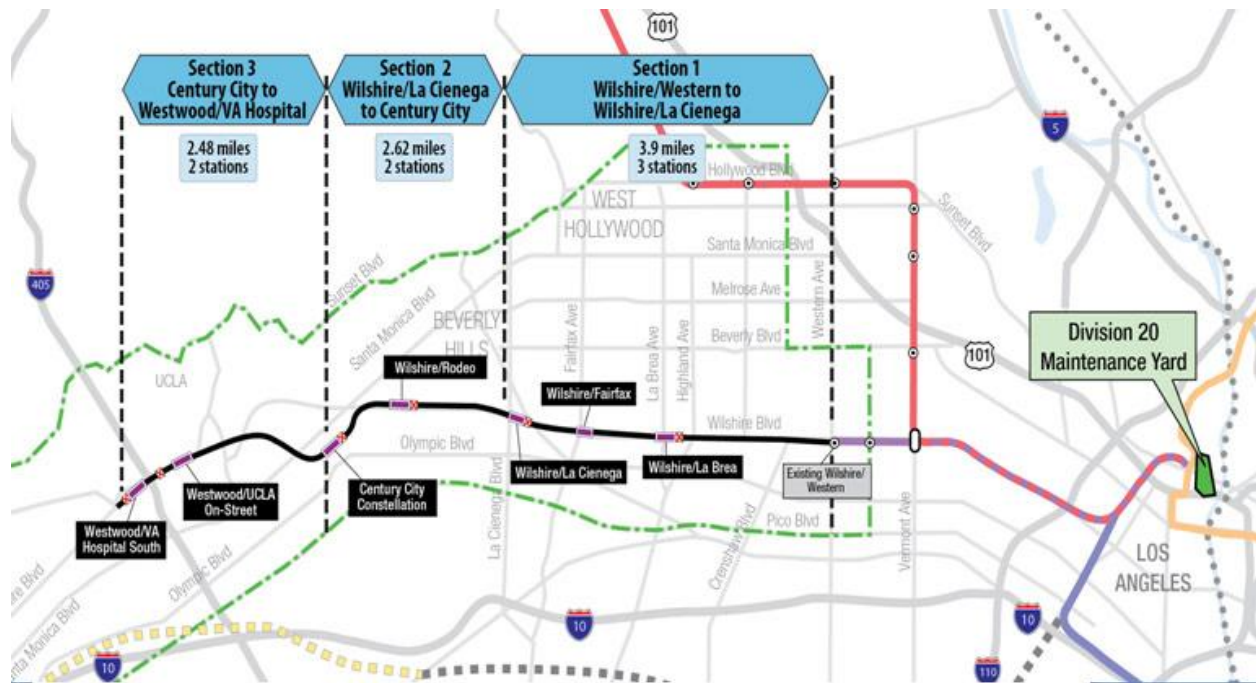
The Board motion directed an independent audit of Mod 52 that includes the following objectives:

Objective 1A, 1B	<ul style="list-style-type: none">•1A: Perform an assessment and analysis of the scope of work among Mod 21, 36, 43, and 52.•1B: Perform an assessment and analysis of the total work hours to perform the proposed advanced preliminary engineering work .
Objective 2	<ul style="list-style-type: none">• Evaluate the proposed billable rates associated with the development of advanced preliminary engineering work.
Objective 3	<ul style="list-style-type: none">• Identify management redundancies and recommend cost saving efficiencies.
Objective 4A, 4B	<ul style="list-style-type: none">•4A: Review of Project Contract and Delivery Methods.•4B: Review and evaluate, for accuracy and completeness, the PE drawings versus the current APE drawings.

Note that Metro and the PB Design team have been working on this project for several years with numerous submittals, numerous iterations, and thousands of pages of documents. Additionally, the solicitation for the Design/Build contractor short list for Section 2 was issued on September 14, 2015, where an initial set of plans and specifications were provided. However, we understand that additional documentation, including modified/revised sets of plans and specifications, may be provided to Design/Build contractors in addendums. The audit team has received and reviewed the documents listed in Attachment 1, the original issued RFP documents, and Addendum 3. Commentary and opinions presented in this report could differ or be revised once additional details become available.

2.2 Project Overview

The Metro Westside Purple Line Extension Project will add approximately nine miles and seven new stations to the existing Purple Line. The project will extend west from the current line's terminus at Wilshire/Western Station. The project is subdivided into three sections as shown in the illustration below, "Westside Purple Line Extension Project Map". Section 1 is currently under construction. Section 2, which includes 2.62 miles of tunnels extending from the Wilshire/La Cienega Station and the construction of the Wilshire/Rodeo and Century City/Constellation Stations, is nearing the completion of the design phase and is the focus of this independent audit.



Parson Brinkerhoff (PB) was awarded the original contract for the Westside Purple Line Extension in 2007. The original value of the contract was \$3,681,575. At the end of November 2015, 56 modifications (Mods) have been approved, increasing the total contract value to \$152,503,102. On February 26, 2015, the Metro Board of Directors approved Board Item 47 to authorize Mod 52 and also approved a motion that directs the Metro's Inspector General to conduct an independent audit on Mod 52. Leading this audit is Owen Group, along with the aid of Subcontractors Brierley Associates (for the review of geotechnical items) and BCA Watson Rice (for the review of billable rates).

Section 1 Construction Delivery Method:

In September 2012, Metro's Construction Committee recommended that the Metro Board of Directors select the Design/Build process for Section 1 of the Westside Subway Extension Transit Corridor Project. Prior to this, no decisions regarding what type of project delivery method would be used had been made. The decision to use a Design/Build contract delivery method was made based on the work reported in the "LACMTA Westside Subway Extension Project Review of

Contracting and Delivery Methods,” dated August 6, 2012. This included descriptions of viable contracting and delivery methods with:

- pros and cons
- a recommended decision methodology (TCRP 131)
- precedents
- goals and objectives
- the experience and practice of other agencies
- input from FTA (Federal Transit Administration) and the FTA Project Management Oversight Contractor (PMOC)
- two specific workshops on the Westside Subway Extension (WSE) project, which were held on June 20 and 21, 2012.

Section 2 Construction Delivery Method:

In January 2015, the decision to use the Design/Build contracting process for Section 2 was made. Since the decision for Section 1 to use Design/Build contracting process was made in 2012, it is likely that PB and Metro were working on Section 2 under contract Modification 43 with the anticipation that the project procurement would be similar to Section 1 (Design/Build). However, since the procurement type was unknown, design decisions at earlier stages may have been made to cover both possibilities. This is significant since the design level of effort (LOE) for each contracting method is different; therefore, it is possible that project designs are more advanced than typically seen on a Design/Build project. A more detailed discussion of the project procurement is provided in Section 3.6.

2.3 Project Phase Definitions

There are various New Starts project phase terms that are cited in Metro Board reports, project documentation, and FTA documents. Metro is applying for FTA funding through the New Starts program. New Starts is an FTA funding program for supporting locally planned, implemented, and operated transit "guideway" capital investment projects. Since these terms are used frequently in this report, the following summary of definitions is provided:

Alternate Analysis /Alternative Study A subway corridor analysis of a range of alternatives designed to address locally identified mobility and other problems in a specific transportation corridor. An Alternate Analysis (AA) is considered complete with the selection of a locally preferred alternative (LPA) to advance into Preliminary Engineering (PE).

Conceptual Engineering

Another term used to describe the AA study and the preparation of plans during the Draft EIS/EIR preparation.

Advanced Conceptual Engineering Includes the necessary data collection, coordination, design studies, and design work to fully document the environmental impacts, to respond to comments in the Final EIS/Final EIR, and to develop a detailed cost estimate sufficient for advancement to later stages of project delivery.

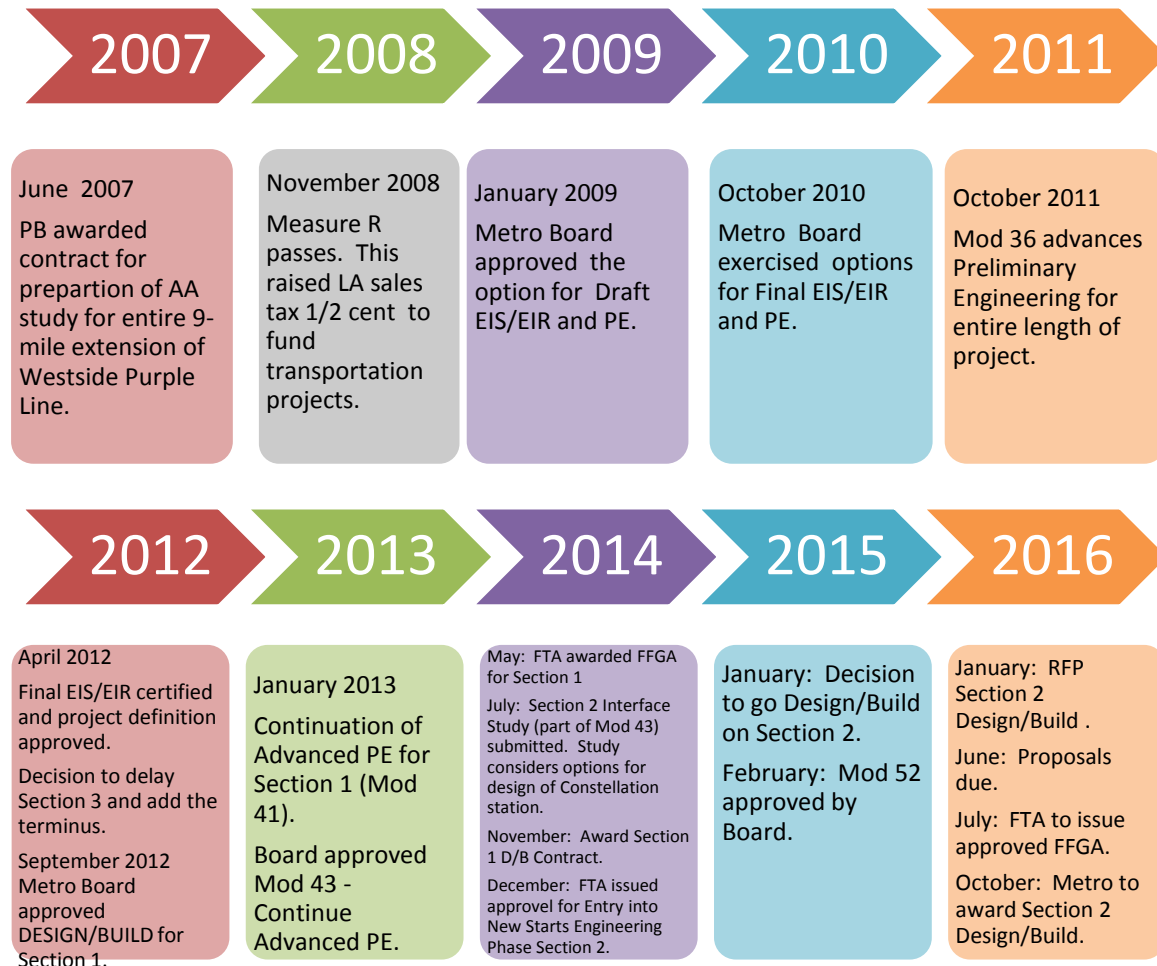
Preliminary Engineering At completion of alternatives analysis (AA) and Metro has selected a proposed New Starts mode and general alignment, Metro requested FTA approval to begin preliminary engineering (PE). During PE, the project sponsor (Metro) refines the definition of the LPA's scope, schedule, and budget sufficient to complete the Federal environmental review process required by the National Environmental Policy Act of 1969 (NEPA). The products of preliminary engineering include a final scope, a highly accurate cost estimate, a thorough project management plan suitable for the phase of project development, and a solid financial plan, with a majority of the proposed local funding committed to the project.

Advanced Preliminary Engineering Advanced Preliminary Engineering is not defined by FTA. However, it is a term used by PB and Metro to describe a higher level of engineering detail than the PE plans, but less than the detail required for the Final Design plans. For this project, it appears that these plans that are issued as the RFP documents for the Design/Build procurement as either Contract Definition drawings or issued as reference drawings.

Final Design Final Design is the last phase of New Starts project development during which the project sponsor prepares for construction. Final design is also the stage during which FTA may enter into a multi-year commitment to fund a proposed New Starts project. This commitment is called a full funding grant agreement. In the case of this Design/Build Contract, Final Design will be the stage where the Design/Build Contractor prepares the final plans for construction.

2.4 Project Timeline

Understanding the key decisions, dates, and driving factors that lead to these Mods was a critical component of the analysis and aided in the formulation of the findings. The following illustration briefly outlines key project milestones and decisions.



After a review of the available documents, the following timeline has been prepared to summarize key dates throughout the project's history. The timeline highlights key contract Mods, Metro Board approvals, project definitions, and other important design decisions.

July 16, 2007: PB's original contract, PS-4350-2000, is executed. The original contract value is **\$3,681,575**, for the preparation of an Alternative Analysis and Conceptual Engineering (AA Study) for the 9-mile extension of the Metro Westside Purple heavy rail transit subway system. This is from its current western terminus at the Wilshire/Western Station to a new western terminus near the West Los Angeles Veterans Affairs (VA) Hospital. The project includes 7 underground stations.

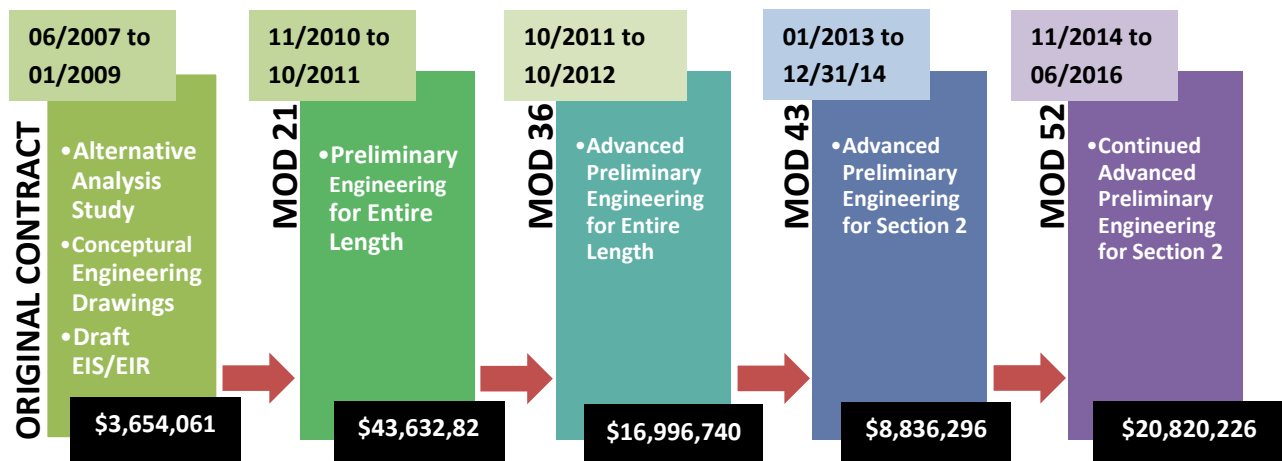
- November 2008: Measure R is passed, which proposed a half cent sales tax increase on each dollar of taxable sales (originating in or made from Los Angeles County) for thirty years in order to pay for transportation projects and improvements.
- January 2009: Metro Board approves the AA study and PB begins the Draft EIS/EIR and Preliminary Engineering. The draft EIS/EIR identified three construction sections for the full 9-mile project ending at Wilshire/Fairfax (Section 1), Century City (Section 2), and the Westwood/VA Hospital Station (Section 3).
- July 21, 2009: Mods 9-20 advanced conceptual engineering/draft EIS/EIR (added contract value of **\$18,590,710**).
- April 2010: The Metro Board adopts a support position on the 30/10 initiative to accelerate the construction of twelve (12) Measure R and Long Range Transportation Plan (LRTP) projects and complete them by 2019. These 12 projects were originally scheduled to be completed thru 2039.
- November 1, 2010: Metro executes Mod **21** for preliminary engineering (PE) for the entire project's EIR. Mod 21 added contract value of **\$43,632,826**.
- January 2011: FTA grants approval to enter into Preliminary Engineering, and in May 2011, PB begins PE for Full Funding Grant Agreement (FFGA). The entire length of the project was included.
- October 27, 2011: Metro executes Mod **36** for advanced preliminary engineering for the entire project (added contract value of **\$16,996,740**). Mod 36 advances the Preliminary Engineering design (entire length of project) in order to provide a higher level of detail that refines cost estimates, project schedules, and risk assessments. FTA requires that the project's design is continued to be advanced throughout the FTA New Starts application process.
- April 18, 2012: The Planning and Programming Committee provides a Project Definition for Board approval. This project definition appears to be when the project is split into three Sections. The decision to delay Section 3 and add the terminus was made at this point. Moreover, Westfield Mall coordination was part of PB's scope as directed in the Metro Board Item April 18, 2012 (This affects Constellation Station).
- September 20, 2012: The Construction Committee recommends that the Metro Board of Directors select the Design/Build process for Section 1 of the Westside Subway Extension Transit Corridor Project.
- November 2012: The Section 1 RFQ for Tunnels, Stations, and Systems is released. Also, Measure J (which would have been an extension of Measure R) fails to pass. Without Measure J funding, only Section 1 can be built.

- January 2013: The Metro Board authorizes the continuation of Advanced Preliminary Engineering for Section 1 under Mod 41. The Board also approves advanced preliminary engineering for Section 2 (Mod 43) as well as approves the staff recommendation for the continuation of first, second, and third decade Measure R project development. Mod 43 would put Section 2 design in a “holding pattern” so that the project does not lose the New Starts process and maintain the engineering expertise.
- April 22, 2013: Metro executes Mod **43** for advanced preliminary engineering for Section 2 (added contract value of **\$8,836,296**).
- June 27, 2014: Metro executes Mod 49 for a period of performance extension for advanced preliminary engineering for Section 2. No additional contract value authorized.
- November 19, 2014: The Metro Board approves Change Notice/RFP for continuation of Advanced Preliminary Engineering Scope of Services.
- December 31, 2014: The Federal Transit Administration (FTA) approves Metro's request for Section 2 to enter the New Starts Engineering phase of the FTA Capital Investment Grant Program. With this engineering approval, Metro has the automatic pre-award authority to incur costs for engineering activities, demolition, and other non-construction activities, such as the procurement of rails, ties, commodities, and other specialized equipment. In addition, Metro has automatic pre-award authority to acquire real property, perform advanced utility relocations, and procure rail vehicles, since the National Environmental Policy Act (NEPA) review process has been completed for the entire 9 mile Project.
- January 12, 2015: The Independent Cost Estimate is completed for continuation of Advanced Preliminary Engineering Services. Metro estimating unit developed a value of \$18,854,662 as compared to the Contractor's cost proposal of \$21,247,963. The estimate is based on the scope of work submitted and a quantitative technical analysis that estimated the labor hours that would be required to complete the consulting services requested in the scope of work statement.
- January 15, 2015: The Construction Committee recommends that the Metro Board of Directors select the Design/Build process for Section 2 of the Westside Subway Extension Transit Corridor Project (Wilshire/La Cienega to Century City Constellation).
- February 26, 2015: The Metro Board of Directors approves Mod **52**. A motion from board members KNABE, KUEHL, SOLIS, DUPONT- WALKER, and NAJARIAN directed the Metro Inspector General to conduct an independent audit on Contract PS43502000, Mod 52.

- March 31, 2015: Contract Mod **52** is executed (added contract value of **\$20,820,226**). The following is noted:
- The period of performance appears to be from November 2014 thru June 2016. However, the contract Mod was not executed until March 2015.
- September 14, 2015: The Design/Build RFQ/RFP C1120 is issued for the Purple Line Extension Section 2 Project.
- November 2015: 56 Mods to the contract have been executed. Current contract value is **\$152,503,102**.

2.5 Overview of Contract Mods 21, 36, 43, and 52

The project has gone through a number of design phases beginning with an AA Analysis and progressing through conceptual engineering, preliminary engineering, and advanced preliminary engineering phases. The design phases for Section 2 are covered under the original Contract (PS-4350-2000) and information concerning Mods 21, 36, 43, and 52 are shown below:



Original Contract PS-4350-2000:

The original contract included an alternatives analysis (AA) study for the Purple Line Extension Transit Corridor. This stage of design considered whether transit improvements were needed in the area, and evaluated different types of transit improvements and alignments. Conceptual Engineering Drawings were completed as part of the original contract. The alternatives analysis was completed in January 2009, when the Metro Board approved the preparation of an Environmental Impact Study/Environmental Impact Report (Draft EIS/EIR), which included the analysis of subway alternatives.

Contract Mod 21:

In November 2010, this Mod included the development of advanced conceptual engineering. The Advanced Conceptual Engineering phase encompassed all design activities and products (including all necessary data collection, coordination, design studies, and design work) to support two major goals:

1. To fully document environmental impacts and to respond to comments in the Final EIS/Final EIR.
2. To develop a detailed cost estimate sufficient for advancement to later stages of project delivery.

After completion of the Advanced Conceptual Engineering phase, the Project entered the Preliminary Engineering phase, also included as part of Mod 21. During the Preliminary Engineering phase, PB prepared the Preliminary Engineering documents, which consisted of drawings and other related documents to fix and describe the size and character of the entire Project. These drawings included civil, architectural, structural, utilities, mechanical, and electrical drawings. Tasks included systems design, equipment selection, identification of construction staging areas, development of construction sequencing and scheduling, economic analysis of construction and operations, and development of user safety and maintenance requirements. Mod 21 covers the entire Westside Purple Line Extension.

Contract Mod 36:

This contract Mod was executed in October 2011 to advance the design to the Advanced Preliminary Engineering phase. Although Preliminary Engineering had been sufficiently completed to support the environmental approval process, the goal of this design phase was to complete more detailed engineering. This was to better define the scope and site specific interface and coordination issues to reduce potential cost and schedule risks to the Project (Construction Committee Meeting Recommendation, October 20, 2011). Mod 36 covers the entire Westside Purple Line Extension.

Contract Mod 43:

In April 2013, Mod 43 was executed to continue Advanced Preliminary Engineering of Section 2. One of the primary objectives of this contract Mod was to work towards obtaining FTA approvals for receiving the FFGA (Construction Committee Meeting Recommendation, January 17, 2013). This change order was to fund PB's services through June 2014, with future work being funded on a year-to-year basis. This approach was taken by Metro to result in more accurate budgeting for each year, while providing better control over consultant services. In June 2014, the period of performance for the Advanced Preliminary Engineering for Section 2 was extended through December 31, 2014 (Contract Mod 49, no additional contract value authorized).

Mod 43 also maintained the technical expertise in the project office until funding sources become available (Measure J did not pass in November 2012). A more detailed discussion of Mod 43 is provided in Sections 3.3.1 and 3.3.2 below.

Contract Mod 52:

In February 2015, Contract Mod 52 was presented to the Metro Board. Mod 52 increased the value of the Westside Purple Line Extension contract with PB by \$20.8 million, and provided for:

- Continued Advanced Preliminary Engineering
- Design for advanced relocation of utilities
- Engineering support services during the Design/Build solicitation process
- Design support services during construction
- Advanced Preliminary Engineering services to continue planning of construction and third party coordination with the City, County, State, utility companies, and major stakeholders/property owners for Section 2 of the Westside Purple Line Extension Project
- Other tasks to support the FTA New Starts project approval process

Mod 52 also allowed staff to issue the Request for Proposal (RFP) for the major Design/Build Contract in FY16, and to further Metro's efforts to receive an FTA Full Funding Grant Agreement (FFGA) and to secure a United States Department of Transportation low interest Transportation Infrastructure Finance and Innovation Act (TIFIA) loan. Approval of both is expected in Federal Fiscal Year 2016.

Summary Remarks Regarding the Mods:

During the early stages of the project, the design was advanced for the entire length simultaneously. Early contract Mods 21 and 36 do not differentiate between separate project sections. In April 2012, the Planning and Programming Committee provided a Project Definition which was approved by the Metro Board of Directors. This project definition appears to be when the project split into three Sections. Advanced Preliminary Engineering (APE) for Section 1 is assumed to have been completed as part of contract Mods 36 and 41. Preliminary Engineering for Section 2 was completed as part of Mods 21 and 36. Mods 43 and 52 specify that they are specifically for Section 2 Advanced Preliminary Engineering.

3.0 OBJECTIVE 1A: SCOPE OF WORK COMPARISON

3.1 Scope:

Perform an assessment and analysis of the scope of work among Mods 21, 36, 43, and 52.

3.2 Methodology:

The audit team reviewed the scope of work focusing on the scope of work categories that overlapped among the Mods. The main area of focus on was what was done at each stage of design (each mod) and whether any overlap occurred from one mod to the next.

Next, the team compared and reviewed PB’s progress reports that relate to Mod 43 and 52 in order to better understand the progress of the engineering work.

A detailed discussion of the engineering design scope between Mod 43 and Mod 52 is presented in Section 8.0 Drawings Review.

3.3 Findings:

3.3.1 Comparison of Mods

The table below lists the major scope of work categories in Mods 36, 43, and 52, and is color coded to show the common categories among the Mods. For example, “Project Management” is common among all Mods and is highlighted in the same color.

Scope of Work Comparison and SOW Categories		
Mod 36	Mod 43	Mod 52
Project Management	Project Management	Project Management and Project/Office Administration
Constructability	Constructability for Section 2	Constructability and Estimating
Geotechnical	Geotechnical Section 2	Geotechnical
Engineering	Engineering Services during Construction Section 2	Engineering Support during Construction
-	Advanced Utility Relocations Contract	Utility Relocation
-	Engineering Work Section 2	Engineering
-	RFP Documents Section 2	RFP Production and bid Support Services
Project Control and Administration	Demolition Contract package for Section 2	Environmental / New Starts
Contracts Support		Special Studies
Permitting and MOU’s		
Coordination and Third Parties		
Environmental and Planning		

As depicted in the figure above the scope of work for Mod 43 and 52 have several categories that are common, such as Project Management, Constructability, and Engineering. Given this, we further reviewed the specific tasks under each of those categories in order to determine the level of any redundancy, among the Mods. We summarized the scope of work categories in Exhibit B. Our review revealed that there is a high potential for overlap between Mod 43 and Mod 52 for two reasons:

- 1) Mod 43 was executed to maintain the technical expertise in the project office until funding sources become available. Based on the scope of work of Mod 43 and Mod 52, it is apparent that Metro was aware that Mod 43 alone would not be sufficient to take Section 2 to the RFP process and to obtain FFGA approvals. (According to interviews and review of Metro Board items)
 - At the execution of Mod 43 in early 2013, it was not known when or how Section 2 was going to be funded, because Measure J had failed to pass in the November 2012 election.
 - The Metro Board intended to fund Section 2 and did not want the project to stop. There were also some major elements of engineering work that needed to be completed to support the FTA New Starts Project approval process for FFGA.
 - The board report for Mod 43 said that this contract Mod was intended to reduce the risk of losing key engineering consulting staff that would be required when funding became available.
- 2) There were major Design Changes to both of the Stations in Segment 2:
 - Rodeo Station- revision of the advanced preliminary drawings to remove the crossover and modify the North Entrance according to the Value Engineering (VE) report dated June 5, 2015.
 - Constellation Station- revision of the preliminary drawings (from Mod 21) to advanced preliminary drawings, while simultaneously revising the access at Westfield Mall and addition of the terminus section to allow for the future extension of Section 3.

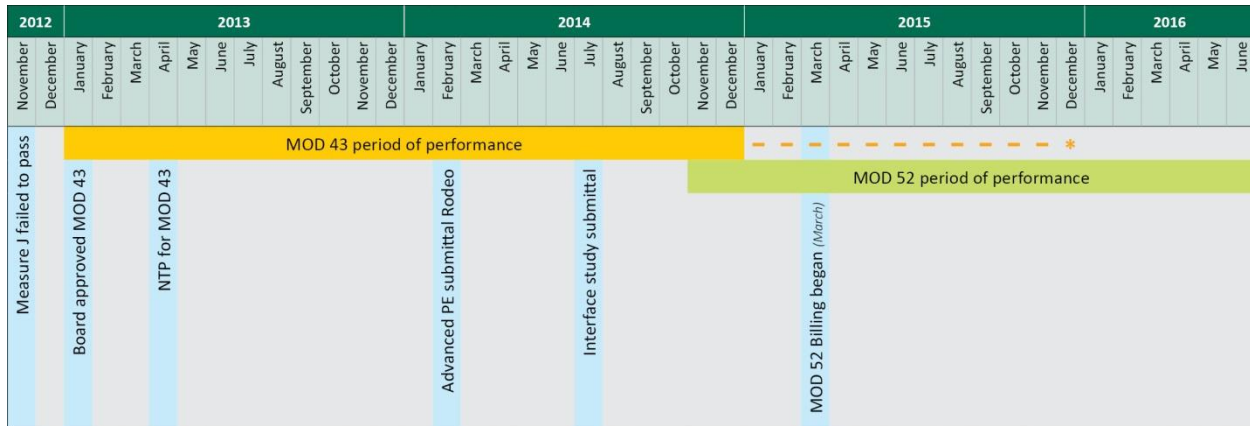
Finding 1A-1: The funding for Section 2 was unknown in early 2013, but Mod 43 was executed to keep the technical expertise of the staff on board until funding became available. It was understood that Mod 43 was not sufficient to complete Section 2 through the RFP process and obtain FFGA approvals. Through all of the re-baselining of Mod 43 forecasted hours, it is unclear how PB transitioned from Mod 43 to Mod 52. Given this, going forward, Metro needs to implement a methodology to ensure oversight and accountability for the services delivered for each Mod.

Recommendation 1A-1: Metro should implement a methodology to ensure adequate oversight and documentation that accounts for exactly what was delivered at the end of one contract Mod to the next, what was paid for, what was not done, etc. in order to have better control over the contracts.

Although development of such methodology could result in escalation of contract cost, it should provide a means for Metro to better track costs and personnel used on their various projects.

3.3.2 Distribution of Hours in Mod 43

The original period of time for Mod 43 was 10 months; however, in June 2014, the period of performance for the Advanced Preliminary Engineering for Section 2 was extended through December 31, 2014 (Contract Mod 49, no additional contract value authorized). Mod 52 of the contract was executed in March 2015. The approved Scope of Work (and budget) for Mod 52 was for 20 months, from November 2014 through June 2016. The timeline below shows the overlap between the two Mods.



* MOD 43 Geotech Work

The planned hours for the contract Mod 43 varied over the duration of the contract. As described in Section 3.3.1 above, through all of the re-baselining of Mod 43 forecasted hours, it is unclear how PB transitioned from Mod 43 to Mod 52.

As of April 2015 (last month Mod 43 hours expended was included in PB’s monthly progress reports), 35,110 hours of 51,074 hours has been utilized. The commentary of the progress report indicates that the remainder of the hours would be for geotechnical engineering efforts, which are scheduled to be completed in December 2015. This is consistent with the fact that geotechnical efforts were substantially delayed in Mod 43, and didn’t take place until March 2015; beginning just as Mod 52 was being executed.

Finding 1A-2: It is unclear how the work was transitioned between Contract Mods 43 and 52. It is also unclear as to whether the field investigation work indicated in Mod 52 was to be in addition to the work proposed as part of Mod 43. Additionally, the fault study continued between Mod 43 and 52, but the status of completion at the end of Mod 43 is unknown. This fault study will likely lead into additional design efforts of the tunnel sections within the fault zone, but the impact to the project for the Mod 52 scope is unknown.

See recommendation 1A-1.

3.3.3 Mod 43 Project Deliverables

The scope for contract Mods 43 and 52 call for Advanced Preliminary Engineering services. Mod 43 calls for the continued development of the design of Section 2 stations to a level that will allow production of the RFP package. The scope of work deliverables for Mod 43 included a Draft Advanced Preliminary Engineering drawings for both the Wilshire/Rodeo Station and the Century City/Constellation stations.

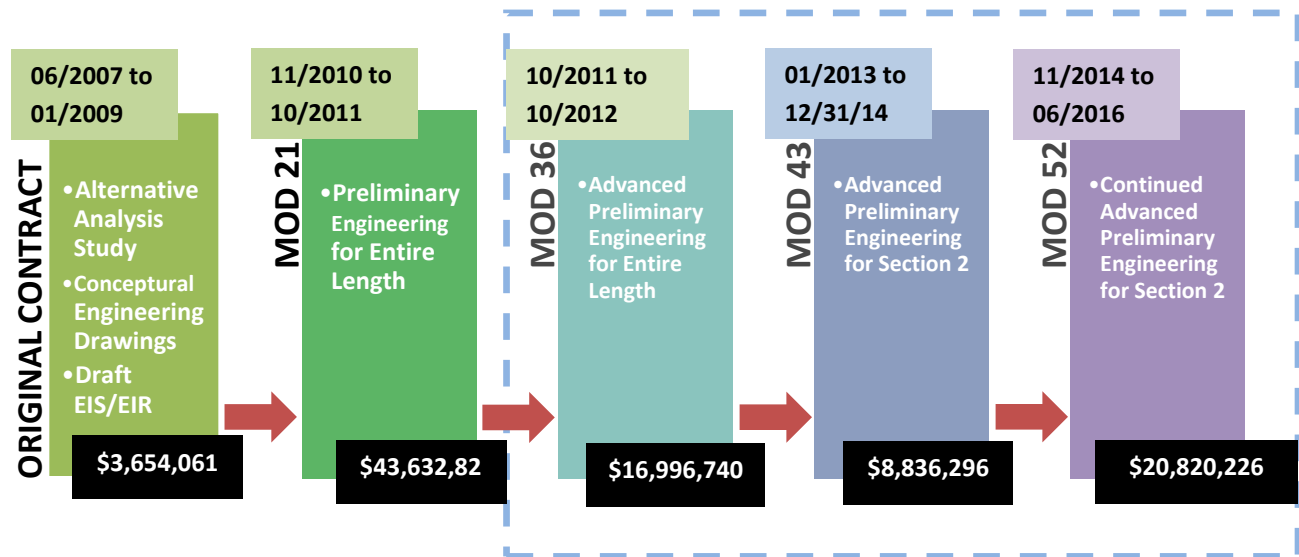
Finding 1A-3: Only the Wilshire/Rodeo Station drawing package was submitted as part of Mod 43 and the drawing set was later updated as part of Mod 52. Although included in the scope of work (SOW) for Mod 43; an Advanced Preliminary Engineering drawing set for Century City/Constellation was not produced prior to Mod 52. In lieu of APE drawings, an interface study was completed.

It would appear on the surface that the level of effort for interface drawings is significantly less than the development of APE drawings. It appears that the work for the APE drawings that were supposed to be performed in Mod 43 (43.03.010) were then included in Mod 52 (52.03.010.1). It is understood that there was a lot of time spent on coordinating with Westfield Mall for the Constellation Station during Mod 43, however there was a specific Mod 43 scope item for Coordination and Third Party Support – Section 2, Westfield Mall (43.02.010) that accounts for this work effort.

Recommendation 1A-3: A detailed review should be made to determine whether all the hours allocated for the Advanced Preliminary Drawings for the Century City/Constellation station in Mod 43 were used for this effort. A detailed work plan should be implemented that describes the rational of each task, including a description at the end of the task explaining the status including what was performed. In this case, it appears that a deliverable was not completed at the conclusion of Mod 43 and was completed as part of Mod 52.

3.3.4 Could Have Mods 36, 43 and 52 Been Avoided?

One of the major concerns of Metro is whether Mod 36, 43, and 52 were necessary to advance the level engineering beyond Preliminary Engineering. In other words, could Metro have put the plans produced from Mod 21 out to bid for a Design/Build contract? And are the Advanced Preliminary Engineering (Mod 36, 43, and 52) necessary for a Design/Build project? The total for Mods 46, 43 and 52 combined was \$46.6 million.



In our opinion, some of the services in Mod 36, 43, and 52 may have been avoided if the decision was made earlier (prior to Mod 36 which was effective October 2011) to select the Design/Build process for section 2. However, the decision was made to use the Design/Build process for section 2 in January 2015, which was after Mods 36, 43, and 52 were executed. See section 7.4 contains additional discussion regarding the importance of timely selection of delivery methods.

Advancing of the design beyond preliminary engineering, then putting the project to a Design/Build contract can create potential duplication of design effort. This is because the design team for the Design/Build contractor will be taking the design risk; they will need to re-verify all designs given to them by the PB team, and may re-create the design work. Although this issue is mitigated by using the Building Information Management (BIM) design Computer Aided Design (CAD), duplicated effort may still occur. Further discussion of project procurement is provided in Section 7.2 (Project Delivery Methods).

The design team for section 2 determined that advance preliminary engineering was necessary. Some of the reasons for advancing the design beyond preliminary engineering are described below.

1. The Lessons Learned report dated February 11, 2015, identifies four items in the design phase that are recommended, and the work effort for design for Mods 43 and 52 were focused on the following items.

- Standardization of rooms and equipment layouts as part of the Project Definition requirements to reinforce Metro Rail Design Criteria Standards and Directives for Design/Build Contract.
 - Use 3-D BIM CAD to optimize multi-disciplinary engineering coordination for early identification of potential conflicts that could occur during construction.
 - Advance the design to a sufficient level of detail and provide CAD files to the Design/Build Contractor to improve the overall project schedule and develop cost estimates.
 - Including detailed construction planning during preliminary engineering to develop suggested construction sequencing, traffic control plans and staging areas to reduce impacts and facilitate the approval of permits, peak hour work exemptions and nighttime noise variances.
2. For large/complex projects, early definition of critical project elements to a higher level of design helps refine cost estimates and helps reduce risks associated with construction. This can be viewed as a form of due diligence that would help develop the true cost of the project. As lessons learned from past Metro projects, third party permitting and coordination (including right of way requirements) can create major schedule delays and increased costs for the owner. Due to the history of poor past performance of some construction contracts, Metro and PB decided to perform Advance Preliminary Engineering prior to going out to bid for the Design/Build contract.

The level of risks, impacts, stakeholder requirements, and negotiations (i.e. sensitive structures, utilities, etc.) and costs associated with relocations, this higher level of design provides value in minimizing construction risks.

Finding 1A-4: In order to avoid costly delays and overruns, Metro implemented their lessons learned from past projects and performed detailed engineering prior to going to out to bid for the Design/Build Contract.

Recommendation 1A-4: Metro should continue to implement lessons learned, where appropriate. In addition, Metro should consider alternate procurement methods that might reduce the need for additional design effort. See Recommendation 4A-4.

4.0 OBJECTIVE 1B: ASSESSMENT OF WORK HOURS

4.1 Scope:

Perform an assessment and analysis of the total work hours to perform the proposed Advanced Preliminary Engineering work.

4.2 Methodology:

The Audit team gathered and reviewed all available pertinent information regarding the project's history and development, Mods, payments, progress, staffing, deliverables, etc., in order to perform an analysis of the total work hours proposed in Mod 52. This analysis includes the incurred costs and incurred hours from different perspectives: hours proposed, hours breakdown, hours spent, and cost percentages.

The first task was to review the hours proposed for Mod 52 and to compare that to Metro's Independent Cost Estimate.

Next, we reviewed the line-item breakdown of hours and calculated each item's percentage of total hours. We created a side-by-side comparison of PB's proposed hours vs. Metro's Independent Cost Estimate, and calculated the variance. We separated Mod 52 Scope of Work into design vs. design support.

Finally, we compared PB's incurred design costs for this project to the cost estimates provided to FTA in order to calculate cost percentages.

4.3 Findings:

4.3.1 Analysis of Estimated Hours and Hours Spent

Total Estimated Hours

We were given three different sources that show the line item breakdown of Mod 52 proposed hours. These sources are:

1. PB's Section 2 Schedule, dated 11/21/14
2. Metro's Independent Cost Estimate, dated 01/13/15
3. PB's Resource and Cost Projection and Contractor's Cost Proposal, dated 01/14/15

We analyzed and reviewed these estimates, and compared them to the final Metro approved hours for Mod 52. We also compared them to PB's monthly progress reports. As summarized in the table below, there are variances between the Final Metro approved hours for Mod 52 (128,075 hours) and PB's monthly progress reports, which state 132,112 hours. We calculated the variation of hours from Metro's Independent Cost Estimate. As shown in the table below, PB's Initial Estimate was 24% over the Metro Estimate. The Final Metro Approved Hours were 10% above the Metro Estimate.

Mod 52 Proposed Man-hours by Source			
Source	Date	Total Hours	Variation above Metro Estimate
PB's Section 2 Schedule (Initial Estimate)	11/21/2014	145,092	24%
Metro's Independent Cost Estimate	01/13/2015	116,604	-
PB's Resource and Cost Projection and Contractor's Cost Proposal	01/14/2015	129,056	11%
PB's Monthly Progress Reports "Planned Hours"		132,112	13%
Final Metro-approved Hours for Mod 52	Feb. 2015	128,075	10%

The table above is a summary of the information in Exhibits G, H and I. Exhibit G “Variance Comparison” shows Metro’s Independent Estimate and PB proposed hours side-by-side, and shows the variance in hours. The total variance is approximately 24%. Exhibits H and I present the summary breakdown of PB’s Proposed Mod 52 Hours and Metro’s Independent Cost Estimate. These exhibits show the “percentage of total hours” for each line item in the scope of work for Mod 52. Exhibit H shows that PB’s highest hours allocated was for Engineering at 25%, then Geotechnical at 18%, and RFP Production also at 18%.

These exhibits demonstrate that opinions regarding the required level of effort vary. The largest variance is the geotechnical estimate, which is the most complex area of the project and one of the areas with the most risk. The variances in the other areas were substantially closer to Metro’s Independent Estimate.

Hours Spent on Design versus Design Support

The scope of Mod 52 includes engineering design (plans, drawings) and also non-design elements (or design-support, which includes reports, studies, management, coordination, permitting, FFGA processing, etc.). We calculated the total hours for design and total hours for design-support, from both the PB and Metro estimates. We found that Metro proposed 56% of the hours be allocated to non-design work, and PB allocated 67% of the hours to non-design hours.

Allocation of Hours		
	Design Plans	Design Support
Metro Independent Estimate	44%	56%
PB Estimate	33%	67%

Given that variance can occur, it is important to develop a detailed cost loaded work plan, which would enhance control, oversight, and accountability of project hours.

Finding 1B-1: PB's Initial Estimate for hours was 24% above that of Metro's Independent Cost Estimate. The final approved hours were also higher (by 10%) than the Metro's Estimate. Also, variances exists between PB's monthly progress reports "planned hours" (132,112 hours) and the final Metro approved hours for Mod 52 (128,075 hours).

Recommendation 1B-1: A detailed cost loaded work plan should be developed for each contract modification that summarizes the current state of the project, clearly describes project objectives, and rational basis for proposed work. In addition, each task should summarize a rational basis for design and anticipated personnel including management.

4.3.2 FTA Project Cost Estimates Compared to PB Incurred Costs

Published documents (such as the TCRP Report 138: Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects) use percentages to calculate capital project soft costs. Thus, when asked to assess the amount of hours (money) spent on this project so far, this analysis is based on percentages as another way of looking at costs incurred.

The US Federal Transit Administration (FTA) has been involved at every stage of this project from 2007. They reviewed and accepted every estimate for every cost category before they allowed the project to move forward. At the major approval phases of this New Starts Project (Alternative Analysis, Entry into Preliminary Engineering, and FFGA), Metro/PB has submitted a cost estimate that was approved by FTA. Note that the initial estimate is typically a rough estimation, usually a percentage add-on estimate to estimates of hard construction costs. In the Preliminary Engineering phases, the soft cost estimate is still typically conceptual in nature. When the project is in Final Design, and as construction begins, the estimate of the project cost is more tailored, accurate, and well developed since the project itself is better defined.

The audit team reviewed the cost estimates submitted by Metro/PB to FTA at 1) Preliminary Engineering Phase (Entire Project), 2) FFGA (Section 1), and 3) FFGA (Section 2). Our focus was on Standard Cost Category (SCC) 80 Professional Services, also defined as “soft costs.”

FTA defines soft costs to be equivalent to Standard Cost Category (SCC) 80 Professional Services, which includes: “all professional, technical, and management services related to the design and construction of fixed infrastructure during the preliminary engineering, final design, and construction phases of the project. This includes environmental work, design, engineering and architectural services, specialty services such as safety or security analysis, and value engineering, risk assessment, cost estimating, scheduling, before and after studies, ridership modeling and analysis, auditing, legal services, administration and management, by agency staff or outside consultants.”

Soft costs (from the perspective of the project Sponsor – Metro) are classified into components based on either the timing or purpose of the cost, as follows:

- **80.01 – Preliminary Engineering** – Costs of early designs, negotiations for operations and maintenance, developing financial plans, and ridership studies. Should include contractor’s soft costs for Preliminary Engineering under Design/Build contracts.
- **80.02 – Final Design** – all costs associated with the Final Design stage. Costs for services similar to the above description are captured here.
- **80.03 – Project Management for Design and Construction** – Project management oversight costs. Costs to support design, management, and administrative efforts for legal, technical, and environmental consultants are reported here.
- **80.04 – Construction Administration and Management**
- **80.05 – Insurance**
- **80.06 – Legal, Permits, Review Fees by Other Agencies**
- **80.07 – Survey, testing, Investigation, Testing**
- **80.08 – Start Up**

In Design/Build contracts, where the division between a contractor’s design and construction cost may be less transparent to a project sponsor, FTA directs grantees to report design costs incurred by the Design/Build contractor in the SCC 80 category.

For this report, we are assuming PB’s contract falls into the Categories 80.01 Preliminary Engineering and 80.02 Final Design. Based on the FTA New Starts Cost Worksheets, we’ve compiled the following summary table of estimates. The summary table below shows that the Section 2 estimate for Preliminary Engineering and Final Design is \$143,623,000. This budget includes all of PB’s Preliminary Engineering to Advanced Preliminary Engineering work and also includes the budget for the Design part of the Design/Build Contract.

FTA Estimates							
Design Stage	Section	Number of Stations	Miles	Base Year	Year of Revenue	Base Year Dollars (Categories 80.01 + 80.02 only)	Year of Expenditure Dollars (Categories 80.01 + 80.02 only)
PE	Entire Project	7	9.36	2010	2022	\$235,080,000	\$280,034,000
FFGA	Section 1	3	3.92	2013	2024	\$148,774,000	\$162,962,000
FFGA	Section 2	2	2.54	2015	2025	\$143,623,000	\$165,406,000
FFGA	Section 3	2	2.9	-	-	-	-

In order to determine the design costs incurred for Section 2. We used the following process:

1. Exhibit C is a compiled list of the Mod’s and categorized them into either a) All sections, b) Section 1, c) Section 2, and d) Section 3. (See note "A" in table below.)
2. Calculate the weighted average of “All Sections” based on length of the construction and allocated the associated cost to the appropriate section. (See note “B” in table below.)
3. Added the costs the two costs together resulting in an incurred cost.

The table below shows the calculated value of the costs incurred by the end of November 2015 for the design.

PB's Cost Incurred in each Section				
	All Sections	Section 1	Section 2	Section 3
Total (A) =	\$87,631,929	\$33,797,021	\$30,634,864	\$439,292
Miles per Section =	9.36 miles	3.92 miles	2.54 miles	2.9 miles
All Sections Total Weighted out per miles (B) =	-	\$36,700,551	\$23,780,459	\$27,150,918
Total Each Section (A) + (B) =	\$152,503,106	\$70,497,572	\$54,415,323	\$27,590,210

Finding 1B-2: PB's design fees for Section 2 are approximately \$54,415,323 or 2.21% of the estimated capital project budget (\$2,466,596,000) and 3.86% of construction budget (\$1,410,005,000). At the completion of Mod 52, PB's design fees for Section 2 will be approximately 38% (\$54,415,323 of \$143,623,000) of the estimated design budget, leaving the remainder (approximately \$89,207,677) for the design portion of the Design/Build contract. These cost percentages appear to fall within historical values reported by TCRP Report 138.

When design costs are initially estimated for a large/complex capital project such as this, the estimate may include large cost elements such as vehicles, start-up, TVMs, etc. that are not directly related with actual design of the station and alignment; but add to the design cost. This needs to be understood if the design team is basing their fees on the project cost.

5.0 OBJECTIVE 2: PROPOSED BILLABLE RATES

5.1 Scope:

Evaluate the proposed billable rates associated with the development of Advanced Preliminary Engineering work.

5.2 Methodology:

Metro Board directed the OIG to conduct an independent audit of Contract Modification 52 (Mod 52). One of the objectives of the audit is to evaluate the proposed billable rates associated with the development of Advanced Preliminary Engineering work under Mod 52. The CPA firm that conducted the audit of proposed costs for Mod 52 has experience in conducting change order cost audits of architectural/engineering/construction companies and applying the cost principles of FAR 31.2 and/or OMB Circular A-87.

The objective of this review was to evaluate the proposed costs to determine if the costs were adequately supported and allowable under FAR 31.2 and/or OMB Circular A-87. To complete this objective, BCA Watson and Rice, LLP, performed the following tasks for Parsons Brinckerhoff (PB) (prime contractor), Advantec, AMEC, D'Leon, and Intueor (subcontractors).

- Reviewed Mod 52 and the Updated Advanced Memorandum on Costs to obtain an understanding of the pertinent requirements and the terms and conditions.
- Reviewed the cost proposals (Form 60) to obtain an understanding of the nature of the proposed costs.
- Selected a random sample of at least 25% of the proposed staff and performed the following tasks to verify the reasonableness of the proposed direct labor rates.
 - Compared the proposed direct labor rates to company payroll records or other supporting documents, and noted any differences.
 - Judgmentally selected a sample invoice and compared the invoiced direct labor rates to the proposed direct labor rates and labor rates approved under Mod 52, and noted any differences.
 - Obtained and reviewed explanation for any direct labor rate differences identified.
 - Compared the invoiced direct labor rates to company payroll records for the rate differences.
- Reviewed the proposed escalation rates and compared the rates to the Employment Cost Index published by the Bureau of Labor Statistics.
- Reviewed the proposed indirect cost rate (ICR) and performed the following tasks to verify the reasonableness of the proposed ICR.
 - Performed a trend analysis of the indirect cost rates for fiscal year 2010 to fiscal year 2014, and compared the average rate for that period to the indirect cost rate proposed.
 - Reviewed the audited or reviewed indirect cost rate report for the most recently completed fiscal year and compared to the indirect cost rate being proposed for reasonableness.

- If no indirect cost rate audit or review was conducted, we reviewed the unaudited indirect cost rate calculation for the most current available year, reconciled the calculation to the company trial balance, and scanned accounts for unallowable costs according to FAR Part 31.2.
- Selected a random sample of at least 25% of the proposed other direct costs (ODC) and verified the ODC proposed against similar items such as historical invoices, vendor quotes, price lists, etc.
- Reviewed the proposed profit rate and determined whether it was equal to or less than 10%.

5.3 Findings:

We found that overall the proposed billable rates and overhead rates associated with advanced engineering work in Mod 52 were reasonable and adequately supported. We found that the labor rates invoiced by PB and its subcontractors were equal to or lower than the approved rates in the contract. However, we noted that for PB and its subcontractors, the proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.

5.3.1- Prime Contractor

Review of Contract Modification 52 and Updated Advanced Memorandum on Costs

On March 30, 2015, Metro executed Modification 52, which increased PB's contract value by \$20,820,226 to provide the necessary staff to complete Advanced Preliminary Engineering in support of Metro's Westside Purple Line Extension Section 2 Project. The estimated period of performance for this modification is February 1, 2015 to June 30, 2016. According to the Updated Advanced Memorandum on Costs, the indirect cost rates are provisional rates and are subject to retroactive adjustments upon completion of audits of final annual indirect rates for PB and twenty other subcontractors. Direct labor hourly rates proposed for PB are listed on PB's proposed Form 60 cost form. PB's fixed fee for this modification is \$676,183. For subcontractors, the direct labor hourly rates are fixed and the fee shall be fixed and not exceed 8% of the direct labor and labor overhead. Any proposed adjustments to labor rates not fixed are subject to Metro audit and prior approval. Proposed other direct costs (ODC) and travel costs shall be applied as approved by Metro or the following:

- Actuals, as supported by invoices
- Mileage reimbursement (for the use of non-project vehicles) in accordance with the IRS standard mileage rates
- Metro's travel and business expense policy

Review of Direct Labor Rates

PB proposed 60 individuals for Mod 52. Of the 60 individuals proposed, we selected 30 individuals and compared their proposed pay rates to payroll registers, dated March 2015. No differences were noted.

One invoice was selected for testing and compared the invoiced rates to the contracted rates. (Note: the proposed rates and contract rates were the same). Based on our review, we noted that the labor rates invoiced were higher than the proposed/contracted rates for 32 individuals as detailed in the table on the following page.

Labor Category	Invoiced Rate	Proposed/ Contract Rate	Difference
Sr Supv Engineer	\$ 79.51	\$ 77.38	\$ 2.13
Sr Engineering Mgr	97.34	94.50	2.84
Sr Prin Technical Specialist	82.82	80.56	2.26
Sr Engineering Mgr	119.26	115.78	3.48
Lead Estimator	57.92	56.78	1.14
Supv Engineer	66.63	64.68	1.95
Sr Engineering Mgr	109.23	107.08	2.15
Sr Engineer	39.50	36.57	2.93
Sr Technical Specialist	59.61	58.44	1.17
Technical Mgr	109.85	108.22	1.63
Sr Engineering Mgr	105.29	102.52	2.77
Sr Supv Engineer	82.18	78.64	3.54
Sr Supv Engineer	70.71	68.98	1.73
Sr Project Control Mgr	85.72	82.42	3.30
Sr Systems Operator	39.99	38.82	1.17
Supv Engineer	76.02	74.52	1.50
Exec Technical Mgr	174.55	169.46	5.09
Sr Supv Engineer	85.65	83.15	2.50
Project Control Specialist	47.51	45.90	1.61
Sr Supv Architect	90.43	88.65	1.78
Exec Asst II	44.35	43.48	0.87
Admin Supv III	40.18	39.20	0.98
Sr Supv Engineer	83.96	80.34	3.62
Sr Supv Engineer	71.67	63.42	8.25
Sr Engineering Mgr	91.20	88.97	2.23
Sr Engineer	47.41	46.02	1.39
Sr Supv Engineer	84.60	82.94	1.66
Sr Supv Engineer	85.44	82.15	3.29
Engineer II	35.73	34.52	1.21
Lead Engineer	47.57	43.40	4.17
Supv Engineer	62.43	59.88	2.55
Architect II	33.89	32.27	1.62

According to PB officials, the differences are the result of pay increases, effective August 2015. The invoice selected for testing was dated October 6, 2015, and was for services rendered in September 2015. According to Metro’s Contract Administrator, the above labor rate differences have been approved by Metro, but no formal written approval was provided. We also noted that 24 of the 32 individuals invoiced received labor rate increases exceeding the approved 2.3% labor escalation rate allowed by Metro (see discussion below regarding approved labor escalation rate).

Of the 32 individuals invoiced on October 6, 2015, five (5) individuals were charged using the home office overhead rate, twenty-six (26) were charged using the field overhead rate and one (1) individual was charged using both the home office and field overhead rates.

Finding 2-1: A number of individuals invoiced received labor rate increases exceeding the approved 2.3% labor escalation rate allowed by Metro. According to Metro’s Contract Administrator, the labor rate differences for PB have been approved by Metro, but no formal written approval was provided.

Recommendation 2-1: We recommend that Metro’s approval of labor rate increases be formally approved in writing. Furthermore, labor rate increases for individuals exceeding the annual labor escalation rate percentage approved by Metro should be formally documented and justified in the contract files.

Review of Labor Escalation Rate

PB proposed a labor escalation rate of 3% for the year 2016. During our audit, we inquired with Metro’s Contract Administrator on the allowability of the escalation rate and its supporting documents. Metro’s Contract Administrator provided us with a copy of the Bureau of Labor Statistics Employment Cost Index for the Southwest Region for wages and salaries for private industry workers. It shows a percent change from September 2013 to September 2014 of 2.3% for the West Pacific area. According to Metro’s Contract Administrator, Metro allowed a 2.3% escalation rate for Contract Modification 52.

Finding 2-2: PB’s proposed escalation rate of 3% is higher than the 2.3% allowed by Metro.

Based on our review of the cost proposal and detailed cost schedule, we found PB’s proposed escalation rate of 3% for year 2016 to be higher than the 2.3% escalation rate according to the Bureau of Labor Statistics Employment Cost Index.

Recommendation 2-2: PB’s proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharge should be paid back to Metro.

Review of Indirect Cost Rates (ICR)

According to Contract Modification 52, PB’s proposed ICR of 139.60% for field office and 159.30% for home office are provisional ICRs subject to retroactive adjustments upon completion of the ICR audits for the period when the work is performed. During our review, we met with Metro’s

Contract Administrator to clarify the terms and requirements for Contract Modification 52. We were informed that Contract Modification 52 is a cost plus fixed fee compensation type, and indirect cost rates are subject to adjustment based on the fiscal year when the work is performed, which would be fiscal years 2015 and 2016.

Finding 2-3: PB’s proposed Indirect Cost Rates for home office and field office are provisional and subject to retroactive adjustments.

To determine whether PB’s provisional home office and field office ICR is reasonable, we conducted a trend analysis of PB’s audited ICRs for fiscal years 2010 to 2014, as detailed in the table below. Based on this trend analysis, the provisional ICR for both project office and home office appear reasonable. However, if PB’s home office and project/field office ICR for 2015 and 2016 trends similar to 2013 and 2014, it may result in an overpayment of overhead costs to PB, and, as a result, PB will owe Metro a refund due to the overpayment of overhead costs.

Fiscal Year	Home Office	Project Office (Westside Extension)
2010	162.70%	not provided
2011	158.70%	139.60%
2012	160.20%	134.80%
2013	152.93%	129.92%
2014	153.82%	135.04%

Recommendation 2-3: PB should submit to Metro its audited ICR for fiscal year 2015, as soon as it is completed to determine whether the ICR trend is the same as 2013 and 2014. If so, Metro should consider adjusting PB’s provisional ICR for both home office and field office to reflect the lower audited ICR rates and to prevent a potential overbilling of overhead costs.

Review of Other Direct Costs (ODC)

PB proposed other direct costs in the amount of \$1,007,649. We selected \$832,649 (83%) of the proposed costs for review. Based on our review of supporting documents and inquiries of PB officials, we found the proposed other direct costs to be reasonable and adequately supported.

PB billed \$26,525.69 in other direct costs on the October 6, 2015 invoice. Based on our review of the October other direct costs invoiced, we found the costs were billed at cost (without mark-up) and were adequately supported.

Review of Profit/Fee Rate

PB proposed an 8% fee of its labor and overhead costs for Contract Modification 52. We found PB’s proposed fee of 8% to be reasonable and in conformity with government allowable profit rates of a maximum 10%.

5.3.2 Advantec – Subcontractor

Review of Direct Labor Rates

Advantec proposed 4 individuals for Mod 52. Of the 4 individuals proposed, we selected 2 individuals and compared their proposed pay rates to payroll registers. Based on this comparison, we found no differences.

We also selected one invoice for testing and compared the invoiced rates to the proposed/contracted billing rates for the individuals invoiced and found no differences.

Review of Labor Escalation Rate

Advantec proposed a labor escalation rate of 3% for the year 2016. During our audit, we inquired with Metro's Contract Administrator on the allowability of the escalation rate and its supporting documents. Metro's Contract Administrator provided us a copy of the Bureau of Labor Statistics Employment Cost Index for the Southwest Region for wages and salaries for private industry workers. It showed a percent change from September 2013 to September 2014 of 2.3% for the West Pacific area. According to Metro's Contract Administrator, Metro allowed a 2.3% escalation rate for Contract Modification 52.

Finding 2-4: Advantec's proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.

Based on our review of the cost proposal and detailed cost schedule, we found Advantec's proposed labor escalation rate of 3% for the year 2016 to be higher than the 2.3% escalation rate according to the Bureau of Labor Statistics Employment Cost Index.

Recommendation 2-4: Advantec's proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharges should be paid back to Metro.

Review of Indirect Cost Rates (ICR)

According to Modification 52, Advantec's proposed ICR of 150% is a provisional ICR subject to retroactive adjustment upon completion of the ICR audits for the period when the work is performed. During our review, we met with Metro's Contract Administrator to clarify the terms and requirements for Contract Modification 52. We were informed that Contract Modification 52 is a cost plus fixed fee compensation type, and indirect cost rates are subject to adjustment based on the fiscal year the work is performed, which would be fiscal years 2015 and 2016.

Finding 2-5: Advantec's proposed ICR is a provisional rate and subject to retroactive adjustments.

Based on Advantec's Form 60, Advantec proposed a company-wide ICR of 150% and did not propose a separate ICR for home office and field office. We also found that Advantec's ICR is unaudited. To determine whether Advantec's proposed provisional ICR is reasonable, we

conducted a trend analysis of Advantec’s unaudited ICRs for fiscal years 2010 to 2014. As shown in the table below, Advantec’s proposed provisional ICR is lower than the range of company-wide ICR’s for fiscal years 2010 to 2014.

However, because Advantec’s ICRs for fiscal years 2010 to 2014 are unaudited, Advantec’s ICR, when audited, will most likely be lower. For example, for fiscal year 2013, Advantec’s ICR was reduced from 175.78% to 150.87% under a contract pre-award price review that our firm conducted for another transit agency. Our review identified and excluded certain FAR unallowable costs, including advertisement, interest, entertainment, officer life insurance, marketing, sales tax, direct project costs, distribution of profit, related party rent, and unsupported costs.

Fiscal Year	Company Wide ICR
2010	156.51%
2011	176.29%
2012	197.32%
2013	150.87%
2014	186.22%

Recommendation 2-5: Metro should require Advantec to submit an audited ICR for 2015 and 2016, conducted by an independent CPA before adjusting Advantec’s provisional ICR for final payment.

Review of Other Direct Costs (ODC)

Advantec did not propose or invoice for any other direct costs.

Review of Profit/Fee Rate

Advantec proposed an 8% fee based on its proposed labor and overhead costs for Contract Modification 52. We found Advantec’s proposed fee of 8% to be reasonable and in conformity with government allowable profit rates of a maximum 10%.

5.3.3 AMEC – Subcontractor

Review of Direct Labor Rates

AMEC proposed 39 individuals for Mod 52. Of the 39 individuals proposed, we selected 14 individuals and compared their proposed pay rates to payroll registers. Based on our review, we noted differences between the proposed rates and the rates paid according to the payroll registers for 2 individuals as detailed below.

Labor Category	Proposed Rate	Rate per Payroll Register	Difference
Senior Hydrogeologist	48.75	48.03	0.72
Tech Prof 3	32.31	31.94	0.37

According to AMEC officials, the proposed rates above reflect pay increases of 2 percent that were anticipated at the time the rates were proposed. However, the actual pay increases were less than the anticipated increases, resulting in the differences calculated above. Therefore, since AMEC 's proposed rate is higher than the actual pay rates being paid by AMEC , then the differences noted above are acceptable.

We also selected one invoice for testing and compared the invoiced billing rates to proposed billing rates and to the contracted rates. Based on these comparisons, we found no differences.

Review of Labor Escalation Rate

AMEC proposed a labor escalation rate of 3% for the year 2016. During our audit, we inquired with Metro's Contract Administrator on the allowability of the escalation rate and its supporting documents. Metro's Contract Administrator provided us with a copy of the Bureau of Labor Statistics Employment Cost Index for the Southwest Region for wages and salaries for private industry workers. It showed a percent change from September 2013 to September 2014 of 2.3% for the West Pacific area. According to Metro's Contract Administrator, Metro allowed a 2.3% escalation rate for Contract Modification 52.

Finding 2-6: AMEC's proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.

Based on our review of the cost proposal and detailed cost schedule, we found AMEC's proposed labor escalation rate of 3% for the year 2016 to be higher than the 2.3% escalation rate according to the Bureau of Labor Statistics Employment Cost Index.

Recommendation 2-6: AMEC's proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharges would be paid back to Metro.

Review of Indirect Cost Rates (ICR)

According to Contract Modification 52, AMEC's proposed ICR of 167.11% for home office is considered a provisional ICR subject to retroactive adjustments pending completion of the ICR audits for the period when the work is performed. During our review, we met with Metro's

Contract Administrator to clarify the terms and requirements for Modification 52. We were informed that Modification 52 is a cost plus fixed fee compensation type, and indirect cost rates are subject to adjustment based on the fiscal year the work is performed, which would be fiscal years 2015 and 2016.

Finding 2-7: AMEC’s proposed ICR is provisional and subject to retroactive adjustments.

AMEC proposed an ICR of 167.11% for home office and did not propose any ICR for project office. AMEC provided us with a CPA audit report for fiscal year 2014, but did not provide any ICR information for fiscal years 2010 to 2013 (see table below). According to the CPA ICR audit report, AMEC’s 2014 home office audited ICR was 160% and AMEC’s 2014 audited field office ICR was 140.38%. Thus, the proposed provisional ICR of 167.11% is 7.11% higher than the audited home office ICR and 19.62% higher than the audited field office ICR. If AMEC’s home office and field office ICR for 2015 and 2016 trends similar to 2014, it may result in an overpayment of overhead costs to AMEC; and, as a result, AMEC will owe Metro a refund due to the overpayment of overhead costs.

Fiscal Year	Home Office	Field Office
2010	n/a	n/a
2011	n/a	n/a
2012	n/a	n/a
2013	n/a	n/a
2014	160.00%	140.38%

Recommendation 2-7: AMEC should submit to Metro its audited ICR for fiscal year 2015, as soon as it is completed, to determine whether the ICR trend is the same as 2014. If so, Metro should consider adjusting AMEC’s provisional ICR for both home office and field office to reflect the lower audited ICR rates and to prevent a potential overbilling of overhead costs.

Review of Other Direct Costs (ODC)

AMEC proposed other direct costs in the amount of \$61,021. We selected \$33,138 (54%) of the proposed costs for review. Based on our review of supporting documents and inquiries of PB officials, we found the proposed other direct costs to be reasonable and adequately supported.

AMEC billed \$41.98 in other direct costs on the September 25, 2015 invoice selected for testing. Based on our review of the other direct cost invoiced, we found it was billed at cost (without mark-up) and was adequately supported.

Review of Profit/Fee Rate

AMEC proposed an 8% fee based on its proposed labor and overhead costs for Contract Modification 52. We found AMEC’s proposed fee of 8% to be reasonable and in conformity with government allowable profit rates of a maximum 10%.

5.3.4 D’Leon – Subcontractor

Review of Direct Labor Rates

D’Leon proposed 6 individuals for Mod 52. Of the 6 individuals proposed, we selected 3 individuals and compared their proposed pay rates to payroll registers. Based on this comparison, we found no differences.

We also selected one invoice for testing and compared the invoiced rates to the proposed/contracted billing rates for the individuals invoiced and found no differences.

Review of Labor Escalation Rate

D’Leon proposed a labor escalation rate of 3% for the year 2016. During our audit, we inquired with Metro’s Contract Administrator on the allowability of the escalation rate and its supporting documents. Metro’s Contract Administrator provided us with a copy of the Bureau of Labor Statistics Employment Cost Index for the Southwest Region for wages and salaries for private industry workers. It showed a percent change from September 2013 to September 2014 of 2.3% for the West Pacific area. According to Metro’s Contract Administrator, Metro allowed a 2.3% escalation rate for Modification 52.

Finding 2-8: D’Leon’s proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.

Based on our review of the cost proposal and detailed cost schedule, we found D’Leon’s proposed labor escalation rate of 3% for the year 2016 to be higher than the 2.3% escalation rate according to the Bureau of Labor Statistics Employment Cost Index.

Recommendation 2-8: D’Leon’s proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharges should be paid back to Metro.

Review of Indirect Cost Rates (ICR)

According to Contract Modification 52, D’Leon’s proposed ICR of 130% for project office and 142% for home office are considered provisional ICRs subject to retroactive adjustments pending completion of the ICR audits for the period when the work is performed. During our review, we met with Metro’s Contract Administrator to clarify the terms and requirements for Contract Modification 52. We were informed that Contract Modification 52 is a cost plus fixed fee compensation type, and indirect cost rates are subject to adjustment based on the fiscal year the work is performed, which would be fiscal years 2015 and 2016.

Finding 2-9: D’Leon’s proposed ICR for home office and field office are provisional and subject to retroactive adjustments.

D’Leon proposed an ICR of 130% for field office and did not propose any ICR for home office. D’Leon provided us with unaudited ICR schedules for fiscal years 2012 and 2014, but did not provide any ICR information for fiscal years 2010, 2011, and 2013 (see table below). The proposed ICR of 130% is slightly higher than the fiscal year 2014 ICR of 129.13% for field office.

Because D’Leon’s ICR was unaudited, we conducted further analysis of D’Leon’s 2014 unaudited ICR for reasonableness. We reviewed D’Leon’s unaudited ICR calculation schedule and compared certain amounts on the schedule to D’Leon’s Income Statement. We noted that the combined amount on the ICR schedule allocated to home office and field office exceeded the amount shown on the Income Statement. It appears that the costs allocated to field office are additional costs not identified on the Income Statement. Exhibit 1 on the following page summarizes the costs allocated to home office and field office compared to the Income Statement and its variance. Since D’Leon’s ICR for fiscal years 2012 and 2014 was unaudited, the actual audited ICR may be lower, particularly when costs are properly allocated for home and field office.

Fiscal Year	Home Office	Field Office
2010	not provided	not provided
2011	not provided	not provided
2012	142.00%	130.00%
2013	not provided	not provided
2014	141.32%	129.13%

Metro Office of Inspector General
 Westside Purple Line Extension Section 2 – Mod 52

EXHIBIT 1					
Summary of D'Leon Home Office Costs and Field Office Costs vs. Income Statement Amounts					
Description	Home Office Costs	Field Office Costs Proposed	Total Home Office and Field Office Costs	Income Statement	Variance
	(a)	(b)	(c=a+b)	(d)	(c-d)
Direct Labor	880,680.35	483,808.00	1,364,488.35	880,680.35	483,808.00
Fringe Benefits					
Vacation, Holiday, Paid Leave	112,629.08	61,873.58	174,502.66	112,629.08	61,873.58
Payroll Taxes	126,647.08	69,574.47	196,221.55	126,647.08	69,574.47
Group Insurance	83,506.79	45,875.05	129,381.84	83,506.79	45,875.05
Pension and Profit Sharing	3,194.50	1,754.92	4,949.42	3,194.50	1,754.92
Incentive Payment	86,327.49	47,424.62	133,752.11	86,327.49	47,424.62
Training Education	1,577.70	866.72	2,444.42	1,577.70	866.72
Employee Welfare & Moral	11,159.56	6,130.58	17,290.14	11,159.56	6,130.58
Total Fringe Benefits	425,042.20	233,499.94	658,542.14	425,042.20	233,499.94
Expenses					
Recruiting	81,817.92	44,947.25	126,765.17	81,817.92	44,947.25
Auto Expenses	6,348.73	-	6,348.73	6,348.73	-
Professional & Consulting Other	146,567.65	80,517.98	227,085.63	146,567.65	80,517.98
Workers' Compensation	12,079.00	6,635.68	18,714.68	12,079.00	6,635.68
Dues and Subscriptions Exp	1,129.32	620.40	1,749.72	1,129.32	620.40
Licenses	5,821.08	3,197.85	9,018.93	5,821.08	3,197.85
Maintenance Expense	5,452.00	-	5,452.00	5,452.00	-
State Income Taxes	800.00	439.49	1,239.49	800.00	439.49
Office Expense	23,323.53	-	23,323.53	23,323.53	-
Postage Shipping	1,115.69	612.91	1,728.60	1,115.69	612.91
Printing and Reproduction Exp	632.51	-	632.51	3,325.51	(2,693.00)
Salaries Off Not Project Labor Management	195,675.10	107,495.50	303,170.60	195,675.10	107,495.50
Repairs Expense	1,362.16	-	1,362.16	1,362.16	-
Research and Development Exp	24,391.69	-	24,391.69	24,391.69	-
Building Cost Rent	45,849.16	-	45,849.16	43,156.16	2,693.00
Auto Lease	14,059.44	7,723.65	21,783.09	14,059.44	7,723.65
Telephone	6,985.31	3,837.43	10,822.74	6,985.31	3,837.43
Travel	40,890.33	22,463.39	63,353.72	40,890.33	22,463.39
Insurance Auto	6,557.00	3,602.13	10,159.13	6,557.00	3,602.13
Insurance Gen/Prof Liability	27,071.00	14,871.65	41,942.65	27,071.00	14,871.65
Total Expenses	819,544.87	391,243.91	1,210,788.78	819,544.87	391,243.91
Total Indirect Cost	1,244,587.07	624,743.85	1,869,330.92	1,244,587.07	624,743.85
Percent of Direct Labor	141.32%	129.13%			

Recommendation 2-9: Metro should require D’Leon to submit an audited ICR for 2015 and 2016, conducted by an independent CPA before adjusting D’Leon’s provisional ICR for final payment. If the 2015 audited ICR is lower than the provisional 130% ICR, Metro should consider adjusting D’Leon’s provisional ICR to prevent a potential overbilling of overhead costs.

Review of Other Direct Costs (ODC)

D’Leon did not propose or invoice for any other direct costs.

Review of Profit/Fee Rate

D’Leon proposed a fee of 8% based on its proposed labor and overhead costs for Contract Modification 52. We found D’Leon’s proposed fee of 8% to be reasonable and in conformity with government allowable profit rates of a maximum 10%.

5.3.5 Intueor - Subcontractor

Review of Direct Labor Rates

Intueor proposed 8 individuals for Mod 52. Of the 8 individuals proposed, we selected 4 individuals and compared their proposed pay rates to payroll registers. Based on this comparison, we found no differences.

We also selected one invoice for testing and compared the invoiced rates to the proposed/contracted billing rates for the individuals invoiced and found no differences.

Review of Labor Escalation Rate

Intueor proposed a labor escalation rate of 3% for the year 2016. During our audit, we inquired with Metro's Contract Administrator on the allowability of the escalation rate and its supporting documents. Metro's Contract Administrator provided with us a copy of the Bureau of Labor Statistics Employment Cost Index for the Southwest Region for wages and salaries for private industry workers. It showed a percent change from September 2013 to September 2014 of 2.3% for the West Pacific area. According to Metro's Contract Administrator, Metro allowed a 2.3% escalation rate for Contract Modification 52.

Finding 2-10: Intueor's proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.

Based on our review of the cost proposal and detailed cost schedule, we found Intueor's proposed labor escalation rate of 3% for the year 2016 to be higher than the 2.3% escalation rate according to the Bureau of Labor Statistics Employment Cost Index.

Recommendation 2-10: Intueor's proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharges should be paid back to Metro.

Review of Indirect Cost Rates (ICR)

According to Contract Modification 52, Intueor's proposed ICR of 140.36% for field office and 156.53% for home office are considered as a provisional ICR subject to retroactive adjustments pending completion of the ICR audits for the period when the work is performed. During our review, we met with Metro's Contract Administrator to clarify the terms and requirements for Contract Modification 52. We were informed that Contract Modification 52 is a cost plus fixed fee compensation type, and indirect cost rates are subject to adjustment based on the fiscal year the work is performed, which would be fiscal years 2015 and 2016.

Finding 2-11: Intueor's proposed ICR for home office and field office are provisional and subject to retroactive adjustments.

Intueor proposed an ICR of 140.36% for field office and 156.53% for home office. Intueor provided us with a CPA audit report for fiscal years 2010, 2013 and 2014, but did not provide any ICR information for fiscal year 2011 and 2012 (see table below). Intueor’s proposed provisional ICR of 140.36% for field office and 156.53% for home office is lower than the fiscal year 2014 audited ICR of 170.84% for field office and 189.17% for home office. Thus, Intueor’s proposed provisional ICR appears reasonable and adequately supported.

Fiscal Year	Home Office	Field Office
2010	165.97%	140.36%
2011	not provided	not provided
2012	not provided	not provided
2013	187.01%	not provided
2014	189.17%	170.84%

Recommendation 2-11: Intueor should submit to Metro the actual audited ICR for fiscal year 2015, as soon as it is completed. If the audited ICR for 2015 continues to trend higher than Intueor’s provisional ICR, then Metro should consider increasing Intueor’s provisional ICR to better reflect the actual overhead costs to be paid to Intueor.

Review of Other Direct Costs (ODC)

Intueor did not propose or invoice for other direct costs.

Review of Profit/Fee Rate

Intueor proposed a fee of 8% based on its proposed labor and overhead costs for Contract Modification 52. We found Intueor’s proposed fee of 8% to be reasonable and in conformity with government allowable profit rates of a maximum 10%.

6.0 OBJECTIVE 3: MANAGEMENT REDUNDANCIES

6.1 Scope:

Identify management redundancies and recommend cost-saving efficiencies.

6.2 Methodology:

In order to identify management redundancies, we reviewed Metro’s Westside Purple Line Extension Section 2 Project Integrated Project Management Office Team Matrix Organization chart, reviewed some corresponding job descriptions, and interviewed Metro and PB executive staff. We identified the staff roles most directly involved in the Projects’ current work effort.

We also reviewed the scope of work related to Mod 52, and determined the roles played by Metro and PB management staff in the aid of these items.

Moreover, we reviewed PB’s Mod 52 timesheets in order to identify the different roles of management staff in terms of the scope of work.

Finally, we performed a cost-incurred and hours-incurred analysis from PB’s timesheets from February 28 to August 28, 2015 on Mod 52 in order to separate the executive management level hours from technical-level hours and supervising-level hours. In our review of timesheets, we divided PB staff into three categories: Executive Management, Supervising Engineering, and Technical Engineering Levels, with pay rate and staff titles as the dividing factors between the categories.

6.3 Findings:

6.3.1 Identification of Metro Staff

According to the Section 2 Metro Integrated Project Management Office (IPMO) Team Organizational chart, there are three general groups/departments that are associated with Westside Purple Line Extension Project. These general groups are 1) Vendor/Contract Management, 2) Engineering and Construction, and 3) Program Management Oversight. Within each of those departments is 2-3 Metro management staff as identified in the figure below.

Vendor/Contract Management	Engineering and Construction	Program Management
<ul style="list-style-type: none"> • Vendor/Contract Management – I. Page • Director Contracts Administration – T. Clark • Sr. Contract Administrator – Z. Munoz 	<ul style="list-style-type: none"> • Project Director E.O. – Dennis Mori • Project Management D.E.O. – M. Mckenna • Director Construction Management – Vacant • Senior Engineering Manager – Vacant 	<ul style="list-style-type: none"> • Executive Director PMO – Brian Boudreau • Project Control D.E.O. – Vacant • Director Project Control – R. Wilson • Senior Project Control Manager (Schedule) – A. Alva • Project Control Supervisor (Cost) – L. Ramirez • Configuration Management Manager – Vacant • Estimating Manager – Vacant • Senior Estimator – F. Bavanad

After discussion with Dennis Mori, Metro’s Executive Officer and Project Director, and review of the Metro organizational chart, we’ve identified these three categories of Metro Management Staff as the ones with some level of involvement with the project’s current work effort. Moreover, the PB organizational chart identifies four Metro management-level staff on the project. These managers are:

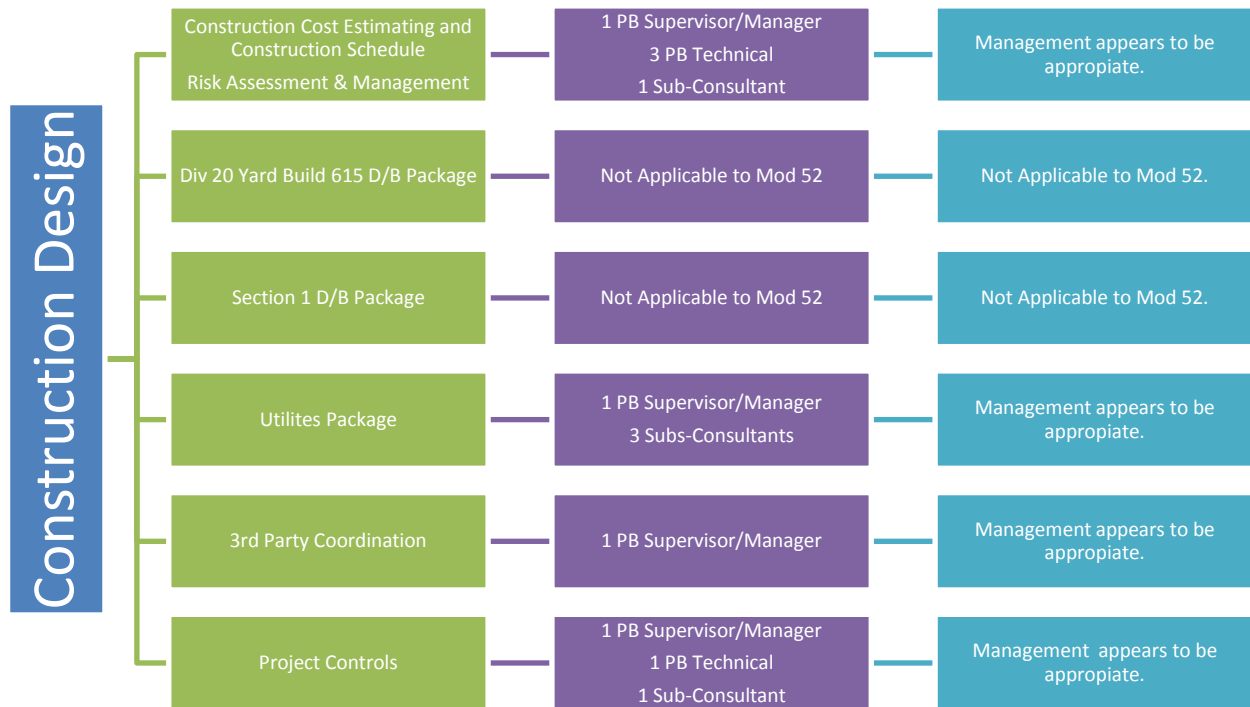
1. Dennis Mori – Executive Officer and Project Director
2. Jim Cohen – Deputy Project Direction Construction
3. Rick Wilson – Director Project Controls
4. David Mieger – Executive Officer Planning

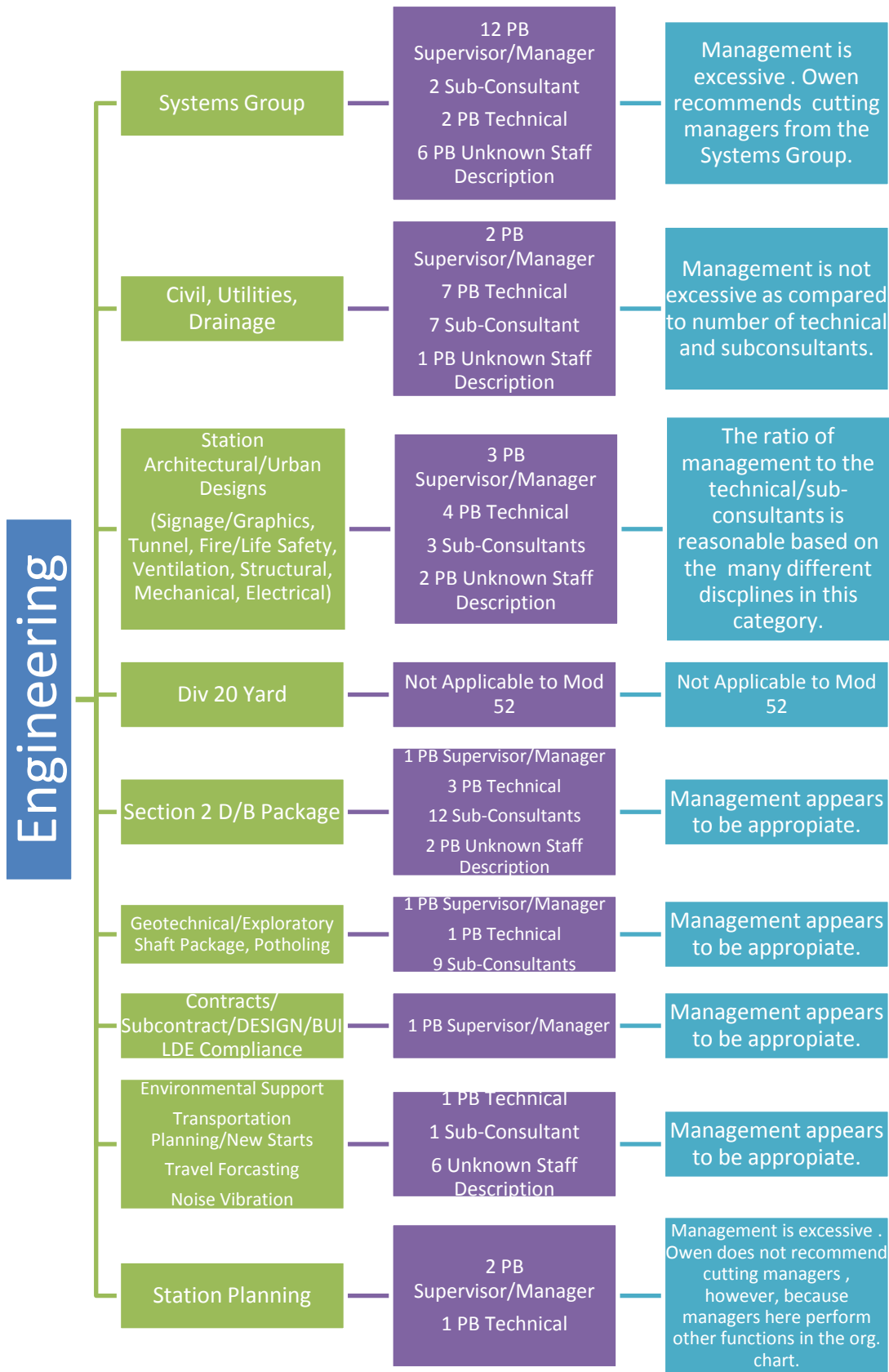
Finding 3-1: Our review did not disclose any apparent management/staff redundancies between Metro and PB. Although Metro has a number of staff from various departments (Procurement, Project Oversight, etc.,) who provide support to the Westside Purple Line Extension Section 2, these personnel only provide part-time, intermittent support for the project. The core Metro project management team for Section 2 is lean and consists of only four individuals including the Metro’s Project Director who is also responsible for managing Sections 1 and 3.

6.3.2 Analysis of PB’s Organizational Chart

In PB’s cost-plus fixed fee contract, the more FTE’s (full-time-equivalents, or “people”), the more the project will cost. Moreover, the more “top-heavy” an organization is, with supervisors and managers, the more the project will cost Metro. In order to maximize cost-effectiveness, Metro needs to keep the contractors employees and management at a minimum level needed to accomplish the project within targeted timeframes.

The diagrams below show a summary of the number of employees proposed in PB’s organizational chart by discipline. We used the titles from the invoices of Mod 52 to determine whether the employee was a manager, supervisor, or technical staff. It is understood that the employees proposed may not be the employees who actually work on the project. The organizational chart also does not necessarily show who is full time or part time; where the timesheets show exactly who is billing to the project and to what work category and task item. Therefore, the unknown staff descriptions in the Engineering chart below are the employees who were proposed on the organizational chart but never charged to the Mod 52 work.





As stated in the diagrams above, the following are the findings and recommendations based on PB's Organizational chart:

Finding 3-2: In the “Construction Design Services” section of PB’s organizational chart, the number of proposed managing/supervising staff is appropriate.

Finding 3-3: In the Engineering Services, “Systems Group,” section in PB’s organizational chart, there are 12 managers proposed versus 10 staff. This appears to be excessive based on the ratio of Supervisors/Managers to technical/sub-consultants

Recommendation 3-3: Metro should perform a detailed review the System’s Group’s tasks and requirements in view of streamlining managers.

Finding 3-4: In Engineering Services, “Civil, Utilities & Drainage,” there are 2 PB Supervisors/Managers, 7 PB Technical and 7 Sub-Consultants. This seems appropriate as the ratio of management to the technical/sub-consultants is reasonable based on the many different sub-disciplines in this category.

Finding 3-5: In Engineering Services, “Station Architectural/Urban Designs” there are 3 PB Supervisors/Managers, 4 PB Technical and 3 Sub-Consultants. This seems appropriate as the ratio of management to the technical/sub-consultants is reasonable based on the many different sub-disciplines in this category.

Finding 3-6: In Engineering Services, “Station Planning” there are 2 PB Supervisors/Managers and 1 PB Technical.

While this may seem excessive, we do not recommend streamlining managers from this discipline because the staff identified under Station Planning performs other functions within the organizational chart, and working only part time on Station Planning tasks.

For evaluating the number of managers needed, the article by Blenko, Mankins, and Rogers in their Forbes article (see Attachment 6) “The Key to Successful Corporate Reorganization,” a new structure that enables a leadership team to make critical decisions better and faster is the key to a successful corporate reorganization. Simply changing an organization’s structure may *seem* like an effective way of unlocking better performance. However, corporate reorganizations are actually a risky investment of time and resources. A Bain & Company study of 57 major reorganizations found that less than one third produced significant improvement in performance. Instead of reshuffling an organizational chart, a company needs to reorganize in a way that allows the organization to make faster decisions.

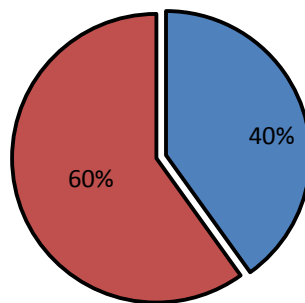
6.3.3 Cost and Hours-Incurred Analysis

Compiling hours incurred from timesheets from February 28 to September 25, 2015, we found that PB billed 19,528 hours (or 40%), while the subcontractors combined billed 29,529.65 hours (60%).

Mod 52 Hours Billed								
	Feb 28 to March 27	March 28 to April 24	April 25 to May 29	May 30 to June 26	June 27 to July 31	August 1 to August 28	August 29 to Sep. 25	Total Hours
PB	1,472	2,169	2,711.5	2,405	5,158.5	3,119	2,493	19,528
Subs	0	5,394.5	4,552.5	3,333.5	5,403.5	5,092.75	5,752.9	29,529.65

Hours Billed By PB vs. Subcontractors

■ PB ■ Subs

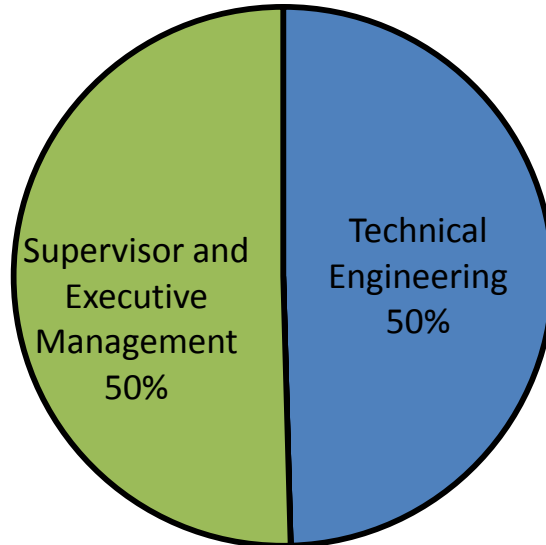


Next, we reviewed the timesheets to determine how much time was billed by PB Executive Managers, PB Supervising Engineers, and PB Technical Engineers. The hours and percentage of total hours incurred from February 28 to September 25, 2015, by category of PB staff are as follows:

Hours and Cost Incurred Analysis				
PB Staff Category	Hours	Percentage of Total Hours	Cost	Percentage of Total Cost
PB Technical Engineering	9,678.5	50%	\$422,964	33%
PB Management - Supervision and Executive	9,849.5	50%	\$851,730	67%
Totals:	19,528		\$1,274,694	

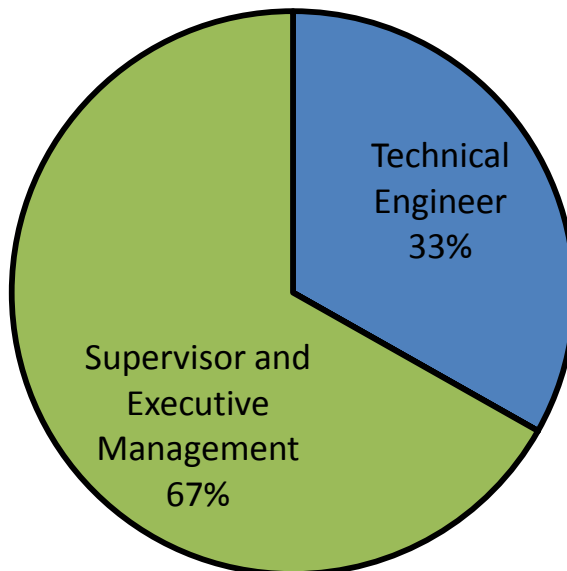
Percentage of Hours Spent

By PB Staff on Mod 52
from February 28 to September 25, 2015



Percentage of Cost Incurred

By PB Staff on Mod 52
from February 28 to September 25, 2015



Finding 3-7: From the review of the timesheets, PB Executive Management and Supervisors combined have billed 50% of the hours and PB Technical Staff have billed 50% of the hours. Because Managers and Supervisors have a higher pay rate, 50% of the hours billed by them resulted in a higher portion of cost (67%). This indicates that Metro needs to perform an organizational/functional review to optimize the level of management and supervisors needed on the project.

Recommendation 3-7: Metro should perform an organizational review that aims to streamline management functions and combine roles of PB staff. While it is understood that a project of this magnitude requires the unique knowledge from various disciplines, we believe that a detailed analysis could identify opportunities for streamlining.

7.0 OBJECTIVE 4A: REVIEW OF PROJECT CONTRACT AND DELIVERY METHODS

7.1 Cost-Plus Contract: How the Contract Type Affects Costs

Section 2254.003 of the California Government Code prevents government agencies from selecting a provider of professional services based on lowest price, but makes the selection and award on the basis of qualifications for a fair and reasonable price. That being said, Metro selected PB to perform these professional services based on PB's qualifications and quality of work, not based on cost.

Moreover, PB's contract with Metro is divided into two parts: A cost-plus contract between PB and Metro, and hourly-not-to-exceed contracts with PB's sub consultants. Rather than being a fixed-price contract, in which a contractor is paid a negotiated amount, regardless of incurred expenses, PB's cost-plus contract with Metro means that PB is paid for all of its allowed expenses to a set limit plus additional payment to allow for a profit. The main disadvantages to Metro of using this type of contract are a limited certainty as to what the final cost will be, and there is less incentive for the consultant to be efficient compared to a fixed-price contract.

In complex projects such as this, the cost plus contract is generally accepted as the best type of contract because of the projects' many unknowns and risks. It would be more cumbersome to have a fixed-price contract and numerous change orders as more unknowns become apparent and design becomes more refined. We do not recommend an alternative contract type.

Finding 4A-1: Metro chose PB based on qualifications, is getting a value product from a highly qualified consulting firm (PB), using a cost-plus contract. Despite the disadvantages to the project owner using a cost-plus contract, this type of contract is historically used for large/complex engineering projects that have many unknowns and risks.

Recommendation 4A-1: Metro should utilize a Design Review Committee to provide additional oversight and accountability over the Design Team to ensure that only permissible costs are paid and the contractor is exercising adequate overall cost controls, and the design meets Metro's design criteria and requirements.

Design Review Committee: This review committee would be made up of a minimum of three people from Metro staff that are outside of the Westside Purple Line Extension Project and should include a director, a technical manager, and an accounting manager. The committee would meet periodically, such as every two months and when a major project milestone is reached. The committee should also meet with the Project Director to review project status, deviations from the contract and schedule, project design, design costs, and design changes and their corresponding implications to the project cost and schedule. They would review the projects detailed project work plan and determine if the Design Engineer is delivering the deliverables in the contract.

The general goal of the Design Review Committee is to ultimately determine that the design meets the design criteria and Metro's Requirements. The main advantage to implementing this committee is that it would identify project deviations on a real-time basis and thus help mitigate the effects of any issues that might arise.

7.2 Project Delivery Methods

The following is a brief discussion of the traditional types of project delivery methods. A discussion on an alternative project delivery method is provided in Section 7.5.

Design/Bid/Build Method – The traditional method of project delivery involves three sequential project phases: design, procurement, and construction. In Design/Bid/Build contracts, the designer (like PB) is hired by the owner develops 100% of the design for construction and seals the drawings with professional stamps, secure all the necessary permits and provides supervision during construction . The contractor who bids on the project has no or little liability (risk) for the design. The designer has most of the responsibility for the design in case of errors and omissions. Design/Bid/Build process may have a longer duration when compared to other project delivery methods since all design work must be fully completed and permitted (or reviewed) prior to solicitation of the construction contract.

Design/Build Method – This project delivery method combines design services with construction performance under one contract. This procurement type became popular in the 1990s. It is viewed as a fast tracking effort (when schedule is tight), owner usually completes Preliminary Engineering or Bridging Documents (often referred to as 30% PS&E, but in case of Metro Westside Extension this has increased to Advanced Engineering. this can help with scheduling and developing accurate cost estimates.) and then these documents are put out to bid to Design/Builder entities (contractor). The design build contractor assumes the design risks and theoretically cannot execute a change orders for design errors or omissions. Due to this shift in design responsibility or risk, the design build contractor usually charges the full design fee for the project; therefore in this scenario the total design fee (owner’s designer + contractor’s designer fees) are usually higher than Design/Bid/Build projects.

Hybrid Method – In the hybrid project delivery method, certain tasks of the project are Design/Bid/Build and other tasks are Design/Build. For example, because this project involves complex tunneling in a congested urban area, utility relocations can cause significant scheduling delays for the Design/Build contractor. If performed properly, completing the third party coordination and relocations as a Design/Bid/Build method in advance of the Design/Build contract could potentially to provide significant value to project, especially in terms of keeping the project schedule. The Lessons Learned report dated February 11, 2015 identified Advanced Utility relocation as a priority for this project; however, for section 2 the hybrid method was not pursued for various reasons, as discussed in Section 7.3.

7.3 Advanced Utility Relocation (AUR) and Hybrid Project Delivery

On a complex tunneling project in a congested urban area, utility relocations can cause significant scheduling delays for the Design/Build contractor. If performed properly, completing the third party coordination and relocations in advance of the Section 2 Design/Build contract has the potential to provide significant value to project, especially in terms of keeping project schedule and minimizing change orders. This was also identified in the Lessons Learned report dated February 11, 2015.

Part of the SOW for Mod 52 is for utility relocations. Utility relocation work includes utility relocation coordination (including third parties), potholing and trenching field work, and utility relocation design. The plan was that the utility relocations for the project will be issued as a separate contract in advance of the Design/Build contract for the Section 2 work.

With the approval FTA to perform engineering activities and perform utility relocation work, Metro planned potholing for utilities at the Wilshire/Rodeo Station. However, that was delayed for a few months because of delays in obtaining 3rd party permits within the City of Beverly Hills. This meant pursuing the hybrid procurement method of a separate Final Design (Design/Bid/Build) Advanced Utility Relocation (AUR) was abandoned. It was determined that the plans could not be prepared, procured, and constructed in time to significantly benefit the Overall Design/Build Contract. Additionally, the FTA and Metro Procurement policies have certain conflict of interest protections that limit the use of the EIR/EIS Consultant to perform major Final Design engineering activities. Although FTA and Metro Procurement approvals were obtained for PB to perform limited Final Design and prepare Design/Bid/Build documents for the AUR work, this approach was not pursued for the Section 2 Project due to schedule constraints.

PB had proposed 14,115 hours for Utility Relocations in Mod 52 (10% of total hours in the Mod). This includes:

- Task 52.07.010 Utility Relocation Coordination (including Third Parties) (3,650 Hours)
 - Developing Relocation Sequencing for Sections 2 Utility Relocations
 - Deliver Coordination Layouts to Third Parties
 - Deliver Third Party Profile Drawings (Draft, Final, Camera Ready)
 - Finalizing AUR Packaging Strategy
 - Support Metro with Third Party Utility Relocations
 - AUR Work Coordination
- Task 52.07.020 Potholing and Trenching (1,000 hours)
 - Finalize Potholing Contracts and Permitting
 - Undertake Potholing and Trenching Fieldwork at Century City
 - Deliver Potholing Report and Drawings (Draft, Final)
- Task 52.07.030 Utility Relocation Design (9,465 hours)
 - Prepare Utility Relocation Drawings (including worksite traffic control plans) and Specifications for Metro Managed Relocation Contracts
 - Deliver Wilshire/Rodeo AUR Contract Drawings and Specifications
 - Deliver Century City/Constellation AUR Contract Drawings and Specifications

Please also refer to Attachment 2, “Utilities Work Effort,” for a summary of the work effort PB has provided.

Finding 4A-2: For the reasons cited above, separate Advanced Utility Relocation (AUR) Contracts will not be issued as previously planned and recommended by the Lessons Learned report. However, this option was not pursued for the reasons discussed earlier such as delays in obtaining 3rd party permits and schedule constraints.

Recommendation 4A-2: Some of the Mod 52 hours proposed by PB under Section 52.07 Utility Relocations may need to be reallocated since Advanced Utility Relocation (AUR) contract will not be pursued for Mod 52. Another option is to modify the Design/Build contract (which is currently out to bid) to have the contractor perform the Utility Relocations as a Design/Bid/Build and have PB as the engineering of record for that portion of the project.

7.4 Importance of Timely Selection of Delivery Method

According to the Design Build Institute of America (DBIA) February 2014 publication titled “Design/Build Done Right: Best Design Build Practices for the Transportation Sector”, (Attachment 4) an owner’s choice of project delivery method and procurement approach strongly influences project results. These choices are among the first decisions an owner should make on the project, and they form the foundation for how the project will be developed, procured and executed, and how the key project stakeholders communicate and relate to each other.

The following is an excerpt from TRCP 131: A Guidebook for the Evaluation of Project Delivery Methods

Timing of Project Delivery Method Selection Transit projects, especially those that receive federal funds, follow several steps during their development.

These steps can be summarized as follows:

- *Alternative Analysis—Draft Environmental Impact Statement (AA/DEIS),*
- *Final Environmental Impact Statement (FEIS)*
- *Full Funding Grant Agreement (FFGA).*

The first two steps roughly coincide with conceptual design (5 to 15% of the design effort) and preliminary engineering (25 to 30% of the design effort). The timing of the FFGA, which represents the federal government’s commitment to fund the project, depends on the project delivery method; the FFGA can come at the end of preliminary engineering or at final design. In selecting a project delivery method, the owner should realize that the window of opportunity to select some methods will close as the project moves through various stages of development...Most of the benefits can be realized by engaging the constructor as soon as possible. The decision point for project method delivery selection should not be confused with the time that the constructor is engaged. As an example, an owner may decide to engage a Design/Build contractor at the end of preliminary engineering or even later in order to clarify

the project scope and reduce the uncertainty. However, the owner should have decided on the type of delivery (e.g., Design/Build) much earlier, so that the design documents can be developed to properly accommodate the type of delivery method.

Advancing of the design beyond preliminary engineering, then putting the project to a Design/Build contract can create potential duplication of design effort. Additionally, the level of effort for the design team is higher for Design/Bid/Build project than a Design/Build project. This is because the design team for the Design/Build contractor will be taking the design risk; they will need to re-verify all designs given to them by the PB team. Although this issue is mitigated by using the BIM design CAD, there still may be some duplicated effort. Further discussion of project delivery methods is provided in Section 7.2.

In January 2015, the decision was made to use the Design/Build contracting process for Section 2. During the preliminary engineering design phase, while the project delivery was unknown, design decisions were probably made to cover both Design/Bid/Build and Design/Build. This is significant since the design level of effort for each contracting method is different; therefore it is possible that project designs are more advanced than typically seen on a Design/Build project.

Finding 4A-3: Metro left the decision open until late in the project whether to use the Design/Build or Design/Bid/Build project delivery method. In January 2015, the decision was made to use the Design/Build contracting process for Section 2.

Recommendation 4A-3: Due to the level of effort required for the different project delivery methods, the decision on which method to use should be made in the early stages of project, and no later than the preliminary engineering phase in order to reduce duplication of design effort.

7.5 Alternative Project Delivery Method

Metro should consider other alternative methods of project delivery for future projects beyond the traditional Design/Bid/Build and traditional Design/Build methods.

According to TCRP Report 131: A Guidebook for the Evaluation of Project Delivery Methods:

Transit agencies have different motivations in selecting a delivery method other than Design/Build. The research team found that no single project delivery method was superior to all others and that transit agencies need to carefully analyze the characteristics of each project to find the project delivery method most suitable for meeting a project's requirements.

The most common reasons for choosing an alternative project delivery method given by project directors interviewed for this research were the following:

- 1. Reducing/compressing/accelerating the project delivery period,*
- 2. Encouraging innovation,*

3. Establishing a budget and involving a contractor early in the process, and

4. Meeting flexibility needs during the construction phase.

Transit agencies should carefully study the risks, costs, and benefits associated with each project delivery method in relation to a particular project under consideration and select the project delivery method that best suits the legal, technical, and business environment in which the project must be built.

Legal limitations on using other delivery methods have mostly been removed, and this has provided more flexibility in the choice of project delivery method. In review of Construction Committee Staff Report 52, dated January 15, 2015, where Metro staff recommended to Metro Board the utilization of Design/Build project delivery method for Section 2, we found that Metro Staff did not mention any consideration of alternative project delivery methods.

The delivery method presented here is a modified form of Design/Build process called “Design-Risk”. It is understood that federal funding may restrict Metro from using the same Design team in the preliminary phase as in the final phase due to conflict of interest. The Design Risk method meets this requirement.

The following discussion is not meant to be a comprehensive explanation of this method, but a brief introduction to Metro who may entertain the idea for future projects.

How Design-Risk Project Delivery Method Works:

In general, this is a modified Design/Build process usually called “Design-Risk” or Project Management at Risk (PM at Risk). It is very similar to Construction Management at Risk (CM at Risk) with exception of the designer is hired by the contractor and not the owner. This modified process selects the Design/Builder on qualifications and proposed fees (typically a design competition is not utilized). This method also enables the Design/Builder and the owner to work together from the beginning of the project.

This method is a two-step project delivery process consisting of a first phase defining the full scope of the project, followed by a second phase to complete the design and construct the project. There would be separate contracts for the first and second phases.

During the first phase, the owner works with the designer to establish and define the scope and best design practice that meets the project requirement while meeting the budget and schedule. The Design/Builder confirms the project program, develops the preliminary engineering or schematic design for the project, continues into advance engineering or design development, commits to a guaranteed maximum price (GMP) and schedule, confirms that other criteria are appropriate, and obtains board approval. In this phase, the owner usually utilizes the services of the contractor (Design/Builder) for Cost Estimating, Scheduling, Constructability Review and Value Engineering. This can ultimately reduce cost by not engaging additional professional services to provide these services as are custom in other construction delivery methods.

The second phase is a guaranteed maximum price (GMP) Design/Build contract that incorporates Preliminary Engineering, updated criteria, direct construction cost budget, contingency, remaining design fees, any management fees, overhead and profit and schedule as agreed to in the first phase.

The Site Authority (owner or in this case Metro) is not obligated to proceed with Phase 2, or with the selected Design/Builder. Also, the Design/Builder is not obligated to proceed with Phase 2 if the contractor so determines that the budget is not adequate, or for other business reasons. Work products and electronic files of the Design/Builder are the property of the Site Authority (owner or in this case Metro). In the event the Metro and/or the Design/Builder do not continue into Phase 2, the Site Authority can use the design documents in any manner, including as bridging documents for subsequent contracts.

Benefits of Design-Risk Method

- The design Risk Method one of the best project delivery methods for eliminating additional cost for design, estimating, scheduling, QA/QC reviews, etc. It is the closest method to Integrated Project Delivery (IPD), which is not commonly used in California where all stakeholders (owner, designer and contractor) are party to the same contract.
- This method provides a mechanism for the owner to select the design builder based on best qualification along with the design portion within the project's scope and budget. The owner can be involved with the design process from the beginning with a little or no risk.
- Hiring the Design/Builder from the beginning of the project allows all the investigation and due diligence to be done upfront which reduces the risk of surprises during construction. This option provides many benefits for large/complex projects such as the Westside Purple Line Extension.
- If the owner/agency is well-educated and experienced with design and construction of complex projects and knows the objective goal (as in the case with Metro), this process can be very beneficial since the owner has direct control and access to the designer and can provide direction to the Design/Builder from the early phases of the project.

Finding 4A-4: Metro did not consider alternative forms of project delivery methods for the Westside Purple Line Extension Project besides the traditional Design/Bid/Build, Design/Build, or Hybrid methods.

Recommendation 4A-4: For future transit construction projects, Metro should consider the Design-Risk project delivery method described above due to the potential benefits of this method. We also recommend that Metro designates a committee to evaluate the pros and cons of each project delivery method and select the most appropriate method for the project using the decision matrix provided in the TCRP Report 131.

8.0 OBJECTIVE 4B: REVIEW OF DRAWINGS

8.1 Scope:

Review and evaluate for accuracy and completeness of the Preliminary Engineering drawings versus the current Advanced Preliminary Engineering drawings.

8.2 Methodology:

The objective is to determine the status of the drawings prior to Mod 52, and to determine what changes and updates were made as part of Mod 52. A detailed summary of the differences between the drawing sets prepared as part of Mod 21, Mod 43, and Mod 52, was developed. The audit team reviewed various drawings, documents, and reports to assess the design work performed in Mod 52. The following drawing sets were reviewed:

Drawing Set	Date Issued	Mod. No.
PE Volume 4 – Final Submission – Rodeo	October 2011	21
PE Volume 5 – Century City Constellation Station	October 2011	21
Advanced Preliminary Engineering Drawings	February 7, 2014	43
Advanced Preliminary Engineering Drawings	July 10, 2015	52
Advanced Preliminary Engineering Drawings	May 1, 2015	52
Westside Subway Extension Project, Section 2, Contract C1120	September 1, 2015	52

The total number of sheets submitted as indicated by the index of drawings in each submittal was compared between Mod 21, 43, and 52. Exhibit D is a compiled a list of drawings, which are highlighted in similar color for the same plan type in each package.

The plans were divided by the different engineering disciplines (mechanical, structural, electrical, architectural, utilities and geotechnical) and a review of the plans was performed by Owen and Brierley engineers. Due to the size and complexity of the project, the plans were reviewed using a sampling method, where approximately 30% of the plans were reviewed. The reviewers focused on the plans with the most risk to the project.

The November 19, 2015 email to the Owen team from Dennis Mori included a cost loaded work plan that shows a Gantt chart schedule and a list of tasks, but not a detailed work plan. Several findings and recommendations in this report are based on the fact that a detailed work plan or project management plan was not available for review.

The bulk of the design changes in Mod 52 are as follows:

- Rodeo Station- revision of the advanced preliminary drawings to remove the cross-over and modify the North Entrance according to the Value Engineering (VE) report dated June 5, 2015.
- Constellation Station- revision of the preliminary drawings (from Mod 21) to advanced preliminary drawings, while simultaneously revising the access at Westfield Mall and addition of the terminus section to allow for the future extension of Section 3. This explains the 40% higher spent hours on the Constellation Station versus the Rodeo Station.

8.3 Findings:

This section contains observations and findings regarding the overall drawing set. A more detailed discussion of each engineering discipline is provided in Attachment 5. Generally, the drawings we reviewed appeared to be accurate and complete.

Design vs. Design-Support

It is a common perception that drawings and the number of drawings are the essence of engineering, and that level of effort in terms of monies spent and hours expended is in direct proportion to the percent completion of the project. However, for this project the amount of effort is not reflected in the project plans and details, and this is expected for underground construction projects where there is a significant level of effort for assessing potential impacts and preparation of contractual documents for the Design/Build procurement. The level of effort spent between engineering design issues (plans, drawings, etc.) and non-design elements (design support, reports, studies, management, third party coordination, etc.) is discussed in detail in Section 4.3.1 of this report. In general approximately 40% of the level of effort was devoted to drawing production.

Iterations of Design

Numerous iterations of design (e.g. interim memos, designs, calculation packages, etc.) between the milestone deliveries in Mod 21, 43, and 52 are likely to have taken place in the development of the plans and contractual documents and represent a significant level of effort, especially in regards to third party coordination (i.e. Westfield, City of Beverly Hills, City of Los Angeles, etc.). The review of these various intermediate project documents was not part of this audit.

Level of Effort and Value Added

Overall, a considerable amount of the effort was put forth in the overall design of the project with some project components receiving more attention than others. Some designs (particularly support of excavation (SOE), utilities, staging areas, and traffic control plans) were advanced more than typically expected for Design/Build, but add significant value to the project for the following reasons:

- Better identification and quantification of construction and long-term risks that will and can be mitigated
- More refined estimate of direct and indirect costs
- Accelerated design and construction schedule.

However, it does appear development of designs and contractual documents related to the Fault study still needs to progress in order for Design/Build contractors to bid on the project, specifically relating to the information on the active fault crossing and revisions to the GDR and GBR once more information becomes available. It is assumed that the information and documents relating to the fault study will be issued as an addendum to the RFP. It is understood that there has been significant coordination and delays relating to securing the appropriate 3rd party permits for the needed testing.

Including Reference Drawings in the RFP

It also appears that some drawings were developed but not included in the RFP documents, (SOE and structural design). It could have been that the PB/Metro design team wanted to better understand the risks, and to get a better cost estimate and evaluate impacts to the schedule. By developing these plans and not including them in the package, PB and Metro are getting the benefit of an innovative design by allowing the Design/Build contractor to provide an independent design. Although this approach includes some duplication of effort, it will allow for initiative by the Design/Build team and allow PB/Metro to assess potential project risks and impacts which may not be completely understood by the Design/Build team. Although some of the drawings have not been included as part of the Project Definition drawings of the RFP issued on September 14, 2015, available drawings lists (titled Percentage Complete) indicate that a significant number drawings (such as for SOE) will be developed as reference drawings. The RFP indicated that reference drawings will be issued in an addendum.

Reduction in the Number of Sheets

Separate Advanced Preliminary Engineering (APE) drawing sets were prepared for Wilshire/Rodeo Station and Tunnels and Century City Constellation Station and Tunnels as part of Mod 52. In addition, the RFP project definition drawings were prepared, which cover all of the Section 2 work, in other words the RFP combined all the drawings for both stations and tunnels. The APE (Mod 52) sets contain approximately 530 and 410 sheets respectively (940 sheets total); and the project definition drawings contain approximately 430 sheets, or roughly half of the total number of sheets previously issued. While some of the reduction in sheet numbers is the result of sheets that were duplicated in each of the Advanced Preliminary Engineering drawing sets, the discrepancy in the total number of sheets is predominately the result of the following:

- No structural drawings and station excavation protection and support drawings are included in the project definition drawings. These drawings account for 78 drawings in the Advanced Preliminary Engineering drawings sets. A significant level of effort was required to generate the structural drawings and the station support of excavation drawings.
- There is a significant reduction in the number of utility relocation drawings provided in the RFP set. The Advanced Preliminary Engineering drawing sets contain 83 utility drawings, while the Project Definition Drawings only contain 13 drawings.
- There is a significant reduction in the number of ventilation and plumbing and fire protection drawings (Advanced Preliminary Engineering drawing sets – 104 drawings; RFP Project Definition drawings – 26 drawings).
- Reduction in electrical design drawings (Advanced Preliminary Engineering drawing sets – 108 drawings; RFP Project Definition drawings – 27 drawings).
- No street work restoration, traffic control, and Temporary Street grading drawings have been included in the RFP Project Definition drawings (54 drawings in the Advanced Preliminary Engineering drawing sets).

Developing and producing these drawings (that were then not part of the RFP package) would have required a significant level of effort.

Available drawing lists, titled *Percentage Complete as of December 31st, 2014* (undated, unauthored), believed to be associated with the Mod 52 work planning, indicate that a significant number of drawings will be developed as reference drawings.

Metro Design Criteria and Drawings

Finding 4B-1: Metro’s Standard Design Criteria that have been developed, modified, and updated over the years are of considerable and accurate detail. For a Design/Build project like this, these standard design criteria should be sufficient enough to include to the bid documents; and therefore some of the drawing sheets may not be needed in the RFP project definition drawings. However, Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering requires drawings to be provided for many of these areas.

Recommendation 4B-1: For future Design/Build projects, consider revising and reducing the RFP drawing delivery requirements for disciplines that have detailed standard design criteria such as structures, mechanical, electrical, and signals and train control. (See Attachment 5 for further discussion.)

It is noted that the drawings that have corresponding design criteria only have basic information or contain typical drawings; however, since the drawing packages has undergone significant administrative changes, i.e. changing drawing numbers, drawing scale, gridlines etc.; reducing the number of drawings would save time and make the design team more efficient. The following are areas where advanced preliminary engineering drawings were produced where maybe a scoping narrative and Metro Design Criteria would have been sufficient. See sections later in this section for a more detailed discussion regarding these plans.

- Mechanical Plans - Plumbing and Fire Protection
- Station Electrical Plans
- Traction Power Plans
- Communications Systems Plans
- Train Control Plans

It is understood that one of the Lessons Learned identified in the February 11, 2015 report was to “Advance the design to a sufficient level of detail...to improve the overall project schedule and development of cost estimates.” The implementation of a Design Review Committee, a detailed work plan, and a review of Metro policies for drawing delivery requirements would help mitigate this issue.

Scale, Grid Lines, Sheet Numbering

Finding 4B-2: For the Century City/Constellation Station drawings and the Wilshire/ Rodeo Station drawings, the scale, grid lines, sheet numbering, and sheet naming were completely changed between the 2011, 2014, and 2015 drawing sets. The level of effort to make wholesale changes for each of the drawing sets is significant. Moreover, detailed work plan was not available to determine how much time was needed to develop the plans in the plans set and to substantiate the cost and hours to develop the products for Mod 52 and the RFP.

See Recommendation 1B-1

9.0 CONCLUSION

Our assessment and analysis of Section 2 Mod 52 (including limited review of Mods 21, 36, and 43) found that PB had reasonably performed and delivered within budget and industry standards and delivered agreed-upon scope items of the Mod at the different stages of design. We found:

- PB's design fees for Section 2 are approximately \$54,415,323 or 2.21% of the estimated capital project budget and 3.86% of construction budget. At the completion of Mod 52, PB's design fees for Section 2 will be approximately 38% of the estimated design budget, leaving the remainder (approximately \$89,207,677) for the design portion of the Design/Build contract. These cost percentages appear to fall within historical values reported by Transportation Cooperative Research Program (TCRP) Report 138 (*Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects*).
- Overall the proposed billable rates and overhead rates associated with advanced engineering work in Mod 52 were reasonable and rates in the contract were used to bill for PB and subcontractor services, except that PB's and subcontractor proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.
- The review did not disclose any management/staff redundancies between Metro and PB. The core Metro project management team for Section 2 is lean consisting of only four individuals.
- Generally, the design drawings we reviewed appeared to be accurate and complete. Some drawings have not been completed yet (the period of performance for Mod 52 is through June 2016).
- PB is performing work on a on a Cost-Plus contract which must be closely managed to minimize cost. The main disadvantages to Metro of using this type of contract are a limited certainty as to what the final cost will be, and there is less incentive for the consultant to be efficient compared to a fixed-price contact.

Major decisions and events that have affected the project's schedule and design costs include:

- Preliminary engineering and advanced preliminary engineering work was well underway when the decision was made to use the Design/Build process for section 2 in January 2015, which was after Mods 36, 43, and 52 were executed. Prior to January 2015 when the project delivery method was unknown, design decisions were probably made to cover both Design/Bid/Build and Design/Build. This is significant since the design level of effort for each contracting method is different.
- Failure of Measure J to pass in 2012 put into question project funding, and resulted in Mod 43 with limited funding. Based on the scope of work of Mods 43 and 52, it is apparent that Metro was aware that Mod 43 alone would not be sufficient to take Section 2 to the RFP process and obtain FFGA approvals.

- Metro left the decision open until late in the project whether to use the Design/Build or Design/Bid/Build project delivery method. Decision was made to use the Design/Build process for section 2 in January 2015, which was after Mods 36, 43, and 52 were executed.
- Decision to add the terminus section to Century City/Constellation Station and to coordinate with Westfield Mall required significant redesign of the station.
- Decision to remove the crossover at Wilshire Rodeo Station (Value Engineering decision) required significant redesign of the station.

This audit identified opportunities to enhance management, control, oversight, and accountability over the project. Attachment K presents a comprehensive list of findings and recommendations. Key improvement areas are:

- Develop a detailed cost loaded work plan for each contract modification that summarizes the current state of the project, clearly describes project objectives, and rational basis for proposed work.
- Utilize a Design Review Committee to provide additional oversight and accountability over the Design Team to ensure that only permissible costs are paid and the contractor is exercising adequate overall cost controls, and the design meets Metro’s design criteria and requirements.
- Implement a methodology to ensure adequate oversight and documentation that accounts for exactly what was delivered at the end of one contract Mod to the next, what was paid for, what was not done, etc. in order to have better control over the contracts.
- Perform an organizational review that aims to streamline management functions and combine roles of PB staff.
- Make the decision on which project delivery method to use in the early stages of project, and no later than the preliminary engineering phase in order to minimize duplication of design effort.
- For future transit construction projects, consider the Design-Risk project delivery method due potential benefits of this method. Also, designate a committee to evaluate the pros and cons of each delivery project method and select the most appropriate method for the project
- For future Design/Build projects, consider revising and reducing the RFP drawing delivery requirements for disciplines that have detailed standard design criteria such as structures, mechanical, electrical, and signals and train control.
- Perform a detailed review of labor escalation costs billed and determine if any adjustments are required.

10.0 LIST OF EXHIBITS

Exhibit A – Comparison of Selected Scope Items for Mods 21, 36, 43, and 52

Exhibit B – Scope of Work Common Tasks

Exhibit C – Contract Modification Authority (CMA) / Change Order Log

Exhibit D – Progression of Design Based on Plan Submittals – Constellation Station

Exhibit E – Progression of Design Based on Plan Submittals – Rodeo Station

Exhibit F – PB Monthly Reports Section 2 Summary

Exhibit G – Variance Comparison between PB and Metro Hours

Exhibit H – PB’s Proposed Mod 52 Hours

Exhibit I – Metro’s Independent Cost Estimate

Exhibit J – Geotechnical Drawing History for Mod 43 to 52

Exhibit K – Summary Table of Findings and Recommendations

11.0 LIST OF ATTACHMENTS

Attachment 1 – List of Documents Reviewed

Attachment 2 – Utilities Work Effort

Attachment 3 – Project Map

Attachment 4 – DBIA Transportation Section “Design-Build Done Right”

Attachment 5 – Detailed Review of Drawings by Discipline

Attachment 6 - The Key to Successful Corporate Reorganization

Exhibit A

Comparison of Selected Scope Items for Mods 21, 36, 43, and 52

Exhibit A: Comparison of Selected Scope Items for Modifications #21, 36, 43, and 52

Mod #21 – Advanced Conceptual Engineering (ACE) and Preliminary Engineering (PE)		Mod #36 – Advanced PE		Mod #43 – Advanced PE Section 2 Additional Work		Mod #52 – Continuation of Advanced PE	
Scope	Deliverables	Scope	Deliverables	Scope	Deliverables	Scope	Deliverables
Engineering Structural Design – Structural Design of Stations							
<p>1. ACE - Station Programs, Concepts, and Locations</p> <p>2. ACE - Develop preliminary structural design documents for all structures during Advanced Conceptual Engineering</p> <p>3. PE – Station Programs, Concepts and Locations</p> <p>4. PE – Structural Design</p>	<p>1A. Project Station Program Documents including Station Site Plan Report</p> <p>1B. Drawings, Presentation Boards, and Models</p> <p>1C. Station Exiting Report per NFPA 130</p> <p>1D. Station Capacity and Circulation Report</p> <p>2A. Preliminary Structural Drawings</p> <p>2B. Outline specifications</p> <p>3. Drawings, Presentation Boards, and Models</p> <p>4. Structural Drawings</p>	<p>1. Continue to advance structural design of Wilshire/La Cienega and Wilshire/Fairfax station modules, based on updated geotechnical data</p> <p>2. General Drawing updates to station PE packages (Wilshire/La Brea, Wilshire/Rodeo, Century City/Constellation, Westwood/UCLA, Westwood/VA Stations) based on updated geotechnical data.</p>	<p>1. Wilshire/La Cienega Station Advanced PE Submission – Structural Elements, draft/final</p> <p>2. Wilshire/Fairfax Station Advanced PE Submission - Structural Elements, draft/final</p> <p>3. Wilshire/La Brea Station PE Update Submission - Structural Elements (1 submission only)</p> <p>4. Wilshire/Rodeo Station PE Update Submission - Structural Elements (1 submission only)</p> <p>5. Century City/Constellation Station PE Update Submission – Structural Elements (1 submission only)</p> <p>6. Westwood/UCLA Station PE Update Submission - Structural Elements (1 submission only)</p> <p>7. Westwood/VA Station PE Update Submission - Structural Elements (1 submission only)</p>	<p>1. & 2.</p> <p>a) Continued Development of the design of the Section 2 (Wilshire/Rodeo & Century City/Constellation) stations to a level that will allow the production of the RFP. Work to include architecture, civil, mechanical & electrical, systems, utilities design, structural, building protection and excavation support.</p> <p>b) Incorporate VE findings as appropriate</p> <p>c). Undertake FLS, CFD, design criteria etc. work to support station designs</p> <p>d) Update BIM model in parallel with the design</p> <p>e). Coordinate the Section 2 Utilities relocation with the station and appendages design and other advanced utility relocation activities as required</p>	<p>1. Wilshire/Rodeo Station - Advanced PE Submission, Draft</p> <p>2. Century City/Constellation - Advanced PE Submission, Draft</p>	<p>1. Advanced PE design of the Century City/Constellation stations to a level that will allow the production of the RFP. Work to include architecture, civil, mechanical & electrical, systems, utilities design, structural, building protection and excavation support. Work includes BIM modeling, drawing changes, and analysis. Additionally, incorporate VE findings as appropriate, update BIM model in parallel with the design and coordinate the Section 2 station and appendages design with utility relocation and other advanced utility relocation activities as required.</p> <p>2. Revise plans for the Wilshire/Rodeo station due to the proposed removal of the crossover. Work includes BIM modeling, drawing changes, schedules and reports. Additionally, undertake FLS, CFD work to support station designs and coordinate the Section 2 Utilities relocation with the station and appendages design and other advanced utility relocation activities as required. Modification of entrance to suit future development at Art Gallery.</p> <p>3. Prepare Basis of Design for Section 2 and other related reports (e.g., SUSMP)</p> <p>4. Section 2 Advanced PE - Station Design Validation - Undertake Capacity and circulation and emergency exiting analysis.</p> <p>5. Section 2 Advanced PE - Undertake Fire Life Safety, Hazard Analysis, System Reliability and System Integration to support station and system wide designs.</p>	<p>1. Century City/Constellation - Advanced PE Submission, Draft</p> <p>2. Wilshire/Rodeo - Updated Advanced PE Submission, Draft</p> <p>3A. Preliminary Engineering Report Final</p> <p>3B. Basis of Design Section 2</p> <p>4A. Century City/Constellation - Advanced PE Submission, Draft</p> <p>4B. Wilshire/Rodeo Station - Update Adv. PE Submission</p> <p>5. Century City/Constellation - Advanced PE Submission, Draft</p>

Exhibit A: Comparison of Selected Scope Items for Modifications #21, 36, 43, and 52

Mod #21 – Advanced Conceptual Engineering (ACE) and Preliminary Engineering (PE)		Mod #36 – Advanced PE		Mod #43 – Advanced PE Section 2 Additional Work		Mod #52 – Continuation of Advanced PE	
Scope	Deliverables	Scope	Deliverables	Scope	Deliverables	Scope	Deliverables
Engineering Tunnel Design – Tunnel & Cross Passage Design							
<p>1. ACE Alignment Design</p> <p>2. ACE Tunnel Design</p> <p>3. PE Alignment Design</p> <p>4. PE Tunnel Design</p>	<p>1A. Plan Set (Including Plan & Profile and Typical Section Drawings, Structures, Systems Elements, Landscape, and street improvements)</p> <p>1B. ROW Drawings</p> <p>2A. Tunnel Design Drawings</p> <p>2B. Building and Adjacent Structure Protection Reports</p> <p>2C. Outline Specifications</p> <p>3. Plan Set</p> <p>4A. Tunnel Design Drawings</p> <p>4B. Building and Adjacent Structure Protection Reports</p>	<p>1. Advance tunnel and cross passage design for MOS1</p> <p>2. Fault crossing analysis, drawings</p> <p>3. Support Metro in the development of guide specifications</p>	<p>1. Tunnel and cross passage advanced PE design package for MOS1, draft/final</p> <p>2. Fault crossing design drawings for site specific hazard analysis updated</p> <p>3. Guide Specification updates as required, draft/final</p>	<p>1. Advance the tunnel and cross passage design for Section 2 to a level that will allow the production of the RFP</p> <p>2. Fault crossing analysis for fault in Section 2 including production of report and drawings</p> <p>3. Adjacent Structures Support Design: Gain additional existing building information and advance the adjacent building protection proposals as it is obtained</p>	<p>1. Tunnel and cross passage advanced PE design package for Section 2, draft/final</p> <p>2. Fault crossing design drawings for site specific hazard analysis updated</p> <p>3. Advanced PE adjacent buildings Protection Report, draft/final</p>	<p>1. Update Tunnel and Cross passage Design for Reach 4, Wilshire/La Cienega to Wilshire/Rodeo Drawings were produced as part of Rodeo Submittal</p> <p>2. Prepare Tunnel Design Reach 5, Wilshire/Rodeo to Century City Constellation</p> <p>3. Prepare Section 2 Building Protection Report, includes Data Collection for affected structures</p> <p>4. Fault Crossing Design. Review fault parameters for design. Prepare technical memorandum and drawings</p>	<p>1. Update Advanced PE Tunnel Design Package for Reach 4 of Section 2 – Draft</p> <p>2. Advanced PE Tunnel Design Package for Reach 5 of Section 2 – Draft</p> <p>3. Building Protection Report for Section 2 - Draft/Final (includes drawings and sketches)</p> <p>4. Technical Memo, Fault crossing design (Section 2) Draft/Final</p>
Geotechnical – Field Work							
<p>1. ACE - Prepare a work plan of proposed additional geotechnical and environmental field investigations needed to fill in gaps in available information.</p> <p>2. ACE - Perform a building foundation inventory (within zone of influence of proposed underground construction), perform soil sampling, borings, prepare logs of test borings, record ground water levels and install permanent ground water observation wells at appropriate locations.</p>	<p>1. ACE - Geotechnical and Environmental Work Plan</p> <p>2. ACE - Geotechnical and Environmental Report</p>	<p>1. Update the Preliminary Geotechnical and Environmental report including geological profile drawings based on:</p> <p>a. Continue geotechnical investigation and in-fill borings (Includes Deferred work), esp, phase 5 in Century City area when alignment selected</p> <p>b. Deepen borings several locations for current profile</p> <p>c. Associated lab testing and reports</p> <p>d. Dewatering investigation/ pump testing</p>	<p>1. Preliminary Geotechnical & Environmental Report (Final)</p>	<p>1. Advance the geotechnical fieldwork for Section 2 including infill borings, environmental borings at Stations, Phase 5 work detailed during PE (fault study fieldwork), deepen existing borings where required, undertake additional borings for station entrances and appendages. Undertake field and laboratory testing program associated with the geotechnical fieldwork.</p>	<p>1. Deliverables contained within reports below</p>	<p>1. Perform geotechnical fieldwork (including lab work) for Century City Constellation. Includes 12 borings and one pump test.</p> <p>2. Perform geotechnical fieldwork (including lab work) for Wilshire/Rodeo. Includes 7 borings.</p> <p>3. Perform other geotechnical fieldwork including fault investigation and horizontal directional drilling (HDD). Fault investigation to be 18 continuous core borings and 41 CPTs. HDD to be approx. 750 ft – three @ ~250 ft each.</p>	<p>1. Traffic Control Drawings (not submitted to Metro)</p> <p>2. Permits (not submitted to Metro)</p> <p>3. Fieldwork boring logs</p> <p>4. Laboratory Testing Results</p>
Geotechnical – Data Report							

Exhibit A: Comparison of Selected Scope Items for Modifications #21, 36, 43, and 52

Mod #21 – Advanced Conceptual Engineering (ACE) and Preliminary Engineering (PE)		Mod #36 – Advanced PE		Mod #43 – Advanced PE Section 2 Additional Work		Mod #52 – Continuation of Advanced PE	
Scope	Deliverables	Scope	Deliverables	Scope	Deliverables	Scope	Deliverables
	PE – Geotechnical Data Report			1. Produce Geotechnical Data Report for Section 2 fieldwork.	2. Deliverables contained within Section 2 RFP Documents.	Prepare Geotechnical Data Reports	1. Geotechnical Data Report - Century City/Constellation & Tunnel, Draft/Final 2. Geotechnical Data Report - Wilshire/Rodeo & Tunnel, Draft/Final 3. Geotechnical Data Report - Stations, Camera Ready 4. Geotechnical Data Report - Tunnels, Draft/Final/Camera Ready
Geotechnical – Technical Memoranda							
	PE – Geotechnical and Environmental Conditions TM, as required PE – Geotechnical Interpretive Report PE – Geotechnical Design Memos PE – Geotechnical Risk Allocation			1. Produce various Geotechnical Technical Memoranda summarizing/interpreting Section 2 geotechnical data for use by the Project	1. No specific deliverables to Metro	1. Prepare Geotechnical Technical Memoranda for Section 2 in support of the engineering design for the station, tunnels, support of excavation, adjacent properties and structures	1. Geotechnical Memoranda (Draft/Final)
Geotechnical – Geotechnical Baseline Report (GBR)							
	PE – Geotechnical Baseline Report	1. Finalize PE Geotechnical baseline report 2. Update geotechnical baseline report for Advanced PE	1. PE Geotechnical Baseline Report (Final) 2. Advanced PE Geotechnical Baseline Report (Draft/final)			1. Prepare Geotechnical Baseline Report	1. Geotechnical Baseline Report - Draft/Final/Camera Ready
Geotechnical – Numerical & Physical Modelling – Section 2							
				1. Continued development of an analytical program for lining evaluation through fault zone including structural analysis of lining section, numerical analysis of tunnel at fault crossings, evaluation, specification of the laboratory testing program, and constructability considerations for Section 2. 2. Physical testing of recommendations from report generated in item 1, through the use of a half scale or full scale fabricated model of segments in a structural laboratory to test capacity of individual segments. Test joints between segments. Test assembled rings under large deformations. Test capability of joints and welds to remain intact as yielding occurs. Testing of the frangible backpacking.	1. Report on Numerical Modelling for Fault Crossings at Section 2 2. Report on Physical Modelling for Fault Crossings at Section 2	1. Undertake Numerical Fault Modeling/ Design and prepare report	1. Numerical Fault Modeling Report, Draft/Final
Geotechnical – Continuation of Geologic Study at Fault Zones for Tunnel Crossings							
		1. Continuation of Geologic Study at Santa Monica Fault Zone including additional investigation WBHL at tunnel crossing 2. Probabilistic Fault Hazard	1. Tunnel Fault Zone Geotechnical Report (Draft/Final) 2. Probabilistic Fault Displacement Hazard analysis	1. Fault Study Fieldwork 2. Continuation of Geologic Study at Santa Monica Fault Zone including additional investigation WBHL at tunnel crossing	1. Deliverables contained within reports below 2. Tunnel Fault Zone Geotechnical Report (Draft/Final)	1. Prepare Fault Study Report	1. Fault Study Report, Draft/Final

Exhibit A: Comparison of Selected Scope Items for Modifications #21, 36, 43, and 52

Mod #21 – Advanced Conceptual Engineering (ACE) and Preliminary Engineering (PE)		Mod #36 – Advanced PE		Mod #43 – Advanced PE Section 2 Additional Work		Mod #52 – Continuation of Advanced PE	
Scope	Deliverables	Scope	Deliverables	Scope	Deliverables	Scope	Deliverables
			report (draft/Final)	3. Probabilistic Fault Hazard analysis	3. Probabilistic Fault Displacement Hazard analysis report (draft/Final)		
Geotechnical – Oil Well Exploration: HDD Investigations							
		1. Directional drilling exploration and magnitometer survey Century Park East to under BHHS area	1. Report on HDD and recommendations	1. Directional drilling exploration and magnitometer survey Century Park East to under BHHS area 2. Commence preparation of HDD/Oil Well Report (using information produced during fieldwork)	1. Deliverables contained within report below 2. Report on HDD and recommendations (to be delivered in next phase)	1. Prepare HDD/Oil Well Report	1. HDD/Oil Well Report, Draft/Final
Section 2 RFP Documents							
				1. Prepare RFP package for Section 2 DB contract including drawings, specifications, reports (GDR, GBR etc.)	1. Section 2 RFP Package – Draft/Final/Camera Ready	1. Prepare RFP Project Definition and Reference Drawings and Specifications for Section 2, Reference Reports, Contract Reports (other) and provide general RFP production support to Metro. Provide bid support services during the procurement phase, including preparation of addenda.	1. Section 2 RFP Technical Documents – Draft/Final/Camera Ready a. General Requirement Sections (60) b. Technical Requirement Sections (247)

Exhibit B

Scope of Work
Common Tasks

Exhibit B: Scope of Work Common Tasks			
Scope of Work for Mod 36 (Preliminary Engineering for all Sections)	Scope of Work for MOD 43 (Continued Advanced Preliminary Engineering Section 2)	Scope of Work for MOD 52 (Continued Advanced Preliminary Engineering Section 2)	Comments
	\$8.9 Million	\$20.8 Million	
Project Management Project Control and Administration -Updated PIP -schedule, monthly progress reports and invoices, change control forms -Sub Contract Management -QA/QC of deliverables -Document Control and IT/Admin Support	Project Management -additional project control support (No Specific Mod 43 deliverable)	Project Management and Project/Office Administration -Updated PIP -schedule, monthly progress reports and invoices, change control forms -Sub Contract Management -QA/QC of deliverables -Document Control and IT/Admin Support	No Redundancy. Expected for continuation of project.
Constructability -Prepare Construction Noise and Vibration Monitoring Program -Construction Traffic Drawings, Draft/Final -Guidelines for "Field Engineer's Manual", Draft/Final -TW deliverables provided under other WBS items -Paleontology draft contract language, Draft/Final -Excavated Material disposal Study Report, Draft/Final -Updates to Cross Passage Construction Study Report, Draft/Final -Updates to Gassy Ground Construction techniques Study Report, Draft/Final -Updates to TBM Requirements Study Report, Draft/Final -Staging and Logistics Study Report, Draft/Final -Review of current industry practices report, Draft/Final -TBM launch site design study report, Draft/Final -Implementation Schedule -Post PE VE Report, as required (incorporation of VE recommendations covered under Engineering), Draft/Final	Constructability for Section 2 -General Constructability Support -Industry Review -Permitting/MOU's Support -Coordination & Third Parties Support -Develop Sequencing for Sections 2 Utility Relocations -VE & Secondary Mitigations -Estimating Support -Advanced PE Estimate -Commencement of Engineers Estimate Section 2 Adv. Utility Relocations	Constructability and Estimating -General constructability Support: application for long lead permits, preparation of MOU's, MOA's for Section -Estimating Support -Risk Management -Traffic Plans for Peak Hour Exemptions	No Redundancy. Expected for continuation of project.
Engineering -Updated Configuration Management Plan, Draft/Final -Configuration Management baseline, Draft/Final -Configuration Management Audits/Reports -Architectural - Station Design, Directive Drawings, Yard Architectural Elements, Art Program, Joint Development, Prepare D/B package for Parking Garage at VA Property and cost estimate -Civil - Advanced Traffic design based on latest entrance locations, General Drawings updates to station PE, Meet with third parties, Street and pavement design at stations, pavement studies, Yard and Shop facilities work, Drainage, Support to Metro Real estate, Coordination of surveys, Track design, PSR/FSR submission as required by Caltrans -Electrical - general drawing updates to station PE packages , update directive drawings for smoke enclosures, Yard advanced PE submission,	Engineering Work Section 2 -Section 2 Stations Advanced PE architectural, civil, mechanical and electrical, systems, utilities design, structural, building protection, and excavation support - Advanced PE submission for both stations -Blast Protective Design Report -Systems and Track Linewide Advanced PE Design - Draft -Tunnel Advanced PE design -Potholing and Trenching Fieldwork -Topo Survey for streets and staging areas and buildings -Engineering support for Metro Real Estate property certifications	Engineering -Technical engineering management for delivery of Advanced PE Design and RFP document production -Advanced PE design of Constellation Station to a level that will allow production of RFP. Includes architecture, civil, mechanical and electrical, systems, utilities design, structural, building protection and excavation support. -BIM modeling, drawing changes, and analysis. -incorporate VE findings as appropriate. Update BIM in parallel with design -coordinate station and appendages design with utility relocation and other AUR activities. -Revise plans for Rodeo station due to proposed removal of crossover -Basis of Design and other related reports -Real Estate property certifications -Replacement property study - Draft/Final -Relocation Plan - Draft/Final -Blast protective Design report -Tunnel Design Package for Reach 4 and Reach 5 -Building Protection Report -Fault Crossing Design -Ventilation Report -Station design Validation -Fire Life Safety -Systems and Track Package -Systems Reports -Station area planning, coordinate station entrance and ancillary appendage design to accommodate mutual objectives of Metro and recent property developers	Redundancy found.
Geotechnical See Exhibit A	Geotechnical Section 2 See Exhibit A	Geotechnical See Exhibit A	See Exhibit A
	RFP Documents Section 2 -Prepare RFP package for Section 2 DB contract including drawings, specifications, reports - Draft, Final, Camera Ready	RFP Production and bid Support Services -Prepare RFP Project Definition and Reference Drawings and Specifications for Section 2, Reference Reports, Contract Reports (other) and provide general RFP production support to Metro. Provide bid support services during the procurement phase, including preparation of addenda. -Section 2 RFP Technical Documents - Draft/Final/Camera Ready General Requirement Sections (60) Technical Requirement Sections (247)	Redundancy found.

<p>Engineering</p>	<p>Engineering Services during Construction Section 2 -Demolition Contract Engineering support during construction through 6/27</p>	<p>Engineering Support during Construction -Engineering Services during Construction of the AUR contract of Rodeo Station -Engineering Services during Construction of the AUR contract of Constellation Station</p>	<p>No Redundancy</p>
	<p>Advanced Utility Relocations Contract -Production of the contract package for AUR - IFB Drawing Set and IFB Technical Specifications -Support during AUR Contract Procurement -technical support during bid phase of AUR contract - formal responses to technical questions associated with the bid process</p>	<p>Utility Relocation -Finalize AUR packaging strategy -Develop Relocation Sequencing -Support with Third Party Utility Relocations and AUR work coordination - profile drawings and coordination layouts to Third Parties -Finalize Potholing Contracts and Permitting - Undertake Potholing and Trenching Fieldwork at Constellation and Rodeo, -Prepare Potholing Report -Prepare Utility Relocation Drawings(AUR Contract Drawings and Specifications) with worksite traffic control plans</p>	<p>Redundancy found.</p>

Exhibit C

Contract Modification Authority (CMA) / Change Order Log

Exhibit C: Contract Modification Authority (CMA) /Change Order Log					
Mod No.	Description	Preliminary Engineering (All Sections)	Section 1	Section 2	Section 3
N/A	INITIAL AWARD (6-8-07)	\$3,654,061			
1-8	ALTERNATIVES ANALYSIS (9-1-09)	\$27,515			
9-20	ADVANCED CONCEPTUAL ENGINEERING/DRAFT/EIS/EIR/(9-16-10)	\$18,590,710			
21	PRELIMINARY ENGINEERING (11-1-10)	\$43,632,826			
22	FINAL EIS/EIR (11-1-10)	\$4,761,377			
23	CLOSE-OUT ALTERNATIVE ANALYSIS (1-12-11)	-\$31,300			
24	ADDITIONAL FAULT INVESTIGATION-TRANSECT 2 (5-6-11)		\$480,250		
25	RISK MANAGEMENT SUPPORT		\$208,417		
26	ADDITIONAL FAULT INVESTIGATION TRANSEC 4 (7-5-11)		\$453,264		
27	CENTURY CITY REFINID RIDERSHIP FORECAST (4-13-11)		\$22,985		
28	ADDITIONAL RAIL SIMULATION STUDY (4-20-11)		\$72,646		
29	REVISIONS TO SAFETY MANUAL		\$0		
30	OIL WELL INVESTIGATION PROGRAM		\$107,165		
31	ADDITIONAL FAULT INVESTIGATION TRANSEC 3 (6-2-11)		\$411,949		
32	ADDITIONAL FAULT INVESTIGATION TRANSEC 7 (7-5-11)		\$310,754		
33	HISTORIC PROPERTY SURVEY (5-13-11)		\$46,442		
34	ADDITIONAL FAULT INVESTIGATION TRANSEC 6		\$102,054		
35	ADDITIONAL STATION ENTRANCE REPORT (8-9-11)		\$119,074		
36	ADVANCED PRELIM ENGINEERING (11-1-11)	\$16,996,740			
37	LADWP UTILITY RELOCATIONS (4-17-12)		\$84,659		
38	TITLE V1 SERVICE EQUITY (4-17-12)		\$51,185		
39	DESIGN SERVICE FOR EXPLORATORY SHAFT (7-5-12)		\$0		
40	PERIOD OF PERFORMANCE EXTENSION (10-31-12)		\$0		
41	BID PERIOD SERVICE (3-25-13)		\$18,816,205		
42	CANCELLED				
43	ADVANCED PRELIM ENGINEERING (SECTION 2) (4-22-13)			\$8,836,296	
44	ADDITIONAL BORINGS (8-16-13)				\$439,292
45	ADDITIONAL CAPACITY STUDY (10-9-13)			\$24,030	
46	VENTILATION STUDY (12-18-13)			\$470,527	
47	ADDITIONAL AUR WORK (2-11-14)		\$493,563		
48	DESIGN SUPPORT SERVICES DURING CONSTR. FY15 (5-30-14)		\$11,657,611		
49	PERIOD OF PERFORMANCE EXTENSION (6-26-14)			\$0	
50	NEW STARTS SUPPORT SECTION 2 (8-11-14)			\$357,057	
51	SECTION 2 STATION AREA PLANNING (8-21-14)			\$126,728	
52	CONTINUED ADVANCED PRELIM ENGINEERING SECTION 2			\$20,820,226	
53	UTILITY ENGINEER SUPPORT (1-7-15)		\$358,798		
54	PERIOD OF PERFORMANCE EXTENSION (12-23-14)			\$0	
55	PERIOD OF PERFORMANCE EXTENTION (12-24-14)			\$0	
56				\$0	
		All Sections	Section 1	Section 2	Section 3
	Total (A) =	\$87,631,929	\$33,797,021	\$30,634,864	\$439,292
	Miles Per Section =	9.36 miles	3.92 miles	2.54 miles	2.9 miles
	All Sections Total Weighted out Per miles (B) =	-	\$36,700,551	\$23,780,459	\$27,150,918
	Total Each Section (A) + (B) =	\$152,503,106	\$70,497,572	\$54,415,323	\$27,590,210

Exhibit D

Progression of Design Based on Plan Submittals – Constellation Station

Exhibit D: Constellation Progression of Design Based on Plan Submittals

Exhibit D: Constellation Progression of Design Based on Plan Submittals					
Actual No. of Sheets Submitted Per Drawing Index					
Constellation 2011 Preliminary	Drawing Count	Total	Constellation Advanced 2015	Drawing Count	Total
Index	6	6	Index	6	
General Plan and Profile	21	21	General Arrangement Plans and Sections	23	40
			Track Alignment	17	
Right of Way	10	10	Right of Way	12	12
Maintenance and Protectin of Traffic and Hauling Route	10	11	Construction Staging Areas - Demo and staging and Restoration	9	44
Signage and Striping Restoration	1		Street Work Demo	6	
			Traffic Control Street Signage, Striping and Signals (Existing)	6	
			Street Work Restoration	5	
			Traffic Control, Street Signage & Striping and Signals Restoration	4	
			Temporary Street Grading	5	
			Traffic Control Staging	6	
			Street Lighing	3	
Utilities (Existing)	11	24	Existing Active Utilites - Stations	11	63
Utilities (Relocated)	13		Existing Utilites - Tunnel Reaches	10	
			Utility Relocation Temporary	9	
			Utility Relocation Permanant	33	
Architectural	19	19	Architectural Drawings	24	24
Structural	50	50	Structural	15	37
			Station Excavation Protection and Support	22	
Mechanical Tunnel Ventilation	40	76	Mechanical Ventilation	28	51
Mechanical Plumbing and Fire	36		Mechanical Plumbing and Fire	23	
Electrical	27	27	Electrical	54	54
Signals and Train Control	14	14	Signals and Train Control	11	11
Systems Design	14	28	Systems Design	7	26
Traction Power	14		Traction Power	19	
Station Workzone	7	7	Station Water and Gas Proof	13	13
Civil Grading	2	2	Tunnels and Crosspassages	11	11
Restriping	2	2	Geotechnical and Building Instrumentation	9	9
General Drawings	1	1	Tractwork	3	3
Drainage	9	9	Corrosion Control	6	6
Total Sheets=	307		Total Sheets=	410	

Exhibit E

Progression of Design Based on Plan Submittals – Rodeo Station

Exhibit E: Rodeo Progression of Design Based on Plan Submittals								
Actual No. of Sheets Submitted Per Drawing Index								
Rodeo Preliminary 2011	Drawing Count	Total	Rodeo Advanced 2014	Drawing Count	Total	Rodeo 2015 Updated	Drawing Count	Total
Cover sheet + Key Map	2	2	Cover Sheet	1	1	Cover sheet + Key Map	2	2
Index	6	6	Index	7	7	Index	6	6
General Plan and Profile Drawings	18	18	General Arrangement Plans and Sections	17	34	General Arrangement Plan and Sections	22	41
			Track Alignment	17		Track Alignment	19	
Right of Way	10	10	Right of Way	9	9	Right of Way	9	9
Restriping, Curb Cuts and Street Furniture	2	24	Staging Areas, Demo, Staging and Reconstruction	6	39	Construction Staging Areas, Demo, Staging and Restoration	6	54
Maintenance and Protection of Traffic and Hauling Routes	19		Street Demolition and Restoration	10		Street Work - Demo	4	
Signage and Striping Restoration	3		Signage and Striping Restoration	3		Traffic Control, Street Signage, Striping and signals, Existing	8	
			Maintenance and Protection of Traffic and Hauling Routes	20		Street Work Restoration	8	
						Traffic Control Street Signage Striping and Signals Restoration	7	
						Temporary Street Grading	5	
						Traffic Control Staging	14	
				Street Lighting	2			
Utilities Existing	16	33	Composite Utilities	15	45	Existing Active Utilities Station	9	65
Utilities Relocated	17		Temporary Utility Relocation During Excavation	15		Existing Abandoned Utilites	3	
			Permenant Utility Relocation After Excavation	15		Existing Utilities Tunnel Reaches	12	
						Utility Relocation Temporary	18	
						Utility Relocation Permenant	23	
Architectural Drawings	16	16	Architectural	32	43	Architectural	32	32
			Architectural Directive	11				
			Tunnels and Crosspassages	14	14	Tunnels and Crosspassages	11	11
Station Workzone	9	9	Station Water Gas Proof	11	11	Station Water and Gasproof	12	12
Structural	45	45	Structural	12	31	Structural	15	41
			Station Excavation Protection and Support	19		Station Excavation Protection and Support	26	
			Geotechnical and Building Intrumentation	4	4	Geotechnical and Building Intrumentation	5	5
Mechanical Ventilation	35	65	Mechanical Ventilation	34	65	Mechanical Ventilation	27	53
Mechanical Plumbing and Fire	30		Mechanical Plumbing and Fire	31		Mechanical Plumbing and Fire	26	
Electrical	21	21	Electrical	104	104	Electrical	54	54
Signal and Train Control	14	14	Signals and Train Control	37	37	Signals and Train Control	7	7
Systems	14	28	Systems	41	75	Systems	6	18
Traction Power	14		Traction Power	34		Traction Power	12	
			Survey Control Monumentation	5	5	Survey Control Monumentation	5	5
Civil Grading, Drainage and Surface Work	1	1	Contract Rail	12	12			
General Drawings	1	1	Tractwork	3	3			
Drainage	7	7						
Total Plans Submitted =	300		Total Plans Submitted =	539		Total Plans Submitted =	415	

Exhibit F

PB Monthly Reports Section 2 Summary

LEGEND GEOTECHNICAL TASKS IN RED TUNNEL AND STRUCTURAL ENGINEERING TASKS IN BLUE									
Date	December 27 2014 - January 30 2015	January 31 - February 27 2015	February 28 - March 27 2015	March 28 - April 24 2015	April 25 - May 29 2015	May 30 to June 26 2015	June 27 to July 31 2015	August 1 to August 28 2015	August 29 to September 25 2015 - Draft
Actual Hours	Mod. 43 - 2,334 hrs.	Mod. 43 - 2,426 hrs.	Mod. 43 & 52 - 3,937 hrs.	Mod. 43 - 219 hrs. Mod. 52 - 5,668 hrs.	Mod. 52 - 7,048 hrs.	Mod. 52 - 6,547 hrs.	Mod. 52 - 11,162 hrs.	Mod. 52 - 9,400 hrs.	Mod. 52 - 9,377 hrs.
Actual Full Time Equivalent (FTE)	13 FTE	15 FTE	25 FTE	Mod. 43 - 1.37 FTE Mod. 52 - 36 FTE	44 FTE	41 FTE	70 FTE	59 FTE	59 FTE
Forecasted FTE	13 FTE	21 FTE	21 FTE	Mod. 52 - 52 FTE	71 FTE	72 FTE	70 FTE	67 FTE	52 FTE
Commentary	Section 2 work will be rebaselined in the next period. Forecast for planned hours will be adjusted to reflect revised scope and schedule. Additionally, work has yet to commence on geotechnical fieldwork.	Following Metro Board Action that occurred on Feb. 26, 2015, the Project Team get the go ahead to finalize rebaselining of the schedule for Section 2. Forecast for planned hours will be adjusted to reflect revised scope and schedule.	Work commenced on Mod 52 this period. Rebaselining of the Section 2 schedule is complete. The rebaselining of the planned hours associated with the rebaselined Section 2 schedule will be completed and reported on from next period. Staffing increased to meet the requirements of the rebaselined Section 2 schedule and deliverables.	Work on Mod. 43 was partially rebaselined this period to account for the remaining work and the commencement of Mod 52. The remaining budget will be utilized for Geotech work. A change to extend the end of performance from June to December 2015 will be requested. For work on Mod. 52: Staffing level has not been achieved. As a result, the technical reports being worked on during this period did not reach the anticipated level of completion.	Geotechnical work, potholing and technical reports for Constellation did not reach the anticipated level of completion.	Geotechnical work and potholing at Rodeo Station area has not started. Some technical reports did not reach the anticipated level of completion.	Geotechnical work and potholing at Rodeo Station area has not started yet.	Geotechnical work and potholing at Rodeo Station area are due to commence early next period.	Geotechnical work and potholing at Rodeo Station area commenced during this period.
TASK			Description						
Contract Modification 52 was Signed Finalized Schedule for Section 2			X						
Wilshire/Rodeo Station	Medium Growth Rate Study completed and being reviewed internally.	Second Draft Medium Fire Growth Rate Study was completed last period and is being reviewed internally.	Second Draft Medium Fire Growth Rate Study was completed last period and is being reviewed internally.	Second Draft Medium Fire Growth Rate Study was completed in period 8 (Feb. 2015) and is still being review internally.					
			Water distribution lines along the alignment requiring shut-off valves have been identified and gas lines are currently under investigation.						
	Continued to work with SEC on incoming power feeds.	Continued to work with SEC on incoming power feeds.	Continued to work with SCE on incoming power feeds.	Continued to work with SCE on incoming power feeds.	Continued to work with SCE on incoming power feeds is pending SCE second power feed analysis.				
				Permit applications for the Geotechnical site investigation were submitted to City of Beverly Hills (COBH).	Permit applications for the Geotechnical site investigation submitted to COBH. Meetings held with COBH on geotechnical and potholing fieldwork.	Continue on meetings held with COBH on geotechnical and potholing work towards receiving permits in August 2015.			
				Utility potholing sub-contractor finalizing their proposal.	Utility potholing sub-contractor began traffic control drawing production for submittal with permitting package.	Utility potholing sub-contractor continued traffic control drawing production for submittal with permitting package. Work plan and pothole/trenching plan prepared and submitted.	Utility potholing - pending COBH council meeting and authorization to proceed.	Utility potholing - street permits issued. First stage of potholes were marked in preparation for start of work on Sept. 1.	Utility potholing - trenching and potholing fieldwork is nearly complete.
				Existing building information downloaded from COBH internet site where available and collated.					
				Real estate property identification for construction staging planning.					
				Finalized SOW for Historic American Building Survey for the ACE Gallery Building.					
							Building protection for station - screening is complete. A ground movement analysis is underway.	Building protection for stations - ground movement analysis is complete.	Building protection for stations - sensitivity analysis to alternative strut spacing and other cases is complete. Some updates to dewatering settlement to be finalized. Report writing underway.
					Building protection for tunnel is underway.	Building protection for tunnel is underway.	Building protection for tunnels is underway.	Building protection for tunnels is underway.	Building protection for tunnels is underway.
						Tunnel seismic design is underway.	Tunnel seismic design for fault crossing is on-going.	Tunnel seismic design for fault crossing is on-going.	Tunnel seismic design for fault crossing is on-going.
					Advanced PE submittal for July. Submittal revised to remove crossover structure. Advanced PE drawing model and production including: Architectural and Structural program - model masses with new east module (without crossover) - center circulation model massed with center loaded platform. General Arrangement drawing sheets for the station site and Tunnel Reach 5 - Station moved 7 feet south to not preclude a future entrance to the north and 150+ feet to the east with removal of crossover. Track alignment will be adjusted next month. Utility relocations - first stage utility relocations have started. Traffic control and street lighting restoration has started.	Continued Advance PE for the Wilshire/Rodeo Station which included removing the crossover. Drawing production is complete and drawings have been locked down for QA/QC including: Architectural and Structural Mechanical, Electrical and System programs General Arrangement drawing sheets for the station site and Tunnel Reach 5 Tunnel Drawings from Wilshire/La Cienega Station to Rodeo Station Track Alignment Utility relocations - first stage utility relocations Traffic Control and street lighting restoration Street Restoration	Submitted Advanced PE drawings for Metro review. Update includes removal of the Crossover at Wilshire/Rodeo Station and station alignment revisions to incorporate this change.		

					Scope of work for COBH departments and Third Parties for RFP review and support completed.				
						Advanced PE REVIT model is complete and is ready for QA/QC clash detection.	Advanced PE REVIT model QA/QC clash detection has been completed.		

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Century City/Constellation Station	Potholing and trenching - potholes are 60% complete. Remaining potholing scheduled for February.	Potholes and trenching were completed this period.	Geotechnical fieldwork at Century City/Constellation commenced and was 60% complete at period end.	Geotechnical site investigation borings completed. Laboratory testing and report preparation are underway.	Geotechnical site investigation borings are completed, laboratory testing near completion. GDR and GDM updates due next month.				
	Geotechnical Site Investigation Traffic Control Plans have been submitted. Site investigation field work is scheduled to commence next period.	Geotechnical Site Investigation Traffic Control Plans have been submitted. Site investigation field work is scheduled to commence second week of March.		Geotechnical preliminary design values have been prepared for the GDM for the stations. Structural analysis started using GDM design Values. Geotechnical numerical modeling started using GDM design values.	Structural analysis for west ancillary module underway.	Draft GDR and GDM submitted for internal review.	Structural analysis for the station and station main entrance is complete and ready for QA/QC review	QA/QC review of the structural analysis for the station is complete.	Updates to the structural analysis for the station following QA/QC checks are complete.
	Architectural REVIT model for crossover module under development incorporating the emergency exhaust plenum and tunnel side dampers together with updates for the incoming power switch room.	Architectural REVIT model for crossover module developed. Architectural model for west ancillary module under development. System and mechanical crossover REVIT models under review. Model updates scheduled to commence next month.	The architectural program and REVIT model for the west ancillary module is near completion and the system and mechanical crossover REVIT models are now complete for Advanced PE design.	Advanced PE drawings Production continued, including: Architectural and structural program, REVIT model and drawings. Mechanical, Electrical and System program, REVIT model and drawings. General arrangement drawing sheets for the station site and Tunnel Reach 5 (Rodeo to Century City). Track alignment and ROW from Wishnie/Rodeo Station to Century City Constellation Station.	Advanced PE submittal for Metro review (May 1). Advanced PE drawings production has been completed.	Began responses to Metro review comments received on Advanced PE submittal for Century City Constellation Station			
	Continued to work on draft building protection reports for station area and tunnel alignments.	Continued to work on draft building protection reports for station area and tunnel alignments.	Continued to work on draft building protection reports for station area and tunnel alignments.	Utility relocations - first state utility relocations. Traffic Control and street lighting restoration. Street restoration. Building protection - Instrumentation. Meetings with third parties.	Building protection screening is completed, geotechnical numerical modeling is underway for general case.	Building protection screening is completed, geotechnical numerical modeling is underway for general case.	Building protection - ground movement analysis has been completed and the Building Protection Report is in preparation.	Building protection - building protection report is in preparation.	Building protection - analysis is complete and report is in preparation.
	Major utilities along Tunnel Reach 5 requiring preconstruction survey are being identified and tabulated.	Major utilities along Tunnel Reach 5 requiring preconstruction survey have been identified.	Meeting were held with LADWP, telecom companies, BOE, BSL, and LADOT to discuss requirements for construction and street restoration.	Street restoration. Building protection - Instrumentation. Meetings with third parties.	Continued Real Estate property identification and staging plans, and met with third parties to review utility relocation plans and street restoration.	Continued Real Estate property identification and staging plans, and met with third parties to review utility relocation plans and street restoration.			
	Street restoration drawing sheets have been set up.	Street restoration drawing sheets are under preparation.	Street restoration drawings are still under development.		Street restoration, BSS requested landscape drawings as part of the APE submittal. Supplemental submittal to BSS to be prepared next month.	Street restoration, BSS requested landscape drawings as part of the APE submittal. Supplemental submittal to BSS has been prepared and submitted this period.			Street work reference designs are near completion.
	General arrangement drawing sheets for Tunnel Reach 5 have been set up.	General arrangement drawing sheets for Tunnel Reach 5 have been set up.	General arrangement drawing sheets for the station site and Tunnel Reach 5 are near completion with information on major utilities requiring instrumentation being added.						Sanitary sewer and storm drain temporary and permanent relocations reference designs are near completion.
			JMB (developer) joint development updated to the entrance configuration were received from JMB this month. The impact on station entrance and appendages is currently under consideration.						
	Temporary Street Grading for flush deck placement is under development.	Temporary Street Grading for flush deck placement was completed and drawing sheets are under development.							
						Three options for the long term Traffic Stage for building the station staging out of the street have been prepared for a LADOT meeting to be held next month to discuss before preparing Traffic Mgmt. Plans for peak hour exemptions.	Traffic management plans - traffic analysis for construction phase TBM delivery and assembly completed. Traffic analysis is underway for the three options building the station staging out of the street which were prepared last month for LADOT.	Traffic management for Section 2 construction is underway. Traffic analysis for construction staging on Constellation Blvd. is complete.	Traffic management plans for Section 2 Construction are complete and were submitted. Traffic management report that accompanies the traffic analysis and plans is complete and submitted.
						Meetings have been held with third parties on continuing coordination of traffic management, street restoration and utility relocations.		Design coordination meetings were held with LADWP-Water, LADWP-Power, and Telecommunications companies. Comment review meetings were held with all of the City Agencies.	Design coordination meetings were held with LADWP-Water, LADWP-Power, SCG, and Telecommunications companies.
						Utilities - Coordination with ATT and other utilities for relocation away from excavation support and decking. Structural analysis for the station is being finalized and is ready for QA/QC checking.		Draft AT&T coordination drawings including plan and profile were completed and forwarded to AT&T for them to procure design services to do the detailed design.	
								Draft Telecom Joint Trench coordination drawings including plan and profile were completed and sent to Cable Engineering Services for their design input.	
	Street "furniture" field investigation log of inventory compiled and ready for internal review.	Street "furniture" field investigation log was completed.				Station Site Street Furniture and Equipment Report completed and submitted.			Final checking of the coordination for the combined street furniture program.
					Assisted Metro with preparation for Industry review to be held June 4, including submittal of drawing package, reports, and description of work.	Assisted Metro with presentation for the Industry Review meeting that was held on June 4.			

										LADWP - Water relocation detailed design is underway.	LADWP - Water relocation detailed design are near completion.
	Main Station Entrance (JMB) - Several entrance footprints were evaluated for utility and traffic impacts in preparation for developing final layout with building owners and their architects.	Westfield joint development entrance updates to the configuration were received from Westfield and reviewed. A workshop held with the Westfield Mall consultants, Gensler Architects to work through some of the design issues.								SCG natural gas coordination drawings near completion.	SCG coordination drawings are completed and with SCG for final design.

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RFP Documents							Completed RFP Project Definition Drawings which are ready for QA/QC review.	A readiness review meeting for contract C1120 was held on 8/21/15. The RFP project definition drawings were submitted to Metro on 8/24. GDR submitted 8/24.	Technical requirements are underway for all disciplines.
							Geotechnical Baseline Reports and other reports are in preparation.	Geotechnical Baseline Reports and other reports are in preparation.	Geotechnical fieldwork commenced on September 9th and 24/62 borings were completed.
								Preparation of "Basis of Design Report" underway.	Production of geotechnical reports continues.
Section 2 System Wide	System Operating Plan for Section 2 under development.	System Operating Plan for Section 2 under development.	System Operating Plan for Section 2 is nearing completion	System Operating Plan for Section 2 is under internal review	System Operating Plan for Section 2 is under internal review	System Operating Plan for Section 2 is under internal review	System Operating Plan for Section 2 is under internal review	System Operating Plan for Section 2 QA/QC was performed	System Operating Plan Report finalized and submitted
Engineering tasks applicable to all of Section 2. Work includes the system operating plan, operation and maintenance plan, failure analysis, communications, traction power, and trackwork.	Operation and Maintenance Plan for Section 2 under development. Failure Analysis Report for Section 2 under development.	Operation and Maintenance Plan for Section 2 under development. Failure Analysis Report for Section 2 under development.	Operation and Maintenance Plan for Section 2 is nearing completion Failure Analysis Report for Section 2 is nearing completion	Operation and Maintenance Plan for Section 2 is under internal review Failure Analysis Report for Section 2 is under internal review	Operation and Maintenance Plan for Section 2 has been completed Failure Analysis Report for Section 2 is under internal review	Failure Analysis Report for Section 2 is under internal review System wide APE drawings have been completed and locked down for QA/QC review, including Train Control, Communications, Traction Power and Trackwork	Failure Analysis Report for Section 2 is under internal review System wide APE drawings have been completed and were submitted to Metro on July 17, 2015 including Train Control, Communications, Traction Power and Trackwork	Failure Analysis Report for Section 2 QA/QC was performed Traction Power Load Flow Analysis was completed and is ready for QA/QC and internal review	Failure Analysis Report finalized and submitted Traction Power Load Flow Analysis was completed and is pending QA/QC and internal review
General						Supported Metro by providing presentation materials for their industry review meeting on June 4. Completed and submitted Value Engineering alternatives for Section 2 this period.			
Utility Coordination and Third Parties				Coordination with multiple utilities to document existing conditions including: Century City Constellation Station: LADWP Power, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, SCE Comm, Time Warner, and Southern California Gas. Rodeo Station: Southern California Edison, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, Time Warner, and Southern California Gas.	Coordination with multiple utilities to document existing conditions including: Century City Constellation Station: LADWP Power, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, SCE Comm, Time Warner, and Southern California Gas. Rodeo Station: Southern California Edison, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, Time Warner, and Southern California Gas.	Coordination with multiple utilities to document existing conditions including: Century City Constellation Station: LADWP Power, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, SCE Comm, Time Warner, and Southern California Gas. Rodeo Station: Southern California Edison, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, Time Warner, and Southern California Gas.	Coordination with multiple utilities to document existing conditions including: Century City Constellation Station: LADWP Power, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, SCE Comm, Time Warner, and Southern California Gas. Rodeo Station: Southern California Edison, Level 3, AT&T, XO, Nextlink, Verizon Business, Centurylink, Zayo, Time Warner, and Southern California Gas.	Coordination continues with multiple utilities to document existing conditions including Century City Constellation Station Site Utilities: Water Relocation split in scope between LADWP and D/B Contractor has been completed with exhibits and has been forwarded to LADWP for discussion. Coordination with LADWP-Power design is ongoing.	Coordination continues with multiple utilities to plan the utility relocations at the Century City Constellation Station Site Utilities: Discussions on to assign design and construction responsibilities for each LADWP water main segment is continuing. Preliminary conduit design of the LADWP power service is in progress. Preliminary design discussions with SCG concerning their relocation. Preliminary conduit design of the AT&T telephone lines is in progress. Preliminary conduit relocations of the SCE electrical line.
						Utility Corridors - PB has been developing utility corridors for the temporary utility relocations for both stations.	Utility Corridors - PB has been developing utility corridors for the temporary utility relocations for both stations.	Utility Corridors - PB has been developing utility corridors for the temporary utility relocations for both stations.	Utility Corridors - PB has been developing utility corridors for the temporary utility relocations for both stations. PB will be developing profiles for the various utilities.
Support of Stakeholder	Continued to support Metro in meeting with adjacent property owners, JMB and Westfield, to review entrance requirements.	No Mod. 43 submittals.	Participated in ongoing discussions with Westfield and JMB on the integration of station entrances into their respective property development plans.						
Major Submittals (from Mod. 52 unless stated otherwise)	Mod. 43: Geotech. & Env. Work Plan - City of LA - Advanced PE Phase (Draft)	No Mod. 43 submittals.	Mod. 43: 03.03.110 QA - Sec 2 - Building and Adjacent Structure Protection Report Tunnel (Draft)	Mod. 52 Baseline Schedule	C1120 - Section 2 Adv. PE Design - Century City Constellation Station	Draft Operation and Maintenance Plan was completed and submitted this period	Section 2 C1120 APE Design - Wilshire/Rodeo Station & Tunnels Updated	Section 2 Relocation Plan (Draft)	Preparation of "Basis of Design Report" underway.
	Mod. 43: Section 2 Relocation Plan (Draft)	No Mod. 52 submittals.	No Mod. 52 submittals.		Section 2 Adv. PE Design - W-3003 Parcel Certification package	Section 2 Value Engineering Alternatives	Section 2 - C1120 - APE Design - Systems and Track	Wilshire/Rodeo Station Street Equipment & Furniture Inventory (Draft)	Response to PMOC Comments Capital Cost Estimate
					Wilshire/Rodeo Station Medium Growth Rate Fire Study - Draft	Section 2 Capital Cost Estimate Basis Assumption PPGA Submittal		Advanced PE Century City/Constellation Review Package	Response to PMOC Characterization Review
					Emergency Egress Calculations for Century City/Constellation Station	Section 2 Construction Approach		RFP Technical Documents Issued for Solicitation Submittal	AT&T Plan and Profile
						Section 2 Risk Management Progress Report			O&M Plan (Draft)
						Section 2 Risk and Contingency Management Plan (Draft)			Systems Failure Recovery Analysis Report (Draft)

Exhibit G

Variance Comparison between PB and Metro Hours

Exhibit G: Variance Comparison Between PB and Metro Hours

Exhibit G: Variance Comparison Between PB and Metro Hours					
Metro Equivalent Task	WBS Item	Scope of Work MOD 52	PB Initial proposed Hours	Metro's Independent Estimate	Variance
1.0	52.01.010	Project Management	3,200	3,080	120
3.0	52.01.020	Project Controls	3,200	3,080	120
2.1	52.01.030	Sub Contract Management	1,600	1,540	60
2.7	52.01.040	QA/QC	1,600	1,540	60
2.0	52.01.050	Project Office Admin	8,000	7,680	320
7.4	52.02.010	General Constructability Support	3,840	4,240	-400
7.9	52.02.020	Cost Estimating Support	7,740	7,350	390
7.1	52.02.030	Risk Management	480	500	-20
7.4.10	52.02.040	Traffic Plans for Peak Hour Exemptions	2,460	2,466	-6
7.1	52.03.005	Engineering Team Management	1,600	1,420	180
7.1.1, 7.1.2	52.03.010	Stations Advanced PE	18,620	21,278	-2658
7.3	52.03.020	Systems and Track Adv PE	4,790	4,791	-1
7.2	52.03.05	Architectural Support to Metro	490	504	-14
7.1.3	52.03.060	Support to Metro Real Estate	4,640	4,620	20
5.5.5	52.03.080	Blast Protective Design Support	320	316	4
7.1.1.6	52.03.110	Tunnel Design	4,460	1,947	2513
7.1.1.9	52.03.150	Ventilation CFD Analysis	1,400	1,378	22
18.1, 18.2	52.04.010	Support Metro with FTA/PMOC Tasks	320	320	0
18.1	52.04.020	Environmental / New Starts	2,502	2,537	-35
18.2	52.04.030	Supplemental EIS/EIR	200	192	8
7.1.5	52.05.010	Geotechnical Field/Lab Work	19,220		
7.1.3		Basis of Design		988	
7.1.4		Station Design Validation		741	
7.1.5		Fire Life Safety		988	
7.1.5	52.05.020	Geotechnical Engineering and Reports	6,535	530	6005
18.3.5	52.05.07	Litigation Support	680	700	-20
6.4.5	52.05.08	Tunnel Advisory Panel Coordination	240	280	-40
7.0	52.06.10	RFP Production & Bid Support Services	26,460	20,399	6061
7.4	52.07.010	Utility Relocation Coordination	3,650	3,540	110
7.3.10	52.07.020	Potholing and Trenching	1,000	1,078	-78
7.1.8	52.07.030	Utility Relocation Designs	9,465	9,589	-124
18.3	52.10	Engineering Support during Construction	1,980	1,992	-12
7.8	52.99.010	Special Studies	4,400	5,000	-600
		Total Hours =	145,092	116,604	24.43%

Exhibit H

PB's Proposed Mod 52 Hours

Exhibit H: PB's Proposed Mod 52 Hours

Exhibit H: PB's Proposed Mod 52 Hours			
WBS	Task Name	Hours	Percentage of Total
52.01	Project Management & Project/Office Admin	17,600	12%
52.02	Constructability and Estimating	14,520	10%
52.03	Engineering	36,320	25%
52.04	Environmental / New Starts	3,022	2%
52.05	Geotechnical	26,675	18%
52.06	RFP Production & Bid Support Services	26,460	18%
52.07	Utility Relocation	14,115	10%
52.1	Engineering Services During Construction	1,980	1%
52.99	Special Studies	4,400	
	Total Hours =	145,092	

Exhibit I

Metro's Independent Cost Estimate

Exhibit I: Metro's Independent Cost Estimate

Exhibit I: Metro's Independent Cost Estimate			
Metro Equivalent Task	Scope of Work MOD 52	Hours	Percentage of Total
1.1	Project Management	3,080	2.64%
3	Project Control	3,080	2.64%
7	RFP Production and bid support	20,399	17.49%
7.1	Constellation Station Advanced PE	12,522	10.74%
7.1	Rodeo Station Advanced PE	8,756	7.51%
7.1	Risk Management Support	500	0.43%
7.2	Architectural Support to Metro	504	0.43%
7.3	Systems and Track Advanced PE Package - Rodeo Reach 4 - update without crossover	1,216	1.04%
7.3	Systems and Track Advanced PE Package - Constellation Reach 5	1,993	1.71%
7.3	Project Wide Systems Report	1,582	1.36%
7.4	General Constructability Support	4,240	3.64%
7.4	Traffic Plan	2,466	2.11%
7.9	Estimating Support	7,350	6.30%
18.2	Supplemental Environmental Review	192	0.16%
18.3	Engineering Support During Construction - Rodeo AUR	996	0.85%
18.3	Engineering Support During Construction - Constellation AUR	996	0.85%
18.1, 18.2	Support to Metro FTA/PMOC/FFGA Roadmap	320	0.27%
18.3.5	Litigation Support	700	0.60%
5.5.5	Basis of Design	988	0.85%
7.1.1.6	Tunnel Design	1,947	1.67%
7.1.1.9	Ventilation Design	1,378	1.18%
7.1.5	Geotechnical	810	0.69%
7.4, 7.3.10, 7.1.8	Advanced Utility Relocations	14,207	12.18%
	Project Administration	10,760	9.23%
	Blast Protective Design Support	316	0.27%
	Environmental / New Starts	2,537	2.18%
	Engineering Management	1,420	1.22%
	Station design Validation	741	0.64%
	Fire Life Safety	988	0.85%
	Support to metro real estate	4,620	3.96%
	Special Studies	5,000	4.29%
	Total Proposed Hours =	116,604	

Exhibit J

Geotechnical Drawing History for Mod 43 to 52

Exhibit J: Geotechnical, Excavation and Support, and Structural Drawing History from Mod 43 to 52 to RFP

Exhibit J: Geotechnical, Excavation and Support, and Structural Drawing History from Mod 43 to 52 to RFP				
Drawing Section	Mod. 43. Advanced PE Drawings Wilshire/Rodeo (February 2014)	Mod. 52 Advanced PE Drawings Century City/Constellation (May 2015)	Mod. 52 Advanced PE Drawings Wilshire/Rodeo (July 2015)	Mod. 52 - RFP Drawings Wilshire Rodeo and Century City Constellation Combined (September 2015)
Construction Staging and Laydown Area	6 Drawings	9 Drawings	6 Drawings	5 Drawings
Drawings include site demolition, construction, and restoration plan sheets.	2 - Demolition Plan Sheets 2 - Construction Site Plan Sheets 2 - Site Restoration Plan Sheets	3 - Demolition Plan Sheets 3 - Construction Site Plan Sheets 3 - Restoration Site Plan Sheets	Same general drawings, more details and notes added. Notes revised, proposed construction staging details added. Minor revisions.	Wilshire/Rodeo: 2 Demolition Plan Sheets. Very minor updates to call outs. Century City: 3 Demolition Plan Sheets. Minor updates to callouts and notes.
SUMMARY/COMMENTS	Drawings are specific to work to be completed at Wilshire/Rodeo .	Drawings are specific to work to be completed at Century City/Constellation. Drawings appear to be produced to the same level of detail as for the Wilshire/Rodeo Station Mod. 52 Drawing set (July 2015). Level of effort anticipated to be moderate.	Since the Mod. 43 drawing set (Feb 2014), no additional drawings have been added to this section. Overall, the changes are relatively minor with a few additional call outs and modifications to the notes. Level of effort anticipated to be small.	Only demolition drawings are provided. Construction site plan and site restoration drawings are not included as part of the package. Why have these sheets been removed? Level of effort anticipated to be small.
Tunnels and Crosspassages	14 Drawings	11 Drawings	11 Drawings	8 Drawings
Tunnel Drawings. Note - drawings do not include fault crossing details.	General arrangement on tangent General arrangement on curve Alignment and walkway control data Precast concrete segments - general arrangement Precast concrete segments - connection details Precast concrete segments - segment tolerances First stage concrete invert sections and details Typical secondary lining - CIP secondary liner	No change to general arrangement on tangent. Additional tangent with secondary lined added. Vehicle Dynamic Envelope (VDE) added. Minor changes to VDE, secondary lining Very minor changes No change No change No change Additional detail added, minor detail updates No change	Same as Mod. 52 Century City/Constellation Drawings (May 2015). " " " " " " "	Very minor changes. REMOVED REMOVED REMOVED Same as Mod. 52 advanced PE packages. Same as Mod. 52 advanced PE packages. Same as Mod. 52 advanced PE packages. Same as Mod. 52 advanced PE packages.
Tunnel Drainage Drawings	Tunnel drainage - Sections and Details - Typical	Very minor changes	"	Same as Mod. 52 advanced PE packages.
Tunnel Crosspassage Drawings	General arrangement - plan and sections General arrangement - plan and sections Gas and water proofing alternative A Gas and water proofing details - alternatives A & B Gas and water proofing details - alternative A	Very minor changes No change REMOVED REMOVED REMOVED	" " REMOVED REMOVED REMOVED	Same as Mod. 52 advanced PE packages. Same as Mod. 52 advanced PE packages. - - -
SUMMARY/COMMENTS		3 drawings were removed. No changes were made to 5 of these sheets. Where changes have been made, they are very minor and include modifications to the title block, notes, small dimensioning updates, and changes to the secondary lining and VDE envelope. Level of effort anticipated to be small.	Repeat of the drawing set provided in the Century City/Constellation Advanced PE Package (May 2015).	Trimmed down version of drawings provided as part of the Mod. 52 Advanced PE packages. Why have sheets been removed? Level of effort anticipated to be small.

Exhibit J: Geotechnical, Excavation and Support, and Structural Drawing History from Mod 43 to 52 to RFP

Drawing Section	Mod. 43. Advanced PE Drawings Wilshire/Rodeo (February 2014)	Mod. 52 Advanced PE Drawings Century City/Constellation (May 2015)	Mod. 52 Advanced PE Drawings Wilshire/Rodeo (July 2015)	Mod. 52 - RFP Drawings Wilshire Rodeo and Century City Constellation Combined (September 2015)
Geotechnical Instrumentation	4 Drawings	9 Drawings	5 drawings	8 drawings
Drawings include instrumentation plans for the stations, tunnels, and cross passages. Instrumentation details are provided.		NEW DRAWING - General notes, includes list of major utilities.	General Notes, includes list of major utilities	General notes sheet for both advanced PE drawing sets has been combined (1 sheet)
	Geotechnical and Building Instrumentation - Wilshire/Rodeo Station	2- Layout Plan 2- Cross Section	Notes and details moved to previous sheet, instrumentation plan appears to be the same	Wilshire: Same as July 2015 Advanced PE package (1 sheet) Constellation: Design updates from May 2015 Advanced PE package (2 sheets)
	Tunnel Crosspassage Typical Instrumentation Plan	Very minor changes	Same as Mod. 52 Century City/Constellation Drawings (May 2015).	Same as Mod. 52 Advanced PE packages (1 sheet)
	Typical Tunnel Details	No change	Same as Mod. 52 Century City/Constellation Drawings (May 2015).	Same as Mod. 52 Advanced PE packages (1 sheet)
	Details	No change	Same as Mod. 52 Century City/Constellation Drawings (May 2015).	Minor updates (1 sheet)
		NEW DRAWING - Additional sheet of instrumentation details		Minor updates (1 sheet)
SUMMARY/COMMENTS		Instrumentation layouts and cross sections have been prepared specifically for the Century City Constellation Station. Two additional drawings containing a list of major utilities and the general notes and additional instrumentation details have been added. Very minor to no changes have been made to the tunnel and crosspassage instrumentation drawings and the previously existing instrumentation detail drawing. Moderate level of effort anticipated.	Very minor changes have been made to these drawings. Instrumentation detail sheets are identical to those provided in the Century City/Constellation Advanced PE Package (May 2015). Level of effort anticipated to be small.	Repeated drawings in the Mod. 52 Advanced PE packages have been removed. Century City/Constellation Station cross section sheets have been removed. Why have sheets been removed?

Exhibit J: Geotechnical, Excavation and Support, and Structural Drawing History from Mod 43 to 52 to RFP

Drawing Section	Mod. 43. Advanced PE Drawings Wilshire/Rodeo (February 2014)	Mod. 52 Advanced PE Drawings Century City/Constellation (May 2015)	Mod. 52 Advanced PE Drawings Wilshire/Rodeo (July 2015)	Mod. 52 - RFP Drawings Wilshire Rodeo and Century City Constellation Combined (September 2015)
Water/Gas System	11 Drawings	13 Drawings	12 Drawings	9 Drawings
Drawings include water/gas barrier system drawings for the stations.	4 - Water/Gas System Developed View	5 - Water/Gas System Developed View	3 - Water/Gas System Developed View Besides scaling of sheets, minor changes to drawings.	1 - Water/Gas mitigation depicted for 'typical station.' Minor changes to platform module sheet developed as part of the Wilshire/Rodeo Mod. 52 Advanced PE package (May 2015)
	Typical Station Appendages - Barrier System	Typical Appendage	Moderate to Major changes from Mod. 43 Advanced PE set (Feb. 2014)	Depicted for 'typical station'. Similar to sheet developed as part of the Wilshire/Rodeo Mod. 52 Advanced PE package (May 2015)
	Detail Sheet	Minor changes	Very minor changes	Same as from advanced PE packages.
	Concrete lining construction typical section and details	Minor changes	Very minor changes	REMOVED
	Concrete lining construction - construction/control joint	Minor changes	Very minor changes	REMOVED
	Construction joint details - construction joint	Minor changes	Very minor changes	Same as Mod. 52 Advanced PE packages.
	Water/Gas Barrier System - Entrance - Developed View	REMOVED	REMOVED	-
	Water/Gas Barrier System - Entrance - Isometric View	REMOVED	REMOVED	-
		NEW DRAWING - Gas Venting System Vent Pipe Layout System	Prepared for specific station.	Depicted for 'typical station'. Same as sheet developed for Wilshire/Rodeo Mod. 52 Advanced PE package.
		NEW DRAWING - Gas Venting System Sections and Details	Similar. Prepared for specific station.	Same as Mod. 52 advanced PE packages.
	NEW DRAWING - Gas Venting System Gas Cent Pipe Details	Similar. Prepared for specific station.	Same as Mod 52 advanced PE packages.	
		NEW DRAWING - Gas Venting System Isometric View/Trench Drain	REMOVED	
SUMMARY/COMMENTS		Significant effort for the new gas venting system drawings. The remaining changes in the set are relatively minor. Overall level of effort is anticipated to be moderate.	About 1/2 of these drawings are unique to the specific station. The rest are duplicated between the two drawing packages. Level of effort is anticipated to be small.	Water/Gas mitigation drawings developed for 'typical station'. The typical station sheets are consistent with those provided in the Mod. 52 Wilshire/Rodeo Advanced PE drawing set (July 2015). Small level of effort required to update drawings. Specific details for the individual stations have been removed. Why?

Exhibit J: Geotechnical, Excavation and Support, and Structural Drawing History from Mod 43 to 52 to RFP

Drawing Section	Mod. 43. Advanced PE Drawings Wilshire/Rodeo (February 2014)	Mod. 52 Advanced PE Drawings Century City/Constellation (May 2015)	Mod. 52 Advanced PE Drawings Wilshire/Rodeo (July 2015)	Mod. 52 - RFP Drawings Wilshire Rodeo and Century City Constellation Combined (September 2015)
Structural	12 Drawings	15 Drawings	15 Drawings	0 Drawings
Structural drawings are for the stations only. Structural tunnel drawings are included in the Tunnels and Crosspassages drawings. No rebar and other structural detailing provided.	3 - Track and Platform Level Plan	3 - Track and Platform Level Plan	3 sheets. Moderate updates, refining details. No major changes.	
	3 - Concourse & Roof Level Plan	3 - Concourse & Roof Level Plan	3 sheets. Significant changes.	
	Structural Details	1 - Upper Concourse & Roof Level Plan	REMOVED	
		1 - Plan Details	NEW DRAWING - Longitudinal Section - East Ancillary & Platform Module	
		3 - Longitudinal Section	NEW DRAWING - Longitudinal Section - West Ancillary Module	
	Structural Transverse Section - Crossover Module	3 - Transverse Sections	Transverse Section - East Ancillary Module	
	Structural Transverse Section - Platform Module		Minor changes	
	Structural Transverse Section - Ancillary Module		Transverse Section - West Ancillary Module	
	Typical Appendages	1 - Typical Appendages	Major changes	
	Landing Plan		Moderate Changes	
			NEW DRAWING - Entrance - Plaza Level Plan	
		NEW DRAWING - Entrance - Longitudinal Section		
SUMMARY/COMMENTS		Drawings prepared for the specific station. Level of effort is anticipated to be significant.	Compared to Mod. 43 Wilshire/Rodeo Set: 1 Drawings removed and 4 drawings added. Significant effort for the 4 new drawings. Design changes to the station and additional details are provided at this time. Level of effort is anticipated to be significant.	Structural drawings have been completely removed. Why?
Excavation and Support Drawings	19 Drawings	22 Drawings	26 Drawings	0 drawings
Drawings include the station excavation sequence and support of excavation drawings.	6 - Excavation Sequence	No change except for note updates.	Same as for Century City/Constellation Advanced PE set (May 2015).	
	2 - Pile Layout	Pile Layout - 3 sheets - Unique to Station Excavation	Minor to moderate design changes from Mod. 43 Wilshire/Rodeo set (Feb. 2014). NEW DRAWINGS - Pile cap plan (2 sheets). Pile cap plan moved and updated from pile layout sheets. Moderate level of effort.	
	2 - Decking Plan	Decking Plan - 3 sheets - Unique to Station Excavation	Minor to moderate design changes from Mod. 43 Wilshire/Rodeo set (Feb. 2014). NEW DRAWINGS - Decking Beam Plan (2 sheets). Decking beam plan moved and updated from decking panel plan sheets. Moderate level of effort.	
	2 - Strut and Tie-Back Plan	Strut and Tie Back Plan - Unique to Station Excavation	Minor to moderate design updates from Mod. 43 Wilshire/Rodeo set (Feb. 2014).	
	7 - Cross Sections	7 - General arrangement cross sections - Unique to Station	6 - Cross Sections. Moderate changes from Mod. 43 Wilshire/Rodeo set (Feb. 2014). NEW DRAWINGS - 2 - Longitudinal Elevation sheets NEW DRAWINGS - 2 - 3D View sheets	
SUMMARY/COMMENTS		6 of the drawings are repeated in the Mod. 52 Wilshire/Rodeo Set (July 2015). The remaining 16 drawings are unique Century City Constellation Station. Level of effort is anticipated to be significant.	Compared to Mod. 43 Wilshire/Rodeo Set: 1 less cross section and 8 new drawings. Moderate design updates/changes were made to the excavation support. Level of effort is anticipated to be moderate.	Excavation and support drawings have been completely removed. Why?

Exhibit K

Summary Table of Findings and Recommendations

Exhibit K: Summary of All Findings and Recommendations					
No.	Finding	Recommendation	Status	Completion Date	Comments
1A-1	<u>Finding 1A-1</u> : The funding for Section 2 was unknown in early 2013, but Mod 43 was executed to keep the technical expertise of the staff on board until funding became available. It was understood that Mod 43 was not sufficient to complete Section 2 through the RFP process and obtain FFGA approvals. Through all of the re-baselining of Mod 43 forecasted hours, it is unclear how PB transitioned from Mod 43 to Mod 52. Given this, going forward, Metro needs to implement a methodology to ensure oversight and accountability for the services delivered for each Mod.	<u>Recommendation 1A-1</u> : Metro should implement a methodology to ensure adequate oversight and documentation that accounts for exactly what was delivered at the end of one contract Mod to the next, what was paid for, what was not done, etc. in order to have better control over the contracts..			
1A-2	<u>Finding 1A-2</u> : It is unclear how the work was transitioned between Contract Mods 43 and 52. It is also unclear as to whether the field investigation work indicated in Mod 52 was to be in addition to the work proposed as part of Mod 43. Additionally, the fault study continued between Mod 43 and 52, but the status of completion at the end of Mod 43 is unknown. This fault study will likely lead into additional design efforts of the tunnel sections within the fault zone, but the impact to the project for the Mod 52 scope is unknown.	<u>Recommendation 1A-2</u> : See recommendation 1A-1.			
1A-3	<u>Finding 1A-3</u> : Only the Wilshire/Rodeo Station drawing package was submitted as part of Mod 43 and the drawing set was later updated as part of Mod 52. Although included in the scope of work (SOW) for Mod 43; an Advanced Preliminary Engineering drawing set for Century City/Constellation was not produced prior to Mod 52. In lieu of APE drawings, an interface study was completed.	<u>Recommendation 1A-3</u> : A detailed review should be made to determine whether all the hours allocated for the Advanced Preliminary Drawings for the Century City/Constellation station in Mod 43 were used for this effort. A detailed work plan should be implemented that describes the rationale of each task, including a description at the end of the task explaining the status including what was performed. In this case, it appears that a deliverable was not completed at the conclusion of Mod 43 and was completed as part of Mod 52.			
1A-4	<u>Finding 1A-4</u> : In order to avoid costly delays and overruns, Metro implemented their lessons learned from past projects and performed detailed engineering prior to going to out to bid for the Design/Build Contract.	<u>Recommendation 1A-4</u> : Metro should continue to implement lessons learned, where appropriate. In addition, Metro should consider alternate procurement methods that might reduce the need for additional design effort. See Recommendation 4A-4.			

<p>1B-1</p>	<p><u>Finding 1B-1:</u> PB's Initial Estimate for hours was 24% above that of Metro's Independent Cost Estimate. The final approved hours were also higher (by 10%) than the Metro's Estimate. Also, variances exists between PB's monthly progress reports "planned hours" (132,112 hours) and the final Metro approved hours for Mod 52 (128,075 hours).</p>	<p><u>Recommendation 1B-1:</u> A detailed cost loaded work plan should be developed for each contract modification that summarizes the current state of the project, clearly describes project objectives, and rational basis for proposed work. In addition, each task should summarize a rational basis for design and anticipated personnel including management.</p>			
<p>2-1</p>	<p><u>Finding 2-1:</u> A number of individuals invoiced received labor rate increases exceeding the approved 2.3% labor escalation rate allowed by Metro. According to Metro's Contract Administrator, the labor rate differences for PB have been approved by Metro, but no formal written approval was provided.</p>	<p><u>Recommendation 2-1:</u> We recommend that Metro's approval of labor rate increases be formally approved in writing. Furthermore, labor rate increases for individuals exceeding the annual labor escalation rate percentage approved by Metro should be formally documented and justified in the contract files.</p>			
<p>2-2</p>	<p><u>Finding 2-2:</u> PB's proposed escalation rate of 3% is higher than the 2.3% allowed by Metro.</p>	<p><u>Recommendation 2-2:</u> PB's proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharge should be paid back to Metro.</p>			
<p>2-3</p>	<p><u>Finding No. 2-3:</u> PB's proposed Indirect Cost Rates for home office and field office are provisional and subject to retroactive adjustments.</p>	<p><u>Recommendation 2-3:</u> PB should submit to Metro its audited ICR for fiscal year 2015, as soon as it is completed to determine whether the ICR trend is the same as 2013 and 2014. If so, Metro should consider adjusting PB's provisional ICR for both home office and field office to reflect the lower audited ICR rates and to prevent a potential overbilling of overhead costs.</p>			
<p>2-4</p>	<p><u>Finding 2-4:</u> Advantec's proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.</p>	<p><u>Recommendation 2-4:</u> Advantec's proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharges should be paid back to Metro.</p>			
<p>2-5</p>	<p><u>Finding 2-5:</u> Advantec's proposed ICR is a provisional rate and subject to retroactive adjustments.</p>	<p><u>Recommendation 2-5:</u> Metro should require Advantec to submit an audited ICR for 2015 and 2016, conducted by an independent CPA before adjusting Advantec's provisional ICR for final payment.</p>			
<p>2-6</p>	<p><u>Finding 2-6:</u> AMEC's proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.</p>	<p><u>Recommendation 2-6:</u> AMEC's proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharges would be paid back to Metro.</p>			
<p>2-7</p>	<p><u>Finding 2-7:</u> AMEC's proposed ICR is provisional and subject to retroactive adjustments.</p>	<p><u>Recommendation 2-7:</u> AMEC should submit to Metro its audited ICR for fiscal year 2015, as soon as it is completed, to determine whether the ICR trend is the same as 2014. If so, Metro should consider adjusting AMEC's provisional ICR for both home office and field office to reflect the lower audited ICR rates and to prevent a potential overbilling of overhead costs.</p>			

<p>2-8</p>	<p><u>Finding 2-8:</u> D’Leon’s proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.</p>	<p><u>Recommendation 2-8:</u> D’Leon’s proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overchargers should be paid back to Metro.</p>			
<p>2-9</p>	<p><u>Finding 2-9:</u> D’Leon’s proposed ICR for home office and field office are provisional and subject to retroactive adjustments.</p>	<p><u>Recommendation 2-9:</u> Metro should require D’Leon to submit an audited ICR for 2015 and 2016, conducted by an independent CPA before adjusting D’Leon’s provisional ICR for final payment. If the 2015 audited ICR is lower than the provisional 130% ICR, Metro should consider adjusting D’Leon’s provisional ICR to prevent a potential overbilling of overhead costs.</p>			
<p>2-10</p>	<p><u>Finding 2-10:</u> Intueor’s proposed labor escalation rate of 3% is higher than the 2.3% allowed by Metro.</p>	<p><u>Recommendation 2-10:</u> Intueor’s proposed escalation rate of 3% for the year 2016 should be reduced to 2.3% to reflect the escalation rate allowed by Metro according to the Bureau of Labor Statistics Employment Cost Index. Any overcharges should be paid back to Metro.</p>			
<p>2-11</p>	<p><u>Finding 2-11:</u> Intueor’s proposed ICR for home office and field office are provisional and subject to retroactive adjustments.</p>	<p><u>Recommendation 2-11:</u> Intueor should submit to Metro the actual audited ICR for fiscal year 2015, as soon as it is completed. If the audited ICR for 2015 continues to trend higher than Intueor’s provisional ICR, then Metro should consider increasing Intueor’s provisional ICR to better reflect the actual overhead costs to be paid to Intueor.</p>			
<p>3-3</p>	<p><u>Finding 3-3:</u> In the Engineering Services, “Systems Group,” section in PB’s organizational chart, there are 12 managers proposed versus 10 staff. This appears to be excessive based on the ratio of Supervisors/Managers to technical/sub-consultants</p>	<p><u>Finding 3-3:</u> Metro should perform a detailed review the System’s Group’s tasks and requirements in view of streamlining managers.</p>			
<p>3-7</p>	<p><u>Finding 3-7:</u> From the review of the timesheets, PB Executive Management and Supervisors combined have billed 50% of the hours and PB Technical Staff have billed 50% of the hours. Because Managers and Supervisors have a higher pay rate, 50% of the hours billed by them resulted in a higher portion of cost (67%). This indicates that Metro needs to perform an organizational/functional review to optimize the level of management and supervisors needed on the project.</p>	<p><u>Recommendation 3-7:</u> Metro should perform an organizational review that aims to streamline management functions and combine roles of PB staff. While it is understood that a project of this magnitude requires the unique knowledge from various disciplines, we believe that a detailed analysis could identify opportunities for streamlining.</p>			
<p>4A-1</p>	<p><u>Finding 4A-1:</u> Metro chose PB based on qualifications, is getting a value product from a highly qualified consulting firm (PB), using a cost-plus contract. Despite the disadvantages to the project owner using a cost-plus contract, this type of contract is historically used for large/complex engineering projects that have many unknowns and risks.</p>	<p><u>Recommendation 4A-1:</u> Metro should utilize a Design Review Committee to provide additional oversight and accountability over the Design Team to ensure that only permissible costs are paid and the contractor is exercising adequate overall cost controls, and the design meets Metro’s design criteria and requirements.</p>			

<p>4A-2</p>	<p><u>Finding 4A-2:</u> For the reasons cited above, separate Advanced Utility Relocation (AUR) Contracts will not be issued as previously planned and recommended by the Lessons Learned report. However, this option was not pursued for the reasons discussed earlier such as delays in obtaining 3rd party permits and schedule constraints.</p>	<p><u>Recommendation 4A-2:</u> Some of the Mod 52 hours proposed by PB under Section 52.07 Utility Relocations may need to be reallocated since Advanced Utility Relocation (AUR) contract will not be pursued for Mod 52. Another option is to modify the Design/Build contract (which is currently out to bid) to have the contractor perform the Utility Relocations as a Design/Bid/Build and have PB as the engineering of record for that portion of the project.</p>			
<p>4A-3</p>	<p><u>Finding 4A-3:</u> Metro left the decision open until late in the project whether to use the Design/Build or Design/Bid/Build project delivery method. In January 2015, the decision was made to use the Design/Build contracting process for Section 2.</p>	<p><u>Recommendation 4A-3:</u> Due to the level of effort required for the different project delivery methods, the decision on which method to use should be made in the early stages of project, and no later than the preliminary engineering phase in order to reduce duplication of design effort.</p>			
<p>4A-4</p>	<p><u>Finding 4A-4:</u> Metro did not consider alternative forms of project delivery methods for the Westside Purple Line Extension Project besides the traditional Design/Bid/Build, Design/Build, or Hybrid methods.</p>	<p><u>Recommendation 4A-4:</u> For future transit construction projects, Metro should consider the Design-Risk project delivery method described above due to the potential benefits of this method. We also recommend that Metro designates a committee to evaluate the pros and cons of each project delivery method and select the most appropriate method for the project using the decision matrix provided in the TCRP Report 131.</p>			
<p>4B-1</p>	<p><u>Finding 4B-1:</u> Metro’s Standard Design Criteria that have been developed, modified, and updated over the years are of considerable and accurate detail. For a Design/Build project like this, these standard design criteria should be sufficient enough to include to the bid documents; and therefore some of the drawing sheets may not be needed in the RFP project definition drawings. However, Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering requires drawings to be provided for many of these areas.</p>	<p><u>Recommendation 4B-1:</u> For future Design/Build projects, consider revising and reducing the RFP drawing delivery requirements for disciplines that have detailed standard design criteria such as structures, mechanical, electrical, and signals and train control. (See Attachment 5 for further discussion.)</p>			
<p>4B-2</p>	<p><u>Finding 4B-2:</u> For the Century City/Constellation Station drawings and the Wilshire/ Rodeo Station drawings, the scale, grid lines, sheet numbering, and sheet naming were completely changed between the 2011, 2014, and 2015 drawing sets. The level of effort to make wholesale changes for each of the drawing sets is significant. Moreover, detailed work plan was not available to determine how much time was needed to develop the plans in the plans set and to substantiate the cost and hours to develop the products for Mod 52 and the RFP.</p>	<p><u>Recommendation 4B-2:</u> See Recommendation 1B-1</p>			

Attachment 1

List of Documents Reviewed

Attachment 1: List of Documents Reviewed

- Request for Proposal for RFP No.. Ps13563 Westside Purple Line Extension Section 2 Mod #52 Issued 6-12-15
- TE for WSE Section 2 Constellation Drawing List Adv PE and RFP Rev JW
- TE for WSE Section 2 Rodeo Drawing List Adv PE and RFP Rev JW
- Metro Board Items
 - #1 Program and Planning Committee June 20, 2007: Award Contracts and Amend the FY8 Budget to Provide for AA Study
 - #33 Executive Management and Audit Committee Revised April 15, 2010: MTA Position on 30/10 Initiative
 - #7 Program and Planning Committee: July 14, 2010: Strategy for Long Range Transportation Plan Accelerated Financial Plan Update
 - #22 Program and Planning Committee: October 20-21 2010: Approve recommendations for project EIS EIR
 - #47 Construction Committee: October 20, 2011: Advanced Preliminary Engineering and Support Final Design
 - #59 Regular Board Meeting: May 24, 2012: Approve Project Definition for Phases 2 and 3
 - #71 Construction Committee: January 17, 2013: Contract Modification 41
 - #84 Regular Board Meeting: January 24, 2013: Post Measure J Actions
 - #72 Program and Planning Committee: September 17, 2014: Approve pursuit of federal New Starts Funds and TIFIA Loan for Section 2
 - #47 Construction Committee: February 19, 2015: Contract Modification 52
- Contract Mod 21 – Advanced Conceptual Engineering and Preliminary Engineering Technical Scope of Work
- Contract #4350-2000 Statement of Work for Contract Option 1 (Cost Plus Fixed Fee Contract)
- Contract Mod 22 – Final EIS/EIR
- Attachment A Mod 22 – Environmental Impact and Related Procedures
- Contract Mod 23 – Alternative Study
- Contract Mod 36 – Preliminary Engineering All Sections Task Deliverables 11-29-11 (Scope of Work)
- Contract Mod 43 – Advanced Preliminary Engineering Section 2 Scope of Work
- Contract No. PS43502000 Issued 7-16-07 – Limited Notice to Proceed for AA Study, Tunnel Feasibility reviews, and Conceptual Engineering
- Contract Mod 52
 - Approved Change Notice
 - C1045 List of Subs as of 1-12-15
 - Section 2 Scope and Deliverables for Metro
 - Section 2 Cost Plan As for 01-04-15 for Metro
 - Independent Cost Estimate Report for Mod 52
 - Mod 52 Form 60 Original
 - Mod 52 Proposed Task Cost breakdown I and II
 - Payroll Certification PB – Westside Staff – 06March 15

Attachment 1: List of Documents Reviewed

- PB Signed Change Notice Mod 52
- Pre-Negotiation Plan (PNP) Mod 52 Final Signed
- PS43502000 MOD 00052 Executed
- Section 2 List of RFP Reports and Docs 11 26 14
- Section 2 Original Scope and approved Changes
- Section 2 scope and deliverables Draft 11-19-2014
- Westside Section 1 & 2 PB Team Staffing
- Westside Section 1 Projected Monthly Project Status Report – 201501
- Westside Section 2 Drawing Count by Discipline
- Westside Section 2 Drawings and Percentage of Compl as of 20141231
- Westside Section 2 Procurement Plan
- Westside Section 2 Project Schedule with Milestones Leading to FFGA
- Westside Section 2 Projected staffing levels
- Drawings
 - 43.03.160A-Section 2 Study for Century City Constellation Station (DRAFT) 7-29-2014 submitted
 - 2014_02_07 Advanced Prelim Section 2 Rodeo
 - 2015_07_10 Advanced Prelim Section 2 Rodeo Updated
 - 2015-05-01 Advanced Prelim Section 2_Constellation
 - PE Volume-4_Final Submission Rodeo
 - PE Volume-5_Final Submission Constellation
- Prior Audit Report
- Metro Purple Line General Fact Sheet
- PE Volume-5_Final Submission Constellation
- ple_general_factsheet_2014
- Project Map
- TCRP 138 - Estimating Soft Costs for Major Public Transportation Fixed Guideway Projects
- Westside IRP Final Report
- PB Invoices/Timesheets from March 27, 2015 to August 28, 2015
- C1045 Section 1 Conformed General Requirements and Technical Requirements
- General Requirements issued in Amendment 3
- Technical Requirements issued in Amendment 3
- GBR issued in Amendment 3
- GDMs issued in Amendment 3
- PB Monthly Progress Reports
- Structural Calculations for Rodeo/Constellation
- Support for Excavation Structural Calculations
- Metro Standard Drawings
- Draft Building Protection Calculations
- Metro Purple Line Extension Section 2 Contract C1120
 - 01. General Requirements (Amd 3) 11.02.15
 - 05. GBR (Amd 3) 11.02.15
 - 06. Technical Requirements (Amd 3)
 - 08. GDMs (Amd 3) 11.02.15

Attachment 1: List of Documents Reviewed

- 08.01 EDR - Constellation Station (Amd 3) 11.02.15
- 08.02 EDR - Rodeo Station (Amd 3) 11.02.15
- 08.03 EDR - Reach 4 & 5 (Amd 3) 11.02.15
- RFQ-RFP No. C1120 technical and manuals
 - 2- Technical Documents
 - 1. General Requirements
 - 02. Metro Rail Design Criteria
 - 04. Metro Rail Standard Drawings
 - 07. Project Definition Drawings
 - 09. Geotech Data Reports (GDRs)
 - 3 – Manuals
 - RFQ-RFP No. C1120
 - Construction and Demolition Debris Recycling and Reuse Policy Manual
 - Construction Safety Security Manual R4 1 20120901
 - Energy and Sustainability Policy
 - Environmental Policy
 - Labor Compliance Manual Updated 5-20-2013 (REV 3) – Copy
 - Pro-Form 087 DEOD Contract Compliance Manual Westside 2 9.4.15(Rc-Fta) (3)
 - Sustainability Policy
 - Water Use and Conservation
- FTA FFGA Roadmap and Guidelines
- FTA Risk Assessment and Lessons Learned
- MTA Board Items Westside Purple Line Section 2
- Westside Constellation Entrance Studies
- Westside Fire Life Safety Basis for Design
- Westside Project Delivery Method
- Westside Section 2 Alignment Video
- Other Metro Projects
- RFP NO PS13563 - WESTSIDE PURPLE LINE EXTENSION - SECTION NO 2 - MOD #52
- 2007 PS43502000 Westside Ext. AA Contract
- October 2015 Westside Purple Line Extension Section 1 Project Monthly Project Status Report
- Segment 2 org chart
- C1045 GRs (Conformed 110314)
- C1045 TRs (Conformed 110314)
- 01. General Requirements (Amd 3) 11.02.15
- 06. Technical Requirements (Amd 3) 11.02.15
- Rodeo Calculation Package
- Support_of_Excavation_11-2015
- Draft Building Protection Calculations - Century City Constellation 20151112
- Draft Building Protection Calculations - Wilshire Rodeo Station 20151112

Attachment 2

Utilities Work Effort

Attachment 2: Utilities Work Effort

Per our discussions with Metro Project Director, PB performed the following level of engineering detail and utility coordination to prepare the Advanced Preliminary Engineering as part of the technical documents for the C1120 Contract:

Construction by Third Party Utility Owners in Advance of C1120 Design/Build Contract

Street Lighting - Century City Constellation Station area and adjacent side streets – Street Lighting Circuits upgraded by BSL from high voltage series circuits to multiple circuits and from fluorescent to LED light fixtures in advance of the Project. (PB Coordinated location of power source outside the area impacted by station construction and prepare a set of post installed plans to show the C1120 Contractor the upgrade.)

Utilities – That have been relocated in advance of the Project to clear the excavation support wall, temporary decking and access through decking at Century City Constellation Station include:

Century City Constellation Station Site:

1) Fiber Optic Telecommunication cables. PB prepared a set of joint trench plans to 60% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model. Final joint trench alignment design by CES. PB from CES final design prepares coordinated profiles near 60% complete. CES will finalize the design. PB includes information on a set of composite existing utility plans for the C1120 Contractor to show facilities and installed location. PB to prepare basic watch manual traffic control plans for use by Metro for permitting application and for CES to finalize.

2) LADWP – Power Vaults and Ducts from Maintenance Hole number 1930 to 10020 and vault number 10010, including Ducts to immediately west of the Launch Box along Constellation Boulevard. (PB prepared a set of electrical plans showing the existing combined line separated in to two lines, 4.8kV and 34.5 kV to 60% complete, coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model. Final duct bank alignment and maintenance hole locations prepared by LADWP-Power. PB from LADWP final design prepares coordinated profiles near 60% complete for LADWP to finalize. PB includes information on a set of composite existing utility plans for the C1120 Contractor to show facilities and installed location. PB to prepare traffic control plans and excavation support drawings for BOE approval.

3) LADWP – Water from Century Park East to immediately west of the Launch Box along Constellation Boulevard. PB prepared a set of water relocation plans and profiles to 85% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model. Balance of work is pending Metro's agreement with LADWP-Water.

4) AT&T California – Vaults and duct. PB prepared a set of AT&T plans to 60% complete coordinated with station construction, and other existing and relocated utilities. Includes

Attachment 2: Utilities Work Effort

development of 3-D utility model. Final alignment design by AT&T. PB from AT&T final design prepares coordinated profiles near 60% complete. AT&T to finalize. PB includes information on a set of composite existing utility plans for the C1120 Contractor to show facilities and installed location. PB to prepare basic watch manual traffic control plans for use by Metro for permitting application and for AT&T to finalize.

5) Southern California Gas – Vaults and duct. PB prepared a set of SCG plans to 60% complete coordinated with station construction, and other existing and relocated utilities. Includes development of 3-D utility model. Final gas alignment design by SCG. PB from SCG final design prepares coordinated profiles near 60% complete. SCG to finalize. PB includes information on a set of composite existing utility plans for the C1120 Contractor to show facilities and installed location. PB to prepare basic watch manual traffic control plans for use by Metro for permitting application and for SCG to finalize.

Wilshire/Rodeo Station Site:

1) AT&T California Same as above 1.01-2.a.4)

2) Southern California Gas As above 1.01-2.a.5)

3) Southern California Edison (SCE) As above 1.01-2.a.2) except existing line is not separated in to medium and high voltage.

Construction by C1120 Design/Build Contract

Century City Constellation Station

1) Los Angeles Department of Water and Power (LADWP) – Water distribution lines along Constellation Boulevard to the west of the launch box and Avenue of the Stars. PB prepared a set of water relocation Project Definition Drawings, plans and profiles to 85% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model.

2) Storm Drain – Temporarily relocate with High Density Polyethylene (HDPE) piping, support and protect in-place during construction. PB prepared a set of storm drain temporary relocation Project Reference Drawings, plans and profiles to 85% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model. Reinstall concrete spigot and socket pipe to City approved standard. PB prepared a set of storm drain permanent relocation Project Reference Drawings, plans and profiles to 60% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model.

Attachment 2: Utilities Work Effort

3) Sanitary Sewer - Temporarily relocate with HDPE piping, support and protect in-place during construction. Reinstall with vitrified clay spigot and socket pipe to City approved standard details with the same number of inlets at the same location as the existing. As above for Storm Drain

Wilshire/Rodeo Station

1) City of Beverly Hills (COBH) Water - Temporarily relocate, support and protect in-place during construction. PB prepared a set of water relocation Project Definition Drawings, plans and profiles to 85% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model. Reinstall 36 inches below gutter flow line. PB prepared a set of water relocation Project Definition Drawings, plans and profiles to 85% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model.

2) Southern California Edison (SCE) – Permanently relocate in accordance with SCE City approved design from existing vaults 5034709 to 5038703 and 5038703 to 5038779 and support and protect in-place during construction. PB prepared a set of electrical plans showing the relocated line to 60% complete, coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model. Final duct bank alignment and maintenance hole locations prepared by SCE. PB from SCE final design prepares coordinated profiles near 60% complete for SCE to finalize. PB includes a set of SCE plans for the C1120 Contractor. (SCE may undertake the work in advance of C1120 Contract)

3) Storm Drain – Temporarily relocate with HDPE piping, support and protect in-place during construction. PB prepared a set of storm drain temporary relocation Project Reference Drawings, plans and profiles to 85% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model. Reinstall concrete spigot and socket pipe to City approved standard. PB prepared a set of storm drain permanent relocation Project Reference Drawings, plans and profiles to 60% complete coordinated with station construction and other existing and relocated utilities. Includes development of 3-D utility model.

4) Sanitary Sewer - Temporarily relocate with HDPE piping, support and protect in-place during construction. Reinstall vitrified clay spigot and socket pipe to City approved standard. Same as above for Storm Drain 1.02-B.2

5) Fire Alarm – Permanently relocate support and protect in-place during construction. (C1120 Contractor to prepare design).

Construction by Third Party Utility Owners during C1120 Design/Build Contract

Century City Constellation Station Site

1) Third Party Utility Relocations:

Attachment 2: Utilities Work Effort

a. LADWP Power – Power vaults, maintenance holes (MH) and duct banks installation from MH number 10020 to MH numbers 10040, 10060, 10080, and 1930. Cabling and equipment installation from vault number 10010 to vault numbers 10030, 10050, 10070, 10090 and 1930, and test and commission as shown on the Project Definition Documents. (Same as 1.01-2.a.4 except PB includes the information on a set of composite advanced relocation utility plans for the C1120 Contractor to show facilities to be installed at the same time as C1120 Contract in place of a set of existing active drawings).

b. AT&T California – Communication equipment installation, cabling pulling and splicing from vault number 21100 to vault number 21105, and vault number 21105 to vault number 17805 including lateral service tie-ins. (Same as 1.01-2.a.4 except PB includes the information on a set of composite advanced relocation utility plans for the C1120 Contractor to show facilities to be installed at the same time as C1120 Contract in place of a set of existing active drawings).

Based on MTA's recent experience and "Lessons Learned" in managing AUR contracts from the various other major rail projects, the amount of detail and coordination above is determined to be still necessary to properly identify scope and allocate risks between MTA and the C1120 Design/Build Contractor.

Attachment 3

Project Map

Metro Purple Line Extension



Subject to Change 15-1381 © 2015 LACMTA

Attachment 4

DBIA Transportation Section “Design-Build Done Right”

TRANSPORTATION SECTOR

Design-Build Done Right

BEST DESIGN-BUILD PRACTICES



FINAL DRAFT FOR INDUSTRY INPUT
Comments due to bestpractices@dbia.org



DBIA
DESIGN-BUILD
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TRANSPORTATION SECTOR

BEST DESIGN-BUILD PRACTICES

Design-Build Done Right

A DESIGN-BUILD INSTITUTE OF AMERICA PUBLICATION

The information contained in this document is intended for use with *Design-Build Done Right Universally Applicable Best Design-Build Practices* (hereafter referred to as “Universal Best Practices”) published by the Design-Build Institute of America (DBIA) in February 2014. For a copy of this document, visit <http://www.dbia.org> and go to the “Resources” section.

The best practices and additional considerations contained in this publication are specific to the transportation sector.

Like DBIA’s *Universal Best Practices*, this document includes three primary sections:

- (I) Procuring Design-Build Services
- (II) Contracting for Design-Build Services
- (III) Executing the Delivery of Design-Build Projects

Within each of these three sections, you will find the following subcategories intended to enhance and expound upon the *Universal Best Practices*:

- (I) Additional best practices to guide implementation of *Universal Best Practices* in the transportation sector.
- (II) Additional considerations to help define and clarify the key project elements and how these additional best practices can be implemented.

The combination of *Universal Best Practices*, market sector best practices and additional considerations are the basis for “Design-Build Done Right” in the transportation sector.

COVER PHOTO CREDITS

Top Row, Left to Right:

ODOT I-71/I-670 Interchange - Columbus Crossroads, Owner: Ohio Department of Transportation, 2014 National Design-Build Honor Award Winner; **Draper Light Rail Extension**, Owner: Utah Transit Authority, 2014 National Design-Build Honor Award Winner; **Denver Union Station Transit Improvements**, Owner: Denver Union Station Project Authority, 2014 National Design-Build Honor Award Winner - Project of the Year

Bottom Row, Left to Right:

Phase 4 Development of the President George Bush Turnpike - Western Extension Design-Build, Owners: North Texas Tollway Authority and HDR Engineering, Inc., 2013 National Design-Build Merit Award Winner; **San Diego International Airport Green Build Landside Project**, Owner: San Diego County Regional Airport Authority, 2013 National Design-Build Honor Award Winner; **I-85/Yadkin River Bridge**, Owner: North Carolina Department of Transportation, 2014 National Design-Build Honor Award Winner



WHAT'S UNIQUE ABOUT THE TRANSPORTATION SECTOR?

The U.S. Department of Transportation (DOT) is the federal government's lead agency for planning and supporting the nation's land, air and sea-based travel systems. The Moving Ahead for Progress in the 21st Century Act (MAP-21) is the federal government's primary financial resource for supporting highway, bridge, transit and airport projects throughout the U.S. Correspondingly, the U. S. DOT establishes the requirements tied to all federally funded projects, whether procured traditionally or using design-build project delivery. The local and state regulations combined with these federal requirements will dictate project requirements. A majority of the transportation design-build projects procured in the U.S. receive some level of federal funding. Federal programs normally stipulate requirements governing land acquisition, environmental permitting, design parameters, the project review process and to an extent project procurement.

DBIA has identified several key elements, common to most transportation projects that have unique influence in the use of DBIA's best practices. These project elements are considered unique in the way that they impact the pre-award project development process, the design-build procurement process and the post-award project process. They include:

- environmental permitting
- right-of-way (ROW) acquisition
- utility relocations
- maintenance of traffic/construction staging
- use of Alternative Technical Concepts (ATCs)

In addition to the requirements that federal programs place upon project criteria, state agencies and transportation authorities have developed similar local and state agency guidelines that affect project requirements for each of these elements. In some cases, local or state criteria for these elements can be more restrictive than their federal counterparts.

Because of the importance of environmental permitting, ROW acquisition, utility relocations, maintenance of traffic/construction staging and the use of ATCs has on design-build projects, DBIA emphasizes how best practices can be related to these project activities. DBIA is focused on providing guidance related to these key elements and how they are implemented in the design-build process with the goal of maximizing the benefits to the owner, design-builder and community while enhancing project success.

I. PROCURING DESIGN-BUILD SERVICES

An owner's choices of project delivery system and procurement approach strongly influences project results. These choices are among the first decisions an owner makes on a project. They form the foundation for how the project will be developed, procured and executed and how the key project stakeholders communicate and relate to each other. In making these choices, it is critical for an owner to consider the particulars and circumstances of each project, including the procurement options available to the owner. After thoroughly considering these issues, an owner should make a strategic decision as to how to take full advantage of the many benefits that are inherent in the design-build process.

In addition to the procurement best practices and implementing techniques outlined in DBIA's [Universal Best Practices](#), DBIA recommends the following for projects in the transportation sector:

A. The following are Additional Best Practices specifically tied to transportation.

- i. Procurement documents need to address line and grade development in a manner that allows flexibility with ROW, environmental, storm water facilities, utility impacts and other project characteristics without advancing the design to a level that stifles innovation and best value. Utilizing this approach can stimulate the benefits of competitive design creativity which drives design-build delivery. A defined set of line and grade documents will provide sufficient detail to define the project footprint, horizontal and vertical alignment, proposed bridge and retaining structures, required environmental mitigation, ROW and utility impacts while still allowing for best-value procurement that achieves maximum benefit from the use of design-build delivery.

- ii. Procurement documents need to clearly define the existing ROW by compiling existing surveys and accurately tying these to a control survey provided to the design-builder.
- iii. Prepare advance Subsurface Utility Engineering (SUE) plans, which accurately locates existing underground utilities and provides sufficient information for design-builders to identify, locate or avoid utility structures located within the project footprint.
- iv. The owner must appropriately address risk when ROW acquisition is assigned to a design-build team. Prior to release of the RFP it is recommended that owners verify that all ROW can be obtained prior to execution of the contract. The eminent domain process is one way of addressing ROW acquisition.
- v. When ROW acquisition is the responsibility of the owner and all ROW will not be acquired prior to Notice to Proceed, the owner should develop a ROW acquisition schedule and include it in the contract agreement.
- vi. Regardless of which party acquires the ROW, the owner should develop a contract budget allowance and stay involved throughout the acquisition process.
- vii. Use ATCs to allow design-build teams to provide input to the owner regarding new ideas, innovations or concepts that may not have been reflected in the criteria package developed by the owner.
- viii. Owners should encourage design-build teams to submit ATCs that may address reductions in ROW acquisition, avoid utility relocations and reduce environmental impacts without compromise to the project quality or intent.

B. Additional Considerations.

- i. Owners should provide specific guidance in the specifications regarding the ROW acquisition process, guidelines and procedures that the design-builder will follow.
- ii. Identify parcels that were identified to be taken and approximate costs of each.
- iii. It is generally recommended that the owner serve as the final oversight agency for the acquisition of the property and that the design-builder provide the technical expertise to quantify, appraise, negotiate and package the land acquisitions for approval and implementation by the owner agency.
- iv. It is recommended that the owner identify all public and private utility owners occupying the ROW. The owner should also participate in open meetings in advance of the procurement to meet with utility owners and provide advance notice to relocation activities and engage them in the process as well as secure utility agreements whenever possible before the RFP is released.
- v. Owner involvement in the early ROW acquisition and utility relocation is essential to define the process and establish priorities of all parties.
- vi. Owners should consider including an “allowance” in the contract for utility relocation costs and should develop a risk matrix and risk mitigation strategies. Owners should evaluate how best to assign risks associated with utilities relocation and assign those risks to the party most capable of managing those risks, including early relocation efforts.
- vii. When deviations from the design concepts specified in the RFP are prohibitive, the owner should explain to proposers the reasons for specifying certain design concepts/configurations and why some design features cannot be changed. Doing so reduces wasted time and unnecessary ATCs.
- viii. If a railroad is impacted, meet early with the railroad management team to discuss the project and define scope.

II. CONTRACTING FOR DESIGN-BUILD SERVICES

The use of fair and clear contracts is fundamental to any delivery process. Because there are some important differences between design-build contracts and those for other delivery systems, it is particularly important for the individuals who administer the design-build procurement and execution to understand the contract's language and its practical application. DBIA also recognizes that the construction industry currently tends to focus on the contract between the owner and design-builder. For design-build to succeed, however, the principles must also be incorporated into the contracts of those subconsultants, subcontractors and major suppliers working within the design-build team.

In addition to the contracting best practices and implementing techniques outlined in DBIA's *Universal Best Practices*, DBIA recommends the following for projects in the transportation sector:

A. The following are additional best practices specifically tied to the contracting of transportation projects.

- i. Contract language should specify the owner's responsibilities and the design-builder's responsibilities. This should include design, permitting, ROW, utilities, construction and coordination aspects.
- ii. Contracts should be clear about rules of engagement with specific third parties regarding utility relocations, ROW acquisitions and/or environmental permitting. If it is determined the design-builder is responsible for the third-party improvements, points of contact for the third parties should be included in the contract agreement.
- iii. Utility Agreements or Memoranda of Understanding (MOUs) should be developed with all impacted utility owners to clearly define divisions of responsibilities. The contract language should clearly state which party has responsibility for each component of the utilities requiring relocation.
- iv. The contract language should address risk allocation when unexpected utilities are encountered.
- v. Owners should clearly identify design-build submittal requirements for the utility work plan, emergency response plan, SUE validation, utility plans and conflict matrix, including record drawing requirements if applicable.

B. Additional Considerations.

- i. Contracts should be clear that the owner's inability to provide ROW for the improvements is not the design-builder's risk or liability.
- ii. When possible, include provisions that at some level allow design-build entities to identify priorities for acquisition in order to optimize the approach to their design solution.
- iii. The contract language should clearly specify if there are restrictions placed upon the contractor's ability to perform work on third-party property or facilities or if time restrictions apply.



Left to Right:

Fairfax County Parkway, Phases I, II and IV, Owner: Virginia Department of Transportation, FHWA Eastern Federal Lands Highway Division, U.S. Department of Transportation, 2013 *Design-Build Merit Award*

I-295 Meadowville Interchange, Owner: Virginia Department of Transportation, Chesterfield County, 2013 *Design-Build Merit Award*

- iv. When work is being performed by the private utility, the MOU should include schedule commitments that can be contractually relied on by design-builders.
- v. Considering the added sensitivity associated with railroad facilities, it is recommended that railroad grade crossing permits and all railroad coordination be defined by the owner during the permit process.
- vi. Owners should endeavor to obtain all environmental permits prior to issuance of the RFP. Permitting agencies should be made aware that the RFP design is a base-line condition and conceptual in nature. Provisions should be made that anticipate some future level of refinement that does not take the agency entirely by surprise or prohibit permit re-submittals.

III. EXECUTING THE DELIVERY OF DESIGN-BUILD PROJECTS

DBIA recognizes that the best practices associated with the execution of a design-build project are similar to those projects delivered under other systems. It is not the intent of this document to focus on identifying general best practices associated with design, construction or project management. Rather, this document's best practices for project execution focus on unique features of the design-build process, where successful execution is based upon relationships built upon trust, transparency and team integration. Individuals not only need to be competent in their specific areas of responsibility, but they also must understand the design-build process and that success is directly dependent upon the ability of the entire team to work together collaboratively.

In addition to the post-award best practices and implementing techniques outlined in DBIA's *Universal Best Practices*, DBIA recommends the following for projects in the transportation sector:

A. The following are additional best practices specifically tied to the execution of transportation projects.

- i. When a project has received environmental clearance and received a NEPA Record of Decision, changes proposed by the design-builder may constitute the need for a NEPA re-evaluation. Assignment of any/all project risks associated with these proposed changes must be addressed in the RFP and contract documents.
- ii. Design-builders proposing on state or federally funded projects must familiarize themselves with the overall NEPA process and its requirements. This is especially true when proposing changes to approved concepts which deviate from the environmental documents that may impact schedule and costs.
- iii. Owners may wish to incentivize design-build teams to find ways to protect utilities as opposed to relocating them.
- iv. When utilizing design-build project delivery, maintenance of traffic is a responsibility typically assigned to the design-build team. Allowing maximum flexibility with schedule incentives will help incentivize design-build teams to execute projects at maximum efficiency and cost.
- v. Similarly, when utility relocation and/or ROW acquisition are included as a responsibility of the design-build team, owner guidance, continuous owner support and the inclusion of contract incentives may lead to increased efficiencies and cost reductions.

B. Additional Considerations.

- i. Owners should schedule a meeting early in the post-award phase to introduce the design-builder to the third parties to develop communications, responsibilities and schedules regimes.
- ii. Use of separate task forces to address issues related to ROW acquisition, utility relocation and environmental permitting will engage agencies, private and public utilities and property owners into the process.

- iii. All parties involved with environmental compliance should attend the project coordination meetings during the design phase as well as construction.
- iv. It is recommended that owners and reviewing agencies establish a process which allows them to commit to the timely review of submittals and to respond quickly to requests by the design-build team.
- v. Protocols for timely communications among the owner, design-builder and permitting agencies will help establish methods for reducing delays and improving quality of performance.

Additional resources are available at www.dbia.org.



Questions or Comments? Email BestPractices@dbia.org



Clockwise from Top:

I-15 Corridor Expansion I-15 CORE, Owner: Utah Department of Transportation, *2013 National Design-Build Award*

Phase 4 Development of the President George Bush Turnpike - Western Extension Design Build, Owners: North Texas Tollway Authority, HDR Engineering, Inc., *2013 Design-Build Merit Award*

Akutan Airport Project, Owner: Alaska Department of Transportation and Public Facilities, *2013 Design-Build Honor Award*



DESIGN-BUILD DONE RIGHT

Transportation Sector

BEST DESIGN-BUILD PRACTICES

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DBIA extends a special thanks to all of the industry leaders who helped shape this document. A special thanks is extended to DBIA's Transportation Markets Committee Thought Leader, James Avitabile, PE, DBIA of RS&H, and the full Transportation Markets Committee, including the Virginia Department of Transportation, Jacksonville Transportation Authority, Maryland Highway Department, Federal Highway Administration, Utah Department of Transportation, and San Mateo County Transit Authority (Sam Trans) representatives who participated in this committee.

Attachment 5

Detailed Review of Drawings by Discipline

Attachment 5: Detailed Review of Plans

The following sections are a detailed review of the plans and include observations regarding the progression of design from Preliminary Engineering to Advanced Preliminary Engineering, and an analysis of the level of effort. The findings and recommendations are included in Section 8.0 Review of Drawings of the report.

8.3.1 General Plan and Profile / Track Alignment Plans

General plan and profile and track alignment plans sheets were developed as part of the Advanced Preliminary Engineering packages for both stations. These sheets show the alignment of the left and right track to the surface streets' plan and profile. In summary, the Preliminary Engineering (2011) has 21 track plan & profile and cross section sheets for Century City/Constellation Station; and 18 track plan & profile and cross section sheets for Wilshire Rodeo Station. The RFP project definition drawings have a total of 36 track plan & profile and cross section sheets for both stations in a combined set.

The total number of sheets did not significantly change, the level of design detail for these sheets significantly increased, which would be expected. However, the sheet numbering and naming for all of these sheets between the 2011 Preliminary Engineering and the 2014 Advanced Preliminary Engineering, then again for the 2015 Advanced Preliminary Engineering, then changed once again for the RFP Project Definition Drawings where the plans were combined. There appears to be a significant amount of unnecessary administrative document control work.

The Advanced Preliminary Engineering Wilshire/Rodeo Station Plans (2014) for Mod 43, Sheets C-3021 thru C-3027 are duplicated in Sheets C-3121 thru C-3127. Since there are no cross section sheets, it is assumed that sheets C-3121 thru C-3127 were intended to be the cross section sheets. This issue does not matter because the plans have progressed further and reissued in subsequent deliverables. This is another indication that there was not a clear definition of the status of the project at the completion of Mod 43, and that a detailed work plan must be developed and maintained.

8.3.2 Architectural Plans

Station Architectural plan sheets were developed as part of the Preliminary Engineering (PE) and Advanced Preliminary Engineering (APE) packages for both stations. The Preliminary Engineering Architectural drawings (2011) provided does not appear complete according to requirements of the Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering, refer to Sections 7.1., and 7.1.1.7. They appear to be (at most) on the level of Advanced Conceptual Engineering (ACE), based on the completed drawings. The plans lacked the typical General sheets for Project Information, General Notes, Code Analysis, etc. However, it is understood that the purpose of the drawings were to process the EIS/EIR and the lacking information did not effect that process.

Subsequent Mods (36, 43, and 52) did not include a detailed narrative for the technical scope of services to be delivered; therefore, analysis for the level of completion of the drawings is subjective.

In general, the entire architectural layout of the building/station was reworked including space locations, footprints, mechanical room locations and size, etc. on each floor. This required rework or new architectural design for all areas. A significant level of effort would have been required to redesign these drawings. The level of detail provided in the architectural drawings for design build is evaluated to be appropriate.

8.3.3 Mechanical Design - Ventilation

For the Century City/Constellation Station drawing set the number of drawings in the 2011 set was 40 sheets, whereas the number of drawings in the 2015 set was 28 sheets. For the Wilshire/Rodeo Station drawing set the number of drawings in the 2011 set is 34 sheets, the 2014 set has 34 sheets, and the 2015 set has 27 sheets. This is due to the 2015 drawings not including sheets in areas where there was not any mechanical work. The drawings appear to be sections cut from 3D models developed for the stations. The plans include the mechanical supply and exhaust fans for three stories of the underground subway station and the emergency purge system with sound attenuation.

The significant design changes through the drawing progression is that the 2011 drawings have electric heaters to be installed in toilet rooms and split system heat pumps for security room and IT rooms. This design was removed in the 2015 drawings. The change in design may have been a result of a value engineering study.

In general, the entire architectural layout of the building/station was reworked including space locations, footprints, mechanical room locations and size, etc. on each floor. This required a rework or new mechanical design for all areas. A significant level of effort would have been required to redesign these drawings. The level of detail provided in the mechanical drawings for design build is evaluated to be appropriate and is consistent with the requirements for Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering, refer to Section 7.1.1.9. However, Metro has detailed design criteria for Mechanical Systems and these drawings may not be needed for a design/build project; therefore, Metro should analyze and add to project lessons learned the level of detail expected for producing these plans, especially in light of the numerous administrative changes to the drawing that have happened throughout this project.

It is understood that right-of-way acquisition, especially for the fire and life safety requirements, is a complex issue and attention to these designs in our opinion is warranted. Additionally, these types of designs are subject to significant third party coordination, requiring higher level of design and potentially numerous iterations; therefore having some knowledge on potential claims that can be avoided is beneficial to the project.

8.3.4 Mechanical Design - Plumbing and Fire Protection

For the Century City/Constellation Station the 2011 drawing set is 36 sheets, whereas the 2015 set has 23 sheets. For the Wilshire/Rodeo Station drawing set the number of drawings in the 2011 set is 24 sheets, the 2014 set has 31 sheets, and the 2015 set has 26 sheets. This is due to the 2015 drawings not including sheets in areas where there was not any plumbing work. The general

Attachment 5: Detailed Review of Plans

plumbing design for this station includes sewer, water, and sumps systems. The 2011 drawings show toilet rooms having plumbing for many occupied spaces, which were removed in the 2015 drawing set, including a large reduction in the sump/ejector system. The change in design may have been a result of a value engineering study.

In general, the entire architectural layout of the building/station was reworked, including space locations, footprints, mechanical/sprinkler/pump room locations and size, etc. on each floor. This required a rework or new plumbing/sprinkler design for all areas. The level of detail provided in the mechanical drawings for design build is evaluated to be appropriate and is consistent with the requirements for Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering, refer to Section 7.1.1.9. However, Metro has detailed design criteria for Mechanical Systems and these drawings may not be needed for a design/build project; therefore, Metro should analyze and add to project lessons learned the level of detail expected for producing these plans, especially in light of the numerous administrative changes to the drawing that have happened throughout this project.

8.3.5 Electrical Design

For the Century City/Constellation Station drawing set the number of drawings in the 2011 set is 27 sheets, whereas the 2015 set has 54 sheets. For the Wilshire/Rodeo Station drawing set the number of drawings in the 2011 set is 21 sheets, the 2014 set has 104 sheets, and the 2015 set has 54 sheets. This is due to the 2015 drawings not including sheets in areas where there was not any electrical work. The project RFP Project Definition Package combined the two stations but only has a total of 27 sheets.

Available drawing lists, titled *Percentage Complete as of December 31st, 2014* (undated, unauthored), believed to be associated with the Mod 52 work planning, indicate that a significant number of electrical drawings will be developed as reference drawings to be used in preparation of the cost estimate and schedule.

In general, the entire architectural layout of the building/station was reworked, including space locations, footprints, room locations and size, etc. on each floor. This required a rework or new electrical design for all areas. The level of detail provided in the electrical drawings for design build is evaluated to be appropriate and is consistent with the requirements for Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering, refer to Section 7.1.1.8. However, Metro has detailed design criteria for Electrical Systems and these drawings may not be needed for a design/build project; therefore, Metro should analyze and add to project lessons learned the level of detail expected for producing these plans, especially in light of the numerous administrative changes to the drawing that have happened throughout this project.

8.3.6 Traction Power Plans

For the Century City/Constellation Station drawing set the number of drawings in the 2011 set is 14 sheets, whereas the 2015 set has 19 sheets. For the Wilshire/Rodeo Station drawing set the number of drawings in the 2011 set is 14 sheets, the 2014 set has 34 sheets, and the 2015 set has

Attachment 5: Detailed Review of Plans

11 sheets. The project RFP Project Definition Package combined the two stations but only has a total of 15 sheets.

Available drawing lists, titled *Percentage Complete as of December 31st, 2014* (undated, unauthored), believed to be associated with the Mod 52 work planning, indicate that a significant number of traction power drawings will be developed as reference drawings.

The level of detail provided in the traction power drawings for design build is evaluated to be appropriate with the requirements for Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering, refer to Section 7.3.3, which only require drawings for the Traction Power Substations. However, Metro has detailed design criteria for Traction Power and these drawings may not be needed for a design/build project; therefore, Metro should analyze and add to project lessons learned the level of detail expected for producing these plans, especially in light of the numerous administrative changes to the drawing that have happened throughout this project.

8.3.7 Communications Systems Plans

For the Century City/Constellation Station drawing set the number of drawings in the 2011 set is 14 sheets, whereas the 2015 set has 7 sheets. For the Wilshire/Rodeo Station drawing set the number of drawings in the 2011 set is 14 sheets, the 2014 set has 41 sheets, and the 2015 set has 6 sheets. The project RFP Project Definition Package combined the two stations but only has a total of 28 sheets.

The level of detail provided in the Communications Systems drawings for design build includes a lot of typical drawings. The requirements for Contract PS4350-2000 Part A – Technical Scope of Services, for Preliminary Engineering, refer to Section 7.3.5, only require specifications of UPS. However, Metro has detailed design criteria for Communication Systems and these drawings may not be needed for a design/build project; therefore, Metro should analyze and add to project lessons learned the level of detail expected for producing these plans, especially in light of the numerous administrative changes to the drawing that have happened throughout this project.

8.3.8 Train Control Plans

For the Century City/Constellation Station drawing set the number of drawings in the 2011 set is 14 sheets, whereas the 2015 set has 11 sheets. For the Wilshire/Rodeo Station drawing set the number of drawings in the 2011 set is 14 sheets, the 2014 set has 37 sheets, and the 2015 set has 7 sheets. The project RFP Project Definition Package combined the two stations but only has a total of 12 sheets.

Available drawing lists, titled *Percentage Complete as of December 31st, 2014* (undated, unauthored), believed to be associated with the Mod 52 work planning, indicate that a significant number of traction power drawings will be developed as reference drawings to be used in preparation of the cost estimate and schedule.

The level of detail provided in the Train Controls drawings for design build is evaluated to be appropriate with the requirements for Contract PS4350-2000 Part A – Technical Scope of Services,

for Preliminary Engineering, refer to Section 7.3.4. However, Metro has detailed design criteria for Train Control Systems and these drawings may not be needed for a design/build project; therefore, Metro should analyze and add to project lessons learned the level of detail expected for producing these plans, especially in light of the numerous administrative changes to the drawing that have happened throughout this project.

8.3.9 Utilities Plans

The Utilities plan sheets were developed as part of the Advanced Preliminary Engineering packages for both stations. These sheets show the existing utilities locations, sizes, owners have and dimensions relative to street centerlines and right of ways. There is information on Water, Sewer, Gas, Sewer, Abandoned lines, Storm drains, TC, CATV, Fire Alarm and electrical power lines. Cross sections indicating vertical location of utilities in reference to the proposed street centerline were provided. Permanent composite utility relocation plans were also provided, as well as their cross section relative to the Stations and the final LAWDP Power, AT&T, Joint Telecom, LADWP Water, Southern California Gas, and LABOE Sanitary Sewer and Storm Drain are shown.

The utilities design has been taken to a level of sufficient detail and the relocations of existing utilities have been identified, but that detail is around 60-80% complete. The plans show the product of the coordination effort, but are not 100% stamped drawings ready for Construction. There will be more effort required by the Design/Build Contract to bring the plans to 100%.

The research and collection of utility as-built drawings, plotting and verifying of utilities, and the coordination with utility owners, as to the methods by which conflicts between existing utilities lines and Metro's proposed construction may be resolved, is a significant work effort. The delivered product shows the outcome of this effort.

There is a significant reduction in the number of utility relocation drawings provided in the RFP set. The Advanced Preliminary Engineering drawing sets contain 83 utility drawings, while the Project Definition Drawings only contain 13 drawings. It is understood that many of these drawings are currently awaiting approval and are expected to be included in the RFP as an addendum.

8.3.10 Construction Traffic Control

The Traffic Control plans and the peak hour exemptions were developed as part of the Advanced Preliminary Engineering packages for both stations. This area of design was identified as a priority in the Lessons Learned report dated February 11, 2015. However, there were only 13 Traffic control sheets in the RFP project definition drawings. It is understood that many of these drawings are currently awaiting approval and are expected to be included in the RFP as an addendum.

8.3.11 Construction Staging and Laydown Area Drawings

Demolition, Construction, and Site Restoration plan sheets were developed as part of the Advanced Preliminary Engineering packages for both stations. This area of design was identified as a priority in the Lessons Learned report dated February 11, 2015. Only the demolition plan sheets have been included in the RFP Project Definition drawings. A significant level of effort would have been

required to develop the construction and site restoration plan sheets for the Wilshire/Rodeo Advanced Preliminary Engineering drawing set as part of Mod 43 and the Century City/Constellation Advanced Preliminary Engineering drawing set as part of Mod 52.

8.3.12 Tunnel and Cross Passage Drawings

The tunnel and cross passage drawings were developed during Mod 43 for the Wilshire/Rodeo Advanced Preliminary Engineering package. A significant level of effort would have been required to produce these drawings. The same base drawings were used to develop the Century/City Constellation set as part of Mod 52, and only minor changes have been made. The same set of drawings was used in the updated Wilshire/Rodeo Advanced Preliminary Engineering package, part of Mod 52. The same sheets are also used in the RFP Project Definition drawings. The level of effort as part of Mod 52 is anticipated to be low.

Fault crossing details are not provided in the drawing set. Typically, some type of note would be expected to delineate where changes in design are expected to occur (e.g. active fault zone crossings). It is also understood that additional drawings and reports will be issued in addendums to the RFP, which can explain why these drawings are not available at the time of this audit.

8.3.13 Geotechnical Instrumentation Drawings

The geotechnical instrumentation drawings include instrumentation plans for the stations, tunnels, and cross passages. Instrumentation details are provided. The geotechnical instrumentation drawings were developed during Mod 43 for the Wilshire/Rodeo Advanced Preliminary Engineering package. Drawings specific to Century City/Constellation were developed as part of Mod 52. Minor changes were made to the updated Wilshire/Rodeo package as part of Mod 52. Duplicated drawings have been removed and small changes have been made to the sheets for use in the RFP Project Definition drawings. A significant level of effort would have been required to develop the geotechnical instrumentation drawings for the Century City/Constellation Station. However, the level of effort required for the other drawing packages produced as part of Mod 52 is anticipated to be low.

8.3.14 Water/Gas System Drawings

Drawings include water/gas barrier system drawings for the stations. Drawings were developed specifically for the Wilshire/Rodeo Station as part of Mod 43 and for the Century City/Constellation Station as part of Mod 52. Small changes have been in the updated Wilshire/Rodeo Station as part of Mod 52. Although previously developed for each station, the RFP Project Definition drawings are for a 'typical station.' The 'typical station' sheets are consistent with the Wilshire/Rodeo Advanced Preliminary Engineering drawings. It is anticipated that a significant level of effort was required to develop the Century City/Constellation drawings. However, none of these drawings were included in the RFP Project Definition drawings.

Available drawing lists, titled *Percentage Complete as of December 31st, 2014* (undated, unauthored), believed to be associated with the Mod 52 work planning, indicate that a significant number of

Water/Gas System drawings will be developed as reference drawings. The RFP indicated that reference drawings will be issued in an addendum.

8.3.15 Station Structural Drawings

Structural drawings are for the stations. Structural tunnel drawings are included in the tunnels and cross passages drawings. The drawings appear to be sections cut from the 3D models developed for the stations. No rebar and other structural details are provided. The Wilshire/Rodeo Station drawings were originally developed as part of Mod 43, and significant updates were made as part of the updated set produced during Mod 52. The Century City/Constellation drawings were originally produced as part of Mod 52. No station structural drawings are provided as part of the RFP Project Definition drawings. A significant level of effort would have been required to develop these drawings.

Available drawing lists, titled *Percentage Complete as of December 31st, 2014* (undated, unauthored), believed to be associated with the Mod 52 work planning, indicate that the station structural drawings will be developed as reference drawings. The RFP indicated that reference drawings will be issued in an addendum.

8.3.16 Station Excavation and Support

Mod 52 includes support of excavation (SOE) drawing sets for the Wilshire/Rodeo and Century City/Constellation Stations. These drawing sets include the following drawings:

- Excavation sequence including soldier pile installation, traffic staging during soldier pile installation, utility support, excavation stages and strut installation, removal of bracing to allow pass-through of the TBM, staging of station construction and brace removal, backfilling above the completed station and re-installation of utilities. Staging for construction of two typical appendage types are also included. The sequences in the two SOE drawing sets are identical except for only a few minor changes to the notes and callouts. These drawings were developed as part of Mod 43, and a small level of effort would have been expended on these drawings as part of Mod 52.
- The support of excavation drawings include:
 - Soldier pile layout.
 - Soldier pile cap layout.
 - Deck panel layout for the road decking.
 - Deck beam layout for support of the deck panels.
 - Shoring strut and tie-back plan.
 - Cross sections along the length of the station showing the station, station appendages, adjacent buildings including basements, shoring, and the decking.

In addition to the drawings listed above, the Mod 52 Wilshire/Rodeo Station SOE drawing set includes:

- Longitudinal elevations showing the shoring and decking.

Attachment 5: Detailed Review of Plans

- 3D views of the station showing the shoring and decking.

It is expected that a similar level of effort would be involved in the SOE design for both the Rodeo and Constellation Stations. It appears that the Rodeo Station has about 30% more appendages that protrude from the plan location of the main station than the Constellation Station, and designing appendage shoring that ties into the main shoring adds significant complexity to the overall SOE design. However, the Constellation Station is about 30% longer than the Rodeo Station, and you might require coordination of retrieving the TBM through the Constellation Station SOE bracing system.

The Mod 52 Wilshire/Rodeo Station SOE drawing set appears to be developed further than the Mod 52 Century City/Constellation drawing set. In addition to the Wilshire/Rodeo set including longitudinal elevations and 3D views, the Wilshire/Rodeo set also shows the shoring and decking for the station appendages in the soldier pile layout, the cap layout, deck panel layout and the deck beam layout drawings.

The Wilshire/Rodeo Advanced Preliminary Engineering set was initially developed as part of Mod 43. A number of additional drawings were included as part of the updated Wilshire/Rodeo Advanced Preliminary Engineering set developed as part of Mod. 52.

The general layout plan of the station superstructure is similar for Modifications 43 and 52 of the Wilshire/Rodeo Station design. The Wilshire/Rodeo Station extends from approximate track Station 637+82 to 648+09 for Mod 43, and from approximate track Station 637+84 to 646+85. Longitudinal elevations and 3D views of the shoring and decking system were added to the Mod 52 SOE drawing set. Mod 52 included design calculations for shoring and decking components. A minor change to the SOE drawings is that the Mod 43 drawing set shows the soldier pile layout and the pile cap layout on the same drawings pages, but the Mod 52 drawings show the soldier pile layout and the pile cap layout on separate pages. Similarly, the Mod 43 drawing set shows the deck panel layout and the deck beam layout on the same drawings pages, but the Mod 52 drawings show the deck panel layout and the deck beam layout on separate pages.

There are significant changes to the station appendages between the Mod 43 and 52 drawing sets. Generally the appendages in the Mod 52 SOE drawing set have a more complicated geometry and cover more area in plan view than the appendages in the Mod 43 SOE drawing set, such as the appendage near Station 637+90 on the south side of the station, the Muck Retrieval Shaft/Construction Access Shaft appendage near Station 638+60 on the north side of the station, and the appendage near Station 646+00 on the south side of the station. The Mod 52 SOE drawing set also shows more appendages than the Mod 43 SOE drawing set, such as the appendage near Station 643+00 on the north side of the station, the appendage near Station 644+20 on the north side of the station, and the appendage near Station 645+00 on the south side of the station.

Although the Wilshire/Rodeo Station was reconfigured between Mod 43 and Mod 52 (the result of the removal of a train crossover), it was our opinion that a redesign of the SOE containing more detail than the Mod 43 design was not required. We believe that a detailed cost loaded work plan

should be developed for each contract modification that summarizes the current state of the project, clearly describes project objectives, and rational basis for proposed work. (See Recommendation 1B-1.) In addition, each task should summarize a rational basis for design and anticipated personnel including management. Subsequent reporting during contract execution should include a cost and schedule update and indicate any areas of potential cost overages and schedule impact. Duplicated and unnecessary work can be avoided with a detailed Project Management Plan.

Mod 43 did not include any SOE design drawings or calculations for Century City/Constellation Station. The SOE design for the Century City/Constellation Station was first presented in Mod 52.

None of these drawings have been included as part of the RFP Project Definition drawings. Available drawing lists, titled *Percentage Complete as of December 31st, 2014* (undated, unauthored), believed to be associated with the Mod 52 work planning, indicate that the station SOE drawings will be developed as reference drawings to be used in preparation of the cost estimate, schedule, and community outreach. The RFP indicated that reference drawings will be issued in an addendum.

8.3.17 Support of Excavation (SOE) Review

SOE “Building Protection Calculations” are included in Mod 52 for the Wilshire/Rodeo and Century City/Constellation Stations. These calculation packages include the following:

- SOE analyses to estimate shoring wall and bracing loads at three design sections. Bracing removal and re-bracing construction stages are incorporated in these analyses.
- FLAC numerical analyses to estimate shoring wall deflections for two locations along the Wilshire/Rodeo Station and for three locations along the Century City/Constellation Station. These analyses incorporate surcharge loads from adjacent buildings, site dewatering, a staged excavation, and the brace removal construction stages. The Century City/Constellation Station calculation package also presents a similar FLAC numerical analysis for a documented excavation case history.
- Empirical wall deflection calculations.
- Compiled characteristics of buildings near the station excavation.

Mod 52 also includes SOE structural design calculation packages that size SOE structural members for the Wilshire/Rodeo and Century City/Constellation Stations. These two calculation packages are nearly identical to each other and include loading analysis and sizing calculations for the following:

- Precast concrete deck slabs – includes analysis of several different traffic loading scenarios, analysis for lifting the deck slabs, and slab reinforcement details.
- Deck beams – members are sized, and checks on multiple service, fatigue and fracture limit states are provided.
- Deck bracing – deck bracing members, gusset plates, welds and bolted connections are designed to resist vehicle braking and seismic loading onto the deck.

Attachment 5: Detailed Review of Plans

- Shoring struts – a bracing load result summary is presented, and strut capacities are calculated for pipe struts with eight different diameters.

It is our opinion that the SOE designs are moderately to highly complex due to the quantity of appendages. Other matters that make this SOE design relatively complex include:

- Urban environment challenges, including easement constraints, foundations of adjacent building, limited site access, coordinating traffic control, and coordinating utility support or relocation.
- SOE design considerations to allow the TBM to pass through the stations or having to retrieve the TBM from a station, if required.
- Coordinating the bracing removal with construction of the station structure, including re-bracing.

Theoretically, the SOE work can be bid on without any SOE design information provided in the RFP as long as critical information is presented, such as the station geometry, station appendage geometry, ground and groundwater conditions, adjacent building and building foundation information, utility information and provisions for traffic control. However, providing a viable preliminary SOE design in the RFP will help bidders to more easily determine what is required for the SOE system, and bidders will be less likely overlook critical issues. It is Brierley's opinion that the Mod 52 SOE design is at around 60% for the Wilshire/Rodeo Station and at around 50% for the Century City/Constellation Station. SOE designs at around 20% to 40% are typically provided in RFP documents for Design/Build projects of this type and scope.

There is a diminishing level of return for preliminary SOE design efforts to better understand the SOE's implications on other design aspects of the job. Advancing the SOE design to around 15% to 25% will provide a significant amount of information to give a fairly good idea of the SOE's effects on issues like cost, schedule, utility relocation, and geotechnical monitoring program. Additional work on the SOE design beyond 15% to 25% will provide more detailed information, but the additional detail will not likely significantly change the effects on estimated cost, schedule, etc.

No specific line item was included in Mod 52 for this work, but the design effort probably took a considerable amount of time. Additionally the level of effort is likely to be determined by stakeholder requirements and impacts, and this may have been an iterative effort associated with station design due to 3rd party requirements.

Because of the complexities due to the site conditions, risks and consequences, more attention to these designs in our opinion is warranted. Additionally, having designs prepared to a higher level of design will give PB/Metro the ability to assess potential risks and consequences to the 3rd party improvements. Furthermore, these types of designs are subject to contractor claims, so having some knowledge on potential claims that can be avoided is beneficial to the project.

8.3.18 Tunnel Design Review

Mod 52 includes tunnel drawing sets for the Wilshire/Rodeo and Century City/Constellation Tunnels. The Mod 52 Wilshire/Rodeo and Century City/Constellation Tunnel drawing sets appear to be identical and include the following drawings:

- Typical tunnel cross sections showing track locations, vehicle dynamic envelopes, invert concrete with drain pipe, contact rail and evacuation walkways. Sections are shown for an alignment on a tangent, an alignment on a tangent with a secondary tunnel lining, an alignment on a curve with the walkway on the outside of the curve, and an alignment on a curve with the walkway on the inside of the curve.
- Alignment and walkway control data for track geometry through tunnel curves.
- Concrete tunnel segmental lining general arrangement.
- Concrete tunnel segment gasket details.
- Tolerances for tunnel concrete segments.
- Stray current invert collector details.
- Secondary liner details including details for water proofing and dowel tie-in to the primary tunnel liner.
- Drainage details.
- Cross passage and sump pit details.

The Mod 52 Wilshire/Rodeo and Century City/Constellation Tunnel Drawing sets include some information on the required geometries and possible configurations for the tunnel segmental lining, tunnel segment gaskets, stray current invert collectors and waterproofing details. However, all of the information that would be required for a final design is not included, such as, reinforcement and dimension details, the invert of the concrete and the evacuation walkway, reinforcement and tunnel tie-in details for the cross passages and sump pits, and details on tunnel segment hardware components and tunnel segment geometries. The Mod 52 tunnel drawings are estimated to be around 20% level of design, and are at an appropriate level for the Design/Build RFP Project Definition Drawings.

The RFP Project Definition Drawing set is very similar to the Mod 52 Wilshire/Rodeo and Century City/Constellation Tunnel Drawing sets, except the following details have been left out of the RFP set:

- Vehicle dynamic envelope dimensions detail.
- Typical tunnel cross sections for the curved tunnel alignment.
- Alignment and walkway control data for track geometry through tunnel curves.
- Concrete tunnel segment connection details.

Also, tunnel design calculations were not included for the Wilshire/Rodeo and Century City/Constellation tunnels in Mod 52.

Changes in drawing sets between Mod 43 and Mod 52 are noted below:

Attachment 5: Detailed Review of Plans

- Century City/Constellation Tunnel: Mod 43 did not include any tunnel drawings for Century City/Constellation Station. The tunnel drawings for the Century City/Constellation Station were first presented in Mod 52.
- Wilshire/Rodeo Tunnel: The Mod 52 Wilshire/Rodeo tunnel drawing set is very similar to the Mod 43 tunnel drawing set. Three sheets of gas and waterproofing details that were included in the Mod 43 drawing set were removed from the Mod 52 tunnel drawing set. The following details were added to the Mod 52 tunnel drawing set that were not shown in the Mod 43 tunnel drawing set:
 - Vehicle dynamic envelope dimensions detail.
 - Typical tunnel cross section for an alignment on tangent with a secondary tunnel lining.
 - A waterproofing detail for a concrete dowel anchor.

Overall, it appears that few changes were made to the tunnel drawing sets between Mod 43 and Mod 52. This is not an indication that some level of effort was made to validate the design during Mod 52, but without a detailed work plan it is difficult to determine the status of the design at the conclusion of Mod 43 and what additional work was required for Mod 52.

The SOW for contract Mods 21, 36, 43, and 52, as it relates to tunnels, stations (structural and support of excavation), and geotechnical engineering aspects of the project are summarized in Exhibit A.

Engineering Tunnel Design – Tunnel & Cross Passage Design

The SOW for Mod 43 includes advancing the tunnel and cross passage design for Section 2 to a level that will allow the production of the RFP package, continuing fault crossing analyses, gaining additional existing building information, and advancing the adjacent building protections proposals. The corresponding deliverables include the tunnel and cross passages Advanced Preliminary Engineering design package, updated fault crossing design drawings, and the Advanced Preliminary Engineering adjacent buildings protection report. Mod 52 tasks and deliverables are very similar.

PB's progress reports indicate that work related to these tasks was being completed as part of Mod 43. However, detailed descriptions are not provided, so the extent to which these tasks were completed is unclear. For example, in May 2014, comments on the Tunnel Geotechnical Design Memorandum were incorporated and multiple progress reports indicated that work continued on the building protection program report for Section 2.

Included as part of the Wilshire/Rodeo Advanced Preliminary Engineering package, the general arrangement drawing sheets for Tunnel Reach 4 were complete and submitted in February 2014. By January 2015, the general arrangement drawing sheets for Tunnel Reach 5 had been set up.

Geotechnical Field Work

Both Contract Mods 43 and 52 specify that additional field work will be completed. PB's progress reports indicate that the Geotechnical field work associated with Mod 43 was delayed until March 2015. A detailed work plan was not available for review to understand if separate geotechnical field

Attachment 5: Detailed Review of Plans

investigations were performed concurrently, and the effect it had to the project deliverables, schedule, and budget.

The independent cost estimate, completed in January 2015, indicates that a difference in the geotechnical and environmental investigation SOW includes the cost difference between current scopes versus scope defined in Mod 43. The independent cost estimate also assumes a small number of hours for the preparation of the Geotechnical Data Reports (GDRs), Geotechnical Design Memoranda (GDMs), and the Geotechnical Baseline Report (GBR), with 148, 78, and 78 hours respectively. It also indicates that additional effort on these tasks is included as part of Mod 43. The equivalent hour breakdown prepared by PB is unavailable, so the hours assumed for each of these tasks by PB is unknown. A detailed work plan was not available for review to understand the amount of work that need to be performed in Mod 52 to complete the geotechnical reports.

The independent cost estimate also indicates a reduction in the Mod 52 proposed field fault investigation efforts. The number of continuous core borings is reduced from 18 to 8, and the 41 CPTs have been removed. Additional clarification is needed to determine the effect these items had on project deliverables, schedule, and budget.

Geotechnical Data Report

The Mod 43 Scope of Work includes producing a GDR based on the Section 2 field work. Mod 52 calls for the same thing. Three GDR's were issued as part of the RFP documents as part of Mod 52. Interim versions of the GDRs are unavailable for review. This made it difficult to determine status of these documents and associated work to be completed during Mod 52.

Fault Study

Mod 43 included fault study field work, a continuation of the geologic study at Santa Monica Fault Zone, and a probabilistic fault hazard analysis. Continuing into Mod 52, additional field work related to the fault study is included in the SOW and the fault study report needs to be completed. An interim report for the fault study at the completion of Mod 43 and/or a detailed work plan was not available for review; therefore it is difficult to determine what needed to be completed as part of work under Mod 52.

Numerical fault modeling reports are included in the SOW for both Contract Mods 43 and 52. The scopes provided does not indicate how much modeling was performed in Mod 43 and is expected to be performed under Mod 52.

At the time of this report, no detailed information was available on the fault crossing analysis and design work specified in the SOW for both Contract Mods 43 and 52. The SOW for Contract Mods 43 and 52 indicate that a significant level of effort was to be expended on fault investigations and studies. The progress reports provide indications that this work was being pursued. From Mod 43, in June 2014, a teleconference with the Tunnel Advisory Panel members to review the status of the Probabilistic Fault Hazard Studies was completed. From the beginning of Mod 52, in June 2015, tunnel seismic design for fault crossings have been ongoing as of the most recent available progress report from September 2015. It appears that a significant level of effort was spent on the fault

crossing analysis. We anticipate the tunnel design through active fault crossings will be left to the Design/Build team, and all the information will be provided to the Design/Build team through addendums to the RFP.

The available PB report, *Century City Area Fault Investigation Report* (November 2011), and the *Response to Preliminary Review Comments of Century City Area Fault Investigation Report by Shannon & Wilson* (April 2012), indicate that Section 2 stations will be constructed outside of active fault zones, but that the tunnels will need to pass through active fault zones. These reports indicate that tunnel crossings of the fault zones will require special designs to accommodate fault movement. They also indicate that, during subsequent design phases, exploration will continue to evaluate the location of the fault zones more precisely with respect to the tunnel alignment selected and the fault characteristics for design. We understand this work is ongoing, but do not know what was done under Mod 43. It is unknown what level of effort was needed by PB to finish the preliminary design.

Geotechnical Oil Well Exploration:

Directional drilling exploration is specified in both Contract Mods 43 and 52. The progress reports indicate the geotechnical investigation work was delayed until March 2015, and it is unclear if all of the investigation work outlined in the SOW for Mod 43 and/or Mod 52 was completed.

Section 2 RFP Documents:

The SOW for Mod 43 includes preparing the RFP package for the Section 2 Design/Build contract including drawings, specifications, and reports (GDR and GBR etc.). This work is also included in Mod 52, and was completed as part of Mod 52. PB's progress report from June 2014 for Mod 43 indicates that the delivery of Section 2 RFP documents and milestones will be revised to match the newly adopted schedule for Section 2. The documents are not clear and how the budget accounted for this task between Mod 43 and 52.

8.3.19 Specifications

Specifications were expected to be developed for each stage of the project. The following information, taken from the applicable contract modification SOW information, is summarized below:

Preliminary Engineering (Mod 21) deliverables include an outline of the following specifications:

- structural design
- tunnels
- station architectural design
- maintenance facility design
- construction safety
- electrical design
- mechanical design
- subsystems
- standard specifications

Attachment 5: Detailed Review of Plans

Mod 36: For tunnel design, draft and final versions of the updated guide specifications are required. The SOW specifically mentions the following:

- TBM specification for gassy and non-gassy areas
- Specifications for the Design/Build (DESIGN/BUILD) package for the VA Parking Garage (architectural design)
- Tunnel and cross passage design specifications
- Sustainability specifications (environmental engineering)

Mod 43: The SOW includes preparing the RFP package for the Section 2 DESIGN/BUILD contract, including specifications.

Mod 52: The SOW includes preparing the RFP package for the Section 2 DESIGN/BUILD contract, including specifications. Mod 52 also required PB to prepare the utility relocation specifications for the Metro-managed relocation contracts. However, the Advance Utility Relocation contracts did not happen as originally planned, it is assumed these specifications will be included in the RFP contract documents as an addendum.

PB's progress report from June 2014 for Mod 43 indicates that the delivery of Section 2 RFP documents and milestones will be revised to match the newly adopted schedule for Section 2. C1045 Section 1 Conformed General Requirements (GR) Division 1 and Conformed Technical Requirements (TR) Divisions 2-34 dated November 3, 2014 were provided and assumed to be part of the Mod 43 deliverables.

The Section 2 RFP technical requirements (specifications) were issued on November 2, 2015, as part of Amendment No. 3. These specifications appear to be based on the Section 1 RFP technical requirements. Specifications were also issued as part of Mod 43. The level of effort required to modify these specifications is anticipated to be relatively low. A quick review of both technical specification packages (for Section 1 and 2) indicates that the specifications are predominately the same. The level of effort expended to generate the technical requirements should have predominately occurred as part of the Section 1 RFP contract package preparation (Mod 41).

In total, 244 technical specifications have been developed for the Section 2 RFP Design/Build Contract package (2,396 page document). Five of these specifications are new:

- 03 48 43 Precast Concrete Platform Edge Pavers
- 12 93 14 Bicycle Lockers and Racks
- 21 22 00 Clean Agent Fire-Extinguishing System
- 31 32 14 Compensation Grouting
- 31 81 00 Jet Grouting

Eight specifications from the Section 1 package were removed:

- 10 14 26 Station Marker
- 10 17 16 Public Telephones

- 10 77 00 Bicycle Metal Lockers and Racks
- 31 13 16 Selective Tree and Shrub Trimming (Tree Pruning)
- 33 39 13 Sanitary Sewerage Maintenance Holes, Frames, and Covers
- 33 49 13 Storm Drainage Maintenance Holes and Structures
- 33 71 19 Electrical Underground Ducts and Vaults
- 34 21 61 Traction Power DC Load-Break Devices

8.3.20 Geotechnical Documents

In the traditional Design/Bid/Build procurement framework, the design is completed by the Owner's consultant prior to a competitive bidding process. Under this procurement process, all of the geotechnical investigation and geotechnical reports, including the geotechnical data report (GDR) and geotechnical baseline report (GBR), are finalized prior to the bidding process. In the Design/Build procurement framework, adjustments to the GDR, GBR, and other geotechnical reports development process need to be made. For Design/Build projects, the GDR has essentially the same objective as for Design/Bid/Build projects - to assemble all data and information that has been obtained in the course of site characterization efforts, and to disclose this information in an organized fashion. The primary difference is that the geotechnical investigation may not be complete and the Design/Builder will be required to complete additional site investigation and present its investigations in an updated GDR. This is the case on the Section 2 Westside Subway Extension Project. Geotechnical Design Memoranda (GDMs) have also been included as part of the RFP package. The GDMs present the preliminary engineering design parameters and the Design/Builder will be required to review and update the engineering design parameters for final design.

In Design/Build contracts, typically two GBRs are developed. Initially, based on the site investigations and the preliminary design completed by the Owner, the Owner's Engineering Consultant (in this case, PB) would prepared a GBR for Bidding (GBR-B). Evaluations presented in the GBR-B are then subject to evaluation by the Design/Build team, and is then modified or ratified in a GBR for Construction (GBR-C), prepared by the Design/Build team. As part of the detailed design and construction planning process, the GBR-C accounts for information obtained in subsequence subsurface explorations and the Design/Builders chosen means and methods. The usual intent is that the GBR-C will supersede or join together with the GBR-B, depending on how it is written.

The following geotechnical documents, dated September 1, 2015, were issued as part of the RFQ/RFP for Section 2 of the Project:

- Geotechnical Data Report – Tunnel Reaches 4 and 5
- Geotechnical Data Report – Century City Constellation Station
- Geotechnical Data Report – Wilshire/Rodeo Station

As part of Amendment No. 3, on November 2, 2015, the following additional geotechnical documents have been issued:

Attachment 5: Detailed Review of Plans

- Geotechnical Baseline Report
- Geotechnical Design Memoranda – Century City Constellation Station
- Geotechnical Design Memoranda – Wilshire/Rodeo Station
- Geotechnical Design Memoranda – Reaches 4 and 5

All seven of these geotechnical reports were prepared after Mod 52 was executed. However, it is unclear if some of these reports were supposed to be developed during Mod 43, but only delivered during the Mod 52 time period.

Geotechnical Data Reports

From the available documents, we are able to understand what level of geotechnical field and laboratory work was completed. Geotechnical subsurface investigations were completed throughout the Advanced Conceptual Engineering (ACE), Preliminary Engineering (PE), and Advanced Preliminary Engineering phases for this project. Key information is summarized below.

Century City/Constellation Station

The geotechnical exploration summary provided in the Century City/Constellation Station GDR indicates that the geotechnical explorations at the Century City Constellation Station site consisted of:

- four rotary wash borings
- two hollow-stem auger borings
- one cone penetration test sounding
- in-situ pressure meter tests within selected borings
- primary (p) and secondary (s) wave suspension logging within selected borings
- installation of groundwater monitoring wells within selected borings

Two borings and one CPT were completed as part of the Preliminary Engineering phase and four borings were completed as part of the Advanced Preliminary Engineering phase. The total footage drilled was 758 feet, with an average borehole depth of 126 feet. The CPT was pushed 62 feet. 39 previously completed geotechnical borings from prior investigations were used in the development of the geotechnical data report.

Wilshire/Rodeo Station

Geotechnical explorations at the Wilshire/Rodeo Station site consisted of:

- five rotary wash borings
- one sonic boring
- one CPT sounding
- in-situ pressuremeter tests in one boring
- installation of groundwater monitoring wells at one location

Attachment 5: Detailed Review of Plans

Per the GDR, two borings were completed as part of the Advanced Conceptual Engineering phase and five borings were completed as part of the Preliminary Engineering phase. No additional borings were completed as part of the Advanced Preliminary Engineering phase. In addition, 37 relevant explorations from prior investigations that are located near the station site, were used in the development of the GDR.

Tunnel Reaches 4 and 5

Geotechnical explorations along the tunnel reaches 4 and 5 alignment consisted of:

- 26 rotary wash borings
- one hollow-stem auger boring
- three sonic core borings
- nine CPT soundings with seismic measurements at one location
- in-situ pressuremeter tests at three borings
- installation of groundwater monitoring wells at four locations

Four borings were completed as part of the Advanced Conceptual Engineering phase, 25 borings were completed as part of the Preliminary Engineering phase, and one boring was completed as part of the Advanced Preliminary Engineering phase. A significant number of borings, completed as part of prior investigations, were included in the development of the geotechnical data report.

Using the contract modification SOW summary, we can develop a general sense of the geotechnical field work that was planned to take place as part of Mod 52:

- 12 borings, one pump test, and associated lab work for Century City/Constellation Station,
- 7 borings and associated lab work for Wilshire/Rodeo Station
- Fault investigation to include 18 continuous core borings and 41 cone penetration tests (CPTs)
- Horizontal Direction Drilling - 3 drives, each 250 feet in length (750 feet total length)

Comparing the SOW to what the GDR reports, there is a discrepancy in the number of borings completed as part of Mod 52. The SOW indicates that 12 borings in the vicinity of Century City/Constellation Station will be completed and 7 borings in the vicinity of Wilshire/Rodeo Station will be completed. The GDRs indicate that 4 additional borings were completed at Century City/Constellation and no additional borings were completed at Wilshire/Rodeo as part of the Advanced Preliminary Engineering phase.

The fault investigation and HDD results have not been included in the GDR. We expect this will need to be included the GDR and addressed in the GBR.

Geotechnical Design Memoranda

Three separate Geotechnical Design Memoranda (GDMs) were prepared for specific areas of the project. These areas are the Constellation Station, Wilshire/Rodeo Station, and Tunnel Reaches 4 and 5. Generally these report geologic and geotechnical data collected for the project, present

Attachment 5: Detailed Review of Plans

interpretations of ground conditions, and provide design and construction considerations for the proposed project. They also present quantifications of various material properties and subsurface conditions typically found in the GBRs.

These reports may be useful during the Advanced Preliminary Design by the owner's engineer, but additional changes or revisions to this report should be discouraged since the Design/Build team will likely provide additional reports that better reflect information used in final design or final contract documents. Any revision to this document after issuance to the Design/Build teams should be discouraged to avoid any differences in opinion or conflicts that may ensue. Hence, any references to revisions to this document by the owner's engineer should be removed.

From review of the GDMs, it is difficult to determine how many permutations have been made of the documents or if any other smaller GDMs were prepared and used as the basis for information or interpretations of various areas of focus or information. Therefore, it is difficult to determine the level of effort that has been put forth in the development of these GDMs in Mod 52. However, a significant amount of effort would be expected in development of these GDMs, which could be on the same order of magnitude of data collection costs.

Geotechnical Baseline Report

A single GBR has been prepared for the entire project. This report presents a project description, summarizes geologic and geotechnical conditions relative to the project, presents engineering characteristics of subsurface conditions needed for design and construction of the project, summarizes obstructions that need to be considered in design and construction of the project, and lists references used in the development of the report.

This is a contractual document with the primary purpose of:

- Ensuring specific subsurface conditions are considered by the Design/Build team as baseline conditions in preparing their bids, and
- Developing a contractual procedure for cost adjustments when ground conditions exposed during construction are poorer than baseline conditions established in contractual documents.

Together, the existing GBR and GDM in effect represent a GBR consistent with the recommendations provided by FHWA (2009) in content.

However, the GBR is not a standalone document that baselines conditions per the recommendations by FHWA (2009). Moreover, we estimate the level of effort in development of the GBR is much less than development of the GDR and GDMs.

Additionally, the GBR does not include specific information for the fault crossing that will be needed for tunnel design. Nor does it appear the GBR has undergone a third party review as recommended by FHWA (2009) based on review of documents received.

Attachment 5: Detailed Review of Plans

Based on review this document, it needs to be updated or amended with specific information for the fault crossing. We understand this information is forthcoming and will be supplied to Design/Build team at a later date.

5.4 Other Geotechnical Reports

In addition to the preparation of the GDRs and GBR, the Geotechnical SOW for the project included additional deliverables:

- Preparing technical memoranda for Section 2 in support of the engineering design for the station, tunnels, support of excavation, adjacent properties and structures
- Numerical Fault Modeling Report
- Fault Study Report
- HDD/Oil Well Report

From this list, the only information currently available pertains to the fault investigation. The Century City Area Fault Investigation Report, prepared by PB and dated November 30, 2011, is available for review. Based on the date of this report, we believe that the report corresponds to Contract Modification 21. At this time, the field fault exploration program included:

- 7 rotary-wash continuous core boreholes
- 49 hollow stem auger continuous core boreholes
- 192 CPTs
- 5 P-wave seismic reflection profiles
- 5 S-wave seismic reflection profiles
- 5 downhole suspension PS velocity measurements

The fault study was conducted to evaluate the potential for active faults intersecting the Project's Century City station options and tunnel alignments along Santa Monica and Constellation Boulevards.

In April 2012, PB provided a response to preliminary review comments of the Century City Area Fault Investigation Report by Shannon and Wilson. Based on the date, this work was likely completed as part of Contract Modification 36.

More recent versions of the Fault Investigation/Study reports are currently available, but one should be expected prior to the completion of Preliminary Design since this information would be needed by the design teams for internal design and costing purposes.

Attachment 6

The Key to Successful Corporate Reorganization

Attachment 6: The Key to Successful Corporate Reorganization

7/30/2010 @ 4:23PM

The Key To Successful Corporate Reorganization

<http://www.forbes.com/2010/07/30/corporate-reorganization-abb-ford-leadership-managing-bain.html>

New chief executives often feel compelled to reorganize their companies. In fact, nearly half launch some kind of reorganization during their first two years on the job. Even that brisk pace seems to be accelerating, with Hewlett-Packard, Nokia and Caterpillar recently announcing organizational overhauls.

The spike in ambitious plans to reorganize doubtless reflects the economic cycle. Companies are only now clawing their way back to health, and full recovery seems to demand strong medicine. Changing an organization's structure can seem like an effective way of shaking up the entire operation and thereby unlocking better performance.

But corporate reorganizations are risky investments of time, energy and resources, and many do little to improve the business. Chrysler restructured its organization three times in the three years preceding its bankruptcy and eventual combination with Fiat. None of those reorgs had much effect. A recent Bain & Company study of 57 major reorganizations found that fewer than one third produced any meaningful improvement in performance. Some actually destroyed value.

What do the few successful reorganizers know that so many others don't? The reorganizations that work best don't just reshuffle the boxes and lines on an org chart. Rather they improve a company's ability to handle its most important decisions. They enable people in the organization to make better decisions. They speed up decision making. They also increase the "yield," or the proportion of decisions that are executed effectively.

An example is ABB, the big Zurich-based power technology and automation company, which came close to bankruptcy in late 2002. One reason for its near-failure: Key decisions about big power-project bids involved negotiations among dozens of different ABB units, each with its own profit goals and incentives, and the process dragged on, often failing to produce competitive bids.

A new CEO, Jürgen Dormann, analyzed the decision failures and then cut through the tangled web by consolidating divisions and centralizing profit-and-loss accountability. The reorg worked—it restored ABB's ability to generate fast, competitive bids—because Dormann's team knew that the purpose of the new structure was to support and smooth the progress of those decisions and others that were equally important.

Why are decisions so central? When you think about it, an organization's performance is really no more and no less than the sum of the decisions it makes and executes. A new org chart can't make much difference unless it somehow leads to better, faster decisions and execution.

In fact, redesigning the org chart is almost always counterproductive if leaders fail to think through what the critical decisions are for the business, who should be responsible for them, and how the new structure will help people make and execute them better. Some years back, for instance, the Internet company Yahoo! reorganized into three groups, dubbed Audience, Advertisers and Publishers, and Technology. But important decisions bogged down, and Yahoo! executives wound up having to create new roles and management levels to coordinate the three units. Product development slowed, and costs increased.

Compare that approach with Ford's recent reorganization under Alan Mulally. Mulally had already mapped out a simple schematic depicting the key decisions that had to be made at each stage in Ford's value chain, along with the infrastructure required to execute them effectively. Every week, he and his team were tracking their progress in making and executing these decisions. They divested non-core brands such as Aston Martin,

Attachment 6: The Key to Successful Corporate Reorganization

Jaguar, Land Rover and Volvo, reduced the number of production platforms, began consolidating both suppliers and dealers and so on.

Along the way they decided to reorganize the company, moving from a structure based on regional business units to a global matrix of functions and geographies. This new structure enabled Ford's leadership team to make some of those critical decisions better and faster—creating global car platforms, for instance, which had been painfully difficult under the old structure. Ford still faces challenges, of course, but so far Mulally's approach has helped Ford ride out the hurricane currently lashing the global auto industry and turn in stronger performance than its U.S. competitors.

The turbulent global economy means that more companies will scramble to reorganize in the months ahead. Keep your eyes on the results. The companies that manage to keep critical decisions at the center of their efforts are likely to emerge far stronger than those that merely reshuffle the org chart one more time.

Marcia W. Blenko, Michael C. Mankins and Paul Rogers lead the Global Organization practice for Bain & Company. Their book, Decide & Deliver, will be published by HBR Press in September.