



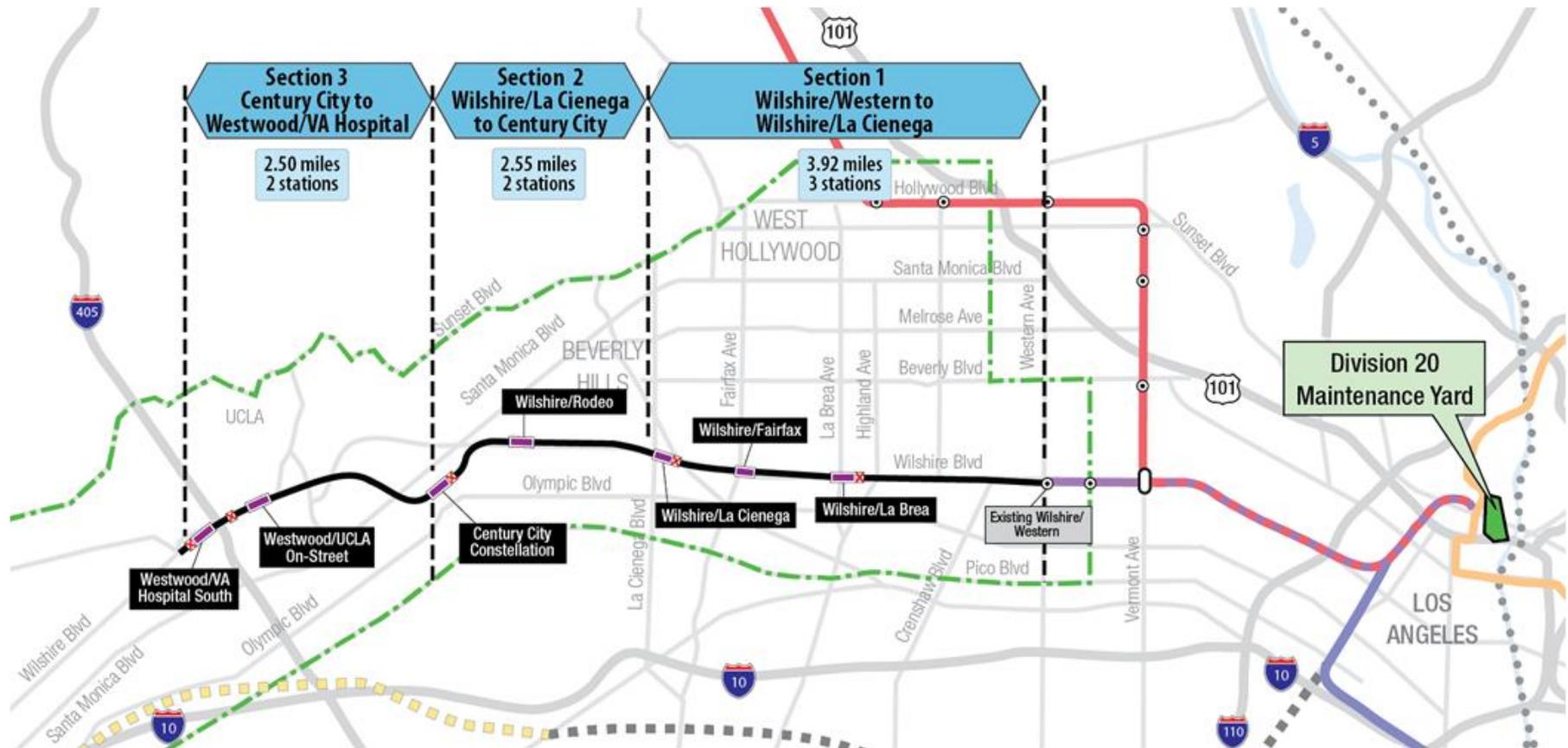
# Westside Purple Line Extension Project FTA PMOC FFGA Risk Assessment Workshop



October 21 - 23, 2015  
“Lessons Learned”

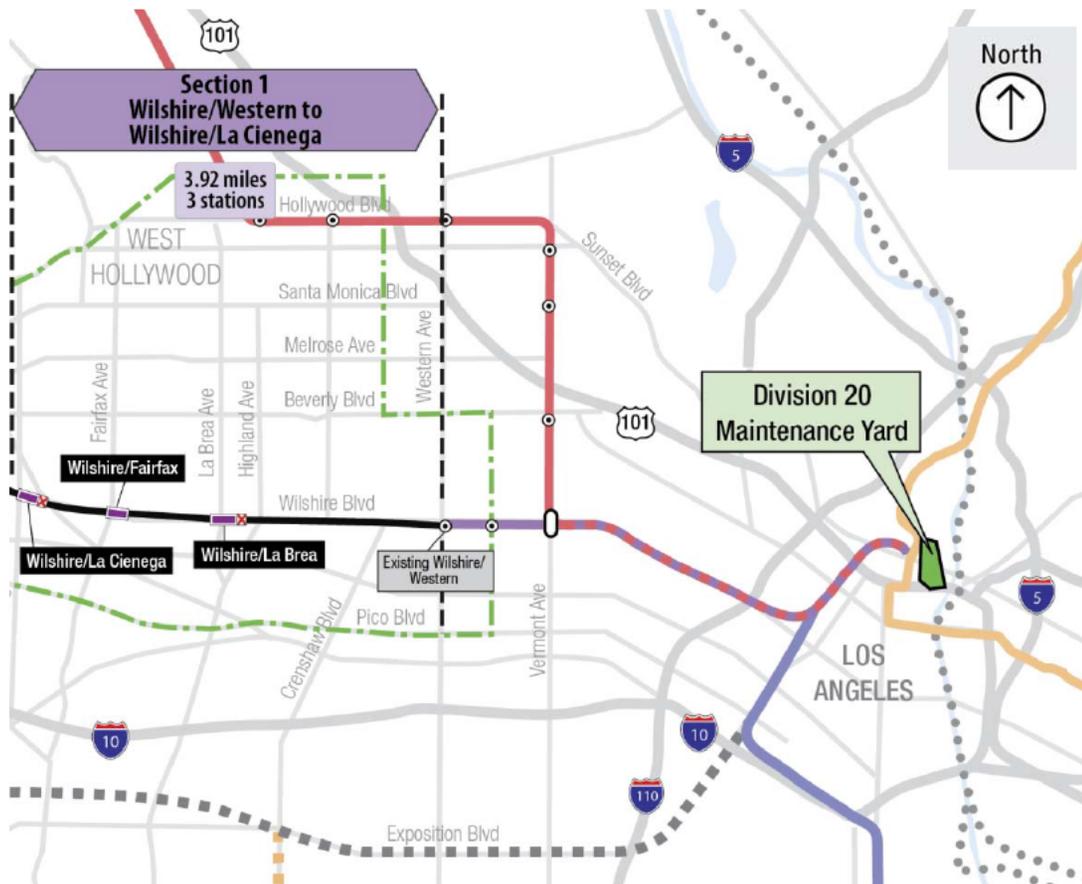


# Los Angeles County Metropolitan Transportation Authority Westside Purple Line Extension Project 9-Mile Alignment



The FTA Record Of Decision for the 9-Mile Alignment was issued on August 9, 2012

# Los Angeles County Metropolitan Transportation Authority Westside Purple Line Extension Project - Section 1 (Wilshire/Western to Wilshire/La Cienega)



- FTA Record of Decision for entire 9-mile Project - August 9, 2012
- FTA Full Funding Grant Agreement for initial 3.92 miles (Section 1 Wilshire/Western to Wilshire/La Cienega) – May 21, 2014
- Extension of Purple Line from existing Wilshire/Western station
- Twin-bored tunnels and 3 new subway stations:
  - Wilshire/La Brea
  - Wilshire/Fairfax
  - Wilshire/La Cienega
- Division 20 Yard Modifications
- FFGA Budget: \$2.82 Billion
- Revenue Service Date:
  - FFGA – October 31, 2024
  - Forecast – November 8, 2023

Westside Purple Line Extension  
"Lessons Learned"

# Introduction

- Metro's "Lessons Learned" Program Procedure # LL-1
- Over 200 "Lessons Learned" were collected from the following sources:
  - Metro Project Delivery Team
  - Metro Engineering
  - PB Team (Design/Design Services)
  - Construction Management Support Services Consultant
- Collected from the following work:
  - Design/Build (Tunnels, Stations, Systems and Trackwork) Contract – In progress
  - Exploratory Shaft Contract – Construction Complete
  - Advanced Utility Relocation Contracts – In progress
  - MOW/NRV Building 61S Contract – In progress
- "Lessons Learned" from recent experiences of other Transit Agencies considered
- The "Lessons Learned" list has been consolidated into the following categories:
  - Design
  - Third Party
  - Construction

"Lessons Learned"

**DESIGN PHASE**

# Design Phase

1. Standardization of rooms and equipment layouts as part of Project Definition requirements to reinforce Metro Rail Design Criteria Standards and Directives for Design-Build Contract.
2. Use 3-D Building Information Management (BIM) Computer Aided Design (CAD) to optimize multi-disciplinary engineering coordination for early identification of potential conflicts that could occur during construction.
3. Advance the design to a sufficient level of detail and provide CAD files to the Design/Build Contract to improve the overall project schedule and development of cost estimates.
4. Include 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.

# Modular Station Concepts and BIM to Provide Design Efficiencies and Resolve Potential Conflicts

*The Westside Subway Extension Section 1 adopted the use of Modular Station concept utilizing standardized room layouts that were developed for the Metro Red Line.*

## Westside Approach:

3-D station modules were further developed using BIM (2-D modules were used for the Metro Red Line). The updated modules included:

- 9 different modules developed during PE.
- Section 1 modules are fully compatible to be adapted for Section 2 which will save design time and provide cost savings.
- Adopted clear span station design.
- Clear span design used for station footprints Project Definition drawings in the C1045 Design/Build Contract as the basis for Advanced Utility Relocation designs.
- CADD files will be provided in the Section 2 Design/Build Contract as reference and tools for the Design/Build Team.

# Modular Station Concepts and BIM to Provide Design Efficiencies and Resolve Potential Conflicts

WESTSIDE SUBWAY EXTENSION PROJECT  
ADVANCED PRELIMINARY ENGINEERING  
Contract No. PS-4350-2000



## BIM Coordination & Management Plan APE Update

Task No. 3.11.040 (Deliverable No. 3.11.040.01-A)

Prepared for:



Prepared by:

**PARSONS  
BRINCKERHOFF**

777 South Figueroa Street, Suite 1100  
Los Angeles, CA 90017

Review Copy		
	Date	Initials
Originator	15 Oct 2012	ME
Checker	16 Oct 2012	JZ
Back Checker	19 Oct 2012	GM
Verified by	01 Nov 2012	RA/GA

November 2, 2012

Los Angeles County Metropolitan Transportation Authority  
Westside Subway Extension, Section 1

### SECTION 01 31 28

#### BUILDING INFORMATION MODEL

#### PART 1 - GENERAL

##### 1.01 SECTION INCLUDES

- A. Furnishing a digital, 3-dimensional, comprehensive, fully-integrated, as-designed and As-Built Building Information Model (BIM) of Segment 1 stations, appendages, entrances, tunnels, cross-passages, utilities, civil data, survey information and other structures and features of the constructed Project.
- B. Requirements for a Design and an As-Built BIM, for use by Metro.

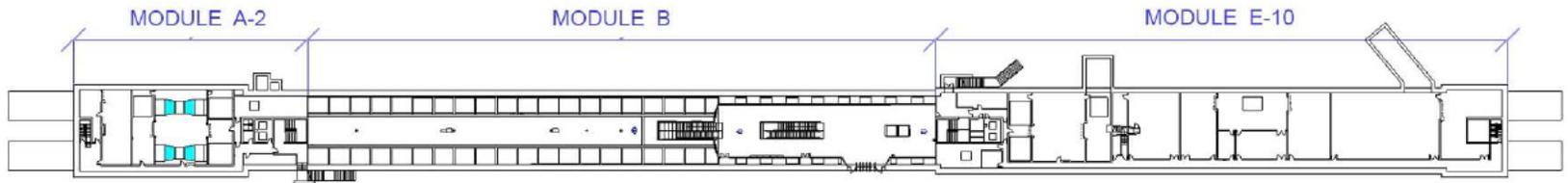
##### 1.02 RELATED SECTIONS

- A. Section 01 31 03 Design Management Requirements
- B. Section 01 33 00 Submittal Procedures
- C. Section 01 43 10 Project Quality Program Requirements – Design/Build
- D. Section 01 78 39 As-Built Drawings and Current Status Documents

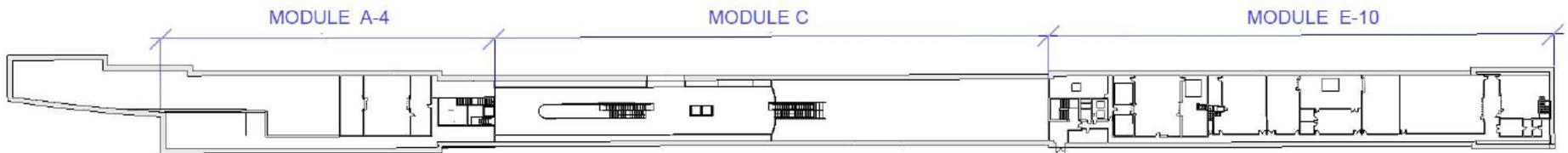
##### 1.03 REFERENCES

- A. Reference Standards
  1. Los Angeles County Metropolitan Transportation Authority (Metro):
    - a. Metro CADD Standards
  2. City of Los Angeles
    - a. City of Los Angeles CADD Standards
  3. National BIM Standard (NBIMS) – United States™ Version 2
  4. U.S. Army Corps of Engineers BIM Standards
- B. Units of Measurement
  1. BIM Electronic Files shall be developed and delivered in US Feet.
- C. Coordinate System
  1. All BIM Electronic Files shall be developed and delivered in the project coordinate system, which has been set to permanent project monuments using California State Plane Coordinates System, NAD 83, Zone 5 (2007.0 epoch). Elevations are set to NAVD 88, Los Angeles Benchmarks 12-16091, 13-13450, and 13-13352 (2000 adj.) or as updated in the Metro Design Criteria.

# Modular Station Concepts and BIM to Provide Design Efficiencies and Resolve Potential Conflicts



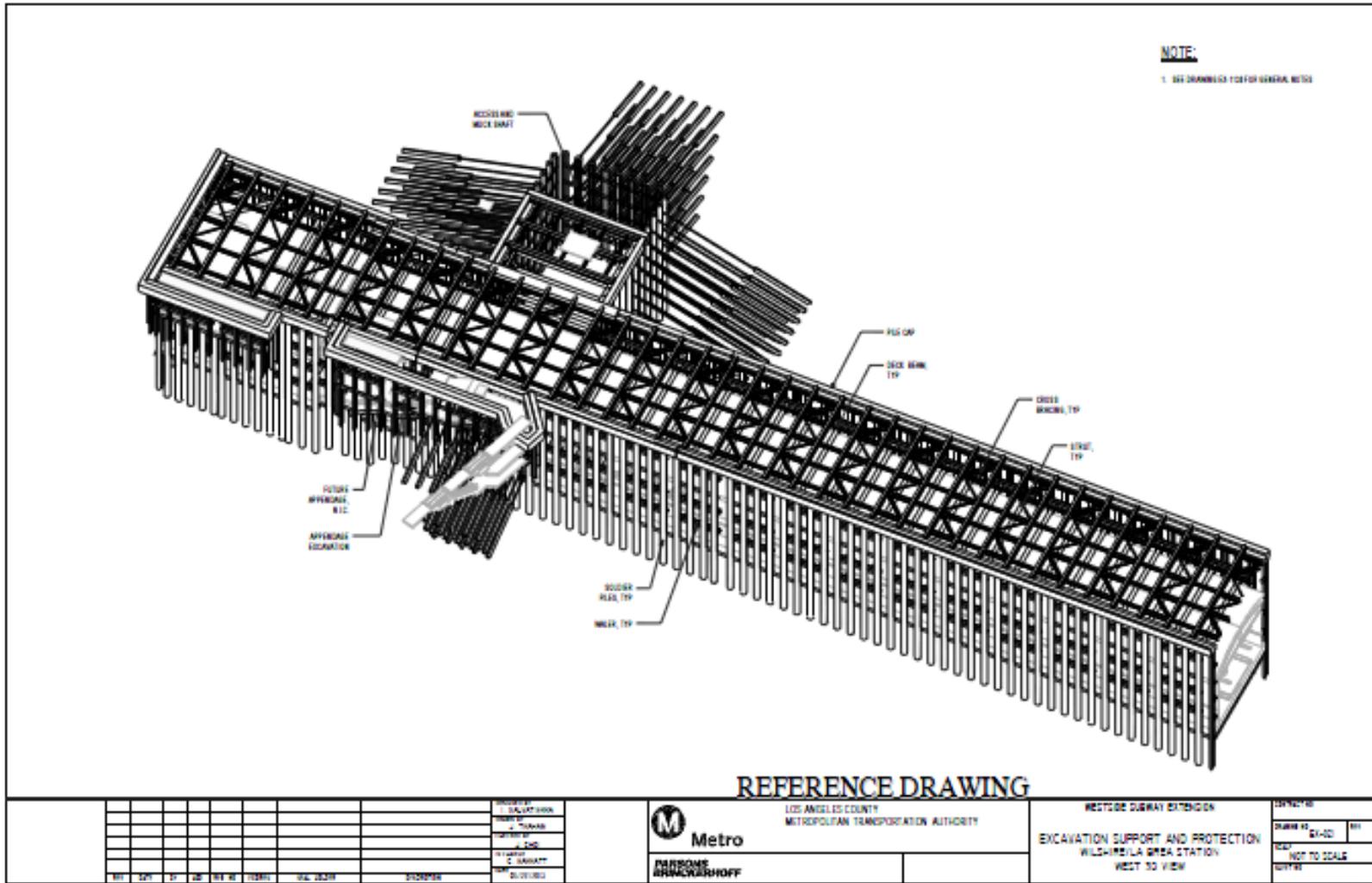
RODEO STATION



CENTURY CITY STATION

- Module A-2 - Equivalent in Fairfax station
- Module B – Equivalent in Fairfax station
- Module E-10 – Equivalent in La Brea and La Cienega stations
- Module A-4 (Terminus)
- Module C – Center Loaded Platform module

# 3-D Excavation Support Drawing Shoring and Deck Beams for Clear Span Station Design



# Performing Detailed Construction Planning During PE Identifies Potential Impacts/Mitigations Facilitates Early Third Party Coordination

*Include 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.*

WESTSIDE SUBWAY EXTENSION PROJECT  
 ADVANCED PRELIMINARY ENGINEERING  
 Contract No. PS-4350-2000



**Construction Approach Report – Section 1 (Final)**  
 Task No. 2.01.020 (Deliverable No. 2.01.020.06-B)

Prepared for:

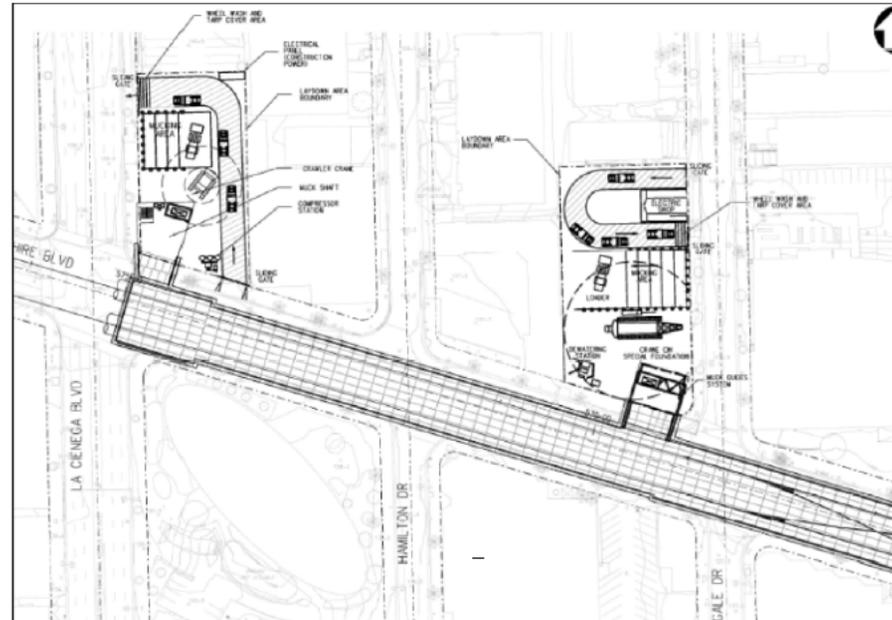


Prepared by:

**PARSONS BRINCKERHOFF**  
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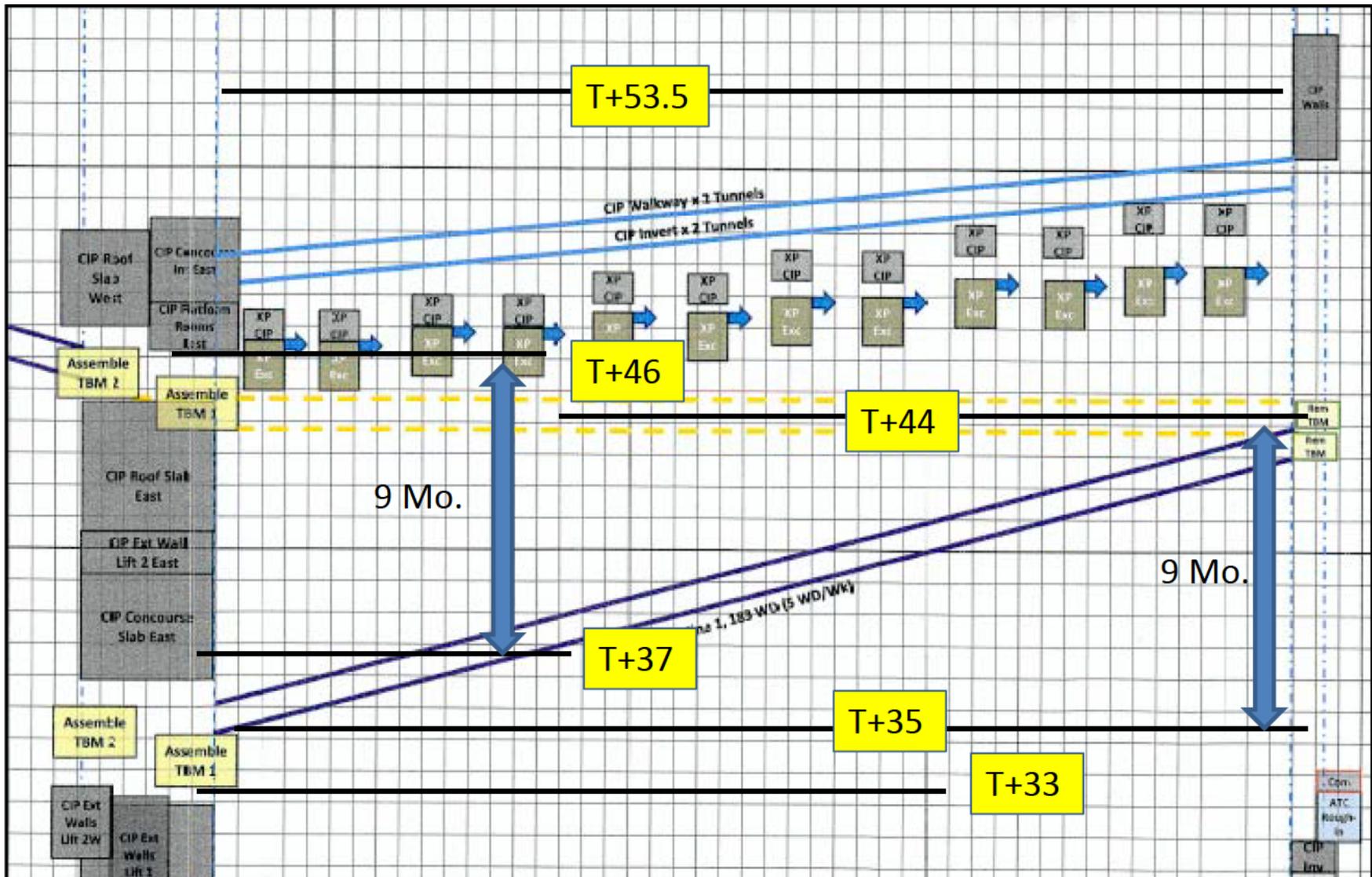
Review Copy	Date	Initials
Originator	13-Sep-2012	LC
Checker	26-Sep-2012	NH
Back Checker	27-Sep-2012	LC
Verified by	28-Sep-2012	LC

October 15, 2012



Laydown Areas at Wilshire/La Cienega

# Suggested Tunnel Sequence and Cross Passage Construction Reach 1 (Wilshire/La Cienega to Wilshire/Western)



"Lessons Learned"

# **THIRD PARTY & OTHER STAKEHOLDERS**

## Third Party and Other Stakeholders

1. Perform critical path design/construction activities on behalf of third parties, when necessary, to meet the project schedule.
2. Do as much planning and permitting as possible ahead of construction.
3. Provide sufficient staffing to support project changes during design and construction.
4. Involve third party and other stakeholders as early as possible and plan for potential changing requirements of stakeholders during the project design and construction phases.

# Perform Critical Path Design/Construction Activities on Behalf of Third Parties When Necessary to Meet the Project Schedule

*Westside Subway Extension requires utility relocations at the station sites to enable construction of the support of excavation and temporary bridge decking structures. This placed work required by third parties on the critical path of the project.*

## Westside Approach:

- At La Brea site, the team used approved contractors for telecoms, water and power relocation work— PB engineers were used to design water and power re-arrangement on behalf of City of LA to release AUR documents for Contract C1048 in sufficient time to have construction completed in time for C1045 D/B Contractor to start with this critical path station work.
- At Fairfax and La Cienega sites, a similar approach was used.



# Do as Much Planning and Permitting As Possible Ahead of Construction

*Putting in place permits and other agreements with the various City Agencies takes time and provides the framework for how work is to be undertaken. Having these in place as soon as possible, and ideally prior to going out to contract, significantly reduces construction bid/schedule risk.*

## Westside Approach:

- Obtain permits and MOAs prior to construction to extent possible.
- Applied for and received Night Time Noise Variance and Peak Hour Exemptions ahead of contracts being awarded.
- Put in place a Memorandum of Understanding (MOA) with City of Beverly Hills for the work to be performed in Beverly Hills.
- Prepared Worksite Traffic Control Plans (WTCPs) and temporary traffic signal drawings in support of AUR Contracts, Night Time Noise Variance and Peak Hour Exemptions.
- Prepared updated WTCP's for changing AUR project requirements to mitigate construction delays.
- Prepare work-arounds for potential delays due to MOAs. (e.g. Contract C1056).

# Do As Much Planning and Permitting As Possible Ahead of Construction

BOARD OF PUBLIC WORKS MEMBERS  
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DEPARTMENT OF PUBLIC WORKS  
 BUREAU OF ENGINEERING  
 GARY LEE MOORE, P.E., CITY ENGINEER  
 1148 S. BROADWAY, SUITE 700  
 LOS ANGELES, CA 90015-2213  
 http://eng.lacity.org

May 12, 2014

Dennis Mori, Project Director  
 Purple Line Extension Project  
 Metropolitan Transportation Authority  
 One Gateway Plaza  
 Los Angeles, CA 90012  
 Attention: Bryan Hancock

**SUBJECT: PURPLE LINE EXTENSION PROJECT (PLE): EXEMPTION FROM LAMC 62.61(B): PROHIBITION FROM WORK OR OBSTRUCTIONS DURING PEAK TRAFFIC HOURS – W.O. E1907395**

This letter supersedes the Peak Traffic Hours Prohibition exemption approval, dated November 13, 2013, for the La Brea Subway Station pile installation construction on Wishire Blvd from Mansfield Ave to Detroit St. The Metro Purple Line Extension Project's request, dated November 6, 2013 for the exemption from the Peak Traffic Hours Prohibition from **Monday January 5, 2015 to Friday July 31, 2015** is hereby granted with the following conditions:

1. This peak hour exemption approval is only for Stages 1, 1A, 1B, 2, 2A, and 2B of the attached WTCP drawings.
2. Stages 1C, 1D, 2C, 2D, 3, and 3A do NOT require peak hour exemptions since the pile installation constructions are on the weekends.
3. Closures will be executed per attached approved WTCP drawings.
4. For any nighttime work, MTA shall obtain a noise variance from the Los Angeles Police Commission. Nighttime is defined as 9:00 pm to 7:00 am.
5. Metro shall cold plane and overlay 2-inch Asphalt Concrete (AC), sand blast Portland Cement Concrete (PCC), and restripe sections of the Bus Rapid Transit (BRT) pavements modified by the approved WTCP for the PLE project at the locations indicated on the attached pavement restoration layouts. On Wilshire Boulevard between Mansfield Avenue and Cloverdale Avenue, Metro shall cold plane and overlay 2-inches of AC except for sections identified as full replacement on the PE drawings.
6. Notify Emergency response services (POLICE and FIRE).

AN EQUAL EMPLOYMENT OPPORTUNITY EMPLOYER 

Peak Hour Exemption Letter for Excavation Support Pile Installation at La Brea Station – City of Los Angeles

Project: City of Beverly Hills  
 Location: Beverly Hills, CA

**BUY AMERICA CERTIFICATION**

**Instructions:**  
 Bidder to complete the Buy America Certification listed below. Bidder shall certify EITHER COMPLIANCE OR NON-COMPLIANCE (not both). This Certification MUST BE submitted with the Bidder's bid response.

**Certification requirement for procurement of steel, iron, or manufactured products.**

*Certificate of Compliance with 49 U.S.C. 5323(j)(1)*  
 The bidder or offeror hereby certifies that it **WILL MEET** the requirements of 49 U.S.C. 5323(j)(1) and the applicable regulations in 49 CFR Part 661 and any amendments thereto.  
 Signature: Dave Woollums J3775D hydrants comply with the requirements of Title 49 USC 5323(j)(1) and the applicable regulations in 49 CFR Part 661 except for a seal ring with no available USA source. The seal ring represents less than 1% of the hydrant's material costs.  
 Company Name: James Jones, a division of Mueller Co.  
 Title: VP R&D and Engineering  
 Date: 9/30/2014

*Certificate of Non-Compliance with 49 U.S.C. 5323(j)(1)*  
 The bidder or offeror hereby certifies that it **CANNOT COMPLY** with the requirements of 49 U.S.C. 5323(j)(1) and 49 C.F.R. 661.5, but it may qualify for an exception pursuant to 49 U.S.C. 5323(j)(2)(A), 5323(j)(2)(B), or 5323(j)(2)(D), and 49 C.F.R. 661.7.  
 Signature: \_\_\_\_\_  
 Company Name: \_\_\_\_\_  
 Title: \_\_\_\_\_  
 Date: \_\_\_\_\_

**Special Note: Make sure you have signed only one of the above statements -- either Compliance OR Non-Compliance (not both).**

Buy America Certification for Fire Hydrants installed by the Advanced Utility Relocation Contract – City of Beverly Hills

# Provide Sufficient Staff to Support 3<sup>rd</sup> Party Related Changes to the Project During Design and Construction Phases

*Stakeholder requirements can change due to multiple factors, such as personnel, staff rotations, standards, agreements, or community impacts. The team must be able to respond to such changes in a way that minimizes the impact to the project.*

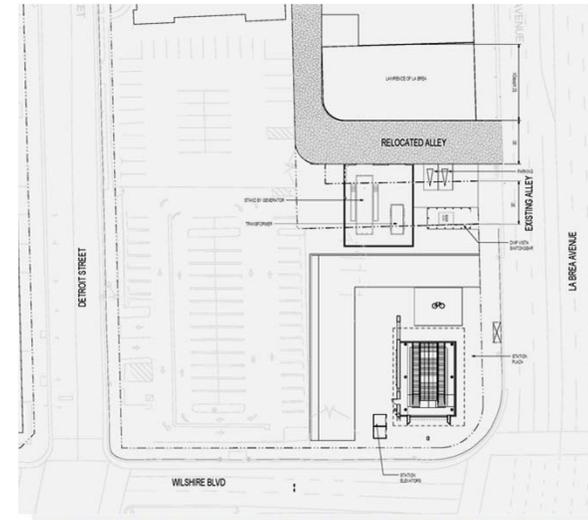
## Westside Approach:

- Engineering Management Services Consultant provides Right-Of-Way Engineering to develop Legal Descriptions, Plat Maps and Certifications.
- Monthly Real Estate schedule updates for acquisition of parcels tied to Contract milestone access dates based on availability of parcels.
- Third Party coordination includes Utilities, Construction Management, Real Estate, Community Relations , City Agencies and elected officials.
- Initiated early partnering sessions with LA BOE on shoring requirements.

# Third Party and Other Stakeholders Wilshire/La Brea Example



C1045 RFP -Wilshire/La Brea Entrance and Surface Power Equipment



Modified - Wilshire/La Brea Entrance and Surface Power Equipment



The design of the Wilshire/La Brea Entrance and surface power equipment were modified to meet the requirements of LADWP and the re-certification of the property to accommodate the development plans of the property owner.

"Lessons Learned"

# CONSTRUCTION PHASE

## Construction Phase

1. Integrated, experienced team can respond to field conditions quickly.
2. Do not underestimate the impact of construction on the community.
3. Advanced Contracts provide a valuable team learning experience.
4. “Lessons Learned” should be collected and applied on a continuous basis.

# Integrate Engineering Team Support into the Construction Management Team

*On the Advanced Utility Relocation (AUR) Contracts, the Contractor found changed conditions and unforeseen obstacles when trenches were opened, threatening the construction schedule. Design based on old As-Built records (2d)*

Westside Approach (To provide faster resolution of issues and keep the job moving forward):

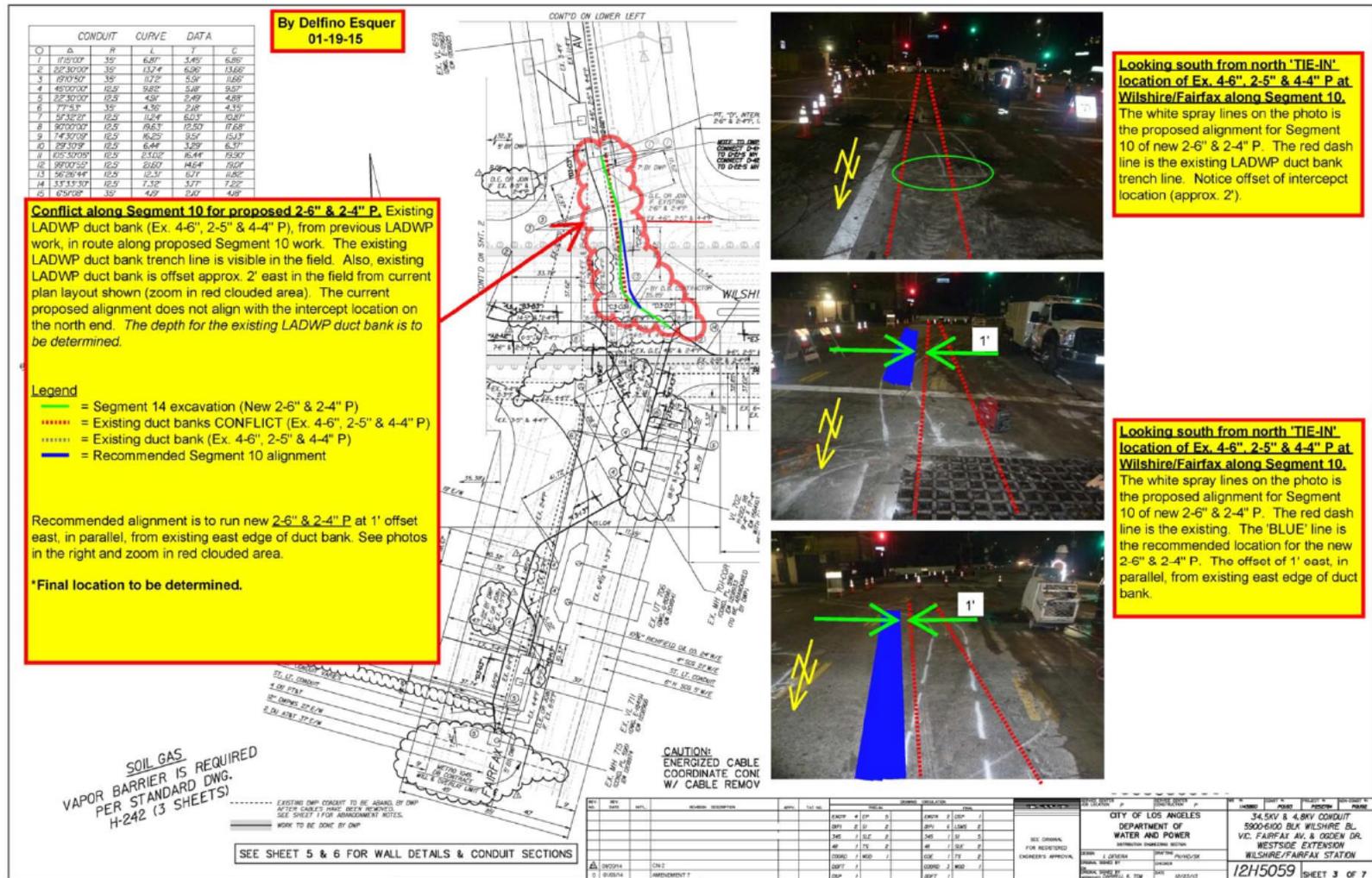
- Conflicts resolved in the field: A field Engineer was appointed to observe night shift work and facilitate resolution quickly (next day) of conflicts discovered during construction.
- A dedicated engineering team is available during AUR contract construction to respond to site RFI's, update utility profiles etc.
- Advanced potholing at La Cienega ahead of the C1056 contract NTP to get a head start on finding unforeseen conditions.
- Used a task force approach to problem solving across multiple contracts, for example:
  - Vault cradles for Wilshire/Fairfax station involved C1045, C1055, Metro, BOE, CONAD.
  - Vault Bridge at Fairfax involved C1055, Metro, BOE, CONAD, LADOT, SCG.
- Daily coordination meetings are held to review data provided and propose solutions.
- Up to date Engineering CAD models are available at the site office.
- Project As-Builts kept up to date for timely preparation of record drawings.

# Integrated Team Supports Design and Construction



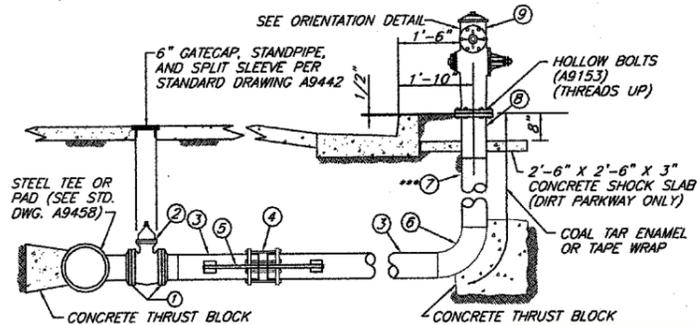
The Integrated Project Office Team use Computer Aided Design (CAD) workstations at the field location to keep field staff up to date on status of utility relocation by AUR Contractors as red-line (As-Built) information is collected from work in-progress.

# Typical Conflict Resolution Provided by the Field Engineer

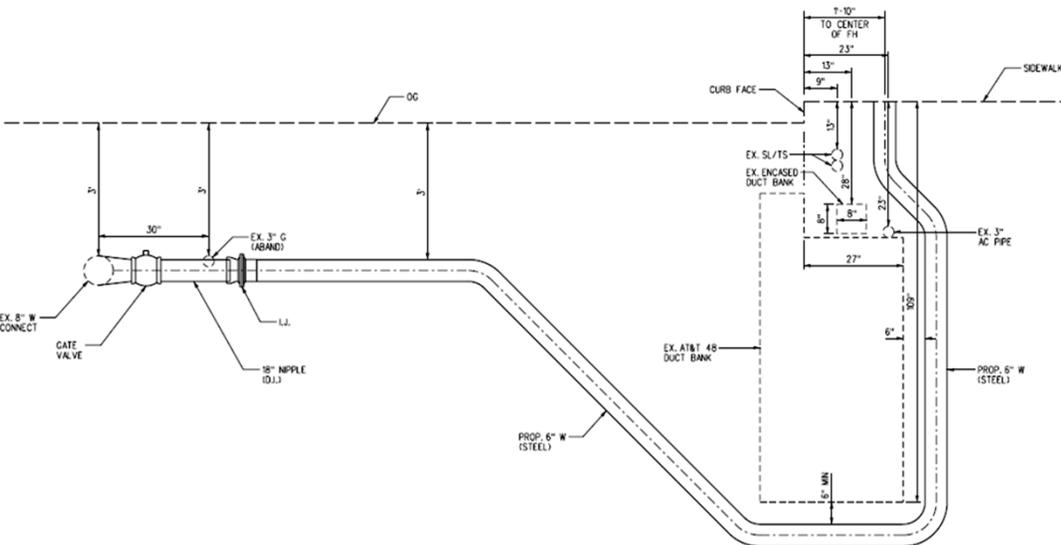


CITY OF LOS ANGELES  
DEPARTMENT OF WATER AND POWER  
34,5KV & 4,8KV CONDUIT  
5900-6100 BLK WILSHIRE BL.  
VIC. FAIRFAX AV. & OGDEN DR.  
WESTSIDE EXTENSION  
WILSHIRE/FAIRFAX STATION  
12H5059 SHEET 3 OF 7

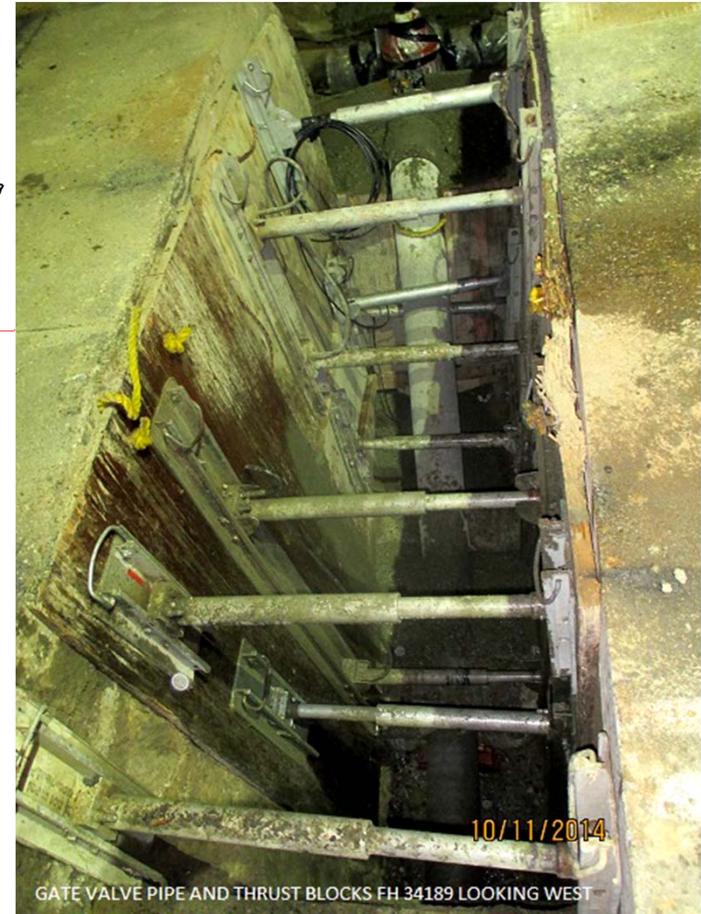
# Construction Management of Differing Site Conditions



**ORIGINAL DESIGN BASED ON PREVIOUS AS-BUILT DRAWINGS**



**MODIFICATION AS-CONSTRUCTED BASED ON SITE CONDITIONS**



The differing site condition required an 8 feet deeper excavation and more time and materials.

# Do Not Underestimate the Impact of Construction on the Community

*The team procured Nighttime Noise Variance Permits ahead of appointing construction contractors. However strict compliance (no complaints) with these permits is vital as they must be renewed every six months.*

## Westside Approach:

- Advanced the construction of the noise barrier fence at the Crenshaw Yard.
- Specified that all Westside contractors are to use noise blankets around construction street at night.
- Shared noise abatement best practices with all Westside contractors.
- Limited noisy activities (saw cutting, paving etc) to daytime hours.
- Worked with the City of LA to gain an earlier start to the work to give a longer window for noisier activities.
- Worked with the City of LA to increase the size of traffic closures, with minimal additional community impact, enabling more efficient working by contractors, minimizing time impact.
- Worked with contractors and suppliers to install low impact back up alarms on construction vehicles.
- Developed a detailed noise control plan and performed noise compliance oversight.

## Re-Sequencing Scope Modification (Sound Wall)



Sound Wall constructed by the C1055 Contractor at the Wilshire/Crenshaw site.

- Although the site is not considered a construction site by the LAPD Noise Commission, a sound wall was constructed around the contractor staging and laydown yard, shared by four contractors.
- The sound wall which would have been constructed by the fourth contractor was constructed earlier by the second contractor in response to community requests.
- Additional Contract Modification Authority was required for Contract C1055 to transfer the scope from the fourth contractor (C1045).
- A deductive Change Order will be issued to Contract C1045 and the credit amount will be returned to the Project Contingency for use during the construction of the Westside Purple Line Project.

# Use of Blankets Around Equipment to Mitigate Noise



Night time construction for utility relocation work at Wilshire/ La Brea

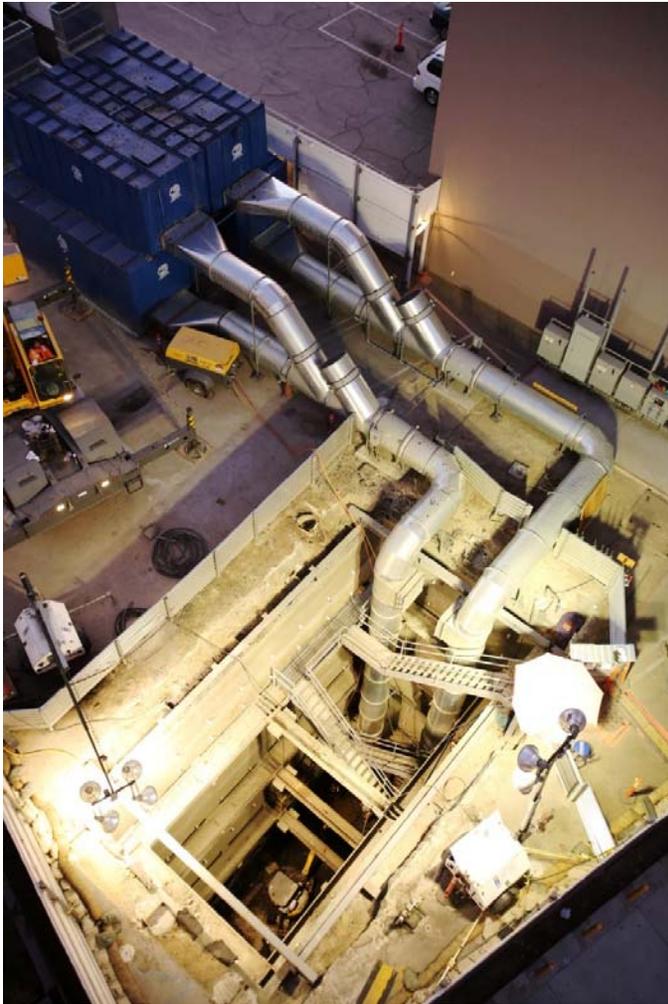
# Perform Pre-Construction Work and Learn Lessons from Recent Experiences of Others

*At Wilshire/Fairfax Station, unusual tar sand soils exist. To better understand the behavior of these soils, the team advanced an Exploratory Shaft Contract. This Contract not only enabled the collection of samples but enabled the team to understand how to work with the community, internal and external stakeholders and each other.*

## Westside Approach:

- Recent construction of an underground parking near the Wilshire/Fairfax Station site provide lessons learned and an opportunity to construct an Exploratory Shaft.
- Exploratory Shaft contract provided better understanding of tar sands and their behavior during construction (a top 10 risk to the project).
- Required working with multiple stakeholders both outside the project and within (e.g. Metro Engineering, TAP, BOE, Building & Safety):
  - Incorporated requirements of City departments for private property (TCE).
  - Enabled the design and construction management teams to learn how to work together under a relatively small, low risk contract.
  - "Lessons Learned" applied to follow on contracts.

# Perform Pre-Construction Work and Learn Lessons from Recent Experiences of Others



Wilshire/Fairfax Exploratory Shaft



Construction of LACMA parking garage in 2006 used similar methods for fossil identification and removal

# Perform Pre-Construction Work and Learn Lessons from Recent Experiences of Others

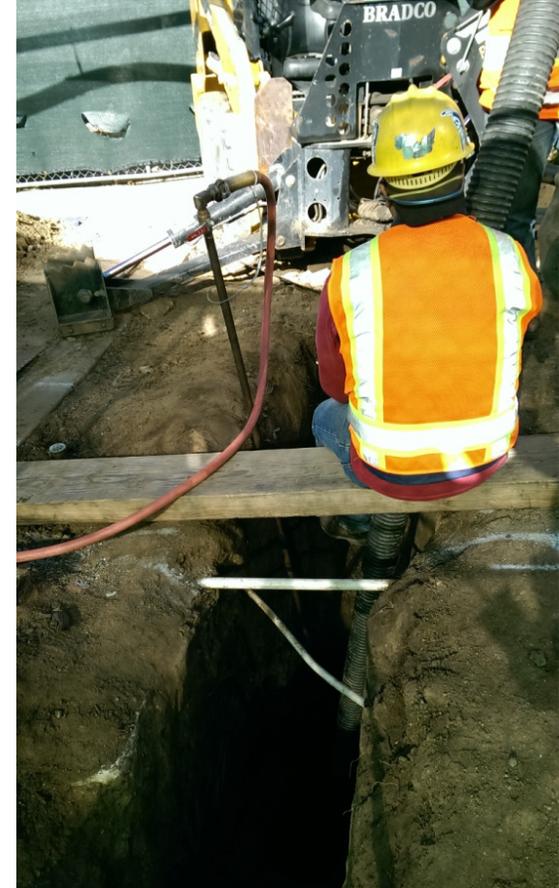


LA Metro staff were provided a presentation by SFMTA staff and consultants and tour of the MUNI Central Subway Project February 2015 where valuable “Lessons Learned” were shared regarding procurement, engineering, construction management and community relations.

# Perform Pre-Construction Work and Learn Lessons from Recent Experiences of Others



Pre-Construction work has begun for the Century City Constellation Station at the future station entrance site that will be part of the JMB Property development.



A Right of Entry was obtained to begin the potholing for utilities on the JMB Property.

Westside Purple Line Extension  
"Lessons Learned"  
Discussion

*"Those that fail to learn from history are doomed to repeat it."*

**Sir Winston Churchill**