



Board Report

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PLANNING AND PROGRAMMING COMMITTEE  
MAY 20, 2020

EXECUTIVE MANAGEMENT COMMITTEE  
MAY 21, 2020

**SUBJECT: CENTINELA GRADE SEPARATION**

**ACTION: APPROVE RECOMMENDATIONS**

**RECOMMENDATION**

CONSIDER:

- A. RECEIVING AND FILING the Centinela Grade Separation Screening Analysis for Design Concepts/Engineering Design Report;
- B. APPROVING Project Definition as an Aerial Grade Separation at the Florence/Centinela Crossing of the Crenshaw/LAX Line supported by Bus Bridging during the Construction Period;
- C. FILING an environmental Statutory Exemption pursuant to CEQA;
- D. Authorizing staff to proceed with preliminary engineering and final design services on the Centinela Grade Separation. This is not a request for construction funding.

**ISSUE**

In December 2018 the Metro Board approved the initiation of an engineering and environmental study to support development of the Centinela Grade Separation (Item #2018-0245). The study has been conducted in cooperation with the City of Inglewood and has included the development of 15% design and a Funding and Delivery Strategy Plan for the project.

Board approval is needed to approve funding to advance engineering design to include the preparation of construction bid documents. Approval of a funding plan is needed to support final design and construction activities for the grade separation with minimal impacts to the construction, opening and operation of the Crenshaw/LAX (CLAX) LRT Project.

**BACKGROUND**

### History

The Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for CLAX was completed in 2011. Applying Metro's Grade Crossing Policy in 2011 resulted in a determination that an at-grade crossing application was appropriate. In 2013 the California Public Utilities Commission (CPUC) granted approval of the at-grade crossing pending inclusion of several supplemental measures intended to improve safety and increase queuing and traffic capacity. The final at-grade crossing is currently nearing completion in accordance with all the CPUC's supplemental requirements.

In 2015 the City of Inglewood approved the construction of a 72,000 seat NFL Stadium approximately 1.5 miles south of the Centinela/Florence crossing. Additional development adjacent to the stadium including a performance arts venue, residential units, retail and office space, hotel rooms, and 25 acres of new recreational park and amenities were also approved. More recently, in February 2018, the City of Inglewood initiated the environmental clearance process for the proposed Inglewood Basketball and Entertainment Center (IBEC), which includes an 18,000-seat arena for the Los Angeles Clippers near the NFL stadium. Attachment A includes a map of these projects and expected events.

All of the aforementioned developments were approved or proposed after the 2011 CLAX EIR/EIS certification and are anticipated to generate additional traffic which was not considered in the original Grade Crossing Policy analysis. To mitigate some of this anticipated increase in traffic, developers have funded the citywide installation of a traffic signal priority system and the City of Inglewood has developed special event traffic and access management plans for the venues under construction and future

IBEC. The City of Inglewood remains concerned about the potential increase in regional trips and the associated traffic impacts of having an at-grade crossing at Centinela/Florence. Metro Board action in 2017 directed staff to conduct grade separation feasibility studies to address these concerns. In November 2018 the Metro Board received the initial feasibility findings and directed staff to initiate an engineering design study and supportive environmental analysis to be funded in cooperation with the City of Inglewood.

### **DISCUSSION**

The Centinela Grade Separation Screening Analysis/Engineering Design report (Attachment B) evaluated three alternatives to be considered for grade separation (LRT Aerial Grade Separation, LRT Below Grade Undercrossing, and LRT At Grade with Centinela and Florence lowered). The analysis has identified the LRT Above Grade-Aerial Grade Separation (Attachment C) which elevates the CLAX LRT on a bridge above the Centinela/Florence at-grade intersection to be the less impactful to the community and the operation of the CLAX LRT Line. The aerial grade separation will remove the required crossing gates and warning systems currently required for the at-grade crossing. It will not have permanent right-of-way or utility impacts as noted with the other alternatives under consideration. The aerial grade separation will allow the CLAX LRT to operate efficiently and add capacity to the intersection to accommodate the mobility needs of the planned regional sports/entertainment venues in the City of Inglewood.

The preliminary project costs ranged from \$185-\$241 million with the recommended design option

falling in the middle of this range. The recommended aerial grade separation includes the costs for a bus bridge to operate during the construction phase of the project. This cost is based on advanced conceptual design (15% level of engineering) and should be considered preliminary pending further refinement in the Preliminary Engineering (30% design) and Final Design (100% design) phases of project design.

### Environmental Clearance

The California Environmental Quality Act (CEQA) provides for Statutory Exemptions for certain activities and specified actions. According to CEQA Guidelines Section 15282 (g) "Any railroad grade separation project which eliminates an existing grade crossing, or which reconstructs an existing grade separation as set forth in Section 21080.13 of the Public Resources Code" is to be considered statutorily exempt from the analysis required under CEQA. The grade separation at Centinela Avenue meets the criteria for Statutorily Exempt projects.

In order to further support the Statutory Exemption finding, community outreach efforts were conducted with adjacent property owners and stakeholders in the vicinity of the project. These included the City of Inglewood Councilmembers Dotson and Padilla, Mayor Butts, Westchester Rotary Club, St. John Chrysostom Church, St. Mary's Academy and the Inglewood Park Cemetery. Outreach will continue during the upcoming design and construction phases to incorporate community concerns.

Technical reports are under development on traffic, air quality, visual, noise, vibration, real estate and acquisition, parklands and community facilities, construction impacts and utilities. Initial analysis is indicating minimal environmental impacts with the proposed grade separation project which cannot be mitigated appropriately during project design, construction and operation. The project will have significant beneficial effects on traffic and circulation.

### Equity Platform

The Project is consistent with the recently adopted Metro Equity Platform Framework and will bring new benefits of enhanced mobility and regional access to minority and/or low-income populations within the Project area. In 2015, the City of Inglewood identified that 56.5 percent of its residents in Downtown Inglewood are African American and 35.7 percent are Hispanic (2015 City of Inglewood, Inglewood TOD Existing Conditions Report), while 20.7 percent of the residents in the City of Inglewood are classified as living in poverty (2017, American Community Survey). Additionally, Metro staff will work with the City of Inglewood to look to the Equity Platform Framework as the project outreach engages residents, stakeholders, elected representatives, resource agencies and community-based organizations in the project area.

### **DETERMINATION OF SAFETY IMPACT**

These actions will not have any impact on the safety of our customers and/or employees because this project is at the beginning of the design phase.

### **FINANCIAL IMPACT**

Funding for Design- The Board approved \$2,200,000 in the FY 2020 budget for Professional Services in Cost Center 4350, Project 405406 (Centinela Grade Separation). The sources of funds are Local Prop A, C and TDA Administrative funds. These funds are not eligible for bus and/or rail operating or capital expenses. Staff is currently working to identify additional funds for inclusion in the proposed FY 2021 budget to complete preliminary engineering and design services. Authorization for further work to proceed is subject to approval of funding in the FY 2021 budget. Since this is a multi-year project, the Cost Center Manager and Chief Planning Officer will be responsible for budgeting in future years.

Funding for Construction- Funding for the construction of the project is not included in the Metro Long Range Transportation Plan Financial Forecast or Measure R or Measure M Expenditure Plans and has not been approved by the Board. Should Metro pursue construction of this project, it will require a determination of payment responsibility and the identification of potential funding sources.

Metro staff is actively working with the South Bay Cities Council of Governments and the City of Inglewood to develop a funding plan for the project that considers the availability and eligibility of funding sources, and upon Board direction, attempt to secure the funds. Metro has not yet programmed any funding for the construction of the project, either directly or through the multi-year subregional programs (MSP), where projects are nominated by the subregion. The South Bay Cities COG has supported the use of \$130,000,000 for the project from one of the MSP for the subregion, the Subregional Equity Program (SEP). As construction is not a topic for discussion at present, the use of the SEP funds for funding of projects will be discussed in the June/July Board cycle. Metro has allocated funding for the SEP starting in FY 2043 in the Long Range Transportation Plan Financial Forecast and has not developed yet an administrative process to program SEP funds to the subregions.

## **IMPLEMENTATION OF STRATEGIC PLAN GOALS**

A grade separation at Centinela/Florence intersection would support the goals outlined in the Metro Vision 2028 Strategic Plan by addressing the mobility challenges in the project area including increasing travel demand, travel times, and roadway congestion. Specifically, the Project meets Vision 2028 Goal #4, Transform LA County through regional collaboration and national leadership, as this project will be advanced through a close partnership with the City of Inglewood to solve a regional challenge, as the special events at the NFL Stadium and other event venues in and around the Entertainment District at Hollywood Park are expected to attract attendees from throughout the region.

## **ALTERNATIVES CONSIDERED**

The Board could choose not to approve any or all the recommendations. This is not recommended as this would further delay the construction of the project and not be in operation in time for the City of Inglewood to host the planned major events (i.e. FIFA World Cup and 2028 Olympics).

## **NEXT STEPS**

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Upon Board approval, staff will proceed with preliminary engineering and final design services and continue to work with the City of Inglewood and the South Bay Cities Council of Governments to secure the necessary construction funding for the project.

**ATTACHMENTS**

Attachment A - Map of Inglewood Projects

Attachment B - Centinela Grade Separation Screening Analysis for Design Concepts/Engineering Design Report

Attachment C - Rendering of Above-Ground Aerial Grade Separation

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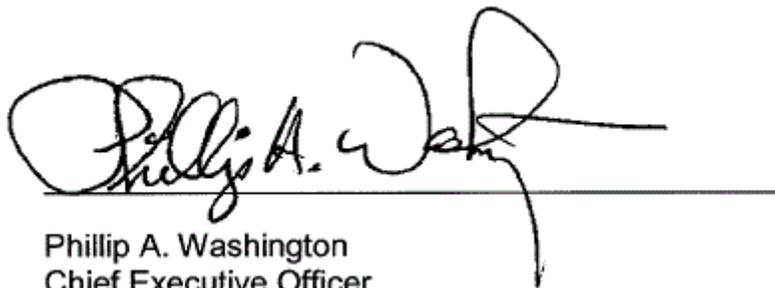
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Chief Executive Officer

# Map of Inglewood Projects



NFL Stadium (72,000 seats) & Performance Arena (6,000 seats)

- 50 Stadium events (incl. 22 NFL games, two on weekdays and 20 on weekends)
- 75 Arena events
- 10,000 parking spaces
- 23,600 event demand

Forum (17,500 seats)

- 82 events (37 large events)
- 3,000 parking spaces
- 5,400 event demand

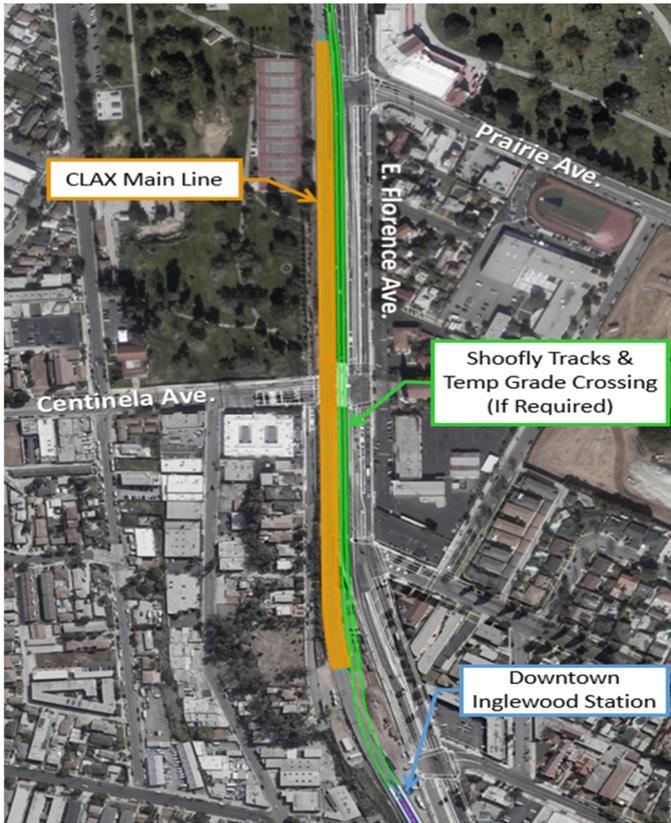
Inglewood Basketball & Entertainment Center (Clippers Arena, 18,000 seats)

- 105 events (44 large events)
- 3,500 parking spaces
- 5,700 event demand

(Event Information Source: Inglewood)

## Legend

- █ Metro Green Line
- █ Metro Crenshaw/LAX Line (proposed)
- Inglewood's People Mover (proposed)



## Screening Analysis for Design Concepts

Centinela/Florence Grade Separation  
Conceptual Engineering Design Study

DRAFT Technical Memorandum

*Inglewood, CA*  
May 15, 2020



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# 1 Introduction

The Los Angeles County Metropolitan Transportation Authority (Metro) is evaluating the Grade Separation of the Crenshaw/LAX (CLAX) light rail transit (LRT) line at the intersection of Centinela and Florence Avenues (Project). The intention of the grade separation is to address concerns about potential increases in regional trip-making and impacts to traffic at the planned at-grade crossing related to significant future development adjacent to the crossing. This planned at-grade rail crossing is located within a quarter-mile of downtown Inglewood adjacent to existing activity centers (the Forum), new projects under construction (Inglewood NFL Stadium, Performance Arena, and Hollywood Park Development Area), and proposed future activity centers and transit infrastructure (Inglewood Basketball and Entertainment Center and Transit Connector).

The purpose of this screening analysis technical memorandum (memo) is to develop grade separation alternatives to a level that helps facilitate consensus on the scope of the project so major project components and the project's footprint can be clearly defined. The alternative concept development, analysis, and initial screening criteria presented here were prepared in a collaborative effort with Metro and Metro's environmental consultant. This memo aims to describe: three (3) main design concepts and the basis of their development, initial screening criteria for high-level analysis, the results of that initial screening analysis, and a recommendation of the most promising alternative to be advanced to a 15% level of engineering.

## 1.1 Background

The Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for CLAX was completed in 2011. Applying Metro's Grade Crossing Policy in 2011 resulted in a determination that an at-grade crossing application was appropriate. In 2013 the California Public Utilities Commission (CPUC) granted approval of the at-grade crossing pending inclusion of several supplemental measures intended to improve safety and increase queuing and traffic capacity. The final as-built grade crossing would include all of the CPUC's supplemental requirements.

In 2015 the City of Inglewood (CITY) approved the construction of a 72,000 seat NFL Stadium approximately 1.5 miles south of the Centinela/Florence crossing. Additional development adjacent to the stadium including a performance arts venue, residential units, retail and office space, hotel rooms, and 25 acres of new recreational park and amenities were also approved. In 2018 the CITY initiated the environmental clearance process for the proposed Inglewood Basketball and Entertainment Center (IBEC). All of the aforementioned developments were approved or proposed after the 2011 CLAX EIR/EIS certification and are anticipated to generate additional traffic which was not considered in the original Grade Crossing Policy analysis.

To mitigate some of this anticipated increase in traffic, developers have funded the citywide installation of a traffic signal priority system and the CITY has developed special event traffic and access management plans for the venues under construction and future IBEC. The CITY remains concerned about the potential increase in regional trips and the associated traffic impacts of having an at-grade crossing at Centinela/Florence. A

Metro Board action in 2017 directed staff to conduct grade separation feasibility studies and initiate the environmental clearance process to address these concerns. In December 2018 the Metro Board received the initial feasibility findings and directed staff to initiate an engineering design study to be funded in cooperation with the CITY.

## 2 Proposed Alternatives

### 2.1 Alternative 1A – LRT Above Grade

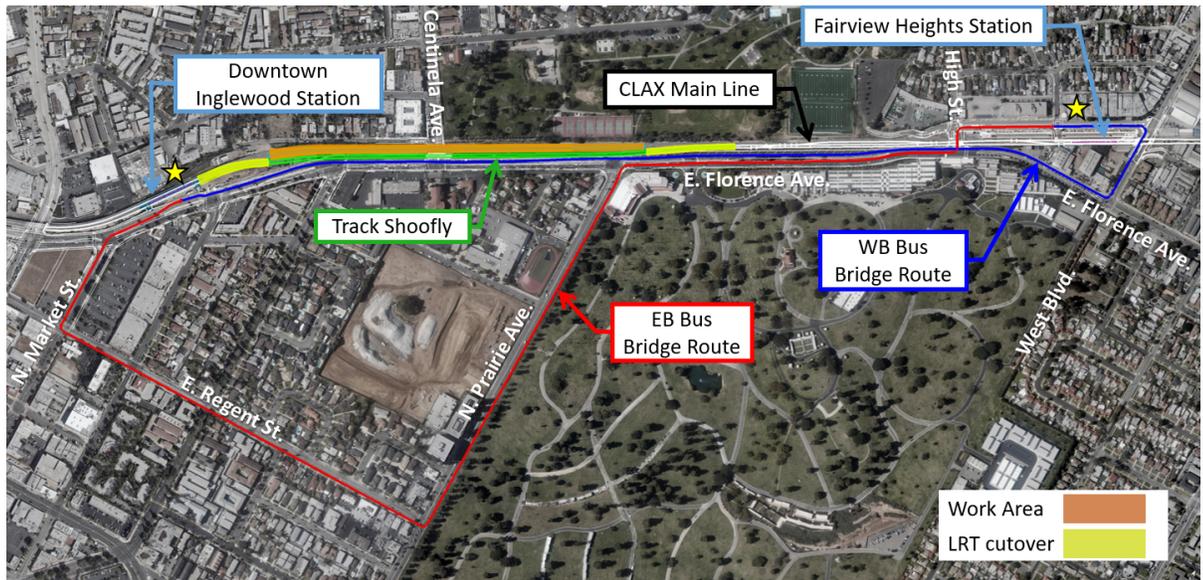
Alternative 1A proposes to elevate the CLAX LRT on retained fill with a precast concrete girder bridge above the Centinela/Florence intersection which would remain at grade. The LRT limits of Alternative 1A extend approximately 2950 feet from just east of the Downtown Inglewood Station to just west of the Fairview Heights Station. Alternative 1A utilizes a temporary double-track shoofly to maintain rail operations during the grade separation construction.

Figure 2-1. Alternative 1A – LRT Above Grade



Source: HDR

**Figure 2-2. Alternative 1A – LRT Above Grade Shoofly and Temporary Bus Shuttle Route**



Source: HDR

## 2.1.1 Geometric Configuration

### Roadway

The roadway modifications in Alternative 1A would be limited to the grade crossing removal, sidewalk and curb ramp modifications at the Centinela/Florence intersection. The proposed grade separation structure would provide a minimum of 16' vertical clearance. A traffic signal proposed as part of the previous CLAX design at La Colina Drive and Centinela Avenue would need to be removed; the intersection would be changed to stop control. The sidewalk on the eastside of Centinela Avenue would extend south to the intersection of Florence Avenue and a new crossing would be introduced at the northeast and northwest corners of Florence Avenue and Centinela Avenue. The street profile of Centinela Avenue would be adjusted slightly associated with the grade crossing panel removal. La Colina Drive would remain unchanged (see Attachment A1 for Alternative 1A Roadway Layout).

### LRT Alignment

The track replacement limits of Alternative 1A extend approximately 2950 feet from just east of the Downtown Inglewood Station to just west of the Fairview Heights Station.

Alternative 1A proposes to elevate the CLAX LRT line approximately 25' above the existing Centinela Avenue roadway elevation at the crossing. The track raise is proposed to be achieved using retained fill sections with ballasted track at a maximum grade of 3.3% and a precast concrete girder bridge with direct fixation track above the Centinela/Florence intersection. No changes were made to the CLAX horizontal alignment. The tracks would be on ballast on the retained fill section, and direct fixation on the bridge.

The existing CLAX horizontal alignment and the proposed vertical alignment would allow for operating speeds of 45 MPH adjacent to the Downtown Inglewood Station and 65 MPH going east over Centinela Avenue to the Fairview Heights Station. See Attachment A1 for the proposed Alternative 1A LRT plan and profile.

During construction, a temporary shoofly track would be constructed in the westbound lanes of Florence Avenue to allow LRT passenger operations to continue. The proposed shoofly horizontal and vertical alignments allow for operating speeds of up to 35 MPH adjacent to the Downtown Inglewood Station and up to 50 MPH going east along Florence Avenue towards North Prairie Avenue. See Section 2.1.7 for additional discussion on LRT operations during construction.

Key geometric characteristics of Alternative 1A are summarized in Table 2-1 below.

| Condition | Horizontal Alignment        | Max Grade   | Vertical Clearance to Centinela Ave | Operating Speeds   |
|-----------|-----------------------------|---|-------------------------------------|--|
| Temporary | Shoofly in WB Florence Ave  | Top-of-Rail (TOR) profile to match existing Florence Avenue roadway profile | Shoofly is at-grade                 | 35 MPH adjacent to Downtown Inglewood Station, 50 MPH going east to Fairview Heights Station |
| Permanent | No change to CLAX alignment | 3.3%  | 16' minimum permanent design        | 45 MPH adjacent to Downtown Inglewood Station, 65 MPH going east to Fairview Heights Station |

Source: HDR

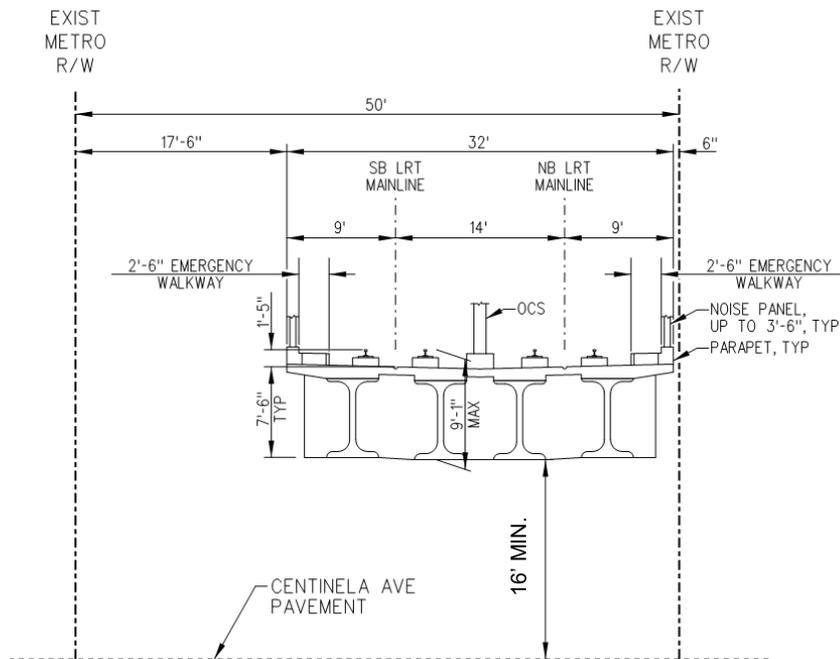
### 2.1.2 Right-of-Way Requirements and Impacts

No permanent right-of-way impacts are anticipated at this time.

### 2.1.3 Structure Configuration

The aerial structure is a single-span precast posttensioned Caltrans wide flange girder superstructure with the cast-in-place (CIP) concrete deck supported on seat type cantilever reinforced concrete abutments on pile foundations (see Figure 2-3 for preliminary bridge deck section). The overall structure width is 32 feet including emergency walkways, and total structure length is 150 feet. The proposed structure depth is 7 feet, 6 inches.

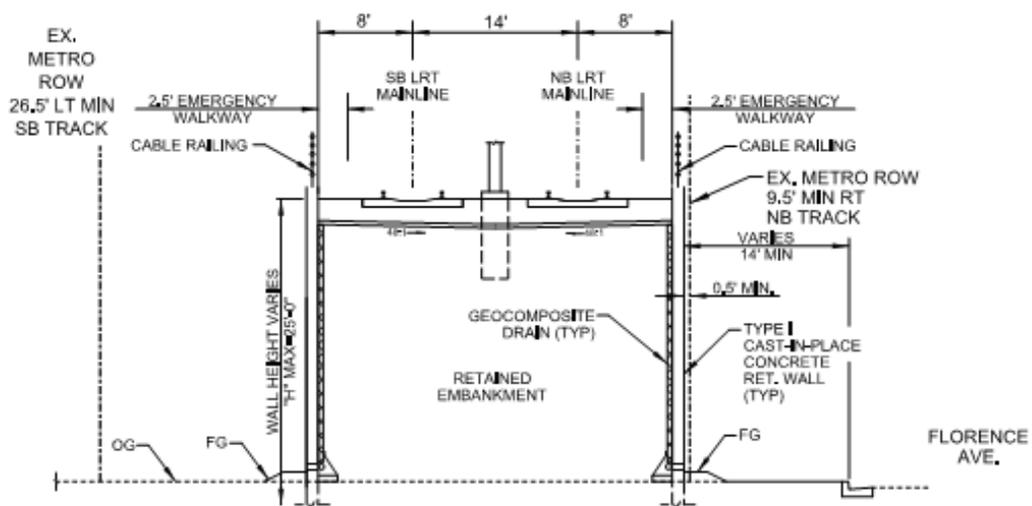
**Figure 2-3. Alternative 1A – Preliminary Bridge Section**



Source: HDR

The retaining walls would extend approximately 1000 feet west of Centinela and 725 feet east of Centinela. The maximum design height is approximately 25 feet. The retaining wall type, to be determined, could be cast-in-place concrete wall, or mechanically stabilized earth (MSE) wall. See Figure 2-4 for a preliminary retained fill section.

**Figure 2-4. Alternative 1A – Preliminary Retained Fill Section**



Source: HDR

## 2.1.4 Drainage Impacts

Alternative 1A would only create minor impacts to the existing drainage facilities since there is no proposed trenching or grading below the existing surface.

Drainage impacts for Alternative 1A:

- Proposed track drainage west of Centinela Avenue would flow westerly and would connect to the existing drainage network and flow back east towards Centinela Avenue within the existing underdrain
- Proposed track drainage east of Centinela Avenue would flow easterly and would connect to the existing drainage network and flow back west towards Centinela Avenue within the existing underdrain

## 2.1.5 Utility Impacts

The most significant conceptual relocation for all three alternatives involves an existing 60" ductile iron water line owned by LADWP Water. The line is located approximately 255' east of Centinela/Florence with approximately 7-8' of cover below the existing CLAX alignment.

The water line's location and depth place it potentially in conflict with the proposed retaining wall footings for Alternative 1A. A combination of additional protection, special footing design, or relocation, would need to be evaluated during final design in conjunction with the retaining wall type selection.

In the locations where the proposed temporary shoofly track crosses an existing utility, the utility must be protected in place by concrete encasement or steel casing.

## 2.1.6 Stage Construction and Traffic Handling

During construction, Alternative 1A would require shifting of the existing tracks onto WB Florence Avenue with a shoofly alignment from approximately 300' west of Hillcrest Boulevard to approximately 500' east of Prairie Avenue. A bus shuttle between the Downtown Inglewood and Fairview Heights Station would be utilized when track cutovers and signal testing occurs. See Figure 2-2.

While the lane configuration on Centinela Avenue remains unchanged, the lane configuration along Florence Avenue is reduced to accommodate the shoofly alignment between west of the Downtown Inglewood Station and east of Prairie Avenue. The shoofly alignment reduces the width of Florence Avenue by 25.5' on the west side of Centinela Avenue and by 38.5' on the east side of Centinela Avenue. Pedestrian circulation would be maintained throughout construction.

The proposed construction sequence of Alternative 1A is as follows:

1. Construct shoofly tracks and temporary grade crossing. Through traffic on Florence reduced to two lanes in each direction, the EB left turn lane at Centinela reduced to one lane.
2. Track cutover to the shoofly. CLAX line would operate on the shoofly tracks after testing. Demolish the existing tracks. Construct the proposed retaining walls and bridge abutment.

3. Temporary weekend closures of Centinela Ave to install the precast bridge girders. Traffic would be detoured, See Attachment D1.
4. Construct the bridge superstructure, tracks, OCS and other system components.
5. Track cutover to proposed track. Conduct testing. Demolish the shoofly tracks, temporary crossing. Restore street and sidewalk.

The construction duration is estimated at 29 months.

See Attachment D1 for preliminary Alternative 1A Stage Construction and Traffic Handling.

### 2.1.7 LRT and Bus Operations during Construction

The shoofly alignment would shift a small portion of existing track off of the CLAX main line just east of the Downtown Inglewood Station and enter Florence Avenue approximately 300' west of Hillcrest Boulevard. The shoofly continues east along Florence Avenue utilizing ballasted track embedded into Florence Avenue with TOR set to match the existing Florence Avenue roadway profile until approximately 500' east of Prairie Avenue. The shoofly alignment then turns back north out of Florence Avenue and rejoins the CLAX main line with another small segment of shifted existing track west of the Fairview Heights Station. The shoofly geometric configuration allows for operating speeds of up to 35 MPH adjacent to the Downtown Inglewood Station and up to 50 MPH going east along Florence Avenue towards North Prairie Avenue.

In addition to the CLAX main line track shifts and embedded track in Florence Avenue, temporary systems (train control, communications, and traction power), structural concrete curb walls, duct banks, and underdrains would be required for the shoofly.

A temporary at-grade crossing would also be required at the intersection of the shoofly alignment and Centinela Avenue to allow for traffic operations to continue during construction. The temporary at-grade crossing would require CPUC approval and be constructed to Permanent Grade Crossing standards including placement of temporary traffic signals, pedestrian warning devices, vehicle quadrant gates, and pedestrian swing gates, hand railing, signage and other forms of pedestrian channelization.

The shoofly tracks and construction laydown area would occupy the proposed bus terminal at the Downtown Inglewood station. The existing layout facility on La Brea Avenue south of Manchester Blvd is expected to be used for layover during construction.

The staging approach to this Alternative also requires a bus shuttle between the Downtown Inglewood and Fairview Heights Station when track cutovers and signal testing occurs. It is assumed that each track cutover between the shoofly and CLAX main line would take approximately five months. At the Downtown Inglewood station, passengers would board and alight at the curbside on Florence Avenue. At the Fairview Heights station, boarding and alighting would take place on Redondo Blvd. See Figure 2.2 for the potential bus shuttle route.

During the cutover periods, the CLAX would remain in service north of the project site, but the Light Rail Vehicles (LRV) would not have access to the maintenance yard.

Provisions are needed to accommodate light duty maintenance, daily inspections on the mainline, and hauling vehicles to and from the yard when necessary.

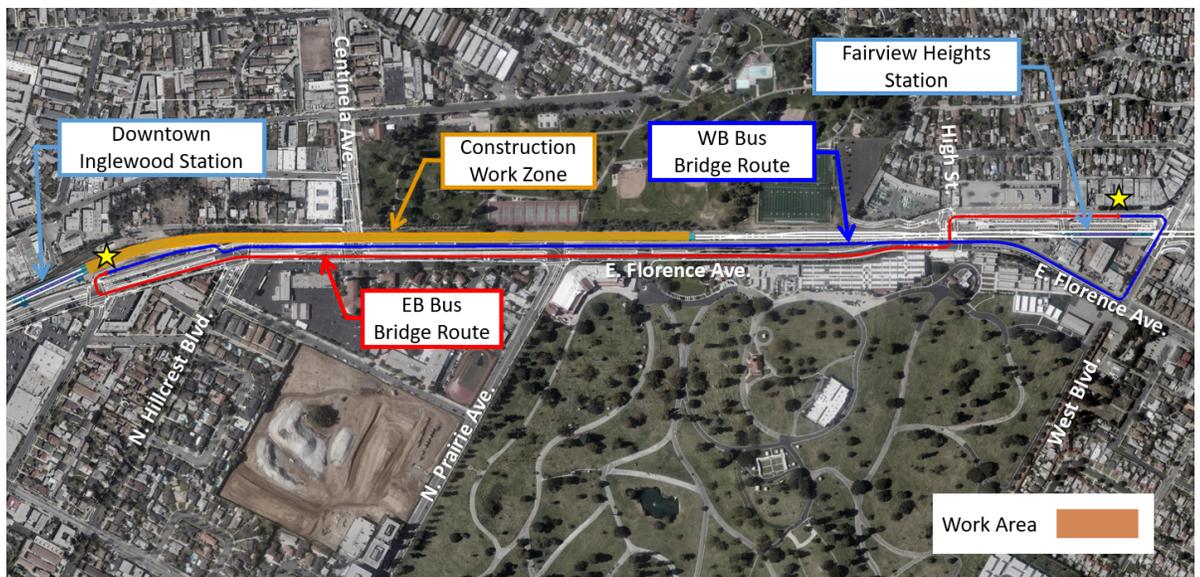
## 2.1.8 ROM Cost Estimate

The current ROM cost for Alternative 1A is approximately \$241M inclusive of a temporary track-shoofly and bus shuttling, all project soft cost, contingencies, and other direct and indirect costs.

## 2.2 Alternative 1B – LRT Above Grade Without Shoofly

Alternative 1B proposes the same track and roadway modifications as Alternative 1A but utilizes bus shuttling exclusively in place of a temporary shoofly alignment.

Figure 2-5. Alternative 1B – LRT Above Grade without Shoofly



Source: HDR

### 2.2.1 Geometric Configuration

#### Roadway

Roadway geometry would remain at its existing lane configuration with the same modifications as described in Alternative 1A.

#### LRT Alignment

The proposed modifications, key geometric characteristics, and operating speed for the permanent LRT condition are the same as Alternative 1A.

Utilizing a bus shuttle during construction negates the need to construct and remove a temporary shoofly track. The proposed modifications to raise the CLAX main line above Centinela/Florence would be constructed prior to the full opening of the CLAX main line

with potential night and weekend closures of the Centinela/Florence intersection as required to place the precast concrete girder bridge above the existing roadway.

## 2.2.2 Right-of-Way Requirements and Impacts

No permanent right-of-way impacts are anticipated at this time.

## 2.2.3 Structure Configuration

The structure configuration is similar to Alternative 1A.

## 2.2.4 Drainage Impacts

Drainage impacts are similar to Alternative 1A with the exception that shoofly underdrains and the need to accommodate shoofly related track drainage are no longer required.

## 2.2.5 Utility Impacts

Alternative 1B would have the same potential utility impacts and relocation approach as Alternative 1A, except all the modifications related to the shoofly. The 60" ductile iron water line owned by LADWP is the most significant potential impact.

The primary difference with Alternative 1A is that no relocations would be required in Florence Avenue to accommodate a temporary shoofly during construction.

## 2.2.6 Stage Construction and Traffic Handling

Alternative 1B would include the same construction activities as Alternative 1A but without the construction/demolition of the shoofly. Roadway geometry would remain at its existing lane configuration with a small impact to the northeast and northwest corners due to the implementation of k-rail to protect the proposed construction areas. There would be no need for railroad crossing gates and would therefore alleviate turning movements onto Centinela Avenue. Pedestrian circulation would be maintained throughout construction. The construction duration is estimated at 23 months. See Attachment D2 for preliminary Alternative 1B Stage Construction and Traffic Handling.

## 2.2.7 LRT and Bus Operations during Construction

The staging approach for Alternative 1B requires the CLAX line to be out of service between the Downtown Inglewood Station and Fairview Heights stations during construction. Alternative 1B would exclusively utilize a bus shuttle between these two stations for passenger movements during the full duration of construction.

The proposed bus terminal at the Downtown Inglewood station would be in service maintaining bus operations during construction.

The CLAX line would remain in service north of the project site during construction, but the Light Rail Vehicles (LRV) would not have access to the maintenance yard. Provisions are needed to accommodate light duty maintenance, daily inspections on the mainline, and hauling vehicles to and from the yard when necessary.

## 2.2.8 ROM Cost Estimate

The current ROM cost for Alternative 1B is approximately \$200M inclusive of bus shuttling, all project soft cost, contingencies, and other direct and indirect costs.

## 2.3 Alternative 1C – LRT Above With Delayed Opening of CLAX Main Line

Alternative 1C proposes the same track, structure, roadway, and structural configurations and modifications as described above for Alternatives 1A and 1B. Alternative 1C also has the same drainage, right-of-way, and utility impacts as Alternative 1B. In Alternative 1C, the opening of the CLAX mainline would be delayed through the project limits to allow all construction to be completed with the railroad offline.

Figure 2-6. Alternative 1C – LRT Above Grade without Shoofly



Source: HDR

### 2.3.1 Stage Construction and Traffic Handling

Alternative 1C features the same construction activities and traffic handling as Alternative 1B.

### 2.3.2 LRT and Bus Operations during Construction

As the CLAX main line would not be operation, no bus shuttle is necessary between the Downtown Inglewood and Fairview Heights Stations. The proposed bus terminal at the Downtown Inglewood station would be available for bus service.

### 2.3.3 ROM Cost Estimate

The current ROM cost for Alternative 1C is approximately \$186M inclusive of all project soft cost, contingencies, and other direct and indirect costs.

## 2.4 Alternative 2 – LRT Below Grade

Alternative 2 would lower the existing CLAX LRT line using a combination of semi-depressed guideways (u-wall trench sections) and a cut-and-cover box section under the Centinela/Florence intersection which would remain at grade. The track replacement limits of Alternative 2 extend approximately 3,000' from just east of the Downtown Inglewood Station to just west of the Fairview Heights Station. Figure 2-7 below illustrates the Alternative 2 components. Similar to Alternative 1A, Alternative 2 would utilize shoofly tracks to maintain the CLAX line operation during construction. See Figure 2-2 for the shoofly tracks layout and the temporary bus shuttling routes.

**Figure 2-7. Alternative 2 – LRT Below Grade**



Source: HDR

### 2.4.1 Geometric Configuration

#### Roadway

The roadway modifications in Alternative 2 are limited to the Centinela/Florence intersection and the connection to the grade separation structure. Similar to Alternative 1 (1A, 1B, 1C), the traffic signal proposed as part of the previous CLAX design at La Colina Drive and Centinela Avenue would need to be removed and the intersection would operate under stop control. The sidewalk on the eastside of Centinela Avenue would extend south to the intersection of Florence Avenue and a new crossing would be introduced at the northeast and northwest corners of Florence Avenue and Centinela Avenue. The street profile of Centinela would be modified slightly associated with the grade crossing panel removal. The street profiles for Florence Avenue and La Colina Drive remain unchanged (see Attachment A2).

## LRT Alignment

For Alternative 2 the track would be lowered approximately 24'-29' below existing top-of-rail through Centinela Avenue with a maximum depth of approximately 32' east of the crossing. No changes would be made to the existing CLAX horizontal alignment.

Initially, two vertical alignments were studied for Alternative 2. Both vertical alignments maintain a minimum of 15' of vertical clearance in the cut-and-cover box section under Centinela Avenue and 16' of vertical clearance below struts in the u-wall trench sections.

The first vertical alignment option involved the relocation of a 39" CITY storm drain line approximately 10' below Centinela Avenue and a 60" LADWP water line approximately 7' below existing ground east of the crossing. This option was removed from consideration due to the substantial constructability challenge that would require closures of Florence Avenue.

The second vertical alignment option proposes to raise the 39" SD and 60" water lines to the extent possible to minimize the LRT lowering and excavation. The 39" SD would include a protection channel integral to the cut-and-cover box roof under Centinela Avenue and the 60" water line would pass through the U-wall trench section either concrete encased or with a utility bridge.

Maintaining the existing CLAX horizontal alignment, coupled with the proposed vertical alignment, would allow for operating speeds of 45 MPH adjacent to the Downtown Inglewood Station and 65 MPH going east to the Fairview Heights Station. See Attachment A2 for the proposed Alternative 2 LRT plan and profile.

During construction, a temporary shoofly track would be constructed in the westbound lanes of Florence Avenue to allow LRT passenger operations to continue at the same operating speeds as Alternative 1 (1A, 1B, 1C). See Section 2.3.7 for additional discussion on LRT operations during construction. Key geometric characteristics of Alternative 2 are summarized in Table 2-2 below.

**Table 2-2. Alternative 2 Key LRT Geometric Features**

| Condition | Horizontal Alignment        | Max Grade   | Vertical Clearance   | Operating Speeds  |
|-----------|-----------------------------|---|--|---|
| Temporary | Shoofly in WB Florence Ave  | TOR profile to match existing Florence Avenue roadway profile | Shoofly is at-grade  | 35 MPH at Downtown Inglewood Station, 50 MPH east to Fairview Heights Station |
| Permanent | No change to CLAX alignment | 5%  | <ul style="list-style-type: none"> <li>• 15' min. – Cut-and Cover Tunnel</li> <li>• 16' min. – U-Wall Strut</li> </ul> | 45 MPH at Downtown Inglewood Station, 65 MPH east to Fairview Heights Station |

Source: HDR

## 2.4.2 Right-of-Way Requirements and Impacts

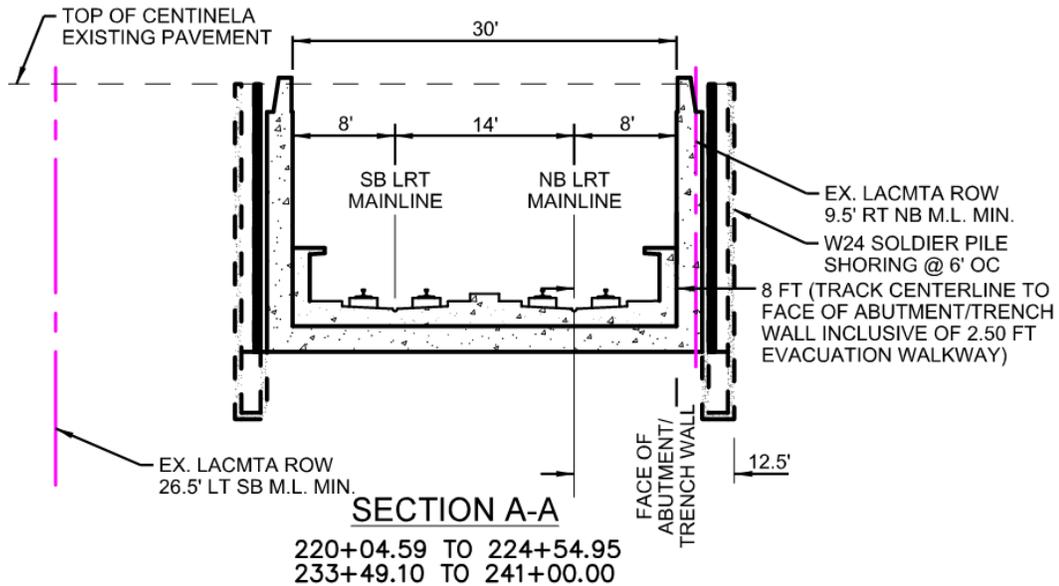
No permanent right-of-way impacts are anticipated at this time.

## 2.4.3 Structure Configuration

Structurally Alternative 2 consists of U-section walls with and without struts and a single span cut-and-cover reinforced concrete box structure under Centinela Avenue.

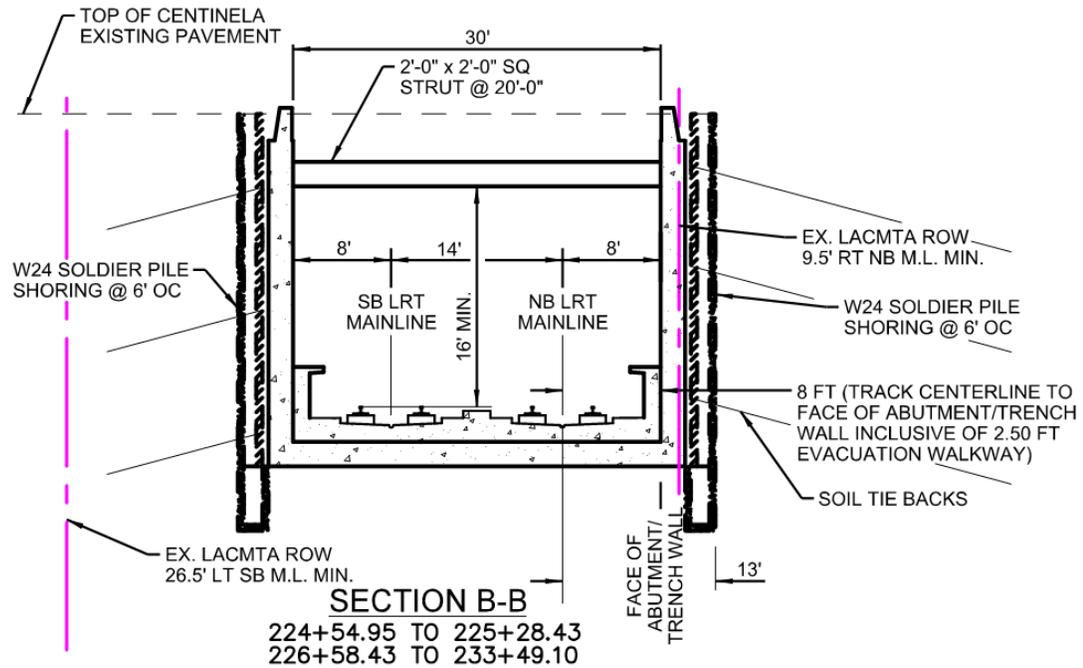
The width of the U-section is 30' between the faces of walls, the length is approximately 540' west of Centinela and 1,440' east of Centinela, and the maximum design height is 32' where the alignment travels below the raised 60" water line. Standard U-section walls are proposed for depths up to 20' below existing top of rail and strutted U-section walls are proposed when the depth is between 20' and 32'. The standard U-Section walls are proposed to be constructed using soldier piles for shoring that would potentially require tie-backs when excavation exceeds 20 feet. See Figures 2-8 and 2-9 below.

**Figure 2-8. Alternative 2 – Standard U-Section**



Source: HDR

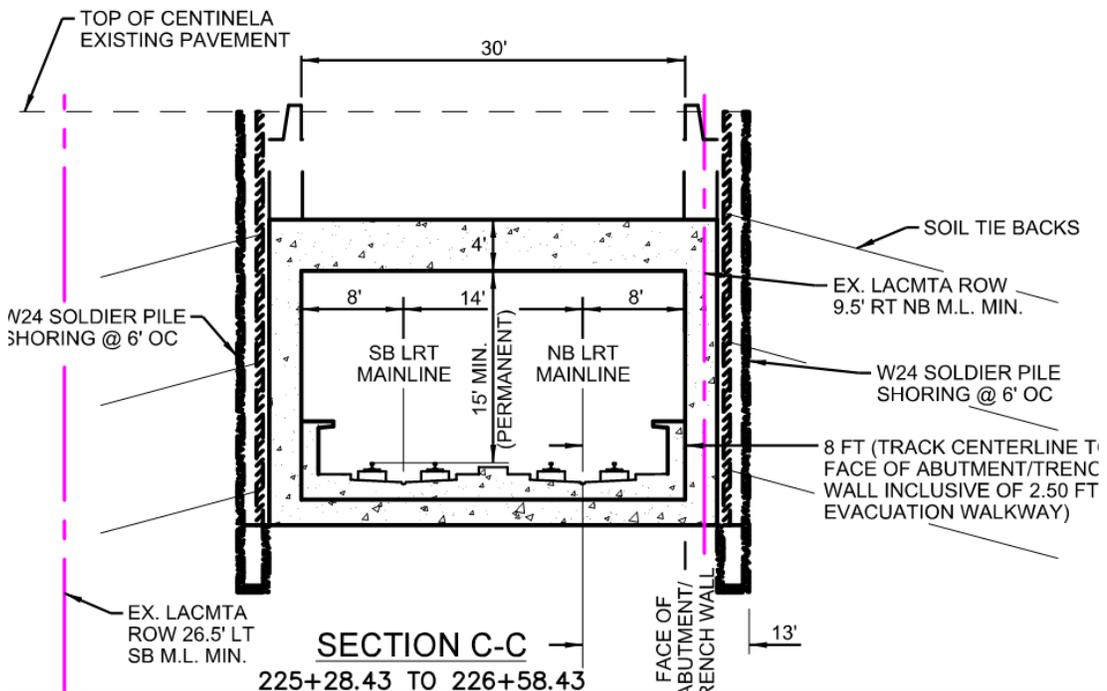
**Figure 2-9. Alternative 2 – U-Section with Struts**



Source: HDR

The cut-and-cover box under Centinela Avenue has a span of 30' between inside faces of the box, a height of 20'-8" from bottom of invert slab to top of roof slab and 3' minimum soil cover below existing ground. The total box length is 150 feet. See Figure 2-10 below

**Figure 2-10. Alternative 2 – Cut-and-Cover Box below Centinela Avenue**



Source: HDR

## 2.4.4 Drainage Impacts

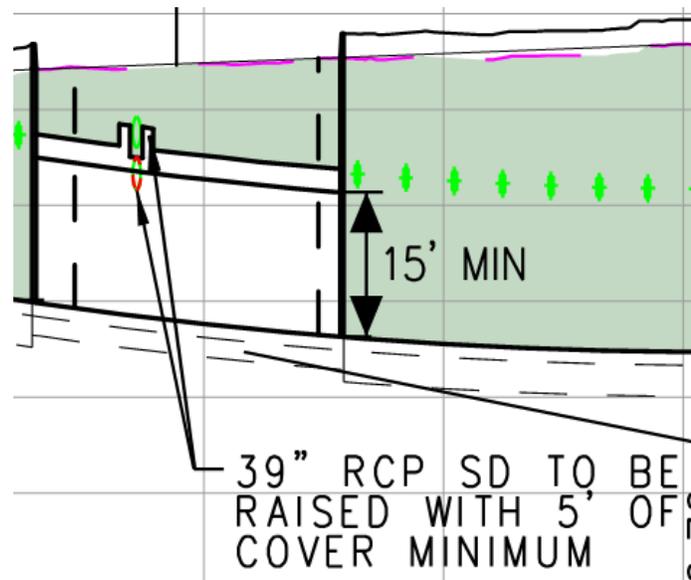
The proposed track profile for Alternative 2 would require the existing 39-inch CITY Storm Drain (ID # 1257) to be raised approximately 4'-4" at its current location and require a support structure to be built integral to the cut-and-cover box roof slab. The drainage implications are noted below and depicted in Figures 2-11 and 2-12:

Raise 39-inch CITY Storm Drain and 60-inch LADWP Water:

- Track alignment would be lowered to accommodate 16' minimum vertical clearance below utilities and/or their protection structures as noted above
- Proposed track drainage would flow towards Centinela Avenue (following existing flow pattern)
- A pump station proposed within existing Metro right-of-way at the northeast quadrant of the Florence Avenue and Centinela Avenue crossing would be required for the track drainage and would need to be pumped to the existing 39-inch CITY Storm Drain near La Colina Drive.

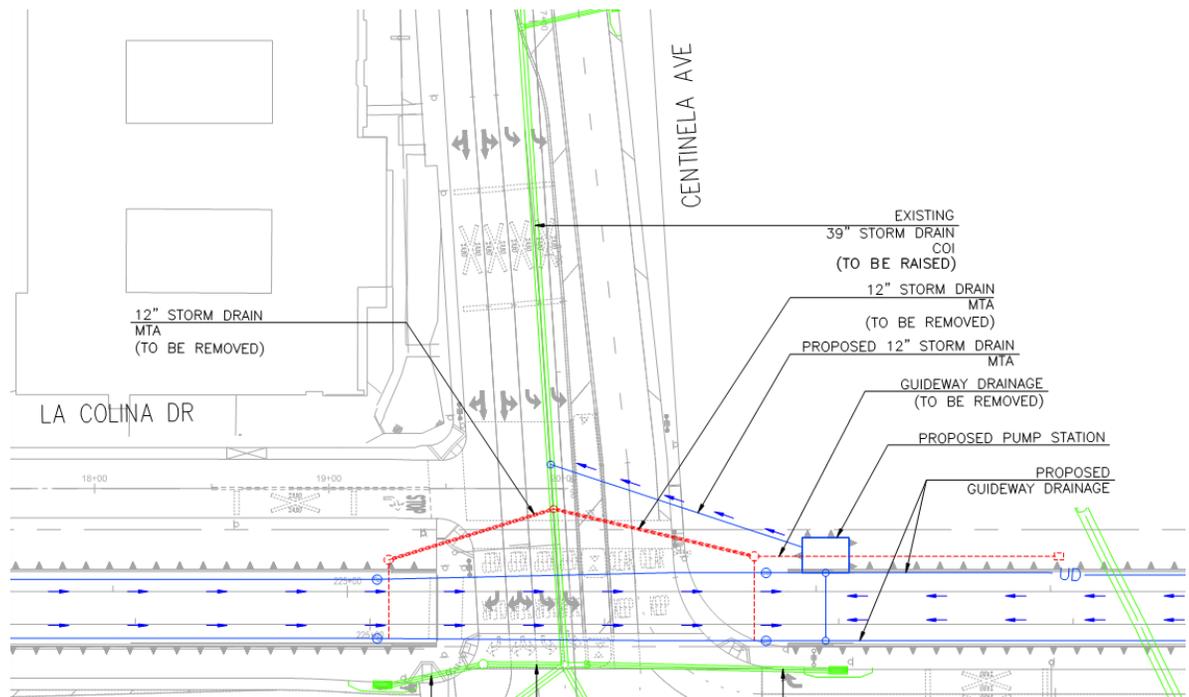
While the existing pipe profile allows raising the pipe, a hydraulic analysis would be required to assess the full extent of drainage modifications associate with raising the storm drain.

**Figure 2-11. Alternative 2 – Raised 39" SD Line under Centinela Avenue**



Source: HDR

**Figure 2-12. Alternative 2 – Proposed Pump Station Location and Additional Key Drainage Modifications**



Source: V&A

### 2.4.5 Utility Impacts

As discussed in Section 2.1.5, an existing 60" ductile iron water line owned by LADWP Water possess the most significant utility impact to Alternative 2. The water line's location and depth result in a significant impact with the line being in direct conflict with any efforts to lower the existing CLAX alignment below the existing Centinela Avenue roadway profile. Numerous additional minor relocations would be required to accommodate any potential track lowering concept.

Two potential approaches to resolve the water line impact have been studied at a high-level. Key considerations of each approach are outline below.

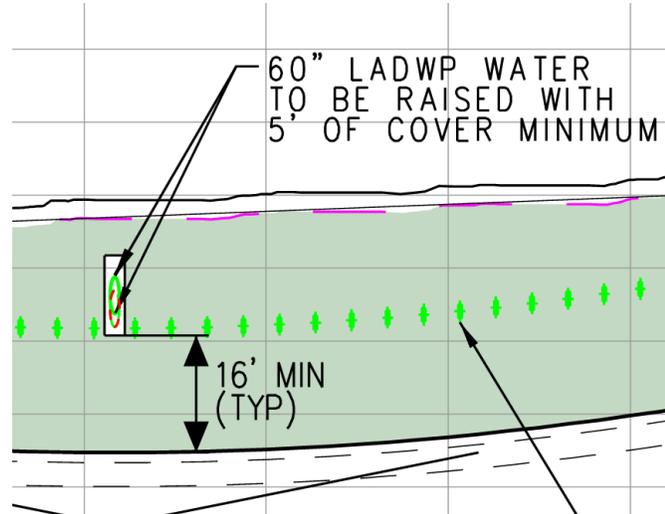
1. Raising the 60" water line in place – Recommended Approach.

Raising the line would require consideration of the following:

- a. Steeper track profile grade (5% maximum) with deeper excavation to achieve minimum vertical clearance below the raised water line
- b. 3'-0" deep utility protection girder penetrating LRT U-Section walls supporting the line above (see Figure 2-13 below)
- c. Potential concerns related to protecting the line include:
  - i. Utility protection girder would be penetrating the U-Section at the point of the deepest U-Section and could result in the need to provide additional wall thickness, which could encroach into the Florence Avenue street right of way

on the south side. Detailed analysis would be performed to determine the wall thickness if Alternative 2 is selected for final design.

**Figure 2-13. Alternative 2 – 60” LADWP Water Integral Roof Protection Slab**



Source: HDR

2. Relocate the 60” water line.

Two initial options have been identified to potentially relocate the line:

- a. Lower the line below the track profile
  - i. Significant feasibility, constructability, and cost concerns as 15'-20' of lowering would be required assuming a 4' roadway bridge depth and a minimum of 5' of cover from the bottom of invert slab to top of water line
- b. Realign the water line east to cross under the tracks closer to Osage Avenue or North Prairie Avenue
  - i. Requires substantial trenching to reroute the 60” water line causing prolonged impacts to traffic on Florence and North Prairie Avenues

As with Alternative 1A, in locations where the proposed temporary shoofly track crosses an existing utility, the utility must be protected in place by concrete encasement or steel casing.

## 2.4.6 Stage Construction and Traffic Handling

Alternative 2 is proposed to be constructed with shoofly tracks. The shoofly tracks and temporary traffic configuration on Florence Avenue is the same as described in Alternative 1A.

The proposed construction sequence of Alternative 2 is as follows:

1. Construct shoofly tracks and temporary grade crossing. Through traffic on Florence reduced to two lanes in each direction, the EB left turn lane at Centinela reduced to one lane.

2. Track cutover to the shoofly. CLAX line would operate on the shoofly tracks after testing. Demolish the existing tracks. Construct the proposed U-section walls.
3. Construct CIDH piles of the cut-and-cover box section on Centinela Ave in three phases, with reduced lanes on Centinela.
4. Under temporary closure of Centinela Ave, install temporary decking.
5. Construct the remainder of the box structure, tracks, OCS and other system components.
6. Track cutover to proposed track. Conduct testing. Demolish the shoofly tracks, temporary crossing. Restore street and sidewalk.

The construction duration of Alternative 2 is estimated at 36 months.

See Attachment D4 for preliminary Alternative 2 Stage Construction and Traffic Handling.

#### 2.4.7 LRT and Bus Operation during Construction

The LRT shoofly, bus operation, and bus shuttling are the same as describe in Alternative 1.

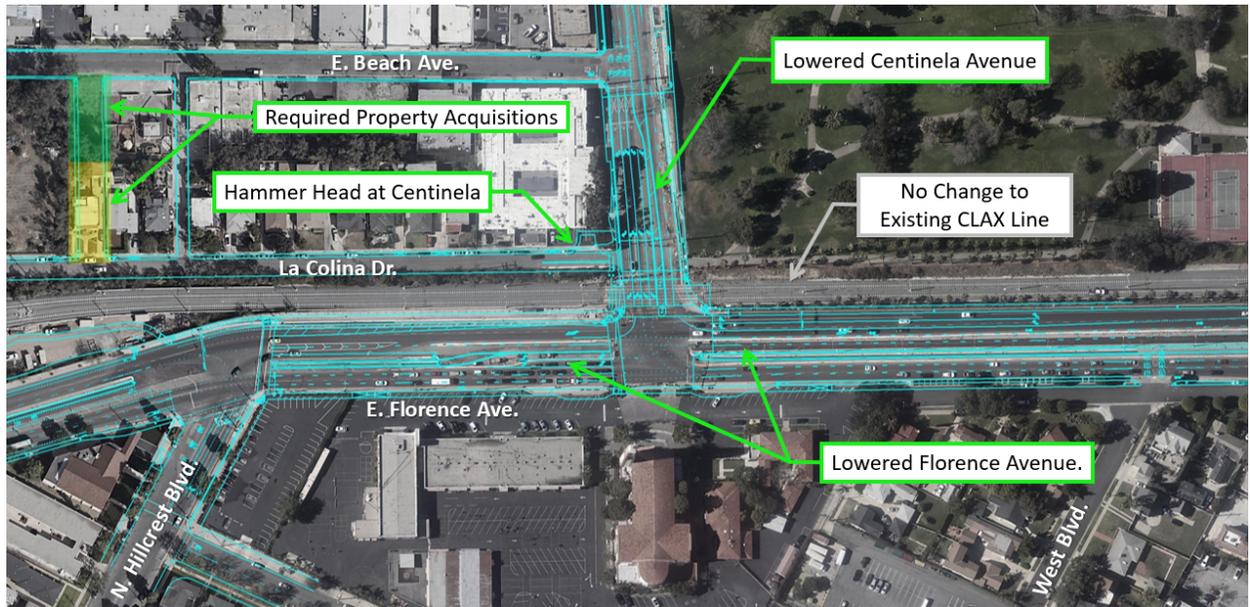
#### 2.4.8 ROM Cost Estimate

The current ROM cost for Alternative 2 is approximately \$321M inclusive of a temporary track-shoofly and bus shuttling, pump station, and all project soft cost, contingencies, and other direct and indirect costs.

### 2.5 Alternative 3 – LRT At-Grade

Alternative 3 proposes to maintain the CLAX alignment and realign Centinela Avenue and Florence Avenue. Based on the existing terrain and Centinela Avenue's steep profile grade, the grade separation would be achieved by lowering Centinela and Florence.

**Figure 2-14. Alternative 3 – LRT At-Grade**



Source: HDR

## 2.5.1 Geometric Configuration

### Roadway

Alternative 3 proposes significant impacts to Florence Avenue, Centinela Avenue and La Colina Drive. The alternative proposes to keep the existing track elevations unchanged and proposes to depress Florence Avenue and Centinela Avenue by up to 24 feet. To avoid acquiring up to 5 properties on La Colina Drive to maintain connection to Centinela Avenue, La Colina Drive would remain at existing grade and terminate with a hammer head just west of the existing intersection. A replacement access to La Colina Drive is proposed through a new 34' wide local street between Beach Avenue and La Colina Drive. The proposed length of the new street is about 275 feet long. The lane configuration on Florence Avenue and Centinela Avenue would remain unchanged.

The existing posted speed limit on Florence Avenue is 40 mph and the design speed used for proposed design is 45mph. The revised profile extends from Hillcrest Boulevard to Osage Avenue. The proposed profile on Florence Avenue east of Centinela Avenue is up to 6% grade. A separate sidewalk profile is proposed at 5% with an intermediate landing for accessibility. A short retaining wall would separate the sidewalk from the roadway.

The existing posted speed limit on Centinela Avenue is 20 mph and the design speed for the proposed modifications is 45 mph per City of Inglewood's speed survey. The profile change extends from south of Beach Avenue to Florence Avenue.

Pedestrian access would be maintained with sidewalks on Centinela and Florence.

## LRT Alignment

Alternative 3 proposes to leave the existing CLAX LRT line at-grade and grade separate Centinela Avenue below the existing LRT line. No changes are proposed to the existing CLAX horizontal or vertical alignment.

### 2.5.2 Right-of-Way Requirements and Impacts

In order to maintain access to the properties along La Colina Drive, a new street was proposed. As a result of this new street, 2 properties would need to be purchased: 1 single family residential at 367 La Colina Drive would require a full acquisition and partial acquisition would be required for a portion of the vacant lot located directly north of the full property acquisition at 358 E Beach Avenue. The new local street is a 34' wide street that follows City of Inglewood Local Street width criteria and is about 275' long between Beach Avenue and La Colina Drive. The alignment of proposed new street is proposed at about 750' west of Centinela Avenue.

With Florence Avenue lowered substantially, the two existing driveways at the St. John Church and school would be closed. Access to the property would be at the existing driveways on Grace Avenue.

### 2.5.3 Structure Configuration

The proposed structure is a single-span cast-in-place prestressed concrete box girder bridge supported on seat type abutments on secant pile foundations. The overall structure width is 30 feet, and total structure length is 150 feet. The proposed structure depth is 7 feet, 6 inches.

Due to Right-of-way restrictions, a top-down construction method is proposed to construct the bridge abutments and retaining walls. The 5-foot diameter cast-in-drilled-hole (CIDH) piles at 6 feet spacing with 2-foot diameter secant piles would be proposed for the abutment and retaining walls.

### 2.5.4 Drainage Impacts

Alternative 3 proposes the most significant impacts to the existing drainage network due to the lowering of Florence Avenue and Centinela Avenue. This roadway depression would require the relocation of all existing storm drains. In addition, a pump station would be required for the depressed area created by the grade separation.

Drainage impacts for Alternative 3:

- A storm water pump station would be required for the depressed Florence/Centinela intersection and the track drainage.
- Six existing catch basins would be impacted and reconstructed
- One existing catch basin would be removed
- One new additional catch basin would be required along the south side of Florence Avenue
- Approximately 2300 LF of various size storm drain pipe would be replaced.

### 2.5.5 Utility Impacts

Alternative 3 requires the most extensive utility relocation/replacement. In this alternative, all existing utilities within the roadway lowering limits would be impacted requiring a complete removal and relocation of all impacted utilities.

### 2.5.6 Stage Construction and Traffic Handling

With Florence and Centinela Avenues depressed in this alternative, it is infeasible to provide shoofly tracks to maintain the CLAX line's operation. Pedestrian and bicyclists would not have access to the Centinela/Florence intersection and would be detoured around the construction site.

To minimize the CLAX line outage and impact to Florence Avenue traffic, the proposed construction sequence of Alternative 3 is as follows:

1. Construct the new street connecting Beach Avenue and La Colina Drive and subsequently construct the hammerhead at the east end of La Colina.
2. Under long term closure of Centinela Avenue, construct the secant pile walls on Centinela Avenue and the north side of Florence Avenue while maintaining the CLAX line operation to the extent possible. Traffic would be detoured.
3. Under long term closure of Florence Avenue and the CLAX line, construct the remaining retaining walls and bridge structure, drainage and utility relocations, and all roadway modifications. Traffic would be detoured.
4. Construct restoration track work and systems. Conduct revenue testing.

The construction duration of Alternative 3 is estimated at 36 months.

See Attachment D5 for preliminary Alternative 3 Stage Construction and Traffic Handling.

### 2.5.7 LRT and Bus Operation during Construction

The proposed roadway modifications to lower portions of Centinela/Florence below the LRT line would be constructed under live track conditions for as long as possible until track outage is required. Bus shuttling would be provided when the CLAX line is out of service. The bus lines operating on Florence Avenue would be detoured. The bus terminal at the Downtown Inglewood station would remain in service.

### 2.5.8 ROM Cost Estimate

The current ROM cost for Alternative 3 is approximately \$218M inclusive of bus shuttling, right-of-way acquisitions, pump station, and all project soft cost, contingencies, and other direct and indirect costs.

## 3 Screening Matrix

Each alternative studied in this screening analysis has different design, operation characteristics, impacts, and cost. A screening matrix was compiled to rank the alternatives based on the following evaluation categories:

- CLAX Line Design and Operation
- Street Design and Operation
- Public Utilities and Drainage Impacts
- Community and Right of Way Impacts
- Construction Impacts
- Cost

In Table 3-1 below, each evaluation criteria was individually ranked, and summarized as an average ranking for each evaluation category. The highest performing alternative for each category is assigned with ranking score of 1. The cumulative ranking score is the sum of the six evaluation category rankings. The best performing alternative would have the lowest cumulative ranking score.

**Table 3-1. Centinela/Florence Grade Separation Alternatives Screening Analysis Matrix**

Rankings Value: The highest performing alternative would be assigned with a ranking value of 1

| Evaluation Criteria                       |                            | <b>Alternative 1A<br/>LRT Above Grade, Bridge<br/>Overcrossing</b>   | <b>Alternative 1B<br/>LRT Above Grade, Bus<br/>Shuttling</b>   | <b>Alternative 1C<br/>LRT Above Grade, No Bus<br/>Shuttling</b>  | <b>Alternative 2<br/>LRT Below Grade, Trench</b>   | <b>Alternative 3<br/>LRT At Grade, Centinela and<br/>Florence Lowered</b>  |
|---|----------------------------|--|--|--|--|--|
| <b>CLAX Line Design<br/>and Operation</b> | <b>Average<br/>Ranking</b> | <b>1.3</b>   | <b>1.3</b>   | <b>1.3</b>   | <b>1.7</b>   | <b>1</b>   |
| Headway, travel time                      | Ranking                    | 1  | 1  | 1  | 1  | 1  |
|   | Findings                   | Insignificant change to travel time, does not affect headways.   | Insignificant change to travel time, does not affect headways.   | Insignificant change to travel time, does not affect headways.   | Insignificant change to travel time, does not affect headways.   | No change  |
| CLAX Line<br>Maintenance                  | Ranking                    | 1  | 1  | 1  | 1  | 1  |
|   | Findings                   | The proposed grade separation would be maintained in the same manner as the La Brea aerial structure.<br>Hi-rail access from adjacent grade crossings. | The proposed grade separation would be maintained in the same manner as the La Brea aerial structure.<br>Hi-rail access from adjacent grade crossings. | The proposed grade separation would be maintained in the same manner as the La Brea aerial structure.<br>Hi-rail access from adjacent grade crossings. | The proposed grade separation would be maintained in the same manner as the other trench segments on the CLAX line.<br>Hi-rail access from adjacent grade crossings. | The proposed grade separation would be maintained in the same manner as the La Brea aerial structure (tracks on bridge structure with roadway below).<br>Hi-rail access from adjacent grade crossings. |
| Track Geometry                            | Ranking                    | 2  | 2  | 2  | 3  | 1  |
|   | Findings                   | 3.5% max grade   | 3.5% max grade   | 3.5% max grade   | 5.0% max grade   | No change  |
| <b>Street Design and<br/>Operation</b>    | <b>Average<br/>Ranking</b> | <b>2</b>   | <b>2</b>   | <b>2</b>   | <b>1</b>   | <b>3</b>   |
| Vehicle Traffic<br>Operation, Circulation | Ranking                    | 2  | 2  | 2  | 1  | 3  |
|   | Findings                   | Retaining walls and bridge abutment limit visibility, maintain lane configuration and circulation  | Retaining walls and bridge abutment limit visibility, maintain lane configuration and circulation  | Retaining walls and bridge abutment limit visibility, maintain lane configuration and circulation  | No change in visibility, maintain lane configuration and circulation   | Reduced visibility due to retaining walls.<br>Steep grades toward intersection.<br>La Colina cut off at Centinela, access from Beach and new connecting local road                                     |
| Pedestrian<br>Circulation, Safety         | Ranking                    | 2  | 2  | 2  | 1  | 3  |
|   | Findings                   | Retaining walls and bridge abutment limit visibility, maintain circulation   | Retaining walls and bridge abutment limit visibility, maintain circulation   | Retaining walls and bridge abutment limit visibility, maintain circulation   | No change in visibility, maintain circulation  | La Colina cut off at Centinela, access from Beach and new connecting local road.<br>Long sustained grades, not as pedestrian friendly.<br>Sense of being hidden, need extra lighting.                  |

| Evaluation Criteria                          |                        | Alternative 1A<br>LRT Above Grade, Bridge<br>Overcrossing   | Alternative 1B<br>LRT Above Grade, Bus<br>Shuttling                              | Alternative 1C<br>LRT Above Grade, No Bus<br>Shuttling                           | Alternative 2<br>LRT Below Grade, Trench  | Alternative 3<br>LRT At Grade, Centinela and<br>Florence Lowered   |
|--|------------------------|---|--|--|---|--|
| <b>Public Utilities and Drainage Impacts</b> | <b>Average Ranking</b> | <b>2</b>  | <b>1</b>   | <b>1</b>   | <b>3.5</b>  | <b>3.5</b>   |
| Utilities                                    | Ranking                | 2   | 1  | 1  | 3   | 4  |
|  | Findings               | Temporary protection of utilities under shoofly tracks. No permanent relocations.   | No permanent relocations.  | No permanent relocations.  | Temporary protection of utilities under shoofly tracks. Temporary protection/relocation of utilities on Centinela, permanent restoration on top of the roof slab. 66" DWP water line to be relocated. | All utilities on Centinela and Florence to be relocated, including the 66" DWP water line.   |
| Drainage                                     | Ranking                | 2   | 1  | 1  | 4   | 3  |
|  | Findings               | Minor modifications for the reconfigured track drainage. New inlets and laterals. Temporary drainage system needed at the intersection for shoofly condition. | Minor modifications for the reconfigured track drainage. New inlets and laterals | Minor modifications for the reconfigured track drainage. New inlets and laterals | Track drainage requires new pump station. Existing 39" SD on Centinela to be replaced. Temporary drainage system needed at the intersection for shoofly.  | Replace all inlets and pipes on Florence and Centinela.  |
| <b>Community and Right of Way Impacts</b>    | <b>Average Ranking</b> | <b>1.3</b>  | <b>1.3</b>   | <b>1.3</b>   | <b>1.0</b>  | <b>2.3</b>   |
| Access Impacts                               | Ranking                | 1   | 1  | 1  | 1   | 2  |
|  | Findings               | No change   | No change  | No change  | No change   | La Colina cut off at Centinela, access from Beach and new connecting local road. Church access on Florence removed; access from Grace Ave only.                              |
| Right of Way Impacts                         | Ranking                | 1   | 1  | 1  | 1   | 2  |
|  | Findings               | Construction staging and laydown areas need to be identified  | Construction staging and laydown areas need to be identified                     | Construction staging and laydown areas need to be identified                     | Construction staging and laydown areas need to be identified  | One residential full take, one residential partial take. TCE and footing easement along Florence and Centinela. Construction staging and laydown areas need to be identified |
| Visual Impacts                               | Ranking                | 2   | 2  | 2  | 1   | 3  |
|  | Findings               | Retaining walls limit visibility, particularly residents on La Colina   | Retaining walls limit visibility, particularly residents on La Colina            | Retaining walls limit visibility, particularly residents on La Colina            | Improved with LRT lowered   | Substantial retaining walls on both sides of Centinela and Florence.   |

| Evaluation Criteria                           |                        | Alternative 1A<br>LRT Above Grade, Bridge<br>Overcrossing   | Alternative 1B<br>LRT Above Grade, Bus<br>Shuttling  | Alternative 1C<br>LRT Above Grade, No Bus<br>Shuttling   | Alternative 2<br>LRT Below Grade, Trench  | Alternative 3<br>LRT At Grade, Centinela and<br>Florence Lowered  |
|---|------------------------|---|--|--|---|---|
| <b>Construction Impacts</b>                   | <b>Average Ranking</b> | <b>1.8</b>  | <b>1.4</b>   | <b>1</b>   | <b>2.2</b>  | <b>2.8</b>  |
| Construction Duration                         | Ranking                | 2   | 1  | 1  | 4   | 3   |
|   | Findings               | 29 months   | 23 months  | 23 months  | 40 months   | 36 months   |
| Construction Impacts                          | Ranking                | 2   | 1  | 1  | 2   | 3   |
|   | Findings               | Reduced lane configuration for duration of construction. Intermittent full closure of Centinela Ave between La Colina Dr. and Florence Ave.   | Minimal impact; street traffic not affected.   | Minimal impact; street traffic not affected.             | Reduced lane configuration for duration of construction. Intermittent full closure of Centinela Ave between La Colina Dr. and Florence Ave.   | Long-term closure of Centinela and Florence requires detour.  |
| Bus Services                                  | Ranking                | 2   | 1  | 1  | 2   | 3   |
|   | Findings               | Downtown Inglewood Station terminal would be occupied by the shoofly tracks and unusable. Bus Service and Layover locations would need to be temporarily relocated.   | Downtown Inglewood Station terminal would be in service.   | Downtown Inglewood Station terminal would be in service. | Downtown Inglewood Station terminal would be occupied by the shoofly tracks and unusable. Bus Service and Layover locations would need to be temporarily relocated.   | Bus service on Florence will be detoured during construction. Downtown Inglewood Station terminal would remain in service.  |
| CLAX Line Maintenance                         | Ranking                | 2   | 3  | 1  | 2   | 4   |
|   | Findings               | Shoofly provides continuous access except cutover periods. During cutover, rail cars servicing the north segment has no access to the yard, needs remote cleaning and inspections. Hi-rail vehicles need to access the track from adjacent crossings. | Rail cars servicing the north segment has no access to the yard, needs remote cleaning and inspections. Hi-rail vehicles need to access the track from adjacent crossings. | No maintenance needs as this segment is not in service.  | Shoofly provides continuous access except cutover periods. During cutover, rail cars servicing the north segment has no access to the yard, needs remote cleaning and inspections. Hi-rail vehicles need to access the track from adjacent crossings. | Long term track outage during construction restricts access. Rail cars servicing the north segment has no access to the yard, needs remote cleaning and inspections. Hi-rail vehicles need to access the track from adjacent crossings. |
| Access to La Brea Station During Construction | Ranking                | 1   | 1  | 1  | 1   | 1   |
|   | Findings               | Station parking to be out of service with shoofly. Access to station platform maintained.   | No impact  | No impact  | Station parking to be out of service with shoofly. Access to station platform maintained.   | No impact   |

| Cost | Ranking | 4 | 2      | 1      | 5      | 3      |
|------|---------|---|--------|--------|--------|--------|
|      |         |   | \$241M | \$201M | \$185M | \$321M |

**Cumulative Ranking Score**

**12.5**

**9.1**

**7.7**

**14.4**

**15.6**

## 4 Recommendation

Based on the screening matrix, it is apparent that the LRT above grade alternatives (1A, 1B and 1C) prevail by consistently ranking higher than Alternatives 2 and 3 among most evaluation categories, primarily due to lower cost and shorter construction duration.

Alternative 2 has the highest cost, but has relatively less impacts than Alternative 3. Alternative 3 brings the most significant impacts to the community. Among the above-grade alternatives, Alternative 1A carries the most schedule and cost impacts due to requiring shoo fly tracks during construction. Differentiating between Alternatives 1B and 1C is dependent on the CLAX operating condition at the time of construction.

It is recommended to advance the LRT above grade alternative to the preliminary engineering phase, while the selection among Alternatives 1A, 1B, and 1C is in progress concurrently.

# 5 Attachments

## **ATTACHMENT A – TRACK AND ROADWAY LAYOUTS AND PROFILES**

**A1T – ALTERNATIVE 1 (1A, 1B, 1C) TRACK PLAN AND PROFILE**

**A1R – ALTERNATIVE 1 (1A, 1B, 1C) ROADWAY LAYOUT AND PROFILES**

**A2T – ALTERNATIVE 2 TRACK PLAN AND PROFILE**

**A2R - ALTERNATIVE 2 ROADWAY LAYOUT AND PROFILES**

**A3R – ALTERNATIVE 3 ROADWAY LAYOUT AND PROFILES**

## **ATTACHMENT B – DRAINAGE EXHIBITS**

**B1 – ALTERNATIVE 1 (1A, 1B, 1C)**

**B2 – ALTERNATIVE 2**

**B3 – ALTERNATIVE 3**

## **ATTACHMENT C – UTILITY EXHIBITS**

**C1 – ALTERNATIVE 1 (1A, 1B, 1C)**

**C2 – ALTERNATIVE 2**

**C3 – ALTERNATIVE 3**

## **ATTACHMENT D – STAGE CONSTRUCTION EXHIBITS**

**D1 – ALTERNATIVE 1A**

**D2 – ALTERNATIVE 1B**

**D3 – ALTERNATIVE 2**

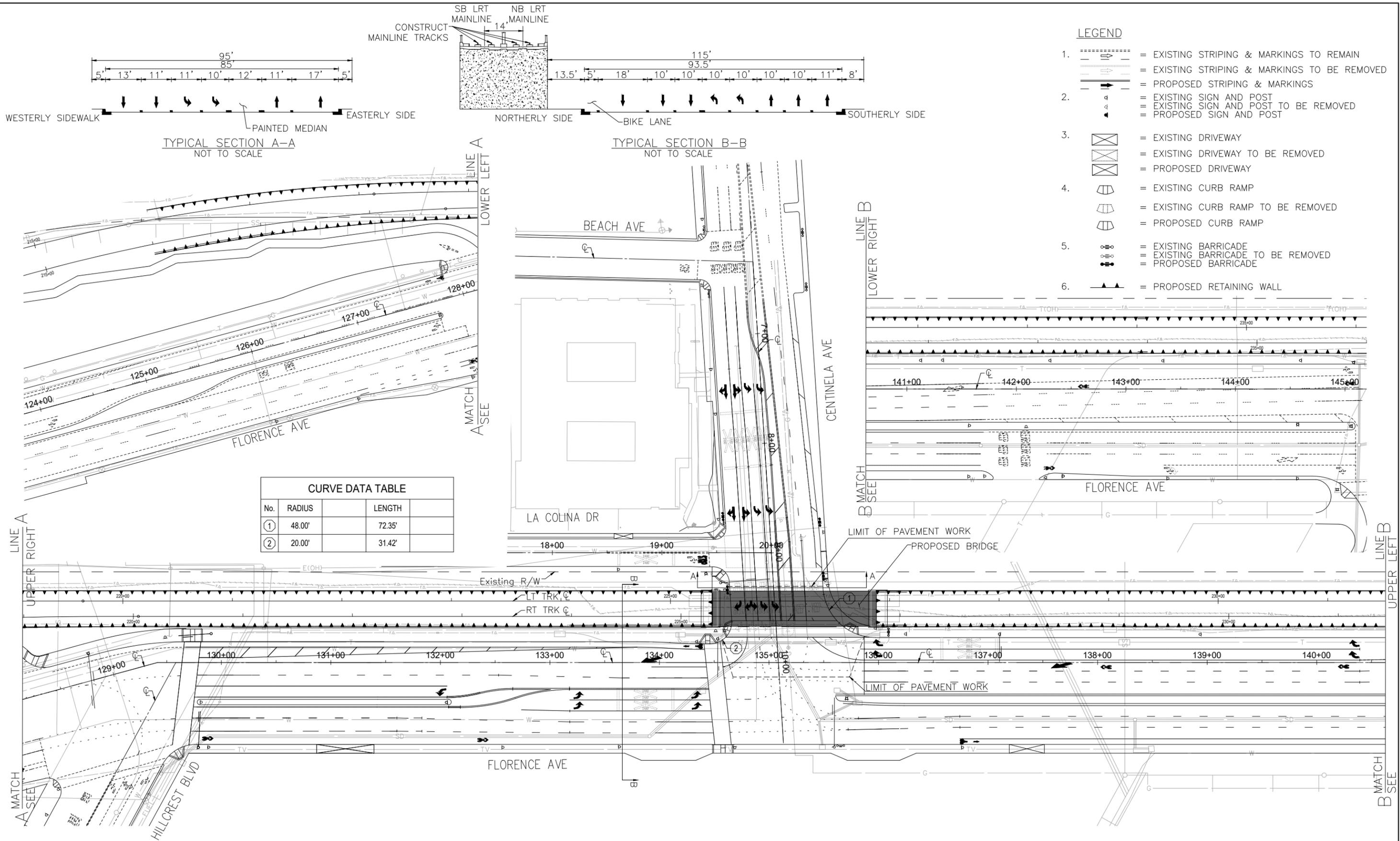
**D4 – ALTERNATIVE 3**



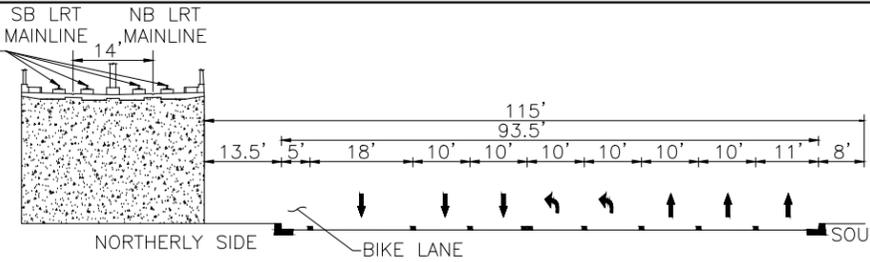
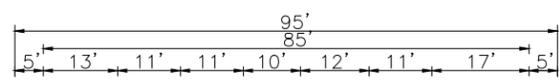
# Attachment A – Track and Roadway Layouts and Profiles



41R - ALTERNATIVE 1 (1A, 1B, 1C) ROADWAY LAYOUT



- LEGEND**
- 1. = EXISTING STRIPING & MARKINGS TO REMAIN
  - = EXISTING STRIPING & MARKINGS TO BE REMOVED
  - = PROPOSED STRIPING & MARKINGS
  - 2. = EXISTING SIGN AND POST
  - = EXISTING SIGN AND POST TO BE REMOVED
  - = PROPOSED SIGN AND POST
  - 3. = EXISTING DRIVEWAY
  - = EXISTING DRIVEWAY TO BE REMOVED
  - = PROPOSED DRIVEWAY
  - 4. = EXISTING CURB RAMP
  - = EXISTING CURB RAMP TO BE REMOVED
  - = PROPOSED CURB RAMP
  - 5. = EXISTING BARRICADE
  - = EXISTING BARRICADE TO BE REMOVED
  - = PROPOSED BARRICADE
  - 6. = PROPOSED RETAINING WALL



**CURVE DATA TABLE**

| No. | RADIUS | LENGTH |
|-----|--------|--------|
| ①   | 48.00' | 72.35' |
| ②   | 20.00' | 31.42' |

\$ DATES  
 \$ FILES  
 \$ PENITLS  
 \$ PLTDIVLS

V:\2019\VA-1907 - LA Metro SES - HDR\Florence\_Centinela\Design\01\_Screening\_Analysis\CADD\Sheets\Restoration\SES\_Centinela\_Layout - Alt 1 Layout.dwg May 13, 2020 B42en...jregrete

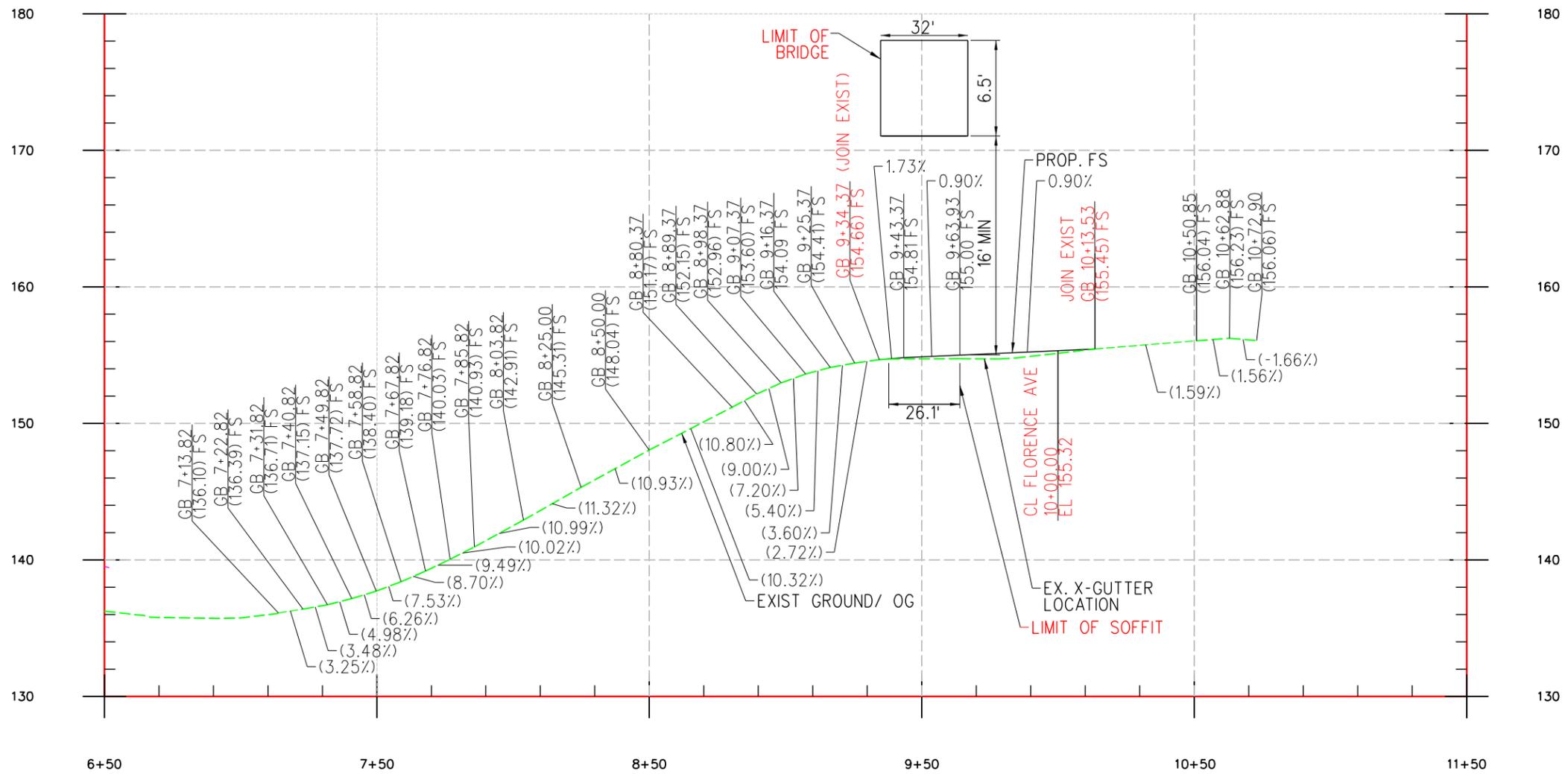


**V&A INC.**  
 975 S FAIR OAKS AVE  
 PASADENA, CA 91105  
 213.972.9700



CENTINELA GRADE SEPARATION  
 ALTERNATIVE 1  
 LAYOUT

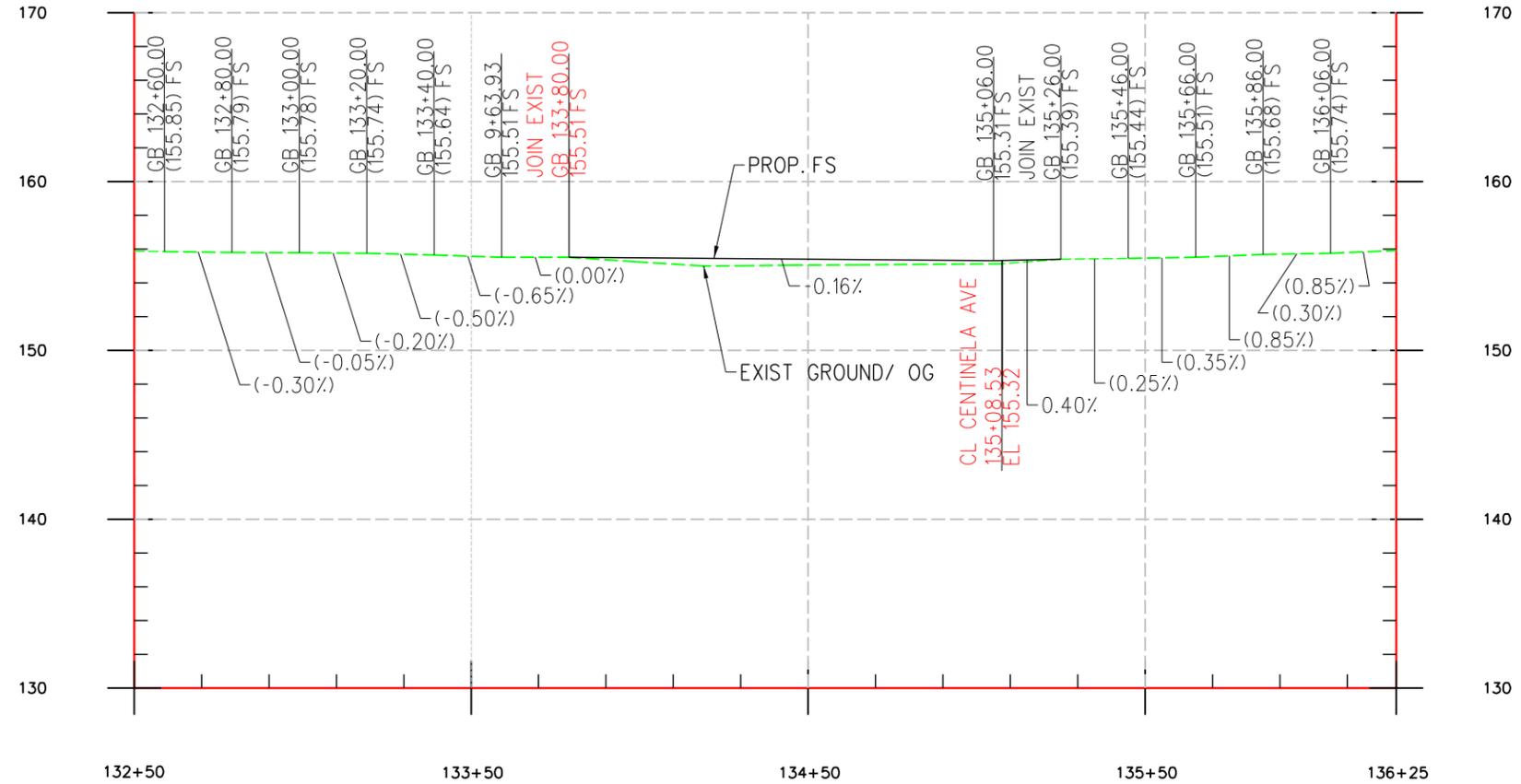
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 DATE: 05-13-2020



CENTINELA AVENUE CL PROFILE

\$DATE\$  
 \$LEVEL\$  
 \$PROJECT\$  
 \$SHEETNO\$

|  |  |  |   |   |
|--|--|--|---|---|
| <p>V&amp;A INC.<br/>975 S. FAIR OAKS AVE<br/>PASADENA, CA 91105<br/>213.972.9700</p> |  |  | CENTINELA GRADE SEPARATION<br>ROADWAY GEOMETRY<br>ALTERNATIVE 1 | HORZ: 1"=50'<br>SCALE: VERT: 1"=10'<br>DATE: 05-13-2020 |
|--|--|--|---|---|



FLORENCE AVENUE CL PROFILE

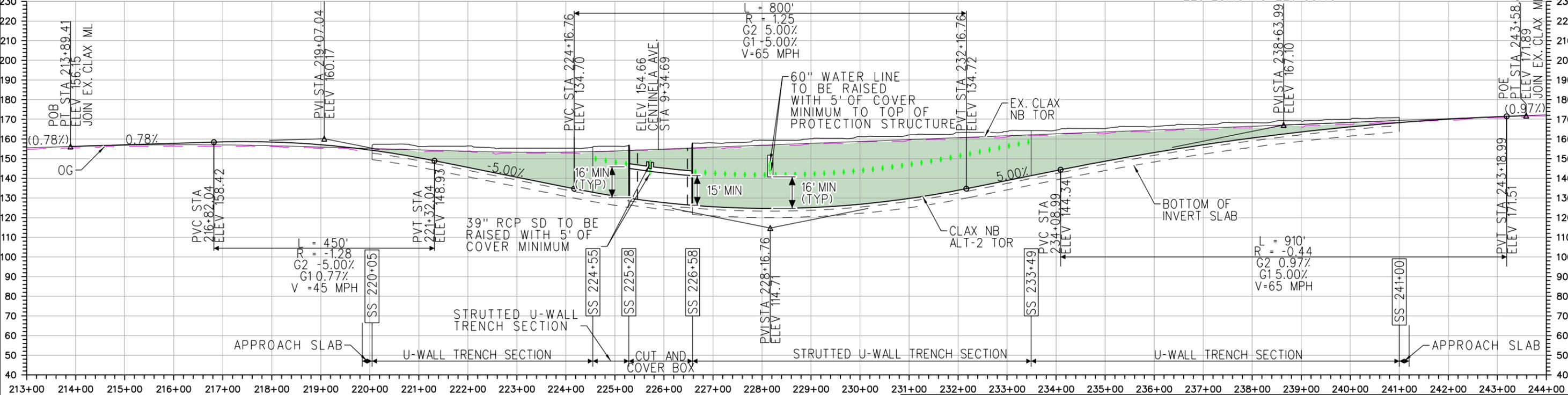
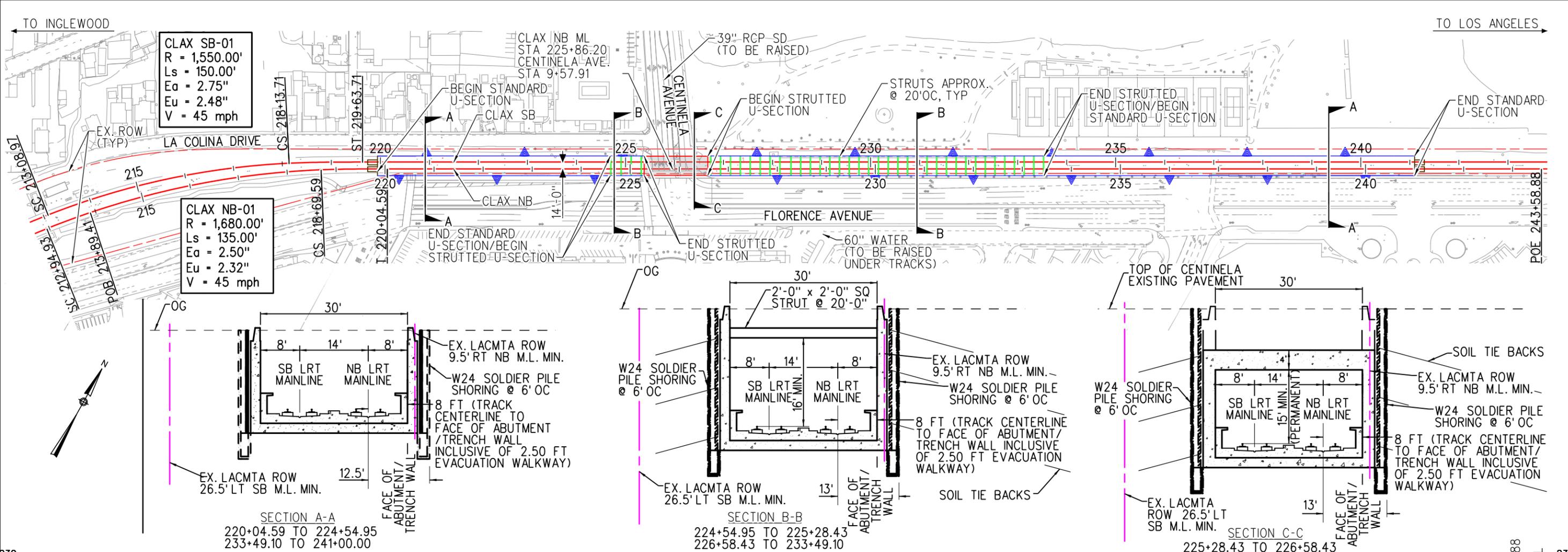
\$DATE\$  
 \$PROJECT\$  
 \$SHEET\$  
 \$TOTAL\$



CENTINELA GRADE SEPARATION  
 ROADWAY GEOMETRY  
 ALTERNATIVE 1

HORZ: 1"=50'  
 SCALE: VERT: 1"=10'  
 DATE: 05-13-2020

A2T - ALTERNATIVE 2 TRACK PLAN AND PROFILE

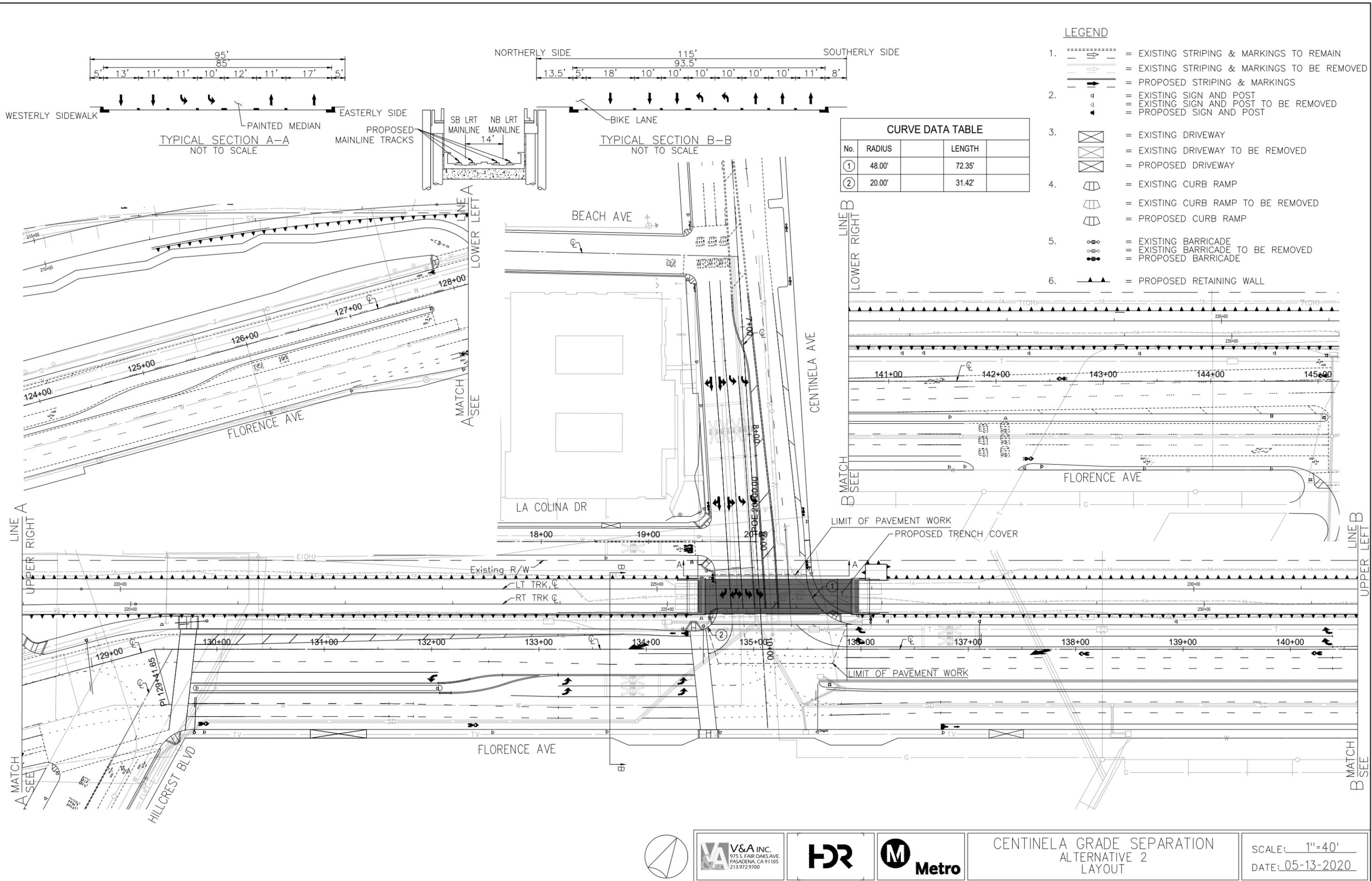


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 p:\pwworking\west01\d0574176\Centinela Track P&P - Alt 2 (Utility Clearance Controls).dgn  
 c:\pwworking\west01\d0574176\Centinela Track P&P - Alt 2 (Utility Clearance Controls).dgn



|  |  |   |                                    |
|--|--|---|------------------------------------|
|  |  | CENTINELA GRADE SEPARATION<br>TRACK PLAN AND PROFILE<br>ALTERNATIVE 2 | SCALE: 1"=200'<br>DATE: 05-15-2020 |
|--|--|---|------------------------------------|

A2R - ALTERNATIVE 2 ROADWAY LAYOUT



- LEGEND**
- EXISTING STRIPING & MARKINGS TO REMAIN
    - EXISTING STRIPING & MARKINGS TO BE REMOVED
    - PROPOSED STRIPING & MARKINGS
  - EXISTING SIGN AND POST
    - EXISTING SIGN AND POST TO BE REMOVED
    - PROPOSED SIGN AND POST
  - EXISTING DRIVEWAY
    - EXISTING DRIVEWAY TO BE REMOVED
    - PROPOSED DRIVEWAY
  - EXISTING CURB RAMP
    - EXISTING CURB RAMP TO BE REMOVED
    - PROPOSED CURB RAMP
  - EXISTING BARRICADE
    - EXISTING BARRICADE TO BE REMOVED
    - PROPOSED BARRICADE
  - PROPOSED RETAINING WALL

**CURVE DATA TABLE**

| No. | RADIUS | LENGTH |
|-----|--------|--------|
| ①   | 48.00' | 72.35' |
| ②   | 20.00' | 31.42' |

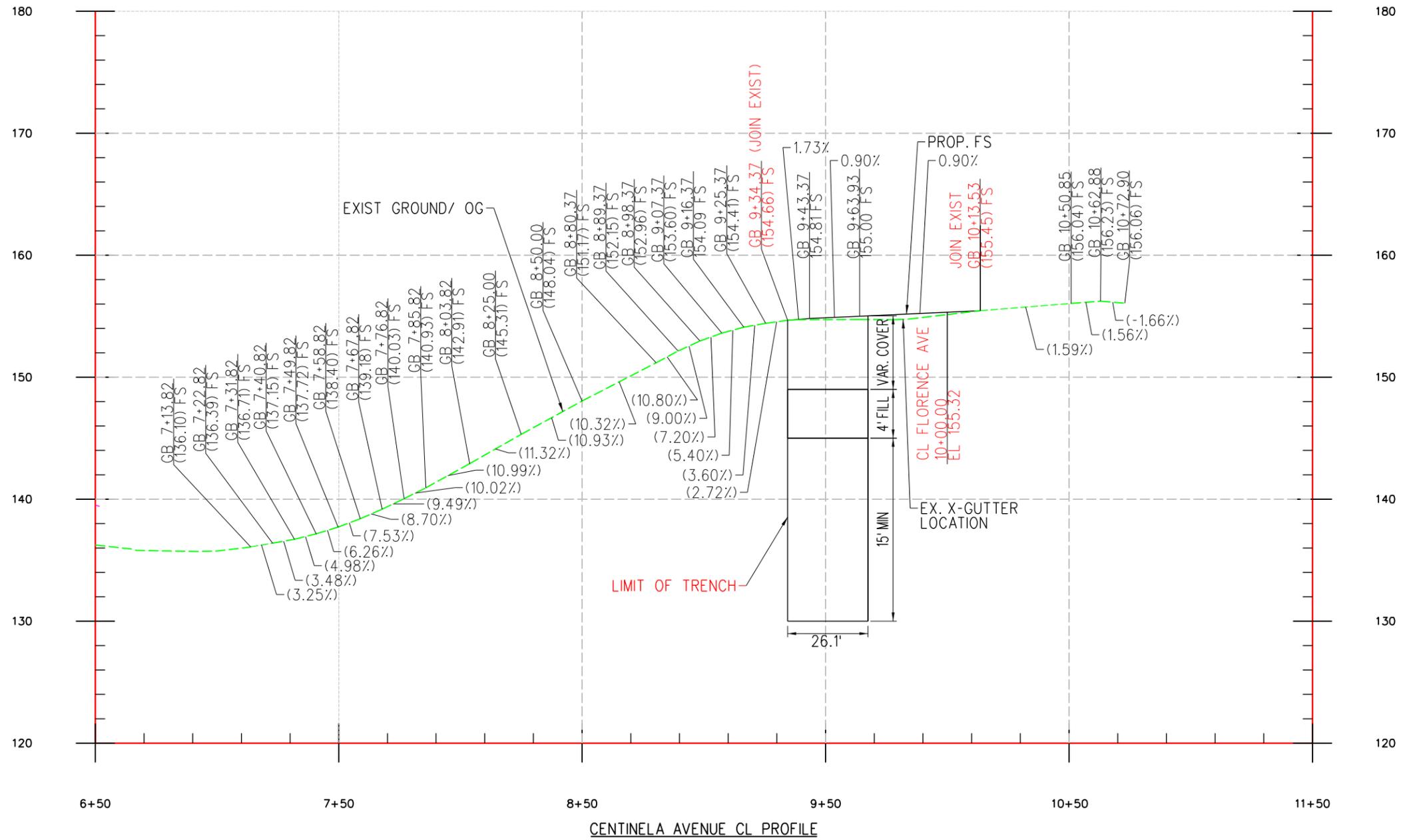
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 \$PENTBL\$  
 \$PLTDIVLS



CENTINELA GRADE SEPARATION  
 ALTERNATIVE 2  
 LAYOUT

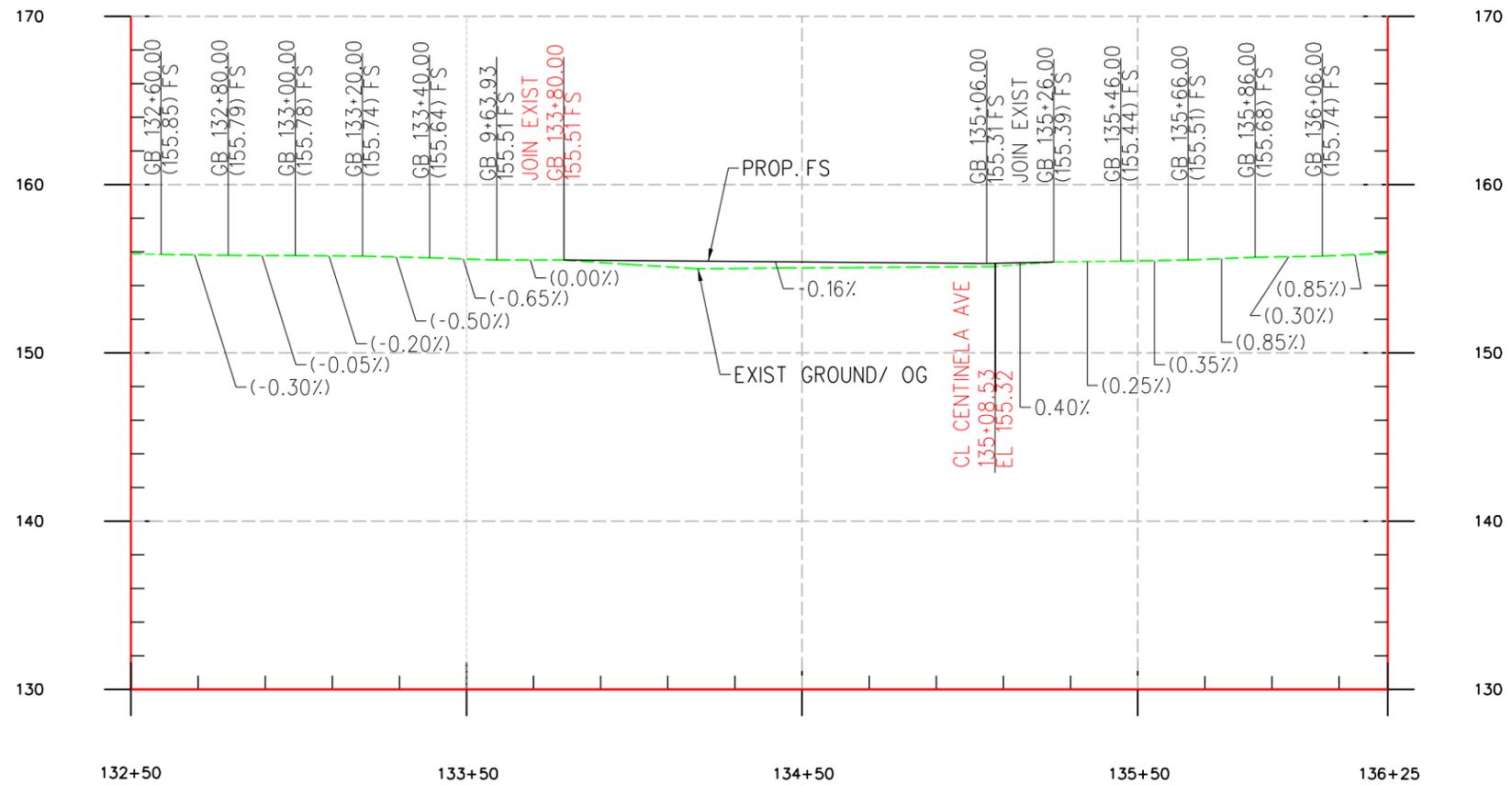
SCALE: 1"=40'  
 DATE: 05-13-2020

NOTES:  
1. SEE TRACKWORK PLANS (T) FOR TRACK RELATED WORK



\$DATE\$  
 \$LEVEL\$  
 \$PLOTNO\$  
 \$SHEETNO\$

|  |  |  |   |  |
|--|--|--|---|--|
| V&A INC.<br>975 S. FAIR OAKS AVE<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION                              |  |
|  |  |  | ROADWAY GEOMETRY  |  |
|  |  |  | ALTERNATIVE 2   |  |
|  |  |  | HORZ: 1"=50'<br>SCALE: VERT: 1"=10'<br>DATE: 05-13-2020 |  |



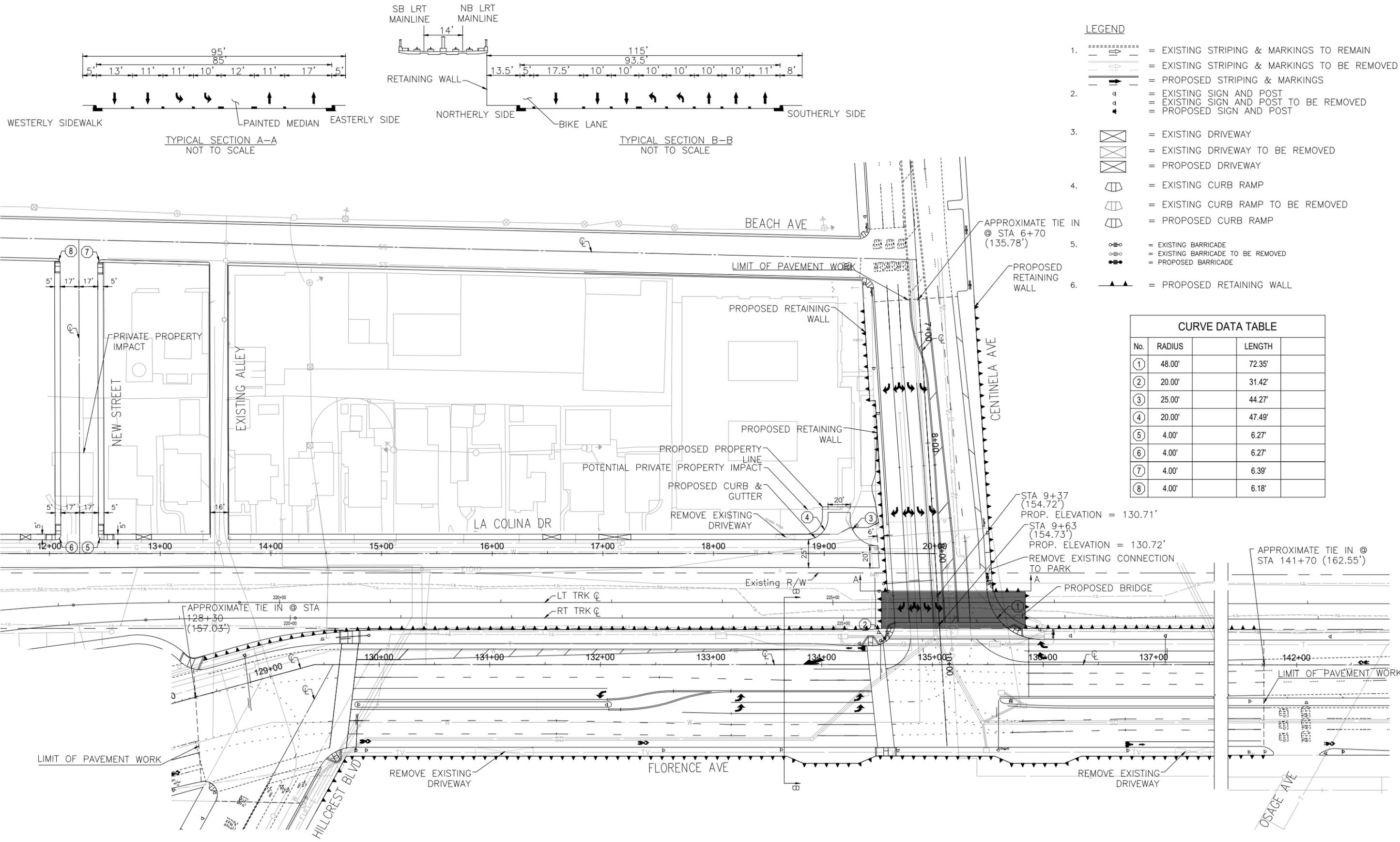
FLORENCE AVENUE CL PROFILE

\$TIMES

\$DATE\$  
\$PROJECT\$  
\$SHEET\$  
\$TOTAL\$

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|--|--|--|--|--|
| <p>V&amp;A INC.<br/>975 S. FAIR OAKS AVE<br/>PASADENA, CA 91105<br/>213.972.9700</p> |  |  | <p>CENTINELA GRADE SEPARATION<br/>ROADWAY GEOMETRY<br/>ALTERNATIVE 2</p> | <p>HORZ: 1"=50'<br/>SCALE: VERT: 1"=10'<br/>DATE: 05-13-2020</p> |
|--|--|--|--|--|

A3R - ALTERNATIVE 3 ROADWAY LAYOUT



- LEGEND**
- 1. = EXISTING STRIPING & MARKINGS TO REMAIN
  - = EXISTING STRIPING & MARKINGS TO BE REMOVED
  - = PROPOSED STRIPING & MARKINGS
  - 2. = EXISTING SIGN AND POST
  - = EXISTING SIGN AND POST TO BE REMOVED
  - = PROPOSED SIGN AND POST
  - 3. = EXISTING DRIVEWAY
  - = EXISTING DRIVEWAY TO BE REMOVED
  - = PROPOSED DRIVEWAY
  - 4. = EXISTING CURB RAMP
  - = EXISTING CURB RAMP TO BE REMOVED
  - = PROPOSED CURB RAMP
  - 5. = EXISTING BARRICADE
  - = EXISTING BARRICADE TO BE REMOVED
  - = PROPOSED BARRICADE
  - 6. = PROPOSED RETAINING WALL

**CURVE DATA TABLE**

| No. | RADIUS | LENGTH |
|-----|--------|--------|
| ①   | 48.00' | 72.35' |
| ②   | 20.00' | 31.42' |
| ③   | 25.00' | 44.27' |
| ④   | 20.00' | 47.49' |
| ⑤   | 4.00'  | 6.27'  |
| ⑥   | 4.00'  | 6.27'  |
| ⑦   | 4.00'  | 6.39'  |
| ⑧   | 4.00'  | 6.18'  |

\$DATES \$FILES \$SPENTBL \$SPLDIRVLS  
 \$TIMES



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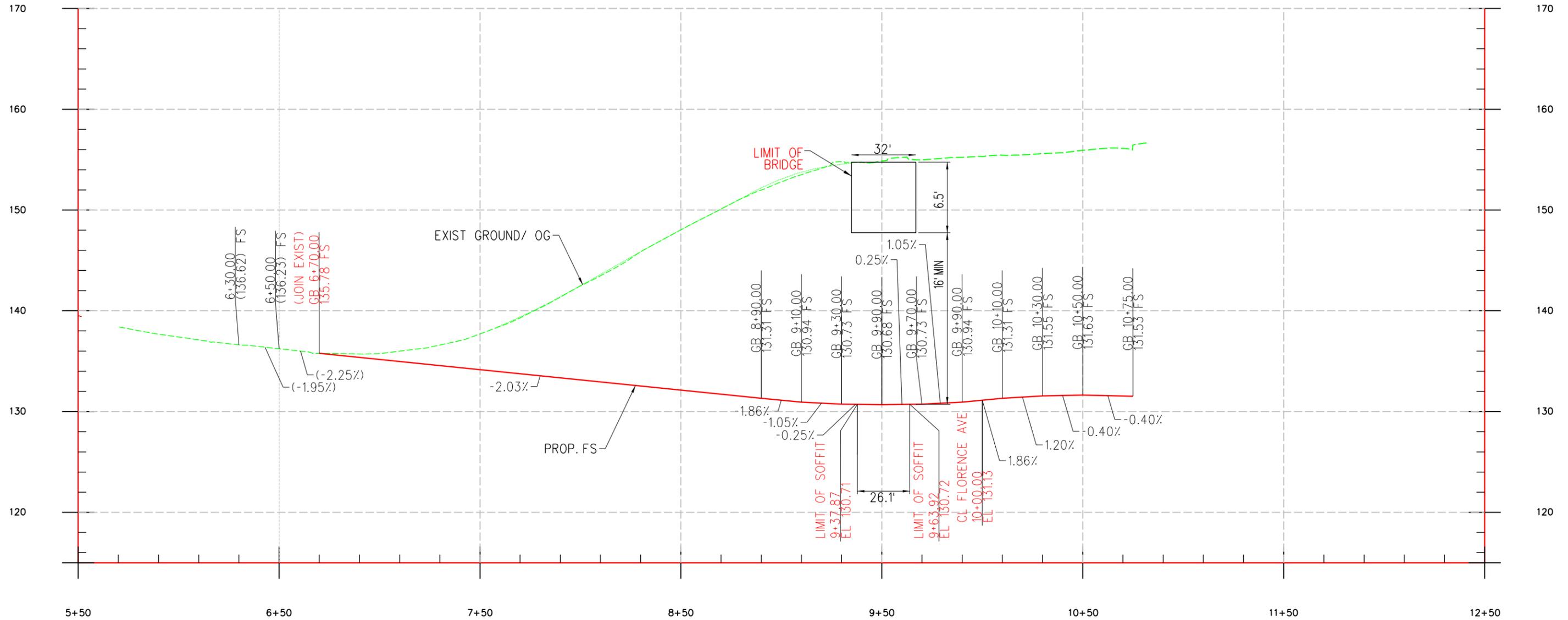


CENTINELA GRADE SEPARATION  
 ALTERNATIVE 3  
 LAYOUT

SCALE: 1"=40'  
 DATE: 05-13-2020

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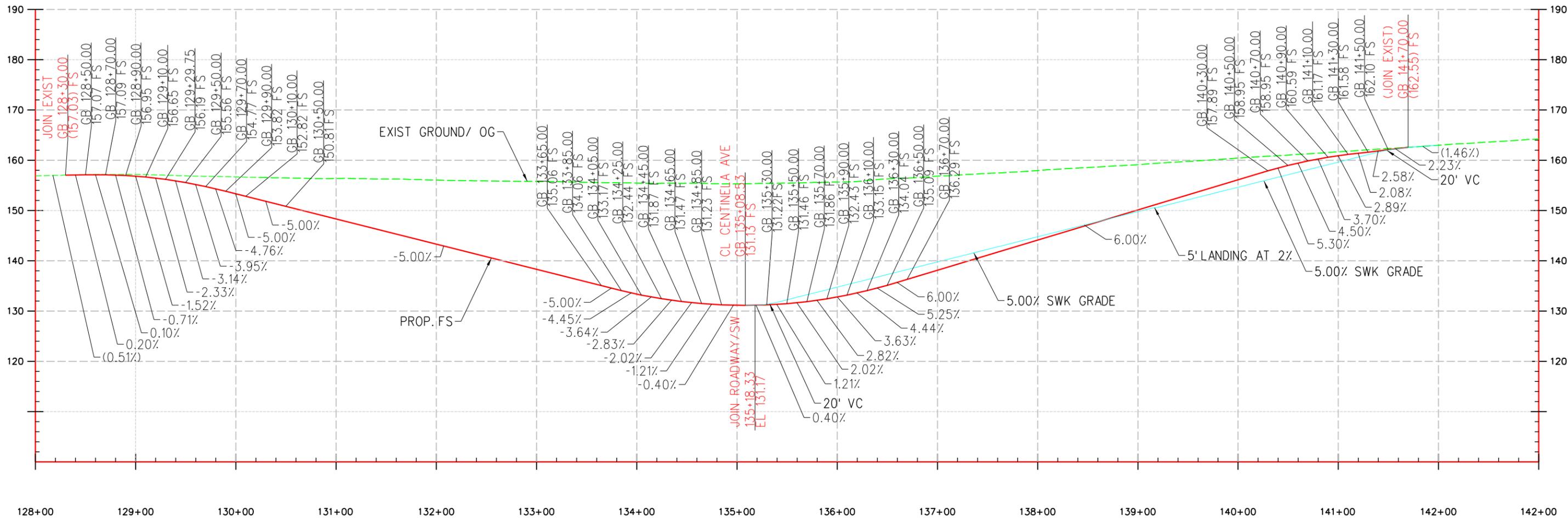
A3R - ALTERNATIVE 3 CENTINELA AVE. PROFILE



CENTINELA AVENUE CL PROFILE

\$DATE\$  
 \$LEVEL\$  
 \$PROJECT\$  
 \$SHEETNO\$

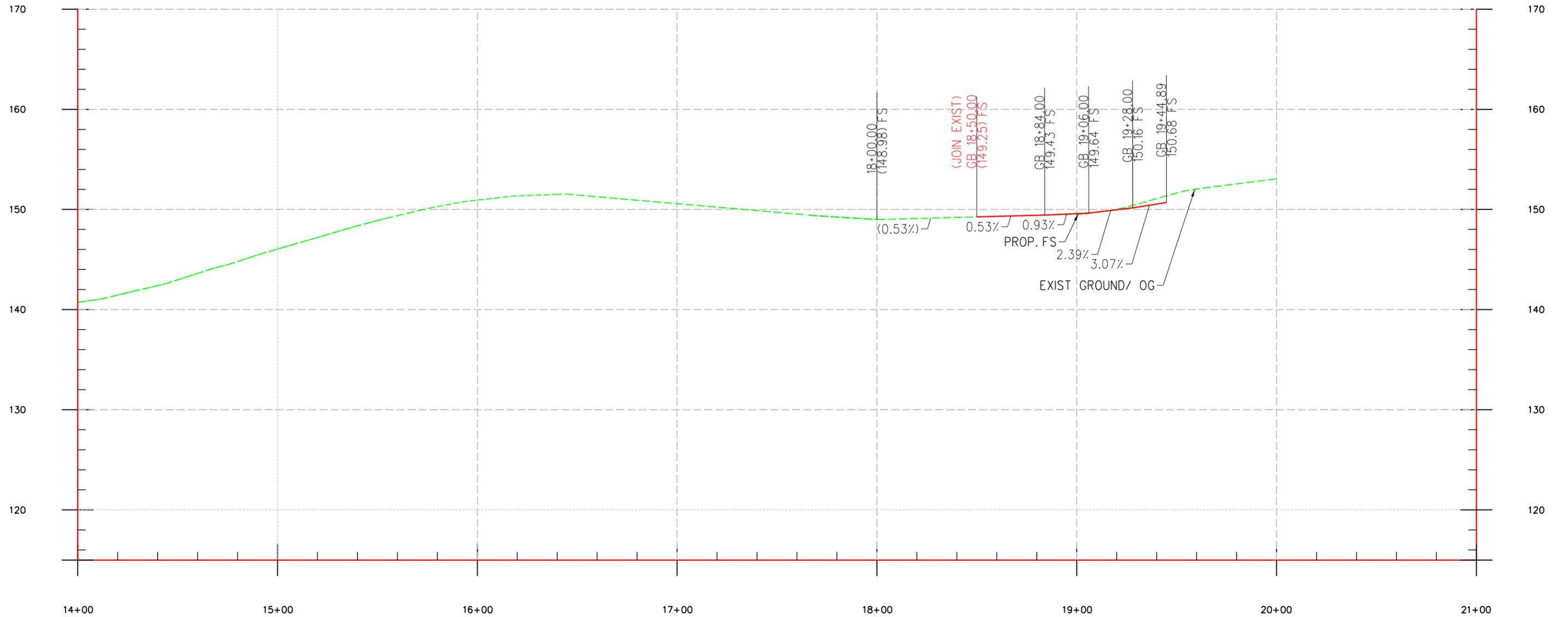
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| <p>V&amp;A INC.<br/>975 S. FAIR OAKS AVE<br/>PASADENA, CA 91105<br/>213.972.9700</p> |  |  | <p>CENTINELA GRADE SEPARATION<br/>ROADWAY GEOMETRY<br/>ALTERNATIVE 3</p> | <p>HORZ: 1"=50'<br/>SCALE: VERT: 1"=10'<br/>DATE: 05-13-2020</p> |
|--|--|--|--|--|



FLORENCE AVENUE CL PROFILE

\$DATE\$  
 \$FILE\$  
 \$PLOT\$  
 \$TITLE\$

|  |  |  |   |  |
|--|--|--|---|--|
| <p>V&amp;A INC.<br/>975 S. FAIR OAKS AVE<br/>PASADENA, CA 91105<br/>213.972.9700</p> |  |  | CENTINELA GRADE SEPARATION<br>ROADWAY GEOMETRY<br>ALTERNATIVE 3 | HORZ: 1"=100'<br>SCALE: VERT: 1"=20'<br>DATE: 05-13-2020 |
|--|--|--|---|--|



LA COLINA DR CL PROFILE

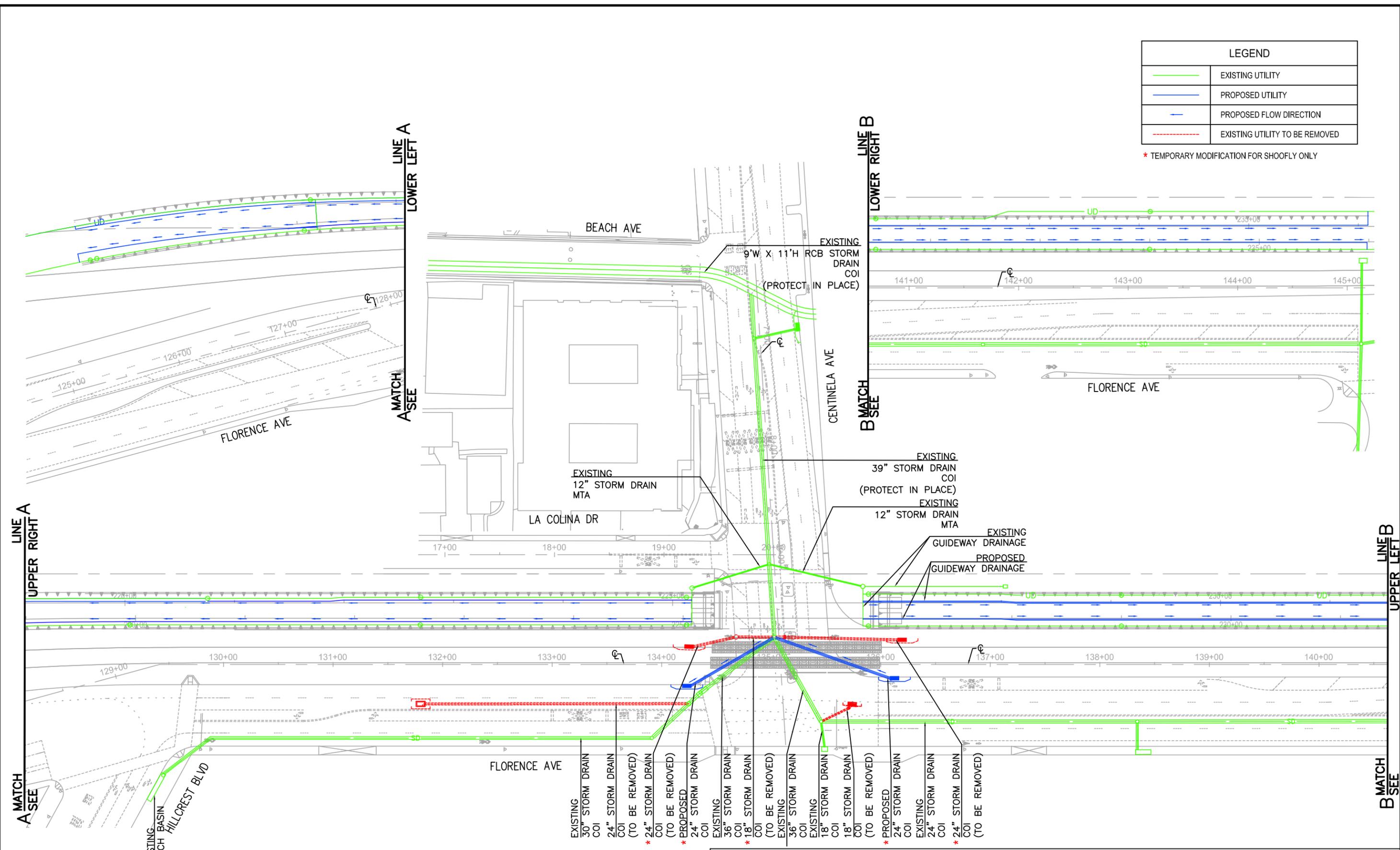
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 \$SHEETNO\$

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|--|--|--|---|---|
| <p>V&amp;A INC.<br/>975 S. FAIR OAKS AVE<br/>PASADENA, CA 91105<br/>213.972.9700</p> |  |  | CENTINELA GRADE SEPARATION<br>ROADWAY GEOMETRY<br>ALTERNATIVE 3 | HORZ: 1"=50'<br>SCALE: VERT: 1"=10'<br>DATE: 05-13-2020 |
|--|--|--|---|---|

# Attachment B – Drainage Exhibits

| LEGEND |                                |
|--------|--------------------------------|
|        | EXISTING UTILITY               |
|        | PROPOSED UTILITY               |
|        | PROPOSED FLOW DIRECTION        |
|        | EXISTING UTILITY TO BE REMOVED |

\* TEMPORARY MODIFICATION FOR SHOOFLY ONLY



- EXISTING 30" STORM DRAIN COI
- 24" STORM DRAIN COI (TO BE REMOVED)
- \* 24" STORM DRAIN COI (TO BE REMOVED) PROPOSED
- \* 24" STORM DRAIN COI (TO BE REMOVED)
- EXISTING 36" STORM DRAIN COI
- \* 18" STORM DRAIN COI (TO BE REMOVED)
- EXISTING 36" STORM DRAIN COI
- EXISTING 18" STORM DRAIN COI
- 18" STORM DRAIN COI (TO BE REMOVED)
- \* PROPOSED 24" STORM DRAIN COI
- EXISTING 24" STORM DRAIN COI
- \* 24" STORM DRAIN COI (TO BE REMOVED)

\$TIMES  
 \$DATE\$  
 \$REVISION\$  
 \$PROJECT\$  
 \$SHEETNO\$



**V&A INC.**  
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 PASADENA, CA 91105  
 213.972.9700



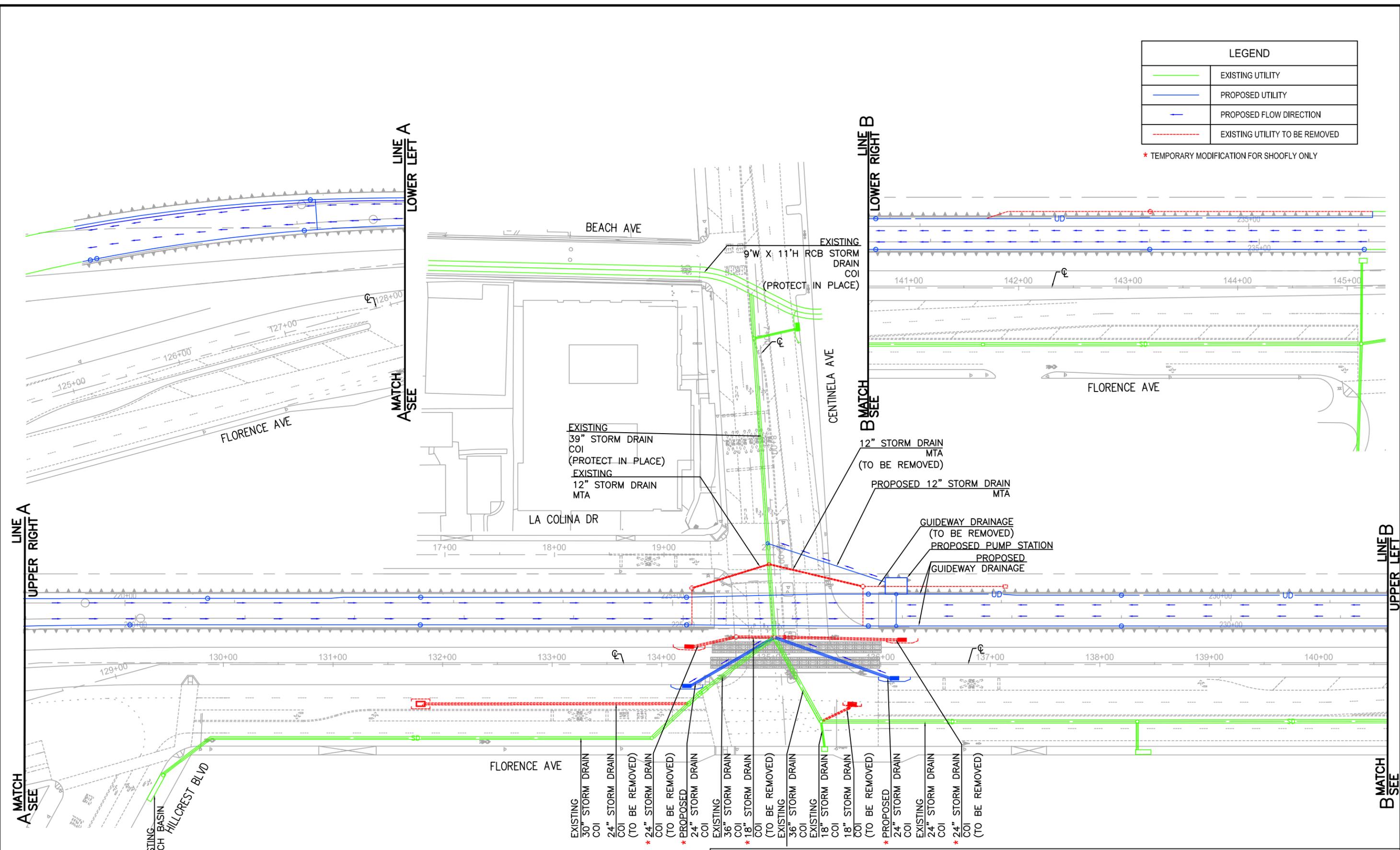
**CENTINELA GRADE SEPARATION  
 ALTERNATIVE 1 - LRT ABOVE GRADE  
 DRAINAGE EXHIBIT**

SCALE: **1"=40'**  
 DATE: **05-13-2020**

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| LEGEND |                                |
|--------|--------------------------------|
|        | EXISTING UTILITY               |
|        | PROPOSED UTILITY               |
|        | PROPOSED FLOW DIRECTION        |
|        | EXISTING UTILITY TO BE REMOVED |

\* TEMPORARY MODIFICATION FOR SHOOFLY ONLY



DATE: 05-13-2020  
 SCALE: 1"=40'  
 SHEET: B2  
 PROJECT: CENTINELA GRADE SEPARATION ALTERNATIVE 2 - LRT BELOW GRADE DRAINAGE EXHIBIT



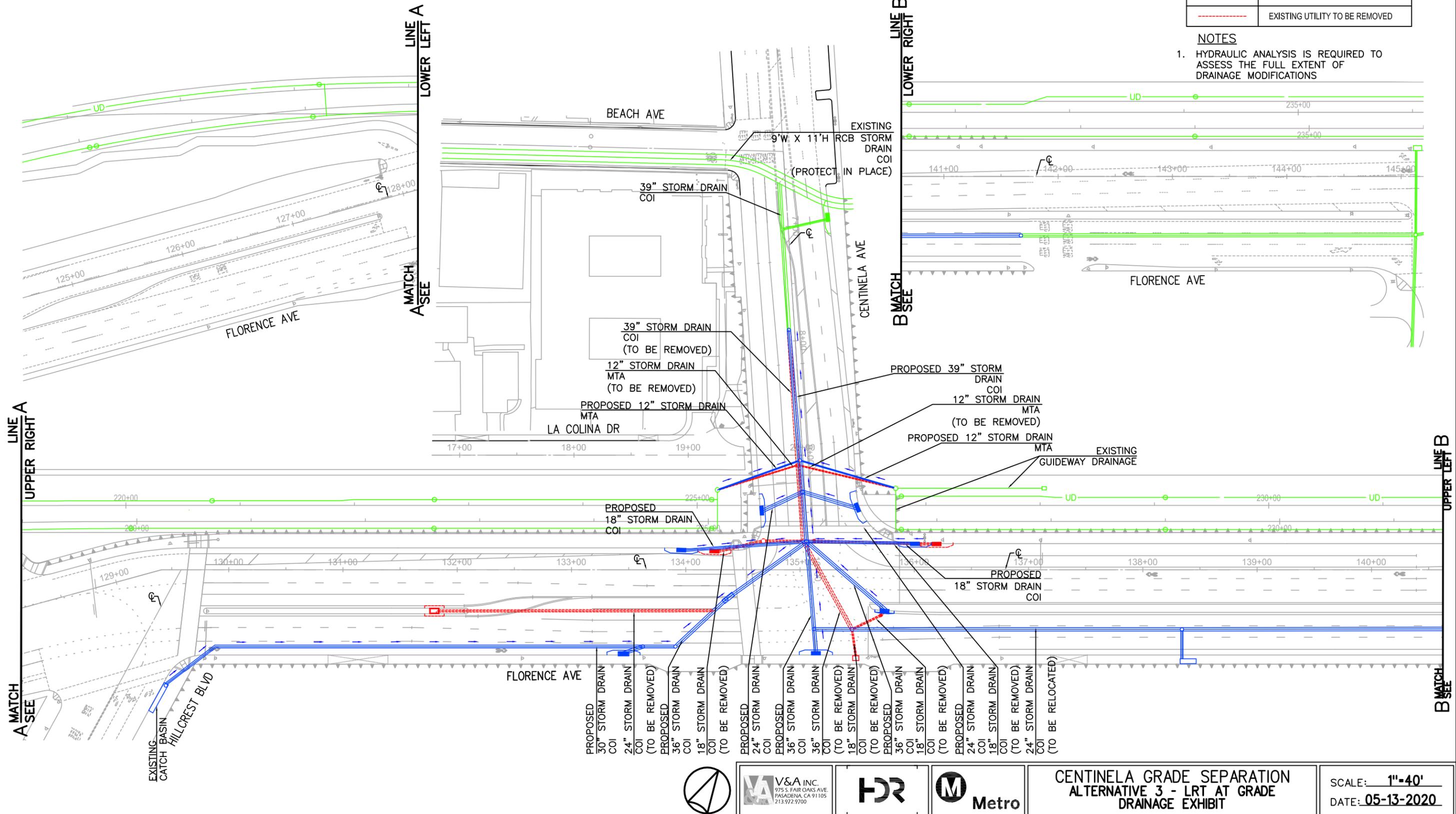
CENTINELA GRADE SEPARATION  
 ALTERNATIVE 2 - LRT BELOW GRADE  
 DRAINAGE EXHIBIT

SCALE: 1"=40'  
 DATE: 05-13-2020

V:\2019\VA-1907 - LA Metro SES - HDR\Florence\_Centinela\Design\01\_Screening\_Analysis\CAD\Sheets\Drainage\SES\_Centinela\_Drainage\_Exhibit - Alt 2.dwg May 13, 2020 10:59am\_jmg/et

| LEGEND |                                |
|--------|--------------------------------|
|        | EXISTING UTILITY               |
|        | PROPOSED UTILITY               |
|        | PROPOSED FLOW DIRECTION        |
|        | EXISTING UTILITY TO BE REMOVED |

- NOTES**
- HYDRAULIC ANALYSIS IS REQUIRED TO ASSESS THE FULL EXTENT OF DRAINAGE MODIFICATIONS



DATE: 05-13-2020  
 BY: [Signature]  
 CHECKED: [Signature]  
 APPROVED: [Signature]



**V&A INC.**  
 975 S. FAIR OAKS AVE.  
 PASADENA, CA 91105  
 213.972.9700



**CENTINELA GRADE SEPARATION  
 ALTERNATIVE 3 - LRT AT GRADE  
 DRAINAGE EXHIBIT**

SCALE: **1"=40'**  
 DATE: **05-13-2020**

V:\B3\VA-1907 - LA Metro SES - HDR\Florence\_Centinela\Design\01\_Screening\_Analysis\CADD\Sheets\Drainage\SES\_Centinela\_Drainage\_Exhibit - Alt 3.dwg May 13, 2020 9:02am\_jpegrete



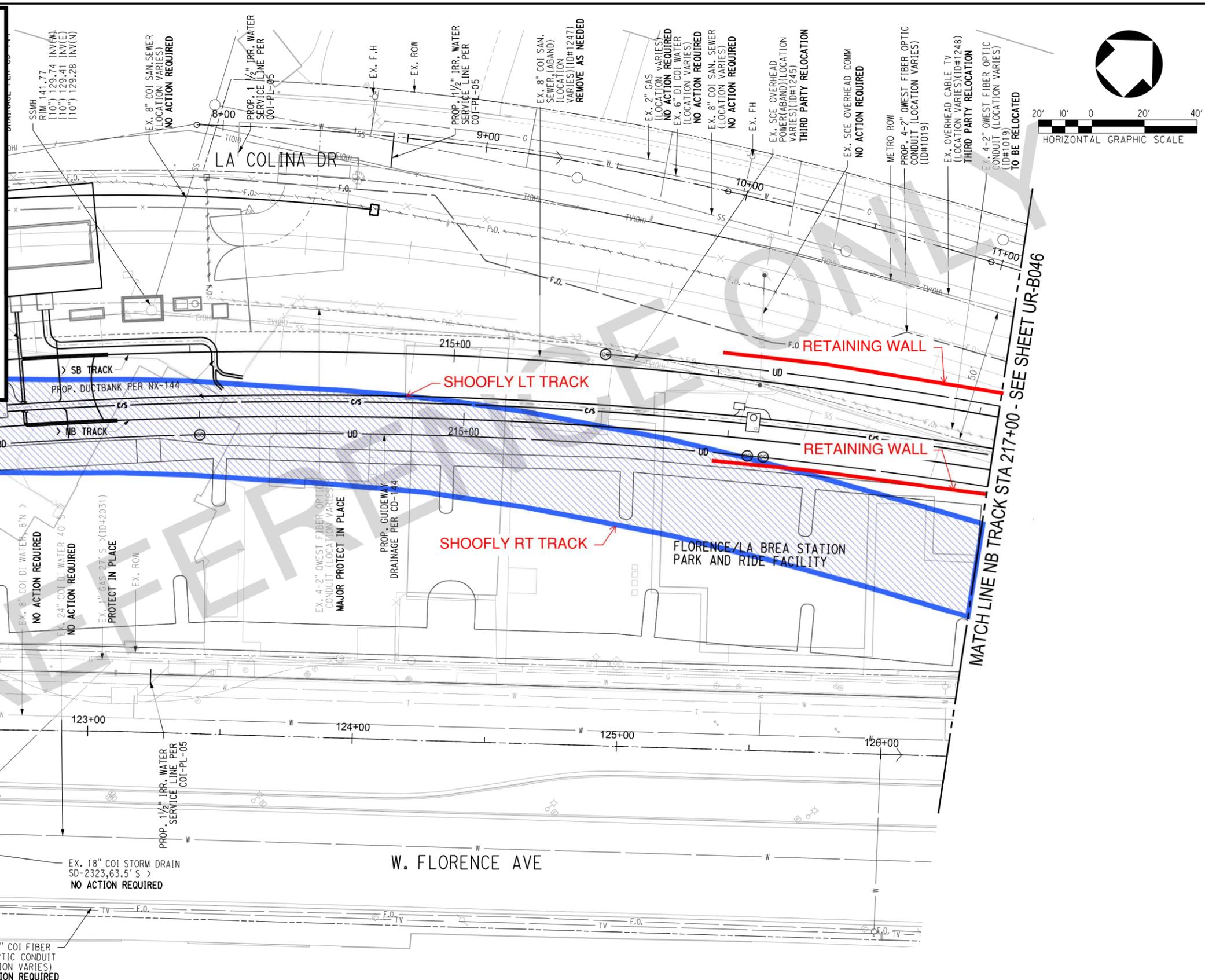
# Attachment C – Utility Exhibits

**GENERAL NOTES**

1. ALL OCS POLES ARE ASSUMED TO BE RELOCATED DUE TO CONFLICT WITH PROPOSED AERIAL TRACK.
2. DEPENDING ON DEPTH OF THE RETAINING WALL, UTILITIES RUNNING PARALLEL WITH TRACK MAY BE SUBJECT TO RELOCATION.
3. ANY UTILITIES OR STRUCTURES IN CONFLICT WITH AERIAL ALIGNMENT SHALL BE RELOCATED.
4. DEPENDING ON DEPTH OF THE RETAINING WALL, THE 60" WATER LINE MAY BE SUBJECT TO RELOCATION FOR THE AERIAL.

**LEGEND**

- CONCRETE ENCASEMENT
- STEEL CASING
- RETAINING WALL
- SHOOFLY TRACK
- RELOCATE
- POTENTIAL 60" WATER RELOCATION



MATCH LINE NB TRACK STA 212+00

MATCH LINE NB TRACK STA 217+00 - SEE SHEET UR-B046

NOT FOR CONSTRUCTION

|   |      |    |     |        |         |             |
|---|------|----|-----|--------|---------|-------------|
| THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1994, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA. |      |    |     |        |         |             |
| REV   | DATE | BY | APP | REG NO | EXPIRES | SEAL HOLDER |
|   |      |    |     |        |         |             |
|   |      |    |     |        |         |             |
|   |      |    |     |        |         |             |
|   |      |    |     |        |         |             |

|             |          |
|-------------|----------|
| DESIGNED BY |          |
| DRAWN BY    |          |
| CHECKED BY  |          |
| IN CHARGE   |          |
| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**BA INC.**  
 THE ENGINEERING EXCELLENCE

ALTERNATIVE 1  
AERIAL EXHIBIT

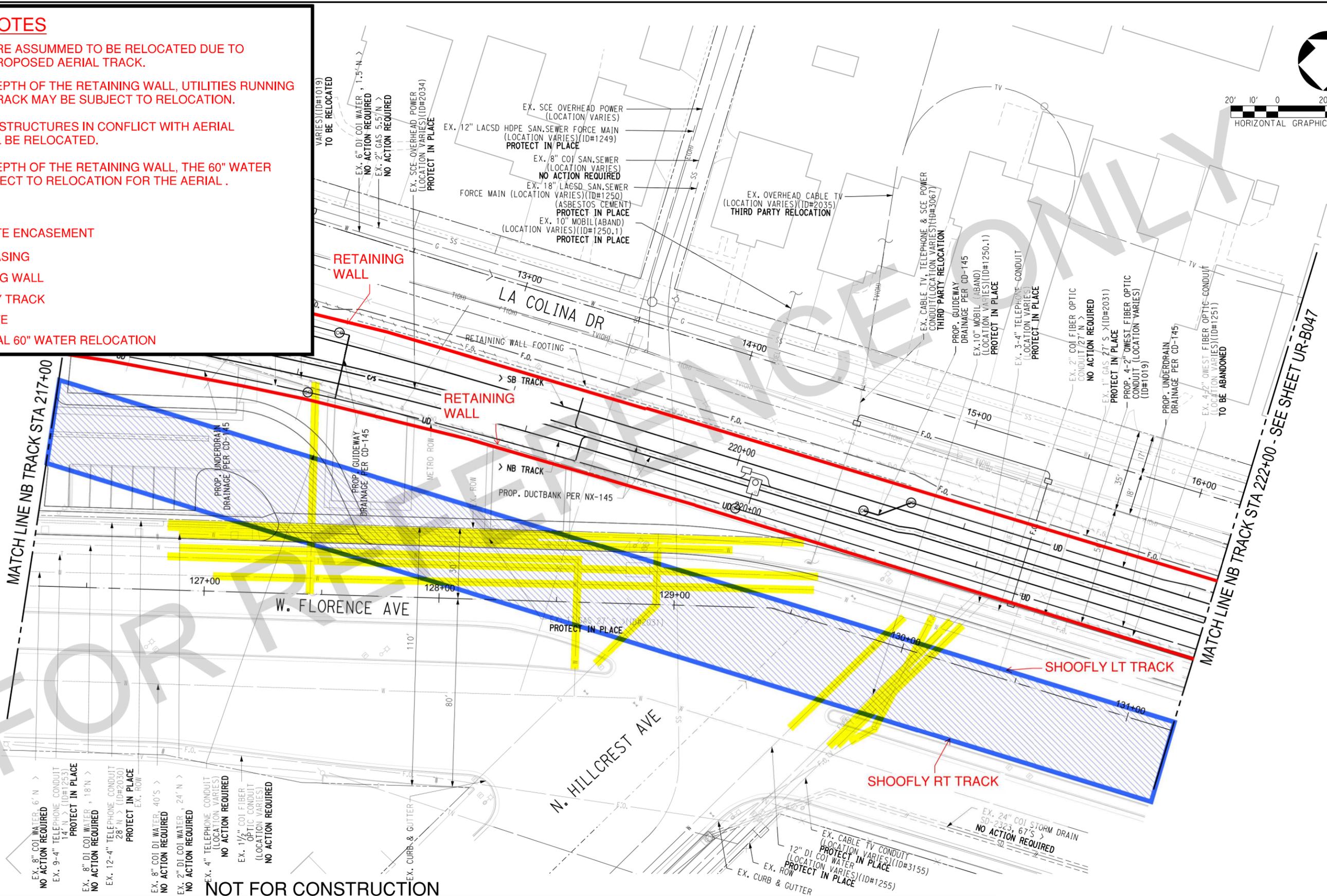
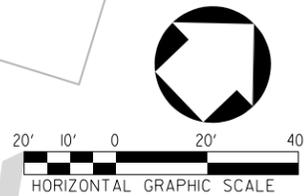
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 PLOT DATE= 01/01/20

**GENERAL NOTES**

1. ALL OCS POLES ARE ASSUMED TO BE RELOCATED DUE TO CONFLICT WITH PROPOSED AERIAL TRACK.
2. DEPENDING ON DEPTH OF THE RETAINING WALL, UTILITIES RUNNING PARALLEL WITH TRACK MAY BE SUBJECT TO RELOCATION.
3. ANY UTILITIES OR STRUCTURES IN CONFLICT WITH AERIAL ALIGNMENT SHALL BE RELOCATED.
4. DEPENDING ON DEPTH OF THE RETAINING WALL, THE 60" WATER LINE MAY BE SUBJECT TO RELOCATION FOR THE AERIAL.

**LEGEND**

- CONCRETE ENCASEMENT
- STEEL CASING
- RETAINING WALL
- SHOOFLY TRACK
- RELOCATE
- POTENTIAL 60" WATER RELOCATION



NOT FOR CONSTRUCTION

| THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA. |      |    |     |        |         |             |             |
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| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**EA INC.**  
 TRUE ENGINEERING EXCELLENCE

**ALTERNATIVE 1  
 AERIAL EXHIBIT**

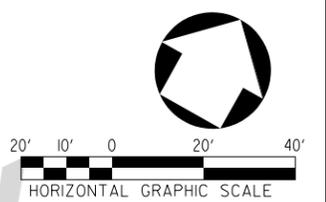
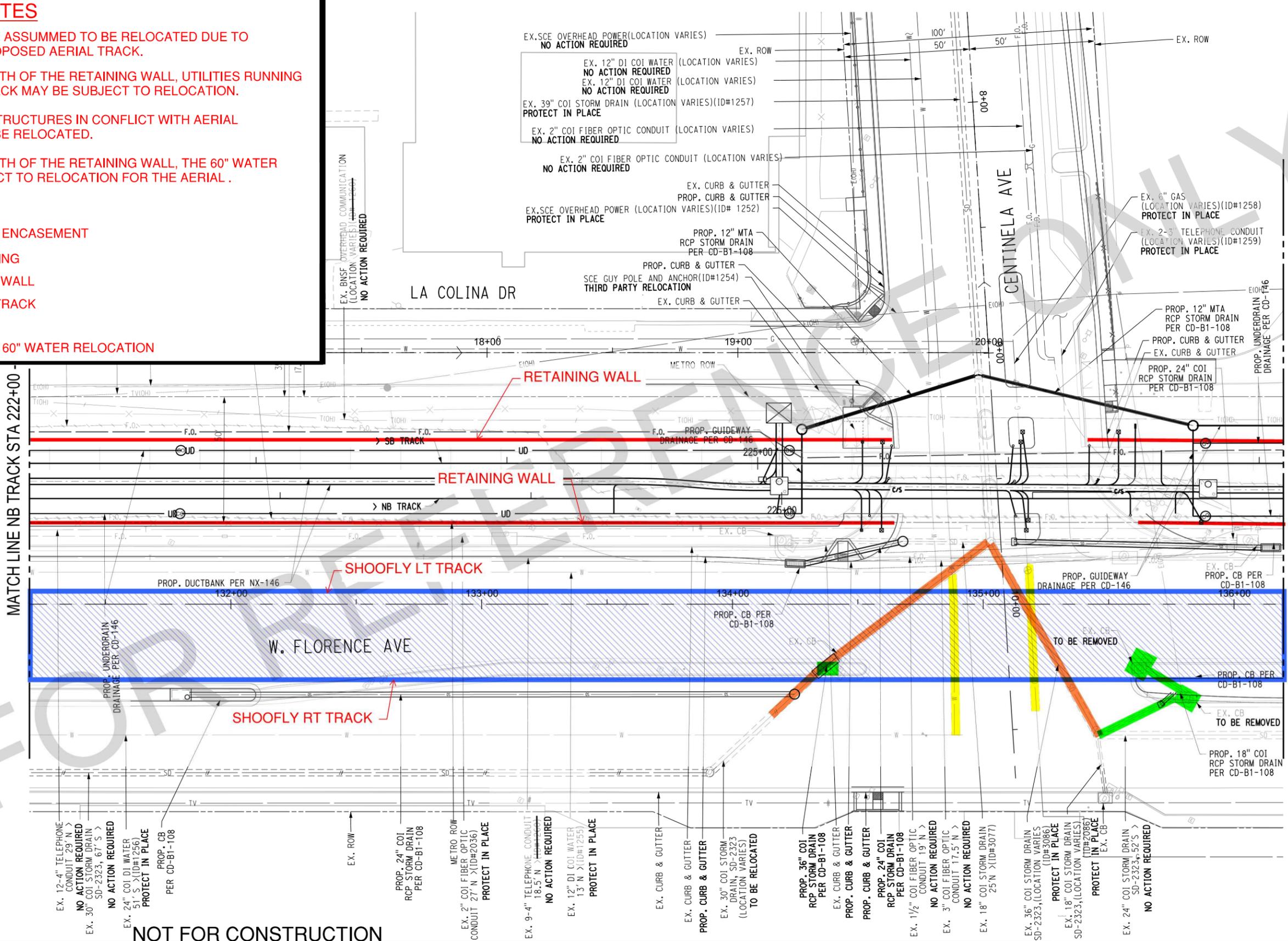
09/05 24-FEB-2016 p:\mtr\ba352\mb\cpr\design\_Baile\Documents\Walt\150955\_Crescent\LAAX Transit Corridor Design Part A\AeroCAD\Utility\_Sheets\CD1088\URB047.dwg  
 PLOT DATE: 01/07/20

**GENERAL NOTES**

1. ALL OCS POLES ARE ASSUMED TO BE RELOCATED DUE TO CONFLICT WITH PROPOSED AERIAL TRACK.
2. DEPENDING ON DEPTH OF THE RETAINING WALL, UTILITIES RUNNING PARALLEL WITH TRACK MAY BE SUBJECT TO RELOCATION.
3. ANY UTILITIES OR STRUCTURES IN CONFLICT WITH AERIAL ALIGNMENT SHALL BE RELOCATED.
4. DEPENDING ON DEPTH OF THE RETAINING WALL, THE 60" WATER LINE MAY BE SUBJECT TO RELOCATION FOR THE AERIAL.

**LEGEND**

- CONCRETE ENCASEMENT
- STEEL CASING
- RETAINING WALL
- SHOOFLY TRACK
- RELOCATE
- POTENTIAL 60" WATER RELOCATION



MATCH LINE NB TRACK STA 222+00

MATCH LINE NB TRACK STA 227+00 - SEE SHEET UR-B048

NOT FOR CONSTRUCTION

|   |      |    |     |        |         |             |
|---|------|----|-----|--------|---------|-------------|
| THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1994, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA. |      |    |     |        |         |             |
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| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**BA INC.**  
 THE ENGINEERING EXCELLENCE

ALTERNATIVE 1  
AERIAL EXHIBIT

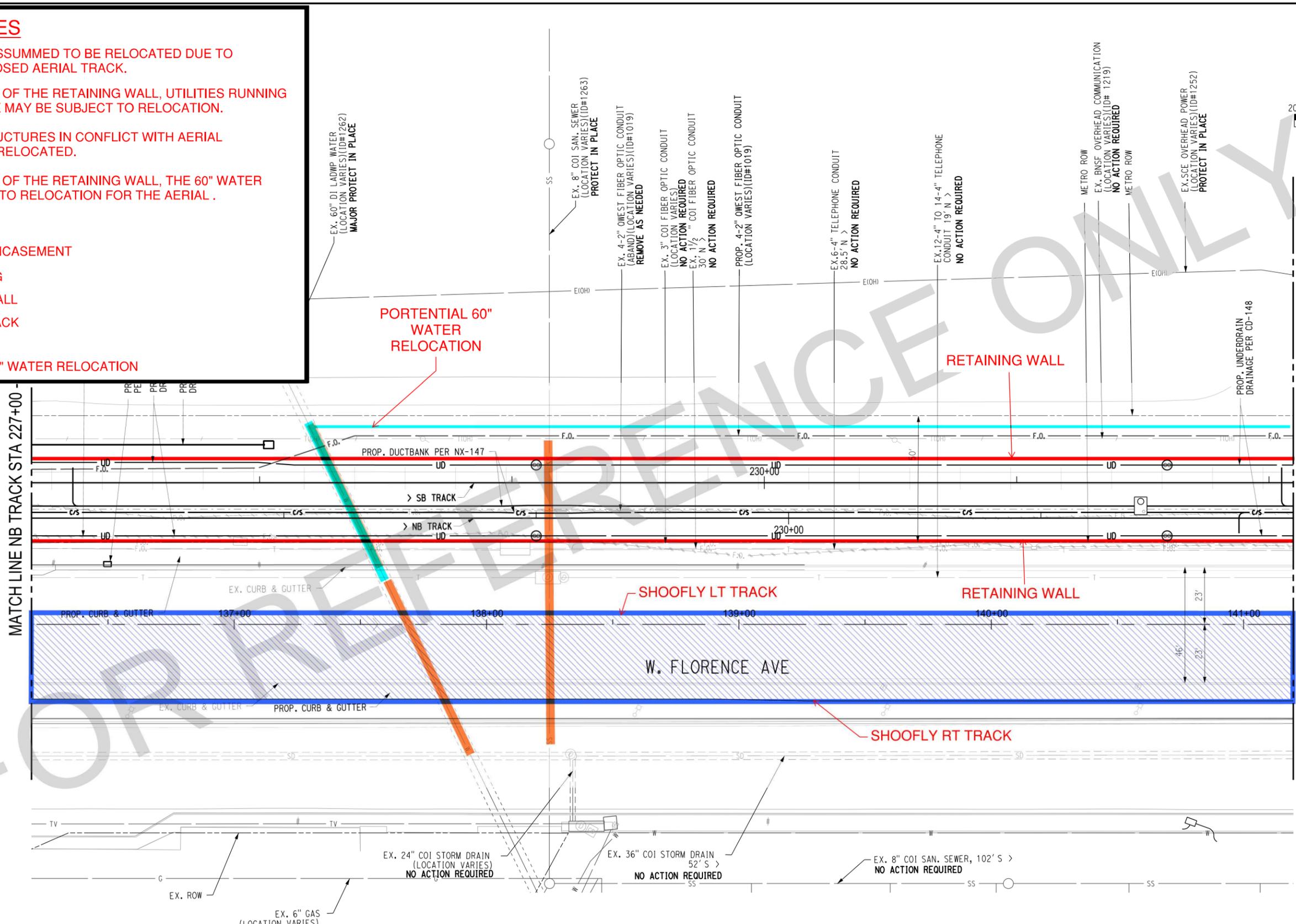
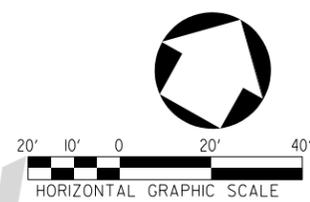
24-FEB-2016 09:36 USER: smalley P:\mtr\ba52\mb\c\p\design\_Baile\Documents\Walt\150951\_Cresnew\LAX Transit Corridor\Design\_Plan\_Aerial\CD\Utility\_Sheets\CD\URB048\URB048.dwg Penable: CVD/jen

**GENERAL NOTES**

1. ALL OCS POLES ARE ASSUMED TO BE RELOCATED DUE TO CONFLICT WITH PROPOSED AERIAL TRACK.
2. DEPENDING ON DEPTH OF THE RETAINING WALL, UTILITIES RUNNING PARALLEL WITH TRACK MAY BE SUBJECT TO RELOCATION.
3. ANY UTILITIES OR STRUCTURES IN CONFLICT WITH AERIAL ALIGNMENT SHALL BE RELOCATED.
4. DEPENDING ON DEPTH OF THE RETAINING WALL, THE 60" WATER LINE MAY BE SUBJECT TO RELOCATION FOR THE AERIAL.

**LEGEND**

- CONCRETE ENCASEMENT
- STEEL CASING
- RETAINING WALL
- SHOOFLY TRACK
- RELOCATE
- POTENTIAL 60" WATER RELOCATION



NOT FOR CONSTRUCTION

| THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1994, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA. |      |    |     |        |         |             |
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| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**EA INC.**  
 TRUE ENGINEERING EXCELLENCE

**ALTERNATIVE 1  
 AERIAL EXHIBIT**

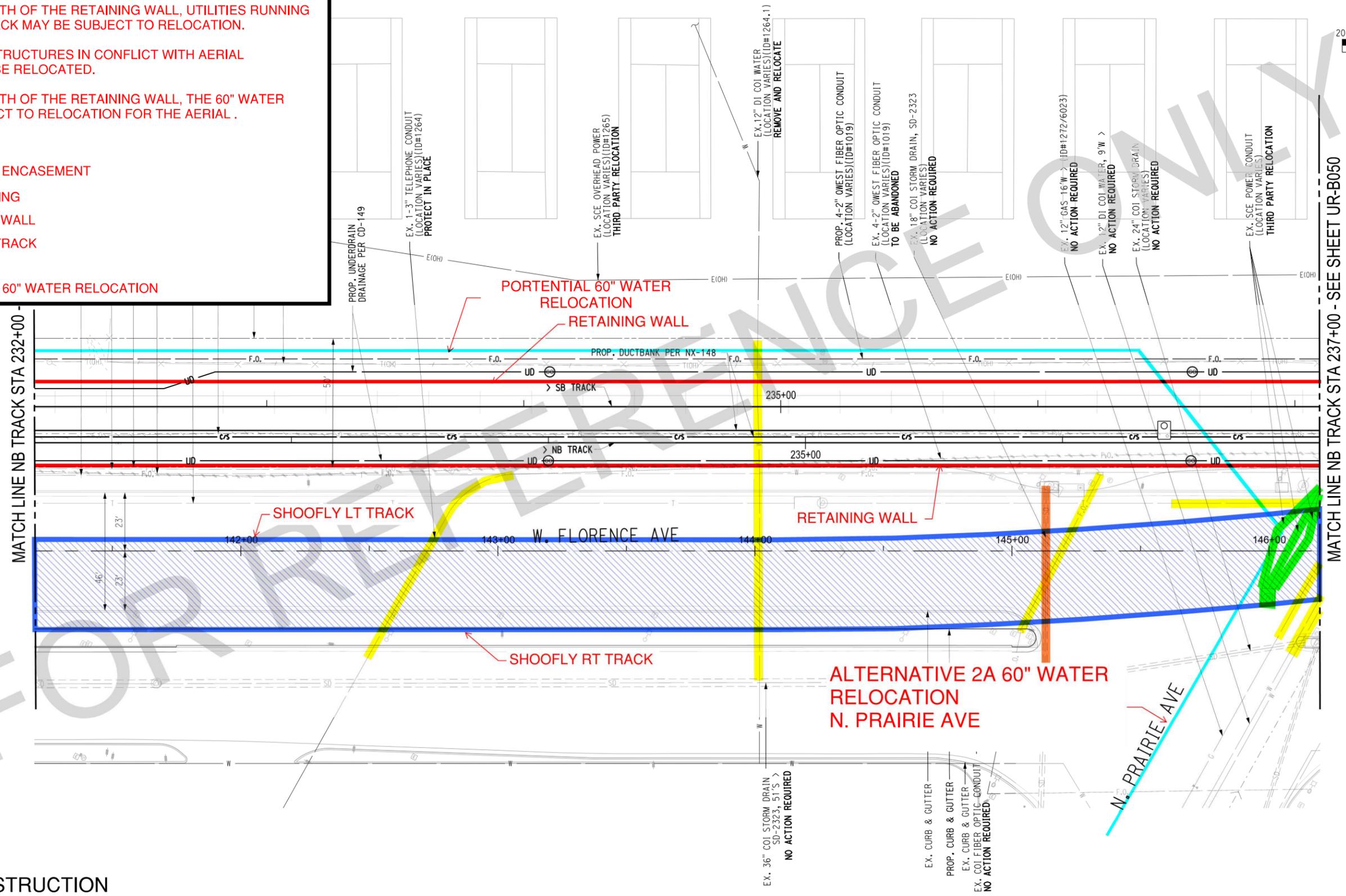
24-FEB-2016 09:36 USER= smalley P01 Draw= SPLTDRAWSS Penable= CVD.pen

**GENERAL NOTES**

1. ALL OCS POLES ARE ASSUMED TO BE RELOCATED DUE TO CONFLICT WITH PROPOSED AERIAL TRACK.
2. DEPENDING ON DEPTH OF THE RETAINING WALL, UTILITIES RUNNING PARALLEL WITH TRACK MAY BE SUBJECT TO RELOCATION.
3. ANY UTILITIES OR STRUCTURES IN CONFLICT WITH AERIAL ALIGNMENT SHALL BE RELOCATED.
4. DEPENDING ON DEPTH OF THE RETAINING WALL, THE 60" WATER LINE MAY BE SUBJECT TO RELOCATION FOR THE AERIAL.

**LEGEND**

- CONCRETE ENCASEMENT
- STEEL CASING
- RETAINING WALL
- SHOOFLY TRACK
- RELOCATE
- POTENTIAL 60" WATER RELOCATION



NOT FOR CONSTRUCTION

|   |      |    |     |        |         |             |
|---|------|----|-----|--------|---------|-------------|
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**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**EA INC.**  
 THE ENGINEERING EXCELLENCE

ALTERNATIVE 1  
AERIAL EXHIBIT

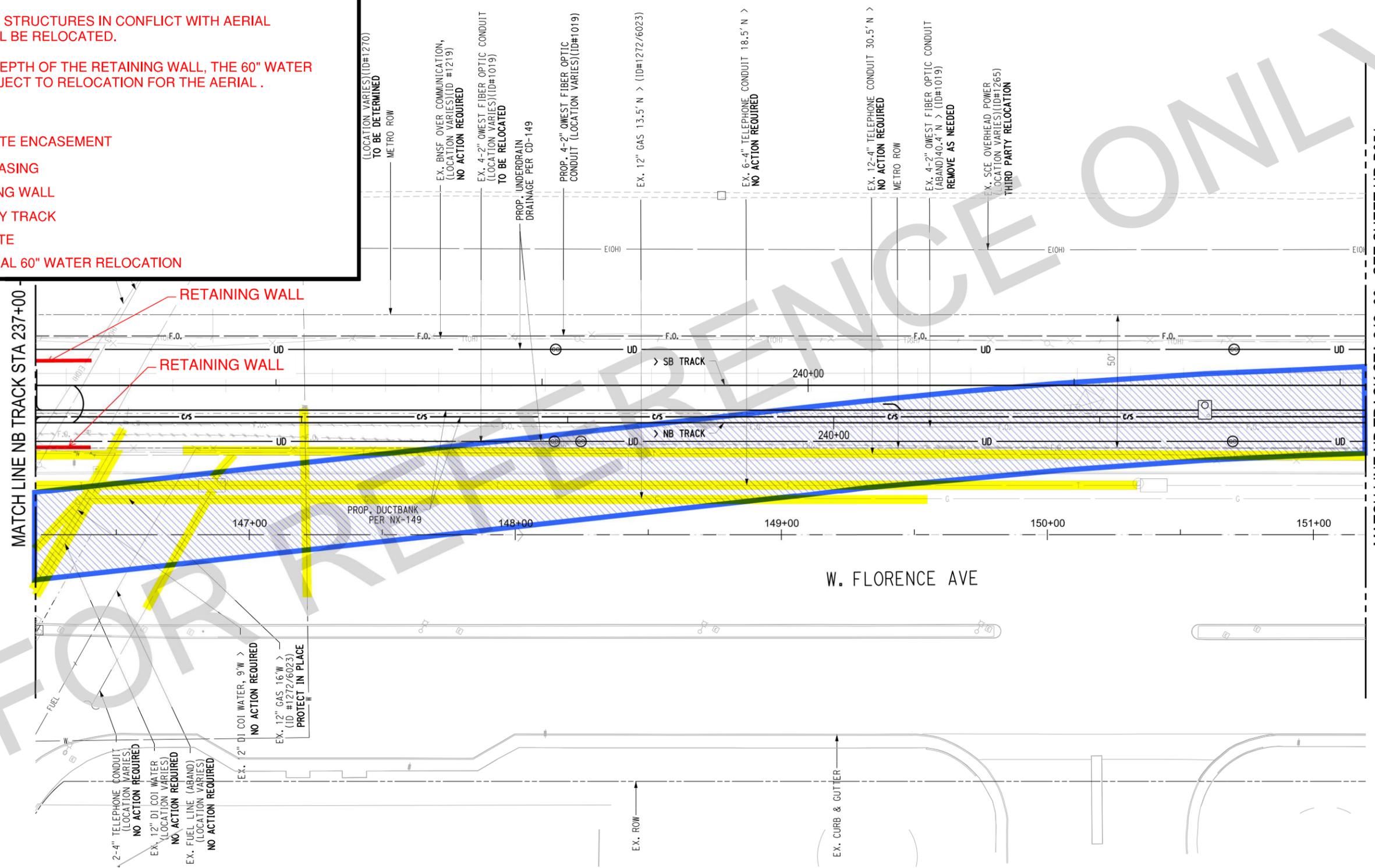
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 Penable: CVD,pen  
 Plot Date: SPLTD\RVSS

**GENERAL NOTES**

1. ALL OCS POLES ARE ASSUMED TO BE RELOCATED DUE TO CONFLICT WITH PROPOSED AERIAL TRACK.
2. DEPENDING ON DEPTH OF THE RETAINING WALL, UTILITIES RUNNING PARALLEL WITH TRACK MAY BE SUBJECT TO RELOCATION.
3. ANY UTILITIES OR STRUCTURES IN CONFLICT WITH AERIAL ALIGNMENT SHALL BE RELOCATED.
4. DEPENDING ON DEPTH OF THE RETAINING WALL, THE 60" WATER LINE MAY BE SUBJECT TO RELOCATION FOR THE AERIAL.

**LEGEND**

- CONCRETE ENCASEMENT
- STEEL CASING
- RETAINING WALL
- SHOOFLY TRACK
- RELOCATE
- POTENTIAL 60" WATER RELOCATION



MATCH LINE NB TRACK STA 237+00

MATCH LINE NB TRACK STA 242+00 - SEE SHEET UR-B051

NOT FOR CONSTRUCTION

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|---|------|----|-----|--------|---------|-------------|
| THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA. |      |    |     |        |         |             |
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| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**BA INC.**  
 TRUE ENGINEERING EXCELLENCE

ALTERNATIVE 1  
AERIAL EXHIBIT

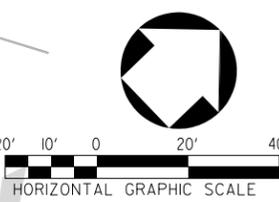
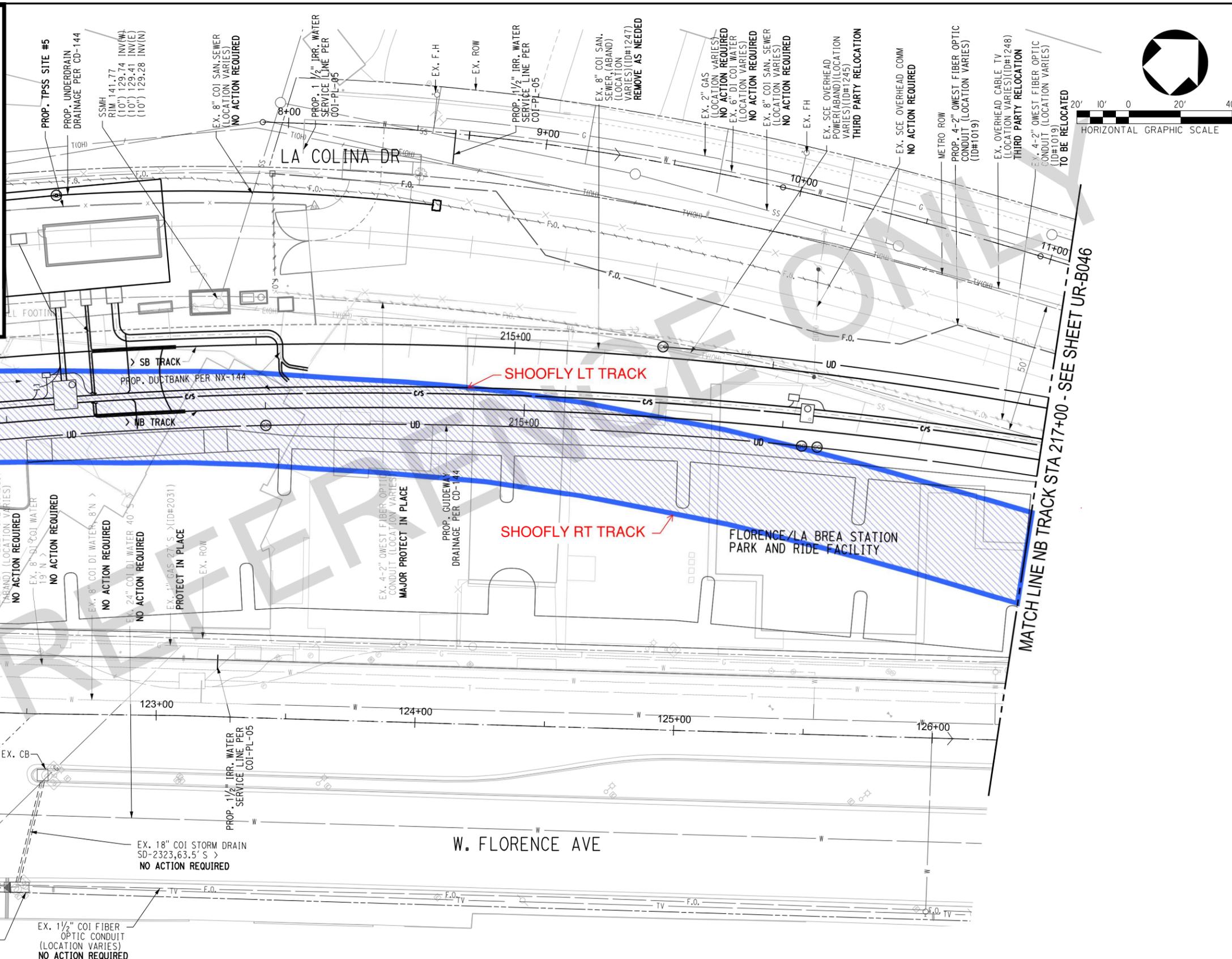
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 USER= smelley  
 PLOT DATE= 12/10/19

**GENERAL NOTES**

1. ALL EXISTING UTILITY DEPTHS TO BE FIELD VERIFIED AND POSSIBLY TEMPORARILY HUNG.
2. ALL UTILITES WITH A DEPTH GREATER THAN 10' MAY BE SUBJECT TO RELOCATION.

**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 212+00 - SEE SH

MATCH LINE NB TRACK STA 217+00 - SEE SHEET UR-B046

NOT FOR CONSTRUCTION

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**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**EA INC.**  
 CIVIL ENGINEERING & ARCHITECTURE

**ALTERNATIVE 2  
 BELOW GRADE**

24-FEB-2016 09:05 USER: smalley P:\mtrb\352\mtrb\cadd\design\Bldg\Documents\Walt\50955\LAAX Transit Corridor Design Part A\Area CADD\Utility Sheets\C0288\URB046.dwg P:\mtrb\352\mtrb\cadd\design\Bldg\Documents\Walt\50955\LAAX Transit Corridor Design Part A\Area CADD\Utility Sheets\C0288\URB046.dwg

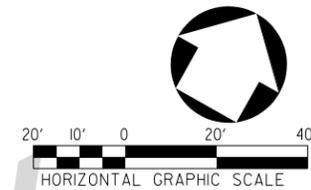


**GENERAL NOTES**

1. ALL EXISTING UTILITY DEPTHS TO BE FIELD VERIFIED AND POSSIBLY TEMPORARILY HUNG.
2. ALL UTILITES WITH A DEPTH GREATER THAN 10' MAY BE SUBJECT TO RELOCATION.

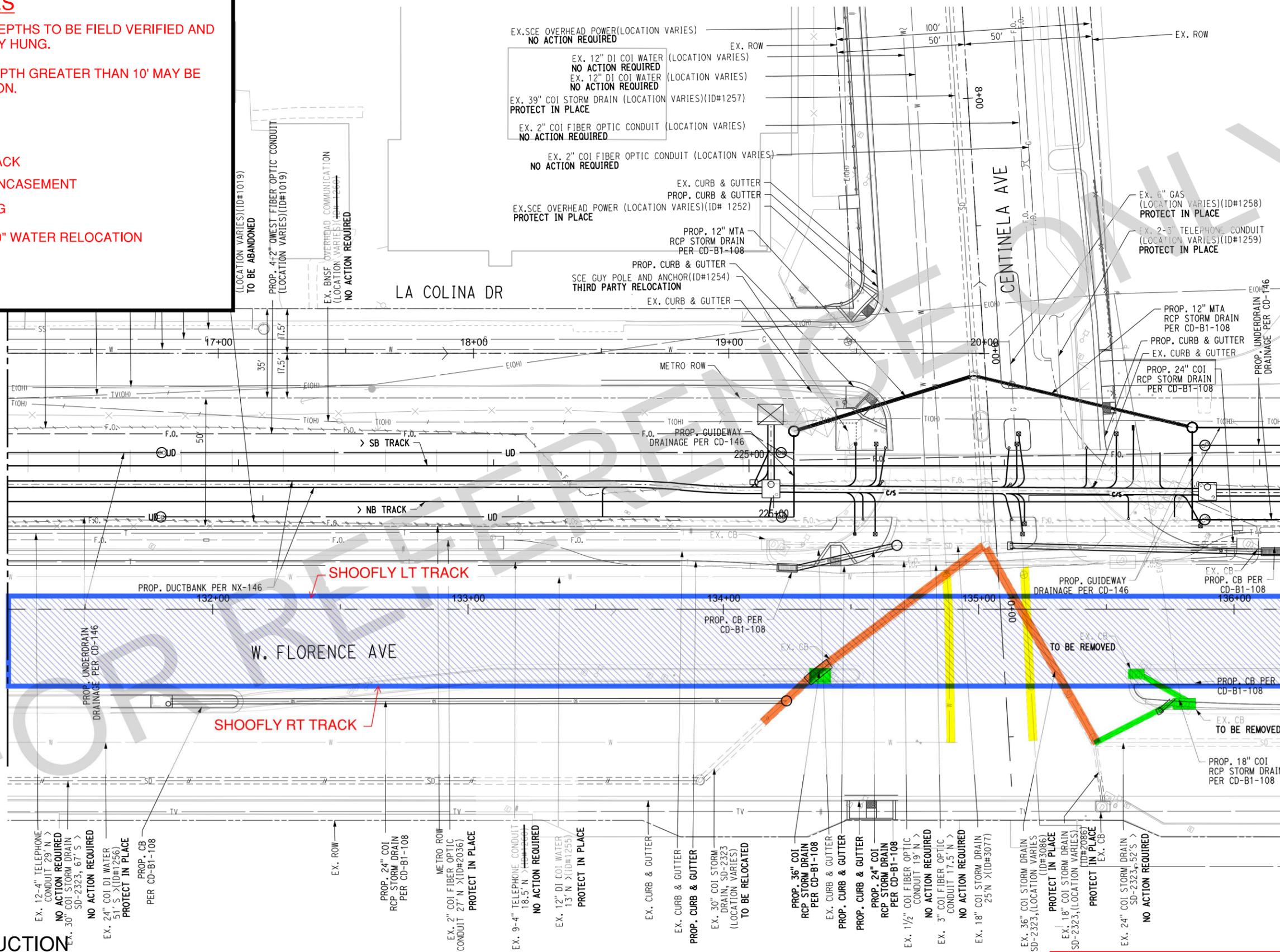
**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 222+00 - SEE SH

MATCH LINE NB TRACK STA 227+00 - SEE SHEET UR-B048



NOT FOR CONSTRUCTION

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**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**EA INC.**  
 ENGINEERING ARCHITECTURE

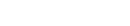
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**GENERAL NOTES**

1. ALL EXISTING UTILITY DEPTHS TO BE FIELD VERIFIED AND POSSIBLY TEMPORARILY HUNG.
2. ALL UTILITES WITH A DEPTH GREATER THAN 10' MAY BE SUBJECT TO RELOCATION.

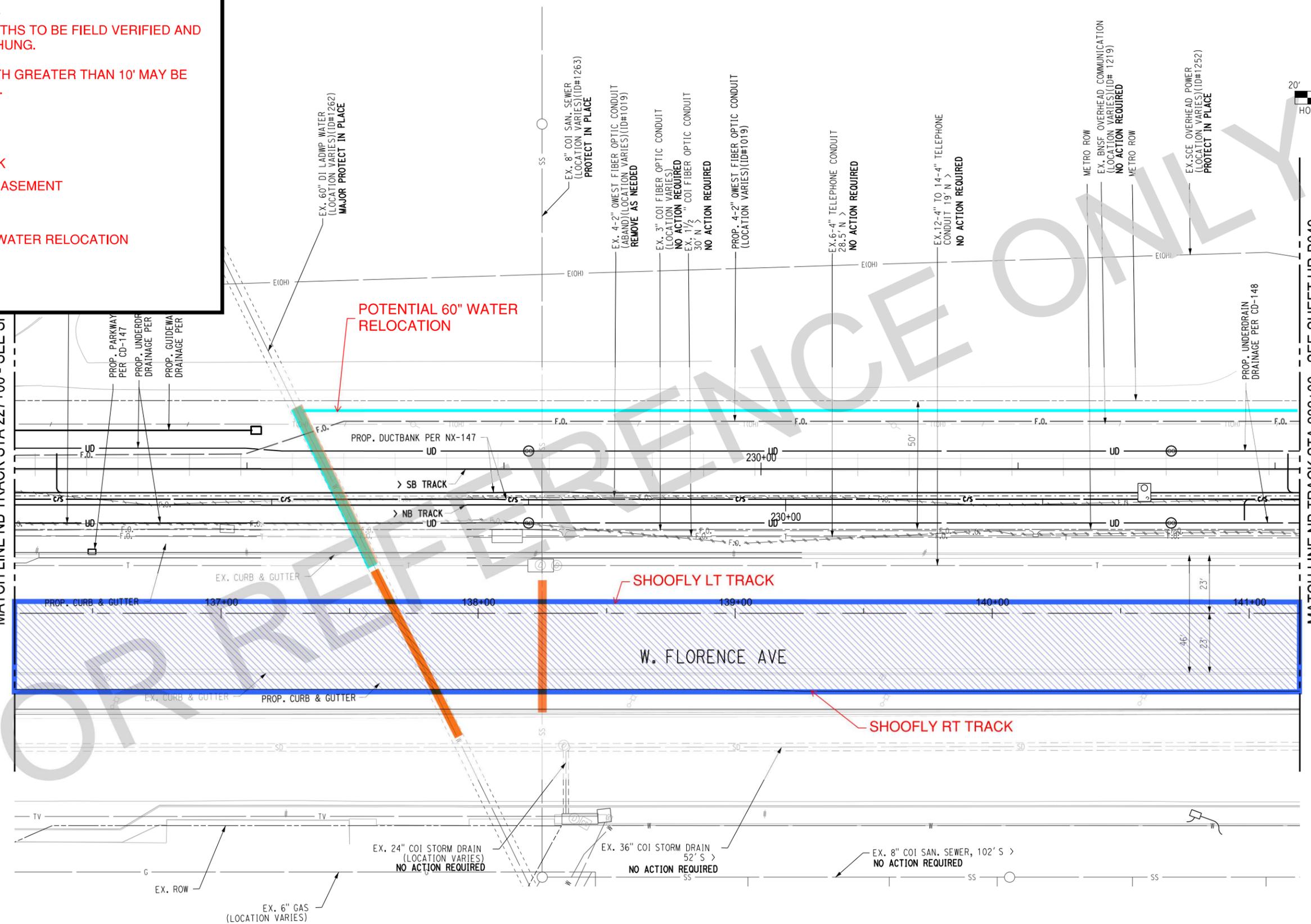
**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 227+00 - SEE SH

MATCH LINE NB TRACK STA 232+00 - SEE SHEET UR-B049



**NOT FOR CONSTRUCTION**

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**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**



ALTERNATIVE 2  
BELOW GRADE

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**GENERAL NOTES**

1. ALL EXISTING UTILITY DEPTHS TO BE FIELD VERIFIED AND POSSIBLY TEMPORARILY HUNG.
2. ALL UTILITES WITH A DEPTH GREATER THAN 10' MAY BE SUBJECT TO RELOCATION.

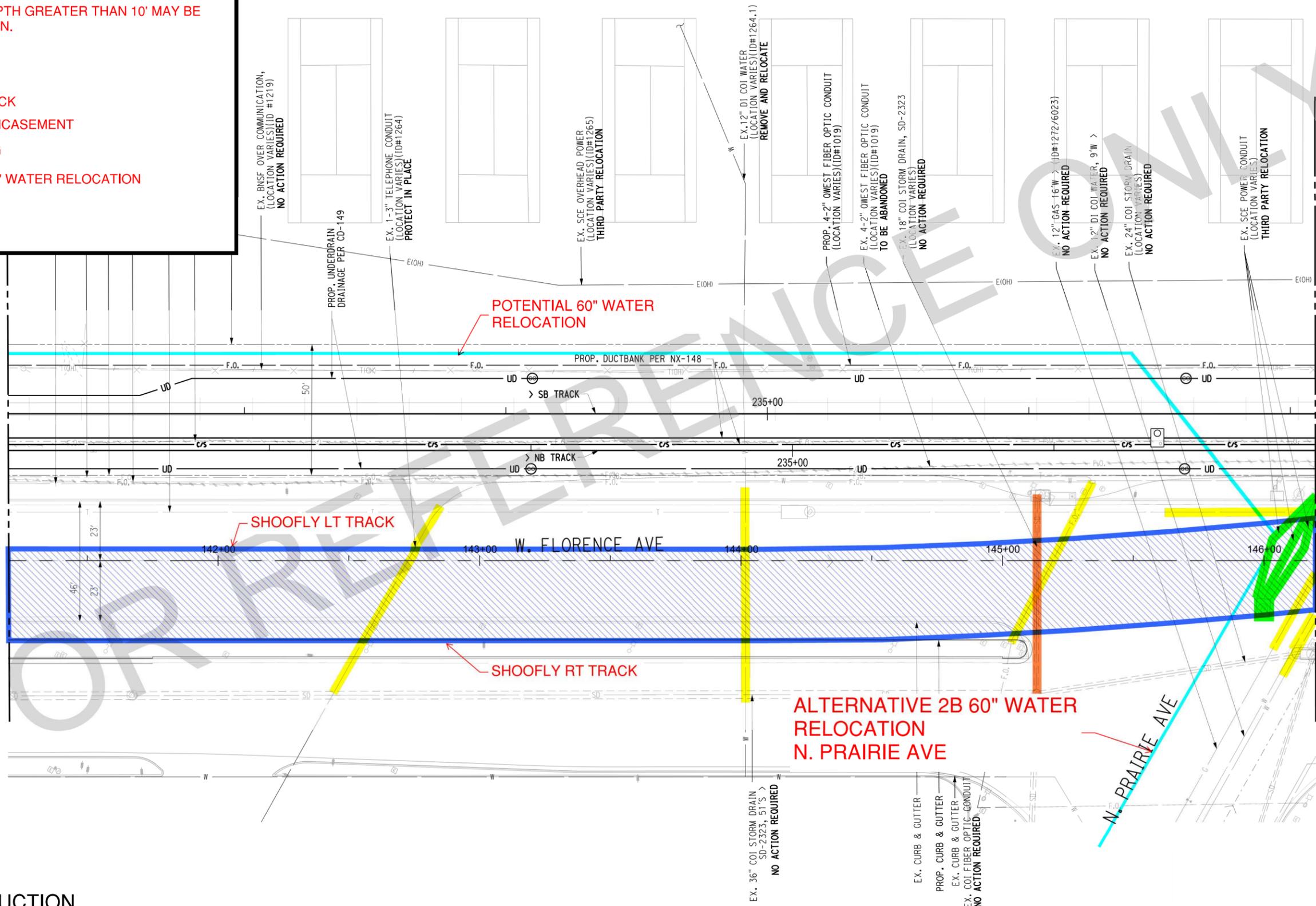
**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 232+00 - SEE SH

MATCH LINE NB TRACK STA 237+00 - SEE SHEET UR-B050



**NOT FOR CONSTRUCTION**

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**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**BA INC.**  
 THE ENGINEERING RESOURCE

**ALTERNATIVE 2  
 BELOW GRADE**

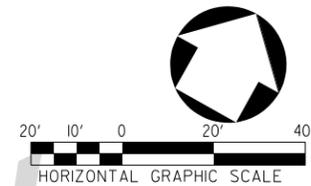
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**GENERAL NOTES**

1. ALL EXISTING UTILITY DEPTHS TO BE FIELD VERIFIED AND POSSIBLY TEMPORARILY HUNG.
2. ALL UTILITES WITH A DEPTH GREATER THAN 10' MAY BE SUBJECT TO RELOCATION.

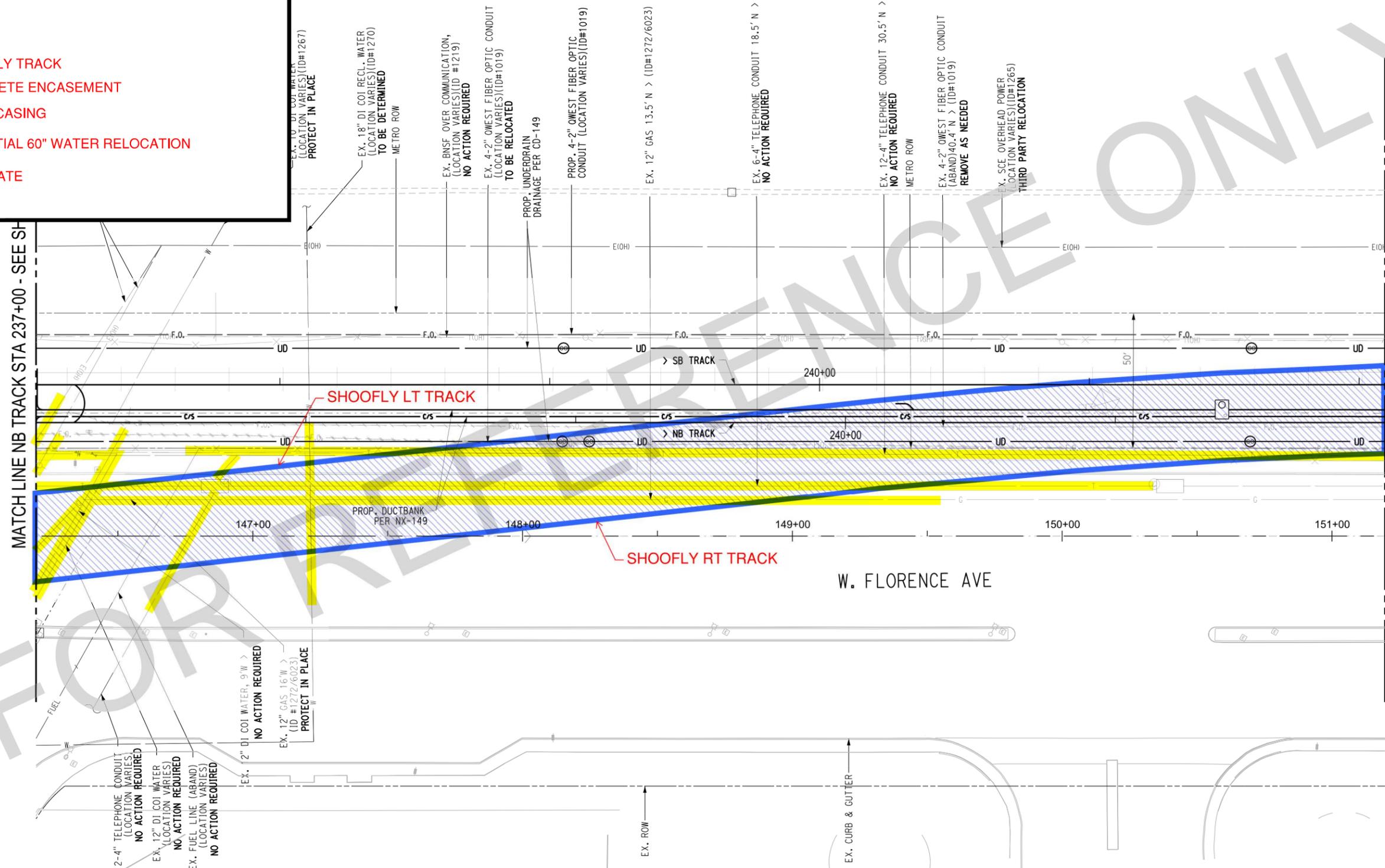
**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 237+00 - SEE SH

MATCH LINE NB TRACK STA 242+00 - SEE SHEET UR-B051



NOT FOR CONSTRUCTION

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**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**



**ALTERNATIVE 2  
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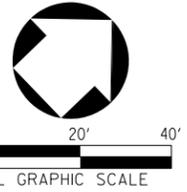
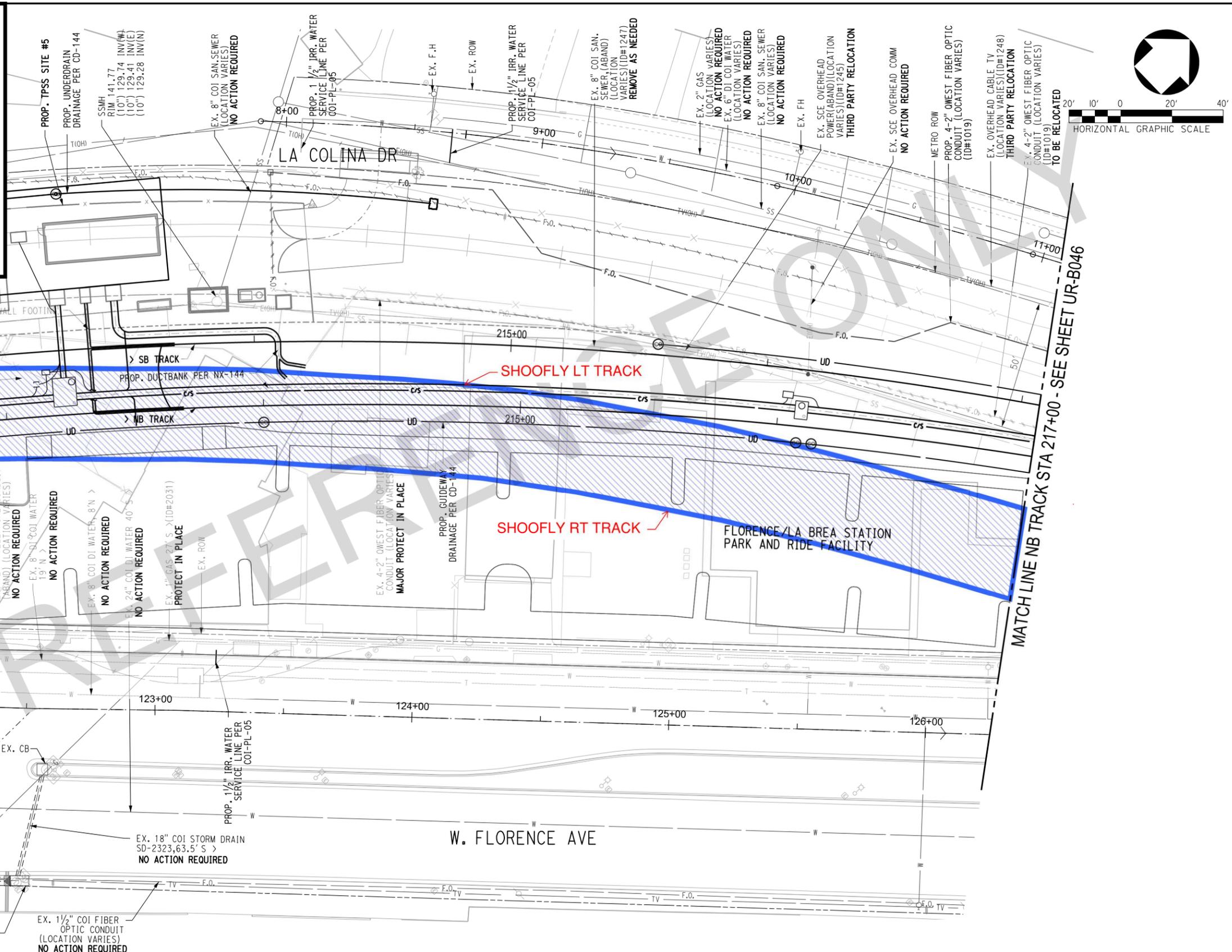
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**GENERAL NOTES**

1. ALL UTILITIES CROSSING PROPOSED TRACK ALIGNMENT AT A DEPTH OF 10' FEET OR LESS WILL BE RELOCATED.

**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 212+00 - SEE SHEET UR-B045

MATCH LINE NB TRACK STA 217+00 - SEE SHEET UR-B046

**NOT FOR CONSTRUCTION**

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| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**EA INC.**  
 ENGINEERING ARCHITECTURE INTERIOR DESIGN

**ALTERNATIVE 3  
 RELOCATIONS**

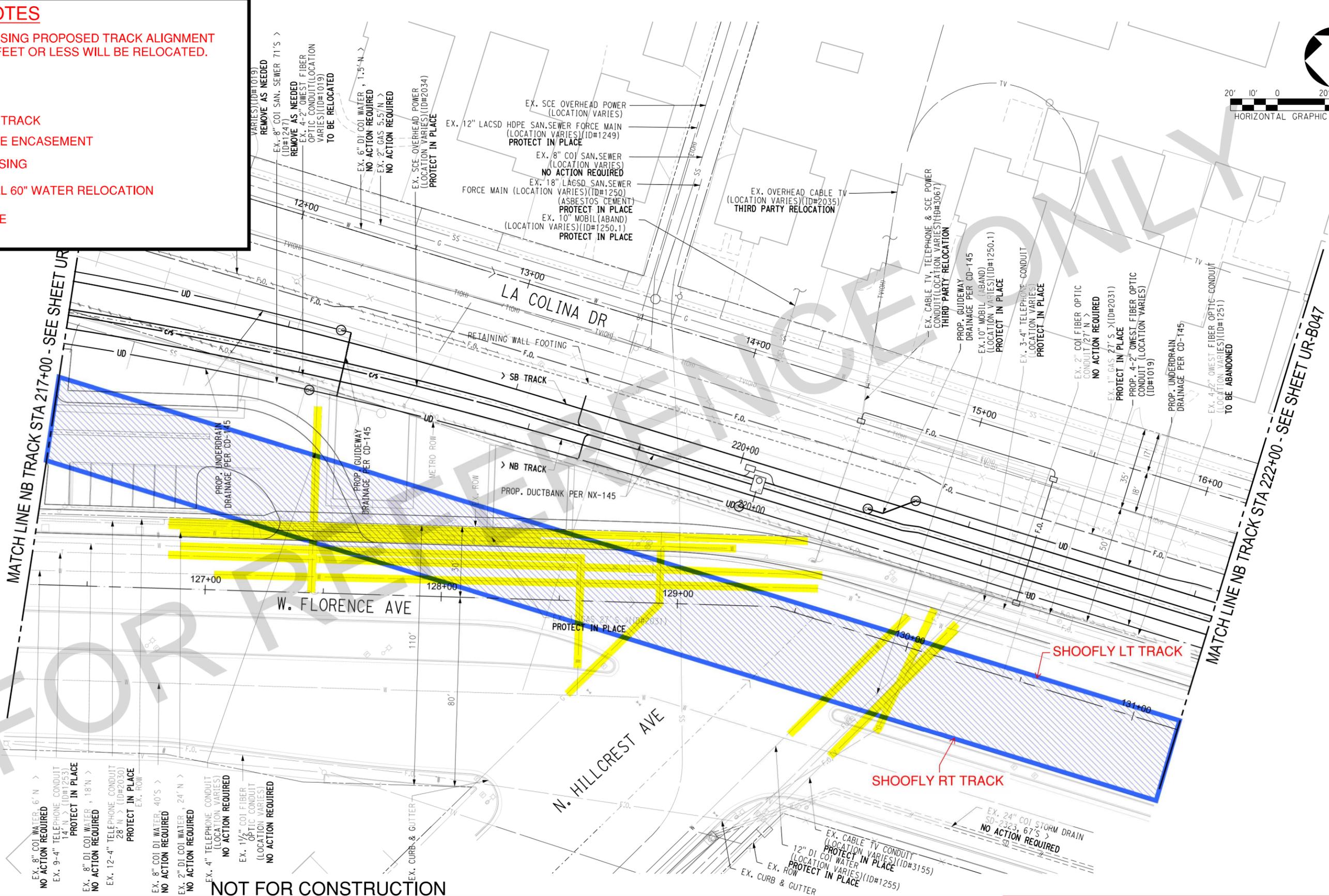
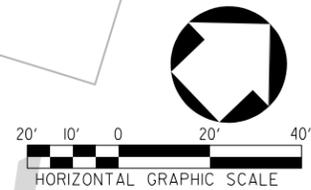
24-FEB-2016 09:05 USER: smalley P:\mtrb\352\mtrb\cadd\design\Bldg\Documents\Walters\59595\Drawings\LAX Transit Corridor\Design Post-Award\CADD\Utility\_Sheets\C0368\URB046.dwg

**GENERAL NOTES**

1. ALL UTILITIES CROSSING PROPOSED TRACK ALIGNMENT AT A DEPTH OF 10' FEET OR LESS WILL BE RELOCATED.

**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



EX. 8" COI WATER, 6' N >  
NO ACTION REQUIRED  
EX. 9-4" TELEPHONE CONDUIT  
14' N > (ID#1253)  
PROTECT IN PLACE  
EX. 8" DI COI WATER, 18' N >  
NO ACTION REQUIRED  
EX. 12-4" TELEPHONE CONDUIT  
28' N > (ID#2030)  
PROTECT IN PLACE  
EX. ROW  
EX. 8" COI WATER, 40' S >  
NO ACTION REQUIRED  
EX. 2" DI COI WATER, 24' N >  
NO ACTION REQUIRED  
EX. 4" TELEPHONE CONDUIT  
(LOCATION VARIES)  
NO ACTION REQUIRED  
EX. 1 1/2" COI FIBER  
OPTIC CONDUIT  
(LOCATION VARIES)  
NO ACTION REQUIRED  
EX. CURB & GUTTER

NOT FOR CONSTRUCTION

|                  |
|------------------|
| DESIGNED BY      |
| DRAWN BY         |
| CHECKED BY       |
| IN CHARGE        |
| DATE<br>12/10/19 |

| REV | DATE | BY | APP | REG NO | EXPIRES | SEAL HOLDER | DESCRIPTION |
|-----|------|----|-----|--------|---------|-------------|-------------|
|     |      |    |     |        |         |             |             |
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**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**BA INC.**  
TRANSPORTATION ENGINEERING

**ALTERNATIVE 3  
RELOCATIONS**

09/05 24-FEB-2016 p:\mtr\ba\52\mb\c\p\design\_Ba\ba\Documents\Walt\50955\_Crescent\LAx Transit Corridor Design East Awaro\CADD\Utility\_Sheets\C088\URB030.dwg  
 USER= smalley  
 Penable= CVD,pen  
 PLOT Date= 3/11/2019



**GENERAL NOTES**

1. ALL UTILITIES CROSSING PROPOSED TRACK ALIGNMENT AT A DEPTH OF 10' FEET OR LESS WILL BE RELOCATED.

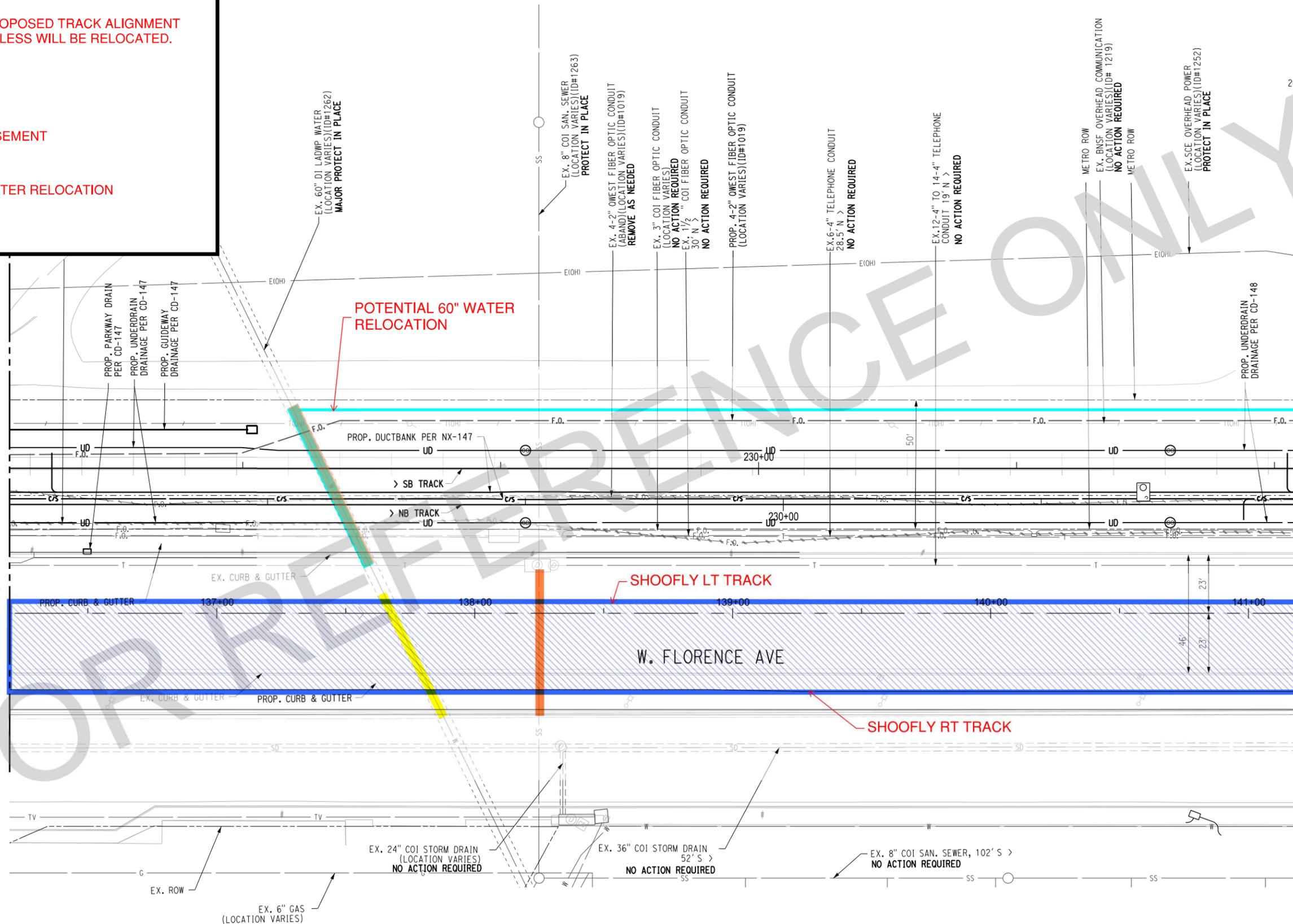
**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 227+00 - SEE SHEET UR

MATCH LINE NB TRACK STA 232+00 - SEE SHEET UR-B049



**NOT FOR CONSTRUCTION**

|   |      |    |     |        |         |             |
|---|------|----|-----|--------|---------|-------------|
| THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1994, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA. |      |    |     |        |         |             |
| REV   | DATE | BY | APP | REG NO | EXPIRES | SEAL HOLDER |
|   |      |    |     |        |         |             |
|   |      |    |     |        |         |             |
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|-------------|----------|
| DESIGNED BY |          |
| DRAWN BY    |          |
| CHECKED BY  |          |
| IN CHARGE   |          |
| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**EA INC.**  
 THE ENGINEERING EXCELLENCE

**ALTERNATIVE 3 RELOCATIONS**

24-FEB-2016 09:36 USER= smalley  
 P:\mtr\352\mb\cpl\design\Ballo\Documents\Wash50955\Cresshaw-LAX Transit Corridor Design\East Awaro\CADD\Utility Sheets\C0388\URB030.dwg  
 Penable= CVD.jen  
 P01 Draw= SPLTDRAWSS

**GENERAL NOTES**

1. ALL UTILITIES CROSSING PROPOSED TRACK ALIGNMENT AT A DEPTH OF 10' FEET OR LESS WILL BE RELOCATED.

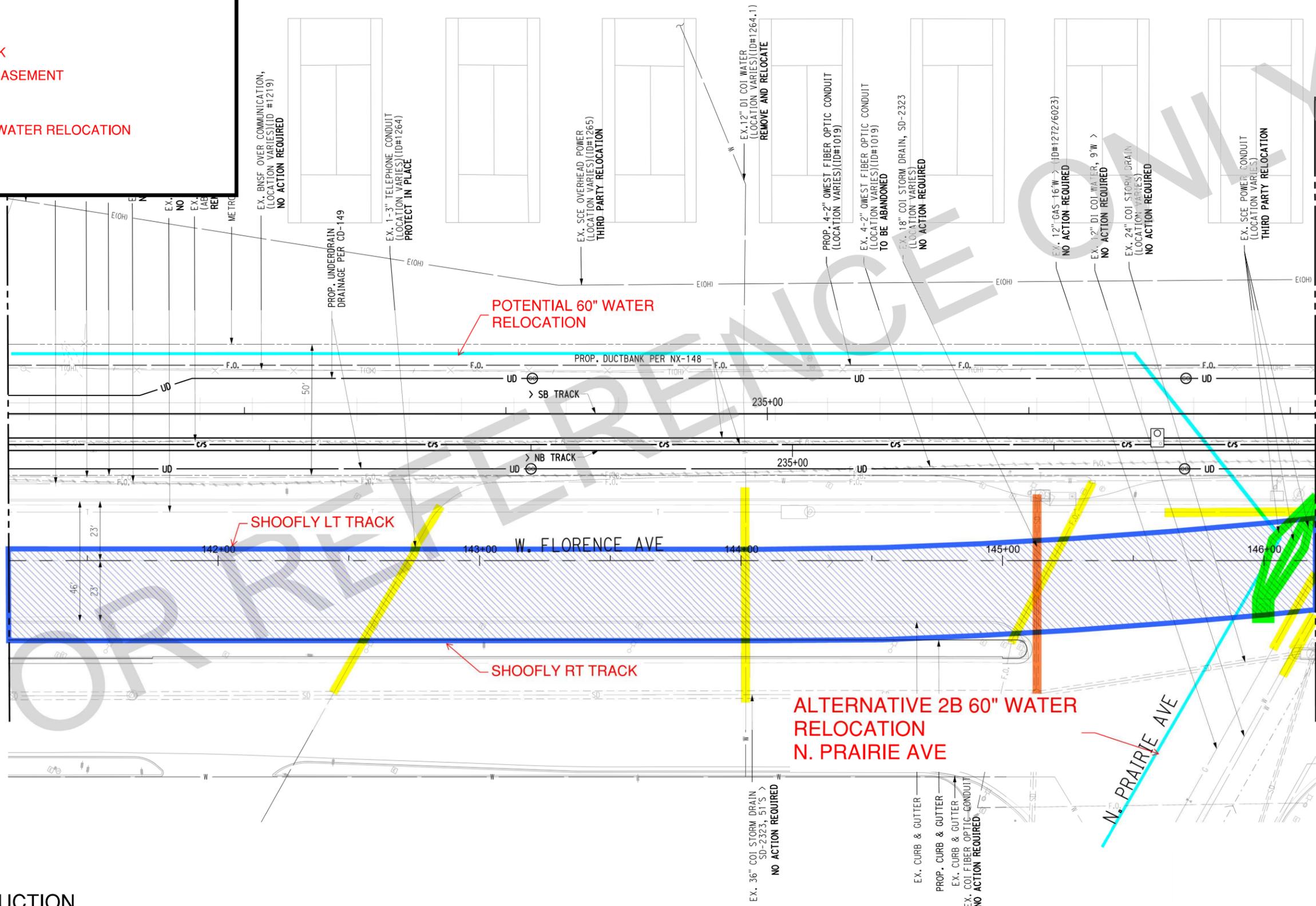
**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



MATCH LINE NB TRACK STA 232+00 - SEE SHEET UR-B050

MATCH LINE NB TRACK STA 237+00 - SEE SHEET UR-B050



NOT FOR CONSTRUCTION

THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1994, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA.

| REV | DATE | BY | APP | REG NO | EXPIRES | SEAL HOLDER | DESCRIPTION |
|-----|------|----|-----|--------|---------|-------------|-------------|
|     |      |    |     |        |         |             |             |
|     |      |    |     |        |         |             |             |
|     |      |    |     |        |         |             |             |
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|-------------|----------|
| DESIGNED BY |          |
| DRAWN BY    |          |
| CHECKED BY  |          |
| IN CHARGE   |          |
| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**BA INC.**  
 THE ENGINEERING PROFESSION

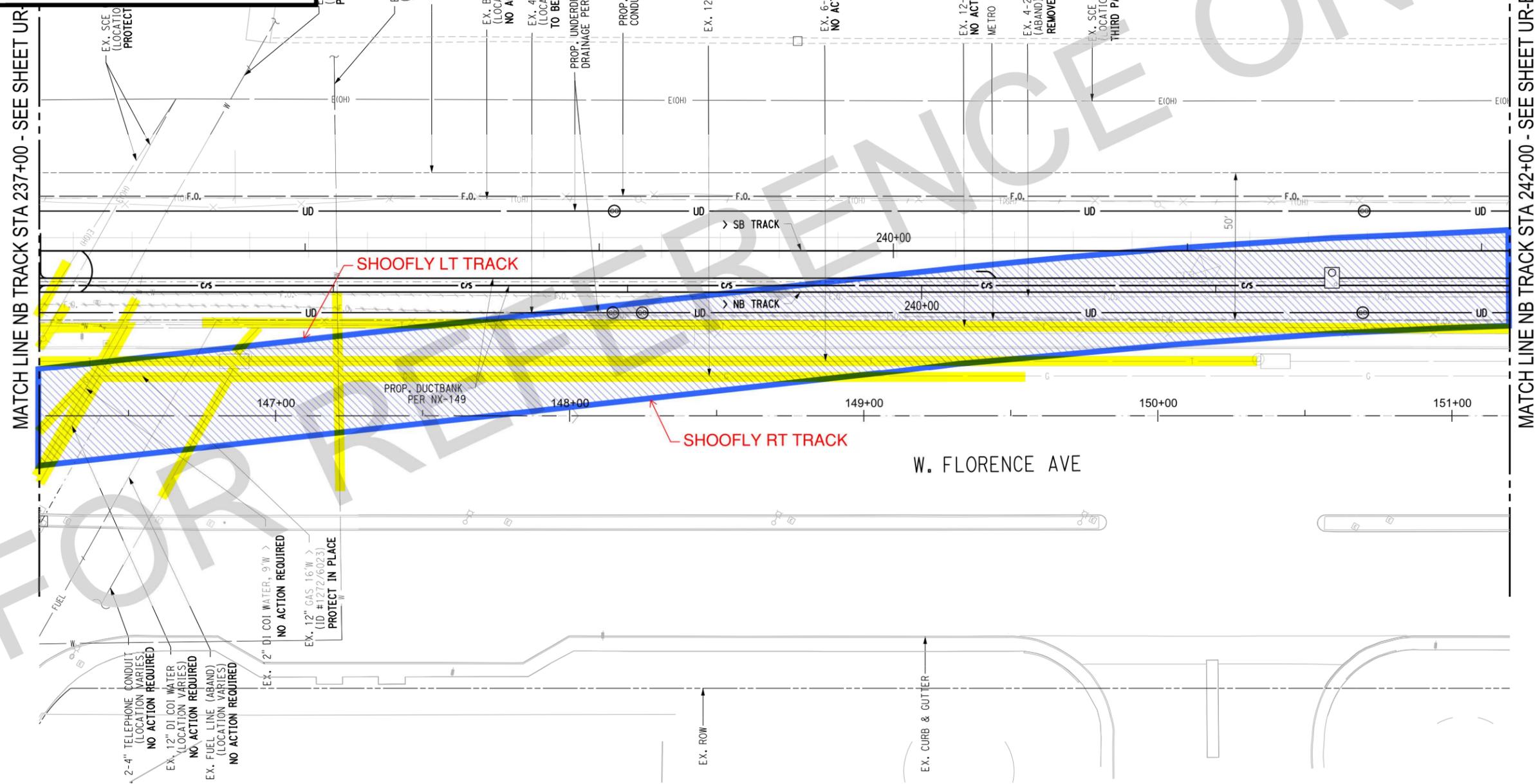
**ALTERNATIVE 3  
 RELOCATIONS**

**GENERAL NOTES**

1. ALL UTILITIES CROSSING PROPOSED TRACK ALIGNMENT AT A DEPTH OF 10' FEET OR LESS WILL BE RELOCATED.

**LEGEND**

-  SHOOFLY TRACK
-  CONCRETE ENCASEMENT
-  STEEL CASING
-  POTENTIAL 60" WATER RELOCATION
-  RELOCATE



NOT FOR CONSTRUCTION

|   |      |    |     |        |         |             |
|---|------|----|-----|--------|---------|-------------|
| THE PREPARATION OF THIS DRAWING HAS BEEN FINANCED IN PART THROUGH A GRANT FROM THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL TRANSIT ADMINISTRATION (FTA), UNDER THE FEDERAL TRANSIT ACT OF 1964, AS AMENDED, AND IN PART BY THE TAXES OF THE CITIZENS OF LOS ANGELES COUNTY AND OF THE STATE OF CALIFORNIA. |      |    |     |        |         |             |
| REV   | DATE | BY | APP | REG NO | EXPIRES | SEAL HOLDER |
|   |      |    |     |        |         |             |
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| DESIGNED BY |          |
| DRAWN BY    |          |
| CHECKED BY  |          |
| IN CHARGE   |          |
| DATE        | 12/10/19 |

**M** LOS ANGELES COUNTY METROPOLITAN TRANSPORTATION AUTHORITY  
**Metro**

**BA INC.**  
THE ENGINEERING EXCELLENCE

**ALTERNATIVE 3 RELOCATIONS**

# Attachment D – Stage Construction Exhibits

| LEGEND |                     |
|--------|---------------------|
|        | DIRECTION OF TRAVEL |

STAGE 1 (6 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. CONSTRUCT SHOOFLY, MEDIANS, GATES, TEMPORARY CURB AND RAMPS (TEMPORARY/ SECTIONAL CLOSURES)
2. INSTALL TEMPORARY TRAFFIC SIGNAL

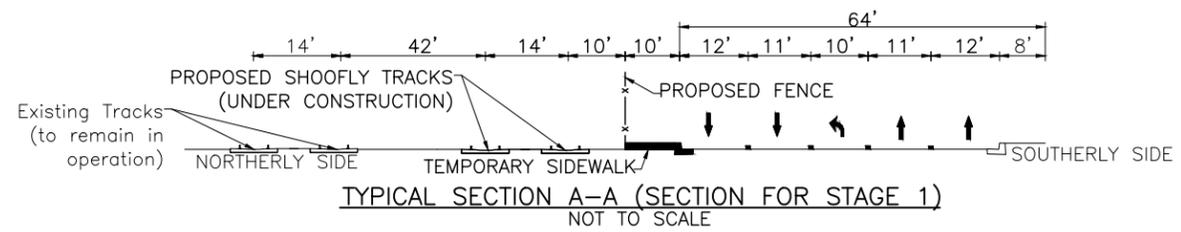
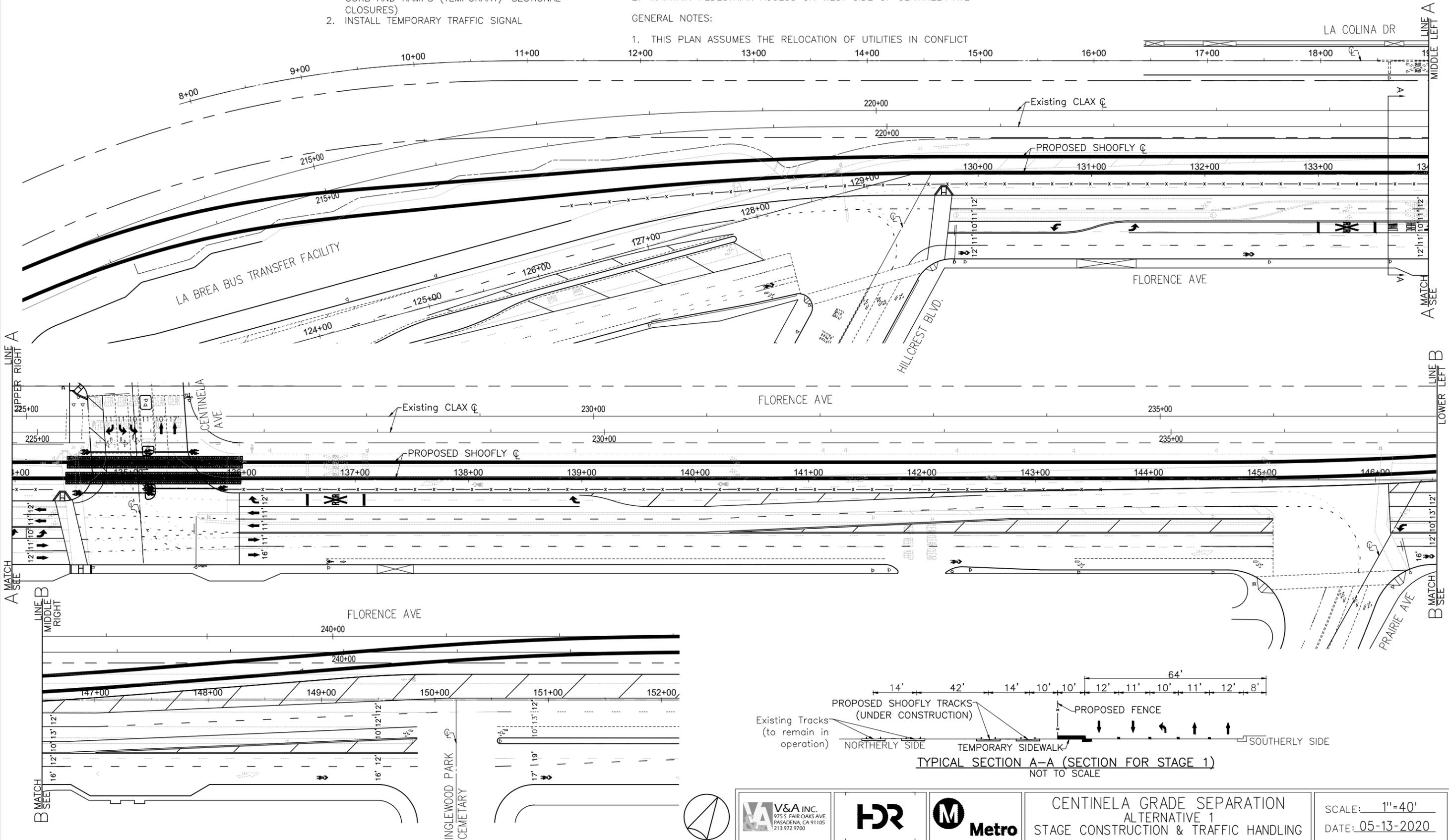
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$TIMES  
 \$FILES  
 \$PENCILS  
 \$PLTDRVL\$

|   |  |  |                            |  |               |
|---|--|--|----------------------------|--|---------------|
| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |  | SCALE: 1"=40' |
|   |  |  | ALTERNATIVE 1              |  |               |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  |                            |  |               |

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| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | PROPOSED RETAINING WALL |

STAGE 2 (9 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. TRACK CUTOVER TO SHOOFLY
2. REVENUE TESTING
3. DEMOLISH EXISTING TRACKS
4. CONSTRUCT APPROACH RETAINING WALLS AND BRIDGE

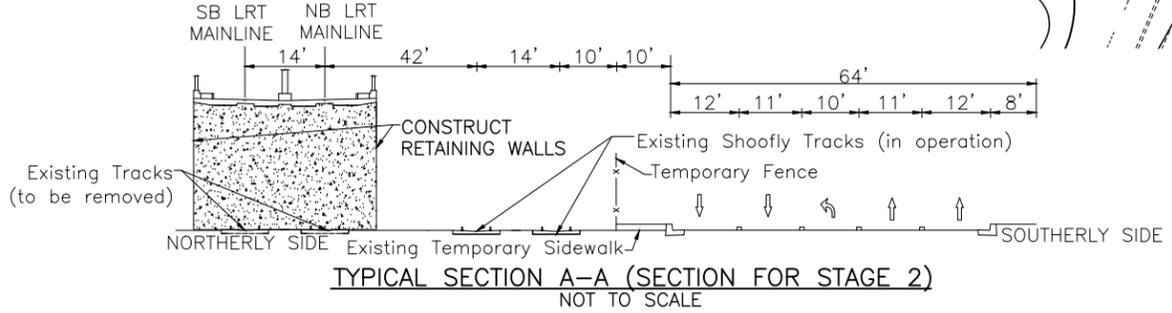
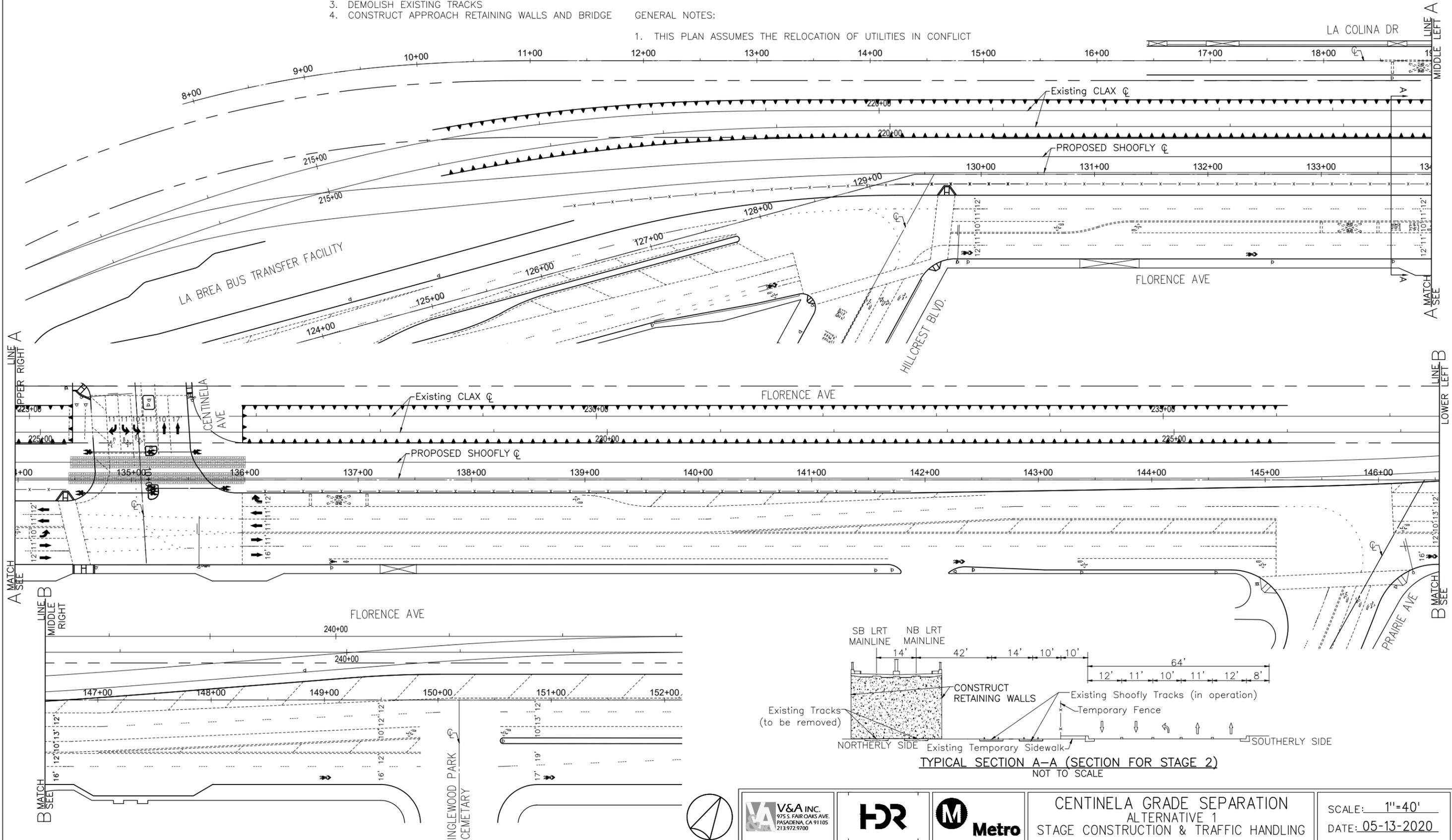
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



|   |  |  |                            |                  |
|---|--|--|----------------------------|------------------|
| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |                  |
|   |  |  | ALTERNATIVE 1              |                  |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  | SCALE: 1"=40'              | DATE: 05-13-2020 |

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STAGE 3 (9 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. INSTALL PRECAST CONCRETE BRIDGE GIRDERS DURING TEMPORARY/ WEEKEND CLOSURES
2. CONSTRUCT BRIDGE SUPERSTRUCTURE
3. CONSTRUCT TRACKWORK AND SYSTEMS

NOTES CONT.

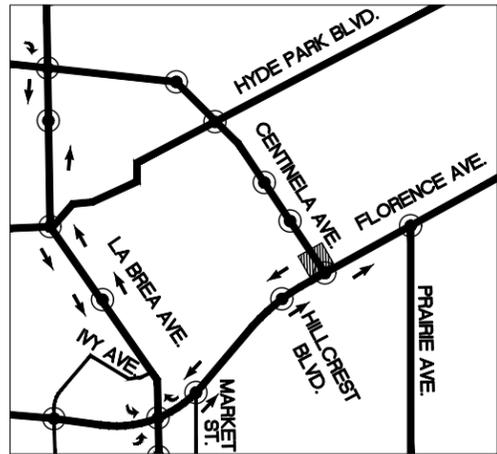
TRAFFIC HANDLING:

1. INTERMITTENT FULL CLOSURE OF CENTINELA AVE BETWEEN LA COLINA DR AND FLORENCE AVE FOR CONCRETE GIRDER INSTALLATION
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

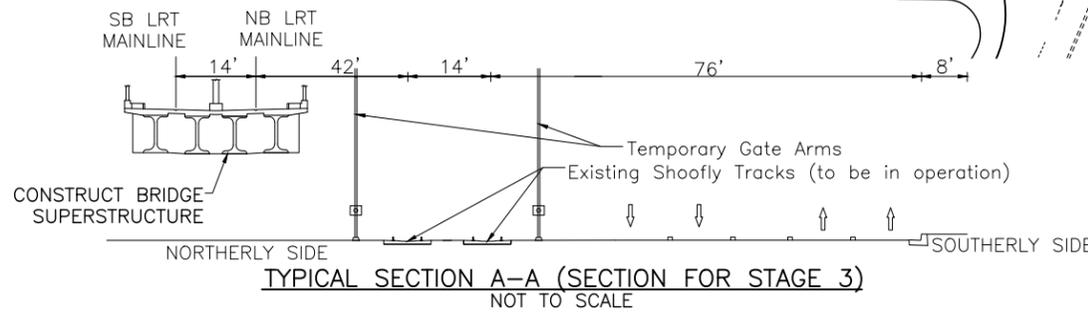
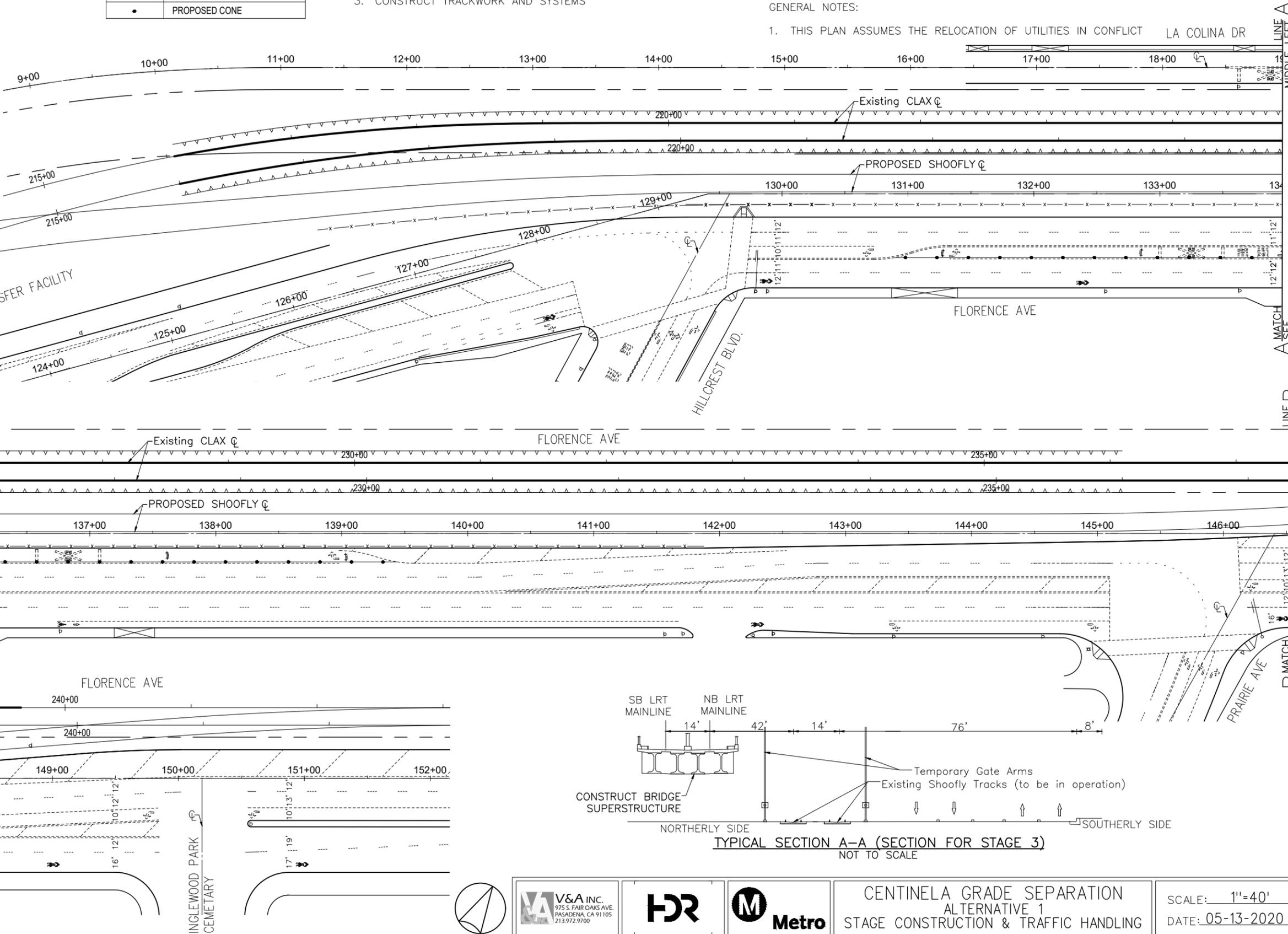
GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT WITH LA COLINA DR

| LEGEND |                             |
|--------|-----------------------------|
|        | DIRECTION OF TRAVEL         |
|        | EXISTING RETAINING WALL     |
|        | PROPOSED TYPE III BARRICADE |
|        | PROPOSED CONE               |



TEMPORARY/ WEEKEND CLOSURE DETOUR  
NOT TO SCALE



\$TIMES  
 \$FILES  
 \$PENIBLS  
 \$PLDRVL\$

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|---|--|--|----------------------------|------------------|
| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |                  |
|   |  |  | ALTERNATIVE 1              |                  |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  | SCALE: 1"=40'              | DATE: 05-13-2020 |

| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | EXISTING RETAINING WALL |

STAGE 4 (5 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. CONSTRUCT CUTOVER TO NEW CONSTRUCTION
2. CONSTRUCT REMAINING TRACKWORK AND SYSTEMS
3. REMOVE SHOOFLY TRACKS AND SIGNAL EQUIPMENT (TEMPORARY/ SECTIONAL CLOSURES)
4. REVENUE TESTING
5. CONSTRUCT CURB RAMP FOR RELOCATED CROSSWALK
6. RESTORE ROADWAY PAVEMENT
7. INSTALL NEW TRAFFIC SIGNAL
8. MEDIAN RESTORATION ON FLORENCE AVE AND CENTINELA AVE
9. RESTORE STRIPING

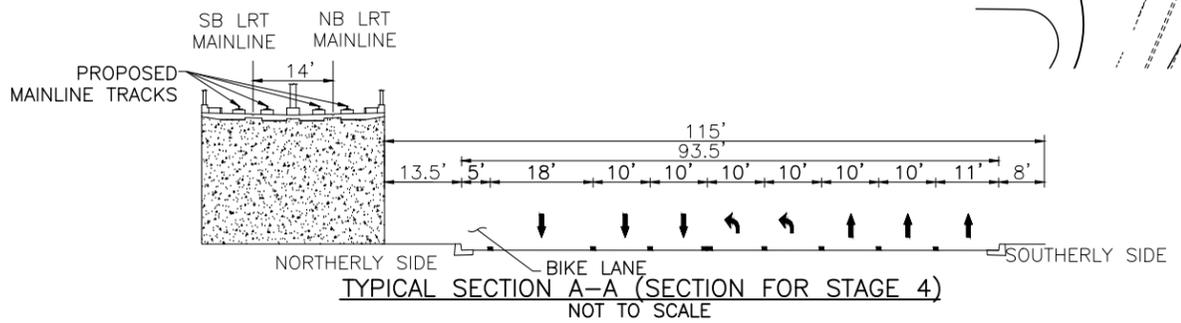
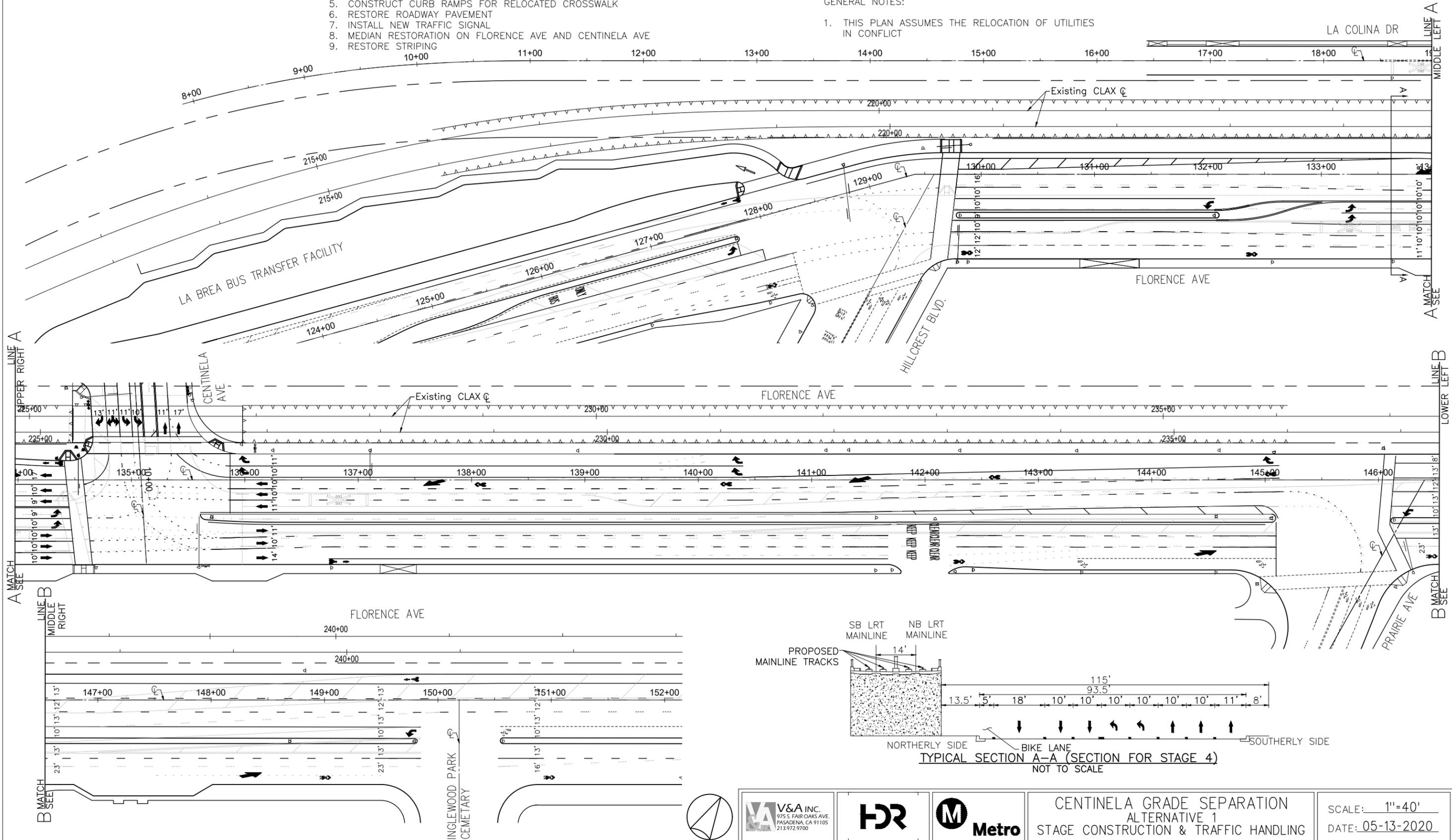
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$TIMES  
 \$FILES  
 \$PENCILS  
 \$PLTDRVL\$

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| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |                  |
|   |  |  | ALTERNATIVE 1              |                  |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  | SCALE: 1"=40'              | DATE: 05-13-2020 |

| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | PROPOSED RETAINING WALL |

STAGE 1 (9 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. DEMOLISH EXISTING TRACKS
2. CONSTRUCT APPROACH RETAINING WALLS AND BRIDGE ABUTMENT

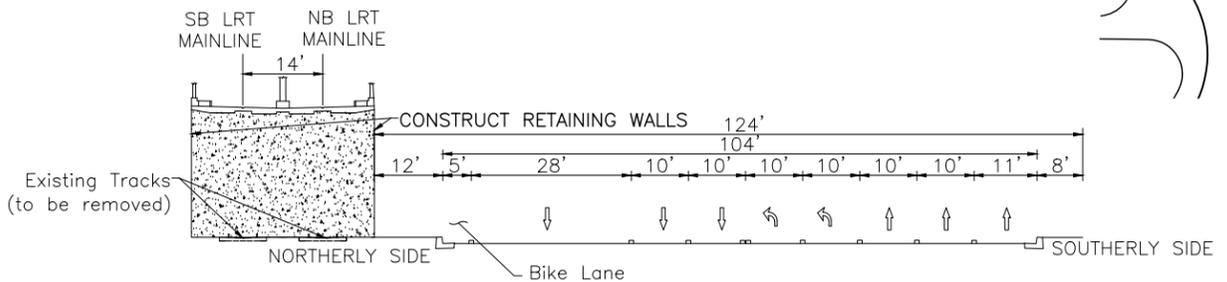
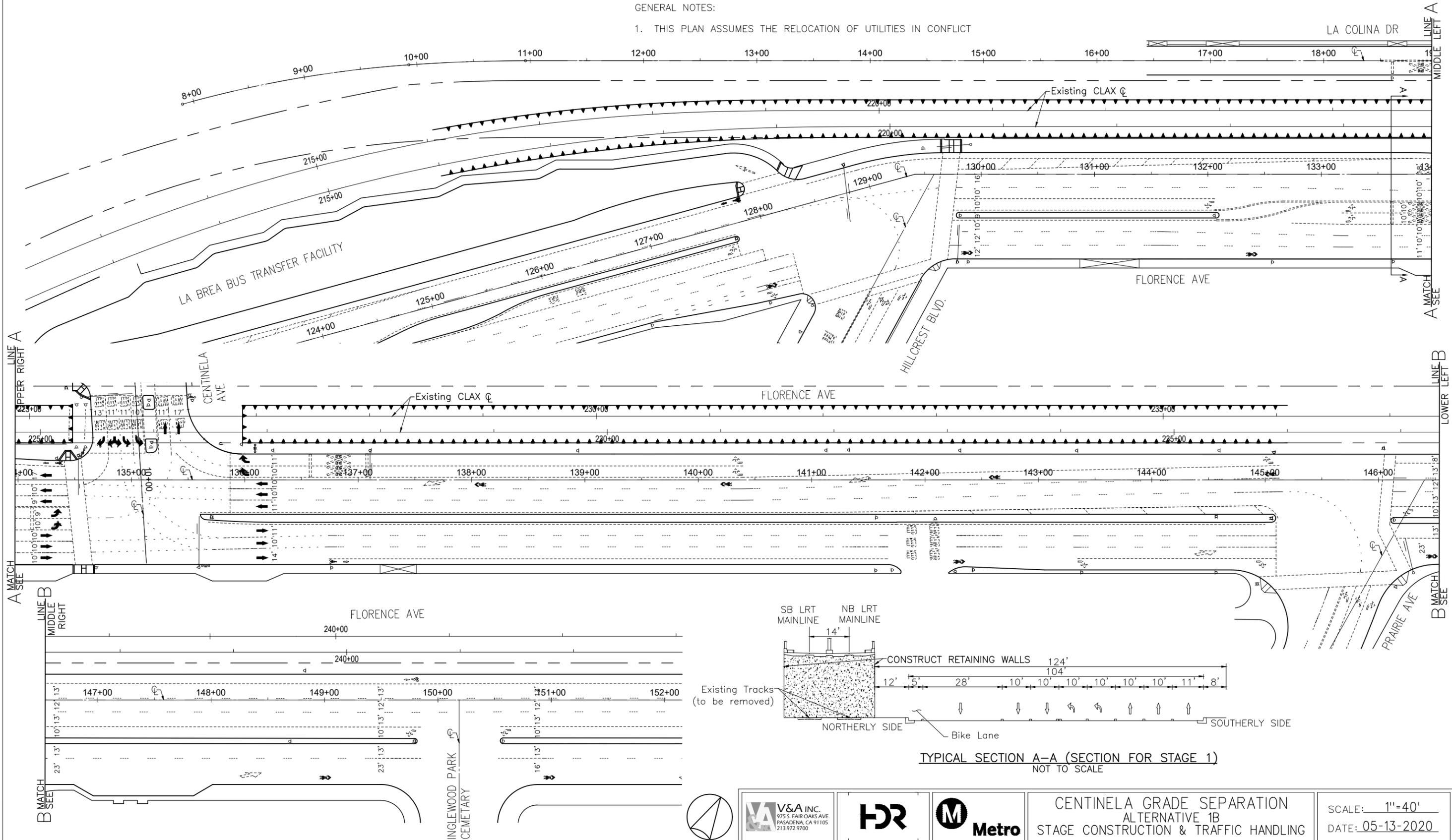
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



TYPICAL SECTION A-A (SECTION FOR STAGE 1)  
NOT TO SCALE

\$TIMES  
 \$FILES  
 \$PENCILS  
 \$PLTDRVL\$

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|   |  |  |   |                                   |
|---|--|--|---|-----------------------------------|
| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION<br>ALTERNATIVE 1B<br>STAGE CONSTRUCTION & TRAFFIC HANDLING | SCALE: 1"=40'<br>DATE: 05-13-2020 |
|---|--|--|---|-----------------------------------|

STAGE 2 (9 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. INSTALL PRECAST CONCRETE BRIDGE GIRDERS DURING TEMPORARY/ WEEKEND CLOSURES
2. CONSTRUCT BRIDGE SUPERSTRUCTURE
3. CONSTRUCT TRACKWORK AND SYSTEMS

NOTES CONT.

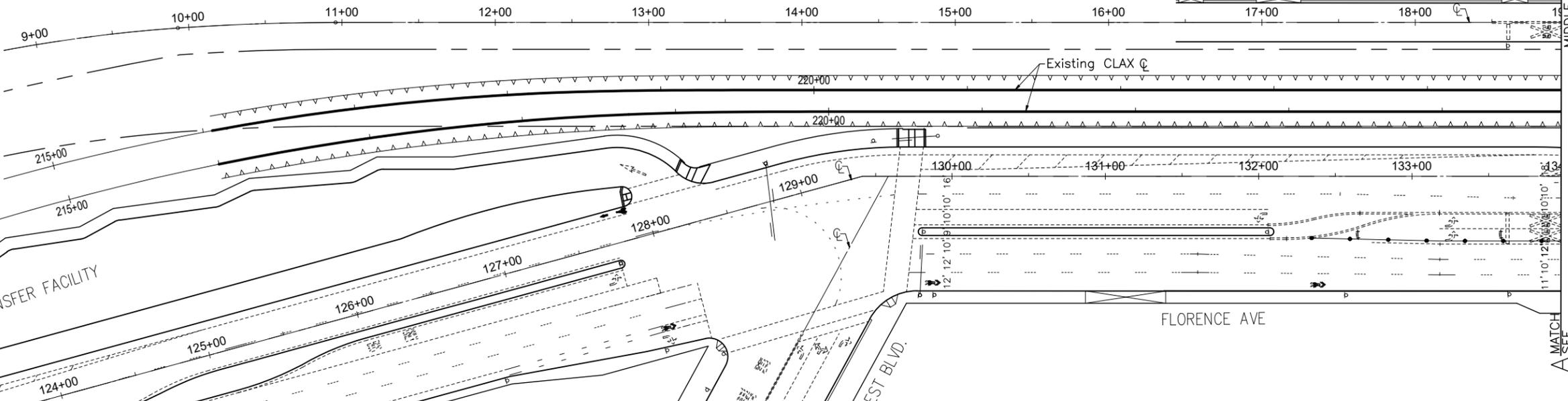
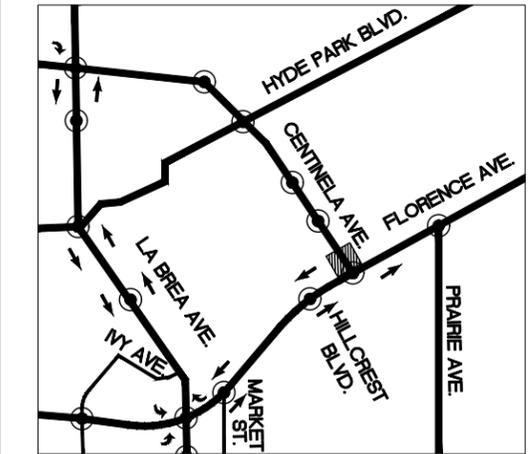
TRAFFIC HANDLING:

1. INTERMITTENT FULL CLOSURE OF CENTINELA AVE BETWEEN LA COLINA DR AND FLORENCE AVE FOR CONCRETE GIRDER INSTALLATION
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

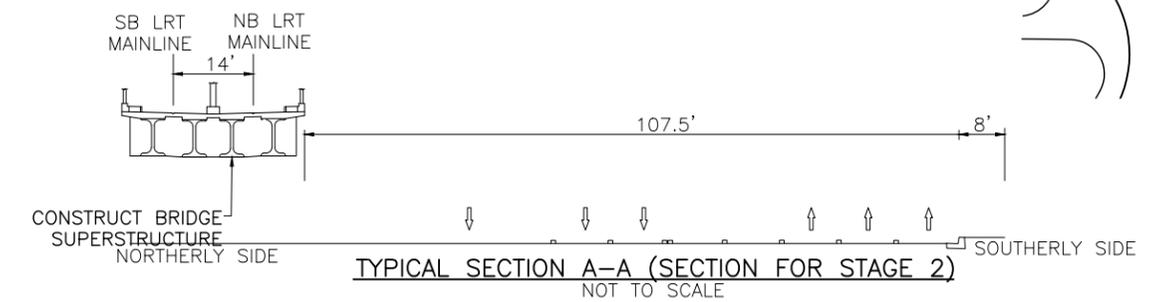
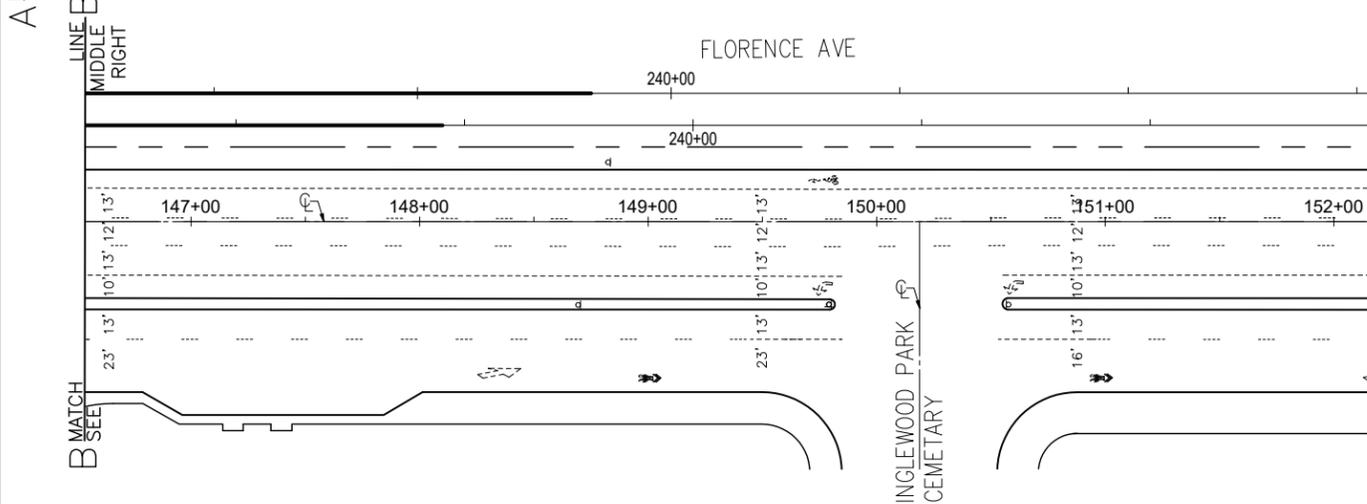
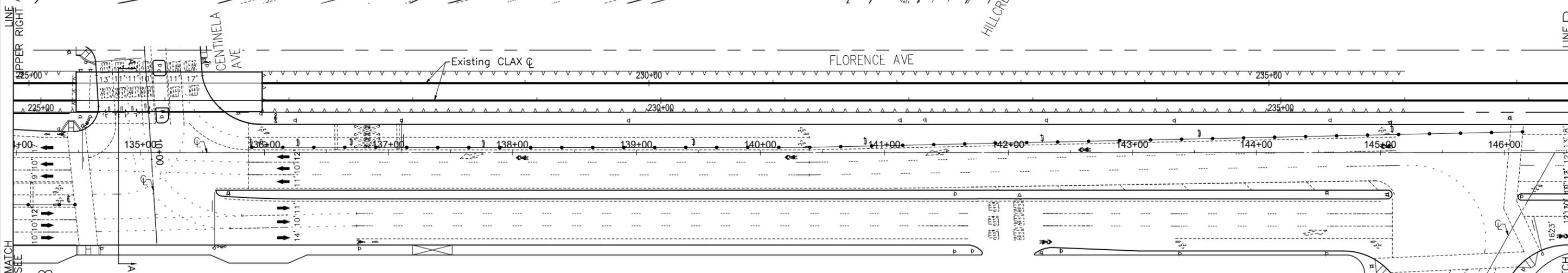
GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT LA COLINA DR

| LEGEND |                             |
|--------|-----------------------------|
|        | DIRECTION OF TRAVEL         |
|        | EXISTING RETAINING WALL     |
|        | PROPOSED TYPE III BARRICADE |
|        | PROPOSED CONE               |



TEMPORARY/ WEEKEND CLOSURE DETOUR  
NOT TO SCALE



\$ TIMES  
 \$ FILES  
 \$ PENIBL  
 \$ PLDRVL



**V&A INC.**  
975 S. FAIR OAKS AVE.  
PASADENA, CA 91105  
213.972.9700



CENTINELA GRADE SEPARATION  
ALTERNATIVE 1B  
STAGE CONSTRUCTION & TRAFFIC HANDLING

SCALE: 1"=40'  
DATE: 05-13-2020

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| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | EXISTING RETAINING WALL |

STAGE 3 (5 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. REMOVE GRADE CROSSING PANELS
2. TRACK CUTOVER TO FINAL ALIGNMENT
3. REVENUE TESTING
4. CONSTRUCT CURB RAMP FOR RELOCATED CROSSWALK
5. RESTORE ROADWAY PAVEMENT
6. INSTALL NEW TRAFFIC SIGNAL
7. RESTORE STRIPING

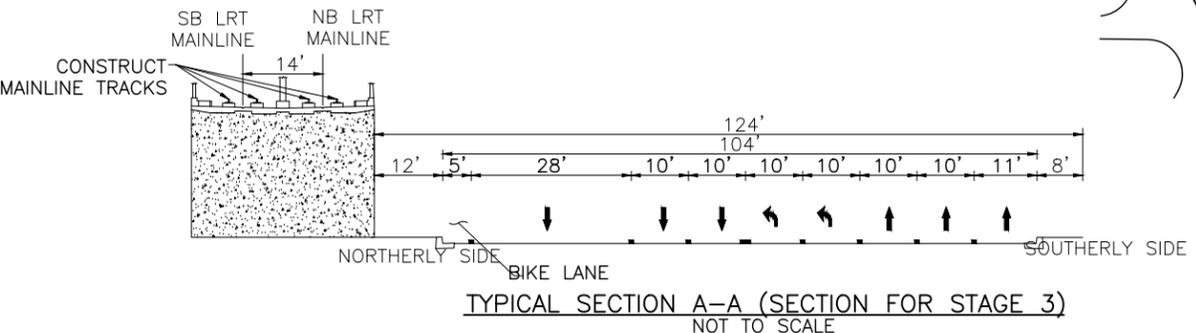
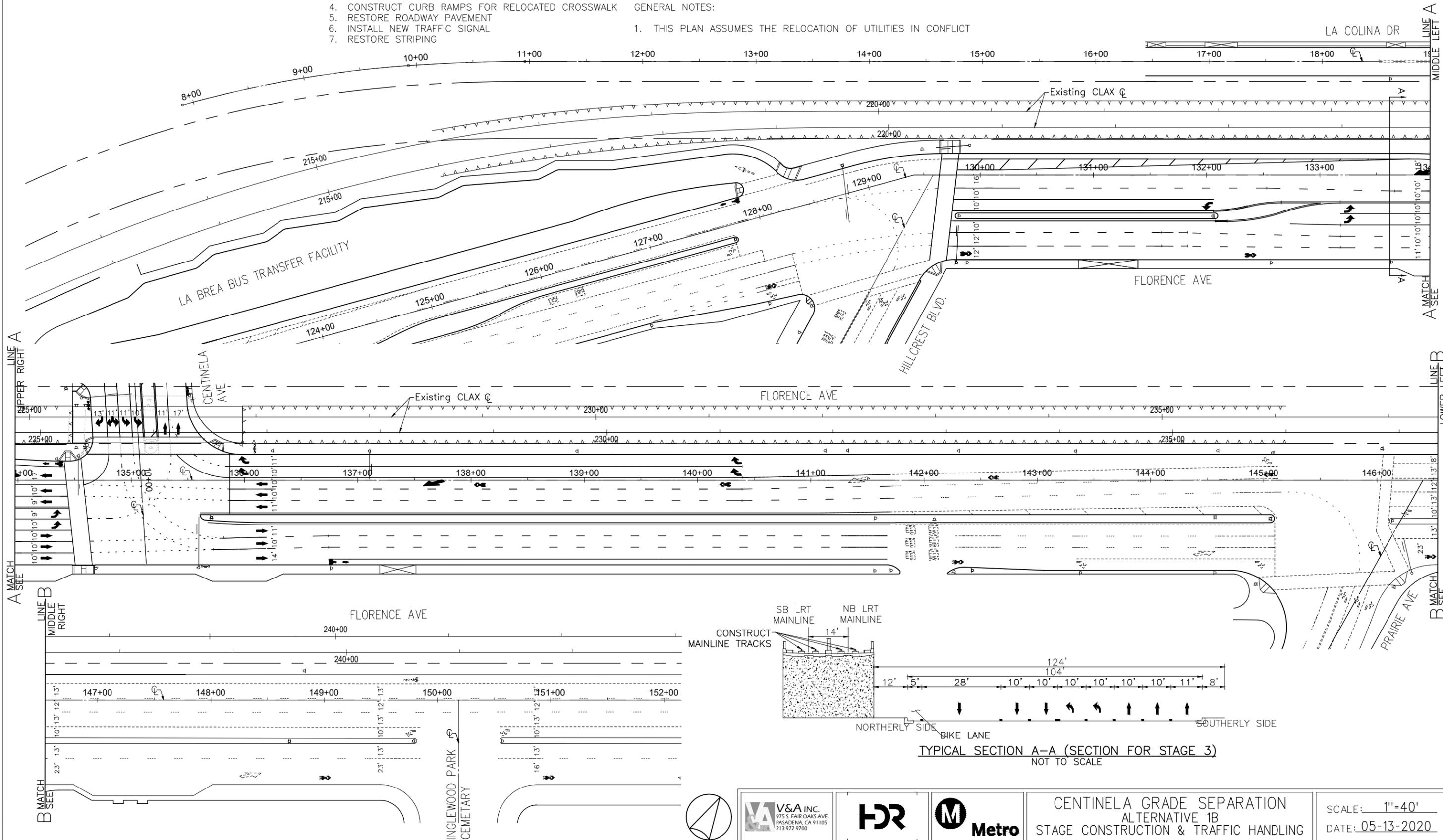
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$TIMES  
 \$FILES  
 \$PENCILS  
 \$PLTDRVL\$

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|   |  |  |                            |  |               |
|---|--|--|----------------------------|--|---------------|
| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |  | SCALE: 1"=40' |
|   |  |  | ALTERNATIVE 1B             |  |               |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  |                            |  |               |

| LEGEND |                     |
|--------|---------------------|
|        | DIRECTION OF TRAVEL |

STAGE 1 (6 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. CONSTRUCT SHOOFLY, MEDIANS, GATES, TEMPORARY CURB AND RAMPS (TEMPORARY/SECTIONAL CLOSURES)
2. INSTALL TEMPORARY TRAFFIC SIGNAL

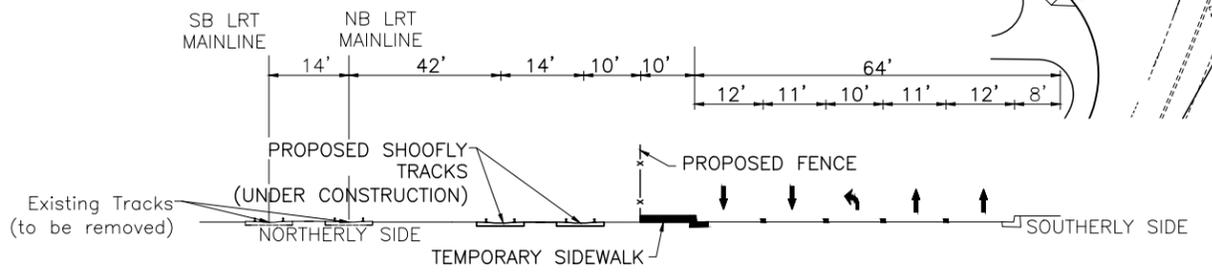
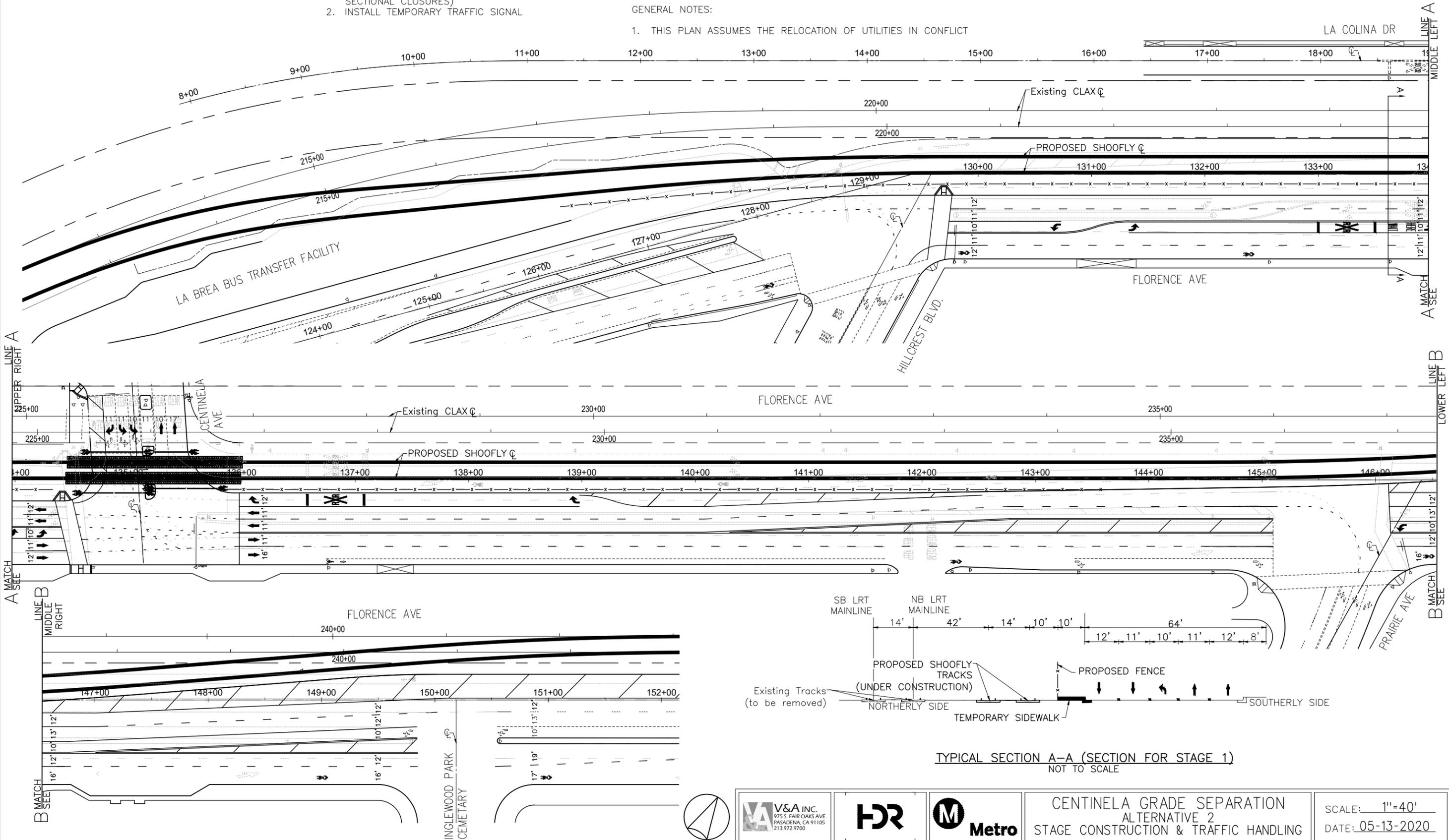
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



TYPICAL SECTION A-A (SECTION FOR STAGE 1)  
NOT TO SCALE

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| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |  | SCALE: 1"=40' |
|   |  |  | ALTERNATIVE 2              |  |               |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  |                            |  |               |

| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | PROPOSED RETAINING WALL |

STAGE 2 (12 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. TRACK CUTOVER TO SHOOFLY TRACK
2. DEMOLISH EXISTING TRACK
3. CONSTRUCT APPROACH RETAINING WALLS AND BRIDGE ABUTMENT

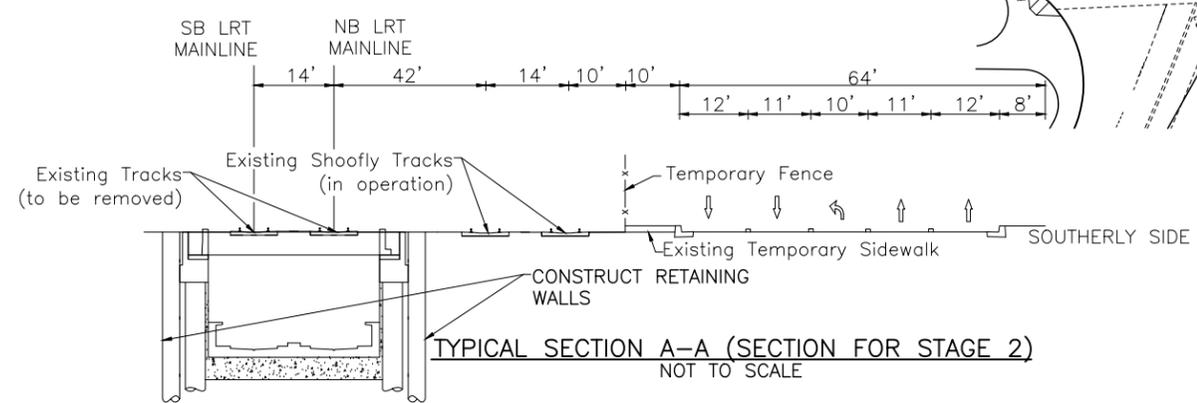
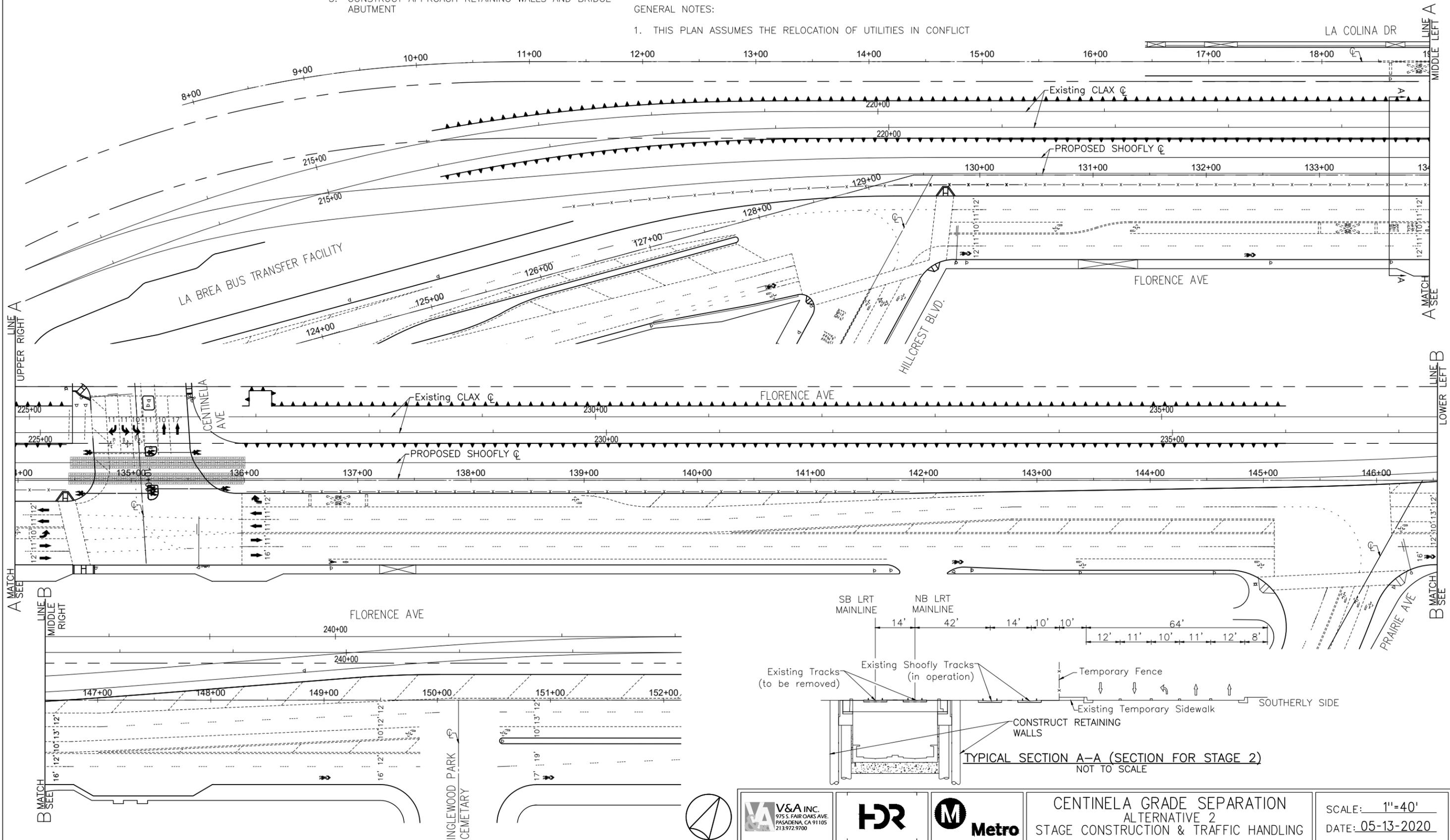
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



|   |  |  |                            |                  |
|---|--|--|----------------------------|------------------|
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|   |  |  | ALTERNATIVE 2              |                  |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  | SCALE: 1"=40'              | DATE: 05-13-2020 |

| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | EXISTING RETAINING WALL |
|        | PROPOSED WORK AREA      |

STAGE 3 (5 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. REMOVE GRADE CROSSING PANELS (PREEXISTING CROSSING BY CLAX CONSTRUCTION)
2. CENTER CIDH PILE INSTALLATION
3. INSTALL TEMPORARY DECKING

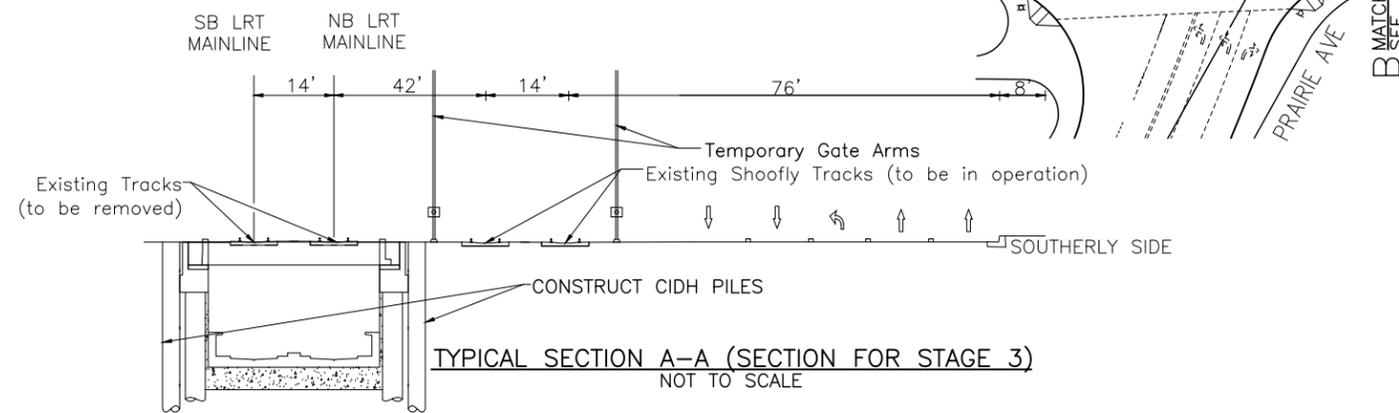
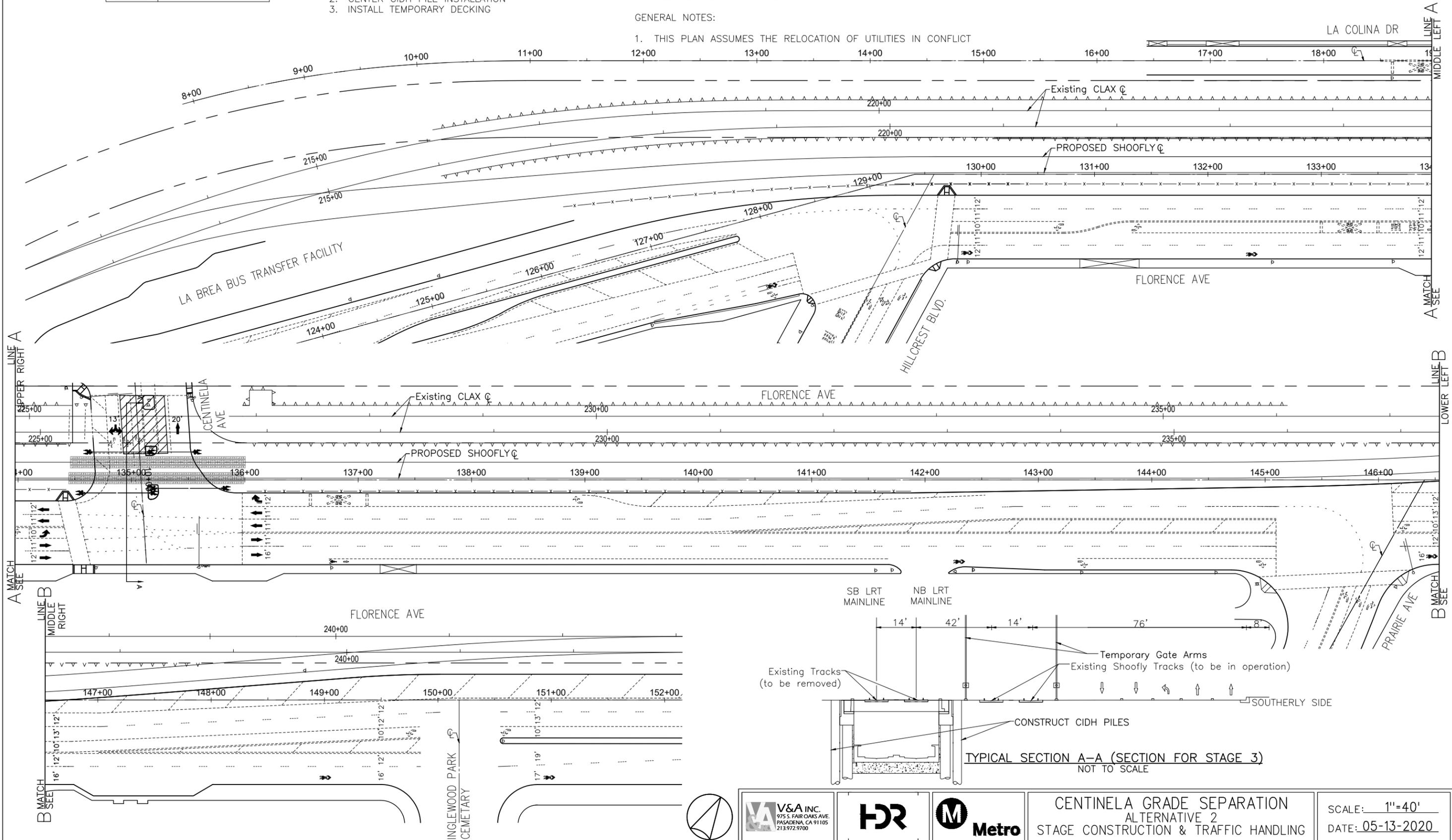
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE
3. RESTRICT WB RT FOR WB-67

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$ TIMES  
 \$ FILES  
 \$ PENIBLS  
 \$ PLTDVLS

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| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |  | SCALE: 1"=40' |
|   |  |  | ALTERNATIVE 2              |  |               |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  |                            |  |               |

| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | EXISTING RETAINING WALL |
|        | PROPOSED WORK AREA      |

STAGE 4 (5 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. REMOVE GRADE CROSSING PANELS (PREEXISTING CROSSING BY CLAX CONSTRUCTION)
2. WEST SIDE CIDH PILE INSTALLATION
3. INSTALL TEMPORARY DECKING

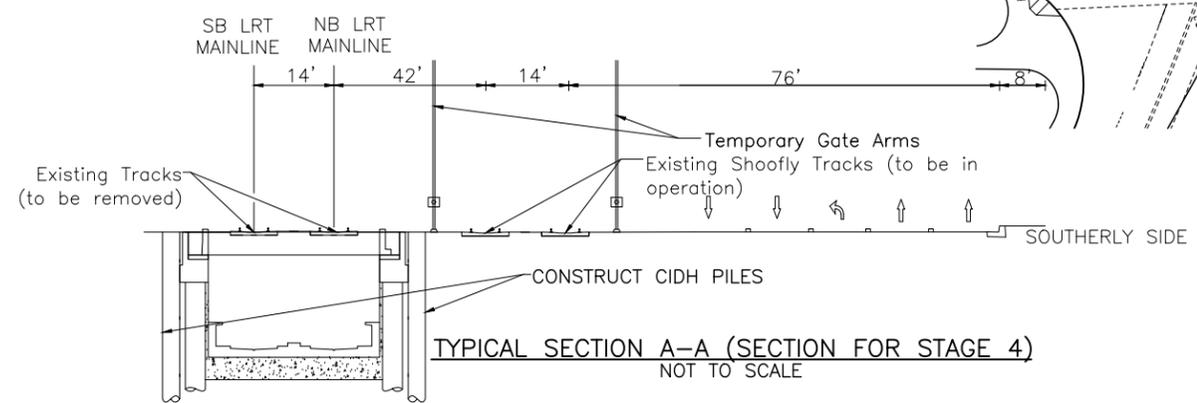
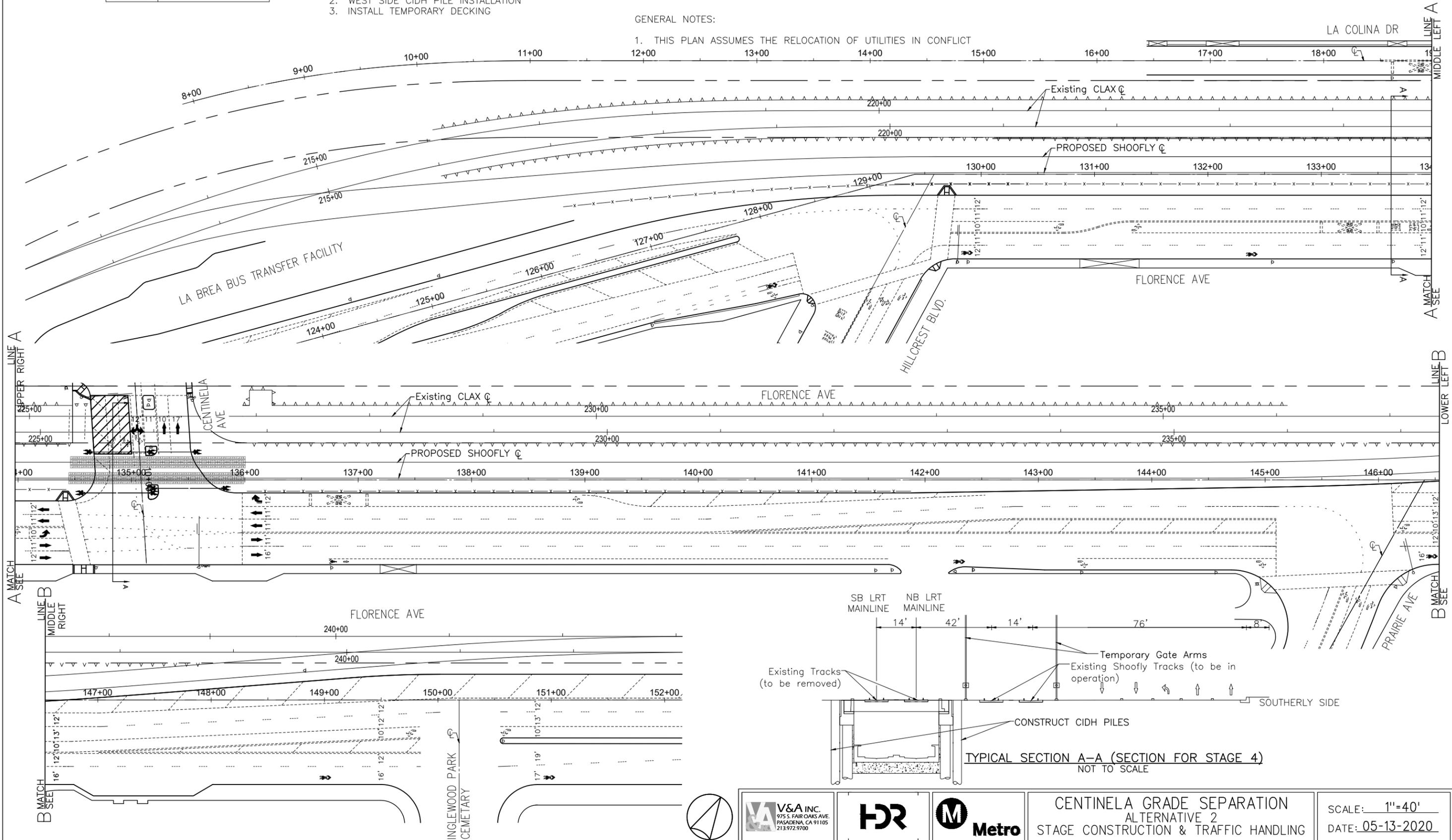
NOTES CONT.

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

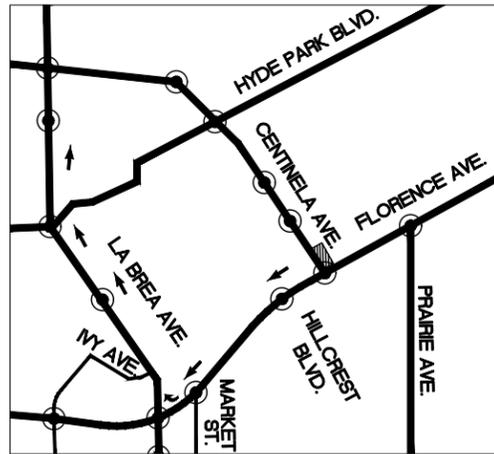
1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$ TIMES  
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|---|--|--|----------------------------|--|---------------|
| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |  | SCALE: 1"=40' |
|   |  |  | ALTERNATIVE 2              |  |               |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  |                            |  |               |



NB CENTINELA AVE CLOSURE DETOUR  
NOT TO SCALE

| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | EXISTING RETAINING WALL |
|        | PROPOSED WORK AREA      |

STAGE 5 (5 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. REMOVE GRADE CROSSING PANELS (PREEXISTING CROSSING BY CLAX CONSTRUCTION)
2. EAST SIDE CIDH PILE INSTALLATION
3. INSTALL TEMPORARY DECKING

NOTES CONT.

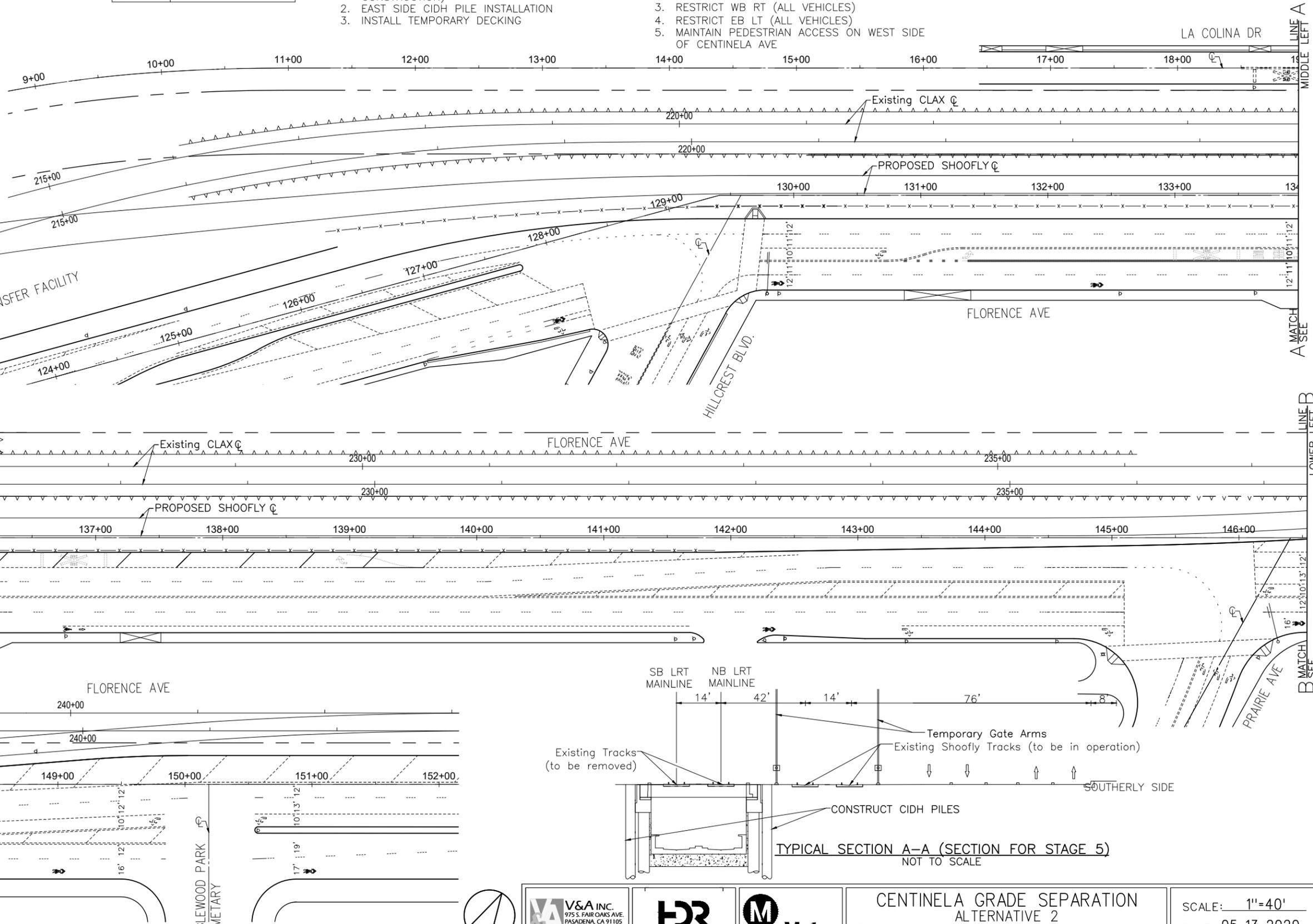
TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. TEMPORARY CLOSURE OF NB CENTINELA AVE BETWEEN FLORENCE AVE AND LA COLINA DR
3. RESTRICT WB RT (ALL VEHICLES)
4. RESTRICT EB LT (ALL VEHICLES)
5. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

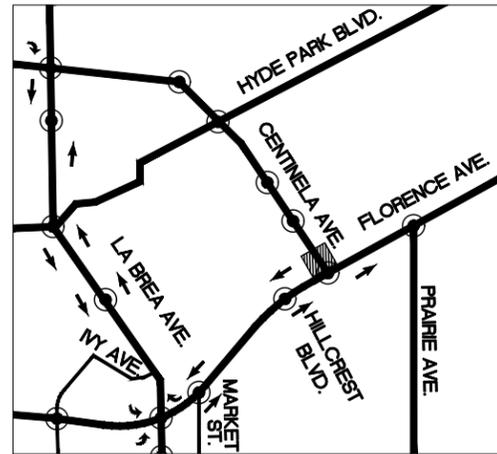
NOTES CONT.

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



|   |  |  |                            |                  |
|---|--|--|----------------------------|------------------|
| <br>V&A INC.<br>975 S. FAIR OAKS AVE.<br>PASADENA, CA 91105<br>213.972.9700 |  |  | CENTINELA GRADE SEPARATION |                  |
|   |  |  | ALTERNATIVE 2              |                  |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  | SCALE: 1"=40'              | DATE: 05-13-2020 |



| LEGEND |                             |
|--------|-----------------------------|
|        | DIRECTION OF TRAVEL         |
|        | EXISTING RETAINING WALL     |
|        | PROPOSED TYPE III BARRICADE |
|        | PROPOSED CONE               |
|        | PROPOSED WORK AREA          |

STAGE 6 (INTERMITTENT 1 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. INSTALL PERMANENT DECKING

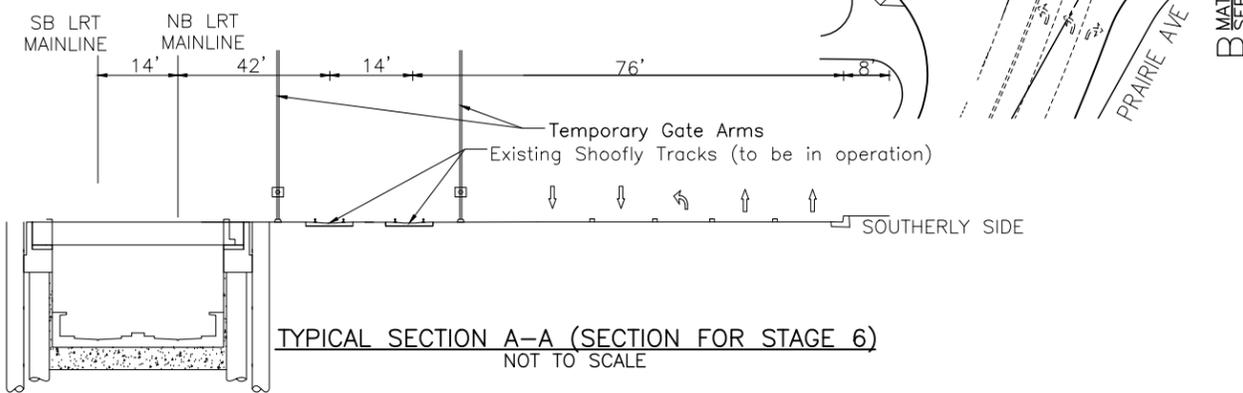
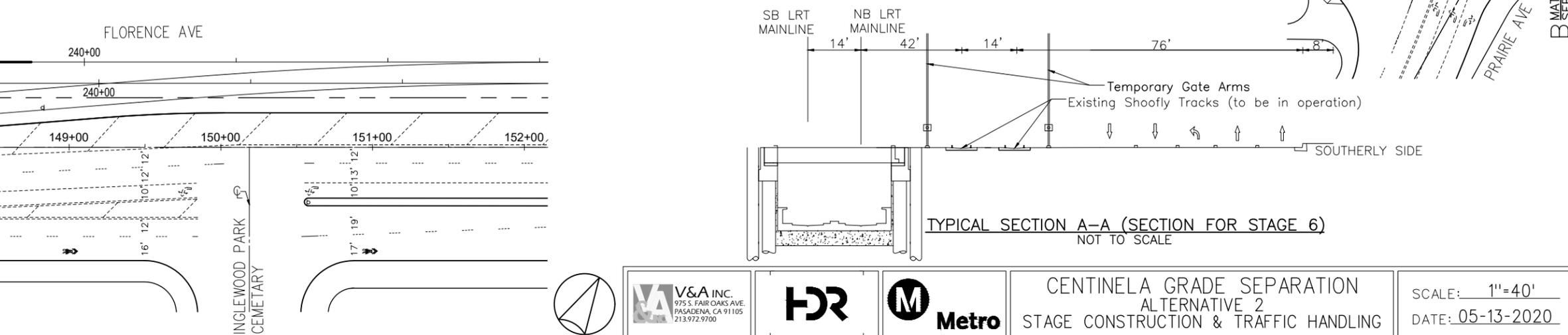
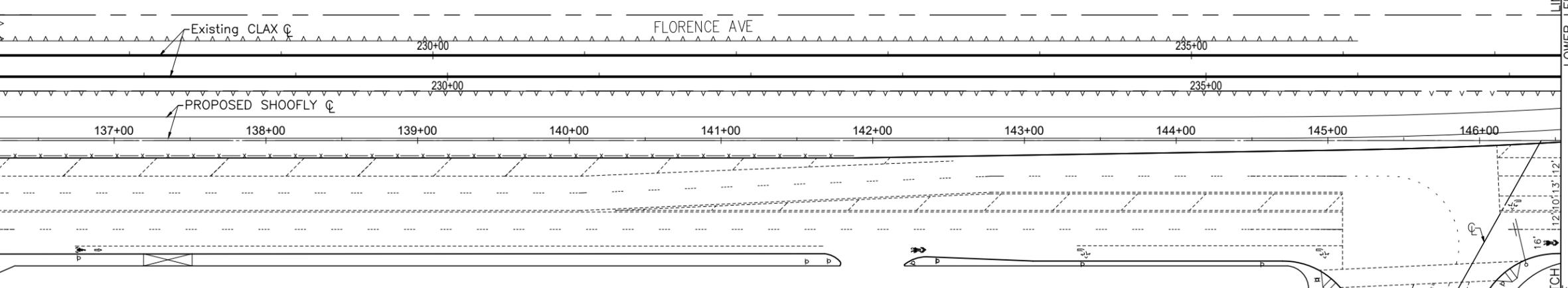
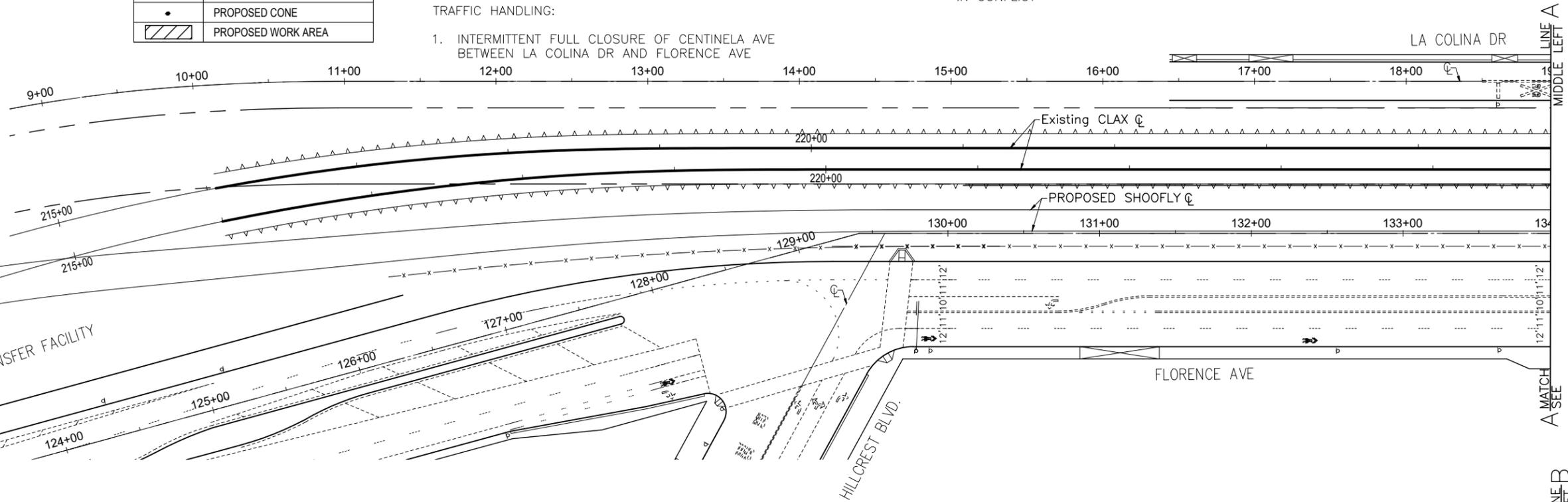
TRAFFIC HANDLING:

1. INTERMITTENT FULL CLOSURE OF CENTINELA AVE BETWEEN LA COLINA DR AND FLORENCE AVE

NOTES CONT.

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$ TIMES  
 \$ FILES  
 \$ PENIBLS  
 \$ PLTDIVLS



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 PASADENA, CA 91105  
 213.972.9700

**CENTINELA GRADE SEPARATION**  
 ALTERNATIVE 2  
 STAGE CONSTRUCTION & TRAFFIC HANDLING

SCALE: 1"=40'  
 DATE: 05-13-2020

STAGE 7 (5 MONTH DURATION):

NOTES CONT.

| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | EXISTING RETAINING WALL |

CONSTRUCTION ACTIVITIES:

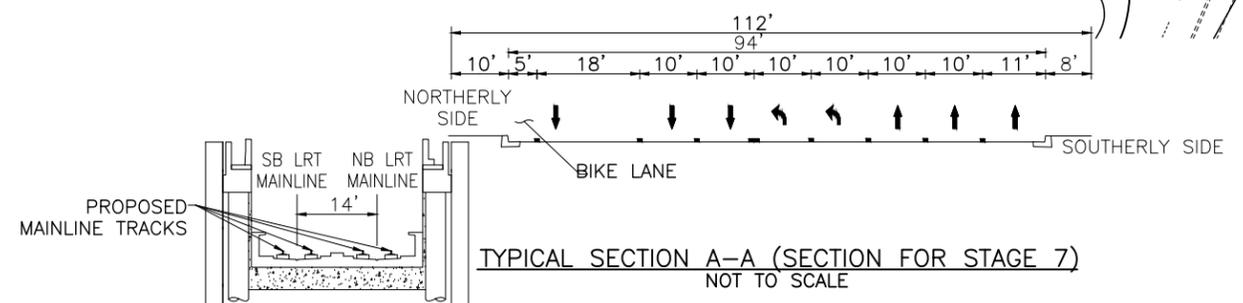
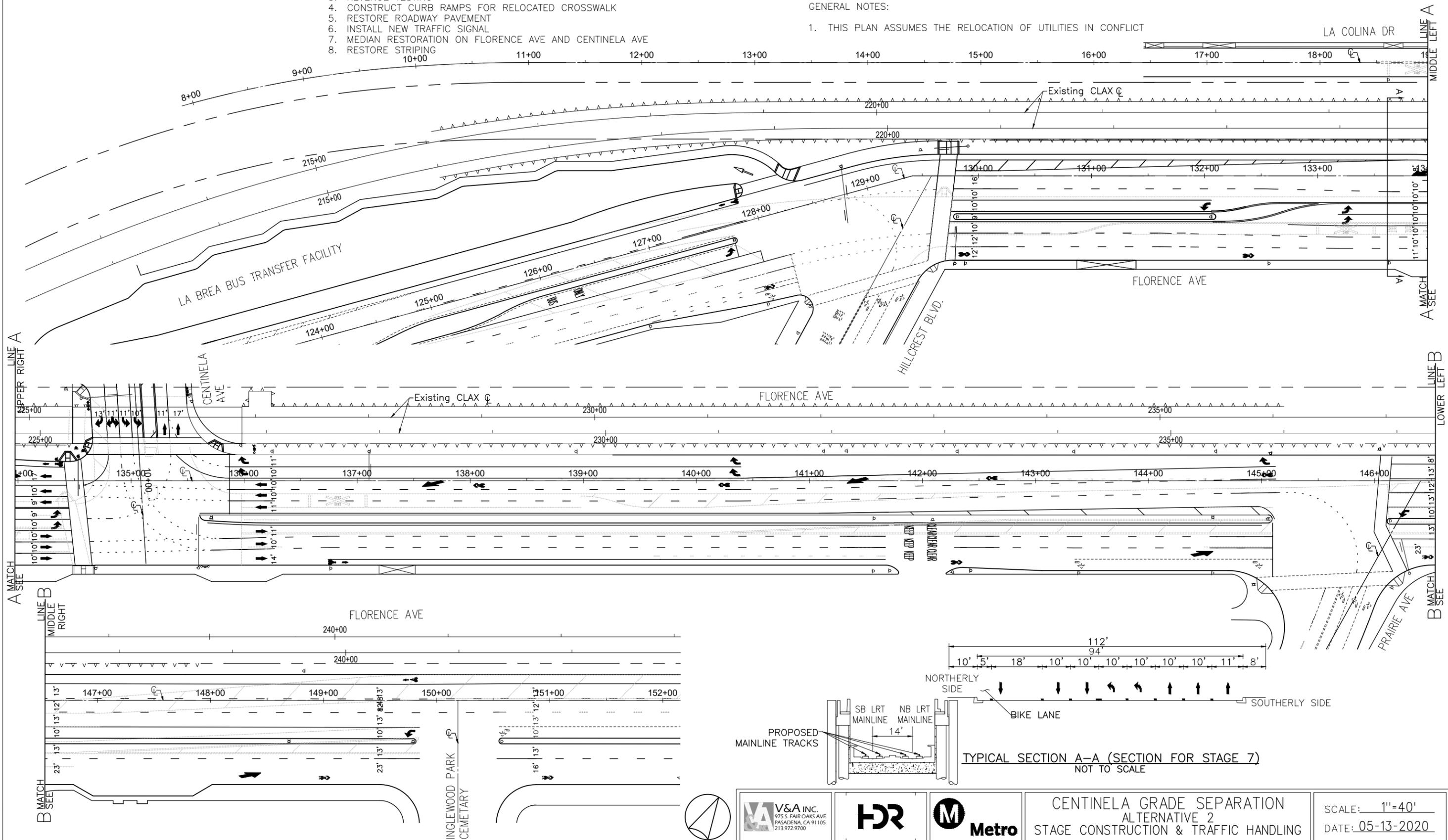
1. CONSTRUCT REMAINING TRACKWORK AND SYSTEMS
2. REMOVE SHOOFLY TRACKS AND SIGNAL EQUIPMENT (TEMPORARY/ SECTIONAL CLOSURES)
3. REVENUE TESTING
4. CONSTRUCT CURB RAMP FOR RELOCATED CROSSWALK
5. RESTORE ROADWAY PAVEMENT
6. INSTALL NEW TRAFFIC SIGNAL
7. MEDIAN RESTORATION ON FLORENCE AVE AND CENTINELA AVE
8. RESTORE STRIPING

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

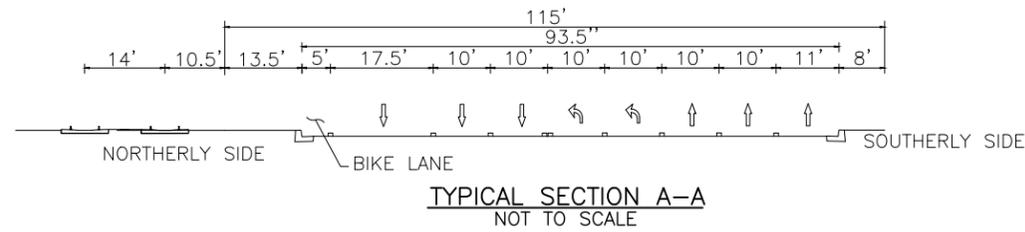
1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$ DATES  
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|---|--|--|----------------------------|--|---------------|
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|   |  |  | ALTERNATIVE 2              |  |               |
| STAGE CONSTRUCTION & TRAFFIC HANDLING                                       |  |  |                            |  |               |

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| LEGEND |                     |
|--------|---------------------|
|        | DIRECTION OF TRAVEL |

STAGE 1 (5 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

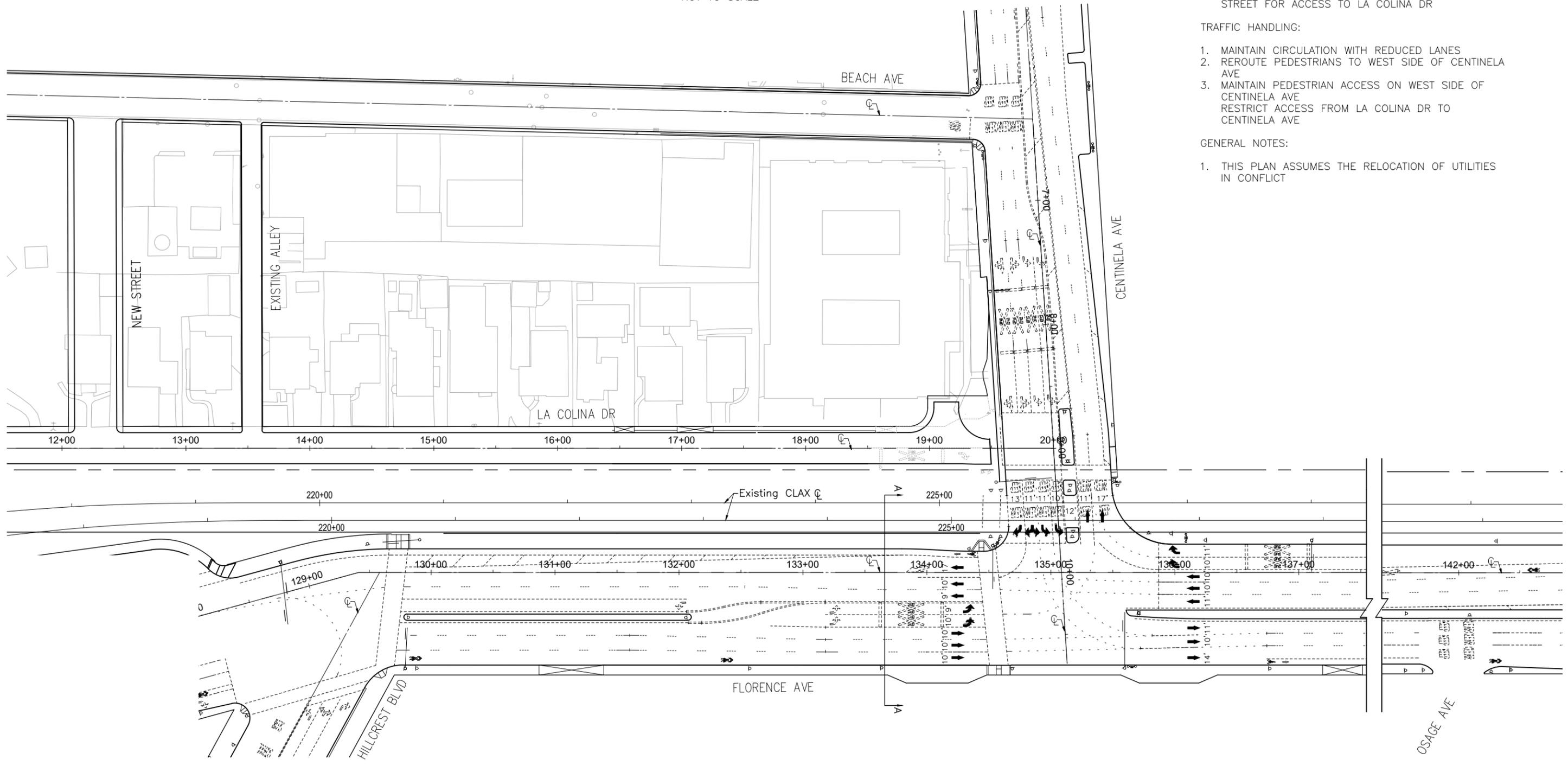
1. CONSTRUCT HAMMERHEAD TURNAROUND AND NEW STREET FOR ACCESS TO LA COLINA DR

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. REROUTE PEDESTRIANS TO WEST SIDE OF CENTINELA AVE
3. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE  
RESTRICT ACCESS FROM LA COLINA DR TO CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$ DATES  
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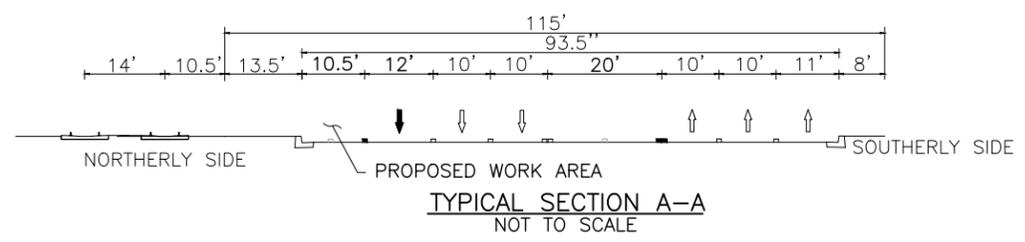


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CENTINELA GRADE SEPARATION  
ALTERNATIVE 3  
STAGE CONSTRUCTION & TRAFFIC HANDLING

SCALE: 1"=40'  
DATE: 05-13-2020



| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | PROPOSED RETAINING WALL |
|        | PROPOSED WORK AREA      |

STAGE 2 (10 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

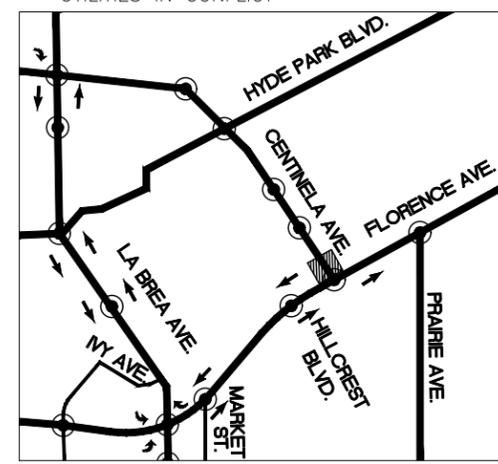
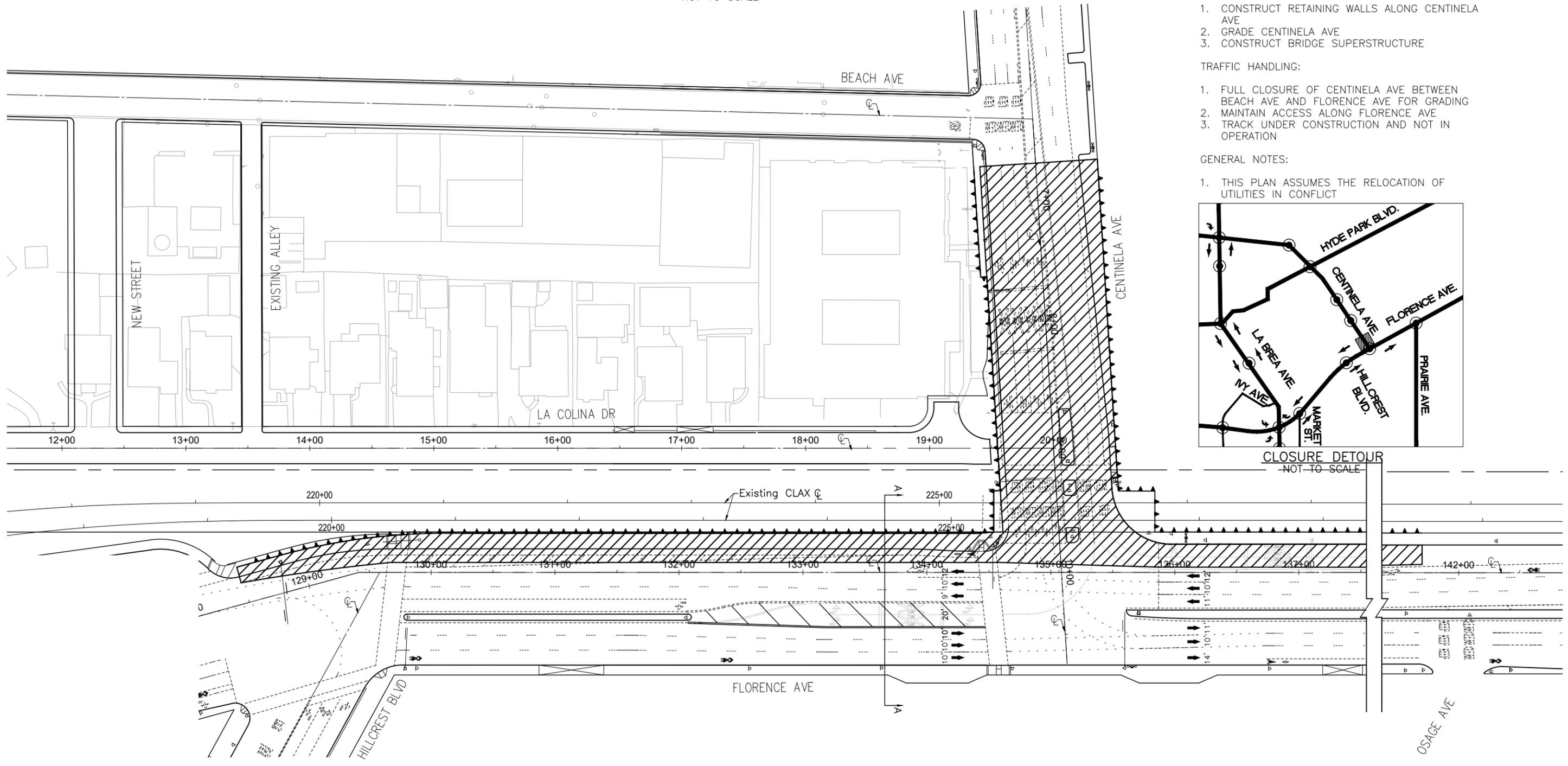
1. CONSTRUCT RETAINING WALLS ALONG CENTINELA AVE
2. GRADE CENTINELA AVE
3. CONSTRUCT BRIDGE SUPERSTRUCTURE

TRAFFIC HANDLING:

1. FULL CLOSURE OF CENTINELA AVE BETWEEN BEACH AVE AND FLORENCE AVE FOR GRADING
2. MAINTAIN ACCESS ALONG FLORENCE AVE
3. TRACK UNDER CONSTRUCTION AND NOT IN OPERATION

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$ TIMES  
 \$ FILES  
 \$ PENALS  
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CENTINELA GRADE SEPARATION  
 ALTERNATIVE 3  
 STAGE CONSTRUCTION & TRAFFIC HANDLING

SCALE: 1"=40'  
 DATE: 05-13-2020

STAGE 3 (12 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

1. GRADE FLORENCE AVE
2. CONSTRUCT RETAINING WALLS ALONG FLORENCE AVE
3. REMOVE GRADE CROSSING PANELS (PREEXISTING CROSSING BY CLAX CONSTRUCTION)
4. CONSTRUCT CURB RAMPS FOR RELOCATED CROSSWALK
5. RESTORE PAVEMENT, SIDEWALK, CURB AND GUTTER ALONG FLORENCE AVE
6. INSTALL NEW TRAFFIC SIGNAL

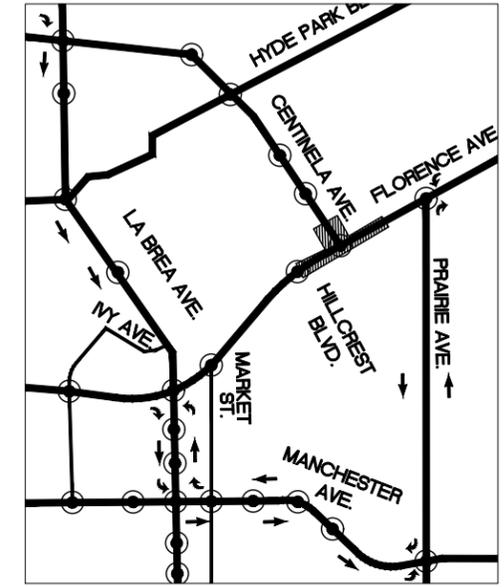
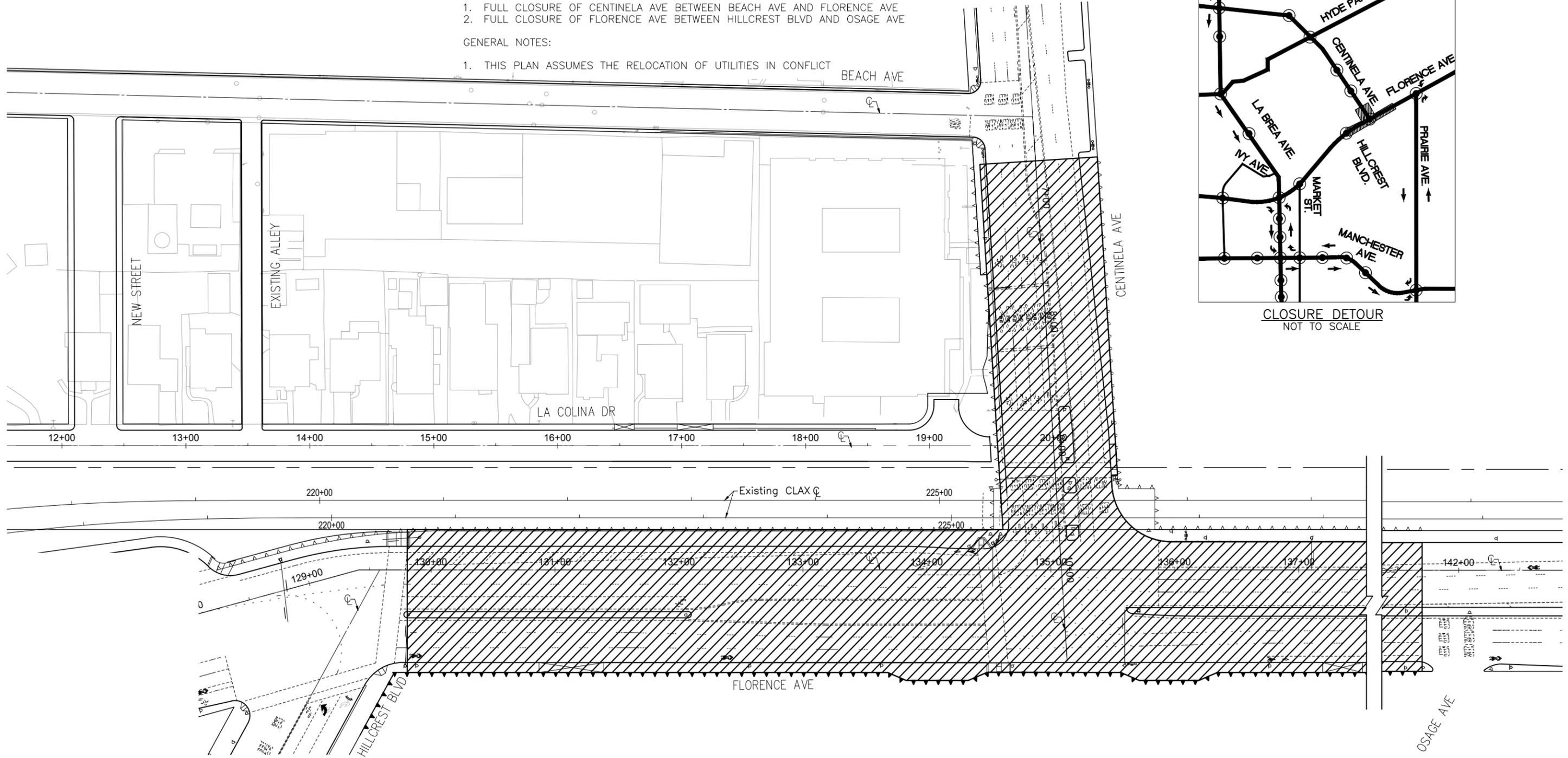
TRAFFIC HANDLING:

1. FULL CLOSURE OF CENTINELA AVE BETWEEN BEACH AVE AND FLORENCE AVE
2. FULL CLOSURE OF FLORENCE AVE BETWEEN HILLCREST BLVD AND OSAGE AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT

| LEGEND  |                         |
|---|-------------------------|
|  | DIRECTION OF TRAVEL     |
|  | PROPOSED RETAINING WALL |
|  | EXISTING RETAINING WALL |
|  | PROPOSED WORK AREA      |



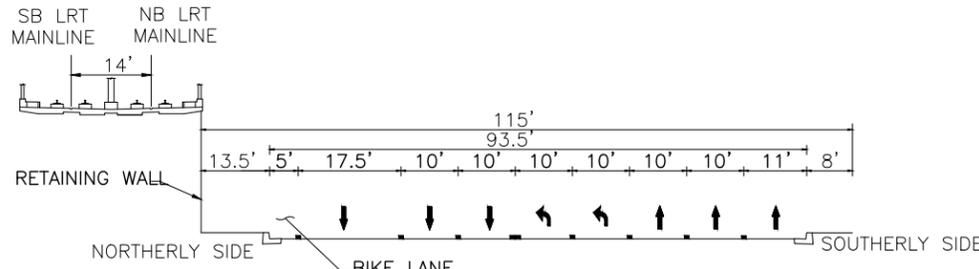
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|--|---|---|

CENTINELA GRADE SEPARATION  
 ALTERNATIVE 3  
 STAGE CONSTRUCTION & TRAFFIC HANDLING

SCALE: 1"=40'  
 DATE: 05-13-2020



| LEGEND |                         |
|--------|-------------------------|
|        | DIRECTION OF TRAVEL     |
|        | EXISTING RETAINING WALL |

STAGE 4 (5 MONTH DURATION):

CONSTRUCTION ACTIVITIES:

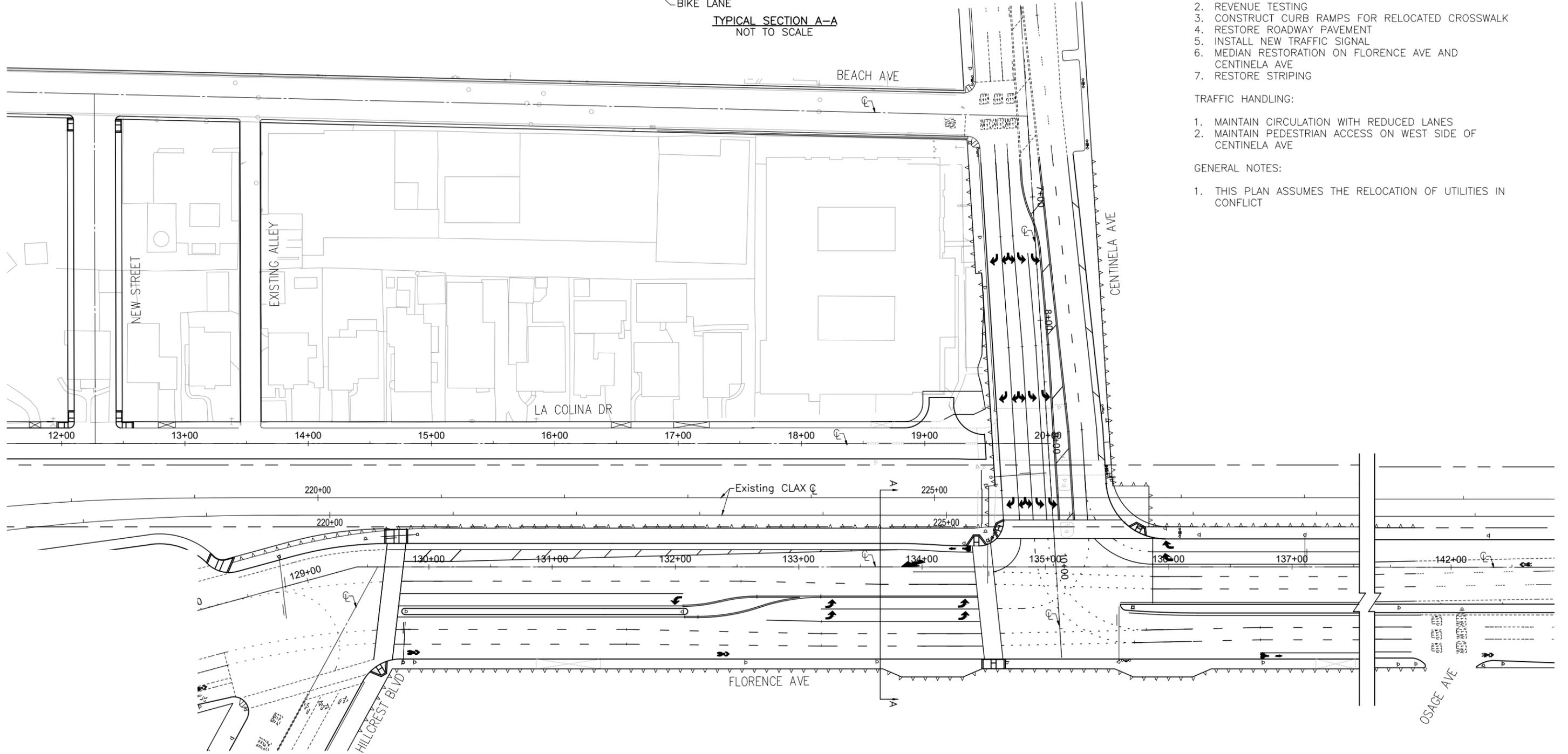
1. CONSTRUCT REMAINING TRACKWORK AND SYSTEMS
2. REVENUE TESTING
3. CONSTRUCT CURB RAMPS FOR RELOCATED CROSSWALK
4. RESTORE ROADWAY PAVEMENT
5. INSTALL NEW TRAFFIC SIGNAL
6. MEDIAN RESTORATION ON FLORENCE AVE AND CENTINELA AVE
7. RESTORE STRIPING

TRAFFIC HANDLING:

1. MAINTAIN CIRCULATION WITH REDUCED LANES
2. MAINTAIN PEDESTRIAN ACCESS ON WEST SIDE OF CENTINELA AVE

GENERAL NOTES:

1. THIS PLAN ASSUMES THE RELOCATION OF UTILITIES IN CONFLICT



\$ TIMES  
 \$ FILES  
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 \$ PLTDRVL \$



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**CENTINELA GRADE SEPARATION  
 ALTERNATIVE 3  
 STAGE CONSTRUCTION & TRAFFIC HANDLING**

SCALE: 1"=40'  
 DATE: 05-13-2020

# ATTACHMENT C



# Centinela Grade Separation

## Project Definition, PE & Funding Strategy



Planning & Programming Committee  
May 20, 2020  
Executive Management Committee  
May 21, 2020  
Legistar File No. 2020-0199



**Metro**

# Recommendation

## Authorize:

- Receiving and Filing the Centinela Grade Separation Screening Analysis/Engineering Study
- Approving Project Definition as an Aerial Grade Separation
- Filing an environmental Statutory Exemption pursuant to CEQA
- Authorizing staff to proceed with Preliminary Engineering with an option for final design services

# Project Background & Study Content

## Board Direction

- Study authorized in December 2018 based on prior Grade Separation/Traffic Study and growth forecasts generated by NFL Stadium and associated other new developments since time of Crenshaw/LAX EIS/EIR in 2011

## Study Elements

- Engineering Design- 15% design evaluated several alternatives with recommendation for LRT Above Grade-Aerial configuration. Cost range of \$185-\$241 million
- Environmental Review- To support the Statutory Exemption; technical studies (Transportation, Air Quality, Visual and Aesthetics, Noise and Vibration etc.)
- Community Outreach- Meetings conducted with adjacent stakeholders. In addition, a project update letter was mailed within an approximate 500 ft radius (5,000 addresses) of the proposed study site to address any initial questions or concerns



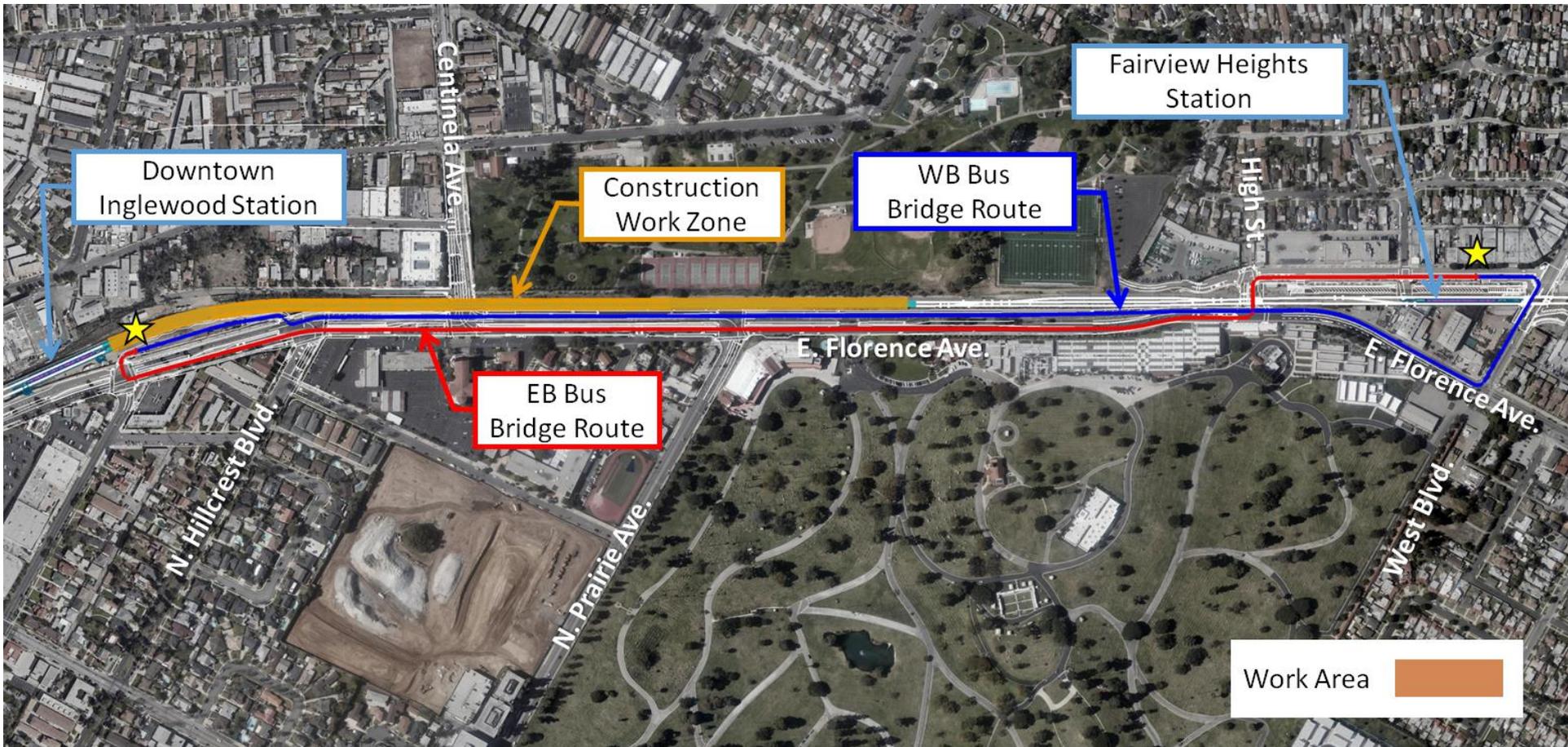
# Project Funding Strategy

## Funding Need

- **Design**- Board approved \$2.2 million in the FY20 budget to initiate design work. Staff is completing 15% design and is working to identify additional funds for inclusion in the proposed FY21 budget to complete Preliminary and Final Design
- **Construction**- Project cost estimates to be refined during Preliminary Engineering (30% design) from the current range of \$185-241million (15% design)
- **Local Funding Contribution**
  - Working with both South Bay Cities COG and City of Inglewood to develop a funding plan for the construction of the project
  - South Bay Cities COG has supported the use of \$130 million from the multi-year Subregional Equity Program (SEP)
  - SEP allocation funding is available in FY2043 per the LRTP Financial Forecast
- Other potential state and federal funding opportunities



# Centinela Grade Separation Construction Staging



# Next Steps/Project Schedule

## Summer/Fall 2020

- Continue design and file the Statutory Exemption
- Continue to work the City of Inglewood and the South Bay Cities Council of Governments to secure construction funding for the project

## Spring/Summer 2021

- Board approval for funding plan and construction
- Construction duration approximately 23 months