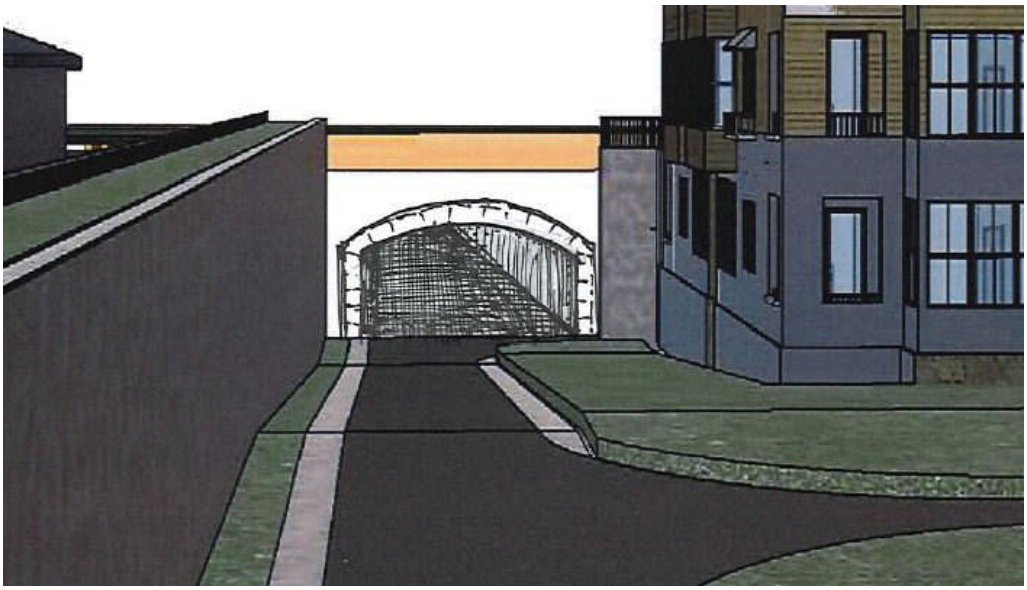
PRELIMINARY FEASIBILITY STUDY

Villa Street to Meridian Way Pedestrian and Bicycle Tunnel

Feasibility Study For Prometheus Real Estate Group



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260 Sheridan Avenue, Suite 150, Palo Alto, CA 94306 • (650) 617-5930 • Fax (650) 617-5932
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EXECUTIVE SUMMARY

This report studies the physical and technical feasibility of constructing a pedestrian and bicycle path and tunnel connecting Villa Street to Meridian Way, Central Expressway and Farley Street in Mountain View, California. The proposed pedestrian and bicycle path and tunnel would pass through the proposed Villa Street development, under the existing rail lines and Central Expressway daylighting onto Meridian Way. The City of Mountain View has expressed a desire to provide a pedestrian and bicycle tunnel to allow for an additional pedestrian and bicycle crossing of Central Expressway in between Rengstorff Avenue and Shoreline Blvd. The bicycle and pedestrian tunnel was stipulated as a required mitigation measure to allow additional for bicycle and pedestrian traffic, unless proven to be technically or physically infeasible. An overcrossing connection was not pursued due to the length of ramps required and lack of right-of-way available to accommodate them.

This report examines at a conceptual level the area's existing condition and the physical and technical feasibility of creating a 20-foot wide, 228-foot long, and eight-foot three-inch high tunnel. The applicable Federal, State, and City standards (Engineering, Fire Marshal, and Municipal Code), Santa Clara County Roads and Airports Department roadway standards, and urban design safety criteria were identified and applied to the project. A conceptual tunnel design was then developed and tested against these criteria. In summary, the tunnel concept is a feasible project that provides improved, safe travel between the Villa Street development and Meridian Way.

Safety has been a key factor in the design of the tunnel and plaza features. Clear sightlines, good lighting, and a direct path for entering and existing the tunnel are key elements incorporated into the overall conceptual design of the project. The 20-foot width of the tunnel creates a sense of openness that reduces the perception of being in a confined space and enhances the feeling of security for users, as well as providing for the shortest connection between the tunnel entrances. The tunnel is to be well lit by a combination of lighting types as well as the natural light available from a glass block skylight inset at the roadway median. Conceptual opening designs for either end of the tunnel confirm that not only is easy access possible from the tunnel to the sidewalk level, but that there are safe and compatible design options that can accommodate pedestrians and bicyclists while harmonizing with the proposed development.

Conflicts with existing utilities are identified in this report. Engineering solutions are available for protection of all of the utilities in the area, which include fiber optic cable, water, and storm drain lines. To allow traffic to flow along the Central Expressway while the tunnel is under construction, a "cut and cover" approach, with reinforced concrete box culvert segments placed into the ground in sequential stages, is the recommended method of construction. This is the same approach that was used to construct the tunnel at the San Antonio Caltrain station, north of the proposed site.

1.0 INTRODUCTION

The developer for the Villa Street development project has retained Hohbach-Lewin, Inc. to determine the feasibility of creating a bicycle and pedestrian path connecting the Villa Street neighborhood, utilizing a new path through the new development, under the rail tracks and Central Expressway, then daylighting along a new path parallel to Meridian Way with the path continuing on to Farley Street (see Figure 1-1 Vicinity Map).

This feasibility study was based on the scope of work document revised May 15, 2018. It reviews the conditions at the proposed tunnel site and potential connections utilizing the proposed development, the identified design criteria for the tunnel design, and the need for fire and emergency personnel accessible stairwells.

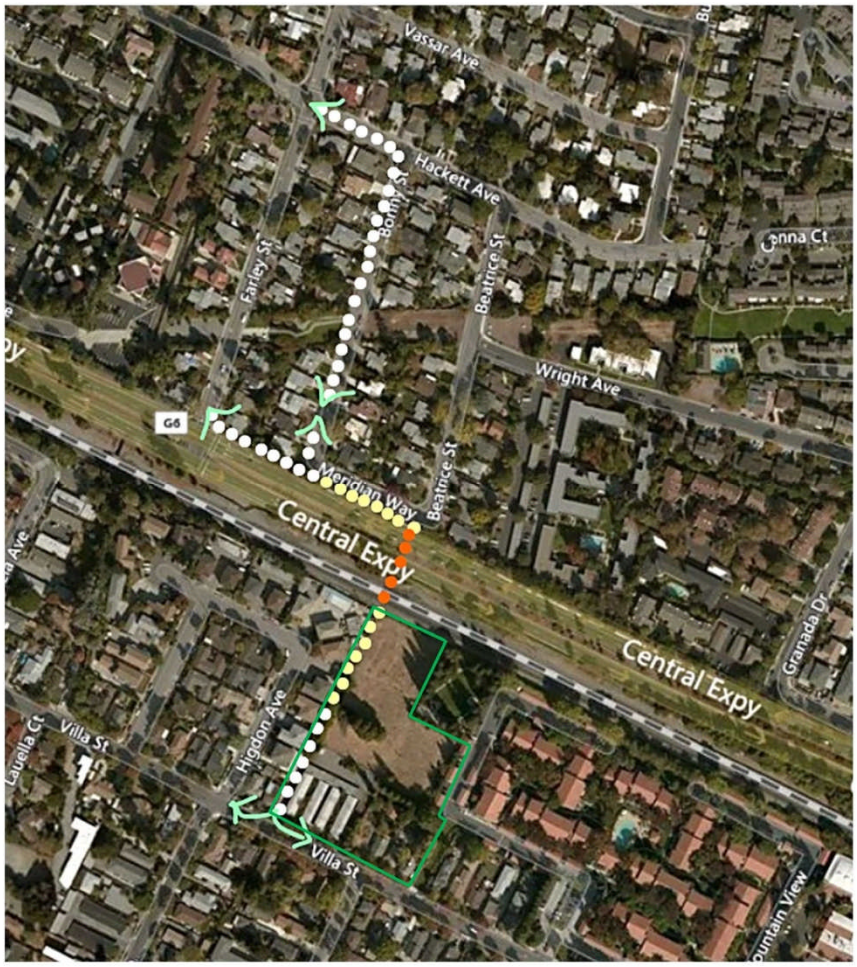


Figure 1-1: Vicinity Map

2.0 EXISTING CONDITIONS

2.1 PROPOSED VILLA STREET DEVELOPMENT SITE, CENTRAL EXPRESSWAY AND MERIDIAN WAY

VILLA STREET DEVELOPMENT SITE

The Villa Street Development is the site of proposed multi-family residential apartments (see Figure 2-1). The site will include a new relatively straight pedestrian and bicycle path that eventually ramps downward and transitions into the new tunnel. The tunnel crosses under the rail tracks and Central Expressway and doglegs approximately 90-degrees to the west, ramping back upwards to grade onto Meridian Way. The pedestrian traffic can travel on to the existing Meridian Way sidewalk or on to the existing Central Expressway sidewalk continuing on to Farley Street. The bicycle traffic can continue in route through the residential streets on to a future bike lane.

Figure 2-1: Proposed Villa Steet Development Site

RAIL TRACKS, JOINT POWERS BOARD (CALTRAIN) RIGHT-OF-WAY

A proposed electrification project which is currently in design – presently at the 40% Construction Document stage has been considered in the conceptual design of the proposed tunnel.

CENTRAL EXPRESSWAY

At Central Expressway near the proposed pedestrian tunnel, the sidewalk only exists along the east side. Adjacent to Meridian, the sidewalk sweeps around numerous trees, power poles and some above ground AT&T utility cabinets (see Figures 2-2, 2-3 and 2-4). The utility cabinets may need to be relocated should the exiting portion of the tunnel come into conflict. Several of the trees will likely need to be removed to accommodate the proposed tunnel. A topographic survey of the area has been performed and has been incorporated into the design and conceptual plans. See conceptual plans in Appendix C.

Figure 2-2: Central Expresseway East Side (facing south)

Figure 2-3: Central Expresseway East Side (facing north)

Figure 2-4: Central Expresseway East Side, Existing AT&T Utility Cabinets

MERIDIAN WAY

Meridian Way is a small street segment in a residential neighborhood that connects Beatrice Street and Bonny Street (see Figure 2-6). It includes only two side yards for two homes on its south side and runs as a frontage road parallel with Central Expressway separated by an ivy lined chain link fence (see Figure 2-5). Meridian Way is located between Rengstorff Avenue and South Shoreline Boulevard. A topographic survey of the area has been completed and has been incorporated in the conceptual plans in Appendix C.

Figure 2-5: Meridian Way looking West

Figure 2-6: Aerial of Meridian Way

2.2 DEVELOPMENT OF SUBTERRANEAN CROSSING

The City of Mountain View has expressed a desire to provide a pedestrian and bicycle tunnel to enhance pedestrian safety and minimize potential conflicts with the approximately 30,000 vehicles daily on the Central Expressway. One way to achieve the goals of pedestrian access between the surrounding communities is by means of a pedestrian and bicycle tunnel. The tunnel would run beneath the rail tracks and Central Expressway and directly connect a future pathway from Villa Street development to Meridian Way.

2.3 GEOTECHNICAL AND GROUNDWATER ISSUES

A Geotechnical Assessment Report prepared by TRC, Inc. dated July 29, 2015 contains data and conclusions prepared for the proposed new Villa Street development. It was used here to provide general geotechnical recommendations for the preliminary design of the proposed pedestrian tunnel foundations, retaining walls, cuts, and embankments; and to identify geotechnical issues, such as foundation settlement and stability, seismic impacts, soil liquefaction, and high groundwater table that may impact the design and construction of the structures. According to this report, groundwater occurs from 18 to 20 feet below existing grade across the Villa Street development site. An additional study will be needed to ascertain the level and quality of groundwater at the tunnel site. If contaminants are present, this may affect the feasibility of pumping groundwater directly to the storm drain system.

2.4 EXISTING UTILITIES

A site topographic survey was provided for the site of the proposed Villa Street development prepared by Kier & Wright on September 2016. Those plans indicate grades and existing utilities at and near the development site. Other information was gathered from available City and County records and information. A topographic

survey of the area of the proposed tunnel and associated path was performed by Dains Land Surveying. All utility locations will still be located by the appropriate regional notification center, such as Underground Service Alert (USA), and verified (potholed) in the field after obtaining an encroachment permit from Santa Clara County Roads and Airports Department. This activity is not included in the scope of this draft of the study and will be performed in a subsequent phase of the study. According to Santa Clara County utility maps, research and site observations and confirmed by site topographic survey, an existing 16-inch PCCP (prestressed concrete cylinder pipe) water main is located near the center of the east bound lanes of Central Expressway in addition to a 6" Lateral that provides water to the Meridian Way side neighborhood. Also, within county right-of-way on Central Expressway is an existing 36" RCP storm drain line that runs along the south side of the east bound lanes as well as a 30" RCP storm drain line along the north side of the west bound lanes of Central Expressway passing underneath the existing sidewalk. The existing 36" RCP storm drain line is located with approximately 2.6 feet of cover and is at a distance of 7.2 feet to the bottom of the pipe from existing roadway grade. The existing 30" RCP storm drain line is down approximately 5.8 feet to the top of pipe and 9.5 feet to the bottom of pipe from existing grade. Multiple fiber and communication lines owned by Cablecom, Verizon, AT&T and Zayo are known to exist within Central Expressway. AT&T underground telephone conduit are also assumed to be located along the east-bound side of Central Expressway as evident by the existing manholes discovered along the roadway. Information as to their horizontal and vertical positions were requested from the various utility companies listed above. Utility maps were received showing the existing fiber utility lines, which provides schematic horizontal locations but do not indicate vertical depths. Extensive potholing will need to be conducted in order to confirm locations of the existing fiber and communication lines.

3.0 DESIGN CRITERIA

The design criteria from agencies with jurisdiction over the proposed Villa Street to Meridian Way Tunnel Project have been reviewed to provide a basis for the engineering and urban design of the proposed tunnel alternatives. Design criteria for the tunnel include adherence to the following standards and codes:

A. Engineering Standards of the Santa Clara County Roads and Airports Department, Caltrain, Caltrans, American Associations of State Highway and Transportation Officials (AASHTO), and Americans with Disabilities Act Accessibility Guidelines (ADAAG) shall be conformed to in design. The design of the pedestrian tunnel shall conform to the Caltrain Design Criteria, *Standards for Design and Maintenance of Structures, Chapter 5: Pedestrian Underpass*; California Department of Transportation (Caltrans) Bridge Design Specifications (BDS). Provisions in the following documents shall also be considered as guidelines when sufficient criteria are not provided by BDS:
   1. 2002 Interim American Associations of State Highway and Transportation Officials (AASHTO), LRFD Bridge Design Specifications, 8th edition, 2017.
   2. American Concrete Institute (ACI) Building Code Requirements for Structural Concrete (ACI 318-02) and Commentary (ACI 318R-02), Farmington Hills, Michigan, 2002.
   3. Section 1003.1, *Class I Bikeways (Bike Paths)*, Chapter 1000, Caltrans Highway Design Manual (HDM) 6th Edition, 2017
   4. Caltrans Bridge Memo to Designers, California Department of Transportation, Sacramento, California, 1998, as updated.
   5. Caltrans Bridge Design Aids Manual, California Department of Transportation, Sacramento, California, 1995.

B. City of Mountain View Municipal Codes and Standards
C. Urban Design Criteria for Safety, Community Design + Architecture, Inc. (See Appendix A)
D. Peninsula Corridor Joint Powers Board, Caltrain Design Criteria 2011

3.1 ENGINEERING STANDARDS

TUNNEL DESIGN CRITERIA AND PARAMETERS

Vertical Clearance

According to the Santa Clara Roads and Airports Division, the required minimum roadway depth between the top of pavement and the top of a tunnel structure is 12 inches. *Chapter 5: Pedestrian Underpass* from the Joint Powers Boards (Caltrain) *Standards for Design and Maintenance of Structures* requires a clearance of 3 feet from the bottom of the tie to the top of the pedestrian underpass. The minimum tunnel vertical clearance is eight feet (HDM, Chapter 1000, Topic 1003), although the City of Mountain View has requested a greater vertical clearance, if feasible. For present engineering purposes, the minimum tunnel vertical clearance is assumed to be eight feet three inches.

Horizontal Clearance

The City of Mountain View prefers a 20-foot width for the new connecting pedestrian and bicycle tunnel under the Central Expressway. This tunnel width could allow for a clear separation of bicyclists and pedestrians in the new tunnel. The tunnel is connected on both ends by a 10-foot wide path with 2-foot wide shoulders per Caltrans Class I Bike Path standards (HDM, Chapter 1000, Section 1003.1)

Minimum bike lane width in Mountain View is five feet. Minimum sidewalk width is four feet per ADA requirements; however, five feet is the Mountain View standard for monolithic and separated sidewalks.

Loads and Load Combinations (Load Factor Design Only)

1.5D+1.5E+2.5(L+I)

a. (D) Dead Loads – 150 pcf concrete weight, 140 pcf soil weight
b. (L) Live Loads – HS20-44 Truck Loads
c. (E) Earth Pressure Loads – 42 pcf and 140 pcf
d. (I) Impact Loads – varies from 0 to 30 percent

The tunnel top slab depth will be established by the structural design requirements. For initial engineering purposes, the assumed minimum top slab dimension is 12 inches. If the final tunnel span is less than 20 feet, a thinner top slab may be considered.

ACCEPTABLE GRADES

Per AASHTO standards, sidewalk and other walkways that incorporate pedestrian access routes shall be designed with maximum grades of 5 percent and maximum cross slope of 2 percent. Per ADAAG 4.8.1, any part of an accessible route with slope greater than 1:20 shall be considered a ramp.

ADA REQUIREMENTS
All ADA requirements shall be per AASHTO standards, the latest version of the Caltrans Highway Design Manual, and ADA Accessibility Guidelines.

RAMPS

Per ADAAG, Section 4.8, accessible ramps shall be designed with maximum running slopes of 1:12 (8.33%), maximum horizontal projection of 30 feet, maximum elevation change of 30 inches, and with minimum 5 feet of landing with maximum slope of 1:48 (2.08%). The ramps should also include handrails, and shall comply with all other requirements of section 4.8.

SIDEWALKS

While the City of Mountain View requires a five-foot standard width for monolithic and separated sidewalks, the Santa Clara County Roads and Airports Department of Santa Clara requires a four-foot six-inch minimum sidewalk width adjacent to multi-family dwelling units, with a maximum 2 percent side slope. ADA requires only a four-foot sidewalk width.

3.2 FIRE MARSHAL STANDARDS

SEC.14.2.5. Chapter 5, Section 503.2, Fire Apparatus Access Roads, amended. Section 503.2.1 of the California Fire Code was amended to read as follows:
503.2.1. Dimensions. Fire apparatus access roads shall have an unobstructed width of not less than twenty (20) feet (6,096 mm) and an unobstructed vertical clearance of not less than 13 feet 6 inches (4,115 mm).

The City of Mountain View's Fire Department Standards for the Emergency Vehicle Access (EVA) required for the Meridian Way and Villa Street sides near the proposed tunnel area as follows:

- Adequate truck and ladder rescue response to the both the Villa Street development and Meridian Way sides of the proposed tunnel
- A 20-foot clear paved width for the EVA
- Accommodation of hose lines that can only run 150 feet from a hydrant
- Adequate through ways and turn-arounds for the EVA: dead-ends are not acceptable

- Collapsible bollards (the knock-down kind) can be permitted
- Pavement should be designed for 70,000 lb vehicular loads (concrete is acceptable)
- Current turning radii is 21 feet to the inside and 5 feet to the outside
- Adequate turning radius for a gurney to get down the ramp to the tunnel for emergency purposes.

3.3 CITY OF MOUNTAIN VIEW MUNICIPAL CODE REGULATIONS

HERITAGE TREES

City of Mountain View Municipal Code: SEC. A36.32.100. Removal of Trees. Removal of healthy, shade providing, aesthetically valuable trees of any size is discouraged "Heritage Trees," as defined, shall generally be retained according to the provisions of the City Code; and the removal of street trees of any type shall only occur in compliance with City Code regarding Issuance of Permits; Conditions; Term. (Ord. No. 8.02, 5/28/02.)

LANDSCAPING

The Villa Street development landscaping areas along the bicycle and pedestrian path will be by designed by the project landscape architect.

3.4 URBAN DESIGN CRITERIA FOR SAFETY

This section of the Design Criteria provides design considerations and guidelines for the urban design aspects and physical characteristics of underground passages. It addresses a broad range of safety concerns associated with pedestrian and bicycle underpasses as well as solutions for reducing the opportunities for crime and vandalism and raise the level of personal safety for users of underground passages.

Underground walkways enable cyclists and pedestrians to cross wide roads with high traffic volumes - such as Central Expressway, more safely by eliminating conflicts with moving vehicles. However, the portions of underpasses that are visually disconnected from street level can create opportunities for personal crimes, such as assault and robbery. Such conditions also provide opportunities for vandalism of the underground passage itself, including graffiti, damaging of light fixtures and other design elements. Another aspect of pedestrian underpasses that can create safety concerns is the predictable travel route they cause users to take. At street level, on the other hand, a potential assault or robbery victim can escape in many directions. Though, underground passages can also, at times, deter some criminal activity because of the limited escape routes available to an offender.

GENERAL DESIGN FOR SAFETY

- As a general rule of thumb, underpasses should be as wide as possible so that users feel less confined. The more open and spacious the tunnel feels, the greater the perception (and potentially the reality) of safety.
- If underpasses are intended for use by both cyclists and pedestrians, enough width has to be provided to safely accommodate simultaneous use for both modes. Ramps leading to the underground passage should also be designed to accommodate both pedestrian and bicycle movement. Eight feet (8') clear width should be considered the minimum for such ramps.
- Whenever possible, underpasses should have clear sight lines so that pedestrians are able to see from one end of the tunnel to the other while they are still in a location where they have multiple choices to move away from the tunnel should they feel unsafe. Spacious tunnels with clear sightlines will encourage people to use them, making users more likely to choose the below grade crossing rather than risk crossing a heavily traveled road at grade level.

- In the entrance areas of underpasses and within the tunnel itself, recessed surfaces and other potential hiding areas should be avoided.
- If pedestrians must take turns of more than 60 degrees, either within the tunnel or along a stairwell/ramp, an angled full-length mirror should be placed so that pedestrians can see the area obstructed from direct view.
- With the design of the underpass plazas, efforts should be made to maintain visibility of as many plaza areas as possible from adjacent at-grade pedestrian areas and passing cars on the street. This increases the levels of casual surveillance and deters crime. Maximizing visibility from the street also increases the ability for police and other public safety personnel to patrol the area by car.
- Providing alternate exit routes within a plaza increases the opportunities for a potential crime victim to evade assault or robbery, and can thus reduce the risk of such crimes to occur in the first place. A predictable route, like that through an underpass, can be made safer by providing additional exits along the tunnel route.
- Stairs and ramps should be visible from within the tunnel portion of the underground passage whenever possible to provide visual clues to the location of exit routes.

ADJACENT USES

Adjacent buildings of the development and open spaces should be designed to allow for "casual surveillance" and multiple sightlines into the underpass. Adjacent buildings should be designed with windows and patios that have views onto the underpass entrances. The sense of being observed can deter potential offenders from committing crimes.

SIGNS

Signs should be provided at strategic locations to indicate which streets and key uses (e.g., Villa Street, Meridian Way and Central Expressway) that the stairs and ramps lead to, or if any alternate route is available.

PEDESTRIAN/BICYCLE MOVEMENT

In order to avoid potential conflicts between pedestrians and bicyclists within the underpass, different paving patterns and colors can be used to demarcate separate bicycle and pedestrian zones. This approach is used in the Palo Alto pedestrian and bicycle tunnel, shown in the Lighting Section, below. The City of Mountain View recommends installing "Walk your Bike" signs along the walks, ramps and within the tunnel.

MAINTENANCE

A well maintained underpass facility enhances the sense of safety and community ownership and can reduce or mitigate incidents of littering, graffiti, and vandalism. The underpass and all associates facilities should therefore be maintained regularly. This should include all planting areas, irrigation components, light fixtures, and concrete walls and surfaces. The regular presence of landscape/maintenance staff at the site provides additional security presence.
All underpass elements should be subject to the City of Mountain View policy to remove graffiti within 24 hours. If exposed concrete walls are used in the underpass and connecting paths and ramps, they should be treated so that graffiti can quickly be removed or painted over. The quick removal or cleanup of graffiti has proven in many communities to reduce the reoccurrence of graffiti.

LANDSCAPING

Landscaping should be designed to minimize the obstruction of sightlines between adjacent buildings, sidewalks, streets and underpass entrances. Trees with branched up tree trunks and low growing groundcover

are preferable to trees with low crowns and large, dense shrubs, which can obstruct view lines and create potential hiding places. Overgrown landscaping should be trimmed to minimize hiding spaces.

LIGHTING

The design of underpasses should seek to maximize the opportunities for natural light to penetrate into underpass spaces. Well-lit tunnels are perceived as being safer. Whenever possible, natural light should be allowed to penetrate into the underpass through skylights (i.e., a skylight could potentially be located in the existing median of Central Expressway above proposed tunnel) to provide a connection between the tunnel and the area above it as an additional light source. See Figures 3-1 and 3-2 below. It is preferable to use multiple sources of light rather than just a few large fixtures to provide consistent lighting levels and to reduce the contrast between shadow and light, which will help to provide for a more continuous visibility for users. The tunnel walls should be painted a light color as opposed to a dark or mid-tone color to maximize reflectivity and the distribution of light throughout the tunnel. The tunnel ceiling should be painted in the lightest color used within the tunnel to reduce the sense of enclosure. See Figure 3-3 below. Light should be designed not only to illuminate, but also to aesthetically enhance the underpass. This increases the appearance of the area as a well-cared for facility. This can be achieved through decorative lighting fixtures, lighting effects or a combination of the two. See Figure 3-4 below.

Figure 3-1: Skylight, Stevens Creek Trail tunnel under El Camino Real, Mountain View

Figure 3-2: Skylight visible at surface of road way median, Stevens Creek Trail tunnel at El Camino Real, Mountain View

Figure 3-3: Lighting and wall and ceiling colors, Stevens Creek Trail tunnel under El Camino Real, Mountain View

The Palo Alto Pedestrian and Bike Tunnel on Homer Avenue, is an excellent example of a well-lit tunnel. Indirect, continuous up lighting along the ceiling edges provides ambient light free of glare and creates a sense of openness.

Figure 3-4: Lighting Example
The sconce-like accent looks pleasing to the eye, provides rhythm and articulation of the tunnel's side walls, as well as a sense of progress to those who travel through the space.

Unshielded lighting should be avoided, as eye-level light sources can produce a blinding glare that reduces visibility for users of the tunnel and associated walks and ramps, and to protect adjacent properties from potential lighting impacts. Light fixtures should be placed where they will not eventually be blocked by maturing vegetation and lighting should be regularly maintained and lamps replaced. High-mounted, downward or upward deflecting lights are preferred. All pathways, potential hiding spots, and signs should be well lit. It is important that all lights should be vandal resistant, as a lighting system that is functioning at all times, is one of the most important safety features of a well-designed underpass.

For underpasses, facial recognition and security considerations should be of primary concern because of the limited options for retreat from a hostile individual. The underpasses should be lit so as to be able to see a face from about 30 feet. Recommended lighting values for a pedestrian underpass are listed in Table 1.

Table 1: Maintained Illuminance Values for Walkways and Bikeways

	E_H lux/fc	E_{ymin} lux/fc	Eavg/Emin *
Day	100.0/10.0	50.0/5.0	3.0
Night	40.0/4.0	20.0/2.0	3.0

* Horizontal Only

E_H = Average horizontal illumination at walkway/bikeway

E_{ymin} = Minimum vertical illumination at 1.5 m (4.9 ft.) above walkway/bikeway measured in both directions parallel to the main pedestrian flow

Source: the American National Standard Practice for Roadway Lighting, June 27, 2000.

EMERGENCY ACCESS

If space provides, all underpasses should include stairways and ramps that allow emergency personnel easy access to all lower portions of entrance areas and the tunnel itself. Landings located where sharp ramp direction changes occur should be sized to accommodate the turning radius of a gurney.

SURVEILLANCE, PHONE, AND ALARM SYSTEMS

The proposed tunnel project and associated walks and ramps need to be designed to maintain visibility for nearby patrolling police officers or for security personnel on site at the Villa Street development. Lighting, as discussed in the previous section, is also vitally important. The advent of mobile phones has offered a greater degree of safety and access to assistance than was formerly available to most people. The combination of mobile phone availability and the likelihood that surveillance devices, call boxes, or alarm systems will be falsely triggered, vandalized, or otherwise rendered inoperative, suggest that these installed devices do not need to be used in this project.

3.5 PENINSULA CORRIDOR JOINT POWERS BOARD/CALTRAIN

The Peninsula Corridor Joint Powers Board (JPB) has adopted a new set of design criteria (2011) that will be applied to the project where required. The present conceptual design proposal will require reconstruction of the portion of the tracks within the proposed tunnel alignment. An encroachment permit for the tunnel construction and any temporary installations or access to the right-of-way will be required. Flagging services will be required as work will occur across the rail lines.

4.0 PROPOSED TUNNEL DESIGN AND CONSTRUCTION SCHEME

4.1 TUNNEL PLANNING CONTEXT

One 220-foot long by 20-foot wide pedestrian and bicycle tunnel is proposed for crossing under Central Expressway connecting the Villa Street development and Meridian Way. A tunnel entrance has been placed at the northeast corner of the proposed Villa Street Development and the other along Meridian Way near Central Expressway. The orientation of the tunnel was established to provide a straight sightline from the Villa Street Development to the Meridian Way side. This tunnel orientation offers a clear sightline through the tunnel into most of the ramps beyond. Clear sightlines, directing openings, and good lighting are all critical elements and part of the set of safety design guidelines that have inspired the overall conceptual design of the tunnel (and associated ramps and stairwells). The accessible design of these spaces enhances the feeling of security for users and provides the shortest connection between the tunnel entrances. The tunnel is to be well lit by a combination of lighting types as well as the natural light available from a glass block skylight inset at the Central Expressway median.

4.2 VILLA STREET CONNECTION AND DEVELOPMENT SIDE OPENING

As space is limited, the Villa Street development entrance is a purely functional, minimalist approach to the tunnel opening (see C1.0 and C2.1, Appendix C). A direct 10-foot wide pedestrian and bicycle path with 2-foot shoulders on either side connects the existing public sidewalk on both sides of Villa Street to the tunnel and provides access for the surrounding neighborhood. A portion of the path (200 feet) ramps down to the elevation of the tunnel entrance. This portion of the path will be constructed during the proposed development construction phase to minimize any impact to the development. A retaining wall along the west and north property line will be constructed to allow the path to be constructed up to and including the "hammerhead" turnaround. A number of existing trees will need to be removed along the west property line prior to construction of path and associated retaining wall. An existing PG&E power junction pole will need to be relocated as well at the northwest corner of the property. Proposed trees have been limited to landscape areas outside of the remaining proposed path alignment to allow for constructability when the final connection to the tunnel is made at a later date. To further minimize impact to the development, construction staging will take place on Meridian Way as shown in the Conceptual Staging Plans (see ST1.0, Appendix C). Exiting path at the northwest corner of the development shall be maintained during construction of the final connection of the path by means of a temporary exiting path adjacent to the construction.

4.3 MERIDIAN WAY OPENING

Several design iterations of the Meridian Way opening were analyzed for the ramp connection at this end of the tunnel and two options were presented to the city but ultimately one option was decided to be most feasible per the existing constraints (see C2.2 and C2.3, Appendix C). The Meridian Way ramp employs a straight, continuous ramp run at 90 degrees from the Meridian Way end of the tunnel. A switch-back stairwell provides an alternative entry or exit route for non-accessible users and emergency personnel. This option minimizes disturbance to the existing Central Expressway roadway, sidewalk, power poles, electrical cabinets, utilities, and trees. This option also provides connections to the existing dead-ended sidewalks that currently terminate at the south ends of Bonny and Beatrice Streets. In addition to a generous ramp that has been designed to accommodate not only graduated travel for those that desire or need it, this option also provides easy and rapid access for emergency personnel to the tunnel. This option will, however, require that a portion of the Meridian Way street width be used to accommodate the proposed ramp width. Still, 25 feet clear width of travel way remains for two-way traffic.

4.5 TUNNEL STRUCTURAL ENGINEERING DESIGN

The structural design shape for the tunnel is a box section with 12 inch top and bottom slabs and walls. The corners of the box are parabolic curves that are strengthened by reinforced steel to withstand loading pressure from all sides. A typical cross section is shown on S1.0 in Appendix C. Spot elevations and slope for the tunnel are shown in profile view. See C2.2 and C2.3, Appendix C.

4.6 GEOTECHNICAL AND GROUNDWATER ISSUES

For conceptual design of the tunnel, no further specific geotechnical investigations have been performed and the conceptual structural design is based on presently available information. Should the design proceed further into development, additional studies would be needed within the Central Expressway right-of-way to definitively determine groundwater levels and potential additional design requirements, parameters and recommendations. At the minimum, a study will be needed to ascertain the level and quality of groundwater at the tunnel site. If contaminants are present, this may affect the design and feasibility of pumping groundwater directly into the storm drain system. Soil borings may need to be completed, depending on the history of the site.

4.7 UTILITY IMPACTS

The proposed walk from Villa Street to the ramp leading down to the tunnel will conflict with an existing onsite power pole and transformer vault. See C2.1, Appendix C. These will need to be relocated and should be coordinated with PG&E. The proposed tunnel ramp on the Meridian Way side may conflict with three existing AT&T cabinets located behind the existing sidewalk along Central Expressway due to their proximity to the proposed tunnel alignment. See C2.2 and SH1.1, Appendix C. During the construction of the proposed tunnel crossing Central Expressway, the existing 16-inch PCCP (prestressed concrete cylinder pipe) water main located near the center of the east bound lanes (see C2.2 and SH1.2), the existing 6" PVC just south of the median (see C2.2 and SH1.0), the existing 12" RCP and 36" RCP storm drain lines that run along the south side of the east bound lanes (see C2.2 and SH1.2), the 30" RCP storm drain line along the north side of the west bound lanes of Central Expressway (see C2.2 and SH1.1), an existing sanitary sewer manhole near the intersection of Beatrice Street and Meridian Way (see C2.2 and SH1.1), as well as the multitude of existing fiber and communications lines owned by Cablecom, Verizon, AT&T, Zayo will need to be protected in place and shored during the cut-and-cover construction process.

4.8 CONSTRUCTION METHODS AND STAGING

Due to the parameters of the proposed tunnel, such as depth, cross section, and span, the most economically feasible construction method is the "cut and cover" approach. This involves shoring and excavating incremental sections and placing individual segments of pre-cast reinforced concrete box culvert into the ground at appropriate stage. See Section 5.0 for more information. This is the also the method that was used to construct the San Antonio Caltrain station pedestrian tunnel north of the project site. See photos in Figure 4-2 below.

Figure 4-2: Construction Stages of the San Antonio Caltrain Pedestrian and Bicycle Underpass

Construction of the tunnel will require a specific staging strategy to accommodate the high levels of traffic on Central Expressway. Average daily traffic (ADT), according to monitoring of the Central Expressway near this area (Dowling, 2003) is more than 1,230 southbound vehicles during the evening commute hours. Northbound vehicles count slightly fewer at 930; however, the projection for the year 2015 is that these peak commute hour trips will increase to 1,600 and 1,200 southbound and northbound, respectively. Therefore, a staging plan with three phases is proposed to maintain a minimum of two lanes and one rail track open in each direction during construction.

The staging is proposed as follows in Table 2. See also, Appendix C for conceptual Construction Staging Plans and Shoring Plans.

Table 2: Construction Staging

Stage	Construction Area: Closed Lanes	Open Lanes
1	Onsite construction of Villa Street Development and onsite pedestrian and bicycle path	Traffic lanes not affected.
2	Median, eastbound and westbound left lanes of Central Expressway and north and southbound Caltrain rail lines	Left lane of the eastbound direction is closed in the construction zone and traffic is shifted to the right lane and right shoulder. Left lane of the westbound direction is closed in the construction zone and traffic is shifted to the right lane and right shoulder. A shoofly for each the north and south bound rail tracks is constructed to allow construction to take place in the existing location of the north and south bound rail tracks.
3	Westbound right lane and shoulder of Central Expressway, Meridian Way side and area at existing north and southbound Caltrain rail lines	Right lane and shoulder of the westbound direction is closed in the construction zone and traffic is shifted to the left lane and median area; No change to the existing eastbound travel lanes on Central Expressway. Rail traffic is returned to the original alignment of the existing north and south bound rail tracks while the remainder of construction within Caltrain right-of-way is completed.
4	Eastbound right lane and shoulder of Central Expressway	Right lane of the eastbound direction is closed in the construction zone and traffic is shifted to the left lane and median area; No change to the westbound travel lanes on Central Expressway

5.0 CONCEPTUAL COST ESTIMATES, CONSTRUCTION MEANS AND METHODS, STAGING AND SCHEDULE

5.1 CONCEPTUAL COST ESTIMATE

See Appendix B.

5.2 CONSTRUCTION MEANS AND METHODS, STAGING

See conceptual Construction Staging Plan and Shoring Plans in Appendix C.

5.3 CONSTRUCTION SCHEDULE

Project Design and Construction Schedule	
Activity	**Duration**
Award - Contract	1 month
Preliminary Design	6 months
Final Design	4 months
Approvals/Bid	3 months
Award - Contract	2 months
Phase 1 - Excavation/Tunnel	3 months
Phase 2 - Excavation/Tunnel	3 months
Phase 3 - Excavation/Tunnel	3 months
Finishes and Electrical	3 months
Total Duration	28 months

6.0 RIGHT-OF-WAY, PERMITS, AND AGENCY REQUIREMENTS

The proposed tunnel project crosses several jurisdictions and ownerships. The relationships of these parties and a broad outline of their interests and requirements are described here.

6.1 CITY OF MOUNTAIN VIEW

Meridian Way, which is within City of Mountain View right-of-way, will be utilized as the one of the connection points of the Tunnel from the Villa Street and the future Villa Street development.

The City of Mountain View can require permits for any construction activities within its jurisdictional reach. This means that the City would be responsible for reviewing and approving all design development drawings showing the fully realized tunnel and connections of that tunnel to Prometheus's Villa Street development. Building permits will be required for the tunnel as a part of the development project. Review by the Fire Official will be required for methods required for rapid fire fighter to access to the tunnel. The Police Department will review all plans from the perspective of ensuring public safety. Public Works will review the Meridian Way ramp and associated improvements. The Community Development Department will review the tunnel and ramp proposals to ensure they meet the requirements of the municipal zoning codes, development disposition agreements, any requirements for public art, and overall design compatibility.

6.2 SANTA CLARA COUNTY ROADS AND AIRPORTS DEPARTMENT

The Santa Clara County Roads and Airports Department is responsible for the Central Expressway and has expressed interest in locating pedestrian pathways out of zones with high traffic volumes and speeds. This decision would *require* tunnel construction as the City of Mountain View has envisioned in the Villa Street Development.

For any work, including potholing, to take place on or under the Central Expressway, an encroachment permit must be obtained from the Santa Clara County Roads and Airports Department. Planning work that has already been developed for each of the County's Expressways and adopted by the County must be implemented further through the next design development stages. The Santa Clara County Roads and Airports Department will review the design plan, tunnel structural plans, accommodation of the fiber optic cables and water lines, as well as the construction methods and traffic staging plans. Depending on whether contaminants are found during the Phase I study for groundwater levels and quality, a General Permit may be required. This could be secured working with Santa Clara Roads and Highways Department and the California State Department of Toxic Substances Controls.

6.3 PENINSULA CORRIDOR JOINT POWERS BOARD/CALTRAIN

The Peninsula Corridor Joint Powers Board's (JPB) right-of-way ends at the face of the retaining wall south of Central Expressway and at the headwall of the proposed tunnel or Villa Street development property line. Any work within the Caltrain right-way, i.e. constructing the proposed tunnel, will require JPB approval as well as an encroachment permit. The JPB has adopted a new set of design criteria (2011) that will be applied to the project. Hohbach-Lewin's present conceptual design proposal meets the design criteria, including plans for future electrification of the rail line. An encroachment permit for temporary installations or for access to the right-of-way will be required for construction as well as provision for flagging services.

6.4 Santa Clara Valley Transportation Authority (VTA)

It has been determined per VTA service maps and confirmed through correspondence with Thomas Esch, Construction Contracts Administration Manager, that the proposed tunnel and associated path is not within VTA jurisdiction.

7.0 OTHER CONSIDERATIONS

7.1 FINAL CENTRAL EXPRESSWAY ROAD CONFIGURATION

The road way configuration of Central Expressway is not expected to be altered from its current configuration due to the tunnel construction.

7.2 ONGOING MAINTENANCE OF THE TUNNEL AND PLAZA AREAS

Responsibilities for maintenance and operations of the tunnel and bicycle and pedestrian path areas will need to be negotiated between the City, Santa Clara County Roads and Airports Department and Caltrain. Maintenance is a key component to constructing and maintaining an area that feels safe, clean, and cared for, as discussed in the safety section.

8.0 ENVIRONMENTAL CONCERNS AND IMPACT – CEQA SCREENING

The California Environmental Quality Act (CEQA) must be observed in the creation of any public project ("projects" are defined as activities which have the potential to have a physical impact on the environment). If federal financing sources are used to pay for the project, or there is any federal agency involvement, the project will also be subject to the requirements of the National Environmental Policy Act (NEPA). While feasibility studies are exempt from CEQA, the eventual design and construction of the project will require CEQA review. The proposed tunnel project would most likely need to be evaluated under the following CEQA initial study areas:

- Geology/Soils
- Hydrology
- Cultural (Native American) Resources
- Transportation/Traffic
- Utilities/Service Systems

If the project is considered to have environmental impacts on any of these areas, additional studies may be required to show the extent of the impacts and methods for mitigation of that impact prior to or during construction.

8.1 AREA OF POTENTIAL ENVIRONMENTAL IMPACT

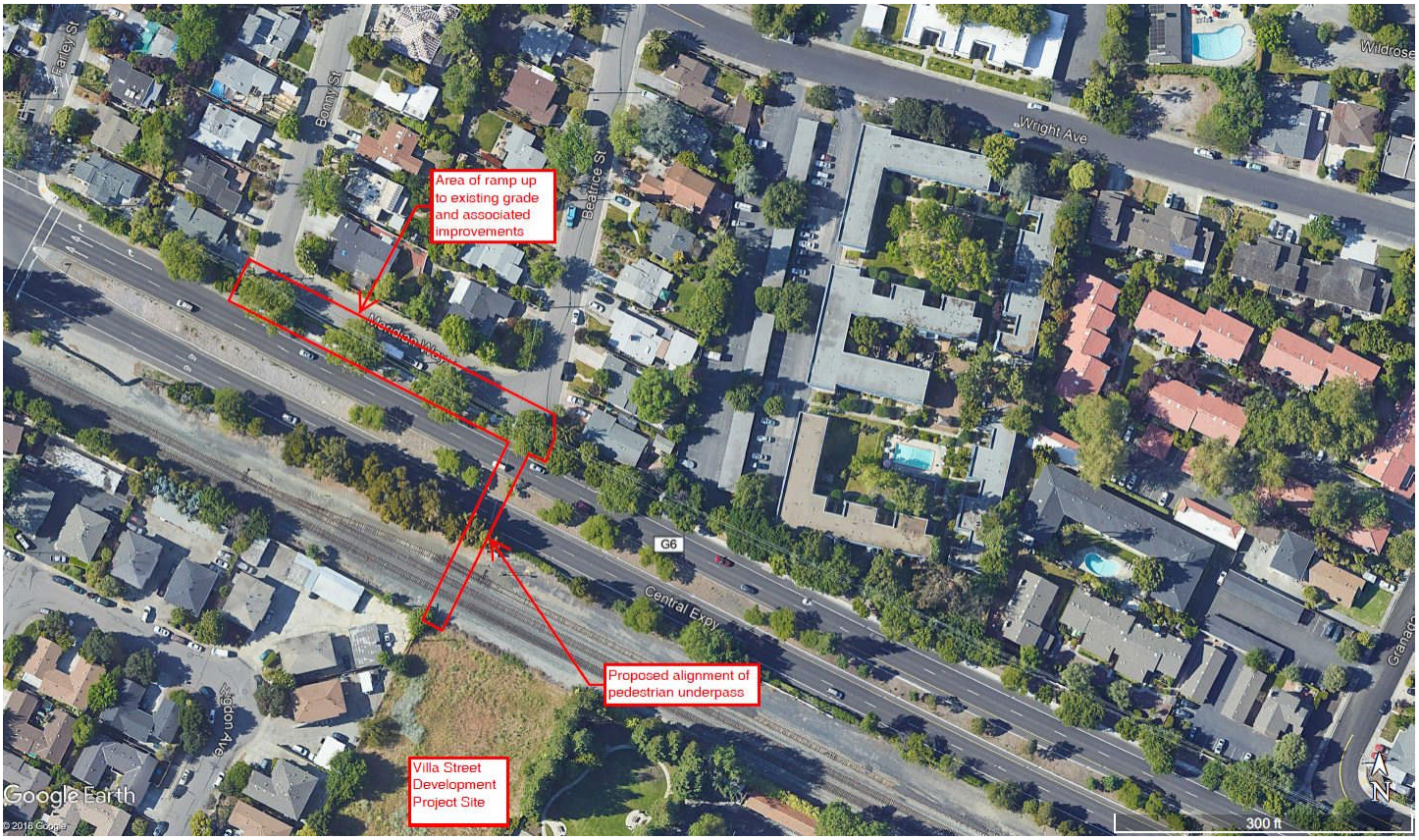


Figure 8-1: Area of Potential Environmental Impact

9.0 CONCLUSIONS AND RECOMMENDATIONS

In summary, Hohbach-Lewin, Inc. has demonstrated that it is technically and physically feasible to build a pedestrian and bicycle tunnel under Central Expressway that connects Villa Street through future Villa Street development and on to Meridian Way. The proposed tunnel meets all requirements outlined in the technical and planning Design Criteria discussed in Section 3.0 of this report.

Recommendations for future work include:

1. Work with all owners/agency jurisdictions to prepare an agreement delineating responsibilities for specific permits and approvals, project development, maintenance, operations, and emergency service provision regarding the tunnel project.
2. Work with the Santa Clara County Roads and Airports Department to get feedback for proposed tunnel alignment. Work with the City of Mountain View to get approval of proposed tunnel design and ramp and sidewalk connections options on Meridian Way and any necessary utility relocation.
3. Establish groundwater levels and quality; determine if contaminants exist. Identify the measures necessary to remediate and manage, if necessary.
4. Conduct environmental review. Prepare mitigation measures that can resolve environmental issues during the design development phase, if possible.
5. Prepare design documents and construct.

10.0 APPENDICES

APPENDIX A – REFERENCES

1. Parsons, San Antonio/Mayfield Pedestrian and Bicycle Tunnel Feasibility Report, Project 07-25, April 30, 2008.

2. Nolte, Project Plans for Construction of Homer Avenue Caltrain Undercrossing, April 9, 2003.

3. Liggett, Robin; Loukaitou-Sideris, Anastasia; Iseki, Hiroyuki; "Protecting Against Transit Crime: The Importance of the Built Environment". UCLA School of Public Affairs, California Policy Options – Paper 917, 2004.

4. "Pedestrian and Bicycle Bridges and Tunnels", Safe Routes to School Guide. http://www.saferoutesinfo.org/guide/engineering/Pedestrian_bicycle_bridges_and_tunnels.cfm

5. Brennan, Dean; Zelinka, Al; SafeScape: Creating Safer, More Livable Communities through Planning and Design. Planners Press, American Planning Association, Chicago, 2001

6. "Design Principles" Crime Prevention through Environmental Design- Vancouver. www.designcentreforcpted.org/Pages/Principles.html

7. City of Mountain View, Stevens Creek Trail Draft Environmental Impact Report, Reach 4, Segment 2, June 2002.

8. National Crime Prevention Council, Crime Prevention Through Environmental Design Guidebook, Appendix C: "Examples of CPTED Strategies Applicable to Public Spaces", October 2003

9. The Standard Practice Subcommittee of the Illuminating Engineering Society of North America Roadway Lighting Committee, American National Standard Practice for Roadway Lighting, ANSI/ IESNA, 6/27/00.

APPENDIX B – CONCEPTUAL ENGINEER'S ESTIMATE OF PROBABLE COST

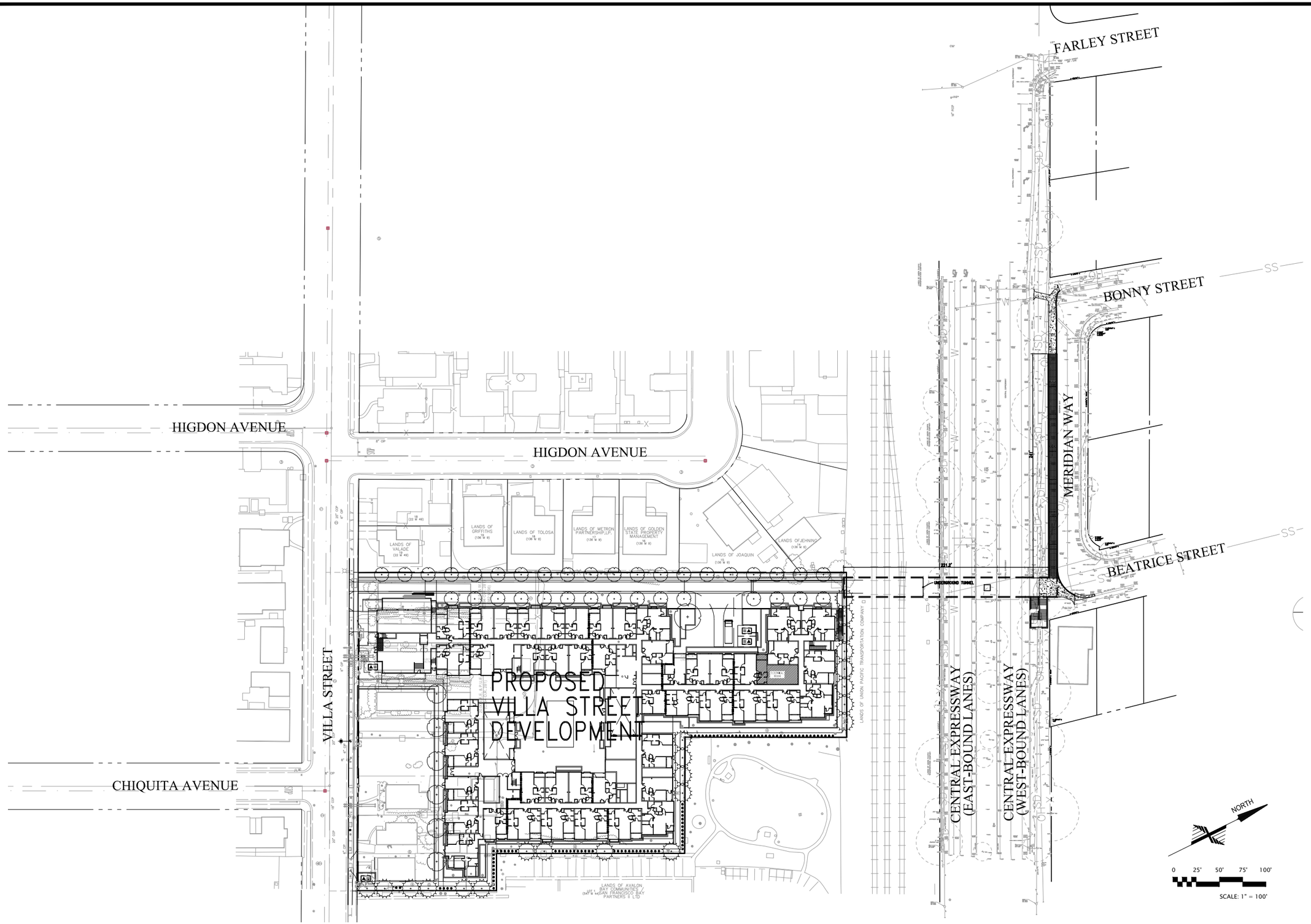
APPENDIX B COST ESTIMATE DETAIL

Villa Street Development Bicycle and Pedestrian Tunnel Project Cost Estimate

Item	Unit	Quantities	Unit Price	Total	
Tunnel and Roadway					
Site preparation	Allow	1	$90,000.00	$90,000.00	
Structure excavation (box culvert)	CY	5,693	$66.00	$375,764.40	
Temporary shoring	SF	18,900	$125.00	$2,362,500.00	
OSHA railing	LF	1,270	$50.00	$63,500.00	
Structural concrete, box culvert	CY	665	$1,390.00	$924,711.40	
Structure backfill (box culvert)	CY	2296	$72.00	$165,304.80	
Bar reinforcing steel (box culvert)	LB	5,645	$1.50	$8,467.50	
Bentonite waterproofing	SF	22,216	$8.50	$188,836.00	
Skylight	Each	1	$24,000.00	$24,000.00	
Class 2 aggregate base	Ton	223	$66.00	$14,713.38	
Concrete floor slab	SF	4,199	$12.00	$50,388.00	
Remove base and resurface	SF	4,800	$11.00	$52,800.00	
A/C roadway	Ton	56	$186.00	$10,410.42	
Traffic Control System	LS	1	$240,000.00	$240,000.00	
Pavement marking and traffic stripe	LS	1	$36,000.00	$36,000.00	
Water main installation and modifications	LS	2	$180,000.00	$360,000.00	
Railroad track rerouting, reconstruction and coordination	LS	1	$350,000.00	$350,000.00	
Tunnel finishes	Allow	1	$30,000.00	$30,000.00	
Support and protect existing utilities	Allow	1	$30,000.00	$30,000.00	
Lighting (undercrossing and plaza)	LS	1	$144,000.00	$144,000.00	
Drainage pump system	Each	1	$6,000.00	$6,000.00	
Architectural finishes	Allow	1	$120,000.00	$120,000.00	
Tunnel and Roadway Subtotal					$5,647,396
Ramp					
Temporary shoring	SF	3,610	$125.00	$451,250.00	
Retaining wall	LF	480	$600.00	$288,000.00	
Concrete floor slab	SF	1,920	$12.00	$23,040.00	
Architectural finishes	Allow	1	$120,000.00	$120,000.00	
Ramp Subtotal					$882,290.00
Meridian Way Improvements					
Concrete sidewalk	SF	2,786	$9.00	$25,074.00	
Curb and gutter	LF	35	$35.00	$1,225.00	
Drainage pump system	Each	1	$5,000.00	$5,000.00	
Architectural/landscape finishes	Allow	1	$50,000.00	$50,000.00	
Sewer manhole relocation	Allow	1	$25,000.00	$25,000.00	
Meridian Way Improvements Subtotal					$106,299.00

Tunnel and Roadway Subtotal	$5,647,396
Ramp Subtotal	$882,290
Meridian Way Improvements Subtotal	$106,299
Subtotal	$6,635,985
Mobilization 10%	$663,598
Total	$7,299,583
Overall Contingency is 55%	
Design: 35%	$2,322,595
Escalation: 20% (6.25% over 3 years)	$1,327,197
Development Costs are 70%	$4,645,189
Tunnel, Roadway, Ramp and Meridian Way Improvements + Contigency	**$15,594,565**

APPENDIX C - CONCEPTUAL PLANS



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OVERALL SITE PLAN
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Job	12859
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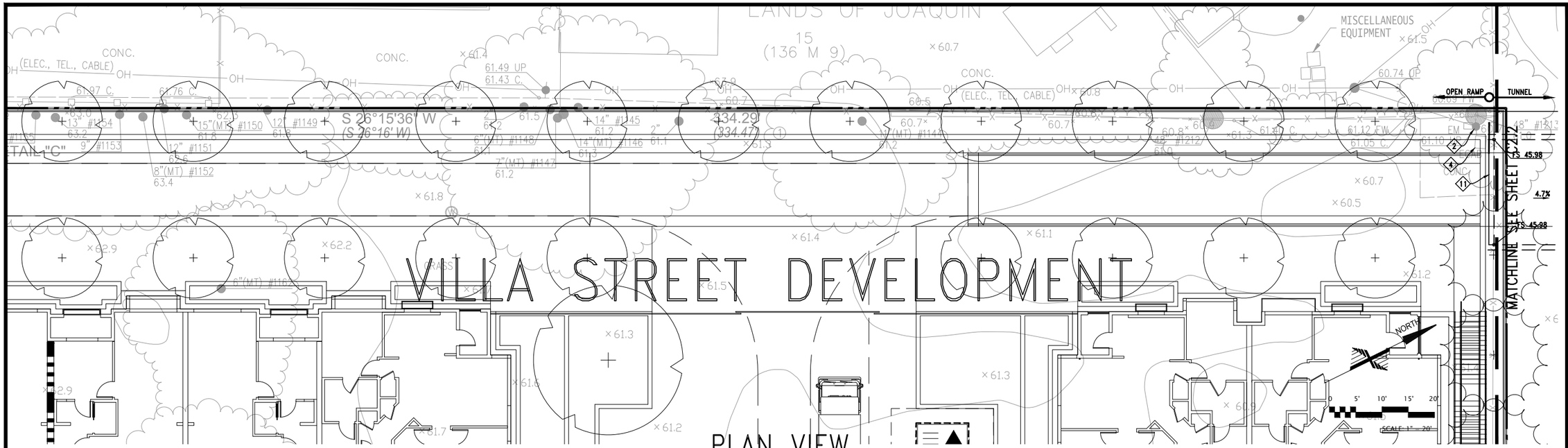
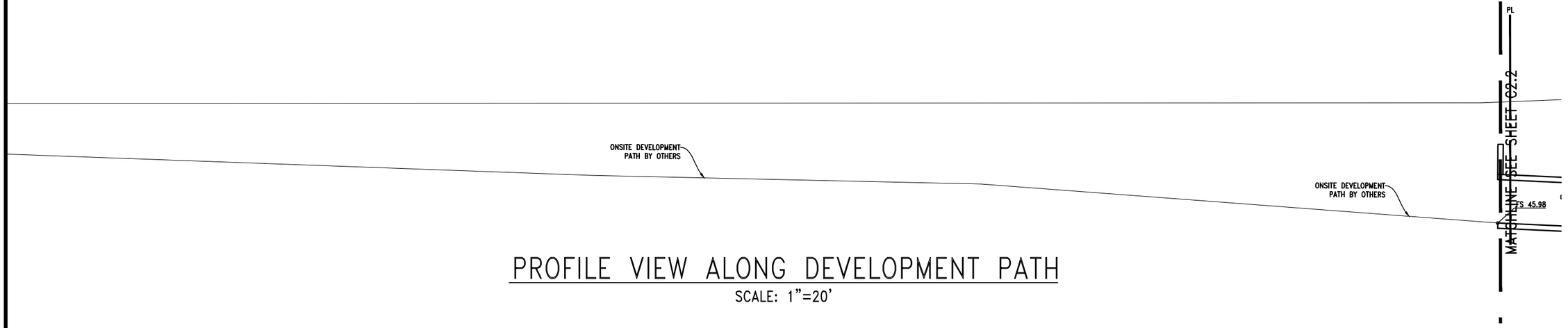


PLAN VIEW



PROFILE VIEW ALONG DEVELOPMENT PATH

SCALE: 1"=20'

LEGEND

XX.XX / XX%	GRADE ELEVATION / SLOPE AND DIRECTION	TW	TOP OF WALL
(E)	EXISTING		CONCRETE WALK
FG	FINISHED GRADE		RAMPED SECTION OF PATH
FS	FINISHED SURFACE		
GB	GRADE BREAK		UNDERGROUND TUNNEL
PL	PROPERTY LINE		
RTE	RAILROAD TRACK ELEVATION		
TC	TOP OF CURB		

KEYNOTES

1. TUNNEL
2. EXISTING ELECTRICAL POLE AND BOX TO BE RELOCATED OR REMOVED
3. EXISTING CURB AND GUTTER AT SOUTH EDGE OF CENTRAL EXPRESSWAY
4. EXISTING ELECTRICAL CABINET TO BE RELOCATED
5. BEGINNING OF PEDESTRIAN RAMP
6. END OF PEDESTRIAN RAMP AND ENTRANCE TO 20' WIDE PEDESTRIAN UNDERPASS
7. PEDESTRIAN WALKWAY TO PUBLIC SIDEWALK ON VILLA ST
8. PROPOSED TRANSFORMER LOCATION. SEE ELECTRICAL DRAWINGS FOR INFORMATION.
9. MINIMUM 2' CLEARANCE TO ALLOW FOR SHORING
10. EXISTING PUBLIC SIDEWALK
11. HEADWALL
12. CONNECT TO EXISTING PUBLIC SIDEWALK
13. EXISTING RESIDENTIAL DRIVEWAY
14. SKYLIGHT OPENING
15. EXISTING 16" WATER TRANSMISSION MAIN.
16. EXISTING STORM DRAIN
17. EXISTING WATER MAIN TO BE PROTECTED IN PLACE AND TO REMAIN IN SERVICE DURING CONSTRUCTION. WATER MAIN SHALL NOT BE OUT OF SERVICE FOR ANY LENGTH OF TIME WITH OUT BYPASS.
18. EXISTING SEWER MANHOLE TO BE RELOCATED

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GRADING PLAN
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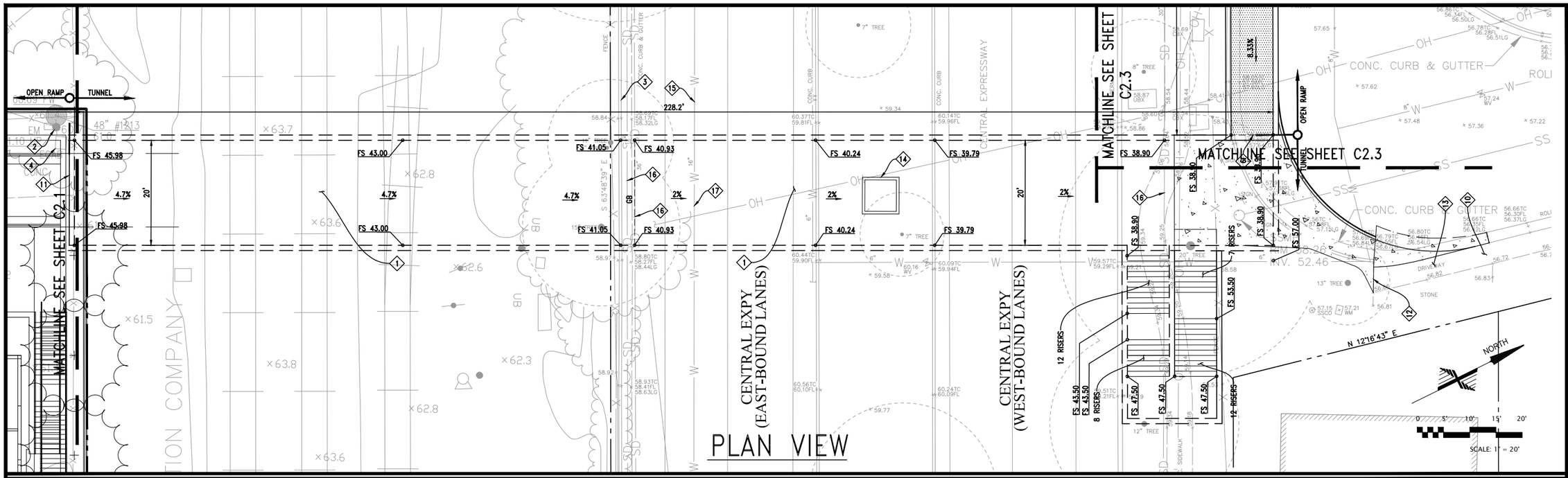
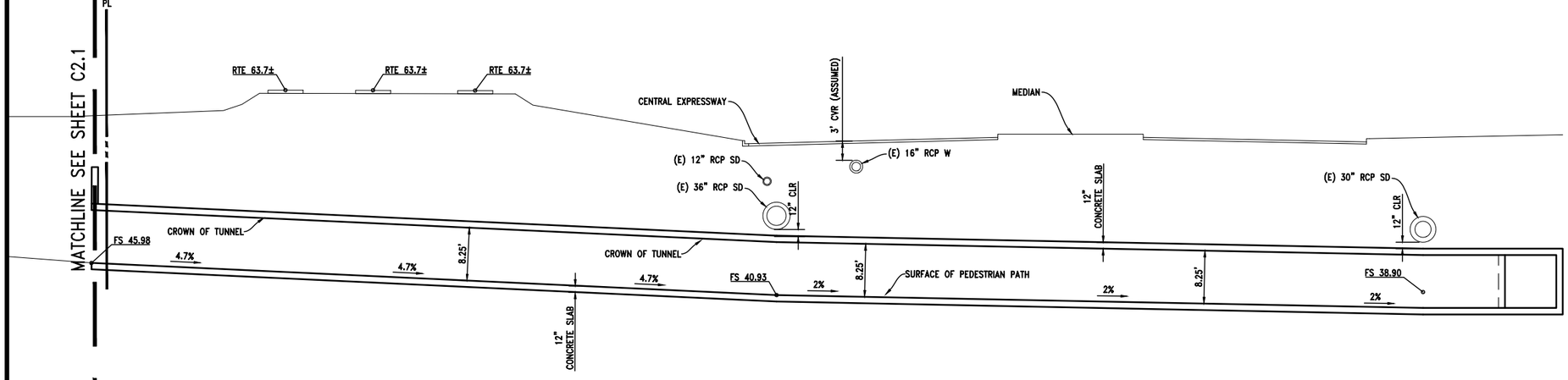


PLAN VIEW



PROFILE VIEW ALONG CENTERLINE OF TUNNEL

SCALE: 1"=20'

LEGEND

XX.XX	GRADE ELEVATION	TW	TOP OF WALL
XX	SLOPE AND DIRECTION		CONCRETE WALK
(E)	EXISTING		RAMPED SECTION OF PATH
FG	FINISHED GRADE		
FS	FINISHED SURFACE		UNDERGROUND TUNNEL
GB	GRADE BREAK		
PL	PROPERTY LINE		
RTE	RAILROAD TRACK ELEVATION		
TC	TOP OF CURB		

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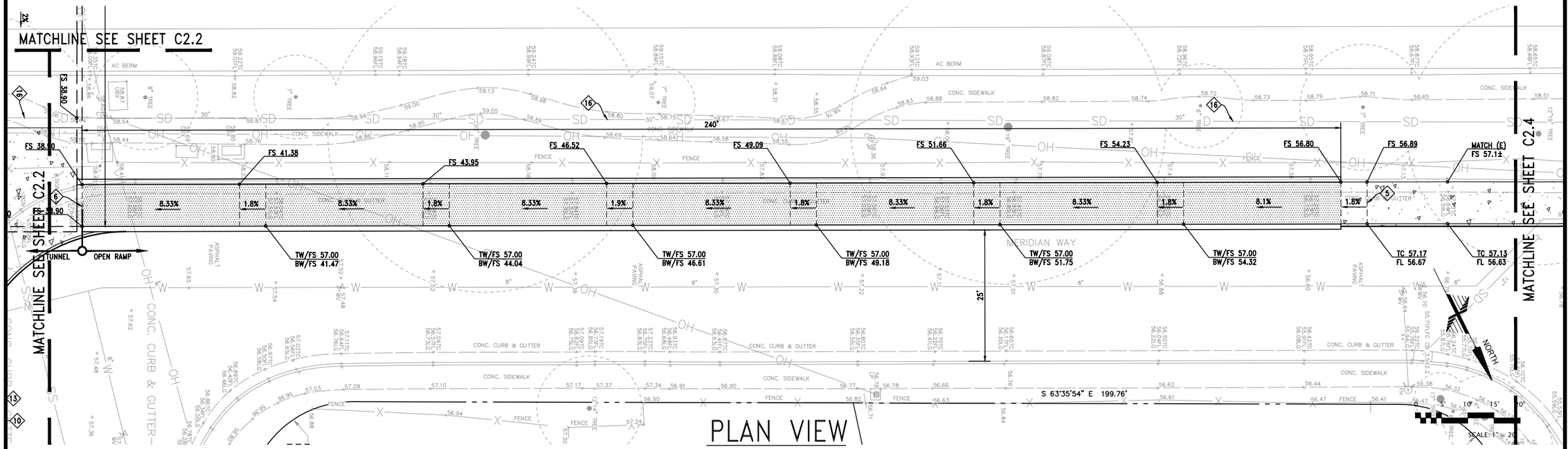

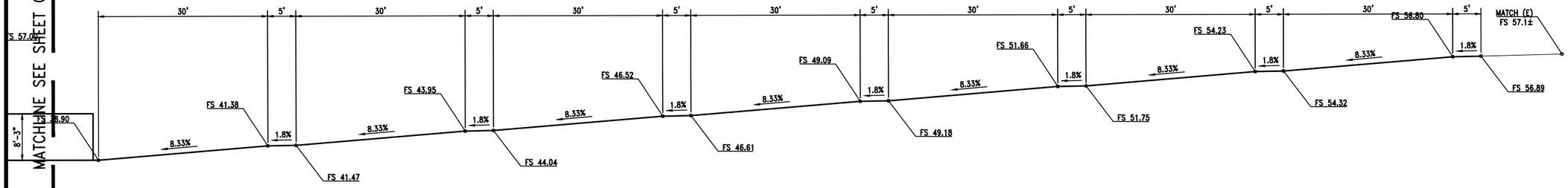

PROFILE VIEW ALONG RAMP ON MERIDIAN WAY

SCALE: 1"=20'

LEGEND

XX.XX	GRADE ELEVATION	TW	TOP OF WALL
XX%	SLOPE AND DIRECTION		CONCRETE WALK
(E)	EXISTING		RAMPED SECTION OF PATH
FG	FINISHED GRADE		
FS	FINISHED SURFACE		UNDERGROUND TUNNEL
GB	GRADE BREAK		
PL	PROPERTY LINE		
RTE	RAILROAD TRACK ELEVATION		
TC	TOP OF CURB		

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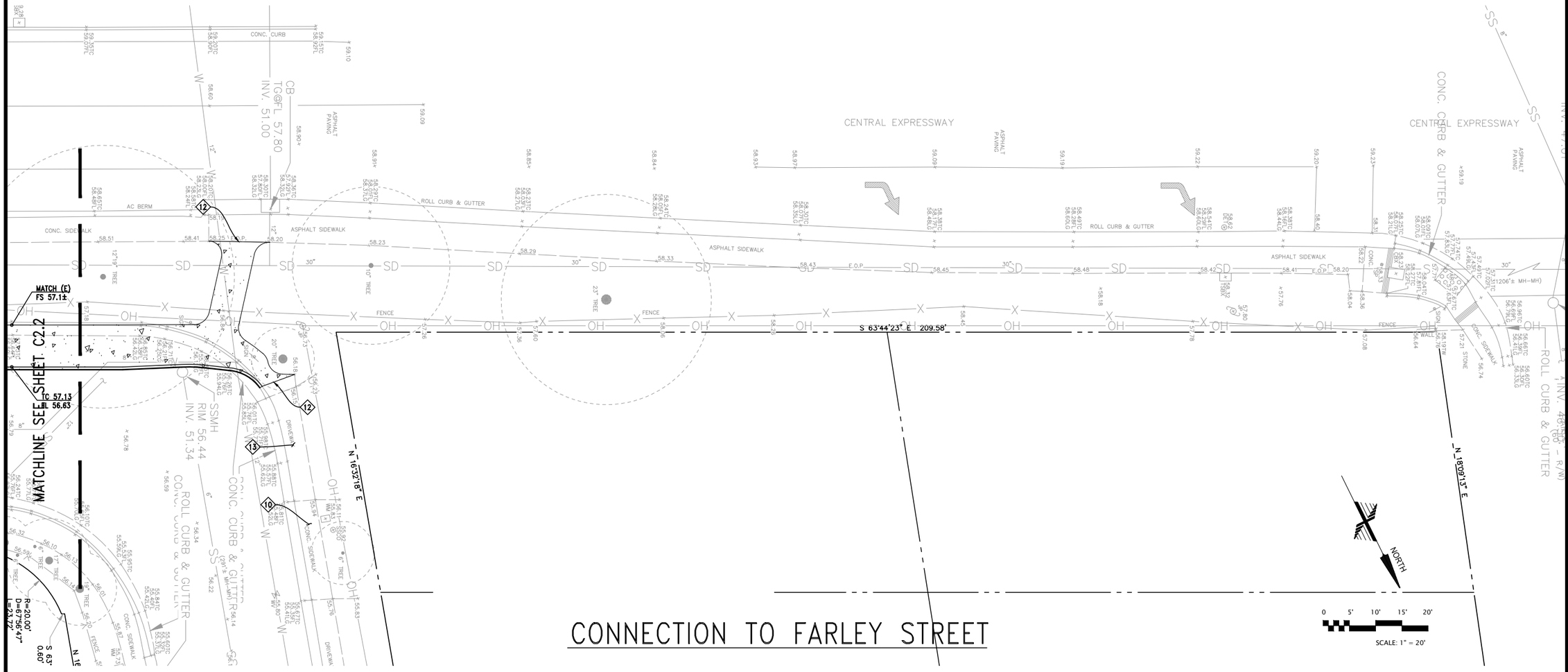

LEGEND

XX.XX	GRADE ELEVATION
XX%	SLOPE AND DIRECTION
(E)	EXISTING
FG	FINISHED GRADE
FS	FINISHED SURFACE
GB	GRADE BREAK
PL	PROPERTY LINE
RTE	RAILROAD TRACK ELEVATION
TC	TOP OF CURB
TW	TOP OF WALL
	CONCRETE WALK
	RAMPED SECTION OF PATH
	UNDERGROUND TUNNEL

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GRADING PLAN

PEDESTRIAN UNDERPASS

VILLA ST DEVELOPMENT

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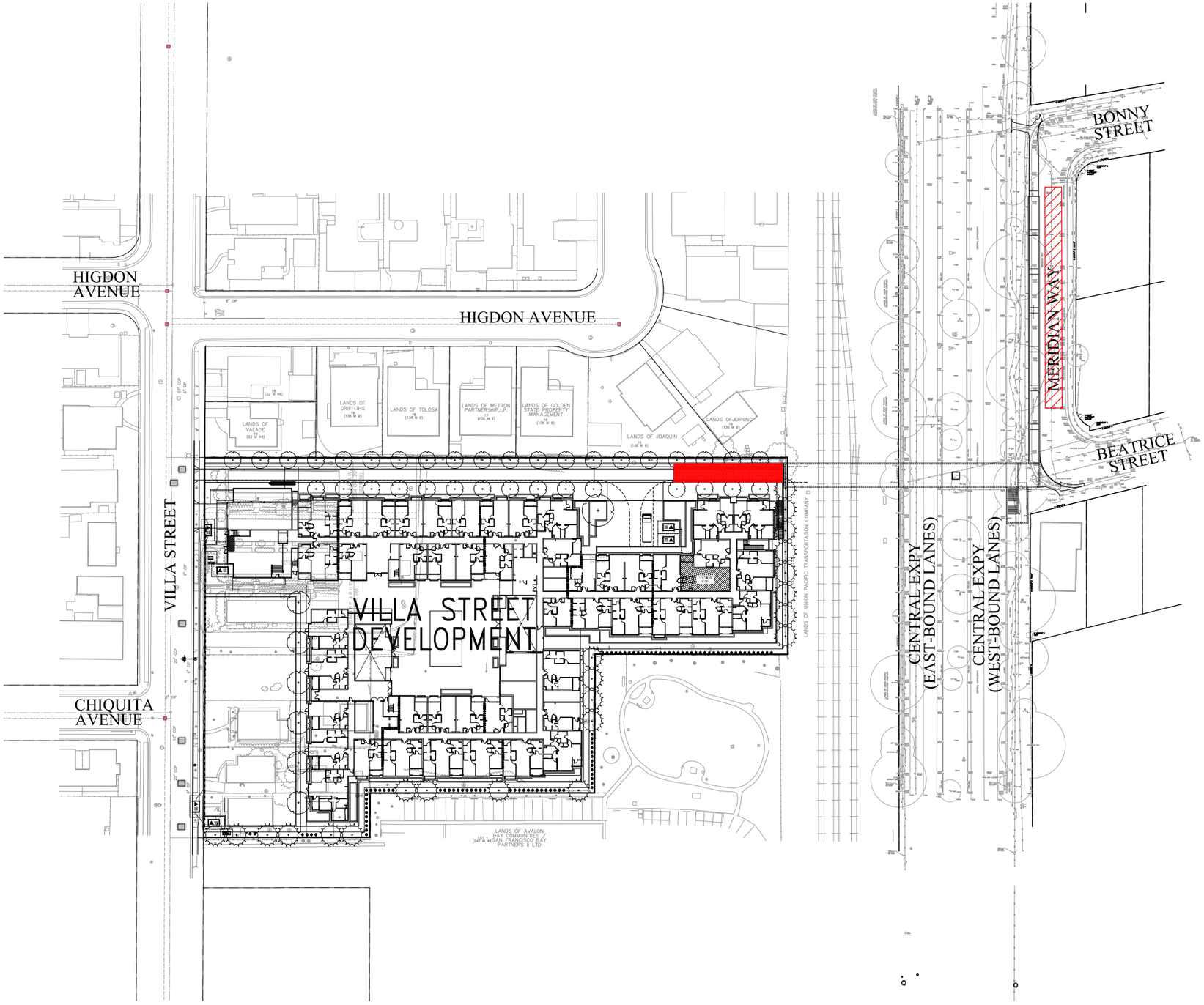

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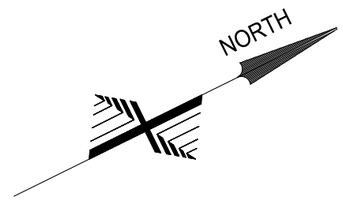
- CONSTRUCTION STAGING AREA



0 50' 100' 150' 200'

SCALE: 1" = 100'

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Palo Alto, CA 94306
(650) 617-5930

CONSTRUCTION STAGE 1

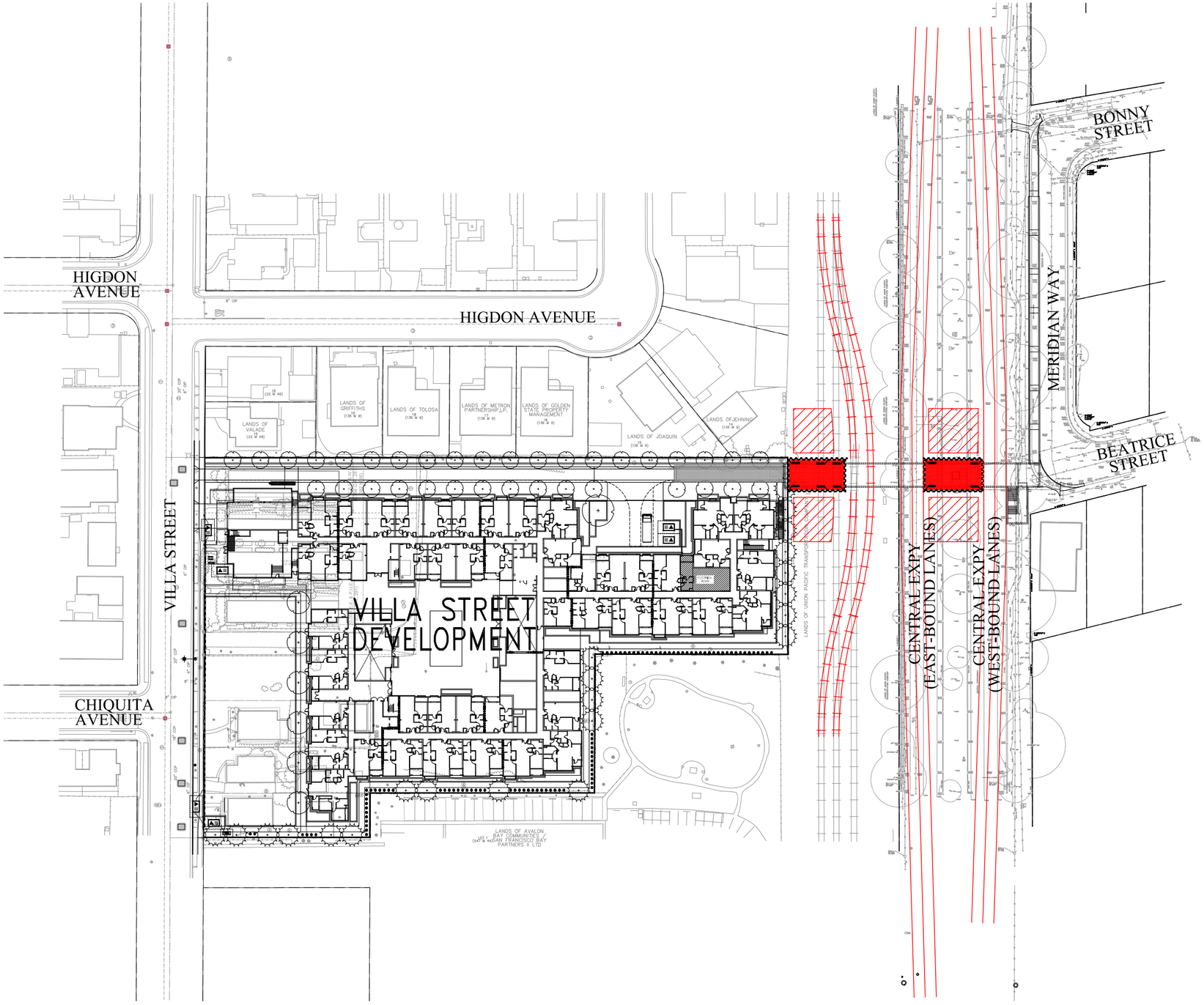
PEDESTRIAN UNDERPASS

VILLA ST DEVELOPMENT

MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	ST1.0

Plot Date: June 13, 2018 - 9:49 AM



LEGEND

- CONSTRUCTION THIS STAGE
- COMPLETED CONSTRUCTION
- CONSTRUCTION STAGING AREA

NORTH

0 50' 100' 150' 200'

SCALE: 1" = 100'

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CONSTRUCTION STAGE 2

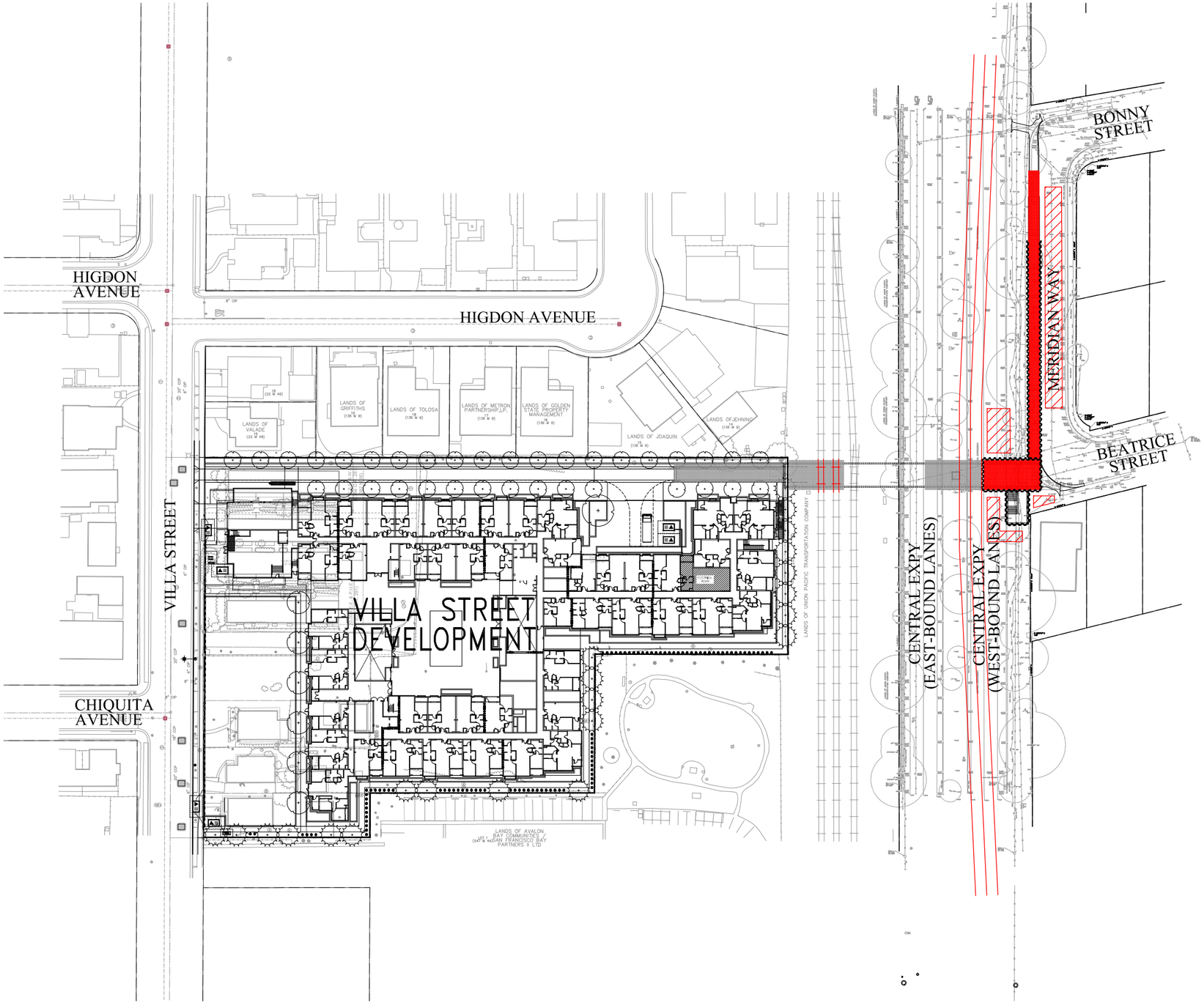
PEDESTRIAN UNDERPASS

VILLA ST DEVELOPMENT

MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	ST2.0

Plot Date: June 13, 2018 - 9:49 AM



LEGEND

- CONSTRUCTION THIS STAGE
- COMPLETED CONSTRUCTION
- CONSTRUCTION STAGING AREA

NORTH

0 50' 100' 150' 200'

SCALE: 1" = 100'

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CONSTRUCTION STAGE 3

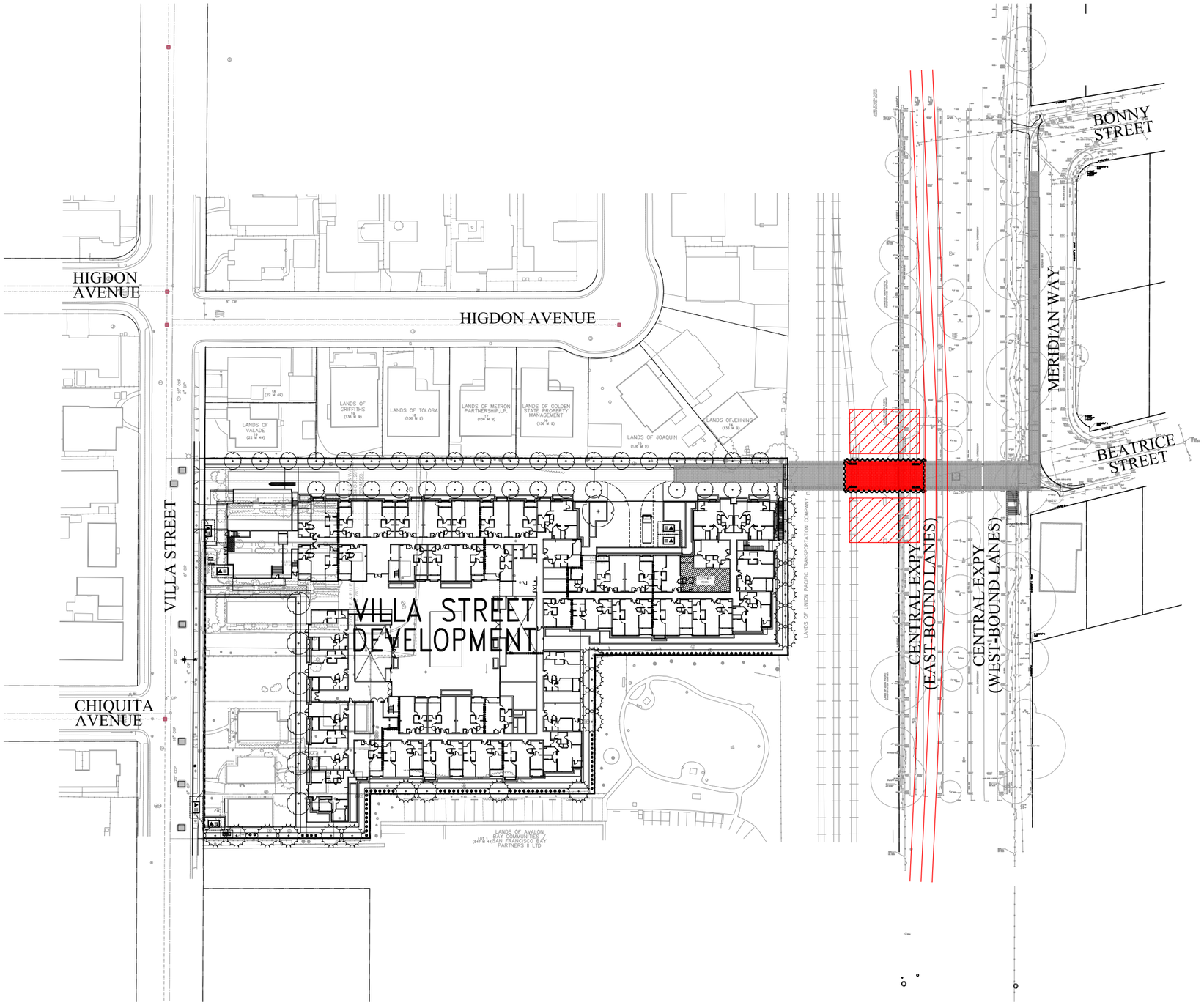
PEDESTRIAN UNDERPASS

VILLA ST DEVELOPMENT

MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	ST3.0

Plot Date: June 13, 2018 - 9:49 AM



LEGEND

- CONSTRUCTION THIS STAGE
- COMPLETED CONSTRUCTION
- CONSTRUCTION STAGING AREA

NORTH

0 50' 100' 150' 200'

SCALE: 1" = 100'

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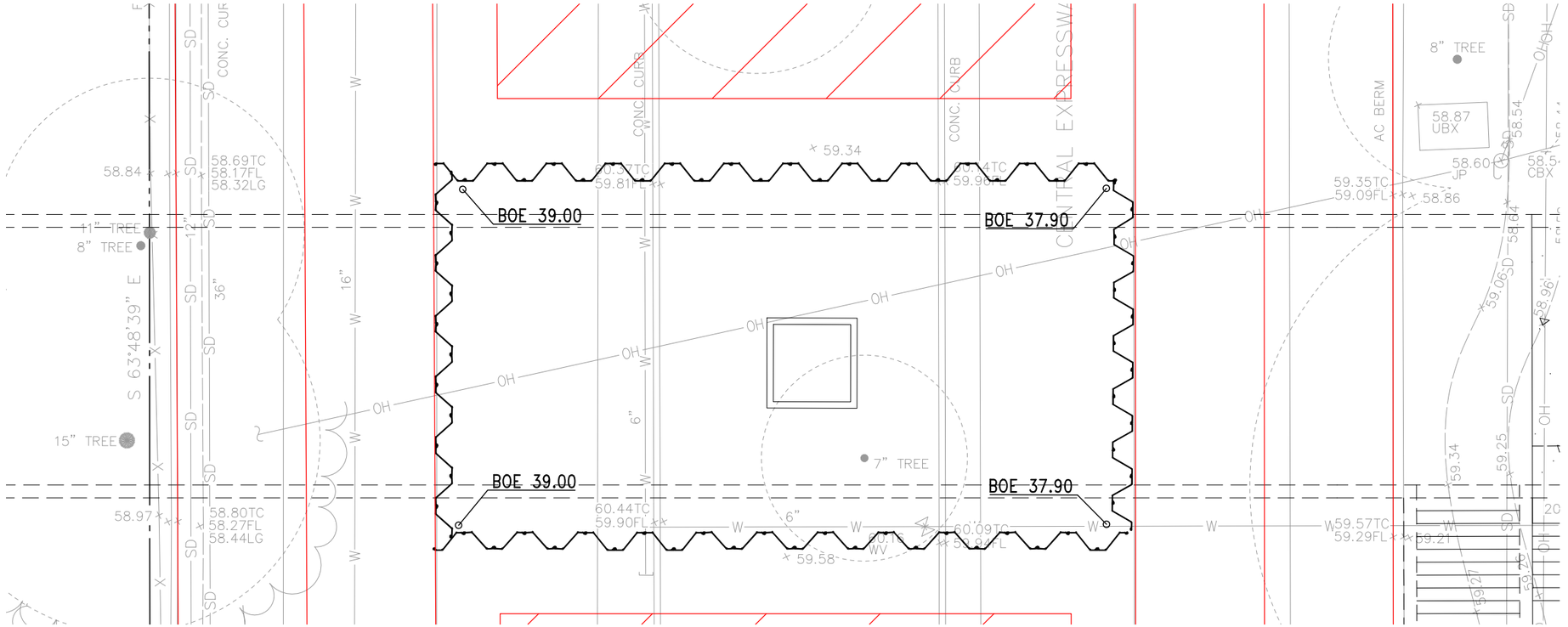
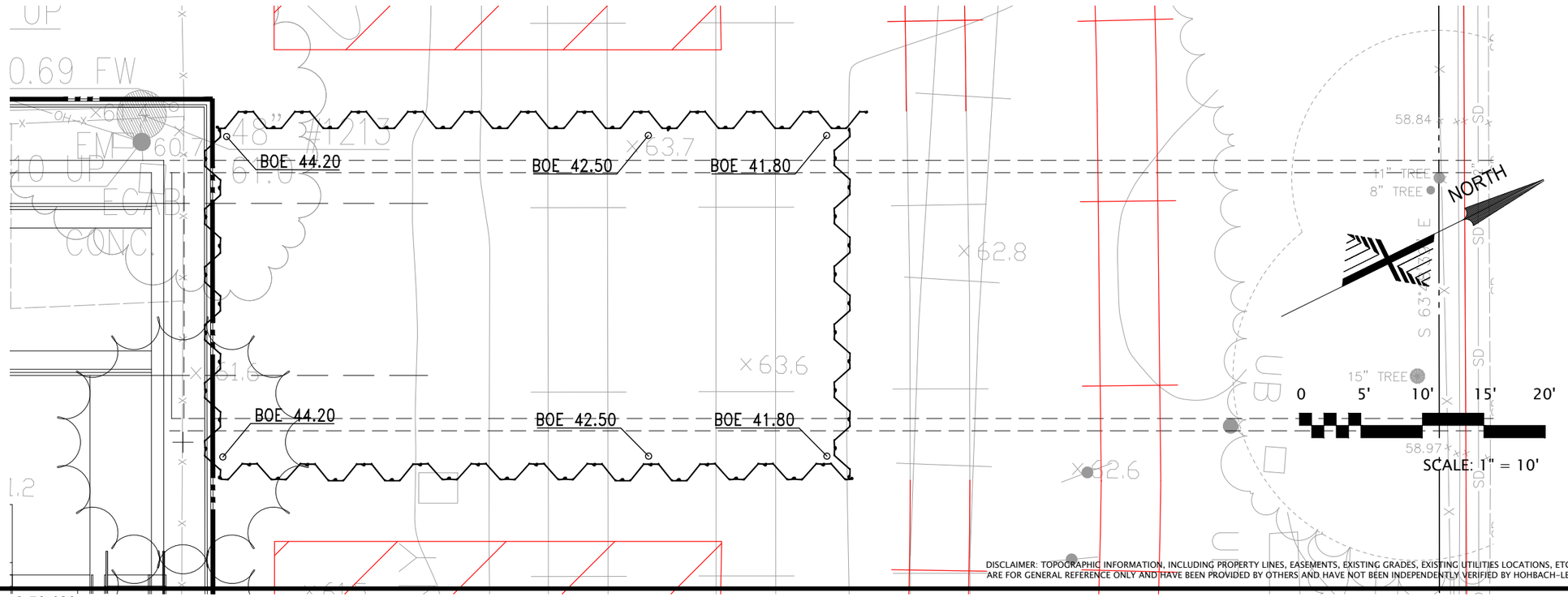
(650) 617-5930

CONSTRUCTION STAGE 4
PEDESTRIAN UNDERPASS
VILLA ST DEVELOPMENT
MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	ST4.0

Plot Date: June 13, 2018 - 9:50 AM





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SHORING PLAN – STAGE 2

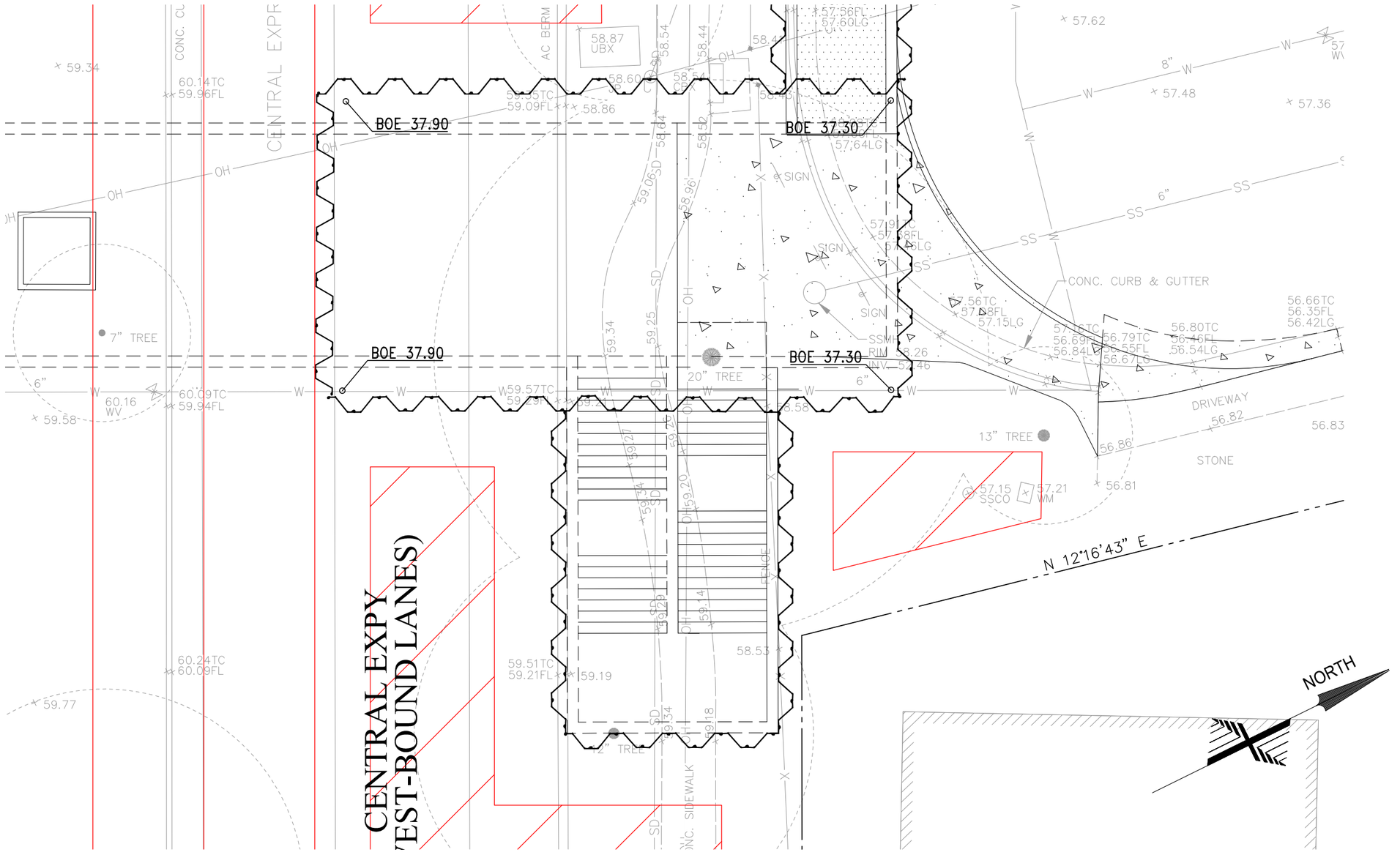
PEDESTRIAN UNDERPASS

VILLA ST DEVELOPMENT

MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	SH1.0

Plot Date: June 13, 2018 - 9:50 AM



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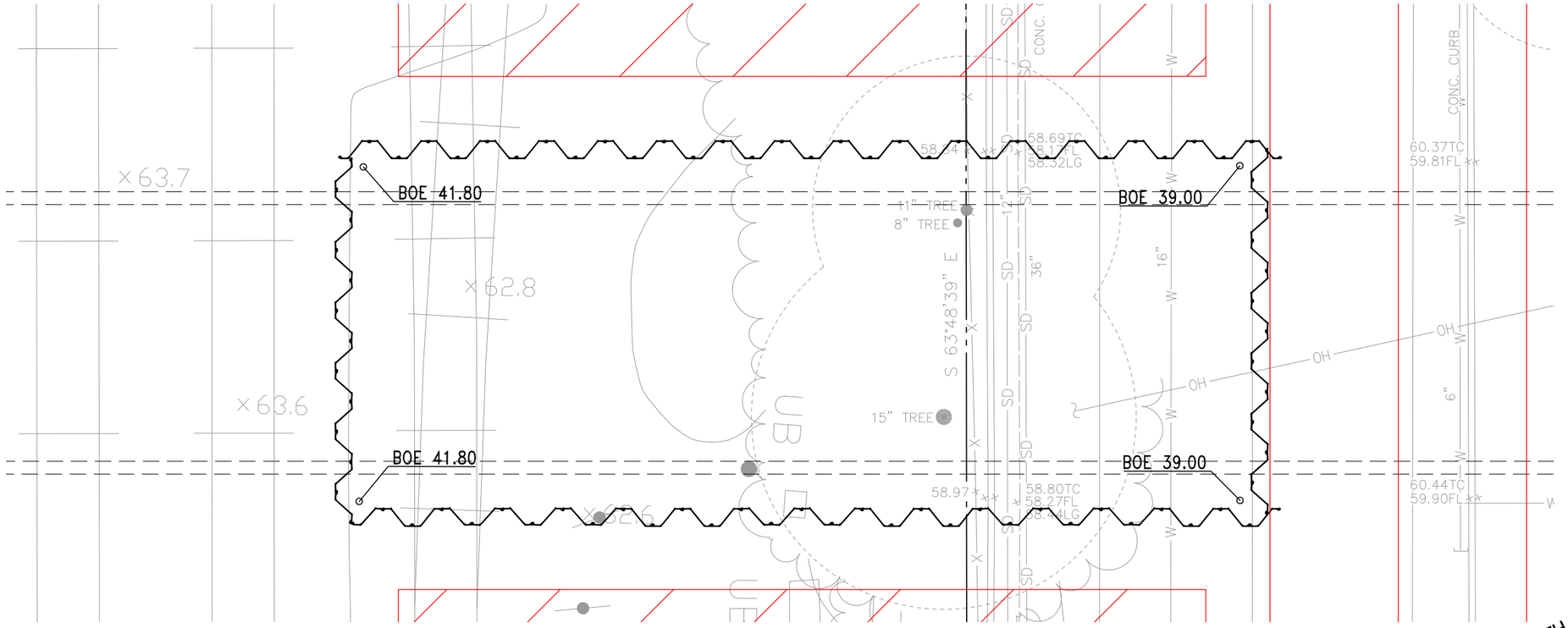
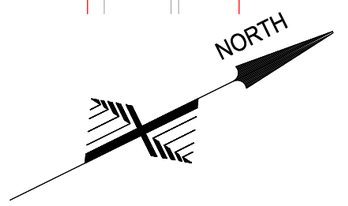
SHORING PLAN – STAGE 3

PEDESTRIAN UNDERPASS
VILLA ST DEVELOPMENT
MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	SH1.1

Plot Date: June 13, 2018 - 9:50 AM





0 5' 10' 15' 20'

SCALE: 1" = 10'

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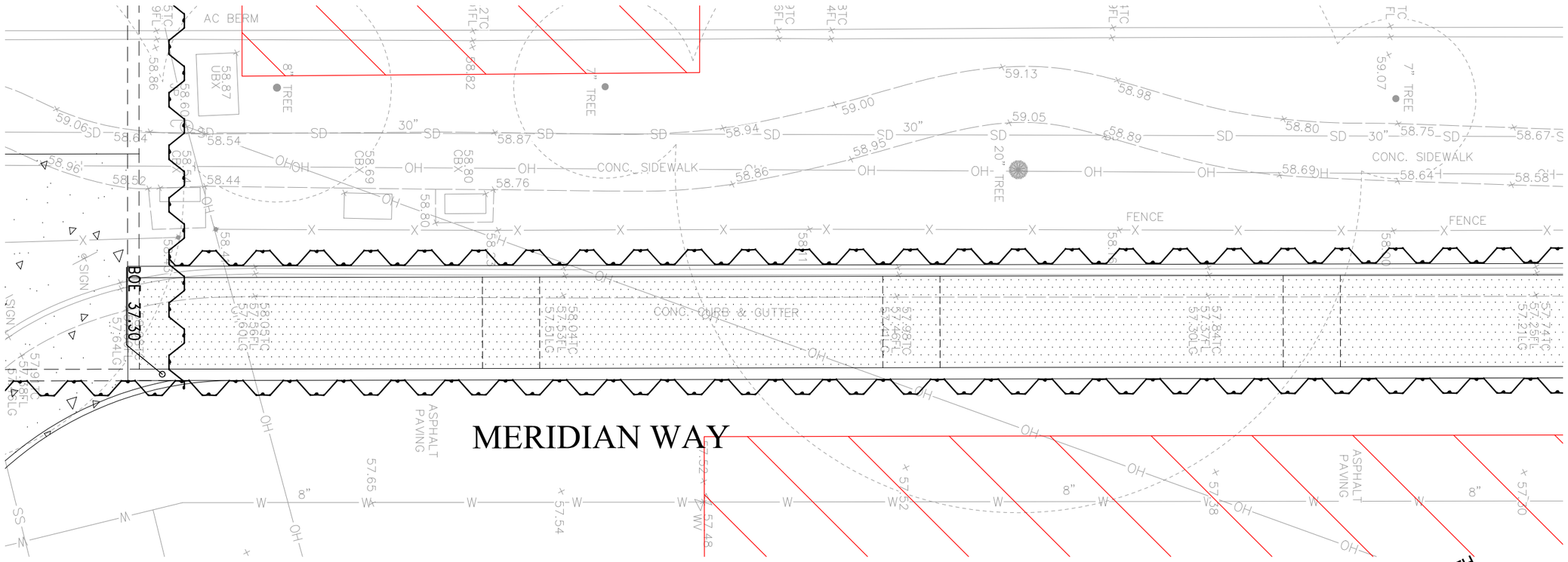
SHORING PLAN – STAGE 4

PEDESTRIAN UNDERPASS
VILLA ST DEVELOPMENT
MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	SH1.2

Plot Date: June 13, 2018 - 9:50 AM



0 5' 10' 15' 20'

SCALE: 1" = 10'

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SHORING PLAN – STAGE 3

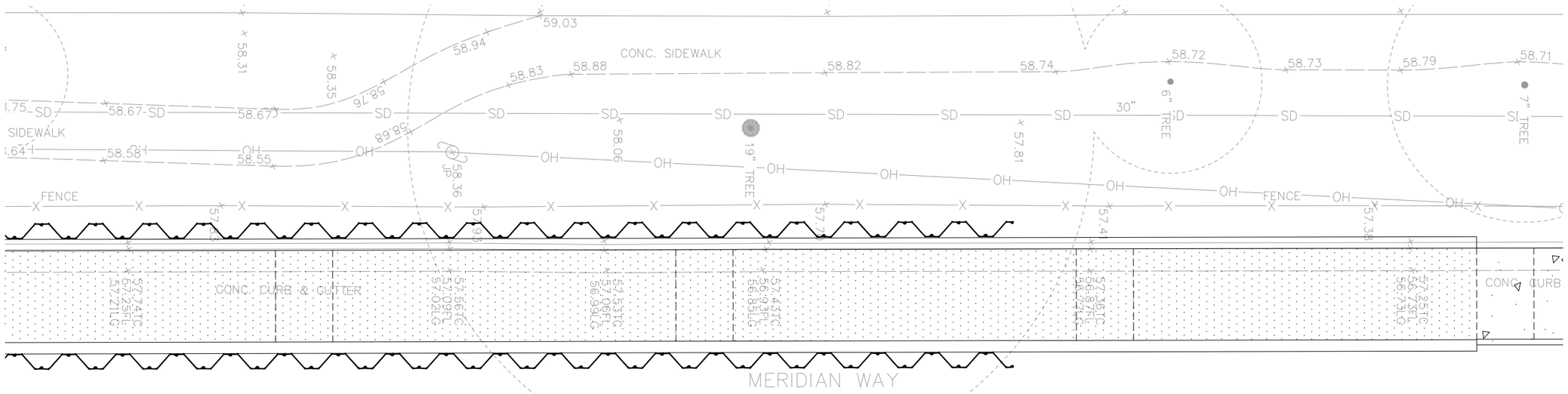
PEDESTRIAN UNDERPASS

VILLA ST DEVELOPMENT

MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	SH1.3

Plot Date: June 13, 2018 - 9:50 AM



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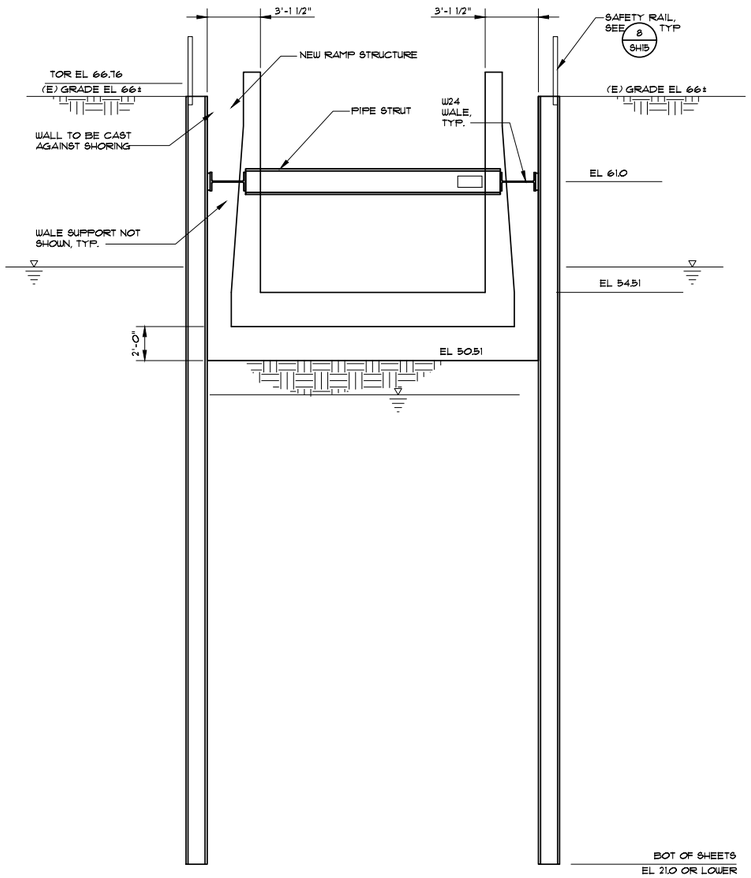
SHORING PLAN – STAGE 3

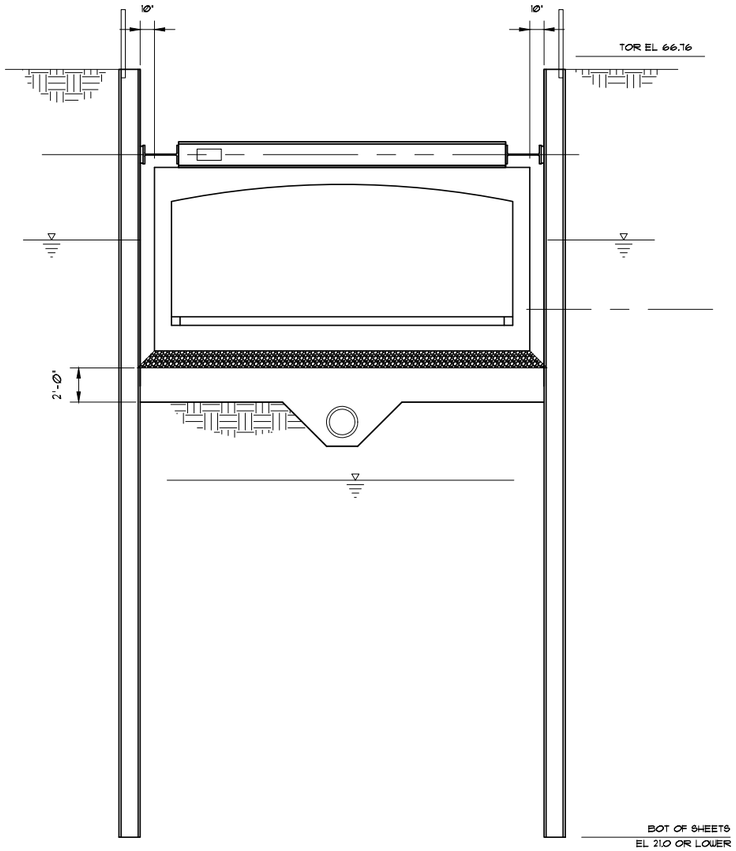
PEDESTRIAN UNDERPASS
VILLA ST DEVELOPMENT
MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	SH1.4

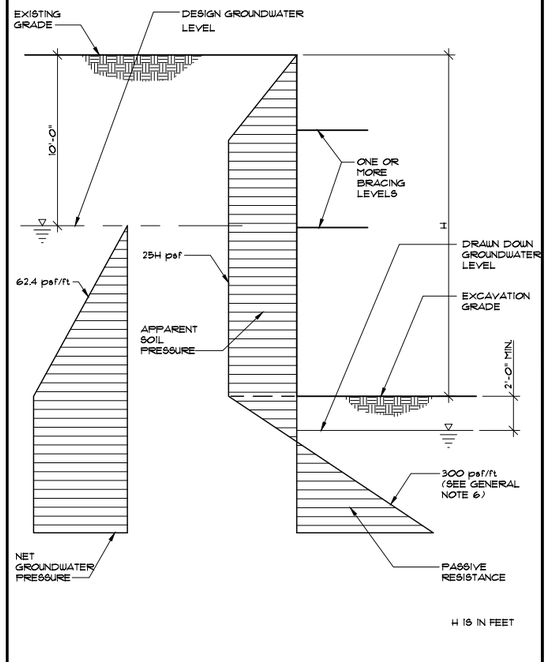
Plot Date: June 13, 2018 - 9:50 AM



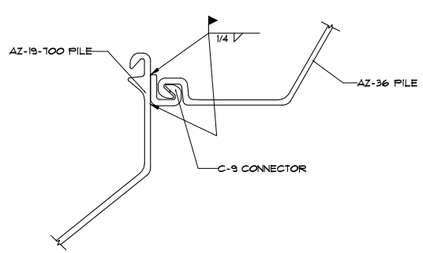
4 SECTION 1/4"=1'-0"



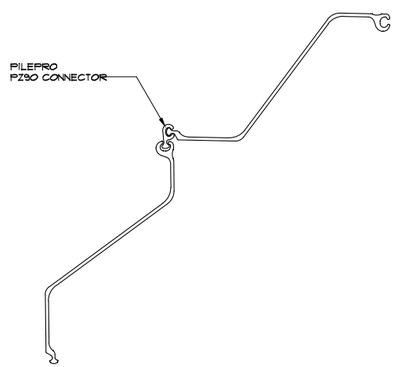
3 SECTION 1/4"=1'-0"



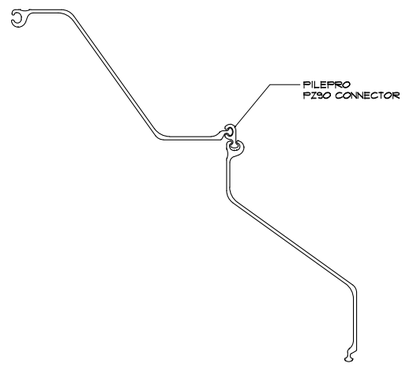
1 SOIL AND WATER PRESSURES FOR BRACED WALL SYSTEMS N.T.S.



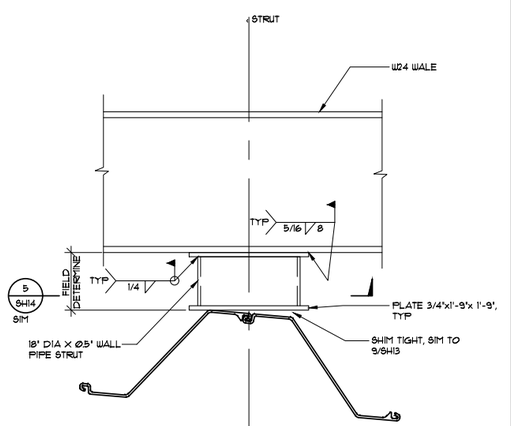
7 **WELDED CONNECTION** 1"=1'-0"



6 **CORNER CONNECTION** 1 1/2"=1'-0"



5 **CORNER CONNECTION** 1 1/2"=1'-0"



2 WALER CONNECTION 1"=1'-0"

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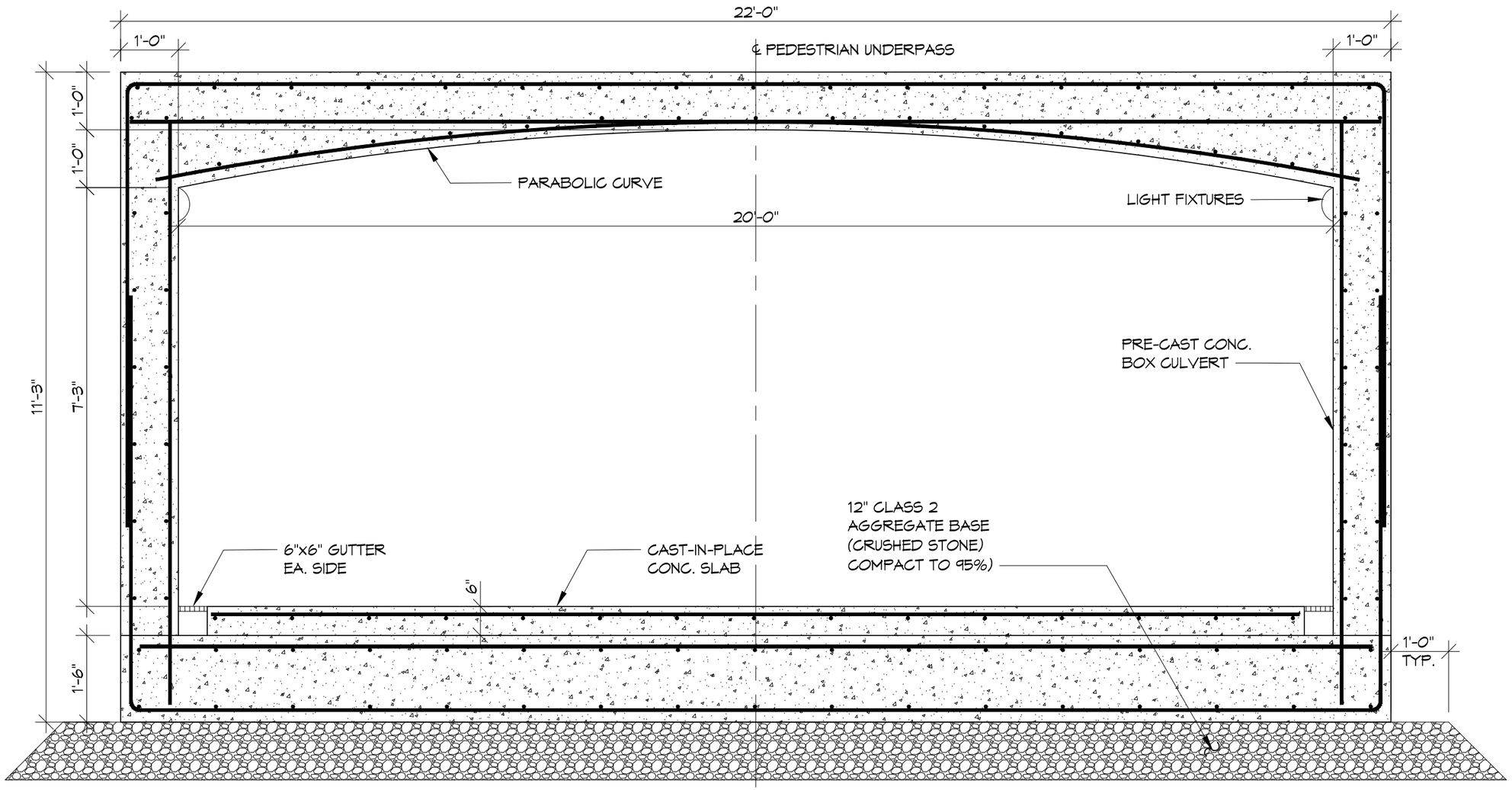
SHORING DETAILS
PEDESTRIAN UNDERPASS
VILLA ST DEVELOPMENT
MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	SH2.1

Plot Date: June 13, 2018 - 9:50 AM



TUNNEL CROSS SECTION

1/2"=1'-0"

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TUNNEL CROSS SECTION

PEDESTRIAN UNDERPASS

VILLA ST DEVELOPMENT

MOUNTAIN VIEW, CA

Date	6/12/2018
Scale	AS SHOWN
Drawn	VAB, MM
Checked	JAR
Job	12859
Sheet	S1.0