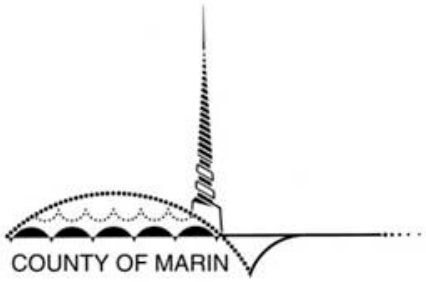

County of Marin

Alto Tunnel Investigation and Cost Estimate Update – 2017

Report Status (Final)
Revision No. #3

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September 2017

Distribution

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Revision Log

Revision No.	Date	Revision Description
1	8-1-17	Revised after comments from County of Marin
2	9-11-17	Revised after comments from County of Marin
3	9-14-17	Corrected total estimate amounts on p.21 to be consistent with detailed project costs on p.20.

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1.0 Introduction

1.1 Project Description

In 2009, the County of Marin commissioned a corridor study of three specific bike/pedestrian routes connecting the cities of Mill Valley and Corte Madera. The Alto Tunnel route (see Figure 1), which follows the route of the former Union Pacific Railroad alignment and would include reopening the Alto railroad tunnel, was one of the alternates studied. In 2010, Jacobs Associates (now McMillen Jacobs Associates) prepared a cost estimate to reopen the Alto Tunnel as a bike/pedestrian route. In 2016, McMillen Jacobs Associates was retained by the County of Marin to perform an investigation into the tunnel to update the cost estimate completed in 2010. This report provides a summary of the investigation and the updated cost estimate.

1.2 Definitions

There are several terms used in this study that are unique to the tunnel construction industry. Definitions of selected tunneling terms are given below.

Face:	Location in tunnel where excavation is taking place.
Ground Support:	General term for the materials installed to stabilize the ground around a shaft or tunnel excavation.
Initial Support:	Any combination of ground support elements installed prior to installation of a final lining, including steel sets, shotcrete, spiling, etc.
Roadheader:	A piece of construction equipment that consists of a rotary cutterhead equipped with picks that are attached to a hydraulically operated boom, which in turn is mounted on a base frame.
Spiling or Forepoling:	A mining technique used to advance an excavation in caving ground by driving poles, slabs, or sheathing into the ground ahead of the excavation or simultaneously with it.
Stand-up Time:	A general term describing the length of time the tunnel is anticipated to remain stable without any support.
Steel Set:	Structural steel member used for ground support, curved to match the theoretical shape of the tunnel or shaft excavation and uniformly blocked or expanded to the excavated surface.
Top Heading and Bench:	Method of excavating a tunnel face by excavating, stabilizing, and supporting the upper portion of the tunnel first and then excavating and supporting the lower portion of the tunnel.

1.3 Report Organization

This report is organized into the following sections:

- Section 2.0 summarizes the previous studies performed for Alto Tunnel.
- Section 3.0 presents a chronology of work performed at the tunnel, as well as an interpretation of the existing conditions at the tunnel.
- Section 4.0 summarizes the work performed for this investigation, and the existing conditions of the Alto Tunnel.
- Section 5.0 presents the known historical conditions and results of the investigation.
- Section 6.0 presents the functional design criteria for the tunnel rehabilitation, as well as the approach to such rehabilitation.
- Section 7.0 presents a conceptual approach for filling and permanently closing the tunnel.
- Section 8.0 presents cost estimates for both rehabilitating and permanently closing the tunnel.
- Section 9.0 summarizes the tunnel feasibility study.
- The appendices include photos, tunnel rehabilitation figures, and the feasibility study level cost estimate.

1.4 Quality Assurance

This memorandum was prepared by Carol Ravano, Shawn Spreng, and staff members of McMillen Jacobs Associates. Technical review was provided by David Crouthamel of McMillen Jacobs Associates.

1.5 Limitations

This technical memorandum was prepared based on a limited assessment of the Alto Tunnel by drilling and laser scanning through five boreholes. Personnel entry into the Alto Tunnel for an internal inspection was not made; therefore, an assessment of the anticipated condition of the tunnel interior was developed based on the laser scan results, previous inspection reports, and comparisons with other tunnels of similar construction, condition, and age.

2.0 Previous Studies

Several studies and observations have been produced for the Alto Tunnel and the nearby Cal Park Hill Tunnel that are pertinent to the current feasibility study. These documents are summarized below.

- **Mill Valley to Corte Madera Bike and Pedestrian Corridor Study – Appendix B Tunnel Feasibility Study.** This work was completed in April 2010 and consisted of the following:
  - Functional design criteria to frame the Alto Tunnel rehabilitation technical requirements.
  - A feasibility-level cost estimate for reopening the Alto Tunnel and developing it for bicycle/pedestrian use, based on recent construction bids for the Cal Park Hill Tunnel Rehabilitation.
  - A conceptual-level cost estimate
- **Alto Tunnel Scoping Study, Volume I—Background Information.** This document contains a detailed history of the tunnel and summarizes all reference materials available at the date of the scoping study. This work was completed in August 2001.
- **Alto Tunnel Scoping Study, Volume II—Engineering Summary and Proposed Supplemental Investigation**. This document provides a summary of the tunnel's condition for each reach of the tunnel. This work was completed in August 2001.
- **An Alto Tunnel Primer.** John Palmer, a member of the Scott Valley Homeowners' Association, prepared a series of articles describing the Alto Tunnel history, the technical studies completed through 2003, and his opinion of the issues associated with reopening the tunnel.
- **Cal Park Hill Tunnel Documents.** The Cal Park Hill Tunnel was built in 1884 as a single-track railway tunnel. In 1924 it was widened to accommodate a double track and was converted back to a single track before it was closed. It has been rehabilitated for use as a pedestrian and bike pathway by the County of Marin, and as a commuter rail transportation corridor by the Sonoma Marin Area Rail Transit Agency (SMART). The Cal Park Hill Tunnel original construction was similar to that of the single track Alto Tunnel, and both tunnels were constructed in the same year.
  - Cal Park Construction Contract Documents (including design drawings, specifications, and geotechnical reports) and construction observations were considered in the development of the Alto Tunnel feasibility study.

3.0 Existing Conditions

3.1 Chronology

The following is a summary chronology of Alto Tunnel events pertinent to this tunnel investigation.

1884 The Alto Tunnel was constructed by Northwestern Pacific Railroad serving the Corte Madera to Sausalito communities. The 2,173-foot-long tunnel has a cross section 16 feet wide by 20 feet high. A single narrow-gauge track served the railroad. The Northwestern Pacific Railroad (RR) was a joint venture of Southern Pacific RR and Santa Fe RR.

1929 Southern Pacific RR became the sole owner of the Alto Tunnel.

1940 The Corte Madera–Sausalito line was closed to passenger rail traffic. Freight traffic continued along the line.

1950–1960s Construction of homes adjacent to the railroad right-of-way on the Mill Valley side.

1971 The Corte Madera–Sausalito line and the Alto Tunnel were closed to freight rail traffic. At the time of the tunnel closure, heavy bulkheads were built at each end of the tunnel to prevent further access.

1972 The Golden Gate Transit District attempted to purchase the railroad's right-of-way, including the Alto Tunnel, for use as a commuter rail line. Community concerns over land ownership, right-of-way, noise, and rail safety prevented the purchase.

Kaiser Engineers evaluated the condition of the tunnel for Golden Gate Transit and expressed its concerns about continued deterioration of the tunnel supports. Its recommendations were not implemented.

Late 1970s The County of Marin purchased additional right-of-way from Southern Pacific RR.

1975 A lean concrete plug, approximately 124 feet long, was installed 170 feet south of the North Portal to improve stability and security.

1977 A private party offered to purchase the tunnel to use as a commercial enterprise. However, the sale was not successful because of fee title issues.

1979 Southern Pacific RR sealed the Alto Tunnel.

1981 A portion of the tunnel near the South Portal collapsed and caused a large depression adjacent to Underhill Road. The depression destroyed a residence and underground utilities.

Some of the old rail right-of-way, excluding the Alto Tunnel, was converted to multipath use.

The County of Marin hired the firm of Copple Foreaker Associates to study the tunnel in anticipation of its possible purchase from Southern Pacific. The Foreaker Study, as it came to be known, described the tunnel as being in an advanced state of decay because of moisture and neglect.

1982 A depression and a portion of the tunnel were backfilled with gravel. In total, 400 feet of the tunnel was filled with concrete or gravel. The Foreaker Study was updated to reflect the backfill work to fill the depression and tunnel. The dates of these events have not been confirmed.

1983	The County of Marin and the Northwestern Pacific Railroad Company entered into a 15-month option wherein the County would purchase a 1-mile portion of the railroad right-of-way. The agreement was completed in part.
1990	Northwestern Pacific Railroad Company sells a portion of the railroad property at the south end of the tunnel to the Mr. and Mrs. Michael Casey.
1994	The Marin County Department of Parks and Open Space hired Brady and Associates to explore the possibility of developing a bike path and reconstructing the Alto Tunnel.
2000	Safe Routes Marin showed interest in evaluating the possibility of utilizing the Alto Tunnel as part its bike master plan. The Marin County Department of Public Works researched and verified both the County's and the railroad's current rights-of-way. The portions of the tunnel still controlled by the railroad included the 275-foot portion from the South Portal north, and the 490-foot section from the North Portal south.
2001	The Congestion Management Agency of the Marin County Department of Public Works commissioned a new feasibility study from the firms of Quincy Engineering, Jacobs Associates, and Parikh Consultants to evaluate the Alto Tunnel for its possible conversion to pedestrian and bicycle use. An inspection team confirmed that access to the tunnel interior was blocked by a concrete plug.
2008	Marin County Department of Public Works commissioned the Corte Madera to Mill Valley Corridor Study to evaluate bicycle and pedestrian routes connecting Corte Madera and Mill Valley.
2010	Marin County commissioned Jacobs Associates to produce the Mill Valley to Corte Madera Bike and Pedestrian Corridor Study – Appendix B Tunnel Feasibility Study, which produced a feasibility level cost estimate for reopening the Alto Tunnel and developing it for bicycle/pedestrian use, based on recent construction bids for the Cal Park Hill Tunnel Rehabilitation.
2016–2017	McMillen Jacobs Associates was retained by Marin County Department of Public Works to perform a limited investigation into the tunnel to refine the 2010 feasibility level cost estimate for tunnel rehabilitation.

4.0 2017 Investigation

McMillen Jacobs Associates completed a limited investigation to gain visual access and perform laser scanning of the Alto Tunnel interior to determine its current condition and update cost estimates for reconstruction. The scope of work included drilling five boreholes into the tunnel from the public right-of-way (ROW) in two locations, as shown in Figure 2 and summarized in Table 1, and placing a down-hole scanning device into the tunnel to scan the tunnel interior for evaluation of the tunnel supports for distortion, collapse, and frequency of occurrence. There was no personnel access into the tunnel interior.

Table 1. Summary of Investigation Boreholes

Location	Boring No.	Date Completed	Ground Surface Elevation	Hole Length	Coordinates
Underhill Site	Borehole 1	02/22/2017	145 ft	120 ft	37.914705° N, -122.524281° W
	Borehole 2	02/15/2017	147 ft	330 ft	37.914722° N, -122.524289° W
Chapman Site	Borehole 3	03/28/2017	325 ft	380 ft	37.917164° N, -122.525717° W
	Borehole 4	03/17/2017	325 ft	238 ft	37.917198° N, -122.525770° W
	Borehole 5	03/14/2017	324 ft	363 ft	37.917220° N, -122.525808° W

Local homeowners and the community were informed of the investigation work through two public meetings that were held in January 2017. Approval for right-of-entry was obtained by an agreement with Union Pacific Railroad. An encroachment permit was filed for the Alto Tunnel Study with the City of the Mill Valley, and permission to install monitoring wells was permitted by the Marin County Environmental Health Services. The drilling locations are shown in Figure 3 and Figure 4.

On February 6, 2017, drilling commenced for the investigation at the Underhill Site. Drill Tech Drilling and Shoring (DrillTech) performed the borehole drilling and casing using a Klemm 806 double-head drill rig to drill the hole and simultaneously place a 5-1/2 inch steel outer casing for the length of the borehole. A slightly larger hole with a 7-5/8 inch steel casing was used in the overburden soils in the top 0 to 15 feet of the holes. Each of the five boreholes was drilled at an angle to penetrate the tunnel at locations spaced approximately 300 feet apart along the historical tunnel alignment. Subsurface conditions encountered in all five borings were similar, with the driller noting up to 15 feet of soil underlain by variably soft to hard Franciscan Complex rocks. All boreholes successfully penetrated the tunnel. A camera and light were advanced to the bottom of each borehole through the installed casing. Video was recorded at the bottom of the borehole to investigate the structure of the tunnel and material encountered within the cavity. During the initial investigation, it was discovered that Borings B-1, B-2, and B-3 terminated in collapsed rubble.

After completion of the drilling project, a concrete Christy box well-monument was constructed at the ground surface to cover and protect each borehole.

On April 18, 2017, McMillen Jacobs and its scanning subconsultant Renishaw deployed a C-ALS Cavity Profiler to the bottom of each borehole through the installed casing. The cavity profiler provided video imagery as well as a three-dimensional (3-D) model of survey data points of the tunnel interior encountered at each borehole. Because collapsed material was found in the crown of the tunnel in B-1, B-2, and B-3, scanning was not possible; however, the boreholes were surveyed for alignment. An intact

tunnel interior was observed in Boreholes B-4 and B-5. The known and inferred conditions of the tunnel are shown on Figure 1 in Appendix B; a discussion of the findings can be found in Section 4.2. Examples of the cross sections observed in Borehole B-4 are shown in Figure 3 of Appendix B. Photos of the drilling process are shown in Appendix A.

5.0 Tunnel Condition

5.1 Known Historical Conditions

The North Portal of the Alto Tunnel is located between Tunnel Lane and Montecito Drive. Several residences are located immediately adjacent to the portal structure. The inactive rail bed is overgrown with vegetation and is poorly drained. Access to the tunnel is prevented by a steel bulkhead at Station 277+61.9. The tunnel was originally supported by redwood timber (10 by 14 inches) sets in a 7-segment configuration spaced 1 to 5 feet apart. Wood lagging, spanning between the sets along both sides and the crown of the tunnel, consists of split redwood approximately 2 inches thick and 5 to 8 inches wide. As the 7-piece sets deteriorated, they were replaced by 5-piece sets of similar dimensions. It was reported that in the 300 feet of tunnel north of the South Portal, 7-piece sets were also replaced with 5-piece sets.

There is a 30.9-foot-long concrete portal barrel, constructed in the 1950s, at the north end of the tunnel. South of the barrel, there are 139 lineal feet of gunite over either steel sets, timber sets, or timber and steel sets. The documents that we have reviewed do not give a definite description of the method of installation or of the materials used in this section. The gunite may have been placed over the original timber sets; newer steel sets may have been placed and the existing timber sets removed; or the timber sets may have been left in place between the newer steel sets. Additional investigation should be performed in this section to confirm what materials are present. Because of the inadequate drainage, approximately 18 inches of standing water were present in this section during the 2001 investigation.

In 1975, a 125-foot-long lean concrete “plug” was placed between approximately Stations 275+92 and 274+68. This plug was placed to increase the stability of this section of tunnel and the ground above it, and for security purposes. There is a remnant wooden bulkhead at the north end of this plug, which was visible during the 2001 investigation. To the south of the concrete plug, there is reported to be an approximately 170-foot-long zone of uncompacted backfill material. However, based on a review of the historical documents, it is not possible to definitively determine if the backfill material is present. The scan in the tunnel performed in 2017 also was unable to confirm the presence of the fill. For estimating purposes, it has been assumed that the fill is in place, and the timber sets are intact.

5.2 Results of 2017 Investigation

Laser scans at Boreholes B-4 and B-5 confirm that the tunnel is intact, with 7-piece sets at those locations. The scan at B-4 extends between approximately Stations 268+00 and 270+00 and shows 7-piece timber sets spaced at approximately 4 feet on center, with no noticeable distress or deformations. There are approximately 2 to 3 feet of standing water in this portion of the tunnel. Boring B-5 terminated close to the tunnel side wall, so only a single line scan could be performed at this location. The line scan indicates that the tunnel is open at this location. Standing water was not observed at B-5. Discrete cross sections taken from the laser scan are shown in Figure 3 of Appendix B.

Based on the results of the laser scanning at B-4 and B-5, as well as previous information that indicates that the northern portion of the tunnel is generally in good rock (as evidenced by the lighter support originally installed here), we have assumed for cost estimating purposes that the tunnel is intact with no significant failures between the southern extents of the uncompacted fill at approximately Sta. 272+98 and the central portion of the tunnel at approximately Sta. 267+00. This is shown schematically on Figure 2 in Appendix B.

Videos of Borings B-1, B-2, and B-3 reveal that all three boreholes terminate in collapsed rubble material. Because there was no void to measure, scanning was not performed at these borings. The borings were accurately measured with gyroscopic surveying equipment, and it was confirmed that they broke through the tunnel and encountered rubble at approximately the theoretical tunnel crown location. There was no significant gap between the rubble and the intact rock and/or timber supports. This indicated that the tunnel is completely filled with collapsed material at these locations.

The southern half of the tunnel is known to be in worse condition than the northern half. The geology is generally weaker, and heavier supports were installed during original construction. During an inspection into the tunnel in the 1970s, a few small localized collapses were found in this half, as well as one moderate collapse approximately 900 feet north of the south portal. The collapses revealed by the drilling indicate that the condition of the tunnel has deteriorated since it was last entered in the late 1970s. For cost estimating purposes, it has been assumed that the entire southern half of the tunnel, south of Station 267+00, is either filled with collapsed material or significantly distressed. This is shown schematically on Figure 2 in Appendix B.

6.0 Tunnel Rehabilitation

6.1 Tunnel Repair

Based on the information gathered during the investigation and an analysis of previous studies, as outlined in Section 4.0, five different tunnel repair types have been developed. These repair types and a table showing their locations are shown in Appendix B. The basic design is to line the entire tunnel with a wide flange steel section, either W6 or 8, spaced from 3 to 5 feet apart, depending on the existing conditions in the tunnel, with shotcrete applied over and between the steel sets.

The new tunnel will have a clear opening 11.5 feet wide and over 14 feet tall. The new tunnel size was selected so that the new steel sets could be placed within the old timber sets. This eliminates the high cost and risk associated with tearing out old timber supports, many which are likely in distress, to stand new supports of a similar size. The tunnel size is significantly taller and slightly wider than Cal Park's 11.4-foot-wide wide pedestrian tunnel.

Five different repair support types (see Table 2) have been defined to address the range of tunnel conditions anticipated:

- Type 1 – North Portal barrel and in the section with gunite over steel or timber sets: W6x25 steel sets at 4-feet on center (o.c.); shotcrete. Annular space between sets and existing gunite to be backfilled with low strength concrete.
- Type 2 – Concrete plug section; the plug will be excavated using a small roadheader: W6x25 steel sets at 4-ft o.c.; shotcrete.
- Type 3 – Intact northern portion of tunnel: W8x35 steel sets at 5-ft o.c.; shotcrete. Annular space between new sets and existing timber supports to be backfilled with low strength concrete. In area of potentially uncompacted fill, the fill would be mucked out prior to set placement.
- Type 4 – Collapsed and inferred not intact sections with limited rock and debris: Excavate through portions of the tunnel partially filled with rock and debris; place shotcrete as initial support prior to placement of steel sets. W8x35 steel sets at 3-ft o.c.; shotcrete. Annular space between new sets and temporary shotcrete to be filled with low strength concrete.
- Type 5 – Collapsed and inferred not intact sections with extensive rock and debris: Excavating through portions of the tunnel filled with rock and debris using channel spile presupport in crown, continuous wood lagging elsewhere, potentially using top heading and bench method; W8x35 steel sets at 3-ft o.c.; shotcrete.

In areas where the steel sets are placed within a larger opening (Types 1, 3, and 4), stayform (expanded wire mesh) will be installed on the back flange of the steel set and shotcrete will be applied over the stayform. After the shotcrete shell is formed, the annular space between the stayform and the original tunnel will be backfilled with low strength concrete. A similar process was performed in the Cal Park Tunnel. Types 2 and 5 tunnel support are not within larger openings; therefore, the shotcrete will be applied directly over the substrate. In all support types the shotcrete thickness will be a minimum of 4 inches thick between steel sets. The shotcrete section thickens at the steel set to encapsulate the steel set with a minimum of 2 inches of cover for corrosion protection purposes. Below the tunnel springline additional shotcrete will be placed between the steel sets and troweled to produce a smooth and uniform surface to minimize injury potential for pathway users.

Table 2. Tunnel Rehabilitation Repair Types

Repair Type	Steel Set Size and Spacing	Excavation/Initial Support	Low Strength Concrete Backfill
1	W6 x 25 @ 4-ft o.c.	None necessary.	Yes
2	W6 x 25 @ 4-ft o.c.	Roadheader through low-strength concrete.	No
3	W8 x 35 @ 5-ft o.c.	Excavate through uncompacted fill. No initial support anticipated.	Yes
4	W8x 35 @ 3-ft o.c.	Excavate through limited collapsed rock and debris; use shotcrete as initial support.	Yes
5	W8 x 35 @ 3-ft o.c.	Excavate through extensive collapsed rock and debris, cemented pea gravel; use spiling as presupport.	No

6.2 Tunnel Facilities

The following sections describe the tunnel facilities assumed for cost estimating purposes. These facilities and the general tunnel operation are similar to what are in place at the Cal Park pedestrian tunnel. Details are shown on Figure 6 in Appendix B.

6.2.1 General Description

The potential pedestrian/bicycle path tunnel should have the following general characteristics:

- The 2,173-foot-long tunnel will be converted from a single-track rail tunnel with current interior dimensions of approximately 16 feet wide by 20 feet tall to a bike/pedestrian tunnel with interior clear dimensions of approximately 11.5 feet wide by 14 feet tall.
- The existing intact timber sets in the tunnel will not be removed; a smaller diameter bike/pedestrian tunnel will be built inside the larger diameter tunnel.
- The smaller diameter tunnel will be lined with steel sets with shotcrete and wire mesh lagging. The annulus between the smaller diameter bike/pedestrian tunnel and the existing timber-lined tunnel will be backfilled with a low-strength concrete.

6.2.2 Ventilation and Lighting

Natural air ventilation is sufficient for the normal tunnel usage. Natural ventilation relies on weather (wind, temperature, and pressure difference due to elevation) to maintain air flow. Historically, tunnels shorter than about 2,500 feet and with noncombustible elements and usage can be ventilated naturally. However, a ventilation system will be installed to address the emergency scenario of a maintenance vehicle or fire in the tunnel. This system will comprise:

- Twelve fans spaced at 200 foot intervals
- Movement of 3,000 cubic feet per minute (CFM) per vane axial fan providing 15 feet per minute of air movement through the tunnel

Low energy lighting will be provided just outside the portals as well as throughout the tunnel. Lighting will have a backup power supply.

6.2.3 Safety and Security

In addition to ventilation and lighting, the following safety and security provisions are recommended:

- Radio communications (leaky coaxial cable, cell phones if possible) for public safety in the tunnel
- Emergency call stations at portals and at 200-foot increments in the tunnel
- A system for user notice when maintenance, emergency vehicle, or another blockage is present in tunnel
- Security cameras at portals and at approximately 300-foot increments in the tunnel
- Lockable portal gates
- Bollards at portals to block unauthorized vehicle entry
- Anti-graffiti coating of portal structures and tunnel walls (optional)

6.2.4 Fire Prevention and Suppression

The following fire safety provisions are recommended:

- Fire alarm pull stations at portals and at 200-foot increments in the tunnel
- Sprinkler system in the tunnel
- 1,000 gpm fire hydrants on the portal sides of the emergency access turnarounds and wet-standpipe fire hose connections at 200-foot increments in the tunnel

6.2.5 Emergency Access

The following incident response provisions are recommended:

- A 20-foot-wide traffic corridor from street to portals: 12-foot-wide paved path with 4-foot-wide compacted earth shoulder on either side
- Overhead clearance of 13 feet minimum
- A 16-foot-wide shunt or hammerhead vehicle turnaround as close as possible to each portal (225 feet from North Portal, 150 feet from South Portal)
- Pull-off parking near the portals for emergency vehicles

7.0 Alto Tunnel Closure

If the Alto Tunnel is not developed for bicycle and pedestrian use and the tunnel is permanently closed, then it is recommended that the Alto tunnel be completely backfilled with a stable material. We recommend a staged approach, whereby the largest voids are filled with relatively low-cost controlled-low-strength-material (CLSM), followed by higher cost material with higher mobility to fill the smaller voids in the collapsed and inferred not intact sections. Secondary, and possibly tertiary rounds of drilling, verification, and grouting would be required to ensure all voids are filled. This process is shown in Figures 8 and 9 in Appendix B.

The first phase of backfilling would place CLSM into the intact northern half of the tunnel through existing boreholes B-4 and B-5. CLSM would be pumped until the tunnel and borings are filled. Next, a low viscosity grout such as neat cement would be pumped into the collapsed and inferred not intact sections in the southern half of the tunnel through existing boreholes B-1, B-2, and B-3. Grout would be pumped until the tunnel and borings are filled. Next, a bulkhead would be constructed at the north portal, and the northern 170 feet of tunnel would be backfilled with CLSM. Prior to construction of the bulkhead, a pipe with injection ports would be installed along the tunnel crown for contact grouting.

The second phase of backfilling would be targeted at verifying that the tunnel is backfilled and filling any remaining voids. A series of 5-inch-diameter secondary grout holes would be drilled to intercept the tunnel. The boreholes would be videoed to determine the extent of remaining voids. If extensive voids (>1 cubic yard) are found, the voids may be filled with CLSM. If no voids or only small voids are found, the boreholes will be filled with grout to refusal. Following secondary grouting, the preinstalled pipe at the North Portal will be grouted to fill any remaining voids.

If no large voids are found during the second phase of backfilling, then the operation is complete. If extensive voids are discovered and filled during secondary grouting, then a tertiary round of boreholes will be drilled and grouted, in a similar manner as described for secondary grouting.

8.0 Feasibility Level Cost Estimate

8.1 Estimate Methodology

An opinion of probable construction cost was developed for both the Alto Tunnel rehabilitation as well as permanent closure, and is presented in Appendix C. The estimates are based on the figures in Appendix B.

The scope of work and work sequence for the tunnel rehabilitation includes:

- Establishing work laydown areas at both portals of the tunnel
- Excavating, re-supporting, and relining collapsed sections of the tunnel
- Re-supporting and relining non-collapsed sections of the tunnel
- Paving a smooth invert
- Installing tunnel utilities and fire / life safety systems
- Backfill the exploratory boreholes from the surface
- Site restoration of the laydown areas

The scope of work for the permanent closure of the tunnel includes:

- Establishing work laydown areas at both portals of the tunnel, and at strategic borehole locations along the tunnel alignment.
- Placing a controlled low strength material into the larger voids in the tunnel by pumping it through the existing boreholes
- Placing a fluid grout (assumed cement based) into the collapsed and inferred not intact sections of the tunnel
- Drilling secondary boreholes from the surface along the tunnel alignment
- Performing secondary grouting (assumed cement based) along the alignment to fill additional voids not filled during the initial phase of backfilling/grouting
- Drilling tertiary boreholes from the surface to verify complete ground filling (estimate assumes no additional tertiary grouting).
- Site restoration of the laydown areas

For each element of work making up the project, a takeoff was performed that quantified the amount of work and materials required for that element in such terms as cubic yards of excavation, steel supports, cubic yards of shotcrete, grout, etc. A cycle time analysis was performed to determine the likely rate at which the task could be executed based on a specific crew size and equipment spread handling the relative amounts of each type of material required. In this fashion, the cost of performing each discrete task was tabulated in terms of labor, equipment, material, and subcontract costs. The construction cost estimate is based primarily on production rates calculated for conditions specific to this contract.

Resource rates for labor, equipment, materials, and subcontracts are detailed in the cost estimates in Appendix C. Labor wage rates for the estimate are based on current prevailing wage rate determinations

for Marin County, published by the State of California. These rates are segregated into base wages and fringes to calculate applicable payroll taxes.

The construction equipment used in the estimate is based on the US Army Corps of Engineers Construction Equipment Ownership and Operating Expense Schedule – Region VII, which covers the Southwest Region. Recent budgetary vendor quotes for steel rock support, shotcrete, etc. are used in this estimate. For other items, a combination of sources such as RS Means or recent cost data from similar projects is used with adjustments as appropriate. Subcontractor pricing and production rates are primarily taken from recent contractor budget quotes for minor subcontractor items, and escalated and prorated costs for similar work performed on the Cal Park Hill Tunnel.

This project is estimated assuming the contract will be a design-bid-build delivery. Indirect costs are calculated and added to the direct cost using this basis of contract delivery. The general conditions costs are detailed as part of the Indirect Costs in the estimate. The Indirect Costs include items such as Equipment Ownership/Mobilization, Field Supervision, Bonds Insurance and Taxes, and Contractor Markup. Local and State Sales Taxes are also included where applicable.

The construction estimate is reported in June 2017 dollars. Escalation is added to the base estimate at a rate recommended by McMillen Jacobs (3%), and computed to the midpoint of construction for each activity indicated.

This estimate was prepared in conformance with the Association for the Advancement of Cost Engineering's Cost Estimate Class 3 recommendations (AACE, 1997); however, it should be cautioned that significant portions of the tunnel have not been observed. The design definition is now recommended at 20%, and McMillen Jacobs recommends the owner carry a minimum of 20% for design allowance to accommodate any changes as the design is completed.

The following assumptions were made for the cost estimates:

- All work is estimated on a single 8-hour shift, 5-day workweek.
- The estimates assume no utility conflicts.
- The contract will be fixed price lump sum using a design-bid-build delivery.
- A disposal site is located within two hours of the site.
- Potential water discharged from the tunnel will be treated and discharged into a local sewer.
- Sufficient potable water is available at each site.

The following exclusions were made for the cost estimates:

- All sewer discharge fees are excluded.
- All required permits and easements will be obtained prior to bidding the contract.
- Adjacent pathway improvements were not included.

8.2 Estimate Summary

8.2.1 Alto Tunnel Rehabilitation

A summary of the estimated cost of rehabilitating the Alto Tunnel is given in Table 3.

Table 3. Summary of Estimated Cost of Alto Tunnel Rehabilitation

PROJECT CONSTRUCTION COSTS	OPINION OF PROBABLE COST
Subtotal Construction Cost	$24.95M
Escalation	$461K
Contingency	$5.0M
Total Construction Cost with Contingency	**$30.4M**

PROJECT DEVELOPMENT COSTS	OPINION OF PROBABLE COST
Survey, Technical Studies, and Engineering Design (15%)	$4.56M
Environmental Analysis, Documentation, and Permits (10%)	$3.04M
Project Administration (10%)	$3.04M
Construction Management (10%)	$3.04M
Design Services During Construction	$1.25M
Allowance to Address Right of Way Issues[1]	$1.50M
Total Project Development Costs	**$16.43M**

TOTAL ESTIMATED PROJECT COST	**$46.8M**

[1] A placeholder allowance developed by others.

8.2.2 Alto Tunnel Closure

A summary of the estimated cost of filling and permanently closing the Alto Tunnel is given in Table 4.

Table 4. Summary of Estimated Cost to Fill and Permanently Close Alto Tunnel

PROJECT CONSTRUCTION COSTS	OPINION OF PROBABLE COST
Subtotal Construction Cost	$4.49M
Escalation	$19K
Contingency	$902K
Total Construction Cost with Contingency	**$5.41M**

PROJECT DEVELOPMENT COSTS	OPINION OF PROBABLE COST
Survey, Technical Studies, and Engineering Design (15%)	$0.81M
Environmental Analysis, Documentation, and Permits (10%)	$0.54M
Project Administration (10%)	$0.54M
Construction Management (10%)	$0.54M
Design services during construction	$0.40M
Allowance for ROW permitting	$0.25M
Total Project Development Costs	**$3.08M**

TOTAL ESTIMATED PROJECT COST	**$8.5M**

9.0 Summary

Our limited investigation into the interior of the Alto Tunnel reveals that the condition of the southern half of the tunnel has deteriorated since it was last inspected in the late 1970s, with all three borings in the southern half intercepting collapses. The two borings penetrating the northern half of the alignment encountered open tunnel with no apparent signs of deformation. Therefore, it has been assumed for cost estimating purposes that the northern half of the tunnel is intact with no significant zones of collapse material, while the southern half of the tunnel is collapsed, inferred not intact, or significantly distressed.

Preliminary designs for the rehabilitation of Alto Tunnel were developed. A new tunnel interior cross section similar to the Cal Park pedestrian tunnel cross section was chosen so that the new tunnel supports could be placed within the existing supports without first removing them. Five support types were developed to accommodate different existing tunnel conditions and support types. The appurtenant fire/life/safety, and operations and maintenance features within the finished tunnel are assumed to be similar to what was installed at Cal Park.

A separate design for the complete filling and permanent closure of Alto Tunnel was also developed.

A new opinion of probable cost was prepared based on the inferred tunnel conditions and the rehabilitation and permanent closure designs. The preliminary level estimate of construction costs, assuming a 20% contingency to reflect design definition and current uncertainties, is approximately $46.8 million in 2017 dollars to rehabilitate the tunnel, and $8.5 million to backfill and permanently close the tunnel.

10.0 References

Association for the Advancement of Cost Engineering (AACE). August 1997. Cost Estimate Classification System, AACE International Recommended Practice No. 17R-97.

Jacobs Associates. 2009. Task 4.1. Geotechnical Study.

Jacobs Associates. 2001. Alto Tunnel Scoping Study. Prepared for Marin County Department of Public Works.

Palmer, John. 2003. An Alto Tunnel Primer.

Figures

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Figure 1. Location map of eastern Marin County, showing location of Alto Tunnel and Cal Park Hill Tunnel (modified from Google Maps, 2009, no scale)

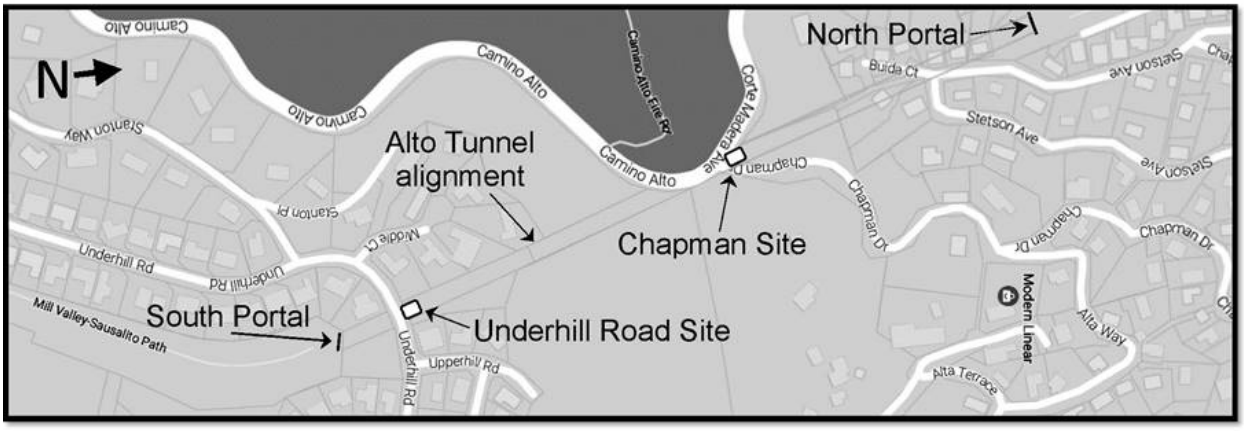

Figure 2. Plan view of Alto Tunnel showing locations of geotechnical investigation

Figure 3. Plan view of Chapman Site showing the location of investigation over the tunnel alignment

Figure 4. Plan view of Underhill Site showing the location of investigation over the tunnel alignment.

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Appendix A. Site Photos

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Photo 1. Location of Investigation at the Underhill site after restoration.

Photo 2. Location of investigation at Chapman site after restoration.

Photo 3. Klemm drill being utilized for the borehole drilling of BH-2 at the Underhill Site location.

Photo 4. Klemm drill being utilized for the borehole drilling of BH-3 at the Chapman Site location.

Photo 5. Typical concrete Christy box installation to seal each borehole following the investigation.

Photo 6. View of bottom of Borehole B-1 showing void area filled with collapsed material.

Photo 7. View through bottom of casing of Borehole B-2 showing void area filled with collapsed material.

Photo 8. View through bottom of casing of Borehole B-3 showing fibrous wood debris.

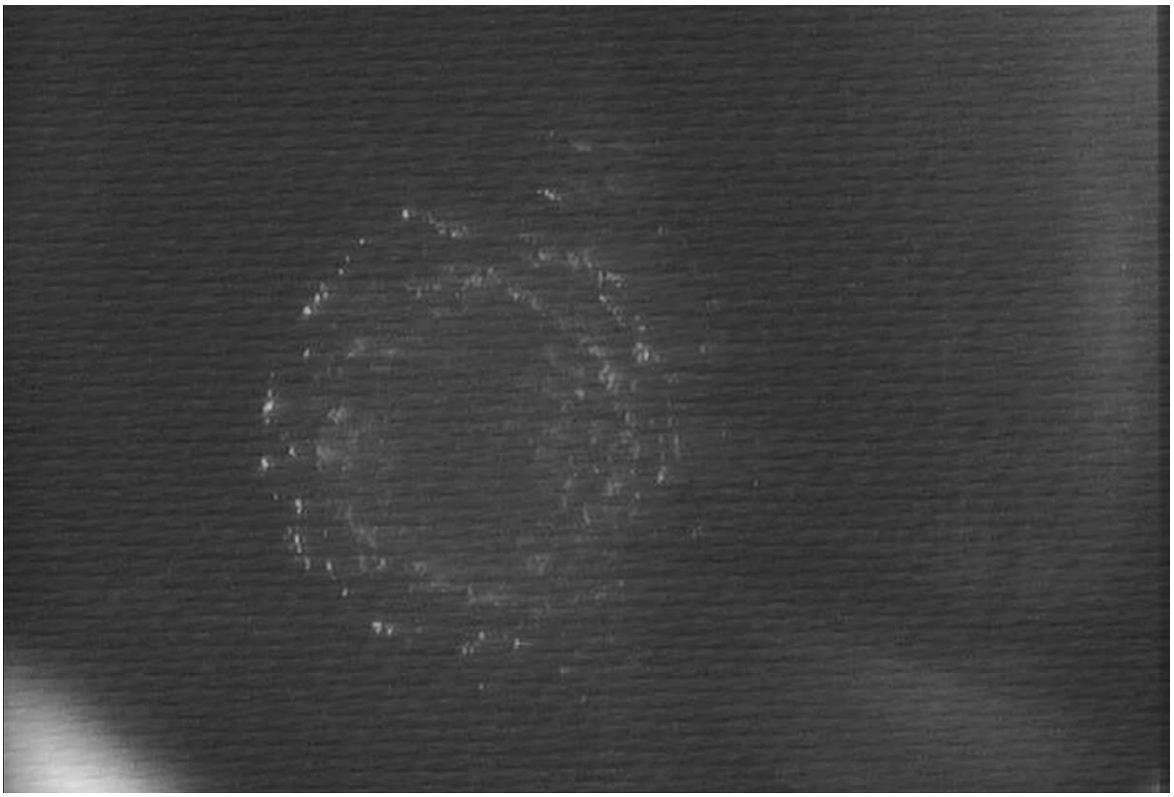

Photo 9. View of bottom of Borehole B-4 showing cavity and rings from water droplets.

Photo 10. View of bottom of Borehole B-5 showing fibrous wood debris.

Photo 11. Renishaw was on-site for deployment of the cavity and tunnel scanning equipment.

Appendix B. Tunnel Rehabilitation and Permanent Closure Figures

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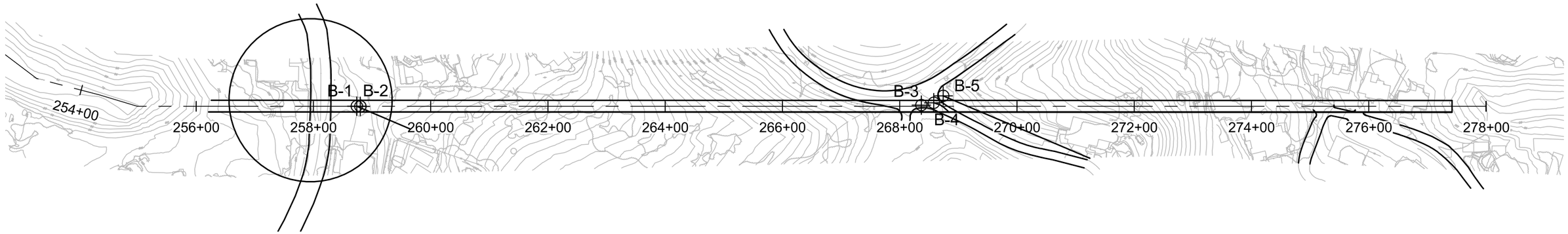

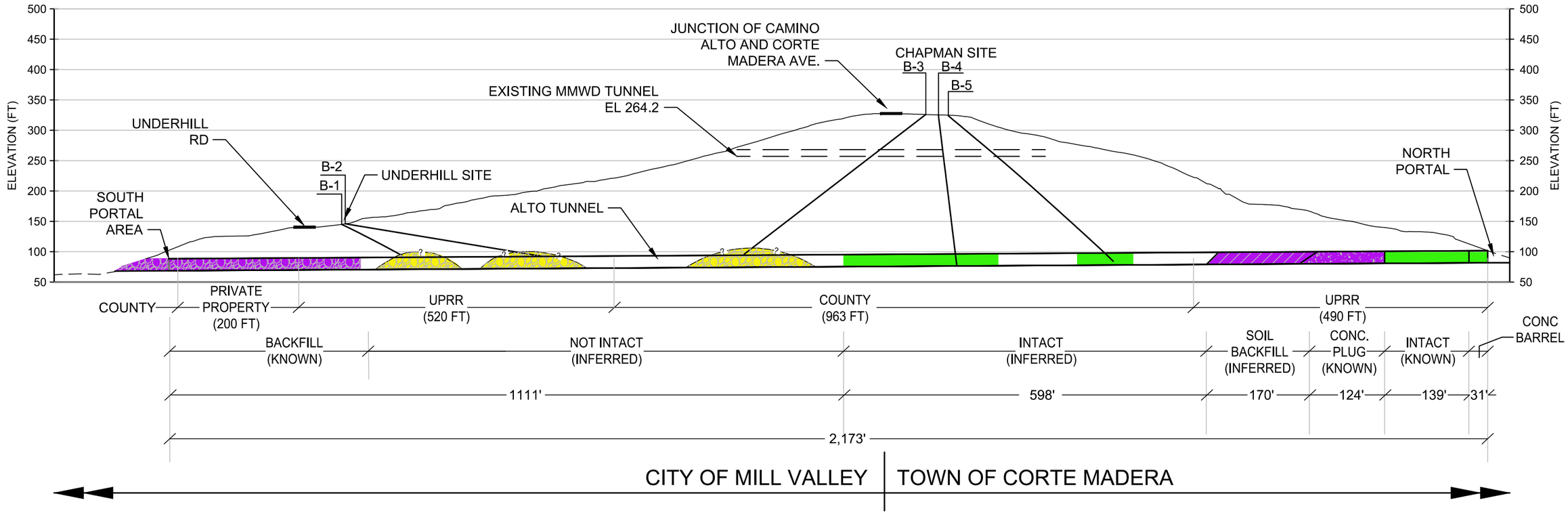

ALTO TUNNEL INVESTIGATION KNOWN AND INFERRED CONDITIONS

LEGEND

- NOT INTACT (INFERRED)
- INTACT (KNOWN AND INFERRED)
- CONCRETE / SOIL BACKFILL (KNOWN AND INFERRED)

NOTE: DISTANCES MEASURED AT CENTERLINE OF TUNNEL.

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FIGURE
B-1

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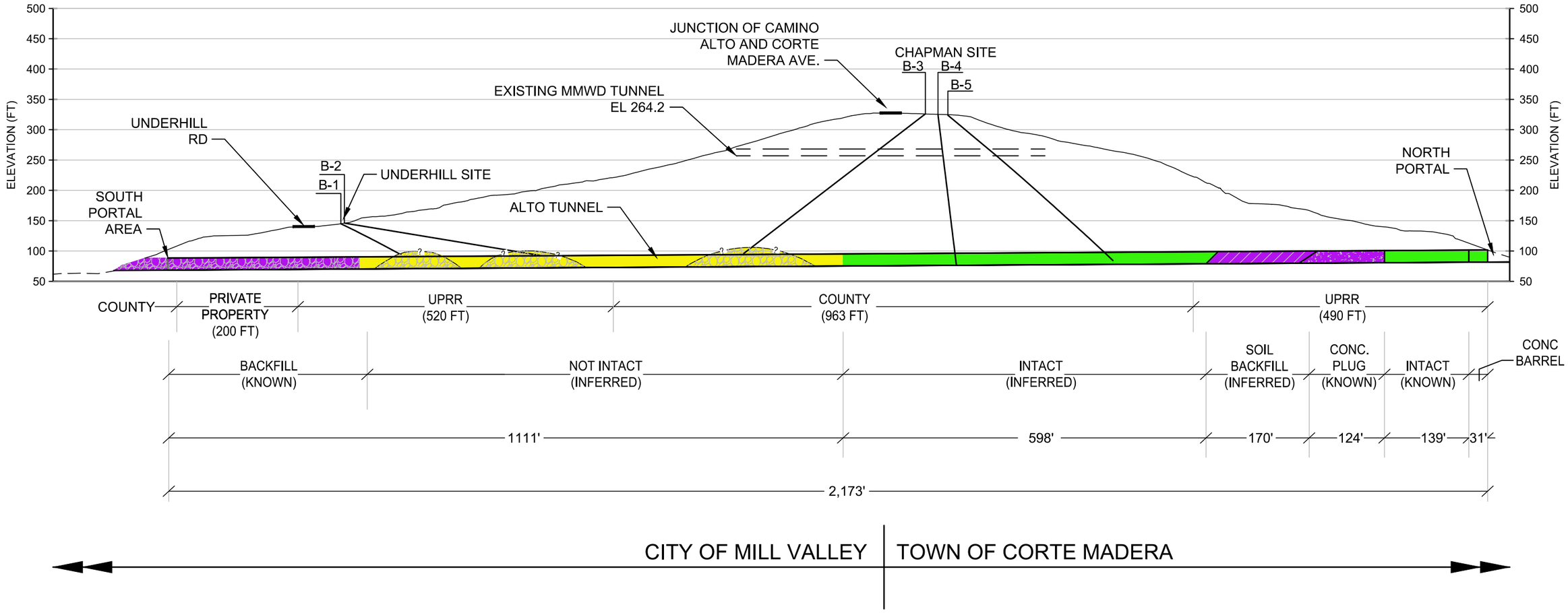

ALTO TUNNEL INVESTIGATION KNOWN AND INFERRED CONDITIONS

LEGEND

- NOT INTACT (INFERRED)
- INTACT (KNOWN AND INFERRED)
- CONCRETE / SOIL BACKFILL (KNOWN AND INFERRED)

NOTE: DISTANCES MEASURED AT CENTERLINE OF TUNNEL.

REPAIR ASSUMPTIONS

BEGIN STA	END STA	REPAIR SECTION	REPAIR TYPE
255+89	258+50	COLLAPSED AND BACKFILLED TUNNEL SECTION	TYPE 4 - 25% TYPE 5 - 75%
258+50	267+00	INFERRED NOT INTACT TUNNEL SECTION	TYPE 4 - 50% TYPE 5 - 50%
267+00	274+68	UN-COMPACTED FILL AND INTACT TUNNEL SECTION	TYPE 3
274+68	275+92	CONCRETE PLUG SECTION	TYPE 2
275+92	277+62	NORTH PORTAL BARREL AND GUNITE OVER TIMBER / STEEL SETS	TYPE 1

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COST ESTIMATE - KNOWN AND INFERRED CONDITIONS

FIGURE
B-2

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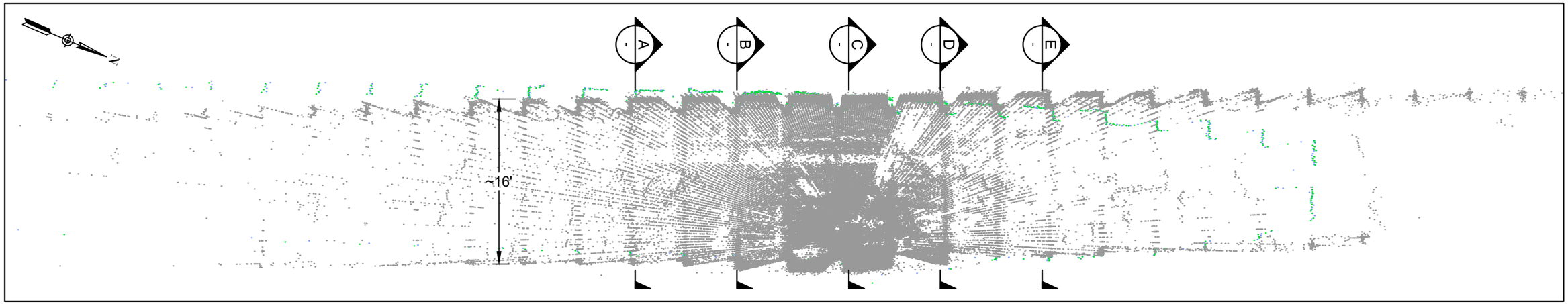
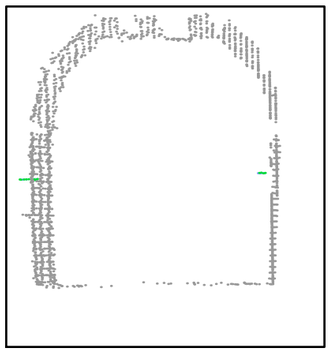


TUNNEL PROBE SCAN - PLAN VIEW

SCALE: 1" = 10'-0"



SECTION @ STA 268+67 (A / -)

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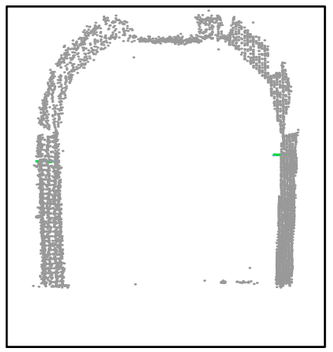

SECTION @ STA 268+77 (B / -)

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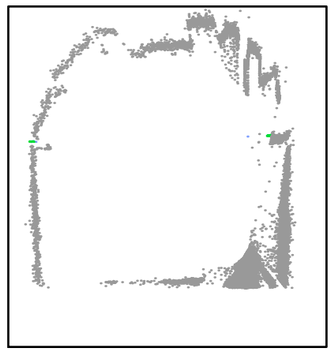

SECTION @ STA 268+86 (C / -)

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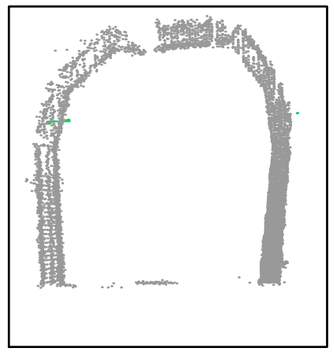
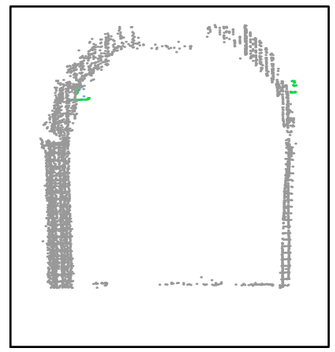


SECTION @ STA 268+97 (D / -)

SCALE: 1" = 10'-0"



SECTION @ STA 269+07 (E / -)

SCALE: 1" = 10'-0"

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TUNNEL SCANS - PLAN AND SECTIONS

FIGURE
B-3

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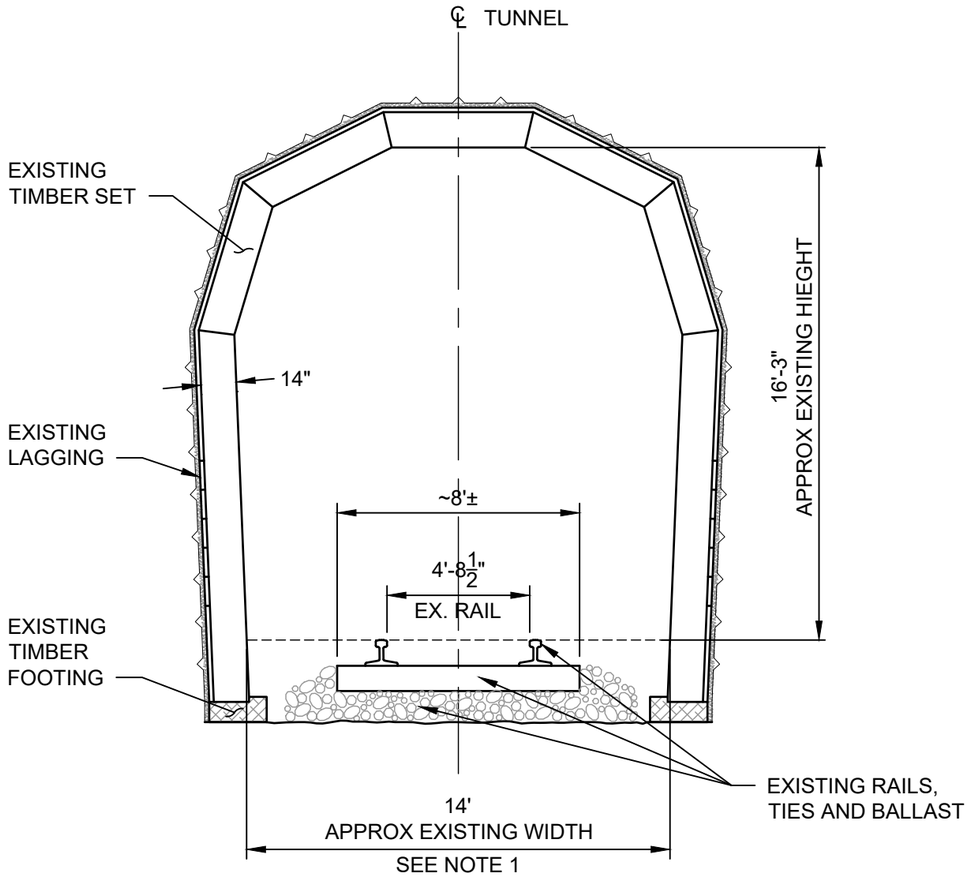
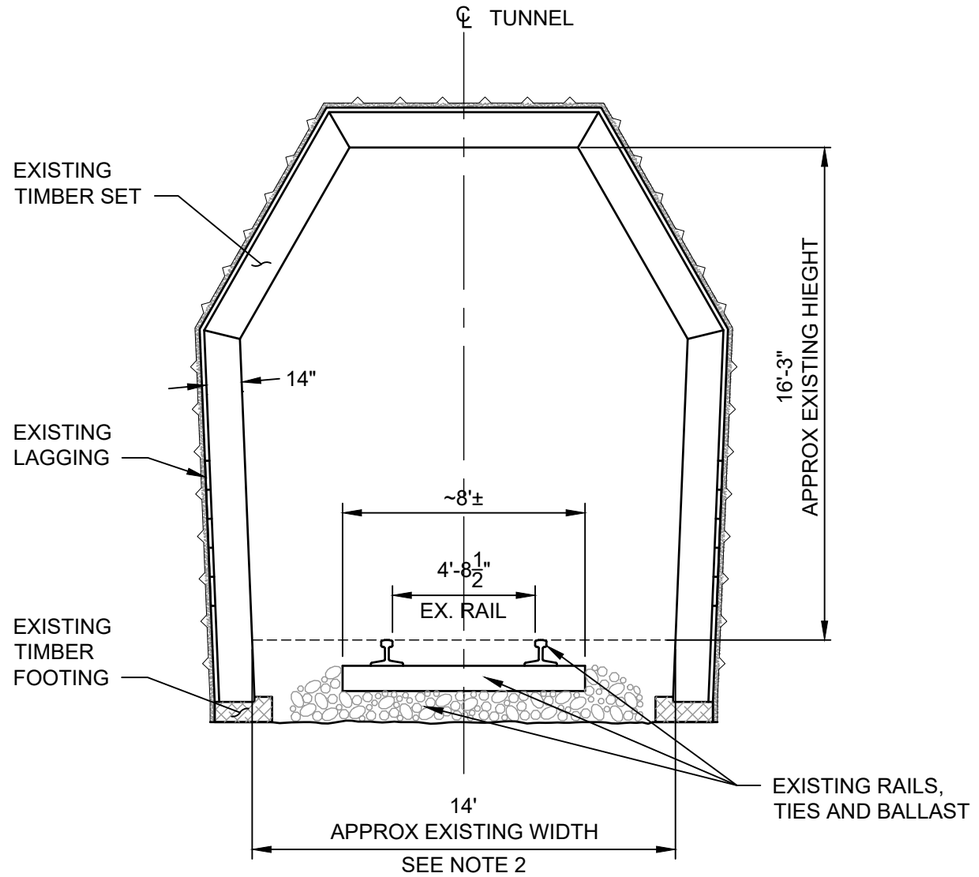


EXISTING 7 PIECE TUNNEL SECTION (A / -)

SCALE: 1" = 5'-0"



EXISTING 5 PIECE TUNNEL SECTION (B / -)

SCALE: 1" = 5'-0"

NOTES:

1. EXISTING TUNNEL WIDTH OF 7-PIECE SET IS ESTIMATED FROM SCAN AT STA 268+97.

2. DIMENSIONS OF 5-PIECE TUNNEL SUPPORTS ARE INFERRED, BASED ON TYPICAL HISTORICAL RAILROAD CONSTRUCTION DESIGN.

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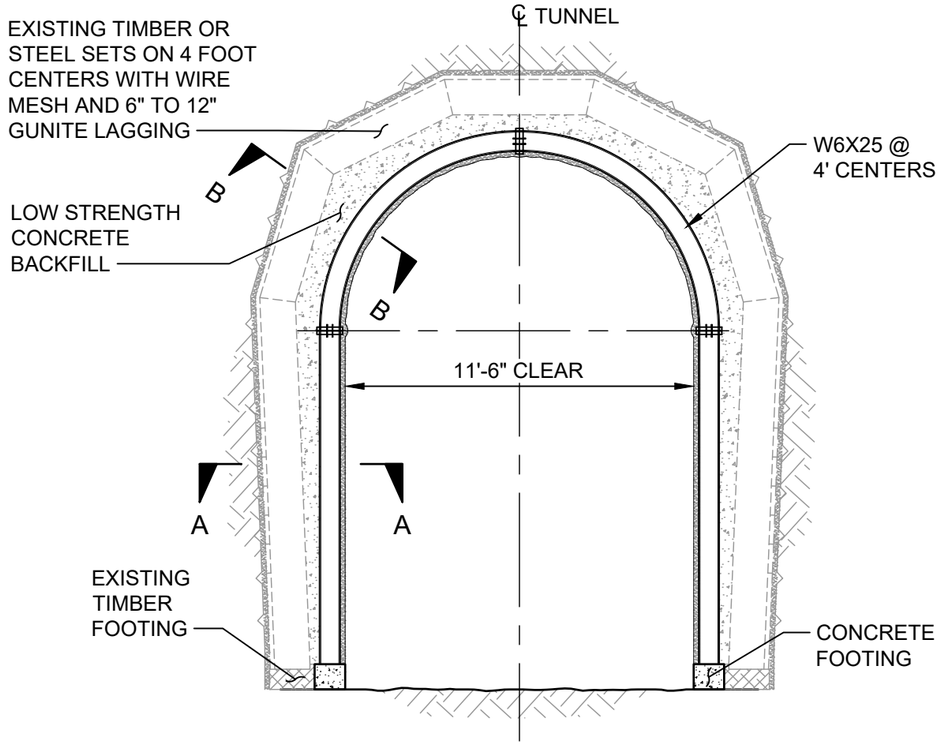
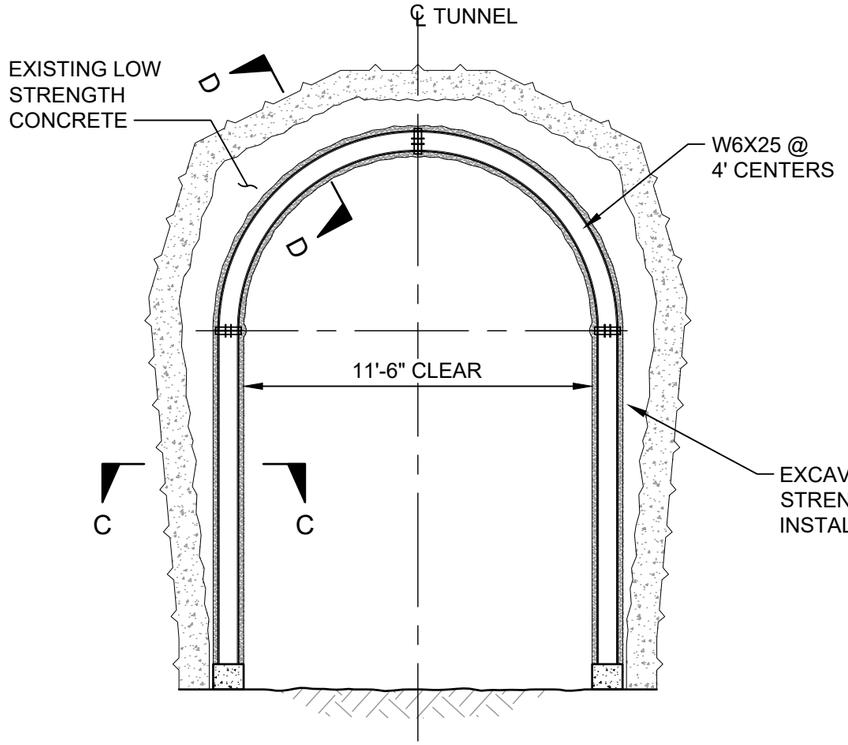
EXISTING CROSS SECTIONS

FIGURE
B-4



TYPE 1 REPAIR

SCALE: 1" = 5'-0"

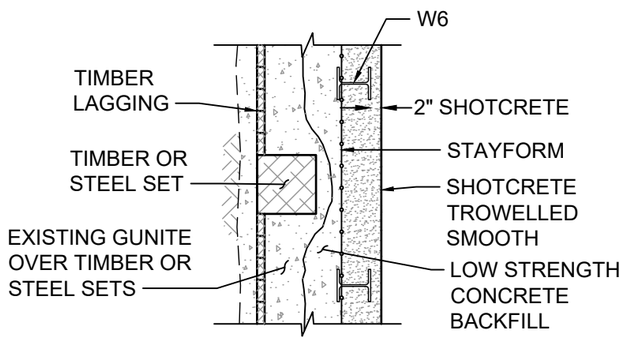


NOTES:

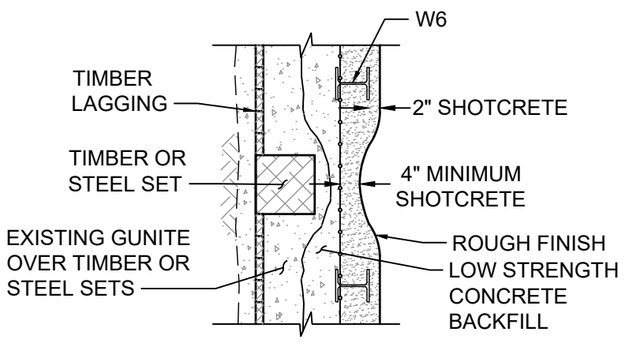
1. BELOW TUNNEL SPRINGLINE, SHOTCRETE WILL BE SMOOTH TROWELLED. ABOVE SPRINGLINE, SHOTCRETE WILL NOT BE TROWELLED.
2. PROVIDE 2" SHOTCRETE COVER OVER ALL STEEL SECTIONS.
3. DETAILS OF DRAINAGE, LIGHTING AND EMERGENCY AMENITIES NOT SHOWN FOR CLARITY, DETAILS SHOWN ON FIGURE 5.
4. SEE TABLE, FIGURE 1, FOR REPAIR TYPES AND EXTENTS.

TYPE 2 REPAIR

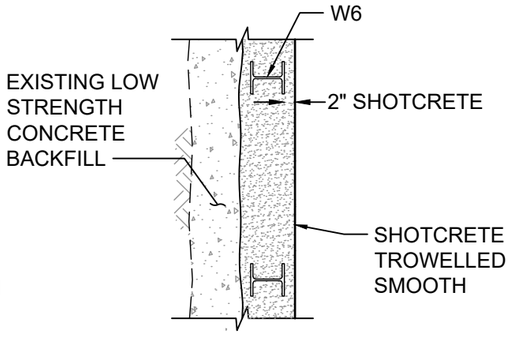
SCALE: 1" = 5'-0"



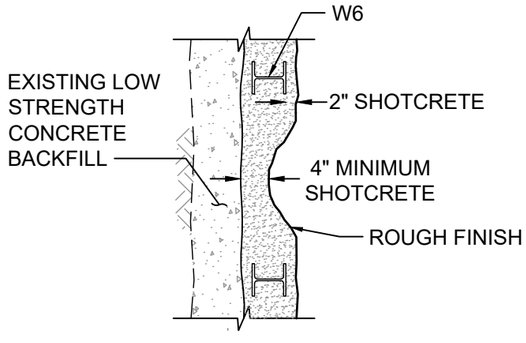
SECTION A
SCALE: 1" = 3'-0"



SECTION B
SCALE: 1" = 3'-0"



SECTION C
SCALE: 1" = 3'-0"



SECTION D
SCALE: 1" = 3'-0"

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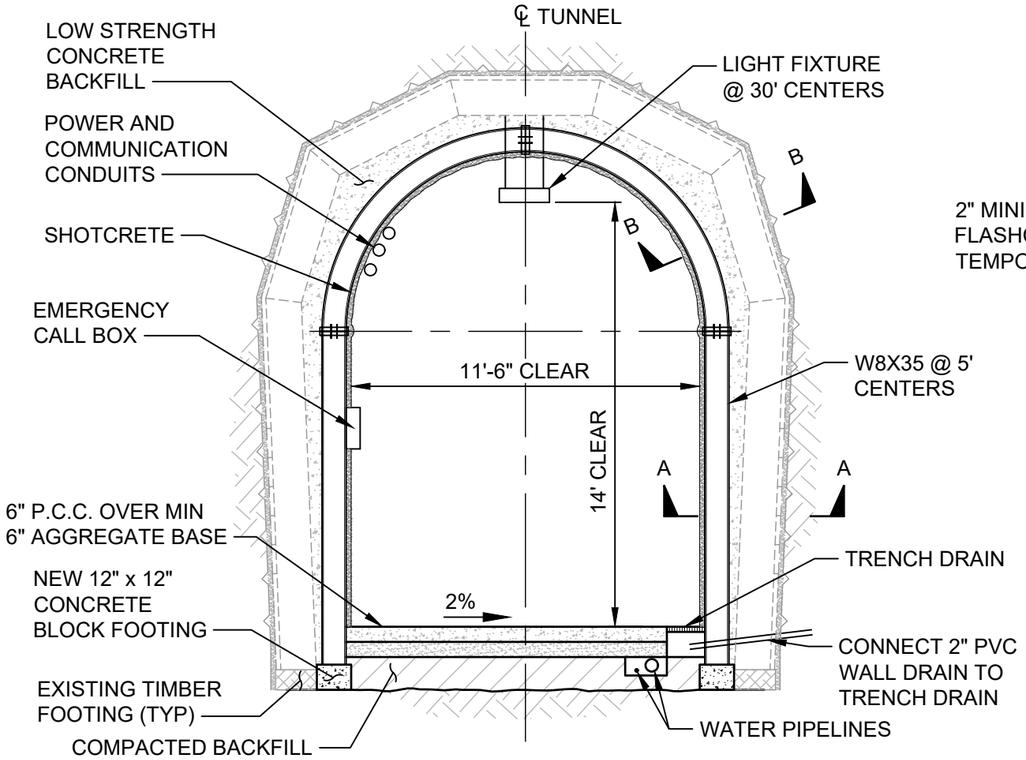
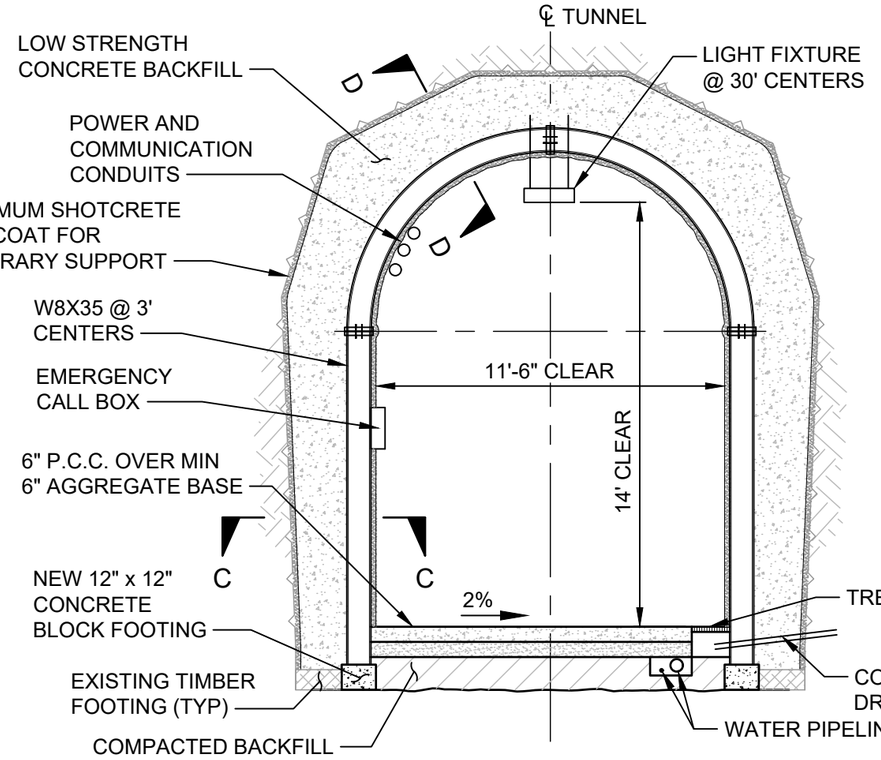
PROPOSED TUNNEL REPAIR CROSS SECTIONS

FIGURE
B-5



TYPE 3 REPAIR

SCALE: 1" = 5'-0"



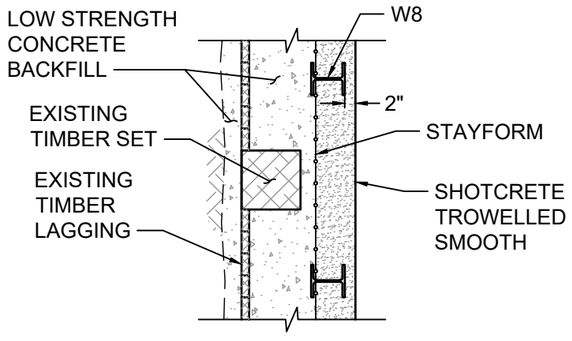
TYPE 4 REPAIR

TEMPORARY SUPPORT USING SHOTCRETE

SCALE: 1" = 5'-0"

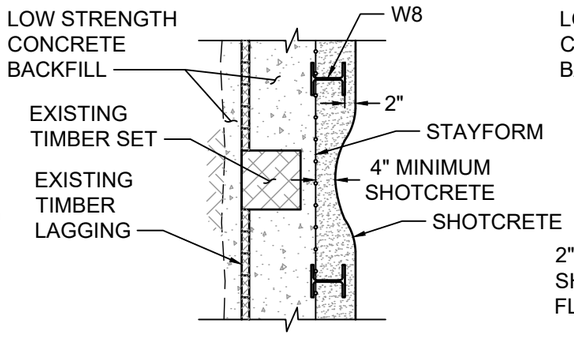
NOTES:

1. BELOW TUNNEL SPRINGLINE, SHOTCRETE WILL BE SMOOTH TROWELLED. ABOVE SPRINGLINE, SHOTCRETE WILL NOT BE TROWELLED.
2. PROVIDE 2" SHOTCRETE COVER OVER ALL STEEL SECTIONS.
3. IN COLLAPSED AND INFERRED NOT INTACT SECTIONS, PROVIDE TEMPORARY STABILIZATION SUPPORT AS NEEDED, USING SHOTCRETE OR SPILING.
4. LOCATION OF TIMBER SETS AND LAGGING IN SECTION DETAILS WILL VARY.
5. SEE TABLE, FIGURE 1, FOR REPAIR TYPES AND EXTENTS.



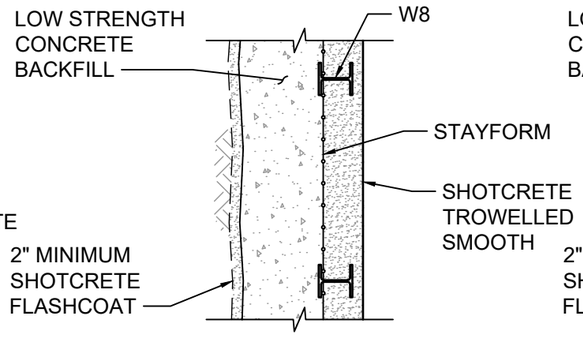
SECTION A

SCALE: 1" = 3'-0"



SECTION B

SCALE: 1" = 3'-0"



SECTION C

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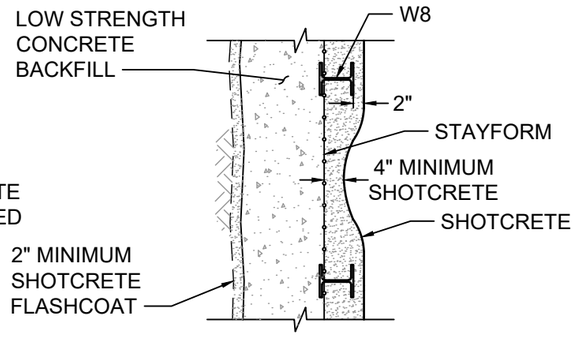

SECTION D

SCALE: 1" = 3'-0"

PROJECT # 5581.0

McMILLEN JACOBS ASSOCIATES	ALTO TUNNEL INVESTIGATION MARIN COUNTY, CALIFORNIA	DATE SEPT 2017
	PROPOSED TUNNEL REPAIR CROSS SECTIONS	FIGURE B-6

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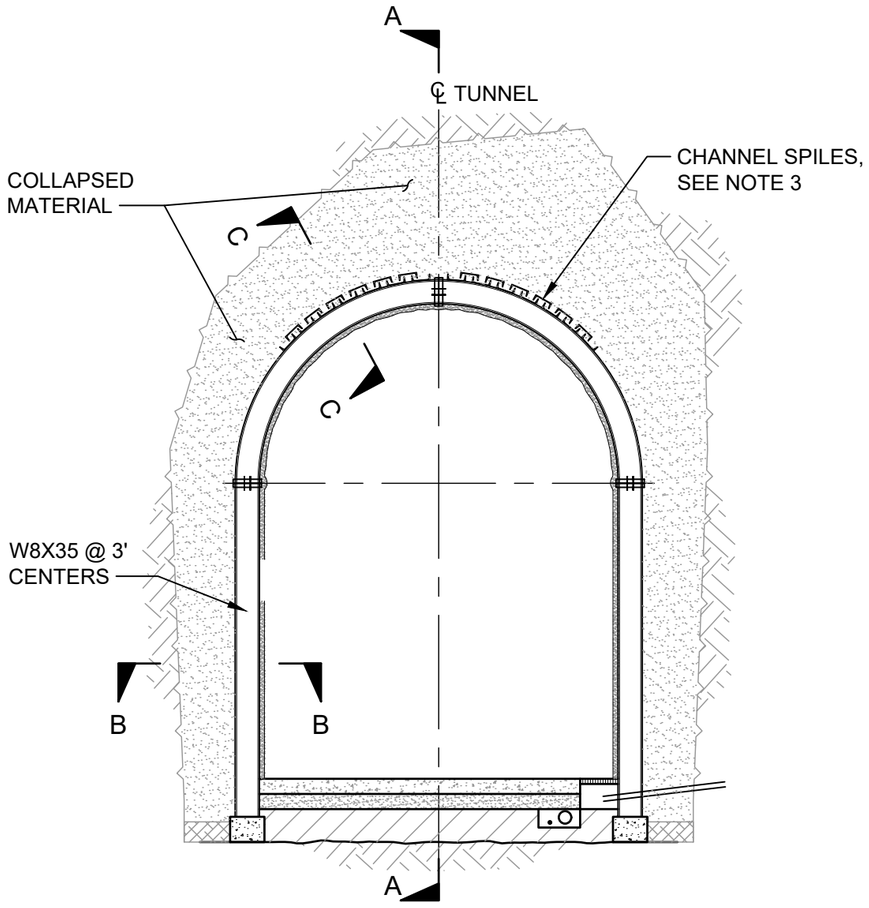
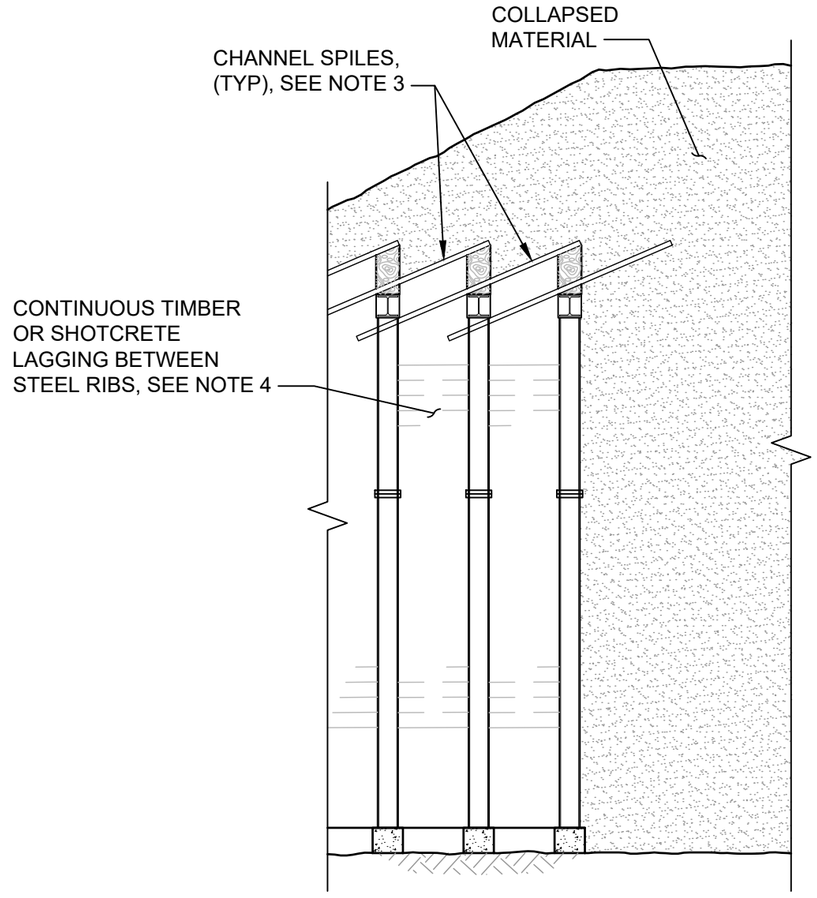


TYPE 5 REPAIR

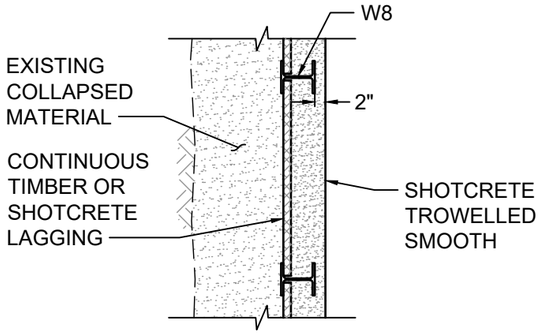
TEMPORARY SUPPORT USING SPILING

SCALE: 1" = 5'-0"



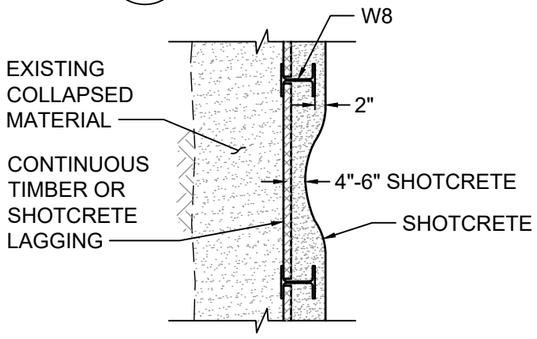
SECTION A

SCALE: 1" = 5'-0"



SECTION B

SCALE: 1" = 3'-0"



SECTION C

SCALE: 1" = 3'-0"

NOTES:

1. IN COLLAPSED AND INFERRED NOT INTACT SECTIONS, PROVIDE TEMPORARY STABILIZATION SUPPORT AS NEEDED, USING SHOTCRETE OR SPILING. SEE TABLE, FIG 1.
2. EXCAVATION LINES SHOWN ARE NOT INTENDED TO BE REPRESENTATIVE OF ANTICIPATED GROUND CONDITIONS, GROUND BEHAVIOR, OR AMOUNT OF OVERBREAK THAT MAY OCCUR DURING TUNNEL EXCAVATION.
3. PROVIDE PRE-SUPPORT OF THE TUNNEL CROWN AS NEEDED TO MAINTAIN TUNNEL STABILITY. PRE-SUPPORT SHALL CONSIST OF CHANNEL SPILES AS INDICATED, OR ALTERNATE PRE-SUPPORT MEASURES SELECTED BY THE CONTRACTOR.
4. PROVIDE CONTINUOUS TIMBER OR SHOTCRETE LAGGING BETWEEN STEEL RIBS. CONTINUOUS LAGGING IS NOT REQUIRED IN THE CROWN WHERE CHANNEL SPILING PRE-SUPPORT IS INSTALLED.
5. SEE TABLE, FIGURE 1, FOR REPAIR TYPES AND EXTENTS.

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MARIN COUNTY, CALIFORNIA

PROPOSED TUNNEL REPAIR CROSS SECTION

DATE SEPT 2017

FIGURE B-7

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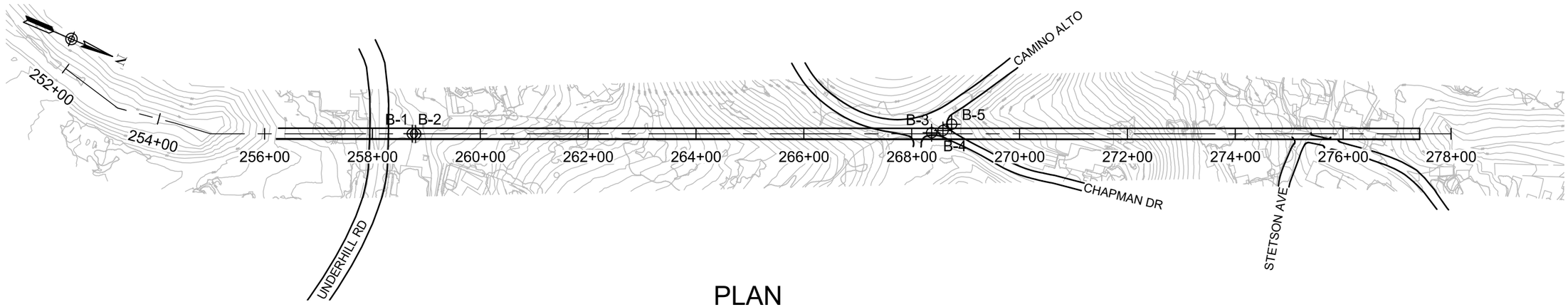
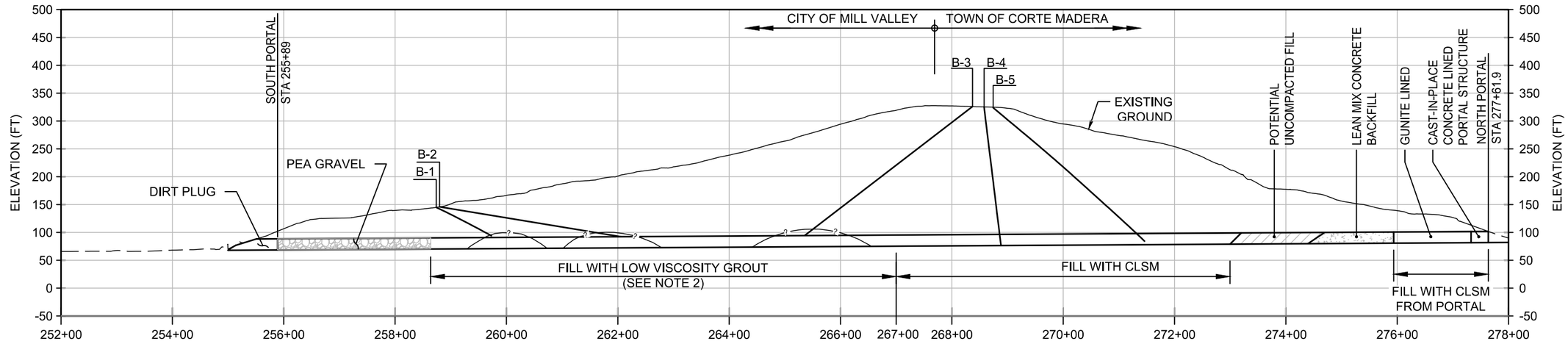


PLAN

SCALE: 1" = 200'-0"



PROFILE

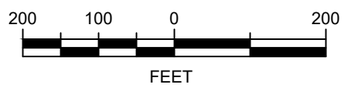
SCALE: 1" = 200'-0"

SEQUENCE OF WORK - PHASE 1:

1. PLACE CLSM THROUGH EXISTING BORINGS B-4 AND B-5 UNTIL TUNNEL AND BORINGS HAVE BEEN FILLED.
2. CONSTRUCT BULKHEAD AT NORTH PORTAL AND PLACE CLSM FROM NORTH PORTAL.
3. PLACE LOW VISCOSITY GROUT IN COLLAPSED SECTIONS OF TUNNEL THROUGH EXISTING BORINGS B-1, B-2 AND B-3 UNTIL BORINGS ARE FILLED.

NOTES:

1. PERFORM PRIMARY GROUTING THROUGH EXISTING 5" DIAMETER HOLES.
2. INDIVIDUAL COLLAPSES ARE SHOWN SCHEMATICALLY ONLY. ACTUAL NUMBER, SIZE, AND EXTENT OF COLLAPSE NOT KNOWN.



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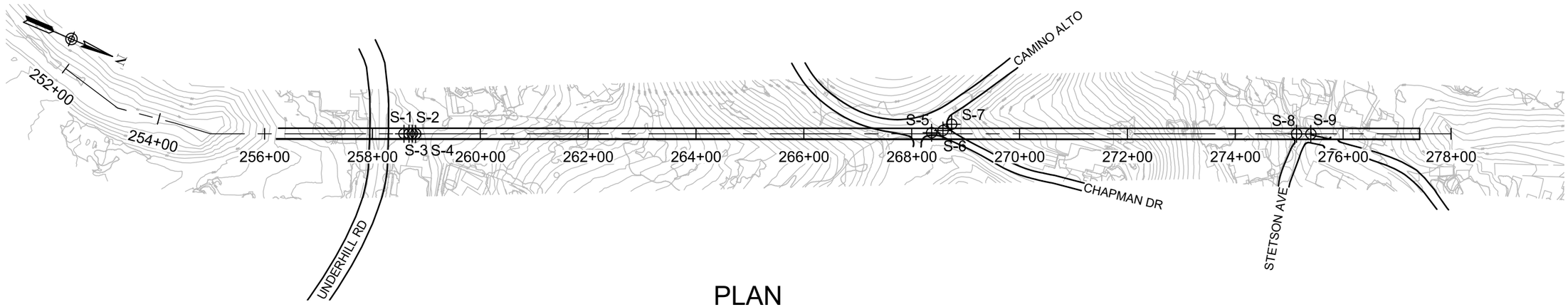
PHASE 1 - TUNNEL PERMANENT CLOSURE - PRIMARY BACKFILL

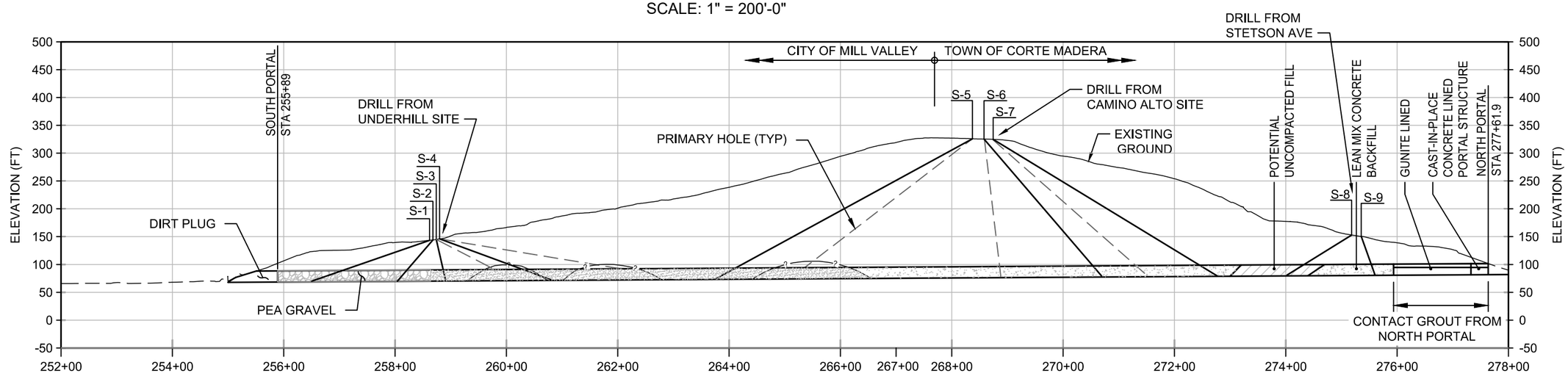
DATE
SEPT
2017

FIGURE
B-8



PLAN

SCALE: 1" = 200'-0"



PROFILE

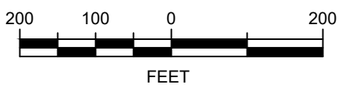
SCALE: 1" = 200'-0"

SEQUENCE OF WORK - PHASE 2:

1. DRILL NEW 5" DIAMETER HOLES S-1 THROUGH S-9 AS SHOWN TO INVERT OF TUNNEL, AND VIDEO INSPECT EACH HOLE.
   - IF VOIDS ARE SIGNIFICANT (> 1 CUBIC YARD), FILL WITH CLSM.
   - IF NO VOIDS OR ONLY SMALL VOIDS ARE FOUND, PUMP NEAT CEMENT GROUT. GROUT UNTIL HOLES ARE FILLED.
2. CONTACT GROUT NORTH PORTAL BACKFILL THROUGH PRE-INSTALLED GROUT PIPE WITH INJECTION PORTS.
3. PERFORM TERTIARY GROUTING THROUGH ADDITIONAL HOLES ONLY IF SIGNIFICANT VOIDS WERE FOUND IN SECONDARY HOLES.

NOTES:

1. PERFORM PRIMARY GROUTING THROUGH EXISTING 5" DIAMETER HOLES.
2. INDIVIDUAL COLLAPSES ARE SHOWN SCHEMATICALLY ONLY. ACTUAL NUMBER, SIZE, AND EXTENT OF COLLAPSE NOT KNOWN.



PROJECT # 5581.0

McMILLEN JACOBS ASSOCIATES

ALTO TUNNEL INVESTIGATION
MARIN COUNTY, CALIFORNIA

DATE
SEPT
2017

PHASE 2 - TUNNEL PERMANENT CLOSURE - SECONDARY BACKFILL

FIGURE
B-9

Appendix C. Factored Construction Cost Estimates for Alto Tunnel based on Cal Park Hill Tunnel Bids

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McMILLEN JACOBS ASSOCIATES

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
Tunnel Rehab Study					**4:19 PM**

OPINION OF PROBABLE ESCALATED CONSTRUCTION BID INCLUDING OWNER CONTINGENCY

No.	Item or Group Item Description	Group Item Cost	Item Quantity/Unit	Item Unit Cost	Status	Item Cost
001	South Site Preparation		LS			$56,669
002	North Site Preparation		LS			$56,669
	Site Preparation	**$113,337**				
003	South Site-Excav./Supp. Collapsed w/o Spiles		377 lf	$3,918 /lf		$1,475,385
004	South Site-Excav./Supp. Collapsed w Spiles		488 lf	$5,933 /lf		$2,894,295
005	North Site - Existing Gunite Lined Section		140 lf	$2,627 /lf		$367,713
006	North Site Lean Concrete Backfilled Section		124 lf	$4,577 /lf		$567,492
007	North Site - Uncompacted Fill Section		170 lf	$3,927 /lf		$667,543
008	North Site Intact Tunnel Section		598 lf	$2,758 /lf		$1,649,326
009	North Site-Excav./Supp. Collapsed w/o Spiles		107 lf	$3,933 /lf		$422,590
010	North Site-Excav./Supp. Collapsed w Spiles		139 lf	$5,950 /lf		$828,190
	Tunnel - Re-excavation and Support	**$8,872,533**	**2,173 LF**	**$4,083 /LF**		
011	Tunnel Sub Base w/ Drainage		2,173 LF	$380 /LF		$826,391
012	Tunnel Agg Base		2,173 LF	$84.19 /LF		$182,941
013	Tunnel Paving		2,173 LF	$211 /LF		$457,899
	Tunnel Invert	**$1,467,230**	**2,173 LF**	**$675 /LF**		
014	Graffiti Protection		43,460 sf	$4.12 /sf		$178,925
015	Tunnel Water / Fire Protection		2,173 LF	$380 /LF		$825,740
016	Tunnel Power / Lighting / CCTV		2,173 LF	$1,213 /LF		$2,636,805
017	Tunnel Ventilation		2,173 LF	$140 /LF		$304,220
	Tunnel Fire Life Safety	**$3,945,690**	**LS**			
018	Geotechnical Instrumentation		LS			$200,000
	Instrumentation and Monitoring	**$200,000**	**LS**			
019	Fill Existing boreholes		190 cf	$137 /cf		$26,023
020	South Portal Site Restoration		LS			$41,809
021	North Portal Site Restoration		LS			$41,809
	Site Restoration	**$109,641**	**LS**			
022	Hazardous Material Allowance	Allowance	LS			$200,000
023	Portal Modifications	Allowance	LS			$200,000
				Subtotal Direct Cost		**$15,108,432**
024	Equipment Ownership not in Direct Cost			2.4% directs		$362,997
025	General Mobilization		0.5 mo	1.9% unesc.bid		$465,681
026	Demobilization/Punchlist		0.5 mo	0.6% unesc.bid		$156,781
027	General Plant Operation/Maintenance		23.8 mo	$25,906 /mo		$616,553
028	Field Supervision		26.8 mo	$112,828 /mo		$3,023,803
029	Overhead Maintenance/Service		26.8 mo	$44,240 /mo		$1,185,620
030	Bonds, Insurance, and Taxes not in General Mobilization			2.1% unesc.bid		$517,144
031	Contractor Markup			12.7% of cost		$2,820,597
032	Financing Charges			0.4% unesc.bid		$88,047
033	Contractor Contingency			2.4% unesc.bid		$604,337
				Subtotal Indirect Cost		**$9,841,561**
034	Escalation from NTP			1.8% unesc.bid		$461,432
26.75 mo project duration after NTP				**Escalated Construction Bid**		**$25,411,425**
035	Owner Contingency			19.7% esc.bid		$5,002,300
				Opinion of Probable Escalated Construction Bid including Owner Contingency		**$30,413,725**

Table of Contents:

Estimate Notes:

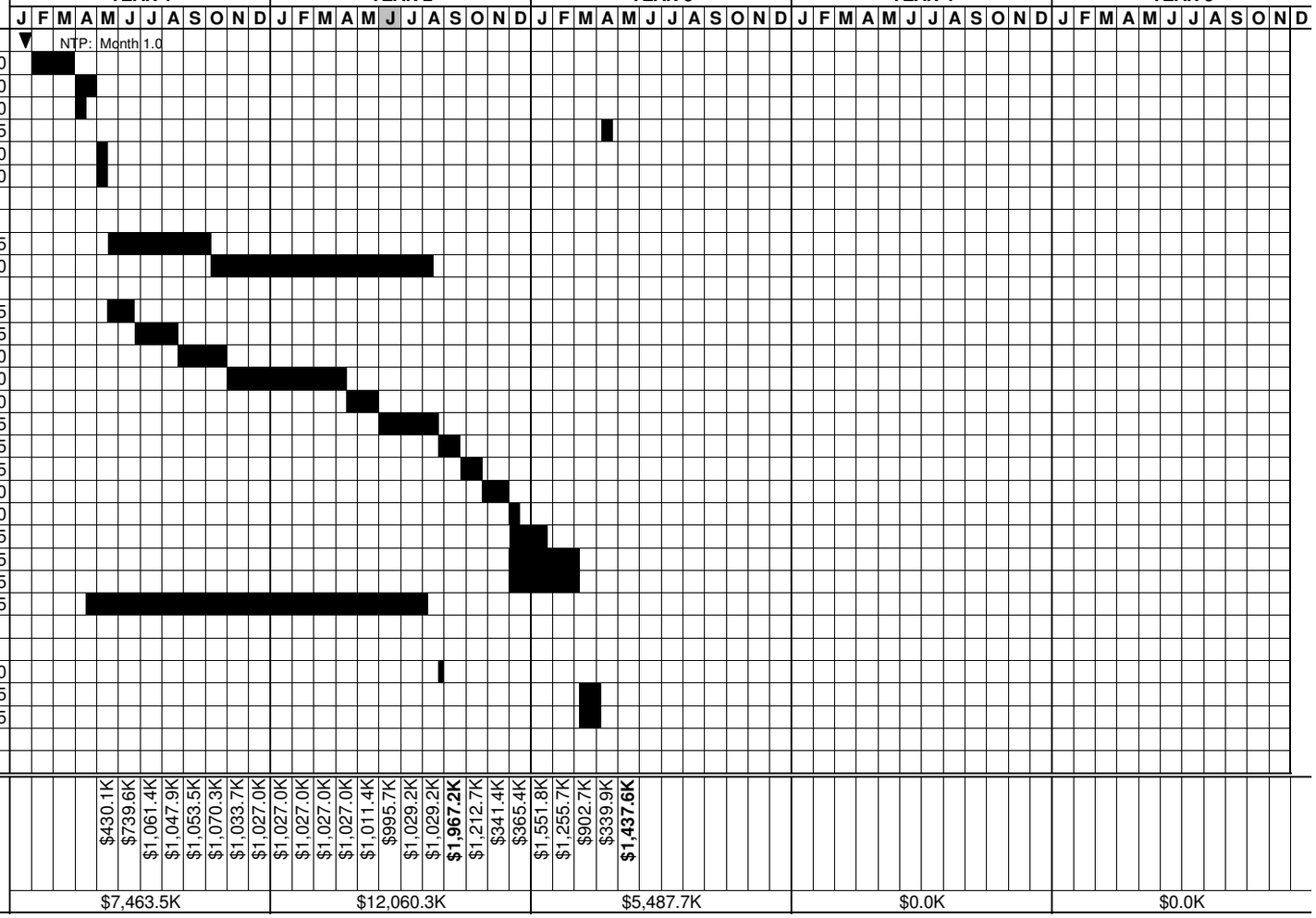
0.651395

McMILLEN JACOBS ASSOCIATES

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel **Tunnel Rehab Study**	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017** **4:19 PM**

CONSTRUCTION SCHEDULE AND MONTHLY PROGRESS PAYMENTS

Activity No. and Description	Bid Amount	Dur. (mos)	Start mo	End mo
NTP			1.00	
Preliminary Submittals		2.00	1.00	3.00
024 Equipment Mobilization	$0	1.00	3.00	4.00
025 General Mobilization	$465,681	0.50	3.00	3.50
026 Demobilization/Punchlist	$156,781	0.50	27.25	27.75
001 South Site Preparation	$108,693	0.50	4.00	4.50
002 North Site Preparation	$108,693	0.50	4.00	4.50
003 South Site-Excav./Supp. Collapsed w/o Spiles	$2,829,860	4.75	4.50	9.25
004 South Site-Excav./Supp. Collapsed w Spiles	$5,551,399	10.25	9.25	19.50
005 North Site - Existing Gunite Lined Section	$705,292	1.25	4.50	5.75
006 North Site Lean Concrete Backfilled Section	$1,088,477	2.00	5.75	7.75
007 North Site - Uncompacted Fill Section	$1,280,380	2.25	7.75	10.00
008 North Site Intact Tunnel Section	$3,163,488	5.50	10.00	15.50
009 North Site-Excav./Supp. Collapsed w/o Spiles	$810,549	1.50	15.50	17.00
010 North Site-Excav./Supp. Collapsed w Spiles	$1,588,509	2.75	17.00	19.75
011 Tunnel Sub Base w/ Drainage	$1,585,058	1.00	19.75	20.75
012 Tunnel Agg Base	$350,890	1.00	20.75	21.75
013 Tunnel Paving (Note 4b)	$480,794	1.25	21.75	23.00
014 Graffiti Protection (Note 4b)	$187,871	0.50	23.00	23.50
015 Tunnel Water / Fire Protection (Note 4b)	$867,027	1.75	23.00	24.75
016 Tunnel Power / Lighting / CCTV (Note 4b)	$2,768,646	3.25	23.00	26.25
017 Tunnel Ventilation (Note 4b)	$319,431	3.25	23.00	26.25
018 Geotechnical Instrumentation	$383,610	15.75	3.50	19.25
019 Fill Existing boreholes	$49,914	0.25	19.75	20.00
020 South Portal Site Restoration	$80,192	1.00	26.25	27.25
021 North Portal Site Restoration	$80,192	1.00	26.25	27.25
022 Hazardous Material Allowance (Note 4a)	$200,000			
023 Portal Modifications (Note 4a)	$200,000			
Opinion of Probable Escalated Construction Bid, Duration, and Monthly Progress Payments	**$25,411,425**	**26.8 months**		



1. Project calendar is based on 9 observed holidays and 9 critical inclement weather days per year distributed monthly as shown in the Estimate Metrics summary on page 20.
2. Payments are made 30 days after pay applications including 10% retention which is reduced to 5% after 75% is earned, 19 months after NTP. Payments releasing retention bolded. 50% of the contract is earned 17 months after NTP.
3. Spread $9.8M indirects + $0.5M escalation - $0.6M mob. Mob/demob paid as scheduled. Bond paid at NTP.
4. (a) Allowances cannot be scheduled so progress payments do not reflect their payment and sum to the total bid amount less the $400K in Allowances. (b) Indirect costs spread limited to a 5% subcontract markup.

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
Tunnel Rehab Study					**4:19 PM**

DIRECT COST DETAIL

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
001	**South Site Preparation**	**1 LS**		**10 days**	**10 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
240	**$17,064**	**$3,678**	**$3,426**	**$32,500**	**$56,669**

Status (Additive)	Work schedule			Other ST pay	Other OT pay
1.000 Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	240.0 mhr	$720
S	cg	Clearing and grubbing	2.00 acre			$10,000 /acre	2.00 acre	$20,000
S	tfnc	Temporary Construction Fenc	500.0 lf			$25.00 /lf	500.0 lf	$12,500
L	lab	General Labor (Grp 3)				$63.14 /mhr	80.00 mhr	$5,051
L	lfm	Labor FM				$67.17 /mhr	80.00 mhr	$5,374
L	eo35+	Excavator >.5cy (OG2)				$82.99 /mhr	80.00 mhr	$6,639
E	b305	Cat 305 Mini-Exc 11k/.17cy				$45.98 /hr	80.00 hr	$3,678
M	swppp	Silt Fence / Straw Waddles	500.0 lf			$5.41 /lf	500.0 lf	$2,706

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
002	**North Site Preparation**	**1 LS**		**10 days**	**10 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
240	**$17,064**	**$3,678**	**$3,426**	**$32,500**	**$56,669**

Status (Additive)	Work schedule			Other ST pay	Other OT pay
1.000 Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	240.0 mhr	$720
S	cg	Clearing and grubbing	2.00 acre			$10,000 /acre	2.00 acre	$20,000
S	tfnc	Temporary Construction Fenc	500.0 lf			$25.00 /lf	500.0 lf	$12,500
L	lab	General Labor (Grp 3)				$63.14 /mhr	80.00 mhr	$5,051
L	lfm	Labor FM				$67.17 /mhr	80.00 mhr	$5,374
L	eo35+	Excavator >.5cy (OG2)				$82.99 /mhr	80.00 mhr	$6,639
E	b305	Cat 305 Mini-Exc 11k/.17cy				$45.98 /hr	80.00 hr	$3,678
M	swppp	Silt Fence / Straw Waddles	500.0 lf			$5.41 /lf	500.0 lf	$2,706

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
003	**South Site-Excav./Supp. Collapsed w/o Spiles**	**377 lf**	**3.68 lf/day**		**102 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
7,775	**$552,580**	**$377,796**	**$343,921**	**$201,088**	**$1,475,385**
20.647	$1,467.47	$1,003.30	$913.34	$534.02	$3,918.14

Status (Additive)	Work schedule			Other ST pay	Other OT pay
1.000 Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	7775 mhr	$23,324
L	sh	Tunnel shifter				$72.23 /mhr	818.4 mhr	$59,114
L	min	Tunnel miner			4	$68.45 /mhr	3274 mhr	$224,090
L	lab	General Labor (Grp 3)				$63.14 /mhr	818.4 mhr	$51,671
L	att	Portal Attendant				$66.60 /mhr	818.4 mhr	$54,507
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	818.4 mhr	$66,394
L	lo35-	Loader oper. <3.5cy (OG4)			0.5	$79.39 /mhr	409.2 mhr	$32,486
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	409.2 mhr	$32,486
L	conc	Concrete equip.oper. (OG5)			50%	$77.79 /mhr	409.2 mhr	$31,831
E	b320	Backhoe Cat 320, 44k/1.5cy				$59.88 /hr	818.4 hr	$49,004
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	818.4 hr	$37,019
E	sp12	Shotcrete plant, skid 12cy/hr				$23.09 /hr	818.4 hr	$18,896
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	818.4 hr	$62,073
E	bl3	Extension Boom, 3.0ton				$42.61 /hr	818.4 hr	$34,876
M	8set	8-in. Steel Set	127.0 ea			$1,984 /ea	127.0 ea	$251,950
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf		$104 /cy	608.5 cy	$63,306
M	lumb	Lumber for lagging/blocking		10.00 bf/lf		$1.42 /bf	3766 bf	$5,340
S	muck	Muck disposal	2937 bcy	1.60 lcy/bcy		$35.83 /lcy	4699 lcy	$168,370
S	muckc	Muck disp. Contam. Non Haz.	320.8 bcy	1.60 lcy/bcy		$63.75 /lcy	513.2 lcy	$32,718
E	g210	Generator, skid 210kW				$57.33 /hr	818.4 hr	$46,921

E	p140	Pump, subm. 140gpm/20ft head	$1.42 /hr	818.4 hr	$1,161
E	wtp	Water Treatment Plant	$3.58 /hr	818.4 hr	$2,931
E	wd4	Welder 400A Diesel, trailer	$12.02 /hr	818.4 hr	$9,837
E	cp16	Compressor, trailer 1600cfm	$127 /hr	818.4 hr	$103,706
E	vf100	Ventilation fan 100hp	$13.90 /hr	818.4 hr	$11,373

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
004	**South Site-Excav./Supp. Collapsed w Spiles**	**488 lf**	**2.375 lf/day**		**205 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
15,610	**$1,109,481**	**$774,845**	**$749,468**	**$260,500**	**$2,894,295**
32.001	$2,274.43	$1,588.43	$1,536.41	$534.02	$5,933.29

Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	15610 mhr	$46,831
L	sh	Tunnel shifter				$72.23 /mhr	1643 mhr	$118,691
L	min	Tunnel miner			4	$68.45 /mhr	6573 mhr	$449,932
L	lab	General Labor (Grp 3)				$63.14 /mhr	1643 mhr	$103,745
L	att	Portal Attendant				$66.60 /mhr	1643 mhr	$109,441
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	1643 mhr	$133,308
L	lo35-	Loader oper. <3.5cy (OG4)			0.5	$79.39 /mhr	821.6 mhr	$65,226
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	821.6 mhr	$65,226
L	conc	Concrete equip.oper. (OG5)			0.5	$77.79 /mhr	821.6 mhr	$63,912
E	vh	Vibro Hammer				$9.92 /hr	1643 hr	$16,298
E	b320	Backhoe Cat 320, 44k/1.5cy				$59.88 /hr	1643 hr	$98,391
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	1643 hr	$74,327
E	sp12	Shotcrete plant, skid 12cy/hr				$23.09 /hr	1643 hr	$37,940
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	1643 hr	$124,632
E	bl3	Extension Boom, 3.0ton				$42.61 /hr	1643 hr	$70,024
M	8set	8-in. Steel Set	164.0 ea			$1,984 /ea	164.0 ea	$325,353
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf		$104 /cy	788.3 cy	$82,010
M	spile	C6x13 Channel Spile	3903 ea			$73.88 /ea	3903 ea	$288,356
M	lumb	Lumber for lagging/blocking		10.00 bf/lf		$1.42 /bf	4878 bf	$6,917
S	muck	Muck disposal	3804 bcy	1.60 lcy/bcy		$35.83 /lcy	6087 lcy	$218,115
S	muckc	Muck disp. Contam. Non Haz.	415.5 bcy	1.60 lcy/bcy		$63.75 /lcy	664.9 lcy	$42,385
E	g210	Generator, skid 210kW				$57.33 /hr	1643 hr	$94,209
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	1643 hr	$2,330
E	wtp	Water Treatment Plant				$3.58 /hr	1643 hr	$5,885
E	wd4	Welder 400A Diesel, trailer				$12.02 /hr	1643 hr	$19,752
E	cp16	Compressor, trailer 1600cfm				$127 /hr	1643 hr	$208,222
E	vf100	Ventilation fan 100hp				$13.90 /hr	1643 hr	$22,834

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
005	**North Site - Existing Gunite Lined Section**	**140 lf**	**5.699 lf/day**		**24.6 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
1,870	**$132,878**	**$95,970**	**$126,700**	**$12,164**	**$367,713**
13.354	$949.13	$685.50	$905.00	$86.89	$2,626.52

Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	1870 mhr	$5,609
L	sh	Tunnel shifter				$72.23 /mhr	196.8 mhr	$14,215
L	min	Tunnel miner			4	$68.45 /mhr	787.2 mhr	$53,887
L	lab	General Labor (Grp 3)				$63.14 /mhr	196.8 mhr	$12,425
L	att	Portal Attendant				$66.60 /mhr	196.8 mhr	$13,107
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	196.8 mhr	$15,966
L	lo35-	Loader oper. <3.5cy (OG4)			0.5	$79.39 /mhr	98.40 mhr	$7,812
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	98.40 mhr	$7,812
L	conc	Concrete equip.oper. (OG5)			0.5	$77.79 /mhr	98.40 mhr	$7,654
E	c76	Conc. pump, trailer 76cy/hr			0.5	$52.05 /hr	98.40 hr	$5,121

DIRECT COST DETAIL

E	b320	Backhoe Cat 320, 44k/1.5cy			$59.88 /hr	196.8 hr		$11,784
E	lhd3	Load-Haul-Dump 4ton/2.5cy			$45.23 /hr	196.8 hr		$8,902
E	sp12	Shotcrete plant, skid 12cy/hr			$23.09 /hr	196.8 hr		$4,544
E	l950	Wheel Loader Cat 950/3.5cy			$75.85 /hr	196.8 hr		$14,927
E	bl3	Extension Boom, 3.0ton			$42.61 /hr	196.8 hr		$8,387
M	6set	6-in. Steel Set	36.00 ea		$1,426 /ea	36.00 ea		$51,320
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf	$104 /cy	226.3 cy		$23,537
M	clsc	Controlled Low Strength Conc		2.003 cy/lf	$97.43 /cy	280.4 cy		$27,321
M	sform	Stay-form		44.682 sf/lf	$2.71 /sf	6256 sf		$16,929
S	muckc	Muck disp. Contam. Non Haz.	119.3 bcy	1.60 lcy/bcy	$63.75 /lcy	190.8 lcy		$12,164
M	lumb	Lumber for lagging/blocking		10.00 bf/lf	$1.42 /bf	1400 bf		$1,985
E	g210	Generator, skid 210kW			$57.33 /hr	196.8 hr		$11,283
E	p140	Pump, subm. 140gpm/20ft head			$1.42 /hr	196.8 hr		$279
E	wtp	Water Treatment Plant			$3.58 /hr	196.8 hr		$705
E	wd4	Welder 400A Diesel, trailer			$12.02 /hr	196.8 hr		$2,366
E	cp16	Compressor, trailer 1600cfm			$127 /hr	196.8 hr		$24,938
E	vf100	Ventilation fan 100hp			$13.90 /hr	196.8 hr		$2,735

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
006	**North Site Lean Concrete Backfilled Section**	**124 lf**	**2.807 lf/day**		**44.2 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	3,359	**$238,749**	**$184,223**	**$78,301**	**$66,219**	**$567,492**
	27.090	$1,925.40	$1,485.67	$631.46	$534.02	$4,576.55

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	3359 mhr	$10,078
L	sh	Tunnel shifter				$72.23 /mhr	353.6 mhr	$25,541
L	min	Tunnel miner			4	$68.45 /mhr	1414 mhr	$96,821
L	lab	General Labor (Grp 3)				$63.14 /mhr	353.6 mhr	$22,325
L	att	Portal Attendant				$66.60 /mhr	353.6 mhr	$23,551
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	353.6 mhr	$28,686
L	lo35-	Loader oper. <3.5cy (OG4)			0.5	$79.39 /mhr	176.8 mhr	$14,036
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	176.8 mhr	$14,036
L	conc	Concrete equip.oper. (OG5)			0.5	$77.79 /mhr	176.8 mhr	$13,753
E	ch	AQ1500 Cutterhead Attach.				$59.36 /hr	353.6 hr	$20,991
E	b320	Backhoe Cat 320, 44k/1.5cy				$59.88 /hr	353.6 hr	$21,173
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	353.6 hr	$15,995
E	sp12	Shotcrete plant, skid 12cy/hr				$23.09 /hr	353.6 hr	$8,164
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	353.6 hr	$26,819
E	bl3	Extension Boom, 3.0ton				$42.61 /hr	353.6 hr	$15,068
M	6set	6-in. Steel Set	32.00 ea			$1,426 /ea	32.00 ea	$45,618
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf		$104 /cy	200.4 cy	$20,847
M	lumb	Lumber for lagging/blocking		10.00 bf/lf		$1.42 /bf	1240 bf	$1,758
S	muck	Muck disposal	967.1 bcy	1.60 lcy/bcy		$35.83 /lcy	1547 lcy	$55,445
S	muckc	Muck disp. Contam. Non Haz.	105.6 bcy	1.60 lcy/bcy		$63.75 /lcy	169.0 lcy	$10,774
E	g210	Generator, skid 210kW				$57.33 /hr	353.6 hr	$20,273
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	353.6 hr	$501
E	wtp	Water Treatment Plant				$3.58 /hr	353.6 hr	$1,266
E	wd4	Welder 400A Diesel, trailer				$12.02 /hr	353.6 hr	$4,250
E	cp16	Compressor, trailer 1600cfm				$127 /hr	353.6 hr	$44,807
E	vf100	Ventilation fan 100hp				$13.90 /hr	353.6 hr	$4,914

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
007	**North Site - Uncompacted Fill Section**	**170 lf**	**3.68 lf/day**		**46.2 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	3,511	**$249,552**	**$170,618**	**$156,589**	**$90,784**	**$667,543**
	20.654	$1,467.95	$1,003.63	$921.11	$534.02	$3,926.72

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
Tunnel Rehab Study					**4:19 PM**

DIRECT COST DETAIL

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	3511 mhr	$10,534
L	sh	Tunnel shifter				$72.23 /mhr	369.6 mhr	$26,697
L	min	Tunnel miner			4	$68.45 /mhr	1478 mhr	$101,202
L	lab	General Labor (Grp 3)				$63.14 /mhr	369.6 mhr	$23,335
L	att	Portal Attendant				$66.60 /mhr	369.6 mhr	$24,616
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	369.6 mhr	$29,984
L	lo35-	Loader oper. <3.5cy (OG4)			0.5	$79.39 /mhr	184.8 mhr	$14,671
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	184.8 mhr	$14,671
L	conc	Concrete equip.oper. (OG5)			0.5	$77.79 /mhr	184.8 mhr	$14,376
E	b320	Backhoe Cat 320, 44k/1.5cy				$59.88 /hr	369.6 hr	$22,131
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	369.6 hr	$16,718
E	sp12	Shotcrete plant, skid 12cy/hr				$23.09 /hr	369.6 hr	$8,534
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	369.6 hr	$28,033
E	bl3	Extension Boom, 3.0ton				$42.61 /hr	369.6 hr	$15,750
M	8set	8-in. Steel Set	58.00 ea			$1,984 /ea	58.00 ea	$115,064
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf		$104 /cy	274.7 cy	$28,581
M	lumb	Lumber for lagging/blocking		10.00 bf/lf		$1.42 /bf	1700 bf	$2,411
S	muck	Muck disposal	1326 bcy	1.60 lcy/bcy		$35.83 /lcy	2121 lcy	$76,013
S	muckc	Muck disp. Contam. Non Haz.	144.8 bcy	1.60 lcy/bcy		$63.75 /lcy	231.7 lcy	$14,771
E	g210	Generator, skid 210kW				$57.33 /hr	369.6 hr	$21,190
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	369.6 hr	$524
E	wtp	Water Treatment Plant				$3.58 /hr	369.6 hr	$1,324
E	wd4	Welder 400A Diesel, trailer				$12.02 /hr	369.6 hr	$4,443
E	cp16	Compressor, trailer 1600cfm				$127 /hr	369.6 hr	$46,835
E	vf100	Ventilation fan 100hp				$13.90 /hr	369.6 hr	$5,136

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
008	**North Site Intact Tunnel Section**	**598 lf**	**5.699 lf/day**		**105 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
7,972	**$566,624**	**$409,237**	**$621,506**	**$51,960**	**$1,649,326**
13.332	$947.53	$684.34	$1,039.31	$86.89	$2,758.07

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	7972 mhr	$23,917
L	sh	Tunnel shifter				$72.23 /mhr	839.2 mhr	$60,617
L	min	Tunnel miner			4	$68.45 /mhr	3357 mhr	$229,785
L	lab	General Labor (Grp 3)				$63.14 /mhr	839.2 mhr	$52,984
L	att	Portal Attendant				$66.60 /mhr	839.2 mhr	$55,893
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	839.2 mhr	$68,082
L	lo35-	Loader oper. <3.5cy (OG4)			50%	$79.39 /mhr	419.6 mhr	$33,312
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	419.6 mhr	$33,312
L	conc	Concrete equip.oper. (OG5)			0.5	$77.79 /mhr	419.6 mhr	$32,640
E	c76	Conc. pump, trailer 76cy/hr			0.5	$52.05 /hr	419.6 hr	$21,839
E	b320	Backhoe Cat 320, 44k/1.5cy				$59.88 /hr	839.2 hr	$50,249
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	839.2 hr	$37,960
E	sp12	Shotcrete plant, skid 12cy/hr				$23.09 /hr	839.2 hr	$19,376
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	839.2 hr	$63,651
E	bl3	Extension Boom, 3.0ton				$42.61 /hr	839.2 hr	$35,762
M	8set	8-in. Steel Set	151.0 ea			$1,984 /ea	151.0 ea	$299,563
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf		$104 /cy	966.4 cy	$100,536
M	clsc	Controlled Low Strength Conc		2.003 cy/lf		$97.43 /cy	1198 cy	$116,698
M	sform	Stay-form		44.682 sf/lf		$2.71 /sf	26720 sf	$72,311
M	lumb	Lumber for lagging/blocking		10.00 bf/lf		$1.42 /bf	5980 bf	$8,480
S	muckc	Muck disp. Contam. Non Haz.	509.4 bcy	1.60 lcy/bcy		$63.75 /lcy	815.1 lcy	$51,960
E	g210	Generator, skid 210kW				$57.33 /hr	839.2 hr	$48,114
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	839.2 hr	$1,190
E	wtp	Water Treatment Plant				$3.58 /hr	839.2 hr	$3,006
E	wd4	Welder 400A Diesel, trailer				$12.02 /hr	839.2 hr	$10,088

E	cp16	Compressor, trailer 1600cfm	$127 /hr	839.2 hr	$106,341
E	vf100	Ventilation fan 100hp	$13.90 /hr	839.2 hr	$11,662

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
009	**North Site-Excav./Supp. Collapsed w/o Spiles**	**107 lf**	**3.68 lf/day**		**29.2 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
2,219	**$157,726**	**$107,836**	**$99,648**	**$57,380**	**$422,590**
20.654	$1,467.93	$1,003.61	$927.41	$534.02	$3,932.97

Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	2219 mhr	$6,658
L	sh	Tunnel shifter				$72.23 /mhr	233.6 mhr	$16,873
L	min	Tunnel miner			4	$68.45 /mhr	934.4 mhr	$63,963
L	lab	General Labor (Grp 3)				$63.14 /mhr	233.6 mhr	$14,749
L	att	Portal Attendant				$66.60 /mhr	233.6 mhr	$15,558
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	233.6 mhr	$18,951
L	lo35-	Loader oper. <3.5cy (OG4)			0.5	$79.39 /mhr	116.8 mhr	$9,273
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	116.8 mhr	$9,273
L	conc	Concrete equip.oper. (OG5)			50%	$77.79 /mhr	116.8 mhr	$9,086
E	b320	Backhoe Cat 320, 44k/1.5cy				$59.88 /hr	233.6 hr	$13,987
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	233.6 hr	$10,567
E	sp12	Shotcrete plant, skid 12cy/hr				$23.09 /hr	233.6 hr	$5,394
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	233.6 hr	$17,718
E	bl3	Extension Boom, 3.0ton				$42.61 /hr	233.6 hr	$9,955
M	8set	8-in. Steel Set	37.00 ea			$1,984 /ea	37.00 ea	$73,403
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf		$104 /cy	173.6 cy	$18,064
M	lumb	Lumber for lagging/blocking		10.00 bf/lf		$1.42 /bf	1074 bf	$1,524
S	muck	Muck disposal	838.0 bcy	1.60 lcy/bcy		$35.83 /lcy	1341 lcy	$48,044
S	muckc	Muck disp. Contam. Non Haz.	91.53 bcy	1.60 lcy/bcy		$63.75 /lcy	146.4 lcy	$9,336
E	g210	Generator, skid 210kW				$57.33 /hr	233.6 hr	$13,393
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	233.6 hr	$331
E	wtp	Water Treatment Plant				$3.58 /hr	233.6 hr	$837
E	wd4	Welder 400A Diesel, trailer				$12.02 /hr	233.6 hr	$2,808
E	cp16	Compressor, trailer 1600cfm				$127 /hr	233.6 hr	$29,601
E	vf100	Ventilation fan 100hp				$13.90 /hr	233.6 hr	$3,246

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
010	**North Site-Excav./Supp. Collapsed w Spiles**	**139 lf**	**2.37 lf/day**		**58.6 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
4,454	**$316,532**	**$221,061**	**$216,264**	**$74,333**	**$828,190**
31.996	$2,274.03	$1,588.15	$1,553.69	$534.02	$5,949.90

Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	4454 mhr	$13,361
L	sh	Tunnel shifter				$72.23 /mhr	468.8 mhr	$33,862
L	min	Tunnel miner			4	$68.45 /mhr	1875 mhr	$128,364
L	lab	General Labor (Grp 3)				$63.14 /mhr	468.8 mhr	$29,598
L	att	Portal Attendant				$66.60 /mhr	468.8 mhr	$31,223
L	eo35-	Excavator Operator (OG3)				$81.13 /mhr	468.8 mhr	$38,032
L	lo35-	Loader oper. <3.5cy (OG4)			0.5	$79.39 /mhr	234.4 mhr	$18,609
L	MW	HD Mech/Welder (OG4)			0.5	$79.39 /mhr	234.4 mhr	$18,609
L	conc	Concrete equip.oper. (OG5)			50%	$77.79 /mhr	234.4 mhr	$18,234
E	vh	Vibro Hammer				$9.92 /hr	468.8 hr	$4,650
E	b320	Backhoe Cat 320, 44k/1.5cy				$59.88 /hr	468.8 hr	$28,071
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	468.8 hr	$21,205
E	sp12	Shotcrete plant, skid 12cy/hr				$23.09 /hr	468.8 hr	$10,824
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	468.8 hr	$35,557
E	bl3	Extension Boom, 3.0ton				$42.61 /hr	468.8 hr	$19,978

DIRECT COST DETAIL

M	8set	8-in. Steel Set	48.00 ea		$1,984 /ea	48.00 ea	$95,225
M	s5	Shotcrete, 5000psi mix		1.616 cy/lf	$104 /cy	225.0 cy	$23,401
M	spile	C6x13 Channel Spile	1114 ea		$73.88 /ea	1114 ea	$82,303
M	lumb	Lumber for lagging/blocking		10.00 bf/lf	$1.42 /bf	1392 bf	$1,974
S	muck	Muck disposal	1086 bcy	1.60 lcy/bcy	$35.83 /lcy	1737 lcy	$62,239
S	muckc	Muck disp. Contam. Non Haz.	118.6 bcy	1.60 lcy/bcy	$63.75 /lcy	189.7 lcy	$12,094
E	g210	Generator, skid 210kW			$57.33 /hr	468.8 hr	$26,878
E	p140	Pump, subm. 140gpm/20ft head			$1.42 /hr	468.8 hr	$665
E	wtp	Water Treatment Plant			$3.58 /hr	468.8 hr	$1,679
E	wd4	Welder 400A Diesel, trailer			$12.02 /hr	468.8 hr	$5,635
E	cp16	Compressor, trailer 1600cfm			$127 /hr	468.8 hr	$59,405
E	vf100	Ventilation fan 100hp			$13.90 /hr	468.8 hr	$6,514

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
011	**Tunnel Sub Base w/ Drainage**	**2173 LF**	**100 LF/day**		**21.7 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	1,215	**$86,393**	**$65,304**	**$87,983**	**$586,710**	**$826,391**
	0.559	$39.76	$30.05	$40.49	$270.00	$380.30

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	1215 mhr	$3,646
M	aggf	Fine aggregate	2331 ton			$36.19 /ton	2331 ton	$84,338
S	tds	Tunnel Drainage System				$270 /lf	2173 LF	$586,710
L	sh	Tunnel shifter				$72.23 /mhr	173.6 mhr	$12,539
L	min	Tunnel miner			2	$68.45 /mhr	347.2 mhr	$23,767
L	lab	General Labor (Grp 3)				$63.14 /mhr	173.6 mhr	$10,960
L	att	Portal Attendant				$66.60 /mhr	173.6 mhr	$11,562
L	lo35-	Loader oper. <3.5cy (OG4)				$79.39 /mhr	173.6 mhr	$13,782
L	MW	HD Mech/Welder (OG4)				$79.39 /mhr	173.6 mhr	$13,782
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	173.6 hr	$7,853
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	173.6 hr	$13,167
E	c14	Compactor, BW11AS, 14t/54"				$52.15 /hr	173.6 hr	$9,053
E	g210	Generator, skid 210kW				$57.33 /hr	173.6 hr	$9,953
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	173.6 hr	$246
E	wtp	Water Treatment Plant				$3.58 /hr	173.6 hr	$622
E	cp16	Compressor, trailer 1600cfm				$127 /hr	173.6 hr	$21,998
E	vf100	Ventilation fan 100hp				$13.90 /hr	173.6 hr	$2,412

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
012	**Tunnel Agg Base**	**2173 LF**	**100 LF/day**		**21.7 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	1,215	**$86,393**	**$65,304**	**$31,244**	**$0**	**$182,941**
	0.559	$39.76	$30.05	$14.38	$0.00	$84.19

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	1215 mhr	$3,646
M	aggc	Coarse aggregate	882.8 ton			$31.26 /ton	882.8 ton	$27,598
L	sh	Tunnel shifter				$72.23 /mhr	173.6 mhr	$12,539
L	min	Tunnel miner			2	$68.45 /mhr	347.2 mhr	$23,767
L	lab	General Labor (Grp 3)				$63.14 /mhr	173.6 mhr	$10,960
L	att	Portal Attendant				$66.60 /mhr	173.6 mhr	$11,562
L	lo35-	Loader oper. <3.5cy (OG4)				$79.39 /mhr	173.6 mhr	$13,782
L	MW	HD Mech/Welder (OG4)				$79.39 /mhr	173.6 mhr	$13,782
E	lhd3	Load-Haul-Dump 4ton/2.5cy				$45.23 /hr	173.6 hr	$7,853
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	173.6 hr	$13,167
E	c14	Compactor, BW11AS, 14t/54"				$52.15 /hr	173.6 hr	$9,053
E	g210	Generator, skid 210kW				$57.33 /hr	173.6 hr	$9,953
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	173.6 hr	$246

E	wtp	Water Treatment Plant	$3.58 /hr	173.6 hr		$622
E	cp16	Compressor, trailer 1600cfm	$127 /hr	173.6 hr		$21,998
E	vf100	Ventilation fan 100hp	$13.90 /hr	173.6 hr		$2,412

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
013	**Tunnel Paving**	**2173 LF**	**100 LF/day**		**21.7 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	521	**$35,062**	**$13,233**	**$1,562**	**$408,041**	**$457,899**
	0.240	$16.14	$6.09	$0.72	$187.78	$210.72

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	520.8 mhr	$1,562
S	tp	Tunnel Paving	3139 sy			$130 /sy	3139 sy	$408,041
L	sh	Tunnel shifter				$72.23 /mhr	173.6 mhr	$12,539
L	lab	General Labor (Grp 3)				$63.14 /mhr	173.6 mhr	$10,960
L	att	Portal Attendant				$66.60 /mhr	173.6 mhr	$11,562
E	g210	Generator, skid 210kW				$57.33 /hr	173.6 hr	$9,953
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	173.6 hr	$246
E	wtp	Water Treatment Plant				$3.58 /hr	173.6 hr	$622
E	vf100	Ventilation fan 100hp				$13.90 /hr	173.6 hr	$2,412

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
014	**Graffiti Protection**	**43460 sf**		**10 days**	**10 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	0	**$0**	**$0**	**$0**	**$178,925**	**$178,925**
	0.000	$0.00	$0.00	$0.00	$4.12	$4.12

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
S	graff	Graffiti Protection				$4.12 /sf	43460 sf	$178,925

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
015	**Tunnel Water / Fire Protection**	**2173.00 LF**		**30 days**	**30 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	0	**$0**	**$0**	**$0**	**$825,740**	**$825,740**
	0.000	$0.00	$0.00	$0.00	$380.00	$380.00

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
S	tfp	Tunnel Fire Protection				$380 /lf	2173 LF	$825,740

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
016	**Tunnel Power / Lighting / CCTV**	**2173 LF**		**60 days**	**60 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	1,440	**$96,946**	**$36,590**	**$4,320**	**$2,498,950**	**$2,636,805**
	0.663	$44.61	$16.84	$1.99	$1,150.00	$1,213.44

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	1440 mhr	$4,320
S	tlp	Power / Lighting / CCTV				$1,150 /lf	2173 LF	$2,498,950
L	sh	Tunnel shifter				$72.23 /mhr	480.0 mhr	$34,671
L	lab	General Labor (Grp 3)				$63.14 /mhr	480.0 mhr	$30,305
L	att	Portal Attendant				$66.60 /mhr	480.0 mhr	$31,969
E	g210	Generator, skid 210kW				$57.33 /hr	480.0 hr	$27,520
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	480.0 hr	$681
E	wtp	Water Treatment Plant				$3.58 /hr	480.0 hr	$1,719
E	vf100	Ventilation fan 100hp				$13.90 /hr	480.0 hr	$6,670

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DIRECT COST DETAIL

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
017	**Tunnel Ventilation**	**2173 LF**		**60 days**	**60 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
0	**$0**	**$0**	**$0**	**$304,220**	**$304,220**
0.000	$0.00	$0.00	$0.00	$140.00	$140.00

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
S	tv	Tunnel Ventilation				$140 /lf	2173 LF	$304,220

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
018	**Geotechnical Instrumentation**	**1 LS**		**320 days**	**320 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
0	**$0**	**$0**	**$200,000**	**$0**	**$200,000**

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	xmisc	Miscellaneous material	200.0 lot			$1,000 /lot	200.0 lot	$200,000

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
019	**Fill Existing boreholes**	**190 cf**		**5 days**	**5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
240	**$15,964**	**$5,116**	**$4,943**	**$0**	**$26,023**
1.263	$84.02	$26.92	$26.02	$0.00	$136.96

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	240.0 mhr	$720
M	cs	Cement, Portland 94lb sack	190.0 sack			$11.70 /sack	190.0 sack	$2,223
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687
L	lab	General Labor (Grp 3)			4	$63.14 /mhr	160.0 mhr	$10,102
L	lo35-	Loader oper. <3.5cy (OG4)				$79.39 /mhr	40.00 mhr	$3,176
E	l950	Wheel Loader Cat 950/3.5cy				$75.85 /hr	40.00 hr	$3,034
E	c76	Conc. pump, trailer 76cy/hr	*Substitute for grout mixer/pump*		1	$52.05 /hr	40.00 hr	$2,082
M	xmisc	Miscellaneous material	2.00 lot	*Hoses, etc.*		$1,000 /lot	2.00 lot	$2,000

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
020	**South Portal Site Restoration**	**1 LS**		**20 days**	**20 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
320	**$20,849**	**$0**	**$960**	**$20,000**	**$41,809**

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	320.0 mhr	$960
S	sr	Site restoration	2.00 acre			$10,000 /acre	2.00 acre	$20,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	160.0 mhr	$10,102
L	lfm	Labor FM				$67.17 /mhr	160.0 mhr	$10,747

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
021	**North Portal Site Restoration**	**1.00 LS**		**20 days**	**20 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
320	**$20,849**	**$0**	**$960**	**$20,000**	**$41,809**

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	320.0 mhr	$960
S	sr	Site restoration	2.00 acre			$10,000 /acre	2.00 acre	$20,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	160.0 mhr	$10,102
L	lfm	Labor FM				$67.17 /mhr	160.0 mhr	$10,747

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No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
022	**Hazardous Material Allowance**	**1 LS**		**0 days**	**0 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
0	**$0**	**$0**	**$200,000**	**$0**	**$200,000**

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	ai	Allowance Item	$200,000	allowance		$1.00	200000	$200,000

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
023	**Portal Modifications**	**1 LS**		**0 days**	**0 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
0	**$0**	**$0**	**$200,000**	**$0**	**$200,000**

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	ai	Allowance Item	$200,000	allowance		$1.00	200000	$200,000

Project	Client	Job No.	Estimator	Rev	Computed on
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INDIRECT COST DETAIL

No. Item Description — Item Quantity/Unit — #N/A

024 Equipment Ownership not in Direct Cost — **LS**

Equipment spread to Directs	Labor	Equipment	Material	Subcontract	Item Cost
$626,600	**$0**	**$149,700**	**$213,297**	**$0**	**$362,997**

Notes: Payment via Equipment Mobilization Bid Item $0

- Source Code: Fleet, Purchase, Mob Purchase, or Rental/lease.
- Ownership cost/hr is based on actual equipment months on-site at a single-shift utilization rate of 173 hours/month.

	Fleet Equipment		Purchased Equipment		Fleet + Purchase		Rental
	Value	W/O	Value	W/O	Value	W/O	Amount
	$2,666K	23%	$609K	60%	$3,275K	30%	$5K

R/T	Resource Description	Source Code	Number of Units or Rental Period	Unit Purchase cost, Unit Book value, or Rental Rate per period	Project Write off	Unit Freight & Erection (carried in Mob/Demob) Freight in/out	E/D mhr	Ownership Cost/hr	Equip. mos	Project Cost excluding freight/erection
M	Sales Tax			$609,030	0.0%	(no sales tax)				$0
Hourly Equipment used in Direct Cost Items: $626,600										
E	Cat 305 Mini-Exc 11k/.17cy	R	1 mo	$5,000		$500		$31.25	0.9	in directs
E	Backhoe Cat 320, 44k/1.5cy	F	2 ea	$225,000	25%	$1,000		$22.85	28.4	in directs
E	Load-Haul-Dump 4ton/2.5cy	F	2 ea	$190,000	25%	$1,000		$18.03	30.4	in directs
E	Shotcrete plant, skid 12cy/hr	F	2 ea	$75,000	25%	$500		$7.62	28.4	in directs
E	Wheel Loader Cat 950/3.5cy	F	2 ea	$217,000	25%	$1,000		$20.43	30.7	in directs
E	Extension Boom, 3.0ton	F	2 ea	$158,000	25%	$500		$16.05	28.4	in directs
E	Vibro Hammer	F	2 ea	$25,000	25%	$500		$5.92	12.2	in directs
E	Generator, skid 210kW	F	2 ea	$50,000	25%	$400		$4.22	34.2	in directs
E	Pump, subm. 140gpm/20ft head	F	2 ea	$5,000	50%	$50.00		$0.84	34.2	in directs
E	Water Treatment Plant	F	2 ea	$40,000	10%	$500		$1.35	34.2	in directs
E	Welder 400A Diesel, trailer	F	2 ea	$18,000	10%	$200		$0.73	28.4	in directs
E	Compressor, trailer 1600cfm	F	2 ea	$180,000	25%	$400		$17.08	30.4	in directs
E	AQ1500 Cutterhead Attach.	F	1 ea	$60,000	25%	$500		$42.42	2.0	in directs
E	Ventilation fan 100hp	F	2 ea	$20,000	25%	$400		$1.69	34.2	in directs
E	Conc. pump, trailer 76cy/hr	F	1 ea	$100,000	10%	$500		$17.92	3.2	in directs
E	Compactor, BW11AS, 14t/54"	F	1 ea	$100,000	10%	$500		$28.80	2.0	in directs
General Plant: $149,700										
E	Pickups	P	8 ea	$30,000	50%	$400		$3.65	190	$120,000
E	Mechanics Truck	P	1 ea	$50,000	33%	$400		$4.02	23.8	$16,500
E	Street Sweep	P	1 ea	$40,000	33%	$400		$3.21	23.8	$13,200
Lineal Plant: $173,297										
M	Fanline, 24-in Metal Ducting	P	2,390 LF	$25.00	100%	$1.00				$59,758
M	Temp Tunnel Lighting	P	2,390 LF	$40.00	75%	$1.00				$71,709
M	4-In Air & Water Line	P	4,781 LF	$10.00	50%	$1.00				$23,903
M	8-in Discharge Line	P	2,390 lf	$15.00	50%	$1.00				$17,927
Other Plant: $40,000										
M	Fan Silencer	P	2 ea	$20,000	100%	$2,000				$40,000

No. Item Description — Item Quantity/Unit — Mob/demob paid as scheduled. Bond paid at NTP.

025 General Mobilization — **0.5 mo**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
522	**$33,238**	**$10,051**	**$422,392**	**$0**	**$465,681**
1,044.000	$66,475.22	$20,102.82	$844,783.50	$0.00	$931,361.53

Work schedule		Other ST pay	Other OT pay
8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts Small tools and supplies				$3.00 /mhr	522 mhr	$1,566
M	Freight-see equipment ownership	50% of total (balance in Demobilization)			$34,852	(3.5% of equip. cost)	$17,426
M	Transfer from cost item 030 Bonds, Insurance, and Taxes not in General Mob				LS		$199,600
M	Dryhouse	2 ea	400 sf/ea		$20.00 /sf	800 sf	$16,000
M	Fire protection system	2 loc			$2,000 /loc	2 loc	$4,000
M	First Aid trailer/furnishings	400 sf			$40.00 /sf	400 sf	$16,000
M	Fuel+Lube facilities	2 loc			$5,000 /loc	2 loc	$10,000
M	Job light and power system	2 loc			$10,000 /loc	2 loc	$20,000
M	Job sanitary system	2 loc			$10,000 /loc	2 loc	$20,000
M	Job water distribution	2 loc			$10,000 /loc	2 loc	$20,000
M	Office copier/computers/fax	1 sets			$5,000 /sets	1 sets	$5,000
M	Office furnishings	1 sets			$2,000 /sets	1 sets	$2,000

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M	Office trailers	1 ea	400 sf/ea	$40.00 /sf	400 sf		$16,000
M	Engineers Office Complex	1 ea	200 sf/ea	$40.00 /sf	200 sf		$8,000
M	Shop	2 loc	800 sf/loc	$10.00 /sf	1600 sf		$16,000
M	Signs	2 loc		$5,000 /loc	2 loc		$10,000
M	Superintendent/survey trailer	2 loc	200 sf/loc	$30.00 /sf	400 sf		$12,000
M	Warehouse	2 loc	800 sf/loc	$10.00 /sf	1600 sf		$16,000
L	Labor crew - 1 operator x 2 loc			2 $75.41 /mhr	174 mhr		$13,121
L	Labor crew - 2 laborers x 2 loc			4 $57.81 /mhr	348 mhr		$20,117
E	Wheel Loader Cat 966/4.8cy 2 loc			2 $57.77 /hr	174 hr		$10,051
M	Crushed Rock for Yard	400 ton		$32.00 /ton	400 ton		$12,800

No.	Item Description	Item Quantity/Unit	
026	**Demobilization/Punchlist**	**0.5 mo**	Mob/demob paid as scheduled. Bond paid at NTP.

manhours	Labor	Equipment	Material	Subcontract	Item Cost
522	**$32,873**	**$9,416**	**$114,492**	**$0**	**$156,781**
1,044.000	$65,746.48	$18,832.89	$228,983.50	$0.00	$313,562.87

Work schedule			Other ST pay	Other OT pay
8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts Small tools and supplies				$3.00 /mhr	522 mhr	$1,566
M	Freight-see equipment ownership	50% of total (balance in Mobilization)			$34,852 total		$17,426
M	50% of Gen'l Mob matl less freight	1 LS		0.5	$191,000 /LS	0.5 LS	$95,500
L	Laborer			4	$57.81 /mhr	348 mhr	$20,117
L	Equipment Operator			2	$73.31 /mhr	174 mhr	$12,756
E	Wheel Loader Cat 966/4.8cy 2 loc			2	$54.12 /hr	174 hr	$9,416

No.	Item Description	Item Quantity/Unit	
027	**General Plant Operation/Maintenance**	**23.8 mo**	The duration is from the end of mob to the start of demob.

manhours	Labor	Equipment	Material	Subcontract	Item Cost
2,055	**$125,889**	**$0**	**$348,164**	**$142,500**	**$616,553**
86.505	$5,300.61	$0.00	$14,659.52	$6,000.00	$25,960.12

Work schedule			Other ST pay	Other OT pay
8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts Small tools and supplies				$3.00 /mhr	2054.5 mhr	$6,164
M	Access road maintenance				$2,500 /mo	23.75 mo	$59,375
M	Cell phone/radio fees		10 umo/mo		$120 /umo	237.5 umo	$28,500
M	Craft shop maintenance				$600 /mo	23.75 mo	$14,250
M	Drinking water supplies				$600 /mo	23.75 mo	$14,250
M	Dryhouse supplies			2	$1,000 /mo	47.5 mo	$47,500
M	Fire Protection supplies			2	$600 /mo	47.5 mo	$28,500
M	First Aid supplies			2	$1,000 /mo	47.5 mo	$47,500
M	Job light and power supplies			2	$500 /mo	47.5 mo	$23,750
S	Job sanitary system maintenance			2	$2,000 /mo	47.5 mo	$95,000
S	Office cleaning			1	$2,000 /mo	23.75 mo	$47,500
M	Office copier/computers/fax supplies			1	$500 /mo	23.75 mo	$11,875
M	Office phone/fax/data line fees			1	$200 /mo	23.75 mo	$4,750
M	Office supplies			1	$600 /mo	23.75 mo	$14,250
M	Water treatment plant supplies			2	$500 /mo	47.5 mo	$23,750
L	Water truck/Sweeper driver			0.5	$61.27 /mhr	2054.5 mhr	$125,889
M	Cap Lamps & Chargers			20	$50.00 /mo	475 mo	$23,750

No.	Item Description	Item Quantity/Unit	
028	**Field Supervision**	**26.8 mo**	The duration is from NTP to project completion.

man-months	Labor	Equipment	Material	Subcontract	Item Cost
278	**$3,023,803**	**$0**	**$0**	**$0**	**$3,023,803**
10.376	$113,039.37	$0.00	$0.00	$0.00	$113,039.37

Vehicles		Relocations	
8 ea	126 vmo	0 ea	

See the 'Resources' sheet for an explanation of field supervisory class codes, and associated labor burdens.
'R?' and 'V?' codes denote if relocation expenses (both ways) are paid or a vehicle assigned, respectively - see cost item 029.
15.25 mo. Tunneler's work

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R/T	Class	Resource Description	R?	V?	Personnel	Duration	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
L	-	Labor burden for personnel below - see the 'Resources' sheet						31.4% weighted average		$723,428
L	KP	Project Manager		y	1 ea		0.5	$15,000 /mmo	13.375 mmo	$200,625
L	EP	Project Engineer		y	1 ea			$10,000 /mmo	26.75 mmo	$267,500
L	EP	Field Engineer			1 ea	15.3 mmo/ea		$6,000 /mmo	15.25 mmo	$91,500
L	EP	Office Engineer			1 ea			$5,000 /mmo	26.75 mmo	$133,750
L	EP	Business Manager			1 ea		0.5	$8,000 /mmo	13.375 mmo	$107,000
L	EP	Safety Manager		y	1 ea		0.5	$10,000 /mmo	13.375 mmo	$133,750
L	NL	Warehouseman			1 ea	15.3 mmo/ea		$5,000 /mmo	15.25 mmo	$76,250
L	NL	Secretary/Clerk			1 ea			$3,000 /mmo	26.75 mmo	$80,250
L	KP	General Superintendent		y	1 ea			$13,000 /mmo	26.75 mmo	$347,750
L	EP	Walkers - Dayshift			2 ea	15.3 mmo/ea		$9,000 /mmo	30.5 mmo	$274,500
L	EP	Party Chief			1 ea		0.5	$10,000 /mmo	13.375 mmo	$133,750
L	NL	Instrumentman			1 ea	15.3 mmo/ea	0.5	$9,000 /mmo	7.625 mmo	$68,625
L	NL	1st Aid EMT - Dayshift		y	1 ea	15.3 mmo/ea		$4,500 /mmo	15.25 mmo	$68,625
L	NL	Town Runner		y	1 ea	15.3 mmo/ea		$8,000 /mmo	15.25 mmo	$122,000
L	KP	Equipment Supt		y	1 ea	15.3 mmo/ea	0.5	$11,000 /mmo	7.625 mmo	$83,875
L	EP	Subcontract Mgr			1 ea		0.1	$10,000 /mmo	2.675 mmo	$26,750
L	KP	Electrical Supt.		y	1 ea	15.3 mmo/ea	0.5	$11,000 /mmo	7.625 mmo	$83,875

No.	Item Description	Item Quantity/Unit	
029	**Overhead Maintenance/Service**	**26.8 mo**	The duration is from NTP to project completion.

	Labor	Equipment	Material	Subcontract	Item Cost
	$0	**$0**	**$273,033**	**$912,588**	**$1,185,620**
	$0.00	$0.00	$10,187.79	$34,051.77	$44,239.57

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	Payroll processing, wage labor	322 mmo	4.33 chk/mmo		$5.50 /chk	1393 chk	$7,662
M	Payroll processing, salary labor	278 mmo	2 chk/mmo		$5.50 /chk	556 chk	$3,058
M	Drug tests	22 test			$200 /test	22 test	$4,400
M	Audit fees	2.2 yr			$5,000 /yr	2.2 yr	$11,000
M	Legal fees	2.2 yr			$5,000 /yr	2.2 yr	$11,000
M	Personnel recruiting	2.2 yr			$1,000 /yr	2.2 yr	$2,200
M	Design department charge	2.2 yr	Home Office Overhead		$10,000 /yr	2.2 yr	$22,000
M	IT/EDP department charge	2.2 yr	items: 0.4% of bid.		$2,000 /yr	2.2 yr	$4,400
M	Equipment department charge	2.2 yr			$10,000 /yr	2.2 yr	$22,000
M	Accounting department charge	2.2 yr			$5,000 /yr	2.2 yr	$11,000
M	HR department charge	2.2 yr			$2,000 /yr	2.2 yr	$4,400
M	Corporate department charge	2.2 yr			$5,000 /yr	2.2 yr	$11,000
M	CPM scheduling charge	26.8 mo			$500 /mo	26.8 mo	$13,400
M	Project website maintenance				$2,000 /mo	26.8 mo	$53,600
M	Unreimbursed DRB expenses		3 mo/mtg		$4,800 /mtg	8.933333 mtg	$42,880
M	Unreimbursed partnering expenses		6 mo/mtg		$3,500 /mtg	4.466667 mtg	$15,633
M	Job photographs/video				$500 /mo	26.8 mo	$13,400
M	Pre-construction survey	1 LS			$10,000 /LS	1 LS	$10,000
M	Post-construction survey	1 LS			$10,000 /LS	1 LS	$10,000
S	Grouting Consultant	1 LS			$10,000 /LS	1 LS	$10,000
S	Environmental Consultant	26.80 mo	32 hr/mo		$250 /hr	857.6 hr	$214,400
S	Noise Monitoring Consultant	26.80 mo	32 hr/mo		$250 /hr	857.6 hr	$214,400
S	Security Service Day/Night/Weekend	26.80 mo			$17,679 /mo	26.8 mo	$473,788

No.	Item Description	Item Quantity/Unit
030	**Bonds, Insurance, and Taxes not in General Mob**	**LS**

	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
	$0	**$0**	**$517,144**	**$0**	**$517,144**

Items which are specified to be paid under General Mobilization are calculated here and flagged 'Y' in the 'Xfer to Mob?' field.
Basis of contractor's equipment insurance is $2,666K fleet book value + $609K new purchases.

R/T	Resource Description	Xfer to Mob?	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	Credit for items specified to be transferred to cost item 025, General Mobilization					LS		-$199,600
M	Performance bond	Y	$25.0 M unescalated bid			$8.00 /K Bid	$24,950 K bid	$199,600
M	Builder's risk		$25.0 M cost	2.3 yr		$3.00 /K-yr	$57,385 K-yr	$172,155

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
Tunnel Rehab Study					**4:19 PM**

INDIRECT COST DETAIL

M	Automobile/pickup insurance	126.0 vmo			$70.00 /vmo	126 vmo		$8,820
M	Contractor equip. insurance	2.3 yr	$3,275 K/yr		$10.00 /K	$7,533 K		$75,325
M	Excess liability umbrella	1 LS			$100,000 /LS	1 LS		$100,000
M	Incident deductibles	1 LS			$50,000 /LS	1 LS		$50,000
M	State/Local business tax	1 LS			$10,000 /LS	1 LS		$10,000
M	Permits and licenses	1 LS			$50,000 /LS	1 LS		$50,000
M	Personal property tax	2.3 yr	$3,275 K/yr	0.45	$15.00 /K	3389.625 K		$50,844

No.	Item Description	Item Quantity/Unit
031	**Contractor Markup**	**LS**

Labor	Equipment	Unclassified Material	Subcontract	Item Cost
$0	**$0**	**$2,820,597**	**$0**	**$2,820,597**

R/T	Resource Description	Resource Quantity	Markup	12.7% of cost	Resource Cost
M	Direct Labor	$3,912,706	30%	5.3%	$1,173,812
M	Field Supervision	$3,023,803	30%	4.1%	$907,141
M	Equipment	$2,703,658	5%	0.6%	$135,183
M	Material (excluding allowance items)	$5,312,128	5%	1.2%	$265,606
M	Subcontract	$6,777,101	5%	1.5%	$338,855

No.	Item Description	Item Quantity/Unit
032	**Financing Charges**	**LS**

	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
Status (Additive)	**$0**	**$0**	**$88,047**	**$0**	**$88,047**

Invoices	Securities ROR	Cost of capital	Progress payments	Retained earnings
Net 30 days	1.5%	3.0%	30 days	10% reduced to 5% at 75% of earned value

Calculate finance charges on the time elapsed from expenditures to perform the work to revenue received from progress payments.
Equipment purchases financing $609,030 + $0 tax.
(60 payments x $10,943/mo - $609,030 x 100% allocation) x 60% average job writeoff.

R/T	Description	Resource Quantity	Average Financing Period	Project Allocation	Notes	Resource Cost
M	Direct labor payroll/add-ons	$3,546,030	43 days	100%	based on 4 payroll periods/mo	$12,729
M	Field supervision payroll/add-ons	$3,023,803	38 days	100%	based on 2 payroll periods/mo	$9,590
M	Equipment purchases financing	$609,030	5 years	100%	of purchase financed	$28,358
M	Material purchases/tax	$4,502,599	30 days	100%	of cost items 001-029	$11,270
M	First retention release	$935,625	19 mo	0%	cash; 100% securities; net 1.5% rate	$15,574
M	Last retention release	$311,875	27 mo	0%	cash; 100% securities; net 1.5% rate	$10,525

No.	Item Description	Item Quantity/Unit
033	**Contractor Contingency**	**LS**

	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
Status (Additive)	**$0**	**$0**	**$604,337**	**$0**	**$604,337**

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	General Conditions	1 LS		0.02	$15,108,432 /LS	0.02 LS	$302,169
M	Mitigation Measures	1 LS		0.02	$15,108,432 /LS	0.02 LS	$302,169

No.	Item Description	Item Quantity/Unit
034	**Escalation from NTP**	**LS**

Status (Additive)	Labor	Equipment	Material	Subcontract	Item Cost
Escalation up to NTP (not applicable)	$0	$0	$0	$0	$0
Escalation after NTP	$138,964	$42,204	$101,179	$179,085	$461,432
Total Escalation	**$138,964**	**$42,204**	**$101,179**	**$179,085**	**$461,432**

Since a fixed schedule date for NTP is not specified, escalation is calculated from NTP to the midpoint of each schedule activity for direct costs and on a yearly basis over the project duration for indirect costs. The average composite annual escalation rate is 3.0%.

R/T	Resource Description	Unescalated Cost	Escalation Rate/Year	Compounding Periods		(not applicable)	Escalated Cost
L	Direct Labor	$3,912,706	3.0%	2	(semi-annually)	6/20/2017	$79,339
L	Field Supervision	$3,023,803	3.0%	1	(annually)	6/20/2017	$59,625
E	Equipment	$2,703,658	3.0%	1	(annually)	6/20/2017	$42,204
M	Material (including unclassified)	$8,132,725	3.0%	4	(quarterly)	6/20/2017	$101,179
S	Subcontracts	$6,777,101	3.0%	1	(annually)	6/20/2017	$179,085

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
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INDIRECT COST DETAIL

No.	Item Description	Item Quantity/Unit				
035	**Owner Contingency**	**LS**				
		Labor	Equipment	Unclassified Material	Subcontract	Item Cost
	Status (Additive)	**$0**	**$0**	**$5,002,300**	**$0**	**$5,002,300**

C/T	Type of Contingency	Amount	Contingency Level	Resource Cost
T	Design Definition	$25,011,425	20.0% of total (less allowances)	$5,002,300

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
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RESOURCE RATE AND USAGE DETAIL

DIRECT LABOR

Basis: Prevailing wage rates

Employer Insurance Add-ons	Ind. Rate	Exp. Mod	Eff Rate	*Memo: Estimate Total*
Workers' Compensation	6.0%		6.0%	*$129,415*
Commercial General Liability	10.0%		10.0%	*$215,691*
CIGA/Terrorism/Other Add-ons	1.0%		1.0%	*$21,569*

Employer Payroll Tax Add-ons	Tax Rate	Annual Inc. Cap
Fed. Social Security Tax	6.200%	$118,500
Fed. Medicaid Tax	0.145%	
Fed. Unemployment Tax	0.600%	$7,000
CA Unemployment Tax	3.400%	$7,000
CA SDI	1.100%	$100,800

Overtime	Rate		
General/Saturday overtime	1.5x		
Sunday/Holiday overtime	2.0x		
Misc. General overtime	2.0%	built in rates	*$54,287*

Weighted average: $35.99 /mhr Base+Vac
$33.33 /mhr Fringes/Ins/Taxes

Code	Resource/Group Description	Hourly Base+Vac	Hourly Fringes	Daily Subsistance/Travel	Ins & Taxes	Misc. Gen'l OT	Adjusted Rate/mhr	Total mhrs	Total Cost
	Laborers								
lfm	Labor FM	$35.24	$22.20		$8.76	$0.97	$67.17	520	$34,929
lab	General Labor (Grp 3)	$32.04	$22.20		$7.97	$0.92	$63.14	6,564	$414,425
	Operating Engineers								
eo35+	Excavator >.5cy (OG2)	$41.14	$30.43		$10.20	$1.22	$82.99	160	$13,278
eo35-	Excavator Operator (OG3)	$39.66	$30.43		$9.83	$1.20	$81.13	4,923	$399,403
lo35-	Loader oper. <3.5cy (OG4)	$38.28	$30.43		$9.50	$1.18	$79.39	2,849	$226,163
mw	HD Mech/Welder (OG4)	$38.28	$30.43		$9.50	$1.18	$79.39	2,809	$222,988
conc	Concrete equip.oper. (OG5)	$37.01	$30.43		$9.19	$1.16	$77.79	2,462	$191,487
	Tunnel Laborers								
sh	Tunnel shifter	$38.89	$22.66		$9.65	$1.04	$72.23	5,924	$427,901
min	Tunnel miner	$35.89	$22.66		$8.91	$0.99	$68.45	20,387	$1,395,579
att	Portal Attendant	$34.42	$22.66		$8.55	$0.97	$66.60	5,924	$394,553
Mobilization Labor		$32.34	$22.45	$0.00	$7.95	$0.93	$63.67	522	$33,238
Demobilization Labor		$31.98	$22.20	$0.00	$7.87	$0.92	$62.98	522	$32,873
GP Operation/Maintenance Labor		$31.12	$21.60	$0.00	$7.65	$0.90	$61.27	2,055	$125,889
Craft Labor Escalation									$79,339
Total Craft Labor		**$2,041,429 escalated payroll**				**55,620 mhrs**			**$3,992,044**

FIELD SUPERVISORY LABOR (see cost item 028)

Employer Insurance Add-ons	Ind. Rate	Exp. Mod	Eff. Rate	*Memo: Estimate Total*
Workers' Compensation	1.8%		1.8%	*$41,407*
Commercial Gen'l Liability	5.0%		5.0%	*$115,019*

Permanent Employee Benefits	Rate	Applied to classifications
Key empl. bonus plan	8.0%	KP
Employee medical plan	10.0%	KP, EP, EL, NP, NL
Retirement/Pension plan	5.0%	KP, EP, NP
Non-exempt salaried OT	2.0%	NP, NL

Employer Payroll Tax Add-ons

7.7% payroll tax rate based on $8,288/mmo weighted base salary.

Field Supervisory Labor Classification	Class	Total Burden
Key permanent employee	KP	37.5%
Exempt permanent employee	EP	29.5%
Exempt local hire employee	EL	24.5%
Non-exempt permanent employee	NP	31.5%
Non-exempt local hire employee	NL	26.5%

	Total mmos	Total Cost
Supervisory Salaries	278	$3,023,803
Supervisory Labor Escalation		$59,625
Total Supervisory Labor	**278 mmos**	**$3,083,429**

RESOURCE RATE AND USAGE DETAIL

EQUIPMENT (see Cost Item 024 for development of hourly ownership costs)

Basis: COE Rates, Year 2011 — Unit Cost — ***Memo:*** *Total including General Plant Mob/O&M*

Region 8	Electricity	$0.12 /kWh	*730,832 kWh*	*$87,700*
Fuel/Power Factor High	Diesel	$3.89 /gal	*305,431 gal*	*$1,188,127*
	Gas	$3.20 /gal	*0 gal*	*$0*

Code	Resource/Group Description	Air Diesel Elec Gas	HP/CFM	HPF	Equipment Value	Parts Cost/hr	Elec/Fuel Cost/hr	Ownership Cost/hr	Total Cost/hr	Total hrs	Total Cost
b305	Cat 305 Mini-Exc 11k/.17cy	D	47	65	$72,813	$7.77	$6.96	$31.25	$45.98	160	$7,357
b320	Backhoe Cat 320, 44k/1.5cy	D	128	65	$217,913	$18.07	$18.96	$22.85	$59.88	4,923	$294,789
	Loaders										
L950	Wheel Loader Cat 950/3.5cy	D	197	65	$217,586	$26.24	$29.18	$20.43	$75.85	5,310	$402,777
	Haul Units										
lhd3	Load-Haul-Dump 4ton/2.5cy	D	82	70	$186,000	$14.13	$13.08	$18.03	$45.23	5,270	$238,398
	Concrete Equipment										
c76	Conc. pump, trailer 76cy/hr	D	127	70	$93,635	$13.87	$20.26	$17.92	$52.05	558	$29,042
sp12	Shotcrete plant, skid 12cy/hr	E	80	75	$52,467	$10.00	$5.47	$7.62	$23.09	4,923	$113,672
	Compactors										
c14	Compactor, BW11AS, 14t/54"	D	70	80	$107,377	$10.59	$12.76	$28.80	$52.15	347	$18,107
	Plant Equipment										
cp16	Compressor, trailer 1600cfm	D	500	75	$180,565	$24.20	$85.44	$17.08	$126.72	5,270	$667,852
g210	Generator, skid 210kW	D	314	65	$37,885	$6.61	$46.50	$4.22	$57.33	5,924	$339,640
p140	Pump, subm. 140gpm/20ft he	E	2	90	$4,135	$0.41	$0.16	$0.84	$1.42	5,924	$8,401
vf100	Ventilation fan 100hp	E	100	90	$5,500	$4.00	$8.21	$1.69	$13.90	5,924	$82,320
wd4	Welder 400A Diesel, trailer	D	48	80	$17,797	$2.54	$8.75	$0.73	$12.02	4,923	$59,179
wtp	Water Treatment Plant	E	15	90	$350,000	$1.00	$1.23	$1.35	$3.58	5,924	$21,218
	Utility Equipment										
bl3	Extension Boom, 3.0ton	D	84	85	$158,400	$10.30	$16.27	$16.05	$42.61	4,923	$209,799
	Attachments										
ch	AQ1500 Cutterhead Attach.	E	160	75	$55,000	$6.00	$10.94	$42.42	$59.36	354	$20,991
vh	Vibro Hammer	A	200	75	$25,000	$4.00		$5.92	$9.92	2,112	$20,948
Equipment Ownership (excludes $626,600 componant spread to Direct Costs)											$149,700
Mobilization Equipment										174	$10,051
Demobilization Equipment										174	$9,416
Equipment Escalation											$42,204
					Total Equipment			**67,353 hrs**			**$2,745,862**

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
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RESOURCE RATE AND USAGE DETAIL

MATERIALS

Code	Resource/Group Description	Unit Cost/Measure	Notes	Add Tax (-/N)?	Unit Cost F.O.B Job	Total Quantity	Total Cost
	Add-ons						
tax	Sales Tax	8.250%	***Memo:*** *Tax on Material* *$180,750*				
			…and Equipment Purchases *$0*				
sts	Small tools and supplies	$3.00 mhr	(4.6% of raw direct labor rate)		$3.00	55,620	$166,860
	Concrete/Cement						
cs	Cement, Portland 94lb sack	$10.81 sack	RSMeans		$11.70	190	$2,223
aggf	Fine aggregate	$33.43 ton	Means 310516100400 / 2012 C		$36.19	2,331	$84,338
aggc	Coarse aggregate	$28.88 ton	Means 310516100300 / 2012 C		$31.26	883	$27,598
s5	Shotcrete, 5000psi mix	$96.10 cy			$104.03	3,463	$360,283
clsc	Controlled Low Strength Conc	$90.00 cy			$97.43	1,478	$144,019
	Formwork						
lumb	Lumber for lagging/blocking	$1.31 bf			$1.42	21,430	$30,389
sform	Stay-form	$2.50 sf			$2.71	32,975	$89,240
	Permanent Materials						
swppp	Silt Fence / Straw Waddles	$5.00 lf	plug		$5.41	1,000	$5,413
8set	8-in. Steel Set	$1,833 ea	plug		$1,984	585	$1,160,559
6set	6-in. Steel Set	$1,317 ea	plug		$1,426	68	$96,937
spile	C6x13 Channel Spile	$68.25 ea	plug		$73.88	5,017	$370,659
xmisc	Miscellaneous material	$1,000 lot		N	$1,000	202	$202,000
ai	Allowance Item	$1.00 LS		n	$1.00	400,000	$400,000
Equipment Ownership not in Direct Cost Materials and Taxes							$213,297
Mobilization Freight and Materials							$420,826
Demobilization Freight and Materials							$112,926
General Plant Operation/Maintenance Materials							$342,000
Overhead Maintenance/Service Materials							$273,033
Bonds, Insurance, and Taxes not in General M		(unclassified)					$517,144
Contractor Markup		(unclassified)					$2,820,597
Financing Charges		(unclassified)					$88,047
Contractor Contingency		(unclassified)					$604,337
Material Escalation							$101,179
					Total Material		**$8,633,903**

SUBCONTRACTS

Code	Resource/Group Description	Unit Cost/Measure	Notes		Total Quantity	Total Cost
	Sitework					
cg	Clearing and grubbing	$10,000.00 acre		$10,000	4	$40,000
muck	Muck disposal	$35.83 lcy		$35.83	17,532	$628,225
muckc	Muck disp. Contam. Non Haz.	$63.75 lcy		$63.75	2,921	$186,203
sr	Site restoration	$10,000.00 acre	Plug Price	$10,000	4	$40,000
tfnc	Temporary Construction Fenc	$25.00 lf		$25.00	1,000	$25,000
	Specialty Subcontracts					
graff	Graffiti Protection	$4.12 sf		$4.12	43,460	$178,925
tds	Tunnel Drainage System	$270.00 lf		$270.00	2,173	$586,710
tfp	Tunnel Fire Protection	$380.00 lf		$380.00	2,173	$825,740
tlp	Power / Lighting / CCTV	$1,150.00 lf		$1,150	2,173	$2,498,950
tp	Tunnel Paving	$130.00 sy		$130.00	3,139	$408,041
tv	Tunnel Ventilation	$140.00 lf		$140.00	2,173	$304,220
General Plant Operation/Maintenance Subcontracts						$142,500
Overhead Maintenance/Service Subcontracts						$912,588
Subcontract Escalation						$179,085
				Total Subcontract		**$6,956,186**
				Escalated Construction Bid		**$25,411,425**

RESOURCE RATE AND USAGE DETAIL

SUMMARY BY RESOURCE TYPE

Cost Type	Labor	Equipment	Material	Subcontract	Total
Direct* Cost	$3,720,705	$2,534,491	$2,731,223	$5,722,014	$14,708,432
Indirect* Cost	$3,215,803	$169,168	$1,371,377	$1,055,088	$9,841,561
Indirect Cost (unclassified)	-	-	$4,030,125	-	
Owner Allowances	$0	$0	$400,000	$0	$400,000
Escalation from NTP	$138,964	$42,204	$101,179	$179,085	$461,432
Escalated Construction Bid	**$7,075,473**	**$2,745,862**	**$8,633,903**	**$6,956,186**	**$25,411,425**
Relative Direct* + Indirect* Costs	34%	13%	20%	33%	100% on $20,519,868

SUMMARY BY COST TYPE

Cost Type	Total	% Total Estimate	% Direct, Equipment and Plant Cost	Applicable Cost Items
Mobilization/Demobilization	$622,462	2.5%	4.0%	025 - 026
Directs, Equipment, and Plant	$15,687,982	62.9%	100.0%	From 001 - 024, 027 -
Overhead/Profit	$8,239,549	33.0%	52.5%	028 - 033
Owner Allowances	$400,000	1.6%	2.5%	Between 022 - 023
Unescalated Construction Bid	**$24,949,993**		**159.0%**	

UNESCALATED TIME-RELATED INDIRECT COST BREAKDOWN

Cost Type	Average Cost/month	Exclude?
Lineal/Other Plant Equipment CFC	$546 /mo	
GP operation/maintenance	$26,534 /mo	
Weekend maintenance		
Field supervision	$115,565 /mo	
OH maintenance/service	$45,313 /mo	
Total	**$187,958 /mo (excluding markup)**	**$227,268 /mo (including markup)**

Monthly costs include adjustments totalling 2.4% for:
- bonds, insurance, and taxes
- financing charges

but exclude contractor contingency

DISTRIBUTION OF PROJECT NON-WORKDAYS

Type of non-workday	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year	Total Project
Holiday		1	1	0	0	1	0	1	0	1	0	2	2	9	19
Inclement Weather Day		2	2	1	0	0	0	0	0	0	0	2	2	9	21
Total		**3**	**3**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**4**	**4**	**18**	**40**

McMILLEN JACOBS ASSOCIATES

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
Tunnel Abandonment Study					**4:05 PM**

OPINION OF PROBABLE ESCALATED CONSTRUCTION BID INCLUDING OWNER CONTINGENCY

No.	Item or Group Item Description	Group Item Cost	Item Quantity/Unit	Item Unit Cost	Status	Item Cost
001	South Portal Site Preparation		LS			$33,646
002	North Portal Site Preparation		LS			$33,646
003	Underhill Site Preparation		LS			$28,646
004	Camino Alto Site Preparation		LS			$28,646
005	Stetson Ave. Site Preparation		LS			$28,646
	Site Preparation	**$153,231**				
006	Fill Intact Tunnel w/ CLSM 267+00 to 272+98		6,205 cy	$116 /cy		$719,034
007	Fill Intact Tunnel w/ CLSM 276+00 to 277+62		1,764 cy	$120 /cy		$212,160
008	Fill Collapse Tunnel w/ Grout 258+75 to 267+00		5,736 cy	$57.83 /cy		$331,691
	Phase 1 Backfill	**$1,262,885**	**LS**			
009	Drill New Boreholes		2,160 lf	$98.00 /lf		$211,680
010	Contact Grout Remaining Voids		7,016 cy	$80.36 /cy		$563,816
011	Drill New Tertiary Boreholes		432 lf	$98.00 /lf		$42,336
012	Tertiary Grouting		213 cy	$768 /cy		$163,340
	Phase 2 / 3 Tunnel Backfill	**$981,172**	**LS**			
013	South Portal Site Restoration		LS			$15,452
014	North Portal Site Restoration		LS			$15,452
015	Underhill Site Restoration		LS			$10,452
016	Camino Alto Site Restoration		LS			$10,452
017	Stetson Ave. Site Restoration		LS			$10,452
	Site Restoration	**$62,261**	**LS**			
				Subtotal Direct Cost		**$2,459,549**
018	Equipment Ownership not in Direct Cost			3.4% directs		$82,500
019	General Mobilization		0.5 mo	3.9% unesc.bid		$173,274
020	Demobilization/Punchlist		0.5 mo	1.8% unesc.bid		$81,853
021	General Plant Operation/Maintenance		5.5 mo	$18,863 /mo		$103,745
022	Field Supervision		8.5 mo	$44,734 /mo		$380,238
023	Overhead Maintenance/Service		8.5 mo	$43,176 /mo		$366,992
024	Bonds, Insurance, and Taxes not in General Mobilization			5.3% unesc.bid		$238,389
025	Contractor Markup			12.3% of cost		$490,309
026	Financing Charges			0.3% unesc.bid		$14,593
027	Contractor Contingency			2.2% unesc.bid		$98,382
				Subtotal Indirect Cost		**$2,030,274**
028	Escalation from NTP			0.4% unesc.bid		$18,939
8.5 mo project duration after NTP				**Escalated Construction Bid**		**$4,508,761**
029	Owner Contingency			20.0% esc.bid		$901,800
				Opinion of Probable Escalated Construction Bid including Owner Contingency		**$5,410,561**

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Estimate Notes:

0.825466

McMILLEN JACOBS ASSOCIATES

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel **Tunnel Abandonment Study**	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017** **4:05 PM**

CONSTRUCTION SCHEDULE AND MONTHLY PROGRESS PAYMENTS

Activity No. and Description	Bid Amount	Dur. (mos)	Start mo	End mo	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
					J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
NTP			1.00		▼ NTP: Month 1.0				
Preliminary Submittals		2.00	1.00	3.00					
018 Equipment Mobilization	$0	1.00	3.00	4.00					
019 General Mobilization	$173,274	0.50	3.00	3.50					
020 Demobilization/Punchlist	$81,853	0.50	9.00	9.50					
001 South Portal Site Preparation	$58,189	0.25	4.00	4.25					
002 North Portal Site Preparation	$58,189	0.25	4.00	4.25					
003 Underhill Site Preparation	$49,542	0.25	4.00	4.25					
004 Camino Alto Site Preparation	$49,542	0.25	4.00	4.25					
005 Stetson Ave. Site Preparation	$49,542	0.25	4.00	4.25					
006 Fill Intact Tunnel w/ CLSM 267+00 to 272+98	$1,243,523	0.75	4.25	5.00					
007 Fill Intact Tunnel w/ CLSM 276+00 to 277+62	$366,918	0.25	5.00	5.25					
008 Fill Collapse Tunnel w/ Grout 258+75 to 267+00	$573,638	0.75	5.00	5.75					
009 Drill New Boreholes	$366,087	1.00	5.75	6.75					
010 Contact Grout Remaining Voids	$975,085	1.50	6.75	8.25					
011 Drill New Tertiary Boreholes	$73,217	0.25	8.25	8.50					
012 Tertiary Grouting	$282,486	0.25	8.50	8.75					
013 South Portal Site Restoration	$26,724	0.25	8.75	9.00					
014 North Portal Site Restoration	$26,724	0.25	8.75	9.00					
015 Underhill Site Restoration	$18,077	0.25	8.75	9.00					
016 Camino Alto Site Restoration	$18,077	0.25	8.75	9.00					
017 Stetson Ave. Site Restoration	$18,077	0.25	8.75	9.00					
Opinion of Probable Escalated Construction Bid, Duration, and Monthly Progress Payments	**$4,508,761**	**8.5 months**			$155.9K $1,357.7K $928.9K **$550.9K** $617.6K $594.6K **$303.2K**				
					$4,508.8K	$0.0K	$0.0K	$0.0K	$0.0K

1. Project calendar is based on 9 observed holidays and 9 critical inclement weather days per year distributed monthly as shown in the Estimate Metrics summary on page 16.
2. Payments are made 30 days after pay applications including 10% retention which is reduced to 5% after 75% is earned, 6 months after NTP. Payments releasing retention bolded. 50% of the contract is earned 6 months after NTP.
3. Spread $2.0M indirects + $0.0M escalation - $0.3M mob. Mob/demob paid as scheduled. Bond paid at NTP.

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
Tunnel Abandonment Study					**4:05 PM**

DIRECT COST DETAIL

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
001	**South Portal Site Preparation**	**1 LS**		**5 days**	**5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
120	**$8,532**	**$2,589**	**$2,525**	**$20,000**	**$33,646**

Status (Additive)	Work schedule	Other ST pay	Other OT pay
1.000 Schedule factor (Normal)	8 hr/shift / 1 shift/day / 5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	120.0 mhr	$360
S	cg	Clearing and grubbing	1.00 acre			$10,000 /acre	1.00 acre	$10,000
S	tfnc	Temporary Construction Fenc	400.0 lf			$25.00 /lf	400.0 lf	$10,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687
L	eo35+	Excavator >.5cy (OG2)				$82.99 /mhr	40.00 mhr	$3,320
E	b305	Cat 305 Mini-Exc 11k/.17cy				$64.73 /hr	40.00 hr	$2,589
M	swppp	Silt Fence / Straw Waddles	400.0 lf			$5.41 /lf	400.0 lf	$2,165

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
002	**North Portal Site Preparation**	**1 LS**		**5 days**	**5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
120	**$8,532**	**$2,589**	**$2,525**	**$20,000**	**$33,646**

Status (Additive)	Work schedule	Other ST pay	Other OT pay
1.000 Schedule factor (Normal)	8 hr/shift / 1 shift/day / 5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	120.0 mhr	$360
S	cg	Clearing and grubbing	1.00 acre			$10,000 /acre	1.00 acre	$10,000
S	tfnc	Temporary Construction Fenc	400.0 lf			$25.00 /lf	400.0 lf	$10,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687
L	eo35+	Excavator >.5cy (OG2)				$82.99 /mhr	40.00 mhr	$3,320
E	b305	Cat 305 Mini-Exc 11k/.17cy				$64.73 /hr	40.00 hr	$2,589
M	swppp	Silt Fence / Straw Waddles	400.0 lf			$5.41 /lf	400.0 lf	$2,165

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
003	**Underhill Site Preparation**	**1 LS**		**5 days**	**5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
120	**$8,532**	**$2,589**	**$2,525**	**$15,000**	**$28,646**

Status (Additive)	Work schedule	Other ST pay	Other OT pay
1.000 Schedule factor (Normal)	8 hr/shift / 1 shift/day / 5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	120.0 mhr	$360
S	cg	Clearing and grubbing	0.50 acre			$10,000 /acre	0.50 acre	$5,000
S	tfnc	Temporary Construction Fenc	400.0 lf			$25.00 /lf	400.0 lf	$10,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687
L	eo35+	Excavator >.5cy (OG2)				$82.99 /mhr	40.00 mhr	$3,320
E	b305	Cat 305 Mini-Exc 11k/.17cy				$64.73 /hr	40.00 hr	$2,589
M	swppp	Silt Fence / Straw Waddles	400.0 lf			$5.41 /lf	400.0 lf	$2,165

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
004	**Camino Alto Site Preparation**	**1 LS**		**5 days**	**5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
120	**$8,532**	**$2,589**	**$2,525**	**$15,000**	**$28,646**

Status (Additive)	Work schedule	Other ST pay	Other OT pay
1.000 Schedule factor (Normal)	8 hr/shift / 1 shift/day / 5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	120.0 mhr	$360
S	cg	Clearing and grubbing	0.50 acre			$10,000 /acre	0.50 acre	$5,000
S	tfnc	Temporary Construction Fenc	400.0 lf			$25.00 /lf	400.0 lf	$10,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687

L	eo35+	Excavator >.5cy (OG2)			$82.99 /mhr	40.00 mhr	$3,320
E	b305	Cat 305 Mini-Exc 11k/.17cy			$64.73 /hr	40.00 hr	$2,589
M	swppp	Silt Fence / Straw Waddles	400.0	lf	$5.41 /lf	400.0 lf	$2,165

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
005	**Stetson Ave. Site Preparation**	**1 LS**		**5 days**	**5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
120	**$8,532**	**$2,589**	**$2,525**	**$15,000**	**$28,646**

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	120.0 mhr	$360
S	cg	Clearing and grubbing	0.50 acre			$10,000 /acre	0.50 acre	$5,000
S	tfnc	Temporary Construction Fenc	400.0 lf			$25.00 /lf	400.0 lf	$10,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687
L	eo35+	Excavator >.5cy (OG2)				$82.99 /mhr	40.00 mhr	$3,320
E	b305	Cat 305 Mini-Exc 11k/.17cy				$64.73 /hr	40.00 hr	$2,589
M	swppp	Silt Fence / Straw Waddles	400.0 lf			$5.41 /lf	400.0 lf	$2,165

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
006	**Fill Intact Tunnel w/ CLSM 267+00 to 272+98**	**6,205 cy**	**400 cy/day**	**2 days**	**17.5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
980	**$71,092**	**$35,475**	**$612,467**	**$0**	**$719,034**
0.158	$11.46	$5.72	$98.70	$0.00	$115.88

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

2 days setup/takedown

598 LF

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	980.0 mhr	$2,940
L	lfm	Labor FM				$67.17 /mhr	140.0 mhr	$9,404
L	lab	General Labor (Grp 3)			2	$63.14 /mhr	280.0 mhr	$17,678
L	lo35-	Loader oper. <3.5cy (OG4)				$79.39 /mhr	140.0 mhr	$11,114
L	MW	HD Mech/Welder (OG4)				$79.39 /mhr	140.0 mhr	$11,114
L	conc	Concrete equip.oper. (OG5)			2	$77.79 /mhr	280.0 mhr	$21,781
M	clsm	Controlled Low Strength Material				$97.43 /cy	6205 cy	$604,527
E	l950	Wheel Loader Cat 950/3.5cy				$99.13 /hr	140.0 hr	$13,878
E	c76	Conc. pump, trailer 76cy/hr			2	$51.78 /hr	280.0 hr	$14,499
E	g210	Generator, skid 210kW				$40.29 /hr	140.0 hr	$5,641
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	140.0 hr	$199
E	wtp	Water Treatment Plant				$8.99 /hr	140.0 hr	$1,258
			Hoses, pipes, etc					
M	xmisc	Miscellaneous material	5.00 lot			$1,000 /lot	5.00 lot	$5,000

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
007	**Fill Intact Tunnel w/ CLSM 276+00 to 277+62**	**1,764 cy**	**400 cy/day**	**2 days**	**6.4 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
307	**$22,017**	**$10,322**	**$179,821**	**$0**	**$212,160**
0.174	$12.48	$5.85	$101.94	$0.00	$120.27

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

2 days build portal bulkhead

170 LF

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	307.2 mhr	$922
L	lfm	Labor FM				$67.17 /mhr	51.20 mhr	$3,439
L	lab	General Labor (Grp 3)			2	$63.14 /mhr	102.4 mhr	$6,465
L	lo35-	Loader oper. <3.5cy (OG4)				$79.39 /mhr	51.20 mhr	$4,065
L	MW	HD Mech/Welder (OG4)				$79.39 /mhr	51.20 mhr	$4,065

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
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DIRECT COST DETAIL

L	conc	Concrete equip.oper. (OG5)		$77.79 /mhr	51.20 mhr		$3,983
M	clsm	Controlled Low Strength Material		$97.43 /cy	1764 cy		$171,856
M	lumb	Lumber for lagging/blocking	1121 bf	$1.42 /bf	1121 bf		$1,589
M	ply1	Plywood MDO 1"	280.2 sf	$1.62 /sf	280.2 sf		$455
E	l950	Wheel Loader Cat 950/3.5cy		$99.13 /hr	51.20 hr		$5,075
E	c76	Conc. pump, trailer 76cy/hr		$51.78 /hr	51.20 hr		$2,651
E	g210	Generator, skid 210kW		$40.29 /hr	51.20 hr		$2,063
E	p140	Pump, subm. 140gpm/20ft head		$1.42 /hr	51.20 hr		$73
E	wtp	Water Treatment Plant		$8.99 /hr	51.20 hr		$460
		Hoses, pipes, etc.					
M	xmisc	Miscellaneous material	5.00 lot	$1,000 /lot	5.00 lot		$5,000

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
008	**Fill Collapse Tunnel w/ Grout 258+75 to 267+00**	**5,736 cy**	**450 cy/day**	**2 days**	**14.7 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	1,529	**$106,652**	**$51,072**	**$173,967**	**$0**	**$331,691**
	0.267	$18.59	$8.90	$30.33	$0.00	$57.83

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

2 days setup/takedown
825 LF
67% Void Percentage

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	1529 mhr	$4,586
L	lfm	Labor FM			2	$67.17 /mhr	235.2 mhr	$15,799
L	lab	General Labor (Grp 3)			6	$63.14 /mhr	705.6 mhr	$44,549
L	lo35-	Loader oper. <3.5cy (OG4)			2	$79.39 /mhr	235.2 mhr	$18,672
L	MW	HD Mech/Welder (OG4)				$79.39 /mhr	117.6 mhr	$9,336
L	conc	Concrete equip.oper. (OG5)			2	$77.79 /mhr	235.2 mhr	$18,296
M	cb	Cement, bulk	713.6 ton			$119 /ton	713.6 ton	$84,968
M	h20	Water	113.9 kgal			$108 /kgal	113.9 kgal	$12,326
M	xg	Grout Admixtures				$10.83 /cy	5736 cy	$62,087
E	l950	Wheel Loader Cat 950/3.5cy			2	$99.13 /hr	235.2 hr	$23,315
E	gsm	Grout Slurry Mixer, 4cy			2	$20.74 /hr	235.2 hr	$4,877
E	c76	Conc. pump, trailer 76cy/hr			2	$51.78 /hr	235.2 hr	$12,179
E	g210	Generator, skid 210kW			2	$40.29 /hr	235.2 hr	$9,477
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	117.6 hr	$167
E	wtp	Water Treatment Plant				$8.99 /hr	117.6 hr	$1,057
		Hoses, pipes, etc.						
M	xmisc	Miscellaneous material	10.00 lot			$1,000 /lot	10.00 lot	$10,000

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
009	**Drill New Boreholes**	**2160 lf**	**100 lf/day**		**21.6 work days**

	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	0	**$0**	**$0**	**$0**	**$211,680**	**$211,680**
	0.000	$0.00	$0.00	$0.00	$98.00	$98.00

	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
S	drill	Drilling Subcontractor				$98.00 /lf	2160 lf	$211,680

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DIRECT COST DETAIL

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
010	**Contact Grout Remaining Voids**	**7016.17 cy**	**230 cy/day**	**2 days**	**32.5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
3,380	**$235,795**	**$112,913**	**$215,108**	**$0**	**$563,816**
0.482	$33.61	$16.09	$30.66	$0.00	$80.36

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

2 days setup/takedown
2049 LF
33% Void Percentage

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	3380 mhr	$10,140
L	lfm	Labor FM			2	$67.17 /mhr	520.0 mhr	$34,929
L	lab	General Labor (Grp 3)			6	$63.14 /mhr	1560 mhr	$98,492
L	lo35-	Loader oper. <3.5cy (OG4)			2	$79.39 /mhr	520.0 mhr	$41,282
L	MW	HD Mech/Welder (OG4)				$79.39 /mhr	260.0 mhr	$20,641
L	conc	Concrete equip.oper. (OG5)			2	$77.79 /mhr	520.0 mhr	$40,451
M	cb	Cement, bulk	872.9 ton			$119 /ton	872.9 ton	$103,940
M	h20	Water	139.3 kgal			$108 /kgal	139.3 kgal	$15,078
M	xg	Grout Admixtures				$10.83 /cy	7016 cy	$75,950
E	l950	Wheel Loader Cat 950/3.5cy			2	$99.13 /hr	520.0 hr	$51,548
E	gsm	Grout Slurry Mixer, 4cy			2	$20.74 /hr	520.0 hr	$10,782
E	c76	Conc. pump, trailer 76cy/hr			2	$51.78 /hr	520.0 hr	$26,926
E	g210	Generator, skid 210kW			2	$40.29 /hr	520.0 hr	$20,952
E	p140	Pump, subm. 140gpm/20ft head				$1.42 /hr	260.0 hr	$369
E	wtp	Water Treatment Plant				$8.99 /hr	260.0 hr	$2,337
		Hoses, pipes, etc.						
M	xmisc	Miscellaneous material	10.00 lot			$1,000 /lot	10.00 lot	$10,000

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
011	**Drill New Tertiary Boreholes**	**432 lf**	**100 lf/day**		**4.3 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
0	**$0**	**$0**	**$0**	**$42,336**	**$42,336**
0.000	$0.00	$0.00	$0.00	$98.00	$98.00

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
S	drill	Drilling Subcontractor				$98.00 /lf	432.0 lf	$42,336

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
012	**Tertiary Grouting**	**212.611 cy**	**230 cy/day**	**2 days**	**2.9 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
302	**$21,040**	**$10,075**	**$132,225**	**$0**	**$163,340**
1.419	$98.96	$47.39	$621.91	$0.00	$768.26

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

2 days setup/takedown
2049 LF
1% Void Percentage

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	301.6 mhr	$905
L	lfm	Labor FM			2	$67.17 /mhr	46.40 mhr	$3,117
L	lab	General Labor (Grp 3)			6	$63.14 /mhr	139.2 mhr	$8,789
L	lo35-	Loader oper. <3.5cy (OG4)			2	$79.39 /mhr	46.40 mhr	$3,684
L	MW	HD Mech/Welder (OG4)				$79.39 /mhr	23.20 mhr	$1,842
L	conc	Concrete equip.oper. (OG5)			2	$77.79 /mhr	46.40 mhr	$3,609
M	cb	Cement, bulk	872.9 ton			$119 /ton	872.9 ton	$103,940
M	h20	Water	139.3 kgal			$108 /kgal	139.3 kgal	$15,078
M	xg	Grout Admixtures				$10.83 /cy	212.6 cy	$2,302
E	l950	Wheel Loader Cat 950/3.5cy			2	$99.13 /hr	46.40 hr	$4,600

E	gsm	Grout Slurry Mixer, 4cy		2	$20.74 /hr	46.40 hr		$962
E	c76	Conc. pump, trailer 76cy/hr		2	$51.78 /hr	46.40 hr		$2,403
E	g210	Generator, skid 210kW		2	$40.29 /hr	46.40 hr		$1,870
E	p140	Pump, subm. 140gpm/20ft head			$1.42 /hr	23.20 hr		$33
E	wtp	Water Treatment Plant			$8.99 /hr	23.20 hr		$209
			Hoses, pipes, etc.					
M	xmisc	Miscellaneous material	10.00 lot		$1,000 /lot	10.00 lot		$10,000

No.	Item Description		Item Quantity/Unit	Production rate	Other fixed time	Total time
013	**South Portal Site Restoration**		**1 LS**		**5 days**	**5 work days**
	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	80	**$5,212**	**$0**	**$240**	**$10,000**	**$15,452**
	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	80.00 mhr	$240
S	sr	Site restoration	1.00 acre			$10,000 /acre	1.00 acre	$10,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687

No.	Item Description		Item Quantity/Unit	Production rate	Other fixed time	Total time
014	**North Portal Site Restoration**		**1 LS**		**5 days**	**5 work days**
	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	80	**$5,212**	**$0**	**$240**	**$10,000**	**$15,452**
	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	80.00 mhr	$240
S	sr	Site restoration	1.00 acre			$10,000 /acre	1.00 acre	$10,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687

No.	Item Description		Item Quantity/Unit	Production rate	Other fixed time	Total time
015	**Underhill Site Restoration**		**1 LS**		**5 days**	**5 work days**
	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	80	**$5,212**	**$0**	**$240**	**$5,000**	**$10,452**
	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	80.00 mhr	$240
S	sr	Site restoration	0.50 acre			$10,000 /acre	0.50 acre	$5,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687

No.	Item Description		Item Quantity/Unit	Production rate	Other fixed time	Total time
016	**Camino Alto Site Restoration**		**1 LS**		**5 days**	**5 work days**
	manhours	Labor	Equipment	Material	Subcontract	Item Cost
	80	**$5,212**	**$0**	**$240**	**$5,000**	**$10,452**
	Status (Additive)		Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	80.00 mhr	$240
S	sr	Site restoration	0.50 acre			$10,000 /acre	0.50 acre	$5,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
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DIRECT COST DETAIL

No.	Item Description	Item Quantity/Unit	Production rate	Other fixed time	Total time
017	**Stetson Ave. Site Restoration**	**1 LS**		**5 days**	**5 work days**

manhours	Labor	Equipment	Material	Subcontract	Item Cost
80	**$5,212**	**$0**	**$240**	**$5,000**	**$10,452**

	Status (Additive)	Work schedule		Other ST pay	Other OT pay
1.000	Schedule factor (Normal)	8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Code	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts	Small tools and supplies				$3.00 /mhr	80.00 mhr	$240
S	sr	Site restoration	0.50 acre			$10,000 /acre	0.50 acre	$5,000
L	lab	General Labor (Grp 3)				$63.14 /mhr	40.00 mhr	$2,525
L	lfm	Labor FM				$67.17 /mhr	40.00 mhr	$2,687

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
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INDIRECT COST DETAIL

No.	Item Description	Item Quantity/Unit						
018	**Equipment Ownership not in Direct Cost**	**LS**				#N/A		
	Equipment spread to Directs	Labor	Equipment	Material	Subcontract	Item Cost		
	$95,900	**$0**	**$82,500**	**$0**	**$0**	**$82,500**		

Notes: Payment via Equipment Mobilization Bid Item $0

- Source Code: Fleet, Purchase, Mob Purchase, or Rental/lease.
- Ownership cost/hr is based on actual equipment months on-site at a single-shift utilization rate of 173 hours/month.

	Fleet Equipment		Purchased Equipment		Fleet + Purchase		Rental
	Value	W/O	Value	W/O	Value	W/O	Amount
	$859K	10%	$330K	25%	$1,189K	14%	$10K

R/T	Resource Description	Source Code	Number of Units or Rental Period	Unit Purchase cost, Unit Book value, or Rental Rate per period	Project Write off	Unit Freight & Erection (carried in Mob/Demob) Freight in/out	E/D mhr	Ownership Cost/hr	Equip. mos	Project Cost excluding freight/erection
M	Sales Tax			$330,000	0.0%	(no sales tax)				$0
Hourly Equipment used in Direct Cost Items: $95,900										
E	Cat 305 Mini-Exc 11k/.17cy	R	2 mo	$5,000		$500		$50.00	1.2	in directs
E	Wheel Loader Cat 950/3.5cy	F	2 ea	$217,000	10%	$1,000		$43.71	5.7	in directs
E	Generator, skid 210kW	F	2 ea	$50,000	10%	$400		$10.07	5.7	in directs
E	Pump, subm. 140gpm/20ft head	F	1 ea	$5,000	10%	$50.00		$0.84	3.4	in directs
E	Water Treatment Plant	F	1 ea	$40,000	10%	$500		$6.76	3.4	in directs
E	Grout Slurry Mixer, 4cy	F	2 ea	$40,000	10%	$500		$9.98	4.6	in directs
E	Conc. pump, trailer 76cy/hr	F	2 ea	$100,000	10%	$500		$17.66	6.5	in directs
General Plant: $82,500										
E	Pickups	P	8 ea	$30,000	25%	$400		$7.88	44.0	$60,000
E	Mechanics Truck	P	1 ea	$50,000	25%	$400		$13.14	5.5	$12,500
E	Street Sweep	P	1 ea	$40,000	25%	$400		$10.51	5.5	$10,000

No.	Item Description	Item Quantity/Unit						
019	**General Mobilization**	**0.5 mo**				Mob/demob paid as scheduled. Bond paid at NTP.		
	manhours	Labor	Equipment	Material	Subcontract	Item Cost		
	261	**$16,619**	**$5,026**	**$151,630**	**$0**	**$173,274**		
	522.000	$33,237.61	$10,051.41	$303,259.20	$0.00	$346,548.22		
		Work schedule			Other ST pay	Other OT pay		
	8 hr/shift	1 shift/day	5 day/week		0 hr/shift	0 hr/shift		

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts Small tools and supplies				$3.00 /mhr	261 mhr	$783
M	Freight-see equipment ownership	50% of total (balance in Demobilization)			$9,850	(5.5% of equip. cost)	$4,925
M	Transfer from cost item 024 Bonds, Insurance, and Taxes not in General Mob				LS		$35,922
M	Dryhouse	1 ea	400 sf/ea		$20.00 /sf	400 sf	$8,000
M	Fire protection system	1 loc			$2,000 /loc	1 loc	$2,000
M	First Aid trailer/furnishings	400 sf			$40.00 /sf	400 sf	$16,000
M	Fuel+Lube facilities	1 loc			$5,000 /loc	1 loc	$5,000
M	Job light and power system	1 loc			$10,000 /loc	1 loc	$10,000
M	Job sanitary system	1 loc			$10,000 /loc	1 loc	$10,000
M	Job water distribution	1 loc			$10,000 /loc	1 loc	$10,000
M	Office copier/computers/fax	1 sets			$5,000 /sets	1 sets	$5,000
M	Office furnishings	1 sets			$2,000 /sets	1 sets	$2,000
M	Office trailers	1 ea	400 sf/ea		$40.00 /sf	400 sf	$16,000
M	Shop	1 loc	800 sf/loc		$10.00 /sf	800 sf	$8,000
M	Signs	5 loc			$2,000 /loc	5 loc	$10,000
M	Warehouse	1 loc	800 sf/loc		$10.00 /sf	800 sf	$8,000
L	Labor crew - 1 operator x 2 loc			1	$75.41 /mhr	87 mhr	$6,560
L	Labor crew - 2 laborers x 2 loc			2	$57.81 /mhr	174 mhr	$10,058
E	Wheel Loader Cat 966/4.8cy 2 loc			1	$57.77 /hr	87 hr	$5,026

No.	Item Description	Item Quantity/Unit						
020	**Demobilization/Punchlist**	**0.5 mo**				Mob/demob paid as scheduled. Bond paid at NTP.		
	manhours	Labor	Equipment	Material	Subcontract	Item Cost		
	261	**$16,437**	**$4,708**	**$60,708**	**$0**	**$81,853**		
	522.000	$32,873.24	$9,416.45	$121,416.00	$0.00	$163,705.68		
		Work schedule			Other ST pay	Other OT pay		
	8 hr/shift	1 shift/day	5 day/week		0 hr/shift	0 hr/shift		

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost

Project	Client	Job No.	Estimator	Rev	Computed on
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INDIRECT COST DETAIL

M	sts Small tools and supplies			$3.00 /mhr	261 mhr		$783
M	Freight-see equipment ownership	50% of total (balance in Mobilization)		$9,850 total			$4,925
M	50% of Gen'l Mob matl less freight	1 LS	0.5	$110,000 /LS	0.5 LS		$55,000
L	Laborer		2	$57.81 /mhr	174 mhr		$10,058
L	Equipment Operator		1	$73.31 /mhr	87 mhr		$6,378
E	Wheel Loader Cat 966/4.8cy 2 loc		1	$54.12 /hr	87 hr		$4,708

No. Item Description — Item Quantity/Unit

021 General Plant Operation/Maintenance — **5.5 mo**

The duration is from the end of mob to the start of demob.

manhours	Labor	Equipment	Material	Subcontract	Item Cost
476	**$29,167**	**$0**	**$55,328**	**$19,250**	**$103,745**
86.545	$5,303.07	$0.00	$10,059.64	$3,500.00	$18,862.71

Work schedule			Other ST pay	Other OT pay
8 hr/shift	1 shift/day	5 day/week	0 hr/shift	0 hr/shift

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	sts Small tools and supplies				$3.00 /mhr	476 mhr	$1,428
M	Access road maintenance				$2,500 /mo	5.5 mo	$13,750
M	Cell phone/radio fees		10 umo/mo		$120 /umo	55 umo	$6,600
M	Craft shop maintenance				$600 /mo	5.5 mo	$3,300
M	Drinking water supplies				$600 /mo	5.5 mo	$3,300
M	Dryhouse supplies			1	$1,000 /mo	5.5 mo	$5,500
M	Fire Protection supplies			1	$600 /mo	5.5 mo	$3,300
M	First Aid supplies			1	$1,000 /mo	5.5 mo	$5,500
M	Job light and power supplies			1	$500 /mo	5.5 mo	$2,750
S	Job sanitary system maintenance			1	$2,000 /mo	5.5 mo	$11,000
S	Office cleaning			1	$1,500 /mo	5.5 mo	$8,250
M	Office copier/computers/fax supplies			1	$500 /mo	5.5 mo	$2,750
M	Office phone/fax/data line fees			1	$200 /mo	5.5 mo	$1,100
M	Office supplies			1	$600 /mo	5.5 mo	$3,300
M	Water treatment plant supplies			1	$500 /mo	5.5 mo	$2,750
L	Water truck/Sweeper driver			0.5	$61.27 /mhr	476 mhr	$29,167

No. Item Description — Item Quantity/Unit

022 Field Supervision — **8.5 mo**

The duration is from NTP to project completion.

man-months	Labor	Equipment	Material	Subcontract	Item Cost
32	**$380,238**	**$0**	**$0**	**$0**	**$380,238**
3.765	$44,733.82	$0.00	$0.00	$0.00	$44,733.82

Vehicles 5 ea — 24 vmo — Relocations 0 ea

See the 'Resources' sheet for an explanation of field supervisory class codes, and associated labor burdens.
'R?' and 'V?' codes denote if relocation expenses (both ways) are paid or a vehicle assigned, respectively - see cost item 023.
5.50 mo end of mobe to beginning of demob

R/T	Class	Resource Description	R?	V?	Personnel	Duration	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
L	-	Labor burden for personnel below - see the 'Resources' sheet						32.8% weighted average		$93,988
L	KP	Project Manager		y	1 ea		0.5	$15,000 /mmo	4.25 mmo	$63,750
L	EP	Project Engineer		y	1 ea		0.5	$10,000 /mmo	4.25 mmo	$42,500
L	EP	Field Engineer			1 ea	5.5 mmo/ea		$6,000 /mmo	5.5 mmo	$33,000
L	EP	Safety Manager		y	1 ea		0.5	$10,000 /mmo	4.25 mmo	$42,500
L	NL	Secretary/Clerk			1 ea	5.5 mmo/ea	0.5	$3,000 /mmo	2.75 mmo	$8,250
L	KP	General Superintendent		y	1 ea	5.5 mmo/ea		$13,000 /mmo	5.5 mmo	$71,500
L	NL	1st Aid EMT - Dayshift		y	1 ea	5.5 mmo/ea		$4,500 /mmo	5.5 mmo	$24,750

No. Item Description — Item Quantity/Unit

023 Overhead Maintenance/Service — **8.5 mo**

The duration is from NTP to project completion.

Labor	Equipment	Material	Subcontract	Item Cost
$0	**$0**	**$70,724**	**$296,268**	**$366,992**
$0.00	$0.00	$8,320.41	$34,855.11	$43,175.52

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	Payroll processing, wage labor	49 mmo	4.33 chk/mmo		$5.50 /chk	213 chk	$1,172
M	Payroll processing, salary labor	32 mmo	2 chk/mmo		$5.50 /chk	64 chk	$352
M	Drug tests	10 test			$200 /test	10 test	$2,000
M	Audit fees	0.7 yr			$4,000 /yr	0.7 yr	$2,800

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INDIRECT COST DETAIL

M	Legal fees	0.7 yr			$4,000 /yr	0.7 yr	$2,800
M	Personnel recruiting	0.7 yr			$1,000 /yr	0.7 yr	$700
M	Design department charge	0.7 yr			$5,000 /yr	0.7 yr	$3,500
M	IT/EDP department charge	0.7 yr	Home Office Overhead		$2,000 /yr	0.7 yr	$1,400
M	Equipment department charge	0.7 yr	items: 0.5% of bid.		$5,000 /yr	0.7 yr	$3,500
M	Accounting department charge	0.7 yr			$4,000 /yr	0.7 yr	$2,800
M	HR department charge	0.7 yr			$2,000 /yr	0.7 yr	$1,400
M	Corporate department charge	0.7 yr			$4,000 /yr	0.7 yr	$2,800
M	CPM scheduling charge	8.5 mo			$500 /mo	8.5 mo	$4,250
M	Project website maintenance				$2,000 /mo	8.5 mo	$17,000
M	Job photographs/video				$500 /mo	8.5 mo	$4,250
M	Pre-construction survey	1 LS			$10,000 /LS	1 LS	$10,000
M	Post-construction survey	1 LS			$10,000 /LS	1 LS	$10,000
S	Grouting Consultant	1 LS			$10,000 /LS	1 LS	$10,000
S	Environmental Consultant	8.50 mo	32 hr/mo		$250 /hr	272 hr	$68,000
S	Noise Monitoring Consultant	8.50 mo	32 hr/mo		$250 /hr	272 hr	$68,000
S	Security Service Day/Night/Weekend	8.50 mo			$17,679 /mo	8.5 mo	$150,268

No.	Item Description	Item Quantity/Unit	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
024	**Bonds, Insurance, and Taxes not in General Mob**	**LS**	**$0**	**$0**	**$238,389**	**$0**	**$238,389**

Items which are specified to be paid under General Mobilization are calculated here and flagged 'Y' in the 'Xfer to Mob?' field.
Basis of contractor's equipment insurance is $859K fleet book value + $330K new purchases.

R/T	Resource Description	Xfer to Mob?	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	Credit for items specified to be transferred to cost item 019, General Mobilization					LS		-$35,922
M	Performance bond	Y	$4.5 M unescalated bid			$8.00 /K Bid	$4,490 K bid	$35,922
M	Builder's risk		$4.5 M cost	0.8 yr		$3.00 /K-yr	$3,592 K-yr	$10,776
M	Automobile/pickup insurance		24.0 vmo			$70.00 /vmo	24 vmo	$1,680
M	Contractor equip. insurance		0.8 yr	$1,189 K/yr		$10.00 /K	$951 K	$9,512
M	Excess liability umbrella		1 LS			$100,000 /LS	1 LS	$100,000
M	Incident deductibles		1 LS			$50,000 /LS	1 LS	$50,000
M	State/Local business tax		1 LS			$10,000 /LS	1 LS	$10,000
M	Permits and licenses		1 LS			$50,000 /LS	1 LS	$50,000
M	Personal property tax		0.8 yr	$1,189 K/yr	0.45	$15.00 /K	428.04 K	$6,421

No.	Item Description	Item Quantity/Unit	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
025	**Contractor Markup**	**LS**	**$0**	**$0**	**$490,309**	**$0**	**$490,309**

R/T	Resource Description	Resource Quantity	Markup	12.3% of cost	Resource Cost
M	Direct Labor	$587,539	35%	5.1%	$205,639
M	Field Supervision	$380,238	35%	3.3%	$133,083
M	Equipment	$325,037	5%	0.4%	$16,252
M	Material	$2,017,167	5%	2.5%	$100,858
M	Subcontract	$689,534	5%	0.9%	$34,477

No.	Item Description	Item Quantity/Unit	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
026	**Financing Charges**	**LS**	**$0**	**$0**	**$14,593**	**$0**	**$14,593**

Status (Additive)	Invoices	Securities ROR	Cost of capital	Progress payments	Retained earnings
Net	30 days	1.5%	3.0%	30 days	10% reduced to 5% at 75% of earned value

Calculate finance charges on the time elapsed from expenditures to perform the work to revenue received from progress payments.
Equipment purchases financing $330,000 + $0 tax.
(60 payments x $5,930/mo - $330,000 x 100% allocation) x 25% average job writeoff.

R/T	Description	Resource Quantity	Average Financing Period	Project Allocation	Notes	Resource Cost
M	Direct labor payroll/add-ons	$531,532	43 days	100%	based on 4 payroll periods/mo	$1,908
M	Field supervision payroll/add-ons	$380,238	38 days	100%	based on 2 payroll periods/mo	$1,206

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INDIRECT COST DETAIL

M	Equipment purchases financing	$330,000	5 years	100% of purchase financed	$6,445
M	Material purchases/tax	$1,665,803	30 days	100% of cost items 001-023	$4,170
M	First retention release	$168,383	6 mo	0% cash; 100% securities; net 1.5% rate	$232
M	Last retention release	$56,128	9 mo	0% cash; 100% securities; net 1.5% rate	$632

No.	Item Description	Item Quantity/Unit
027	**Contractor Contingency**	**LS**

	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
Status (Additive)	**$0**	**$0**	**$98,382**	**$0**	**$98,382**

R/T	Resource Description	Resource Qty/Unit	Production rate	Factor	Resource Unit Cost	Resource Quantity	Resource Cost
M	General Conditions	1 LS		0.02	$2,459,549 /LS	0.02 LS	$49,191
M	Mitigation Measures	1 LS		0.02	$2,459,549 /LS	0.02 LS	$49,191

No.	Item Description	Item Quantity/Unit
028	**Escalation from NTP**	**LS**

Status (Additive)	Labor	Equipment	Material	Subcontract	Item Cost
Escalation up to NTP (not applicable)	$0	$0	$0	$0	$0
Escalation after NTP	$4,490	$0	$14,449	$0	$18,939
Total Escalation	**$4,490**	**$0**	**$14,449**	**$0**	**$18,939**

Since a fixed schedule date for NTP is not specified, escalation is calculated from NTP to the midpoint of each schedule activity for direct costs and on a yearly basis over the project duration for indirect costs. The average composite annual escalation rate is 3.0%.

R/T	Resource Description	Unescalated Cost	Escalation Rate/Year	Compounding Periods	(not applicable)	Escalated Cost
L	Direct Labor	$587,539	3.0%	2 (semi-annually)	6/20/2017	$4,490
L	Field Supervision	$380,238	3.0%	1 (annually)	6/20/2017	$0
E	Equipment	$325,037	3.0%	1 (annually)	6/20/2017	$0
M	Material (including unclassified)	$2,507,475	3.0%	4 (quarterly)	6/20/2017	$14,449
S	Subcontracts	$689,534	3.0%	1 (annually)	6/20/2017	$0

No.	Item Description	Item Quantity/Unit
029	**Owner Contingency**	**LS**

	Labor	Equipment	Unclassified Material	Subcontract	Item Cost
Status (Additive)	**$0**	**$0**	**$901,800**	**$0**	**$901,800**

C/T	Type of Contingency	Amount	Contingency Level	Resource Cost
T	Design Definition	$4,508,762	20.0% of total	$901,800

RESOURCE RATE AND USAGE DETAIL

DIRECT LABOR

Basis: Prevailing wage rates

Employer Insurance Add-ons	Ind. Rate	Exp. Mod	Eff Rate	***Memo:*** *Estimate Total*
Workers' Compensation	6.0%		6.0%	*$19,767*
Commercial General Liability	10.0%		10.0%	*$32,945*
CIGA/Terrorism/Other Add-ons	1.0%		1.0%	*$3,295*

Overtime	Rate
General/Saturday overtime	1.5x
Sunday/Holiday overtime	2.0x
Misc. General overtime	2.0% built in rates

$7,731

Employer Payroll Tax Add-ons	Tax Rate	Annual Inc. Cap
Fed. Social Security Tax	6.200%	$118,500
Fed. Medicaid Tax	0.145%	
Fed. Unemployment Tax	0.600%	$7,000
CA Unemployment Tax	3.400%	$7,000
CA SDI	1.100%	$100,800

Weighted average: $34.56 /mhr Base+Vac
$33.58 /mhr Fringes/Ins/Taxes

Code	Resource/Group Description	Hourly Base+Vac	Hourly Fringes	Daily Subsistance/Travel	Ins & Taxes	Misc. Gen'l OT	Adjusted Rate/mhr	Total mhrs	Total Cost
	Laborers								
lfm	Labor FM	$35.24	$22.20		$8.76	$0.97	$67.17	1,393	$93,556
lab	General Labor (Grp 3)	$32.04	$22.20		$7.97	$0.92	$63.14	3,187	$201,227
	Operating Engineers								
eo35+	Excavator >.5cy (OG2)	$41.14	$30.43		$10.20	$1.22	$82.99	200	$16,598
lo35-	Loader oper. <3.5cy (OG4)	$38.28	$30.43		$9.50	$1.18	$79.39	993	$78,817
mw	HD Mech/Welder (OG4)	$38.28	$30.43		$9.50	$1.18	$79.39	592	$46,998
conc	Concrete equip.oper. (OG5)	$37.01	$30.43		$9.19	$1.16	$77.79	1,133	$88,120
Mobilization Labor		$32.34	$22.45	$0.00	$7.95	$0.93	$63.67	261	$16,619
Demobilization Labor		$31.98	$22.20	$0.00	$7.87	$0.92	$62.98	261	$16,437
GP Operation/Maintenance Labor		$31.12	$21.60	$0.00	$7.65	$0.90	$61.27	476	$29,167
Craft Labor Escalation									$4,490
Total Craft Labor				**$295,853 escalated payroll**				**8,496 mhrs**	**$592,029**

FIELD SUPERVISORY LABOR (see cost item 022)

Employer Insurance Add-ons	Ind. Rate	Exp. Mod	Eff. Rate	***Memo:*** *Estimate Total*
Workers' Compensation	1.8%		1.8%	*$5,153*
Commercial Gen'l Liability	5.0%		5.0%	*$14,313*

Permanent Employee Benefits	Rate	Applied to classifications
Key empl. bonus plan	8.0%	KP
Employee medical plan	10.0%	KP, EP, EL, NP, NL
Retirement/Pension plan	5.0%	KP, EP, NP
Non-exempt salaried OT	2.0%	NP, NL

Employer Payroll Tax Add-ons

7.6% payroll tax rate based on $8,945/mmo weighted base salary.

Field Supervisory Labor Classification	Class	Total Burden
Key permanent employee	KP	37.4%
Exempt permanent employee	EP	29.4%
Exempt local hire employee	EL	24.4%
Non-exempt permanent employee	NP	31.4%
Non-exempt local hire employee	NL	26.4%

	Total mmos	Total Cost
Supervisory Salaries	32	$380,238
Total Supervisory Labor	**32 mmos**	**$380,238**

RESOURCE RATE AND USAGE DETAIL

EQUIPMENT (see Cost Item 018 for development of hourly ownership costs)

Basis: COE Rates, Year 2011 — Unit Cost — ***Memo:*** *Total including General Plant Mob/O&M*

Region 8	Electricity	$0.12 /kWh	*65,369 kWh*	*$7,844*
Fuel/Power Factor High	Diesel	$3.89 /gal	*20,391 gal*	*$79,321*
	Gas	$3.20 /gal	*0 gal*	*$0*

Code	Resource/Group Description	Air Diesel Elec Gas	HP/CFM	HPF	Equipment Value	Parts Cost/hr	Elec/Fuel Cost/hr	Ownership Cost/hr	Total Cost/hr	Total hrs	Total Cost
b305	Cat 305 Mini-Exc 11k/.17cy	D	47	65	$72,813	$7.77	$6.96	$50.00	$64.73	200	$12,946
	Loaders										
L950	Wheel Loader Cat 950/3.5cy	D	197	65	$217,586	$26.24	$29.18	$43.71	$99.13	993	$98,416
	Concrete Equipment										
c76	Conc. pump, trailer 76cy/hr	D	127	70	$93,635	$13.87	$20.26	$17.66	$51.78	1,133	$58,657
gsm	Grout Slurry Mixer, 4cy	E	120	80	$40,000	$2.00	$8.76	$9.98	$20.74	802	$16,621
	Plant Equipment										
g210	Generator, skid 210kW	D	314	33	$37,885	$6.61	$23.61	$10.07	$40.29	993	$40,001
p140	Pump, subm. 140gpm/20ft he	E	2	90	$4,135	$0.41	$0.16	$0.84	$1.42	592	$840
wtp	Water Treatment Plant	E	15	90	$350,000	$1.00	$1.23	$6.76	$8.99	592	$5,321
Equipment Ownership (excludes $95,900 componant spread to Direct Costs)											$82,500
Mobilization Equipment										87	$5,026
Demobilization Equipment										87	$4,708
					Total Equipment			**6,284 hrs**			**$325,037**

Project	Client	Job No.	Estimator	Rev	Computed on
Alto Tunnel	**Marin County**	**5581.0**	**TLP**	**0**	**6/20/2017**
Tunnel Abandonment Study					**4:05 PM**

RESOURCE RATE AND USAGE DETAIL

MATERIALS

Code	Resource/Group Description	Unit Cost/Measure	Notes	Add Tax (-/N)?	Unit Cost F.O.B Job	Total Quantity	Total Cost
	Add-ons						
tax	Sales Tax	8.250%	***Memo:*** *Tax on Material* *$96,403*				
			…and Equipment Purchases *$0*				
sts	Small tools and supplies	$3.00 mhr	(4.6% of raw direct labor rate)		$3.00	8,496	$25,487
	Concrete/Cement						
cb	Cement, bulk	$110.00 ton	Ashgrove Cement 10/2012		$119.08	2,459	$292,848
clsm	Controlled Low Strength Mate	$90.00 cy			$97.43	7,969	$776,383
xg	Grout Admixtures	$10.00 cy			$10.83	12,964	$140,339
	Formwork						
lumb	Lumber for lagging/blocking	$1.31 bf			$1.42	1,121	$1,589
ply1	Plywood MDO 1"	$1.50 sf			$1.62	280	$455
	Permanent Materials						
swppp	Silt Fence / Straw Waddles	$5.00 lf	plug		$5.41	2,000	$10,825
h20	Water	$100.00 kgal			$108.25	392	$42,483
xmisc	Miscellaneous material	$1,000 lot		N	$1,000	40	$40,000
Mobilization Freight and Materials							$150,847
Demobilization Freight and Materials							$59,925
General Plant Operation/Maintenance Materials							$53,900
Overhead Maintenance/Service Materials							$70,724
Bonds, Insurance, and Taxes not in General M		(unclassified)					$238,389
Contractor Markup		(unclassified)					$490,309
Financing Charges		(unclassified)					$14,593
Contractor Contingency		(unclassified)					$98,382
Material Escalation							$14,449
					Total Material		**$2,521,924**

SUBCONTRACTS

Code	Resource/Group Description	Unit Cost/Measure	Notes		Total Quantity	Total Cost
	Sitework					
cg	Clearing and grubbing	$10,000.00 acre		$10,000	4	$35,000
sr	Site restoration	$10,000.00 acre	Plug Price	$10,000	4	$35,000
tfnc	Temporary Construction Fenc	$25.00 lf		$25.00	2,000	$50,000
	Specialty Subcontracts					
Drill	Drilling Subcontractor	$98.00 lf		$98.00	2,592	$254,016
General Plant Operation/Maintenance Subcontracts						$19,250
Overhead Maintenance/Service Subcontracts						$296,268
				Total Subcontract		**$689,534**
				Escalated Construction Bid		**$4,508,762**

RESOURCE RATE AND USAGE DETAIL

SUMMARY BY RESOURCE TYPE

Cost Type	Labor	Equipment	Material	Subcontract	Total
Direct* Cost	$525,316	$232,803	$1,327,414	$374,016	$2,459,549
Indirect* Cost	$442,460	$92,234	$338,389	$315,518	$2,030,274
Indirect Cost (unclassified)	-	-	$841,672	-	
Owner Allowances	-	-	-	-	-
Escalation from NTP	$4,490	$0	$14,449	$0	$18,939
Escalated Construction Bid	**$972,266**	**$325,037**	**$2,521,924**	**$689,534**	**$4,508,762**
Relative Direct* + Indirect* Costs	27%	9%	46%	19%	100% on $3,648,151

SUMMARY BY COST TYPE

Cost Type	Total	% Total Estimate	% Direct, Equipment and Plant Cost	Applicable Cost Items
Mobilization/Demobilization	$255,127	5.7%	9.6%	019 - 020
Directs, Equipment, and Plant	$2,645,794	58.9%	100.0%	001 - 018, 021 -
Overhead/Profit	$1,588,902	35.4%	60.1%	022 - 027
Owner Allowances	-			
Unescalated Construction Bid	**$4,489,823**		**169.7%**	

UNESCALATED TIME-RELATED INDIRECT COST BREAKDOWN

Cost Type	Average Cost/month	Exclude?
Lineal/Other Plant Equipment CFC	$0 /mo	
GP operation/maintenance	$19,926 /mo	
Weekend maintenance		
Field supervision	$47,254 /mo	
OH maintenance/service	$45,608 /mo	
Total	**$112,788 /mo (excluding markup)**	**$134,100 /mo (including markup)**

Monthly costs include adjustments totalling 5.6% for:
- bonds, insurance, and taxes
- financing charges

but exclude contractor contingency

DISTRIBUTION OF PROJECT NON-WORKDAYS

Type of non-workday	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Calendar Year	Total Project
Holiday		1	1	0	0	1	0	1	0	1	0	2	2	9	4
Inclement Weather Day		2	2	1	0	0	0	0	0	0	0	2	2	9	3
Total		**3**	**3**	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**4**	**4**	**18**	**7**