Last Chance Grade Permanent Restoration Project

Environmental Study Request (ESR) Project Description

Submittal SUB#057

August 2022 - FINAL

EA# 01-0F280
Project EFIS# 0115000099
Del Norte County, U.S. 101,
PM 12.0/15.5

Caltrans

LAST CHANCE GRADE

Chapter 1. Project Description

1.1 Project Location, Purpose, and Need

The Last Chance Grade (LCG) Permanent Restoration Project is located on a section of U.S. Highway 101 (U.S. 101) known as Last Chance Grade in southern Del Norte County, California. It is approximately 10 miles south of Crescent City, between post miles (PMs) 12.7 and 16.5 (Figure 1).

The purpose of the project is to develop a long-term solution to the instability and potential roadway failure at LCG. The project would consider alternatives that provide a more reliable connection, reduce maintenance costs, and protect the economy, natural resources, and cultural landscapes.

A long-term sustainable solution at LCG is needed to address:

- Economic ramifications of a long-term failure and closure
- Risk of delay/detour to the traveling public
- Increasing maintenance and emergency project costs
- Increases in the frequency and severity of large storm events caused by climate change

LCG is an area of geologic instability; there is a landslide complex that is approximately 3 miles long with over 30 active landslides. This instability has required significant expenditures of tax dollars on emergency construction projects and maintenance activities to keep the highway open and safe. Between 1997 and 2021, landslide mitigation efforts, including retaining walls, drainage improvements, and roadway repairs cost more than $85 million. There is no foreseeable end to such expenditures, and effects of climate change may exacerbate conditions.

Other than U.S. 101, there are no viable routes between Crescent City and Klamath. Klamath is a community just south of LCG; many people routinely travel to and from Crescent City for work, school, or personal business. Typically, a one-way journey between the two cities would be about 22 miles, taking approximately 30-40 minutes. However, in the event of a closure, a 449-mile detour would be required, which would take approximately 8 hours (Figure 2).

Potential economic consequences of an emergency one-year closure of LCG include the loss of approximately 3,800 jobs and the reduction of business output by nearly half a billion dollars ($456 million) (Caltrans District 1 2018). Such a closure would also lead to an estimated $236 million in travel costs to be collectively borne by individuals, businesses, and government institutions.

1.2 Alternatives

There are three alternatives for this project, which include two build alternatives—X and F—that were developed to meet the purpose and need of the project (Figures 3a and 3b), as well as a no-build alternative. Both build alternatives would require geotechnical investigations (Figure 4).

Alternative X would involve reengineering a 1.6-mile-long portion of the existing roadway. This alternative would include a series of retaining walls, underground drainage features, and strategic eastward retreats to minimize the risk of landslides (Figures 5-7, 14, and 15a).

Alternative F would involve constructing an approximately 6,000-foot-long (1.1-mile) tunnel to avoid the most intense area of known landslides and geologic instability, thereby avoiding the portion of U.S. 101 most prone to closure (Figures 8-14, 15b).

For the ***No-Build Alternative***, no work would be done to the existing highway; existing conditions would persist, including the continuation of emergency repairs and enhanced maintenance.

1.2.1 Geotechnical Investigations

Geotechnical investigations would be conducted to confirm the location of basal failure planes and landslide depths. Twenty-two boring locations are currently proposed for the project alternatives, as follows (Figure 4):

- **Alternative X:** B-59 to B-66, B-68, and B-70 to B-77
- **Alternative F**: B-56 and B-57
- **Alternative X and F:** B-67, B-69, and B-78

While some locations could be accessed by old or existing roads, most boreholes would be accessed by helicopter to minimize impacts to environmental resources and due to access limitations, including vegetation thickness and topography.

Exact placement of the boreholes would be determined prior to the investigation; locations would be based on accessibility, safety, and avoidance of environmental resources.

Additional boreholes may be required; these would be drilled within the currently proposed project footprint, such as along the walls for Alternative X and at the portals for Alternative F. If additional information is needed along the Alternative F tunnel alignment, the information would be obtained through an exploratory tunnel that would begin at the north and/or south portal location.

Truck-and-Track Drilling Operations

Boreholes B-56, B-57, B-63, and B-78 are on or adjacent to old or existing roads and would be drilled using a truck- or track-mounted drill rig. Minor limbing and trimming of vegetation with hand tools may be required due to the size of the drilling equipment and the exact placement of the boreholes.

Borehole B-57 is located on an overgrown road. Clearing and grading the road may be required for access.

Helicopter Drilling Locations

The remaining boreholes would be accessed by helicopter. The potential helicopter drilling sites were identified based on openings in the canopies; exact placement of the boreholes would be based on accessibility for helicopters and field personnel, safety, and avoidance of environmental resources.

Access trails would be needed for the drill teams to reach helicopter borehole locations. Creation of the trails would require trimming of vegetation with hand tools and other minor disturbances, such as moving or cutting downed debris. In addition, given the steep terrain, measures such as temporary stairs and/or ropes may be needed. Access trails would be maintained for the duration of instrumentation monitoring activities, which could span several years. Tree impacts would be limited to trimming or removal of small diameter trees where feasible; tree removal would be coordinated with the appropriate agencies.

Each borehole location would require approximately 50 x 50 feet of vegetation to be trimmed for the drilling activities. Some boring locations may require more than two boreholes; where this is the case, the boreholes would be installed within 10 feet of each other, within the same 50 x 50 foot work area.

There are three potential helicopter staging areas in clearings along Green Diamond Resource Company logging roads, east of the project area. An AS350 Airbus Helicopter with a 1,400-pound load capacity and low noise and downdraft would likely be used to transfer equipment to drilling sites. Equipment would be lowered from the helicopter using a 100- to 200-foot cable. A prefabricated modular steel drill platform, approximately 20 x 20 feet, would be placed at each drill site. Ground disturbance may be needed to ensure the platform has stable contact with the ground.

Approximately 12 helicopter trips would be needed to deliver equipment from the staging area to each borehole location. The longest flight path is approximately 2 miles, between the easternmost helicopter staging area and the southernmost boring location (B-59). Based on the anticipated flight speed, each flight would take approximately 7 to 8 minutes. Assuming a few miles round trip and no complications, approximately 90 minutes would be needed for each drilling location. Additional flights to resupply drill sites would also be required. Work at each location is anticipated to take one week. Depending on equipment and staff availability, two crews may work simultaneously; however, both crews would be serviced by the same helicopter.

Drilling Procedure

To obtain quality soil and rock samples, a mud rotary drilling system would be required for the borings. Borings would be 4.75 inches in diameter and extend up to 400 feet below the ground. Drilling fluid (clean water or water thickened with agency-approved biodegradable polymer) would be contained and recirculated through a closed system, and the soil cuttings/fluid would be stored in a mud tank. The cuttings would be placed in steel drums and disposed of at a licensed facility. Instrumentation, such as inclinometers, would be installed in the boreholes and connected to data loggers with remote download capabilities. The instrumentation would be monitored for several years before being destroyed. For decommissioning, each borehole would be filled with hydrated bentonite pellets and cut off 5 feet below the ground. Upon completion of decommissioning, all materials would be removed, and all disturbed areas would be restored.

1.2.2 Alternative X

Alternative X would involve reengineering a 1.6-mile-long section of the existing highway to minimize the risk of landslides (Figures 5, 6, and 7).

This alternative would be between post miles (PMs) 14.08 and 15.9. Main project components would include the construction of an underground drainage system and a series of retaining walls. Geotechnical investigations would be conducted to inform project design.

From the south, at approximately PM 14.11, an access road would be created for the underground drainage gallery. Work on the roadway would begin near PM 14.3. Existing retaining walls on the east side of the highway would be removed and a single new wall would be constructed. On the west side of the highway, a retaining wall would be constructed in a gap between existing walls. The reengineered highway would be shifted to the east by up to 130 feet at spot locations and curves near the northern limits would be reduced. These changes would reduce this section of highway from 1.6 miles to 1.3 miles.

Details on these and other project features are included in the sections below.

Roadway Design

The existing highway has 12-foot lanes and, except for a few locations, shoulder widths range from 0 to 4 feet. Vehicle speeds range from 35 to 55 miles per hour (mph). Within the area of improvement, Alternative X would maintain two 12-foot lanes, while increasing shoulders to 8 to 10 feet (Figure 7b). The wider shoulders would improve access for bicyclists and pedestrians and provide refuge for stranded vehicles. The new highway would accommodate vehicle speeds of 35 mph. Guardrail would be replaced and upgraded where needed. Permanent lighting is not anticipated.

Underground Drainage System

Prior to work on the highway retaining walls, an underground drainage system would be constructed to capture and redirect groundwater from within the slope to the Pacific Ocean (Figures 6a, 6b, and 7a). This redirection of groundwater would reduce slope movement.

The underground drainage system would consist of three drainage galleries installed at various elevations, parallel to the slope's contours, to ensure groundwater is removed from the slope's basal failure planes. The drainage galleries would consist of 12-foot diameter tunnels constructed using tunnel boring machines (TBMs) and lined with segments of concrete. Drainage would be achieved by drilling into the tunnel walls and installing small-diameter perforated pipes (or drains) that would radiate outward into the surrounding substrate to capture groundwater. Each drainage gallery would be between 6,700 and 7,200 feet long, with a total combined length of approximately 21,000 linear feet.

An access road would be needed for the construction and maintenance of the drainage system. The road is anticipated to be 24 to 32 feet wide; the greater widths within this range would be needed to allow vehicles to navigate sharp roadway curves. The road may be wider near vertical shafts to provide sufficient space for maintenance activities (Figure 6b). It is anticipated that porous pavement would be used to filter stormwater. In addition, a temporary access road, approximately 12 feet wide, would be needed for construction of the outfall.

Highway Retaining Walls

Currently, a series of retaining walls within the project limits support the existing highway. However, a more robust, comprehensive, and proactive system of retaining walls is needed to improve the slope instability and address earth movement.

On the uphill (east) side of the highway, existing walls would be removed and a single continuous wall, approximately 6,000 feet long and up to 50 feet tall, would be installed (Figures 5a, 5b, and 7b). It is anticipated that one 300-foot section of wall would be tiered to accommodate the road realignment and to improve slope stability and resilience at this location. The second level tier would be up to 50 feet tall and third level tier up to 35 feet tall. Benches would be required above and between each wall to both increase slope stability and provide access for construction.

On the downhill (west) side of the highway, a single wall, approximately 300 feet in length, would be installed in a gap between existing walls (Figures 5a and 7b). This retaining wall would be up to 10 feet high. The benches adjacent to the existing walls would be used and extended for construction access and future wall maintenance.

The new walls would be anchored soldier pile walls with timber lagging. Soldier pile walls consist of steel beams inserted into the ground at regular intervals, with horizontal timber supports (lagging) between the soldier piles to retain the slope. To construct the walls, slopes would be excavated, and augers and oscillators used to prepare holes for the steel beams. Once steel beams are inserted, the holes would be backfilled with concrete, and timber lagging placed. Ground anchors would be installed to secure the wall to the slope using a multi-directional drill rig. No pile driving is anticipated for the construction of the walls.

Roadway Drainage

In addition to the underground drainage system, Alternative X may affect up to 14 existing culverts: PMs 14.08, 14.22, 14.35, 14.56, 14.65, 14.73, 14.75, 14.88, 14.96, 15.02, 15.06, 15.15, 15.31, and 15.38 (Figure 6a). Work may include extending the culverts to match new roadway widths and placing rock slope protection (RSP) at outfalls. Outfall locations would not be moved—existing culverts would be extended to the east, as needed.

Utilities

There are no existing utilities within the Alternative X project area. However, a trenched conduit would be installed within the shoulder or paved area of the highway to accommodate broadband cable as part of a larger Caltrans effort to provide broadband along state highways.

Excavation

Substantial excavation would be required to realign the existing highway and construct the retaining walls. Approximately 270,000 cubic yards of material would be removed. Some of this material could be incorporated into the construction of the alternative, with the remainder exported to a legally permitted off-site location. It is anticipated that 15,000 to 20,000 truck trips to and from the project site would be needed to dispose of the excess material.

Staging Areas

Existing paved or graveled areas within the right of way and lanes closed to facilitate construction would be used as staging (Figure 14). In addition, a staging area would be created near the entrance to the underground drainage system access road, as well as at various locations along the access road (Figure 6b). These areas support construction and would be used for activities such as parking equipment and storing materials.

Equipment

Equipment used for construction includes earthmovers/loaders, excavators, augers, oscillators, bulldozers, multi-directional rig, graders, pavers, and other heavy equipment. Noise generated from equipment is anticipated to be 85-95 A-weighted decibels (dBA) for loaders, graders, pavers, and rubber-tired equipment and up to 110 dBA for bulldozers, multi-directional rig, augers, oscillators, and other tracked equipment.

Construction Scenario

Alternative X would be constructed in a specific sequence, with the underground drainage system constructed first to reduce the movement of the landslide, followed by construction of the retaining walls, as described below. Tunnel boring associated with the drainage galleries would operate continuously, including overnight. No other nighttime construction is planned, though occasional night work may be required. Night lighting may be needed for the safety and security of the construction area.

The general sequence of construction activities would be:

1. Conduct geotechnical investigations.
2. Clear and grub as needed for site access.
3. Construct access road to the underground drainage system.
4. Construct the underground drainage system.
5. Once the underground drainage system is constructed, close northbound side of highway.
6. Remove existing walls and install new walls on east side of highway.
7. Switch traffic to northbound lane and construct wall on west side of highway.
8. Install new guardrails.
9. Repave and restripe.

Traffic Management

Because there are no feasible detours, Alternative X would be constructed without any long-term closures. During construction, the highway would be reduced to a single lane, with delays typically up to 30 minutes. Longer closures, typically in the range of 2-3 hours, may be needed periodically to allow placement of construction equipment. Informational signage, flaggers, and temporary traffic lights would be used for the duration of construction.

Right of Way

Alternative X would require up to 11.2 acres of new right of way, primarily to the east of the existing highway (Figure 15a). A subterranean easement of approximately 37.8 acres would be needed for the underground drainage system.

Construction Schedule

Alternative X is anticipated to take 3 to 5 years to complete; construction is projected to start in 2031 and be completed by 2035.

Construction and Maintenance Costs

Alternative X is anticipated to cost approximately $580 million in 2022 dollars. The adjusted cost estimate for 2031, the anticipated start of construction, is $880 million. Most of the cost is related to structures—primarily the retaining walls and underground drainage system. The remaining amount would be for roadway construction and right of way acquisition.

The underground drainage system is anticipated to reduce the need for emergency closures due to landslides. However, the roadway, walls, and underground drainage system would need periodic maintenance. Assuming the walls and underground drainage system perform as anticipated, annual maintenance costs are anticipated to be approximately $2 to $5 million per year in 2022 dollars.

1.2.3 Alternative F

Alternative F would involve constructing an approximately 6,000-foot (1.1-mile) tunnel to the east of the existing highway to avoid the most intense areas of known landslides and geologic instability (Figures 8-14 and 15b).

This alternative would be between PMs 13.42 and 15.7. Portions of the alternative are near sections of the California Coastal Trail. However, no work is proposed on the trail, and it is anticipated the trail would remain accessible during construction.

Main components of this alternative include the construction of tunnel portals and the tunnel, a bridge, and an Operations Maintenance Center (OMC). Geotechnical investigations would be conducted to inform project design.

From the south, Alternative F would diverge from the existing highway near the end of the existing truck climbing lane (PM 14.2), traveling approximately 800 feet towards the southern portal. The portal would open into a single, large diameter tunnel, which would be approximately 200 feet below ground for most of its length. The tunnel would exit the hillside just north of the existing slide. A bridge would be constructed at the northern portal to reconnect the new alignment to the existing highway. An Operations Maintenance Center would be built south of the tunnel to facilitate tunnel operation and maintenance.

More details on these features and other project components are included below.

Roadway Design (Outside of Tunnel)

The existing highway has 12-foot lanes and, except for a few locations, shoulder widths range from 0 to 4 feet, with vehicle speeds of 35 to 55 mph. The new alignment would be a substantial change from the existing roadway. While the new alignment would maintain 12-foot lanes in either direction, shoulders would be expanded to 8 to 10 feet. The wider shoulders would improve access for bicyclists and pedestrians and provide refuge for stranded vehicles. Guardrail would be replaced and upgraded where needed. Alternative F would accommodate vehicle speeds of at least 45 mph.

Tunnel Portals and Portal Approaches

Alternative F would diverge from the existing highway at PM 14.33 and travel approximately 800 feet to the southern portal (Figures 8b and 9). Near the area of divergence, a concrete retaining wall on spread footings would be constructed below the downhill (west) side of the new road segment. This wall would be up to 20 feet high.

The approach to the southern portal would require excavation into the hillside. Cut slopes would be protected and reinforced with concrete retaining walls on spread footings. These retaining walls would be up to 50 feet high, with an average height of 30 feet.

An Engineered Deformation Absorption System (EDAS) would be constructed between the retaining walls at the southern portal and the cut slopes. This system is intended to absorb earthflow movement by using columns engineered to compress over time. As the earthflow continues to move downhill toward the Pacific Ocean, the portal would remain intact. To minimize impacts, once constructed, a “roof” would be placed over the highway for an approximately 500-foot section of the portal and soil would be placed on top of the roof (Figures

8b, 9, and 13a). The backfilled soil would be graded to match the surrounding topography and revegetated.

The tunnel would exit the hillside north of the existing slide (Figures 8c and 10). The northern portal would be supported by retaining walls. These walls would likely be up to 30 feet high, made of concrete, and on cast-in-drilled-hole (CIDH) pile foundations.

After exiting the tunnel, the new highway would travel approximately 1,100 feet, crossing a new bridge to reconnect the new alignment to the existing U.S. 101.

Permanent lighting is anticipated at the tunnel portals.

Tunnel

The Alternative F tunnel would be approximately 6,000 feet long and approximately 200 feet below the ground.

The tunnel would be a single cavern with a 12-foot lane in each direction, and 8- to 10-foot shoulders (Figure 13b). In addition, separated 6-foot bike/pedestrian lanes would be included in the tunnel. These would be approximately 8 feet above the highway and located above pressurized emergency egress corridors. The lanes would be accessed by ramps at the portals.

The tunnel would include various safety features, including ventilation, lighting, longitudinal pressurized chambers for emergency egress, emergency communications systems, equipment chambers, and a fire suppression system. A drainage facility would be constructed to collect water within the tunnel, which would be drained to a holding facility near the southern portal for disposal.

The tunnel would be built using the Sequential Excavation Method (SEM), which is characterized by the sequential excavation of material followed by installation of support. Two crews would be working on the tunnel at one time, with one crew working from the southern portal northward and the other from the northern portal southward. Upon completion of the tunnel, the roadway and other tunnel facilities would be completed.

Bridge

A bridge would be constructed to span a Wilson Creek tributary between the northern portal and where the new alignment merges with U.S. 101 to the north.

The single-span, pre-cast, concrete girder bridge would be approximately 150 feet long and 48 feet wide, with a single 12-foot-wide lane in each direction, and 10-foot-wide shoulders (Figure 13b). The wider shoulders would improve access for bicyclists and pedestrians and provide refuge for stranded vehicles. Further, a separate 6-foot-wide path is proposed that would allow southbound bicyclists and pedestrians an alternative access route around the bridge to the southbound pedestrian/bike lane in the tunnel (Figure 10).

The bridge abutment locations would be accessed by the existing highway from the north and through a staging area created for bridge construction and tunnel access located immediately to the south. The concrete abutments and associated wingwalls would be constructed on CIDH pile foundations. A crane would place pre-cast concrete girders on the abutments, and falsework would be constructed using the girders as support. Rebar would be installed, the concrete deck would be cast, and see-through bridge rails installed. RSP may be placed for bank stabilization.

The bridge deck would not contain drains (scuppers). Instead, water would be conveyed to the ends of the bridge via gravity and discharged to adjacent vegetated slopes or RSP.

Operations Maintenance Center

An Operations Maintenance Center (OMC) would be required for the tunnel (PM 13.52). The OMC would be located south of the tunnel on approximately 1.4 acres. The site would include a building, parking spaces, outdoor storage, and maintenance equipment (Figures 8a and 11).

The building would be an approximately 12-foot-tall, 18,000-square-foot, single-story structure. It would contain equipment and other facilities related to tunnel maintenance, operations and emergency response. It is anticipated the roof would be planted (i.e., a “green” roof) to blend into the surrounding terrain.

Construction of the OMC would involve cutting into the hillside and regrading a portion of the existing highway to create an access road to the facility. It is anticipated that porous pavement would be used to filter stormwater.

Permanent outdoor lighting would be required for this facility.

Roadway Drainage

In addition to drainage features associated with the tunnel, bridge, and OMC described above, there would be changes to drainages at various other locations.

At the tunnel portals, bridge, and OMC, stormwater runoff would be captured and conveyed to existing drainages at PMs 14.08 and 14.35 for the south portal; at PM 15.38 for the north portal and bridge, and PM 13.42 for the OMC (Figures 8a, 8b, and 8c). Some culverts would be extended to accommodate roadway changes. In addition, new inlets and culverts would be installed near the south portal, the north portal, and the OMC, which would be connected to existing culverts. Culvert outfall locations would remain unchanged; any lengthening of existing culverts would occur to the east. RSP may be needed at the outlets.

A new culvert would be installed under the northern tunnel approach between the bridge and the northern portal; the culvert would be 24 inches in diameter or larger, and approximately 200 feet long (Figure 10).

Best Management Practices (BMPs), such as bioswales, may be implemented to offset impacts to water quality. Potential areas for bioswales or other BMPs have been identified near the northern and southern portals and the OMC (Figures 9, 10, and 11).

Utilities

To provide electricity to the OMC and tunnel, these facilities would be connected to an existing PacificCorp transformer, which is in the vicinity of the OMC. Lines would be run through an approximately 1,000-foot ductbank from the transformer to the OMC, and then through an approximately 4,000-foot ductbank from the OMC to the tunnel (Figures 12a-12c).

In addition, within the project area, a trenched conduit would be installed within the shoulder or paved area of the highway and within the underground utility space of the tunnel to accommodate broadband cable as part of a larger Caltrans effort to provide broadband along state highways.

Excavation

Alternative F would require excavation for the tunnel and associated features, generating approximately 1.1 million cubic yards of material. This material would need to be transported off-site for disposal and/or reuse. It is anticipated that approximately 70,000 truck trips to and from the project site would be needed to dispose of excavated materials.

Staging Areas

Existing paved or graveled areas within the right of way and lanes closed to facilitate construction would be used as staging. In addition, staging areas would be constructed adjacent to the northern and southern portals, and within the proposed footprint of the OMC. The new bridge would also be used for staging once completed (Figures 9, 10, 11, and 14). These areas support construction and would be used for such activities as parking equipment and storing materials.

Equipment

Equipment used for construction includes earthmovers/loaders, excavators, augers, oscillators, bulldozers, graders, pavers, and other heavy equipment. Noise generated from equipment is anticipated to be 85-95 dBA for loaders, graders, pavers, and rubber-tired equipment and up to 110 dBA for bulldozers, augers, oscillators, and other tracked equipment.

Construction Scenario

The following is an overview of the general sequence of events for the construction of Alternative F. Some activities may be run concurrently. Tunneling activities may occur 24 hours a day. No other nighttime construction is planned, though occasional night work may be required. Night lighting may be needed for safety and security of the construction area.

The general sequence of construction activities would be as follows:

1. Conduct geotechnical investigations.
2. Clear and grub as needed for project site access.
3. The northern and southern portal areas and the OMC site would be graded.
4. Staging areas would be constructed near the southern and northern portals, as well as at the OMC site.
5. Retaining walls would be constructed at the portals.
6. Work would begin on the tunnel, bridge, and OMC.
7. The OMC and tunnel would be connected to an existing transformer for electricity.
8. Tunnel approaches would be completed.
9. Traffic would be diverted onto the new alignment.

Traffic Management

Because major construction associated with Alternative F would primarily be outside of the existing highway, long-term road closures would not be required. However, occasional 30 minute to 1 hour partial or full lane closures may be needed for some activities, such as moving equipment to or from the tunnel portals, as well as work adjacent to where the new alignment begins and ends. Otherwise, the highway could operate uninterrupted throughout the construction period. Informational signage, flaggers, and temporary traffic lights would be used for the duration of construction or as needed.

Right of Way

Alternative F would require approximately 18.7 acres of new right of way at the OMC and the tunnel portals. In addition, a subterranean easement of approximately 12.1 acres would be needed for below-ground portions of the tunnel, and a temporary construction easement (TCE) of approximately 2 acres for utility work south of the OMC (Figure 15b).

Once operational, Alternative F would bypass approximately 8,000 linear feet of existing roadway and Caltrans right of way, totaling about 35 acres, all of which would be decommissioned. Decommissioning would include removing existing structures to the extent feasible, such as the roadway, culverts, and walls.

Construction Schedule

Alternative F is anticipated to take 6 to 8 years to complete; construction is projected to start in 2031 and be completed by 2038.

Construction and Maintenance Costs

Alternative F is anticipated to cost approximately $1.4 billion in 2022 dollars. The adjusted cost for 2031—the anticipated start of construction—is $2.1 billion. Over 90 percent of the cost would be related to structures—primarily the tunnel, bridge, and retaining wall.

Ongoing maintenance and operations activities would be needed for the tunnel. Activities would include staffing the maintenance facility, refilling water tanks for fire suppression system, refilling fuel tank for backup power generator, periodically washing tunnel walls, and periodically replacing lights, fan units, and railing. In addition, electric power for the OMC and tunnel would need to be maintained.

Annual maintenance costs of the tunnel may vary year to year. However, it is estimated these costs would average $2-3 million per year in 2022 dollars.

1.2.4 No-Build (No-Action) Alternative

Under the No-Build Alternative, no construction would be planned at Last Chance Grade. Regular maintenance and operations would continue, with emergency restoration projects conducted as needed to address landslides and roadway failures.

The size, depth, and instability of the known slide planes at Last Chance Grade, combined with erosion of the coastal bluffs, has resulted in a loss of roadway resiliency. Engineering solutions such as retaining walls have not been able to provide long-term stability but would continue to be necessary to provide an adequate highway facility. Maintenance of the existing road alignment has become more difficult and costly, and costs are expected to escalate as repairs and retreats become even more difficult. In addition, there is the potential that landslide movement that is deep and large enough could cause a major roadway failure, resulting in a long-term closure of the highway.

References

Caltrans District 1, May 2018. *Last Chance Grade Economic Impact of US-101 Closure*.

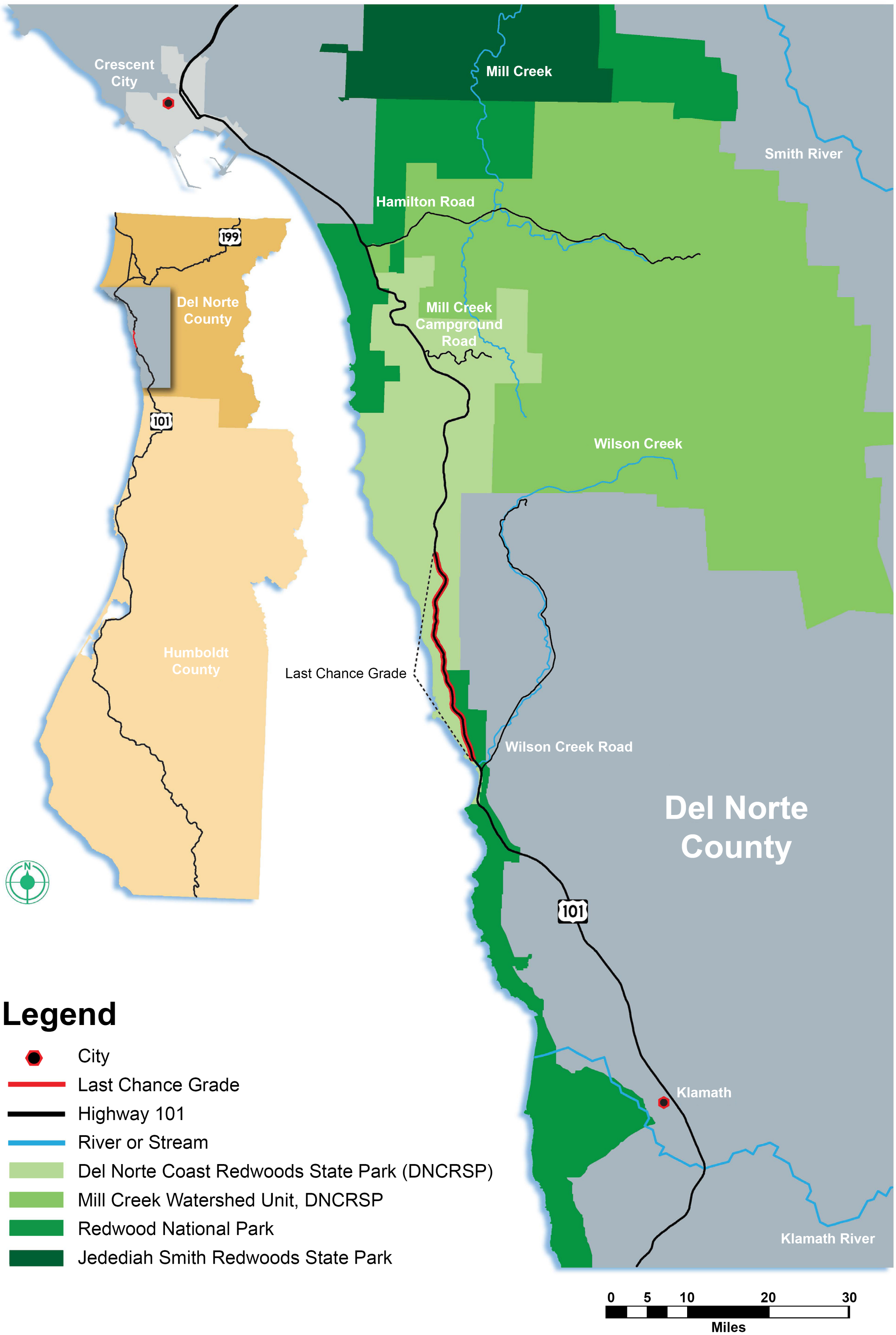


FIGURE 1 – Project Location Map

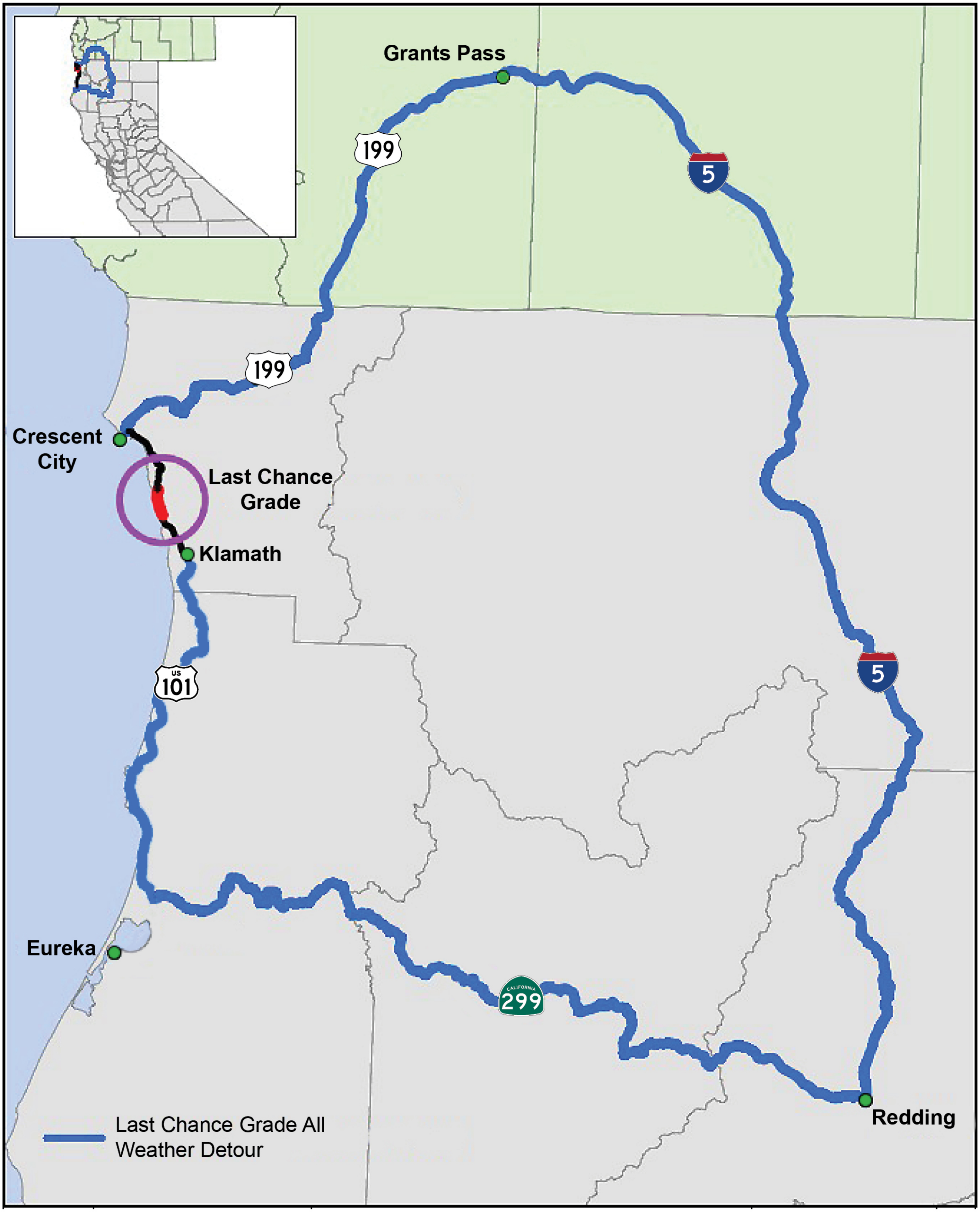


FIGURE 2 – Regional Location and Detour Map

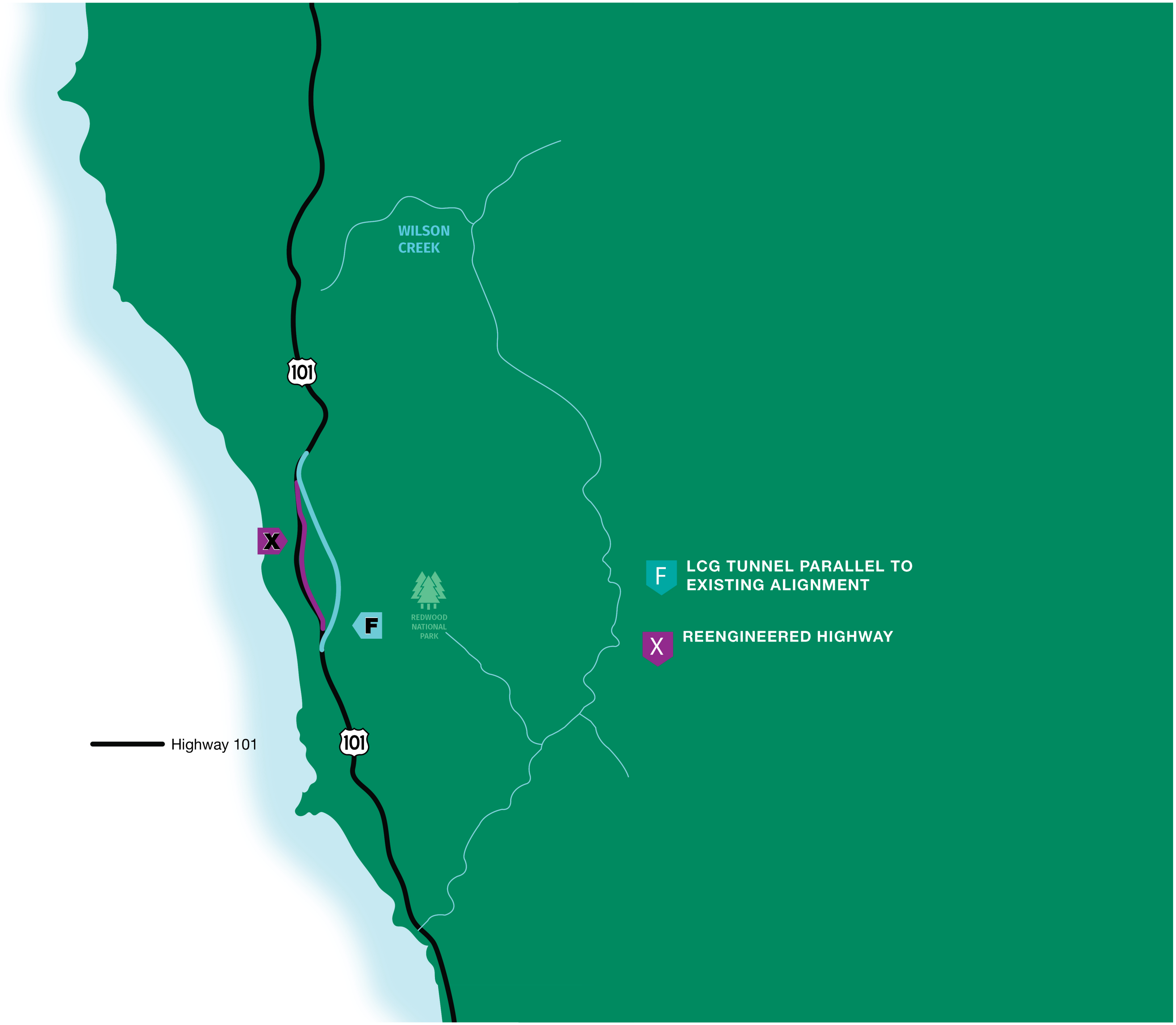


FIGURE 3a –Build Alternatives Overview

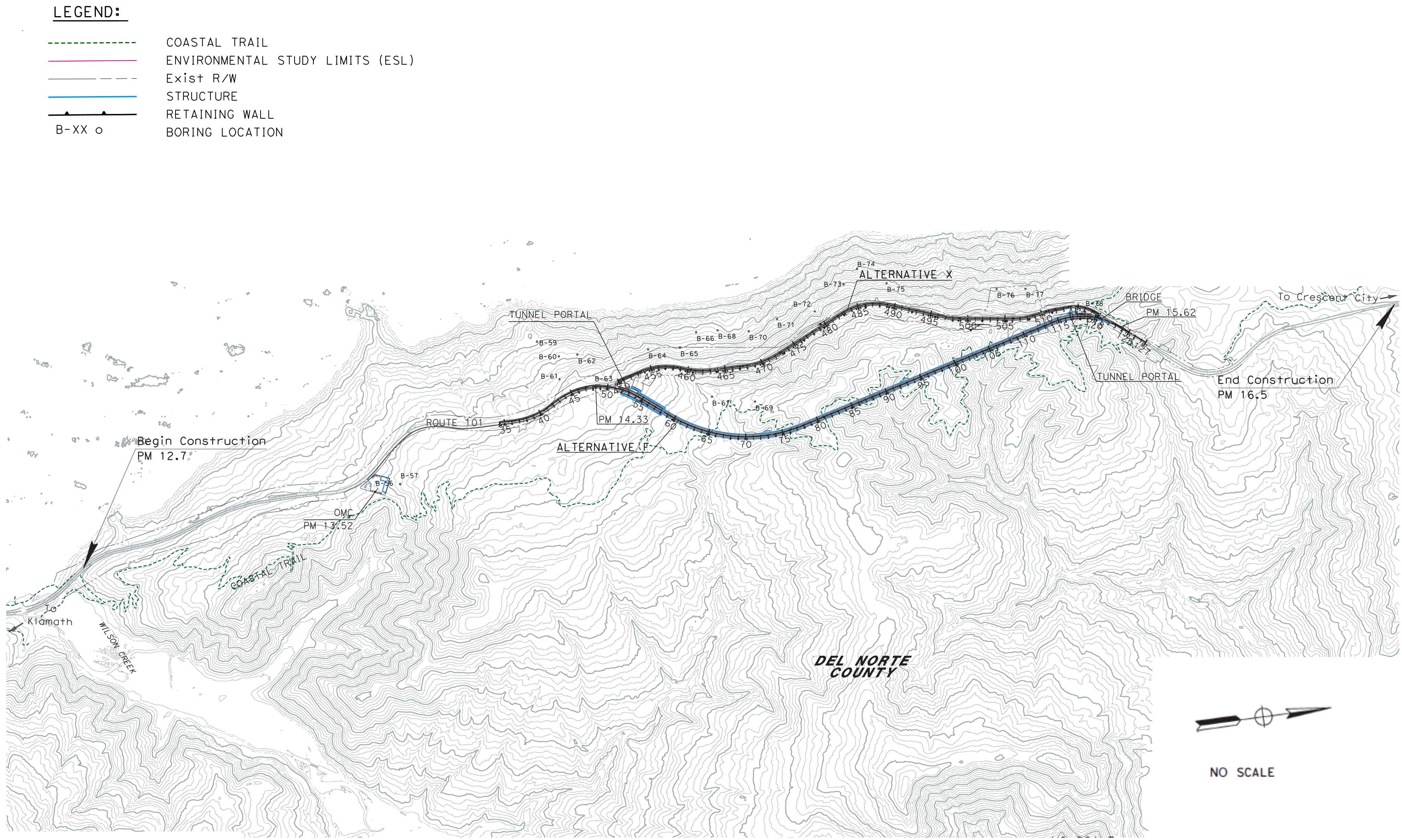


FIGURE 3b – Project Alternative Overview

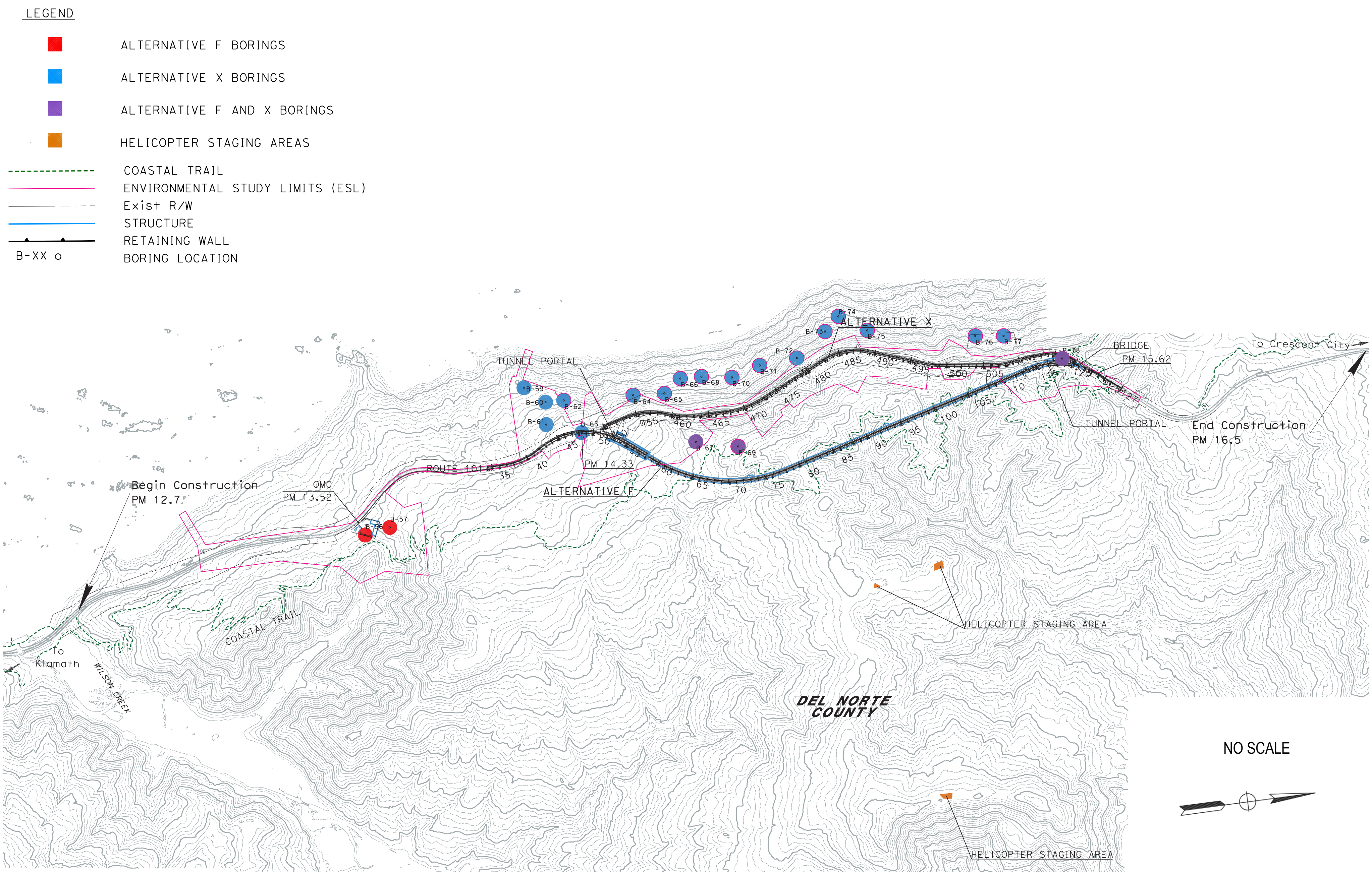


FIGURE 4 – Geotech Investigation Layout

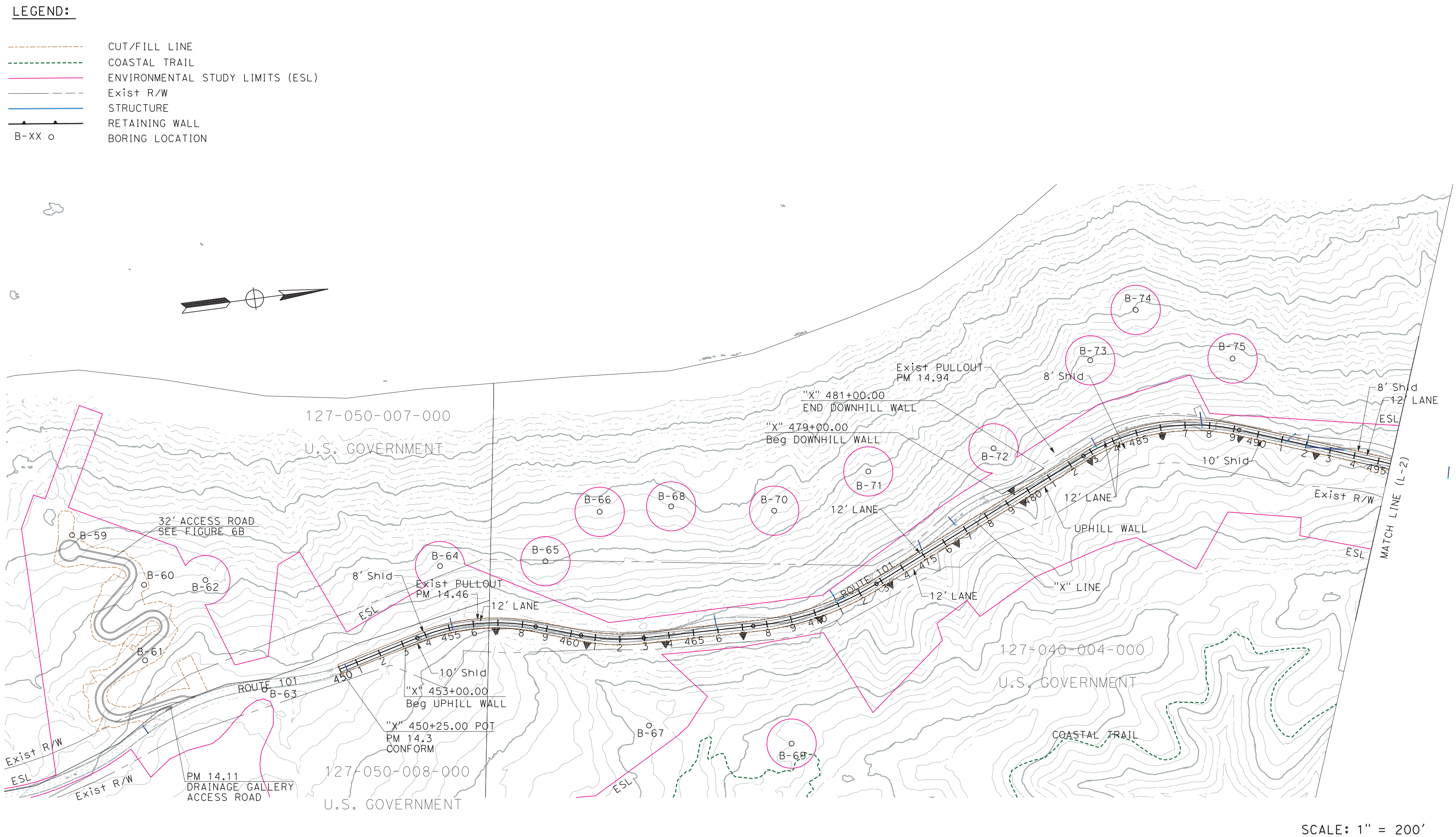
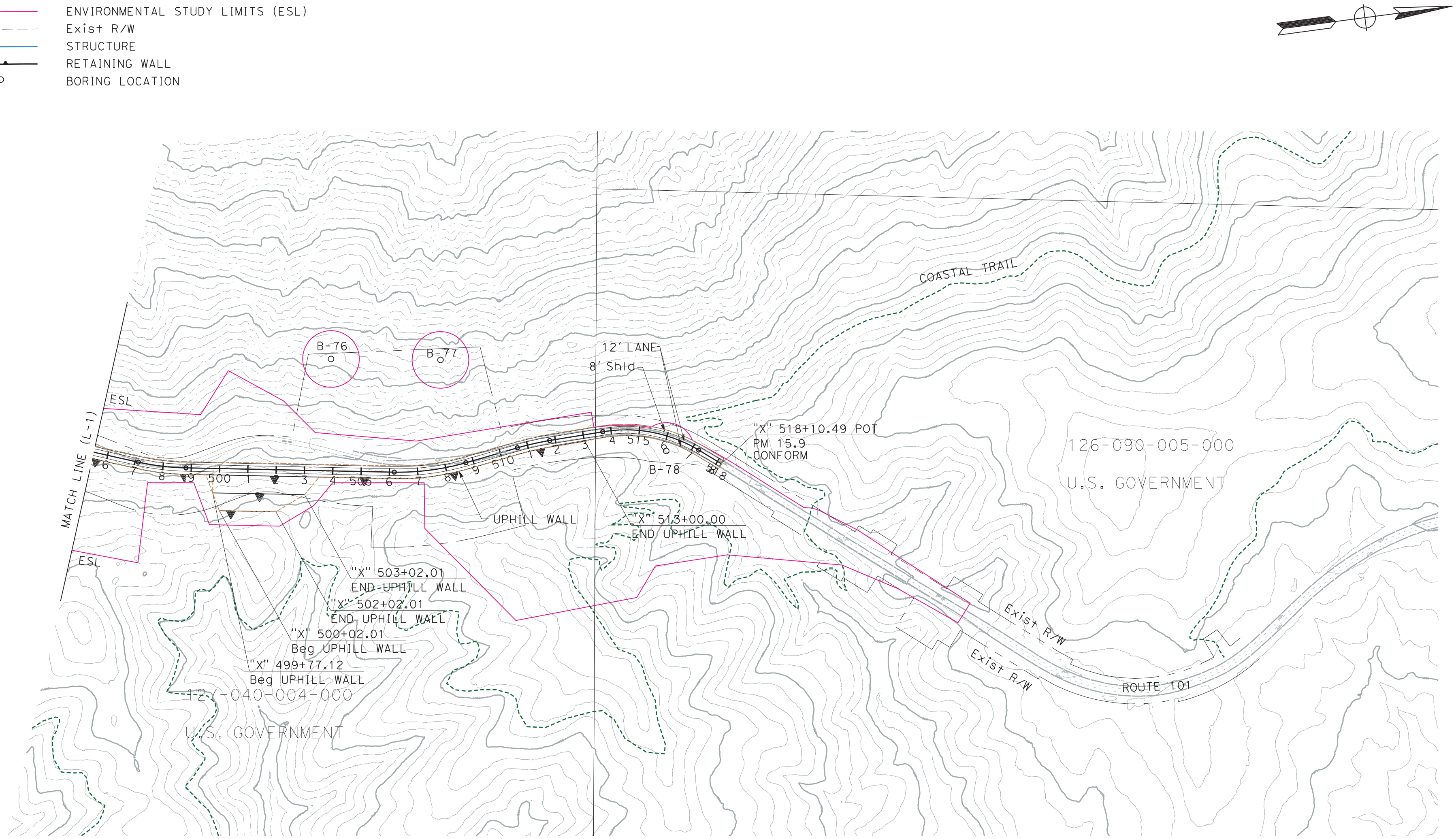


FIGURE 5a –Alternative X Detailed Layout

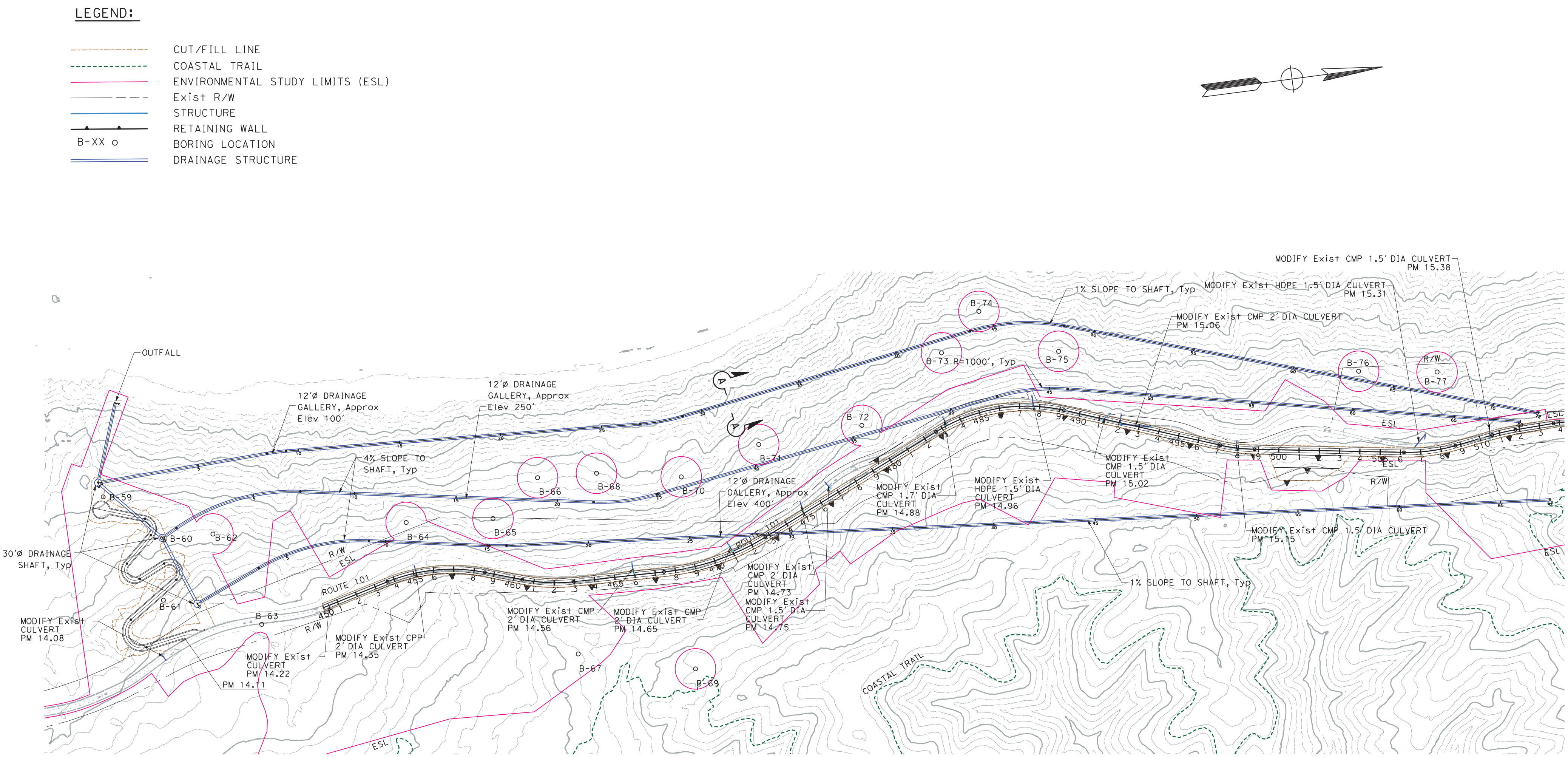
LEGEND:

- CUT/FILL LINE
- COASTAL TRAIL
- ENVIRONMENTAL STUDY LIMITS (ESL)
- Exist R/W
- STRUCTURE
- RETAINING WALL
- B-XX o BORING LOCATION



SCALE: 1" = 200'

FIGURE 5b –Alternative X Detailed Layout



SCALE: 1" = 250'

FIGURE 6a – Alternative X Drainage Gallery Plan

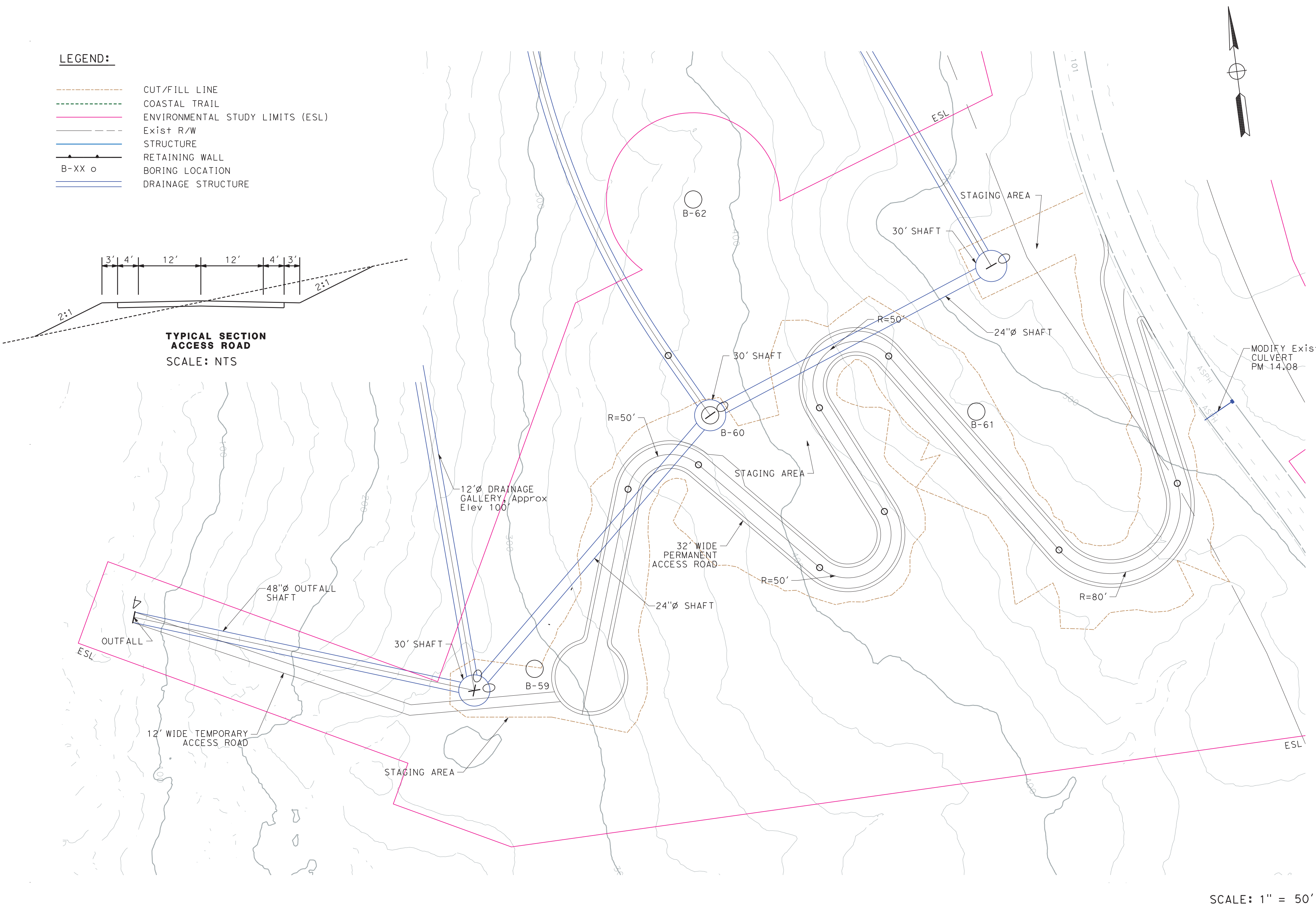


FIGURE 6b – Alternative X Drainage Gallery Access Road, Outfall, and Shaft Layout

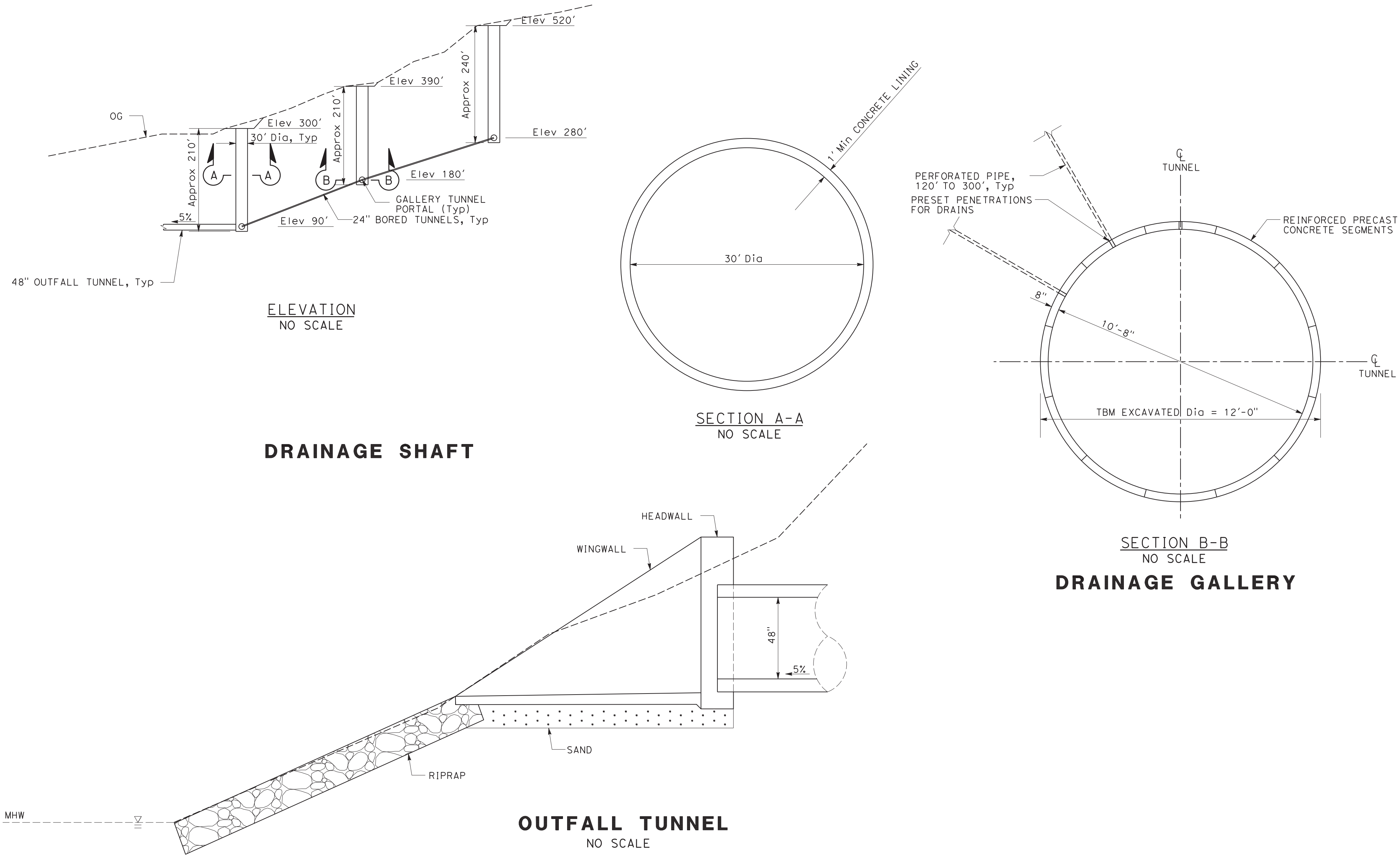


FIGURE 7a – Alternative X Drainage Gallery Cross-Sections

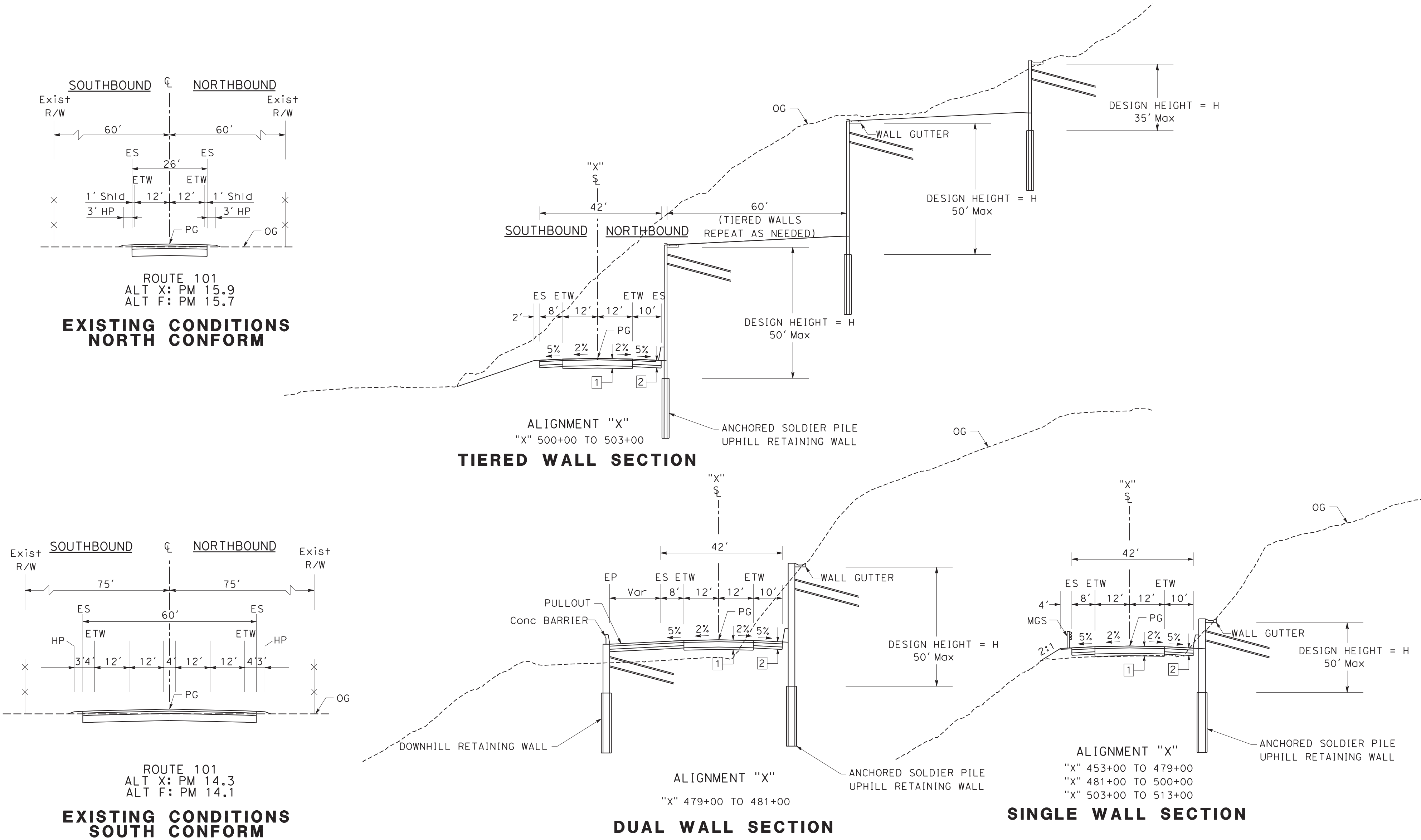


FIGURE 7b– Alternative X Typical Cross Sections

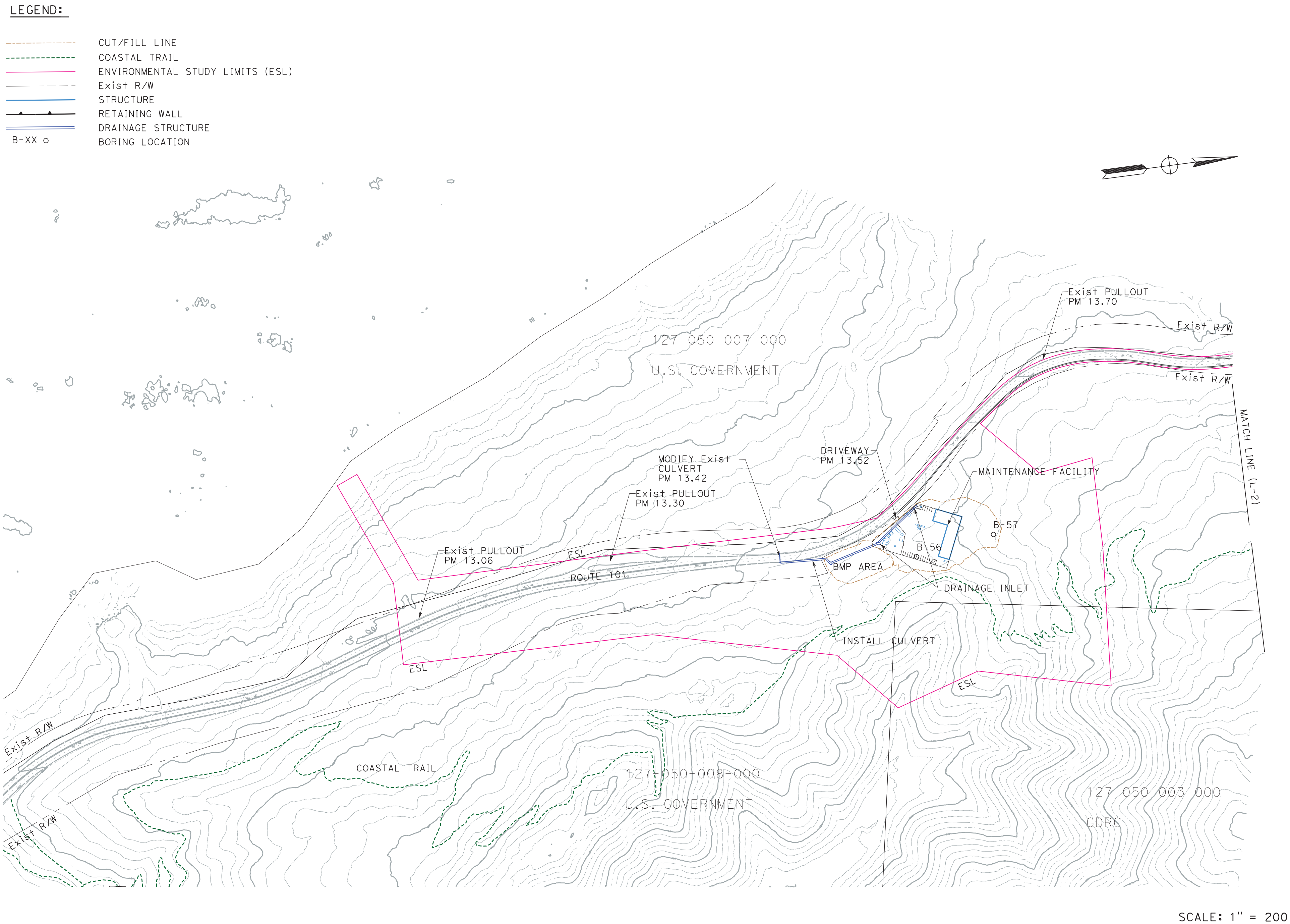


FIGURE 8a – Alternative F Detailed Plan

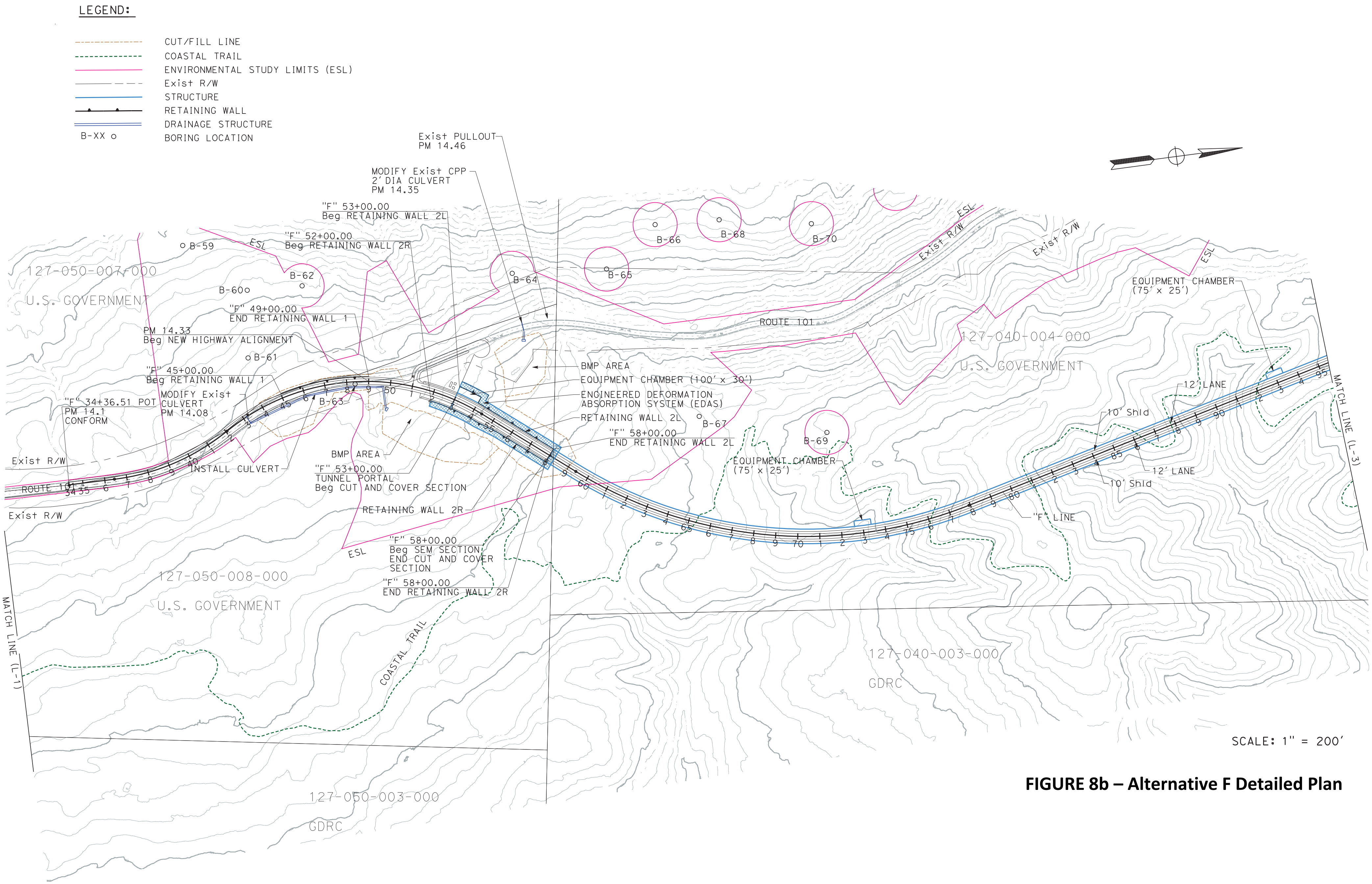


FIGURE 8b – Alternative F Detailed Plan

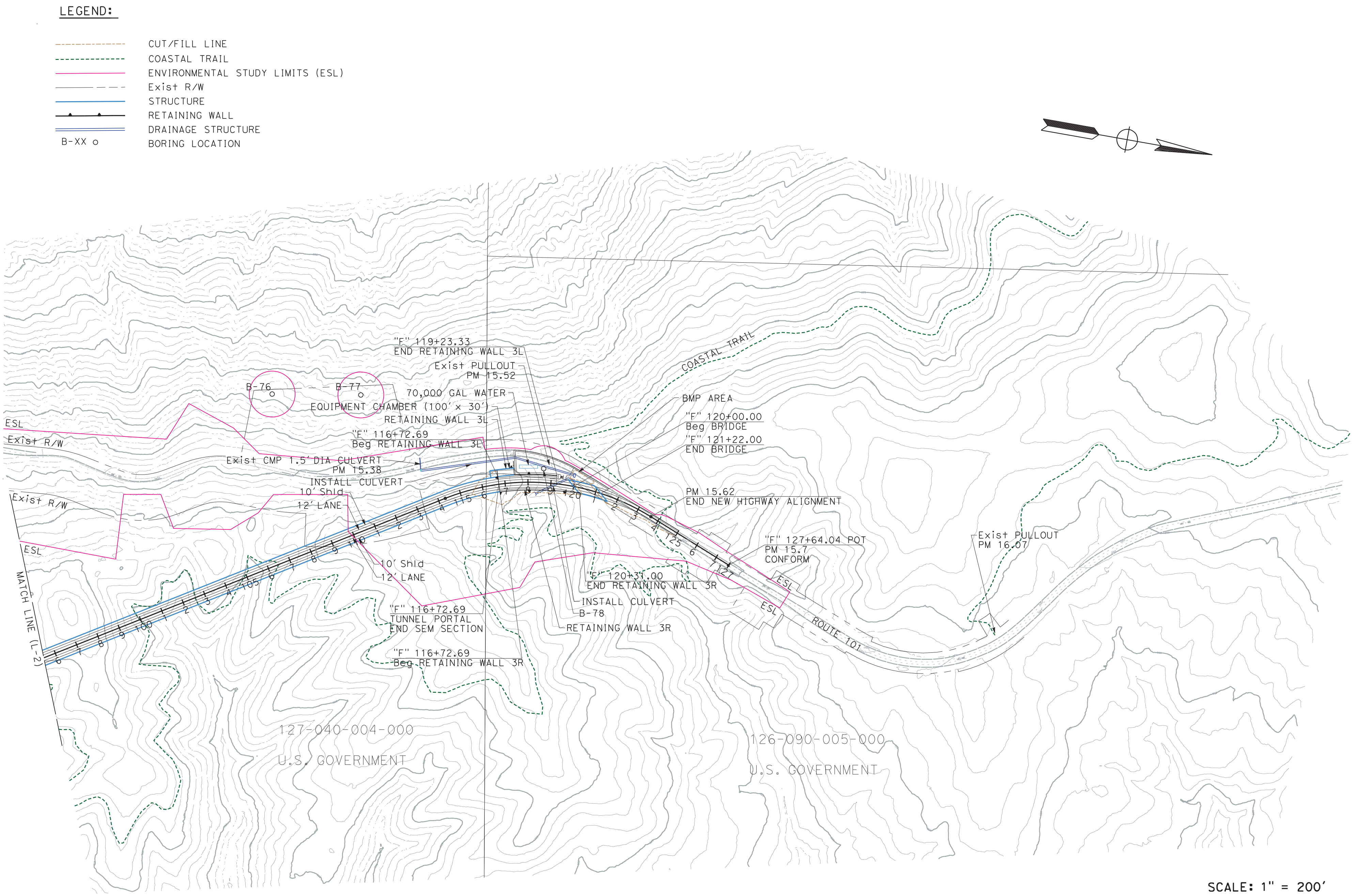
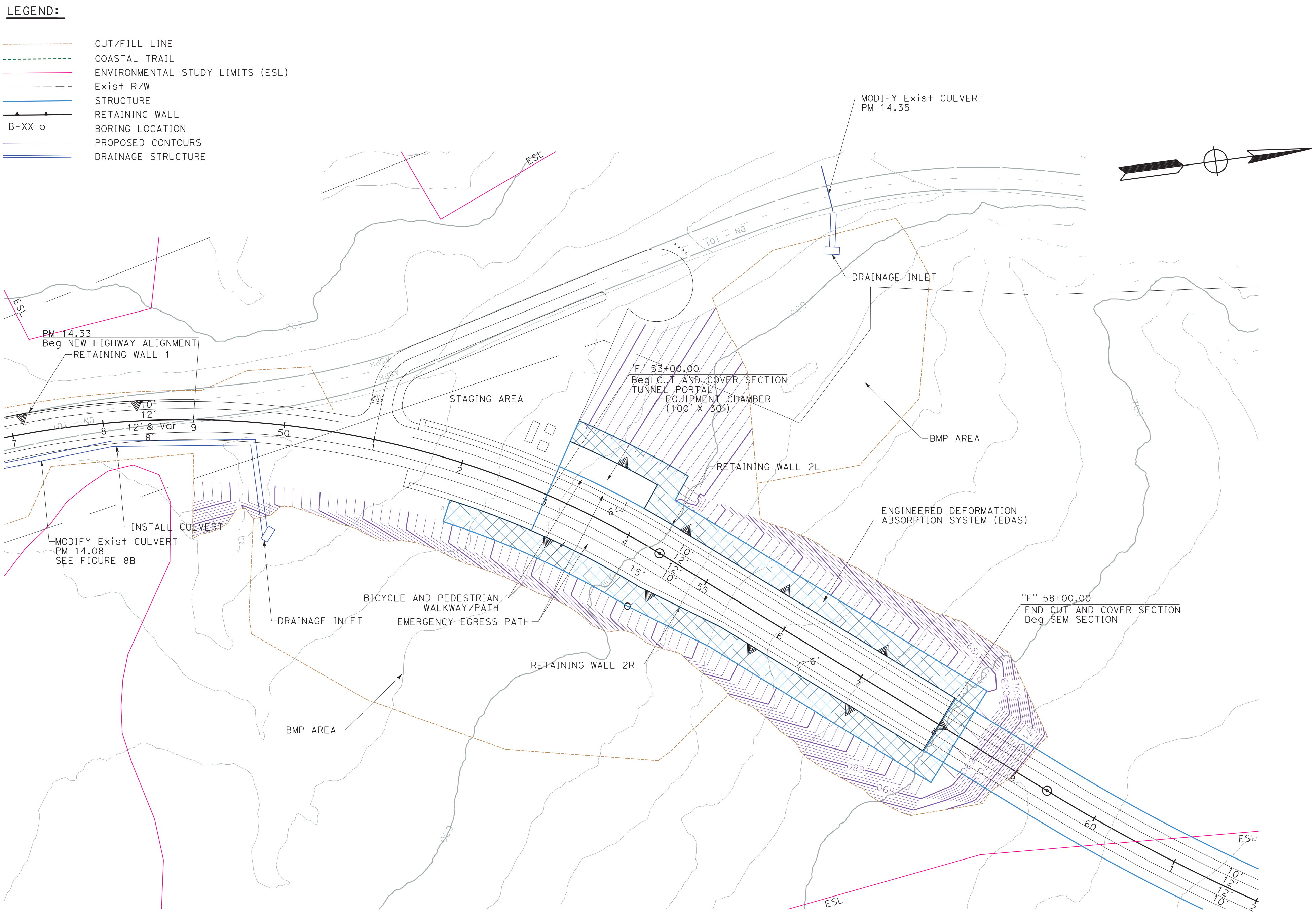


FIGURE 8c – Alternative F Detailed Plan



SCALE: 1" = 50'

FIGURE 9 – Alternative F South Portal Layout

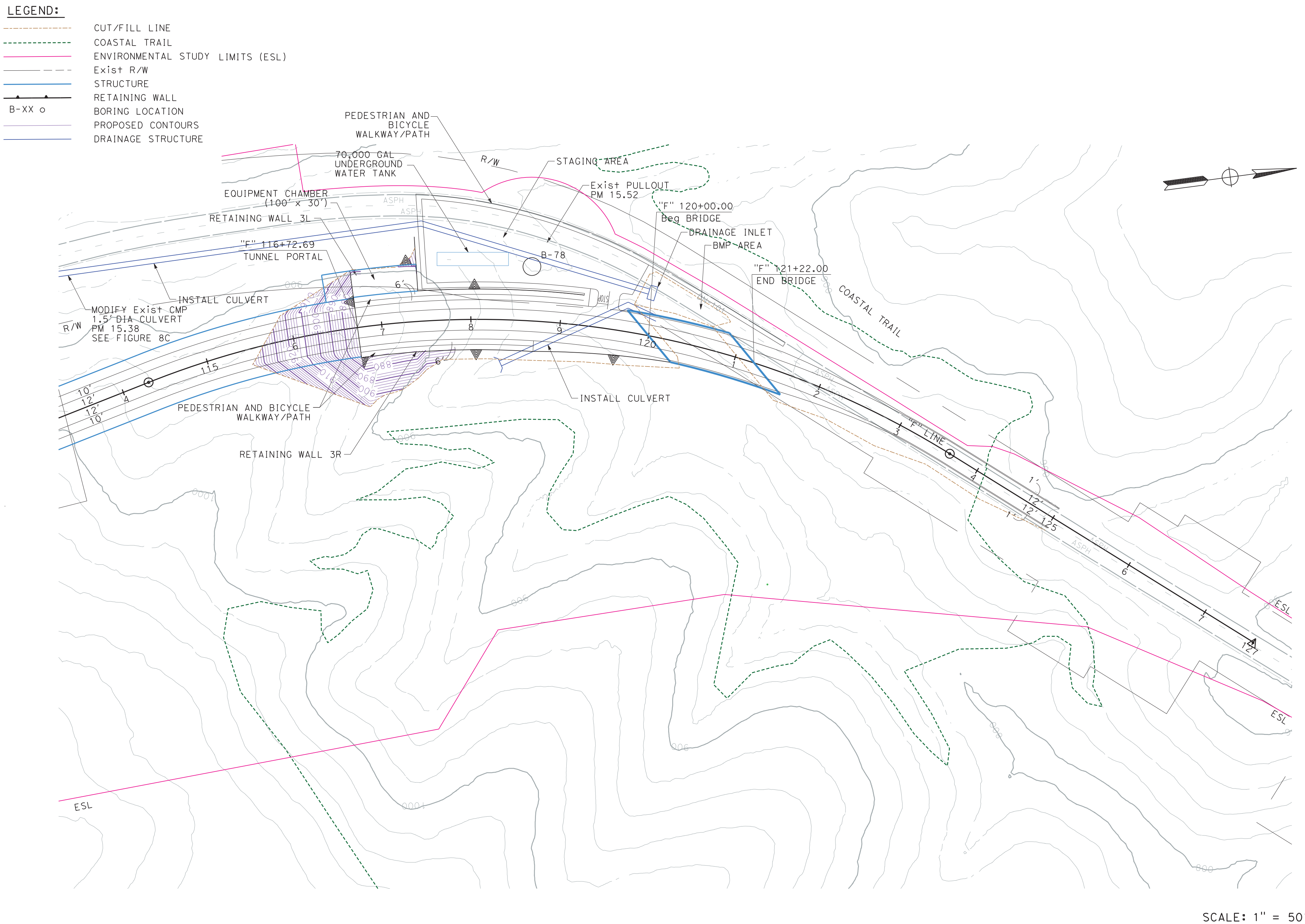


FIGURE 10 – Alternative F North Portal and Bridge Layout

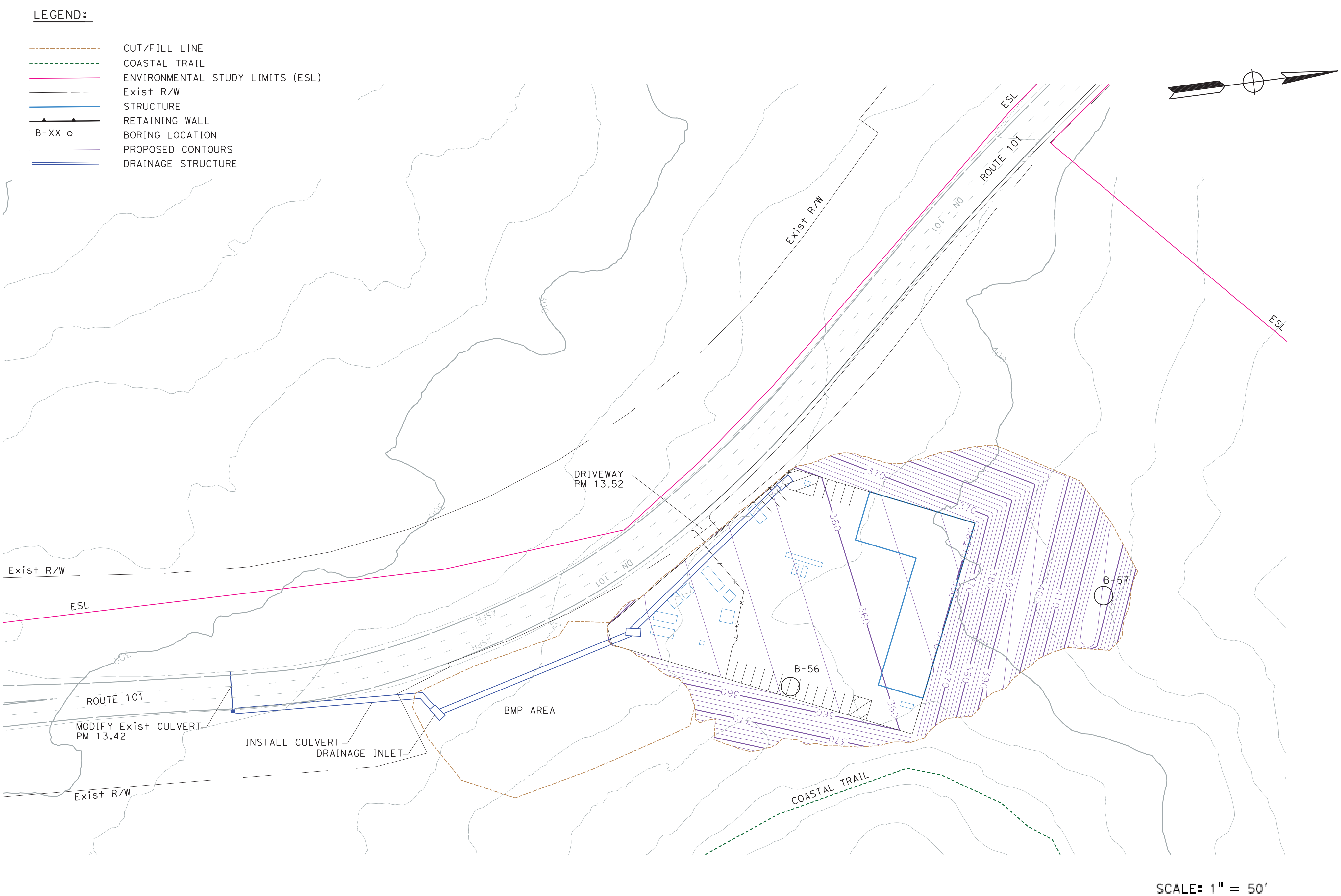
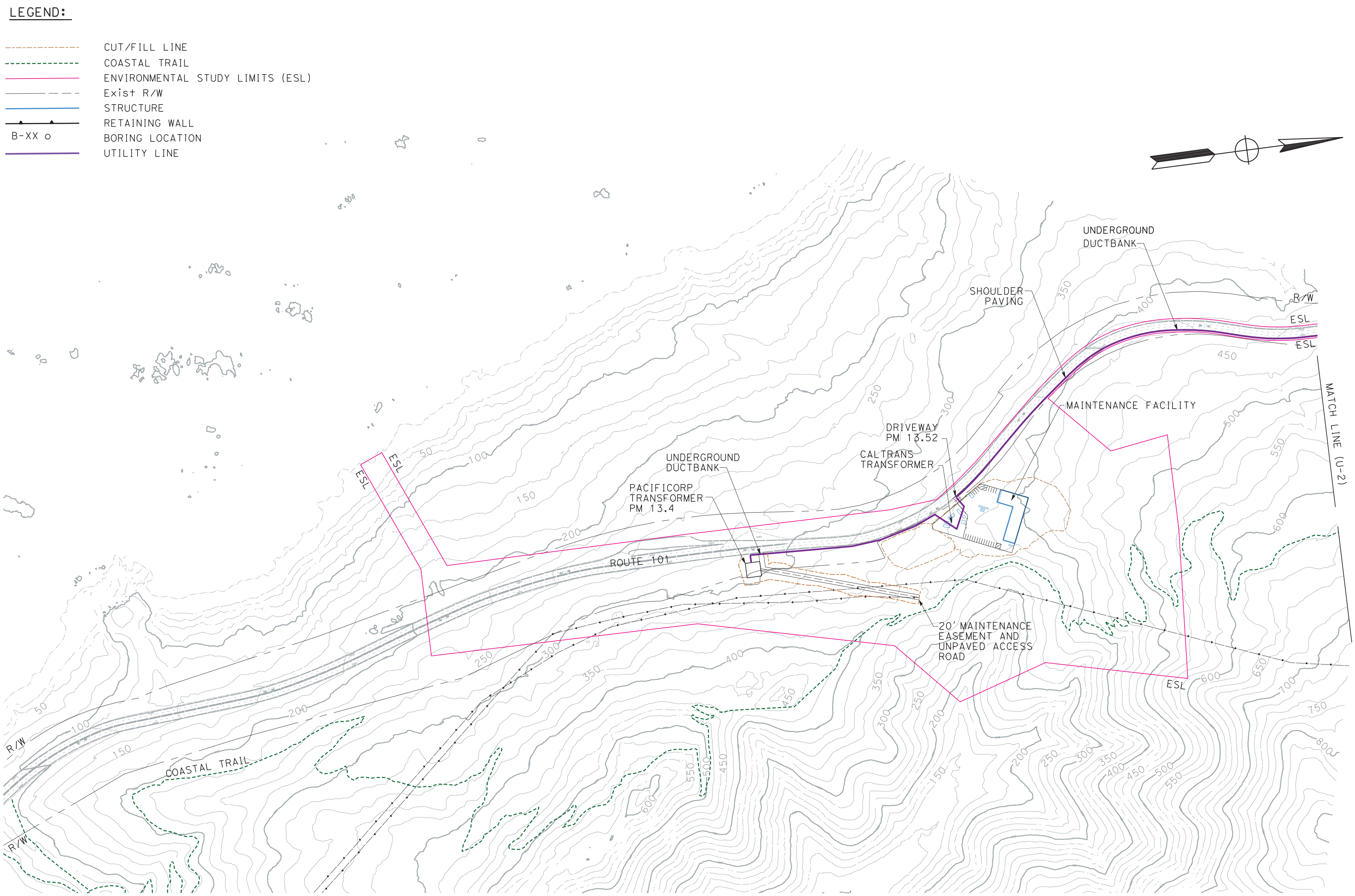


FIGURE 11 – Alternative F Maintenance Facility Layout



SCALE: 1" = 200'

FIGURE 12a – Alternative F Utilities Layout

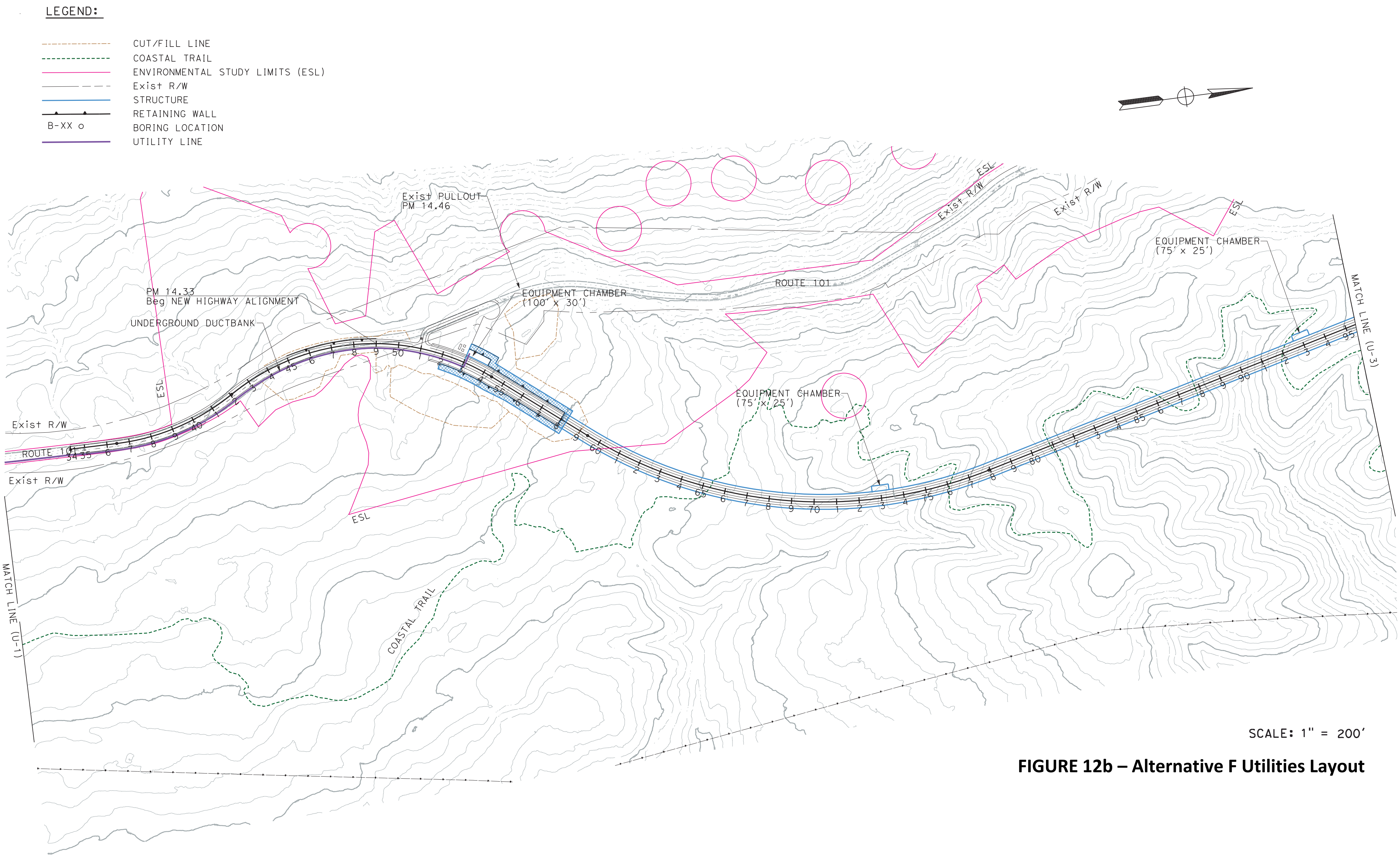


FIGURE 12b – Alternative F Utilities Layout

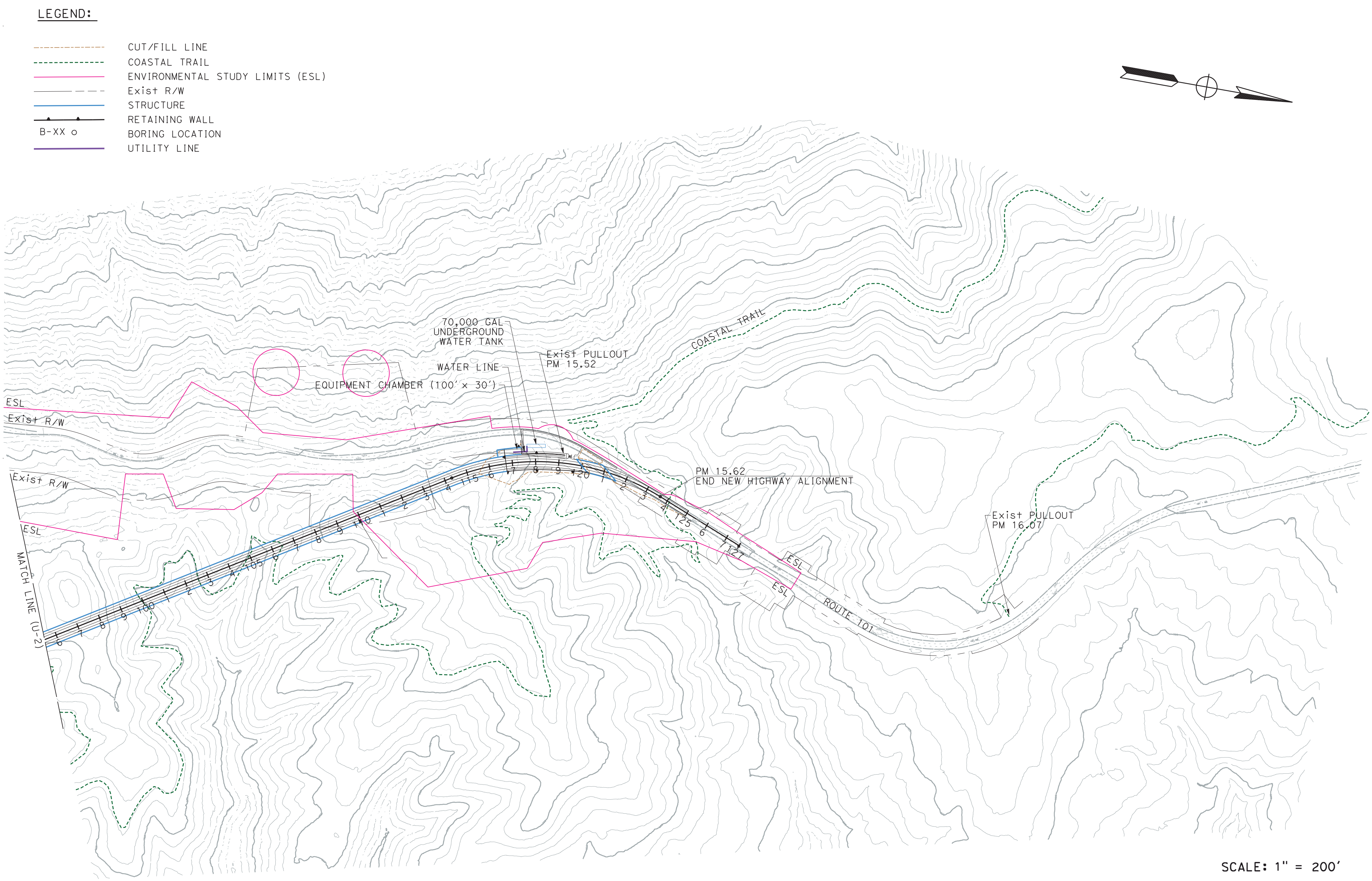
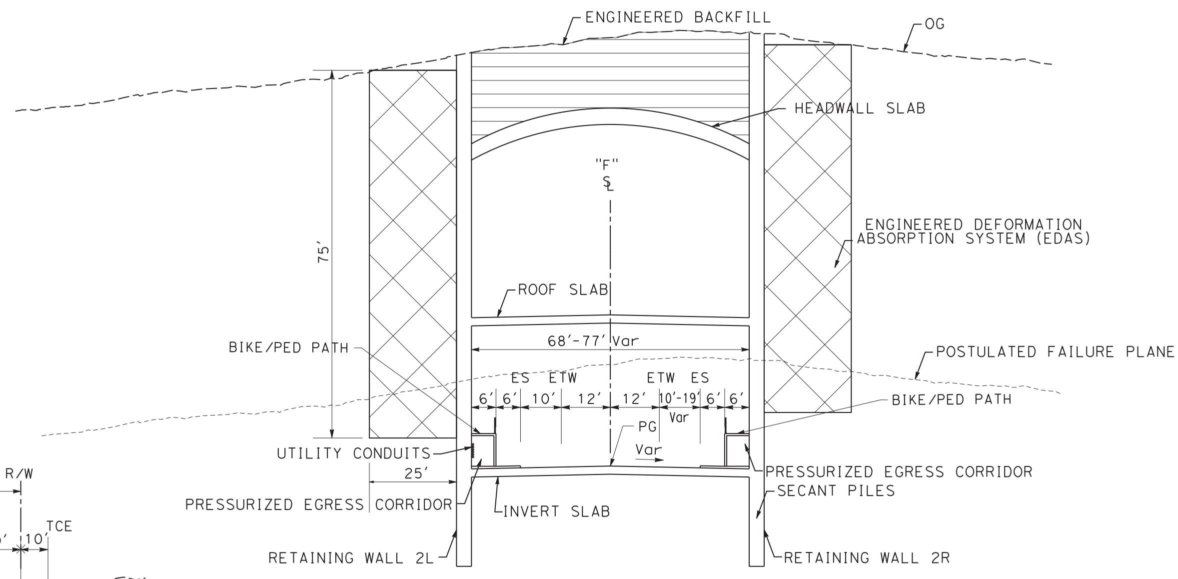
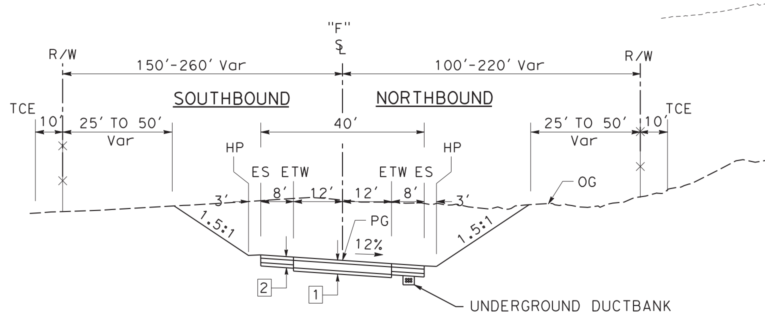


FIGURE 12c – Alternative F Utilities Layout



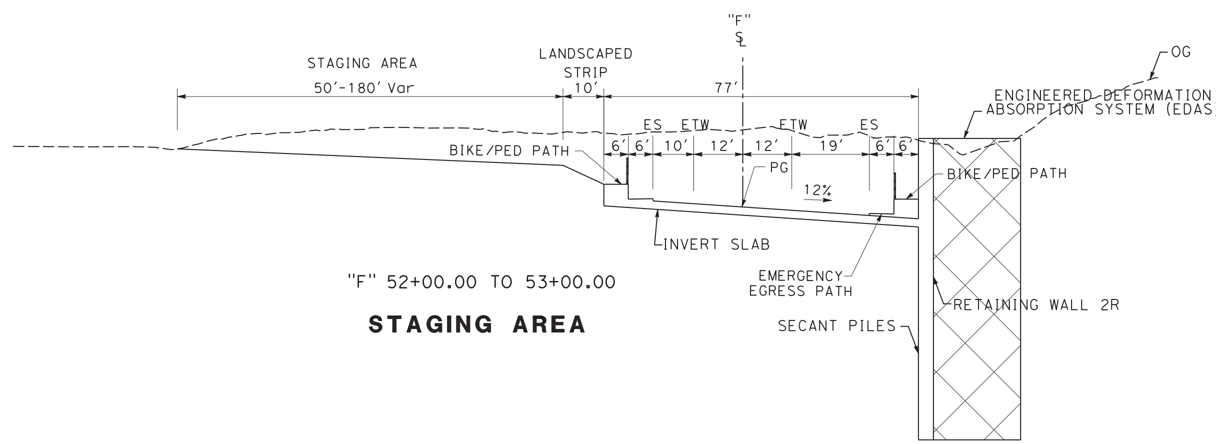
"F" 53+00.00 TO 58+00.00

CUT AND COVER / ENGINEERED DEFORMATION ABSORPTION SYSTEM



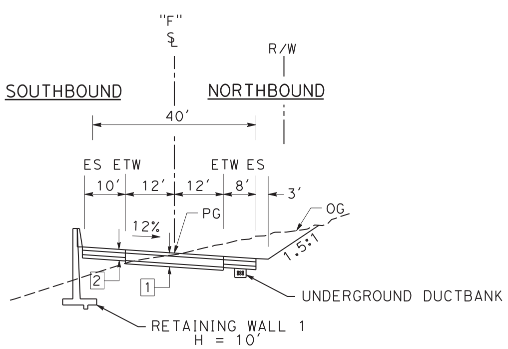
"F" 49+00.00 TO 52+00.00

CUT SECTION



"F" 52+00.00 TO 53+00.00

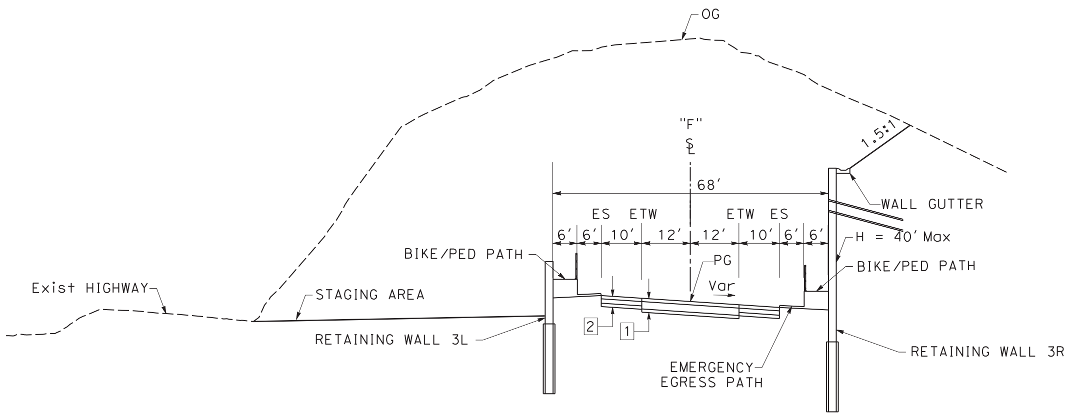
STAGING AREA



"F" 45+00.00 TO 49+00.00

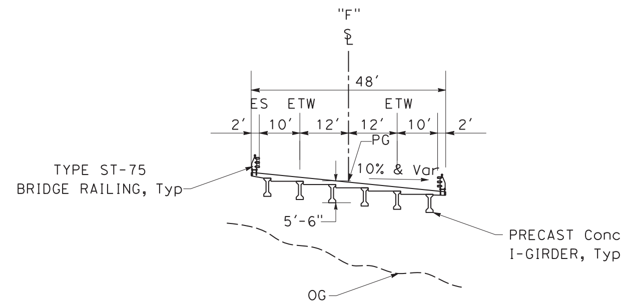
FILL WALL SECTION

FIGURE 13a – Alternative F Typical Cross Sections



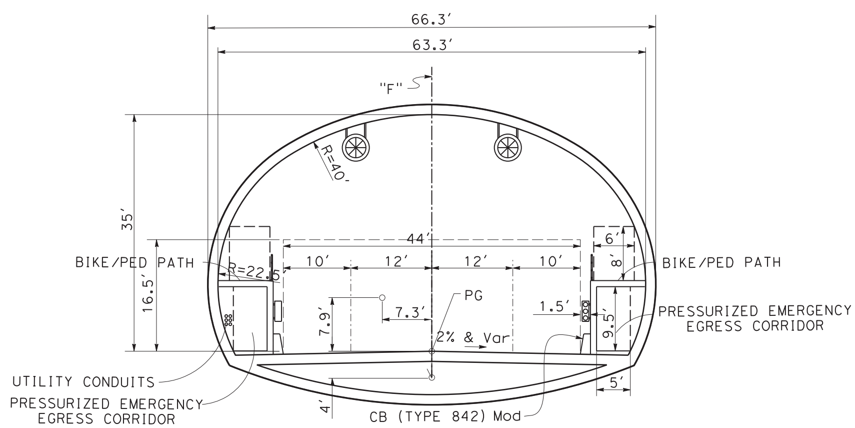
"F" 116+72.69 TO 120+00.00

TUNNEL APPROACH



"F" 120+00.00 TO 121+22.00

BRIDGE



"F" 58+00.00 TO 116+72.69

TUNNEL - SEM SECTION

FIGURE 13b – Alternative F Typical Cross Sections

LEGEND:

- CUT/FILL LINE
- COASTAL TRAIL
- ENVIRONMENTAL STUDY LIMITS (ESL)
- Exist R/W
- STRUCTURE
- RETAINING WALL
- B-XX o BORING LOCATION
- STAGING AT PROPOSED OMC SITE AND PORTAL LOCATIONS (ALT F ONLY)
- STAGING AT EXISTING OFF-ROAD PULLOUTS (ALT F AND X)

STAGING AREA SUMMARY

DESCRIPTION	ALT X	ALT F
Pullout #1	0.35	0.35
Pullout #2	0.43	0.43
Pullout #3	0.10	-
Pullout #4	0.14	-
Pullout #5	0.18	-
Pullout #6	0.09	0.09
Truck climbing lane	0.73	-
OMC Area	-	1.45
S. Portal Staging	-	0.62
N. Portal Staging	-	0.47
TOTAL (acres)	2.02	3.41

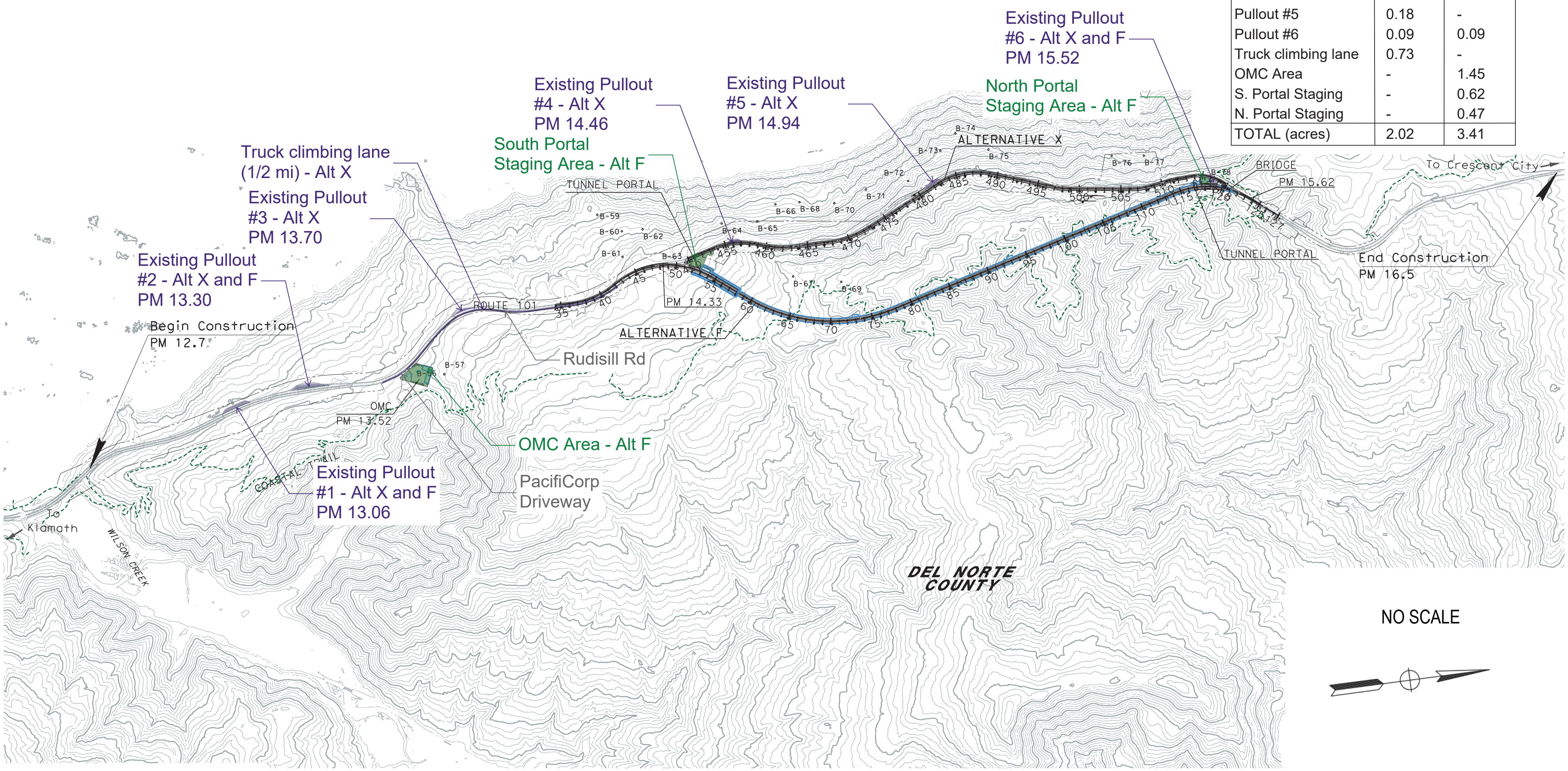
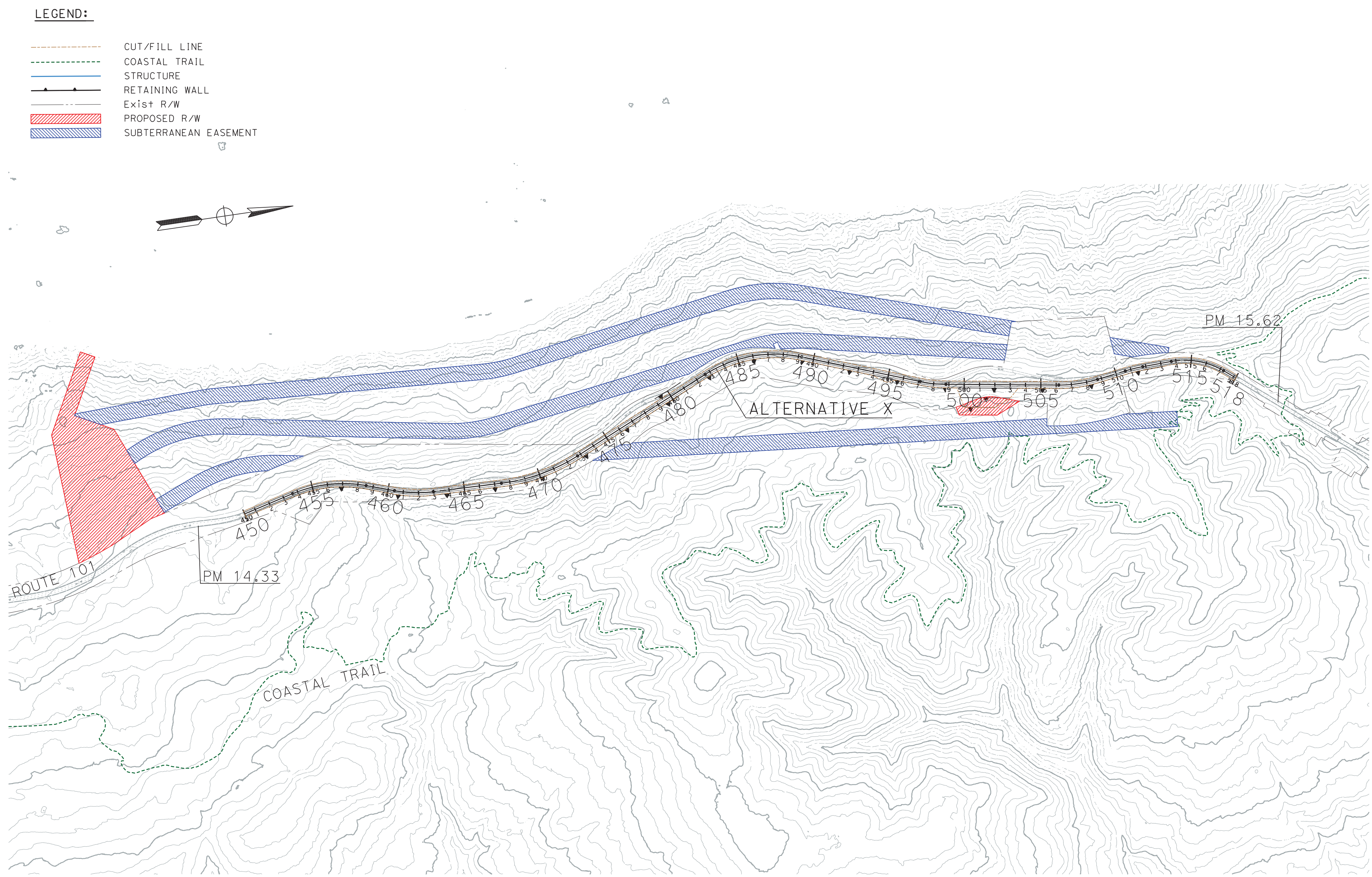


FIGURE 14 – Staging Areas Layout



SCALE: 1" = 300'

FIGURE 15a – Alternative X ROW

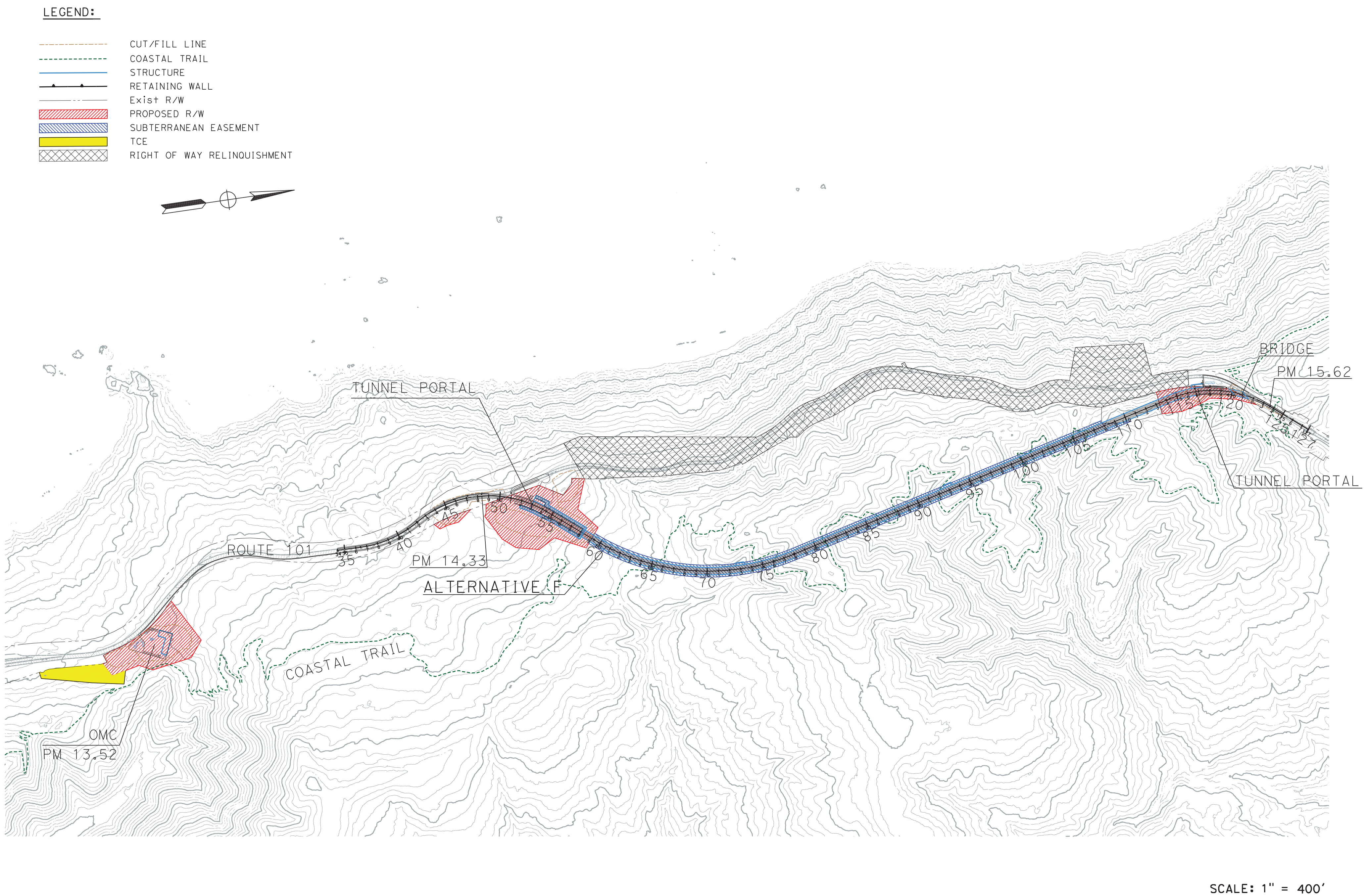


FIGURE 15b – Alternative F ROW/Relinquishment