PUBLIC BEACH ACCESS FEASIBILITY STUDY

Prepared For:

CALIFORNIA STATE COASTAL CONSERVANCY
1330 Broadway, 11th Floor
Oakland, California 94612-2530

Prepared By:

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CHARLES I. RAUW
Consulting Engineers

PUBLIC BEACH ACCESS FEASIBILITY STUDY

SUMMARY

It is feasible to construct a public beach accessway and related off-street parking lot at 27910-27920 Pacific Coast Highway, considering existing site topography, geology and limited site access for mobilization and construction. Development of the proposed beach access facility is estimated to have a construction cost of approximately $520,000 to $600,000 (in 1998 dollars). The proposed alternative beach access facility includes development of a fenced and screened accessway from Pacific Coast Highway to the sandy beach, and a related six-car parking lot.

Preliminary layouts and a profile of the proposed beach access facility are presented on the attached plan sheets (Sheets 1 to 3). The pathway is proposed to be constructed from the following conceptual design elements: (1) at-grade decomposed granite pathways; (2) timber ramp structures to span minor grade changes; (3) minimal cut and fill areas with supporting timber retaining walls; (4) timber stairway and landing structures to traverse moderate grade changes; (5) aluminum bridge and stairway structures to span steep ravine slopes.

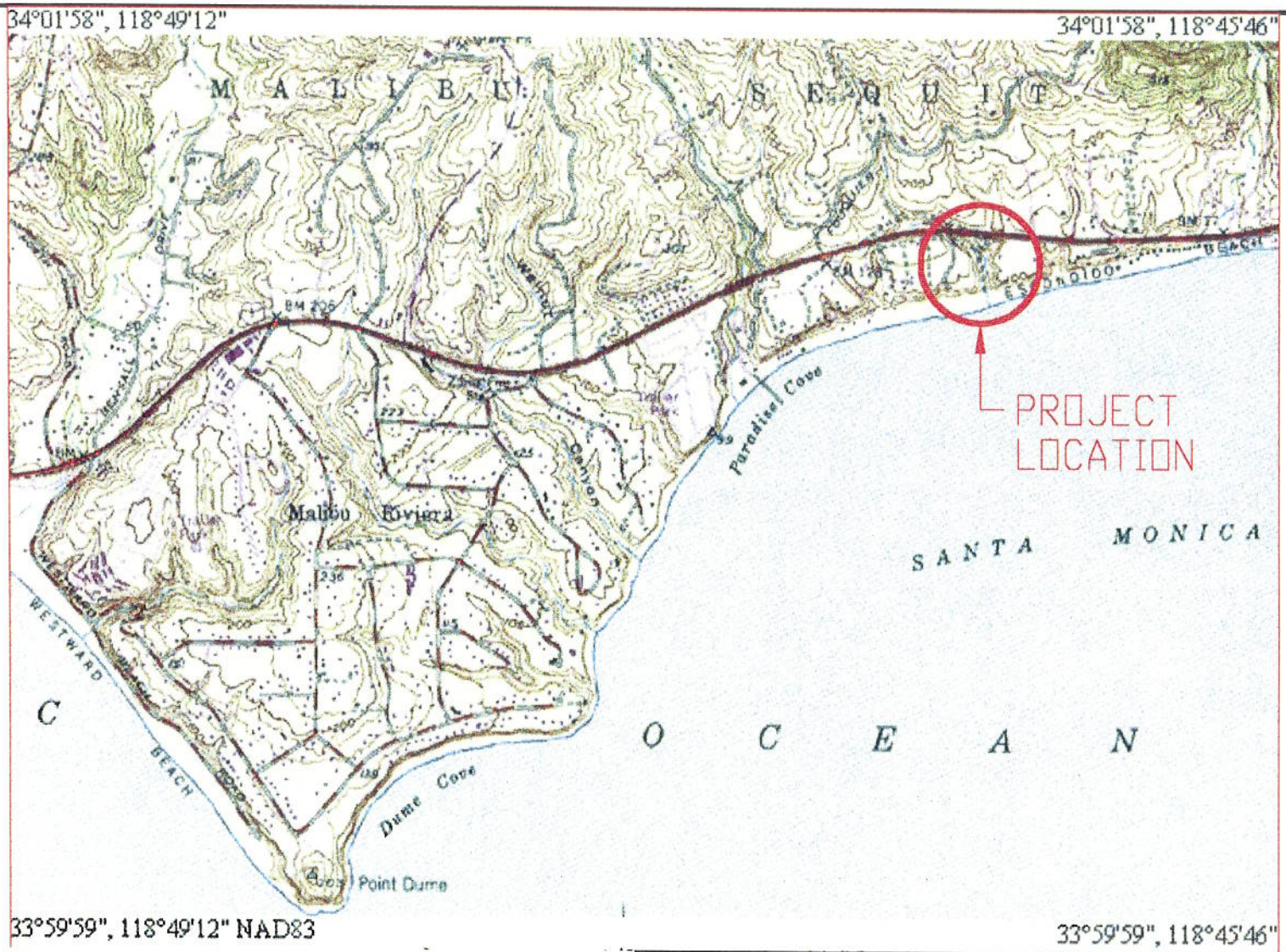
Alternative conceptual design elements analyzed in this report include a larger parking lot extending east into an existing ravine, and development of a shorter beach overlook access facility.

INTRODUCTION

The proposed public beach access facility is located in Malibu, California, as shown on Figure 1. The California State Coastal Conservancy (Coastal Conservancy) holds a ten-foot wide vertical public access easement between the Pacific Coast Highway and the public beach in Malibu, California, as shown in Figure 2. In addition, the Coastal Conservancy has authorized the acceptance of an adjacent parking easement, also shown in Figure 2. The vertical public access easement was exacted through a California Coastal Commission permit application process for the subdivision of a residential parcel at 27900 Pacific Coast Highway (subsequently divided into two parcels at 27910 and 27920 Pacific Coast Highway). At present neither the vertical nor parking easements have been developed and are, therefore, not available for public use.

PURPOSE

The purpose of this investigation was to examine the engineering and construction feasibility of developing the vertical and parking easements for public access and develop an estimate of the probable cost of constructing such a development.



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TITLE
LOCATION MAP
BEACH ACCESS FEASIBILITY STUDY

SCALE
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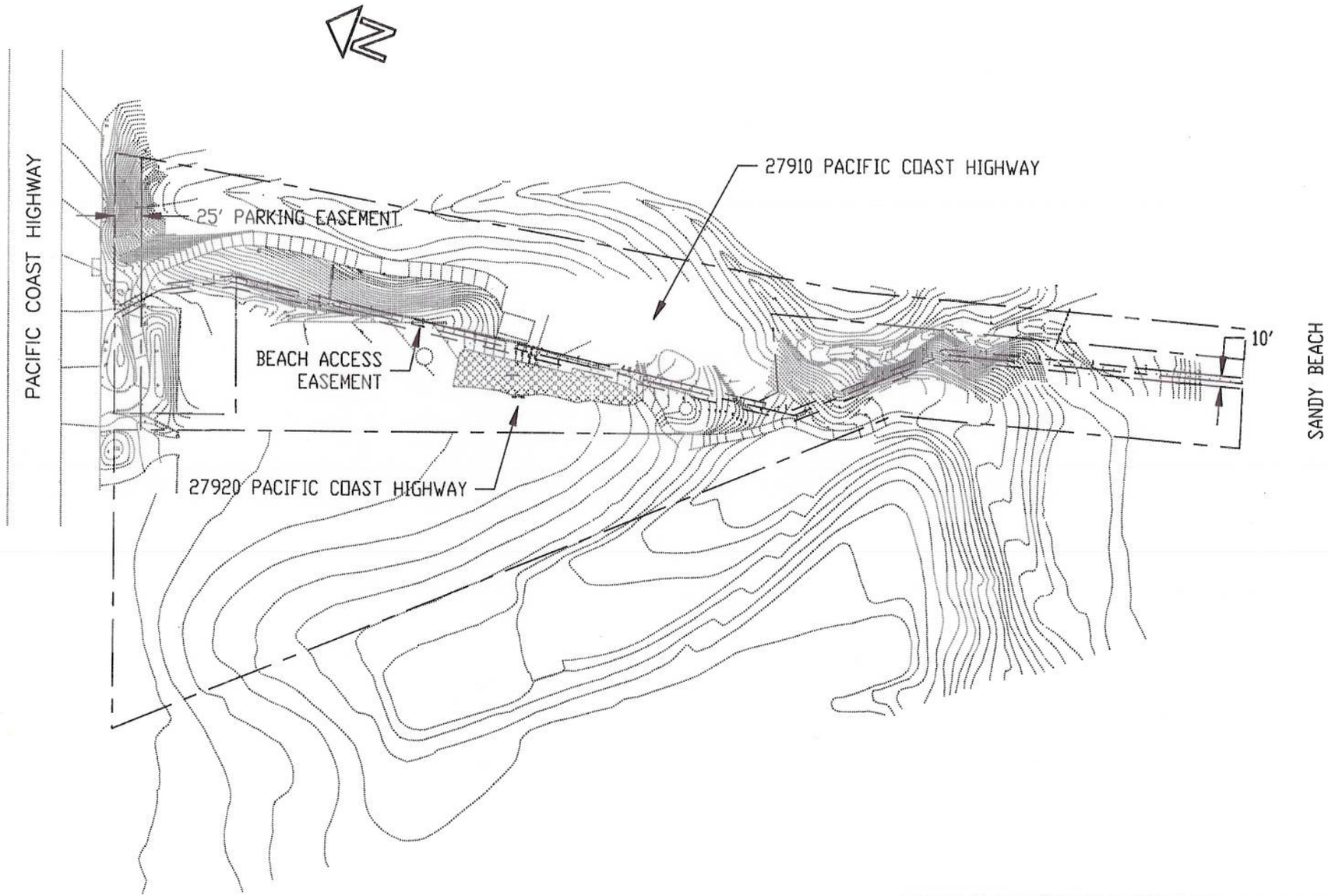
JOB NO.
96-10

FIGURE
1



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TITLE	JOB NO.
EASEMENT LAYOUT BEACH ACCESS FEASIBILITY STUDY	96-10
SCALE AS NOTED	FIGURE 2

SCOPE

The scope of this feasibility investigation included the following services:

1. Conduct a topographic survey of the easements and adjacent features.
2. Assess geologic and geotechnical conditions, including drainage, bluff erosion and slumping potential, existing grades, and general features, including obstacles and obstructions to construction of the parking and vertical easements.
3. Evaluate alternative concepts for parking and vertical easement development.
4. Prepare a preliminary design of the recommended concept, showing plan and section views of the easements.
5. Develop an estimate of probable construction cost for the recommended conceptual public beach access design.
6. Prepare a brief report summarizing the results of the feasibility investigations.

EXISTING CONDITIONS

Topography

As shown in Figure 2, the easements are located south of Pacific Coast Highway. The parking easement runs continuously in an east-west direction across both residential parcels and extends 25 feet south of the northern property boundaries adjacent to Pacific Coast Highway. Within the 27920 Pacific Coast Highway parcel the parking easement overlays significant existing development, including a driveway, concrete walls, a security gate, fencing, landscaping and irrigation, and various utility facilities. Landscaping mounds create the only notable slopes within this area of the parking easement. To the east the majority of the parking easement within the 27910 Pacific Coast Highway parcel overlays the head of a relatively steep drainage ravine. The only existing development within this area of the parking easement is a small portion of driveway, landscaping and irrigation, fencing and a drainage culvert outlet at the bottom of the ravine.

The 10 foot wide vertical easement from its beginning at Pacific Coast Highway initially traverses approximately 50 feet across gently sloping tree filled terrain that crosses a driveway and security gate and then heads south-south easterly along the crest of the ravine slope for approximately 60 feet. At this point the easement heads due south following the crest of the ravine slope for approximately 140 feet through hedges and landscaping until it intersects the driveway on the 27920 Pacific Coast Highway parcel. The easement then follows the driveway for approximately 220 feet. At this point the easement runs along a hedgerow between a gazebo on the west and a putting green on the east, with a small retaining wall separating these two features. The easement then traverses a brushy steep slope and bluff leading down to a sloping turf area. The easement then turns to the southeast near the crest of a steeply sloping

brush covered ravine and extends approximately 160 feet until it intersects an easterly protruding brush covered ridge of the ravine. At this point the easement heads southerly again and crosses another section of brushy steep ravine slope for approximately 60 feet until it intersects another brushy ravine ridge. From this point the easement heads down a sloping brushy coastal bluff approximately 100 feet until it reaches the upper reaches of the sandy beach.

In total the vertical beach access easement is approximately 1,100 feet long and has an elevation change of approximately 125 feet from the Pacific Coast Highway to the sandy beach. Portions of the vertical easement traverse slopes that are too steep for the development of pathways and stairs. Sections of the easement which traverse these steeply sloping areas are proposed to be spanned with pedestrian bridge structures.

Geology

A preliminary engineering geologic evaluation of the vertical and parking easements was performed by Robertson Geotechnical Inc. The evaluation was based on review of existing geologic information and a limited visual field inspection. A report detailing Robertson Geotechnical Inc.'s findings is presented in Appendix A.

In general, the coastal access easement crosses a variety of geologic conditions. Past development including construction of Pacific Coast Highway and residential and landscaping improvements have resulted in varying depths of uncompacted fill in the vicinity of the vertical and parking easements. The natural terrain is blanketed by a dense soil/colluvium, which is variable in thickness, but typically ranges from 1 to 8-½ feet. The upper portion of the site (near Pacific Coast Highway) where the terrain is gentle is underlain by alluvial terrace consisting of expansive consolidated silty sand, clayey sand and sand with gravel. Bedrock underlying the easement consists of diatomaceous siltstone with occasional siliceous and clayey shales.

Active faults do not cross the easement area. Obvious landslides and slope instabilities were not observed along the easement alignment. Some areas of slumping and surficial instability were observed along slopes above the ravine.

Drainage along the beach access easement is generally by sheet flow over the existing contour of the land. Improvements, access roads and pathways locally influence drainage flows. Considerable flows can be anticipated within the ravine as suggested by scour on ravine walls.

Available information does not address or describe ground water conditions for the site. However, ground water is known to accumulate at the base of terrace formations and within fractures of bedrock.

Based on the results of the engineering geologic evaluation, certain preliminary recommendations were made and incorporated in the development of the conceptual design for the public beach access easement. Recommendations significantly influencing conceptual design development included the following:

1. Grading for the access path should be minimized, with cut and fill slopes planned at 2:1 (horizontal to vertical) gradients.
2. Flexible materials should be considered for pathways and walls, and drainage controls provided to minimize impacts of erosion and surficial instabilities.
3. Timbers used for foundation supports for walls and stairways should be founded well into firm bedrock.
4. Foundations for bridge structures spanning the steep east facing slope of the ravine should be 24 inch diameter piles founded a minimum of 8 feet below a 1-½: 1 plane projected up from the ravine axis.
5. Pile support for the stairway extending down to the beach should be founded in bedrock below anticipated scour.

From an engineering geological perspective proposed development of a public access easement is considered feasible, subject to the recommendations and findings presented in Appendix A.

Existing Development Within Easement Areas

The northern portion of the vertical and parking easements extends across the entry areas to 27910 and 27920 Pacific Coast Highway and the head of the drainage ravine (See Photographs 1 to 6). Landscape mounds supporting grasses, trees, and shrubs border either side of the concrete driveways. Wrought iron fencing encloses the sites with security gates extending across the fronts of the properties. A trash receptacle enclosure area surrounded by wrought iron fencing exists near the highway.

Wrought iron fencing exists on the south side of the entry landscaped area to 27910 Pacific Coast Highway and surrounds nearly level to gently southeast sloping lawn (See Photographs 7 to 8). The driveway to 27910 Pacific Coast Highway extends in an easterly direction past the wrought iron fence and then trends southerly paralleling an east facing slope (See Photographs 9 to 10).

The vertical easement trends from the security gate at 27910 Pacific Coast Highway in a south-southeasterly direction across the upper east-facing slope between the eastern edge of the lawn area and the driveway to 27910 Pacific Coast Highway. It then turns in a southerly direction running immediately adjacent to and westerly of the wrought iron fence extending over the east facing slope which descends to the driveway to 27910 Pacific Coast Highway below (See Photographs 9 to 10. This slope supports trees and domestic shrubs. The middle portion of this section of the easement traverses adjacent to a landscaped mound along the driveway to 27920 Pacific Coast Highway (See Photographs 11 to 12). Continuing, the easement then runs along a portion of the concrete driveway to 27920 Pacific Coast Highway past a carport and timber retaining wall on 27910 Pacific Coast Highway (See Photographs 13 to 14).

PHOTO 1: Driveway entrances to 27920 (foreground) and 27910 Pacific Coast Highway.

PHOTO 2: Driveway to 27910 Pacific Coast Highway with wrought iron security gate in background.

PHOTO 3: Landscaping mound at entrance to 27910 Pacific Coast Highway.

PHOTO 4: Driveway entrance, landscaping mound, and security gate at 27920 Pacific Coast Highway.

PHOTO 5: Looking easterly along parking easement adjacent to head of canyon at 27910 Pacific Coast Highway.

PHOTO 4: Looking westerly along parking easement adjacent to head of canyon at 27910 Pacific Coast Highway.

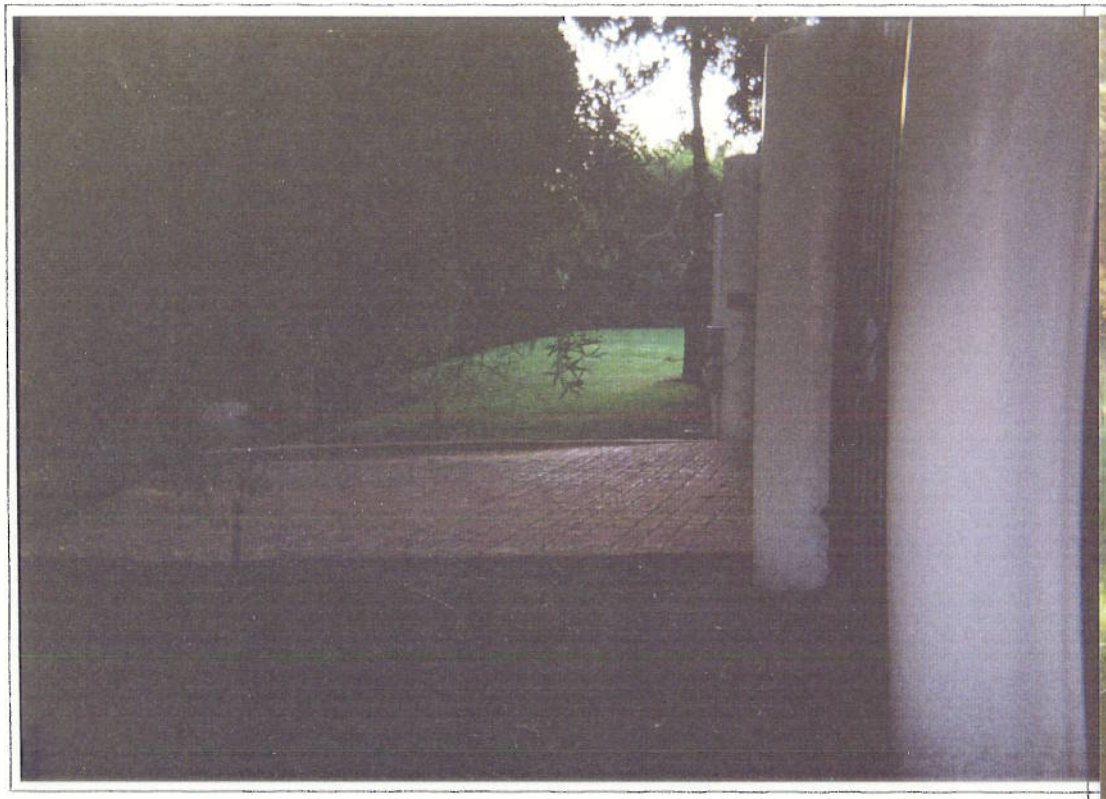


PHOTO 7: Looking southerly past security gate to 27910 Pacific Coast Highway toward lawn area in background. Easement passes at an angle from right to left through security gate.

PHOTO 8: Looking northerly from lawn area toward security gate to 27910 Pacific Coast Highway. Easement passes at an angle from left to right through security gate.

PHOTO 9: Looking northwesterly up driveway at 27910 Pacific Coast Highway toward security gate. Note wrought iron fence up-slope; easement parallels fence on west side.

PHOTO 10: Looking southerly along driveway to 27910 Pacific Coast Highway. Easement parallels wrought iron fence (upper right corner of photo) on west side.

PHOTO 11: Looking northeasterly toward landscaping mound adjacent to driveway to 27920 Pacific Coast Highway. Easement is located to the right of the lawn area in the dense shrubs.

PHOTO 12: Looking northerly up the driveway to 27920 Pacific Coast Highway. Easement is located to the right of lawn area in the dense shrubs in the background and westerly edge intersects the driveway near foreground of photograph.

PHOTO 13: Looking southerly along concrete driveway at 27920 Pacific Coast Highway. Easement is located on the left side of concrete driveway.

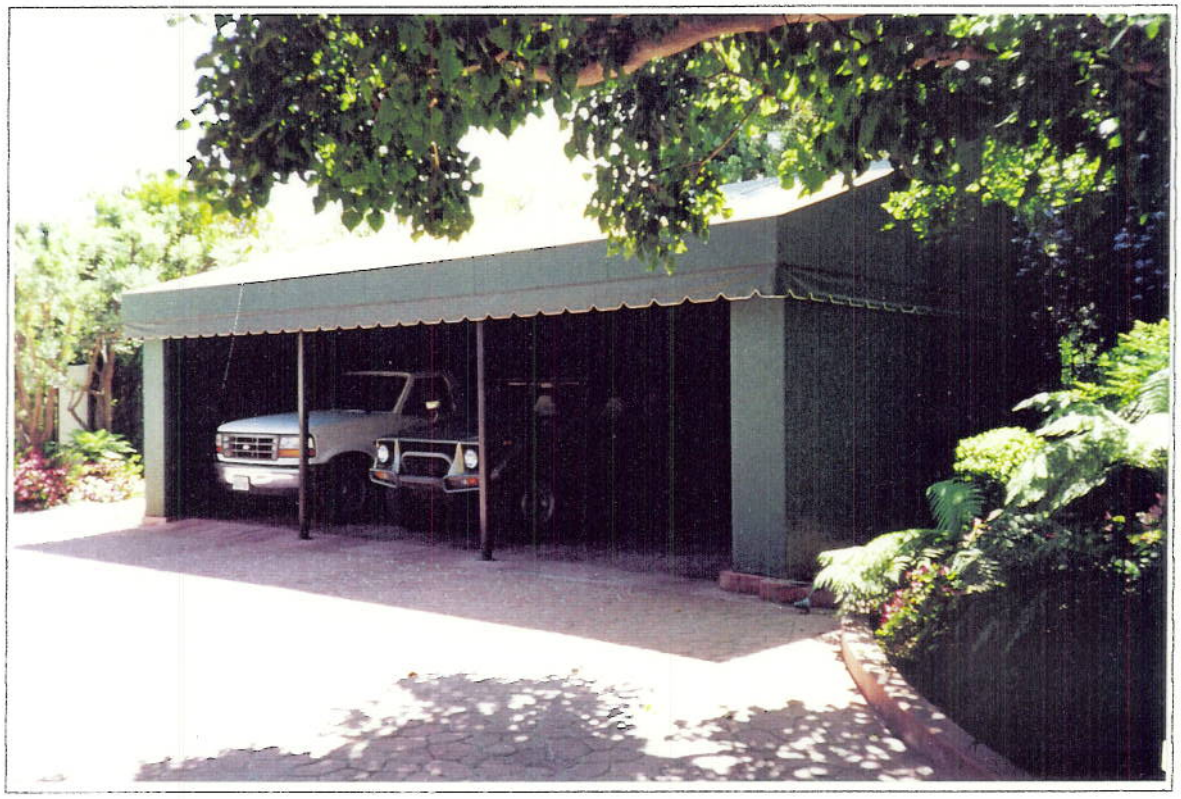


PHOTO 14: Carport at 27910 Pacific Coast Highway. Easement runs behind carport and timber retaining wall (not seen).

The easement continues southerly along the eastern side of the concrete driveway that narrows as it passes through a security gate for, and between the residence and elevated pool of, 27920 Pacific Coast Highway. The eastern side of the easement is adjacent to a security gate and dense hedge between 27910 and 27920 Pacific Coast Highway (See Photographs 15 to 16). The easement passes over and then runs nearly parallel with and on top of a low concrete retaining wall separating the grassy lawn and putting green from the hedge and landscaping on 27910 Pacific Coast Highway. The easement continues across the grassy lawn area touching on an edge of the putting green. A dense hedge and gazebo are located to the west of this section of easement (See Photographs 17 to 18).

At this point the easement, still trending in a southerly direction, traverses down a steeply sloping shrub covered bank and across a grassy lawn area (See Photographs 19 to 20). The toe of the steep slope is retained by a shallow, stucco covered wall. As the easement continues across the grassy lawn, the western side ultimately intersects an existing asphalt private beach access path, at which point the easement turns toward the southeast (See Photograph 21).

Continuing in a southeasterly direction pass a satellite dish to the east, the easement extends across a moderate to steep, east facing slope descending down to the ravine below (See Photograph 22). Slope gradients vary from nearly vertical to as flat as 2:1 (horizontal to vertical) and support dense, well-established native trees, shrubs and grasses. Directly to the west of this section of easement is a relatively flat landscaped area overlooking the beach below and adjacent to the existing asphalt private beach access path on the western flank of this overlook.

The easement intersects an easterly trending ravine ridge and turns southerly again crossing another steep east facing slope and intersecting another easterly trending ravine ridge. Dense trees, shrubs and grasses flank each side of the easement except in areas where the slopes are too steep (See Photographs 23 to 24). Continuing, the easement extends out to a moderate to gentle sloping terrain that intersects the active sandy backshore of the beach (See Photographs 25 to 26). To the west of the easement an elevated parking area constructed on fill and located at the backshore of the sandy beach is the terminus to the existing asphalt private beach access path. To the east, the foot of the ravine is fenced to provide security and a pathway extends in a northerly direction from the beach. The pathway includes stepping-stones and is flanked on both sides by steep ravine walls. Low concrete walls, intermittently constructed, locally stabilize the flow channel along the ravine axis. A variety of established landscaping is present along the channel banks running down the axis of the ravine (See Photographs 27 to 28).

PHOTO 15: Looking northeasterly with security gate for 27920 Pacific Coast Highway on left. Easement is located on concrete driveway to 27920 Pacific Coast Highway. Carport and security gate to 27910 Pacific Coast Highway in background and on right side of photograph.

PHOTO 16: Looking southerly down narrowed driveway to 27920 Pacific Coast Highway with residence and elevated pool to right. Easement angles into dense hedge on left as it trends down slope. Note gazebo structure in background on right.

PHOTO 17: Looking southwesterly across putting green toward top of steep bank. Proposed overlook area is behind putting green. Note concrete wall and dense hedge in background.

PHOTO 18: Looking northwesterly from top of steep bank across putting green. Western edge of easement runs down centerline of photograph.

PHOTO 19: Looking northeasterly across lawn area with steep shrub covered bank on left. Putting green and proposed outlook location are above the bank on the left.

PHOTO 20: Looking southwesterly across lawn area with asphalt beach access path in background. Easement runs across lawn area from right to left and intersects asphalt path.

PHOTO 21: Looking northerly along easement across lawn area with steep shrub covered slope in background. Easement turns to southeast at intersection with asphalt path in foreground.

PHOTO 22: Looking northwesterly from centerline of easement back toward intersection of easement and asphalt path at bottom of lawn area. Note satellite dish structure in upper right portion of photograph.

PHOTO 23: Looking southerly along easement across steep east facing slope of canyon. Note dense trees and shrubs. Bridge structure proposed to spans this area of easement.

PHOTO 24: Example of nearly vertical canyon wall devoid of vegetation due to active local slufling. Easement runs behind top of vertical wall within dense vegetation above.

PHOTO 26: (Above) Looking southerly along centerline of easement as it crosses the sandy beach.

PHOTO 25: (Left) Looking northerly along centerline of easement back toward moderate slope decending to backshore beach. Note security gate on right and foot of canyon access. Note tripod in upper left corner; located on relatively flat landscaped area overlooking canyon and beach.

PHOTO 27: Looking up canyon axis. Note concrete retaining walls, landscaping and narrow flow channel.

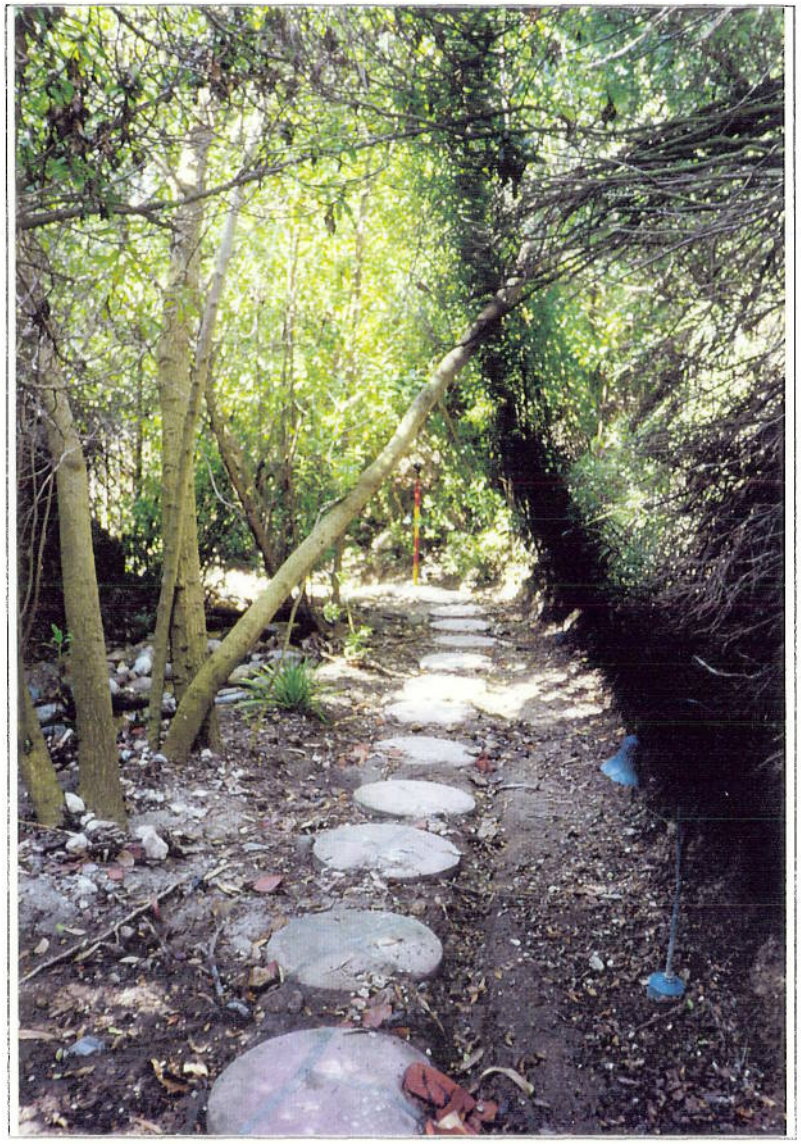


PHOTO 28: Looking down canyon axis. Note dense vegetation and landscaping, steep slope on right, and flow channel to left.

CONCEPTUAL DESIGN

General

The concept for development of the vertical and parking easements was to provide the maximum feasible amount of off-street parking in conjunction with a path from the parking lot to the adjacent beach that could be considered reasonably accessible by foot traffic. Due to the steepness and variability of the existing terrain, and the confined width (10 feet) of the easement, it was not considered feasible to develop an access path to be in compliance with codified Americans with Disabilities Act (ADA) standards. However, a portion of the beach access is in compliance with the "Recommendations for Accessibility Guidelines: Recreational Facilities and Outdoor Developed Areas, July 1994, Section 6 – Developed Outdoor Recreation Facilities, pages 133-201" developed for U.S. Architectural and Transportation Barriers Compliance Board by the Recreation Access Advisory Committee.

Criteria

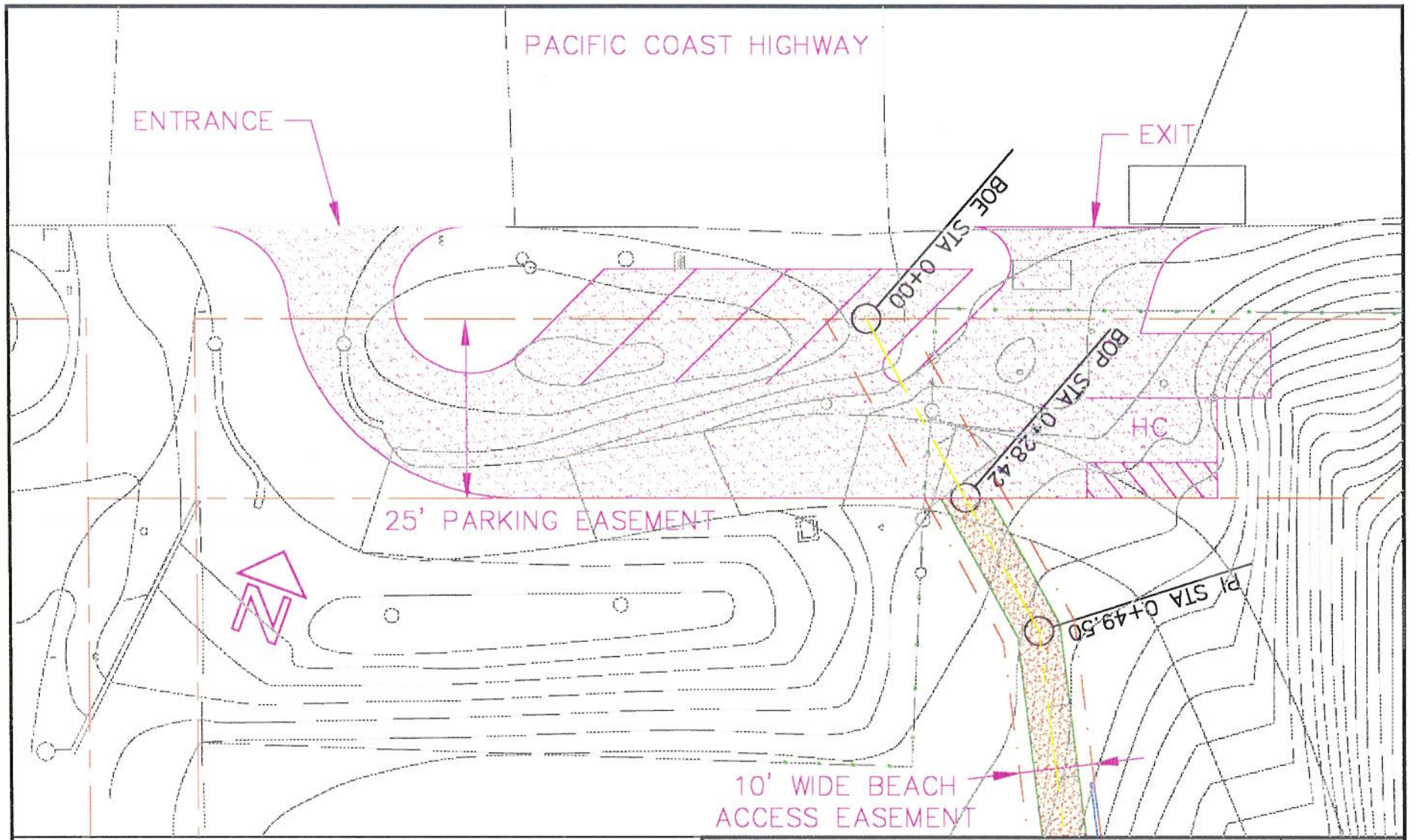
The feasibility study adopted the following criteria for developing conceptual designs for vertical access easement segments:

1. Maximum slope of footpath - 10% (conforming to maximum slope allowed by design standards for outdoor recreation access routes for minimal development and difficult degree of access).
2. Maximum stairway height between landings - 12 feet (per Uniform Building Code, Section 1006.7).
3. Minimum path width - 6 feet.
4. Cut and fill to be minimized, (maximum cut or fill: 2 feet without retaining walls and 5 feet with retaining walls), and located only where grade changes require (in order to maximize the maintenance of existing grades).
5. Cut and fill slopes to be maximum of 2:1 (horizontal to vertical), (per geotechnical recommendations).

Alternatives

<u>West Parking Lot</u>

The West Parking Lot alternative consists of an off-street parking lot containing six spaces (including one handicapped space) separated from Pacific Coast Highway by "dry-scaping" (non-irrigated landscaping) and an entrance and exit lane (Figure 3). The West Parking Lot alternative would be separated from the driveway entrances of the two adjacent residential properties by additional "dry-scaping" and chainlink fencing with redwood slats integrated with residential wrought iron fencing to provide screening and security. In addition, the entrance to the proposed beach accessway would be controlled by a lockable gate, opened only during daylight hours. The West Parking Lot alternative is located on the western side of the parking easement to take advantage of the relatively



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TITLE

WEST PARKING LOT

BEACH ACCESS FEASIBILITY STUDY

SCALE AS NOTED

JOB NO. 96-10

FIGURE 3

flat terrain available in this area. The parking lot overlays significant existing development as previously discussed. Existing developments would need to be removed in order to construct the parking lot. In addition, the existing driveway serving the residence at 27910 Pacific Coast Highway would need to be relocated to the south. To provide ingress and egress to both residences at 27910 and 27920 Pacific Coast Highway, a ±15-foot wide strip along the western flank of the parking easement has been left undeveloped.

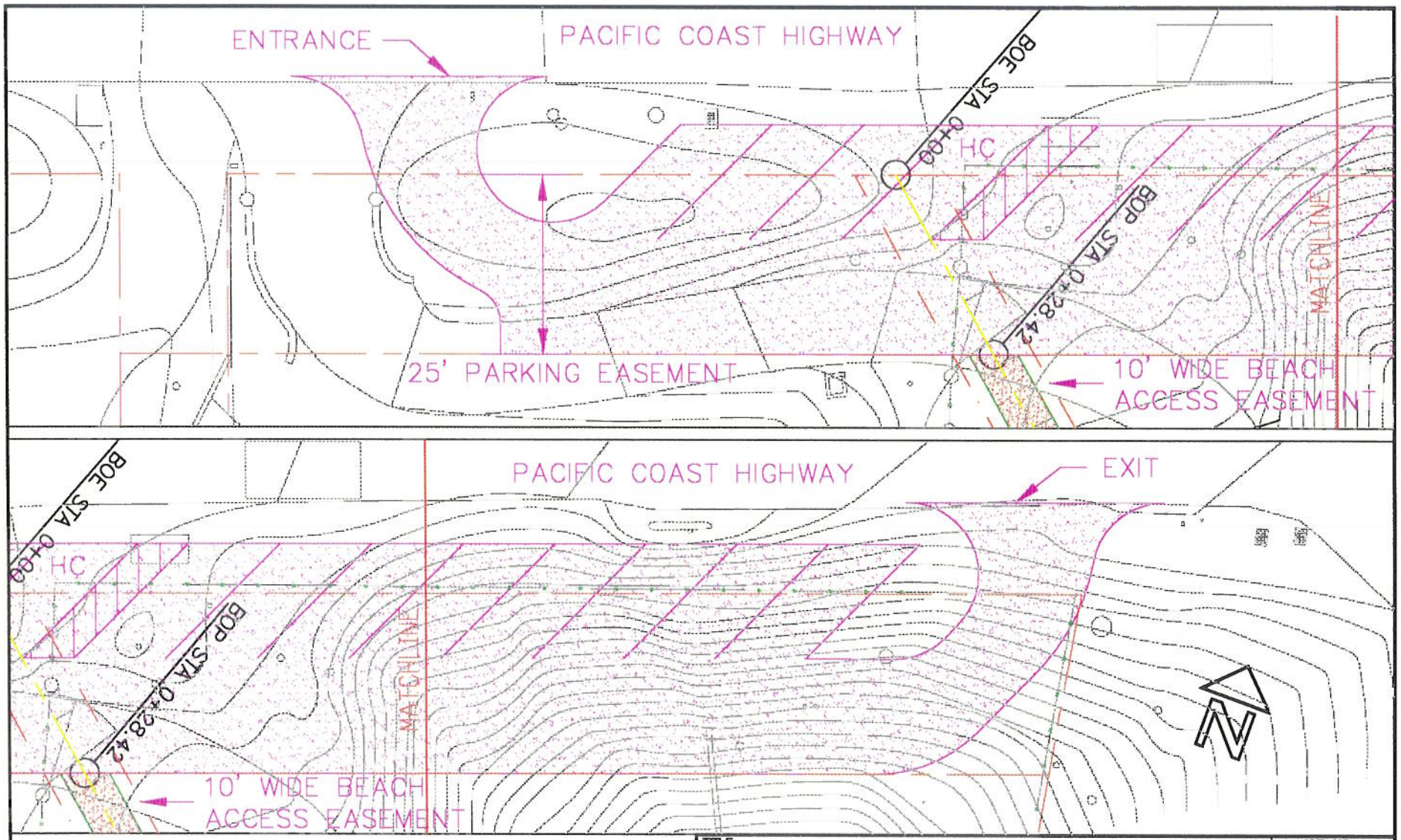
The West Parking Lot alternative is designed for one-way traffic flow. The parking lot would be constructed with an asphalt concrete surface on top of an engineered base, with appropriate curbing, striping and signage. Some fill would be required along the eastern flank of the parking lot to develop the 2 parking spaces located in this area. Chainlink fencing with redwood slats would be installed to screen the parking lot from the adjacent residential properties. Trash receptacles would also be installed. The estimated construction cost for the West Parking Lot alternative is $40,000 to $50,000 (Table II).

East Parking Lot

The East Parking Lot alternative consists of an off-street parking lot containing twelve spaces (including one handicapped space) separated from Pacific Coast Highway by "dry-scaping" and an entrance and exit lane (Figure 4). The East Parking Lot alternative would be separated from the driveway entrances of the two adjacent residential properties by additional "dry-scaping" and screened fencing integrated with residential wrought iron fencing to provide security. In addition, the entrance to the proposed beach accessway would be controlled by a lockable entrance gate, opened only during daylight hours. The layout design is an extension of the West Parking Lot alternative in an easterly direction to the easternmost property boundary of 27910 Pacific Coast Highway. This alternative has a significant increase in construction complexity due to its extension across the head of the drainage ravine. Alternatives considered in developing the East Parking Lot Alternative across the head of the drainage ravine included:

1. Filling the head of the ravine with compacted engineered fill and extending the existing drainage culvert.
2. Constructing a tied-back concrete retaining wall and filling behind the wall with compacted engineered fill.
3. Supporting the parking lot extension on precast prestressed concrete piles, beams, and decking.

The engineering geological evaluation reported the existing slope at the head of the drainage ravine on the south side of Pacific Coast Highway was constructed from roadway fill. Further, the geological evaluation deemed that this roadway fill slope might be unsuitable for construction of a parking lot founded on engineered fill due to the nature of materials likely used during construction. Concerns included the potential for settlement and slumping. Construction of a tied-back retaining wall or pile-supported parking lot over the head of the ravine was not judged to be feasible. Although not evaluated in detail, the estimated construction



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TITLE

EAST PARKING LOT

BEACH ACCESS FEASIBILITY STUDY

SCALE AS NOTED

JOB NO. 96-10

FIGURE 4

cost for the East Parking Lot alternative could be on the order of $100,000 to $200,000.

Beach Access Path

The Beach Access Path alternative consists of a mixture of structures conceptually designed to accommodate the variety of terrain and slopes encountered along the easement. Table I presents a breakdown by station locations (stationing is referenced to the horizontal distance along the centerline of the easement) of the various segments of the access path from the parking lot to the beach. Plan layouts and a profile of the proposed beach access path are presented on the attached plans (Sheets 1 to 3).

A typical section of the decomposed granite pathway is shown in Figure 5. A 2-inch thick decomposed granite walking surface is constructed on top of a 6-inch layer of compacted base rock and contained within redwood headers. The pathway is 6-feet wide and centered within the 10-foot wide easement. For security purposes and to provide screening for the adjacent residential parcels, a 6-foot high chainlink fence (galvanized posts, PVC coated mesh, and redwood slats) is constructed along the easement boundaries. Where appropriate, low preservative treated timber retaining walls would be installed to accommodate sloping terrain.

To minimize cut and fill requirements at certain grade changes, timber ramps are proposed as shown in Figure 6. Ramps would be provided with timber guardrails. Chainlink fencing, as previously described, would also be installed. Timber ramps would be constructed from preservative treated Douglas Fir with 2x6 decking laid perpendicular to the direction of travel.

Timber stairways and landings are proposed for certain segments of the access path in order to negotiate steep terrain. Figure 7 presents a schematic section of a typical stairway and landing installation. Structural support is conceptually provided by 12-inch diameter timber piles embedded in concrete footings. Framework, decking and guardrails are constructed from preservative treated Douglas Fir. Chainlink and fencing would also be installed where appropriate.

In order to span areas of the easement, which cross steep ravine slopes, aluminum bridges and stairways are proposed. Supports are conceptually provided by 24-inch diameter reinforced concrete caissons and caps. Figure 8 presents a typical section of the proposed aluminum bridge and stairway conceptual design. Chainlink fencing is not proposed in areas where aluminum bridges and stairways are constructed.

Aluminum bridges and stairways were selected over other bridge and stairway materials (such as timber or steel) due to weight considerations. Due to the size of the structures, and access and construction constraints, it was assumed that helicopter assistance would be required to set the bridge and stairway sections in place along the accessway spanning the steep ravine slopes. While timber or steel bridge and stairway structure elements (beams, joists, decking, guardrails, etc.) could be segmentally placed by helicopter and then connected, the number

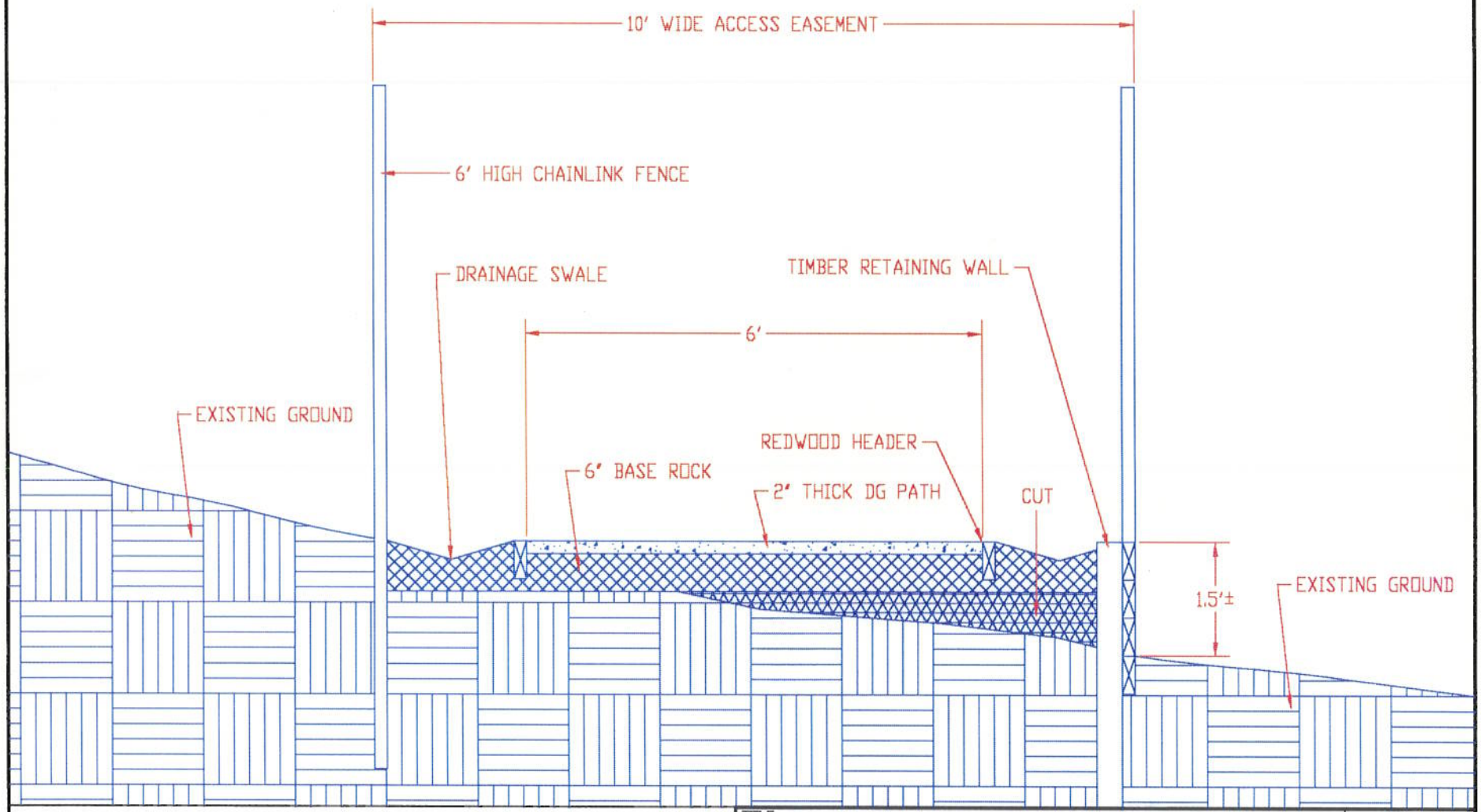
TABLE I

BEACH ACCESS PATH ELEMENTS

Station Location		Path Element	Comments	Grade (percent)	Elevation Change (feet)
0+29.01	2+39.00	Decomposed Granite Path	Cut and fill and timber retaining wall on down slope side of easement required for a portion of segment.	5.0	-10.5
2+39.00	2+59.00	Timber Ramp		9.6	+1.9
2+59.00	3+90.94	Decomposed Granite Path	Cut and fill required for a portion of this segment.	4.7	-6.1
3+90.94	4+40.94	Timber Ramp		10.0	-5.0
4+40.94	5+01.00	Decomposed Granite Path	Cut and fill required for a portion of this segment.	6.4	-3.9
5+01.00	5+51.00	Timber Ramp		10.0	-5.0
5+51.00	5+74.50	Decomposed Granite Path	Cut and fill required for a portion of this segment.	4.8	-1.1
5+74.50	6+16.67	Timber Stairs and Landing		46.5	-19.6
6+16.67	6+31.25	Decomposed Granite Path	Cut and fill required for a portion of this segment.	10.0	-1.5

TABLE I (Continued)
BEACH ACCESS PATH ELEMENTS

Station Location		Path Element	Comments	Grade (percent)	Elevation Change (feet)
6+31.25	6+80.00	Timber Stairs and Landing		24.2	-11.8
6+80.00	8+12.00	Aluminum Bridge	Supported on concrete piles and pile caps.	9.7	-12.8
8+12.00	8+31.58	Aluminum Stairs		50.7	-9.9
8+31.58	8+90.42	Aluminum Bridge	Supported on concrete piles and pile caps.	9.3	-5.5
8+90.42	9+24.67	Aluminum Stairs		56.0	-19.3
9+24.67	9+59.93	Timber Landing and Stairs		29.7	-10.5



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TITLE

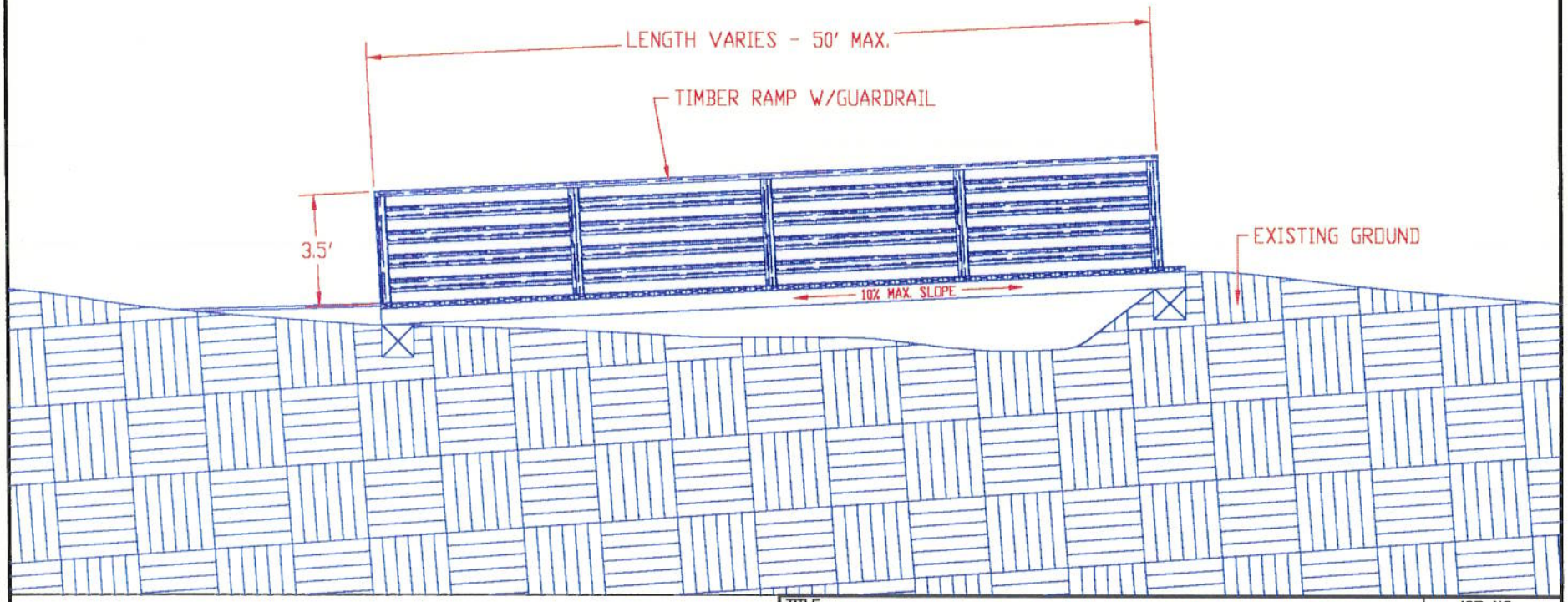
PATHWAY SECTION

BEACH ACCESS FEASIBILITY STUDY

SCALE AS NOTED

JOB NO. 96-10

FIGURE 5



SCALE: 1"=5'

TITLE

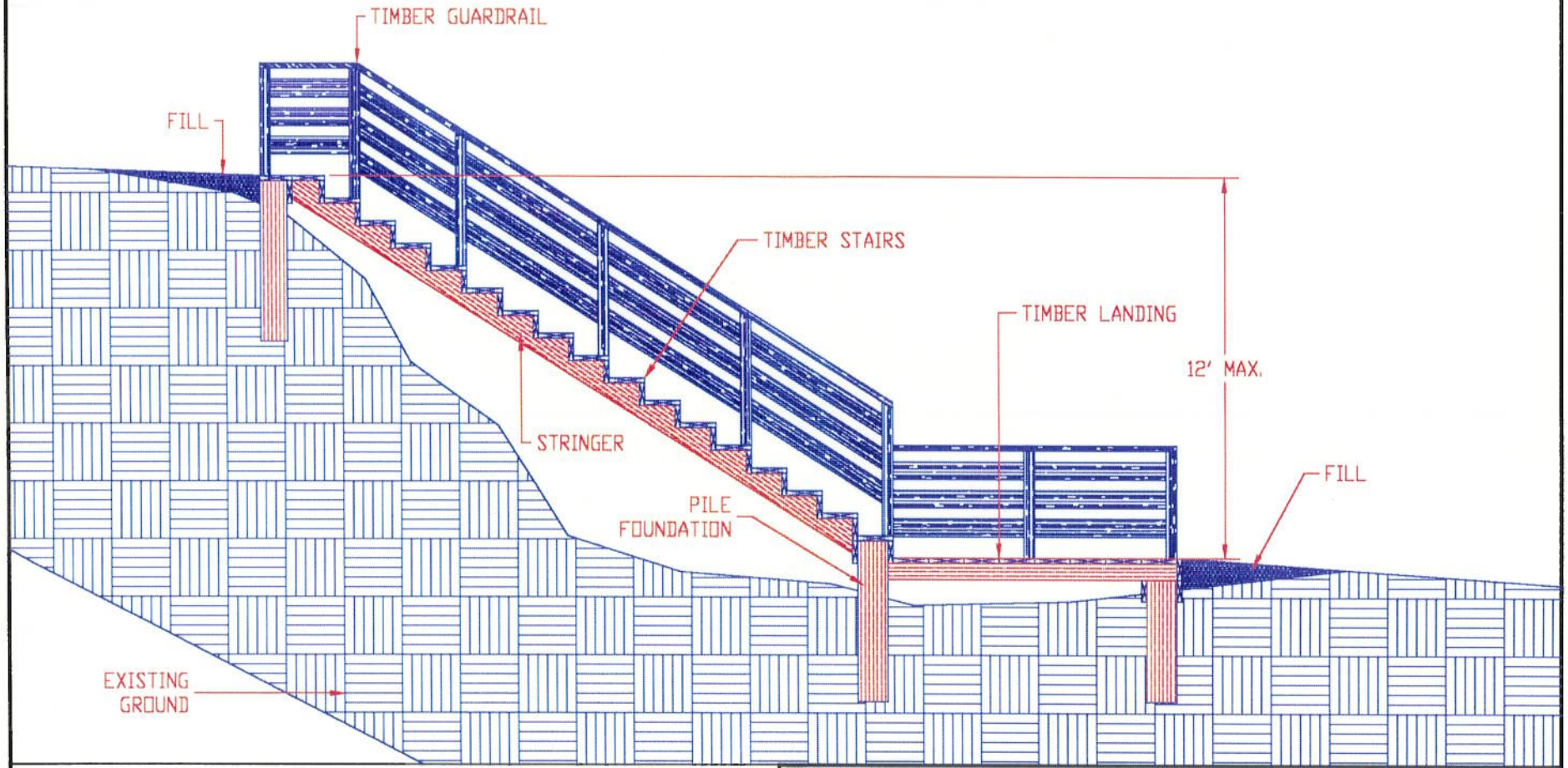
TIMBER RAMP SECTION

BEACH ACCESS FEASIBILITY STUDY

SCALE AS NOTED

JOB NO. 96-10

FIGURE 6



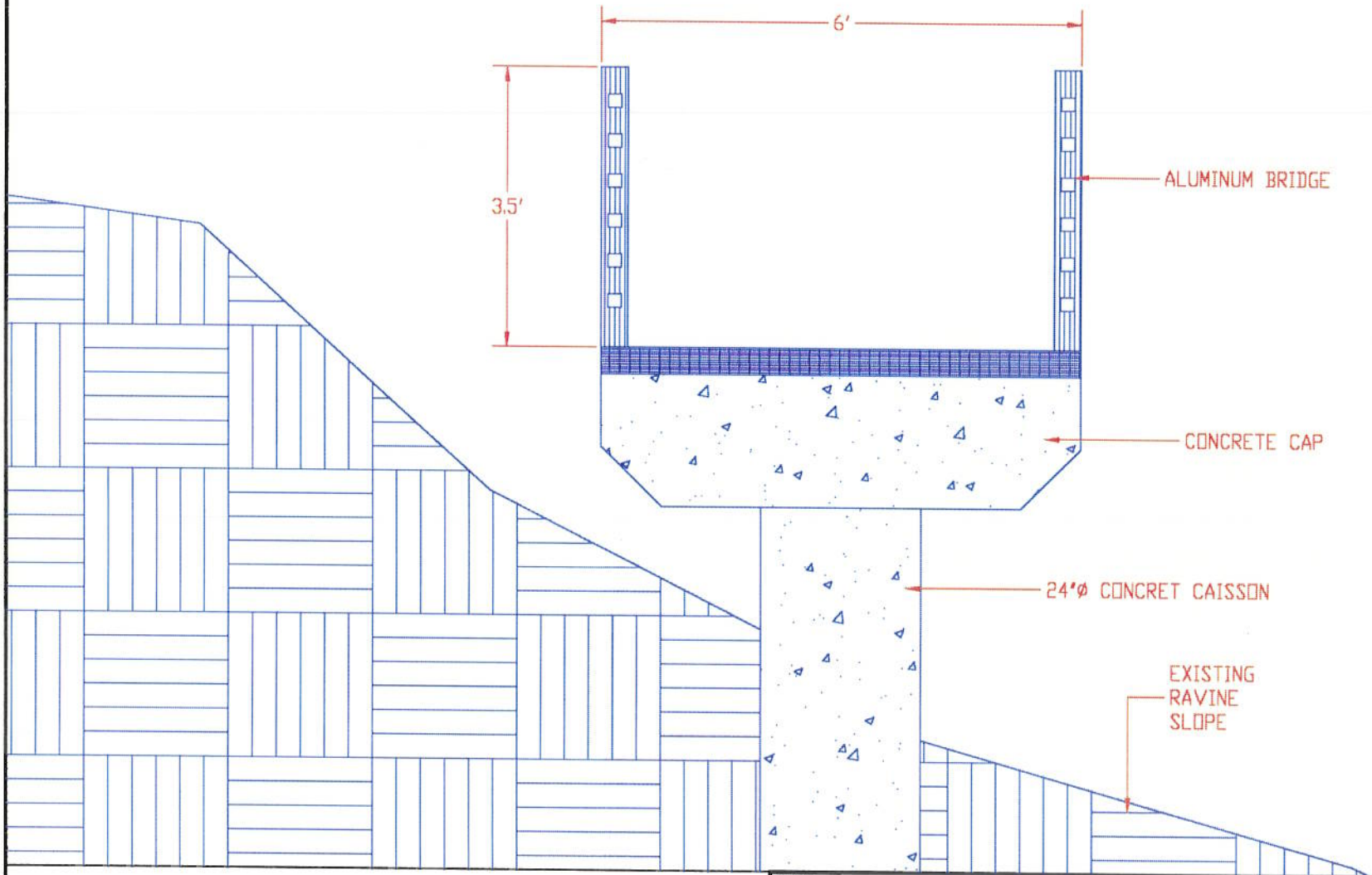
SCALE: 1"=5'

TITLE
TIMBER STAIRS & LANDING
BEACH ACCESS
FEASIBILITY STUDY

SCALE
AS NOTED

JOB NO.
96-10

FIGURE
7



SCALE: 1"=2'

TITLE

BRIDGE SECTION

BEACH ACCESS FEASIBILITY STUDY

SCALE AS NOTED

JOB NO. 96-10

FIGURE 8

of lifts required and cost of helicopter time resulted in overall construction costs which would exceed the cost of furnishing and installing completed aluminum bridge and stairway sections.

At the bottom of the pathway, where timber stairs descend to the sandy beach, a lockable gate, opened only during daylight hours would control the entrance to the proposed beach accessway. In addition, to provide security, a chainlink fence would be constructed from the beach entrance gate up the backshore bluff and into the dense trees and shrubs along the exposed slope.

Beach Overlook and Access Path

The Beach Overlook and Access Path alternative essentially terminates the Beach Access Path alternative near Station 5+74.5 and provides a 10-foot by 10-foot timber decked overlook structure with benches and guardrails. The access pathway extends from the parking lot approximately 600 feet, terminating at the top of a steep but low bluff. From this location views of the Pacific Ocean are available (See attached plan layout Sheet 2).

Alternatives Analysis

West Parking Lot

The West Parking Lot alternative is the recommended parking lot alternative due to favorable existing grades and minimal engineering, environmental and permitting concerns.

East Parking Lot

The East Parking Lot alternative was analyzed with different construction options considered, including: a cantilevered deck supported by concrete piles and beams; compacted fill retained by a tied-back vertical concrete retaining wall; and filling the head of the ravine with compacted fill. The East Parking Lot alternative is not recommended at this time due to potential terrain, habitat, soils and related environmental and construction impacts from land alterations required to site the parking lot extension at the head of the ravine.

Beach Access Path

The Beach Access Path alternative is the recommended access path alternative due to the feasibility of obtaining complete access to the sandy beach from the parking lot.

Beach Overlook and Access Path

The Beach Overlook and Access Path alternative is not recommended at this time due to the stated goal of providing public access to the sandy beach, but remains a feasible and viable design alternative.

CONSTRUCTION CONSTRAINTS

Access

The parking lot easement area provides no particular access problems or significant construction constraints. Since the parking lot is adjacent to Pacific Coast Highway, care will be required in delivering materials and equipment, and in parking construction-related vehicles along the highway shoulder. Flagmen and traffic control may be required at times during construction activities. It may be advisable or required (via permits) to consult with appropriate traffic authorities, such as CalTrans or the Malibu City Police, concerning safe mobilization of equipment and/or materials at the site. Typical construction equipment, materials and methods are envisioned to be used to install the proposed parking facilities.

However, construction of the 10-foot wide beach access easement does present certain challenges and constraints. The 10-foot wide easement can be accessed from Pacific Coast Highway and from the public beach. Existing steeply sloping terrain within and adjacent to the 10-foot wide easement will restrict equipment access over a significant portion of the easement.

Construction Techniques

Actual construction methods and equipment will be left to the contractor to propose prior to construction. Certain limitations can be defined in the contract documents, such as noise levels, clearances, weight limits, etc., in response to permit conditions, environmental concerns and protection of existing developments. However, it is envisioned that standard but small construction equipment and machinery and hand labor would likely be used to develop the beach access path from Station 0+29.01 to the proposed overlook near Station 5+74.5.

From the overlook near Station 5+74.5 down to the sandy beach, portable hydraulic drilling equipment and hand labor is likely to be used to construct aluminum bridge and stairway foundations. Pre-fabricated aluminum bridge and stairway sections could be transported and set on foundations by helicopters. In addition, some materials, such as concrete for foundations, may be transported by helicopter.

Construction Sequencing

Actual sequencing of construction activities will be left to the contractor to propose prior to construction. Constraints can be included in the contract documents that would limit the contractors activities in response to requirements such as permit conditions, environmental concerns and protection of existing developments. It is possible that a contractor could construct the parking lot and the first 600 lineal feet of pathway by operating from Pacific Coast Highway toward the beach. That segment of the proposed accessway spanning the east facing ravine slope would possibly be constructed by mobilizing equipment and materials from the sandy beach.

Existing Development Protection

The contractor may require temporary access to adjacent property outside of the 10-foot wide vertical easement. When operating outside of the easement, the contractor will need to minimize the impact of his operations and equipment on existing developments. The contract documents will contain appropriate language and requirements that will insure the contractor's actions will minimize impacts on adjacent property and that any potential repairs will be made to the satisfaction of and at no cost to the Coastal Conservancy.

ESTIMATE OF PROBABLE CONSTRUCTION COST

Based on conceptual design elements, assumptions, layouts and construction constraints previously discussed, an estimate of probable construction cost was prepared for the proposed alternative. Appendix B presents the results of the estimate of probable construction cost broken down by the various segments of the proposed public beach access facility. Table II presents a summary construction budget based on the estimate of probable construction cost.

TABLE II

Summary Construction Budget

Cost Element	Cost (1998 Dollars)
1. Mobilization	$25,000 to $40,000
2. Parking Lot	$40,000 to $50,000
3. Access Path	$50,000 to $60,000
4. Timber Ramps, Landings & Stairs	$80,000 to $90,000
5. Aluminum Bridge & Stairs	$265,000 to $280,000
6. General Requirements (5 – 7.5%)	$25,000 to $35,000
7. Engineering & Administration (8 – 10%)	$35,000 to $45,000
Construction Budget Subtotal	**$520,000 to $600,000**

a The estimated construction budget does not include a contingency or an allowance for variations in general economic and bidding conditions. These variations may be on the order of ±15%, making the estimated total construction budget range from approximately $440,000 to $690,000. In addition, the estimated construction budget does not include any additional special studies, such as geotechnical subsurface investigations (borings) or soil testing, nor does it include necessary CEQA environmental review, permits and requirements.

b The probable cost of constructing the public access easement up to and including the overlook facility is estimated to be approximately $200,000.

c A preliminary estimate of the additional construction cost that may be realized if, for whatever reason, construction equipment were not allowed to operate outside of the public access easement was made. The majority of the additional costs would likely be associated with the development of the public access facilities adjacent to the steep ravine slopes where hand labor, additional helicopter support and less efficient construction techniques may be required to construct the foundations for the aluminum bridge and stairway components. It was judged that an additional construction cost of approximately $40,000 to $60,000 might be experienced if equipment were not allowed to operate outside of the 10-foot wide public access easement.

CONCLUSIONS

A. It is feasible to construct a public beach accessway and related off-street parking lot at 27910-27920 Pacific Coast Highway, considering existing site topography, geology and limited site access for mobilization and construction.

B. The conceptual design of the beach accessway is proposed to be constructed from the following design elements:

   1. At-grade decomposed granite pathways; (2) timber ramp structures to span minor grade changes;
   2. Minimal cut and fill areas with supporting timber retaining walls;
   3. Timber stairway and landing structures to traverse moderate grade changes; and
   4. Aluminum bridge and stairway structures to span steep ravine slopes.

C. Development of the proposed public beach access facility is estimated to have a construction cost of approximately $520,000 to $600,000 (in 1998 dollars).

D. Alternative conceptual design elements analyzed in this report included a larger parking lot extending east into an existing ravine (East Parking Lot Alternative), and development of a shorter beach overlook access facility.

   1. Due to geologic concerns regarding existing fill, the East Parking Lot Alternative was not deemed feasible.
   2. The shorter Beach Overlook and Access Path alternative is not recommended at this time due to the stated goal of providing public access to the sandy beach, but remains a feasible and viable design alternative.

Appendix A
Geology Report

Robertson Geotechnical Inc.

PRELIMINARY ENGINEERING GEOLOGIC EVALUATION
Malibu Public Beach Access
Concept Study for California State Coastal Conservancy
Vicinity of 27900 and 27920 Pacific Coast Highway
Malibu, California

For

Charles I. Rauw
Consulting Engineers

2256RALA.668 October 30, 1998

Rauw Job No. 57822

2500 Townsgate Road, Suite E, Westlake Village, CA 91361 (805) 373-0057 (818) 991-6367

Robertson Geotechnical Inc.

2256RALA.668
October 30, 1998

Charles I. Rauw
Consulting Engineers
1505 Ortega Drive
Martinez, California 94553

Subject: Preliminary Engineering Geologic Evaluation, Malibu Public Beach Access, Concept Study for California State Coastal Conservancy, Vicinity of 27900 and 27920 Pacific Coast Highway, Malibu, California

Rauw Job No. 57822

Dear Mr. Rauw:

The following report has been prepared at your request and follows site visits and reconnaissance geologic mapping along the public beach access easement across the Chiate and Wildman properties in Malibu. The initial visit was performed on May 14, 1997 in your presence and the presence of Marc Beyeler, Coastal Conservancy, Allan Abshez, Attorney for Mr. Mancuso, Jonathan Horn, Attorney for Mr. Wildman, and Gary Hyden, Landscape Architect. A brief reconnaissance of the easement was made by the group. Geologic mapping was then performed on July 10, 1998 by the undersigned Engineering Geologist. Aerial photographs were viewed. Records at the City of Malibu Department of Building and Safety and in-house documents were researched. The scope of the exploration is limited to the area explored which is shown on the enclosed Geologic Map and Sections. The purpose of our site visits and research was to visually evaluate the geologic conditions along the beach access easement and offer preliminary advice on the construction of the public beach access as an aid in planning. Preliminary findings were discussed with you on October 16, 1998.

Geologic data are plotted on the enclosed Geologic Map, Sheets 1 through 3. The topographic map prepared on the Chiate/Wildman properties by Charles I. Rauw (June 7, 1998) was used as a base. The estimated subsurface distribution of the earth materials and projected geologic structure are shown on Sections A through F. Section A has been

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drawn along the access easement down to the beach. The site is located on the enclosed Regional Geologic Map. Documents reviewed are shown on the enclosed Reference List.

A visual geologic observation does not constitute an investigation or involve subsurface exploration, but is a limited evaluation of geologic conditions of the site as a result of our review of designated documents and our observation of the condition of the site on the dates indicated.

PROPOSED BEACH ACCESS PATHWAY

Plans for the proposed coastal access have not been formally prepared. The scheme for the access path was provided by Mr. Rauw. The concept for the beach access is to utilize minimal grading to extend a foot path from a parking area adjacent to Pacific Coast Highway down to the beach. The pathway surface will utilize gravel or decompose granite. Where necessary, treated timbers will be used for steps and small walls. Wood stairways are planned where the pathway extends over steep slopes. Timber piles supports may be placed in predrilled holes and surrounded in concrete. The pathway is to extend across the east facing slope. Ravines and steep slopes will necessitate utilizing a bridge for this portion of the access. Deepened footings are planned for support of the bridge. The bridge would either be constructed of wood or prefabricated metal. A stairway will then extend over the slope and down to the beach. Some type of pile system may be used to support the end of the stairway so as to minimize the impact of wave attack and sand scour on the stability of the stairway. Preliminary plans have not been prepared and await the conclusions and recommendations of this report.

SITE CONDITIONS

The public beach access easement crosses the development Chiate and Wildman properties which exist south of Pacific Coast Highway, east of its intersection with Winding Way, in the City of Malibu, Los Angeles County, California. Past grading is associated with the residential development of coastal bluff properties and has consisted of cutting and filling for driveway accesses, building areas and landscaping. Vegetation on the

developed portions of the properties consists of domestic trees, shrubs, and grasses. Some native vegetation exists on undeveloped portions of the sites. Developed residential sites exist on adjoining properties at a distance to the north, east and west. The Pacific Ocean exists to the south.

The northern portion of the easement extends from Pacific Coast Highway across the entry area to the Wildman property. Landscaped mounds supporting grasses, trees, palm trees and shrubs border either side of the stamped concrete driveway extending from Pacific Coast Highway east and then south onto the Wildman property. Wrought iron fencing encloses the sites with security gates existing across the fronts of the properties. A trash can enclosure area surrounded by wrought iron fencing exists near the highway. Some cracking and irregularities exist in the stamped concrete driveway to the Wildman house.

A wrought iron fence exists on the south side of the entry landscaping area and surrounds nearly level to gently southeast sloping lawn. The driveway to the Chiate site to the west exists south of the wrought iron fencing. A densely vegetated, shallow slope descends south to this driveway access.

The easement area trends from the Wildman security gate south-southeast diagonally across the lawn. The easement then extends over an east facing slope which descends towards the Wildman driveway. This slope supports trees and domestic shrubs. A moderate to steep slope descends below the east side of the driveway to the south trending canyon below. The slope supports dense ground cover with some well established trees and shrubs. The slope is relatively uniform.

The easement then turns and trends south inside the wrought iron fence along the property line between Wildman and Chiate. This area includes an east facing slope supporting dense ground cover with some shrubs. The easement continues along the wrought iron fence between the two properties. The fence is locally irregular and distorted downhill to the east. This may be due to pressure from well established plants growing through the fence. A shallow wood wall supported by pipe exists on the outside edge of the driveway of the Chiate property to the west of the wrought iron fence. The

stamped concrete driveway extends down to the Wildman carport. The easement exists west of the motor court at the end of the Wildman driveway. The motor court exhibits some cracking.

The easement extends across the east side of the motor court on the Chiate property. Here, concrete panels separated by exposed aggregate strips form the concrete motor court at the end of the Chiate driveway. Then the concrete descends between the house and the wrought iron fence in a southerly direction. Some cracking exists in the concrete panels. The driveway on the Chiate property includes a poured concrete retaining section along the east, downslope edge along the wrought iron fence. This wall likely retains fill existing beneath the driveway. The concrete driveway narrows where it extends along the central and southern portion of the Chiate house. The driveway is bordered on the outside edge by dense trees and shrubs. A gazebo exists on the lawn grasses on the south side of the driveway. The concrete descends down to a narrow asphalt road which turns west and descends over the slope to a parking area along the beach below.

Shrubs border the apparent property line and along the slope descending down to the Wildman lawn. The toe of the slope is retained by a shallow, stucco covered wall along the Wildman property. The wall exists adjacent to a planter bordering the irregular lawn and a small putting green. The easement area trends along the west side of the putting green on the Wildman property and over the south and east facing slopes. Evidence of burrowing rodents exists in the lawn. The densely vegetated slope then descends south to a lower grass covered terrace.

The easement extends across the moderate to steep, east facing slope descending down to the canyon below. Slope gradients vary from nearly vertical to as flat as 2:1 and support dense, well established native tree, shrub and grasses. Very steep slopes adjacent to the canyon axis are devoid of vegetation or support sparse vegetation on the upper portions. The easement then extends out to very gentle terrain and the active beach. The easement exists east of the parking area and a fill slope descending to the sandy beach. Beach sand then extends out to the Pacific Ocean. The axis of the canyon to the

east includes a pathway extending north from the beach. The pathway includes some stepping stones. Steep canyon walls exist on either side of the pathway. Low concrete walls locally create a channel along the canyon axis. Water was flowing in the canyon at the time of the site visit.

DRAINAGE CONDITIONS

Drainage along the coastal access easement is by sheet flow over the existing contour of the land. Drainage locally ponds in planters or sheet flows over slopes to access roads or natural drainages. The general flow is east to the canyon and south towards the beach. Existing topography locally concentrates drainage in ravines and swales. Some drainage control devices locally exist around improvements but were not evaluated in detail. A culvert and 36 inch metal pipe may have been extended to the canyon axis for drainage of 27930 Pacific Coast Highway (Cahill-Leese, 1980). The existing driveway down the beach locally controls drainage. A drain grate exists at the base of the asphalt access road. The drain grate is discharged into a corrugated metal pipe which appears to trend east over the descending slope.

Water was flowing in the canyon east and below the Wildman property. Water flowed to the neighbor's patio at the mouth of the canyon where it infiltrated. Drainage on the beach infiltrates the sand. High flows can be expected in this canyon during and following periods of intense rainfall. Evidence of high flows includes scour on the canyon walls. Scour suggests flows may be on the order of 2 to 3 foot deep near the mouth of the canyon. Concrete walls exist along the central portion of the canyon. A corrugate metal drainpipe outlets through the face of the concrete wall into the mouth of the canyon. Water was flowing through the drainpipe at the time at the time of the site. The inlet for this pipe is not known.

Drainage from Pacific Coast Highway is partially collected in an 8 inch diameter, corrugated metal pipe culvert existing on the south edge of the pavement. The survey by Rauw (June 1998) suggests drainage outlets to the head of the canyon. A 24 inch diameter corrugated metal pipe is also shown outletting into the canyon at the toe of the

fill slope below Pacific Coast Highway. This may be a drainage device for a storm drain system on the north side of the highway. The inlet for the drain pipes were not evaluated.

RESEARCH

Records at the City of Malibu Building Department were researched relative to development of the residential sites adjacent to and in the vicinity of the coastal access easement. The residence at 27910 Pacific Coast Highway was based on geotechnical studies by Tierra Tech (1980-1982). The residence at 27920 Pacific Coast Highway was based on geotechnical studies by Tierra Tech (1986-1988) and Westland (1987, 1988). Improvements at 27930 Pacific Coast Highway were based on studies by Lockwood-Singh (1982-1983), Tierra Tech (1990-1991) and Geolabs-Westlake Village (1994-1996). Investigations were based on shallow and deep borings and backhoe test pits. Reports included the result of laboratory testing. The exploration and laboratory testing with the basis for providing recommendations for development on the various properties. Reports also discuss observations during grading on the sites.

In general, investigators determined that the upper, higher elevations nearest Pacific Coast Highway were underlain by terrace deposits. The terrace was described as being anywhere from 8½ to 15 feet thick and overlying Monterey Formation. Terrace was described as reddish brown sand with gravel and was generally mapped at elevations above 115 to 120. Bedrock underlying the properties was described as sandstone with volcanic gravel, shale, diatomaceous siltstone and sandstone and occasional siliceous tiffacious and clayey siltstone included in the Monterey Formation. Rock was generally weathered and poorly bedded. Bedding was mapped as being undulating in the southern portions of the properties and east to northeast dipping in the central and northern portions. Faults, folds or landslides were not described by investigators. Terrace and bedrock were blanketed by 1 to 8 feet of soil/colluvium which was described as mixtures of sand, silt and clay that were variable dense. Ground water was not described on the sites by the investigators.

GEOLOGIC CONDITIONS

Fill

Different generations of fill exist along the easement. Fill is associated with Pacific Coast Highway and site developments.

A large fill deposit exists at the upper end of the canyon and extends across Pacific Coast Highway. Fill was placed within the canyon to create the highway. The fill mass extends across the Pacific Coast Highway to the canyon axis on the north side. Based on the age of the highway, fill is not compacted. Fill may consist of a variety of material including rubble and debris. Fill has been subject to settlement as evidenced by the depression in the street pavement across the canyon access. The highway canyon fill may be on the order of 25 to 35 feet deep

Landscape mounds on either side of the access driveway near Pacific Coast Highway are postulated to be underlain by fill. Fill was likely generated from surrounding terrace materials. Fill depth may be on the order of 6 to 8 feet at the area of the mounds. Fill exists below the landscaping mound on the east side of the upper portion of the Chiate driveway. The fill extends down to the wrought iron fence along the property line that borders the east side of the upper portion of the easement. The toe of the fill is approximated by the break in slope along the wrought iron fence. Fill exists underlying the landscaped mound at the end of the Wildman driveway and appears to blanket shale bedrock. Fill also exists on the downslope edge of the Wildman driveway.

Minor fill likely blankets all developed and landscaped areas. Fill within the landscaping areas is estimated to be on the order of 1 to 3 feet deep and is likely associated with past construction of planters, grade modifications and landscaping.

Fill exists in the area of the putting green on the Wildman property. Fill exists over the south and east facing slopes descending below the putting green. Burrowing rodents exist within the fill on the south facing slope. Cahill-Leese (1980) shows uncompacted fill to have been placed over a metal drainpipe placed in a ravine extending down to the

canyon. Uncompacted fill may be 10 to 20 feet deep. This fill exists south of the Wildman and Chiate sites. Fill exists at the head of the ravine below the satellite dish along the southern portion of the easement. Fill likely exists over soil/colluvium which may be relatively thick within this draw.

Fill likely exists along the path within the canyon axis. The level pad at the end of the asphalt access road is underlain by fill. Fill may be on the order of 5 feet high and consists of sandy silt with shale fragments. Fill has been placed over beach sand.

Soil/Colluvium

Soil/colluvium blankets the upper portion of the east facing slope. Soil/colluvium typically consists of dark brown to black silty clay and clayey silt with rock fragments that is expansive, moist, variably dense, and subject to consolidation. The soil/colluvium thickens in swales crossing the east facing slope. Colluvium also thickens near the toe of the slope by the beach, grading to talus.

Terrace

Alluvial terrace underlies the more gentle, upper portions of the properties. The terrace typically consists of reddish brown silty sand and sand with gravel. The terrace may be on the order of 8 to 15 feet thick capping the gentle ridgecrest in the higher elevations of the property.

Beach Deposits

Beach deposits underlie the southern portion of the easement along the active beach. Medium to coarse-grained sand is common near the surface with cobbles and boulders in the sand at depth. The sand thickness is variable and subject to scour and migration.

Bedrock

Bedrock underlying site includes siltstone, sandy, silty and diatomaceous shales and sandstone included in the Monterey Formation. Bedrock crops out on the Wildman property above the carport, on steep slopes below the gazebo, and along the asphalt beach access road on the Chiate property. Bedrock is also well exposed on the steep slopes in the canyon. The rock is tan to buff to light brown to white, fractured, broken, moderately hard to hard, and massive to poorly bedded. The rock exposed on steep canyon slopes is very fractured to intensely fractured, massive and locally well jointed.

GEOLOGIC STRUCTURE

Regional mapping (Campbell, and others, 1970) shows bedding in the vicinity of the site dipping to the north, northeast and east at 15 to 60 degrees. South dipping bedding is mapped at a distance to the northeast with tightly folded and overturned bedding mapped to the southwest. Dibblee (1993) maps bedding in the vicinity of the site dipping to the northwest and northeast at 40 to 60 degrees. Shallow east dipping bedding is mapped to the northwest.

Bedding is shown to be locally overturned and contorted in the vicinity of faulting. Faulting is not mapped crossing the property by Campbell (1970) or Dibblee (1993). The Malibu Coast fault is mapped north of the site. Faulting is mapped extending offshore southwest of the property. Active faults do not cross the site.

SLOPE STABILITY

Coastal bluffs in the Malibu area are subject to creep, erosion and instability. The south facing coastal bluffs and steep canyon walls of tributary canyons are especially vulnerable to instability. Bluff retreat is typically on the order of 6 inches per year and occurs as minor erosion and ravelling and catastrophic slump and translation slides. Landslides are not mapped on the site by Dibblee (1993) or Campbell (1970). Slides are mapped on the coastal bluff to the east and west. Obvious active slides were not observed in the vicinity of the coastal access easement. A slide exists on the lower portion

of the asphalt beach access road on the offsite property to the west. Slumping may also exist on canyon flanks.

Possible slump debris was exposed in the axis of the canyon north and upstream of the culvert below the lower pad, south and below the putting green on the Wildman property. The material consists of fractured and broken mudstone that exhibits open structure and random orientation.

The steep slopes on the west side of the canyon axis below the southeastern portion of the Wildman property are subject to instability. Ravelling and rock falls along steep joint planes can be expected. Erosion within the canyon during high flows can aggravate slope instability. The risk of instability is a function of the orientation of fracture and joint planes within the bedrock, the height and steepness of the slope, and the degree of weathering of the rock. Higher and steeper slopes are more vulnerable to instability and long term deterioration. Improvements planned over or above the steep canyon walls should include deepened foundations.

CONCLUSIONS AND RECOMMENDATIONS

General Findings

The coastal access easement crosses a variety of geologic conditions. Fill placed to construct Pacific Coast Highway across the canyon east of the easement exists adjacent to the highway. Fill may be on the order of 25 to 35 feet deep and is not compacted. Fill associated with past site developments and landscaping exists in the vicinity of the pathway. Compacted fill was placed on sites around building areas for residential developments. Uncompacted fill exists along roadways, pathways, in garden areas and landscaping mounds in the vicinity of the access easement. Deep uncompacted fill exists across the south-central portion of the easement and is associated with filling over a drainpipe placed in a ravine.

The natural terrain is blanketed by a variably dense soil/colluvium. Exploration by others describe soil/colluvium ranging from 1 to as much 8½ feet thick. Deeper soil/colluvium likely exists within swales and ravines cross the descending hillside. Fill and soil/colluvium are subject to creep, erosion and surficial instability. The risk of settlement and surficial instability should be considered when planning the pathway to minimize the risk on the long term performance. Soils/colluvium thickens near the southern edge of the slope where it transitions with the beach deposits. Beach sand exists in the southern portion of the site. The sand thickness is variable and subject to periodic scour and migration. Cobbles and boulders typically exist near the lower portion of the sand and armor. The gentle seaward sloping bedrock platform.

The upper portion of the site where terrain is gentle near Pacific Coast Highway is underlain by alluvial terrace typical for the area. The terrace commonly consists of moderately consolidated to well consolidated silty sand, clayey sand and sand with gravel. Portions of the terrace and soil/colluvium have been tested by others to be expansive. This should be considered in the design of concrete slabs and walkways.

Bedrock underlying the area of the easement consists of diatomaceous siltstone with occasional siliceous and clayey shales. The rock is weathered being somewhat soft and punky, grading moderately hard to hard with depth. The rock is locally fractured to very fractured and jointed. Bedding is poorly defined. Where observed, bedding generally dips to the north and east at moderate to steep angles. Exploration by others describes folding of the bedrock near the southern portion of the easement. Folding may be associated with regional faulting. Active faults do not cross the easement area.

The intersection of fracture planes, joint planes and bedding can result in blocks subject to ravelling and rock falls on steep slopes. Steep slopes along the canyon axis are subject to instability which should be considered in the design of the access path where it crosses the east facing slope along the southern portion of the easement. Obvious landslides were not observed along the beach access easement. Some areas of slumping and surficial instability were observed on slopes above the canyon and along the existing

asphalt roadway extending down to the beach parking area. Landslides on steep coastal bluffs are common and have been mapped east and west of the site.

Drainage along the beach access easement is generally by sheet flow over the existing contour of the land. Improvements, access roads and pathways locally influence the drainage flow. An assessment of site drainage on the developments adjacent to the beach access was not performed. Drainage from the highway is directed to the canyon east of the access easement. Another drainpipe for the Chiate site may cross the south-central portion of the easement and outlet to the canyon axis. Water was flowing in the canyon axis at the time of the reconnaissance mapping. Considerable flows can be anticipated as suggested by scour on canyon walls.

Subsurface exploration by others did not describe ground water. Ground water is known to accumulate at the base of the terrace and within fractures in the bedrock. Fluctuations in the level of ground water may occur due to variations in rainfall, temperature, and other factors not evident at the time of the observations reported herein. Fluctuations also may occur across the site. High ground water levels can be extremely hazardous.

Planning Advice

The following items should be considered when planning the beach access pathway. Additional advice can be presented after a specific plan has been developed.

1. Grading for the access path should be minimized. Additional fill should not be placed over slopes unless it is properly compacted onto stable bedrock. Cut slopes and fill slopes should be planned at 2:1 gradients. Due to the steepness of existing slopes, the use of grading to generate the pathway may be limited.

2. Fill and soil/colluvium are subject to creep, erosion and surficial instability. This can impact the long term performance of ridged materials such as concrete if used for the pathways. A more flexible material that can tolerate movement and allow for economical adjustments is recommended. Wood pathways and walls are suggests as

they may be able to remain functional, although distorted by settlement and slope creep. Good drainage control along the pathway can minimize the impact of erosion and surficial instability.

3. If timbers are utilized for support of pathway walls and stairways, they should extend well into firm bedrock. The depth into bedrock should be based on the base of surficial materials. A minimum of 3 foot penetration is recommended for penetration of timber piles planned to be backfilled with concrete. Deeper penetration would be recommended along steep slopes.

4. Where the easement extends obliquely across the very steep, east facing slope, it will be necessary to utilize some type of deepened footing for support of a bridge for the access path. Twenty-four inch diameter friction piles founded in the bedrock are recommended for support of the bridge structures extending across the east facing slope and over ravines along the southern portion of the access easement. The depth of the foundation support should consider the steep slope descending into the canyon. For preliminary planning, it is recommended that footings for the pathway across the steep canyon flank be founded a minimum of 8 feet below a 1½:1 plane projected up from the canyon axis. The 1½:1 Setback Plane is shown graphically on the enclosed Sections. Portions of the foundation extending above the 1½:1 plane will be subject to lateral loading due to creep forces. This should be considered in the design of these foundations. Design parameters for friction piles should be based on additional exploration.

5. The proposed parking area planned adjacent to Pacific Coast Highway may extend within an area of existing landscaping, fill and the highway canyon fill. Construction of the parking area would require adding fill over the existing fill slope. Significant grading would be needed to properly key the toe of the fill slope into bedrock or dense terrace. The fill slope extension may need to be designed as a buttress with adequate backdrains to support the existing face of the uncompacted highway fill slope. The grading will result in loss of existing trees and landscaping on the slope. For purposes of preliminary design, the additional fill can be planned at a 2:1 slope gradient. Prior to

adding fill, it will be necessary to rehabilitate the storm drain outlets extending through the existing slope. The existing storm drain should be verified to be water tight. Any deterioration should be treated by adequate relining of pipes prior to extending the fill slope for a parking area. If the parking area is to be supported by a retaining wall, it may be necessary to utilize soldier piles for support of the additional fill. Additional exploration is recommended prior to providing advice for a pile supported retaining wall for the parking area.

6. The beach sand at the southern end of the access easement is subject to scour and migration. High surf can be expected to impact the base of the stairway extending down to the beach. If a pile is utilized for support of the end of the stairway, it should be founded in bedrock below anticipated scour. The stair design should consider wave impact and uprush.

7. Maintenance of the pathway can be expected due to the nature of the construction and the variety of geologic terrain over which it extends. The need for maintenance should be considered in the design of the system. Good drainage control along the pathway can help minimize the maintenance requirement.

Additional Exploration

Subsurface exploration is recommended prior to completion of formal plans. The scope of the additional exploration should be based on the preliminary plan. Exploration is recommended in areas of proposed bridge foundations and where footings or walls will be required to facilitate the beach access. Exploration is recommended near the south end of the easement where piles are planned for support of the stairway extending to the beach. Exploration can be performed utilizing hand labor, a drill rig, and a portable drill rig. Excavations would be placed in areas of proposed footings, along the top of the steep slope, on the slope, behind retaining walls and at the beach to evaluate foundation soils, fill conditions, expansion potential, slope stability and ground water. Samples would be collected from the exploratory excavations and returned to the laboratory for testing

and analysis. The results would be used to further evaluate the proposed path and design advice.

Drainage Control

Drainage control is imperative for stability of the path. A comprehensive drainage plan should be prepared by a qualified design professional. Parking area, slope, path and stairway drainage should be positively collected and transferred to the street, storm drain, canyon axis, or natural drainage course, in non erosive drainage devices. Drainage should not be allowed to pond on the path or adjacent to any foundation or wall or sheet flow over any descending slope. Drainage should not be discharged on slopes. Dry wells are not recommended.

Drainage swales and area drains should be provided and improved as necessary. Existing drainage channels should be maintained free of debris and vegetation. Cracks in paved surfaces should be sealed to limit infiltration of surface waters. Slopes should be provided with low maintenance, native, erosion control vegetation. Planters located adjacent to the walls or foundations should be eliminated or sealed and properly drained. Drainage from the street, ascending slopes, offsite property, and existing drainage and/or flood control channels should not be permitted to flow onto the path. Upslope flows should be properly directed around the path. Burrowing rodents should be eliminated. All utility lines should be maintained leak free.

The risk of unusual settlement or slope instability can be decreased by proper drainage control and slope maintenance. Pathway drainage devices should be designed so as to not adversely impact homeowner drainage systems. Drainage systems for the access path should be properly maintained. It is the responsibility of the homeowners to maintain their slopes and drainage facilities and improve any deficiencies found during occupancy of their property.

CLOSURE

All properties are subject to some element of risk and the risks can not be eliminated. Properties are subject to hazards including, but not limited to, floods, mudslides, landslides, seepage, erosion, raveling of slopes, concentrated drainage, limited access, differential settlement and heaving and fire. The damage from these hazards can be reduced by the property owner maintaining yard, slopes, walls, slough protection devices and drainage facilities and by correcting any deficiencies found during occupancy of the property. It is not possible to eliminate all hazards.

A visual observation does not utilize subsurface exploration, but relies on the experience and judgment of the engineering geologist to evaluate the performance of the property. Latent defects can be concealed by earth materials and existing improvements and, if such defects are present, they are beyond the evaluation of the geologist. Engineering geology is an inexact science.

This report was prepared on the basis of the proposed plan and the property conditions. In the event of any changes in the plan or condition of the property, as outlined in this report, the conclusions and recommendations contained herein may not be considered valid unless the changes are reviewed by us and our conclusions and recommendations are modified or reaffirmed after such review.

This report is issued and made for your sole use and benefit, and is not transferable. Any liability in connection herewith shall not exceed our fee for the investigation. No warranty, express or implied is made or intended in connection with the above exploration or by the furnishing of this report or by any other oral or written statement.

Thank you for this opportunity to be of service. Please avoid misunderstandings or misinterpretations of this report by calling the undersigned with your questions.

Respectfully submitted:

ROBERTSON GEOTECHNICAL, INC.

HUGH S. ROBERTSON
C.E.G. 1001

CERTIFIED ENGINEERING GEOLOGIST
HUGH S. ROBERTSON
No. 1001
Exp. 2-28-99
GEOLOGIST
STATE OF CALIFORNIA

HSR:td

Enc: Geologic Maps 1, 2 and 3 (three sheets in pocket)
Sections A through F (two sheets in pocket)
Reference List
Regional Geologic Map

xc: (3) Addressee

REFERENCE LIST

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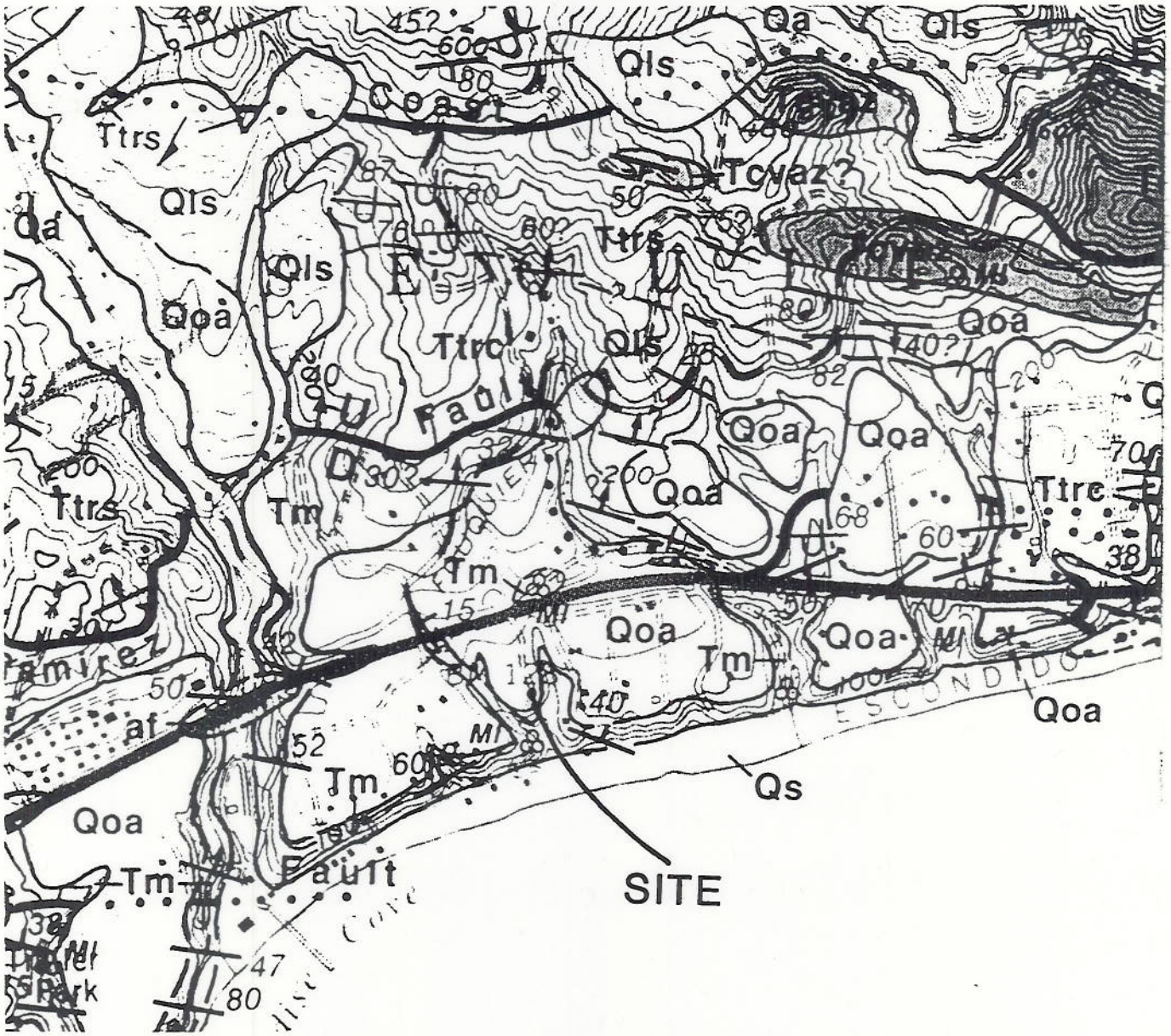
Robertson Geotechnical Inc.

PLATE NO. REGIONAL GEOLOGIC MAP
CLIENT RAUW
JOB NO. 2256RALA.668

REGIONAL GEOLOGIC MAP

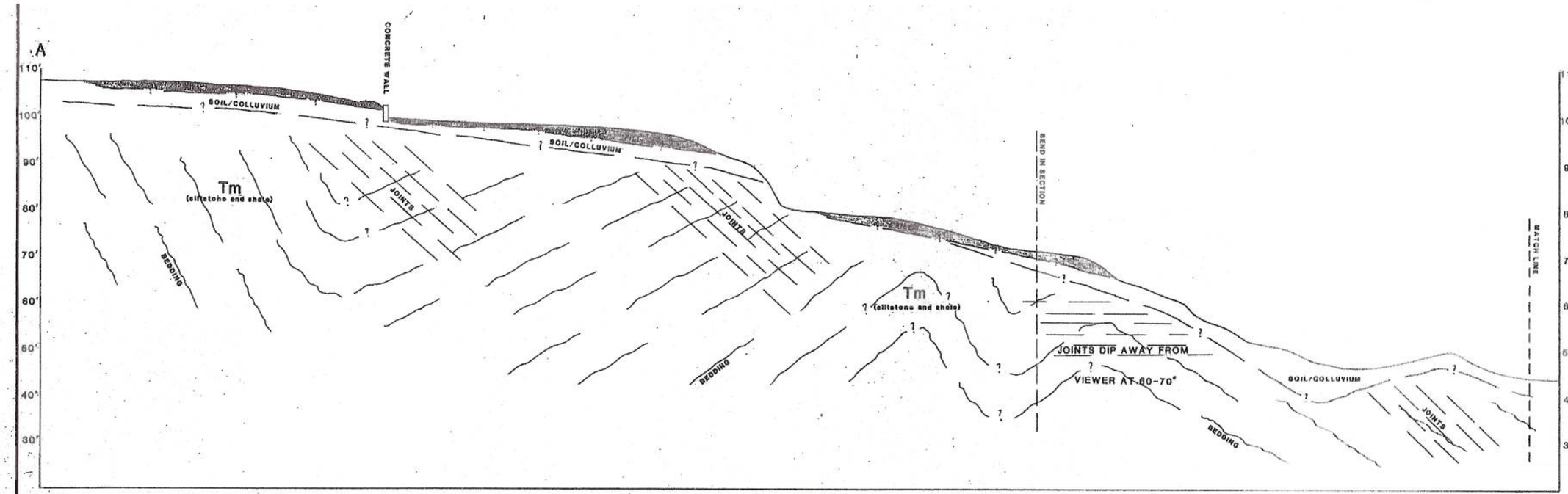
GEOLOGIC MAP OF THE
POINT DUME QUADRANGLE
LOS ANGELES AND VENTURA COUNTIES, CALIFORNIA
Dibblee Geological Foundation Map #DF-48
BY THOMAS W. DIBBLEE, JR.,
AND HELMUT E. EHRENSPECK, 1993



Qs	BEACH SAND		GEOLOGIC CONTACT
Qoa	OLDER ALLUVIUM		FAULT
Tm	MONTEREY FORMATION		MICROFOSSIL LOCALITY
Ml	LATE MIOCENE		
40	BEDDING		

NORTH

SCALE: 1 INCH - 1000 FEET



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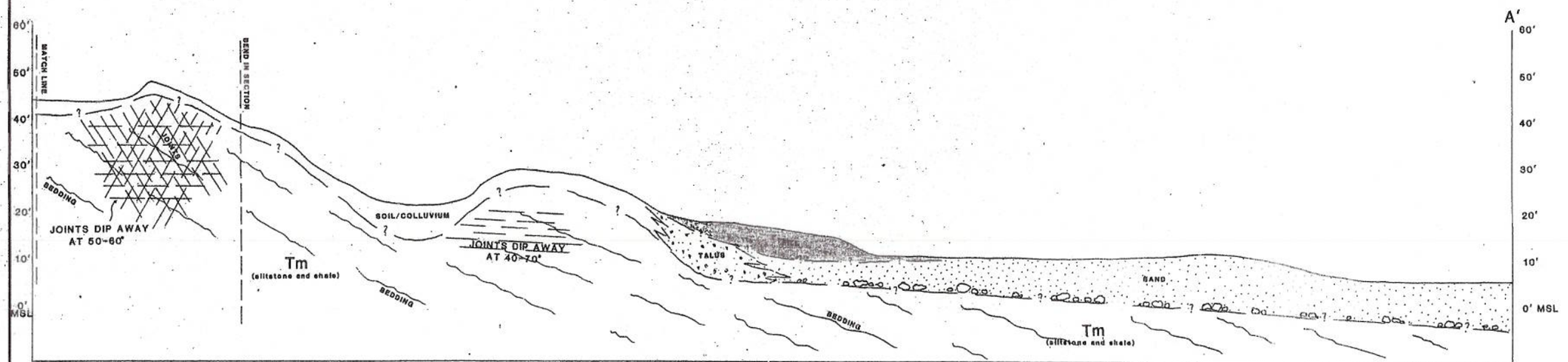


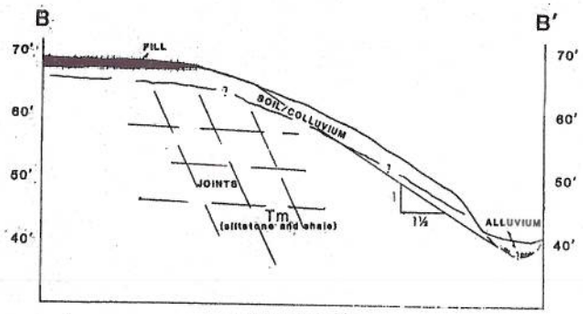
SECTION A

SCALE: 1 INCH = 10 FEET

Robertson Geotechnical Inc.

SECTION A

RAUW 2256RALA.668



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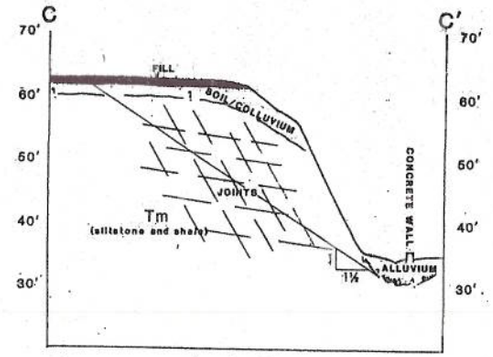

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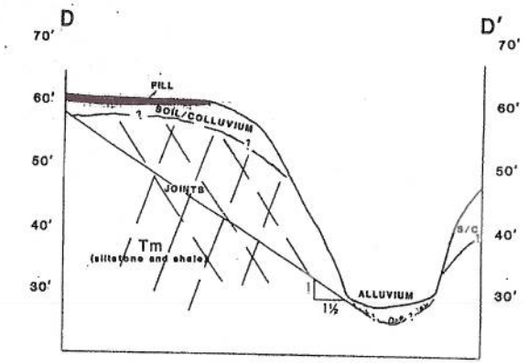

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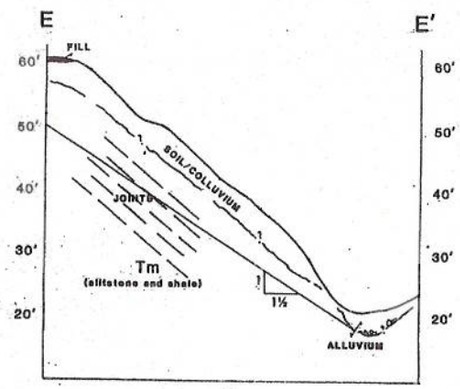

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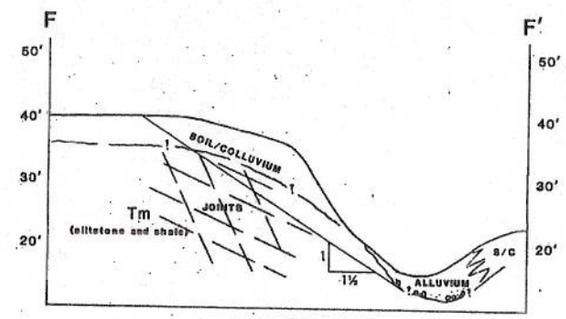


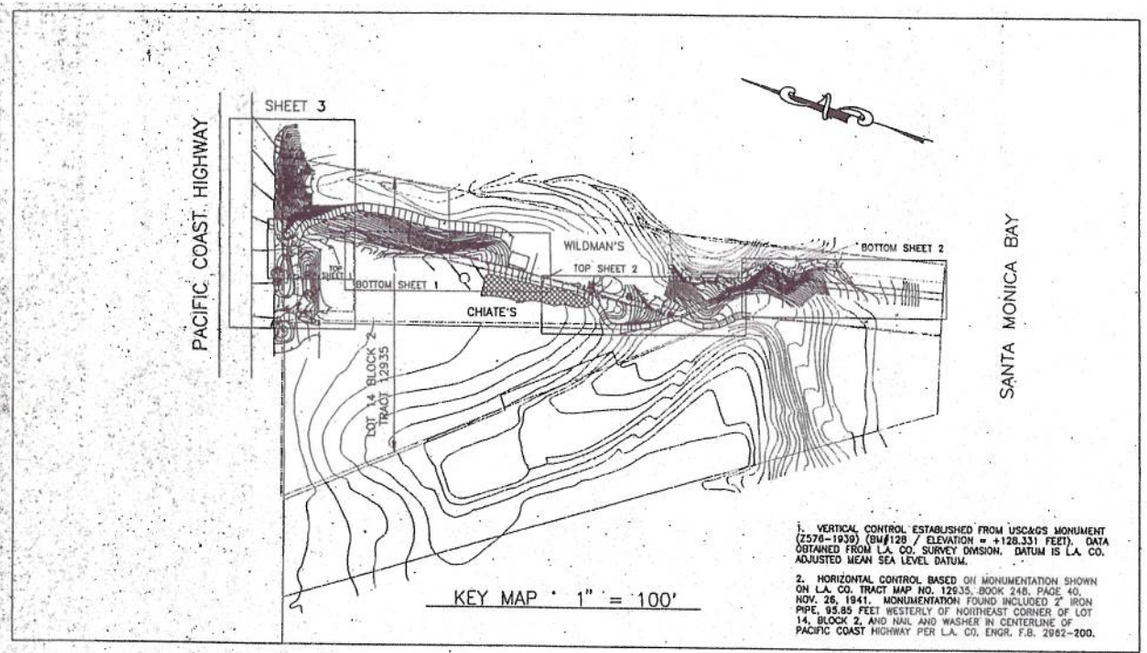
SECTION F

SCALE: 1 INCH = 10 FEET

Robertson Geotechnical Inc.

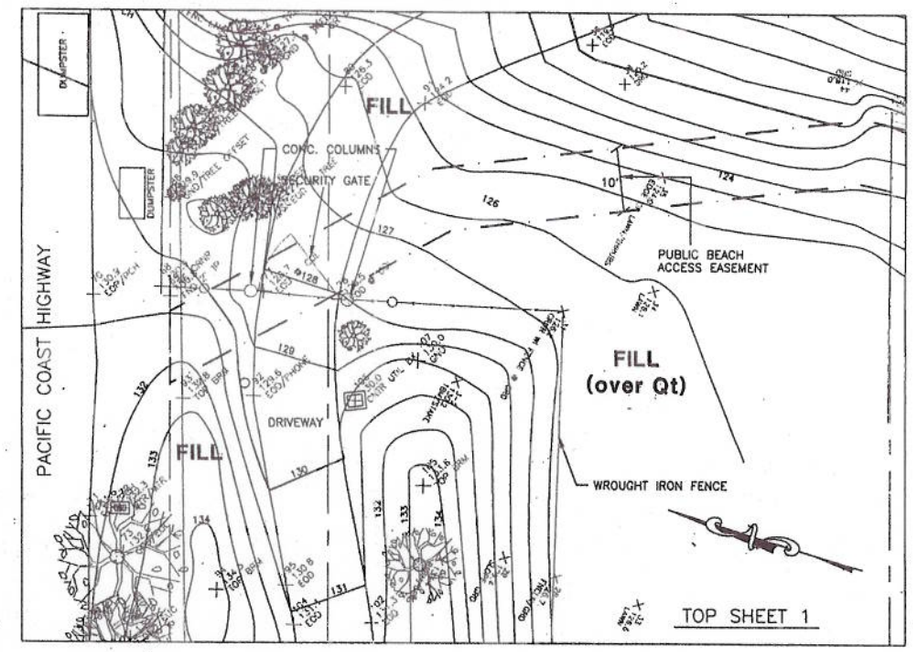
SECTION B,C,D,E,F

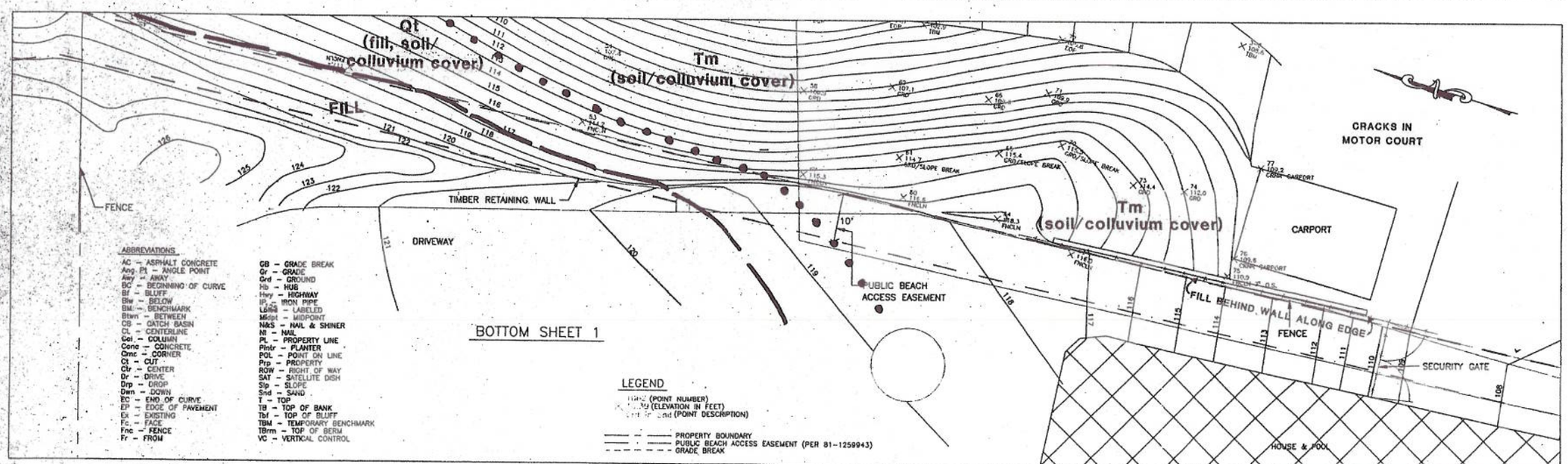
RAUW 2256RALA.668



1. VERTICAL CONTROL ESTABLISHED FROM USC&GS MONUMENT (Z576-1939) (BM#128 / ELEVATION = +128.331 FEET). DATA OBTAINED FROM L.A. CO. SURVEY DIVISION. DATUM IS L.A. CO. ADJUSTED MEAN SEA LEVEL DATUM.

2. HORIZONTAL CONTROL BASED ON MONUMENTATION SHOWN ON L.A. CO. TRACT MAP NO. 12935, BOOK 248, PAGE 40, NOV. 26, 1941. MONUMENTATION FOUND INCLUDED 2" IRON PIPE, 95.85 FEET WESTERLY OF NORTHEAST CORNER OF LOT 14, BLOCK 2, AND NAIL AND WASHER IN CENTERLINE OF PACIFIC COAST HIGHWAY PER L.A. CO. ENGR. F.B. 2962-200.





ABBREVIATIONS

AC – ASPHALT CONCRETE
Ang. Pt – ANGLE POINT
Awy – AWAY
BC – BEGINNING OF CURVE
Bf – BLUFF
Blw – BELOW
BM – BENCHMARK
Btwn – BETWEEN
CB – CATCH BASIN
CL – CENTERLINE
Col – COLUMN
Conc – CONCRETE
Crnr – CORNER
Ct – CUT
Ctr – CENTER
Dr – DRIVE
Drp – DROP
Dwn – DOWN
EC – END OF CURVE
EP – EDGE OF PAVEMENT
Ex – EXISTING
Fc – FACE
Fnc – FENCE
Fr – FROM
GB – GRADE BREAK
Gr – GRADE
Grd – GROUND
Hb – HUB
Hwy – HIGHWAY
IP – IRON PIPE
Lbld – LABELED
Mdpt – MIDPOINT
N&S – NAIL & SHINER
Nl – NAIL
PL – PROPERTY LINE
Pntr – PLANTER
POL – POINT ON LINE
Prp – PROPERTY
ROW – RIGHT OF WAY
SAT – SATELLITE DISH
Slp – SLOPE
Snd – SAND
T – TOP
TB – TOP OF BANK
Tbf – TOP OF BLUFF
TBM – TEMPORARY BENCHMARK
TBrm – TOP OF BERM
VC – VERTICAL CONTROL

LEGEND

(POINT NUMBER)
(ELEVATION IN FEET)
(POINT DESCRIPTION)

PROPERTY BOUNDARY
PUBLIC BEACH ACCESS EASEMENT (PER 81-1259943)
GRADE BREAK

NOTES:

1. PROPERTY & PUBLIC BEACH ACCESS EASEMENT BOUNDARIES ARE SHOWN APPROXIMATELY AND ARE BASED ON L.A. CO. PARCEL MAP NO. 7843 (BOOK 135, PAGE 59), AND DOCUMENT 80-1161952 AS RECORDED IN THE COUNTY OF LOS ANGELES ON 12/11/198
2. SURVEY DOES NOT SHOW ALL STRUCTURES, FEATURES, TREES AND SHRUBS. MUCH OF THE EASEMENT TRAVERSES DENSE SHRUBS, TREES, BRUSH AND STEEP SLOPES.
3. CONTOURS SHOWN ARE IN FEET, REFERENCED TO L.A. COUNTY SURVEY DIVISION ADJUSTED MEAN SEA LEVEL DATUM. DUE TO STEEP SLOPES ALONG EASEMENT, CONTOUR INTERVALS ARE NOT REGULAR.

REGISTERED PROFESSIONAL ENGINEER CHARLES I. RAUW C 33466 Exp. 6/30/99 STATE OF CALIFORNIA

CHARLES I. RAUW
Consulting Engineers 1661 Ortega Drive, Martinez, CA 94553 (925) 229-9037

NO.	DATE	REVISION

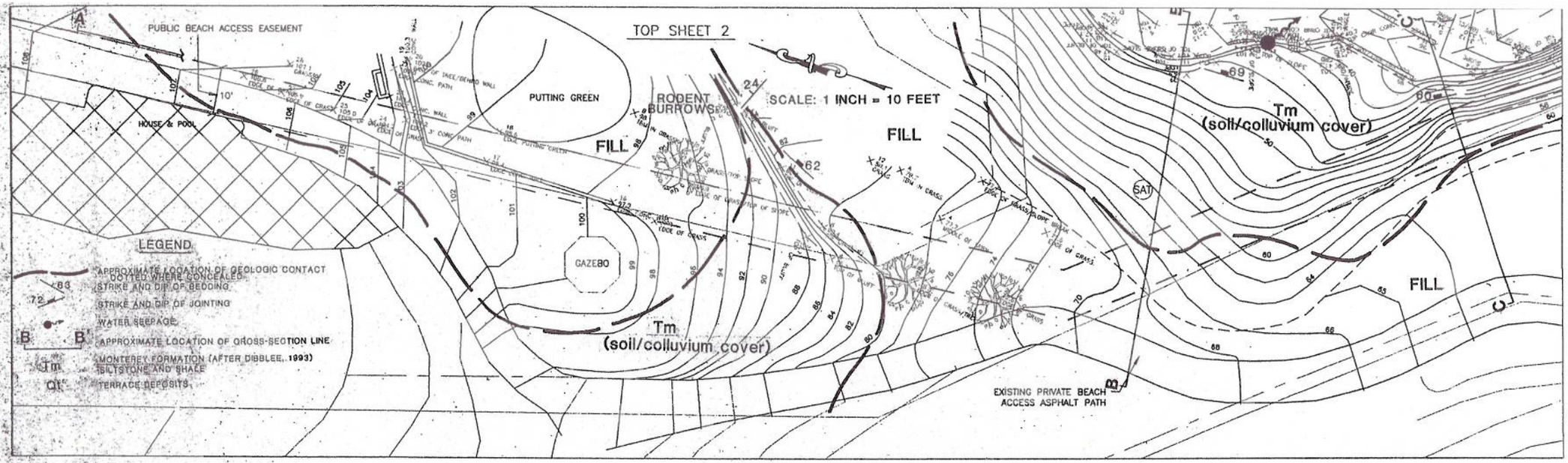
DESIGNER CIR
DRAFTSMAN CIR
CHECKED BY
DR. ENGR.
APPROVED DATE
CALIFORNIA COASTAL CONSERVANCY

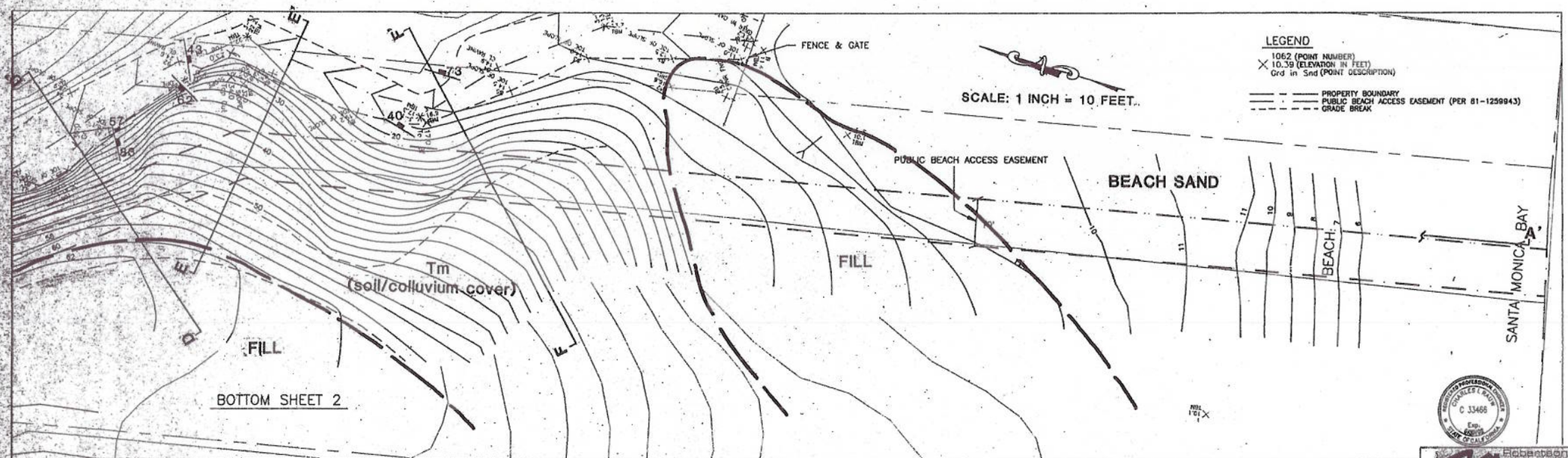
TOPOGRAPHIC SURVEY
CHIATE/WILDMAN PUBLIC ACCESS EASEMENT
CALIFORNIA COASTAL CONSERVANCY
PLAN

SHEET 1 OF 4
JOB NO. 96-10
SCALE 1" = 10' UN
DATE 06-07-98

Robertson Geotechnical Inc.
SEE SHEET 2 FOR LEGEND

GEOLOGIC MAP
SHEET 1
RAUW 2256.RALA.668





NOTES:

1. PROPERTY & PUBLIC BEACH ACCESS EASEMENT BOUNDARIES ARE SHOWN APPROXIMATELY AND ARE BASED ON L.A. CO. PARCEL MAP NO. 7543 (BOOK 135, PAGE 39), AND, DOCUMENT 80-1161952 AS RECORDED IN THE COUNTY OF LOS ANGELES ON 12/11/198
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NO.	DATE	REVISION

DESIGNER CIR
DRAFTSMAN CIR
CHECKED BY
SR. ENGR.

APPROVED DATE
CALIFORNIA COASTAL CONSERVANCY

TOPOGRAPHIC SURVEY
CHIATE/WILDMAN PUBLIC ACCESS EASEMENT
CALIFORNIA COASTAL CONSERVANCY
PLAN

SHEET 2 OF 4
JOB NO. 96-10
SCALE 1" = 10'
DATE 06-07-98

Robertson Geotechnical Inc.
GEOLOGIC MAP
SHEET 2
RAUW 2256.RALA.868

1. VERTICAL CONTROL ESTABLISHED FROM USC&GS MONUMENT (Z576-1939) (BM#128 / ELEVATION = 128.331 FEET). DATA OBTAINED FROM L.A. CO. SURVEY DIVISION. DATUM IS L.A. CO. ADJUSTED MEAN SEA LEVEL DATUM.

2. HORIZONTAL CONTROL BASED ON MONUMENTATION SHOWN ON L.A. CO. TRACT MAP NO. 12935, BOOK 248, PAGE 40, NOV. 26, 1941. MONUMENTATION FOUND INCLUDED 2" IRON PIPE, 95.85 FEET WESTERLY OF NORTHEAST CORNER OF LOT 14, BLOCK 2, AND NAIL AND WASHER IN CENTERLINE OF PACIFIC COAST HIGHWAY PER L.A. CO. ENGR, F.B. 2962-200.

LEGEND

1062 (POINT NUMBER)
10.39 (ELEVATION IN FEET)
Grd in Snd (POINT DESCRIPTION)

PROPERTY BOUNDARY
PUBLIC BEACH ACCESS EASEMENT (PER 81-1259943)
GRADE BREAK

AC - ASPHALT CONCRETE
Ang Pt - ANGLE POINT
Awy - AWAY
BC - BEGINNING OF CURVE
Bf - BLUFF
Blw - BELOW
BM - BENCHMARK
Btwn - BETWEEN
CB - CATCH BASIN
CL - CENTERLINE
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EC - END OF CURVE
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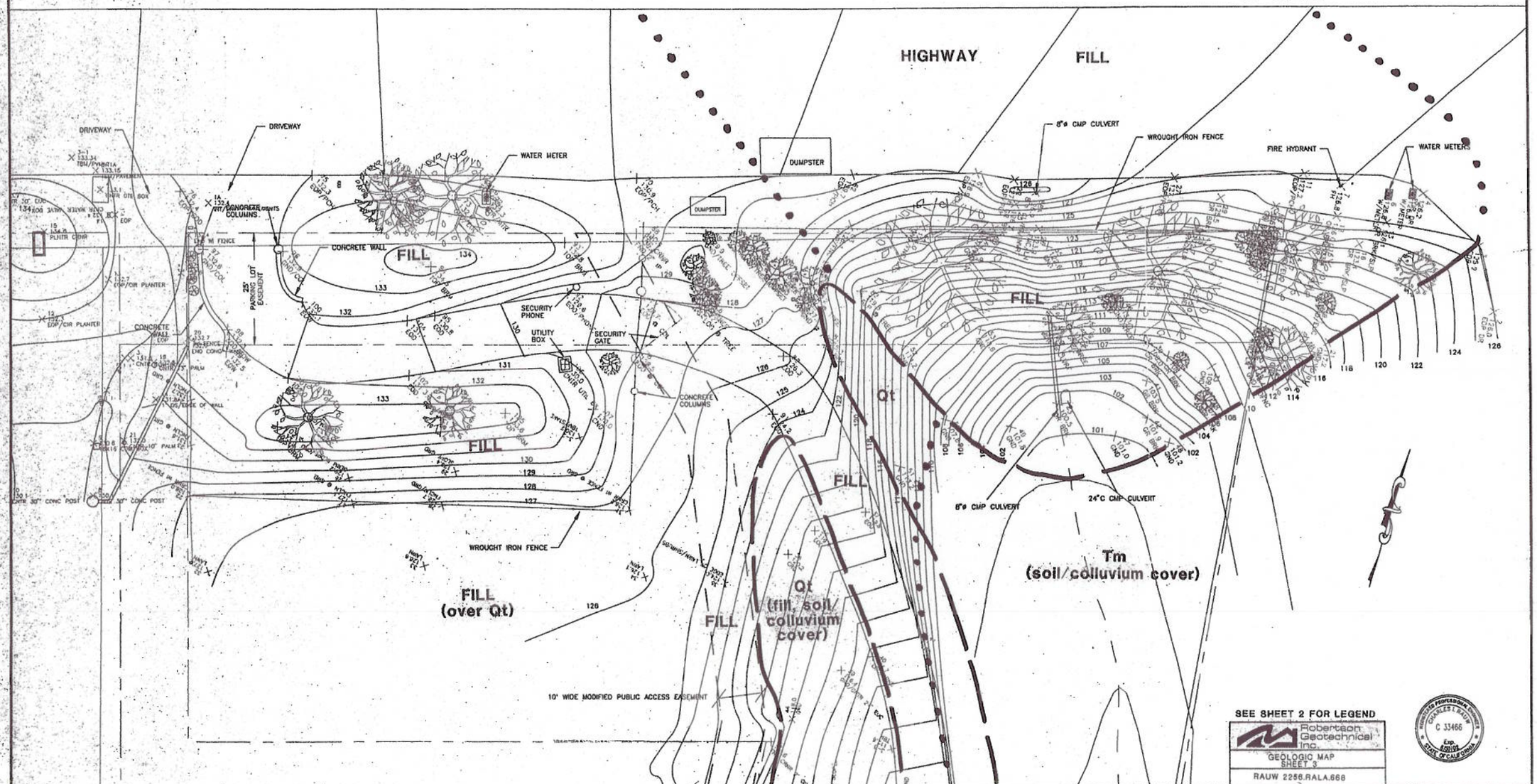
Gr - GRADE
Grd - GROUND
Hb - HUB
Hwy - HIGHWAY
IP - IRON PIPE
Lbled - LABELED
Mdpt - MIDPOINT
N&S - NAIL & SHINER
Nl - NAIL
PL - PROPERTY LINE
Pntr - PLANTER
POL - POINT ON LINE
Prp - PROPERTY
ROW - RIGHT OF WAY
SC - SANITARY CLEAN
Slp - SLOPE
Snd - SAND
T - TOP
TB - TOP OF BANK
Tbl - TOP OF BLUFF
TBM - TEMPORARY BENCHMARK
TBrm - TOP OF BERM
VC - VERTICAL CONTROL



SEE SHEET 2 FOR LEGEND

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GEOLOGIC MAP
SHEET 3

RAUW 2256.RALA.668

REGISTERED PROFESSIONAL ENGINEER CHARLES I. RAUW C 33466 Exp. 6/30/99 STATE OF CALIFORNIA

NOTES:

1. PROPERTY & PUBLIC BEACH ACCESS EASEMENT BOUNDARIES ARE SHOWN APPROXIMATELY AND ARE BASED ON L.A. CO. PARCEL MAP NO. 7543 (BOOK 135, PAGE 59), AND DOCUMENT 80-1161952 AS RECORDED IN THE COUNTY OF LOS ANGELES ON 12/11/198
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CHARLES I. RAUW
Consulting Engineers 1066 Orinda Drive, Martinez, CA 94553 (925) 229-9637

NO.	DATE	REVISION
1		

DESIGNER CIR
DRAFTSMAN CIR
CHECKED BY
DR. ENGR.

APPROVED BY
CALIFORNIA COASTAL CONSERVANCY

TOPOGRAPHIC SURVEY
CHIATE/WILDMAN PUBLIC ACCESS EASEMENT
CALIFORNIA COASTAL CONSERVANCY
PARKING LOT EASEMENT

SHEET 3 OF 4
JOB NO. 96-10
SCALE 1" = 10'
DATE 06-07-98

Appendix B

Construction Cost Estimate

The following table presents elements of the estimate of probable construction cost. It should be understood that construction cost information provided is made on the basis of the design professional's qualifications and experience, and only represents an opinion of the probable construction cost of the project as presently configured, designed, or otherwise defined. The design professional has no control over costs or the price of labor, equipment or materials, or over a contractor's method of pricing. Therefore, no warranty, expressed or implied, as to the accuracy of such an opinion as compared to bid or actual costs, is made.

Assumptions made in preparing the cost estimate include:

1. Construction activities would not be confined within the 10-foot wide beach access easement. That is, where necessary, construction equipment would be allowed to temporarily operate on adjacent residential properties. An allowance for potential construction related repairs to adjacent developments created by construction activities outside of the easement was provided in the cost estimate.
2. Existing development within the vertical beach access and parking easements would be removed by others.
3. Helicopter assistance would be utilized and permitted to transport and set certain elements of the proposed access facility such as aluminum bridges and stairway sections. Helicopter use will minimized construction related disruption to adjacent property owners by reducing overall construction time and potential damage to existing adjacent developments located outside the easement.
4. Construction equipment and materials could be transported to the beach via the existing asphalt driveway directly east of the eastern property boundary of 27910 Pacific Coast Highway.
5. Construction equipment and materials could be transported from the beach up to the existing private parking lot and up the private asphalt public beach access path to obtain access to the vertical easement below the proposed overlook structure near Station 5+74.50.
6. A portion of the parking lot at Zuma Beach County Park could be used as a delivery point and staging area for the helicopter lifts required for the aluminum bridge and stairway sections.

Estimate of Probable Construction Cost

Item No.	Description	Quantity	Unit	Unit Cost	Item Cost
10.	**Timber Stairs (Station 5+74.50 to 6+16.67)**				
	a. Bulkheads	2	EA	$250.00	$500
	b. Timber Stairs	253	SF	$50.00	$12,650
	c. Chainlink Fencing (PVC Coated w/ Redwood Slats)	84	LF	$20.00	$1,680
				Subtotal	$14,830
11.	**DG Path (Station 6+16.67 to 6+31.25)**				
	a. Cut & Fill	6	CY	$15.00	$90
	b. Grading	145	SF	$0.75	$109
	c. Retaining Wall (timber)	0	LF	$45.00	$0
	d. Headers (redwood)	30	LF	$2.50	$75
	e. DG Path (w/drainage)	87	SF	$6.00	$522
	f. Chainlink Fencing (PVC Coated w/ Redwood Slats)	30	LF	$20.00	$600
				Subtotal	$1,396
12.	**Timber Stairs & Landings (Station 6+31.25 to 6+80.00)**				
	a. Bulkheads	2	EA	$250.00	$500
	b. Timber Stairs & Landings	293	SF	$50.00	$14,650
	c. Chainlink Fencing (PVC Coated w/ Redwood Slats)	98	LF	$20.00	$1,960
				Subtotal	$17,110
13.	**Aluminum Bridge (Station 6+80.00 to 8+12.00)**				
	a. Demolition & Repair Work (landscaping, road, path, etc.) - Allowance	1	LS	$7,500.00	$7,500
	b. Erect Temporary Work Platform	1	LS	$2,000.00	$2,000
	c. Machine Excavate Caisson (24" Diameter)	50	LF	$195.00	$9,750
	d. Form & Cast Concrete Columns (24" Diameter)	58	LF	$350.00	$20,300
	e. Form & Cast Concrete Caps (2'x3'x6')	2	EA	$3,500.00	$7,000
	f. Fabricate & Deliver Aluminum Bridge	792	SF	$73.00	$57,816
	g. Install Aluminum Bridge (w/helicopter)	1	LS	$27,500.00	$27,500
				Subtotal	$131,866
14.	**Aluminum Stairs (Station 8+12.00 to 8+31.58)**				
	a. Fabricate & Deliver Aluminum Stairs	120	SF	$125.00	$15,000
	b. Install Aluminum Stairs (w/helicopter)	1	LS	$2,500.00	$2,500
				Subtotal	$17,500
15.	**Aluminum Bridge (Station 8+31.58 to 8+90.42)**				
	a. Demolition & Repair Work (landscaping, road, path, etc.) - Allowance	1	LS	$10,000.00	$10,000
	b. Erect Temporary Work Platform	1	LS	$2,000.00	$2,000
	c. Machine Excavate Caisson (24" Diameter)	40	LF	$195.00	$7,800
	d. Form & Cast Concrete Columns (24" Diameter)	48	LF	$350.00	$16,800
	e. Form & Cast Concrete Caps (2'x3'x6')	2	EA	$3,500.00	$7,000
	f. Fabricate & Deliver Aluminum Bridge	353	SF	$73.00	$25,769
	g. Install Aluminum Bridge (w/helicopter)	1	LS	$2,500.00	$2,500
				Subtotal	$71,869
16.	**Aluminum Stairs (Station 8+90.42 to 9+24.67)**				
	a. Demolition & Repair Work (landscaping, road, path, etc.) - Allowance	1	EA	$2,500.00	$2,500
	b. Erect Temporary Work Platform	1	LS	$2,000.00	$2,000
	c. Machine Excavate Caisson (24" Diameter)	20	LF	$195.00	$3,900
	d. Form & Cast Concrete Columns (24" Diameter)	28	LF	$350.00	$9,800
	e. Form & Cast Concrete Caps (2'x3'x6')	1	EA	$3,500.00	$3,500
	f. Fabricate & Deliver Aluminum Stairs	206	SF	$125.00	$25,750
	g. Install Aluminum Stairs (w/helicopter)	1	LS	$2,500.00	$2,500
				Subtotal	$49,950
17.	**Timber Stairs & Landings (Station 9+24.67 to 959.93)**				
	a. Timber Foundation Piles	4	EA	$2,500.00	$10,000
	b. Timber Stairs & Landings	212	SF	$50.00	$10,600
	c. Chainlink Fencing & Gate (PVC Coated w/ Redwood Slats)	130	LF	$20.00	$2,600
				Subtotal	$20,600
	Subtotal Items 1-17				$495,686
18.	**General Requirements (Bonds, Insurance, Permits, Small Tools, Etc. - 7.5%)**				$37,176.41
	Total Estimated Construction Cost				$532,862

Malibu Public Access Easement
Feasibility Study
November 12, 1998

Estimate of Probable Construction Cost

Aluminum Bridge
Construction Outside Easement

Item No.	Description	Quantity	Unit	Unit Cost	Item Cost
	Public Access Easement Development				
1.	**Mobiliztion, Clearing & Grubbing**				
	a. Mobilization	1	LS	$25,000.00	$25,000
	b. Clearing & Grubbing	15,600	SF	$1.00	$15,600
				Subtotal	**$40,600**
2.	**Parking Lot (West Alternate)**				
	a. Cut and Fill	320	CY	$30.00	$9,600
	b. Grading	6,000	SF	$0.75	$4,500
	c. Curbs, Gutters, & Drains	390	LF	$12.50	$4,875
	d. AC Paving (including base)	3,760	SF	$4.50	$16,920
	e. Signage & Striping	1	LS	$2,500.00	$2,500
	f. Chainlink Fencing & Gate (PVC Coated w/ Redwood Slats)	140	LF	$20.00	$2,800
				Subtotal	**$41,195**
3.	**DG Path (Station 0+29.01 to 2+39.00)**				
	a. Cut & Fill	100	CY	$15.00	$1,500
	b. Grading	2,100	SF	$0.75	$1,575
	c. Retaining Wall (timber)	170	LF	$45.00	$7,650
	d. Headers (redwood)	420	LF	$2.50	$1,050
	e. DG Path (w/drainage)	1,260	SF	$6.00	$7,560
	f. Chainlink Fencing (PVC Coated w/ Redwood Slats)	420	LF	$20.00	$8,400
				Subtotal	**$27,735**
4.	**Timber Ramp (Station 2+39.00 to 2+59.00)**				
	a. Bulkheads	2	EA	$250.00	$500
	b. Timber Ramp	120	SF	$40.00	$4,800
	c. Retaining Wall (timber)	20	LF	$45.00	$900
	d. Chainlink Fencing (PVC Coated w/ Redwood Slats)	40	LF	$20.00	$800
				Subtotal	**$7,000**
5.	**DG Path (Station 2+59.00 to 3+90.94)**				
	a. Cut & Fill	60	CY	$15.00	$900
	b. Grading	1,320	SF	$0.75	$990
	c. Retaining Wall (timber)	25	LF	$45.00	$1,125
	d. Headers (redwood)	264	LF	$2.50	$660
	e. DG Path (w/drainage)	790	SF	$6.00	$4,740
	f. Chainlink Fencing (PVC Coated W/ Redwood Slats)	264	LF	$20.00	$5,280
				Subtotal	**$13,695**
6.	**Timber Ramp (Station 3+90.94 to 4+40.94)**				
	a. Bulkheads	2	EA	$250.00	$500
	b. Timber Ramp	300	SF	$40.00	$12,000
	c. Chainlink Fencing (PVC Coated w/ Redwood Slats)	100	LF	$20.00	$2,000
				Subtotal	**$14,500**
7.	**DG Path (Station 4+40.94 to 5+01.00)**				
	a. Cut & Fill	20	CY	$15.00	$300
	b. Grading	600	SF	$0.75	$450
	c. Retaining Wall (timber)	0	LF	$45.00	$0
	d. Headers (redwood)	120	LF	$2.50	$300
	e. DG Path (w/drainage)	360	SF	$6.00	$2,160
	f. Chainlink Fencing (PVC Coated w/ Redwood Slats)	120	LF	$20.00	$2,400
				Subtotal	**$5,610**
8.	**Timber Ramp (Station 5+01.00 to 5+51.00)**				
	a. Bulkheads	2	EA	$250.00	$500
	b. Timber Ramp	300	SF	$40.00	$12,000
	c. Chainlink Fencing (PVC Coated w/ Redwood Slats)	100	LF	$20.00	$2,000
				Subtotal	**$14,500**
9.	**DG Path (Station 5+51.00 to 5+74.50)**				
	a. Cut & Fill	10	CY	$15.00	$150
	b. Grading	235	SF	$0.75	$176
	c. Retaining Wall (timber)	0	LF	$45.00	$0
	d. Headers (redwood)	47	LF	$2.50	$118
	e. DG Path (w/drainage)	141	SF	$6.00	$846
	f. Chainlink Fencing (PVC Coated w/ Redwood Slats)	47	LF	$20.00	$940
	g. Lookout Platform & Benches (10'X10')	1	LS	$3,500.00	$3,500
				Subtotal	**$5,730**