



SPECIAL USE PERMIT

Cabrillo National Monument
1800 Cabrillo Memorial Drive
San Diego, CA 92106
cabr_permits@nps.gov



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Company/Organization City of San Diego			
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Park Alpha Code
CABR
Type of Use
2501
Permit #
23061

is hereby authorized to use the following described land or facilities in Cabrillo National Monument:
Cabrillo and Gatchell Roads Access on NPS Property

The area must be restored to its original condition at the end of the permit.

The permit begins at 12:00 ☒ am / ☐ pm on 11/01/2023

The permit expires at 11:59 ☐ am / ☒ pm on 10/31/2024.

SUMMARY OF PERMITTED ACTIVITY: (see attached sheets for additional information and conditions)

Providing access to and from the Point Loma Wastewater Treatment Plant 24 hours a day, 365 days a year, via NPS-owned roads for employees, vendors, contractors, and visitors, in order to operate the treatment plant. This permit covers transiting/through access via park roadways only and does not grant access for use of the roadway or adjacent areas for other purposes unless specified in this permit or its amendments.

Person on site responsible for adherence to the terms and conditions of the permit (include contact information)

Tom Rosales (or designated City Manager Representative for this permit), 760-681-7755, trosales@sandiego.gov

Authorizing legislation or other authority

USC Title 54, 36 CFR Parts 1-7, Director's Order 53

Presidential Proclamation Number 1255 (October 14, 1913); Executive Order Number 6166 (June 10, 1933); Executive Order 6228 (July 28, 1933); Presidential Proclamation Number 3273 (February 2, 1959); Presidential Proclamation Number 4319 (September 28, 1974);, and Public Land Order 7447 (July 3, 2000).

APPLICATION FEE

☐ Received Amount
☒ Not Required \$

PERFORMANCE BOND

☐ Required Amount
☒ Not Required \$

LIABILITY INSURANCE

☒ Required Amount
☐ Not Required \$

COST RECOVERY

☒ Required Amount
☐ Not Required \$

LOCATION FEE

☐ Required Amount
☒ Not Required \$

ISSUANCE of this permit is subject to the attached conditions. The undersigned hereby accepts this permit subject to the terms, covenants, obligations, and reservations, expressed or implied herein.

Kris McFadden Kris McFadden
PERMITTEE Signature

Title: Deputy Chief Operating Officer

Date: 09/19/2023

JODI BAILEY

Digitally signed by JODI BAILEY
Date: 2023.11.08 09:54:22 -08'00'

Title: Superintendent

Date:

Authorizing NPS Official

Title:

Date:

Authorizing NPS Official (additional, if required)

**Terms and Conditions of
Special Use Permit PWR-8110-XXX-
XXXX**

I. Background

This Special Use Permit ("SUP" or "Permit") is a renewal of previous permits issued by the National Park Service ("NPS" or "Service") to the Metropolitan Wastewater Department, which is now part of the Public Utilities Department ("PUD") of the City of San Diego ("City" or "Permittee") which operates the Point Loma Wastewater Treatment Plant (the "Treatment Plant"), the primary wastewater treatment plant serving the greater San Diego metropolitan area. The purpose of the Permit is to provide access to and from the Treatment Plant via Cabrillo and Gatchell Roads across land within the boundary of Cabrillo National Monument (the "Park").

The Park was established as a National Monument pursuant to Presidential Proclamation Number 1255, October 14, 1913, and later established as a unit of the National Park System, Department of the Interior, by Executive Order Number 6166, June 10, 1933, and Executive Order Number 6228, July 28, 1933, and subsequently enlarged by Presidential Proclamation Number 3273, February 2, 1959, and Presidential Proclamation Number 4319, September 28, 1974, and Public Land Order 7447, July 3, 2000. The Service administers the Park pursuant to the NPS Organic Act, 54 U.S.C. § 100101 et seq. and its implementing regulations (36 C.F.R. Parts 1-7) and related federal laws. The Director of the Service (or their delegate) authorizes use when those activities conform to the fundamental purpose for which that unit of the NPS was established, and authorizes use only when those uses of the land within the Park will not be a degradation of the values and purposes for which the Park was established.

WHEREAS, the Service has granted access to the City of San Diego (the "City") to use the roads through a right-of-way permit (issued on or about September 10, 1984, for a period of 20 years), and subsequent Special Use Permits (issued November 10, 2004, for a period of 5 years, and March 4, 2010, for a period of 3 years); and

The City has requested to continue using Cabrillo and Gatchell Roads for access to the Treatment Plant and has agreed to comply with the following terms and conditions in order that the Service may grant the City access through the Park.

II. Terms and Conditions

A. Park Specific Terms

The purpose of this Permit is to provide the City continued access to the Treatment Plant over Cabrillo and Gatchell Roads within the Park subject to the following terms and conditions:

1. The lands covered by this Permit are those depicted on the map attached as Exhibit 1, consisting of portions of Cabrillo and Gatchell Roads (sometimes referred to as the "Roads") as they exist at the time of the issuance of this Permit, being a strip of land 40.00 feet in width, lying 20.00 feet on each side of the center lines including slope rights of 1:1 cut and 1 ½: 1 fill to natural ground along said center lines (sometimes referred to herein the "Permitted Area").
2. The City shall be permitted to use the Roads indicated on Exhibit 1 as a means of access to the Treatment Plant through the Park and for maintaining the Roads and their appurtenances. Such access is limited to City-owned vehicles, privately owned vehicles of City employees, visitors, vendors and contractors and agents of the City engaged in the routine maintenance, operation, and upgrades of the

Treatment Plant; no other use is authorized. In order to limit the number of vehicles on the Roads and mitigate for risk, access shall be limited to operational needs only with no more than 60 vehicle trips per day (to and from the plant), of which only 12 can be tractor trailers. During 2023 and 2024 due to planned construction these limits are raised to no more than 145 vehicle trips per day (to and from the plant), of which only 25 can be tractor trailers. As many of the tractor trailer trips as possible will be scheduled outside of the time between 9:00am and 5:00pm (when the Monument is open to the public). If vehicular use is anticipated beyond this amount (e.g., Treatment Plant-affiliated construction project), prior written approval must be received from the Superintendent of the Park ("Superintendent"). Trucks, tractors, and other maintenance and construction equipment of the City or its agents shall not travel outside the Permitted Area for hauling workers, supplies or equipment; maintenance of the Roads shall be accomplished in a manner not requiring travel outside the lands shown on Exhibit 1 unless otherwise approved by the Superintendent.

3. This Permit shall not be construed as a grant of any interest in land but shall be considered a permitted use of the Permitted Area shown on Exhibit 1, subject to revocation or termination as provided hereinafter.
4. The Superintendent shall be notified in writing no less than two weeks prior to a change to City access or through Park Roads, such as the start of any maintenance or repairs to the Permitted Area, or discontinuation of use, unless precluded by emergency conditions or repairs. In which case, the Superintendent, or their representative, shall be notified as soon as possible before such work or actions. All work within the Permitted Area shall be completed to the satisfaction of the Superintendent or their representative.
5. All costs shall be borne by the City for routine and preventative maintenance as well as for modifications to Cabrillo and/or Gatchell Roads, such as their surfaces, curbs, gutters, culverts, inlets, railings, barriers, pavement markings, drainage structures and related appurtenances, and temporary safety signage, necessary to ensure continued safe access to the Treatment Plant and to warn motorcyclists, bicyclists, and pedestrians of danger during all periods of maintenance..
 - a. The Roads will be maintained in accordance with the National Park Service's 1984 Park Road Standards document with a key focus on maintaining the character and feel of the park roadway. It is noted that National Park roads are unique in that park roads serve a distinctively different purpose from most other roads. They are constructed only where and as necessary to provide access for the protection use and enjoyment of the parks. They are located with sensitive concern for the environment and designed with extreme care. The Roads under this agreement will continue to be primarily for park purposes and with the mission of the park as the foremost driver.
 - b. Any modification to the Roads requested by the City shall be subject to approval by the Service. The City shall submit to the Superintendent for their review, refinement and concurrence all drawings and specifications for all work. Work shall not proceed on any project within the Park until written approval has been received by the Superintendent.
 - c. The costs for the completion of required documentation and implementation of mitigation measures required under the National Environmental Policy Act, National Historic Preservation Act, and related laws shall be the responsibility of the City.
 - d. The City shall work with the Service to complete programmatic compliance to cover routine/annual maintenance operations conducted by the City. All other work shall have compliance completed for each effort.
6. The City shall be responsible to perform the following preventative maintenance work on the Roads covered by this agreement.

- a. During the Term of this Special Use Permit, and in the event this Permit is extended, the City shall perform, at their own expense, the following maintenance requirements:
 - a. The Roads shall be treated to reseal the surface pavement not less than once every ten (10) years from the last date of treatment (2019). The treatment method shall be either a micro or chip seal or combination thereof as determined by the NPS pavement preservation program team. Crack sealing, minor roadway patching, and striping shall be completed in conjunction with such treatments.
 - b. Not less than once every five (5) years (last completed in 2019), restripe the Roads with thermoplastic pavement markings to ensure roadway meets FHWA standards for striping visibility including retroreflectivity.
 - c. Replace raised pavement markings in kind as they fail, not less than once per calendar year.
7. During the Term of this Special Use Permit, in order to ensure the near-term continued, safe use of Gatchell Road along an approximate 500-foot long segment to the main entry point of the Treatment Plant, the City shall:
 - a. contract with and manage a consultant team, with appropriate civil, geotechnical, traffic and coastal engineering experience, to provide a broad range of technical services for monitoring the coastal erosion impacting the Permitted area near the Treatment Plant entrance.
 - b. when conditions warrant and as agreed upon by both parties, implement and follow the conditions of Exhibit 2 - Traffic Control Plan (with public access), to reduce the adverse impact of erosion by limiting traffic on an approximate 500-foot long segment, while maintaining public access for pedestrian, bicycle, and vehicle traffic. The City is responsible for the costs for implementing and terminating the plan. The City shall inspect the site regularly and take action as needed to ensure the continued proper and safe implementation of the Traffic Control Plan.
 - c. obtain and maintain updated Permits from the NPS (Research and Collecting Permit) for all long-term monitoring requests.
 - d. with prior approval from the Superintendent through the Research and Collecting Permit process, implement and follow the conditions of Exhibit 3 - Long-term Monitoring Plan (Point Loma Wastewater Treatment Plant Monitoring Program, FINAL DRAFT Monitoring Plan, May 24, 2021, by HDR-Jacobs-Atlas-O'Day). The City is responsible for the costs for implementing the plan.
 - e. provide the NPS with copies of all written communications and data that are relevant, such as those from the consultants and regulatory agencies.
 - i. The contractors shall directly provide to the NPS, data and information from the monitoring results (as required through the Research and Collecting Permits).
 - f. provide timely communications or information whenever conditions change and may have an impact on NPS lands (and access by the visiting public).
 - g. provide notice to the Superintendent in advance of conducting monitoring activities as required by the monitoring plan.
8. To protect the world class views from the Park, the City agrees to use the area on the west side of Gatchell Road immediately inside the southern entrance to the Treatment Plant (Southwest Area) as indicated in City Manager's Report 96-67, Subject: Point Loma Wastewater Treatment Plant Master Plan Environmental Report, only for temporary lay down and Treatment Plant-affiliated construction staging, and not to build any permanent structures there other than its proposed guard station except as provided herein. In the event that the City anticipates the need to alter the use of the Southwest Area from the limited use identified in Report 96-67 (such as a need to materially change plant operations, or changes in regulatory conformance, such as a requirement by the Environmental Protection Agency (EPA) to upgrade the Treatment Plant to secondary treatment, etc.), the City agrees to invite the National Park Service to work with the leadership of PUD to identify and implement mutually acceptable ways to accomplish the change in use while protecting the views from the Park. The City agrees to continue to operate in conformance with Coastal Development Permit (No. 6-94- 063-A2), or with

subsequent permits as amended or reissued, and to notify the Park in writing prior to requesting an amendment to or reissue of said permit.

9. City employees and all City contractors, vendors, and visitors shall obey all posted roadway signs (including speed limits and stop signs) within the Park en route to and from the Treatment Plant. All drivers of vehicles associated with this Permit are subject to being cited for violations of Service regulations (including Park-specific rules) and other applicable federal laws and regulations.
10. The City shall halt any activities and notify the Superintendent immediately upon discovery of any archeological, paleontological or historical artifacts and objects within or adjacent to the Permitted Area. Subject to applicable Federal law, artifacts unearthed are the property of the Service.
11. The City shall be responsible for locating all utilities within the permitted area prior to any work, including NPS owned utilities. Any underground utilities previously located by the Service or owners or operators of such utilities within the Permitted Area, which are damaged or disrupted during maintenance or monitoring efforts by the City shall be repaired or restored by the City or caused to be repaired or restored by the City as soon as possible, in coordination with the Service to ensure environmental and cultural considerations are addressed and at no cost to the Service.
12. The City shall comply with all applicable Service regulations and Federal laws and other existing regulations promulgated thereunder in the use and maintenance of the Permitted Area.
13. The City shall take adequate measures as directed and approved by the Superintendent to prevent or minimize damage to Park resources as a result of the City's use of the Permitted Area. This may include, for example, restoration, soil conservation and protection measures, and repairing the Roads, infrastructure and related appurtenances within the Permitted Area. The City shall dispose of refuse generated by the City's use of the Permitted Area as required by the Superintendent. The Superintendent or their representative may enter and inspect the Permitted Area as deemed necessary and without restriction.
14. The use of pesticides and/or herbicides in maintenance operations within the Permitted Area is strictly prohibited without the prior written permission of the Superintendent. Requests must include the chemical, application rate, method and other control measures required for such use.
15. The City agrees to undertake such soil and resource conservation and protection measures, including control of invasive and non-native plant species within the Permitted Area, in collaboration with the Superintendent.
16. Upon expiration, revocation or termination of this Permit, the City shall leave the Permitted Area in as nearly the same condition at the beginning of the term of this Permit as possible, as directed and approved by the Superintendent.
17. Any modifications or amendments to this Permit must be in writing and signed by both the City and the Service. Any renewals will be subject to regulations existing at the time of renewal and such other terms and conditions deemed necessary to protect the resources of the Park and allow for public use of the Park.
18. No failure by the Service to insist upon strict performance by the City of any term or condition of this Permit, or to exercise any right or remedy consequent upon a breach thereof, shall constitute a waiver of any such breach of such term or condition. No waiver of any breach shall affect or alter this Permit, but each and every term and condition of the Permit shall continue in full force and effect without respect to any other then existing or subsequent breach.

19. This Permit shall be in effect for one (1) year from the effective date hereof, unless prior thereto it is relinquished, abandoned or otherwise terminated pursuant to the provisions of this Permit or of any applicable Federal law or regulation. The effective date of this Permit shall be the date of its execution by the Superintendent.
20. In the event of an emergency that requires that the Roads be closed due to structural failure or instability, this agreement will be suspended.
21. The Superintendent may terminate this Permit upon a major breach of any condition, provided that the Superintendent shall give the City 14 days written notice of the Service's intent to terminate the Permit and provide the City opportunity to remedy the conditions constituting the breach. The City may request an extension with solutions identified and the schedule needed to remedy the conditions constituting the breach. If the City has not remedied the conditions within the 14-day cure period (or initiated the remedy if the remedy is reasonably expected to take longer than 14 days) or within such other period agree to by the parties, the Superintendent may terminate the Permit with additional written notice. Upon termination of the Permit, the City will no longer be allowed to access the Treatment Plant for any purpose via the Roads.

B. Standard Terms and Conditions

22. The Permittee is prohibited from giving false information; to do so will be considered a breach of conditions and be grounds for revocation: [36 CFR 2.32(a)(3)].
23. This Permit may not be transferred or assigned without the prior written consent of the Superintendent.
24. The Permittee shall exercise this privilege subject to the supervision of the Superintendent or designee, and shall comply with all applicable Federal, State, county and municipal laws, ordinances, regulations, codes, and the terms and conditions of this Permit. Failure to do so may result in the immediate suspension of the permitted activity or the revocation of the Permit. All costs associated with clean up or damage repairs in conjunction with a revoked Permit will be the responsibility of the Permittee.
25. The Permittee is responsible for making all necessary contacts and arrangements with other Federal, State, and local agencies to secure required inspections, permits, licenses, etc.
26. The Roads associated with this Permit will remain open and available to the public during park visiting hours. This Permit does not guarantee exclusive use of an area. Permit activities will not unduly interfere with other park visitors' use and enjoyment of the area.
27. This permit may be revoked without notice if damage to resources or facilities occurs or is threatened, notwithstanding any other term or condition of the permit to the contrary.
28. The City agrees that this Permit shall be subject to the express condition that the exercise thereof will not unreasonably interfere with the management and administration by the Service of the Permitted Area except as agreed to by the Superintendent.
29. This Permit is made upon the express condition that the United States, its agents and employees shall be free from all liabilities and claims for damages and/or suits for or by reason of any injury, injuries, or death to any person or persons or property of any kind whatsoever, whether to the person or property of the Permittee, its agents or employees, or third parties, from any cause or causes whatsoever while in or upon said premises or any part thereof during the term of this Permit or occasioned by any occupancy or use of said premises or any activity carried on by the Permittee in connection herewith, and the Permittee hereby covenants and agrees to indemnify,

defend, save and hold harmless the United States, its agents, and employees from all liabilities, charges, expenses and costs on account of or by reason of any such injuries, deaths, liabilities, claims, suits or losses however occurring or damages growing out of the same.

30. The Permittee assumes all risks in using the Permitted Area.
31. Permittee agrees to carry general liability insurance against claims occasioned by the action or omissions of the Permittee, its agents and employees in carrying out the activities and operations authorized by this permit. The Service understands that the City is self-insured..
32. Costs incurred by the Service as a result of accepting and processing the application and managing and monitoring the permitted activity will be reimbursed by the Permittee. If any additional costs are incurred by the Service, the Permittee will be billed on a quarterly basis or at the conclusion of the Permit.
33. The person(s) signing the Permit on behalf of the City must have full authority to make any decisions about the Permitted Activities. He/she shall be responsible for all individuals, groups, vendors, etc. involved with the permit.
34. Nothing herein contained shall be construed as binding the Service to expend in any one fiscal year any sum in excess of appropriations made by Congress or administratively allocated for the purpose of this Permit for the fiscal year, or to involve the Service in any contract or other obligation for the further expenditure of money in excess of such appropriations or allocations.
35. If any provision of this Permit shall be found to be invalid or unenforceable, the remainder of this Permit shall not be affected and the other provisions of this Permit shall be valid and be enforced to the fullest extent permitted by law.

III. Points of Contact

All communications between the City and the Service for purposes of the implementation of this Permit shall be addressed to:

Superintendent
Cabrillo National Monument
1800 Cabrillo Memorial Drive
San Diego, CA 92106-3601

The City Manager of the City of San Diego or their delegate shall direct operations and measures agreed to in this instrument.

City Manager
City of San Diego 202 C Street
San Diego, CA 92101

Exhibit 1. Map of Access Road, Permitted Area.

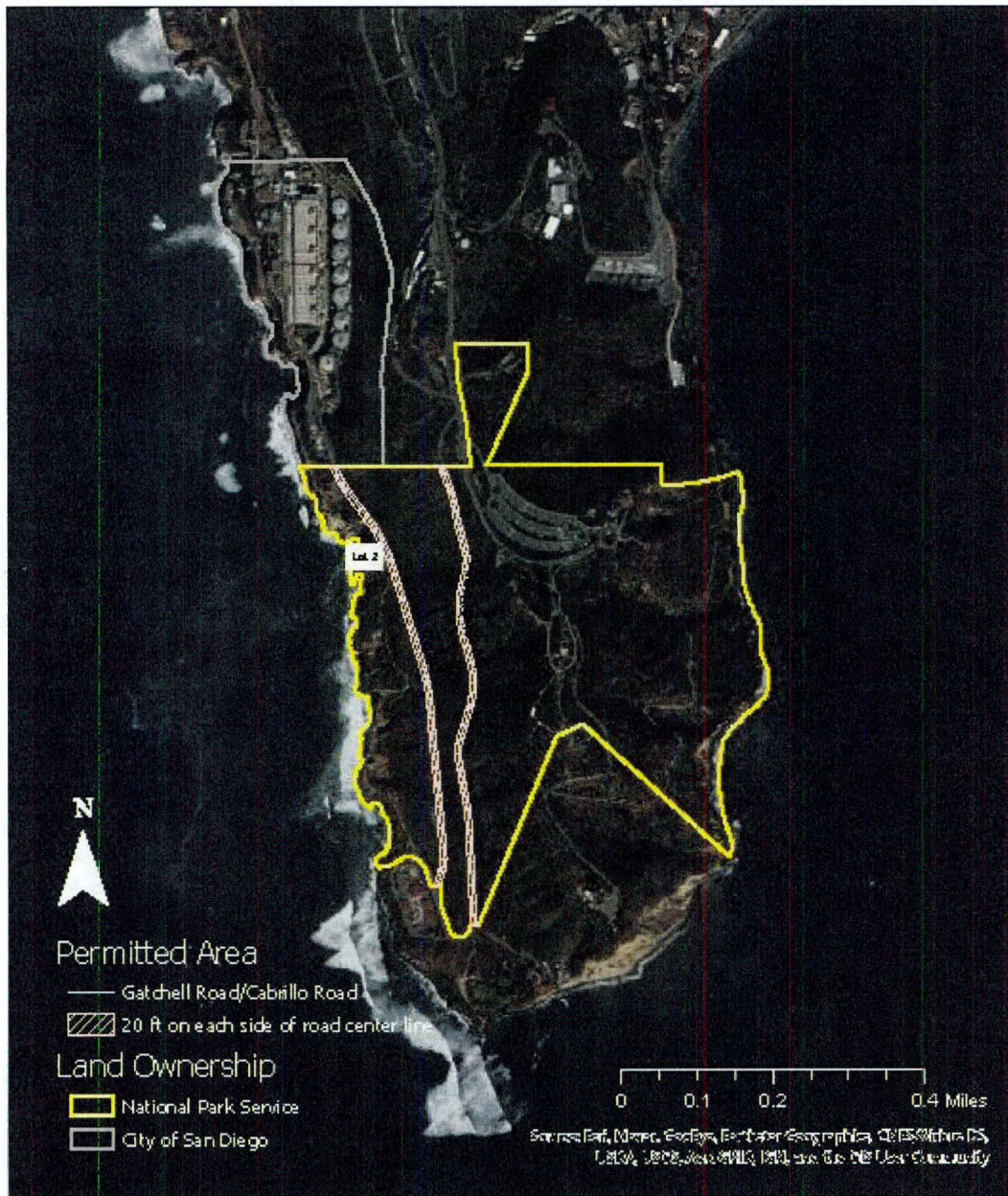
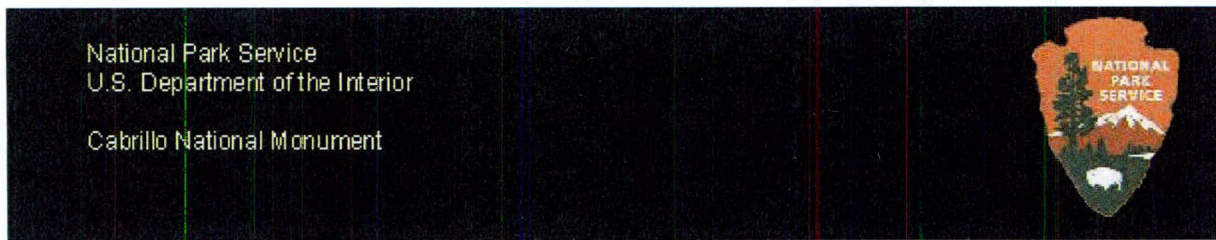


Exhibit 2. Traffic Control Plan (with public access), page 1 of 3

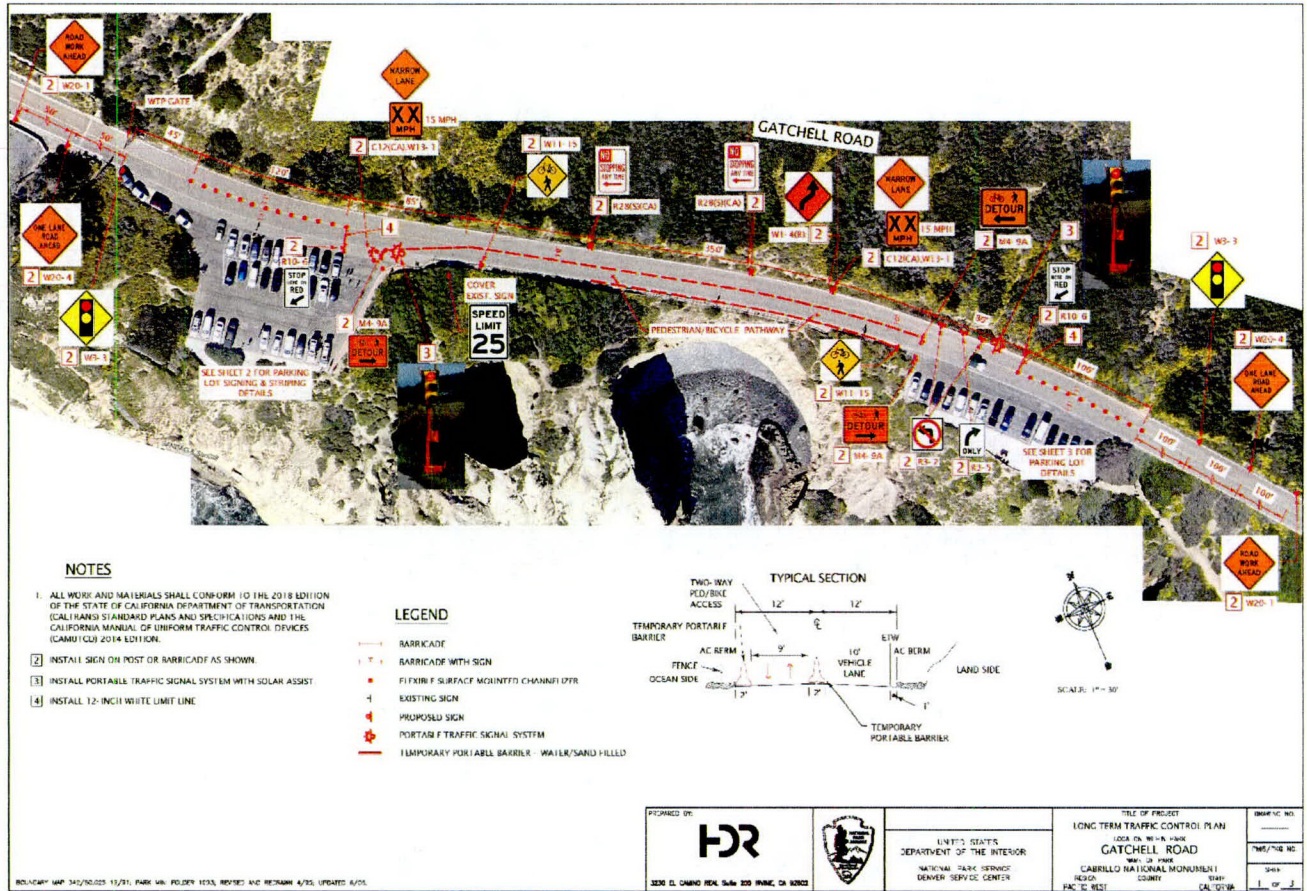


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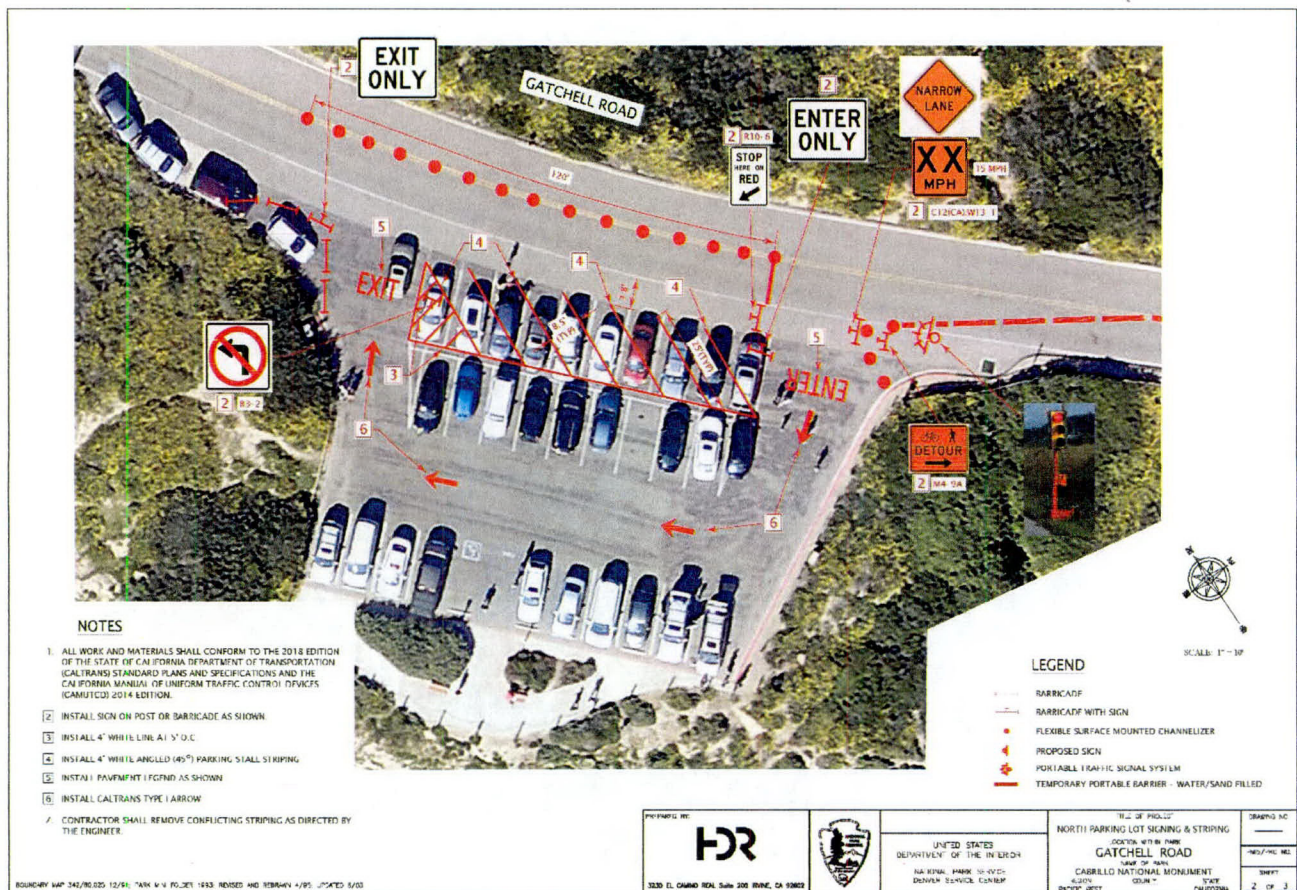


Exhibit 2. Traffic Control Plan (with public access), page 3 of 3

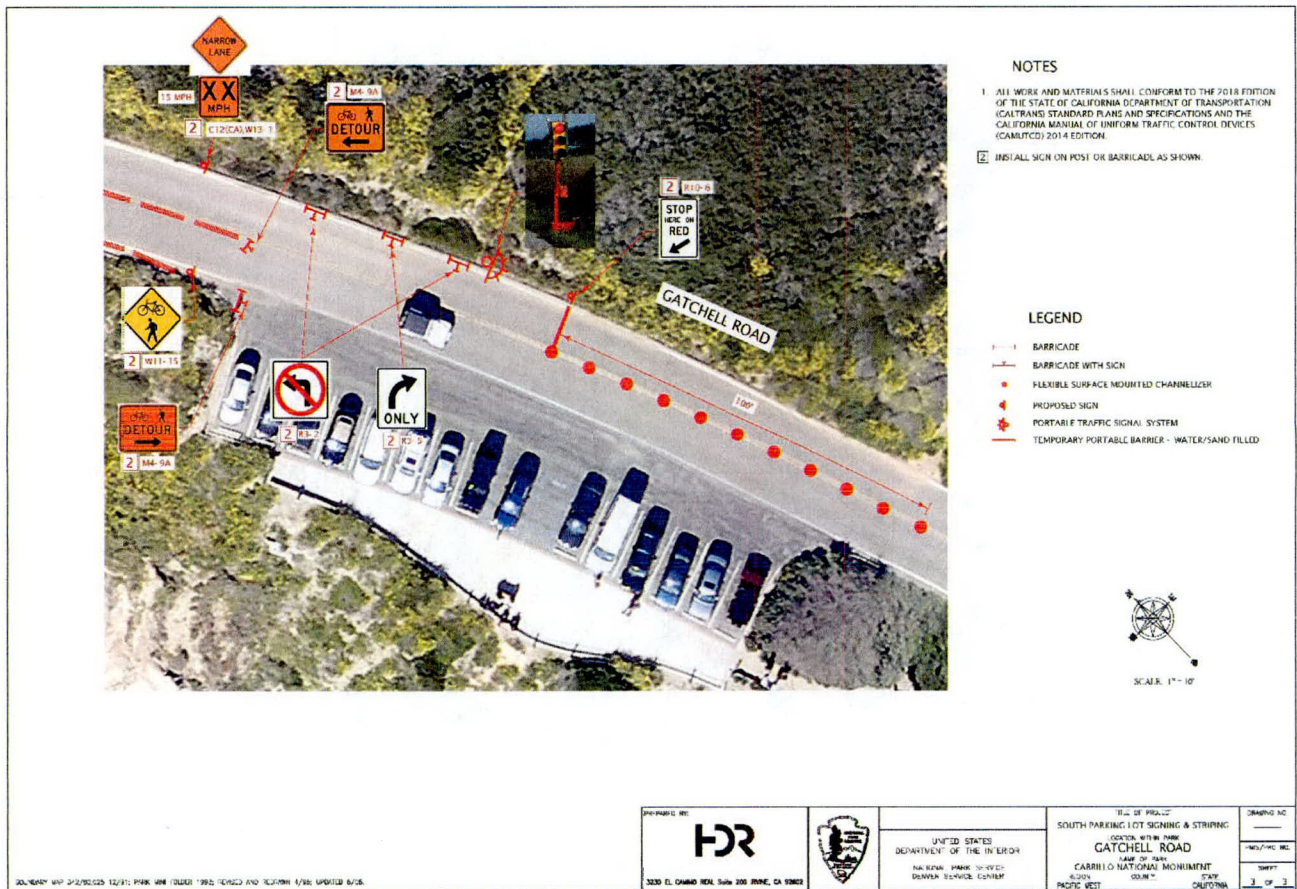


Exhibit 3. Excerpts attached from the Long-term Monitoring Plan – “Point Loma Wastewater Treatment Plant Monitoring Program, FINAL DRAFT Monitoring Program Plan”, May 24, 2021, HDR-Jacobs-Atlas-O’Day

Point Loma Wastewater Treatment Plant Monitoring Program

FINAL DRAFT Monitoring Program Plan

Prepared For

The City of
SAN DIEGO

Version 02

May 24, 2021

City of San Diego

Contract No. H187009, Task Order 11 HDR-Jacobs-Atlas-O'Day

HDR



Jacobs

ATLAS

O'Day
Civil Engineering • Surveying
Certified 125018 • 125019 • 125020 • 125021

Point Loma Wastewater Treatment Plant Monitoring Program

Document Title: Monitoring Program Plan
Document Status: Final Draft Version 01
Date: May 24, 2021
Client Name: City of San Diego
Client No: Contract No. H187009, Task Order 11 HDR-Jacobs-Atlas-O'Day
Project Manager: Mark Seits/HDR
Principal Author: Project Team
File Name: PLWTP Monitoring Program Plan DRAFT rev02 tracked changes from rev01.docx

Document History and Status

Version	Date	Description
00	02/14/2021	Draft
01	04/23/2021	Final Draft
02	05/24/2021	Final

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1. Introduction: Why is the Monitoring Program needed?

1.1 Context To The Problem: Cliff Hazards And Risk To The Point Loma Wastewater Treatment Plant

The Point Loma Wastewater Treatment Plant (PLWTP) is located on a 40-acre site on the sea cliffs of Point Loma's Pacific Ocean coast in San Diego, California. The proximity of the eroding coastline to Gatchell Road has become a concern for public and PLWTP staff safety. Furthermore, Gatchell Road is the only permitted access to the plant, which is used at all times of the day. The potential for cliff erosion to affect the road triggered the need to assess the risk of coastal erosion at the site.

Between June and December 2020, under Contract No. H187009 Task Order 5, HDR-Jacobs Engineering Inc.-Atlas performed for the City of San Diego (City) a Coastal Erosion Assessment (HDR-Jacobs-Atlas 2021). The assessment included the consideration of the hazards posed by the future behavior of cliffs, caves, and coves; the vulnerability of assets exposed to these hazards; potential consequences and risk; and the identification of potential risk mitigation measures and recommendations.

HDR-Jacobs-Atlas (2021) conducted the risk assessment by asset location, cliff units and projected future activity and results are shown in Figure 1. The assessment indicated that while the projected cliff retreat hazard is the greatest at the South Cove, X Cave, and North Cave, the distribution of assets at risk is somewhat different due to the consequence of cliff retreat.

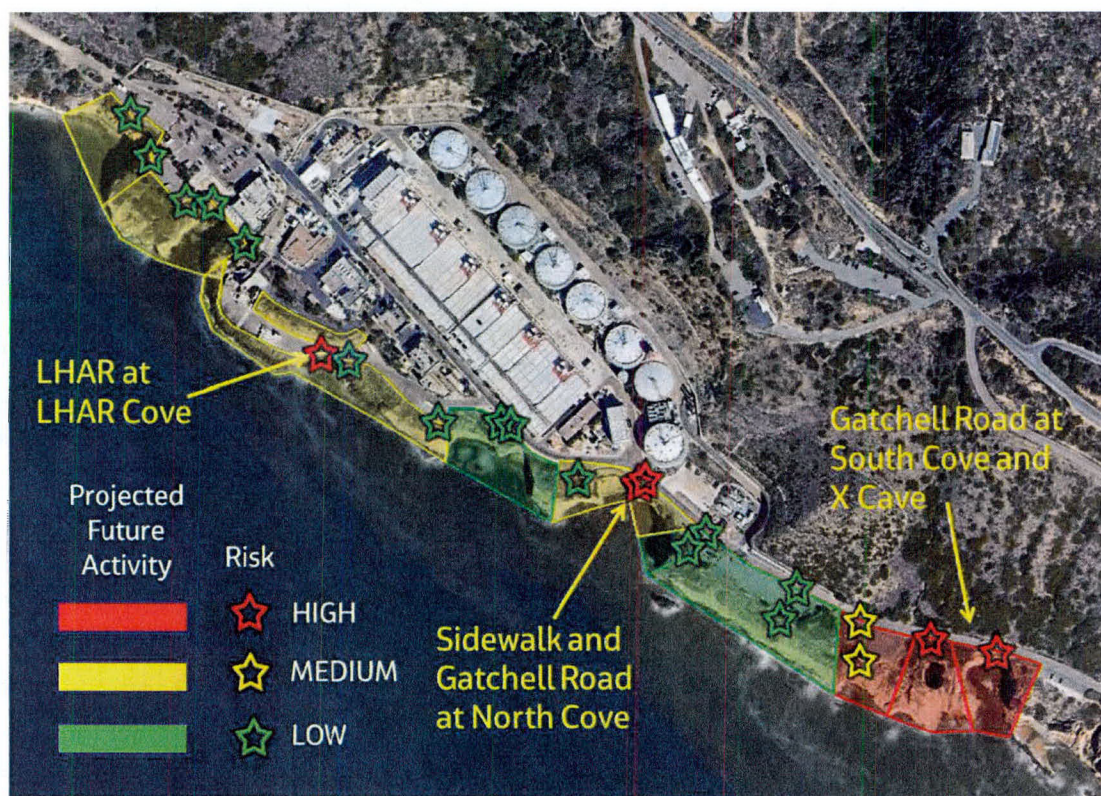


Figure 1. Risk Assessment By Location, Cliff Units And Projected Future Activity
Note: LHAR, Lower Hydro Access Road

1.2 Cliff Failure Mechanisms and Recent Behavior

The PLWTP is situated on a raised wave-cut marine terrace formed when relative sea levels were different from those today. The raised marine terrace is cut in bedrock of the Point Loma Formation, which crops out to form sea cliffs and a shore platform. The terrace is mantled with former beach, estuarine, and colluvial deposits termed Old Paralic Deposits (Qop₆ and 7). Generalized descriptions of these geologic formations and their mechanisms of failure are presented below:

- The Old Paralic Deposits (Qop₆ and 7) form the top of the upper part of the cliff and are also exposed in road cuts in the vicinity of the site. These beach, estuarine and colluvial deposits are composed of siltstone, sandstone, and conglomeratic units. Post-depositional groundwater flows have formed hard duricrust layers at some locations. Unmanned Aerial System (UAS or drone) imagery of the cliffs shows (HDR-Jacobs-Atlas 2021) widespread incision by gullies and piping, which indicates periodic flows of shallow groundwater and surface water that cause erosion.
- The Point Loma Formation (Formation) consists of marine sediments represented by thin-bedded siltstone and fine sandstone to thick-bedded mudstone and sandstone. The Formation is affected by a series of joints and occasional inactive faults that form lines of weakness which are preferentially eroded. Marine action has created 'pseudo-karst' features in the cliffs with caves, coves, blow holes and rock overhangs formed by preferential erosion along weaker zones. Since the beds dip into the cliff (towards the East) at an angle of around 10 degrees, erosion and undercutting promote slab failures that extend upwards into the cliff until a more resistant bed is encountered, to eventually form a cave. Joints are present in two dominant directions that are normal to and parallel with the cliff, forming lines of weakness. Most caves develop along shore normal joints, but in some cases shore parallel joints are subsequently encountered, allowing caves to develop behind the cliffs. Progressive erosion of cave margins eventually causes roof collapse and the formation of blow holes and then coves.

A characteristic of the Point Loma coastline is its complex shape defined by cliffs often including caves, that have collapsed to form coves. Areas of caves and coves are associated with more rapid erosion along joints and inactive faults while stretches of cliffs reflect areas where joints and inactive faults are absent or not aligned at angle that is preferential to erosion. The cliffs are exposed to the action of waves, varying water levels, wind, surface water runoff and groundwater, and are vulnerable to on-going erosion.

The cliffs fail by two main mechanisms. Failure of the lower cliff, which is formed in bedrock, is through toe erosion by wave attack which causes undercutting that triggers failure of the upper cliff. The upper cliff can also fail independently of the lower cliff, often in response to groundwater flow and surface water erosion.

The hazards expected to occur on site are therefore twofold:

- Cliff retreat causing erosion of the road setback. This may be caused by toe erosion of the lower cliff leading to loss of support of the upper cliff and head scarp retreat; heavy rainfall causing failure of the upper cliff and head scarp retreat. Additionally, progressive weakening of the cliff over time, meaning a strength threshold is exceeded, could cause the cliff to collapse unexpectedly.
- Cave roof collapse and settlement or collapse of the road setback. This may be caused by marine erosion, groundwater erosion during heavy rainfall, or unexpected sudden collapse because a strength threshold is exceeded.

Assessment of the limited archive of historical erosion rates, observations of the present activity of the cliff from three UAS surveys (8/25/20, 12/4/20 and 2/24/21), USGS projections of future erosion rates with sea-level rise (Limber et al. 2018), and the close proximity of Gatchell Road to the cliff top (8 feet at the South Cove and 30 feet at the X Cave) all has led to conclude that **the road could be lost within a period of 5 years and will certainly be lost in the longer term. It is unclear if the road will be lost due to a single hazard event, or due to the cumulative impact of several smaller events.** However, given the expected, long lead time (approximately 10 years) for planning, design, environmental review, permitting and construction of an alternative access route to the PLWTP, measures to manage the risk to road users are needed immediately. Risk is also high at the North Cove and the Lower Hydro Access Road (LHAR) Cove because the moderate hazard of projected cliff retreat will directly impact the sidewalk and Gatchell Road, and the LHAR, respectively.

1.3 Recommendations

HDR-Jacobs-Atlas (2021) recommended the urgent implementation of a Monitoring Program (MP) at the high-risk areas of the Gatchell Road: South Cove and X Cave and the North Cove Area. The MP is needed to better inform the City of the risk of cliff erosion by recognizing the evidence of precursors to failure. With an MP in place, evidence for cliff failure or cave collapse can be recognized, communicated to stakeholders, and near-term risk mitigation measures can be identified and implemented such that the road can continue to be used as a safe access to the PLWTP.

HDR-Jacobs-Atlas (2021) also recommended to begin the planning for a long-term safe site access immediately considering the implementation of civil engineering works in coastal areas can potentially take between 5 to 10 years or more and the potential loss of the road within the next 5 years.

Table 1. Monitoring Program Components Objectives and Justifications

MP Component	Description	Objective	Justification for Monitoring and Technique	Justification for Location
Gatchell Road Survey	Regular surveys with a Total Station of 33, 1-inch-diameter control points, installed on an approximately 400-foot-long section of the road by the South Cove and X Cave and 10 control points on a 200-foot long section of Gatchell Road at the North Cove.	• Detect changes, document the location and rate of road changes. • The cause(s) of changes could be determined through the assessment of other monitoring data. • Changes may result from cave collapse or cliff retreat or relate to settlement of the road due to a weak substrate, ground motions, or heavy traffic.	• Cliff changes can manifest in road conditions, and these can represent precursors of cliff failure. • The regular surveys and inspections are cost-effective techniques for detecting and accurately recording road changes. • Will allow locations of persistent change and changes in trends to be detected and characterized, which allows future risk to be better projected.	• No other location will provide data specific to the interaction between Gatchell Road, the South Cove, X Cave and North Cove. • The 1-inch diameter control points on the road surface adjacent to the South Cove, X Cave and North Cove, surveys and visual inspections will have no impact on National Park Service (NPS) property or park operation.
Gatchell Road Visual Inspection	Regular visual inspections of the condition along Gatchell Road at South Cove, X Cave and North Cove, including simple measurements, photos, and video of signs of distress such as cracks, potholes, rutting and settlement.			
UAS (Imagery and LiDAR) Surveys	Regular UAS flyovers of the road, the South Cove, X Cave and North Cove, including imagery and measurements.	• Detect, locate, and qualitatively and quantitatively characterize changes and evidence of failures. • Imagery allows change to be qualitatively described, LiDAR allows change to be quantified. • The resulting database on the magnitude and frequency of failures and their timing would support projections of future cliff behavior and risk.	• The South Cove, X Cave and North Cove are partially or wholly out of sight from Gatchell Road and seaside surveys is the only approach to detect changes. • UAS survey is a cost-effective technique to capture images and perform accurate measurements to detect, assess, and quantify cliff changes.	• No other location will provide data specific to the South Cove, X Cave and North Cove. • Imagery and measurements are collected remotely and will have no impact on NPS property or park operation.

MP Component	Description	Objective	Justification for Monitoring and Technique	Justification for Location
Gatchell Road Geophysical Investigation	Measurement of the condition of the subsurface below Gatchell Road using Multichannel Analysis of Surface Waves (MASW) and Electrical Resistivity Tomography (ERT) geophysical investigations.	Identify location and extent of voids, moisture, and geophysical anomalies in the subsurface below Gatchell Road at the South Cove, X Cave, and North Cove.	• Development of incipient voids and geophysical anomalies often occur "from the bottom up" within the subsurface, such features are often not detected with visual observation of the ground surface but are well established targets for detection by the proposed geophysical methods. • Periodic geophysical surveys at Gatchell Road are cost-effective techniques for detecting and accurately recording developing subsurface features that can be related to void development or other subsurface changes. • Geophysical methods at the performed locations will allow for detection of significant subsurface changes, which allows future risk to be better projected.	• The proposed locations are within the roadway and shoulder area where Gatchell Road overlies projections of geologic features related to South Cove, X Cave, and North Cove, that have a significant potential to form voids, blowholes, subsidence, or collapse features at some time in the future. • The proposed locations are required to assess periodic changes in subsurface conditions below Gatchell Road, performing geophysics at other locations would not provide the required data below the roadway.

MP Component	Description	Objective	Justification for Monitoring and Technique	Justification for Location
Groundwater Monitoring	Continuous measurement and near real-time reporting of groundwater levels at three (3) monitoring wells, near the South Cove, near the X Cave and near the North Cove. Each well will include two vibrating wire piezometer sensors placed near the alluvium/bedrock contact depth, and roughly at mid cliff height. The monitoring wells will be capped with a metal inspection cover of approximately 2 ft ² .	Assess the impact of groundwater on the South Cove, X Cave and North Cove erosion. Understanding variations in ground water levels and relationship to cliff response will allow for more accurate projections of risk to Gatchell Road. The data will also support design of mitigation measures.	- Cliff erosion has been related to heavy rainfall and drought (Duperret et al., 2004) and the associated groundwater response (Hutchison 1969, Pierre and Lahousse 2006, Duperret et al. 2005, Griffiths et al. 2012). - Observations and the presence of pipes, rills, gullies, and overhangs in the upper cliff indicate that shallow groundwater plays a role in the stability at the South Cove, X Cave and North Cove (HDR-Jacobs-Atlas 2021). - Sustained and/or intense rainfall will elevate the ground water table, raise pore-water pressures, weaken sediment, and promote failures. - Groundwater levels have to be measured in situ; boreholes must be drilled to allow installation. - Piezometers allow porewater pressures in several strata to be continuously recorded.	- Monitoring of groundwater at the South Cove, X Cave and North Cove will ensure that measurements are site-specific. - No groundwater level monitoring is known in the PLWTP or vicinity. Suitability of offsite measurements cannot be determined. - While the local geology is similar, local temporal and spatial variations in groundwater flows are expected. The PLWTP area is paved, it features many structures with deep foundations and stormwater drainage. The South Cove/X Cave area is dominated by a 26-acre barren hillside watershed. Localized drainage channels, localized jointing and/or faults may affect perched groundwater pathways that would be observed by groundwater wells at PLWTP. - Impacts on traffic are expected in the 2-week duration of well construction, but none during operation.

MP Component	Description	Objective	Justification for Monitoring and Technique	Justification for Location
Vibration Monitoring	Continuous measurement and near real-time reporting of horizontal and vertical ground vibrations due to cliff movement, earthquakes, vehicular traffic on Gatchell Road and ocean wave impact at the cliff base at the South Cove, X Cave and North Cove. Seismographs at 3 stations will be installed. Each station designed to focus on the one or more of these vibration sources.	Assess the impact of vibrations and their sources on cliff stability.	• Cyclic flexing at sea-swell frequencies may reduce the material strength of coastal cliffs through strain-induced fatigue (Adams et al. 2005, Mitchell and Pope 2004, Young et al. 2013). • Similarly, episodic earthquakes and vehicular traffic may induce similar effects (Valentin et al. 2021). • Seismic patterns have been associated as precursors of cliff collapse (Busby et al. 2002, 2004, Amitrano et al. 2005, Senfaute et al. 2009). • Seismographs are standard sensors for vibration monitoring. • Vibration is a potential source of cliff instability. Vibrations from 4 sources will be monitored: cliff movement, waves, traffic, and earthquakes. Vibrations from these sources occur at different frequencies and this would make sources easily recognizable and filtered in the frequency spectrum. For example, waves can induce vibrations that range from 0.3 to 0.1 Hz for seas, 0.1 to 0.05 Hz for swell and 0.05 to 0.006 Hz for infragravity waves (Young et al., 2011). Traffic vibrations depend on road surface irregularity, and vehicle type, weight, speed, and suspension. The vibration signature of the vehicles transiting Gatchell Road is not known, but expected to be higher than 1 Hz, which is significantly higher than any wave frequency. Earthquakes generate ground motions in the 0.1 to 30 Hz. So even though earthquake vibration frequencies could overlap with traffic or wave-induced frequencies, third-party information about the occurrence of an earthquake would allow to identify the source in the data.	• In-situ measurements are needed for cliff movement and vehicular traffic-induced vibrations. • Seismicity recorded at existing stations in the vicinity would not be representative of what manifested at the site. • While earthquake and wave-induced vibrations could be measured in City property, cost and operation efficiencies will be achieved if corresponding instrumentation is installed in one package in-situ with the cliff movement and vehicular traffic-induced vibration instrumentation. • Impacts on traffic are expected in the 2-week duration of instrumentation installation, but none during operation.

MP Component	Description	Objective	Justification for Monitoring and Technique	Justification for Location
Ground Movement Monitoring	Continuous measurement and near real-time reporting of ground movement at Gatchell Road in the vicinity of X Cave and South Cove. A Shape Acceleration Array (SAA) that can detect settlement in near real time will be installed in a trench. The trench could be in the road margin or the road itself.	Ground movement measurements that can be correlated with metocean and geological processes to understand triggers and thresholds for movement. Once these relationships and thresholds are understood, the SAA can be used to trigger an alarm if a threshold movement is exceeded.	• Requested by NPS. • Similar to vibration monitoring, ground movement could be a precursor to, or indicative of cliff failure or cave collapse (Abdoun et al. 2008, Bennett et al. 2011). • The SAA is an instrument that can provide accurate, near real time data on ground movement. It could ultimately be used to give early warning of failure of the road. • Other monitoring approaches rely on judgment-based projections of future risk based on historical data.	• The SAA must be installed in the area at risk and where road users are exposed to that risk, which is Gatchell Road along the South Cove and X Cave. • Impacts on traffic are expected during the 4-week duration of installation, but none during operation. • The trench will be covered once the SAA is installed. Power source, data logger, and lightning protection will be installed on a pole adjacent to the northern end of the trench.

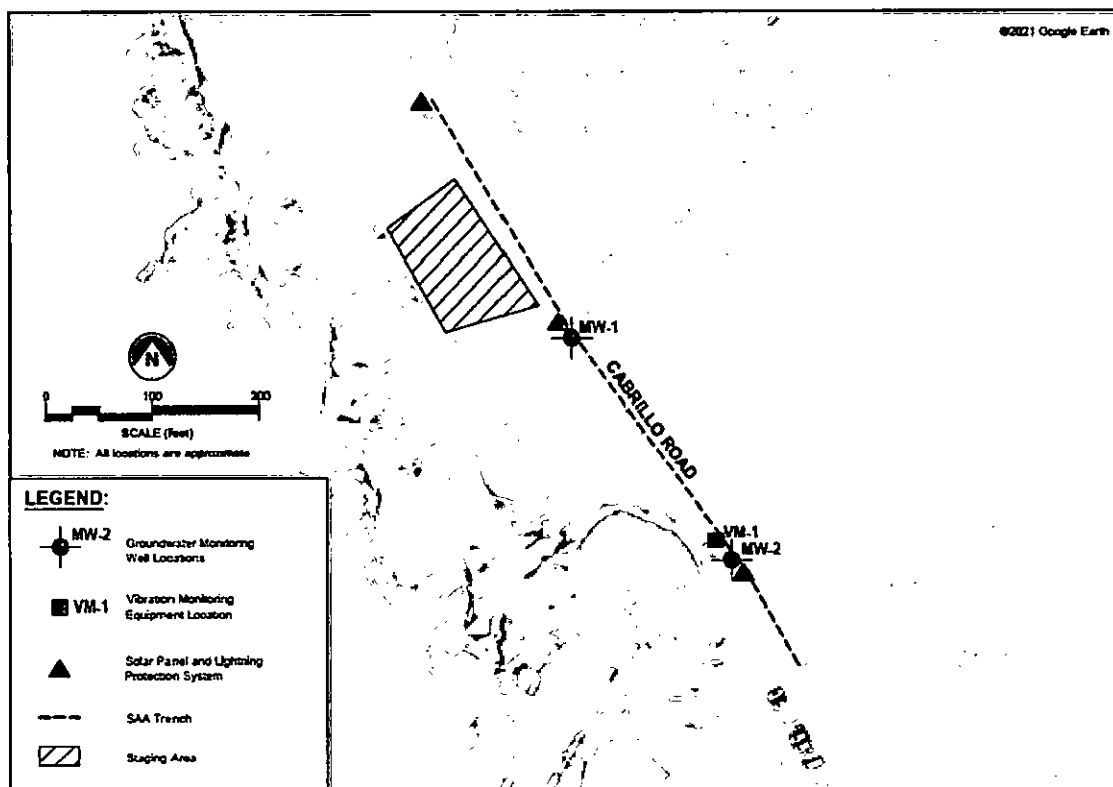


Figure 4. MP Instrumentation Locations at the South Cove and X Cave