6. CLOSED LANDFILL AT MUSSEL ROCK

City of Daly City

VULNERABILITY SUMMARY

Vulnerability of the closed landfill at Mussel Rock (Landfill) is **high**. The asset is highly sensitive to coastal erosion, as collapse of the seawall could expose the contents of the Landfill, potentially releasing garbage into surrounding areas. Because of its location on the open Pacific Coast, the revetment at Landfill is already exposed to erosion and wave impacts, both of which are likely to increase as sea level rises in the future. Adaptive capacity of the Landfill is moderate, as maintenance can reduce vulnerability. Some of the asset's recreational uses are less vulnerable to sea level rise impacts, as they could be migrated inland or potentially accommodated elsewhere.

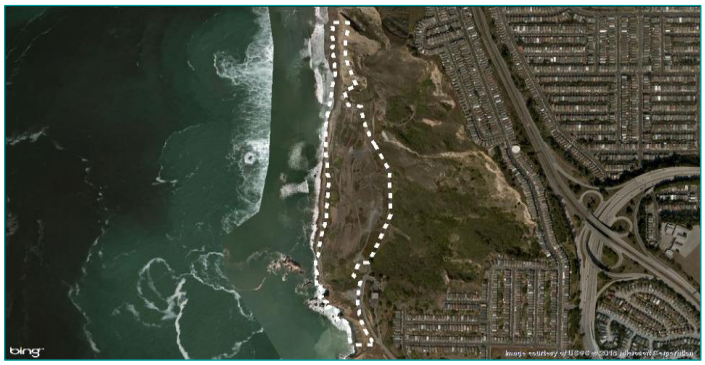
SENSITIVITY	*EXPOSURE*	*ADAPTIVE CAPACITY*	*CONSEQUENCES*
High	*Moderate*	*Moderate*	*High*

ASSET CHARACTERISTICS

Westline Drive | Daly City

Asset Description and Function:

The Landfill contains an unlined municipal landfill in the City of Daly City that operated from 1958 until 1978. It is closed, and is now a valued recreational asset with access to trails, paragliding, and birding. The Landfill lies on a terrace between steep, unstable slopes above the Pacific Ocean. The terracing and the revetments at the base of the Landfill were designed to prevent landslides and the Landfill's contents from being released into the ocean. While there is no official designation, remains of an Ohlone settlement were found on site.



Asset Type	Closed landfill
Asset Risk Class	4
Size	29 acres
Year of Construction	1950s
Elevation	10-60 feet
Level of Use	NA (closed)
Annual O&M Cost	$1,000,000
Special Flood Hazard Area	Asset not in SFHA
Physical Condition	Good
Landowner	City of Daly City

Underground Facilities

The volume of buried waste is estimated at 1 million cubic yards. The Landfill extends up to 75 feet below grade.

Environmental Considerations

Special status plants, animals, and natural communities may be present in the project area; a more detailed analysis will be needed before implementing adaptation strategies.

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ASSET SENSITIVITY

The Landfill's primary function (storing waste) is highly sensitive to erosion because a landslide or cliff collapse (caused by erosion or failure of the seawall and revetment) could cause garbage to be exposed. This would significantly affect the level of service provided by the Landfill, and possibly lead to the release of waste material. The site's other uses are less sensitive to erosion, as trails or other public recreational uses could continue in the area even if some sections of the former landfill collapsed.

SHORELINE VULNERABILITY

Exposure Analysis and Erosion Extent

Exposure to erosion at the Landfill is moderate. The 30- to 35-foot-high revetment at the base of the cliff is exposed to daily wave action and high tides requiring spot repairs every few years. The 2016 storms caused erosion in a few areas on the north side that necessitated emergency repair. However, because the landfill is set back slightly from the cliff, and due to the revetment at the base of the cliff, the Landfill and its materials themselves have never been exposed. As sea level rises, however, more frequent severe storms and wave impacts will increase erosion of the revetment and armoring, potentially leading to landslides. Historical erosion data and future erosion projections indicate that this asset and the surrounding area are particularly at risk from erosion (yellow band on the right). The asset will not be exposed to coastal inundation because it is elevated and slopes upward away from the ocean. A groundwater table increase due to sea level rise may expose the Landfill's contents to water from below ground, but this is being monitored.

Erosion Analysis: Landfill likely to exposed to future erosion.

Erosion at Mussel Rock; though landfill protected by revetment.

Cross-Cutting Vulnerabilities

Continued maintenance of the seawall and revetments are imperative to preventing future landslides and thus exposure of the Landfill, which could create environmental or regional effects.

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ADAPTIVE CAPACITY, CONSEQUENCES, AND POTENTIAL ADAPTATION

Adaptive Capacity

Adaptive capacity of the Landfill is moderate. Culverts onsite address drainage to minimize erosion that could be caused by rain, which ultimately helps maintain the structural integrity of the site. However, severe storms and waves could facilitate coastal erosion, reduce slope stability, and increase the likelihood of landslides. Ongoing monitoring of erosion hot spots and drainage issues reduces the likelihood that a major event will erode the hillside, and enables intervention via additional riprap, gabions, or other adaptation solutions. Ultimately, if erosion were significant enough to expose garbage, it would likely be necessary to relocate the Landfill inland, or remove and distribute all its contents to other sites.

Consequences

Consequences of the loss of the Landfill and spill of garbage would be high; however, the scale of the impact would be local. Exposed landfill materials could spill directly into the ocean, creating an environmental hazard and impact water quality or nearby wildlife. If this occurred, trash would need to be removed and the Landfill set back, or the trash would have to be relocated and the site remediated. Trash release or landslides could have secondary impacts on recreational uses of the site and reduce public access to open space. Any environmental damage could reduce the abundance of wildlife on site, including birds. The costs associated with the latter impacts have not been quantified, but removal of the Landfill is estimated at $200 million. Annual routine site maintenance, which includes the repair of drainage infrastructure averages around $200,000, and repair of the revetment ranges from $1,000,000 upward to $6,000,000.

Drainage line above the gabions.

Additional Important Information

A short section of the revetment will be raised 5 feet. As a requirement of the permit application to raise the revetment, the California Coastal Comission (CCC) requested the City of Daly City consider a long-term solution to the potentially hazardous issues raised by the continued protection of the Landfill. The CCC requested that the City consider various options for the managed retreat of the landfill and associated infrastructure, including a detailed feasibility study and cost assessment to potentially relocate all or some portion of the landfill and remove the seawall at some future date. Additionally, funding for work in the area is limited.

Path looking south. Rock revetment on right, landfill on left.

Asset-Specific Adaptation

Near-term solutions include maintaining the revetments to keep the landfill in place. Alternatives like sand placement on the beach to reduce erosion may bring some short-term relief. In the mid- to long-term, severe armoring or relocation may be required.

Vulnerable Landfills

There is another Asset Vulnerability Profile on vulnerable closed landfills: Half Moon Bay Landfill (AVP#7). The vulnerability assessment analysis shows that there are nine vulnerable solid waste facilities in the County. Three of these facilities are active, while six are closed.