5.3.4 Geology, Soils, Land Capability, and Coverage

This section contains an evaluation of the potential impacts to geology, soils, land capability, and coverage associated with the implementation of the Kings Beach SRA General Plan Revision and Pier Rebuild Project alternatives. The analysis evaluates geologic conditions, relevant soil properties, and associated elements of land capability and coverage. The potential for the project to change siltation or deposition patterns in Lake Tahoe is discussed in Section 5.3.7, Hydrology and Water Quality. The effects resulting from General Plan implementation under all of the alternatives described herein would be the same regardless of ownership of the Plaza parcels.

The existing conditions and significant resource values related to Geology, Soils, Land Capability, and Coverage are summarized in Section 2.2.1, Physical Resources, in Chapter 2, Existing Conditions, of this document. A more detailed description of the existing soils and geologic conditions at the project site and a summary of pertinent regulations are included in the Resources Inventory and Existing Conditions Report, available on the Kings Beach SRA webpage (www.parks.ca.gov/PlanKBSRA) and at CSP and TRPA offices during normal business hours through consideration of project approval. Relevant project goals and guidelines are summarized in Section 4.4.1, Resource Management and Protection, in Chapter 4, The Plan.

This project site is not at risk from expansive soils, landslides, mud slides, or avalanche; it does not cross a known earthquake fault, and the project would not increase the exposure of people or structures to other geologic hazards such as seismically induced ground failure, tsunami, or seiche. Additionally, TRPA regulations do not allow for septic systems or alternative waste disposal systems within the Lake Tahoe Basin. Therefore, these issues are dismissed from further consideration.

The volcanic and glacial history of the Lake Tahoe Basin does not allow for extensive preservation of paleontological resources. Undisturbed or buried lake sediments may contain invertebrate marine fossils, however because these are commonly found and the fossil record well documented, these fossils would not be considered unique paleontological resources. A search of the U.C. Berkeley Museum of Paleontology specimen database found three aquatic snail fossils on the south shore of Lake Tahoe, and one plant fossil in the north shore. (U.C. Berkeley Museum of Paleontology [UCMP] 2017). The project contains active (continuously disturbed) lake sediments and volcanic mudflows (Saucedo 2005), which are unlikely to contain fossils of any kind. Buried lake sediments below the volcanic mudflows could contain common invertebrate fossils, however as discussed above, these would not be considered a unique paleontological resource. For these reasons, impacts to paleontological resources are dismissed from further consideration.

Environmental Impacts and Mitigation Measures

Analysis Methodology

The evaluation of land coverage changes and potential geologic and soil impacts is based on a review of documents pertaining to the project study area, including California Geologic Survey (CGS) and U.S. Geologic Survey (USGS) technical guides, the NRCS 2007 Soil Survey, TRPA regulations and planning documents, environmental documents, existing TRPA Land Coverage and Land Capability documentation, background reports prepared for plans and projects in the vicinity, and published and unpublished geologic literature. The information obtained from these sources was reviewed and summarized to understand existing conditions and to identify potential environmental effects, based on the significance criteria identified below. In determining the level of significance, the analysis

assumes that the proposed project would comply with relevant, federal, state, and local laws, regulations, and ordinances.

Potential soil and geologic effects associated with the project alternatives can be classified as temporary or permanent. Temporary impacts generally include effects associated with construction activities, such as ground disturbance and short-term increases in turbidity. Permanent impacts would be associated with proposed facilities, such as new impervious land coverage and deep soil and geologic disturbance.

Significance Criteria

Significance criteria for determining impacts to geology, soils, land capability, and coverage are summarized below.

CEQA Criteria

Based on Appendix G of the State CEQA Guidelines, impacts to geology, soils, land capability, and coverage would be significant if the project would:

- result in substantial soil erosion or the loss of topsoil, or
- expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, including liquefaction, or landslides.

TRPA Criteria

The TRPA Initial Environmental Checklist was used to develop significance criteria to evaluate the geology, soils, land capability, and coverage impacts of the alternatives. Impacts would be significant if the project would:

- compact or cover soil with impervious surfaces beyond the limits allowed by the land capability districts,
- change the topography or ground relief features in a manner inconsistent with the natural surrounding conditions, or
- substantially change undisturbed soil or native geologic substructures.

Environmental Impacts

Impact 5.3.4-1: Create compaction or land coverage beyond TRPA limits

Land coverage at KBSRA currently exceeds TRPA limits, however coverage mitigation is completed in accordance with TRPA Code Section 30.6 as new projects move through the TRPA permitting process. Under the 1980 General Plan currently in force, no future projects would be allowed to create compaction or land coverage beyond TRPA limits. Therefore, there would be **no** impact with regard to coverage from Alternative 1 and the site would remain overcovered. The action alternatives would all comply with TRPA land coverage regulations and would reduce total coverage at KBSRA relative to existing conditions. The shared-use path in Alternatives 2, 3, and 4 would be exempt from land coverage calculations (TRPA Code Section 30.4.6.D.3). Alternative 2 would create the largest overall reduction in regulated coverage, and Alternative 3 would result in the smallest reduction. Because all alternatives would comply with coverage requirements, implementation of Alternatives 2, 3, and 4 would result in a **less-than-significant** impact on land coverage.

For coverage purposes, the land-based portions of the existing pier, the proposed eastern pier, and other pier alternatives are included in the coverage analysis for the General Plan revision. Land coverage is not calculated below the high-water mark of Lake Tahoe. Prior to approval of the project, coverage calculations for the pier rebuild project would be submitted to TRPA for review consistent with the CSP Special Project Requirements (Section 4.7, CSP Standard and Special Project Requirements); if the project is approved and the EIR/EIS is certified, a TRPA permit would be issued at that time. For this reason, the pier rebuild component of Alternatives 2, 3, and 4 would have **less-than-significant** impact relative to the creation or compaction of land coverage as it is managed by TRPA. The Alternative 1 is the no project alternative and would have **no impact** on land coverage.

Alternative 1: No Project

General Plan Revision

Alternative 1 is the no-project alternative. Land coverage within KBSRA currently exceeds the maximum allowable coverage in all land capability districts (LCDs). Some of the excess coverage has already been mitigated as part of past development at the park, including the existing restroom buildings. The exact amount of excess coverage (taking into consideration the legally existing land coverage and previously mitigated excess coverage) would be determined during the TRPA permitting process. Under the existing General Plan, future projects would not be able to add additional coverage and may be required to mitigate excess coverage consistent with TRPA Code Section 30.6. For reference, Table 5.3.4-1 provides an overview of coverage for Alternative 1 and a comparison of excess coverage with other alternatives.

Table 5.3.4-1 KBSRA Land Coverage Summary by Alternative

Land Coverage District	Project Area (sf)	Base Allowable Land Coverage (%)	Base Allowable Coverage (sf)	Maximum Allowable Transferred Coverage (sf)	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
					Existing Coverage (sf)	Excess Coverage (existing minus max sf)	Proposed Coverage (sf)	Excess Coverage (proposed minus max sf)	Proposed Coverage (sf)	Excess Coverage (proposed minus max sf)	Proposed Coverage (sf)	Excess Coverage (proposed minus max sf)
1b	136,764	1%	1,368	1,368	4,660	3,292	3,912	2,544	3,985	2,617	3,761	2,393
3	13,376	5%	669	669	2,080	1,411	1,064	395	868	199	650	-19
5[1]	291,350	25%	72,837	148,756	151,431	2,675	126,602	-22,154	142,748	-6,008	133,174	-15,582
Total	441,490	-	74,874	150,793	158,171	7,378	131,578	-19,215	147,601	-3,192	137,585	-13,208

[1] Approximately 15,405 square feet (sf) of the project site is within the Kings Beach Town Center and located more than 300 feet from Lake Tahoe and would therefore have a maximum allowable coverage of 70 percent (TRPA Code Section 30.4.B.2.1).

Source: KB Foster 2002, JWA Consulting Engineers 1994, DBW 2003, compiled by Ascent in 2017

Alternative 1 is a continuation of existing conditions under the current General Plan. Although land coverage currently exceeds TRPA limits, coverage mitigation has been implemented through individual projects on the site. Any future projects at KBSRA would be required to mitigate the excess coverage in compliance with TRPA Code. Therefore, Alternative 1 would not result in the creation of new land coverage beyond TRPA limits and there would be **no impact**.

Pier Rebuild Project

For coverage purposes, the land-based portions of the existing pier is included in the coverage analysis for the existing General Plan revision. Land coverage is not calculated below the high-water mark of Lake Tahoe. For this reason, Alternative 1, the no project alternative, would have **no impact** related to the creation of compaction or land coverage.

Alternative 2: Eastern Pier Alternative (Proposed Project)

General Plan Revision

When compared to Alternative 1 (existing conditions), the Alternative 2 General Plan revision would decrease regulated land coverage in LCD 1b by 748 square feet and by 1,016 square feet in LCD 3. In LCD 5, which covers most of the project site, Alternative 2 would reduce coverage by 24,829 square feet when compared to Alternative 1, or existing conditions. A small amount of the proposed coverage (such as additional width in restrooms and wheelchair accessible ramps) would be created by compliance with the Americans with Disabilities Act (ADA). As described in TRPA Code Section 30.4.6.C, impervious areas created to meet ADA standards are not subject to TRPA land coverage calculations (with the exception of coverage associated with vehicular use, such as parking spaces). During final design, ADA compliance areas would be identified and coverage numbers would be adjusted accordingly.

In addition to regulated coverage, Alternative 2 would include the construction of a non-motorized public trail (i.e., the shared-use path or waterfront promenade). This path is part of the implementation element of the Placer County Tahoe Basin Area Plan and is a component of the planned shared-use path network connecting the North Tahoe communities. In accordance with TRPA Code Section 30.4.6.D.3, non-motorized public trails are exempt from the calculation of land coverage, subject to siting and design requirements. Specifically, these design requirements call for minimization of disturbance to low capability lands (LCDs 1a, 1b, 1c, 2, and 3). KBSRA lies between the Kings Beach urban core and Lake Tahoe. The high capability land within the park is dedicated to parking areas, facilities, and stormwater infiltration areas. The proposed path cannot avoid all disturbance in low capability lands without affecting parking spaces, recreation or administrative facilities, or stormwater management infrastructure. Furthermore, the proposed path would be a combination promenade and sand wall which would assist with sand management in the park. For the sand wall to be effective, it must be located where it can intercept windblown sand before it reaches the parking areas and becomes unusable. Finally, the proposed path alignment would minimize disturbance to low capability lands by incorporating existing paved areas where possible. This would reduce the amount new impervious surface by more than 25 percent. The area of new impervious surface created by the proposed path is shown in Table 5.3.4-2, Alternative 2 Land Coverage Detail.

Table 5.3.4-2 Alternative 2 Land Coverage Detail

LCD	Alternative 1 Existing Coverage (sf)	Alternative 2 with Traditional Lawn Area (sf)			Alternative 2 with Artificial Turf (sf)		
		Proposed Impervious Area	New Impervious Area Exempt from Coverage (Non-motorized Path)	Net Change in Coverage (Compared to Alternative 1)[1]	Proposed Impervious Area	New Impervious Area Exempt from Coverage (Non-motorized Path)	Net Change in Coverage (Compared to Alternative 1)
1b	4,660	15,998	12,086	-748	16,130	12,086	-616
3	2,080	2,122	1,058	-1,016	2,122	1,058	-1,016
5	151,431	132,480	5878	-24,829	147,153	5878	-10,156
Total	***158,172***	***150,600***	***19,022***	***-26,593***	***165,405***	***19,022***	***-11,788***

[1] Excludes non-motorized path area, which is exempt from coverage calculations per TRPA Code Section 30.4.6.D.3.

Source: Compiled by Ascent Environmental in 2017

Alternative 2 also includes a lawn area, which would include either traditional or artificial turf. Traditional turf would be exempt from TRPA coverage regulations. If artificial turf were implemented, the lawn area would be considered land coverage. Compared to traditional turf, this would increase

the land coverage in LCD 1b by 131 square feet and in LCD 5 by 14,648 square feet. Overall, compared with Alternative 1, Alternative 2 with the use of artificial turf would reduce coverage by 616 square feet in LCD 1b, by 1,016 square feet in LCD 3, and by 10,156 square feet in LCD 5. Table 5.3.4-2 provides coverage reduction details for Alternative 2.

With either turf option, the proposed land coverage in LCD 5 for Alternative 2 would be below the maximum allowed transferred coverage and would be a reduction in coverage compared to existing conditions. Because of the coverage exemption for non-motorized paths, regulated coverage would also decrease in LCDs 1b and 3. During the TRPA permit review process, the project would be reviewed to determine whether land coverage mitigation fees have been paid for the excess coverage on-site and what additional fees, if any, are required.

Implementation of Alternative 2 would result in a decrease in TRPA-regulated coverage within all LCDs on the project site. The project would meet all TRPA requirements for coverage management, resource protection, and land coverage mitigation. For these reasons, Alternative 2 would have a **less-than-significant** impact related to the creation of compaction or land coverage.

Pier Rebuild Project

For coverage purposes, the land-based portions of the existing and the proposed eastern pier are included in the coverage analysis for the General Plan revision. Land coverage is not calculated below the high-water mark of Lake Tahoe. Prior to approval of the project, coverage calculations for the pier rebuild project would be submitted to TRPA for review. If the project is approved and the EIR/EIS is certified, a TRPA permit would be issued at that time. For these reasons, the Alternative 2 pier rebuild project would have a **less-than-significant** impact related to the creation of compaction or land coverage as it is managed by TRPA.

Alternative 3: Central Pier Alternative

General Plan Revision

The Alternative 3 coverage impacts would be similar to those discussed above for Alternative 2. Alternative 3 would create slightly larger coverage reductions in LCDs 1b and 3, and a smaller coverage reduction in LCD 5 when compared to Alternative 2 (see Table 5.3.4-3 for details). The proposed shared-use path, which is exempt from coverage calculations, would create 3,746 fewer square feet impervious area than the Alternative 2 path. This difference is because of minor variations in the path design and the amount of existing impervious surface within the path footprint.

Table 5.3.4-3 Alternative 3 Land Coverage Detail

LCD	Alternative 1 Existing Coverage (sf)	Alternative 3 (sf)		
		Proposed Impervious Area	New Impervious Area Exempt from Coverage (Non-motorized Path)	Net Change in Coverage (Compared to Alternative 1)[1]
1b	4,660	7,281	3,296	-675
3	2,080	5,969	5,101	-1,212
5	151,431	149,627	6,879	-8,683
Total	***158,172***	***162,877***	***15,276***	***-10,570***

[1] Excludes non-motorized path area, which is exempt from coverage calculations per TRPA Code Section 30.4.6.D.3.

Source: Compiled by Ascent Environmental in 2017

Implementation of Alternative 3 would reduce TRPA-regulated coverage within LCDs 1b, 3, and 5. The project would meet all TRPA requirements for coverage management, resource protection, and land coverage mitigation. For these reasons, Alternative 3 would have a **less-than-significant** impact related to the creation of compaction or land coverage.

Pier Rebuild Project

For coverage purposes, the land-based portions of the existing and central pier are included in the coverage analysis for the General Plan revision. Land coverage is not calculated below the high-water mark of Lake Tahoe. If the project is approved, coverage calculations for the pier rebuild project would be submitted to TRPA review and approval prior to permit issuance. For these reasons, the Alternative 3 pier rebuild project would have a **less-than-significant** impact related to the creation of compaction or land coverage as it is managed by TRPA.

Alternative 4: Western Pier Alternative

General Plan Revision

Alternative 4 coverage impacts would be similar to those discussed above for Alternative 2. Of the three action alternatives, Alternative 4 would create the largest coverage reductions in LCDs 1b and 3, but coverage reductions in LCD 5 would be slightly less than those projected for Alternative 2 (Table 5.3.4-4 for details). The proposed shared-use path, which is exempt from coverage calculations, would create 2,274 fewer square feet of new impervious area than the Alternative 2 path.

Implementation of Alternative 4 would result in a reduction in TRPA-regulated coverage within LCDs 1b, 3, and 5. The project would meet all TRPA requirements for coverage management, resource protection, and land coverage mitigation. For these reasons, Alternative 4 would have a **less-than-significant** impact related to the creation of compaction or land coverage.

Table 5.3.4-4 Alternative 4 Land Coverage Detail

LCD	Alternative 1 Existing Coverage (sf)	Alternative 4 with Traditional Lawn Area (sf)			Alternative 4 with Artificial Turf (sf)		
		Proposed Impervious Area	New Impervious Area Exempt from Coverage (Non-motorized Path)	Net Change in Coverage	Proposed Impervious Area	New Impervious Area Exempt from Coverage (Non-motorized Path)	Net Change in Coverage (Compared to Alternative 1)[1]
1b	4,660	9,547	5,786	-899	9,547	5,786	-899
3	2,080	798	148	-1,430	798	148	-1,430
5	151,431	143,988	10,814	-18,257	152,741	10,814	-9,504
Total	***158,172***	***154,333***	***16,748***	***-20,586***	***163,086***	***16,748***	***-11,833***

[1] Excludes non-motorized path area which is exempt from coverage calculations per TRPA Code Section 30.4.6.D.3.

Source: Compiled by Ascent Environmental in 2017

Pier Rebuild Project

For coverage purposes, the land-based portions of the existing and the western pier are included in the coverage analysis for the General Plan revision. Land coverage is not calculated below the high-water mark of Lake Tahoe. If the project is approved, coverage calculations for the pier rebuild project would be submitted to TRPA review and approval prior to permit issuance. For these reasons, the Alternative 4 pier rebuild project would have a **less-than-significant** impact related to the creation of compaction or land coverage as it is managed by TRPA.

Mitigation Measures

No mitigation measures are required.

Impact 5.3.4-2: Potential for substantial erosion or loss of topsoil

The General Plan revision associated with Alternatives 2, 3, and 4 would encourage recreational improvements that would result in ground disturbance. However, the potential for increased erosion resulting from future projects implemented under the General Plan revision would be minimized through compliance with the stringent TRPA and Lahontan RWQCB code requirements and permit conditions. For this reason, implementation of Alternatives 2, 3, and 4 would have a **less-than-significant** impact related to increased soil erosion or loss of topsoil. Alternative 1 is the no-action alternative and would have **no impact** related to erosion or loss of topsoil.

The potential for changes to lake sediments stemming from the pier component associated with Alternative 1, 2, 3, and 4 is discussed in Section 5.3.7, Hydrology and Water Quality.

Alternative 1: No Project

General Plan Revision

Alternative 1 is the no-project alternative and, as such, would not result in any changes to existing development with KBSRA or change the potential for soil erosion. Therefore, Alternative 1 would have **no impact** related to soil erosion or loss of topsoil.

Pier Rebuild Project

The land-based portions of the existing and proposed piers are included in the soil erosion analysis for the General Plan revision and the project. For a discussion of potential changes to sediment deposition lakeward of the high-water line, see Impact 5.3.7-2 in Section 5.3.7, Hydrology and Water Quality.

Alternative 2: Eastern Pier Alternative (Proposed Project)

General Plan Revision

The proposed General Plan contemplates the future redevelopment of KBSRA including new restrooms, pavilions, an administrative office, a waterfront promenade, reorganized parking, and relocated or expanded recreation amenities. These improvements would require ground disturbance during the demolition of existing structures and construction of new facilities and amenities. Exposed soils could be subject to wind and water erosion which could carry sediment into Lake Tahoe. The General Plan revision also includes a sand wall (placed roughly 150 feet inland of the Lake Tahoe high water mark) which would reduce the amount of beach sand carried by on-shore winds into the parking area. Currently, materials from parking areas must be disposed of and cannot be used to replenish the beach. Sand that collects below the wall would be redistributed on the beach and would not accumulate to form a dune at the walls base. This feature would result in a small decrease in the amount of sand lost to wind erosion at KBSRA.

The three soil map units within the project site have an erosion hazard rating of "slight," indicating that erosion is unlikely under ordinary conditions (NRCS 2007). The potential for erosion would be further reduced through the protective regulations included in TRPA and Lahontan RWQCB code requirements and permit conditions.

Future projects implemented under the Alternative 2 General Plan revision would be required to comply with Chapters 33 and 60 through 68 of the TRPA Code. These requirements include the installation of

best management practices (BMPs) for all projects, as specified in Section 60.4 of the TRPA Code. Temporary BMPs which comply with the TRPA *Handbook of Best Management Practices* must be implemented on construction sites and maintained throughout the construction period until winterization, and permanent BMPs must be installed once construction has been finalized. Improvement plans are submitted for review and approval to ensure conformance with TRPA rules, regulations, and ordinances as part of standard conditions of approval.

In addition, Lahontan RWQCB requires all construction projects that disturb more than one acre to prepare a Storm Water Pollution Prevention Plan (SWPPP) that includes a site-specific Construction Site Monitoring and Reporting Plan (CSMRP) pursuant to the National Pollution Discharge Elimination System (NPDES) 2011 Tahoe Construction Stormwater permit. Project SWPPPs are required to describe the site, construction activities, proposed erosion and sediment controls, means of waste disposal, maintenance requirements for temporary BMPs, and management controls related to stormwater. Temporary BMPs to protect water quality would be required during all site development activities. Water quality controls outlined in a SWPPP would be required to be consistent with or more stringent than TRPA requirements. Controls would be required to ensure that runoff quality meets or surpasses TRPA water quality objectives and the federal and state antidegradation policies, remains within the TRPA and Lahontan RWQCB discharge limits to surface water and groundwater sources, and maintains beneficial uses of Lake Tahoe. Stormwater quality sampling and reporting requirements outlined as a Construction Site Monitoring and Reporting Plan are also part of the SWPPP.

Although the Alternative 2 General Plan revision would encourage recreation improvements that would result in ground disturbance, the potential for increased erosion resulting from implementation of future projects under the General Plan revision would be minimized through compliance with TRPA and Lahontan RWQCB protective code requirements and permit conditions. For this reason, implementation of Alternative 2 would have a **less-than-significant** impact related to increased soil erosion and loss of topsoil.

Pier Rebuild Project

The land-based portions of the existing and proposed piers are included in the soil erosion analysis for the General Plan revision. For a discussion of potential changes to sediment deposition lakeward of the high-water line, see Impact 5.3.7-2 in Section 5.3.7, Hydrology and Water Quality.

Alternative 3: Central Pier Alternative

General Plan Revision

The potential risk of increased erosion or loss of topsoil for Alternative 3 is the same as discussed for Alternative 2 above. Although the Alternative 3 General Plan revision would encourage recreational improvements resulting in ground disturbance, the potential for increased erosion resulting from future projects would be minimized through compliance with the stringent TRPA and Lahontan RWQCB protective code requirements and permit conditions. For this reason, implementation of Alternative 3 would have a **less-than-significant** impact related to increased soil erosion and loss of topsoil.

Pier Rebuild Project

The land-based portions of the existing and proposed piers are included in the soil erosion analysis for the General Plan revision. For a discussion of potential changes to sediment deposition lakeward of the high-water line, see Impact 5.3.7-2 in Section 5.3.7, Hydrology and Water Quality.

Alternative 4: Western Pier Alternative

General Plan Revision

The potential risk of increased erosion or loss of topsoil for Alternative 4 is the same as discussed for Alternative 2 above. Although the Alternative 4 General Plan revision would encourage recreational improvements resulting in ground disturbance, the potential for increased erosion resulting from future projects would be minimized through compliance with the stringent TRPA and Lahontan RWQCB code requirements and permit conditions. For this reason, implementation of Alternative 4 would have a **less-than-significant** impact related to increased soil erosion and loss of topsoil.

Pier Rebuild Project

The land-based portions of the existing and proposed piers are included in the soil erosion analysis for the General Plan revision. For a discussion of potential changes to sediment deposition lakeward of the high-water line, see Impact 5.3.7-2 in Section 5.3.7, Hydrology and Water Quality.

Mitigation Measures

No mitigation measures are required.

Impact 5.3.4-3: Exposure to seismic and geologic hazards

KBSRA is located in a seismically-active area that could experience strong seismic shaking in the event of a large earthquake. The General Plan revision associated with Alternatives 2, 3, and 4 would modify the existing KBSRA development plan and to allow for the future construction of additional restroom facilities, pavilions, concession buildings, and an administrative building. These structures and their users could be susceptible to earthquake damage. The risk to people and structures would be reduced through compliance with the current seismic design requirements of the California Building Standards Code. For this reason, the potential for the General Plan revision for Alternatives 2, 3, and 4 to expose people and structures to seismic and geologic hazards would be a **less-than-significant** impact. Alternative 1 is the no project alternative and as such would have **no impact**.

Piers are resilient structures and are not likely to collapse during an earthquake (SGH 2014). Additionally, the pier rebuild component of Alternatives 2, 3, and 4 would not include a superstructure (pier mounted building) that could place users at risk during a large seismic event. Finally, as a publicly accessible pier, the proposed structure would be required to meet the ASCE standards for Seismic Design of Piers and Wharves. For these reasons, construction and operation of the pier under Alternatives 2, 3, and 4 would have a **less-than-significant** impact relative to exposure of people and structures to seismic and geologic hazards. The existing pier associated with Alternative 1 would be unchanged, and therefore, would not increase the exposure of people or structures to seismic and geologic hazards. There would **no impact** associated with Alternative 1.

Alternative 1: No Project

General Plan Revision

Alternative 1 is the no project alternative. For this alternative no new structures would be built that could be damaged by seismic or geologic hazards or expose people to risk during seismic events. For this reason, Alternative 1 would have **no impact** on the exposure of people and structures to seismic or geologic hazards.

Pier Rebuild Project

Under Alternative 1, the existing Kings Beach Pier would remain in place. Because no alterations would be made to the existing structure, there would be **no impact** on the exposure of people and structure to seismic or geologic hazards.

Alternative 2: Eastern Pier Alternative (Proposed Project)

General Plan Revision

KBSRA is located in a seismically-active area which could experience strong seismic shaking in the event of a large earthquake. The proposed General Plan revision would modify the existing KBSRA development plan to allow for the future construction of additional restroom facilities, group pavilions, concession buildings, and an administrative building. These structures and their users could be susceptible to earthquake damage. Additionally, the areas of KBSRA underlain by beach sands could be susceptible to liquefaction during seismic events. The risk to people and structures would be reduced through compliance with the current seismic design requirements of the California Building Standards Code. For this reason, the potential for the project to expose people and structures to seismic and geologic hazards would be a **less-than-significant** impact.

Pier Rebuild Project

Seismic damage to piers typically results from liquefaction of marine sediments and failure is usually related to economic loss and loss of functionality rather than structural collapse (SGH 2014). Piers that are accessible to the general public are subject to the seismic design criteria included in American Society of Civil Engineers (ASCE) Standard 61-14, Seismic Design of Piers and Wharves. These standards incorporate soil structure, geotechnical parameters, and earthquake hazard levels to minimize a piers risk of structural damage or failure during a predictable seismic event.

Piers are resilient structures and are not likely to collapse during an earthquake (SGH 2014). Additionally, the proposed pier would not include a superstructure (pier mounted building) that could place users at risk during a large seismic event. Finally, as a publicly accessible pier, the proposed structure would be required to meet the ASCE standards for Seismic Design of Piers and Wharves. For these reasons, the potential for the implementation of the Alternative 2 pier rebuild project to expose people and structures to seismic and geologic hazards would be a **less-than-significant** impact.

Alternative 3: Central Pier Alternative

General Plan Revision

The potential seismic and geologic risks associated with the Alternative 3 General Plan revision are the same as those discussed for Alternative 2 above. For the same reasons, the potential for future development implemented through the Alternative 3 General Plan revision to expose people and structures to seismic and geologic hazards would be a **less-than-significant** impact**.**

Pier Rebuild Project

The potential seismic and geologic risks associated with the Alternative 3 pier rebuild project are the same as those discussed for Alternative 2 above. For the same reasons, the potential for the implementation of the Alternative 3 pier rebuild project to expose people and structures to seismic and geologic hazards would be a **less-than-significant** impact**.**

Alternative 4: Western Pier Alternative

General Plan Revision

The potential seismic and geologic risks associated with the Alternative 4 General Plan revision are the same as those discussed for Alternative 2 above. For the same reasons, the potential for future development implemented through the Alternative 4 General Plan revision to expose people and structures to seismic and geologic hazards would be a **less-than-significant** impact.

Pier Rebuild Project

The potential seismic and geologic risks associated with the Alternative 4 pier rebuild project are the same as those discussed for Alternative 2 above. For the same reasons, the potential for the implementation of the Alternative 4 pier rebuild project to expose people and structures to seismic and geologic hazards would be a **less-than-significant** impact.

Mitigation Measures

No mitigation measures are required.

Impact 5.3.4-1: Potential for changes to site topography inconsistent with the natural surroundings or substantial changes to undisturbed soil or geologic substructures

Although the General Plan revision associated with Alternatives 2, 3, and 4 would encourage recreational improvements that would result in ground disturbance, the project site topography is subtle and the potential for grading or topography changes that are inconsistent with the TRPA Code would be minimized through compliance with the stringent TRPA and Lahontan RWQCB protective code requirements and permit conditions. For this reason, implementation of the General Plan revision associated with Alternatives 2, 3, and 4 would have a **less-than-significant** impact related to grading, topography, and geologic substructures. Alternative 1 is the no action alternative and as such would have **no impact**.

The pier rebuild component of Alternatives 2, 3, and 4 would require the removal of existing pilings and installation of new pilings to a depth of 6 to 8 feet below the surface of the lakebed. The project site is underlain by deep, ancient lake sediments that extend over half a mile north of the current Lake Tahoe shoreline (Saucedo 2005), therefore it is unlikely that the piles would encounter bedrock. The disturbance required for the installation of the piles would be limited to the area of the pile footprint and would not substantially alter the subsurface geology. For these reasons, the implementation of the pier rebuild component of Alternatives 2, 3, and 4 would have a **less-than-significant** impact on topography and geologic substructures. The Alternative 1 is the no action alternative and as such would have **no impact** on topography and geologic substructures.

Alternative 1: No Project

General Plan Revision

Alternative 1 proposes no changes to the development pattern or types of amenities at KBSRA, and it does not propose future project which could modify the topography or geologic substructures at the site. Therefore, Alternative 1 would have no impact on existing topography or geologic substructures.

Pier Rebuild Project

Under Alternative 1, the existing Kings Beach Pier would remain in place. Because no alterations would be made to the existing structure, there would be **no impact** to existing topography or geologic substructures.

Alternative 2: Eastern Pier Alternative (Proposed Project)

General Plan Revision

The Alternative 2 General Plan revision would support projects requiring grading, excavation, and permanent, if minor, topography changes. The natural topography of the site is nearly flat in the forested area north of the beach and slopes gently downward from the top of the beach to the water's edge. Because of this, future projects would not require large amounts of cut/fill excavation or topographic changes to prepare a site for development. All future projects implemented through the revised General Plan revision would be subject to the requirements Chapter 33, "Grading and Construction," of the TRPA Code. TRPA Code Chapter 33 includes specific provisions for timing of grading, winterization of construction sites, specifications for cut and fills areas, protection of vegetation during construction, preparation of a Slope Stabilization Plan for projects at the request of TRPA, and limitations on excavation deeper than 5 feet where the potential to intercept groundwater exists. TRPA Code Section 33.3.6 allows excavation deeper than 5 feet in limited circumstances, provided that a soils/hydrologic report has been completed that demonstrates that the excavation would not interfere with or intercept groundwater, no damage occurs to mature trees, excavated material is disposed of properly (as defined in Code Section 33.3.4), and the project site's natural topography is maintained.

Although the General Plan revision associated with Alternative 2 would encourage recreational improvements that would result in ground disturbance, the potential for grading or topographic changes that are inconsistent with the TRPA Code would be minimized through compliance with stringent TRPA Code requirements and permit conditions. For this reason, implementation of Alternative 2 would have a **less-than-significant** impact related to grading, topography, and geologic substructures.

Pier Rebuild Project

The Alternative 2 pier rebuild project would require the removal of 26 existing pier pilings. Rebuilding the pier at the eastern location would require driving 27 new piles to a depth of 6 to 8 feet below the surface of the lakebed. The sands and lake sediments in this area are mixed with cobble material from volcanic mudflows to a depth of approximately 3 feet, and are underlain by ancient lakebed sediments (NRCS 2007). These sediments are deep and extend over half a mile north of the current Lake Tahoe shoreline (Saucedo 2005), therefore it is unlikely that the piles would encounter bedrock. The disturbance required for the installation of the piles would be limited to the area of the pile footprint and would not substantially alter the subsurface geology. For these reasons, the implementation of the Alternative 2 pier rebuild project would have a **less-than-significant** impact on topography and geologic substructures.

Alternative 3: Central Pier Alternative

General Plan Revision

The potential for detrimental modifications of site topography or an adverse effect to geologic substructures resulting from the implementation of Alternative 3 is the same as discussed for Alternative 2 above. Although the General Plan revision associated with Alternative 3 would encourage recreational improvements that would result in ground disturbance, the potential for grading or topography changes that are inconsistent with TRPA Code would be minimized through compliance with the stringent TRPA and Lahontan RWQCB protective code requirements and permit conditions. For this reason, implementation of Alternative 3 would have a **less-than-significant** impact related to grading, topography, and geologic substructures.

Pier Rebuild Project

The effects to topography and geologic substructure from the implementation of the Alternative 3 per rebuild project would be similar to those discussed for Alternative 2. The Alternative 3 pier would require the installation of 33 new piles (six more than Alternative 2). As discussed for Alternative 2, because the geologic substructure consists of deep lake sediments the piling installation would be unlikely to encounter bedrock, and disturbance required for the installation of the piles would be limited to the area of the pile footprint. Therefore, implementation of the Alternative 3 pier rebuild project would have a **less-than-significant** impact on topography and geologic substructures.

Alternative 4: Western Pier Alternative

General Plan Revision

The potential for detrimental modifications of site topography or an adverse effect to geologic substructures resulting from the implementation of Alternative 4 is the same as discussed for Alternative 2 above. Although the General Plan revision associated with Alternative 4 would encourage recreational improvements that would result in ground disturbance, the potential for grading or topography changes that are inconsistent with TRPA Code would be minimized through compliance with the stringent TRPA and Lahontan RWQCB protective code requirements and permit conditions. For this reason, implementation of Alternative 4 would have a **less-than-significant** impact related to grading, topography, and geologic substructures.

Pier Rebuild Project

The effects to topography and geologic substructure from the implementation of the Alternative 4 pier rebuild project would be similar to those discussed for Alternative 2. The Alternative 4 pier would require the installation of 33 new piles (the same number required for Alternative 3, and six more than Alternative 2). As discussed for Alternative 2, because the geologic substructure consists of deep lake sediments the piling installation would be unlikely to encounter bedrock, and disturbance required for the installation of the piles would be limited to the area of the pile footprint. Therefore, implementation of the Alternative 4 pier rebuild project would have a **less-than-significant** impact on topography and geologic substructures.

Mitigation Measures

No mitigation measures are required.

Cumulative Impacts

Cumulative impacts related to land coverage, erosion, and changes to natural topography are considered in the context of the Kings Beach watershed. Seismic effects are localized by nature and are not cumulative. The cumulative projects as well as the proposed project would alter land coverage, create soil disturbance that could lead to increased erosion, or make changes to existing topography. However, all of these projects would be required to comply with the stringent regulatory protections enforced by TRPA and Lahontan RWQCB. These protections control the amount of land coverage that can be created by any project, require temporary and permanent erosion control BMPs, and protect natural topographic features. Therefore, because stringent regulations are in place to safeguard geologic and soil resources for all cumulative projects within the Kings Beach watershed, the proposed project, or the other action alternatives, and the cumulative projects would not result in cumulative adverse effects to these resources.

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