

Marlette Lake Dam Resilient Infrastructure Project

BCA 4 – Facility Type Loss of Function – Additional Facilities

The Marlette Lake Dam is owned and maintained by the State of Nevada. While there are no large permanent population centers in the immediate vicinity of the dam, the area has heavy recreation use and State Route 28, maintained by the Nevada Department of Transportation, and Lake Tahoe are just over one mile downhill from the reservoir. A “Probable Maximum Flood Analysis and Emergency Action Plan (EAP)” was completed in 2002. Results of the probable maximum precipitation modelling analysis showed that the expected runoff from the probable maximum precipitation storm would not overtop the dam. Due to the location of the dam in an area of high seismic activity, the construction of the dam, and the age of the dam, the EAP indicated the most likely cause of failure would be due to a large earthquake in the area. The inundation mapping prepared as a part of the EAP assumes a clear day breach (see Inundation Map Clear Day Breach, Figure A-1). The Potential Marlette Dam Failure Report indicate the potential for substantial damage to any existing structures and improvements within the downstream flow path, including State Route 28 and the Incline Village General Improvement District Export Sanitary Sewer Line, as well as to the ecology of Lake Tahoe. Following is a discussion about the additional potential impacts to Lake Tahoe due to a dam failure.

Clarity of Lake Tahoe

Clarity of Lake Tahoe remains a critically important indicator of ecological health. Since 1968, the clarity of Lake Tahoe has been measured and these measurements have shown a decline in clarity. In 1997, a federal, state, local and tribal partnership launched the Lake Tahoe Environmental Improvement Program (EIP). Through this program, EIP partners implement projects ranging from trails to water quality improvement projects. Since its inception, over \$520 million has been spent in Watershed, Habitat and Water Quality improvement projects alone (see attached Environmental Improvement Project Focus Area – Watersheds, Habitat and Water Quality spreadsheet). In 2011, the Nevada Division of Environmental Protection, in a collaborative effort with the California Regional Water Quality Control Board, Lahontan Region, established a Total Maximum Daily Load (TMDL) Program to further protect water quality in the basin. The TMDL research indicates that the decline in Lake Tahoe’s clarity can be attributed to increased inputs of fine sediment particles and free floating algae fed by the nutrients nitrogen and phosphorus. The TMDL research indicates that the fine sediment particles have a greater impact on clarity so much of the TMDL initial implementation efforts have focused on the reduction of fine sediment particles into Lake Tahoe. See the attached pages from the 2017 Lake Tahoe TMDL Performance Report for additional information.

Additionally, a report by A. Simon (Estimates of Fine-Sediment Loadings to Lake Tahoe from Channel and Watershed Sources. USDA-Agricultural Research Service, National Sedimentation Laboratory, Oxford, MS. 2006) estimated 199.2 tonnes/year (219.58 tons/year) of sediment discharged from Marlette Creek to Lake Tahoe under normal flow conditions. It is reasonable to assume that during a dam breach with high flood flows in Marlette Creek and in the adjacent forest, this volume of fine sediment could be matched or exceed with this one event.

The BCA model does not allow for input to quantify the potential degradation to Lake Tahoe in the event of a dam failure. Flood modeling results completed in the development of the Emergency Action Plan for Marlette Lake indicate extremely high velocities in excess of 30 feet per second with a flow volume of approximately 30,000 cubic feet per second. In addition to material that would be transported from the dam itself and accumulated sediment in the reservoir, the nature of the downstream geology is such that during a dam breach, large amounts of soil, rocks, and trees would also be conveyed downstream to Lake Tahoe (see attached pages from the PMP Analysis).

Marlette Lake Dam

If the dam is breached, there would be costs associated with the design, permitting and construction of the dam repair. A cost estimate was prepared to capture the potential cost to repair damages to the dam in the event of a breach. Total construction and non construction costs are estimated to be \$16,516,585.

State Route 28

Inundation mapping prepared as a part of the Emergency Action Plan shows over 2,400 linear feet of SR 28 would be impacted by flood waters (see Inundation Map Clear Day Breach, Figure A-1). Costs for damage to the road and associated infrastructure were estimated. Water quality improvements completed in 2018 along the seven-mile stretch of road from US Highway 50 to Sand Harbor (EIP 01.01.02.0013) totaled over \$1,039,000 alone. Allocating that cost over a seven-mile stretch of road and calculating the prorated share for a 2,400 linear foot section of inundation area results in an estimated cost to repair the water quality improvements of \$84,000.

It is anticipated that 2,400 linear feet of roadway may be damaged and need to be replaced. A cost estimate was prepared itemizing the construction and non construction costs. The total estimated cost to repair this section of roadway is \$3,696,247.

Incline Village General Improvement District Sanitary Sewer Export Line

Located in SR 28 within the inundation area is the Incline Village General Improvement District (IVGID) effluent export line. This line transports treated effluent from the IVGID water resource recovery facility out of the Lake Tahoe basin to IVGID's wetlands facility southeast of Carson City. The line was originally constructed in 1970 and various sections have been replaced over the years. IVGID currently has plans for replacing additional sections of line including the line in the section of SR 28 that could be inundated in a dam breach. Capital budget information from IVGID indicates an estimated cost of approximately \$10,000,000 for the replacement of a six-mile segment of effluent line or approximately \$315 per linear foot of pipeline. If the dam failure resulted in damage to up to 2,400 linear feet of pipe (the approximate length of pipe within the inundation area), replacement costs are estimated to be \$757,000. Attached is information on IVGID's capital budget and a discussion on the effluent export line and associated ongoing work.

Additionally, the effluent export line has a daily flow of 1.0 million gallons. If there was a dam breach and the effluent export line was damaged, there is a significant potential for a discharge of treated effluent into Lake Tahoe. IVGID only has approximately two to three days of storage capacity, depending on the season, in the event of a break in the export line.

Potential Loss of Life or Hospitalization

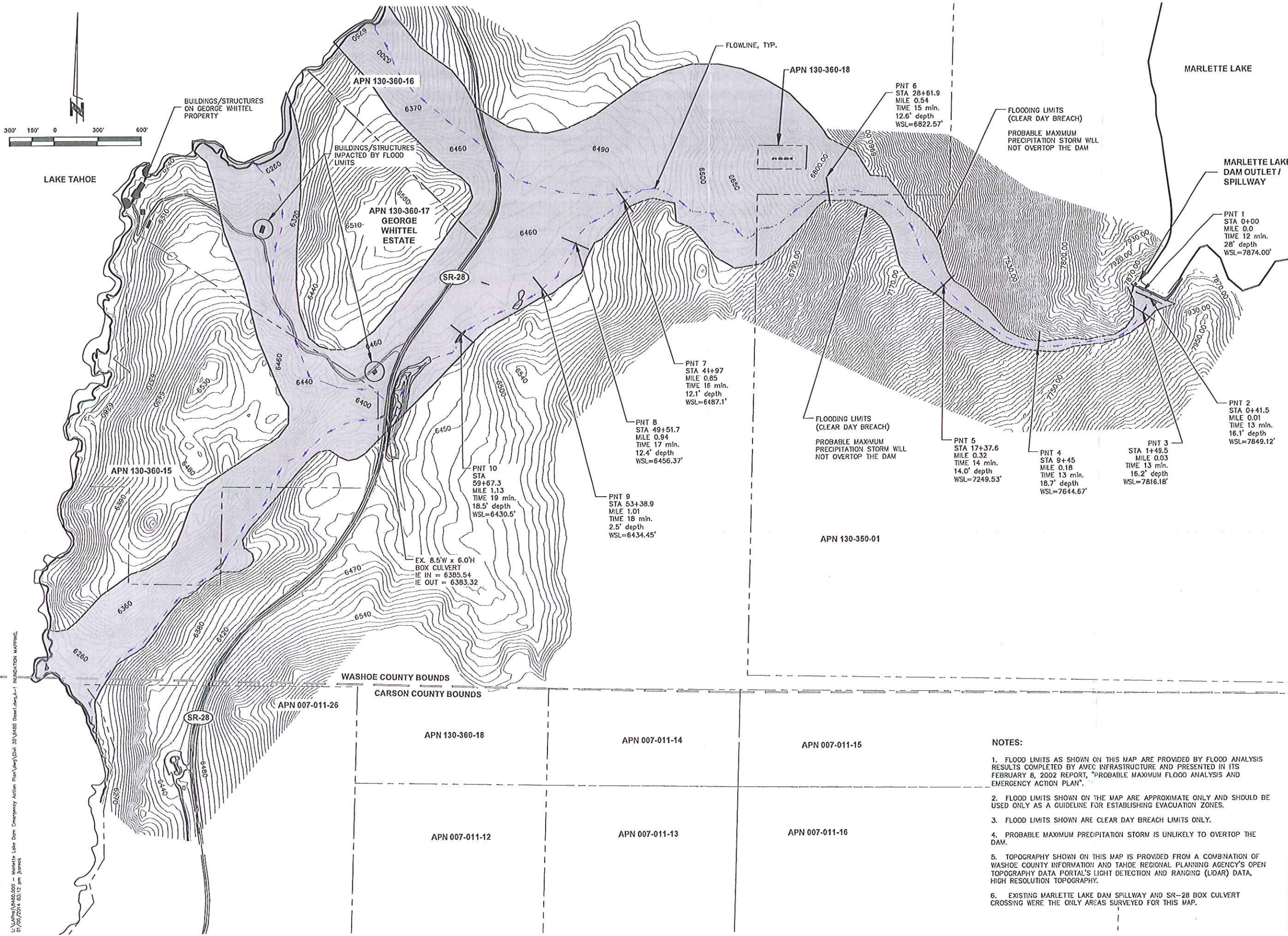
The mapped path of inundation crosses a popular hiking and mountain biking trail, crosses SR 28, and flows to the shores of Lake Tahoe. If there is a sudden breach of the dam, depending on the time of the occurrence, it is possible that there will either be hikers/bicyclists on the trail, recreationists at the beach and/or travelers on the road. Because there is not readily available data on the number of people that could be on the trails or at the beach, we are limiting our calculation of the potential loss of life to only travelers along SR 28. The Average Annual Daily Traffic (AADT) count along this section of road is 7,000 one-way trips per day. This conservatively averages out to 292 trips per hour or about five trips per minute. Traffic varies by time of day, day of the week and time of year. The AADT information is limited to vehicle counts only, not number of passengers in each vehicle, which could be a much higher number if there are multiple passengers in each vehicle. Therefore, it is conservative to estimate that there could be five people potentially hospitalized as a result of the dam breach.



11.29.18

Marlette Lake Dam Resilient Infrastructure Project
 Estimate of Pre-Mitigation Costs of the Dam Fails - Additional Facilities

Item	Damage	Calculation	Estimated Cost
1	Cost to Repair Damage to Existing Erosion Control Improvements	Based on actual costs for a 2018 erosion control project along this section of road. Total project construction cost was \$1,039,000. Cost per linear foot was determined and that cost was applied to a potential length of damaged area of approximately 2,400 LF	\$ 84,000.00
2	Cost to Repair Damage to Sanitary Sewer Export Line	Based on IVGID Capital Projects Budget for export line replacement. Total estimated replacement cost of \$10,000,000 was used to determine a price per linear foot and that cost was applied to the potential length of damaged pipe of 2,400 LF	\$ 757,000.00
3	Cost to Repair Damage to 2400 LF of SR 28	See attached spreadsheet	\$ 3,696,247.00
4	Cost to Repair Dam in the Event of a Dam Breach	See attached spreadsheet	\$ 16,516,555.00
5	Cost of loss of clarity in Lake Tahoe due to release of sediment	It is difficult to put a cost on the loss of clarity to Lake Tahoe. A 2006 report on the Lake Tahoe TMDL estimated that 199.2 tonnes/yr (219.6 tons/yr) enter Lake Tahoe from normal streambank erosion along Marlette Creek. It is feasible that a dam breach event with a large volume of water moving at a high velocity down Marlette Creek could result in the annual sediment load being deposited in this one event.	Unknown



- NOTES:**
1. FLOOD LIMITS AS SHOWN ON THIS MAP ARE PROVIDED BY FLOOD ANALYSIS RESULTS COMPLETED BY AMEC INFRASTRUCTURE AND PRESENTED IN ITS FEBRUARY 8, 2002 REPORT, "PROBABLE MAXIMUM FLOOD ANALYSIS AND EMERGENCY ACTION PLAN".
 2. FLOOD LIMITS SHOWN ON THE MAP ARE APPROXIMATE ONLY AND SHOULD BE USED ONLY AS A GUIDELINE FOR ESTABLISHING EVACUATION ZONES.
 3. FLOOD LIMITS SHOWN ARE CLEAR DAY BREACH LIMITS ONLY.
 4. PROBABLE MAXIMUM PRECIPITATION STORM IS UNLIKELY TO OVERTOP THE DAM.
 5. TOPOGRAPHY SHOWN ON THIS MAP IS PROVIDED FROM A COMBINATION OF WASHOE COUNTY INFORMATION AND TAHOE REGIONAL PLANNING AGENCY'S OPEN TOPOGRAPHY DATA PORTAL'S LIGHT DETECTION AND RANGING (LIDAR) DATA, HIGH RESOLUTION TOPOGRAPHY.
 6. EXISTING MARLETTE LAKE DAM SPILLWAY AND SR-28 BOX CULVERT CROSSING WERE THE ONLY AREAS SURVEYED FOR THIS MAP.

REV	DATE	DESCRIPTION

A-1

DATE: 10/31/2013
DRAWN BY: JMK
DESIGNED BY: RH
CHECKED BY: RH
JOB NO.: 8490.009

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Environmental Improvement Project Focus Area - Watersheds, Habitat and Water Quality

Project #	Project Name	Lead Implementer	Completion Year	Estimated Total Cost	State (Geospatial)
01.01.01.0001	Al Tahoe Erosion Control Project	City of South Lake Tahoe	2012	\$ 6,181,476	CA
01.01.01.0002	Bijou Area Erosion Control Project - Phase 1	City of South Lake Tahoe	2014	\$ 17,503,985	CA
01.01.01.0006	Rocky Point Erosion Control Project	City of South Lake Tahoe	2012	\$ 6,006,066	CA
01.01.01.0007	Sierra Tract Erosion Control Project Phase 1	City of South Lake Tahoe	2010	\$ 3,105,789	CA
01.01.01.0008	Sierra Tract Erosion Control Project Phase 3	City of South Lake Tahoe	2011	\$ 464,395	CA
01.01.01.0009	Sierra Tract Erosion Control Project Phase 4	City of South Lake Tahoe	2016	\$ 4,903,428	CA
01.01.01.0013	Lake Village Water Quality Improvement Project Phase II	Douglas County, NV	2013	\$ 1,925,472	NV
01.01.01.0024	Lake Tahoe Boulevard Erosion Control Project	El Dorado County, CA	2017	\$ 678,793	CA
01.01.01.0032	Brockway Water Quality Improvements	Placer County, CA	2015	\$ 2,375,712	CA
01.01.01.0039	Tahoe City Residential Erosion Control Project	Placer County, CA	2011	\$ 1,875,000	CA
01.01.01.0040	Tahoe Pines Erosion Control Project	Placer County, CA	2011	\$ 1,450,066	CA
01.01.01.0043	Central Incline Village Water Quality Improvement Project - Phase I	Washoe County, NV	2015	\$ 1,908,350	NV
01.01.01.0044	Central Incline Village Water Quality Improvement Project - Phase II	Washoe County, NV	2016	\$ 2,455,770	NV
01.01.01.0045	Fairview/Fairway Phase III Water Quality Improvement Project	Washoe County, NV	2014	\$ 3,605,000	NV
01.01.01.0047	Washoe County Sediment Reduction Project	Washoe County, NV	2011	\$ 261,222	CA, NV
01.01.01.0050	Apalachee Erosion Control Project - Phase 3B.1	El Dorado County, CA	2009	\$ 246,000	CA
01.01.01.0051	Christmas Valley Erosion Control Project - Phase 2A	El Dorado County, CA	2012	\$ 1,080,700	CA
01.01.01.0052	Christmas Valley Erosion Control Project - Phase 2B	El Dorado County, CA	2010	\$ 730,300	CA
01.01.01.0053	Gonowabie Road Slope Repair	Washoe County, NV	2012	\$ 311,955	NV
01.01.01.0054	Dollar Point Erosion Control Project	Placer County, CA	2009	\$ 2,890,000	CA
01.01.01.0055	Homewood Erosion Control Project	Placer County, CA	2012	\$ 1,725,648	CA
01.01.01.0056	Tahoe Estates Erosion Control Project	Placer County, CA	2008	\$ 2,801,639	CA
01.01.01.0057	Crystal Bay Water Quality Improvement Project Phase II	Washoe County, NV	2009	\$ 962,301	NV
01.01.01.0059	Angora Fire Protective Measures	City of South Lake Tahoe	2009	\$ 288,193	CA
01.01.01.0060	Rubicon 5 Erosion Control Project	El Dorado County, CA	2011	\$ 1,211,487	CA
01.01.01.0061	Sawmill 2A Bike Path and Erosion Control Project	El Dorado County, CA	2013	\$ 2,057,099	CA
01.01.01.0062	Warrior Way Water Quality Improvement Project	Douglas County, NV	2013	\$ 220,503	NV
01.01.01.0063	Sierra Tract Erosion Control Project Phase 2	City of South Lake Tahoe	2010	\$ 55,350	CA
01.01.01.0064	Montgomery Estates Area 1 Erosion Control Project	El Dorado County, CA	2013	\$ 1,936,597	CA
01.01.01.0065	Boulder Mountain Erosion Control Project	El Dorado County, CA	2014	\$ 950,363	CA
01.01.01.0066	Christmas Valley Erosion Control Project - Phase 2C	El Dorado County, CA	2013	\$ 1,018,141	CA
01.01.01.0068	Echo View 2 Erosion Control Project	El Dorado County, CA	2013	\$ 701,536	CA

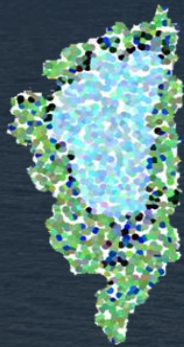
01.01.01.0070	Zephyr Cove Water Quality Improvement Project	Nevada Tahoe Conservation District	2017	\$	960,705	NV
01.01.01.0071	Cave Rock Estates General Improvement District Bed Filter Retrofit	Nevada Tahoe Conservation District	2016	\$	284,031	NV
01.01.01.0075	Forest View Water Quality Improvement Project	El Dorado County, CA	2016	\$	373,124	CA
01.01.01.0077	Blackwood Creek Channel Restoration Phase 3A (Reach 6)	U.S. Forest Service - Lake Tahoe Basin	2012	\$	4,390,000	CA
01.01.01.0079	Crystal Bay Water Quality Improvement Project Phase I	Washoe County, NV	2009	\$	1,292,167	NV
01.01.01.0080	Upper Kingsbury and Lower Kingsbury WQIP (SR 207)	Nevada Division of State Lands	2009	\$	1,357,261	NV
01.01.01.0081	Christmas Valley Erosion Control Project - Phase 1	El Dorado County, CA	2008	\$	1,759,108	CA
01.01.01.0082	Hidden Woods Water Quality Improvement Project - Lakeridge Phase II	Nevada Division of State Lands	2008	\$	286,874	NV
01.01.01.0083	Lake Village Water Quality Improvement Project - Phase 1a and 1b	Douglas County, NV	2009	\$	810,191	NV
01.01.02.0001	U.S. Highway 50 Water Quality Improvement Project - Meyers Road to Incline Road	California Department of Transportation	2014	\$	15,300,000	CA
01.01.02.0002	US Highway 50 Water Quality Improvement Project - Lake Tahoe Airport to US 50/SR 89	California Department of Transportation	2014	\$	12,100,000	CA
01.01.02.0005	US Highway 50 Water Quality Improvement Project - Ski Run Blvd. to Wildwood Avenue	California Department of Transportation	2013	\$	13,906,070	CA
01.01.02.0006	State Route 89 Water Quality Improvement Project - "Y" to Cascade Road	California Department of Transportation	2016	\$	24,420,000	CA
01.01.02.0008	State Route 89 Water Quality Improvement Project - Eagle Falls Viaduct to Meeks Creek	California Department of Transportation	2015	\$	19,215,971	CA
01.01.02.0009	State Route 89 Water Quality Improvement Project - Meeks Creek to Tahoma	California Department of Transportation	2016	\$	20,022,000	CA
01.01.02.0010	State Route 89 Water Quality Improvement Project - El Dorado County Line to State Rou	California Department of Transportation	2017	\$	68,962,000	CA
01.01.02.0011	State Route 431 Water Quality Improvement Project	Nevada Department of Transportation	2012	\$	8,565,408	NV
01.01.02.0012	State Route 28 Crystal Bay (431 to CA Stateline) Erosion Control & Water Quality Improv	Nevada Department of Transportation	2012	\$	8,155,000	NV
01.01.02.0013	SR 28-Washoe County/Carson City Line to Sand Harbor Water Quality Improvement Pro	Nevada Department of Transportation	2018	\$	1,039,873	NV
01.01.02.0014	Highway 50 Water Quality Improvement Project Phase I	Nevada Department of Transportation	2012	\$	7,945,000	NV
01.01.02.0015	Highway 50 Water Quality Improvement Project Phase II	Nevada Department of Transportation	2016	\$	3,873,680	NV
01.01.02.0016	State Route 207 (Kingsbury Grade) Water Quality Improvement Project	Nevada Department of Transportation	2014	\$	6,619,408	NV
01.01.02.0018	State Route 89 Water Quality Improvement Project - Route 28 to Squaw	California Department of Transportation	2010	\$	15,170,000	CA
01.01.02.0020	S.R. 267 Water Quality Improvement Project - Stewart Way to Route 28	California Department of Transportation	2010	\$	8,200,000	CA
01.01.02.0021	S.R. 28 Water Quality Improvement Project - Tahoe City to Kings Beach	California Department of Transportation	2010	\$	48,395,000	CA
01.01.02.0022	S.R. 28 Water Quality Improvement Project - Chipmunk Street to Nevada State Line	California Department of Transportation	2007	\$	2,647,000	CA
01.01.02.0023	State Route 89 Water Quality Improvement Project - Alpine Co. to Route 50 (Luther Pass	California Department of Transportation	2010	\$	25,800,000	CA
01.01.02.0024	U.S. Highway 50 Echo Summit Roadwall Reconstruction (1E14U)	California Department of Transportation	2012	\$	2,359,000	CA
01.01.02.0025	Hold-and-Release Detention Basin Pilot	California Department of Transportation	2010	\$	2,728,000	CA
01.01.02.0026	Roundabout at SR 28 and SR 431	Nevada Department of Transportation	2014	\$	3,205,513	NV
01.01.02.0027	U.S. Highway 50 Water Quality Improvement Project - Trout Creek to Ski Run Boulevard	California Department of Transportation	2013	\$	43,100,000	CA
01.01.03.0006	North Shore Roads Access and Travel Management Plan	U.S. Forest Service - Lake Tahoe Basin	2013	\$	1,289,270	CA
01.01.03.0011	Saxon Creek Low Water Crossing	U.S. Forest Service - Lake Tahoe Basin	2008	\$	150,475	CA
01.01.03.0021	High Meadows Road BMP Retrofits	U.S. Forest Service - Lake Tahoe Basin	2013	\$	610,000	CA
01.01.03.0022	Angora Fire Roads Mitigation (Road Decommissioning)	U.S. Forest Service - Lake Tahoe Basin	2012	\$	161,753	CA

01.01.03.0025	Angora Road BMP Upgrades	U.S. Forest Service - Lake Tahoe Basin	2012	\$	460,000	CA
01.01.03.0027	East Shore Roads ATM Plan	U.S. Forest Service - Lake Tahoe Basin	2015	\$	110,000	CA, NV
01.01.03.0031	North Shore Roads Access and Travel Management Plan - National Forest System Road	U.S. Forest Service - Lake Tahoe Basin	2013	\$	300,000	CA
01.01.03.0032	North Shore Roads Access and Travel Management Plan - Utility Access	U.S. Forest Service - Lake Tahoe Basin	2012	\$	320,000	CA, NV
01.01.03.0037	South Shore Roads Access and Travel Management Plan - Johnson Pass Road Rehabili	U.S. Forest Service - Lake Tahoe Basin	2013	\$	330,000	CA
01.01.03.0047	Meeks Bay Resort Roads BMP Retrofit	U.S. Forest Service - Lake Tahoe Basin	2012	\$	552,500	CA
01.01.04.0001	Alpine Meadows Service Road	California Tahoe Conservancy	2015	\$	460,000	CA
01.01.04.0046	D.L. Bliss Campground Rehabilitation	California Department of Parks and Rec	2009	\$	508,000	CA
01.01.04.0047	Divers Cove Erosion Control & Sand Harbor SEZ Protection	Nevada State Parks	2012	\$	23,515	NV
01.01.04.0052	Spooner Summit Fire Station Parking BMPs	U.S. Forest Service - Lake Tahoe Basin	2010	\$	225,617	NV
01.01.04.0053	USFS Facility BMP Retrofit	U.S. Forest Service - Lake Tahoe Basin	2014	\$	2,425,116	CA, NV
01.01.04.0054	Meeks Bay Highway Corridor BMPs	U.S. Forest Service - Lake Tahoe Basin	2012	\$	765,280	CA
01.01.04.0056	Cold Creek/High Meadows Trails BMP Retrofits	U.S. Forest Service - Lake Tahoe Basin	2012	\$	203,000	CA
01.01.04.0057	Nevada Beach Day Use Area and Campground BMP Retrofit	U.S. Forest Service - Lake Tahoe Basin	2011	\$	2,577,242	NV
01.01.04.0083	Eagle Point Campground Rehabilitation	California Department of Parks and Rec	2014	\$	420,000	CA
01.02.01.0012	Angora Creek Channel & Meadow Restoration	U.S. Forest Service - Lake Tahoe Basin	2016	\$	1,029,000	CA
01.02.01.0013	Angora Fire: Gardner Mountain Meadow Restoration	U.S. Forest Service - Lake Tahoe Basin	2014	\$	53,000	CA
01.02.01.0015	High Meadows/Cold Creek Restoration	U.S. Forest Service - Lake Tahoe Basin	2014	\$	1,900,000	CA
01.02.01.0017	Upper Truckee River Watershed/Ecosystem Restoration: Reach 5 & 6 Planning & Reach	U.S. Forest Service - Lake Tahoe Basin	2017	\$	9,202,000	CA
01.02.01.0020	Angora Creek Fisheries/SEZ Enhancement Project	El Dorado County, CA	2010	\$	1,438,206	CA
01.02.01.0021	Erie Circle Stream Environment Zone	California Tahoe Conservancy	2009	\$	5,000	CA
01.02.01.0024	Upper Truckee River Restoration Project - Airport SEZ Restoration (Reaches 3 and 4)	City of South Lake Tahoe	2012	\$	4,419,542	CA
01.02.01.0025	Upper Truckee River Angora Sub-Watershed Restoration and Sediment Control Project	California Department of Parks and Rec	2014	\$	172,000	CA
01.02.01.0032	Angora Creek fish passage improvement	U.S. Forest Service - Lake Tahoe Basin	2011	\$	100,000	CA
01.02.01.0033	Angora Creek restoration project - golf course reach	California Department of Parks and Rec	1997			CA
01.02.01.0034	Angora Creek Restoration Project - Sewer Line Capture	California Department of Parks and Rec	2002			CA
01.02.02.0006	Lake Forest Meadow Restoration	Placer County, CA	2011	\$	3,095,860	CA
01.02.02.0008	Ward Creek Road and Trail Sediment Reduction	California Department of Parks and Rec	2012	\$	544,000	CA
01.02.02.0010	Lower Blackwood Creek Restoration - Phase 1 (including Eagle Rock)	California Tahoe Conservancy	2017	\$	4,220,935	CA
01.02.02.0011	Drainage and Stream Environment Zone Project Near the Stanford Rock Road Crossing	California Tahoe Conservancy	2013	\$	120,227	CA
01.02.02.0012	Lake Tahoe Boulevard SEZ Enhancement Project	El Dorado County, CA	2017	\$	570,265	CA
01.02.02.0014	Griff Creek Stream Habitat Restoration	Placer County, CA	2017	\$	195,278	CA
01.02.02.0015	Snow Creek Wetlands Restoration	Placer County, CA	2017	\$	4,125,772	CA
01.02.02.0018	Blackwood Creek Restoration Phase 3, Site B	U.S. Forest Service - Lake Tahoe Basin	2012	\$	2,833,000	CA
01.02.02.0022	USFS Watershed Restoration Program	U.S. Forest Service - Lake Tahoe Basin	2012	\$	35,000	CA, NV

01.02.02.0025	Ward Creek Watershed Ecosystem Assessment	U.S. Forest Service - Lake Tahoe Basin	2010	\$	1,750	CA
01.02.02.0026	Griff Creek Restoration at Old Kingswood 500,000 Tank	North Tahoe Public Utility District	2014	\$	395,431	CA
01.02.02.0030	Truckee River First 4-Mile Streambank Stabilization and Restoration	Tahoe City Public Utility District	2017	\$	567,884	CA
01.02.02.0033	Heavenly CWE Implementation Phase 5	Heavenly Ski Resort	2008	\$	3,121,914	CA
01.02.02.0042	Spring Creek Road Improvement Project	U.S. Forest Service - Lake Tahoe Basin	2009	\$	482,900	CA
01.02.02.0043	Blackwood Creek Fish ladder removal and Culvert Replacement	U.S. Forest Service - Lake Tahoe Basin	2006	\$	950,000	CA
01.02.02.0044	Blackwood Creek restoration - Phase 1	U.S. Forest Service - Lake Tahoe Basin	2012	\$	1,100,000	CA
01.02.03.0003	Glenbrook Creek Restoration	Nevada Tahoe Conservation District	2013	\$	595,434	NV
01.02.03.0004	Third Creek/Incline Creek Restoration-Phase II Culvert Replacement	Incline Village General Improvement Dis	2011	\$	2,279,319	NV
01.02.03.0006	SR 28 Access and Erosion Control	Nevada State Parks	2010	\$	129,925	NV
01.02.03.0007	Land Coverage Restoration: Burgundy Hill Conservation Easement	Nevada Division of State Lands	2012	\$	461,675	NV
01.02.03.0008	North Canyon Creek SEZ Restoration Project	Nevada Division of State Lands	2015	\$	941,640	NV
01.02.03.0011	Third Creek Restoration Phase I	Incline Village General Improvement Dis	2010	\$	1,732,987	NV
01.02.03.0012	Third Creek/Incline Creek Restoration-Phase IV	Incline Village General Improvement Dis	2013	\$	1,631,604	NV
01.02.03.0014	Third Creek/Incline Creek Restoration-Phase III Lakeshore Boulevard Culvert Replacement	Incline Village General Improvement Dis	2011	\$	1,183,660	NV
01.02.03.0017	Heavenly Edgewood Creek Restoration	Heavenly Ski Resort	2007	\$	126,931	NV
01.02.03.0020	Edgewood Lodge and Golf Course Improvement	Edgewood Companies	2016	\$	3,118,000	NV
01.02.05.0004	East Shore Furbearer Project - Phase I	Nevada Tahoe Resource Team	2011	\$	28,401	NV
01.02.05.0006	Riparian Wildlife Enhancement Program	Nevada Tahoe Resource Team	2012	\$	54,429	NV
01.02.05.0011	USFS Wildlife/Fish Program	U.S. Forest Service - Lake Tahoe Basin	2014	\$	164,000	CA, NV
01.03.01.0003	Tahoe Yellow Cress (TYC) Conservation Strategy Implementation Phase 1	Tahoe Regional Planning Agency	2015	\$	441,165	CA, NV
01.04.01.0004	Terrestrial Invasive Species Program (TISP)	U.S. Forest Service - Lake Tahoe Basin	2017	\$	669,720	CA, NV
01.04.02.0016	Marlette Lake Aquatic Invasive Species Risk Assessment	Nevada Tahoe Resource Team	2013	\$	75,739	NV
01.04.02.0018	Emerald Bay State Park Aquatic Invasive Species Plant Control: 2009-2013	Tahoe Regional Planning Agency	2013	\$	194,087	CA
01.04.02.0048	Lake-wide Aquatic Invasive Species Control (not including Emerald Bay): 2010-2013	Tahoe Resource Conservation District	2013	\$	5,984,558	CA, NV
01.04.02.0062	Emerald Bay Aquatic Invasive Species Asian Clam Control	Tahoe Regional Planning Agency	2015	\$	1,069,161	CA
Total - EIP Watershed, Habitat and Water Quality Projects					\$	520,583,887

Source: Tahoe Regional Planning Agency Environmental Improvement Program, Lake Tahoe EIP Project Tracker

<https://eip.laketahoeinfo.org/>



LAKE TAHOE TMDL PROGRAM **2017 PERFORMANCE REPORT**

Guiding Efforts to Restore Lake Tahoe's Historic Clarity

From the TMDL Program Managers

Clarity (as measured by Secchi depth) remains a critically important indicator of Lake Tahoe's ecological health. The Lake Tahoe Total Maximum Daily Load (TMDL) provided science-based implementation guidance and established numeric targets needed to restore Lake Tahoe's historic clarity. The TMDL Program is led by the California Regional Water Board, Lahontan Region (Water Board) and Nevada Division of Environmental Protection (NDEP) (TMDL Management Agencies) and is the most important water quality protection policy in the basin. This edition of the TMDL Performance Report continues the TMDL Management Agencies' commitment to regularly report on the efforts to restore Lake Tahoe's clarity and provide a summary of TMDL implementation to date.

The importance of urban stormwater implementation to achieving clarity goals is well known. Thanks to cooperative efforts and strong partnerships between TMDL Management Agencies and Urban Implementers (local governments and state highway departments), the barriers initially identified with the tracking and accounting system have been overcome. Urban Implementers have worked tirelessly to complete their first registrations of pollutant controls in the Lake Clarity Crediting Program (Crediting Program). The Water Board and NDEP are proud and excited not only to present quantitative accomplishments reporting with respect to the Urban Uplands for the first time ever, but to announce Urban Implementer's success in attaining the first five-year milestone, a minimum 10% fine sediment particle load reduction.

We are also grateful for TMDL Management Agencies' strong partnership with the Tahoe Regional Planning Agency (TRPA). Initial steps to integrate the Urban Upland TMDL tracking software into the TRPA's Lake Tahoe Information (LT Info) platform is nearly complete. This effort has provided additional program streamlining and user enhancements to more efficiently and effectively track Lake Clarity Credit information and associated pollutant load reduction values.

The LT Info system's comprehensive Environmental Improvement Program Project Tracker (EIP Tracker) enabled NDEP and Water Board staff to quickly and efficiently gather and assess implementation accomplishments related to the TMDL Non-Urban Source Categories. Results indicate that progress continues to be made and that non-urban implementation is on track to achieve TMDL established goals.

The Water Board and NDEP appreciate the agency partnerships that have formed and grown during this challenging incipient program implementation period. We are grateful to all who continue the hard work to restore Lake Tahoe's clarity and for your support in making the TMDL Program a success!

Sincerely,



Robert Larsen
Senior Environmental Scientist
Lahontan Regional Water Quality Control Board



Jason Kuchnicki
Lake Tahoe Watershed Program Manager
Nevada Division of Environmental Protection

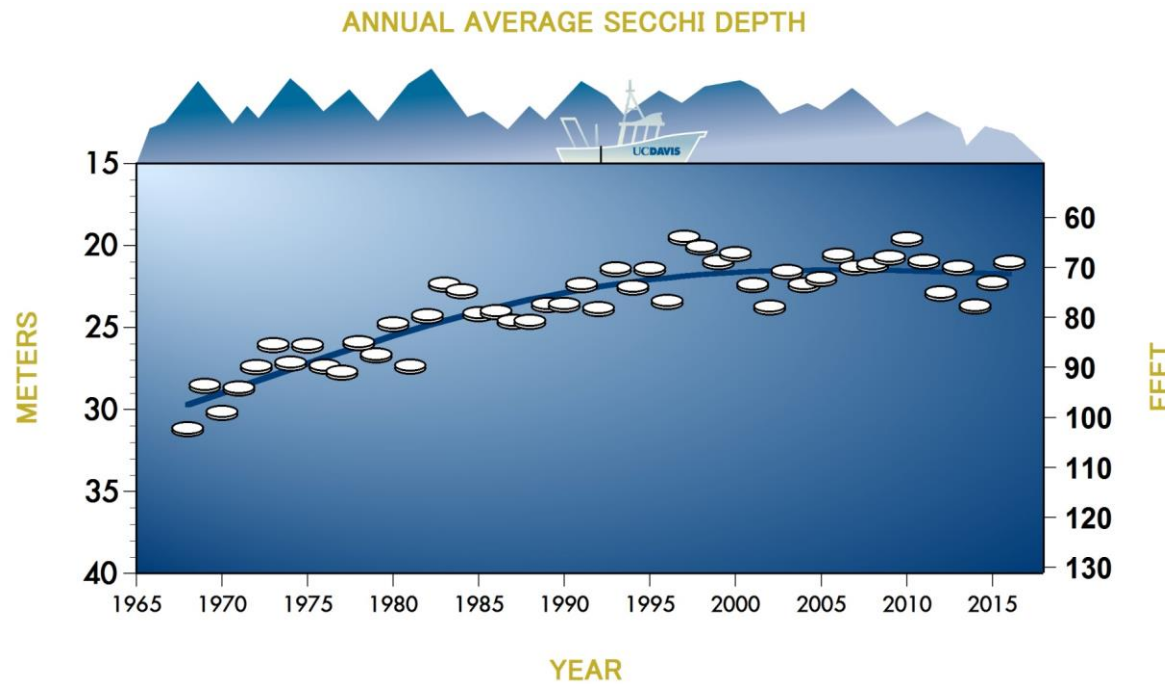
Lake Tahoe Clarity

Lake Tahoe's extraordinary deep water clarity is attributed to its uncommonly clean water which allows sunlight to reach much greater depths than possible in most other water bodies. Clarity has been measured by the University of California at Davis' Tahoe Environmental Research Center (UCD-TERC) since 1968. The average annual Secchi disk depth represents the average of measurements taken every 7-10 days across an entire year.

This monitoring unveiled Lake Tahoe's clarity decline over the past half-century. Lake Tahoe TMDL research attributes the decline to increased inputs of fine sediment particles 16 microns or less in diameter (FSP), and free floating algae fed by the nutrients nitrogen and phosphorus. FSP scatter light, while algae absorb light. As pollutant inputs increase, light is increasingly scattered or absorbed and is unable to penetrate deeper into the water column. Consequently, clarity declines.

TMDL research indicates fine sediment particles have a greater impact on clarity than the algae fed by elevated nutrient concentrations. So while the TMDL specifies reductions for nitrogen, phosphorus and FSP, initial implementation efforts focused on particle reduction are prioritized. An approximate 65%

reduction in FSP, accompanied by reductions in nitrogen and phosphorus of 10% and 35% respectively, are necessary to meet the TMDL numeric target of nearly 100 feet. Approximately half these load reductions are needed to meet the Clarity Challenge, an interim milestone of 80 feet annual average Secchi disk depth, the attainment of which will indicate a trend toward clarity restoration.



Lake Tahoe's long-term trend of clarity decline ended about 15 years ago. Since then, clarity has hovered around a value of 71 feet, but with sizable inter-annual and seasonal variability. UCD-TERC reported the 2016 annual average clarity at 69.2 feet (21.1 m). This is a 3.9 foot decrease from the previous year.

While winter clarity increased by 11.7 feet, large summer clarity declines outweighed improving winter clarity. For a second consecutive year, TERC researchers attributed the disappointing summer values to the continuing effects of climate change and the impact of the Lake's altered biology. The [2016 State of the Lake Report](#) provides additional interpretation of, and context for, the Lake's 2016 clarity measurements.

Introduction

The *2017 TMDL Performance Report* compiles accomplishment reporting results submitted by TMDL Implementers to the Water Board, NDEP and the Tahoe Regional Planning Agency (TRPA). Accomplishment data are summarized and organized by the TMDL pollutant source categories: Urban Uplands, Forest Uplands, Stream Channel Erosion and Atmospheric Deposition.

Urban Uplands Source Category

Runoff from roads and other urban land uses is the largest single source of fine sediment particles (FSP), accounting for more than 70% of the FSP load to the Lake. Moreover, the TMDL implementation analysis concluded that urban stormwater provides the greatest opportunity to control FSP pollution. Restoring Lake Tahoe's clarity therefore hinges on achieving FSP load reductions in the Urban Upland Source Category.

Water quality improvements within the Urban Uplands Source Category are carried out by California and Nevada local governments and state highway transportation departments. These partners (Urban Implementers) implement pollutant controls in the form of roadway operations, stormwater treatment facility construction and maintenance, and/or parcel-based best management practices (BMPs). Urban implementers document their actions through a comprehensive pollutant tracking and accounting system known as the Lake Clarity Crediting Program (Crediting Program).

In previous TMDL Performance Report editions, Urban Implementers were unable to report quantitative load reductions associated with their actions, as Crediting Program tools and protocols were undergoing refinement. Essential revisions were complete in August 2015, enabling Urban Implementers to begin reporting quantitative load reduction accomplishments. This *2017 TMDL Performance Report* provides Urban Uplands Source Category accomplishments as estimated annual average FSP, nitrogen and phosphorus load reductions and associated Lake Clarity Credit awards.

Non-Urban Source Categories

The Forest Uplands, Stream Channel Erosion, and Atmospheric Deposition Source Categories collectively contribute 28% of the total FSP load, 71% of the total nitrogen load, and 43% of the phosphorus load entering Lake Tahoe. Consequently, water quality improvements in these Non-Urban Source Categories are an integral part of achieving TMDL goals.

Non-Urban Implementers include local, state, and federal land and natural resource management agencies that work to implement water quality improvements through the Environmental Improvement Program (EIP). Activities to address non-urban sources are tracked using a set of relevant performance measures (PMs) that quantify the extent of the activities undertaken to improve water quality. This approach does not report estimated pollutant load reductions associated with these activities.

Results were accessed from the [EIP Project Tracker](#), the comprehensive tracking and reporting database for the EIP, and are summarized herein. More detail regarding PM results and specific information related to individual projects and actions associated with the PM data displayed in this report are accessible on the LT Info at www.LakeTahoeInfo.org.

Results contained in this report are also available and may be interactively explored on the **TMDL Online Interface:**

<https://www.enviroaccounting.com/TahoeTMDL/Program/Home>

Urban Upland Source Category

An integral part of the Lake Tahoe TMDL Program, the Crediting Program was developed by the Water Board and NDEP to support ongoing prioritization and targeting of effective actions to reduce pollutant loading from urban stormwater runoff. Using standardized tools and protocols to consistently and transparently estimate and report pollutant load reductions achieved by implementing water quality improvement actions, the Crediting Program establishes a comprehensive load reduction accounting system that connects on-the-ground actions to achieving the milestones set by the Lake Tahoe TMDL.

Urban Implementers use a continuous simulation water quality model called the Pollutant Load Reduction Model (PLRM) to estimate the FSP and nutrient load reduction potential associated with implementation actions. After formal registration of pollutant controls within the system, established condition assessment methods are used to determine whether actual on-the-ground conditions are consistent with modeled inputs. Urban Implementers declare and are awarded credit once pollutant controls are verified as maintained in appropriate condition.

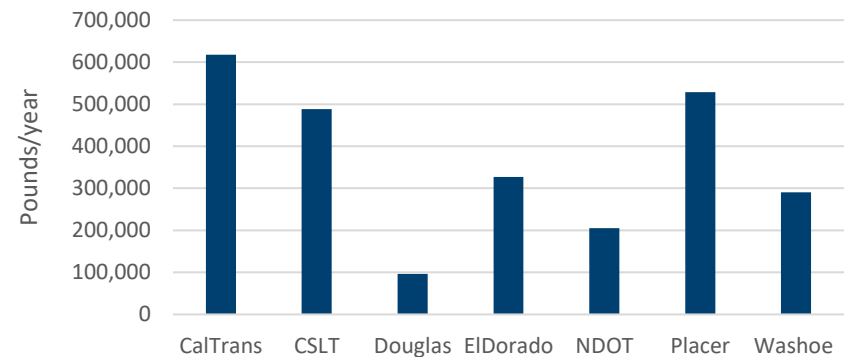
Beginning in 2013, the Water Board and NDEP initiated work to refine the initially-developed Crediting Program protocols and tools to increase efficiency, develop better-integrated systems, enhance the user experience through expanded tool functionality, and streamline protocols and policies to improve effectiveness and reduce operational burden. Urban Implementers worked closely with TMDL Program Managers throughout

the process. Roll out of the updated Crediting Program system occurred in August of 2015. Quantitative load reductions and associated Lake Clarity Credits (credits) can be now reported, linking management to actual water quality benefits.

Accomplishments

Since Crediting Program revisions, Urban Implementers have focused on two primary efforts: updating previously-established jurisdiction baseline pollutant load estimates, and registering pollutant controls within the Crediting Program system. Each Urban Implementer has completed the needed baseline revision using the updated tools.

REVISED BASELINE FSP LOAD ESTIMATES

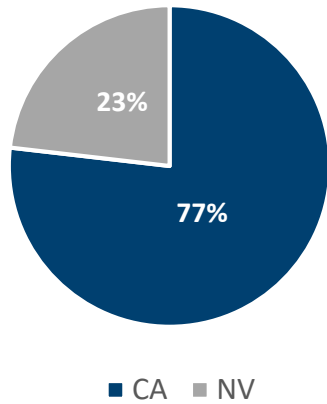


Consistent with previous estimates, the revised results show the bulk of FSP loading comes from the California side of the basin. The discrepancy is primarily due to the distribution of land uses, impervious area and precipitation across the basin. Not only is the impervious acreage of urban land uses much higher in California (~70%) than in Nevada (~30%), but the ratio of road land uses from which disproportionately high pollutant concentrations run off, is approximately 3:1 between the states. Finally, annual average precipitation is approximately 8-9" greater over developed areas within California versus those in Nevada.

URBAN IMPLEMENTERS

California Department of Transportation (Caltrans)
City of South Lake Tahoe (CSLT)
Douglas County
El Dorado County
Nevada Department of Transportation (NDOT)
Placer County
Washoe County

BASELINE LOAD DISTRIBUTION

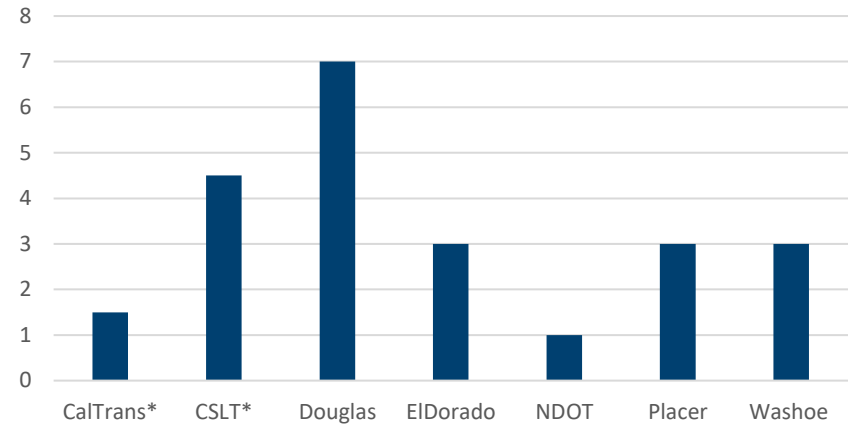


To ensure progress within the Urban Upland Source Category, credit targets based on TMDL-established load reduction milestones were incorporated into permits (CA) and agreements (NV). Water year 2016 (WY2016) credit targets correspond with the first five year milestone: a 10% FSP load reduction from Urban Implementer's *initial* 2004 baseline load estimates. Future credit targets are based on the updated baseline loading estimates.

Urban Implementers have worked through the Crediting Program process to register pollutant controls to attain the WY 2016 credit targets. To date, 23 registrations have been submitted and approved. Registrations include all primary pollutant control types: road operations, stormwater treatment BMPs, and parcel-based BMPs.

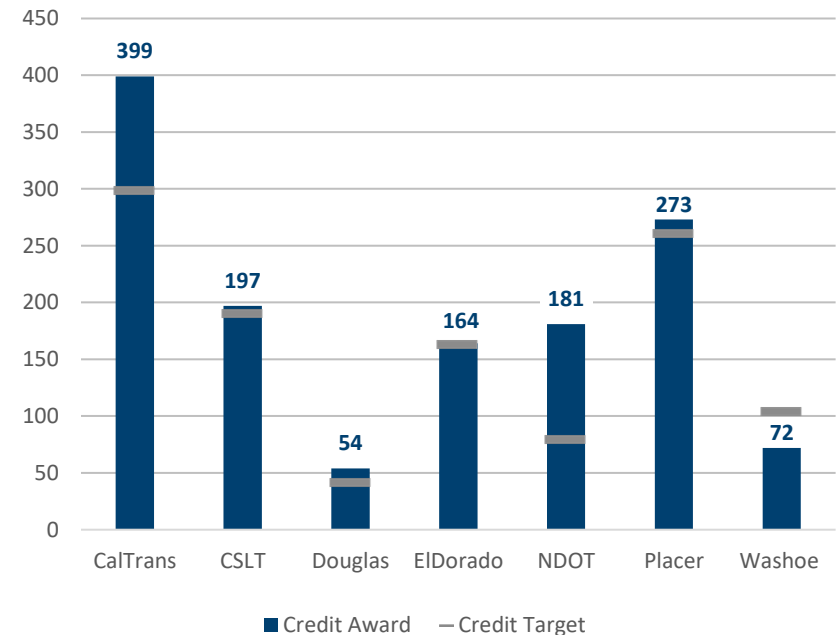
Basinwide, Urban Implementers achieved 118% of the total credits targeted for WY2016. The total number credits attained was 1340 compared to the targeted number of 1135. Nearly all Urban Implementers surpassed their individual WY2016 credit targets. Looking forward, Washoe County determined that expanding their road registration afforded the best opportunity to meet future credit targets, and so chose to do this first before embarking on registering completed water quality improvement projects in overlapping catchments. This shortcoming was nevertheless offset by over-registrations by other Urban Implementers.

WY 2016 REGISTRATIONS



*CSLT and Caltrans share the Bijou Commercial Core registration, shown as 0.5 for each jurisdiction. Credits are distributed equally for this registration.

WY 2016 CREDIT TARGETS AND AWARDS



Urban Upland Source Category pollutant load reductions established for the first five-year milestone are 10%, 7% and 8% for FSP, total phosphorus (TP) and total nitrogen (TN) respectively from baseline levels. The load reductions achieved from Crediting Program registrations exceed the five-year FSP and TP milestones at 12% and 8.5%, respectively. That the expected load reductions for TN fall short of the milestone by less than 2% is not cause for concern as (1) attaining the Clarity Challenge focuses on FSP reductions; and (2) the strategy for attaining TN goals relies primarily on atmospheric source reductions.

Looking Forward

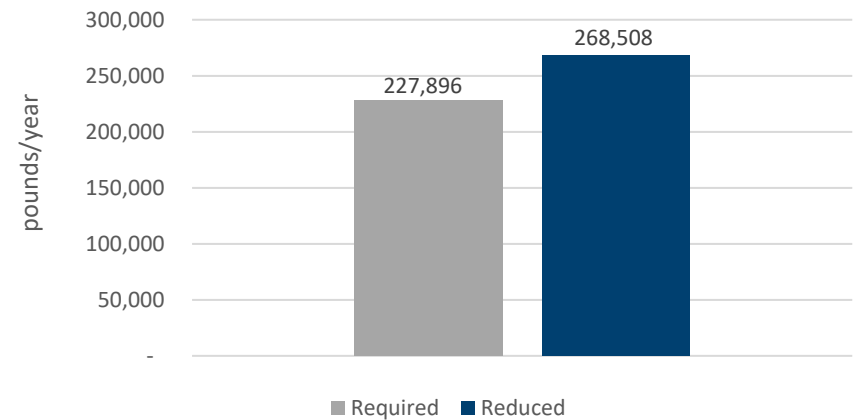
Each Urban Implementer has submitted an *Annual Stormwater Report* describing the actions needed to meet future credit targets. Ongoing storm water treatment and infiltration projects have been enhanced by targeted maintenance of existing facilities, improved street sweeping practices, and refined traction sand selection and application methods. Urban Implementers continue to pair effective storm water management efforts with detailed planning and load estimation work.

Additionally, Urban Implementers will continue to assess condition of registered pollutant controls. This is one component of the Crediting Program that has been less used, and it is anticipated ongoing condition assessment and documentation may result in refinements to make verification more effective and efficient.

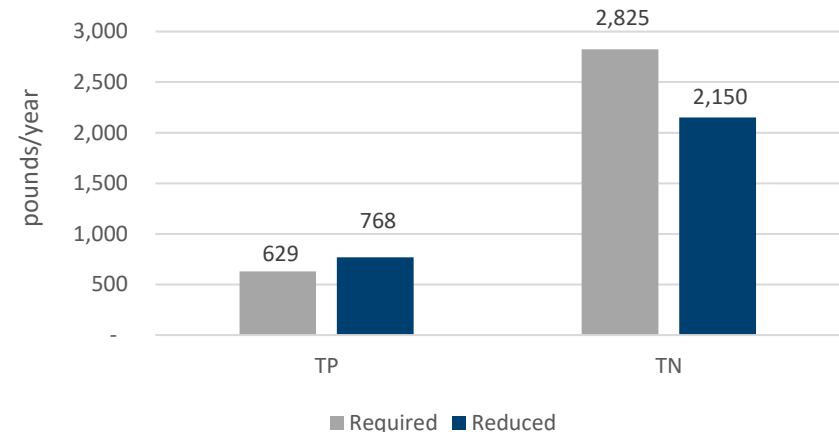
For instance, Urban Implementers have long expressed concern regarding the burden and safety of roadway inspection practice. To address this issue, NDOT has developed and submitted a new protocol known as the Highway Rapid Assessment Methodology (RAM) for approval as a standardized Crediting Program tool. The Highway RAM is an alternative road condition assessment methodology that focuses observations in the shoulders of highways. This modification is expected to improve safety by keeping inspectors outside of driving lanes, and improve efficiency by minimizing the need for road closures while performing observations.

The Water Board and NDEP look forward to further coordination with Urban Implementers to find solutions to address any outstanding concerns and continuously improve Crediting Program effectiveness.

WY 2016 FSP LOAD REDUCTIONS



WY 2016 NUTRIENT LOAD REDUCTIONS



Non-Urban Source Categories

Although Lake Tahoe’s clarity depends primarily on FSP reductions from urban stormwater loads, Non-Urban Source Categories implementation remains an important component of achieving TMDL-established clarity goals. Forest Uplands are estimated to contribute more than a quarter of the total phosphorus loading and Atmospheric Deposition comprises the bulk of the total nitrogen loading to the Lake. While stream channel erosion is estimated to contribute a minor amount of pollutants relative to other source categories, channel restoration represents the most cost-effective actions that can be taken to reduce pollutant loads.

The Lake Tahoe TMDL indicates continued implementation of multi-objective land management activities by Non-Urban Implementers will achieve established load reduction targets for the Forest Upland, Stream Channel Erosion and Atmospheric Deposition Source Categories. Non-

Urban Implementers include local, state and federal natural resource management agencies and their partners who implement projects through the Environmental Improvement Program (EIP).

Activities to address water quality are tracked using a set of performance measures (PMs) (Table 1) selected based on their relevance to lake clarity, their alignment with existing reporting efforts in the Tahoe Basin, and the feasibility of data collection. Activities accomplishments for TMDL relevant PMs retrieved from the [EIP Project Tracker \(https://eip.laketahoeinfo.org/\)](https://eip.laketahoeinfo.org/) are summarized herein under the related source category. A featured project is also highlighted as an example of where significant progress has been made in reducing non-urban pollutant loads. Review of the results indicate that implementation for the Non-Urban Source Categories remains on track with TMDL established goals.

Table 1. TMDL and EIP Performance Measures for Nonurban Source Categories

PERFORMANCE MEASURE	SOURCE CATEGORY	DESCRIPTION
Miles of Roads Treated	Forest Uplands	Tracks the miles of permanent forest roads, paved or unpaved, that are decommissioned or on which stormwater best management practice (BMP) retrofits are implemented
Miles of Roads Inspected and Maintained	Forest Uplands	Tracks the miles of permanent forest roads, paved or unpaved, that are inspected and/or maintained to reduce stormwater pollution
Miles of Roads Created	Forest Uplands	Tracks the miles of permanent forest roads, paved or unpaved, that are created or added to a road owner’s permanent road network
Acres of Disturbed Area Restored or Enhanced	Forest Uplands	Tracks the total acres of disturbed area, not including roads or Stream Environment Zones (SEZ), in the Forested Uplands that is restored, enhanced or created
Facilities with Stormwater Retrofits	Forest Uplands	Tracks the number of public facilities (as parcels) in the Forested Uplands that are retrofitted with BMPs to reduce runoff volumes of and remove fine sediment particles and nutrients therein
Linear Feet of Stream Channel Restored or Enhanced	Stream Channel	Tracks linear feet of stream channel restoration and enhancement
Miles of Street Sweeping	Atmospheric Deposition	Tracks the miles of city, county and state roads that are swept to reduce stormwater pollution during each EIP reporting year as part of regular operations and maintenance procedures
Non-Compliant Wood Stoves Removed or Retrofitted	Atmospheric Deposition	Tracks the number of polluting wood stoves that are removed or replaced to reduce emissions
Miles of Pedestrian and Bicycle Routes Improved or Constructed	Atmospheric Deposition	Tracks the miles of bicycle paths, sidewalks and other transit routes improved, constructed or designated
Pounds of Air Pollutants Removed or Avoided by Project	Atmospheric Deposition	Modeled estimates of the amount of air pollution avoided due to implementation of Tahoe projects

Forest Uplands

The vast majority of the pollutant loading in forestlands occurs as stormwater runoff from paved and unpaved roads, disturbed areas and public facilities. As precipitation falling on these surfaces runs off, it picks up particles and nutrients. Unmitigated, these pollutants are deposited into nearby surface waters that drain to Lake Tahoe.

Forest roads in particular generate more sediment per acre than any other specific source in the Forest Uplands. Due to the potential impacts of forest roads on water quality, three road-related PMs (Table 1) have been identified for tracking and reporting purposes. In 2015 and 2016, Non-Urban Implementers reported the following accomplishments (Table 2):

- Nearly 10 miles of roads decommissioned or retrofitted with stormwater controls
- Approximately 42 and 7 miles of forest roads were inspected and maintained, respectively
- No roads were created or added to the permanent road network.

Disturbed areas are areas with compacted soil, disturbed vegetation and/or impacted hydrology, such as ski runs and recreational areas. Restoring and enhancing disturbed areas increases stormwater infiltration, and reduces erosion and pollutant loading to surface waters. **Acres of Disturbed Area Restored or Enhanced** is the TMDL PM that tracks the total acres of disturbed area (not including roads or Stream Environment Zones (SEZ)) that is restored, enhanced or created. For the 2015-2016 biannual reporting cycle, 1 acre of disturbed area was reported as restored.

Stormwater runoff from public facilities has the potential to deliver pollutants to downstream waters. The **Facilities with Stormwater Retrofits** TMDL PM tracks the number of public facilities in the Forest Upland Source Category that are retrofitted with BMPs to reduce runoff volumes and remove FSP and nutrients contained in runoff. In 2015-2016, 3 facilities/parcels were reported as retrofitted. All 3 retrofits were associated with the Camp Richardson Resort & Campground BMPs & Retrofit project implemented by the US Forest Service Lake Tahoe Basin Management Unit.

Table 2. TMDL Accomplishments for Forest Uplands Source Category Performance Measures

Nonurban Implementing Partner	Roads				Facilities Retrofitted	Disturbed Area Restored
	Treated	Inspected	Maintained	Created		
California State Parks (CA State Parks)	0.75	-	-	-	-	-
California Tahoe Conservancy (CTC)	1.07	12.8	-	-	-	1.1
Diamond Peak Ski Resort (Incline Village General Improvement District - IVGID)	-	-	5.4	-	-	-
Heavenly Mountain Resort (Heavenly)	-	-	-	-	-	-
Homewood Mountain Resort (Homewood)	-	-	-	-	-	-
Nevada Tahoe Resources Team (NTRT)	5	29.2	1.4	-	-	-
U.S. Forest Service Lake Tahoe Basin Management Unit (USFS LTBMU)	3	-	-	-	3	-
TOTALS	10	42	7	0	3	1

Stream Channel Erosion

Linear feet of stream channel restoration and enhancement are tracked and reported under the **Linear Feet of Stream Channel Restored or Enhanced** TMDL PM. The Upper Truckee River, Blackwood Creek and Ward Creek collectively contribute 96 percent of the FSP loading from the source category. Therefore, the TMDL implementation plan relies on channel restoration and enhancement to reduce pollutant loads from these priority systems.

Despite the focus on priority streams, projects to improve the geomorphic function and floodplain connectivity of streams are needed across the Lake Tahoe basin. While erosion of stream bed and bank materials is a relatively small percentage of the overall pollutant loading to the Lake, research indicates stream restoration and enhancement is a very cost-effective way to achieve significant FSP load reductions. Therefore, activities implemented in watersheds throughout the basin are also reported.

During 2015 and 2016, a total of 9,507 feet of stream channel was reported as restored and 2,100 feet enhanced. Nearly 80% (7,340 feet) of the restored-reported total occurred on the Upper Truckee River, the primary FSP

loader in the source category. No activities were reported for Blackwood or Ward Creeks.

Over 45,000 linear feet of stream channel has been restored or enhanced basinwide since 2006. Of this total, about 26,500 linear feet, or roughly 67%, has been focused along TMDL priority tributaries.

Atmospheric Deposition

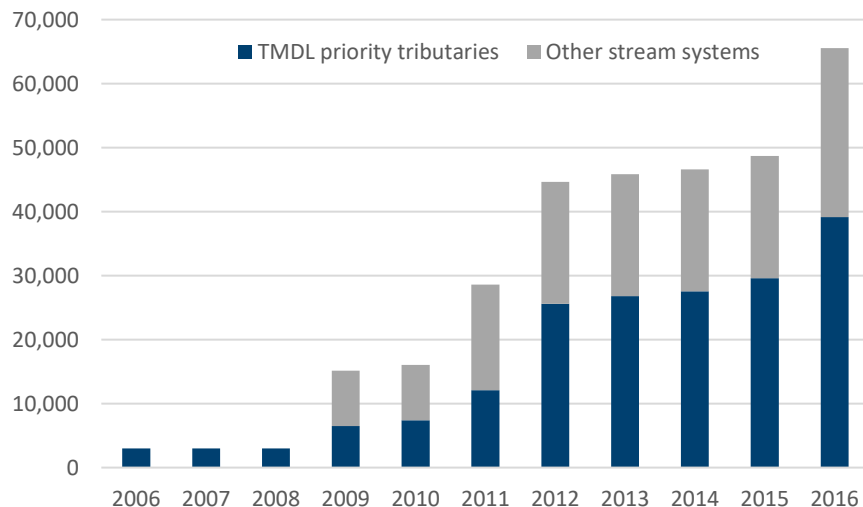
The strategy for reducing FSP and phosphorus from atmospheric deposition calls for actions and controls that reduce dust from roadways, parking lots, and construction sites, such as street sweeping with advanced equipment, or paving or eliminating dirt roads. The strategy for reducing nitrogen generated in-basin as emissions relies on TRPA's 2012 air quality and transportation management plan, which aims to reduce vehicle miles travelled in the Tahoe Basin.

While the TMDL Management Agencies have not formally designated PMs for the Atmospheric Deposition Source Category, four EIP PMs are tracked and reported that are closely aligned with TMDL pollutant load reductions for this source (Table 1). Basinwide accomplishments for the 2015 and 2016 reporting cycle include:

- Swept over 9,500 total miles of streets using high performance sweepers
- Constructed 10.5 total miles of pedestrian and bicycle routes
- Removed/retrofitted a total of 115 non-compliant wood stoves.

No results were reported for the Pounds of Air Pollutants Removed or Avoided by Project PM.

CUMULATIVE LINEAR FEET OF STREAM CHANNEL RESTORED & ENHANCED



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STATE ENGINEERS OFFICE

STATE OF NEVADA

PROBABLE MAXIMUM FLOOD ANALYSIS AND
EMERGENCY ACTION PLAN

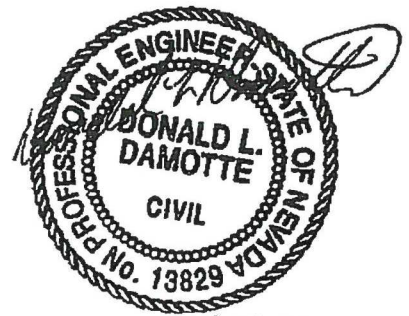
MARLETTE LAKE
WASHOE COUNTY, NEVADA

Project No. 1998-031.31

February 8, 2002

Prepared by:

AMEC INFRASTRUCTURE
9450 Double R Boulevard
Reno, Nevada 89511
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(775) 786-6138



2-15-02

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FIGURE 1	Marlette Lake..... (Appendix A)
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APPENDICES

APPENDIX A	Report on Marlette Dam Potential for Failure Due to a Probable Maximum Precipitation Storm Event
APPENDIX B	Potential Marlette Dam Clear Day Failure Report

Section 1 Project Description

This report provides the results of investigations regarding the possibility of dam failure and overflow potential of Marlette Lake, located on the western slope of the Sierra Nevada Mountains above the east rim of lake Tahoe and provides a list of agency contacts in the event of such an emergency. The location of Marlette Lake is shown in figure 1 in Appendix A.

Two studies were conducted by Nimbus Engineers as a subconsultant to AMEC Infrastructure, Inc. One report, "Potential Marlette Lake Dam failure Report" examined the possibility of a dam breach, i.e. catastrophic failure from occurrences other than flooding. The other report, "Marlette Lake, Potential for Failure Due to A Probable Maximum Precipitation Storm Event" examined the possibility of dam overflow due to a probable maximum precipitation (PMP) rain event. The probability of these events occurring is discussed and recommendations are made based on these findings in Section 2.

A list of agency contacts that may be appropriate in the event of either type of failure is included in Section 3. Given the potential for catastrophic damage to occur with a failure of the dam at Marlette Lake, the State of Nevada Office of Buildings and Grounds should work with the responding agencies identified in this report to inform them of the potential of property damage and possible loss of life in the event of a failure of the dam at Marlette Lake and prepare a detailed plan for response and site coordination between the agencies involved.

Section 2 Results and Recommendations for Marlette Dam

Clear Day Failure Results

A thirty-three foot high dam exists at Marlette Lake that was constructed in the 1870s to increase storage capacity of the alpine lake to provide timber transportation facilities and, later, water supply for the Virginia City area. The dam allows for a storage capacity of approximately 10,000 acre-feet.

Results from the clear day dam failure report indicate the potential for substantial damage not only to any existing structures and/or improvements within the downstream flow path, but also to the relatively fragile ecology of Lake Tahoe itself.

Results indicate extremely high velocities down very steep slopes of up to 40 percent. Flow volume of 30,000 cubic feet of water per second is indicated at velocities in excess of thirty (30) to forty (40) feet per second. The nature of the downstream geology is such that large amounts of material including soil, rocks and boulders and vegetation up to and including trees could be transported.

Additional modeling to define the nature and extent of the mud and debris flow anticipated is recommended for this facility.

Probable Maximum Precipitation Failure Results

Results from the probable maximum precipitation modeling analysis showed that the expected runoff volume from the calculated probable maximum precipitation storm would not overtop the dam. The model indicates that the storage volume of Marlette Lake between the elevation of the spillway outlet and the top to the existing dam, together with spillway release, is sufficient to contain the inflows with a 1-foot allowance for freeboard to the top of the dam.

Recommendations

Based on the findings of the two reports for Marlette Lake, it is likely that a clear day failure could have catastrophic consequences, with the following likely results of this type of event:

1. Flash flooding of State Highway Rt. 28 approximately 1 mile south of Sand Harbor.
2. Erosion of the highway where subjected to flash flooding, with probable road washout.
3. Severe erosion related issues related to the rapid transport of boulders, trees, soil and pavement into Lake Tahoe.
4. Potential loss of life.

Based on the information generated in the reports, no dam or spillway modifications from a hydraulic standpoint are recommended. However, the severity of a clear day failure would

certainly warrant preventative measures to quickly close the highway and warn motorists of impending danger.

It is recommended that seismic-type monitors be placed on, and either side of, the dam to sense movement in the dam and its abutments. Telemetry should also be installed to transmit data from the sensors to monitoring units located in the offices of the State of Nevada Buildings and Grounds. The monitoring equipment should be set up to signal an alarm if movements greater than a preset amount are indicated. This alarm should be set up to automatically notify the proper emergency authorities if such an event appears imminent, or has occurred. It could also be used to activate warning lights and barricade arms across Highway 28 if desired.

Section 4 Conclusions

Based on the data gathered, it is concluded that a maximum precipitation event would cause little damage to Marlette Dam, since the storage capacity of the lake is adequate to withstand a substantial increase in flow. The greater potential of a problem with Marlette Lake arises out of the danger of a clear day failure of the dam.

It is recommended that seismic alarms be installed which would warn of a dam failure, or of a potential imminent dam failure. These alarms should be equipped with the ability to give a call-out alarm to the appropriate emergency personnel.

It is also recommended that, given the potential for catastrophic damage to occur with a failure of the dam at Marlette Lake, the State of Nevada Office of Buildings and Grounds should work with the responding agencies identified in this report to inform them of the potential of property damage and possible loss of life in the event of a failure of the dam at Marlette Lake and prepare a detailed plan for response and site coordination between the agencies involved.

References

Report on Marlette Dam Potential for Failure Due to a Probable Maximum Precipitation Storm Event: Nimbus Engineers, Feb. 28, 2001.

Potential Marlette Dam Failure Report: Nimbus Engineers, Dec. 7, 00.

**Marlette Lake Dam Resilient Infrastructure Project
State Route 28 Replacement**

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Mobilization	LS	1		
2	Removal Of Unsuitable Material	CY	24000	\$ 15.00	\$ 360,000.00
3	Regrade Road Bed	CY	20000	\$ 7.50	\$ 150,000.00
4	10" Type 1 Class B Aggregate Base	SF	86400	\$ 5.00	\$ 432,000.00
5	8" Type 2 PG64-28NV	SF	86400	\$ 9.50	\$ 820,800.00
6	1" Open Grade - PG64-28NV	SF	86400	\$ 2.50	\$ 216,000.00
7	Guard Rail	LF	4800	\$ 65.00	\$ 312,000.00
8	BMP	LS	1	\$ 50,000.00	\$ 50,000.00
9	Traffic Control	LS	1	\$ 150,000.00	\$ 150,000.00
10	48" RCP Culverts	LF	200	\$ 350.00	\$ 70,000.00
11	Headwalls	EA	2	\$ 45,000.00	\$ 90,000.00
12	Striping	EA	1	\$ 15,000.00	\$ 15,000.00
13	Revegetation/Rip Rap	SY	42000	\$ 2.50	\$ 105,000.00
14	Contingency (15%)	LS	1	\$ 415,620.00	\$ 415,620.00
				<i>Construction Total</i>	\$ 3,186,420.00

Engineering (8%)				\$ 254,913.60
Permitting (1.5%)				\$ 47,796.300
Environmental (1.5%)				\$ 47,796.300
Testing/Inspection (2.5%)				\$ 79,660.500
Construction Management (2.5%)				\$ 79,660.500
			<i>Non Construction Total</i>	\$ 509,827.20
Total - Construction and Non Construction				\$ 3,696,247.20

Marlette Lake Dam Resilient Infrastructure Project
Cost Estimate for Dam Repair in the Event of a Breach

ASSUMPTIONS:

- 1 Failure of dam results in 50% of earthen material lost down slope
- 2 Emergency design includes recommended conceptual retrofits to dam
- 3 All environmental studies and permits will still be required
- 4 Survey, Engineer Design, Project Management, Inspection and Testing Cost Similar to Dam Retrofit Costs
- 5 Loss of dam results in at least one complete year of municipal water loss from Marlette Lake.

TASK #	WORK DESCRIPTION	Units	Quantity	Unit Cost	Totals
A	EMERGENCY DESIGN FOR REPLACEMENT OF INFRASTRUCTURE				
A1	Design Dam and Road Survey (aerial photogrammetry & ground collection)	LS	1	\$ 70,000	\$ 70,000
A2	Access Road Improvements Design				
	Engineer	HR	60	\$ 190	\$ 11,400
	Engineer Technician	HR	250	\$ 130	\$ 32,500
A3	Seismic Retrofit Design Plans to Earthen Dam				
	Engineer	HR	190	\$ 190	\$ 36,100
	Engineer Technician	HR	600	\$ 130	\$ 78,000
A4	Retrofit Designs Plans to Spillway				
	Engineer	HR	70	\$ 190	\$ 13,300
	Engineer Technician	HR	205	\$ 130	\$ 26,650
A5	Retrofit Design Plans to Outlet Pipe and Gate Box System				
	Engineer	HR	70	\$ 190	\$ 13,300
	Engineer Technician	HR	200.5	\$ 130	\$ 26,065
A6	Mechanical Building				
	Engineer	HR	60	\$ 190	\$ 11,400
	Engineer Technician	HR	200	\$ 130	\$ 26,000
A7	Instrumentation/Controls Design Plans				
	Engineer	HR	50	\$ 190	\$ 9,500
	Engineer Technician	HR	100	\$ 130	\$ 13,000
A8	Third Party Peer Review				
	Engineer	HR	135	\$ 190	\$ 25,650
A9	Project Advertising	LS	1	\$ 3,605	\$ 3,605
A10	Printing	LS	1	\$ 1,243	\$ 1,243
	Subtotal				\$ 397,713
B	ENVIRONMENTAL STUDIES & PERMITS (Possible EIS will be Required like Boca retro)				
	Federal				
B1	Section 404 Permit/Section 10 Nationwide Permit (Army Corps of Engineers)	HR	48	\$ 130	\$ 6,240
B2	Endangered Species Act Section 7 Consultation (Fish, Wildlife & Migratory Birds)	HR	16	\$ 130	\$ 2,080
B3	Archaeological and Historical Studies	HR	160	\$ 130	\$ 20,800
B4	Wetlands Delineation	HR	96	\$ 130	\$ 12,480
B5	Plant Surveys (Sensitive Plants and Noxious Weeds)	HR	32	\$ 130	\$ 4,160
B6	USFS Right-of-Way (Access from Spooner Lake Road)	HR	24	\$ 210	\$ 5,040
B7	Section 106 of the National Historic Preservation Act	HR	16	\$ 130.00	\$ 2,080
	Subtotal				\$ 52,880
	State (Nevada)				
B8	Bureau of Water Pollution Control (401 Water Quality Permit)	HR	32	\$ 130	\$ 4,160
B9	Division of Water Resources (Application of Dam Plan Approval)	HR	40	\$ 150	\$ 6,000
B10	Division of Water Resources (Notice of Instructions "Cofferdam")	HR	40	\$ 150	\$ 6,000
B11	National Pollution Discharge Elimination Systems (NPDES) Storm Water General Permit	HR	40	\$ 130	\$ 5,200
B12	Temporary Working in Waterways	HR	24	\$ 130	\$ 3,156
B13	Tahoe Regional Planning Agency	HR	80	\$ 150	\$ 12,000
B14	Nevada State Parks	HR	15	\$ 150	\$ 2,250
B15	State Building Permit	HR	15	\$ 150	\$ 2,250
B16	Air Quality Permit (NDEP) for Carson City County	HR	40	\$ 150	\$ 6,000
B17	Nevada Division of State Lands	HR	24	\$ 150	\$ 3,600
B18	State Historical Preservation Office Section 106 Review	HR	24	\$ 150	\$ 3,600
	Subtotal				\$ 54,216
	Local (Washoe County)				
B19	Washoe County Dust Control Permit	HR	24	150	\$ 3,600
	Subtotal				\$ 3,600
C	PROJECT MANAGEMENT, CONSTRUCTION MANAGEMENT, INSPECTION, TESTING				
C1	Project Manager and Inspection (State Public Works Division)				
	SPWD Project Manager	HR	1767	\$ 130	\$ 229,710
	SPWD Inspector	HR	2238	\$ 97	\$ 217,086
C2	Construction Survey (2-man crew with GPS)	HR	350	\$ 250	\$ 87,500
C3	Service During Construction				
	Engineer	HR	390	\$ 190	\$ 74,100
	Engineer Technician	HR	666	\$ 130	\$ 86,580
	Subtotal				\$ 694,976
D	CONSTRUCTION REPAIRS DUE TO SEISMIC FAILURE TO CONCEPTUAL DESIGN				
D1	General Conditioning/Mobilization	LS	1	\$ 345,600	\$ 345,600
D2	SWPPP/BMPs	LS	1	\$ 81,000	\$ 81,000
D3	Clear and Grub	LS	1	\$ 21,600	\$ 21,600
D4	Access Road Improvements	Miles	3	\$ 25,000	\$ 75,000
D5	Construct temporary Cofferdam for Dewatering Outlet Structure	EA	1	\$ 250,000	\$ 250,000
D6	Excavate remainder of dam material and recompact	CY	28000	\$ 200	\$ 5,600,000
D7	Import Material & Compact	CY	35000	\$ 240	\$ 8,400,000
D8	Agg Base Access over Dam	CY	50	\$ 216	\$ 10,800
D9	Replace piping for outlet structure	LF	600	\$ 92	\$ 55,200
D10	New Outlet Structure & Valve Assemble	LS	1	\$ 65,000	\$ 65,000
D11	Mechanical Building	EA	1	\$ 81,000	\$ 81,000
D12	New Spillway Structure	LF	80	\$ 4,100	\$ 328,000
	Subtotal				\$ 15,313,200
	TOTAL ESTIMATE REPLACEMENT COST				\$ 16,516,585

Project Type		
A - Major Projects - New Initiatives	D - Capital Improvement - Existing Facilities	G - Equipment & Software
B - Major Projects - Existing Facilities	E - Capital Maintenance	
C - Capital Improvement - New Initiatives	F - Rolling Stock	

2018/2019 - 5 Year Project Summary Totals - FINAL 05/23/18

Division	Project Number	Project Title	2018 - 2019	2019 - 2020	2020 - 2021	2021 - 2022	2022 - 2023	Total	Project Type	Number of Projects
	2299LV1720	2013 Mid Size Truck #675 Compliance	-	-	-	31,000	-	31,000	F	1
	2299WS1704	Watermain Replacement - Martis Peak Road	-	50,000	625,000	-	-	675,000	D	1
	2299WS1705	Watermain Replacement - Crystal Peak Road	-	-	-	50,000	845,000	895,000	D	1
	2299WS1706	Watermain Replacement - Rifle Pk Ct, Slott Pk Ct	-	-	50,000	325,000	-	375,000	D	1
	2299WS1801	Leak Study R2-1 14inch Steel	65,000	-	-	-	-	65,000	D	1
	2299WS1802	Watermain Replacement - Alder Avenue	50,000	465,000	-	-	-	515,000	D	1
	2299WS1804	R6-1 Tank Road Construction	-	5,000	15,000	110,000	-	130,000	D	1
	Total		1,310,000	980,000	1,190,000	686,000	1,035,000	5,201,000		14
Sewer	2523HE1721	2006 Kenworth T800 Bin truck #587	-	-	-	197,200	-	197,200	F	1
	2524SS1010	Effluent Export Line - Phase II	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	10,000,000	B	1
	2599BD1105	Building Upgrades Water Resource Recovery Facility	-	80,000	40,000	25,000	50,000	195,000	E	1
	2599BD1802	Treatment Plant Fire Panel Replacement	65,000	-	-	-	-	65,000	E	1
	2599DI1104	Sewer Pumping Station Improvements	55,000	50,000	30,000	30,000	30,000	195,000	E	1
	2599DI1703	Sewer Pump Station #1 Improvements	100,000	-	-	-	-	100,000	D	1
	2599SS1102	Water Resource Recovery Facility Improvements	120,000	75,000	75,000	75,000	75,000	420,000	E	1
	2599SS1103	Wetlands Effluent Disposal Facility Improvements	100,000	100,000	100,000	100,000	100,000	500,000	E	1
	2599SS1203	Replace & Reline Sewer Mains, Manholes and Appurtenances	80,000	80,000	55,000	160,000	55,000	430,000	E	1
	2599SS1702	WRRF Biosolids Bins	60,000	30,000	-	-	-	90,000	F	1
	2599SS1707	WRRF Aeration System Improvements	100,000	350,000	-	-	-	450,000	D	1
	2599SS2107	Update Camera Equipment	-	58,000	-	-	-	58,000	G	1
	Total		2,680,000	2,823,000	2,300,000	2,587,200	2,310,000	12,700,200		12
		Total Utilities	4,675,674	4,217,300	4,083,820	4,241,600	3,995,400	21,213,794		55
Internal Service										
Fleet	5190ME1201	Replacement Shop Tools and Equipment	-	-	-	-	16,000	16,000	G	1
	5197CO1801	Fleet Software upgrade - manages rolling stock/equip	-	14,000	-	-	-	14,000	G	1
	Total		-	14,000	-	-	16,000	30,000		2
Buildings	5394LE1723	2003 Genie Scissor Lift	-	15,000	-	-	-	15,000	F	1
	5394LE1724	2004 Equipment Trailer (Tilt)	-	5,100	-	-	-	5,100	F	1
	5394LV1720	Replace 2005 Service Truck 4X4 (1-ton) #555	-	-	-	43,600	-	43,600	F	1
	5394LV1722	Replace 2004 Pick-up Truck 4X4 (1/2-ton) #540	-	-	5,000	-	-	5,000	F	1
	Total		-	20,100	5,000	43,600	-	68,700		4
		Total Internal Service	-	34,100	5,000	43,600	16,000	98,700		6
Community Services										
Championship Golf	3141BD1703	Demolition of #10 Starter Shack	10,000	-	-	-	-	10,000	D	1
	3141BD1706	Venue Signage Enhancement	20,000	40,000	-	-	-	60,000	C	1
	3141FF1804	Champ Golf Exterior Ice-maker Replacement	7,500	-	10,500	-	-	18,000	G	1
	3141GC1103	Irrigation Improvements	25,000	30,000	15,000	26,000	15,000	111,000	E	1
	3141GC1202	Championship Course Bunkers	10,000	-	-	-	-	10,000	E	1
	3141GC1501	Maintenance Building Drainage, Washpad and Pavement improvements	-	30,000	700,000	-	-	730,000	D	1
	3141GC1802	Championship Course Greens and Surrounds	15,000	15,000	-	-	325,000	355,000	E	1
	3141GC1803	Championship Course Tees	13,000	13,000	-	-	-	26,000	E	1
	3141LI1201	Pavement Maintenance of Parking Lots - Champ Course & Chateau	25,000	17,500	52,500	45,000	10,000	150,000	E	1
	3141LI1202	Pavement Maintenance of Cart Paths - Champ Course	55,000	60,000	62,500	55,000	55,000	287,500	E	1
	3142LE1720	1999 Ty-Crop Spreader #429	36,400	-	-	-	-	36,400	F	1
	3142LE1733	2005 Carryall Club Car #564	-	11,000	-	-	-	11,000	F	1
	3142LE1734	2005 Carryall Club Car #565	-	11,000	-	-	-	11,000	F	1
	3142LE1735	2005 Carryall Club Car #566	-	11,000	-	-	-	11,000	F	1
	3142LE1736	2005 Carryall Club Car #567	-	11,000	-	-	-	11,000	F	1
	3142LE1737	2006 Carryall Club Car #589	-	-	11,000	-	-	11,000	F	1
	3142LE1738	2006 Carryall Club Car #590	-	-	11,000	-	-	11,000	F	1
	3142LE1739	2006 Carryall Club Car #591	-	-	11,000	-	-	11,000	F	1
	3142LE1740	2007 Club Car Carryall Ball Picker #600	25,000	-	-	-	-	25,000	F	1
	3142LE1741	2016 Bar Cart #724	-	-	29,000	-	-	29,000	F	1
	3142LE1742	2016 Bar Cart #725	-	-	29,000	-	-	29,000	F	1
	3142LE1746	2012 JD 8500 Fairway Mower #670	-	-	58,000	-	-	58,000	F	1
	3142LE1747	2011 Toro Groundsmaster 4000D #650	-	-	50,000	-	-	50,000	F	1
	3142LE1748	2015 Toro Greensmaster 1600 #711	-	-	-	-	10,000	10,000	F	1
	3142LE1749	2015 Toro Greensmaster 1600 #712	-	-	-	-	10,000	10,000	F	1
	3142LE1750	2013 JD 3235 Fairway Mower #685	-	-	-	60,300	-	60,300	F	1
	3142LE1753	2011 Toro Greensmaster 1000 #652	14,500	-	-	-	-	14,500	F	1

MEMORANDUM

TO: Board of Trustees

THROUGH: Steven J. Pinkerton
General Manager

THROUGH: Joseph J. Pomroy, P.E.
Director of Public Works

FROM: Bradley A. Johnson, P.E.
Director of Asset Management

SUBJECT: Review, discuss and possibly authorize an Engineering Services Contract for the Effluent Export Project – Phase II – 2016/2017 Capital Improvement Program Budget: Fund: Utilities; Division: Sewer; Project # 2524SS1010; Vendors: HDR Engineering in the Amount of \$85,000

STRATEGIC PLAN: Long Range Principle 5 – Assets and Infrastructure

DATE: December 2, 2016

I. RECOMMENDATION

That the Board of Trustees makes a motion to:

1. Authorize an additional services addendum with HDR Engineering totaling \$85,000 for engineering services associated with the Effluent Export Project – Phase II.
2. Authorize Staff to execute the necessary contract documents.

II. DISTRICT STRATEGIC PLAN

Long Range Principle #5 – Assets and Infrastructure – The District will practice perpetual asset renewal, replacement, and improvement to provide safe and superior long term utility services and recreation activities.

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December 2, 2016

- The District will maintain, renew, expand, and enhance District infrastructure to meet the capacity needs and desires of the community for future generations.
- The District will maintain, procure, and construct District assets to ensure safe and accessible operations for the public and the District's workforce.

2015 – 2017 Objective #3 – Complete condition analysis and project scoping for the Effluent Export Project – Phase II.

III. BACKGROUND

The District's effluent export pipeline transports treated wastewater from the District's water resource recovery facility to the disposal point at the District's wetlands facility southeast of Carson City. This pipeline was constructed in 1970 as part of a regional effort to eliminate all wastewater effluent discharges in the Lake Tahoe Basin. The effluent export pipeline has been in continuous service since that time and is comprised of five segments totaling approximately 20-miles in length. Three segments (Segments 1-3), totaling approximately 12-miles, are located within the Lake Tahoe Basin.

As part of the original Effluent Export Project, the District replaced approximately 6-miles of 16-inch diameter effluent export pipeline in the Lake Tahoe Basin. This was accomplished in multiple phases (starting in 2006 and finishing in 2009) and included approximately 18,000-linear feet of Segment 1 (Incline Village to Sand Harbor) and 11,000-linear feet of Segment 3 (around Spooner Meadow). During planning and design of the first phase approximately 13,700-linear feet of Segment 3 and all 17,300-linear feet of Segment 2 were identified to be in good condition and were not identified for replacement. These pipeline segments are in the southbound shoulder of State Route 28 between Sand Harbor and Spooner Meadow.

In August of 2009, a pipe break within the un-replaced portion of Segment 3 washed out State Route 28. An investigation conducted by District Staff and a District hired corrosion consulting engineer revealed areas of advanced corrosion on the damaged pipeline section indicating the un-replaced portions of the export line may be nearing the end of their service life and replacement of the remaining pipeline should be planned and budgeted.

Review, discuss and possibly authorize an Engineering Services Contract for the Effluent Export Project – Phase II – 2016/2017 Capital Improvement Program Budget: Fund: Utilities; Division: Sewer; Project # 2524SS1010; Vendor: HDR Engineering in the Amount of \$85,000

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December 2, 2016

A second significant pipe break within the un-replaced portion of Segment 3 occurred on April 17, 2014 and again caused significant damage to State Route 28 and forced the shutdown of the Southbound lane for two days.

At the January 5, 2011 and the October 10, 2012 meetings, the Board of Trustees authorized preliminary engineering services contracts with HDR Engineering to begin Phase II of the Effluent Export Project. The project was initially scoped to replace the two remaining sections within the Lake Tahoe Basin (a total length of approximately 6-miles). Segment 2 is comprised of approximately 17,300-linear feet of welded, cement mortar lined, high pressure steel pipe. The remaining 13,700-linear feet of Segment 3 is comprised of bell and spigot, cement mortar lined, low pressure steel pipe.

During the construction of the Spooner Pumping Station Improvements Project during the summer of 2012, a section of the high pressure welded steel pipe in Segment 2 was removed. The condition of this pipe section was better than anticipated and, if the section examined is representative of the condition of the rest of Segment 2, could mean replacement of some or all of Segment 2 is not necessary in the near future.

At the April 30, 2014 meeting, the Board of Trustees authorized contracts with PICA Corp and HDR to complete non-destructive electromagnetic inspection, using high-resolution remote field technology (RFT), of Segment 2 and the un-replaced portions of Segment 3 of the effluent export pipeline.

The inspection work utilizes PICA's "SeeSnake" assessment tool. The SeeSnake is a free swimming device employing RFT to identify localized areas of pipe wall loss and measure the depth and length of those local wall loss indications. The SeeSnake measures the time of flight and the signal strength of an electromagnetic signal emitted by an exciter coil contained in the "head" of the SeeSnake and detected by an array of receivers contained in the "tail" of the SeeSnake.

As part of their contract, HDR designed the piping improvements necessary at the Spooner Pumping Station to allow PICA's SeeSnake to be launched as well as the vault and piping improvements near Spooner Summit to allow tool

Review, discuss and possibly authorize an Engineering Services Contract for the Effluent Export Project – Phase II – 2016/2017 Capital Improvement Program Budget: Fund: Utilities; Division: Sewer; Project # 2524SS1010; Vendor: HDR Engineering in the Amount of \$85,000

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retrieval. HDR also procured the necessary permits to allow completion of the improvements.

In late October 2014, the launch and retrieval piping improvements were constructed and in November 2014 PICA arrived to conduct condition assessment activities.

Prior to inserting the SeeSnake into the pipeline, PICA conducted a series of gauging test runs to ensure the SeeSnake would successfully travel the pipeline from the launching location to the retrieval location without becoming stuck or damaged. The gauging test runs started with a series of progressively larger soft foam “squeegee pigs” designed to clean the pipeline and remove any accumulated debris and then finished with a rigid “gauging pig” designed to replicate the SeeSnake. The gauging pig contains a sacrificial aluminum gauge plate designed to deform should the pig encounter any bore reductions in the pipeline. This gauging plate allows detection of any unknown changes in pipe diameter that would cause the SeeSnake to become stuck while allowing, because the plate deforms upon encountering a bore reduction, the gauging pig to pass. The gauging pig also contains a locator beacon to allow PICA to track and assess run progress and travel time as well as geo-locate any problem areas.

During completion of the gauging test runs, the squeegee pigs were successfully launched and retrieved in good condition with little sign of damage or excessive debris. However, the rigid gauging pig encountered a bore reduction just outside the Spooner Pumping Station and sustained substantial damage during the test run. District Staff and PICA opted to end the pigging operation and not insert the SeeSnake tool until a physical assessment of the problem location could be conducted.

In early February 2015, the District exposed a pipeline dismantling joint outside the Spooner Pumping Station, drained the pipeline, and inserted a remotely operated track mounted camera into the pipe. The camera inspection revealed a reduction in the internal diameter of the pipe resulting from a short section of pipe where there was excessive cement mortar lining. This thickened lining was likely the result of a field applied mortar repair dating to the construction of the pipeline in 1970.

Review, discuss and possibly authorize an Engineering Services Contract for the Effluent Export Project – Phase II – 2016/2017 Capital Improvement Program Budget: Fund: Utilities; Division: Sewer; Project # 2524SS1010; Vendor: HDR Engineering in the Amount of \$85,000

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December 2, 2016

At the February 25, 2015 meeting, the Board of Trustees authorized a contract amendment with HDR to design and permit the necessary piping repairs to remove the bore restriction in the pipeline. The Board of Trustees also authorized a contract amendment with PICA to allow their team to remobilize to the site and complete an additional round of confirmatory gauging test runs followed by the comprehensive SeeSnake RFT evaluation.

The pipeline repair work was completed in August 2015 and PICA remobilized to complete condition assessment in September 2015. However, despite successful gauging runs, the SeeSnake tool was damaged during the first assessment run focused on Segment 3. This damage prevented the planned subsequent runs focused on Segment 2. Fortunately, despite the damage, the SeeSnake tool was able to collect comprehensive condition data on Segment 3. A future contract amendment with PICA will be required to allow data collection on Segment 2 once a solution to the SeeSnake damage caused by the pipeline has been developed.

Analysis of the collected data identified a significant number of defects throughout the entire length the un-replaced portions of Segment 3. This data confirms the District's planning approach for the complete replacement of remaining portions of Segment 3. Of the defects identified, as many as 13 locations require immediate replacement and cannot wait for a final approach for pipeline replacement to be developed.

Under the proposed contract amendment, HDR will determine the extent of the necessary repairs, design the pipeline repairs as required, procure any necessary permits, and design the traffic control and pavement repairs to support completion of the work. The repair work is anticipated to be completed in the spring of 2017 under a competitively bid contract awarded by the Board of Trustees at a future date.

Once completed, the repair work will allow sufficient time for the District to continue with condition assessment of Segment 2, pursue federal funding to support pipeline replacement under the United States Army Corps of Engineers Section 595 program, and pursue potential co-location of a replacement pipeline with a future segment of the State Route 28 Shared-Use Path.

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December 2, 2016

IV. BID RESULTS

This item is not subject to competitive bidding within the meaning of Nevada Revised Statutes (NRS) 332.115 as described in subsection (b) Professional Services.

Additionally, per NRS 625.530, selection of a professional engineer or registered architect to perform work on public works projects (where the complete project costs exceed \$35,000) is to be made solely on the basis of the competence and qualifications of the engineer or architect and not on the basis of competitive fees.

HDR Engineering is a nationally recognized leader in pipeline design and engineering and has worked with the District on the Effluent Export Project starting with the early conceptual phases of work in 2001.

V. FINANCIAL IMPACT AND BUDGET

A total of \$2,000,000 for the Effluent Export Project – Phase II is included in the 2016/2017 Capital Improvement Program (CIP) Budget (see attached data sheet) and there is an additional \$7,728,000 carried forward and available from previous years' CIP budgets.

VI. ALTERNATIVES

None. To ensure continued reliable operation of the effluent export system, the District must move forward with the proposed contract.

VII. BUSINESS IMPACT

This item is not a "rule" within the meaning of Nevada Revised Statutes, Chapter 237, and does not require a Business Impact Statement.



Project Summary

Project Number:	2524SS1010	Title:	Effluent Export Line - Phase II	Active:	Yes
Asset Class:	24 - Transmission	Division:	2017	Budget Status:	Data Entry
Budget Year:	2017	Scenario Name:		Locations:	SS - Sewer System
Project Something:					

Project Description

As part of the original Effluent Export Pipeline Project, IVGID replaced approximately 6-miles of 16-inch Export Pipeline. These included approximately 18,000 linear feet (LF) in Segment 1 and 11,000 LF in Segment 3. During planning and design of the first phase approximately 13,700 LF of Segment 3 and all 17,300 LF of Segment 2 were identified to be in good condition and were not identified for replacement. In August 2009, a pipe break within the unreplaced portion of Segment 3 washed out State Route 28. Investigation of the leak by IVGID staff and an IVGID-hired corrosion consulting engineer revealed areas of advanced corrosion on the damaged pipeline section, indicating that unreplaced portions of the export line may be nearing the end of their service and replacement of the remaining pipeline should be planned and budgeted.

The proposed project, Effluent Export Pipeline Project - Phase II, will replace these two remaining sections within the Tahoe Basin (a total length of approximately 6 miles). Segment 2 is comprised of approximately 17,300 LF of welded, cement mortar lined, high pressure steel pipe. The remaining 13,700 LF of Segment 3 is comprised of bell and spigot, cement mortar lined, low pressure steel pipe. The project will be completed over multiple years in a manner similar to the original Effluent Export Pipeline Project. Like Phase I, the Export line will be replaced using open-cut construction, moving the pipeline to the center of the Southbound travel lane.

Project Internal Staff

The Engineering Department will manage all phases of this project.

Project Justification

The effluent export line transports treated wastewater from Incline Village General Improvement District's (IVGID) wastewater treatment plant to the disposal point at the wetlands southeast of Carson City. This line was constructed in the early 1970's as part of a regional effort to eliminate all wastewater effluent discharges in the Lake Tahoe basin. The effluent export line has been in continuous service since that time. Approximately 6 miles of line was replaced as part of the Effluent Export Pipeline Project - Phase I. Phase II will pursue the replacement of the remaining 6 miles of pipe within the Tahoe Basin.

The current Project Cooperation Agreement with the US Army Corps of Engineers will expire with the completion of the Phase I work. IVGID will look to enter into an expanded Project Cooperation Agreement with the US Army Corps of Engineers for 55% funding of all construction costs. The current political climate and financial issues in Washington D.C. make it unlikely that any future funding will be secured for this project. All grant funding has been removed for this project. IVGID will also place the project on the list for the Nevada State Revolving Loan Fund. Funding for this project will be the utility rates.

Forecast		Total Expense	Total Revenue	Difference	Est. Completion Date
Budget Year					
2017	Construction Costs	1,900,000	0	1,900,000	
	Internal Services	100,000	0	100,000	
	Year Total	2,000,000	0	2,000,000	
2018	Construction Costs	1,900,000	0	1,900,000	
	Internal Services	100,000	0	100,000	
	Year Total	2,000,000	0	2,000,000	
2019	Construction Costs	1,900,000	0	1,900,000	
	Internal Services	100,000	0	100,000	
	Year Total	2,000,000	0	2,000,000	
2020	Construction Costs	1,900,000	0	1,900,000	
	Internal Services	100,000	0	100,000	
	Year Total	2,000,000	0	2,000,000	
2021	Construction Costs	1,900,000	0	1,900,000	
	Internal Services	100,000	0	100,000	
	Year Total	2,000,000	0	2,000,000	
2022	Construction Costs	1,900,000	0	1,900,000	
	Internal Services	100,000	0	100,000	
	Year Total	2,000,000	0	2,000,000	
2023	Construction Costs	1,900,000	0	1,900,000	
	Internal Services	100,000	0	100,000	
	Year Total	2,000,000	0	2,000,000	
	Year Total	14,000,000	0	14,000,000	
Year Identified	Start Date	Project Partner	Manager		
2012			Director of Asset Management		