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Subject	Sites Reservoir Recreational Trips Methodology and VMT Summaries	Project Name	Sites Reservoir Recirculated Draft EIR/EIS
Attention	Nicole Williams, ICF Cory Matsui, ICF	Project Number	W8X99202
From	Loren Bloomberg, Jacobs Jose Herrera, Jacobs		
Date	April 5, 2021		
Copies to	Lyna Black, Jacobs		

The purpose of this technical memorandum is to document the assumptions and methodologies that were used to determine the distribution and assignments of recreational trips to the Sites Reservoir. This information was used as input for transportation and air quality analysis in the Sites Reservoir Project Recirculated Draft Environmental Impact Report/Environmental Impact Statement (RDEIR/EIS), including a summary of vehicle miles traveled (VMT) calculations.

1. Introduction

The proposed Sites Reservoir Project (Project) would utilize existing infrastructure to divert unregulated and unappropriated flow from the Sacramento River at Red Bluff and Hamilton City and convey water to a new off-stream reservoir west of Maxwell, California. New and existing facilities would move water into and out of the reservoir, with ultimate release back to the Sacramento River system via existing canals and a new pipeline located near Dunnigan. Construction of the reservoir would necessitate construction of a bridge or bypass road to connect Maxwell with the community of Lodoga. Additional components would include future development of new recreation areas at the reservoir. The RDEIR/SDEIS presents the No Project Alternative and three Action Alternatives to implement the Project. Project alternatives include:

- No Project Alternative
- Alternative 1, 1.5 million acre-feet (MAF) reservoir, bridge, release to the Colusa Basin Drain (CBD), and a range of Reclamation investment up to 7 percent of the Project costs
- Alternative 2, 1.3 MAF reservoir, South Road, partial release to the CBD and Sacramento River, and no Reclamation investment
- Alternative 3, 1.5 MAF reservoir, bridge, release to the CBD, and Reclamation investment up to 25 percent of the Project costs

Detailed descriptions of each alternative and project components are summarized in *Chapter 2: Project Description and Alternatives* of the RDEIR/EIS.

As part of the Water Storage Investment Program (WSIP) application during the early stages of the Project, an analysis was conducted to estimate the number of recreational visitors per year. The following language is an excerpt of the analysis for the application:

It is estimated that approximately 187,000 recreational visitors per year would visit the Sites Reservoir and its recreation areas for all or part of 1 day once the facilities are operational¹. There would be no overlap between the temporary increase in road usage from construction traffic under Alternative 1 and the anticipated increase in recreation visitor traffic during operations. The number of visitors per day would fluctuate, resulting in varying levels of traffic during the recreational season; however, it is anticipated that 70% of recreation visitors would come during the primary recreation season (i.e., May 1 through September 20), and 70% of those visitors would come during weekends and holidays. It is assumed that those estimated 98,000 recreation users would visit the recreation facilities, with an average of 2.6 persons per vehicle. This would result in an increase of 37,693 total trips, or approximately 820 trips per day, during weekends and holidays in the primary recreation season.

Since the analysis was based on recreational visitors that would visit Sites Reservoir for a portion or a full day, a conservative assumption was to categorize the 820 trips as round trips per day, which would result in a maximum of 1,640 one-way trips per day during peak recreational season. This estimate was the basis for the operational analysis.

2. Model Inputs and Assumptions

To estimate the origins/destinations and distribution of the 1,640 one-way daily trips to and from Sites Reservoir during the peak recreational season, a spreadsheet-based customized gravity model was created based on a multi-factor approach to proportion daily trips. A gravity model is a common approach used in transportation planning to assign trips from one traffic analysis zone to another traffic analysis zone by accounting for different regional and local factors that are combined to generate an attraction of trips compared to other surrounding traffic analysis zone. The gravity model approach was applied to capture regional shifts in travel patterns exclusive to the recreational demand of Sites Reservoir based on a defined set of gravity factors. The typical transportation modeling approach that uses regional travel demand models to estimate weekday peak period origin-destination patterns was not suitable for this type of analysis because recreational trips are concentrated on weekend days and arrivals/departures are scattered throughout the day.

One early step in the gravity model was to estimate the number of daily trips that would be newly generated by the Project versus the number of trips that would result from visitors opting to go to Sites Reservoir over other regional reservoirs. These new trips would be visitors that would normally be doing another type of weekend activity (not a recreational trip) elsewhere. A conservative estimate of 5% (or 82 daily trips) was used, to maximize the number of trips that the gravity model would distribute regionally. New trips were assumed to originate from local populations within 25 miles, which would include small population centers such as Arbuckle, Colusa, Maxwell, Williams, and Willows.

The remaining 95% (or 1,558 daily trips) of the trips were those visitors opting for Sites Reservoir over other surrounding regional reservoirs and recreational areas. The locations of those other regional reservoirs, locations of the regional population center trip origins, and the distances between existing and relocated trips were direct inputs to the gravity model.

¹ Sites Project Authority. 2017. WSIP Application: Benefit Calculation, Monetization, and Resiliency Tab. August.

To distribute the relocated recreational trips using the gravity model, local water-dependent or water-enhanced recreation resources located in a broader region were considered. Some of these regional recreational resources are from lakes and reservoirs from the State Water Project and the Central Valley Water Project. **Table 1** is a summary of existing regional recreational areas considered in the gravity model and **Figure 1** is an illustration. **Table 1** includes the approximate recreational use and represents an average of the three most recent years of available data or a single year when only one year of data were available. The units for recreation use are recreation visitor days, defined as a visit by one person for part or all of one day.

Table 2 lists nine regional urban population areas (as defined by the U.S. Census Bureau) that were identified as the likely origins (from south to north) of the estimated recreational trips expected at the Project site that would displace those from the existing recreation areas listed in **Table 1**. **Figure 2** shows the relative locations of these population centers in the regional study area. The population estimates were derived from the Geography Division’s TIGERweb application as a summary of local urban areas and urban clusters. Population data were used only for comparison purposes to determine the relative differences between the population centers.

A separate population center was identified from smaller population areas (not urban areas defined in the U.S. Census Bureau) near the Project site. This population center (the project area population center) includes the Arbuckle, Williams, Colusa, Willows, Orland, Corning, Los Molinos, and Red Bluff urban clusters with an estimated population of 62,000. Smaller towns near the Project site (e.g., Maxwell, Delevan, Sites, and Lodoga) are not identified in the database as urban clusters due to their low population and therefore are not included in these population centers.

Table 1. Existing Regional Recreation Areas

Recreation Area	Distance Relative to Project Area	County(ies)	Recreational Use (visitor days) ¹
Shasta Lake, Keswick Reservoir (Shasta Unit ²)	98 miles north	Shasta	2,330,000
Trinity and Lewiston Lakes (Trinity Unit ¹)	104 miles north	Trinity	425,000
Whiskeytown Lake (Whiskeytown Unit ¹)	90 miles north	Shasta	843,800
Lake Almanor	90 miles northeast	Plumas	244,000
Red Bluff	58 miles north	Tehama	65,000
Black Butte Reservoir	35 miles north	Tehama, Glenn	220,000
Lake Oroville State Recreational Area	47 miles east	Butte	1,200,000
Stony Gorge Reservoir	22 miles north	Glenn	50,000
New Bullards Bar Reservoir	64 miles east	Yuba	104,000
East Park Reservoir	9 miles west	Colusa	53,000
Englebright Reservoir	57 miles east	Yuba	105,000
Inland Valley Reservoir	20 miles southeast	Lake	50,000
Clear Lake	30 miles southwest	Lake	1,000,000
Folsom Lake State Recreation Area, Lake Natoma	78 miles southeast	Sacramento	1,000,000
Lake Berryessa	57 miles south	Napa	1,400,000

Recreation Area	Distance Relative to Project Area	County(ies)	Recreational Use (visitor days) ¹
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Sources: Rischbieter 2000; California Department of Water Resources 2007, 2008, 2012; Guthrie et al. 1995; Dirksen and Dirksen 2003; Stienstra 2004; Dean’s AnglerNet.com 2011; FishersNet.com 2011; Fishsniffer.com 2011; U.S. Forest Service 2011; National Park Service 2016; Unsinn pers. comm.

Notes:

¹Recreational use reported is approximate and represents an average of the 3 most recent years of available data or a single year when only 1 year of data was available. The units for recreation use are recreation visitor days, defined as a visit by one person for part or all of 1 day.

²Unit of the Whiskeytown-Shasta-Trinity National Recreation Area

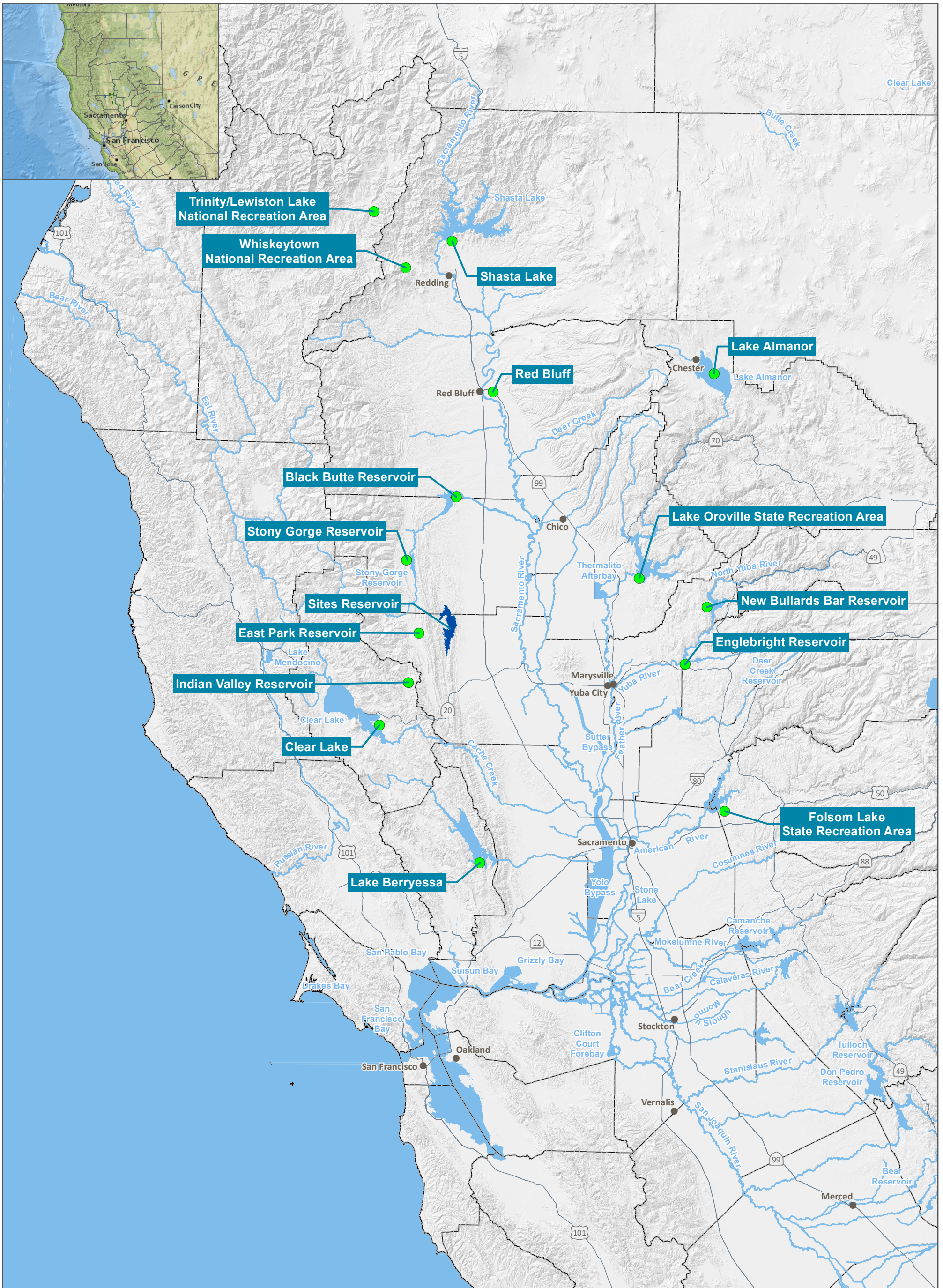
Table 2. Regional Urban Population Near Sites Reservoir

Population Center	Associated Urban Areas	Estimated Population ¹
Modesto	Modesto, Turlock	458,100
Stockton	Stockton, Lodi, Tracy, Manteca	610,500
Bay Area	San Francisco, Oakland, San Jose, Concord, Vallejo, Antioch, Napa	6,088,300
Sacramento	Sacramento	1,723,600
Davis	Davis, Woodland	128,300
Santa Rosa	Santa Rosa, Petaluma	382,300
Yuba	Yuba City	116,700
Chico	Chico	98,200
Redding	Redding	117,700

Source: U.S. Census Bureau 2020

Notes:

¹Population estimates are derived from the Geography Division’s TIGERweb application as a summary of local urban areas and urban clusters; population counts were used only for comparison purposes to determine the relative differences between the population centers selected.



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DATA SOURCES: California Protection Areas Database 2013, U.S. Geological Survey 2018

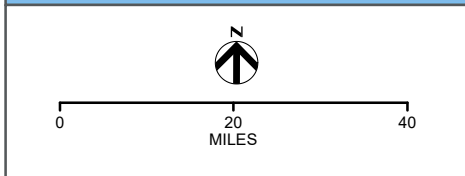
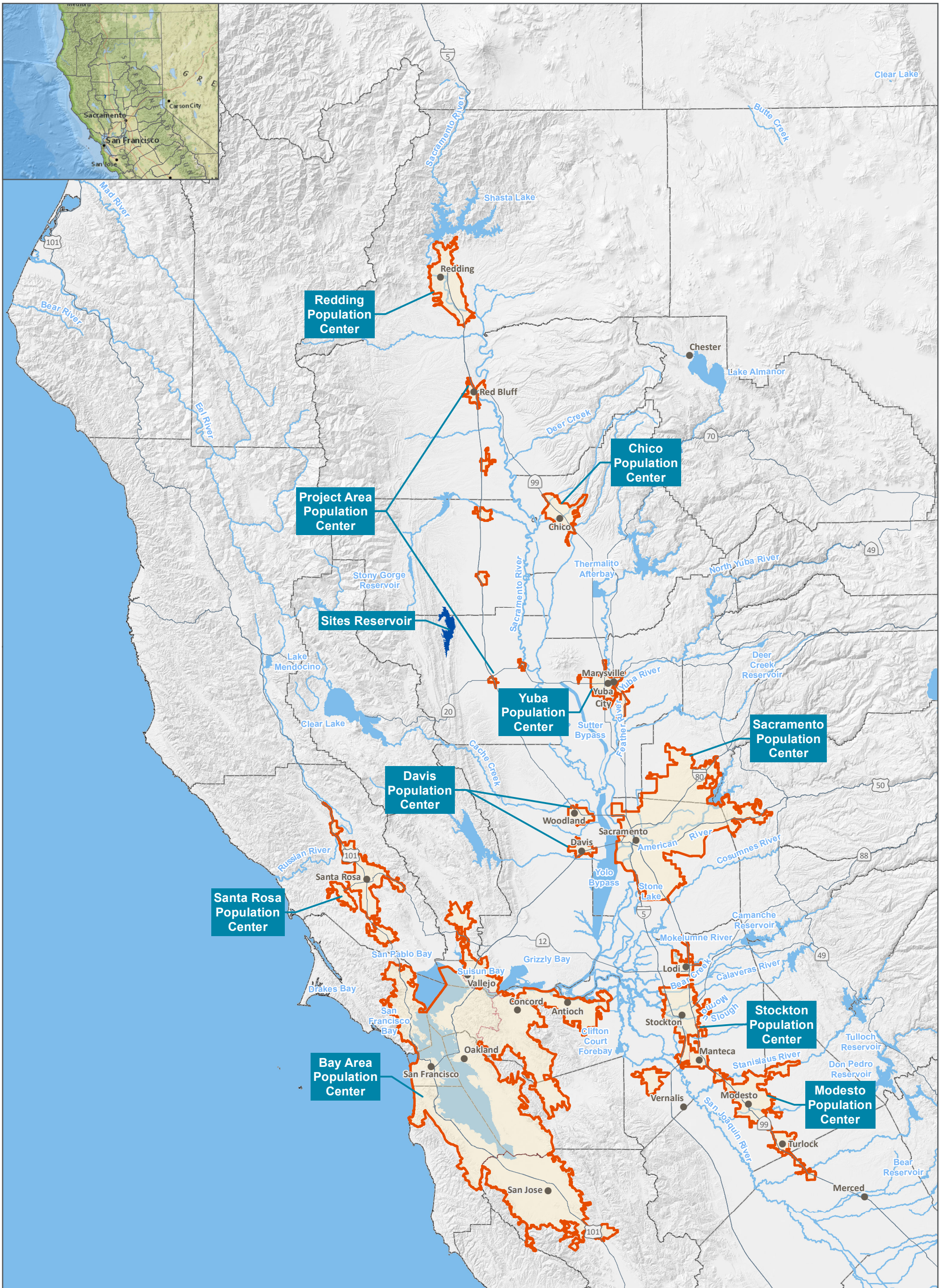
LEGEND

- Regional Recreation Areas
- City
- Rivers
- County
- Water Body

DISCLAIMER: This exhibit is preliminary and is subject to change.

FIGURE 1
RESERVOIRS AND OTHER RECREATION NEAR THE STUDY AREA

MAP DATE: 3/25/2021



DATA SOURCES: California Protection Areas Database 2013, U.S. Geological Survey 2018

LEGEND	
● City	Water Body
□ County	Urban Population Centers
— Rivers	

FIGURE 2
POPULATION CENTERS
NEAR THE STUDY AREA

DISCLAIMER: This exhibit is preliminary and is subject to change.

MAP DATE: 3/25/2021



The distances between the identified regional population centers and the existing regional reservoirs were determined using GoogleMaps "Directions" function using assumed centroids for each regional population center and an assumed recreational destination (for example a parking lot near a campsite and/or shore park) within each of the regional reservoir. The shortest path method was used as the selection criterion for the multiple paths that GoogleMaps provides. Trip distances from each of the regional population center and a location on the east side of Sites Reservoir (rightmost column) were also determined for the same assumed centroids. **Table 3** is a summary of the measured distances used as inputs for the gravity model calculations.

Table 3. Distances to Regional Recreational Areas (in miles, for shortest path)

Population Centers	Origin (Assumed Population Centroid)	Shasta Lake	Trinity/Lewinston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullard's Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa	Sites Reservoir
Modesto	SR 99 at Whitmore Ave	249	280	247	240	211	187	155	186	157	169	138	173	179	92	115	155
Stockton	I-5 at Charter Way (SR 4)	220	251	218	206	180	157	124	155	126	139	107	138	146	62	84	124
Bay Area	I-880 at Davis St (SR 61)	230	261	228	241	191	167	160	165	161	149	146	136	112	120	72	135
Sacramento	I-80 at Elkhorn Blvd	173	204	170	163	132	121	79	120	73	103	59	107	114	20	65	84
Davis	SR 113 at County Road 27	158	189	156	159	119	95	78	93	81	77	65	70	80	50	39	62
Santa Rosa	US 101 at Todd Rd	212	243	209	249	172	148	165	147	170	124	148	84	58	122	60	109
Yuba	SR 99 and Franklin Rd	127	158	125	118	87	75	40	77	41	61	26	67	75	53	77	47
Chico	SR 99 at 1st Ave	82	113	80	75	42	30	30	57	62	73	66	89	97	98	119	58
Redding	I-5 and SR 299 Interchange	12	45	12	97	35	71	101	88	133	119	137	138	145	170	170	104
Project Area Population	I-5 at SR 162	88	119	85	107	48	25	50	23	81	42	77	61	69	117	93	27

Note: A green to red color scale is provided for comparison purposes. The red cells represent longer distances and the green cells represent shorter distances. The blue cells are the distances from the population centers to Sites Reservoir.

3. Gravity Model Trip Distributions

The data summarized in Section 2 were used as inputs into the gravity model calculations by using trips pairs to determine relative gravitational pulls, and in turn, assign a relative number of recreational trips. The logic behind the gravity model was the expectation that Sites Reservoir would attract more trips originating from more populous regions that were originally destined to more popular (higher recreational use) regional recreational areas, in the absence of Sites Reservoir, as compared to originating from lower populated areas destined to a less popular recreational area. The gravity model used the distances from **Table 3** to determine the likelihood for a recreational visitor to make a destination change. For example, if a recreational visitor is currently traveling from the Bay Area to Shasta Lake (230 miles) and would be provided an alternative destination of Sites Reservoir (135 miles), the visitor would be more likely to displace as compared to another recreational visitor that is currently visiting Lake Berryessa (72 miles), since the distance to Sites Reservoir would be more than to Lake Berryessa.

Table 4 is a summary of the trip distance ratios comparing an existing recreational visit trip to a displaced trip to Sites Reservoir. A ratio higher than 1.0 indicates that the existing trip to a regional recreational reservoir would be longer than the displaced trip to Sites Reservoir.

Table 4. Ratio of Trip Distances to Recreational Areas to Sites Reservoir

Population Centers	Origin (Assumed Population Centroid)	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullards Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa	Sites Reservoir
Modesto	SR 99 at Whitmore Ave	1.61	1.81	1.59	1.55	1.36	1.21	1.00	1.20	1.01	1.09	0.89	1.12	1.15	0.59	0.74	1.00
Stockton	I-5 at Charter Way (SR 4)	1.77	2.02	1.76	1.66	1.45	1.27	1.00	1.25	1.02	1.12	0.86	1.11	1.18	0.50	0.68	1.00
Bay Area	I-880 at Davis St (SR 61)	1.70	1.93	1.69	1.79	1.41	1.24	1.19	1.22	1.19	1.10	1.08	1.01	0.83	0.89	0.53	1.00
Sacramento	I-80 at Elkhorn Blvd	2.06	2.43	2.02	1.94	1.57	1.44	0.94	1.43	0.87	1.23	0.70	1.27	1.36	0.24	0.77	1.00
Davis	SR 113 at County Road 27	2.55	3.05	2.52	2.56	1.92	1.53	1.26	1.50	1.31	1.24	1.05	1.13	1.29	0.81	0.63	1.00
Santa Rosa	US 101 at Todd Rd	1.94	2.23	1.92	2.28	1.58	1.36	1.51	1.35	1.56	1.14	1.36	0.77	0.53	1.12	0.55	1.00
Yuba	SR 99 and Franklin Rd	2.70	3.36	2.66	2.51	1.85	1.60	0.85	1.64	0.87	1.30	0.55	1.43	1.60	1.13	1.64	1.00
Chico	SR 99 at 1st Ave	1.41	1.95	1.38	1.29	0.72	0.52	0.52	0.98	1.07	1.26	1.14	1.53	1.67	1.69	2.05	1.00
Redding	I-5 and SR 299 Interchange	0.12	0.43	0.12	0.93	0.34	0.68	0.97	0.85	1.28	1.14	1.32	1.33	1.39	1.63	1.63	1.00
Project Area Population	I-5 at SR 162	3.26	4.41	3.15	3.96	1.78	0.93	1.85	0.85	3.00	1.56	2.85	2.26	2.56	4.33	3.44	1.00

Note: A green to red color scale is provided for comparison purposes. The red cells represent higher ratios and the green cells represent smaller ratios. The blue cells are provided for reference only and represent Sites Reservoir to Sites Reservoir (no change).

Table 5 is a summary of the percent population from the selected regional urban population centers near Sites Reservoir. The percent of total population is an indirect representation of the gravity factors generated by the population data in the gravity model.

Table 5. Percent of Population Summary

Population Center	Estimated Population	% Population
Modesto	458,100	4.7
Stockton	610,500	6.2
Bay Area	6,088,300	62.3
Sacramento	1,723,600	17.6
Davis	128,300	1.3
Santa Rosa	372,300	3.8
Yuba	116,700	1.2
Chico	98,200	1.0
Redding	117,700	1.2
Project Area Population	62,000	0.6
TOTAL AREA POPULATION	9,775,700	100

Table 6 is a summary of the selected regional recreational reservoirs and areas surrounding Sites Reservoir. The percent of total recreation is an indirect representation of the gravity factors generated by the recreational visitor data in the gravity model.

Table 6. Percent of Recreational Use Summary

Recreation Area	% Capacity in Use	Recreational Use (visitor days)	% Recreation	Gravity Factor
Shasta Lake, Keswick Reservoir (Shasta Unit)	98	2,330,000	25.6	0.2563
Trinity and Lewiston Lakes (Trinity Unit ¹)	36	425,000	4.7	0.0468
Whiskeytown Lake (Whiskeytown Unit ¹)	69	843,800	9.3	0.0928
Lake Almanor	53	244,000	2.7	0.0268
Red Bluff	48	65,000	0.7	0.0072
Black Butte Reservoir	73	220,000	2.4	0.0242
Lake Oroville State Recreational Area	57	1,200,000	13.2	0.1320
Stony Gorge Reservoir	75	50,000	0.6	0.0055
New Bullards Bar Reservoir	52	104,000	1.1	0.0114
East Park Reservoir	22	53,000	0.6	0.0058
Englebright Reservoir	67	105,000	1.2	0.0116
Inland Valley Reservoir	66	50,000	0.6	0.0055
Clear Lake	67	1,000,000	11.0	0.1100
Folsom Lake State Recreation Area, Lake Natoma	45	1,000,000	11.0	0.1100
Lake Berryessa	82	1,400,000	15.4	0.1540
TOTAL RECREATIONAL USE		9,089,800	100	

The first data combination in the gravity model was to divide the regional population center total population by the square root of the existing origin and destination trip distances. This calculation was done for each of the regional recreational reservoirs/areas. This initial step generates higher gravitations towards higher population centers but gives less importance to the distance factor because recreational visitors tend to travel long distances. **Table 7** is a summary of the first data combinations using *Equation 1* with each existing origin-destination pair.

$$\text{Equation 1 : } \frac{\text{Population}_O}{\sqrt{\text{Distance}_{O-D}}}; \text{ where } O \text{ is the origin and } D \text{ is destination (for existing recreation)}$$

The second data combination in the gravity model was to divide recreational gravity factor for each existing recreational reservoir (from **Table 6**) by the square root of the ratio of trip distances to recreational areas to Sites Reservoir (from **Table 4**). **Table 8** is a summary of the second data combinations using *Equation 2* with each origin-destination pair.

$$\text{Equation 2 : } \frac{\text{Recreation Gravity Factor (site-specific)}}{\sqrt{\frac{\text{Distance}_{O-D}}{\text{Distance}_{O-Sites}}}};$$

where *O* is the origin, *D* is destination (for existing recreation), and *Sites* is the Sites Reservoir.

The third data combination in the gravity model was to combine the matrices that were created for *Equation 1* and *Equation 2*. This calculation was effectively the gravity calculation for population, recreational use of existing reservoirs, and the change in trip distance that was the basis for the distribution of trips to Sites Reservoir. Both calculation sets were combined by using *Equation 3*. **Table 9** is a summary of the resulting gravity factors for each origin-destination pair.

$$\text{Equation 3: } \frac{\text{Equation 1 Factor}}{\text{Equation 2 Factor}} / 1000$$

Post-processing of the calculated factors was used to convert the factors to percentages that would be used to distribute the 1,558 daily trips to and from Sites Reservoir from the existing recreational trips. The adjustment was to proportion the individual factors from the sum of the total gravity factors calculated. **Table 10** is a summary of the final trip distribution matrix that was ultimately used to determine the displaced trips. **Table 11** is a summary of the origin of the displaced trips per the gravity model calculations. Each value in **Table 11** represents number of trips that are projected to choose Sites Reservoir originating from the regional population centers in the first column (leftmost column) that in the absence of Sites Reservoir would have been destined to the regional recreational reservoirs listed in the first row (top row).

Table 12 is a summary of the trips distributions for relocated trips from the gravity model by regional population centers. **Table 13** is a summary of the trips distributions for relocated trips from the gravity model by the different regional recreational areas.

Table 7. Population and Distance Gravity

Population Centers	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullards Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa
Modesto	29,029.39	27,375.28	29,146.68	29,568.68	31,535.25	33,497.83	36,793.55	33,587.76	36,558.44	35,236.62	38,994.02	34,826.87	34,238.21	47,757.72	42,715.81
Stockton	41,157.74	38,532.40	41,346.11	42,533.32	45,501.60	48,720.65	54,821.64	49,033.97	54,384.81	51,779.22	59,016.17	51,966.49	50,522.69	77,529.51	66,607.52
Bay Area	401,450.42	376,856.12	403,207.32	392,181.69	440,533.71	471,126.57	481,322.14	473,973.28	479,825.02	498,772.72	503,871.04	522,067.16	575,289.99	555,782.93	717,512.68
Sacramento	131,045.47	120,678.52	132,196.69	135,005.43	150,023.08	156,694.00	193,923.98	157,345.54	201,736.10	169,834.70	224,398.03	166,629.99	161,433.11	385,416.28	213,790.49
Davis	10,207.56	9,332.96	10,272.78	10,175.41	11,761.88	13,164.02	14,527.91	13,304.82	14,256.33	14,621.94	15,914.52	15,335.62	14,345.16	18,145.35	20,545.56
Santa Rosa	25,570.29	23,883.63	25,753.15	23,594.12	28,388.30	30,603.61	28,984.22	30,707.53	28,554.80	33,434.34	30,603.61	40,622.24	48,886.57	33,707.27	48,064.89
Yuba	10,357.14	9,285.67	10,439.66	10,744.85	12,513.59	13,477.55	18,454.89	13,301.36	18,228.45	14,944.34	22,890.48	14,259.50	13,477.55	16,032.59	13,301.36
Chico	10,841.73	9,235.62	10,976.41	11,336.39	15,148.89	17,924.40	17,924.40	13,003.73	12,468.36	11,490.63	12,084.63	10,406.64	9,968.26	9,917.27	8,999.78
Redding	33,986.01	17,550.30	33,986.01	11,953.77	19,900.17	13,972.10	11,714.67	12,550.17	10,208.57	10,792.38	10,058.44	10,021.93	9,777.03	9,029.56	9,029.56
Project Area Population	6,613.38	5,687.11	6,729.07	5,997.54	8,954.56	12,407.80	8,773.64	12,936.03	6,893.22	9,572.83	7,070.00	7,943.28	7,468.62	5,735.51	6,433.14

Note: A green to red color scale is provided for comparison purposes. The red cells represent higher factors and the green cells represent lower factors.

Table 8. Recreation and Distance Gravity

Population Centers	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullards Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa
Modesto	0.3249	0.0628	0.1172	0.0334	0.0083	0.0266	0.1320	0.0060	0.0115	0.0061	0.0109	0.0058	0.1182	0.0848	0.1327
Stockton	0.3414	0.0665	0.1231	0.0346	0.0086	0.0272	0.1320	0.0061	0.0115	0.0062	0.0107	0.0058	0.1194	0.0778	0.1268
Bay Area	0.3346	0.0650	0.1206	0.0359	0.0085	0.0269	0.1437	0.0061	0.0125	0.0061	0.0120	0.0055	0.1002	0.1037	0.1125
Sacramento	0.3679	0.0729	0.1321	0.0374	0.0090	0.0290	0.1280	0.0066	0.0107	0.0065	0.0097	0.0062	0.1282	0.0537	0.1355
Davis	0.4092	0.0816	0.1473	0.0430	0.0099	0.0300	0.1481	0.0067	0.0131	0.0065	0.0118	0.0058	0.1250	0.0988	0.1222
Santa Rosa	0.3575	0.0698	0.1285	0.0406	0.0090	0.0282	0.1624	0.0064	0.0143	0.0062	0.0135	0.0048	0.0802	0.1164	0.1143
Yuba	0.4214	0.0857	0.1514	0.0425	0.0097	0.0306	0.1218	0.0070	0.0107	0.0066	0.0086	0.0066	0.1390	0.1168	0.1971
Chico	0.3048	0.0653	0.1090	0.0305	0.0061	0.0174	0.0949	0.0055	0.0118	0.0065	0.0123	0.0068	0.1423	0.1430	0.2206
Redding	0.0871	0.0308	0.0315	0.0259	0.0041	0.0200	0.1301	0.0051	0.0129	0.0062	0.0133	0.0063	0.1299	0.1407	0.1969
Project Area Population	0.4628	0.0982	0.1647	0.0534	0.0095	0.0233	0.1797	0.0051	0.0198	0.0073	0.0195	0.0083	0.1759	0.2290	0.2858
Recreation Gravity Factor	0.2563	0.0468	0.0928	0.0268	0.0072	0.0242	0.1320	0.0055	0.0114	0.0058	0.0116	0.0055	0.1100	0.1100	0.1540

Note: A green to red color scale is provided for comparison purposes. The red cells represent lower factors and the green cells represent higher factors.

Table 9. Calculated Combined Gravity Factors

Population Centers	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullards Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa
Modesto	9.43	1.72	3.42	0.99	0.26	0.89	4.86	0.20	0.42	0.21	0.43	0.20	4.05	4.05	5.67
Stockton	14.05	2.56	5.09	1.47	0.39	1.33	7.24	0.30	0.63	0.32	0.63	0.30	6.03	6.03	8.44
Bay Area	134.32	24.50	48.64	14.07	3.75	12.68	69.18	2.88	6.00	3.06	6.05	2.88	57.65	57.65	80.71
Sacramento	48.21	8.79	17.46	5.05	1.34	4.55	24.83	1.03	2.15	1.10	2.17	1.03	20.69	20.69	28.97
Davis	4.18	0.76	1.51	0.44	0.12	0.39	2.15	0.09	0.19	0.10	0.19	0.09	1.79	1.79	2.51
Santa Rosa	9.14	1.67	3.31	0.96	0.26	0.86	4.71	0.20	0.41	0.21	0.41	0.20	3.92	3.92	5.49
Yuba	4.36	0.80	1.58	0.46	0.12	0.41	2.25	0.09	0.19	0.10	0.20	0.09	1.87	1.87	2.62
Chico	3.30	0.60	1.20	0.35	0.09	0.31	1.70	0.07	0.15	0.08	0.15	0.07	1.42	1.42	1.99
Redding	2.96	0.54	1.07	0.31	0.08	0.28	1.52	0.06	0.13	0.07	0.13	0.06	1.27	1.27	1.78
Project Area Population	3.06	0.56	1.11	0.32	0.09	0.29	1.58	0.07	0.14	0.07	0.14	0.07	1.31	1.31	1.84

Note: A green to red color scale is provided for comparison purposes. The red cells represent higher factors and the green cells represent lower factors.

Table 10. Percent Distribution of Sites Reservoir Trips from Existing Recreation

Population Centers	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullards Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa
Modesto	1.04%	0.19%	0.38%	0.11%	0.03%	0.10%	0.53%	0.02%	0.05%	0.02%	0.05%	0.02%	0.45%	0.45%	0.62%
Stockton	1.55%	0.28%	0.56%	0.16%	0.04%	0.15%	0.80%	0.03%	0.07%	0.04%	0.07%	0.03%	0.66%	0.66%	0.93%
Bay Area	14.78%	2.70%	5.35%	1.55%	0.41%	1.40%	7.61%	0.32%	0.66%	0.34%	0.67%	0.32%	6.34%	6.34%	8.88%
Sacramento	5.30%	0.97%	1.92%	0.56%	0.15%	0.50%	2.73%	0.11%	0.24%	0.12%	0.24%	0.11%	2.28%	2.28%	3.19%
Davis	0.46%	0.08%	0.17%	0.05%	0.01%	0.04%	0.24%	0.01%	0.02%	0.01%	0.02%	0.01%	0.20%	0.20%	0.28%
Santa Rosa	1.01%	0.18%	0.36%	0.11%	0.03%	0.09%	0.52%	0.02%	0.04%	0.02%	0.05%	0.02%	0.43%	0.43%	0.60%
Yuba	0.48%	0.09%	0.17%	0.05%	0.01%	0.05%	0.25%	0.01%	0.02%	0.01%	0.02%	0.01%	0.21%	0.21%	0.29%
Chico	0.36%	0.07%	0.13%	0.04%	0.01%	0.03%	0.19%	0.01%	0.02%	0.01%	0.02%	0.01%	0.16%	0.16%	0.22%
Redding	0.33%	0.06%	0.12%	0.03%	0.01%	0.03%	0.17%	0.01%	0.01%	0.01%	0.01%	0.01%	0.14%	0.14%	0.20%
Project Area Population	0.34%	0.06%	0.12%	0.04%	0.01%	0.03%	0.17%	0.01%	0.02%	0.01%	0.02%	0.01%	0.14%	0.14%	0.20%

Table 11. Trip Distribution of Sites Reservoir Trips from Existing Recreation

	Population Gravity Factor	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullards Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa
Population Centers																
Modesto	0.0469	16	3	6	2	0	2	8	0	1	0	1	0	7	7	10
Stockton	0.0624	24	4	9	3	1	2	12	1	1	1	1	1	10	10	14
Bay Area	0.6228	230	42	83	24	6	22	119	5	10	5	10	5	99	99	138
Sacramento	0.1763	83	15	30	9	2	8	43	2	4	2	4	2	35	35	50
Davis	0.0131	7	1	3	1	0	1	4	0	0	0	0	0	3	3	4
Santa Rosa	0.0381	16	3	6	2	0	1	8	0	1	0	1	0	7	7	9
Yuba	0.0119	7	1	3	1	0	1	4	0	0	0	0	0	3	3	4
Chico	0.0100	6	1	2	1	0	1	3	0	0	0	0	0	2	2	3
Redding	0.0120	5	1	2	1	0	0	3	0	0	0	0	0	2	2	3
Project Area Population	0.0063	5	1	2	1	0	0	3	0	0	0	0	0	2	2	3
Recreation Gravity Factor		0.2563	0.0468	0.0928	0.0268	0.0072	0.0242	0.1320	0.0055	0.0114	0.0058	0.0116	0.0055	0.1100	0.1100	0.1540

Table 12. Sites Reservoir Recreational Daily Trips from Population Centers

Population Center	Estimated Daily One-Way Trips to Sites Reservoir (vehicles per day)	% of Redistributed Trips (by Population Centers)
Modesto	63	3.8
Stockton	94	5.7
Bay Area	898	54.8
Sacramento	322	19.7
Davis	28	1.7
Santa Rosa	61	3.7
Yuba	29	1.8
Chico	22	1.3
Redding	20	1.2
Project Area Population	20	1.2
TOTAL TRIPS	1,558	95

Table 13. Sites Reservoir Recreational Daily Trips from Recreational Areas

Regional Recreational Area	Estimated Daily One-Way Trips to Sites Reservoir (vehicles per day)	Redistributed Trips (by Recreational Areas)
Shasta Lake, Keswick Reservoir (Shasta Unit ²)	399	24%
Trinity and Lewiston Lakes (Trinity Unit ¹)	73	4%
Whiskeytown Lake (Whiskeytown Unit ¹)	145	9%
Lake Almanor	42	3%
Red Bluff	11	1%
Black Butte Reservoir	38	2%
Lake Oroville State Recreational Area	205	13%
Stony Gorge Reservoir	9	< 1%
New Bullards Bar Reservoir	18	1%
East Park Reservoir	9	< 1%
Englebright Reservoir	18	1%
Inland Valley Reservoir	9	1%
Clear Lake	171	10%
Folsom Lake State Recreation Area, Lake Natoma	171	10%
Lake Berryessa	240	15%
TOTAL TRIPS	1558	95%

4. Recreational Trips Assignment

The entering and exiting recreational trips were assigned per the assumed routes in **Table 14**. These routes were selected using a similar approach described to calculate the trip distances in **Table 3** (rightmost column) with a small adjustment for daily variation of travel patterns in the local roadway network.

Table 14. Sites Reservoir Recreational Trip Assignment

Population Center	Assumed Trips Assignment to Local Roadway Network (to and from Sites Reservoir)
Modesto	<ul style="list-style-type: none"> ▪ 100% of trips routed via I-5 (south of Maxwell Sites Road) and Maxwell Sites Road
Stockton	
Bay Area	
Sacramento	
Davis	
Santa Rosa	<ul style="list-style-type: none"> ▪ 100% of trips routed via Maxwell Sites Road west of McDermott Road (traffic enters and leaves south on Danley Road from State Route 20)
Yuba	<ul style="list-style-type: none"> ▪ 100% of trips routed via Maxwell Sites Road (traffic enters and leaves east of I-5)
Chico	<ul style="list-style-type: none"> ▪ 45% of trips routed via I-5 (north of Maxwell Sites Road) and Maxwell Sites Road ▪ 5% of trips routed via I-5 (north of Delevan Road), Delevan Road, McDermott Road, and Maxwell Sites Road ▪ 50% of trips routed via Maxwell Sites Road (traffic enters and leaves east of I-5)
Redding	<ul style="list-style-type: none"> ▪ 95% of trips routed via I-5 (north of Maxwell Sites Road) and Maxwell Sites Road ▪ 5% of trips routed via I-5 (north of Delevan Road), Delevan Road, McDermott Road, and Maxwell Sites Road
Project Area Population (Relocated Trips)	
Project Area Population (New Trips)	<ul style="list-style-type: none"> ▪ 33% of trips routed via I-5 (south of Maxwell Sites Road) and Maxwell Sites Road ▪ 33% of trips routed via I-5 (north of Maxwell Sites Road) and Maxwell Sites Road ▪ 33% of trips routed via Maxwell Sites Road (traffic enters and leaves east of I-5)

5. Analysis of Vehicle Miles Traveled

5.1 Regional Change in Vehicle Miles Traveled

Alternative 1 and 3

An analysis of VMT changes due to the regional trip displacements of recreational visitors was used to support the environmental assessment in *Chapter 18: Navigation, Transportation, and Traffic* of the RDEIR/EIS. The approach focused on converting the trip distance changes, reported in **Table 3**, into a VMT value for each of the assigned trips in **Table 11**. At a regional level, if the recreational trips are isolated from the existing traffic network, the change in VMT for each of the recreational trip would be equal to the difference in the distance between their existing recreational visits (to other reservoirs in the absence of Sites Reservoir) and the future visit to Sites Reservoir. Since the distances to Sites Reservoir are generally shorter, the calculation determines if the VMT increases near access roads to Sites Reservoir would be offset by the net decrease at a regional level. If so, the Project would result in an overall decrease in VMT when considering recreational trips.

Table 15 is a summary of the trip distances differences, in miles, between existing recreational trips and the displaced trips to Sites Reservoir. The trip displacement that would result in the highest increase in distance is a trip originating from the Redding population center that would choose Sites Reservoir over Shasta Lake and Whiskeytown Lake. That trip is estimated to result in an increase of 92 miles. In contrast, the trip displacement that would result in the highest decrease in distance is a trip originating from the Santa Rosa population center that would choose Sites Reservoir over Lake Almanor. The total trip reduction for that trips is 140 miles.

Table 15. Change in Distances for New Trips to Sites Reservoir (in miles, for shortest path)

Population Centers	Origin (Assumed Population Centroid)	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Bullards Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa
Modesto	SR 99 at Whitmore Ave	-94	-125	-92	-85	-56	-32	0	-31	-2	-14	17	-18	-24	63	40
Stockton	I-5 at Charter Way (SR 4)	-96	-127	-94	-82	-56	-33	0	-31	-2	-15	17	-14	-22	62	40
Bay Area	I-880 at Davis St (SR 61)	-95	-126	-93	-106	-56	-32	-25	-30	-26	-14	-11	-1	23	15	63
Sacramento	I-80 at Elkhorn Blvd	-89	-120	-86	-79	-48	-37	5	-36	11	-19	25	-23	-30	64	19
Davis	SR 113 at County Road 27	-96	-127	-94	-97	-57	-33	-16	-31	-19	-15	-3	-8	-18	12	23
Santa Rosa	US 101 at Todd Rd	-103	-134	-100	-140	-63	-39	-56	-38	-61	-15	-39	25	51	-13	49
Yuba	SR 99 and Franklin Rd	-80	-111	-78	-71	-40	-28	7	-30	6	-14	21	-20	-28	-6	-30
Chico	SR 99 at 1st Ave	-24	-55	-22	-17	16	28	28	1	-4	-15	-8	-31	-39	-40	-61
Redding	I-5 and SR 299 Interchange	92	59	92	7	69	33	3	16	-29	-15	-33	-34	-41	-66	-66
Project Area Population	I-5 at SR 162	-61	-92	-58	-80	-21	2	-23	4	-54	-15	-50	-34	-42	-90	-66

Note: A green to red color scale is provided for comparison purposes. The red cells represent higher increases and the green cells represent higher decreases distances.

Table 16 is a summary of the VMT changes for the 1,558 daily relocated trips to Sites Reservoir based on the trip distributions generated from the gravity model calculations. **Table 17** is a summary of how daily VMT from population centers would change when recreation trips are redistributed to Sites Reservoir occur versus other potential recreation locations. The highest estimated VMT reduction of 29,628 vehicle-miles is from trips originating in the Bay Area population center. All of the other population centers have net reductions in VMT. A slight increase in VMT of 275 vehicle-miles is estimated from trips originating in the Redding population center. A separate VMT increase of 2,050 vehicle-miles is attributed to the new trips generating within 25 miles of Sites Reservoir. The total net regional VMT change for relocated trips to Sites Reservoir is an estimated reduction of 49,673 vehicle-miles.

Table 16. Change in Vehicle Miles Traveled of Sites Reservoir Trips from Existing Recreation

Population Centers	Shasta Lake	Trinity/Lewiston	Whiskeytown	Lake Almanor	Red Bluff	Black Butte	Lake Oroville	Stony Gorge	New Buttarids Bar	East Park	Englebright	Indian Valley	Clear Lake	Folsom Lake	Lake Berryessa
Modesto	-1519	-369	-539	-144	0	-49	0	0	-2	0	17	0	-167	437	389
Stockton	-2312	-558	-820	-207	-56	-75	0	-31	-2	-15	18	-14	-227	641	579
Bay Area	-21870	-5291	-7754	-2555	-360	-696	-2964	-148	-267	-73	-114	-5	2272	1482	8714
Sacramento	-7353	-1808	-2573	-684	-111	-289	213	-64	41	-36	93	-41	-1064	2269	943
Davis	-687	-166	-244	-97	0	-33	-59	0	0	0	0	0	-55	37	99
Santa Rosa	-1614	-383	-567	-230	0	-58	-452	0	-61	0	-39	0	343	-87	461
Yuba	-598	-151	-211	-71	0	-28	27	0	0	0	0	0	-90	-19	-135
Chico	-136	-57	-45	-17	0	28	82	0	0	0	0	0	-95	-97	-208
Redding	467	59	169	7	0	0	8	0	0	0	0	0	-89	-144	-201
Project Area Population	-320	-92	-110	-80	0	0	-62	0	0	0	0	0	-95	-203	-208

Table 17. Change in Vehicle Miles Traveled by Population Centers

Population Center	Estimated Daily One-Way Trips to Sites Reservoir (vehicles per day)	Daily VMT Change (all recreational areas, in vehicle-miles)
Modesto	63	-1,945
Stockton	94	-3,079
Bay Area	898	-29,628
Sacramento	322	-10,463
Davis	28	-1,205
Santa Rosa	61	-2,686
Yuba	29	-1,277
Chico	22	-545
Redding	20	+275
Project Area Population	20	-1,169
TOTAL TRIPS	1,558	-51,723
<i>New Trips within 25 miles</i>	82	+2,050
NET TOTAL TRIPS	1,640	-49,673

Alternative 2

The main difference in recreational trips between Alternative 2 and Alternatives 1 and 3 is the realignment of some existing roads that would add travel distance to recreational visitors wanting to reach the recreational areas on the west side of Sites Reservoir. For Alternatives 1 and 3, all recreational areas in Sites Reservoir can be accessed via Maxwell Sites Road and the realigned Sites Lodoga Road. The areas west of the reservoir can be accessed via the newly constructed bridge over Sites Reservoir. For Alternative 2, the west side of the reservoir would need to be accessed via Maxwell Sites Road and the realigned South Road that would route drivers around the southern portion of the reservoir. The difference in trip distances for recreational destinations on the west side of the reservoir between Alternatives 1 and 3 and Alternative 2 was determined to be approximately 31 miles. For recreational trips, it was assumed that the additional trip distance to reach the western recreational areas was not as attractive because of the longer distance to travel, and only 25% of the recreational trips would use the realigned roads.

Table 18 is a summary of how the daily VMT from population centers would change when recreation trips to Sites Reservoir occur, versus other potential recreation locations for Alternative 2. This summary includes the net reduction (similar to Alternatives 1 and 3, as summarized in **Table 17**) and the net increase due to the effects of the realigned roads.

Table 18. Change in Vehicle Miles Traveled by Population Centers for Alternative 2

Population Center	Estimated Daily One-Way Trips to Sites Reservoir (vehicles per day)	Daily VMT Change (all recreational areas, in vehicle-miles)
Modesto	63	-1,945
Stockton	94	-3,079
Bay Area	898	-29,628
Sacramento	322	-10,463
Davis	28	-1,205
Santa Rosa	61	-2,686
Yuba	29	-1,277
Chico	22	-545
Redding	20	+275
Project Area Population	20	-1,169
TOTAL TRIPS	1,558	-51,723
<i>New Trips within 25 miles</i>	82	+2,050
<i>Recreational Trips using Realigned Roads</i>	410	+12,710
NET TOTAL TRIPS	1,558	-36,963

5.2 Local Change in Vehicle Miles Traveled

Alternative 1 and 3

An analysis of VMT changes due to the regional trip displacements of recreational visitors at a local level was done to support the environmental assessment in *Chapter 20: Air Quality* of the RDEIR/EIS. VMT causes air pollutant emissions that affect areas on a geographically smaller scale than the scale of the regional trip displacement analysis. This geographically smaller scale can include local communities, counties and air basins; thus, it was necessary to evaluate local changes in VMT to fully account for the air quality impacts of the project. For this analysis, the VMT changes were focused on the study roadway segments (from *Chapter 18: Navigation, Transportation, and Traffic*) that are directly adjacent to Sites

Reservoir (not including the Red Bluff Pumping Plant and Dunnigan Pipeline roadways). The trips assignments from Section 4 were also used for this analysis. **Table 19** is a list of the study roadway segments that were selected for this analysis and the approximate segment length used for the VMT evaluation. The roadways were selected based on the expected operation and maintenance routes for the Project.

To calculate the change in VMT in this focused study area, the first step was to determine the VMT increase due to the routing of daily recreational trips via the twelve roadway segments, as applicable. The second step was to determine how many trips were already traveling through the study segments that would not represent a change in VMT. For example, a large portion of the displaced recreational visitors were traveling from south of the study area to north of the study area, via the I-5 segments, in their original visit in the absence of Sites Reservoir (for example, from the Bay Area to Shasta Lake). The same visitor is expected to exit I-5 at Maxwell when choosing Sites Reservoir. As part of the second step, it was necessary to calculate the VMT reductions to account for this change in route in this focused study area. **Table 20** is a summary of the trips added for Sites Reservoir and trips already traveling for the original destination in the absence of Sites Reservoir.

Table 19. Study Segments for Local VMT Evaluation

Project Study Segment	Roadway Classification ¹	Segment Length (miles)
I-5, from Delevan Road to Road 57	Interstate	10.1
I-5, from Delevan Road to Maxwell Sites Road	Interstate	5.1
I-5 from Maxwell Sites Road to SR 20	Interstate	8.0
Road 68 from I-5 to County Road F	Rural Minor Collector	2.8
Road D from County Road 69 to County Road 68	Rural Local Road	1.5
Road 69 from Country Road D to end of paved road	Rural Local Road	2.5
Delevan Road from I-5 to McDermott Rd	Rural Local Road	2.5
McDermott Road from Maxwell Sites Rd to Delevan Road	Rural Local Road	9.0
Maxwell Sites Road from I-5 to McDermott Road	Rural Minor Arterial	2.5
Maxwell Sites Road McDermott Road to Lodoga Road	Rural Minor Arterial	7.0
Huffmaster Road	Rural Local Road	6.4
Sites Lodoga Road Realignment, including Bridge	Rural Minor Arterial	6.1

¹Source: Federal Highway Administration

Table 20. Study Segments for Local VMT Evaluation

Project Study Segment	Daily Trips Added for Sites Reservoir	Daily Trips Prior to Sites Reservoir	Total Daily Trip Offsets
I-5, from Delevan Road to Road 57	58	-651	-593
I-5, from Delevan Road to Maxwell Sites Road	52	-651	-599
I-5 from Maxwell Sites Road to SR 20	1,457	-651	807
Road 68 from I-5 to County Road F	0	0	0
Road D from County Road 69 to County Road 68	0	0	0
Road 69 from Country Road D to end of paved road	0	0	0
Delevan Road from I-5 to McDermott Rd	6	0	6
McDermott Road from Maxwell Sites Rd to Delevan Road	6	0	6
Maxwell Sites Road from I-5 to McDermott Road	1,576	-9	1,567
Maxwell Sites Road McDermott Road to Lodoga Road	1,640	-9	1,631
Huffmaster Road	0	0	0
Sites Lodoga Road Realignment, including Bridge	1,640	-9	1,631

The last step was to convert the daily trips offsets into a VMT change using the segment length distances. **Table 21** is a summary of the daily and annual VMT change for recreational visitors for Alternatives 1 and 3. To convert daily VMT change to annual VMT change, a factor of 365 was applied to the daily summaries. Within the focused study area, the two I-5 segments north of Maxwell are estimated to have a VMT reduction of 9,045 vehicle-miles from the displacement of trips for Sites Reservoir recreational visitors. The estimated total daily VMT change for this local study area is a net increase of 22,760 vehicle-miles. The estimated total annual VMT change for this local study area is a net increase of 8,307,514 vehicle-miles. In contrast to the results presented in Section 5.1, at the local level, the VMT increases are not fully offset by the VMT decreases.

Table 21. Alternatives 1 and 3 Daily and Annual VMT Change for Recreational Trips

Project Study Segment	Segment Distance (in miles)	Daily VMT Change (in vehicle-miles)	Annual VMT Change (in vehicle-miles)
I-5, from Delevan Road to Road 57	10.1	-5,990	-2,186,206
I-5, from Delevan Road to Maxwell Sites Road	5.1	-3,055	-1,115,095
I-5 from Maxwell Sites Road to SR 20	8.0	+6,454	+2,355,693
Road 68 from I-5 to County Road F	2.8	0	0
Road D from County Road 69 to County Road 68	1.5	0	0
Road 69 from Country Road D to end of paved road	2.5	0	0
Delevan Road from I-5 to McDermott Rd	2.5	+15	+5,475
McDermott Road from Maxwell Sites Rd to Delevan Road	9.0	+54	+19,710
Maxwell Sites Road from I-5 to McDermott Road	2.5	+3,917	+1,429,713
Maxwell Sites Road McDermott Road to Lodoga Road	7.0	+11,416	+4,166,990
Huffmaster Road	6.4	0	0
Sites Lodoga Road Realignment, including Bridge	6.1	+9,949	+3,631,234
NET TOTAL CHANGE		+22,760	+8,307,514

Alternative 2

Alternative 2 resulted in similar VMT summaries as Alternatives 1 and 3. The only difference was the VMT increase due to the realignments, resulting in an additional trip distance of 31 miles. As discussed earlier, it was assumed that the additional trip distance to reach the western recreational areas was not as attractive, and only 25% of the recreational trips would use the realigned roads. **Table 22** is a summary of the daily and annual VMT change for recreational visitors for Alternative 2. The estimated total daily VMT change for this local study area is a net increase of 42,022 vehicle-miles. The estimated total annual VMT change for this local study area is a net increase of 15,338,144 vehicle-miles.

Table 22. Alternatives 1 and 3 Daily and Annual VMT Change for Recreational Trips

Project Study Segment	Segment Distance (in miles)	Daily VMT Change (in vehicle-miles)	Annual VMT Change (in vehicle-miles)
I-5, from Delevan Road to Road 57	10.1	-5,990	-2,186,206
I-5, from Delevan Road to Maxwell Sites Road	5.1	-3,055	-1,115,095
I-5 from Maxwell Sites Road to SR 20	8.0	+6,454	+2,355,693
Road 68 from I-5 to County Road F	2.8	0	0
Road D from County Road 69 to County Road 68	1.5	0	0
Road 69 from Country Road D to end of paved road	2.5	0	0
Delevan Road from I-5 to McDermott Rd	2.5	+15	+5,475
McDermott Road from Maxwell Sites Rd to Delevan Road	9.0	+54	+19,710
Maxwell Sites Road from I-5 to McDermott Road	2.5	+3,917	+1,429,713
Maxwell Sites Road McDermott Road to Lodoga Road	7.0	+11,416	+4,166,990
Huffmaster Road	6.4	0	0
Sites Lodoga Road Realignment to Western Recreational Areas	37.0	+29,211	+10,661,864
	NET TOTAL CHANGE	+42,022	+15,338,144

6. References

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