Appendix A Supplemental Material

Appendix A Supplemental Material

A.1 List of Preparers

Table A-1.
Lead NEPA and CEQA Agencies

Preparers	Agency	Participation
Jeff Sutton	Tehama-Colusa Canal Authority	Lead CEQA Agency Project Manager
Adam Nickels	Reclamation	Manager, Resource Management

Table A-2.
Consultants

	Consultants									
Name	Qualifications	Background/Expertise	Participation							
CDM Smith										
Anusha Kashyap	M.S. Environmental Engineering 10 years experience	Environmental Engineer	Project Technical Lead							
Gina Veronese	M.S. Agricultural and Resource Economics 16 years experience	Water Resources Planner	Technical Review							
Laura Lawson	B.S. Environmental Studies: Natural Resource Management and Conservation 3 years experience	Water Resources Planner	Deliverable Support, Primary Author: Biological Resources, Air Quality, and GHG							
Abbie Woodruff	M.S. Urban and Environmental Planning 4 years experience	Water Resources Planner	Primary Author: Hydrology and Water Quality, Groundwater and Cumulative Impacts							
Gwen Pelletier, ENV SP	M.S. Environmental Studies 16 years experience	Environmental Scientist	Technical Review: Air Quality and GHG							

Name	Qualifications	Background/Expertise	Participation
Sam Bankston	B.S. Aquatic Biology 9 years experience	Environmental Scientist	Primary Author: Biological Resources
Jennifer Jones	M.S. Environmental Science 20 years experience	Environmental Scientist	Technical Review: Biological Resources
Elise Takebeyashi, PE	M.S. Environmental Engineering 7 years experience	Environmental Engineer	Groundwater Modeler
Brian Heywood, PE	M.S. Environmental Engineering 23 years experience	Environmental Engineer	Technical Review: Groundwater

Key:

ENV SP = Envision Sustainability Professional

P.E. = Professional Engineer

A.2 Acronyms

AF acre-feet

APCD Air Pollution Control District

AQAP Air Quality Attainment Plan

AQMD Air Quality Management District

ATCM Airborne Toxic Control Measure

bgs below ground surface

BMO basin management objective

C2VSim Central Valley Groundwater-Surface Water Simulation Model

CAAQS California Ambient Air Quality Standard

CARB California Air Resources Board CCR California Code of Regulations

CDFW California Department of Fish and Wildlife

CEQ Council of Environmental Quality
CEQA California Environmental Quality Act

CFR Code of Federal Regulations

cfs cubic feet per second

CH₄ methane

CO carbon monoxide CO₂ carbon dioxide

CO₂e carbon dioxide equivalent

CVHM Central Valley Hydrologic Model

CVP Central Valley Project

CVPIA Central Valley Project Improvement Act

dB decibel

dBA A-weighted decibel

dbh diameter at breast height

DWR California Department of Water Resources

EA Environmental Assessment

EDD Employment Development Department

eGRID Emissions & Generation Resource Integrated Database

EIS/EIR Environmental Impact Statement/Environmental Impact Report

ESA Endangered Species Acts

ETAW evapotranspiration of applied water

GAMA Groundwater Ambient Monitoring and Assessment

GGS giant gartersnake GHG greenhouse gas

GIS geographic information system
GMP Groundwater Management Plan

GPS global positioning system

GSP Groundwater Sustainability Plan

GWP global warming potential HCP Habitat Conservation Plan

hp horsepower

ID Irrigation District

IS Initial Study

ITA Indian Trust Asset

Ldn day-night average sound level MCL maximum contaminant level

mg/L milligrams per liter

MUD Municipal Utility District
MWC Mutual Water Company

N₂O nitrous oxide

NAAQS National Ambient Air Quality Standard NCCP Natural Community Conservation Plan NEPA National Environmental Policy Act NMFS National Marine Fisheries Service

NOx nitrogen oxides

NRCS Natural Resources Conservation Service NSVPA Northern Sacramento Valley Planning Area

 O_3 ozone

PM₁₀ inhalable particulate matter PM_{2.5} fine particulate matter

Reclamation U.S. Department of the Interior, Bureau of Reclamation

ROD Record of Decision

SGMA Sustainable Groundwater Management Act

SIP state implementation plan

SLDMWA San Luis & Delta-Mendota Water Authority SRTTG Sacramento River Temperature Task Group

SVSim Sacramento Valley Groundwater-Surface Water Simulation Model

SWP State Water Project

SWRCB State Water Resources Control Board TCCA Tehama-Colusa Canal Authority

TCR The Climate Registry
TDS total dissolved solids
USC United States Code

USDA U.S. Department of Agriculture

USEPA U.S. Environmental Protection Agency

USFWS U.S. Fish and Wildlife Service

USGS U.S. Geological Survey VOC volatile organic compound

WY water year

YSRCP Yuba-Sutter Regional Conservation Plan

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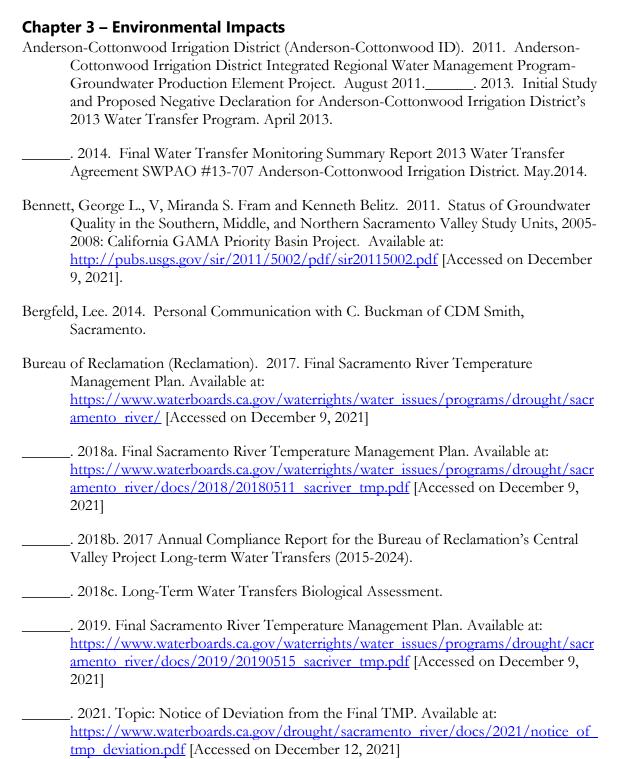
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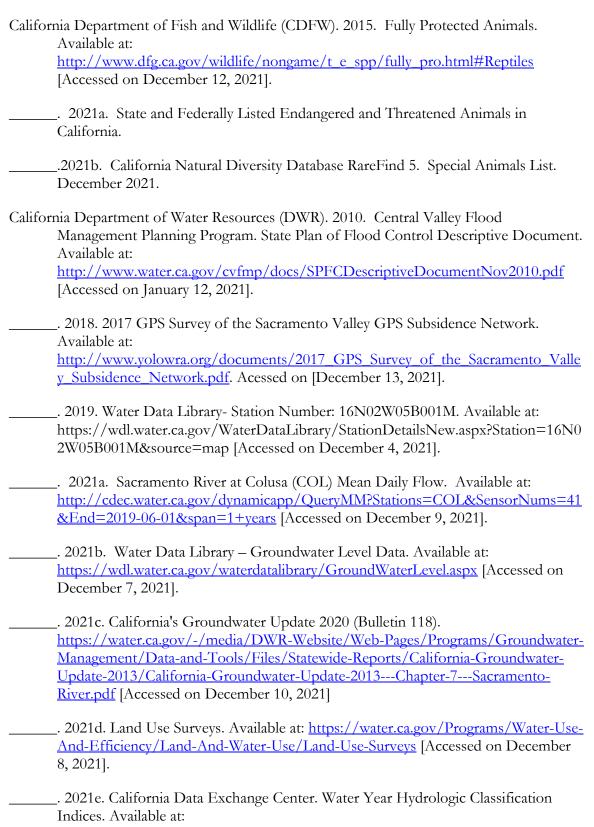
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Appendix A Supplemental Material

Appendix B Special Status Wildlife Species with Potential to Occur

Special-Status Species With Potential to Occur

Special-Status Species With	pecial-Status Species With Potential to Occur									
Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact				
Invertebrates	vertebrates									
California Freshwater shrimp Syncaris pacifica	E	-	Found in 16 stream segements within Marin, Sonoma and Napa counties	Inhabits small, perennial coastal streams with exposed live roots of trees such as alder and willow along undercut banks with overhanging woody debris or stream vegetation.	December to early May	None. No CNDDB occurences have been documented within the Seller Service Area. In addition, no impacts to coastal streams are anticipated.				
Conservancy fairy shrimp Branchinecta conservation	Е		Northern two-thirds of the Central Valley. It ranges from Vina Plains of Tehama County; Sacramento NWR in Glenn County; Jepson Prairie Preserve and surrounding area east of Travis Air Force Base, Solano County; Mapes Ranch west of Modesto. Stanislaus County.	Inhabits the ephemeral water of swales and vernal pools. It is most commonly found in grass or mud bottomed swales, earth sump, or basalt flow depression pools in unplowed grasslands.	Has been collected from early December to early May.	None. Occurrences have been documented within the Seller Service Area. Suitable habitat occurs within the project area. No impacts to vernal pool or other habitats occupied by this species are anticipated. The species is not likely to occur to occur in crop fields and canals due to lack of suitable habitat.				
Delta Green ground beetle Elaphrus viridis	Т		Found in the greater Jepson prairie area in south- central Solano County, California.	Associated with vernal pool habitats, seasonally wet pools that accumlate in low areas with poor drainge.	Emerges in January, breed in February and March, enters dormancy in May	None. No CNDDB occurrences have been documented iwhtin the Seller Service Area. In addition, no impacts to prairie area in south- central Solano County.				
Lange's Metalmark butterfly Apodemia mormo langei	Е	-	Restricted to sand dunes along the southern bank of the Sacramento-San Joaquin River. Within Contra Costa County, it is currently found only at Antioch Sand Dunes.	Inhabits stabilized dunes along the San Joaquin river and is endemic to Antioch sand dunes, Contra Costa county. The butterfly's primary host plant is Eriogonum nudum var. auriculatum. It feeds on nectar of other wildflowers, as well as host plant.	Breeding season is August -September, Larvae hatch during rainy months.	None. No CNDDB occurrences have been documented within the Seller Service Area, In addition, no impacts to sand dunes are anticipated.				
San Bruno Elfin butterfly Callophryus mossii bayensis	E		Found in vicinity of San Bruno mountains, San Mateo County (ESSIG 2012b).	Found in coastal, mountainous areas with grassy ground cover. Colonies are located on steep, north- facing slopes within the fog belt. Larval host plant is Sedum spathulifolium.	Year round	None. No occurrences have been documented in the Seller Service Area and suitable habitat is not present in the area. No impacts are anticipated to mountainous areas near San Bruno. Therefore no impacts to the species are expected.				
Valley elderberry longhorn beetle Desmocerus californicus dimorphus	T,X	-	Central Valley and surrounding foothills below 3,000 feet elevation.	Dependent on elderberry shrubs (host plant) as a food source. Potential habitat is shrubs with stems 1 inch in diameter within Central Valley.	Year round for host plant and exit holes; March-June for adults	None. Elderberry shrubs will not be impacted, therefore no impact to beetles will occur.				
Vernal pool fairy shrimp Branchinecta lynchi	T,X		Endemic to the Central Valley, Central Coast Mountains, and South Coast Mountains of California. It ranges from the Stillwater Plain in Shasta County through most of the length of the Central Valley to Paisley in Tulare County, and along the central Coast Range from northern Solano County to Pinnacles National Monument in San Benito County. Disjunct populations were also reported to occur in San Luis Obispo County, Santa Barbara County, and Riverside County.	Inhabits the ephemeral water of swales and vernal pools. It is most commonly found in grassed or mud bottomed swales, earth sump, or basalt flow depression pools in unplowed grasslands.	Has been collected from early December to early May.	None. Occurrences have been documented in the Seller Service areas. Crop fields and canals are not likely to support this species due to lack of suitable habitat. The project is not expected to impact vernal pools or natural wetlands. Therefore, no impacts to the species are expected.				
Vernal pool tadpole shrimp Lepidurus packardi	E,X		Endemic to the Central Valley of California, with the majority of the populations occurring in the Sacramento Valley. This species has also been reported from the Sacramento River Delta to the east side of San Francisco Bay, and from a few scattered localities in the San Joaquin Valley from San Joaquin County to Madera County	Found in a variety of natural and artificial seasonally ponded habitat types including: vernal pools, swales, ephemeral drainages, stock ponds, reservoirs, ditches, backhoe pits, and ruts caused by vehicular activities.		None. Occurrences have been documented in the Seller Service area. Suitable habitat is present in the project area. Crop fields and canals are not likely to support this species due to lack of suitable habitat. The project is not expected to impact vernal pools or natural wetlands. Therefore, no impacts to the species are expected.				

Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Amphibians						
California Red-legged frog Rana draytonii	Т		Through the Central Valley and coastal regions of central and southern California	Found mostly near ponds in humid forests, woodlands, grasslands, coastal scrub, and streamsides with plant cover. Frequently found in woods adajcent to streams.	Year round	None. No CNDDB occurences have been documented in the Seller Service Area. The project is not expected to impact suitable habitat for the species. Therefore, no impacts on the species are expected.
California tiger salamander Ambystoma californiense	T,X	T, WL	Found in annual grassland habitat, grassy understories of valley-foothill hardwood habitats, and uncommonly along stream courses in valley-foothill riparian habitats. Occurs from near Petaluma, Sonoma Co., east through the Central Valley to Yolo and Sacramento Counties and south to Tulare Co.; and from the vicinity of San Francisco Bay south to Santa Barbara County.	Lives in vacant or mammal-occupied burrows, occasionally other underground retreats, throughout most of the year, in grassland, savanna, or open woodland habitats. Lays eggs on submerged stems and leaves, usually in shallow ephemeral or semi permanent pools and ponds that fill during heavy winter rains, sometimes in permanent ponds; breeding takes place in fish free pools and ponds.	Migrates up to about 2 km between terrestrial habitat and breeding pond. Migrations may occur from November through April.	None. Occurrences have been documented within the Seller Service Areas. Suitable habitat may occur within the project area, but will not be impacted by the project. Cropland idling has the potential to improve habitat for the species.
Foothill yellow-legged frog Rana boylii		E, SSC	This species is known from the Pacific drainages from Oregon to the upper San Gabriel River, Los Angeles County, California, including the coast ranges and Sierra Nevada foothills in the United States.	This species inhabits partially shaded, rocky streams at low to moderate elevations, in areas of chaparral, open woodland, and forest.	Year round	None. Occurrences have been documented within the Seller Service Area. Suitable habitat is present within the project area. However, the project is not expected to impact any suitable rocky stream and woodland habitats. No impact to the species is expected.
Western spadefoot Spea hammondii	-	SSC	This species occurs in the Central Valley and bordering foothills of California and along the Coast Ranges into northwestern Baja California, Mexico.	Lowlands to foothills, grasslands, open chaparral, pine-oak woodlands. Prefers shortgrass plains, sandy or gravelly soil. It is fossorial and breeds in temporary rain pools and slow-moving streams that do not contain bullfrogs, fish, or crayfish.	Year round. Usually in underground burrows most of year, but will travel several meters on rainy nights. Movement is rarely extensive.	None. Occurrences have been documented from Seller Service Areas. Suitable habitat is present in the project area. The project will not impact suitable upland habitat types. The species is not likely to occur in crop fields or canals due to the presence of predatory fish, bullfrogs etc. Cropland idling has the potential to improve habitat for the species.

			1	I		
Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Reptiles	,	•	•			
Giant garter snake Thamnophis gigas	T	Т	Sacramento and San Joaquin Valleys from Butte County in the north to Kern County in the south.	Primarily associated with marshes, sloughs, and irrigation ditches. Generally absent in larger rivers.	Year round	High. In recent years, there have been 34 occurrences of this species in the Seller Service Area. Suitable habitat is present within the Seller Service Areas. Suitable habitat in the Seller Service Area is intermittent based on normal variation in cropping. Impacts may include reduction in suitable aquatic habitat within the Seller Service Area. Conservation measures are in place to maintain aquatic habitat corridors within irrigation ditches.
Western pond turtle/ Pacific pond turtle Actinemys marmorata		SSC	Ranged from extreme western Washington and British Columbia to northern Baja California, mostly to the west of the Cascade-Sierra crest.	The western pond turtle occupies a wide variety of wetland habitats including rivers and streams (both permanent and intermittent), lakes, ponds, reservoirs, permanent and ephemeral shallow wetlands, abandoned gravel pits, stock ponds, and sewage treatment.	Year round	High. Suitable habitat occurs within the project area. Pond turtles may occur in ditches, canals, rice fields, etc. In recent years, there have been numerous occurrence of this species in the Seller Service Area. Impacts may include reduction in suitable aquatic habitat within the Seller Service Area. Conservation measures are in place to maintain aquatic habitat corridors within irrigation ditches.
Birds			•			
Aleutian Cackling Goose	D	WL	Northern San Joaquin Valley, the delta of central	Lakes, marshes and fields, often foraging in open	Wintering in California from mid-	None. Suitable foraging habitat is located within the Seller Service
Branta hutchinsii leucopareia			California, and the Humboldt Bay area	prairies and farm fields	October to mid-April	Area, however there are no recent CNDDB occurrences within the Seller Service Area. No impacts to the species is anticipated.
American peregrine falcon Falco peregrinus anatum	D, MNBMC	D, FP	Throughout California.	Breeds in woodland, forest and coastal habitats on protected cliffs and ledges. Riparian areas and coastal and inland wetlands are important habitats yearlong especially during the non-breeding season.	Year round	None. Crop fields may provide suitable foraging habitat for the species, but birds could relocate to other habitat areas in the vicinity. No nesting habitat will be affected by the project.
Bald eagle Haliaeetus leucocephalus	D, BGEPA	E, FP	Throughout California.	Riparian areas near coasts, rivers, and lakes. Nesting generally occurs in large old-growth trees in areas with little disturbance.	Year round	None. Occurrences have been documented within the Seller Service Area and both areas provide suitable habitat. No impacts to suitable nesting habitat are anticipated. Crop fields represent marginal foraging habitat. Birds would be able to relocate to other suitable habitat areas in the vicinity if fields were fallowed. Environmental commitments limit the amount of land that can be fallowed in a given county.
Bank swallow Riparia riparia		Т	A neotropical migrant found primarily in riparian and other lowland habitats in California west of the deserts during the spring-fall period. Breeding population in California occurs along banks of the Sacramento and Feather rivers in the northern Central Valley.	Requires vertical banks and cliffs with fine-textured or sandy soils near streams, rivers, ponds, lakes, and the ocean for nesting. Feeds primarily over grassland, shrub land, savannah, and open riparian areas during breeding season and over grassland, brushland, wetlands, and cropland during migration.	March-mid-September	None. Known within the Seller Service Areas. No suitable nesting habitat (i.e. cliffs along rivers) will be affected from small changes in river flow. There is potential that the project would reduce the area of cropland habitat used for foraging during migration (wetlands and croplands) due to changes in water application. However, fallow cropland would still providing suitable foraging habitat, and birds could forage at other croplands in the vicinity.

Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Black tern Chlidonias niger		SSC	Common spring and summer visitor to fresh emergent wetlands of California.	Uses fresh emergent wetlands, lakes, ponds, moist grasslands, and agricultural fields. In migration, some take coastal routes and forage offshore.	April-September	Moderate. No occurrences have been documented within either the Buyer or Seller Service Areas. However, suitable habitat is present within the project area (i.e. rice fields) and the project area is within the known range for the species. Water transfers could reduce suitable habitat for the species within the Seller Service Area. Conservation strategies are in place that would reduce potential impacts to this species to negligible.
Burrowing owl Athene cunicularia		SSC	Central and southern coastal habitats, Central Valley, Great Basin, and deserts.	Open annual grasslands or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Dependent upon burrowing mammals (especially California ground squirrel) for burrows.	Year round	None. Occurrences have been documented within Seller Service Area. Suitable habitat occurs within the project area. Agricultural ditches may be suitable habitat for burrowing owl burrow and nesting activity. Water transfers would not affect the suitability of habitat for burrowing owl in the project area.
California black rail Laterallus jamaicensis coturniculus		T, FP	Pacific coast of California, along the lower Colorado River. During breeding season, the species can be found north of San Francisco	Tidal marshes and freshwater marshes, inhabit the drier portions of wetlands with vegetation dominated by fine-stemmed bulrush or grasses.	Year round	None. There are CNDDB records within Sacramento, Sutter, and Yolo counties. However, suitable habitat is unlikely to be impacted by water transfers.
California clapper rail Rallus longirostris obsoletus	Е		and Morro bay.	Found in salt-water and brackish marshes traversed by tidal sloughs. The bird is associated with abundant growths of pickle weed, but feeds on mudbottomed sloughs.	Year round. Non-migratory in coastal wetlands. Juveniles may disperse to freshwater wetlands late summer and autumn.	None. No occurrences have been documented within the Seller Service Area. Suitable habitat does not occur within the project area. Transfers are not expected to impact any suitable habitat (i.e. saltwater marshes).
California least tern Sterna antillarum browni	Е		Nests along the coast from San Francisco Bay south to northern Baja California. Migratory in California. Breeding colonies in Southern California near marine and estuarine shores. In SF Bay found near salt ponds and estuarine shores.	Breeds on bare or sparsely vegetated, flat substrates, sand beaches, alkali flats, landfills or paved areas. Feeds in shallow, estuarine waters.	Late April in southern California to mid- May in northern California. Winters south of California. Absent from mid- October to late April.	None. No occurrences have been documented in the Seller Service Area. Suitable habitat is not found within the project area. No impacts are expected to suitable foraging or breeding habitat (i.e. sand beaches, alkali flats).

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Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Cooper's hawk Accipiter cooperii		WL	Throughout California	Frequents landscapes where wooded areas occur in patches and groves. Often uses patchy woodlands and edges with snags for perching. Dense stands with moderate crown-depths used for nesting.	Year round	None. Occurrences have been documented in Seller Service Area. Suitable habitat occurs within the project area. No potential impacts to preferred foraging or nesting habitat are anticipated.
Double-crested cormorant Phalacrocorax auritus	-	WL	Along the entire coast of California and on inland lakes, in fresh, salt and estuarine waters. Uncommon from San Luis Obispo County south and very rare to the north. Common on Colorado River reservoirs and common in the Central Valley.	Open water with offshore rocks, islands, steep cliffs, dead branches of trees, wharfs, jetties, or even transmission lines. Requires undisturbed nest-sites beside water, on islands or mainland. Uses wide rock ledges on cliffs; rugged slopes; and live or dead trees, especially tall ones. Found on inland lakes, fresh, and estuarine waters.	Year round along coastal regions. Winters inland.	None. No occurrences have been documented within the project area. No negative impacts to foraging or breeding habitat are expected.
Ferruginous hawk Buteo regalis	-	WL	Winter resident and migrant at lower elevations and open grasslands in Modoc Plateau, Central Valley, and Coast ranges. Common winter resident of grassland and agriculture areas in southwestern California. Casual in northeast in summer.	Found in open grasslands, sagebrush flats, desert scrub, low foothills and fringes of pinyon-juniper habitats.	Migratory. Present in CA from Sept. to mid-April.	None. Occurrences have been documented in Sacramento County. Suitable habitat occurs within the project area. No potential impacts to preferred habitat are anticipated.
Golden eagle Aquila chrysaetos	BGEPA	FP	Throughout California	Riparian areas near coasts, rivers, and lakes. Nesting generally occurs in large old-growth trees in areas with little disturbance.	Year round	None. Occurrences have been documented within both the Buyer and Seller Service Areas. Suitable habitat occurs within the project area. No impacts to nesting habitat are expected.
Grasshopper sparrow Ammodramus savannarum	-	SSC	Throughout California's coastline and central valley	Breeds in open grasslands, prairies, hayfields, and pastures, typically with some bare gound.	Year round	None. There are CNDDB records of this species in Sacramento and Yolo counties. This species is unlikely to breed within dense crop fields, and therefore is unlikely to be affected by water transfers.
Greater sandhill crane Grus canadensis tabida		T, FP	Breeds only in Siskiyou, Modoc and Lassen counties and in Sierra Valley, Plumas and Sierra counties. Winters primarily in the Sacramento and San Joaquin valleys from Tehama south to Kings Counties.	In summer, this race occurs in and near wet meadow, shallow lacustrine, and fresh emergent wetland habitats. Frequents annual and perennial grassland habitats, moist croplands with rice or corn stubble, and open, emergent wetlands. It prefers relatively treeless plains.	Migration southward is September- October and northward is March-April.	Moderate. No occurrences have been documented within the project area, but occurrences have been recorded in Butte and Sutter Counties. Suitable foraging and winter roosting habitat is present within the project area (i.e. rice fields). Water transfers could reduce suitable habitat for the species within the Seller Service Area. Conservation strategies are in place for this species and birds will have other suitable wintering sites available.
Least bell's vireo Vireo bellii pusillus	Е	Е	California to northern Baja.	Inhabits low, dense riparian growth along water or along dry parts of intermittent streams. Typically associated with willow, cottonwood, baccharis, wild blackberry, or mesquite in desert localities.	March-August	None. No occurrences have been documented in the Buyer Service Area. Suitable habitat may occur within the project action area. The project is not expected to impact any suitable willow or dense riparian habitat due to small changes in river flow, therefore no impacts to the species are anticipated.

Common Name Scientific Name	Federal Special	G. 4 G. 11G. 4 *	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Merlin Falco columbarius	Status*	State Special Status* WL	Occurs in most of the western half of California below 3,900 ft. Rare in Mojave Desert and Channel Islands.	Frequents coastlines, open grasslands, savannahs, woodlands, lakes, wetlands, edges, and early successional stages. Ranges from annual grasslands to ponderosa pine and montane hardwood-conifer habitats.	Winter migrant from September-May	None. CNDDB occurrences have been documented in the Buyer Service Area. Suitable habitat is present in project area. Foraging habitat may be altered, but Transfers would not decrease suitability. No negative impacts are anticipated.
Mountain plover Charadrius montanus	-	SSC	Found in Central Valley from Sutter and Yuba counties southward, foothill valleys west of San Joaquin Valley, Imperial Valley, plowed fields of Los Angeles and western San Bernardino County, and central Colorado river valley. Does not breed in California.	Found in short grasslands, freshly plowed fields, newly sprouting grain fields, and sod farms. Prefers grazed areas and areas with burrowing rodents.	Winter resident Sept March.	None. Occurrences have been documented in Seller Service Area. Suitable habitat occurs within the project area. Foraging habitat may be affected, but Transfers would not reduce suitability and individuals can relocate to other habitats within the area.
Northern goshawk Accipiter gentilis		SSC	Throughout California	Nests in mature and old-growth forests with a majority of closed canopy.	Year round	None. There are two CNDDB occurrences in Glenn County. Suitable habitat is not present in the project area (i.e. old-growth forests). Water transfers would not affect this species.
Northern harrier Circus cyaneus	-	SSC	Throughout lowland California, concentrated in the Central Valley and coastal valleys.	Breeds in annual grasslands and wetlands. Prefers marshes and grasslands for foraging and nesting. Also uses agricultural fields for nesting and foraging, although nests may be destroyed by agricultural activities.	Year round	None. CNDDB occurrences have been documented in the Buyer Service Area. Suitable habitat is present in project area. Foraging and breeding habitat may be affected, but fallow fields would still represent suitable habitat. Birds can relocate to other habitats within the area.
Northern spotted owl Strix occidentalis caurina	T,X	-	Distributed through the Cascade Range, coastal ranges, and as far south as Marin County.	Associated with forests characterized by dense canopy closer of mature and old-growth tree, abundant logs, and live trees with broken tops.	Year round	None. There are no occurrences of this species in the Seller Service Area. In addition, suitable habitat for the species is not present in the project area. This species will not be impacted by water transfers.
Osprey Pandion haliaetus		WL	Northern California from Cascade Ranges south to Lake Tahoe, and along the coast south to Marin County.	Associated strictly with large, fish-bearing waters, primarily in ponderosa pine through mixed conifer habitats.	Year round	None. Occurrences have been documented in Seller Service Area. Suitable habitat occurs within the project area. Water transfers would be subject to flow requirements. Therefore no impacts to foraging area expected. No impacts to nesting sites are anticipated.
Prairie falcon Falco mexicanus		WL	Found from southeastern deserts northwest throughout Central Valley and inner Coast Ranges and Sierra Nevada. Mostly absent from northern coastal fog belt. Not found in upper elevation of Sierra Nevada.	Inhabits dry, open level or hilly terrain. Breeds on cliffs, forages far afield. Annual grassland to alpine meadows, but primarily perennial grasslands, rangeland, agricultural fields and desert scrub.	Permanent resident. Northern migrants winter in California. Upslope in summer, down slope in winter.	None. CNDDB occurrences have been documented in the Buyer Service Area. Suitable habitat is present within the project area. Foraging habitat (i.e. agricultural fields) may be altered, but Transfers would not reduce suitability.

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Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Purple martin Progne subis		SSC	In south, found on the coast and interior mountain ranges. Absent from higher desert regions. In north, found on coast and inland to Modoc and Lassen counties. Absent from higher slopes of Sierra Nevada. Current breeding populations are known from western Santa Clara and Alameda counties, and western Placer County.	Inhabits woodlands, low elevation coniferous forest of Douglas-fir, ponderosa pine and Monterey pine. Uses open habitats during migration, including grassland, wet meadows, and fresh emergent wetlands.	Summer resident throughout California.	Low. CNDDB occurrences have been documented in Sacramento County. This species is restricted to fairly limited nesting sites with suitable cavities free of brood parasites. When wetlands are unavailable, rice fields may represent relatively high quality foraging habitat. This habitat may be slightly reduced by Transfers, but the species can relocate to other suitable habitat in the vicinity. Crop idling limitations are in place in the environmental commitments.
Saltmarsh common yellowthroat Geothlypis trichas sinuosa		SSC	Resident and summer visitor in San Francisco Bay area. Winter south along coast to San Diego county. Found in No. CA in summer months.	•	Year-round in southern California and San Francisco Bay, Summer resident in northern California.	None. Occurrences have been documented in the Seller Service area and suitable habitat may be present in the project area. Not known from rice fields. Water transfers would not affect suitable breeding or foraging habitat.
Song sparrow ("Modesto" population) Melospiza melodia		SSC	Distributed through the Central Valley from Butte to Stanislaus counties	Enormous variety of open habitats, including tidal marshes, arctic grasslands, desert scrub, chapparral agricultural fields, forest edges, and deciduous woodlands.	Year round. Breeds from mid-March to early August	None. Occurrences have been documents in the Seller Service area and suitable habitat may be present, i.e. agricultural fields. This species has a wide range of suitable habitat and therefore birds can relocate to other habitats within the area.
Suisun song sparrow Melospiz melodia maxillaris	-	SSC	Endemic, restrict to Suisun Marsh from Carquinez Strait east to the confluence of the Sacramento and San Joaquin rivers near Antioch. Highest numbers near Benicia State Park and Martinez shoreline.	Resident of brackish-water marshes. Inhabits cattails, tulles, sedges, and salicornia.	Year round. Non-migratory. Breeds early March to July.	
Swainson's hawk Buteo swainsoni	MNBMC	Т	Lower Sacramento and San Joaquin Valleys, the Klamath Basin, and Butte Valley.	Nests in mature trees, including valley oaks or cottonwoods in or near riparian habitats; forages in grasslands, irrigated pastures, and grain and row crop fields.	Spring and Summer; small wintering population in the Delta	None. CNDDB occurrences have been documented within both the Seller Service Area. Suitable habitat is present within the project area. The project may alter the composition of foraging habitat in the Seller Service Areas, but these areas would still be suitable for the species, and additional habitats in the vicinity would be available. No impacts to riparian breeding habitat are expected from small changes in river flow.
Tricolored blackbird Agelaius tricolor	-	T, SSC	A resident in California found throughout the Central Valley and in coastal districts from Sonoma County south.	Breeds near fresh water, preferably in emergent wetlands with tall, dense cattails or tules, but also in thickets of willow, blackberry, wild rose, tall herbs. Feeds in grassland and cropland habitats.	Year round	Moderate. In recent years, CNDDB occurrences have been documented in the Seller Service Area. Suitable habitat is present within the project area. Foraging habitat may be affected by the project. Environmental commitments limit cropland idling and birds can relocate to other adjacent foraging habitats within the area.
Western snowy plover Charadrius alexandrinus nivosus	Т	SSC	Along the west coast states, with inland nesting taking place at the Salton Sea, Mono Lake, and at isolated sites on the shores of alkali lakes in northeastern California, in the Central Valley, and southeastern deserts.	Nests, feeds, and takes cover on sandy or gravelly beaches along the coast, on estuarine salt ponds, alkali lakes, and at the Salton Sea.	Migration is from July-March (some year round populations).	None. Occurrences have been documented in Yolo County. There is a CNDDB occurrence in Yolo County, however this species is not likely to occur in rice fields. Suitable habitat may occur within the project area. However, Transfers are not expected to impact any suitable breeding or foraging habitat (i.e. sandy beaches or estuarine salt ponds).

Common Name Scientific Name	Federal Special		Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
		State Special Status*				
Western yellow-billed cuckoo Coccyzus americanus	T,X	E	Uncommon to rare summer resident in scattered locations throughout California. Breeding population along Colorado river, Sacramento and Owen Valley, along South Fork of Kern River, Santa Ana River and Amargosa River. May be present along San Luis Rey River.	Deciduous riparian thickets or forests with dense, low-level or understory foliage, and which abut on slow-moving watercourses, backwaters, or seeps. Willow almost always a dominant component of the vegetation. In Sacramento Valley, also utilizes adjacent orchards, especially of walnut. Nests in sites with some willows, dense low-level or understory foliage, high humidity, and wooded foraging spaces.	Summer migration is from June-September.	None. Occurrences have been documented in the Seller Service Area. Suitable habitat is present within the project area. However this species is not likely to occur in crop fields due to lack of suitable foraging and roosting habitat (i.e. dense riparian thickets). No impacts are anticipated to riparian breeding habitat due to small changes in river flow.
White-faced ibis Plegadis chihi		WL	Uncommon summer resident in sections of southern California, a rare visitor in the Central Valley, and is more widespread in migration.	Feeds in fresh emergent wetlands, shallow lacustrine waters, muddy grounds of wet meadows, and irrigated or flooded pastures and croplands. Nests in dense, fresh emergent wetlands.	Present in California from April-October.	Low. Occurrences have been documented in the Seller Service Area. Suitable habitat is present in project area. Low potential impact to foraging habitat in the Seller Service Area. No potential impacts are expected to roosting habitat. Can relocate to other habitats within the area. Environmental committments would limit acreage of allowable cropland idling.
White-tailed kite Elanus leucurus	MNBMC	FP	Central Valley, coastal valleys, San Francisco Bay area, and low foothills of Sierra Nevada.	Savanna, open woodlands, marshes, partially cleared lands and cultivated fields, mostly in lowland situations (Tropical to Temperate zones).	Year round	None. CNDDB occurrences have been documented in the Seller Service Area. Suitable habitat is present within the project area. Foraging habitat may be altered, but will still be suitable for the species. No potential impacts to breeding habitat are anticipated.
Yellow-headed blackbird Xanthocephalus xanthocephalus	-	SSC	Breeds in deep-water, emergent wetlands throughout nonforested regions of western North America.	Breed and roost in freshwater wetlands with dense, emergent vegetation such as cattails. They often forage in fields, typically wintering in large, open agricultural areas.	Year round	Low. Suitable habitat is present within the project area. Foraging habitat may be affected by the project. Environmental commitments limit cropland idling and birds can relocate to other adjacent foraging habitats within the area.
Mammals	<u> </u>					
American badger	I	SSC	Throughout California.	Found in dry, open stages of most shrub, forest, and	Year round. Permanent resident except in	None. Occurrences have been documented in Seller Service Area
Taxidea taxus				herbaceous habitats with friable soils.		and suitable habitat is present within the project area. Suitable habitats are not expected to be impacted.
Marysville California kangaroo rat Dipodomys californicus eximius		SSC	Known only from the Sutter Buttes area in Sutter County	Friable soils in chaparral and valley & foothill grasslands	Year round.	None. There are two occurrences of this species in Sutter County. Suitable habitat is not present within the project area. The species is not likely to be impacted by water transfers.
Pallid bat Antrozous pallidus		SSC		Found in deserts, grasslands, scrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting.	Year round.	None. Occurrences have been documented within the Seller Service Area. Suitable habitat may occur within the project area. No impacts would occur to suitable habitat.
Riparian brush rabbit Sylvilagus bachmani riparius	Е		Isolated populations on Caswell Memorial State Park on the Stanislaus River and along an overflow channel of the San Joaquin River.	Riparian thickets	Year round	None. No CNDDB records of this species have been documented in the project area. Suitable habitat is present in the project area, however, no potential impacts are expected to suitable habitat (i.e. riparian thickets).

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Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Salt-marsh harvest mouse Reithrodontomys raviventris	Е	E, FP	Found in San Francisco Bay and its tributaries.	Found in saline emergent wetlands. Pickle weed is the primary habitat for the species. Requires higher grassland areas for flood escape.	Year round.	None. One CNDDB occurrence has been documented in the Seller Service Area and suitable habitat may be present in the project area. Transfers would not impact saline wetlands and salt marshes.
San Joaquin kit fox Vulpes macrotis mutica	E	Т	Found only in the Central Valley area of California. Kit foxes currently inhabit suitable habitat in the San Joaquin valley and in surrounding foothills of the Coast Ranges, Sierra Nevada, and Tehachapi Mountains; from southern Kern County north to Contra Costa, Alameda, and San Joaquin counties on the west; and near La Grange, Stanislaus County on the east.	Found in annual grasslands or grassy open stages of vegetation dominated by scattered brush, shrubs, and scrub. Build dens for cover. Some agricultural areas may support these foxes.		None. No occurrences have been documented within the Seller Service Area. Suitable habitat, i.e. agricultural fields is present within the project area. However due to the lack of local occurrences, the proposed project is not likely to impact this species.
Townsend's big-eared bat Corynorhinus townsendii		SSC	Along the California coastline	Habitat associations include coniferous forests, deserts, native prairies, riparian communties, active agricultural areas, and coastal habitat types. Populations centers occuring in areas dominated by exposed, cavity forming rock and/or historic mining districts.	Year round.	None. There are CNDDB records for this species in Yolo and Colusa counties. Appropriate rock formations are not present in the project area and will not be impacts by water transsers.
Western mastiff bat Eumops perotis californicus	-	SSC	Found in southeastern San Joaquin Valley and Coastal ranges from Monterey County southward through southern California and from the coast eastward to Colorado Desert.	Found in open, semi-arid habitats, including conifer and deciduous woodlands, coastal scrub, grasslands, and chaparral. Roost in crevices in cliff faces, high buildings, trees and tunnels.	Year round	None. There is one CNDDB occurrence in the Seller Service Area and suitable habitat is present within the project area. No impacts are anticipated to feeding or roosting habitat.
Western red bat Lasiurus blossevillii		SSC	Occurs from Shasta County to Mexican border, west of Sierra Nevada/Cascade crest and deserts. Winters in western lowlands and coastal regions south of SF bay. Not found in desert areas.	Found in trees 2-40ft above ground, from sea level up through mixed conifer forests. Prefers habitat edges and mosaics with trees. Feeds over a wide variety of habitats including grasslands, scrublands and croplands.	Year round. Migrates in spring (March- May) and autumn (SeptOct). Migrates between summer and winter range	None. Occurrences have been documented in the Seller Service Area and suitable habitat is present within the project area. No impacts to roosting habitat are anticipated. Transfers could alter the configuration of foraging habitat, but would not reduce suitability.
Fish		-				
Chinook Salmon (Central Valley spring-run ESU) Oncorhynchus tshawytscha	Т	Т	The Sacramento and San Joaquin Rivers and their tributaries	Cold-water streams with adequate dissolved oxygen for spawning and rearing. Spawning habitat generally consists of clean, loose gravel, in swift, relatively shallow riffles.	Spawning mid-August to early October	None. Suitable habitat is present in project area. However, flow reductions as a result of this project would be low and would not affect this species.
Chinook Salmon (Sacramento River winter-run ESU) Oncorhynchus tshawytscha	E	E	Distributed throughout northern California	Cold-water streams with adequate dissolved oxygen for spawning and rearing. Spawning habitat generally consists of clean, loose gravel, in swift, relatively shallow riffles.	Spawning mid-April to mid-August	None. Suitable habitat is present in project area. However, flow reductions as a result of this project would be low and would not affect this species.

Common Name Scientific Name	Federal Special Status*	State Special Status*	Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
Delta Smelt Hypomesus transpacificus	T,X	Е	Restricted to the upper reaches of the San Francisco Bay and Sacramento-San Joaquin Delta Estuary, from San Pablo Bay upstream to Sacramento on the Sacramento River and Mossdale on the San Joaquin River.	This species can tolerate a wide range of salinity and temperatures. Shallow, fresh, or slightly brackish backwater sloughs and edgewaters with good water quality and substrate are used for spawning.	Year round	None. Occurrences have been documented in the Seller Service Area. Suitable habitat is present in project area. However, flow reductions as a result of this project would be low and would not affect this species.
Eulachon Thaleichthys pacificus	Т	-	Found from nothern California to southwest Alaska.	Adults spend most of their life in the ocean and migrate into freshwater to spawn. Most spawning occurs within tidal influence through some spawning areas area located farther upstream of the river mouth. The species is susceptible to poor water quality.	Spawning between December and May	None. There are no recent CNDDB occurrences within the Seller Service Area. Suitable spawning habitat is present in the project area. However, flow reductions as a resullt of this project would be low and would not affect this species.
Green sturgeon (Southern DPS) Acipenser medirostris	Т	-	Throughout northern and central California; Humboldt Bay, San Francisco Bay and Delta, Monterey Bay, Sacramento, Feather, and Yuba Rivers	Using both freshwater and saltwater habitat, this species spawns in deep pools, in large turbulent freshwater river mainstems.	Spawning Match to July	None. Suitable migration and spawning habitat is present in project area. However, flow reductions as a result of this project would be low and would not affect this species.
Longfin smelt Spirinchus thaleichthys	С	Т	Found on the Sacramento and San Joaquin Rivers in the Delta through Suisun Bay and Suisun Marsh, San Pablo Bay, San Francisco Bay, the Gulf of the Farallones, Humboldt Bay, Eel river estuary and other local coastal areas.	Adult longfin smelt migrate into low salinity or freshwater reaches of coastal rivers and tributary streams to spawn. Encounter a wide variety of water temperatures and salinities during their life cycle but are rarely found in water temperatures greater than 71 degrees F	Spawning in January - March	None. Occurrences have been documented in the Seller Service Area. Suitable habitat is present in project area. However, flow reductions as a result of this project would be low and would not affect this species.
Sacramento perch Archoplites interruptus		SSC	Found in Clear Lake and Alameda Creek/Calaveras Reservoir, as well as in some farm ponds and reservoirs. The species has been introduced through the state including the upper Klamath basin, upper Pit River watershed, Walker River watershed, Mono Lake watershed, and Owens River watershed, and may exist in Sonoma Reservoir in the Russian River watershed.		Spawning March through early August	None. There are no recent CNDDB occurrences within the Seller Service Area. Suitable spawning habitat is present in the project area. However, flow reductions as a resullt of this project would be low and would not affect this species.
Sacramento splittail Pogonichthys macrolepidotus		SSC	Largely confined to the Delta, Suisun Bay, Suisun Marsh, Napa River, Petaluma River, and other parts of the San Francisco Estuary, while spawning on upstream floodplains and channel edges.	Adapted to estuarine life so thet are tolerant of a wide range of salinities and temperatures. Require a rising hydrograph for upstream migration and flooded vegetation for spawning and rearing areas for their early life history stages.	Year round	None. Occurrences have been documented in the Seller Service Area. Suitable habitat is present in project area. However, flow reductions as a result of this project would be low and would not affect this species.
Steelhead (California Central Valley DPS) Oncorhynchus mykiss	Т		Native to streams along the Pacific coast of North America	Populations inhabit small headwater streams, large rivers, lakes, or reservoirs; often in cool clear lakes and cool swift streams with silt-free substrate. Usually requires a gravel riffle for successful spawning.	Year round	None. Occurrences have been documented in the Seller Service Area. Suitable habitat is present in project area. However, flow reductions as a result of this project would be low and would not affect this species.

Common Name Scientific Name	Federal Special		Distribution	Habitat Association	Seasonal Occurrence	Potential For Impact
	Status*	State Special Status*				•

Federal

T = listed as threatened under the federal Endangered Species Act

C = Candidate for listing as threatened or endangered

SC = species of concern; formerly Category 2 candidate for federal listing

BGEPA = Bald and Golden Eagle Protection Act

MNBMC = Fish and Wildlife Service: Migratory Nongame Birds of Management Concern

-- = no designations

X = critical habitat

PX = proposed critical habitat

D = delisted

State

E = listed as endangered under the California Endangered Species Act

T = listed as threatened under the California Endangered Species Act

PT- listed as proposed threatened under Federal Endangered Species Act

CE = candidate endangered under the California Endangered Species Act

FP = fully protected under the California Fish and Game Code

SSC = species of special concern

D= delisted

WL = Watch List

-- = no designations

Appendix C Special Status Plant Species with Potential to Occur

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Adobe-lily Fritillaria pluriflora	-/-/ 1B	Butte, Colusa, Glenn, Lake, Napa, Solano, Tehama, and Yolo Counties	Often adobe, chaparral, cismontane woodland, and valley/ foothill grassland	February-April	None. Not likely to occur in crop fields, no suitable habitat present.
Ahart's dwarf rush Juncus leiospermus var. ahartii	-/-/ 1B	Butte, Calaveras, Placer, Sacramento, Tehama, and Yuba Counties.	Valley and foothill grassland (mesic).	March-May	None. Not likely to occur in crop fields, no suitable habitat present.
Alkali milk-vetch Astragalus tener var. tener	-/-/ 1B	Central western California including Yolo County.	Subalkaline flats and areas around vernal pools.	March-June	None. Not likely to occur in crop fields, no suitable habitat present (i.e. subalkali flats).
alkai-sink goldfields Lasthenia chrysantha	-/-/ 1B	Saccramento and San Joaquin valleys	Vernal pools and wet saline flats	February-April	None. Not likely to occur in crop fields, no suitable habitat is present (i.e. vernal pools).
Anthony Peak lupine Lupinus antoninus	-/-/ 1B	Colusa, Lake, Mendocino, Tehama, and Trinity Counties	Rocky lower and upper montane coniferous forest	May-July	None. Not likely to occur in crop fields, no suitable habitat present (i.e. coniferous forest).
Antioch Dunes evening-primrose Oenothera deltoides ssp. howellii	E,X/E/ 1B	Found only in Contra Costa and Sacramento Counties.	Occurs in inland dunes.	March-September	None. Not likely to occur in crop fields, no suitable habitat present.
Baker's navarretia Navarretia leucocephala ssp. bakeri	-/-/1B	Colusa, Glenn, Lake, Lassen, Mendocino, Marin, Napa, Solano, Sonoma, Sutter, Tehama, and Yolo Counties.	Cismontane woodland, meadows and seeps, vernal pools, valley and foothill grassland, lower montane coniferous forest. Vernal pools and swales, adobe or alkaline soils from 5 - 950m.	April - July	None. The CNDDB contains records of this species within the Seller Service Area. It is very unlikely that Baker's navarretia would establish in rice fields, given the lack of adobe or alkaline soils.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
bearded popcornflower Plagiobothrys hystriculus	-/-/1B	Napa, Solano, and Yolo Counties.	Vernal pools, valley and foothill grassland in wet sites from 10-50m. This species is only known from a few very limited occurrences at the edges of vernal pools, such as at Jepson Prairie and in the Montezuma Hills.	April - May	None. Previous records of bearded popcornflower exist within the Seller Service Area. This species is not expected to occur in rice fields. No vernal pools or grassland habitats would be affected by the proposed Transfers.
bent-flowered fiddleneck Amsinckia lunaris	-/-/1B	Alameda, Contra Costa, Colusa, Lake, Marin, Napa, San Benito, Santa Clara, Santa Cruz, San Mateo, Sonoma, and Yolo Counties.	Cismontane woodland, valley and foothill grassland from 50 - 500m.	March - June	None. Bent-flowered fiddleneck has been previously documented within the Buyer Service Area. Although suitable habitat occurs within the area of analysis, none would be affected by the proposed actions.
big-scale balsamroot Balsamorhiza macrolepis	-/-/1B	Alameda, Butte, Colusa, El Dorado, Lake, Mariposa, Napa, Placer, Santa Clara, Solano, Sonoma, Tehama, and Tuolumne Counties.	Valley and foothill grassland, cismontane woodland. Sometimes on serpentine. 35 - 1000m	March - June	None. This species has been previously documented within both the Buyer Service Areas. However, it is not expected to occur in rice fields due to lack of suitable habitat.
Boggs Lake hedge- hyssop Gratiola hetersepela	-/E/1B	Dispersed throughout the Sacramento and Central Valley. Also in Oregon.	Marsh's, swamps, and vernal pools (clay).	April-August	None. There is a CNDDB occurrence within Sacramento County. Suitable habitat is present but has low potential to occur. No effects anticipated from small changes in river flow.
Bolander's horkelia Horkelia bolanderi	-/-/1B	Colusa, Lake, and Mendocino counties	The edges and vernally mesic areas of chaparral, lower montane coniferous forest, meadows and seeps, and valley/ foothill grassland.	May-August	None. There is a CNDDB occurrence within Colusa County. However, it is not expected to occur in rice fields due to lack of suitable habitat and no effects are anticipated from small changes in river flow.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Brittlescale Atriplex depressa	-/-/1B	Western Central Valley and valleys of adjacent foothills.	Alkali grassland, alkali meadow, alkali scrub, and vernal pools.	April-October	There is a CNDDB occurrence within Glenn, Colusa, and Yolo counties, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. alkali and vernal pools).
Burke's Goldfields <i>Lasthenia burkei</i>	E/-/-	Lake, Mendocino, Napa, and Sonoma counties	Meadows and seeps (mesic), and vernal pools	April-June	None. Although suitable habitat may be present, no CNDDB occurrences were reported in the Seller Service Area. No effects anticipated from small changes in river flow.
Butte County Meadowfoam Limnanthes floccosa ssp. californica	E/-/-	Butte County	Valley and foothill grassland (mesic) and vernal pools	March-May	None. Suitable habitat is not present and no CNDDB occurrences were reported in the Seller Service Area. No effects anticipated from small changes in river flow.
California alkali grass Puccinellia simplex	-/-/1B	Alameda, Butte, Contra Costa, Colusa, Fresno, Glenn, Kings, Kern, Lake, Los Angeles, Madera, Merced, Napa, San Bernardino, Santa Clara, Santa Cruz, San Luis Obispo, Solano, Stanislaus, Tulare, and Yolo counties	mesic sinks, flats, and lake margins of chenopod scrub,	March-May	None. CNDDB records exist for the Seller Service Area. However, transfers are not expected to impact suitable habitat for this species.
Cobb Mountain lupine Lupinus sericatus	-/-/1B	Colusa, Lake, Napa, and Sonoma Counties	Broadleafed upland forest, chaparral, cismontane woodland, and lower montane coniferous forest	March-June	None. There is a CNDDB occurrence within Colusa County, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. coniferous forest).

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Colusa grass Neostapfia colusana	T,X/E/1B	Southern Sacramento Valley, and northern San Joaquin Valley.	Vernal pools.	May-August	None. There is a CNDDB occurrence within Glenn and Colusa counties, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. vernal pools).
Colusa layia Layia septentrionalis	-/-/1B	Colusa, Glenn, Lake, Mendocino, Napa, Sonoma, Sutter, Tehama, and Yolo Counties.	Chaparral, cismontane woodland, valley and foothill grassland. Scattered colonies in fields and grassy slopes in sandy or serpentine soil 145 - 1095m asl.	April - May	None. CNDDB records exist for the Seller Service Area. Transfers are not expected to impact suitable habitat for this species given that rice fields do not provide appropriate conditions.
Contra Costa Goldfields Lasthenia conjugens	E/-/-	San Francisco Bay Delta Regions, and scattered coastal areas.	Cismontane woodlands, playas, valley and foothill grasslands, and vernal pools. Often occurs in vernal pools, swales, and low depressions in open grassy areas 1 - 445m asl.	March-June	None. Suitable habitat is not present and no CNDDB occurrences were reported in the Seller Service Area. No effects anticipated from small changes in river flow.
Contra Costa manzanita Arctostaphylos manzanita ssp. laevigata	-/-/1B	Central California, primarily in the North Coast, the North Coast Range and SF Bay regions.	Slopes and rocky rocky areas, at 0-1,459m asl.	January-March	None. Suitable habitat is not present in crop fields and no CNDDB occurrences were reported in the Seller Service Area.
Contra Costa Wallflower Erysimum capitatum var. angustatum	E,X/-/-	Contra Costa County	Inland dunes. Stabilized dunes of sand and clay near Antioch along the San Joaquin River 3 - 20m asl.	March - July	None. Suitable habitat is not present and no CNDDB occurrences were reported in the Seller Service Area. No effects anticipated from small changes in river flow.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Coulter's goldfields Lasthenia glabrata ssp. coulteri	-/-/1B	Colusa, Kern, Los Angeles, Merced, Orange, Riverside, Santa Barbara, San Bernardino, San Diego, San Luis Obispo, Tehama, Tulare, Ventura, and Yolo counties	Marshes and swamps, playas, and vernal pools	February-June	None. CNDDB records exist in Colusa and Glenn counties. Transfers are not expected to impact suitable habitat for this species.
Crampton's tuctoria (Solano grass) Tuctoria mucronata	E,X/E/1B	Located only in Yolo and Solano Counties.	Valley and foothill grassland (mesic), and vernal pools.	April-August	None. Not likely to occur in crop fields, no suitable habitat present.
Deep-scarred cryptantha Cryptantha excavata	-/-/1B	Colusa, Lake, Mendocino, and Yolo counties	Sandy and gravelly portions of cismontane woodland	April-May	None. There are CNDDB records of this species within Yolo and Colusa counties. However, it is not expected to occur in rice fields due to lack of suitable habitat and no effects are anticipated from small changes in river flow.
Delta tule pea Lathyrus jepsonii var. jepsonii	-/-/1B	Contra Costa, Napa, Sacramento, San Joaquin, Solano, Sonoma and Yolo Counties.	Marshes and swamps (freshwater and brackish)	May-July	None. This species has been previously documented within the Seller Service Area. No impacts to suitable habitat is anticipated.
Diamond-petaled California poppy Eschscholzia rhombipetala	-/-/1B	Alameda, Contra Costa, Colusa, San Joaquin, San Luis Obispo, Stanislaus Counties.	Valley and foothill grassland. Alkaline clay slopes and flats. 0 - 975m asl.	March - April	None. This species has been previously documented in Colusa County. No impacts to suitable habitat are anticipated.
Drymaria-like western flax Hesperolinon drymarioides	-/-/1B	Colusa, Glenn, Lake, Napa, and Yolo Counties	Serpentinite closed- cone coniferous forest, chaparral, cismontane woodland, and valley and foothill grassland.	May-August	None. There are CNDDB occurrences in Glenn and Colusa counties, however this species is not likely to occur in crop fields due

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Dwarf soaproot Chlorogalum pomeridianum var. minus	-/-/1B	Alameda, Colusa, Glenn, Lake, Santa Clara, San Luis Obispo, Sonoma, and Tehama Counties	Chaparral (serpentinite)	May-August	None. There are CNDDB records in Glenn and Colusa counties; however not likely to occur in crop fields, no suitable habitat will be impacted.
El Dorado bedstraw Galium californicum ssp. sierrae	E/-/-	El Dorado County	Gabbroic chaparral, cismontane woodland, and lower montane coniferous forest	May-June	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
Ferris' milk-vetch Astragalus tener var. ferrisae	-/-/1B	Sacramento Valley.	Subalkaline flats and areas around vernal pools.	March-June	None. Although there are CNDDB occurrences within the Seller Service Area, the species is not likely to occur in crop fields, no suitable habitat will be impacted.
Fleshy Owl's-clover Castilleja campestris ssp. succulenta	T,X/-/-	Fresno, Madera, Merced, Mariposa, San Joaquin, and Stanislaus Counties	Vernal pools, oftern acidic	March-May	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
green jewelflower Streptanthus hesperidis	-/-/1B	Colusa, Glenn, Lake, Napa, Sonoma, and Yolo Counties	Serpentinite, rocky chaparral and cismontane woodlands	May-July	None. There are CNDDB records in Glenn and Yolo counties; however not likely to occur in crop fields, no suitable habitat will be impacted.
Greene's narrow- leaved daisy Erigeron greenei	-/-/1B	Colusa, Lake, Napa, and Sonoma Counties	Serpentinite or volcanic chaparral	May-September	None. There are CNDDB records in Colusa County; however not likely to occur in crop fields, no suitable habitat is present.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Greene's tuctoria Tuctoria greeni	E/R/1B	Butte, Colusa, Fresno, Glenn, Madera, Merced, Modoc, Shasta, San Joaquin, Stanislaus, Tehama, and Tulare Counties.	Vernal pools.	May-July	There is a CNDDB occurrence, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. vernal pools).
Hairy Orcutt grass Orcuttia pilosa	E/E/1B	Northern Sacramento Valley, Pit River Valley; isolated populations in Lake and Sacramento counties.	Vernal pools.	May-September	None. There is a CNDDB occurrence within Butte and Glenn counties, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. vernal pools).
Hall's harmonia Harmonia hallii	-/-/1B	Colusa, Lake, Napa, and Yolo Counties	Serpentinite chaparral	April-June	None. CNDDB records exist for the Seller Service Area. Transfers are not expected to impact suitable habitat for this species.
Hartweg's golden sunburst Pseudobahia bahiifolia	E/E/1B	Fresno, Madera, Merced, Stanislaus, Tuolumne, and Yuba counties	Clay and often acidic, cismontane woodland, and valley and foothill grassland	March-April	None. CNDDB records exist within Sutter County. Transfers are not expected to impact suitable habitat for this species.
Heartscale Atriplex cordulata	-/-/1B	Western Central Valley and valleys of adjacent foothills.	Alkali grasslands, alkali meadows, and alkali scrub.	May-October	None. There is a CNDDB occurrence within Butte, Colusa, Yolo, and Glenn counties, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. alkali areas).
Heckard's pepper- grass Lepidium latipes var. heckardii	-/-/1B	Glenn, Solano, and Yolo Counties.	Valley and foothill grassland alkaline flats.	March-May	None. There is a CNDDB occurrence, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. alkali flats).

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Hoover's cryptantha Cryptantha hooveri	-/-/1A	Contra Costa, Kern, Madera, Stanislaus Counties.	Valley and foothill grassland in coarse sand up to 150m asl.	April - May	None. Hoover's cryptantha has been observed within the Seller Service Area. No impacts to suitable habitat for this species are anticipated.
Hoover's spurge Chamaesyce hooveri	T/-/ 1B	Scattered in Glenn, Butte, Colusa, Merced, Stanislaus, Tehama, and Tulare Counties.	Vernal pools.	July-September	None. There is a CNDDB occurrence, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. vernal pools).
Indian valley brodiaea Broiaea coronaria ssp. rosea	-/E/-	Scattered in Glenn, Lake, Colusa, and Tehama Counties.	Closed cone coniferous forest, chaparral, valley and foothill grasslands (serpentinite).	May-June	None. There is a CNDDB occurrence, however this species is not likely to occur in crop fields due to lack of suitable habitat.
Ione (incl. Irish Hill) Buckwheat Eriogonum apricum (incl. var. prostratum)	E/-/-	Amador and Sacramento Counties	Chaparral	July-October	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
Ione Manzanita Arctostaphylos myrtifolia	T/-/-	Amador and Calaveras counties	Acidic, ione soil, clay or sandy chaparral and cismontane woodland	November-March	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
Jepson's coyote- thistle Eryngium jepsonii	-/-/1B	Alameda, Amador, Calaveras, Contra Costa, Fresno, Napa, San Mateo, Solano, Stanislaus, Tuolumne, and Yolo counties	Clay soils of valley and foothill grassland and vernal pools	April-August	None. The species has been observed within the Seller Service Area. No impacts to suitable habitat for this species are anticipated.
Jepson's leptosiphon <i>Leptosiphon jepsonii</i>	-/-/1B	Lake, Napa, Sonoma, and Yolo counties	Usually volcanic soils of chaparral, cismontane woodland, and valley and foothill grassland	March-May	None. The species has been observed within Yolo County. No impacts to suitable habitat for this species are anticipated.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Jepson's milk-vetch Astragalus rattanii var. jepsonianus	-/-/1B	Colusa, Glenn, Lake, Napa, Tehama, and Yolo counties.	Chaparral, cismontane woodland, valley and foothill grassland, often serpentinite.	April-June	None. There are CNDDB occurrences, however this species is not likely to occur in crop fields due to lack of suitable habitat.
Keck's checkerbloom Sidalcea keckii	E/-/1B	Colusa, Fresno, Merced, Napa, Solano, Tulare, and Yolo counties.	Cismontane woodlands, foothill and valley grasslands (serpentinite).	April-May	None. Thereare CNDDB occurrences, however this species is not likely to occur in crop fields due to lack of suitable habitat.
Klamath sedge Carex klamathensis	-/-/1B	Colusa, Lake, and Tehama counties	Serpentinite chaparral, cismontane woodland, and meadows/ seeps		None. Klamath sedge has been recorded by the CNDDB within the Seller Service Area. No impacts would occur to suitable habitat.
Konocti manzanita Arctostaphylos manzanita ssp. elegans	-/-/1B	Colusa, Glenn, Humbodlt, Lake, Mendocino, Napa, Shasta, Sonoma, Tehama, and Trinity counties	Volcanic soils of chaparral, cismontane woodland, and lower montane coniferous forest	January-July	None. There is a CNDDB occurrence within Glenn and Colusa counties, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. coniferous
Large-flowered fiddleneck <i>Amsinckia</i> <i>grandiflora</i>	E/-/-	Alameda, Contra Costa, and San Joaquin Counties.	Cismontane woodland, valley and foothill grassland. Annual grassland in various soils 275 - 550m asl.	April - May	None. Large-flowered fiddleneck has been recorded by the CNDDB within the Seller Service Area. No impacts would occur to suitable habitat.
Layne's Butterweed Senecio layneae	T/-/1B	El Dorado, Placer, Tuolumne, and Yuba counties	Serpentinite or gabbroic, rocky soils of chaparral and cismontane woodland	April-August	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
Legenere Legenere limosa	-/-/1B	Sacramento Valley and south of the North Coast Ranges.	Vernal pools.	May-June	None. Not likely to occur in crop fields, no suitable habitat present (i.e. vernal pools).

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Marsh checkerbloom Sidalcea oregana ssp. hydrophila	-/-/1B	Glenn, Lake, Mendocino, and Napa Counties.	Meadows and seeps, and riparian forest.	June-August	None. There are CNDDB records of this species within the Seller Service Area. Not likely to establish in crop fields and no effects anticipated from small changes in river flow.
Mason's lilaeopsis Lilaeopsis masonii	-/R/1B	Alameda, Contra Costa, Marin, Napa, Sacramento, San Joaquin, Solano, and Yolo Counties.	Freshwater and brackish marshes, riparian scrub. Tidal zones, in muddy or silty soil formed through river deposition or river bank erosion 0 - 10m asl. Populations may be ephemeral, using	April - November	None. Previous records of this species exist within the Buyer Service Area. This species is not expected to establish within rice fields.
Milo Baker's lupine Lupinus milo-bakeri	-/T/1B	Glenn and Mendocino Counties.	Cismontane woodlands, foothill and valley grasslands.	June-September	None. There is a CNDDB occurrence, however this species is not likely to occur in crop fields due to lack of suitable habitat.
Oregon fireweed Epilobium oreganum	-/-/1B	Del Norte, El Dorado, Glenn, Humboldt, Mendocino, Nevada, Placer, Shasta, Siskiyou, Tehama, and Trinity counties	Mesic soils of bogs, fens, lower montane coniferous forest, meadows, seeps, and upper montane coniferous forest	June-September	None. CNDDB records of this species exist within Glenn County. Suitable habitat is not present and species is not likely to be impacted by water transfers.
Palmate-bracted bird's-beak Chloropyron palmatum	E/E/1B	Found in Glenn and Colusa Counties and within the Central Valley.	Alkali meadow, alkali scrub, valley and grasslands.	May-October	None. CNDDB records of this species exist for the Seller Service Area. Not likely to occur in rice fields; no suitable habitat is present (i.e. alkali areas).
Pappose tarplant Centromadia parryi ssp. parryi	-/-/1B	Butte, Colusa, Glenn, Lake, Napa, San Mateo, Solano, Sonoma, and Yolo counties	Often alkaline soils of chaparral, coastal prairie, meadows and seeps, marshes and swamps, and valley and foothill grassland	May-November	None. There are occurrences within Glenn, Colusa, and Yolo counties. This species is not expected to establish within rice fields.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Pincushion navarretia Navarretia myersii ssp. myersii	-/-/1B	Amamdor, Calaveras, Merced, Placer, and Sacramento Counties.	Vernal pools (often acidic).	May	None. Previously documented in Sacramento County. No vernal pools would be affected by transfers.
Pine Hill ceanothus Ceanothus roderickii	E/-/-	El Dorado County	Serpentinite or gabbroic soils of chaparral and cismontane woodland	April-June	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
Pine Hill flannelbush Fremonodendron californicum ssp. decumbens	E/-/-	El Dorado, Nevada, and Yuba counties	Rocky, Gabbroic or serpentinite soils of chaparral and cismontane woodland	April-July	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
pink creamsacs Castilleja rubicundula var. rubicundula	-/-/1B	Butte, Contra Costa, Colusa, Glenn, Lake, Napa, Santa Clara, and Shasta counties	Serpentinite soils of chapparal, cismontane woodland, meadows and seeps, and valley and foothill grassland habitat	April-June	None. CNDDB records of the species have been documented in Yolo, Colusa, and Glenn counties. The species is not likely to occur within crop fields and is not anticipated to be affected by transfering water.
Porter's navarretia Navarretia paradoxinota	-/-/1B	Colusa, Lake, and Napa counties	Serpentinite, openings, vernally mesic, and drainages of meadows and seeps	May-July	None. There is a CNDDB record in Colusa County, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. meadows
Recurved larkspur Delphinium recurvatum	-/-/1B	Disbursed throughout the Sacramento and Central Valley.	Chenopod scrub, cismontane, valley and foothill grasslands (alkali).	March-June	None. There is a CNDDB occurrence, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. alkali soil).
red-flowered bird's- foot trefoil Acmispon rubriflorus	-/-/1B	Colusa, Stanislaus, and Tehama counties	Cismontane woodland and valley and foothill grassland	April-June	None. CNDDB records of this species exist within Colusa County. Suitable habitat is not present and species is not likely to be impacted by water transfers.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Sacramento orcutt grass Orcuttia viscida	E,X/E/1B	Valley grasslands and freshwater wetlands.	Vernal pools.	May-June	None. There is a CNDDB occurrence, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. vernal pools).
saline clover Trifolium hydrophilum	-/-/1B	California's Central coast and Bay Area.	Marshes and swamps, valley and foothill grassland, vernal pools. Mesic, alkaline sites 0 - 300m asl.	April - June	None. Records of saline clover exist within the Seller Service Areas. Rice fields may represent marginally suitable habitat for this species, even so this species is unlikely to be affected by water transfers.
San Joaquin spearscale Atriplex joaquiniana	-/-/1B	Western Central Valley and valleys of adjacent foothills.	Alkali grasslands, and alkali scrub.	April-September	None. There are CNDDB records within the Seller Service Area, however the species is not likely to occur in crop fields, no suitable habitat present (i.e. alkali soils).
Sanford's arrowhead Sagittaria sanfordii	-/-/1B	Central Valley.	Freshwater marshes, shallow streams, and ditches.	May-August	None. Suitable habitat present in ditches; not yet detected. Not likely to establish in crop fields and no effects anticipated from small changes in river flow.
Sanhedrin Mountain stonecrop Sedum sanhedrinum	-/-/1B	Northwestern California and southwestern Oregon.	Rock outcrops and rocky crevices in chaparral, lower montane coniferous forest, and upper montane coniferous forest habitats occuring at 1350-1500 m asl.	May-July	None. There is a CNDDB record in northeastern Colusa County. However, crop fields do not provide suitable habitat for the species.
Scabrid alpine tarplant Anisocarpus scabridus	-/-/1B	Colusa, Humboldt, Lake, Mendocino, Shasta, Tehama, and Trinity counties	Metamorphic, rocky soils of upper montane coniferous forest	June-September	None. There is a CNDDB record in Colusa County, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. montane coniferous forest)

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Serpentine cryptantha Cryptantha dissita	-/-/1B	Colusa, Lake, Mendocino, Napa, Shasta, Siskiyou, and Sonoma counties	Chaparral (serpentinite)	April-June	None. There are CNDDB records in western Colusa County. Howver, the species is not likely to occur in crop fields, because no suitable habitat is present.
Shining navarretia Navarretia nigelliformis ssp. radians	-/-/1B	Alameda, Contra Costa, Fresno, Merced, Monterey, San Benito, San Joaquin, and San Luis Obispo Counties.	Cismontane woodland, valley and foothill grassland, and vernal pools 200 - 1000m asl. Known from grassland, and may not necessarily occur in vernal pools.	April - July	None. There are previous CNDDB records of shining navarettia exist for the Seller Service Area. This species is unlikely to establish within rice fields due to lack of suitable habitat (i.e., vernal pools and native grassland).
Showy Indian Clover Trifolium amoenum	E/-/1B	North Coast Ranges, Central Coast and San Francisco Bay	Valley grassland, wetland-riparian	April - June	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields. No impacts to the species is anticipated.
Silky cryptantha Cryptantha crinita	-/-/1B	Glenn, Shasta, and Tehama counties	Gravelly streambeds of cismontane woodland, lower montane coniferous forest, riparian forest, riparian woodland, and valley and foothill grassland	April-May	None. There is a previous CNDDB record in Glenn County. The species is not likely to occur in crop fields, no suitable habitat present (i.e. gravelly streambeds).
Slender Orcutt grass Orcuttia tenuis	T,X/E/1B	Northern Sacramento Valley, Pit River Valley; isolated populations in Lake and Sacramento Counties	Vernal pools.	May-July	None. There are CNDDB occurrences, however this species is not likely to occur in crop fields due to lack of suitable habitat (i.e. vernal pools).
Small-flowered calycadenia Calycadenia micrantha	-/-/1B	Colusa, Humboldt, Lake, Monterey, Napa, and Trinity counties	Roadsides, rocky, talus, scree and sparsely vegetated areas of chaparral, meadows, and valley and foothill grassland	June-September	None. There is a single CNDDB occurrence in Colusa County. Suitable habitat for this species is not likely to be impacted by water transfers.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Snow Mountain buckwheat Eriogonum nervulosum	-/-/1B	Colusa, Glenn, Lake, Napa, Sonoma, and Yolo Counties	Chaparral (serpentinite)	June-September	None. The CNDDB contains records of this species within the Seller Service Area. It is very unlikely that Baker's navarretia would establish in rice fields, given the lack of chaparral.
Snow Mountain willowherb Epilobium nivium	-/-/1B	Colusa, Glenn, Lake, Mendocino, Tehama, and Trinity	Rocky chaparral and upper montane coniferous forest	June-October	None. Snow mountain willowherb has been recorded by the CNDDB within the Seller Service Area. No impacts would occur to suitable habitat.
Soft salty bird's beak Chloropyron molle ssp. Molle	E/R/1B	Contra Costa, Marin, Napa, Sacrmaneto, Solano, and Sonoma counties	Marshes and swamps	June-November	None. There is a single CNDDB occurrence in Sacramento County. Suitable habitat for this species is not likely to be impacted by water transfers.
Stebbins' Morning- glory Calystegia stebbinsii	E/-/-	El Dorado and Nevada counties	Gabbroic and serpentinite soils of chaparral and cismontane woodland	April-June	None. There are no CNDDB records in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present.
Stony Creek spurge Euphorbia ocellata ssp. rattanii	-/-/1B	Glenn and Tehama counties	Chaparral, riparian scrub, and valley and foothill grassland	May-October	None. There are multiple CNDDB occurrences in Glenn County. However this species is not likely to occur within crop fields and is not likely to be impacted.
Suisun Marsh aster Symphyotrichum lentum	-/-/1B	Contra Costa, Napa, Sacramento, San Joaquin, Solano, and Yolo Counties.	Saline and freshwater marshes and swamps. Most often seen along sloughs with Phragmites, Scirpus, blackberry, Typha, etc. at 0-3m asl.	May - November	None. This species has been previously documented in Sacramento and Yolo counties. This species is not expected to occur within rice fields given

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
Tehama County western flax Hesperolinon tehamense	-/-/1B	Alameda, Glenn, Lake, Napa, Stanislaus, and Tehama counties	Serpentinite chaparral and cismontane woodland	May-July	None. Previously documented in Glenn County. No chaparral and cismontane woodland habitat would be affected by Transfers.
Three-fingered morning-glory Calystegia collina ssp. tridactylosa	-/-/1B	Colusa, Glenn, Lake, Mendocino, and Sonoma counties	Serpentinite, rocky, gravelly, openings of chaparral and Cismontane woodlands.	April-June	None. There is a single occurrence in Colusa County. Not likely to occur in crop fields, no suitable habitat is present.
Tuolumne button-celery Eryngium pinnatisectum	-/-/1B	Amador, Calaveras, Sacramento, Sonoma, and Tuolumne counties	Cismontane woodlands, lower montane coniferous forest, and vernal pools	May- August	None. There is a single occurrence of this species in Sacramento County. Not likely to occur in crop fields; no suitable habitat present (i.e. vernal pools).
Veiny monardella Monardella venosa	-/-/1B	Butte, Sutter, Tuolumne, and Yuba counties	Clay soils of cismontane woodland and valley/foothill grasslands	May-July	None. There is a single occurrence of this species in Sutter County. Not likely to occur in crop fields; no suitable habitat present.
Vernal pool smallscale Atriplex persistens	-/-/1B	Colusa, Madera, Merced, Solano, Stanislaus, and Tulare counties	Vernal pools	June, August, September, October	None. There are CNDDB occurrences in the Seller Service Area. Not likely to occur in crop fields, no suitable habitat present (i.e. vernal pools).
Woolly rose-mallow Hibiscus lasiocarpos var. occidentalis	-/-/1B	Butte, Contra Costa, Colusa, Glenn, Sacramento, San Joaquin, Solano, Sutter, and Yolo Counties.	Marshes and swamps (freshwater). Moist, freshwater-soaked river banks and low peat islands in sloughs. Known from the Delta watershed 0 - 150m asl.	June - September	None. Previously observed in the Seller Service Area. Not likely to establish in rice fields given the lack of suitable habitat (marsh and swamp). This species is sensitive to habitat disturbance and agricultural amendments.

Common Name Scientific name	Special Status* (F/S/CNPS)	Distribution	Habitat Association	Blooming Period	Potential Impact
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*Status explanations:

x= critical habitat

F=Federal

E=Endangered

T=Threatened

SC= Special Concern

S=State

E=Endangered

T=Threatened

SSC=Species of Special Concern

R = Rare

CNPS=California Native Plant Society

1B=Rare, threatened, or endangered in California and elsewhere

2=Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere

3=Plants about which we need more information - A review list

Appendix D Groundwater Existing Conditions

Appendix D Groundwater Existing Conditions

This appendix provides an overview of groundwater existing conditions in the project area.

D.1 Sustainable Groundwater Management Act

Table D-1 provides a summary of the Sustainable Groundwater Management Act (SGMA) basin prioritization for each subbasin within the Seller Service Area. High- and medium-priority groundwater subbasins are required to have Groundwater Sustainability Plans (GSP) developed and submitted to California Department of Water Resources (DWR) for review by January 31, 2022. GSPs for all the subbasins in the Seller Service Area are under development.

Table D-1. Sustainable Groundwater Management Act Basin Prioritization and Status

Basin / Subbasin	Groundwater Sustainability Agency/Agencies (GSA)	Priority
Redding Area / Anderson	Enterprise-Anderson GSA	Medium
Redding Area / Enterprise	Enterprise-Anderson GSA	Medium
Sacramento Valley / Colusa	Reclamation District No. 1004 GSA - Colusa Colusa Groundwater Authority GSA - Colusa Glenn Groundwater Authority GSA County of Glenn GSA - Colusa	High
Sacramento Valley / Sutter	Sutter Community Service District GSA Butte Water District GSA - Sutter Sutter Extension Water District GSA City of Live Oak GSA County of Sutter GSA - Sutter Reclamation District No. 1500 GSA City of Yuba City GSA Reclamation District No. 70 GSA Reclamation District No. 1660 GSA	Medium
Sacramento Valley / Yolo	Yolo Subbasin GSA	High
Sacramento Valley / North American	Sacramento Groundwater Authority GSA West Placer GSA South Sutter Water District GSA Reclamation District No. 1001 GSA County of Sutter GSA - North American	High

Source: DWR 2021a, DWR 2021b

D.2 Change In Groundwater Elevation

In order to determine the general groundwater elevation trends in the project area, groundwater level data was downloaded from the DWR Water Data Library (DWR 2021c). All available data was downloaded for the Redding Area Groundwater Basin monitoring wells and the Sacramento Valley Groundwater Basin monitoring wells and exported into Excel. Data was then filtered by date to limit readings in the spring of the chosen year. For wells with multiple readings, those measurements were averaged to determine a singular measurement. The change in groundwater surface elevation was determined by subtracting the most recent measurement from the earlier measurement. Wells without measurements for one or both of the years were filtered out. The change in groundwater surface elevation was then sorted by well depth: shallow (well depths less than 200 feet deep below ground surface[bgs]), intermediate (well depths greater than 200 feet and less than 600 feet deep bgs), and deep (well depths greater than 600 ft bgs).

D.2.1 Spring 2011 to Spring 2021

Figure D-1 shows the change in groundwater elevation from Spring 2011 to Spring 2021 in the Northern Sacramento Valley. Table D-2 and Table D-3 provide a summary of the change in groundwater elevation from Spring 2011 to Spring 2021 in both the Redding Area Groundwater Basin and Sacramento Valley Groundwater Basin.

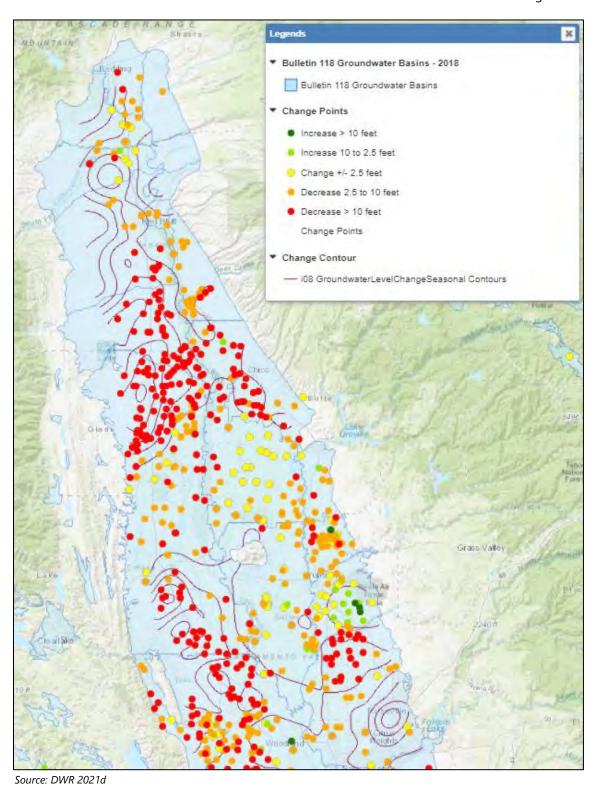


Figure D-1. Spring 2011 to Spring 2021 Change in Groundwater Elevation,
Northern Sacramento Valley

Table D-2. Change in Groundwater Elevation, Redding Area Groundwater Basin,

Spring 2011 to Spring 2021

Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	6.4	-22.2	-6.9	16
Intermediate	0.8	-46.8	-8.8	19
Deep	0.6	-18.2	-6.5	7
All Wells	6.4	-46.8	-7.7	42

Source: DWR 2021c

Table D-3. Change in Groundwater Elevation, Sacramento Valley Groundwater

Basin, Spring 2011 to Spring 2021

Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	6.2	-24.2	-8.5	171
Intermediate	7.1	-45.6	-9.5	258
Deep	25.4	-25.2	-6.8	102
All Wells	25.4	-45.6	-8.1	531

Source: DWR 2021c

D.2.2 Spring 2016 to Spring 2021

Figure D-2 shows the change in groundwater elevation from Spring 2016 to Spring 2021 in the Northern Sacramento Valley. Table D-4 and Table D-5 provide a summary of the change in groundwater elevation from Spring 2016 to Spring 2021 in both the Redding Area Groundwater Basin and Sacramento Valley Groundwater Basin.

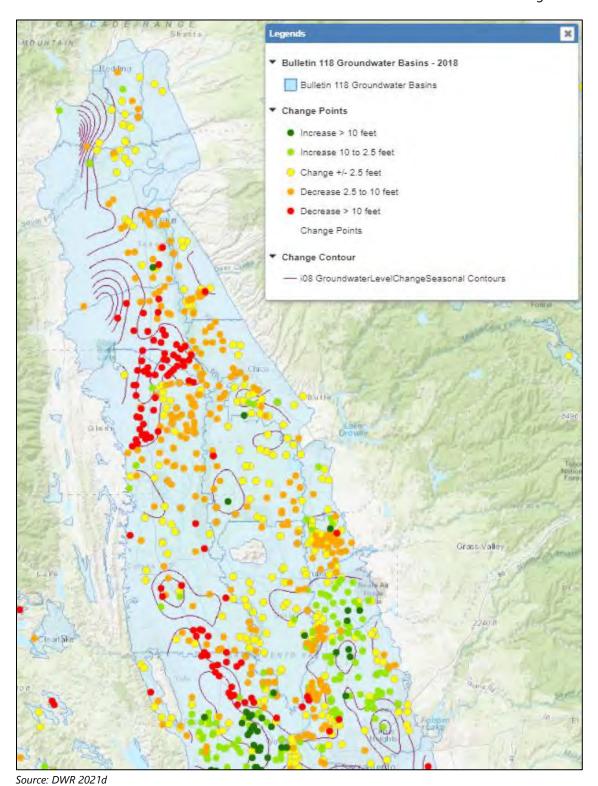


Figure D-2. Spring 2016 to Spring 2021 Change in Groundwater Elevation, Northern Sacramento Valley Table D-4. Change in Groundwater Elevation, Redding Area Groundwater Basin, Spring 2016 to Spring 2021

<u> </u>	<u> </u>			
Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	5.0	-9.0	-1.4	16
Intermediate	9.6	-23.8	-2.5	19
Deep	3.1	-4.0	-0.4	7
All Wells	9.6	-23.8	-1.7	42

Source: DWR 2021c

Table D-5. Change in Groundwater Elevation, Sacramento Valley Groundwater Basin, Spring 2016 to Spring 2021

Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	27.7	-33.8	-6.2	171
Intermediate	14.7	-62.0	-7.8	258
Deep	81.5	-40.5	-2.4	102
All Wells	81.5	-62.0	-7.2	531

Source: DWR 2021c

D.2.3 Spring 2020 to Spring 2021

Figure D-3 shows the change in groundwater elevation from Spring 2020 to Spring 2021 in the Northern Sacramento Valley. Table D-6 and Table D-7 provide a summary of the change in groundwater elevation from Spring 2020 to Spring 2021 in both the Redding Area Groundwater Basin and Sacramento Valley Groundwater Basin.

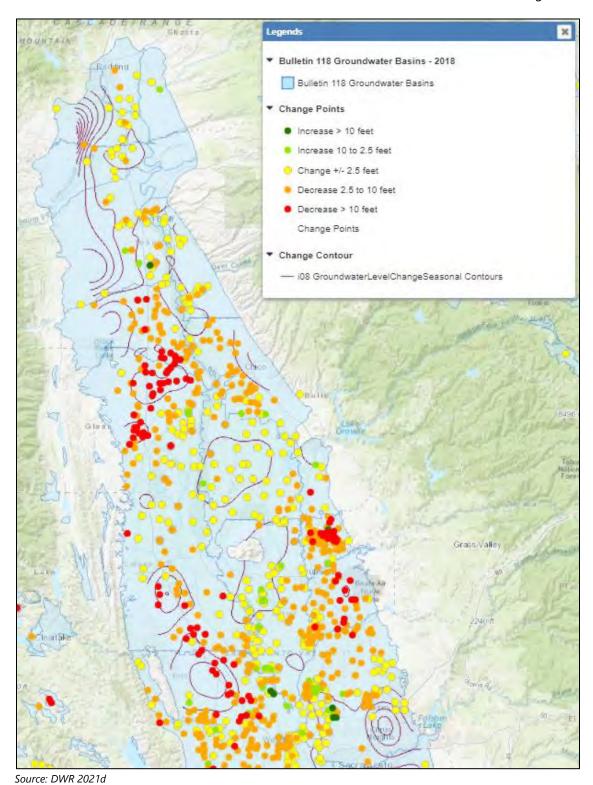


Figure D-3. Spring 2020 to Spring 2021 Change in Groundwater Elevation, Northern Sacramento Valley Table D-6. Change in Groundwater Elevation, Redding Area Groundwater Basin, Spring 2020 to Spring 2021

5p:g = 0=0 to 5p:g = 0= :				
Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	14.9	-5.2	-0.6	16
Intermediate	10.3	-29.4	-4.0	19
Deep	1.1	-11.3	-2.6	7
All Wells	14.9	-28.4	-2.2	42

Source: DWR 2021c

Table D-7. Change in Groundwater Elevation, Sacramento Valley Groundwater Basin, Spring 2020 to Spring 2021

Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	24.9	-55.5	-5.9	171
Intermediate	57.1	-65.0	-5.3	258
Deep	13.0	-20.2	-4.7	102
All Wells	57.1	-65.0	-5.4	531

Source: DWR 2021c

D.2.4 Spring 2016 to Spring 2019

Figure D-4 shows the change in groundwater elevation from Spring 2016 to Spring 2019 in the Northern Sacramento Valley. Table D-8 and Table D-9 provide a summary of the change in groundwater elevation from Spring 2016 to Spring 2019 in both the Redding Area Groundwater Basin and Sacramento Valley Groundwater Basin.

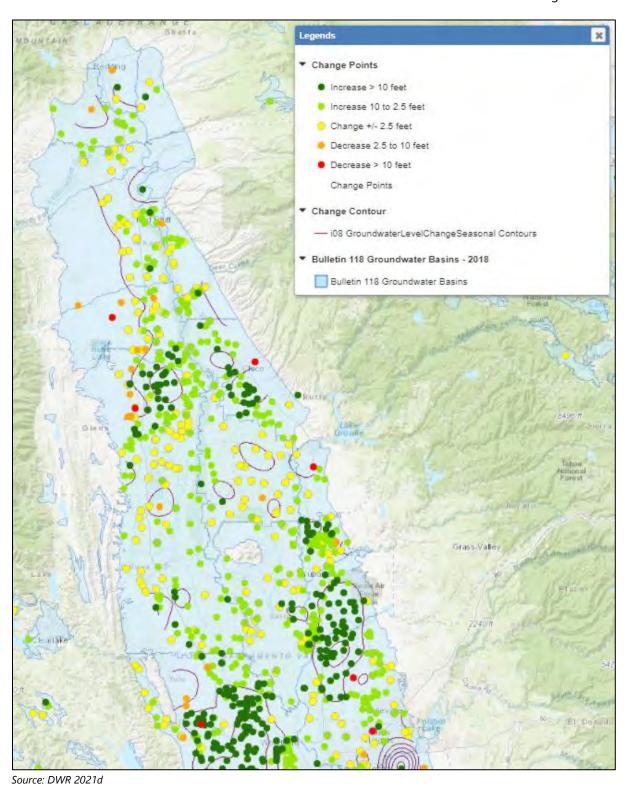


Figure D-4. Spring 2016 to Spring 2019 Change in Groundwater Elevation, Northern Sacramento Valley Table D-8. Change in Groundwater Elevation, Redding Area Groundwater Basin, Spring 2016 to Spring 2019

Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	6.0	-5.0	2.0	16
Intermediate	11.7	-12.8	1.8	19
Deep	2.6		2.0	7
All Wells	11.7	-12.8	1.9	42

Source: DWR 2021c

Table D-9. Change in Groundwater Elevation, Sacramento Valley Groundwater Basin. Spring 2016 to Spring 2019

Well Depth	GWE Maximum Increase (ft)	GWE Maximum Decrease (ft)	GWE Average Change (ft)	Count
Shallow	20.8	-49.6	1.2	171
Intermediate	59.2	-52.0	2.4	258
Deep	90.8	-6.9	5.9	102
All Wells	90.8	-52.0	1.6	531

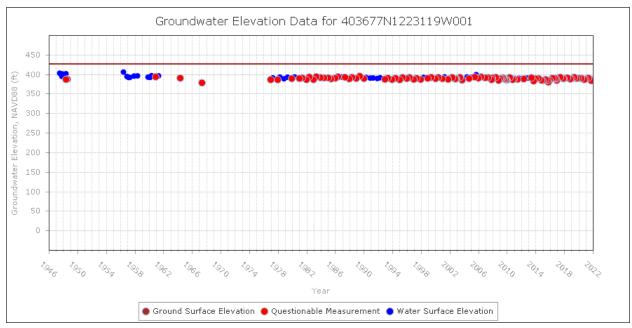
Source: DWR 2021c

D.3 Groundwater Monitoring Data

Figures D-5 through D-29 show groundwater monitoring data for wells within the seller districts. DWR's California Statewide Groundwater Elevation Monitoring (CASGEM) website was used to obtain the monitoring data. As part of the CASGEM program, DWR includes the option for "Questionable Measurement Codes," which are used to identify poor quality data. Directions to manually lookup groundwater level data from DWR's CASGEM website:

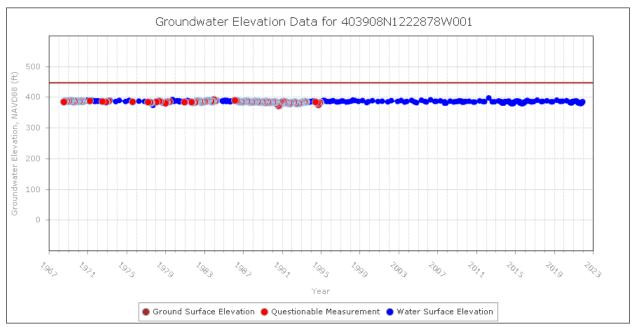
Example Well 29N04W15E002M

- 1. Go to CASGEM Public Login website: https://www.casgem.water.ca.gov/OSS/(S(dll4brrvxzfxr552mrmhepx4))/Default.aspx?ReturnUrl=/oss (setup login if not previously done)
- 2. Select Well Information> State Well Number. Input well number (29N04W15E002M for this example)
- 3. Go to Well Details: View> View Hydrograph



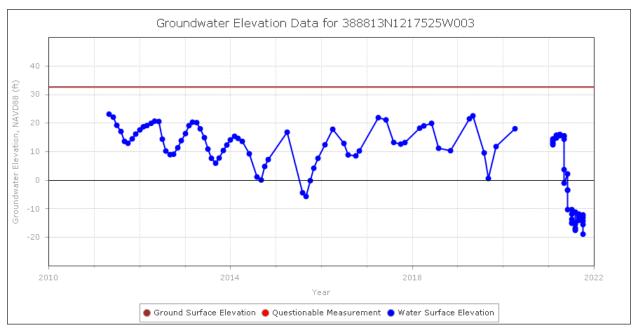
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-5. Anderson-Cottonwood Irrigation District, State Well ID 29N04W15E002M



Source: DWR 2021e

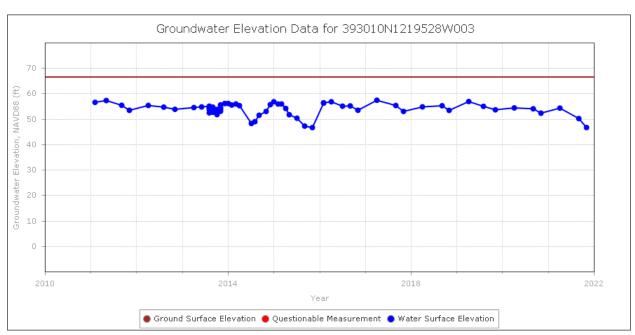
Figure D-6. Anderson-Cottonwood Irrigation District, State Well ID 29N04W02P001M



Source: DWR 2021e

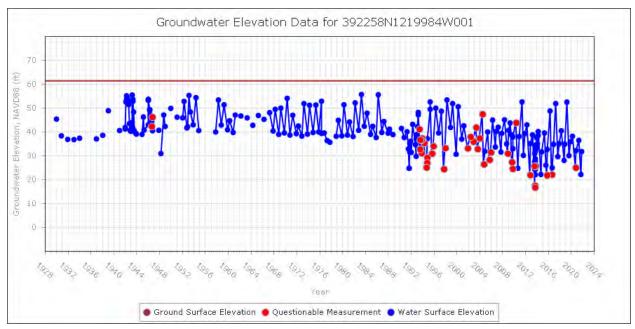
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-7. Burroughs Farms, State Well ID 12N02E21Q003M



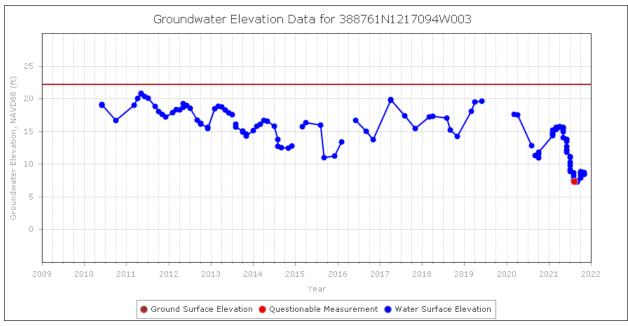
Source: DWR 2021e

Figure D-8. Canal Farms, State Well ID 17N01W27A003M



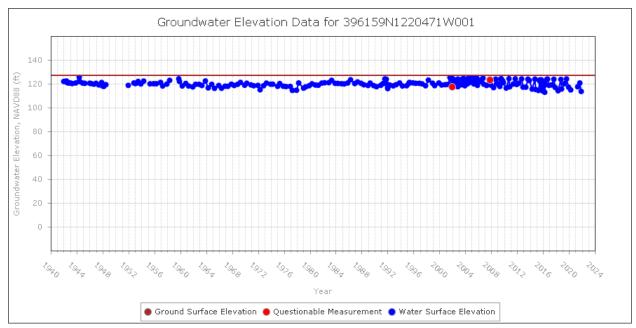
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-9. Eastside Mutual Water Company, State Well ID 16N01W20F001M



Source: DWR 2021e

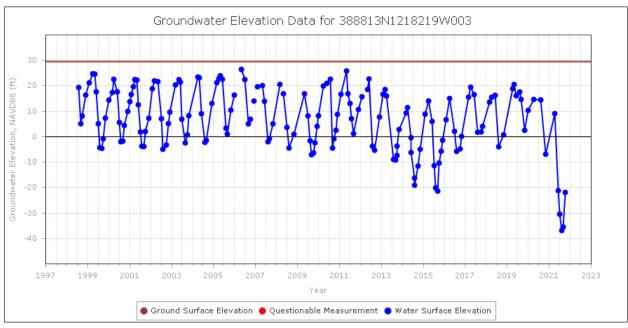
Figure D-10. Giusti Farms, State Well ID 12N02E23H003M



Source: DWR 2021e

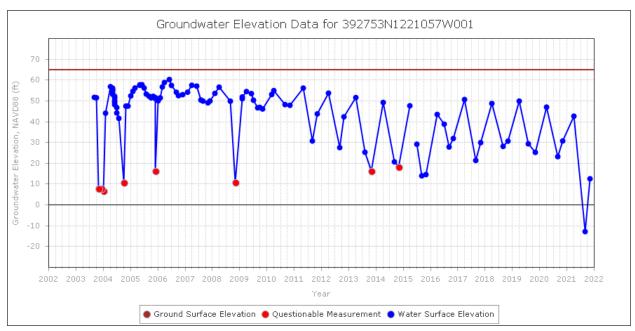
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-11. Glenn-Colusa Irrigation District, State Well ID 20N02W02J001M



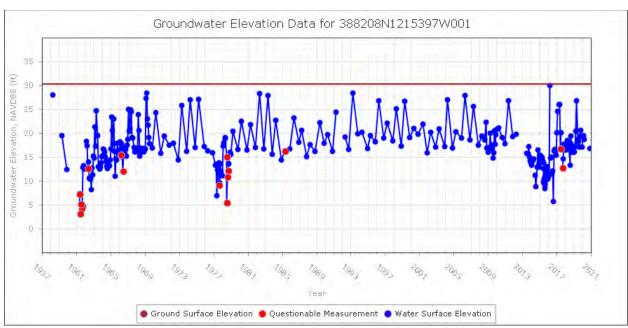
Source: DWR 2021e

Figure D-12. Henle Family Farms, State Well ID 12N01E14R003M



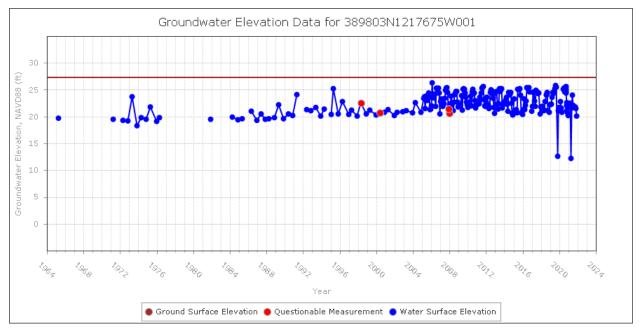
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-13. Maxwell Irrigation District, State Well ID 16N02W05B001M (Deep well; Depth=797 feet)



Source: DWR 2021e

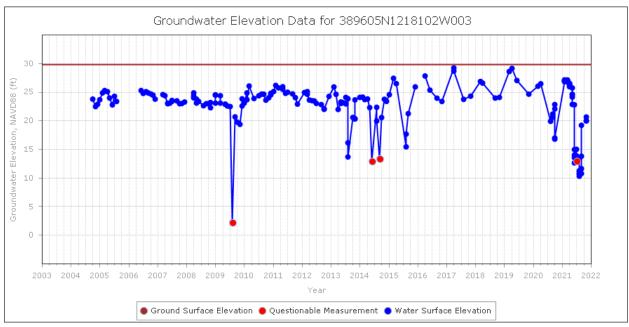
Figure D-14. Natomas Central Mutual Water Company, State Well ID 11N04E09D002M



Source: DWR 2021e

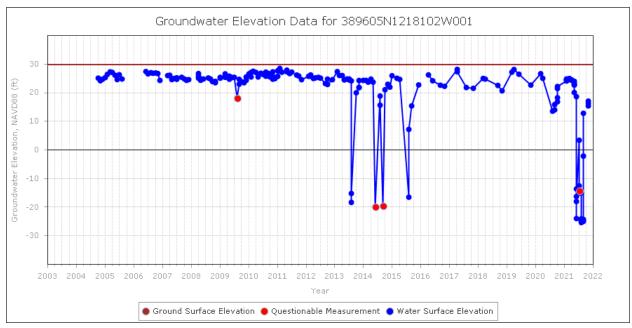
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-15. Pelger Mutual Water Company, State Well ID 13N02E17A001M



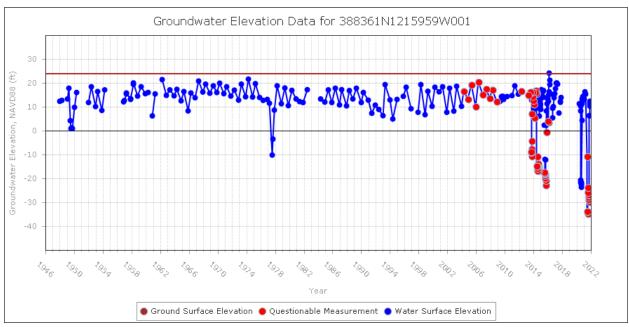
Source: DWR 2021e

Figure D-16. Pelger Road 1700 LLC, State Well ID 13N01E24G004M (Shallow well; Depth=100 feet)



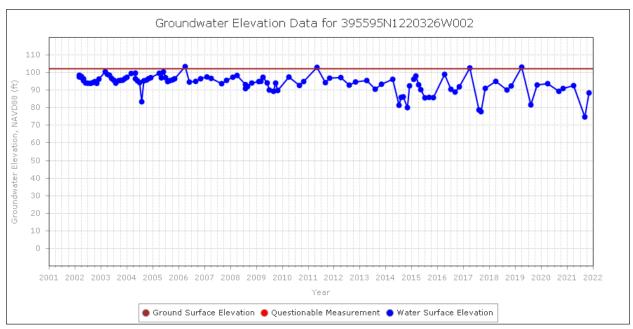
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-17. Pelger Road 1700 LLC, State Well ID 13N01E24G002M (Deep well; Depth=310 feet)



Source: DWR 2021e

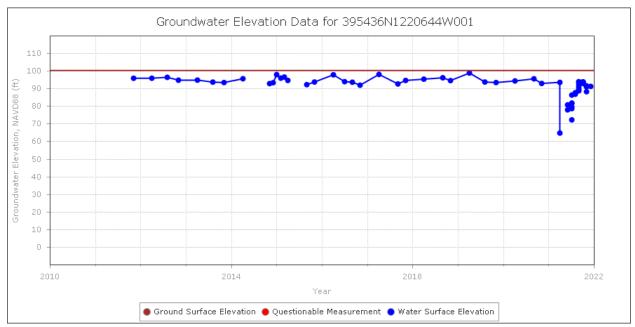
Figure D-18. Pleasant Grove-Verona Mutual Water Company, State Well ID 11N03E01D001M



Source: DWR 2021e

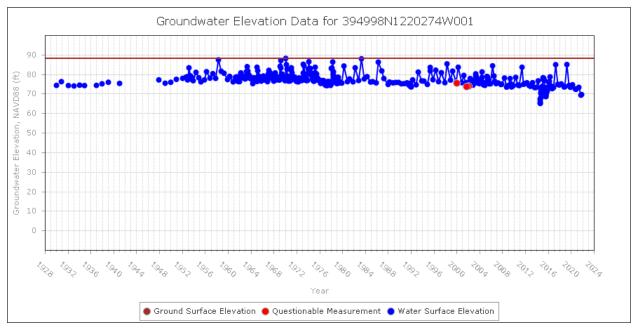
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-19. Princeton-Codora-Glenn Irrigation District and Provident Irrigation District, State Well ID 20N02W25F002M (Depth= 513 feet)



Source: DWR 2021e

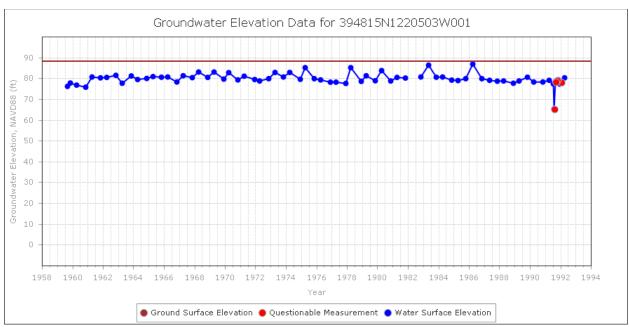
Figure D-20. Princeton-Codora-Glenn Irrigation District and Provident Irrigation District,
State Well ID 20N02W34J001M



Source: DWR's CASGEM website.

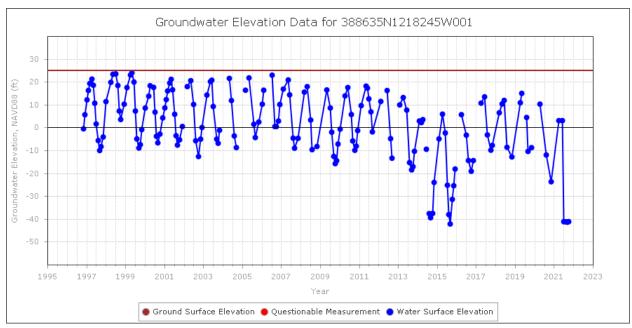
Note: Well number in the title of the figure is the CASGEM Well Number

Figure D-21. Princeton-Codora-Glenn Irrigation District and Provident Irrigation District,
State Well ID 19N02W13J001M



Source: DWR 2021e

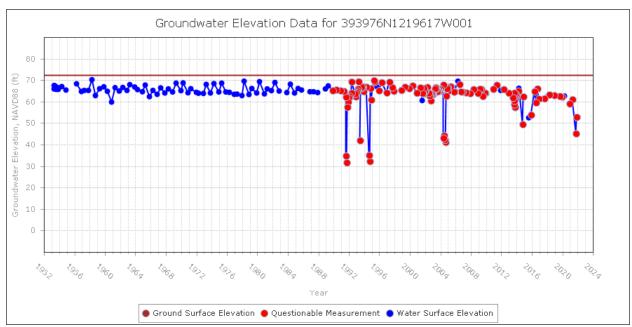
Figure D-22. Provident Irrigation District, State Well ID 19N02W23Q002M



Source: DWR 2021e

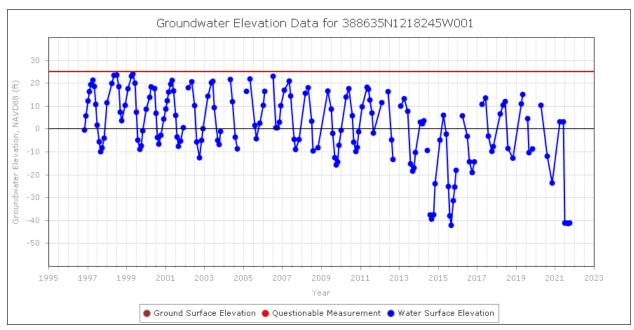
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-23. Reclamation District 108, State Well ID 12N01E26A001M (Deep; Depth= 670 feet)



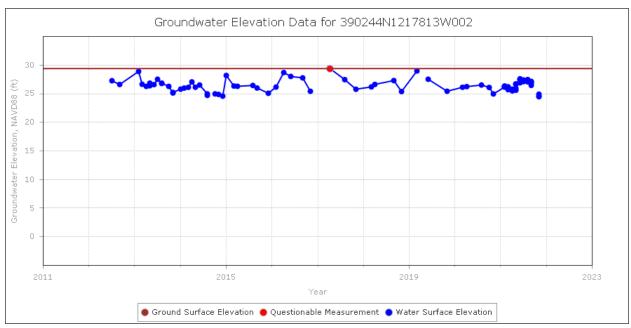
Source: DWR 2021e

Figure D-24. Reclamation District 1004, State Well ID 18N01W22L001M



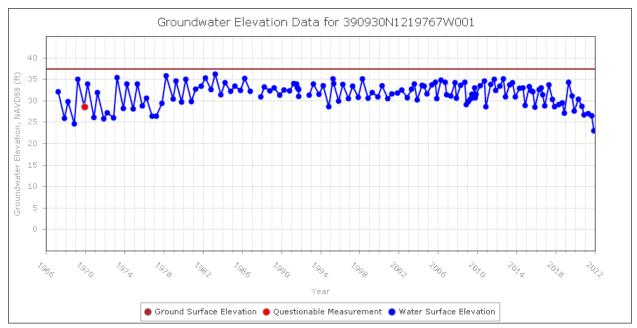
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-25. River Garden Farms, State Well ID 12N01E26A001M (Deep Well; Depth = 670 feet)



Source: DWR 2021e

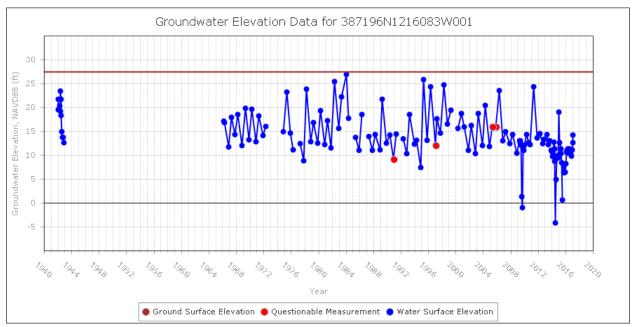
Figure D-26. Sutter Mutual Water Company, State Well ID 14N02E32D002M



Source: DWR 2021e

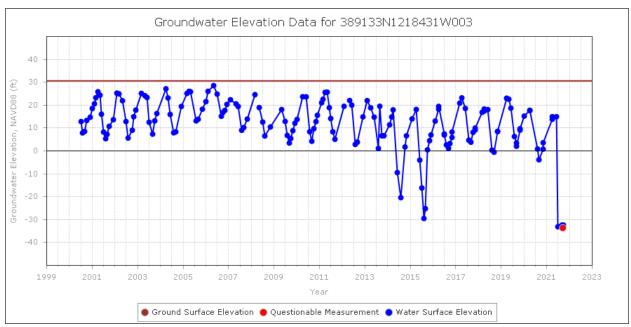
Note: Well number in the title of the figure is the CASGEM Well Number.

Figure D-27. Sycamore Mutual Water Company, State Well ID 14N01W04K003M (Shallow Well; Depth= 73 feet)



Source: DWR 2021e

Figure D-28. Te Velde Revocable Family Trust, State Well ID 10N03E14C001M



Note: Well number in the title of the figure is the CASGEM Well Number

Figure D-29. Windswept Land & Livestock, State Well ID 12N01E03R003M

D.4 Land Subsidence

Figure D-30 shows the ground surface elevation at the Zamora extensometer in Yolo County, Figure D-31 shows the ground surface elevation at the Conaway Ranch extensometer in Yolo County, and Figure D-32 shows the ground surface elevation at the Sutter extensometer in Sutter County.

11N01E24Q008M: Zamora Land Subsidence Extensometer depth 1000 ft bgs

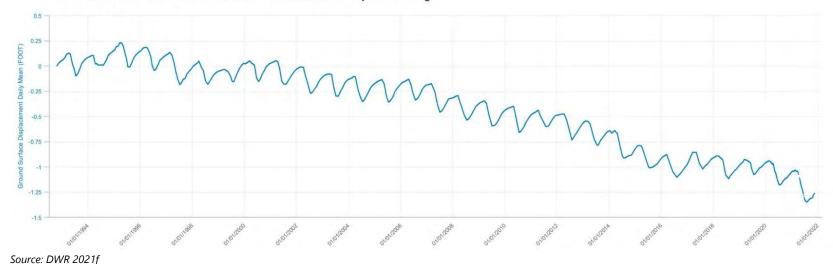


Figure D-30. Zamora Extensometer (11N01E24Q008M) Ground Surface Displacement

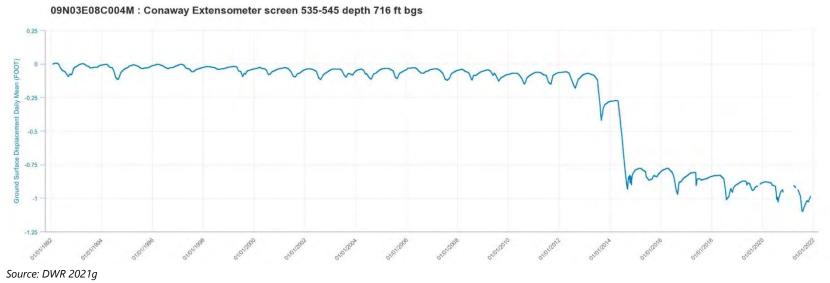


Figure D-31. Conaway Ranch Extensometer (09N03E08C004M) Ground Surface Displacement

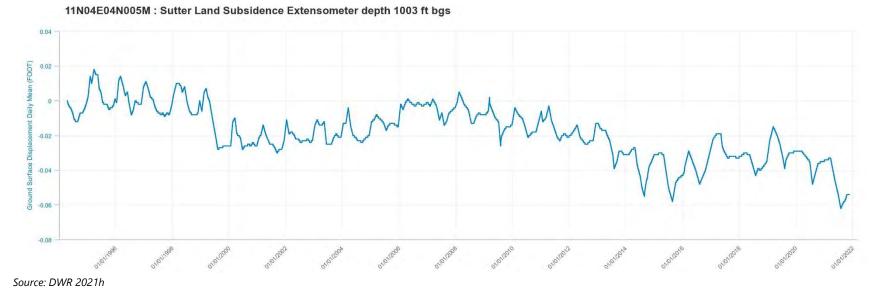


Figure D-32. Sutter Extensometer (11N04E04N005M) Ground Surface Displacement

D.5 References



Appendix E Air Quality Emissions Calculations

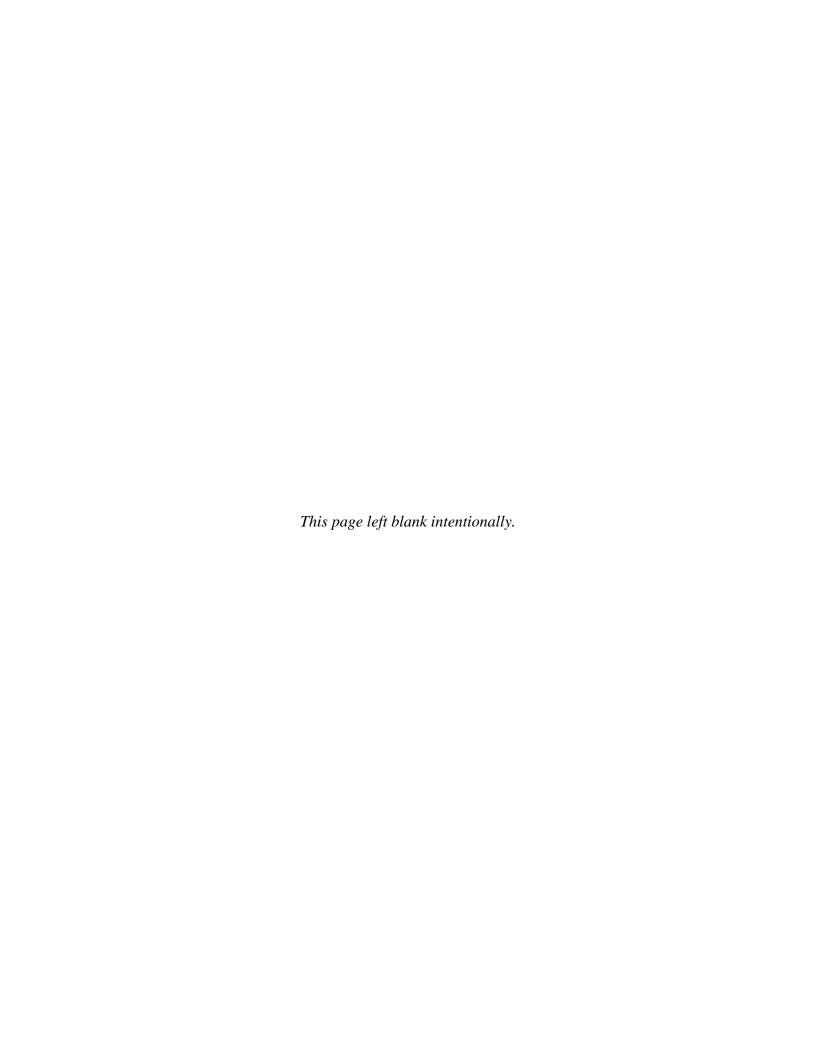


Table E-1. General Conformity Applicability Evaluation (Unmitigated Emissions)

	<u>, , , , , , , , , , , , , , , , , , , </u>	· · ·	Emissions	s (tons per year)		
County/	VOC	NOx	СО	SOx	PM10	PM2.5
_	Sacramento	Sacramento	Sacramento			
Nonattainment Area	Metro ¹	Metro ¹	Area ²	Sacramento ^{3,4}	Sacramento Co.	Sacramento ⁴
Colusa	n/a	n/a	n/a	n/a	n/a	n/a
Glenn	n/a	n/a	n/a	n/a	n/a	n/a
Sacramento	0.3	1.9	1.4	0.6	0.0	0.0
Shasta	n/a	n/a	n/a	n/a	n/a	n/a
Sutter ⁵	9.0	80.3	n/a	7.1	n/a	1.4
Tehama	n/a	n/a	n/a	n/a	n/a	n/a
Yolo	0.9	6.4	2.8	0.4	n/a	0.1
Total	10.2	88.6	4.2	8.0	0.0	1.5
Classification	Severe-15	Severe-15	Maintenance	PM2.5 Precursor	Maintenance	Nonattainment
De Minimis Threshold (tpy)	25	25	100	100	100	100
Exceed?	No	Yes	No	No	No	No

Note:

Table E-2. Emissions Outside of 8-Hour Ozone Nonattainment Area (tons per year)

Water Agency	County	VOC	NOx
Pelger Road 1700 LLC	Sutter	All Electric	All Electric
Pelger Mutual Water Company	Sutter	0.0	0.7
Reclamation District 1004	Sutter	No Engines	No Engines
Total		0.0	0.7

¹The Sacramento Metro 8-hour O3 nonattainment area consist of Sacramento and Yolo Counties and parts of El Dorado, Placer, Solano, and Sutter Counties. Emissions occurring within the attainment area of these counties are excluded from the total emissions.

²The Sacramento Area CO maintenance area is based on the Census Bureau Urbanized Area and consists of parts of Placer, Sacramento, and Yolo Counties. The general conformity applicability evaluation is based on emissions that would occur within the entire county to be conservative.

³All counties are designated as attainment areas for SO2; however, since SO2 is a precursor to PM2.5, its emissions must be evaluated under general conformity.

⁴The 24-hour PM2.5 nonattainment area for Sacramento includes Sacramento County and parts of El Dorado, Placer, Solano, and Yolo Counties. The general conformity applicability analysis assumes that all emissions that could occur within each county would occur within the Sacramento nonattainment area to be conservative.

⁵VOC and NOx emissions are excluded from Cranmore Farms, Pelger Mutual Water Company, and Reclamation District 1004 because they are located in areas designated as attainment for the federal 8-hour O3 NAAQS.

Summary of Daily Groundwater Substitution Emissions by County (Unmitigated)

Table E-3. Daily VOC Emissions (Unmitigated)

, , ,			Daily VO	C Emission	s (pounds pe	er day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.	_		No Grou	ndwater Sul	ostitution			0.00
Canal Farms	1.85							1.85
Conaway Preservation Group			No Grou	ndwater Sul	ostitution			0.00
Eastside Mutual Water Company	5.85							5.85
Giusti Farms								0.00
Glenn-Colusa Irrigation District	10.67	22.92						33.60
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	2.48							2.48
Natomas Central Mutual Water Company			3.71		18.47			22.19
Pelger Mutual Water Company					0.99			0.99
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					37.65			37.65
Princeton-Codora-Glenn Irrigation District	7.65	15.30						22.94
Provident Irrigation District	No Engines	45.45						45.45
Reclamation District 1004	31.70	2.69			No Engines			34.39
Reclamation District 108	43.20						9.18	52.38
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	2.82							2.82
Sutter Mutual Water Company	4.33				78.67			83.00
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	110.56	86.36	3.71	0.00	135.78	0.00	9.18	345.60

Key:

VOC = volatile organic compounds

Table E-4. Daily NOx Emissions (Unmitigated)

			Daily NO	k Emissions	s (pounds pe	er day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	3.70							3.70
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	49.89							49.89
Giusti Farms								0.00
Glenn-Colusa Irrigation District	131.63	282.62						414.25
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	47.10							47.10
Natomas Central Mutual Water Company			20.67		80.69			101.36
Pelger Mutual Water Company					18.76			18.76
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					284.48			284.48
Princeton-Codora-Glenn Irrigation District	94.31	188.61						282.92
Provident Irrigation District	No Engines	560.46						560.46
Reclamation District 1004	405.20	33.13			No Engines			438.33
Reclamation District 108	478.60						68.91	547.51
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	5.64							5.64
Sutter Mutual Water Company	53.39				844.36			897.75
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric		_	0.00
Total	1,269.46	1,064.83	20.67	0.00	1,228.29	0.00	68.91	3,652.15

Key:

NOx = nitrogen oxides

Summary of Daily Groundwater Substitution Emissions by County (Unmitigated)

Table E-5. Daily CO Emissions (Unmitigated)

			Daily CO	Emissions	(pounds pe	r day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Groui	ndwater Sub	ostitution			0.00
Canal Farms	7.40							7.40
Conaway Preservation Group			No Groui	ndwater Sub	ostitution			0.00
Eastside Mutual Water Company	55.85							55.85
Giusti Farms								0.00
Glenn-Colusa Irrigation District	28.36	60.90						89.26
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	43.38							43.38
Natomas Central Mutual Water Company			15.08		69.89			84.97
Pelger Mutual Water Company					24.68			24.68
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					152.36			152.36
Princeton-Codora-Glenn Irrigation District	20.32	40.64						60.96
Provident Irrigation District	No Engines	120.77						120.77
Reclamation District 1004	115.72	7.14			No Engines			122.86
Reclamation District 108	121.81						30.16	151.97
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	11.29							11.29
Sutter Mutual Water Company	11.51				304.27			315.77
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	415.64	229.45	15.08	0.00	551.19	0.00	30.16	1,241.53

CO = carbon monoxide

Table E-6. Daily SOx Emissions (Unmitigated)

			Daily SO	k Emissions	s (pounds pe	er day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.00							0.00
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	24.41							24.41
Giusti Farms								0.00
Glenn-Colusa Irrigation District	8.70	18.69						27.39
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	15.44							15.44
Natomas Central Mutual Water Company			5.95		5.05			11.00
Pelger Mutual Water Company					6.15			6.15
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					33.12			33.12
Princeton-Codora-Glenn Irrigation District	6.24	12.47						18.71
Provident Irrigation District	No Engines	37.06						37.06
Reclamation District 1004	35.28	2.19			No Engines			37.47
Reclamation District 108	30.96						3.99	34.95
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.00							0.00
Sutter Mutual Water Company	3.53				68.61			72.14
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust					_		All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	124.57	70.42	5.95	0.00	112.93	0.00	3.99	317.85

Key: SOx = sulfur oxides

Summary of Daily Groundwater Substitution Emissions by County (Unmitigated)

Table E-7. Daily PM10 Emissions (Unmitigated)

			Daily PM1	0 Emission	s (pounds p	er day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.02							0.02
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	2.78							2.78
Giusti Farms								0.00
Glenn-Colusa Irrigation District	1.84	3.80						5.63
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	2.48							2.48
Natomas Central Mutual Water Company			0.09		0.90			0.99
Pelger Mutual Water Company					1.48			1.48
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					7.72			7.72
Princeton-Codora-Glenn Irrigation District	1.01	2.01						3.02
Provident Irrigation District	No Engines	6.69						6.69
Reclamation District 1004	6.07	0.35			No Engines			6.42
Reclamation District 108	5.05						0.69	5.75
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.03							0.03
Sutter Mutual Water Company	0.57				13.14			13.70
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric		·	0.00
Total	19.85	12.85	0.09	0.00	23.23	0.00	0.69	56.71

Key: PM10 = inhalable particulate matter

Table E-8. Daily PM2.5 Emissions (Unmitigated)

			Daily PM2	.5 Emissior	ns (pounds p	er day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	ostitution			0.00
Canal Farms	0.02							0.02
Conaway Preservation Group			No Grou	ndwater Sub	ostitution			0.00
Eastside Mutual Water Company	2.78							2.78
Giusti Farms								0.00
Glenn-Colusa Irrigation District	1.79	3.71						5.50
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	2.48							2.48
Natomas Central Mutual Water Company			0.09		0.89			0.97
Pelger Mutual Water Company					1.48			1.48
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					7.58			7.58
Princeton-Codora-Glenn Irrigation District	0.98	1.96						2.95
Provident Irrigation District	No Engines	6.53						6.53
Reclamation District 1004	5.97	0.34			No Engines			6.32
Reclamation District 108	4.93						0.68	5.61
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.03							0.03
Sutter Mutual Water Company	0.56				12.95			13.51
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	19.55	12.54	0.09	0.00	22.90	0.00	0.68	55.75

Key: PM2.5 = fine particulate matter

Summary of Annual Groundwater Substitution Emissions by County (Unmitigated)

Table E-9. Annual VOC Emissions (Unmitigated)

·	Ĭ		Annual V	OC Emission	ons (tons pe	r year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.15							0.15
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	0.32							0.32
Glenn-Colusa Irrigation District	0.99	2.13						3.12
Giusti Farms								0.00
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.15							0.15
Natomas Central Mutual Water Company			0.35		1.72			2.06
Pelger Mutual Water Company					0.04			0.04
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					1.84			1.84
Princeton-Codora-Glenn Irrigation District	0.48	0.95						1.43
Provident Irrigation District	No Engines	3.52						3.52
Reclamation District 1004	1.29	0.11			No Engines			1.40
Reclamation District 108	4.02						0.85	4.87
Roberts Ditch Irrigation Company	0.24							0.24
River Garden Farms							All Electric	0.00
Sutter Mutual Water Company	0.30				5.49			5.79
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric						·	0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	7.94	6.72	0.35	0.00	9.08	0.00	0.85	24.94

Key:

VOC = volatile organic compounds

Table E-10. Annual NOx Emissions (Unmitigated)

·			Annual N	Ox Emission	ons (tons per	year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Groui	ndwater Sub	stitution			0.00
Canal Farms	0.30							0.30
Conaway Preservation Group			No Groui	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	2.72							2.72
Glenn-Colusa Irrigation District	12.24	26.28						38.53
Giusti Farms								0.00
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	2.88							2.88
Natomas Central Mutual Water Company			1.92		7.50			9.43
Pelger Mutual Water Company					0.72			0.72
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					13.90			13.90
Princeton-Codora-Glenn Irrigation District	5.88	11.77						17.65
Provident Irrigation District	No Engines	43.44						43.44
Reclamation District 1004	16.49	1.35			No Engines			17.83
Reclamation District 108	44.51						6.41	50.92
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.49							0.49
Sutter Mutual Water Company	3.72				58.89			62.62
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	89.23	82.83	1.92	0.00	81.02	0.00	6.41	261.41

Key:

NOx = nitrogen oxides

Summary of Annual Groundwater Substitution Emissions by County (Unmitigated)

Table E-11. Annual CO Emissions (Unmitigated)

			Annual (CO Emissio	ns (tons per	year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.	_		No Grou	ndwater Sul	ostitution			0.00
Canal Farms	0.60							0.60
Conaway Preservation Group			No Grou	ndwater Sul	ostitution			0.00
Eastside Mutual Water Company	3.04							3.04
Glenn-Colusa Irrigation District	2.64	5.66						8.30
Giusti Farms								0.00
Henle Family LP					All Electric		_	0.00
Maxwell Irrigation District	2.65							2.65
Natomas Central Mutual Water Company			1.40		6.50			7.90
Pelger Mutual Water Company					0.94			0.94
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					7.45			7.45
Princeton-Codora-Glenn Irrigation District	1.27	2.54						3.80
Provident Irrigation District	No Engines	9.36						9.36
Reclamation District 1004	4.71	0.29			No Engines			5.00
Reclamation District 108	11.33						2.80	14.13
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.97							0.97
Sutter Mutual Water Company	0.80				21.22			22.03
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric		_	0.00
Total	28.01	17.85	1.40	0.00	36.11	0.00	2.80	86.18

Key: CO = carbon monoxide

Table E-12. Annual SOx Emissions (Unmitigated)

			Annual S	Ox Emission	ons (tons per	year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.00							0.00
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	1.33							1.33
Giusti Farms								0.00
Glenn-Colusa Irrigation District	0.81	1.74						2.55
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.94							0.94
Natomas Central Mutual Water Company			0.55		0.47			1.02
Pelger Mutual Water Company					0.24			0.24
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					1.62			1.62
Princeton-Codora-Glenn Irrigation District	0.39	0.78						1.17
Provident Irrigation District	No Engines	2.87						2.87
Reclamation District 1004	1.44	0.09			No Engines			1.52
Reclamation District 108	2.88						0.37	3.25
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.00							0.00
Sutter Mutual Water Company	0.25				4.79			5.03
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	8.03	5.48	0.55	0.00	7.11	0.00	0.37	21.55

Key: SOx = sulfur oxides

Summary of Annual Groundwater Substitution Emissions by County (Unmitigated)

Table E-13. Annual PM10 Emissions (Unmitigated)

-			Annual Pl	M10 Emissi	ons (tons pe	r year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.00							0.00
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	0.15							0.15
Giusti Farms								0.00
Glenn-Colusa Irrigation District	0.17	0.35						0.52
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.15							0.15
Natomas Central Mutual Water Company			0.01		0.08			0.09
Pelger Mutual Water Company					0.06			0.06
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					0.38			0.38
Princeton-Codora-Glenn Irrigation District	0.06	0.13						0.19
Provident Irrigation District	No Engines	0.52						0.52
Reclamation District 1004	0.25	0.01			No Engines			0.26
Reclamation District 108	0.47						0.06	0.53
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.00							0.00
Sutter Mutual Water Company	0.04				0.92			0.96
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	1.30	1.01	0.01	0.00	1.43	0.00	0.06	3.82

Key: PM10 = inhalable particulate matter

Table E-14. Annual PM2.5 Emissions (Unmitigated)

			Annual Pl	M2.5 Emissi	ions (tons pe	er year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.00							0.00
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	0.15							0.15
Giusti Farms								0.00
Glenn-Colusa Irrigation District	0.17	0.34						0.51
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.15							0.15
Natomas Central Mutual Water Company			0.01		0.08			0.09
Pelger Mutual Water Company					0.06			0.06
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					0.37			0.37
Princeton-Codora-Glenn Irrigation District	0.06	0.12						0.18
Provident Irrigation District	No Engines	0.51						0.51
Reclamation District 1004	0.24	0.01			No Engines			0.26
Reclamation District 108	0.46						0.06	0.52
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.00							0.00
Sutter Mutual Water Company	0.04				0.90			0.94
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric					_		0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	1.28	0.99	0.01	0.00	1.41	0.00	0.06	3.75

Key: PM2.5 = fine particulate matter

Agency Anderson-Cottonwood Irrigation District Peak Pumping by Transfer Period

Transfer Volume 2,400 acre-feet (Apr-Jun) 800 AF/month 2,400 acre-feet (Jul-Sep) 800 AF/month

4,800 acre-feet/year

Table E-15. Anderson-Cottonwood Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Shasta	0	2	0	0	2
Tehama	0	0	0	0	0
	0	0	0	0	0
Total	0	2	0	0	2

Table E-16. Anderson-Cottonwood Irrigation District Criteria Pollutant Emissions

	Well										
	Location			Power Rating	Emission	Pum	o Rate	Transfer	Volume	Oper	ations
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)
Barney Street	Shasta	Electric	2012	200	n/a	5,500	85%	677	4,062	22	4,010
Crowley Gulch	Shasta	Electric	2012	50	n/a	1,000	15%	123	738	22	4,010
					Total	6,500	100%	800	4,800	43	8,021
				Total (Shas	ta County)	6,500	100%	800	4,800	43	8,021
			•	Total (Teham	na County)	0	0%	0	0	0	0
				Total	(0 County)	0	0%	0	0	0	0

Note: All wells are electric; therefore, no local criteria pollutant emissions.

Key:

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

	Snasta	i enama
PM10	Α	Α
PM2.5	Α	Α
O3	Α	Α

Engines not subject to ATCM if remotely-located.

Peak Month

800 AF/month 5,840 gallons/minute 90% peak pump rate

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

1,000 acre-feet/year

Agency Canal Farms Peak Pumping by Transfer Period

Transfer Volume 575 acre-feet (Apr-Jun) 192 AF/month 425 acre-feet (Jul-Sep) 142 AF/month

Table E-17. Canal Farms Summary of Engines by Fuel Type and Location

			gcocy		
County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	2	0	1	3
Total	0	2	0	1	3

Table E-18. Canal Farms Criteria Pollutant Emissions

	Well											Fuel			Emission	n Factors					Daily En	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Ope	rations	Consumption		(g/hp-hr)			(lb/MMBtu	1)			(pounds	per day)					(tons p	er year)		
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year) (hours/day	(hours/year)	(gal/yr) - diesel (MMBtu/yr) - propane	voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.5
Dennis Well North	Colusa	Electric	unknown	125	n/a	2,500	25%	48	250	3	543	n/a																		
Dennis Well South	Colusa	Electric	unknown	125	n/a	2,500	25%	48	250	3	543	n/a																		
East Well	Colusa	Propane	unknown	250	n/a	5,000	50%	96	500	3	543	345	1.0	2.0	4.0	0.000588	0.00999	0.00999	1.85	3.70	7.40	0.00	0.02	0.02	0.15	0.30	0.60	0.000101	0.0017	0.0017
				-	Total	10,000	100%	192	1,000	10	1,629	345							1.85	3.70	7.40	0.00	0.02	0.02	0.15	0.30	0.60	0.000101	0.0017	0.0017
				Total (Colus	sa County)	10,000	100%	192	1,000	10	1,629	345						Ì	1.85	3.70	7.40	0.00	0.02	0.02	0.15	0.30	0.60	0.000101	0.0017	0.0017

Note: Natural gas emission factors used for propane.

Key:

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year

gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides VOC = volatile organic compound Federal Attainment Status Colusa

Olus O A

PM2.5 A

O3 A

Engines not subject to ATCM if remotely-located.

Peak Month

192 AF/month

1,399 gallons/minute

14% peak pump rate

Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008 Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 bhp-hr = 2,542.5 Btu 1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days

1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

7.13 lb/gal

Propane Emission Factor Sources

 $\underline{\text{http://www.valleyair.org/notices/Docs/2013/08-19-13\%20(C-1132198)/Prelim\%20C-1132198.pdf}\\$

https://www.valleyair.org/busind/pto/gears/GEAR11_Emergcy_Engns.pdf

Agency Eastside Mutual Water Company Transfer Volume

1,067 acre-feet (Apr-Jun) 1,163 acre-feet (Jul-Sep)

Peak Pumping by Transfer Period

634 AF/month 443 AF/month

2,230 acre-feet/year

Table E-19. Eastside Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	3	0	0	0	3
Total	3	0	0	0	3

Table E-20. Eastside Mutual Water Company Criteria Pollutant Emissions

	Well		i i									Fuel			Emission	Factors					Daily En	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pum	p Rate	Transfer '	Volume	Oper	ations	Consumption	\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\							(pounds	per day)					(tons p	er year)			
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr)	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5
ATW-1	Colusa	Diesel	2006	150	T2	4,720	37%	235	827	9	952	8,012	0.2	4.7	3.7	0.93	0.22	0.22	0.71	13.52	10.78	2.69	0.65	0.65	0.04	0.74	0.59	0.15	0.04	0.04
ATW-2	Colusa	Diesel	2002	275	T1	4,000	31%	200	701	9	952	14,689	1.0	6.9	8.5	4.10	0.40	0.40	5.14	36.37	45.07	21.72	2.13	2.13	0.28	1.98	2.46	1.18	0.12	0.12
ATW-3	Colusa	Diesel	2010	200	Т3	4,000	31%	200	701	9	952	10,683	0.1	2.8	2.6	4.10	0.15	0.15	0.58	10.93	10.06	15.80	0.58	0.58	0.03	0.60	0.55	0.86	0.03	0.03
					Total	12,720	100%	634	2,230	26	2,856	33,384							5.85	49.89	55.85	24.41	2.78	2.78	0.32	2.72	3.04	1.33	0.15	0.15
			•	Total (Colus	a County)	12,720	100%	634	2,230	26	2,856	33,384							5.85	49.89	55.85	24.41	2.78	2.78	0.32	2.72	3.04	1.33	0.15	0.15

Key:

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year

gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

Colusa PM10 PM2.5

O3

Engines not subject to ATCM if remotely-located.

Peak Month

634 AF/month 4,631 gallons/minute 36% peak pump rate

Emission factors based on NMHC+NOx standard

Estimated model year

Conversion Factors

1 lb =453.6 g 2,000 lbs 1 ton = 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days

60 minutes 1 hour = 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Giusti Farms Peak Pumping by Transfer Period

Transfer Volume 500 acre-feet (Apr-Jun) 167 AF/month 167 AF/month 500 acre-feet (Jul-Sep)

1,000 acre-feet/year

Table E-21. Giusti Farms Summary of Engines by Fuel Type and Location

			g		
County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	0	0	2	2
Total	0	0	0	2	2

Table E-22. Giusti Farms Criteria Pollutant Emissions

	Well											Fuel			Emissio	n Factors				Daily En	nissions					Annual I	Emissions		
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Opei	rations	Consumption		(g/hp-hr)		(lb/MMBtu)			(pounds	per day)					(tons p	oer year)		
												(gal/yr) - diesel																	
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(MMBtu/yr) - propane	voc	NOx	СО	SOx PM10	PM2.5	voc	NOx	СО	SOx	PM10	PM2.5	voc	NOx	СО	SOx	PM10	PM2.5
Giusti Well 1	Sutter	Propane	2015	150	n/a	3,200	50%	83	500	5	849	324	1.0	2.0	4.0	0.000588 0.00999	0.00999	1.51	3.02	6.03	0.00	0.02	0.02	0.14	0.28	0.56	0.000095	0.0016	0.0016
Giusti Well 2	Sutter	Propane	2015	150	n/a	3,200	50%	83	500	5	849	324	1.0	2.0	4.0	0.000588 0.00999	0.00999	1.51	3.02	6.03	0.00	0.02	0.02	0.14	0.28	0.56	0.000095	0.0016	0.0016
	_	_			Total	6,400	100%	167	1,000	9	1,697	647						3.02	6.03	12.07	0.00	0.03	0.03	0.28	0.56	1.12	0.00019	0.0032	0.0032
				Total (Sutt	er County)	6.400	100%	167	1.000	9	1.697	647						3.02	6.03	12.07	0.00	0.03	0.03	0.28	0.56	1.12	0.00019	0.0032	0.0032

Key:

AF = acre-feet CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour gal/yr = gallons per year gpm = gallons per minute

hp = horsepower NOx = nitrogen oxides

PM10 = inhalable particulate matter PM2.5 = fine particulate matter

SOx = sulfur oxides VOC = volatile organic compound Federal Attainment Status

Sutter PM10 Α PM2.5 M О3 Engines subject to ATCM.

Peak Month

167 AF/month 10 gallons/minute 0% peak pump rate

Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008

Conversion Factors

1 bhp-hr = 2,542.5 Btu 1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Glenn-Colusa Irrigation District <u>Peak Pumping by Transfer Period</u>
Transfer Volume 5,748 acre-feet (Apr-Jun) 1,916 AF/month
5,748 acre-feet (Jul-Sep) 1,916 AF/month

11,495 acre-feet/year

Table E-23. Glenn-Colusa Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	10	7	0	0	17
Colusa	5	6	0	0	11
Total	15	13	0	0	28

Table E-24. Glenn-Colusa Irrigation District Criteria Pollutant Emissions

	Well											Fuel			Emission	n Factors					Daily En	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Oper	ations	Consumption			(g/bh	np-hr)					(pounds	per day)					(tons p	er year)		
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total	I) (AF/month)	(AF/year) ((hours/day)	(hours/year)	(gal/yr)	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
33	Glenn	Diesel	unknown	185	T0	3,000	5%	99	594	6	1,076	11,167	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.18	7.15	2.19	0.35	0.35	0.25	3.09	0.66	0.20	0.03	0.03
34	Glenn	Diesel	unknown	140	T0	4,000	7%	132	792	6	1,076	8,451	1.1	14.1	3.0	0.93	0.22	0.21	2.04	25.11	5.41	1.66	0.39	0.38	0.19	2.33	0.50	0.15	0.04	0.04
62	Glenn	Diesel	unknown	145	T0	3,000	5%	99	594	6	1,076	8,753	1.1	14.1	3.0	0.93	0.22	0.21	2.11	26.00	5.60	1.72	0.41	0.40	0.20	2.42	0.52	0.16	0.04	0.04
80	Glenn	Diesel	unknown	200	T0	2,000	3%	66	396	6	1,076	12,073	1.1	14.1	3.0	0.93	0.15	0.15	2.91	35.87	7.73	2.37	0.38	0.37	0.27	3.34	0.72	0.22	0.04	0.03
81	Glenn	Diesel	unknown	200	T0	2,000	3%	66	396	6	1,076	12,073	1.1	14.1	3.0	0.93	0.15	0.15	2.91	35.87	7.73	2.37	0.38	0.37	0.27	3.34	0.72	0.22	0.04	0.03
83	Glenn	Diesel	unknown	75	T0	1,500	3%	50	297	6	1,076	4,527	1.1	14.1	3.0	0.93	0.3	0.29	1.09	13.45	2.90	0.89	0.29	0.28	0.10	1.25	0.27	0.08	0.03	0.03
165	Glenn	Diesel	unknown	160	T0	3,000	5%	99	594	6	1,076	9,658	1.1	14.1	3.0	0.93	0.22	0.21	2.33	28.69	6.18	1.90	0.45	0.44	0.22	2.67	0.57	0.18	0.04	0.04
185	Glenn	Diesel	unknown	150	T0	3,000	5%	99	594	6	1,076	9,054	1.1	14.1	3.0	0.93	0.22	0.21	2.18	26.90	5.80	1.78	0.42	0.41	0.20	2.50	0.54	0.17	0.04	0.04
187	Glenn	Diesel	unknown	200	T0	3,500	6%	116	693	6	1,076	12,073	1.1	14.1	3.0	0.93	0.15	0.15	2.91	35.87	7.73	2.37	0.38	0.37	0.27	3.34	0.72	0.22	0.04	0.03
15-3-22H-3	Colusa	Diesel	unknown	121	T0	630	1%	21	125	6	1,076	7,304	1.1	14.1	3.0	0.93	0.22	0.21	1.76	21.70	4.68	1.43	0.34	0.33	0.16	2.02	0.43	0.13	0.03	0.03
17-2-6B-1	Colusa	Electric	unknown	121	n/a	2,050	4%	68	406	6	1,076	n/a																		
322N	Colusa	Diesel	unknown	250	T0	2,000	3%	66	396	6	1,076	15,091	1.1	14.1	3.0	0.93	0.15	0.15	3.64	44.83	9.66	2.96	0.48	0.47	0.34	4.17	0.90	0.28	0.04	0.04
GRS-22H-1	Glenn	Electric	unknown	121	n/a	2,300	4%	76	456	6	1,076	n/a																	,	
GRS-34N-1	Glenn	Diesel	unknown	121	T0	1,500	3%	50	297	6	1,076	7,304	1.1	14.1	3.0	0.93	0.22	0.21	1.76	21.70	4.68	1.43	0.34	0.33	0.16	2.02	0.43	0.13	0.03	0.03
GRS-35A-2	Glenn	Electric	unknown	121	n/a	3,600	6%	119	713	6	1,076	n/a																	,	
GRS-84A-1	Glenn	Electric	unknown	121	n/a	3,000	5%	99	594	6	1,076	n/a																		
Haymen	Colusa	Diesel	unknown	121	T0	2,000	3%	66	396	6	1,076	7,304	1.1	14.1	3.0	0.93	0.22	0.21	1.76	21.70	4.68	1.43	0.34	0.33	0.16	2.02	0.43	0.13	0.03	0.03
LaCroix 1	Glenn	Electric	unknown	121	n/a	600	1%	20	119	6	1,076	n/a																		
LaCroix 2	Glenn	Electric	unknown	121	n/a	600	1%	20	119	6	1,076	n/a																	,	
LaCroix 3	Glenn	Electric	unknown	121	n/a	600	1%	20	119	6	1,076	n/a																		
Lagrande	Colusa	Diesel	unknown	121	T0	2,900	5%	96	575	6	1,076	7,304	1.1	14.1	3.0	0.93	0.22	0.21	1.76	21.70	4.68	1.43	0.34	0.33	0.16	2.02	0.43	0.13	0.03	0.03
Reister 1	Colusa	Electric	unknown	121	n/a	850	1%	28	168	6	1,076	n/a																	,	
Reister 2	Colusa	Electric	unknown	121	n/a	850	1%	28	168	6	1,076	n/a																	,	
Reister 3	Colusa	Electric	unknown	121	n/a	850	1%	28	168	6	1,076	n/a																	,	
Reister 4	Colusa	Electric	unknown	121	n/a	890	2%	29	176	6	1,076	n/a																	,	
S2-36T	Glenn	Electric	unknown	121	n/a	2,800	5%	92	555	6	1,076	n/a																		
Vann 1	Colusa	Diesel	unknown	121	T0	1,500	3%	50	297	6	1,076	7,304	1.1	14.1	3.0	0.93	0.22	0.21	1.76	21.70	4.68	1.43	0.34	0.33	0.16	2.02	0.43	0.13	0.03	0.03
Vann 2	Colusa	Electric	unknown	121	n/a	3,500	6%	116	693	6	1,076	n/a																	,	
-					Total	58,020	100%	1,916	11,495	162	30,127	139,438							33.60	414.25	89.26	27.39	5.63	5.50	3.12	38.53	8.30	2.55	0.52	0.51
				Total (Gler	nn County)	40,000	69%	1,321	7,925	98	18,291	95,132							22.92	282.62	60.90	18.69	3.80	3.71	2.13	26.28	5.66	1.74	0.35	0.34
				Total (Colus	sa County)	18,020	31%	595	3,570	64	11,836	44,306							10.67	131.63	28.36	8.70	1.84	1.79	0.99	12.24	2.64	0.81	0.17	0.17
				Total	(0 County)	0	0%	0	0	0	0	0							0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Key:

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year

gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides
PM10 = inhalable particulate matter
PM2.5 = fine particulate matter
SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

 Glenn
 Colusa

 PM10
 A
 A

 PM2.5
 A
 A

 O3
 A
 A

Engines not subject to ATCM if remotely-located.

Peak Month

1,916 AF/month 13,985 gallons/minute 24% peak pump rate

<u>Legend</u>

Engine power rating equal to average horsepower of all wells in GCID's well database

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Henle Family LP <u>Peak Pumping by Transfer Period</u>

Transfer Volume 350 acre-feet (Apr-Jun) 117 AF/month 350 acre-feet (Jul-Sep) 117 AF/month

700 acre-feet/year

Table E-25. Henle Family LP Summary of Engines by Fuel Type and Location

			<u> </u>	71	
County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	1	0	0	1
Total	0	1	0	0	1

Table E-26. Henle Family LP Criteria Pollutant Emissions

	Well Location			Power Rating	Emission		o Rate	Transfer			ations
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)
Well #2	Sutter	Electric	unknown	200	n/a	3,600	100%	117	700	6	1,056
					Total	3,600	100%	117	700	6	1,056
•				Total (Sutte	er County)	3 600	100%	117	700	6	1 056

Key:

AF = acre-feet CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year

gpm = gallons per minute hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

Sutter

PM10 A PM2.5 M O3 N

Engines subject to ATCM.

Peak Month

117 AF/month

7 gallons/minute

0% peak pump rate

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 bhp-hr =2,542.5 Btu 453.6 g 1 lb = 2,000 lbs 1 ton = 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Maxwell Irrigation District

Transfer Volume 1,000 acre-feet (Apr-Jun) 2,000 acre-feet (Jul-Sep)

Peak Pumping by Transfer Period

600 AF/month 760 AF/month

3,000 acre-feet/year

Table E-27. Maxwell Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	2	0	0	0	2
Total	2	0	0	0	2

Table E-28. Maxwell Irrigation District Criteria Pollutant Emissions

	Well											Fuel			Emissio	n Factors					Daily En	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pun	np Rate	Transfer '	Volume	Ope	rations	Consumption			(g/bl	hp-hr)					(pounds	per day)					(tons p	er year)		
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr)	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5
MainWell	Colusa	Diesel	2006	215	T3	3,800	50%	380	1,500	18	2,144	25,857	0.1	2.8	2.6	0.93	0.14925	0.15	1.24	23.55	21.69	7.72	1.24	1.24	0.08	1.44	1.33	0.47	0.08	0.08
TuttleWell	Colusa	Diesel	2006	215	T3	3,800	50%	380	1,500	18	2,144	25,857	0.1	2.8	2.6	0.93	0.14925	0.15	1.24	23.55	21.69	7.72	1.24	1.24	0.08	1.44	1.33	0.47	0.08	0.08
					Total	7,600	100%	760	3,000	35	4,288	51,715							2.48	47.10	43.38	15.44	2.48	2.48	0.15	2.88	2.65	0.94	0.15	0.15
				Total (Colus	sa County)	7,600	100%	760	3,000	35	4,288	51,715							2.48	47.10	43.38	15.44	2.48	2.48	0.15	2.88	2.65	0.94	0.15	0.15

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

Colusa PM10 Α

PM2.5 О3

Engines not subject to ATCM if remotely-located.

Peak Month

760 AF/month 5,548 gallons/minute 73% peak pump rate

Engine information assumed to be equivalent to Eastside MWC because it is the adjacent water district.

Emission factors based on NMHC+NOx standard

Conversion Factors

1 lb = 453.6 g 2,000 lbs 1 ton = 1 kW = 1.34 hp

1 day = 24 hours 1 month =31 days 60 minutes 1 hour =

1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Natomas Central Mutual Water Company Peak Pumping by Transfer Period
Transfer Volume 10,000 acre-feet (Apr-Jun) 3,333 AF/month
10,000 acre-feet (Jul-Sep) 3,333 AF/month
20,000 acre-feet/year

Table E-29. Natomas Central Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sacramento	2	13	0	1	16
Sutter	2	15	0	4	21
Total	4	28	0	5	37

Table E-30. Natomas Central Mutual Water Company Criteria Pollutant Emissions

	Well			The contract of the contract o								Fuel	(g/bh	ıp-hr) - dies		on Factors OC, NOx, an		propane			Daily Er	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Оре	erations	Consumption (gal/yr) - diesel	(II	b/MMBtu) -	SOx, PM1	0, and PM2	2.5 for pro	pane	<u> </u>	Г	(pounds	per day)	Τ	Г		Τ	(tons p	er year)	Ī	
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(qpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day	(hours/year)	(MMBtu/yr) - propane	voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.5
Ameral	Sacramento	Propane	unknown	200	n/a	1,500	2%	71	428	8	1,551	788	1.0	2.0	4.0	0.000588		37 0.009987		7.35	14.70	0.00	0.04	0.04	0.34	0.68	1.37	0.00	0.00	0.00
TNBC Atkinson	Sutter	Electric	unknown	125	n/a	1,800	3%	86	514	8	1,551	n/a																		
TNBC Bennett North	Sutter	Electric	unknown	125	n/a	2,200	3%	105	628	8	1,551	n/a																		
TNBC Betts	Sacramento	Electric	unknown	125	n/a	1,500	2%	71	428	8	1,551	n/a																		
Bianchi	Sutter	Propane	unknown	200	n/a	1,500	2%	71	428	8	1,551	788	1.0	2.0	4.0	0.000588	8 0.00998	0.009987	7 3.68	7.35	14.70	0.00	0.04	0.04	0.34	0.68	1.37	0.00	0.00	0.00
Dhaliwal	Sacramento	Electric	unknown	125	n/a	3,000	4%	143	857	8	1,551	n/a																		
Elkhorn	Sacramento	Electric	unknown	125	n/a	2,700	4%	128	771	8	1,551	n/a																		
TNBC Frazer	Sutter	Electric	unknown	125	n/a	2,000	3%	95	571	8	1,551	n/a																		
Greenbriar	Sacramento	Electric	unknown	150	n/a	3,200	5%	152	914	8	1,551	n/a																		
Kubo	Sacramento	Electric	unknown	25	n/a	1,300	2%	62	371	8	1,551	n/a																		
L-1	Sutter	Diesel	unknown	125	T0	1,600	2%	76	457	8	1,551	10,874	0.1	3.2	0.7	0.93	0.02	0.02	0.21	7.35	1.61	2.14	0.05	0.05	0.02	0.68	0.15	0.20	0.00	0.00
L-10	Sutter	Electric	unknown	30	n/a	1,000	1%	48	286	8	1,551	n/a																		
L-11	Sutter	Electric	unknown	50	n/a	1,500	2%	71	428	8	1,551	n/a																		
L-12	Sutter	Electric	unknown	50	n/a	1,500	2%	71	428	8	1,551	n/a																		
L-13 Bolen Pasture	Sutter	Propane	unknown	200	n/a	2,800	4%	133	799	8	1,551	788	1.0	2.0	4.0	0.000588	8 0.00998	0.009987	3.68	7.35	14.70	0.00	0.04	0.04	0.34	0.68	1.37	0.00	0.00	0.00
L-14 Chappell	Sutter	Electric	unknown	75	n/a	1,800	3%	86	514	8	1,551	n/a																		
L-2	Sutter	Electric	unknown	30	n/a	1,900	3%	90	542	8	1,551	n/a																		
L-3	Sutter	Electric	unknown	50	n/a	1,300	2%	62	371	8	1,551	n/a																		
L-4	Sutter	Electric	unknown	75	n/a	1,300	2%	62	371	8	1,551	n/a																		
L-6	Sutter	Electric	unknown	50	n/a	2,000	3%	95	571	8	1,551	n/a																		
L-7	Sutter	Electric	unknown	30	n/a	1,200	2%	57	343	8	1,551	n/a																		
L-8	Sutter	Electric	unknown	200	n/a	2,800	4%	133	799	8	1,551	n/a																		
L-9	Sutter	Electric	unknown	50	n/a	1,500	2%	71	428	8	1,551	n/a																		
Lauppe	Sutter	Propane	unknown	200	n/a	1,050	1%	50	300	8	1,551	788	1.0	2.0	4.0					7.35	14.70	0.00	0.04	0.04	0.34	0.68	1.37	0.00	0.00	0.00
L-MW	Sutter	Propane	unknown	200	n/a	1,800	3%	86	514	8	1,551	788	1.0	2.0	4.0					7.35	14.70	0.00	0.04	0.04	0.34	0.68	1.37	0.00	0.00	0.00
TNBC Lucich North	Sutter	Diesel	unknown	170	T0	2,500	4%	119	714	8	1,551	14,788	1.1	14.1	3.0	0.93	0.22	0.21	3.56	43.93	9.47	2.91	0.69	0.67	0.33	4.09	0.88	0.27	0.06	0.06
MAP	Sacramento	Electric	unknown	125	n/a	2,000	3%	95	571	8	1,551	n/a																		
TNBC Fisherman's Lake	Sacramento	Electric	unknown	125	n/a	1,500	2%	71	428	8	1,551	n/a																		
Ose-1	Sacramento	Diesel	2013	200	T4I	1,800	3%	86	514	8	1,551	17,398	0.003	1.7	0.03	0.93	0.01	0.01	0.01	6.25	0.11	3.42	0.04	0.04	0.00	0.58	0.01	0.32	0.00	0.00
Ose-2	Sacramento	Electric	unknown	150	n/a	2,400	3%	114	685	8	1,551	n/a																		
Perry	Sacramento	Electric	unknown	125	n/a	2,600	4%	124	742	8	1,551	n/a							<u> </u>											
Plant 3	Sacramento	Electric	unknown	150	n/a	2,500	4%	119	714	8	1,551	n/a							<u> </u>											
Pond R	Sacramento	Electric	unknown	50	n/a	2,300	3%	109	657	8	1,551	n/a							ļ											
TNBC Silva Dairy	Sacramento	Electric	unknown	125	n/a	1,000	1%	48	286	8	1,551	n/a																		
Souza	Sacramento	Electric	unknown	40	n/a	1,200	2%	57	343	8	1,551	n/a	1																	
Spangler	Sutter	Electric	unknown	80	n/a	2,500	4%	119	714	8	1,551	n/a			0.45	0.05		0.063				2.50	2.21			2.22				
Willey	Sacramento	Diesel	2012	148	T4I	-,	3%	95	571	8	1,551	12,874	0.01	2.6	0.10	0.93	0.003	0.003		7.07	0.27	2.53		0.01	0.00	0.66	0.03	0.24	0.00	0.00
			<u>_</u>	F-1-1 (O-		70,050	100%	3,333	20,000		57,371	59,876								101.36		11.00		0.97	2.06	9.43	7.90	1.02	0.09	0.09
				Total (Sacramen			46%	1,547	9,279		24,809	31,060							3.71	20.67		5.95		0.09	0.35	1.92	1.40	0.55	0.01	0.01
				Total (Sutt	ter County)	37,550	54%	1,787	10,721	175	32,562	28,815							18.47	80.69	69.89	5.05	0.90	0.89	1.72	7.50	6.50	0.47	0.08	0.08

AF = acre-feet Federal Attainment Status CO = carbon monoxide Sacramento Sutter g/bhp-hr = grams per brake-horsepower hour Α PM2.5 gal/yr = gallons per year gpm = gallons per minute Engines subject to ATCM. hp = horsepower NOx = nitrogen oxides PM10 = inhalable particulate matter Peak Month PM2.5 = fine particulate matter 3,333 AF/month 24,332 gallons/minute SOx = sulfur oxidesVOC = volatile organic compound 35% peak pump rate

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type
Engine-specific emission factors
Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008

Conversion Factors

2,542.5 Btu 1 bhp-hr = 1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 24 hours 1 day = 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Pelger Mutual Water Company
Transfer Volume 2,000 acre-feet (Apr-Ju

2,000 acre-feet (Apr-Jun) 2,670 acre-feet (Jul-Sep) Peak Pumping by Transfer Period 1,189 AF/month

1,017 AF/month

4,670 acre-feet/year

Table E-31. Pelger Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	1	3	0	0	4
Total	1	3	0	0	4

Table E-32. Pelger Mutual Water Company Criteria Pollutant Emissions

	Well											Fuel			Emission	n Factors					Daily En	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pumj	p Rate	Transfer	Volume	Oper	rations	Consumption			(g/bh	p-hr)					(pounds	per day)					(tons p	er year)		
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr)	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
PMWC#1	Sutter	Electric	unknown	150	n/a	4,800	25%	293	1,149	24	1,300	n/a																		
Well 1 Tucker	Sutter	Electric	unknown	75	n/a	3,100	25%	293	1,149	24	2,013	n/a																		
Well 2 Flopet	Sutter	Diesel	2,008	125	T3	2,300	17%	198	778	24	1,837	12,882	0.1	2.8	3.7	0.93	0.22	0.22	0.99	18.76	24.68	6.15	1.48	1.48	0.04	0.72	0.94	0.24	0.06	0.06
Well 3 Klein	Sutter	Electric	unknown	150	n/a	4,300	34%	406	1,594	24	2,013	n/a																		
					Total	14,500	100%	1,190	4,670	96	7,163	12,882							0.99	18.76	24.68	6.15	1.48	1.48	0.04	0.72	0.94	0.24	0.06	0.06
	•			Total (Sutte	er County)	14,500	100%	1,190	4,670	96	7,163	12,882							0.99	18.76	24.68	6.15	1.48	1.48	0.04	0.72	0.94	0.24	0.06	0.06

Key:

AF = acre-feet CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate

PM10 = inhalable particulate matter
PM2.5 = fine particulate matter
SOx = sulfur oxides

SOx = sulfur oxides
VOC = volatile organic compound

Federal Attainment Status

PM10 A PM2.5 M O3 N

Engines subject to ATCM.

Peak Month

1,189 AF/month 8,681 gallons/minute 60% peak pump rate

Legen

Emission factors based on NMHC+NOx standard

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Pelger Road 1700 LLC <u>Peak Pumping by Transfer Period</u>

Transfer Volume 2,600 acre-feet (Apr-Jun) 867 AF/month 2,600 acre-feet (Jul-Sep) 867 AF/month

5,200 acre-feet/year

Table E-33. Pelger Road 1700 LLC Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	6	0	0	6
Total	0	6	0	0	6

Table E-34. Pelger Road 1700 LLC Criteria Pollutant Emissions

	Well											Fuel
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Oper	ations	Consumption
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr)
North Well	Sutter	Electric	unknown	200	n/a	3,500	19%	162	973	8	1,510	n/a
North Well B	Sutter	Electric	unknown	200	n/a	3,000	16%	139	834	8	1,510	n/a
South Well	Sutter	Electric	unknown	200	n/a	3,000	16%	139	834	8	1,510	n/a
South Well B	Sutter	Electric	unknown	200	n/a	3,000	16%	139	834	8	1,510	n/a
Well #3	Sutter	Electric	unknown	200	n/a	3,100	17%	144	862	8	1,510	n/a
Well #4	Sutter	Electric	unknown	200	n/a	3,100	17%	144	862	8	1,510	n/a
					Total	18,700	100%	867	5,200	49	9,061	0
				Total (Sutte	er County)	18,700	100%	867	5,200	49	9,061	0

Note: All wells are electric; therefore, no local criteria pollutant emissions.

Key:

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter SOx = sulfur oxides

VOC = volatile organic compound

Peak Month

867 AF/month 6,326 gallons/minute 34% peak pump rate

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Transfer Volume Pleasant Grove-Verona Mutual Water Company 8,000 acre-feet (Apr-Jun)

Peak Pumping by Transfer Period 4,757 AF/month

7,000 acre-feet (Jul-Sep)

15,000 acre-feet/year

2,667 AF/month

Table E-35. Pleasant Grove-Verona Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	11	20	0	3	34
Total	11	20	0	3	34

Table E-36. Pleasant Grove-Verona Mutual Water Company Criteria Pollutant Emissions

	Well Location			Power Ratin	g Emission	Pum	np Rate	Transfer Vo	olume	Оре	erations	Fuel Consumption			el and VC		nd CO for p 2.5 for prop				Daily En						Annual E			
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month) (A	AF/year)	(hours/day) (hours/year)	(gal/yr) - diesel (MMBtu/yr) - propane	voc	NOx	co	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.
Kelly 190 Field Well #2	Sutter	Electric	unknown	30	n/a	2,100	3%	135	427	11	1,104	n/a		1000														1		
Kelly Windmill Field Well #2	Sutter	Electric	2002	62.1	n/a	2,000	3%	129	407	11	1,104	n/a																		(
Kelly Windmill North Field Well	Sutter	Propane	2014	133	T2	1,800	2%	116	366	11	1,104	373	1.0	2.0	4.0	5.88E-04	4 9.99E-03	9.99E-03	3.31	6.62	13.24	0.00	0.04	0.04	0.16	0.32	0.65	0.00	0.00	0.00
Kelly306	Sutter	Electric	unknown	60	n/a	3,500	5%	226	711	11	1,104	n/a							7 7 7 7		7									4
MLF Clubhouse B Well	Sutter	Electric	unknown	300	n/a	3,600	5%	232	732	11	1,104	n/a																1		(-
MLF Marsh Well	Sutter	Electric	unknown	300	n/a	3,200	4%	206	650	11	1,104	n/a			1	1				-										1
MLF Monster Well	Sutter	Electric	unknown	60	n/a	3,100	4%	200	630	11	1,104	n/a					-		7 = =			1								
MLF Well #1	Sutter	Electric	unknown	30	n/a	2,000	3%	129	407	11	1,104	n/a				1 5			5 1											
MLF Well #16	Sutter	Electric	unknown	50	n/a	1,700	2%	110	346	11	1,104	n/a								1.0	1									-
MLF Well#11	Sutter	Diesel	2004	250	T2	1,400	2%	90	285	11	1,104	15,482	0.2	4.7	2.6	0.93	0.15	0.15	1.53	29.12	16.26	5.79	0.93	0.93	0.07	1.42	0.79	0.28	0.05	0.08
MLF Well#12/17	Sutter	Electric	unknown	50	n/a	2,200	3%	142	447	11	1,104	n/a				100											$\overline{}$			
MLF Well#13	Sutter	Electric	2000	215	n/a	1,900	3%	122	386	11	1,104	n/a							-	7		7	-					1		-
MLF Well#2B	Sutter	Electric	2000	300	n/a	2,800	4%		569	11	1,104	n/a			1		1													
Nicholas 72-Acre Field North	Sutter	Electric	unknown	40	n/a	1,700	2%		346	11	1,104	n/a					1										$\overline{}$		\rightarrow	į
Nicholas 72-Acre Field South	Sutter	Diesel	2002	62.1	T1	2,000	3%		407	11	1,104	3,846	1.1	6.9	3.0	0.93	0.30	0.29	1.76	10.61	4.68	1.44	0.46	0.45	0.09	0.52	0.23	0.07	0.02	0.02
Nicholas BBC Well	Sutter	Electric	unknown	30	n/a	2,000	3%		407	11	1,104	n/a													1 7 7 7					7
Nicholas Filipino Camp South	Sutter	Diesel	2002	62.1	T1	800	1%	52	163	11	1,104	3,846	1.1	6.9	3.0	0.93	0.30	0.29	1.76	10.61	4.68	1.44	0.46	0.45	0.09	0.52	0.23	0.07	0.02	0.02
Nicholas Filipino Camp#2	Sutter	Electric	unknown	40	n/a	2,300	3%	148	467	11	1,104	n/a										-			11-12-11					
Nicholas Johnston Field Well #2	Sutter	Electric	unknown	40	n/a	2,000	3%	129	407	11	1,104	n/a																		
Nicholas Sand Field Well	Sutter	Diesel	2002	62.1	T2	2,000	3%	-	407	11	1,104	3,846	0.3	5.3	3.7	0.93	0.30	0.29	0.43	8.22	5.77	1.44	0.46	0.45	0.02	0.40	0.28	0.07	0.02	0.02
RiverRanch#19	Sutter	Diesel	2008	99	T3	2,500	3%		508	11	1,104	6,131	0.2	3.3	3.7	0.93	0.30	0.29	0.43	8.21	9.20	2.29	0.74	0.72	0.02	0.40		0.11	0.04	0.04
S&O#16	Sutter	Electric	2014	159	n/a	2,000	3%	129	407	11	1,104	n/a										TITE								
S&O#17	Sutter	Diesel	1999	101	TO	3,000	4%	193	610	11	1,104	6,255	1.1	14.1	3.0	0.93	0.22	0.21	2.87	35.35	7.62	2.34	0.55	0.54	0.14	1.73	0.37	0.11	0.03	0.03
S&O#18A	Sutter	Diesel	1999	101	TO	1,800	2%		366	11	1,104	6,255	1.1	14.1	3.0	0.93	0.22	0.21	2.87	35.35	7.62	2.34	0.55	0.54	0.14	1.73	0.37	0.11	0.03	0.03
S&O#19	Sutter	Diesel	2007	215	T3	1,800	2%		366	11	1,104	13,314	0.1	2.8	2.6	0.93	0.15	0.15	0.80	15.18	13.98	4.98	0.80	0.80	0.04	0.74	0.68	0.24	0.04	0.04
S&O#20	Sutter	Propane	2014	154	n/a	1,800	2%		366	11	1,104	432	1.0	2.0	4.0	5.88E-04	4 9.99E-03		3.83	7.67	15.33	0.00	0.04	0.04	0.19	0.37	0.75	0.00	0.00	0.00
Willey#1	Sutter	Diesel	2000	168	T1	3,000	4%	193	610	11	1,104	10,404	1.1	6.9	3.0	0.93	0.22	0.21	4.77	28.71	12.67	3.89	0.92	0.90	0.23	1.40	0.62	0.19	0.04	0.04
Willey#3	Sutter	Electric	unknown	75	n/a	1,800	2%	116	366	11	1,104	n/a																		
Willey#4	Sutter	Diesel	1974	150	TO	2,000	3%		407	11	1,104	9,289	1.1	14.1	3.0	0.93	0.22	0.21	4.26	52.51	11.31	3.47	0.82	0.80	0.21	2.57	0.55	0.17	0.04	0.04
Willey#5	Sutter	Propane	unknown	180	n/a	2,000	3%	129	407	11	1,104	505	1.0	2.0	4.0			9.99E-03		8.96	17.92	0.00	0.05	0.05	0.22			0.00		0.00
Will-Lee Well#31	Sutter	Electric	unknown	50	n/a	1,500	2%	97	305	11	1,104	n/a																		
Will-Lee Well#32	Sutter	Electric	unknown	300	n/a	2,500	3%	161	508	11	1,104	n/a			1															
Will-Lee Well#33	Sutter	Electric	unknown	75	n/a	2,500	3%		508	11	1,104	n/a				5- T					1	4 5	2-2-3							
Will-Lee Well#4A	Sutter	Diesel	2000	160	T1	1,500	2%		305	11	1,104	9,908	1.1	6.9	3.0	0.93	0.22	0.21	4.54	27.35	12.07	3.70	0.88	0.86	0.22	1.34	0.59	0.18	0.04	0.0
200,000 # 50 0000 \$100 35.50	1	700		4- 1102	Total		100%		15,000	384	37,530	89,883						1				33.12		7.58	1.84	13.90		1.62		0.37
				Total (Su	tter County)	73,800	100%		15,000	23732	37,530	89,883			Ť T				the state of the s		152.36	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		7.58			7.45			0.37

Key: AF = acre-feet CO = carbon monoxide g/bhp-hr = grams per brake-horsepower hour gal/yr = gallons per year gpm = gallons per minute hp = horsepower NOx = nitrogen oxides PM10 = inhalable particulate matter PM2.5 = fine particulate matter SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status Sutter PM2.5 03 Engines subject to ATCM. Peak Month 4,757 AF/month 34,722 gallons/minute 47% peak pump rate

Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008 Emission factors based on NMHC+NOx standard Emission factor from AP-42 because emission standards for pollutant not available for emissions tier Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 bhp-hr = 2,542.5 Btu 1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) 0.855 g/mL 7.13 lb/gal (Based on MSDS for Hess Diesel Fuel All Types)

Princeton-Codora-Glenn Irrigation District Peak Pumping by Transfer Period Agency Transfer Volume

2,500 acre-feet (Apr-Jun) 1,000 AF/month 4,100 acre-feet (Jul-Sep) 1,640 AF/month

6,600 acre-feet/year

Table E-37. Princeton-Codora-Glenn Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	2	1	0	0	3
Colusa	1	1	0	0	2
Total	3	2	0	0	5

Table E-38. Princeton-Codora-Glenn Irrigation District Criteria Pollutant Emissions

	Well											Fuel			Emission	Factors					Daily En	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Oper	ations	Consumption			(g/bh	p-hr)					(pounds	per day)					(tons p	er year)		
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr)	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
J. Southam	Colusa	Electric	unknown	200	n/a	4,000	24%	386	1,553	17	2,108	n/a]
Joel Mann	Glenn	Diesel	unknown	180	T0	3,500	21%	338	1,359	17	2,108	21,291	1.1	14.1	3.0	0.93	0.15	0.15	7.65	94.31	20.32	6.24	1.01	0.98	0.48	5.88	1.27	0.39	0.06	0.06
Jones Well	Glenn	Electric	2012	200	n/a	3,500	21%	338	1,359	17	2,108	n/a																		
M. Cota	Colusa	Diesel	unknown	180	T0	3,000	18%	289	1,165	17	2,108	21,291	1.1	14.1	3.0	0.93	0.15	0.15	7.65	94.31	20.32	6.24	1.01	0.98	0.48	5.88	1.27	0.39	0.06	0.06
Zoller A	Glenn	Diesel	unknown	180	T0	3,000	18%	289	1,165	17	2,108	21,291	1.1	14.1	3.0	0.93	0.15	0.15	7.65	94.31	20.32	6.24	1.01	0.98	0.48	5.88	1.27	0.39	0.06	0.06
					Total	17,000	100%	1,640	6,600	85	10,542	63,874							22.94	282.92	60.96	18.71	3.02	2.95	1.43	17.65	3.80	1.17	0.19	0.18
				Total (Glen	n County)	10,000	59%	965	3,882	51	6,325	42,583							15.30	188.61	40.64	12.47	2.01	1.96	0.95	11.77	2.54	0.78	0.13	0.12
	_	_		Total (Colus	sa County)	7,000	41%	675	2,718	34	4,217	21,291							7.65	94.31	20.32	6.24	1.01	0.98	0.48	5.88	1.27	0.39	0.06	0.06

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year

gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

Glenn Colusa PM10 PM2.5

Engines not subject to ATCM if remotely-located.

Peak Month

1,640 AF/month

11,971 gallons/minute

70% peak pump rate

Emission factors based on NMHC+NOx standard

Information on engine not available; therefore, engine assumed to be diesel as worst-case.

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Tier 4 Exhaust Emission Standards, Phase-In (100<=hp<=175, 2012-2014 model year)

Conversion Factors

453.6 g 1 lb =

1 ton = 2,000 lbs

1 kW = 1.34 hp

24 hours 1 day =

31 days 1 month =

60 minutes 1 hour = 1 acre-foot = 325,851 gallons

 $\underline{\text{http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf}$

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

10,000 acre-feet/year

Agency Provident Irrigation District

Transfer Volume 4,000 acre-feet (Apr-Jun) 6,000 acre-feet (Jul-Sep)

Peak Pumping by Transfer Period

1,333 AF/month 2,000 AF/month

Table E-39. Provident Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	13	3	0	0	16
Colusa	0	0	0	0	0
Total	13	3	0	0	16

Table E-40. Provident Irrigation District Criteria Pollutant Emissions

	Well											Fuel			Emission	Factors					Daily En	nissions					Annual E	missions		
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Ope	rations	Consumption			(g/bh	p-hr)					(pounds	per day)					(tons p	er year)		
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr)	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
Calvert	Glenn	Diesel	unknown	150	T0	3,000	6%	120	600	7	1,086	9,140	1.1	14.1	3.0	0.93	0.22	0.21	2.64	32.59	7.02	2.15	0.51	0.50	0.20	2.53	0.54	0.17	0.04	0.04
D. Alves	Glenn	Diesel	unknown	165	T0	3,000	6%	120	600	7	1,086	10,054	1.1	14.1	3.0	0.93	0.22	0.21	2.91	35.84	7.72	2.37	0.56	0.55	0.23	2.78	0.60	0.18	0.04	0.04
D. Kennedy	Glenn	Electric	unknown	120	n/a	3,000	6%	120	600	7	1,086	n/a																	<u> </u>	
E Weller	Glenn	Diesel	unknown	200	T0	2,500	5%	100	500	7	1,086	12,187	1.1	14.1	3.0	0.93	0.15	0.15	3.52	43.45	9.36	2.87	0.46	0.45	0.27	3.37	0.73	0.22	0.04	0.04
G. Clark #1	Glenn	Diesel	unknown	200	T0	3,000	6%	120	600	7	1,086	12,187	1.1	14.1	3.0	0.93	0.15	0.15	3.52	43.45	9.36	2.87	0.46	0.45	0.27	3.37	0.73	0.22	0.04	0.04
K Hansen#1	Glenn	Diesel	unknown	200	T0	2,600	5%	104	520	7	1,086	12,187	1.1	14.1	3.0	0.93	0.15	0.15	3.52	43.45	9.36	2.87	0.46	0.45	0.27	3.37	0.73	0.22	0.04	0.04
K Hansen#2	Glenn	Electric	unknown	120	n/a	3,500	7%	140	700	7	1,086	n/a																	<u> </u>	
L Hansen#1	Glenn	Diesel	unknown	200	T0	3,800	8%	152	760	7	1,086	12,187	1.1	14.1	3.0	0.93	0.15	0.15	3.52	43.45	9.36	2.87	0.46	0.45	0.27	3.37	0.73	0.22	0.04	0.04
L Hansen#2	Glenn	Diesel	unknown	200	T0	4,500	9%	180	900	7	1,086	12,187	1.1	14.1	3.0	0.93	0.15	0.15	3.52	43.45	9.36	2.87	0.46	0.45	0.27	3.37	0.73	0.22	0.04	0.04
M. Jones #1	Glenn	Diesel	unknown	275	T0	3,000	6%	120	600	7	1,086	16,757	1.1	14.1	3.0	0.93	0.15	0.15	4.84	59.74	12.87	3.95	0.64	0.62	0.38	4.63	1.00	0.31	0.05	0.05
M. Jones #2	Glenn	Diesel	unknown	250	T0	3,000	6%	120	600	7	1,086	15,234	1.1	14.1	3.0	0.93	0.15	0.15	4.40	54.31	11.70	3.59	0.58	0.57	0.34	4.21	0.91	0.28	0.04	0.04
Perez and Perez	Glenn	Diesel	unknown	200	T0	3,200	6%	128	640	7	1,086	12,187	1.1	14.1	3.0	0.93	0.15	0.15	3.52	43.45	9.36	2.87	0.46	0.45	0.27	3.37	0.73	0.22	0.04	0.04
S. Jones #1	Glenn	Diesel	unknown	170	T0	3,200	6%	128	640	7	1,086	10,359	1.1	14.1	3.0	0.93	0.22	0.21	3.00	36.93	7.96	2.44	0.58	0.56	0.23	2.86	0.62	0.19	0.04	0.04
S. Jones #2	Glenn	Diesel	unknown	170	T0	3,200	6%	128	640	7	1,086	10,359	1.1	14.1	3.0	0.93	0.22	0.21	3.00	36.93	7.96	2.44	0.58	0.56	0.23	2.86	0.62	0.19	0.04	0.04
Weller#4	Glenn	Electric	unknown	120	n/a	3,500	7%	140	700	7	1,086	n/a																		
Weller62V	Glenn	Diesel	unknown	200	T0	2,000	4%	80	400	7	1,086	12,187	1.1	14.1	3.0	0.93	0.15	0.15	3.52	43.45	9.36	2.87	0.46	0.45	0.27	3.37	0.73	0.22	0.04	0.04
					Total	50,000	100%	2,000	10,000	112	17,379	157,213							45.45	560.46	120.77	37.06	6.69	6.53	3.52	43.44	9.36	2.87	0.52	0.51
			· ·	Total (Glen	n County)	50,000	100%	2,000	10,000	112	17,379	157,213							45.45	560.46	120.77	37.06	6.69	6.53	3.52	43.44	9.36	2.87	0.52	0.51

Key: AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year gpm = gallons per minute hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter SOx = sulfur oxidesVOC = volatile organic compound Federal Attainment Status

Colusa PM10 PM2.5 О3

Engines not subject to ATCM if remotely-located.

Peak Month 2,000 AF/month 14,599 gallons/minute

29% peak pump rate

Information on engine not available; therefore, engine assumed to be diesel as worst-case. Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

453.6 g 1 lb =1 ton =2,000 lbs 1 kW = 1.34 hp 24 hours 1 day = 1 month = 31 days 60 minutes 1 hour = 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

(Based on MSDS for Hess Diesel Fuel All Types) 0.855 g/mL

Agency Reclamation District 108 Peak Pumping by Transfer Period

Transfer Volume 7,500 acre-feet (Apr-Jun) 2,500 AF/month

7,500 acre-feet (Jul-Sep) 2,500 AF/month

15,000 acre-feet/year

Table E-41. Reclamation District 108 Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	6	7	0	2	15
Yolo	1	3	0	1	5
Yuba	0	0	0	0	0
Total	7	10	0	3	20

Table E-42. Reclamation District 108 Criteria Pollutant Emissions

	Well											Fuel				n Factors					Daily Em	nissions					Annual E	missions		
																C, NOx, and														
	Location			Power Rating	Emission	Pur	np Rate	Transfer	Volume	Ope	rations	Consumption	(lb/	MMBtu) - S	Ox, PM10	0, and PM2.	.5 for prop	ane			(pounds	per day)					(tons pe	er year)		
												(gal/yr) - diesel																		1
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)) (AF/month)	(AF/year)	(hours/day)	(hours/year)	(MMBtu/yr) - propane	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
Field 1	Colusa	Propane	unknown	105	n/a	3,420	6%	152	912	8	1,448	387	1.0	2.0	4.0	5.88E-04	9.99E-03	9.99E-03	1.80	3.60	7.21	0.00	0.02	0.02	0.17	0.34	0.67	0.00	0.00	0.00
Field 100H	Colusa	Diesel	unknown	250	T0	2,385	4%	106	636	8	1,448	20,306	1.1	14.1	3.0	0.93	0.15	0.15	4.89	60.33	13.00	3.99	0.64	0.63	0.46	5.61	1.21	0.37	0.06	0.06
Field 100L1 East	Colusa	Electric	unknown	125	n/a	1,950	3%	87	520	8	1,448	n/a																		1
Field 100L1 West	Colusa	Diesel	unknown	400	T0	2,500	4%	111	666	8	1,448	32,490	1.1	14.1	3.0	0.93	0.15	0.15	7.83	96.52	20.80	6.38	1.03	1.00	0.73	8.98	1.93	0.59	0.10	0.09
Field 100M	Colusa	Diesel	unknown	240	T0	2,200	4%	98	587	8	1,448	19,494	1.1	14.1	3.0	0.93	0.15	0.15	4.70	57.91	12.48	3.83	0.62	0.60	0.44	5.39	1.16	0.36	0.06	0.06
Field 107F	Colusa	Electric	unknown	200	n/a	3,195	6%	142	852	8	1,448	n/a																		
Field 125A	Colusa	Propane	unknown	200	n/a	2,800	5%	124	746	8	1,448	736	1.0	2.0	4.0	5.88E-04	9.99E-03	9.99E-03	3.43	6.86	13.73	0.00	0.04	0.04	0.32	0.64	1.28	0.00	0.00	0.00
Field 4	Colusa	Electric	unknown	200	n/a	3,150	6%	140	840	8	1,448	n/a																		1
Field 53E	Yolo	Propane	unknown	250	n/a	2,295	4%	102	612	8	1,448	920	1.0	2.0	4.0	5.88E-04	9.99E-03	9.99E-03	4.29	8.58	17.16	0.00	0.05	0.05	0.40	0.80	1.60	0.00	0.00	0.00
Field 65E	Yolo	Diesel	unknown	250	T0	3,195	6%	142	852	8	1,448	20,306	1.1	14.1	3.0	0.93	0.15	0.15	4.89	60.33	13.00	3.99	0.64	0.63	0.46	5.61	1.21	0.37	0.06	0.06
Field 66C	Yolo	Electric	unknown	150	n/a	1,620	3%	72	432	8	1,448	n/a																		
Field 81D	Colusa	Diesel	unknown	400	T0	4,250	8%	189	1,133	8	1,448	32,490	1.1	14.1	3.0	0.93	0.15	0.15	7.83	96.52	20.80	6.38	1.03	1.00	0.73	8.98	1.93	0.59	0.10	0.09
Field 81E	Colusa	Diesel	unknown	400	T0	4,250	8%	189	1,133	8	1,448	32,490	1.1	14.1	3.0	0.93	0.15	0.15	7.83	96.52	20.80	6.38	1.03	1.00	0.73	8.98	1.93	0.59	0.10	0.09
Field 90B	Colusa	Electric	unknown	125	n/a	2,295	4%	102	612	8	1,448	n/a																		
Field 92C	Colusa	Diesel	unknown	250	T0	1,440	3%	64	384	8	1,448	20,306	1.1	14.1	3.0	0.93	0.15	0.15	4.89	60.33	13.00	3.99	0.64	0.63	0.46	5.61	1.21	0.37	0.06	0.06
Well#1 Heidrick	Colusa	Electric	unknown	100	n/a	2,550	5%	113	680	8	1,448	n/a																		
Well #4 Huff	Colusa	Electric	unknown	250	n/a	1,250	2%	56	333	8	1,448	n/a																		ĺ
Well #5 RiggsRanch	Colusa	Electric	unknown	150	n/a	4,950	9%	220	1,320	8	1,448	n/a																		
Well #6 CountyLine	Yolo	Electric	unknown	250	n/a	3,375	6%	150	900	8	1,448	n/a																		1
Well#7 Tract 6	Yolo	Electric	unknown	250	n/a	3,195	6%	142	852	8	1,448	n/a																		1
			-	-	Total	56,265	100%	2,500	15,000	156	28,957	179,926							52.38	547.51	151.97	34.95	5.75	5.61	4.87	50.92	14.13	3.25	0.53	0.52
				Total (Colu	sa County)	42,585	76%	1,892	11,353	117	21,718	158,700							43.20	478.60	121.81	30.96	5.05	4.93	4.02	44.51	11.33	2.88	0.47	0.46
				Total (Yo	lo County)	13,680	24%	608	3,647	39	7,239	21,227							9.18	68.91	30.16	3.99	0.69	0.68	0.85	6.41	2.80	0.37	0.06	0.06
				Total (Yul	ba County)	0	0%	0	0	0	0	0	1			1			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

AF = acre-feet <u>Federal Attainment Status</u>

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year

gpm = gallons per minute

hp = horsepower

Colusa
Yolo
Yuba

PM10
A
A
A
N

FM2.5
A
N

FM3.5
A
N
FM3.5
A
N
FM4.5
A
N
FM5.5
A
N
FM5.5
A
N
FM6.5
A
N
FM7.5
A
N
FM8.5
A
N
FM8.5
A
N
FM8.5
A
N
FM8.5
A
N
FM9.5
A

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Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008

Conversion Factors

1 bhp-hr = 2,542.5 Btu
1 lb = 453.6 g
1 ton = 2,000 lbs
1 kW = 1.34 hp
1 day = 24 hours
1 month = 31 days
1 hour = 60 minutes
1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

<u>Diesel Engine Fuel Consumption</u>

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Reclamation District 1004 <u>Peak Pumping by Transfer Period</u>
Transfer Volume 0 acre-feet (Apr-Jun) 0 AF/month
7,175 acre-feet (Jul-Sep) 2,733 AF/month
7,175 acre-feet/year

Table E-43. Reclamation District 1004 Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	1	7	0	0	8
Colusa	17	5	0	0	22
Sutter	0	0	0	0	0
Total	18	12	0	0	30

Table E-44. Reclamation District 1004 Criteria Pollutant Emissions

	Well Location Power Rating Emission Pump Rate Transfer Volume Operati							Fuel			Emission	Factors					Daily En	nissions					Annual E	missions						
	Location			Power Rating	Emission	Pum		Transfer \				Consumption			(g/bh	. ,					(pounds	per day)					(tons p			
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)		(hours/day	(hours/year)	(gal/yr)	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
Barale Well	Colusa	Diesel	TBD	225	T0	4,000	4%	108	285	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Behring Ranch 10 Field Well No. 496441	Colusa	Diesel	2,008	225	T3	5,800	6%	157	413	5	387	4,880	0.1	2.8	2.6	0.93	0.15	0.15	0.35	6.68	6.15	2.19	0.35	0.35	0.01	0.27	0.25	0.09	0.01	0.01
Behring Ranch Club House Well No.496461	Colusa	Electric	unknown	125	n/a	3,400	3%	92	242	5	387	n/a																/		
Behring Ranch Nursery Well No. 17N1W10H1	Colusa	Diesel	TBD	225	T0	1,000	1%	27	71	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Behring Ranch Pearl Well No. 20094	Colusa	Diesel	TBD	225	T0	2,500	2%	68	178	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Behring Ranch Well	Colusa	Electric	unknown	125	n/a	4,000	4%	108	285	5	387	n/a																		
Behring Ranch West Well No.97863	Colusa	Electric	unknown	125	n/a	2,300	2%	62	164	5	387	n/a																		
Claudia Charter	Colusa	Diesel	unknown	225	T0	2,500	2%	68	178	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Dan Charter Well#1	Colusa	Diesel	unknown	225	T0	2,500	2%	68	178	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Dan Charter Well#2	Colusa	Diesel	unknown	225	T0	2,500	2%	68	178	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Drumheller Well No.7	Colusa	Diesel	TBD	225	T0	4,000	4%	108	285	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
East Morgan Well #1 No. 374667 17N01W14N001M	Colusa	Diesel	TBD	225	T0	2,600	3%	71	185	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
East Morgan Well#2 No. 498195 17N01W15Q001M	Colusa	Diesel	TBD	225	T0	1,300	1%	35	93	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Gardener No. 374672	Colusa	Diesel	2,008	215	T3	3,500	3%	95	249	5	387	4,663	0.1	2.8	2.6	0.93	0.15	0.15	0.34	6.39	5.88	2.09	0.34	0.34	0.01	0.26	0.24	0.09	0.01	0.01
Gardener No. 498178	Colusa	Diesel	2,009	215	T3	3,500	3%	95	249	5	387	4,663	0.1	2.8	2.6	0.93	0.15	0.15	0.34	6.39	5.88	2.09	0.34	0.34	0.01	0.26	0.24	0.09	0.01	0.01
Glenn East	Glenn	Electric	unknown	300	n/a	4,500	4%	122	320	5	387	n/a																<u> </u>		
Glenn West	Glenn	Electric	unknown	300	n/a	4,500	4%	122	320	5	387	n/a																		
GVL Well#1	Colusa	Diesel	unknown	225	T0	2,500	2%	68	178	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
GVL Well#2	Colusa	Diesel	unknown	225	T0	2,500	2%	68	178	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Hall Well No. X	Glenn	Electric	TBD	125	n/a	4,500	4%	122	320	5	387	n/a																<u> </u>		
Hall Well No.369428	Glenn	Electric	2,011	125	n/a	4,500	4%	122	320	5	387	n/a																		
Mohammad No.e0084085 17N01W02D001M	Colusa	Electric	TBD	125	n/a	4,500	4%	122	320	5	387	n/a																<u> </u>		
Myers Well #1 No.3457	Glenn	Electric	2,006	40	n/a	2,200	2%	60	157	5	387	n/a																		
Myers Well #2 No. 340884	Glenn	Electric	1,982	100	n/a	4,100	4%	111	292	5	387	n/a																		
Rancho Caleta No. 726883	Colusa	Diesel	2,004	170	T2	4,500	4%	122	320	5	387	3,687	0.2	4.7	3.7	0.93	0.22	0.22	0.44	8.33	6.64	1.66	0.40	0.40	0.02	0.34	0.27	0.07	0.02	0.02
Sikes & Parachini Well #1 WS No.93124	Colusa	Diesel	2,006	173	T2	4,000	4%	108	285	5	387	3,752	0.2	4.7	3.7	0.93	0.22	0.22	0.45	8.48	6.76	1.68	0.41	0.41	0.02	0.34	0.28	0.07	0.02	0.02
Sikes & Parachini Well #2 WS No. 374682	Colusa	Diesel	2,008	150	T3	4,000	4%	108	285	5	387	3,253	0.1	2.8	3.7	0.93	0.22	0.22	0.23	4.45	5.86	1.46	0.35	0.35	0.01	0.18	0.24	0.06	0.01	0.01
Southam Sartain Well 18N01W26D001M	Glenn	Diesel	TBD	225	T0	4,800	5%	130	342	5	387	4,880	1.1	14.1	3.0	0.93	0.15	0.15	2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
Stone Well #6 No.11334	Colusa	Electric	2,006	40	n/a	1,800	2%	49	128	5	387	n/a																		
Wilder Farms Well	Glenn	Electric	unknown	125	n/a	2,500	2%	68	178	5	387	n/a																		
					Total	100,800	100%	2,733	7,175	143	11,597	83,452							34	438	123	37	6	6	1	18	5	2	0	0
				Total (Gler	,	31,600	31%	857	2,249	38	3,093	4,880							2.69	33.13	7.14	2.19	0.35	0.34	0.11	1.35	0.29	0.09	0.01	0.01
				Total (Colu	sa County)	69,200	69%	1,876	4,926	105	8,505	78,572							31.70	405.20	115.72	35.28	6.07	5.97	1.29	16.49	4.71	1.44	0.25	0.24

AF = acre-feet
CO = carbon monoxide
g/bhp-hr = grams per brake-horsepower hour
gal/yr = gallons per year
gpm = gallons per minute
hp = horsepower
NOx = nitrogen oxides
PM10 = inhalable particulate matter
PM2.5 = fine particulate matter
SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status
Glenn Colusa Sutter
PM10 A A A
PM2.5 A A M
O3 A A A
Engines subject to ATCM.

Peak Month
2,733 AF/month
19,952 gallons/minute
20% peak pump rate

<u>Legend</u>

Engine power rating not provided; assumed to be equal to maximum horsepower for all engines operating at the water agency with the same fuel type Emission factors based on NMHC+NOx standard

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes

1 acre-foot = 325,851 gallons http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)
7.13 lb/gal

E-23- February 2022

Agency River Garden Farms Peak Pumping by Transfer Period

Transfer Volume 5,000 acre-feet (Apr-Jun) 3,000 AF/month 1,905 AF/month 5,000 acre-feet (Jul-Sep)

10,000 acre-feet/year

Table E-45. River Garden Farms Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Yolo	0	10	0	0	10
Total	0	10	0	0	10

Table E-46. River Garden Farms Criteria Pollutant Emissions

	Well Location			Power Rating	Emission	Pum	o Rate	Transfer	Volume	Oper	ations
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)
F-1	Yolo	Electric	unknown	150	n/a	3,400	11%	344	1,147	18	1,832
Field 104 PW	Yolo	Electric	2008	200	n/a	2,800	9%	283	945	18	1,832
Field 104-09 PW	Yolo	Electric	2009	200	n/a	3,276	11%	332	1,105	18	1,832
Field 117 PW	Yolo	Electric	2009	200	n/a	2,800	9%	283	945	18	1,832
Field 65 PW	Yolo	Electric	2008	200	n/a	3,200	11%	324	1,080	18	1,832
Field 71 PW	Yolo	Electric	2001	200	n/a	2,200	7%	223	742	18	1,832
Field 91-09 PW	Yolo	Electric	2009	200	n/a	3,300	11%	334	1,113	18	1,832
Field 93 PW	Yolo	Electric	unknown	200	n/a	2,200	7%	223	742	18	1,832
Field 98 PW	Yolo	Electric	1963	200	n/a	3,177	11%	322	1,072	18	1,832
Shop PW	Yolo	Electric	2009	200	n/a	3,287	11%	333	1,109	18	1,832
					Total	29,640	100%	3,000	10,000	177	18,323
				Total (Yo	lo County)	29,640	100%	3,000	10,000	177	18,323

Note: All wells are electric; therefore, no local criteria pollutant emissions.

Key:

Federal Attainment Status AF = acre-feet Yolo CO = carbon monoxide PM10 g/bhp-hr = grams per brake-horsepower hour Α PM2.5 Ν gal/yr = gallons per year gpm = gallons per minute О3 Ν Engines subject to ATCM. hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

Peak Month 3,000 AF/month PM2.5 = fine particulate matter 21,899 gallons/minute SOx = sulfur oxides VOC = volatile organic compound 74% peak pump rate

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

(Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) 0.4 lb/hp-hr

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Roberts Ditch Irrigation Company
Transfer Volume 2,214 acre-feet (Apr-Jun)

2,214 acre-feet (Apr-Jun) 1,886 acre-feet (Jul-Sep) Peak Pumping by Transfer Period

738 AF/month 629 AF/month

4,100 acre-feet/year

Table E-47. Roberts Ditch Irrigation Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	7	0	1	8
Total	0	7	0	1	8

Table E-48. Roberts Ditch Irrigation Company Criteria Pollutant Emissions

	Well			Power Ratin	g Emission	Pum	p Rate	Transfer	Volume	Opera	ations	Fuel Consumption		-hr) - diese MMBtu) - \$	and VO						Daily En						Annual E			
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total) (AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr) - diesel (MMBtu/yr) - propane	voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.
Andreotti	Colusa	Propane	unknown	200	n/a	2,200	11%	80	447	6	1,102	561	1.0	2.0	4.0	5.88E-04	9.99E-03	9.99E-03	2.82	5.64	11.29	0.00	0.03	0.03	0.24	0.49	0.97	0.00	0.00	0.00
Ash	Colusa	Electric	unknown	250	n/a	1,500	7%	55	304	6	1,102	n/a				11.														
Hickel	Colusa	Electric	unknown	250	n/a	1,300	6%	47	264	6	1,102	n/a													-				3	
Stegals	Colusa	Electric	unknown	250	n/a	1,800	9%	66	365	6	1,102	n/a															_			
Well #1	Colusa	Electric	unknown	350	n/a	4,500	22%	164	913	6	1,102	n/a	-															-		
Well #2	Colusa	Electric	unknown	350	n/a	4,500	22%	164	913	6	1,102	n/a																	3	
Yearxa North	Colusa	Electric	unknown	250	n/a	2,200	11%	80	447	6	1,102	n/a						V												-
Yearxa South	Colusa	Electric	unknown	250	n/a	2,200	11%	80	447	6	1,102	n/a									74.3									
					Total	20,200	100%	738	4,100	51	8,818	561							2.82	5.64	11.29	0.00	0.03	0.03	0.24	0.49	0.97	0.00	0.00	0.00
				Total (Colu	usa County)	20,200	100%	738	4,100	51	8,818	561			7				2.82	5.64	11.29	0.00	0.03	0.03	0.24	0.49	0.97	0.00	0.00	0.00

Key:

AF = acre-feet
CO = carbon monoxide
g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year gpm = gallons per minute hp = horsepower

NOx = nitrogen oxides
PM10 = inhalable particulate matter
PM2.5 = fine particulate matter

SOx = sulfur oxides
VOC = volatile organic compound

Federal Attainment Status

Colusa

PM10 A A A

PM2.5 A A M

O3 A A N

Engines subject to ATCM.

Peak Month
738 AF/month
5,387 gallons/minute

27% peak pump rate

Legend

Engin

Engine power rating not provided; assumed to be equal to maximum horsepower for all engines operating at the water agency with the same fuel type Emission factors based on NMHC+NOx standard

Conversion Factors

1 bhp-hr = 2,542.5 Btu
1 lb = 453.6 g
1 ton = 2,000 lbs
1 kW = 1.34 hp
1 day = 24 hours
1 month = 31 days
1 hour = 60 minutes
1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Sutter Mutual Water Company Peak Pumping by Transfer Period
Transfer Volume 8,000 acre-feet (Apr-Jun) 3,200 AF/month
10,000 acre-feet (Jul-Sep) 4,000 AF/month
18,000 acre-feet/year

Table E-47. Sutter Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	27	10	0	7	44
Colusa	1	0	0	0	1
Total	28	10	0	7	45

Table E-48. Sutter Mutual Water Company Criteria Pollutant Emission	S
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Table L-40. Outlet Mutual	Well		lia i Ollutant	Power Rating	Emission	Pum	p Rate	Transfer	Volume	One	erations	Fuel Consumption				n Factors hp-hr)					Daily En							missions er year)		
	Location			Fower Kating	Emission	Fun	nate	Halisiei	Volume	Ope	lations	(gal/yr) - diesel	+	f:	1 (g/b)	T T	1				(pounds	per day)	1		-		(tons p	si year j		fi -
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month	(AF/year)	(hours/day	(hours/year)	(MMBtu/yr) - propane	voc	NOX	co	sox	PM10	PM2.5	voc	NOx	co	sox	PM10	PM2.5	voc	NOx	co	sox	PM10	PM2.5
Ag Industries - Sioux Creek	Sutter	Diesel	unknown	350	TO	2,800	2%	79	354	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.25	0.04	0.04
Ag Industries - Sutter Basin	Sutter	Diesel	unknown	350	TO	3,000	2%	84	379	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.25	0.04	0.04
BD-1	Sutter	Diesel	unknown	225	ТО	2,500	2%	70	316	5	686	8,665	1.1	14.1	3.0	0.93	0.15	0.15	2.78	34.32	7.40	2.27	0.37	0.36	0.19	2.39	0.52	0.16	0.03	0.02
BD-2	Sutter	Diesel	unknown	225	TO	4,000	3%	112	506	5	686	8,665	1.1	14.1	3.0	0.93	0.15	0.15	2.78	34.32	7.40	2.27	0.37	0.36	0.19	2.39	0.52	0.16	0.03	0.02
BD-3	Sutter	Propane	unknown	250	n/a	3,000	2%	84	379	5	686	436	1.0	2.0	4.0		9.99E-03		2.71	5.42	10.85	0.00	0.03	0.03	0.19	0.38	0.76	0.00	0.00	0.00
DB-1	Sutter	Diesel	unknown	350	TO	4,500	3%	126	569	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.25		0.04
Driver	Colusa	Diesel	unknown	350	TO	2,500	2%	70	316	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39		3.53	0.57	0.56	0.30	3.72	0.80	0.25	0.04	0.04
F4N	Sutter	Diesel	unknown	290	TO	3,500	2%	98	442	5	686	11,169	1.1	14.1	3.0	0.93	0.15	0.15	3.59	44.24		2.93	0.47	0.46	0.25	3.09	0.66	0.20	0.03	0.03
FG	Sutter	Propane	unknown	250	n/a	1,500	1%	42	190	5	686	436	1.0	2.0	1 1 2 2 2 2 2 2		9.99E-03	of annual backets around	2.71	5.42	10.85	0.00	0.03	0.03	0.19	0.38	0.76	0.00	0.00	0.00
FT5	Sutter	Diesel	unknown	450	TO	5,200	4%	146	657	5	686	17,331	1.1	14.1	3.0	0.93	0.15		5.57		14.79		0.73	0.71	0.39	4.79	1.03	0.32		0.05
G-16	Sutter	Electric	unknown	250	n/a	4,200	3%	118	531	5	686	n/a	7.3		0.0	0.00	0.,0	0.10	0.01	00.00	7 1.7 0	1.0	0.10	1	0.00	1	1.00	0.02	0.00	0.00
G-2	Sutter	Propane	unknown	125	n/a	3,500	2%	98	442	5	686	218	10	2.0	40	5.88F-04	9.99E-03	9 99F-03	1.36	2.71	5.42	0.00	0.02	0.02	0.09	0.19	0.38	0.00	0.00	0.00
H-1	Sutter	Electric	unknown	150	n/a	2,600	2%	73	329	5	686	n/a	1.0	2.0	7.0	0.002, 04	7 0.00L 00	0.002.00	1.00	4,0	0.42	0.00	0.02	0.02	0.00	0.10	0.00	0.00	0.00	0.00
Hoppin	Sutter	Electric	unknown	250	n/a	2,500	2%	70	316	5	686	n/a	1				1													
L&N Farms	Sutter	Diesel	unknown	170	T2	5,000	4%	140	632	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12	0.03	0.03
L1-1	Sutter	Diesel	unknown	350	TO	4,000	3%	112	506	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.12	0.04	0.04
L1-2	Sutter	Diesel	unknown	350	TO	5,000	4%	140	632	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.25	0.04	0.04
L2-1	Sutter	Diesel	unknown	350	TO	5,500	4%	154	695	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.25	0.04	0.04
LM-11	Sutter	Electric	unknown	150	n/a	3,100	2%	87	392	5	686	n/a	10,10	13341	0,0	0.00	0.10	0,10	4,00	00.00	11.01	0.00	0.07	0.00	0.00	0.72	0.00	0.20	0.04	0.04
LM-53	Sutter	Electric	unknown	150	n/a	4,000	3%	112	506	5	686	n/a				-	1	-				-	1			+				-
Matteoli	Sutter	Diesel	unknown	170	T2	2,500	2%	70	316	5	686	6.547	0.2	17	3.7	0.93	0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12	0.03	0.03
MB-1	Sutter	Propane	unknown	268	n/a	5,300	4%	149	670	5	686	468	1.0	2.0	4.0	77.7.7	9.99E-03		2.91	5.81	11.63	0.00	0.03	0.03	0.20	0.41	0.40	0.00	0.00	0.00
ME-1	Sutter	Diesel	unknown	350	TO	1,300	1%	37	164	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.0015	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.25	0.04	0.04
QHR	Sutter	Propane	unknown	250	n/a	5,200	4%	146	657	5	686	436	1.0	2.0	250000		9.99E-03	0.10	2.71	5.42	10.85	0.00	0.03	0.03	0.19	0.38	0.76	0.00	0.00	0.00
R-24	Sutter	Diesel	unknown	350	TO	2,500	2%	70	316	5	686	13,479	1.1	14.1	3.0	0.93	0.15	0.15	4.33	53.39		3.53	0.03	0.03	0.19	3.72	0.80	0.25	0.04	0.04
R-29	Sutter	Diesel	unknown	150	TO	2,500	2%	70	316	5	686	5,777	111	14.1	3.0	0.93	1	0.13	1.86	22.88		1.51	0.36	0.35	0.30	1.60	0.34	0.23		0.04
S-18	Sutter	Electric	unknown	100	n/a	2,700	2%	76	341	5	686	5,777 n/a	L Let	14.1	3,0	0.93	0.22	0,21	1.00	22.00	4.93	1.51	0.30	0.33	0.13	1,00	0.54	0.11	0.02	0.02
TVN					_	3,000	¥			5																				
VR-57	Sutter	Electric	unknown	75 450	n/a	5,500	2% 4%	84	379	5	686	n/a 17,331	11	14.1	2.0	0.93	0.15	0.15	5.57	68.65	14,79	151	0.72	0.71	0.39	1.70	1.02	0.32	0.05	0.05
Well #1	Sutter	Diesel	unknown	250	TO TO	2,500		154	695 316	5	686 686		1.1	14.1	3.0	0.95	0.15	0.15	5.57	00.00	14.79	4.54	0.73	0.71	0.39	4.79	1.03	0.32	0.05	0.05
Well #10	Sutter Sutter	Electric Diesel	unknown	170	n/a	2,500	2% 2%	70 70	316	5	686	n/a 6,547	0.2	17	0.7	0.93	0.22	0.00	0.45	8,63	6.88	4 74	0.44	0.41	0.03	0.60	0.48	0.12	0.00	0.00
		The Control of the Co	unknown	170	T2	2,500			316	5		6,547	-	4.7	3.7	0.93		0.22				1.71	0.41						0.03	0.03
Well #11	Sutter	Diesel	unknown	170	T2		2%	70			686 686	6,547	0.2				0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12	0.03	0.03
Well #12 Well #13	Sutter Sutter	Diesel Diesel	unknown	170	T2	2,500 2,500	2% 2%	70 70	316 316	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45 0.45	8.63 8.63	6.88 6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12 0.12	0.03	0.03
		1 10 10 10 10 10	unknown	170	T2					5		6,547		4.7		3.31		0.22		707100		1.71	0.41							0.03
Well #14	Sutter	Diesel	unknown		T2	2,500	2%	70	316	- C	686		0.2	4.7	3.7	0.93	0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12		0.03
Well #15	Sutter	Diesel	unknown	170	T2	2,500	2%	70	316	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45	0.03	6.88	1./1	0.41	0.41	0.03	0.00	0.48	0.12	0.03	0.03
Well #16	Sutter	Diesel	unknown	170	T2	2,500	2%	70	316	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45	0.03	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12	0.03	0.03
Well #2	Sutter	Electric	unknown	150	n/a	2,500	2%	70	316	5	686	n/a				-								-	-				-	-
Well #3	Sutter	Electric	unknown	150	n/a	2,500	2%	70	316	5	686	n/a	* 0	20	4.0	E OOF O	0.005.00	0.005.00	4.00	2.00	C E A	0.00	0.00	0.00	044	0.00	O AE	0.00	0.00	0.00
Well #4	Sutter	Propane	unknown	150	n/a	2,500	2%	70	316	5	686	262	1.0	2.0	4.0		9.99E-03		1.63	3.25	6.51	0.00	0.02	0.02	0.11	0.23	0.45	0.00	0.00	0.00
Well #5	Sutter	Propane	unknown	180	n/a	2,500	2%	70	316	5	686	314	1.0	2.0	4.0		9.99E-03		1.95	3.91	7.81	0.00	0.02	0.02	0.14	0.27	0.54	0.00	0.00	0.00
Well #6	Sutter	Diesel	unknown	170	T2	2,500	2%	70	316	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12		0.03
Well #7	Sutter	Diesel	unknown	170	T2	2,500	2%	70	316	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12	0.03	0.03
Well #8	Sutter	Diesel	unknown	170	T2	2,500	2%	70	316	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12		0.03
Well #9	Sutter	Diesel	unknown	170	T2	2,500	2%	70	316	5	686	6,547	0.2	4.7	3.7	0.93	0.22	0.22	0.45	8.63	6.88	1.71	0.41	0.41	0.03	0.60	0.48	0.12	0.03	0.03
				# 1 TYE - 2	Total		100%	4,000	18,000	221	30,892	277,935							83.00	897.75					5.79	62.62	22.03	5.03		0.94
					ter County)		98%	3,930	17,684	217	30,205	264,455							78.67		304.27		13.14		5.49	58.89	21.22	4.79	0.92	0.90
				Total (Colu	isa County)	2,500	2%	70	316	5	686	13,479						1	4.33	53.39	11.51	3.53	0.57	0.56	0.30	3.72	0.80	0.25	0.04	0.04

AF = acre-feet CO = carbon monoxide Federal Attainment Status g/bhp-hr = grams per brake-horsepower hour Sutter Colusa gal/yr = gallons per year PM2.5 gpm = gallons per minute 03 hp = horsepower NOx = nitrogen oxides Engines subject to ATCM. PM10 = inhalable particulate matter Peak Month 4,000 AF/month PM2.5 = fine particulate matter SOx = sulfur oxides 29,198 gallons/minute VOC = volatile organic compound 21% peak pump rate

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type
Tier 4 Exhaust Emission Standards, Phase-In (100<=hp<=175, 2012-2014 model year)
Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008
Engine tier adjusted to be consistent with minimum emission standard required to meet requirements of 17 CCR 93115.

Emission factors based on NMHC+NOx standard
Engine information not provided and assumed to be diesel as worst-case scenario

Conversion Factors

1 bhp-hr = 2,542.5 Btu
1 lb = 453.6 g
1 ton = 2,000 lbs
1 kW = 1.34 hp
1 day = 24 hours
1 month = 31 days
1 hour = 60 minutes

1 acre-foot = 325,851 gallons
http://www.water.ca.gov/pubs/dwrnews/california-water-facts-card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)
7.13 lb/gal

Swenson Farms Peak Pumping by Transfer Period Agency

234 AF/month Transfer Volume (Apr-Jun) 702 acre-feet (Jul-Sep) 199 AF/month 598 acre-feet

1,300 acre-feet/year

Table E-49. Swenson Farms Summary of Engines by Fuel Type and Location

				, , , , , , , , , , , , , , , , , , , 	
County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	1	0	0	1
Total	0	1	0	0	1

Table E-50. Swenson Farms Criteria Pollutant Emissions

	Well										
	Location			Power Rating	Emission	Pump	Rate	Transfer	Volume	Oper	ations
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)
Well 1	Colusa	Electric	unknown	300	n/a	3,500	100%	234	1,300	12	2,017
					Total	3,500	100%	234	1,300	12	2,017
				Total (Colus	sa County)	3,500	100%	234	1,300	12	2,017

Note: All wells are electric; therefore, no local criteria pollutant emissions.

Key:

Federal Attainment Status AF = acre-feet Colusa

CO = carbon monoxide PM10 g/bhp-hr = grams per brake-horsepower hour Α Α PM2.5 Α Α gal/yr = gallons per year gpm = gallons per minute О3 Α

hp = horsepower Engines subject to ATCM.

NOx = nitrogen oxides

PM10 = inhalable particulate matter

Peak Month PM2.5 = fine particulate matter 234 AF/month 1,708 gallons/minute SOx = sulfur oxidesVOC = volatile organic compound 49% peak pump rate

Legend

Engine power rating not provided; assumed to be equal to maximum horsepower for all engines operating at the water agency with the same fuel t Emission factors based on NMHC+NOx standard

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Conversion Factors

1 lb = 453.6 g 2,000 lbs 1 ton = 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Sycamore Mutual Water Company <u>Peak Pumping by Transfer Period</u>

Transfer Volume 4,000 acre-feet (Apr-Jun) 2,400 AF/month 4,000 acre-feet (Jul-Sep) 1,520 AF/month

8,000 acre-feet/year

Table E-51. Sycamore Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	5	0	0	5
Total	0	5	0	0	5

Table E-52. Sycamore Mutual Water Company Criteria Pollutant Emissions

	Well											Fuel
	Location			Power Rating	Emission	Pum	o Rate	Transfer	Volume	Oper	ations	Consumption
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)	(gal/yr)
Well #11	Colusa	Electric	unknown	125	n/a	6,409	29%	696	2,320	19	1,966	n/a
Well #14	Colusa	Electric	unknown	125	n/a	3,270	15%	355	1,183	19	1,966	n/a
Well #15	Colusa	Electric	unknown	125	n/a	3,270	15%	355	1,183	19	1,966	n/a
Well #2a	Colusa	Electric	unknown	125	n/a	4,578	21%	497	1,657	19	1,966	n/a
Well #2b	Colusa	Electric	unknown	125	n/a	4,578	21%	497	1,657	19	1,966	n/a
		•		•	Total	22,104	100%	2,400	8,000	95	9,828	0
				Total (Colus	sa County)	22,104	100%	2,400	8,000	95	9,828	0

Note: All wells are electric; therefore, no local criteria pollutant emissions.

Key:

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

Colusa PM10 A

PM2.5 A A

Engines not subject to ATCM if remotely-located.

Peak Month

2,400 AF/month 17,519 gallons/minute 79% peak pump rate

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency T&P Farms Peak Pumping by Transfer Period

Transfer Volume 217 AF/month 650 acre-feet (Apr-Jun) 550 acre-feet (Jul-Sep) 183 AF/month

1,200 acre-feet/year

Table E-53. T&P Farms Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	2	0	0	2
Total	0	2	0	0	2

Table E-54. T&P Farms Criteria Pollutant Emissions

	Well										
	Location			Power Rating	Emission			Transfer	Volume	Oper	ations
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)
NW-1	Colusa	Electric	unknown	125	n/a	3,500	58%	126	700	6	1,086
NW-2	Colusa	Electric	unknown	75	n/a	2,500	42%	90	500	6	1,086
					Total	6,000	100%	217	1,200	13	2,172
Total (Colusa Count							100%	217	1,200	13	2,172

Note: All wells are electric; therefore, no local criteria pollutant emissions.

Key:

AF = acre-feet

CO = carbon monoxide g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year

gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

Colusa

PM10 Α PM2.5 Α О3

Α

Engines not subject to ATCM if remotely-located.

Peak Month

217 AF/month 1,582 gallons/minute 26% peak pump rate

Conversion Factors

1 lb =453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day =24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Diesel Engine Fuel Consumption

(Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) 0.4 lb/hp-hr

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Te Velde Revocable Family Trust Peak Pumping by Transfer Period Agency

Transfer Volume 2,700 acre-feet (Apr-Jun) 1,605 AF/month 4,394 acre-feet (Jul-Sep) 1,674 AF/month

7,094 acre-feet/year

Table E-55. Te Velde Revocable Family Trust Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Yolo	0	4	0	0	4
Total	0	4	0	0	4

Table E-56. Te Velde Revocable Family Trust Criteria Pollutant Emissions

	Well										
	Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Oper	ations
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)
GW1	Yolo	Electric	unknown	150	n/a	4,200	32%	533	2,257	22	2,919
GW10	Yolo	Electric	unknown	150	n/a	3,000	23%	380	1,612	22	2,919
GW11	Yolo	Electric	unknown	150	n/a	3,000	23%	380	1,612	22	2,919
GW4	Yolo	Electric	unknown	150	n/a	3,000	23%	380	1,612	22	2,919
-				•	Total	13,200	100%	1,674	7,094	89	11,675
	_	_	_	Total (Yol	o County)	13,200	100%	1,674	7,094	89	11,675

Note: All wells are electric; therefore, no local criteria pollutant emissions.

Key:

Federal Attainment Status AF = acre-feet CO = carbon monoxide Yolo PM10 g/bhp-hr = grams per brake-horsepower hour Α PM2.5 gal/yr = gallons per year Ν О3 Ν gpm = gallons per minute hp = horsepower Engines subject to ATCM.

NOx = nitrogen oxides

PM10 = inhalable particulate matter

Peak Month PM2.5 = fine particulate matter 1,674 AF/month 12,219 gallons/minute SOx = sulfur oxidesVOC = volatile organic compound 93% peak pump rate

Legend

Engine power rating not provided; assumed to be equal to maximum horsepower for all engines operating at the water agency with the same fuel type

Conversion Factors

1 lb = 453.6 g 2,000 lbs 1 ton =1 kW = 1.34 hp 1 day =24 hours 1 month = 31 days 60 minutes 1 hour = 325,851 gallons 1 acre-foot =

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

(Based on MSDS for Hess Diesel Fuel All Types) 0.855 g/mL

Agency Windswept Land & Livestock Peak Pumping by Transfer Period

Transfer Volume 1,000 acre-feet (Apr-Jun) 333 AF/month 1,000 acre-feet (Jul-Sep) 333 AF/month

2,000 acre-feet/year

Table E-57. Windswept Land & Livestock Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	4	0	0	4
Total	0	4	0	0	4

Table E-58. Windswept Land & Livestock Criteria Pollutant Emissions

	Well Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Oper	ations
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month)	(AF/year)	(hours/day)	(hours/year)
NCW-1	Sutter	Electric	2013	200	n/a	3,200	30%	100	598	5	1,015
NCW-2	Sutter	Electric	unknown	200	n/a	3,000	28%	93	561	5	1,015
NCW-3	Sutter	Electric	unknown	200	n/a	2,500	23%	78	467	5	1,015
NCW-4	Sutter	Electric	unknown	200	n/a	2,000	19%	62	374	5	1,015
		_			Total	10,700	100%	333	2,000	22	4,060

Key:

AF = acre-feet

CO = carbon monoxide

g/bhp-hr = grams per brake-horsepower hour

gal/yr = gallons per year gpm = gallons per minute

hp = horsepower

NOx = nitrogen oxides

PM10 = inhalable particulate matter

PM2.5 = fine particulate matter

SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status

Sutter

PM10 A PM2.5 M O3 N

Engines subject to ATCM.

Peak Month

333 AF/month 2,433 gallons/minute

23% peak pump rate

Conversion Factors

1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1.34 hp 1 day = 24 hours 1 month = 31 days

1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Table 64. Engine Tier Matrix

										Υe	ar									
HP Range	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
hp <11	T0	T0	T0	T0	T1	T1	T1	T1	T1	T2	T2	T2	T4							
11<=hp<25	T0	T0	T0	T0	T1	T1	T1	T1	T1	T2	T2	T2	T4							
25<=hp<50	T0	T0	T0	T0	T1	T1	T1	T1	T2	T2	T2	T2	T4I	T4I	T4I	T4I	T4I	T4	T4	T4
50<=hp<75	T0	T0	T0	T0	T1	T1	T1	T1	T2	T2	T2	T2	T4I	T4I	T4I	T4I	T4I	T4	T4	T4
75<=hp<100	T0	T0	T0	T0	T1	T1	T1	T1	T2	T2	T2	T2	T3	T3	T3	T3	T4I	T4I	T4I	T4
100<=hp<175	T0	T0	T0	T0	T1	T1	T1	T2	T2	T2	T2	T3	T3	T3	T3	T3	T4I	T4I	T4I	T4
175<=hp<300	T1	T2	T2	T2	T3	T3	T3	T3	T3	T4I	T4I	T4I	T4	T4						
300<=hp<600	T1	T1	T1	T1	T1	T2	T2	T2	T2	T2	T3	T3	T3	T3	T3	T4I	T4I	T4I	T4	T4
600<=hp<750	T1	T1	T1	T1	T1	T1	T2	T2	T2	T2	T3	T3	T3	T3	T3	T4I	T4I	T4I	T4	T4
hp>750	T0	T0	T0	T0	T1	T1	T1	T1	T1	T1	T2	T2	T2	T2	T2	T4I	T4I	T4I	T4I	T4

Key:

T0 = Tier 0 (Noncertified)
T1 = Tier 1
T2 = Tier 2
T3 = Tier 3
T4 = Tier 4
T4I = Tier 4 Interim

CARB Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines

Table 59. Summary of the Emission Standards for New Stationary Diesel-Fueled CI Engines > 50 BHP used in Agricultural Operations

	Diesel PM [1]	HC	NOx	NMHC+NOx	CO
Horsepower Range	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)
50 <hp<100< td=""><td>0.3</td><td></td><td></td><td></td><td></td></hp<100<>	0.3				
100<=HP<175	0.22				
175<=HP	0.15				

Source: See Section 93115.8(a)

Notes

[1] Less than or equal to the emission standard OR Off-Road CI Engine Certification Standard for an off-road engine of the maximum rated power, whichever is more stringent.

[2] Off-Road CI Engine Certification Standard for an off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard, or Tier 1 standards.

[3] Prior to January 1, 2008, these limits shall not apply to engines sold from one agricultural operation to another and funded under State or federal incentive.

Table 60. Emission Standards for Noncertified Greater than 50 BHP In-Use Stationary Diesel-Fueled Engines Used in Agricultural Operations

		PM	HC [2,3]	NOx [2,3]	NMHC+NOx [2,3]	CO [2,3]
Horsepower (HP) Range	Compliance Date [1]	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)
50 <hp<75< td=""><td>2011</td><td>0.3</td><td></td><td></td><td></td><td></td></hp<75<>	2011	0.3				
75<=HP<100	2011	0.3				
100<=HP<175	2010	0.22				
175<=HP<=750	2010	0.15				
750 <hp< td=""><td>2014</td><td>0.075</td><td></td><td></td><td></td><td></td></hp<>	2014	0.075				

Source: See Sections 93115.8(b) (2) and (4)

Note

[1] Compliance date on or after December 31

[2] Engine Certification Standards for off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard.

[3] If no limits have been established for an off-road engine of the same model year and maximum rated power, then the in-use stationary diesel-fueled engine used in an agricultural operation shall not exceed Tier 1 standards in Title 13.

Table 61. Emission Standards Tier 1- and Tier 2-Certified Greater than 50 BHP In-Use Stationary Diesel-Fueled Engines Used in Agricultural Operations

		PM	HC [2,3]	NOx [2,3]	NMHC+NOx [2,3]	CO [2,3]
Horsepower Range (hp)	Compliance Date	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)
50 <hp<75< td=""><td>2015</td><td>0.02</td><td></td><td></td><td></td><td></td></hp<75<>	2015	0.02				
75<=HP<175	2015	0.01				
175<=hp<=750	2014	0.01				
750 <hp< td=""><td>2014</td><td>0.075</td><td></td><td></td><td></td><td></td></hp<>	2014	0.075				

Source: See Sections 93115.8(b)(3) and (4)

Notes:

[1] Compliance date on or after December 31 or 12 years after the date of initial installation, whichever is later.

[2] Off-Road CI Engine Certification Standards for an off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard.

[3] If no limits have been established for an off-road engine of the same model year and maximum rated power, then the in-use stationary diesel-fueled engine used in agricultural operation shall not exceed Tier 1 standards in Tier 13, CCR, section 2423 for an off-road engine of the same maximum rated power irrespective of model year.

Table 62. Tier 1, Tier 2, and Tier 3 Exhaust Emission Standards

					(g/kW-hr)					(g/hp-hr)		
Maximum Rated Power	Tier	Model Year	NOx	НС	NMHC+NOx	CO	PM	NOx	HC	NMHC+NOx	СО	PM
kW<8	T1	2000-2004	-	-	10.5	8.0	1	-	-	7.8	6.0	0.75
hp <11	T2	2005 -2007	-	-	7.5	8.0	0.8	-	-	5.6	6.0	0.60
8≤kW<19	T1	2000-2004	-	-	9.5	6.6	0.8	-	-	7.1	4.9	0.60
11<=hp<25	T2	2005 -2007	-	-	7.5	6.6	0.8	-	-	5.6	4.9	0.60
19≤kW<37	T1	2000-2003	-	-	9.5	5.5	0.8	-	-	7.1	4.1	0.60
25<=hp<50	T2	2004 -2007	-	-	7.5	5.5	0.6	-	-	5.6	4.1	0.45
37≤kW<56	T1	2000-2003	9.2	-	-	-	-	6.9	-	-	-	-
50<=hp<75	T2	2004-2007	-	-	7.5	5.0	0.4	-	-	5.6	3.7	0.30
	T3	2008 -2011	-	-	4.7	5.0	0.4	-	-	3.5	3.7	0.30
56≤kW<75	T1	2000-2003	9.2	-	-	-	-	6.9	-	-	-	-
75<=hp<100	T2	2004-2007	-	-	7.5	5.0	0.4	-	-	5.6	3.7	0.30
·	T3	2008-2011	-	-	4.7	5.0	0.4	-	-	3.5	3.7	0.30
75≤kW<130	T1	2000-2002	9.2	-	-	-	-	6.9	-	-	-	-
100<=hp<175	T2	2003-2006	-	-	6.6	5.0	0.3	-	-	4.9	3.7	0.22
	T3	2007 -2011	-	-	4.0	5.0	0.3	-	-	3.0	3.7	0.22
130≤kW<225	T1	1996-2002	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.40
175<=hp<300	T2	2003-2005	-	-	6.6	3.5	0.2	-	-	4.9	2.6	0.15
	T3	2006 -2010	-	-	4.0	3.5	0.2	-	-	3.0	2.6	0.15
225≤kW<450	T1	1996-2000	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.40
300<=hp<600	T2	2001-2005	-	-	6.4	3.5	0.2	-	-	4.8	2.6	0.15
	T3	2006 -2010	-	-	4.0	3.5	0.2	-	-	3.0	2.6	0.15
450≤kW≤560	T1	1996-2001	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.40
600<=hp<750	T2	2002-2005	-	-	6.4	3.5	0.2	-	-	4.8	2.6	0.15
	T3	2006 -2010	-	-	4.0	3.5	0.2	-	-	3.0	2.6	0.15
kW>560	T1	2000-2005	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.40
hp>750	T2	2006 -2010	-	-	6.4	3.5	0.2	-	-	4.8	2.6	0.15

Source: Title 13, California Code of Regulations, Division 3, Chapter 9, Article 4, Section 2423, "Off-Road Compression-Ignition Engines and Equipment."

NOx and NMHC fraction - Table B-26

NOx 95% NMHC 5%

http://www.arb.ca.gov/msprog/moyer/guidelines/cmp_guidelines_part4.pdf

PM Size Fractions

PM10 0.96 PM2.5 0.937 Ratio 0.98

CARB PMSIZE Profile No. 116 (STAT. I.C. ENGINE-DIESEL)

Table 63. Tier 4 Exhaust Emission Standards

MAXIMUM ENGINE	MODEL YEAR	TYPE	PM	NMHC+ NOx	NMHC	NOx	CO
POWER							
				grams pe	er horsepower-h	our	
hp<11	2008 and later	FINAL	0.30	5.6	-	-	6.0
11<=hp<25							4.9
25<=hp<50	2008-2012	INTERIM	0.22	5.6	-	-	4.1
	2013 and later	FINAL	0.02	3.5			
50<=hp<75	2008-2012	INTERIM	0.22	3.5	-	-	3.7
	2013 and later	FINAL	0.02				
75<=hp<100	2012-2014	PHASE-IN	0.01	-	0.14	0.3	3.7
		PHASE-OUT		3.5	-	-	
		or/ ALT NOx			0.14	2.5	
	2015 and later	FINAL		-		0.3	
100<=hp<175	2012-2014	PHASE-IN	0.01	-	0.14	0.3	3.7
		PHASE-OUT		3.0	-	-	
		or/ ALT NOx		-	0.14	2.5	
	2015 and later	FINAL			0.14	0.3	
175<=hp<=750	2011-2013	PHASE-IN	0.01	-	0.14	0.3	2.6
	2014 and later	PHASE-OUT		3.0	-	-	
		or/ ALT NOx		-	0.14	1.5	
		FINAL				0.3	
750 hp <gen<=1205 hp<="" td=""><td>2011-2014</td><td>INTERIM</td><td>0.07</td><td>-</td><td>0.30</td><td>2.6</td><td>2.6</td></gen<=1205>	2011-2014	INTERIM	0.07	-	0.30	2.6	2.6
	2015 and later	FINAL	0.02		0.14	0.5	
GEN>1205 hp	2011-2014	INTERIM	0.07	-	0.30		2.6
	2015 and later	FINAL	0.02		0.14	0.5	
ELSE>750 hp	2011-2014	INTERIM	0.07	-	0.30	2.6	2.6
	2015 and later	FINAL	0.03	-	0.14		

Source: Title 13, California Code of Regulations, Article 4, Section 2423, "Off-Road Compression-Ignition Engines and Equipment."

AP-42 Emission Factors

Table 65. Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines [a]

	Gasoline	Fuel	Diesel F	uel	
	Emission I	Factor	Emission I	Factor	Emission
	(lb/hp-hr)	(lb/MMBtu)	(lb/hp-hr)	(lb/MMBtu)	Factor
Pollutant	(power output)	(fuel input)	(power output)	(fuel input)	Rating
NOx	0.011	1.63	0.031	4.41	D
CO	6.96E-03 [d]	0.99 [d]	6.68E-03	0.95	D
SOx	5.91E-04	0.084	2.05E-03	0.29	D
PM-10 [b]	7.21E-04	0.1	2.20E-03	0.31	D
CO2 [c]	1.08	154	1.15	164	В
Aldehydes	4.85E-04	0.07	4.63E-04	0.07	D
TOC					
Exhaust	0.015	2.1	2.47E-03	0.35	D
Evaporative	6.61E-04	0.09	0.00	0.00	E
Crankcase	4.85E-03	0.69	4.41E-05	0.01	Е
Refueling	1.08E-03	0.15	0.00	0.00	E

Source: U.S. Environmental Protection Agency. 1996. Compilation of Air Pollutant Emission Factors (AP-42). Chapter 3.3: Gasoline and Diesel Industrial Engines.

[d] Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009

For large stationary diesel engines (greater than 600 horsepower [hp]) see Chapter 3.4: Large Stationary Diesel and All Stationary Dual-Fuel Engines.

[[]a] References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kwhr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

[[]b] PM-10 = particulate matter less than or equal to 10 :m aerodynamic diameter. All particulate is assumed to be 10 μm in size.

[[]c] Assumes 99% conversion of carbon in fuel to CO2 with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

Table 66. Uncontrolled Emission Factors for 4-Stroke Lean-Burn Engines [a]

Pollutant	Emission Factor (lb/MMBtu) [b] (fuel input)	Emission Factor Rating
NOx [c] 90 - 105% Load	4.08E+00	В
NOx [c] <90% Load	8.47E-01	В
CO [c] 90 - 105% Load	3.17E-01	С
CO [c] <90% Load	5.57E-01	В
CO2 [d]	1.10E+02	A
SO2 [e]	5.88E-04	A
TOC [f]	1.47E+00	A
Methane[g]	1.25E+00	С
VOC [h]	1.18E-01	С
PM10 (filterable) [i]	7.71E-05	D
PM2.5 (filterable) [i]	7.71E-05	D
PM Condensable [j]	9.91E-03	D

Source: U.S. Environmental Protection Agency. 2000. Compilation of Air Pollutant Emission Factors (AP-42). Chapter 3.2: Natural Gas-Fired Reciprocating Engines. July. Notes:

[a] Reference 7. Factors represent uncontrolled levels. For NOx, CO, and PM10, "uncontrolled" means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, the data set may include units with control techniques used for NOx control, such as PCC"uncontrolled" means no oxidation control; and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM-10 = Particulate Matter ≤ 10 microns (μ) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA Method 19. To convert from (lb/MMBtu) to (lb/10⁶ scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

lb/hp-hr = (lb/MMBtu) (heat input, MMBtu/hr) (1/operating HP, 1/hp)

- [c] Emission tests with unreported load conditions were not included in the data set.
- [d] Based on 99.5% conversion of the fuel carbon to CO2. CO2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO2, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10⁶ scf, and h = heating value of natural gas (assume 1020 Btu/scf at 60EF).
- [e] Based on 100% conversion of fuel sulfur to SO2. Assumes sulfur content in natural gas of 2,000 gr/10⁶scf.
- [f] Emission factor for TOC is based on measured emission levels from 22 source tests.
- [g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.31 lb/MMBtu vs. 1.25 lb/MMBtu, respectively.
- [h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.
- [i] Considered ≤ 1 μ in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).
- [j] PM Condensable = PM Condensable Inorganic + PM-Condensable Organic

Engine Size Summary

Table 67. Engine Power Rating Summary by Fuel Type

Fuel Type	No. Engines	Avg. HP	Max HP	Min HP
Diesel	23	170	250	60
Electric	47	125	300	30
Natural Gas	0	n/a	0	0
Propane	3	180	250	135

Table E-68. General Conformity Applicability Evaluation (Mitigated Emissions)

			Emissions	s (tons per year)		
County/	VOC	NOx	CO	SOx	PM10	PM2.5
	Sacramento	Sacramento	Sacramento			
Nonattainment Area	Metro ¹	Metro ¹	Area ²	Sacramento ^{3,4}	Sacramento Co.	Sacramento ⁴
Colusa	n/a	n/a	n/a	n/a	n/a	n/a
Glenn	n/a	n/a	n/a	n/a	n/a	n/a
Sacramento	0.3	1.9	1.4	0.6	0.0	0.0
Shasta	n/a	n/a	n/a	n/a	n/a	n/a
Sutter ⁵	4.3	10.0	n/a	7.1	n/a	0.3
Tehama	n/a	n/a	n/a	n/a	n/a	n/a
Yolo	0.9	6.4	2.8	0.4	n/a	0.1
Total	5.5	18.3	4.2	8.0	0.0	0.3
Classification	Severe-15	Severe-15	Maintenance	PM2.5 Precursor	Maintenance	Nonattainment
De Minimis Threshold (tpy)	25	25	100	100	100	100
Exceed?	No	No	No	No	No	No

Note:

Table E-69. Emissions Outside of 8-Hour Ozone Nonattainment Area (tons per year)

Water Agency	County	VOC	NOx
Pelger Road 1700 LLC	Sutter	All Electric	All Electric
Pelger Mutual Water Company	Sutter	0.0	0.7
Reclamation District 1004	Sutter	No Engines	No Engines
Total		0.0	0.7

¹The Sacramento Metro 8-hour O3 nonattainment area consist of Sacramento and Yolo Counties and parts of El Dorado, Placer, Solano, and Sutter Counties. Emissions occurring within the attainment area of these counties are excluded from the total emissions.

²The Sacramento Area CO maintenance area is based on the Census Bureau Urbanized Area and consists of parts of Placer, Sacramento, and Yolo Counties. The general conformity applicability evaluation is based on emissions that would occur within the entire county to be conservative.

³All counties are designated as attainment areas for SO2; however, since SO2 is a precursor to PM2.5, its emissions must be evaluated under general conformity.

⁴The 24-hour PM2.5 nonattainment area for Sacramento includes Sacramento County and parts of El Dorado, Placer, Solano, and Yolo Counties. The general conformity applicability analysis assumes that all emissions that could occur within each county would occur within the Sacramento nonattainment area to be conservative.

⁵VOC and NOx emissions are excluded from Cranmore Farms, Pelger Mutual Water Company, and Reclamation District 1004 because they are located in areas designated as attainment for the federal 8-hour O3 NAAQS.

Summary of Daily Groundwater Substitution Emissions by County (Mitigated)

Table E-70. Daily VOC Emissions (Mitigated)

	Daily VOC Emissions (pounds per day)								
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total	
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00	
Baber, Jack et al.			No Grou	ndwater Sub	ostitution			0.00	
Canal Farms	1.85							1.85	
Conaway Preservation Group			No Grou	ndwater Sub	ostitution			0.00	
Eastside Mutual Water Company	5.85							5.85	
Giusti Farms								0.00	
Glenn-Colusa Irrigation District	10.67	22.92						33.60	
Henle Family LP					All Electric			0.00	
Maxwell Irrigation District	2.48							2.48	
Natomas Central Mutual Water Company			1.80		7.70			9.51	
Pelger Mutual Water Company					0.99			0.99	
Pelger Road 1700 LLC					All Electric			0.00	
Pleasant Grove-Verona Mutual Water Company					7.51			7.51	
Princeton-Codora-Glenn Irrigation District	7.65	15.30						22.94	
Provident Irrigation District	No Engines	45.45						45.45	
Reclamation District 1004	31.70	2.69			No Engines			34.39	
Reclamation District 108	43.20						9.18	52.38	
River Garden Farms							All Electric	0.00	
Roberts Ditch Irrigation Company	2.82							2.82	
Sutter Mutual Water Company	0.33				11.99			12.32	
Swenson Farms	All Electric							0.00	
Sycamore Mutual Water Company	All Electric							0.00	
T&P Farms	All Electric							0.00	
Te Velde Revocable Family Trust							All Electric	0.00	
Windswept Land & Livestock					All Electric			0.00	
Total	106.56	86.36	1.80	0.00	28.19	0.00	9.18	232.09	

Key:

VOC = volatile organic compounds

Table E-71. Daily NOx Emissions (Mitigated)

			Daily NO	x Emission	s (pounds pe	er day)		
Water Agency	Colusa	Glenn	Sacramento		Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Groui	ndwater Sub	stitution			0.00
Canal Farms	3.70							3.70
Conaway Preservation Group			No Groui	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	49.89							49.89
Giusti Farms								0.00
Glenn-Colusa Irrigation District	131.63	282.62						414.25
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	47.10							47.10
Natomas Central Mutual Water Company			16.85		22.39			39.24
Pelger Mutual Water Company					18.76			18.76
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					21.71			21.71
Princeton-Codora-Glenn Irrigation District	94.31	188.61						282.92
Provident Irrigation District	No Engines	560.46						560.46
Reclamation District 1004	405.20	33.13			No Engines			438.33
Reclamation District 108	478.60						68.91	547.51
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	5.64							5.64
Sutter Mutual Water Company	0.69				24.66			25.35
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust					·		All Electric	0.00
Windswept Land & Livestock					All Electric		_	0.00
Total	1,216.75	1,064.83	16.85	0.00	87.52	0.00	68.91	2,454.85

Key:

NOx = nitrogen oxides

Summary of Daily Groundwater Substitution Emissions by County (Mitigated)

Table E-72. Daily CO Emissions (Mitigated)

		Daily CO Emissions (pounds per day)								
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total		
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00		
Baber, Jack et al.			No Grou	ndwater Sub	ostitution			0.00		
Canal Farms	7.40							7.40		
Conaway Preservation Group			No Grou	ndwater Sub	ostitution			0.00		
Eastside Mutual Water Company	55.85							55.85		
Giusti Farms								0.00		
Glenn-Colusa Irrigation District	28.36	60.90						89.26		
Henle Family LP					All Electric			0.00		
Maxwell Irrigation District	43.38							43.38		
Natomas Central Mutual Water Company			7.44		41.48			48.92		
Pelger Mutual Water Company					24.68			24.68		
Pelger Road 1700 LLC					All Electric			0.00		
Pleasant Grove-Verona Mutual Water Company					152.64			152.64		
Princeton-Codora-Glenn Irrigation District	20.32	40.64						60.96		
Provident Irrigation District	No Engines	120.77						120.77		
Reclamation District 1004	115.72	7.14			No Engines			122.86		
Reclamation District 108	121.81						30.16	151.97		
River Garden Farms							All Electric	0.00		
Roberts Ditch Irrigation Company	11.29							11.29		
Sutter Mutual Water Company	6.05				157.41			163.46		
Swenson Farms	All Electric							0.00		
Sycamore Mutual Water Company	All Electric							0.00		
T&P Farms	All Electric							0.00		
Te Velde Revocable Family Trust							All Electric	0.00		
Windswept Land & Livestock					All Electric			0.00		
Total	410.18	229.45	7.44	0.00	376.21	0.00	30.16	1,053.44		

Key:

CO = carbon monoxide

Table E-73. Daily SOx Emissions (Mitigated)

, ,		Daily SOx Emissions (pounds per day)								
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total		
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00		
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00		
Canal Farms	0.00							0.00		
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00		
Eastside Mutual Water Company	24.41							24.41		
Giusti Farms								0.00		
Glenn-Colusa Irrigation District	8.70	18.69						27.39		
Henle Family LP					All Electric			0.00		
Maxwell Irrigation District	15.44							15.44		
Natomas Central Mutual Water Company			5.95		5.05			10.99		
Pelger Mutual Water Company					6.15			6.15		
Pelger Road 1700 LLC					All Electric			0.00		
Pleasant Grove-Verona Mutual Water Company					40.66			40.66		
Princeton-Codora-Glenn Irrigation District	6.24	12.47						18.71		
Provident Irrigation District	No Engines	37.06						37.06		
Reclamation District 1004	35.28	2.19			No Engines			37.47		
Reclamation District 108	30.96						3.99	34.95		
River Garden Farms							All Electric	0.00		
Roberts Ditch Irrigation Company	0.00							0.00		
Sutter Mutual Water Company	2.15				41.82			43.98		
Swenson Farms	All Electric							0.00		
Sycamore Mutual Water Company	All Electric							0.00		
T&P Farms	All Electric							0.00		
Te Velde Revocable Family Trust							All Electric	0.00		
Windswept Land & Livestock					All Electric			0.00		
Total	123.19	70.42	5.95	0.00	93.68	0.00	3.99	297.23		

Key: SOx = sulfur oxides

Summary of Daily Groundwater Substitution Emissions by County (Mitigated)

Table E-74. Daily PM10 Emissions (Mitigated)

			Daily PM1	0 Emissior	ns (pounds p	er day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sul	bstitution			0.00
Canal Farms	0.02							0.02
Conaway Preservation Group			No Grou	ndwater Sul	bstitution			0.00
Eastside Mutual Water Company	2.78							2.78
Giusti Farms								0.00
Glenn-Colusa Irrigation District	1.84	3.80						5.63
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	2.48							2.48
Natomas Central Mutual Water Company			0.07		0.17			0.24
Pelger Mutual Water Company					1.48			1.48
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					1.09			1.09
Princeton-Codora-Glenn Irrigation District	1.01	2.01						3.02
Provident Irrigation District	No Engines	6.69						6.69
Reclamation District 1004	6.07	0.35			No Engines			6.42
Reclamation District 108	5.05						0.69	5.75
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.03							0.03
Sutter Mutual Water Company	0.03				0.73			0.76
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	19.31	12.85	0.07	0.00	3.47	0.00	0.69	36.40

Key: PM10 = inhalable particulate matter

Table E-75. Daily PM2.5 Emissions (Mitigated)

			Daily PM2	.5 Emission	s (pounds p	er day)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.	_		No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.02							0.02
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	2.78							2.78
Giusti Farms								0.00
Glenn-Colusa Irrigation District	1.79	3.71						5.50
Henle Family LP					All Electric		_	0.00
Maxwell Irrigation District	2.48							2.48
Natomas Central Mutual Water Company			0.06		0.17			0.24
Pelger Mutual Water Company					1.48			1.48
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					1.09			1.09
Princeton-Codora-Glenn Irrigation District	0.98	1.96						2.95
Provident Irrigation District	No Engines	6.53						6.53
Reclamation District 1004	5.97	0.34			No Engines			6.32
Reclamation District 108	4.93						0.68	5.61
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.03							0.03
Sutter Mutual Water Company	0.03				0.73			0.76
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric				_			0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric	_	_	0.00
Total	19.03	12.54	0.06	0.00	3.47	0.00	0.68	35.79

Key: PM2.5 = fine particulate matter

Summary of Annual Groundwater Substitution Emissions by County (Mitigated)

Table E-76. Annual VOC Emissions (Mitigated)

, ,			Annual V	OC Emission	ons (tons pe	r year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.15							0.15
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	0.32							0.32
Glenn-Colusa Irrigation District	0.99	2.13						3.12
Giusti Farms								0.00
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.15							0.15
Natomas Central Mutual Water Company			0.35		1.43			1.77
Pelger Mutual Water Company					0.04			0.04
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					0.82			0.82
Princeton-Codora-Glenn Irrigation District	0.48	0.95						1.43
Provident Irrigation District	No Engines	3.52						3.52
Reclamation District 1004	1.29	0.11			No Engines			1.40
Reclamation District 108	4.02						0.85	4.87
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.24							0.24
Sutter Mutual Water Company	0.04				2.02			2.05
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	7.68	6.72	0.35	0.00	4.30	0.00	0.85	19.90

Key: VOC = volatile organic compounds

Table E-77. Annual NOx Emissions (Mitigated)

, <u> </u>	1		Annual N	Ox Emission	ons (tons per	year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.30							0.30
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	2.72							2.72
Glenn-Colusa Irrigation District	12.24	26.28						38.53
Giusti Farms								0.00
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	2.88							2.88
Natomas Central Mutual Water Company			1.92		3.51			5.43
Pelger Mutual Water Company					0.72			0.72
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					2.34			2.34
Princeton-Codora-Glenn Irrigation District	5.88	11.77						17.65
Provident Irrigation District	No Engines	43.44						43.44
Reclamation District 1004	16.49	1.35			No Engines			17.83
Reclamation District 108	44.51						6.41	50.92
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.49							0.49
Sutter Mutual Water Company	0.08				4.11			4.19
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	85.58	82.83	1.92	0.00	10.67	0.00	6.41	187.42

NOx = nitrogen oxides

Summary of Annual Groundwater Substitution Emissions by County (Mitigated)

Table E-78. Annual CO Emissions (Mitigated)

,	Ţ		Annual (CO Emissio	ns (tons per	year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.	_		No Grou	ndwater Sub	ostitution			0.00
Canal Farms	0.60							0.60
Conaway Preservation Group			No Grou	ndwater Sub	ostitution			0.00
Eastside Mutual Water Company	3.04							3.04
Glenn-Colusa Irrigation District	2.64	5.66						8.30
Giusti Farms								0.00
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	2.65							2.65
Natomas Central Mutual Water Company			1.40		6.70			8.11
Pelger Mutual Water Company					0.94			0.94
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					8.13			8.13
Princeton-Codora-Glenn Irrigation District	1.27	2.54						3.80
Provident Irrigation District	No Engines	9.36						9.36
Reclamation District 1004	4.71	0.29			No Engines			5.00
Reclamation District 108	11.33						2.80	14.13
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.97							0.97
Sutter Mutual Water Company	0.69				20.58			21.27
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	27.90	17.85	1.40	0.00	36.36	0.00	2.80	86.32

Key:

CO = carbon monoxide

Table E-79. Annual SOx Emissions (Mitigated)

			Annual S	Ox Emission	ons (tons per	year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Groui	ndwater Sub	stitution			0.00
Canal Farms	0.00							0.00
Conaway Preservation Group			No Groui	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	1.33							1.33
Giusti Farms								0.00
Glenn-Colusa Irrigation District	0.81	1.74						2.55
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.94							0.94
Natomas Central Mutual Water Company			0.55		0.47			1.02
Pelger Mutual Water Company					0.24			0.24
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					1.62			1.62
Princeton-Codora-Glenn Irrigation District	0.39	0.78						1.17
Provident Irrigation District	No Engines	2.87						2.87
Reclamation District 1004	1.44	0.09			No Engines			1.52
Reclamation District 108	2.88						0.37	3.25
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.00							0.00
Sutter Mutual Water Company	0.25				4.79			5.03
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric						_	0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	8.03	5.48	0.55	0.00	7.11	0.00	0.37	21.55

Key: SOx = sulfur oxides

Summary of Annual Groundwater Substitution Emissions by County (Mitigated)

Table E-80. Annual PM10 Emissions (Mitigated)

-			Annual Pl	M10 Emissi	ons (tons pe	r year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.00							0.00
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	0.15							0.15
Giusti Farms								0.00
Glenn-Colusa Irrigation District	0.17	0.35						0.52
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.15							0.15
Natomas Central Mutual Water Company			0.01		0.02			0.03
Pelger Mutual Water Company					0.06			0.06
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					0.08			0.08
Princeton-Codora-Glenn Irrigation District	0.06	0.13						0.19
Provident Irrigation District	No Engines	0.52						0.52
Reclamation District 1004	0.25	0.01			No Engines			0.26
Reclamation District 108	0.47						0.06	0.53
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.00							0.00
Sutter Mutual Water Company	0.00				0.09			0.09
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	1.26	1.01	0.01	0.00	0.25	0.00	0.06	2.60

Key: PM10 = inhalable particulate matter

Table E-81, Annual PM2.5 Emissions (Mitigated)

			Annual Pi	M2.5 Emissi	ions (tons pe	er year)		
Water Agency	Colusa	Glenn	Sacramento	Shasta	Sutter	Tehama	Yolo	Total
Anderson-Cottonwood Irrigation District				All Electric		No Engines		0.00
Baber, Jack et al.			No Grou	ndwater Sub	stitution			0.00
Canal Farms	0.00							0.00
Conaway Preservation Group			No Grou	ndwater Sub	stitution			0.00
Eastside Mutual Water Company	0.15							0.15
Giusti Farms								0.00
Glenn-Colusa Irrigation District	0.17	0.34						0.51
Henle Family LP					All Electric			0.00
Maxwell Irrigation District	0.15							0.15
Natomas Central Mutual Water Company			0.01		0.02			0.03
Pelger Mutual Water Company					0.06			0.06
Pelger Road 1700 LLC					All Electric			0.00
Pleasant Grove-Verona Mutual Water Company					0.08			0.08
Princeton-Codora-Glenn Irrigation District	0.06	0.12						0.18
Provident Irrigation District	No Engines	0.51						0.51
Reclamation District 1004	0.24	0.01			No Engines			0.26
Reclamation District 108	0.46						0.06	0.52
River Garden Farms							All Electric	0.00
Roberts Ditch Irrigation Company	0.00							0.00
Sutter Mutual Water Company	0.00				0.09			0.09
Swenson Farms	All Electric							0.00
Sycamore Mutual Water Company	All Electric							0.00
T&P Farms	All Electric							0.00
Te Velde Revocable Family Trust							All Electric	0.00
Windswept Land & Livestock					All Electric			0.00
Total	1.24	0.99	0.01	0.00	0.25	0.00	0.06	2.55

Key:
PM2.5 = fine particulate matter

Groundwater Substitution Air Quality Emissions (Mitigated)

Agency Natomas Central Mutual Water Company
Transfer Volume 10,000 acre-feet (Apr-Jun) 3,333 AF/month
10,000 acre-feet (Jul-Sep) 3,333 AF/month
20,000 acre-feet/year

Table E-82. Natomas Central Mutual Water Company Summary of Engines by Fuel Type and LocationCountyDieselElectricNatural GasPropaneTotalSacramento2130116Sutter2150421Total4280537

	Well			D. D. diese			B-4-	T	a Walanaa	0		Fuel		-		, NOx, and	-	-			Daily Em						Annual E			
	Location			Power Rating	Emission	Pum	np Rate	Transfe	r Volume	Oper	rations	Consumption	(Ib	MMBtu) - S	SOX, PM10	and PM2.	tor propa	ne			(pounds	per day)					(tons p	er year)		
Wall	(Country)	Fuel Time	Madal Vass	(la.m)	Tion	(aun ma)	(0/ of Total)	/ A = /m = m 4 ls	\ (4 5 6 6 6 7 7)	h a / . l a \	(h a	(gal/yr) - diesel	VOC	NOv		201	DM40	DMO E	VOC	NOv	00	CO++	DM40	DMO F	V00	Nov	00	2011	DM40	DMO E
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total)	(AF/month	/ (/	nours/day)	(hours/year)	(MMBtu/yr) - propane	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO 7.05	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
Ameral	Sacramento	Propane	unknown	200	n/a	1,500	2%	71	428	4	1,551	788	1.0	2.0	4.0	0.000588	0.009987	0.009987	1.76	3.53	7.05	0.00	0.02	0.02	0.34	0.68	1.37	0.00	0.00	0.00
TNBC Atkinson	Sutter	Electric	unknown	125	n/a	1,800	3%	86	514	8	1,551	n/a	-																	+
TNBC Bennett North	Sutter	Electric	unknown	125	n/a	2,200	3%	105	628	8	1,551	n/a	-																	+
TNBC Betts	Sacramento	Electric	unknown	125	n/a	1,500	2%	71	428	8	1,551	n/a	4.0	0.0	4.0	0.000500	0.000007	0.000007	4.70	0.50	7.05	0.00	0.00	0.00	0.04	0.00	4.07	0.00	0.00	0.00
Bianchi	Sutter	Propane	unknown	200	n/a	1,500	2%	71	428	4	1,551	788	1.0	2.0	4.0	0.000588	0.009987	0.009987	1.76	3.53	7.05	0.00	0.02	0.02	0.34	0.68	1.37	0.00	0.00	0.00
Dhaliwal	Sacramento	Electric	unknown	125	n/a	3,000	4%	143	857	8	1,551	n/a																		+
Elkhorn	Sacramento	Electric	unknown	125	n/a	2,700	4%	128	771	8	1,551	n/a																		+
TNBC Frazer	Sutter	Electric	unknown	125	n/a	2,000	3%	95	571	8	1,551	n/a																		
Greenbriar	Sacramento	Electric	unknown	150	n/a	3,200	5%	152	914	8	1,551	n/a																		
Kubo	Sacramento	Electric	unknown	25	n/a	1,300	2%	62	371	8	1,551	n/a																		
<u>L-1</u>	Sutter	Diesel	unknown	125	T0	1,600	2%	76	457	8	1,551	10,874	0.09	3.2	0.7	0.93	0.02	0.02	0.21	7.35	1.61	2.14	0.05	0.05	0.02	0.68	0.15	0.20	0.00	0.00
L-10	Sutter	Electric	unknown	30	n/a	1,000	1%	48	286	8	1,551	n/a ,																		
L-11	Sutter	Electric	unknown	50	n/a	1,500	2%	71	428	8	1,551	n/a																		
L-12	Sutter	Electric	unknown	50	n/a	1,500	2%	71	428	8	1,551	n/a																		
L-13 Bolen Pasture	Sutter	Propane	unknown	200	n/a	2,800	4%	133	799	4	1,551	788	1.0	2.0	4.0	0.000588	0.009987	0.009987	1.76	3.53	7.05	0.00	0.02	0.02	0.34	0.68	1.37	0.00	0.00	0.00
L-14 Chappell	Sutter	Electric	unknown	75	n/a	1,800	3%	86	514	8	1,551	n/a																		
L-2	Sutter	Electric	unknown	30	n/a	1,900	3%	90	542	8	1,551	n/a																		
L-3	Sutter	Electric	unknown	50	n/a	1,300	2%	62	371	8	1,551	n/a																		
L-4	Sutter	Electric	unknown	75	n/a	1,300	2%	62	371	8	1,551	n/a																		
L-6	Sutter	Electric	unknown	50	n/a	2,000	3%	95	571	8	1,551	n/a																		
L-7	Sutter	Electric	unknown	30	n/a	1,200	2%	57	343	8	1,551	n/a																		
L-8	Sutter	Electric	unknown	200	n/a	2,800	4%	133	799	8	1,551	n/a																		
L-9	Sutter	Electric	unknown	50	n/a	1,500	2%	71	428	8	1,551	n/a																		
Lauppe	Sutter	Propane	unknown	200	n/a	1,050	1%	50	300	4	1,551	788	1.0	2.0	4.0	0.000588	0.009987	0.009987	1.76	3.53	7.05	0.00	0.02	0.02	0.34	0.68	1.37	0.00	0.00	0.00
L-MW	Sutter	Propane	unknown	200	n/a	1,800	3%	86	514	4	1,551	788	1.0	2.0	4.0	0.000588	0.009987	0.009987	1.76	3.53	7.05	0.00	0.02	0.02	0.34	0.68	1.37	0.00	0.00	0.00
TNBC Lucich North	Sutter	Diesel	2012	170	T4I	2,500	4%	119	714	8	1,551	14,788	0.1	0.3	3.7	0.93	0.01	0.01	0.44	0.93	11.66	2.91	0.05	0.05	0.04	0.09	1.08	0.27	0.00	0.00
MAP	Sacramento	Electric	unknown	125	n/a	2,000	3%	95	571	8	1,551	n/a																		
IBC Fisherman's Lake	Sacramento	Electric	unknown	125	n/a	1,500	2%	71	428	8	1,551	n/a																		
Ose-1	Sacramento	Diesel	2013	200	T4I	1,800	3%	86	514	8	1,551	17,398	0.003	1.7	0.03	0.93	0.01	0.01	0.01	6.25	0.11	3.42	0.04	0.04	0.00	0.58	0.01	0.32	0.00	0.00
Ose-2	Sacramento	Electric	unknown	150	n/a	2,400	3%	114	685	8	1,551	n/a																		
Perry	Sacramento	Electric	unknown	125	n/a	2,600	4%	124	742	8	1,551	n/a																		
Plant 3	Sacramento	Electric	unknown	150	n/a	2,500	4%	119	714	8	1,551	n/a																		
Pond R	Sacramento	Electric	unknown	50	n/a	2.300	3%	109	657	8	1,551	n/a																		
TNBC Silva Dairy	Sacramento	Electric	unknown	125	n/a	1,000	1%	48	286	8	1,551	n/a																		
Souza	Sacramento	Electric	unknown	40	n/a	1,200	2%	57	343	8	1,551	n/a																		
Spangler	Sutter	Electric	unknown	80	n/a	2,500	4%	119	714	8	1,551	n/a																		
Willey	Sacramento	Diesel	2012	148	T4I	2,000	3%	95	571	8	1,551	12,874	0.01	2.6	0.10	0.93	0.003	0.003	0.03	7.07	0.27	2.53	0.01	0.01	0.00	0.66	0.03	0.24	0.00	0.00
· · · · · · · · · · · · · · · · · · ·	- Castallionio	2.0001			Total	70,050	100%	3,333	20,000	287	57,371	59,876	0.01		J., 10	0.00	0.000	0.000	9.51	39.24	48.92	10.99	0.24	0.24	1.77	5.43	8.11	1.02	0.03	0.03
			Т	otal (Sacrament		32,500	46%	1,547	9,279	129	24,809	31,060	<u> </u>			ĺ			1.80	16.85	7.44	5.95	0.07	0.06	0.35	1.92		0.55		
				Total (Sutte			54%	1,787	10,721	158	32,562	28,815	1		-	}	 		7.70	22.39			0.17		1.43	3.51	6.70	0.47		0.02

```
Key:
AF = acre-feet
                                                                                                                    Federal Attainment Status
CO = carbon monoxide
                                                                                                                                   Sacramento
g/bhp-hr = grams per brake-horsepower hour
                                                                                                                      PM2.5
O3
gal/yr = gallons per year
gpm = gallons per minute
                                                                                                                    Engines subject to ATCM.
hp = horsepower
NOx = nitrogen oxides
PM10 = inhalable particulate matter
                                                                                                                   Peak Month
3,333 AF/month
PM2.5 = fine particulate matter
                                                                                                                         24,332 gallons/minute
SOx = sulfur oxides
                                                                                                                           35% peak pump rate
VOC = volatile organic compound
                                  Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type Engine-specific emission factors
                                   Mitigation requirement
Conversion Factors
                      1 bhp-hr =
                                              2,542.5 Btu
                          1 lb =
                                               453.6 g
                         1 ton =
                                               2,000 lbs
                         1 kW =
                                                 1.34 hp
                                                  24 hours
                         1 day =
                      1 month =
                                                  31 days
1 hour = 60 minutes
1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf
 Diesel Engine Fuel Consumption
                                                      (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
(Based on MSDS for Hess Diesel Fuel All Types)
                             0.4 lb/hp-hr
```

0.855 g/mL 7.13 lb/gal

Groundwater Substitution Air Quality Emissions (Unmitigated)

Agency Pleasant Grove-Verona Mutual Water Company Peak Pumping by Transfer Period
8,000 acre-feet (Apr-Jun) 4,757 AF/month
7,000 acre-feet (Jul-Sep) 2,667 AF/month

15,000 acre-feet/year

Table E-84. Pleasant Grove-Verona Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	11	20	0	3	34
Total	11	20	0	3	34

Table E-85. Pleasant Grove-Verona Mutual Water Company Criteria Pollutant Emissions

	Well								-		Fuel	The second secon	o-hr) - dies	el and VO	THE RESERVE AND ADDRESS.	nd CO for p	200 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			Daily Em	issions					Annual E	missions	1 6	
	Location		Power Rating	Emission	Pum	np Rate	Transfe	Volume	Ope	rations	Consumption (gal/yr) - diesel	(lb)	/MMBtu) - : T	SOx, PM10	o, and PM2	2.5 for pro	oane T			(pounds	per day)					(tons pe	er year)		
Well	(County) Fuel Ty	pe Model Year	(hp)	Tier	(gpm)	(% of Tota	(AF/month	(AF/year)	(hours/day) (hours/year)		voc	NOx	co	SOx	PM10	PM2.5	voc	NOx	co	sox	PM10	PM2.5	voc	NOx	co	sox	PM10	PM:
Kelly 190 Field Well #2	Sutter Electr	c unknown	30	n/a	2,100	3%	135	427	21	1,104	n/a																		
Kelly Windmill Field Well #2	Sutter Electr	ic 2002	62.1	n/a	2,000	3%	129	407	21	1,104	n/a												Lynni		10000		1 45 3 1		X.
Kelly Windmill North Field Well	Sutter Propa	ne 2014	133	n/a	1,800	2%	116	366	2	1,104	373	1.0	2.0	4.0	5.88E-04	4 9.99E-03	9.99E-03	0.47	0.94	1.87	0.00	0.01	0.01	0.16	0.32	0.65	0.00	0.00	0.0
Kelly306	Sutter Electr	c unknown	60	n/a	3,500	5%	226	711	21	1,104	n/a				15				1								2		
MLF Clubhouse B Well	Sutter Electr	c unknown	300	n/a	3,600	5%	232	732	21	1,104	n/a)											
MLF Marsh Well	Sutter Electr	c unknown	300	n/a	3,200	4%	206	650	21	1,104	n/a																		
MLF Monster Well	Sutter Electr	c unknown	60	n/a	3,100	4%	200	630	21	1,104	n/a								0										
MLF Well #1	Sutter Electr	ic unknown	30	n/a	2,000	3%	129	407	21	1,104	n/a				11														
MLF Well #16	Sutter Electr	c unknown	50	n/a	1,700	2%	110	346	21	1,104	n/a							N. J.				Last							
MLF Well#11	Sutter Diese	2011	250	T4I	1,400	2%	90	285	13	1,104	15,482	0.14	0.30	2.61	0.93	0.01	0.01	1.02	2.15	18.81	6.70	0.11	0.11	0.04	0.09	0.79	0.28	0.00	0.0
MLF Well#12/17	Sutter Electr	ic unknown	50	n/a	2,200	3%	142	447	21	1,104	n/a																		-
MLF Well#13	Sutter Electr	ic 2000	215	n/a	1,900	3%	122	386	21	1,104	n/a								è										
MLF Well#2B	Sutter Electr	ic 2000	300	n/a	2,800	4%	180	569	21	1,104	n/a							2											
Nicholas 72-Acre Field North	Sutter Electr	c unknown	40	n/a	1,700	2%	110	346	21	1,104	n/a														1				
Nicholas 72-Acre Field South	Sutter Diese	2008	62.1	T4I	2,000	3%	129	407	5	1,104	3,846	0.18	3.33	3.73	0.93	0.22	0.22	0.12	2.26	2.53	0.63	0.15	0.15	0.01	0.25	0.28	0.07	0.02	0.0
Nicholas BBC Well	Sutter Electr	c unknown	30	n/a	2,000	3%	129	407	21	1,104	n/a	3 P. L.							(-,	3 4 1							1		
Nicholas Filipino Camp South	Sutter Diese	2008	62.1	T4I	800	1%	52	163	5	1,104	3,846	0.18	3.33	3.73	0.93	0.22	0.22	0.12	2.26	2.53	0.63	0.15	0.15	0.01	0.25	0.28	0.07	0.02	0.0
Nicholas Filipino Camp#2	Sutter Electi	ic unknown	40	n/a	2,300	3%	148	467	21	1,104	n/a																		
Nicholas Johnston Field Well #2	Sutter Electr	c unknown	40	n/a	2,000	3%	129	407	21	1,104	n/a																		
Nicholas Sand Field Well	Sutter Diese	2008	62.1	T4I	2,000	3%	129	407	5	1,104	3,846	0.18	3.33	3.73	0.93	0.22	0.22	0.12	2.26	2.53	0.63	0.15	0.15	0.01	0.25	0.28	0.07	0.02	0.0
RiverRanch#19	Sutter Diese	2012	99	T4I	2,500	3%	161	508	17	1,104	6,131	0.14	0.30	3.73	0.93	0.01	0.01	0.54	1.13	14.17	3.53	0.06	0.06	0.02	0.04	0.45	0.11	0.00	0.0
S&O#16	Sutter Electr		159	n/a	2,000	3%	129	407	21	1,104	n/a							(Y								
S&O#17	Sutter Diese	2012	101	T4I	3,000	4%	193	610	17	1,104	6,255	0.14	0.30	3.73	0.93	0.01	0.01	0.55	1.15	14.41	3.59	0.06	0.06	0.02	0.04	0.46	0.11	0.00	0.0
S&O#18A	Sutter Diese		101	T4I	1,800	2%	116	366	17	1,104	6,255	0.14	0.30	3.73	0.93	0.01	0.01	0.55	1.15	14.41	3.59	0.06	0.06	0.02	0.04	0.46	0.11	0.00	0.0
S&O#19	Sutter Diese		215	T4I	1,800	2%	116	366	14	1,104	13,314	0.14	0.30	2.61	0.93	0.01	0.01	0.94	1.98	17.29	6.16	0.10	0.10	0.04	0.08		0.24	0.00	0.0
S&O#20	Sutter Propa		154	n/a	1,800	2%	116	366	0	1,104	432	1.0	2.0	4.0	5.88E-04	4 9.99E-03	9.99E-03	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.37	0.75	0.00	0.00	0.0
Willey#1	Sutter Diese		168	T4I	3,000	4%	193	610	15	1,104	10,404	0.14	0.30	3.73	0.93			0.80	1.69	21.10	5.26	0.08	0.08	0.03		0.76	0.19	0.00	0.
Willey#3	Sutter Electr		75	n/a	1,800	2%	116	366	21	1,104	n/a																10011		
Willey#4	Sutter Diese		150	T4I	2,000	3%	129	407	16	1,104	9,289	0.14	0.30	3.73	0.93	0.01	0.01	0.74	1.56	19.49	4.86	0.08	0.08	0.03	0.05	0.68	0.17	0.00	0.0
Willey#5	Sutter Propa		180	n/a	2,000	3%	129	407	2	1,104	505	1.0	2.0				9.99E-03		1.54	3.08	0.00		0.01	0.22			0.00		
Will-Lee Well#31	Sutter Electr		50	n/a	1,500	2%	97	305	21	1,104	n/a																		
Will-Lee Well#32	Sutter Electr		300	n/a	2,500	3%	161	508	21	1,104	n/a				11	*	i i				7								
Will-Lee Well#33	Sutter Electr		75	n/a	2,500	3%	161	508	21	1,104	n/a										1								
Will-Lee Well#4A	Sutter Diese		160	T4I	1,500	2%	97	305	16	1,104	9.908	0.14	0.30	3.73	0.93	0.01	0.01	0.78	1.63	20.40	5.08	0.08	0.08	0.03	0.06	0.73	0.18	0.00	0.
	1 51000				73,800	100%	4,757	15,000	564	37,530	89,883				1			7.51		-	40.66		1.09			8.13			0.0
			Total (Sut		73,800		4,757	15,000	564	37,530	89,883				1	1		7.51		152.64		1.09	1.09			8.13			0.0

AF = acre-feet
CO = carbon monoxide
g/bhp-hr = grams per brake-horsepower hour
gal/yr = gallons per year
gpm = gallons per minute
hp = horsepower
NOx = nitrogen oxides
PM10 = inhalable particulate matter
PM2.5 = fine particulate matter
SOx = sulfur oxides

VOC = volatile organic compound

Federal Attainment Status
Sutter
PM10 A
PM2.5 M
O3 N
Engines subject to ATCM.

Peak Month
4,757 AF/month
34,722 gallons/minute
47% peak pump rate

Legend

Key:

Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008

Mitigation requirement

Conversion Factors

1 bhp-hr = 2,542.5 Btu

1 lb = 453.6 g

1 ton = 2,000 lbs

1 kW = 1.34 hp

1 day = 24 hours

1 month = 31 days

1 hour = 60 minutes

1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

7.13 lb/gal

Groundwater Substitution Air Quality Emissions (Mitigated)

Sutter MWC

Agency Sutter Mutual Water Company Transfer Volume

Peak Pumping by Transfer Period 8,000 acre-feet (Apr-Jun) 3,200 AF/month 4,000 AF/month 10,000 acre-feet (Jul-Sep)

18,000 acre-feet/year

County	Diesel	Electric	Natural Gas	Propane	Tota
Sutter	27	10	0	7	44
Colusa	1	0	0	0	1
Total	28	10	0	7	45

Table E-87. Sutter Mutual Water Company Criteria Pollutant Emissions

	Well Location			Power Rating	Emission	Pum	p Rate	Transfer	Volume	Ope	erations	Fuel Consumption			sel and Vo		s Ind CO for 12.5 for pro				Daily Er	nissions per day)					Annual E	missions er year)		
Well	(County)	Fuel Type	Model Year	(hp)	Tier	(gpm)	(% of Total	(AF/month)	(AF/year)	(hours/day) (hours/year)	(gal/yr) - diesel (MMBtu/yr) - propane	voc	NOx	со	SOx	PM10	PM2.5	Voc	NOx	со	SOx	PM10	PM2.5	voc	NOx	со	SOx	PM10	PM2.5
Ag Industries - Sioux Creek	Sutter	Diesel	2012	350	T4I	2,800	2%	79	354	3	686	13,479	0.14	0.3	2.6	0.93	0.01	0.01	0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
Ag Industries - Sutter Basin	Sutter	Diesel	2012	350	T4I	3,000	2%	84	379	3	686	13,479	0.14	0.3	2.6	0.93	0.01	0.01	0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
BD-1	Sutter	Diesel	2012	225	T4I	2,500	2%	70	316	3	686	8,665	0.14	0.3	2.6	0.93	0.01	0.01	0.21	0.44	3.89	1.38	0.02	0.02	0.02	0.05	0.44	0.16	0.00	0.00
BD-2	Sutter	Diesel	2012	225	T4I	4,000	3%	112	506	3	686	8,665	0.14	0.3	2.6				0.21	0.44	3.89	1.38	0.02	0.02	0.02	0.05	0.44	0.16	0.00	0.00
BD-3	Sutter	Propane	unknown	250	n/a	3,000	2%	84	379	1.5	686	436	1.0	2.0	4.0	5.88E-0	04 9.99E-0	3 9.99E-03	0.95	1.91	3.81	0.00	0.01	0.01	0.22	0.44	0.87	0.00	0.00	0.00
DB-1	Sutter	Diesel	2012	350	T4I	4,500	3%	126	569	3	686	13,479	0.14	0.3	2.6	0.93	0.01	0.01	0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
Driver	Colusa	Diesel	2012	350	T4I	2,500	2%	70	316	3	686	13,479	0.14	0.3	2.6	0.93			0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
F4N	Sutter	Diesel	2012	290	T4I	3,500	2%	98	442	3	686	11,169	0.14	0.3	2.6	0.93		the second secon	0.27	0.57	5.01	1.78	0.03	0.03	0.03	0.07	0.57	0.20	0.00	0.00
FG	Sutter	Propane	unknown	250	n/a	1,500	1%	42	190	1.5	686	436	1.0	2.0	4.0	5.88E-0	04 9.99E-0	3 9.99E-03	0.95	1.91	3.81	0.00	0.01	0.01	0.22	0.44	0.87	0.00	0.00	0.00
FT5	Sutter	Diesel	2012	450	T4I	5,200	4%	146	657	3	686	17,331	0.14	0.3	2.6	0.93	0.01	0.01	0.42	0.89	7.77	2.77	0.04	0.04	0.05	0.10	0.89	0.32	0.01	0.01
G-16	Sutter	Electric	unknown	250	n/a	4,200	3%	118	531	5	686	n/a														U = -1				
G-2	Sutter	Propane	unknown	125	n/a	3,500	2%	98	442	1.5	686	218	1.0	2.0	4.0	5.88E-0	04 9.99E-0	3 9.99E-03	0.48	0.95	1.91	0.00	0.00	0.00	0.11	0.22	0.44	0.00	0.00	0.00
H-1	Sutter	Electric	unknown	150	n/a	2,600	2%	73	329	5	686	n/a																		
Hoppin	Sutter	Electric	unknown	250	n/a	2,500	2%	70	316	5	686	n/a					Charles		1				- T			1 Dec 1	10 70 700			
L&N Farms	Sutter	Diesel	2012	170	T4I	5,000	4%	140	632	3	686	6,547	0.14	0.3	3.7	0.93	0.01	-2-2-5	0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04	0.48	0.12	0.00	0.00
L1-1	Sutter	Diesel	2012	350	T4I	4,000	3%	112	506	3	686	13,479	0.14	0.3	2.6	0.93	0.01	0.01	0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
L1-2	Sutter	Diesel	2012	350	T4I	5,000	4%	140	632	3	686	13,479	0.14	0.3	2.6				0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
L2-1	Sutter	Diesel	2012	350	T4I	5,500	4%	154	695	3	686	13,479	0.14	0.3	2.6	0.93	0.01	0.01	0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
LM-11	Sutter	Electric	unknown	150	n/a	3,100	2%	87	392	5	686	n/a																		
LM-53	Sutter	Electric	unknown	150	n/a	4,000	3%	112	506	5	686	n/a																		
Matteoli	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93			0.16	0.34	4.20	1.05	0.02		0.02	0.04	0.48	0.12	0.00	0.00
MB-1	Sutter	Propane	unknown	268	n/a	5,300	4%	149	670	1.5	686	468	1.0	2.0		5.88E-0	04 9.99E-0	3 9.99E-03	1.02		4.09	0.00	0.01	0.01	0.23	0.47	0.94	0.00	0.00	0.00
ME-1	Sutter	Diesel	2012	350	T4I	1,300	1%	37	164	3	686	13,479	0.14	0.3	2.6	0.93		0.01	0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
QHR	Sutter	Propane	unknown	250	n/a	5,200	4%	146	657	1.5	686	436	1.0	2.0	4.0		04 9.99E-0		0.95	1.91	3.81	0.00	0.01	0.01	0.22	0.44	0.87	0.00	0.00	0.00
R-24	Sutter	Diesel	2012	350	T4I	2,500	2%	70	316	3	686	13,479	0.14	0.3	2.6				0.33	0.69	6.05	2.15	0.03	0.03	0.04	0.08	0.69	0.25	0.00	0.00
R-29	Sutter	Diesel	2012	150	T4I	2,500	2%	70	316	3	686	5,777	0.14	0.3	3.7	0.93	0.01	0.01	0.14	0.30	3.70	0.92	0.01	0.01	0.02	0.03	0.42	0.11	0.00	0.00
S-18	Sutter	Electric	unknown	100	n/a	2,700	2%	76	341	5	686	n/a																		
TVN	Sutter	Electric	unknown	75	n/a	3,000	2%	84	379	5	686	n/a														4		<u> </u>	السيا	
VR-57	Sutter	Diesel	2012	450	T4I	5,500	4%	154	695	3	686	17,331	0.14	0.3	2.6	0.93	0.01	0.01	0.42	0.89	7.77	2.77	0.04	0.04	0.05	0.10	0.89	0.32	0.01	0.01
Well #1	Sutter	Electric	unknown	250	n/a	2,500	2%	70	316	5	686	n/a				-	#		1					1 - V						
Well #10	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93			0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04	0.48	0.12	0.00	0.00
Well #11	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93			0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04	0.48	0.12	0.00	0.00
Well #12	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93		0.01	0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04	0.48	0.12	0.00	0.00
Well #13	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93	0.01	0.01	0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04	0.48	0.12	0.00	0.00
Well #14	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93		0.01	0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04	0.48	0.12	0.00	0.00
Well #15	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14		3.7	0.93			0.16		4.20	1.05	0.02	0.02		0.04			0.00	0.00
Well #16	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93	0.01	0.01	0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04	0.48	0.12	0.00	0.00
Well #2	Sutter	Electric	unknown	150	n/a	2,500	2%	70	316	5	686	n/a										-							التناسيا	
Well #3	Sutter	Electric	unknown	150	n/a	2,500	2%	70	316	5	686	n/a					1												السيبيا	
Well #4	Sutter	Propane	unknown	150	n/a	2,500	2%	70	316	1.5	686	262	1.0	2.0				3 9.99E-03		1.14	2.29	0.00	0.01		0.13	0.26	0.52	0.00	0.00	0.00
Well #5	Sutter	Propane	unknown	180	n/a	2,500	2%	70	316	1.5	686	314	1.0	2.0	4.0			3 9.99E-03			2.75	0.00	0.01		0.16	0.31	0.63		0.00	0.00
Well #6	Sutter	Diesel	2012	170	T4I		2%	70	316	3	686	6,547	0.14	27.75	3.7				0.16		4.20	1.05	-	0.02						0.00
Well #7	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14		_	0.93			0.16		4.20	1.05		0.02	0.02	0.04		-	0.00	0.00
Well #8	Sutter	Diesel	2012	170	T41	2,500	2%	70	316	3	686	6,547	0.14		3.7	0.93			0.16	0.34	4.20	1.05	0.02	0.02	0.02	0.04		0.12	0.00	0.00
Well #9	Sutter	Diesel	2012	170	T4I	2,500	2%	70	316	3	686	6,547	0.14	0.3	3.7	0.93	0.01	0.01	0.16		4.20	1.05	0.02	0.02		0.04			0.00	0.00
				6-11-72-1-72-N	Total			4,000	18,000	144	30,892	277,935							12.32		163.46		the state of the s	0.76		4.19			0.09	0.09
						139,900		3,930	17,684	141	30,205	264,455					4		11.99		157.41					4.11			0.09	0.09
				Total (Colu	sa County)	2,500	2%	70	316	3	686	13,479					1		0.33	0.69	6.05	2.15	0.03	0.03	0.04	80.0	0.69	0.25	0.00	0.00

AF = acre-feet Federal Attainment Status Sutter CO = carbon monoxide g/bhp-hr = grams per brake-horsepower hour PM10 A PM2.5 gal/yr = gallons per year gpm = gallons per minute 03 Engines subject to ATCM. hp = horsepower NOx = nitrogen oxides Peak Month 4,000 AF/month PM10 = inhalable particulate matter PM2.5 = fine particulate matter 29,198 gallons/minute SOx = sulfur oxides VOC = volatile organic compound 21% peak pump rate

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type Tier 4 Exhaust Emission Standards, Phase-In (100<=hp<=175, 2012-2014 model year) Emission factors from 40 CFR 60, Subpart JJJJ, Table 1 for Non-Emergency SI Lean Burn LPG engines, 100<=HP<500, manufactured after 7/1/2008 Engine tier adjusted to be consistent with minimum emission standard required to meet requirements of 17 CCR 93115. Emission factors based on NMHC+NOx standard Engine information not provided and assumed to be diesel as worst-case scenario Mitigation requirement

Conversion Factors

1 bhp-hr = 2,542.5 Btu 1 lb = 453.6 g 1 ton = 2,000 lbs 1 kW = 1,34 hp 1 day = 24 hours 1 month = 31 days 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) (Based on MSDS for Hess Diesel Fuel All Types)

0.855 g/mL

7.13 lb/gal

CARB Airborne Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines

Table E-88. Summary of the Emission Standards for New Stationary Diesel-Fueled CI Engines > 50 BHP used in Agricultural Operations

Horsepower Range	Diesel PM [1] (g/bhp-hr)	HC (g/bhp-hr)	NOx (g/bhp-hr)	NMHC+NOx (g/bhp-hr)	CO (g/bhp-hr)
50 <hp<100< td=""><td>0.3</td><td></td><td></td><td></td><td></td></hp<100<>	0.3				
100<=HP<175	0.22				
175<=HP	0.15				

Source: See Section 93115.8(a)

Notes

[1] Less than or equal to the emission standard OR Off-Road CI Engine Certification Standard for an off-road engine of the maximum rated power, whichever is more stringent.

[2] Off-Road CI Engine Certification Standard for an off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard, or Tier 1 standards.

[3] Prior to January 1, 2008, these limits shall not apply to engines sold from one agricultural operation to another and funded under State or federal incentive.

Table E-89. Emission Standards for Noncertified Greater than 50 BHP In-Use Stationary Diesel-Fueled Engines Used in Agricultural Operations

		PM	HC [2,3]	NOx [2,3]	NMHC+NOx [2,3]	CO [2,3]
Horsepower (HP) Range	Compliance Date [1]	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)
50 <hp<75< td=""><td>2011</td><td>0.3</td><td></td><td></td><td></td><td></td></hp<75<>	2011	0.3				
75<=HP<100	2011	0.3				
100<=HP<175	2010	0.22				
175<=HP<=750	2010	0.15				
750 <hp< td=""><td>2014</td><td>0.075</td><td></td><td></td><td></td><td></td></hp<>	2014	0.075				

Source: See Sections 93115.8(b) (2) and (4)

Note

[1] Compliance date on or after December 31

[2] Engine Certification Standards for off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard.

[3] If no limits have been established for an off-road engine of the same model year and maximum rated power, then the in-use stationary diesel-fueled engine used in an agricultural operation shall not exceed Tier 1 standards in Title 13.

Table E-90. Emission Standards Tier 1- and Tier 2-Certified Greater than 50 BHP In-Use Stationary Diesel-Fueled Engines Used in Agricultural Operations

		PM	HC [2,3]	NOx [2,3]	NMHC+NOx [2,3]	CO [2,3]
Horsepower Range (hp)	Compliance Date	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)	(g/bhp-hr)
50 <hp<75< td=""><td>2015</td><td>0.02</td><td></td><td></td><td></td><td></td></hp<75<>	2015	0.02				
75<=HP<175	2015	0.01				
175<=hp<=750	2014	0.01				
750 <hp< td=""><td>2014</td><td>0.075</td><td></td><td></td><td></td><td></td></hp<>	2014	0.075				

Source: See Sections 93115.8(b)(3) and (4)

Notes:

[1] Compliance date on or after December 31 or 12 years after the date of initial installation, whichever is later.

[2] Off-Road CI Engine Certification Standards for an off-road engine of the model year and maximum rated power of the engine installed to meet the applicable PM standard.

[3] If no limits have been established for an off-road engine of the same model year and maximum rated power, then the in-use stationary diesel-fueled engine used in agricultural operation shall not exceed Tier 1 standards in Tier 13, CCR, section 2423 for an off-road engine of the same maximum rated power irrespective of model year.

Table E-91. Tier 1, Tier 2, and Tier 3 Exhaust Emission Standards

					(g/kW-hr)					(g/hp-hr)		
Maximum Rated Power	Tier	Model Year	NOx	HC	NMHC+NOx	СО	PM	NOx	HC	NMHC+NOx	СО	PM
kW<8	T1	2000-2004	-	-	10.5	8.0	1	-	-	7.8	6.0	0.7
hp <11	T2	2005 -2007	-	-	7.5	8.0	0.8	-	-	5.6	6.0	0.6
8≤kW<19	T1	2000-2004	-	-	9.5	6.6	0.8	-	-	7.1	4.9	0.6
11<=hp<25	T2	2005 -2007	-	-	7.5	6.6	0.8	-	-	5.6	4.9	0.6
19≤kW<37	T1	2000-2003	-	-	9.5	5.5	0.8	-	-	7.1	4.1	0.6
25<=hp<50	T2	2004 -2007	-	-	7.5	5.5	0.6	-	-	5.6	4.1	0.4
37≤kW<56	T1	2000-2003	9.2	-	-	-	-	6.9	-	-	-	-
50<=hp<75	T2	2004-2007	-	-	7.5	5.0	0.4	-	-	5.6	3.7	0.3
	T3	2008 -2011	-	-	4.7	5.0	0.4	-	-	3.5	3.7	0.3
56≤kW<75	T1	2000-2003	9.2	-	-	-	-	6.9	-	-	-	-
75<=hp<100	T2	2004-2007	-	-	7.5	5.0	0.4	-	-	5.6	3.7	0.3
	T3	2008-2011	-	-	4.7	5.0	0.4	-	-	3.5	3.7	0.3
75≤kW<130	T1	2000-2002	9.2	-	-	-	-	6.9	-	-	-	-
100<=hp<175	T2	2003-2006	-	-	6.6	5.0	0.3	-	-	4.9	3.7	0.2
	T3	2007 -2011	-	-	4.0	5.0	0.3	-	-	3.0	3.7	0.2
130≤kW<225	T1	1996-2002	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.4
175<=hp<300	T2	2003-2005	-	-	6.6	3.5	0.2	-	-	4.9	2.6	0.1
	T3	2006 -2010	-	-	4.0	3.5	0.2	-	-	3.0	2.6	0.1
225≤kW<450	T1	1996-2000	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.4
300<=hp<600	T2	2001-2005	-	-	6.4	3.5	0.2	-	-	4.8	2.6	0.1
	T3	2006 -2010	-	-	4.0	3.5	0.2	-	-	3.0	2.6	0.1
450≤kW≤560	T1	1996-2001	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.4
600<=hp<750	T2	2002-2005	-	-	6.4	3.5	0.2	-	-	4.8	2.6	0.1
	T3	2006 -2010	-	-	4.0	3.5	0.2	-	-	3.0	2.6	0.1
kW>560	T1	2000-2005	9.2	1.3	-	11.4	0.54	6.9	1.0	-	8.5	0.4
hp>750	T2	2006 -2010	-	-	6.4	3.5	0.2	-	-	4.8	2.6	0.1

Source: Title 13, California Code of Regulations, Division 3, Chapter 9, Article 4, Section 2423, "Off-Road Compression-Ignition Engines and Equipment."

NOx and NMHC fraction - Table B-26

NOx 95% NMHC 5%

http://www.arb.ca.gov/msprog/moyer/guidelines/cmp_guidelines_part4.pdf

PM Size Fractions

PM10 0.96 PM2.5 0.937 Ratio 0.98

CARB PMSIZE Profile No. 116 (STAT. I.C. ENGINE-DIESEL)

Table E-92. Tier 4 Exhaust Emission Standards

MAXIMUM ENGINE	MODEL YEAR	TYPE	PM	NMHC+NOx	NMHC	NOx	CO
POWER							
				grams pe	er horsepower-ho	ur	
hp<11	2008 and later	FINAL	0.30	5.6	-	-	6.0
11<=hp<25							4.9
25<=hp<50	2008-2012	INTERIM	0.22	5.6	-	-	4.1
	2013 and later	FINAL	0.02	3.5			
50<=hp<75	2008-2012	INTERIM	0.22	3.5	-	-	3.7
	2013 and later	FINAL	0.02				
75<=hp<100	2012-2014	PHASE-IN	0.01	-	0.14	0.3	3.7
		PHASE-OUT		3.5	-	-	
		or/ ALT NOx			0.14	2.5	
	2015 and later	FINAL		-		0.3	
100<=hp<175	2012-2014	PHASE-IN	0.01	-	0.14	0.3	3.7
		PHASE-OUT		3.0	-	-	
		or/ ALT NOx		-	0.14	2.5	
	2015 and later	FINAL			0.14	0.3	
175<=hp<=750	2011-2013	PHASE-IN	0.01	-	0.14	0.3	2.6
·	2014 and later	PHASE-OUT		3.0	-	-	
		or/ ALT NOx		-	0.14	1.5	
		FINAL				0.3	
750 hp <gen<=1205 hp<="" td=""><td>2011-2014</td><td>INTERIM</td><td>0.07</td><td>-</td><td>0.30</td><td>2.6</td><td>2.6</td></gen<=1205>	2011-2014	INTERIM	0.07	-	0.30	2.6	2.6
•	2015 and later	FINAL	0.02		0.14	0.5	
GEN>1205 hp	2011-2014	INTERIM	0.07	-	0.30		2.6
•	2015 and later	FINAL	0.02		0.14	0.5	
ELSE>750 hp	2011-2014	INTERIM	0.07	-	0.30	2.6	2.6
•	2015 and later	FINAL	0.03	-	0.14		

Source: Title 13, California Code of Regulations, Article 4, Section 2423, "Off-Road Compression-Ignition Engines and Equipment."

Table E-93. Engine Tier Matrix

										Υe	ar									
HP Range	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
hp <11	T0	T0	T0	T0	T1	T1	T1	T1	T1	T2	T2	T2	T4							
11<=hp<25	T0	T0	T0	T0	T1	T1	T1	T1	T1	T2	T2	T2	T4							
25<=hp<50	T0	T0	T0	T0	T1	T1	T1	T1	T2	T2	T2	T2	T4I	T4I	T4I	T4I	T4I	T4	T4	T4
50<=hp<75	T0	T0	T0	T0	T1	T1	T1	T1	T2	T2	T2	T2	T4I	T4I	T4I	T4I	T4I	T4	T4	T4
75<=hp<100	T0	T0	T0	T0	T1	T1	T1	T1	T2	T2	T2	T2	Т3	T3	Т3	T3	T4I	T4I	T4I	T4
100<=hp<175	T0	T0	T0	T0	T1	T1	T1	T2	T2	T2	T2	Т3	Т3	Т3	Т3	Т3	T4I	T4I	T4I	T4
175<=hp<300	T1	T2	T2	T2	T3	Т3	Т3	T3	T3	T4I	T4I	T4I	T4	T4						
300<=hp<600	T1	T1	T1	T1	T1	T2	T2	T2	T2	T2	T3	Т3	T3	T3	T3	T4I	T4I	T4I	T4	T4
600<=hp<750	T1	T1	T1	T1	T1	T1	T2	T2	T2	T2	T3	T3	Т3	T3	Т3	T4I	T4I	T4I	T4	T4
hp>750	T0	T0	T0	T0	T1	T1	T1	T1	T1	T1	T2	T2	T2	T2	T2	T4I	T4I	T4I	T4I	T4

Key:

T0 = Tier 0 (Noncertified)
T1 = Tier 1
T2 = Tier 2
T3 = Tier 3
T4 = Tier 4
T4I = Tier 4 Interim

AP-42 Emission Factors

Table E-94. Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines [a]

	Gasoline	Fuel	Diesel F	uel	
	Emission I	Factor	Emission I	Factor	Emission
	(lb/hp-hr)	(lb/MMBtu)	(lb/hp-hr)	(lb/MMBtu)	Factor
Pollutant	(power output)	(fuel input)	(power output)	(fuel input)	Rating
NOx	0.011	1.63	0.031	4.41	D
CO	6.96E-03 [d]	0.99 [d]	6.68E-03	0.95	D
SOx	5.91E-04	0.084	2.05E-03	0.29	D
PM-10 [b]	7.21E-04	0.1	2.20E-03	0.31	D
CO2 [c]	1.08	154	1.15	164	В
Aldehydes	4.85E-04	0.07	4.63E-04	0.07	D
TOC					
Exhaust	0.015	2.1	2.47E-03	0.35	D
Evaporative	6.61E-04	0.09	0.00	0.00	Е
Crankcase	4.85E-03	0.69	4.41E-05	0.01	Е
Refueling	1.08E-03	0.15	0.00	0.00	Е

Source: U.S. Environmental Protection Agency. 1996. Compilation of Air Pollutant Emission Factors (AP-42). Chapter 3.3: Gasoline and Diesel Industrial Engines. Notes:

For large stationary diesel engines (greater than 600 horsepower [hp]) see Chapter 3.4: Large Stationary Diesel and All Stationary Dual-Fuel Engines.

[[]a] References 2,5-6,9-14. When necessary, an average brake-specific fuel consumption (BSFC) of 7,000 Btu/hp-hr was used to convert from lb/hMBtu to lb/hp-hr. To convert from lb/hp-hr to kg/kwhr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code. TOC = total organic compounds.

[[]b] PM-10 = particulate matter less than or equal to 10 :m aerodynamic diameter. All particulate is assumed to be 10 μm in size.

[[]c] Assumes 99% conversion of carbon in fuel to CO2 with 87 weight % carbon in diesel, 86 weight % carbon in gasoline, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and gasoline heating value of 20,300 Btu/lb.

[[]d] Instead of 0.439 lb/hp-hr (power output) and 62.7 lb/mmBtu (fuel input), the correct emissions factors values are 6.96 E-03 lb/hp-hr (power output) and 0.99 lb/mmBtu (fuel input), respectively. This is an editorial correction. March 24, 2009

Table E-95. Uncontrolled Emission Factors for 4-Stroke Lean-Burn Engines [a]

Pollutant	Emission Factor (lb/MMBtu) [b] (fuel input)	Emission Factor Rating
NOx [c] 90 - 105% Load	4.08E+00	В
NOx [c] <90% Load	8.47E-01	В
CO [c] 90 - 105% Load	3.17E-01	С
CO [c] <90% Load	5.57E-01	В
CO2 [d]	1.10E+02	A
SO2 [e]	5.88E-04	A
TOC [f]	1.47E+00	A
Methane[g]	1.25E+00	С
VOC [h]	1.18E-01	С
PM10 (filterable) [i]	7.71E-05	D
PM2.5 (filterable) [i]	7.71E-05	D
PM Condensable [j]	9.91E-03	D

Source: U.S. Environmental Protection Agency. 2000. Compilation of Air Pollutant Emission Factors (AP-42). Chapter 3.2: Natural Gas-Fired Reciprocating Engines. July. Notes:

[a] Reference 7. Factors represent uncontrolled levels. For NOx, CO, and PM10, "uncontrolled" means no combustion or add-on controls; however, the factor may include turbocharged units. For all other pollutants, the data set may include units with control techniques used for NOx control, such as PCC"uncontrolled" means no oxidation control; and SCR for lean burn engines, and PSC for rich burn engines. Factors are based on large population of engines. Factors are for engines at all loads, except as indicated. SCC = Source Classification Code. TOC = Total Organic Compounds. PM-10 = Particulate Matter ≤ 10 microns (μ) aerodynamic diameter. A "<" sign in front of a factor means that the corresponding emission factor is based on one-half of the method detection limit.

[b] Emission factors were calculated in units of (lb/MMBtu) based on procedures in EPA Method 19. To convert from (lb/MMBtu) to (lb/10⁶ scf), multiply by the heat content of the fuel. If the heat content is not available, use 1020 Btu/scf. To convert from (lb/MMBtu) to (lb/hp-hr) use the following equation:

lb/hp-hr = (lb/MMBtu) (heat input, MMBtu/hr) (1/operating HP, 1/hp)

- [c] Emission tests with unreported load conditions were not included in the data set.
- [d] Based on 99.5% conversion of the fuel carbon to CO2. CO2 [lb/MMBtu] = (3.67)(%CON)(C)(D)(1/h), where %CON = percent conversion of fuel carbon to CO2, C = carbon content of fuel by weight (0.75), D = density of fuel, 4.1 E+04 lb/10⁶ scf, and h = heating value of natural gas (assume 1020 Btu/scf at 60EF).
- [e] Based on 100% conversion of fuel sulfur to SO2. Assumes sulfur content in natural gas of 2,000 gr/10⁶scf.
- [f] Emission factor for TOC is based on measured emission levels from 22 source tests.
- [g] Emission factor for methane is determined by subtracting the VOC and ethane emission factors from the TOC emission factor. Measured emission factor for methane compares well with the calculated emission factor, 1.31 lb/MMBtu vs. 1.25 lb/MMBtu, respectively.
- [h] VOC emission factor is based on the sum of the emission factors for all speciated organic compounds less ethane and methane.
- [i] Considered ≤ 1 μ in aerodynamic diameter. Therefore, for filterable PM emissions, PM10(filterable) = PM2.5(filterable).
- [j] PM Condensable = PM Condensable Inorganic + PM-Condensable Organic

Engine Size Summary

Table E-96. Engine Power Rating Summary by Fuel Type

Fuel Type	No. Engines	Avg. HP	Max HP	Min HP
Diesel	23	170	250	60
Electric	47	125	300	30
Natural Gas	0	n/a	0	0
Propane	3	180	250	135

Summary of Crop Idling Emissions by Air District

Table E-97. Reduced Exhaust Emissions fro	•		k Daily Emiss	sions (lbs/d	ay)			Annual	Project En	nissions ((tpv)	
Air District	VOC	NOx	ĆO	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5
Colusa County APCD												
Baber, Jack et al.	(1)	(17)	(22)	(6)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0)
Canal Farms	(0)	(5)	(6)	(2)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Eastside Mutual Water Company	(1)	(13)	(18)	(4)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0)
Glenn-Colusa Irrigation District	(12)	(222)	(292)	(73)	(18)	(18)	(0)	(8)	(11)	(3)	(1)	(1)
Maxwell Irrigation District	(2)	(37)	(49)	(12)	(3)	(3)	(0)	(1)	(2)	(0)	(0)	(0)
Princeton-Codora-Glenn Irrigation District	(1)	(24)	(32)	(8)	(2)	(2)	(0)	(1)	(1)	(0)	(0)	(0)
Provident Irrigation District	(2)	(37)	(48)	(12)	(3)	(3)	(0)	(1)	(2)	(0)	(0)	(0)
Reclamation District 1004	(3)	(49)	(65)	(16)	(4)	(4)	(0)	(2)	(2)	(1)	(0)	(0)
Reclamation District 108	(8)	(148)	(195)	(48)	(12)	(12)	(0)	(6)	(7)	(2)	(0)	(0)
Roberts Ditch Irrigation Company	(1)	(13)	(18)	(4)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0)
Sycamore Mutual Water Company	(4)	(74)	(97)	(24)	(6)	(6)	(0)	(3)	(4)	(1)	(0)	(0)
Swenson Farms	(1)	(10)	(13)	(3)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)
T&P Farms	(0)	(7)	(9)	(2)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)
Colusa County APCD Subtotal	(34)	(655)	(862)	(215)	(52)	(52)	(1)	(25)	(33)	(8)	(2)	(2)
·	` '				, ,	,		,		. ,		\ /
Glenn County APCD												
Glenn-Colusa Irrigation District	(12)	(222)	(292)	(73)	(18)	(18)	(0)	(8)	(11)	(3)	(1)	(1)
Princeton-Codora-Glenn Irrigation District	(1)	(24)	(32)	(8)	(2)	(2)	(0)	(1)	(1)	(0)	(0)	(0)
Provident Irrigation District	(2)	(37)	(48)	(12)	(3)	(3)	(0)	(1)	(2)	(0)	(0)	(0)
Reclamation District 1004	(3)	(49)	(65)	(16)	(4)	(4)	(0)	(2)	(2)	(1)	(0)	(0)
Glenn County APCD Subtotal	(17)	(332)	(437)	(109)	(26)	(26)	(1)	(13)	(17)	(4)	(1)	(1)
Feather River AQMD												
Giusti Farms	0	0	0	0	0	0	0	0	0	0	0	0
Henle Family LP	0	0	0	0	0	0	0	0	0	0	0	0
Natomas Central Mutual Water Company	0	0	0	0	0	0	0	0	0	0	0	0
Pelger Mutual Water Company	(1)	(19)	(25)	(6)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0)
Pelger Road 1700 LLC	0	0	0	0	0	0	0	0	0	0	0	0
Pleasant Grove-Verona Mutual Water Company	(5)	(89)	(117)	(29)	(7)	(7)	(0)	(3)	(4)	(1)	(0)	(0)
Reclamation District 1004	(3)	(49)	(65)	(16)	(4)	(4)	(0)	(2)	(2)	(1)	(0)	(0)
Sutter Mutual Water Company	(7)	(133)	(175)	(44)	(11)	(11)	(0)	(5)	(7)	(2)	(0)	(0)
Windswept Land & Livestock	0	0	0	0	0	0	0	0	0	0	0	0
Feather River AQMD Subtotal	(15)	(290)	(381)	(95)	(23)	(23)	(1)	(11)	(15)	(4)	(1)	(1)
Yolo-Solano AQMD												
Conaway Preservation Group	(8)	(158)	(208)	(52)	(12)	(12)	(0)	(6)	(8)	(2)	(0)	(0)
Reclamation District 108	(8)	(148)	(195)	(48)	(12)	(12)	(0)	(6)	(7)	(2)	(0)	(0)
River Garden Farms	(4)	(74)	(97)	(24)	(6)	(6)	(0)	(3)	(4)	(1)	(0)	(0)
Te Velde Revocable Family Trust	(3)	(52)	(68)	(17)	(4)	(4)	(0)	(2)	(3)	(1)	(0)	(0)
Yolo-Solano AQMD Subtotal	(23)	(431)	(567)	(141)	(34)	(34)	(1)	(17)	(22)	(5)	(1)	(1)
GRAND TOTAL	(90)	(1,708)	(2,248)	(560)	(135)	(135)	(3)	(65)	(86)	(21)	(5)	(5)

Table E-98. Reduced Peak Daily Fugitive Dust Emissions from Cropland Idling

	Peak D	aily PM10	Emissions (lbs	s/day)	Peak Da	aily PM2.5	Emissions (lbs	/day)
Air District	Land Prep	Harvest	Wind Erosion	Total	Land Prep	Harvest	Wind Erosion	Total
Colusa County APCD								
Baber, Jack et al.	(38)	(3)	9	(33)	(6)	(0)	2	(4)
Canal Farms	(11)	(1)	2	(9)	(2)	(0)	0	(1)
Eastside Mutual Water Company	(30)	(3)	7	(25)	(4)	(0)	1	(3)
Glenn-Colusa Irrigation District	(498)	(42)	120	(420)	(75)	(6)	24	(57)
Maxwell Irrigation District	(83)	(7)	20	(70)	(12)	(1)	4	(10)
Princeton-Codora-Glenn Irrigation District	(55)	(5)	13	(46)	(8)	(1)	3	(6)
Provident Irrigation District	(82)	(7)	20	(69)	(12)	(1)	4	(9)
Reclamation District 1004	(111)	(9)	19	(101)	(17)	(1)	4	(14)
Reclamation District 108	(332)	(28)	44	(316)	(50)	(4)	9	(45)
Sycamore Mutual Water Company	(166)	(14)	39	(141)	(25)	(2)	8	(19)
T&P Farms	(15)	(1)	3	(13)	(2)	(0)	1	(2)
Colusa County APCD Subtotal	(1,421)	(119)	297	(1,243)	(213)	(18)	59	(172)
Glenn County APCD								
Glenn-Colusa Irrigation District	(498)	(42)	120	(420)	(75)	(6)	24	(57)
Princeton-Codora-Glenn Irrigation District	(55)	(5)	13	(46)	(8)	(1)	3	(6)
Provident Irrigation District	(82)	(7)	20	(69)	(12)	(1)	4	(9)
Reclamation District 1004	(111)	(9)	19	(101)	(17)	(1)	4	(14)
Glenn County APCD Subtotal	(746)	(63)	172	(637)	(112)	(9)	34	(87)
Foother Diver A OMD								
Feather River AQMD		^	0	0	0	^	0	0
Giusti Farms	0	0	0	0	0	0	0	0
Henle Family LP	0	0	0	0	0	0	0	0
Natomas Central Mutual Water Company	0 (40)	0	0	0	0	0	0	0
Pelger Mutual Water Company	(42)	(4)	1	(45)	(6)	(1)	0	(7)
Pelger Road 1700 LLC	0	0	0	0	0	0	0	0
Pleasant Grove-Verona Mutual Water Company	(199)	(17)	4	(212)	(30)	(3)	1	(32)
Reclamation District 1004	(111)	(9)	19	(101)	(17)	(1)	4	(14)
Sutter Mutual Water Company	(299)	(25)	6	(318)	(45)	(4)	1	(47)
Windswept Land & Livestock	0	0	0	0	0	0	0	0
Feather River AQMD Subtotal	(651)	(55)	29	(677)	(98)	(8)	6	(100)
Yolo-Solano AQMD								
Conaway Preservation Group	(355)	(30)	11	(373)	(53)	(4)	2	(55)
Reclamation District 108	(332)	(28)	44	(316)	(50)	(4)	9	(45)
River Garden Farms	(166)	(14)	5	(175)	(25)	(2)	1	(26)
Te Velde Revocable Family Trust	(100)	(14)	4	(173)	(17)	(1)	1	(18)
Yolo-Solano AQMD Subtotal	(968)	(81)	64	(986)	(17)	(12)	13	(145)
	(3.3)	(- ')	<u> </u>	(3)	()	(:-)		(1.13)
GRAND TOTAL	(3,786)	(318)	561	(3,543)	(567)	(48)	112	(503)

Table E-99. Reduced Annual Fugitive Dust Emissions from Cropland Idling

Table E-99. Reduced Annual Fugitive Di			Emissions (tpy		Annual PM2.5 Emissions (tpy) Land Prep Harvest Wind Erosion Tot						
Air District			Wind Erosion	Total				Total			
Colusa County APCD					-						
Baber, Jack et al.	(3)	(0)	1	(3)	(1)	(0)	0	(0)			
Canal Farms	(1)	(0)	0	(1)	(0)	(0)	0	(0)			
Eastside Mutual Water Company	(3)	(0)	1	(2)	(0)	(0)	0	(0)			
Glenn-Colusa Irrigation District	(45)	(4)	11	(38)	(7)	(1)	2	(5)			
Maxwell Irrigation District	(7)	(1)	2	(6)	(1)	(0)	0	(1)			
Princeton-Codora-Glenn Irrigation District	(5)	(0)	1	(4)	(1)	(0)	0	(1)			
Provident Irrigation District	(7)	(1)	2	(6)	(1)	(0)	0	(1)			
Reclamation District 1004	(10)	(1)	1	(10)	(1)	(0)	0	(1)			
Reclamation District 108	(30)	(3)	1	(31)	(4)	(0)	0	(5)			
Sycamore Mutual Water Company	(15)	(1)	4	(13)	(2)	(0)	1	(2)			
T&P Farms	(1)	(0)	0	(1)	(0)	(0)	0	(0)			
Colusa County APCD Subtotal	(128)	(11)	23	(115)	(19)	(2)	5	(16)			
Glenn County APCD											
Glenn-Colusa Irrigation District	(45)	(4)	11	(38)	(7)	(1)	2	<i>(E</i>)			
Princeton-Codora-Glenn Irrigation District	(45)	(0)	1	(36)	(7) (1)	(0)	0	(5) (1)			
Provident Irrigation District	(7)	(1)	2	(6)	(1)	(0)	0	(1)			
Reclamation District 1004	(10)	(1)	1	(10)	(1)	(0)	0	(1)			
Glenn County APCD Subtotal	(67)	(6)	14	(58)	(10)	(1)	3	(8)			
Gleffir County Air CD Subtotal	(07)	(0)	<u> </u>	(30)	(10)	(1)		(0)			
Feather River AQMD											
Giusti Farms	0	0	0	0	0	0	0	0			
Henle Family LP	0	0	0	0	0	0	0	0			
Natomas Central Mutual Water Company	0	0	0	0	0	0	0	0			
Pelger Mutual Water Company	(4)	(0)	0	(4)	(1)	(0)	0	(1)			
Pelger Road 1700 LLC	0	0	0	0	0	0	0	0			
Pleasant Grove-Verona Mutual Water Company	(18)	(2)	0	(19)	(3)	(0)	0	(3)			
Reclamation District 1004	(10)	(1)	1	(10)	(1)	(0)	0	(1)			
Sutter Mutual Water Company	(27)	(2)	0	(29)	(4)	(0)	0	(4)			
Windswept Land & Livestock	0	0	0	0	0	0	0	0			
Feather River AQMD Subtotal	(59)	(5)	1	(63)	(9)	(1)	0	(9)			
Yolo-Solano AQMD											
Conaway Preservation Group	(32)	(3)	0	(34)	(5)	(0)	0	(5)			
Reclamation District 108	(32)	(3)	1	(34)	(4)	(0)	0	(5)			
River Garden Farms	(15)	(1)	0	(16)	(2)	(0)	0	(2)			
Te Velde Revocable Family Trust	(10)	(1)	0	(11)	(2)	(0)	0	(2)			
Yolo-Solano AQMD Subtotal	(87)	(7)	2	(92)	(13)	(1)	0	(14)			
		, ,		· · ·				· · · · ·			
GRAND TOTAL	(341)	(29)	41	(329)	(51)	(4)	8	(47)			

Table E-100. Combined Emissions by Air District

		Pea	k Daily Emis	sions (lbs/c	lay)			Annual Project Emissions (tpy)				
Air District	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5
Colusa County APCD												
Baber, Jack et al.	(1)	(17)	(22)	(6)	(34)	(6)	(0)	(1)	(1)	(0)	(3)	(0)
Canal Farms	(0)	(5)	(6)	(2)	(9)	(2)	(0)	(0)	(0)	(0)	(1)	(0)
Eastside Mutual Water Company	(1)	(13)	(18)	(4)	(26)	(5)	(0)	(1)	(1)	(0)	(2)	(0)
Glenn-Colusa Irrigation District	(12)	(222)	(292)	(73)	(437)	(74)	(0)	(8)	(11)	(3)	(38)	(6)
Maxwell Irrigation District	(2)	(37)	(49)	(12)	(73)	(13)	(0)	(1)	(2)	(0)	(6)	(1)
Princeton-Codora-Glenn Irrigation District	(1)	(24)	(32)	(8)	(48)	(8)	(0)	(1)	(1)	(0)	(4)	(1)
Provident Irrigation District	(2)	(37)	(48)	(12)	(72)	(12)	(0)	(1)	(2)	(0)	(6)	(1)
Reclamation District 1004	(3)	(49)	(65)	(16)	(105)	(18)	(0)	(2)	(2)	(1)	(10)	(2)
Reclamation District 108	(8)	(148)	(195)	(48)	(327)	(57)	(0)	(6)	(7)	(2)	(31)	(5)
Sycamore Mutual Water Company	(4)	(74)	(97)	(24)	(147)	(25)	(0)	(3)	(4)	(1)	(13)	(2)
T&P Farms	(0)	(7)	(9)	(2)	(13)	(2)	(0)	(0)	(0)	(0)	(1)	(0)
Colusa County APCD Subtotal	(33)	(632)	(832)	(207)	(1,293)	(221)	(1)	(24)	(32)	(8)	(117)	(18)
Glenn County APCD												
Glenn-Colusa Irrigation District	(12)	(222)	(292)	(73)	(437)	(74)	(0)	(8)	(11)	(3)	(38)	(6)
Princeton-Codora-Glenn Irrigation District	(12)	(24)	(32)	(8)	(437)	(8)	(0)	(1)	(1)	(0)		(1)
Provident Irrigation District	(2)	(37)	(32) (48)	٠,,	(4 6) (72)	(0) (12)	(0)	(1)		(0)	(4) (6)	
Reclamation District 1004	(2)	(49)	(4 6) (65)	(12) (16)	(72) (105)	(12) (18)	(0)	(2)	(2) (2)	(1)	(b) (10)	(1) (2)
Glenn County APCD Subtotal	(17)	(332)	(437)	(109)	(663)	(113)	(1)	(13)	(17)	(4)	(59)	(9)
Olerin Godiny At GD Gablotal	(17)	(002)	(407)	(100)	(000)	(110)	(1)	(10)	(17)	(¬)	(00)	(0)
Feather River AQMD												
Giusti Farms	0	0	0	0	0	0	0	0	0	0	0	0
Henle Family LP	0	0	0	0	0	0	0	0	0	0	0	0
Natomas Central Mutual Water Company	0	0	0	0	0	0	0	0	0	0	0	0
Pelger Mutual Water Company	(1)	(19)	(25)	(6)	(46)	(8)	(0)	(1)	(1)	(0)	(4)	(1)
Pelger Road 1700 LLC	0	0	0	0	0	0	0	0	0	0	0	0
Pleasant Grove-Verona Mutual Water Company	(5)	(89)	(117)	(29)	(219)	(39)	(0)	(3)	(4)	(1)	(20)	(3)
Reclamation District 1004	(3)	(49)	(65)	(16)	(105)	(18)	(0)	(2)	(2)	(1)	(10)	(2)
Sutter Mutual Water Company	(7)	(133)	(175)	(44)	(329)	(58)	(0)	(5)	(7)	(2)	(29)	(5)
Windswept Land & Livestock	0	0	0	0	0	0	0	0	0	0	0	0
Feather River AQMD Subtotal	(15)	(290)	(381)	(95)	(700)	(123)	(1)	(11)	(15)	(4)	(63)	(10)
Yolo-Solano AQMD												
Conaway Preservation Group	(8)	(158)	(208)	(52)	(386)	(68)	(0)	(6)	(8)	(2)	(35)	(6)
Reclamation District 108	(8)	(148)	(195)	(48)	(327)	(57)	(0)	(6)	(7)	(2)	(31)	(5)
River Garden Farms	(4)	(74)	(97)	(24)	(181)	(32)	(0)	(3)	(4)	(1)	(16)	(3)
Te Velde Revocable Family Trust	(3)	(52)	(68)	(17)	(126)	(22)	(0)	(2)	(3)	(1)	(11)	(2)
Yolo-Solano AQMD Subtotal	(23)	(431)	(567)	(141)	(1,020)	(179)	(1)	(17)	(22)	(5)	(94)	(15)
CRAND TOTAL	(90)	(1 605)	(2.240)	(EE2)	(2.676)	(626)	(2)	(CE)	(05)	(24)	(224)	(F2)
GRAND TOTAL	(89)	(1,685)	(2,218)	(553)	(3,676)	(636)	(3)	(65)	(85)	(21)	(334)	(52)

				s (lbs per d				Annual		s (tons pe		
Water Agency	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
Anderson-Cottonwood Irrigation District												
Exhaust Emissions	0	0	0	0	0	0	0	0	0	0	0	0
Land Preparation					0	0					0	0
Harvesting					0	0					0	0
Wind Erosion												-
Anderson-Cottonwood Irrigation District Subtotal	0	0	0	0	0	0	0	0	0	0	0	0
Baber, Jack et al.												
Exhaust Emissions	(1)	(17)	(22)	(6)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0)
Land Preparation					(38)	(6)					(3)	(1)
Harvesting					(3)	(0)					(0)	(0)
Wind Erosion					9	2					1	0
Baber, Jack et al. Subtotal	(1)	(17)	(22)	(6)	(34)	(6)	(0)	(1)	(1)	(0)	(3)	(0)
Canal Farms												
Exhaust Emissions	(0)	(5)	(6)	(2)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
Land Preparation					(11)	(2)					(1)	(0)
Harvesting					(1)	(0)					(0)	(0)
Wind Erosion					2	0					0	0
Canal Farms Subtotal	(0)	(5)	(6)	(2)	(9)	(2)	(0)	(0)	(0)	(0)	(1)	(0)
Conaway Preservation Group												
Exhaust Emissions	(8)	(158)	(208)	(52)	(12)	(12)	(0)	(6)	(8)	(2)	(0)	(0)
Land Preparation					(355)	(53)					(32)	(5)
Harvesting					(30)	(4)					(3)	(0)
Wind Erosion					`11 [′]	2					O O	O O
Conaway Preservation Group Subtotal	(8)	(158)	(208)	(52)	(386)	(68)	(0)	(6)	(8)	(2)	(35)	(6)
Eastside Mutual Water Company		` '	` '	<u> </u>	· · · · · · ·	` ` ` ` `	` '	<u> </u>	<u> </u>	<u> </u>	<u> </u>	
Exhaust Emissions	(1)	(13)	(18)	(4)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0)
Land Preparation					(30)	(4)					(3)	(0)
Harvesting					(3)	(0)					(0)	(0)
Wind Erosion					7	1					1	O O
Eastside Mutual Water Company Subtotal	(1)	(13)	(18)	(4)	(26)	(5)	(0)	(1)	(1)	(0)	(2)	(0)
Giusti Farms												
Exhaust Emissions	0	0	0	0	0	0	0	0	0	0	0	0
Land Preparation					0	0					0	0
Harvesting					0	0					0	0
Wind Erosion												-
Giusti Farms Subtotal	0	0	0	0	0	0	0	0	0	0	0	0
Glenn-Colusa Irrigation District												
Exhaust Emissions	(23)	(444)	(584)	(145)	(35)	(35)	(1)	(17)	(22)	(6)	(1)	(1)
Land Preparation					(996)	(149)					(90)	(13)
Harvesting					(84)	(13)					(8)	(1)
Wind Erosion					241	48					22	4
Glenn-Colusa Irrigation District Subtotal	(23)	(444)	(584)	(145)	(874)	(149)	(1)	(17)	(22)	(6)	(77)	(12)

		Daily	Emissions	(lbs per c	lay)			Annual	Emissions	s (tons per	r year)	
Water Agency	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
Henle Family LP												
Exhaust Emissions	0	0	0	0	0	0	0	0	0	0	0	0
Land Preparation					0	0					0	0
Harvesting					0	0					0	0
Wind Erosion												-
Henle Family LP Subtotal	0	0	0	0	0	0	0	0	0	0	0	0
Maxwell Irrigation District												
Exhaust Emissions	(2)	(37)	(49)	(12)	(3)	(3)	(0)	(1)	(2)	(0)	(0)	(0)
Land Preparation					(83)	(12)					(7)	(1)
Harvesting					(7)	(1)					(1)	(0)
Wind Erosion					20	4					2	0
Maxwell Irrigation District Subtotal	(2)	(37)	(49)	(12)	(73)	(13)	(0)	(1)	(2)	(0)	(6)	(1)
Natomas Central Mutual Water Company												
Exhaust Emissions	0	0	0	0	0	0	0	0	0	0	0	0
Land Preparation					0	0					0	0
Harvesting					0	0					0	0
Wind Erosion												-
Natomas Central Mutual Water Company Subtotal	0	0	0	0	0	0	0	0	0	0	0	0
Pelger Mutual Water Company												
Exhaust Emissions	(1)	(19)	(25)	(6)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0)
Land Preparation					(42)	(6)					(4)	(1)
Harvesting					(4)	(1)					(0)	(0)
Wind Erosion					1	0					0	0
Pelger Mutual Water Company Subtotal	(1)	(19)	(25)	(6)	(46)	(8)	(0)	(1)	(1)	(0)	(4)	(1)
Pelger Road 1700 LLC												
Exhaust Emissions	0	0	0	0	0	0	0	0	0	0	0	0
Land Preparation					0	0					0	0
Harvesting					0	0					0	0
Wind Erosion												-
Pelger Road 1700 LLC Subtotal	0	0	0	0	0	0	0	0	0	0	0	0
Pleasant Grove-Verona Mutual Water Company												
Exhaust Emissions	(5)	(89)	(117)	(29)	(7)	(7)	(0)	(3)	(4)	(1)	(0)	(0)
Land Preparation					(199)	(30)					(18)	(3)
Harvesting					(17)	(3)					(2)	(0)
Wind Erosion					4	1					0	0
Pleasant Grove-Verona Mutual Water Company Subtotal	(5)	(89)	(117)	(29)	(219)	(39)	(0)	(3)	(4)	(1)	(20)	(3)
Princeton-Codora-Glenn Irrigation District										-		
Exhaust Emissions	(3)	(49)	(64)	(16)	(4)	(4)	(0)	(2)	(2)	(1)	(0)	(0)
Land Preparation					(110)	(16)					(10)	(1)
Harvesting					(9)	(1)					(1)	(0)
Wind Erosion					26	5					2	O O
Princeton-Codora-Glenn Irrigation District Subtotal	(3)	(49)	(64)	(16)	(96)	(16)	(0)	(2)	(2)	(1)	(8)	(1)

		Daily	Emissions	s (lbs per d	lay)			Annual	Emissions	s (tons pe	r year)			
Water Agency	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5		
Provident Irrigation District														
Exhaust Emissions	(4)	(73)	(96)	(24)	(6)	(6)	(0)	(3)	(4)	(1)	(0)	(0		
Land Preparation			·	·	(164)	(25)					(15)	(2		
Harvesting					(14)	(2)					(1)	(C		
Wind Erosion					40	8					4	1		
Provident Irrigation District Subtotal	(4)	(73)	(96)	(24)	(144)	(25)	(0)	(3)	(4)	(1)	(13)	(2		
Reclamation District 108														
Exhaust Emissions	(16)	(296)	(389)	(97)	(23)	(23)	(1)	(11)	(15)	(4)	(1)	(1		
Land Preparation					(664)	(100)					(60)	(9		
Harvesting					(56)	(8)					(5)	(1		
Wind Erosion					88	18					3	1		
Reclamation District 108 Subtotal	(16)	(296)	(389)	(97)	(655)	(114)	(1)	(11)	(15)	(4)	(63)	(10		
Reclamation District 1004														
Exhaust Emissions	(8)	(148)	(195)	(48)	(12)	(12)	(0)	(6)	(7)	(2)	(0)	(0		
Land Preparation					(332)	(50)					(30)	(4		
Harvesting					(28)	(4)					(3)	(C		
Wind Erosion					56	11					2	Ċ		
Reclamation District 1004 Subtotal	(8)	(148)	(195)	(48)	(316)	(55)	(0)	(6)	(7)	(2)	(31)	(5		
River Garden Farms														
Exhaust Emissions	(4)	(74)	(97)	(24)	(6)	(6)	(0)	(3)	(4)	(1)	(0)	(0		
Land Preparation		`	`		(166)	(25)					(15)	(2		
Harvesting					(14)	(2)					(1)	(C		
Wind Erosion					` 5 [°]	ì					Ô	, C		
River Garden Farms Subtotal	(4)	(74)	(97)	(24)	(181)	(32)	(0)	(3)	(4)	(1)	(16)	(3		
Roberts Ditch Irrigation Company														
Exhaust Emissions	(1)	(13)	(18)	(4)	(1)	(1)	(0)	(1)	(1)	(0)	(0)	(0		
Land Preparation		`	`		(30)	(4)					(3)	(C		
Harvesting					(3)	(0)					(0)	(C		
Wind Erosion					7	ì					1	, C		
Roberts Ditch Irrigation Company Subtotal	(1)	(13)	(18)	(4)	(26)	(5)	(0)	(1)	(1)	(0)	(2)	(C		
Sutter Mutual Water Company		-												
Exhaust Emissions	(7)	(133)	(175)	(44)	(11)	(11)	(0)	(5)	(7)	(2)	(0)	(0		
Land Preparation					(299)	(45)					(27)	(4		
Harvesting					(25)	(4)					(2)	(C		
Wind Erosion					` 6	ì					Ô	, C		
Sutter Mutual Water Company Subtotal	(7)	(133)	(175)	(44)	(329)	(58)	(0)	(5)	(7)	(2)	(29)	(5		
Swenson Farms		•						<u> </u>						
Exhaust Emissions	(1)	(10)	(13)	(3)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0		
Land Preparation					(22)	(3)					(2)	(C		
Harvesting					(2)	(0)					(0)	(C		
Wind Erosion					5	1					O	`c		
Swenson Farms Subtotal	(1)	(10)	(13)	(3)	(19)	(3)	(0)	(0)	(0)	(0)	(2)	(0		
Sycamore Mutual Water Company		· · · · ·	, ,		, ,	, ,	, ,	. ,		· · · ·		,		
Exhaust Emissions	(4)	(74)	(97)	(24)	(6)	(6)	(0)	(3)	(4)	(1)	(0)	(0		
Land Preparation				(- ·)	(166)	(25)					(15)	(2		
Harvesting					(14)	(2)					(1)	(0		
Wind Erosion					39	8					4	1		

		Daily Emissions (lbs per day)							Annual Emissions (tons per year)					
Water Agency	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5		
Sycamore Mutual Water Company Subtotal	(4)	(74)	(97)	(24)	(147)	(25)	(0)	(3)	(4)	(1)	(13)	(2)		
T&P Farms														
Exhaust Emissions	(0)	(7)	(9)	(2)	(1)	(1)	(0)	(0)	(0)	(0)	(0)	(0)		
Land Preparation					(15)	(2)					(1)	(0)		
Harvesting					(1)	(0)					(0)	(0)		
Wind Erosion					3	1					0	0		
T&P Farms Subtotal	(0)	(7)	(9)	(2)	(13)	(2)	(0)	(0)	(0)	(0)	(1)	(0)		

	Daily Emissions (lbs per day) Annual Emissions (tons per year)											
Water Agency	VOC	NOx	CO	SOx	PM10	PM2.5	VOC	NOx	CO	SOx	PM10	PM2.5
Te Velde Revocable Family Trust												
Exhaust Emissions	(3)	(52)	(68)	(17)	(4)	(4)	(0)	(2)	(3)	(1)	(0)	(0)
Land Preparation					(116)	(17)					(10)	(2)
Harvesting					(10)	(1)					(1)	(0)
Wind Erosion					4	1					0	0
Te Velde Revocable Family Trust Subtotal	(3)	(52)	(68)	(17)	(126)	(22)	(0)	(2)	(3)	(1)	(11)	(2)
Windswept Land & Livestock												
Exhaust Emissions	0	0	0	0	0	0	0	0	0	0	0	0
Land Preparation					0	0					0	0
Harvesting					0	0					0	0
Wind Erosion												-
Windswept Land & Livestock Subtotal	0	0	0	0	0	0	0	0	0	0	0	0
Exhaust Emissions Total	(90)	(1,708)	(2,248)	(560)	(135)	(135)	(3)	(65)	(86)	(21)	(5)	(5)
Land Preparation Total	` o´) o	O O	` ó	(3,837)	(575)	`o´	` o´	` o´	Ò	(345)	(52)
Harvesting Total	0	0	0	0	(322)	(48)	0	0	0	0	(29)	(4)
Wind Erosion Total	0	0	0	0	573	115 [°]	0	0	0	0	42	8
GRAND TOTAL	(90)	(1,708)	(2,248)	(560)	(3,721)	(644)	(3)	(65)	(86)	(21)	(338)	(53)

Size Fractions

Description PM10 PM2.5 Ratio
PM Profile ID No. 411, Windblown Dust - Agricultural
PM Profile ID No. 417, Agricultural Tilling Dust 0.4543 0.0681 0.1499

Table E-102. Summary of Cropland Idling Emissions by County

		Dai	ly Emission	ıs (Ibs/day	')			Annu	ıal Emissi	ons (tons	/yr)	
County	VOC	NOx	СО	SOx	PM10	PM2.5	VOC	NOx	СО	SOx	PM10	PM2.5
Colusa												
Baber, Jack et al.	(1)	(17)	(22)	(6)	(34)	(6)	(0)	(1)	(1)	(0)	(3)	(0
Canal Farms	(0)	(5)	(6)	(2)	(9)	(2)	(0)	(0)	(0)	(0)	(1)	(0
Eastside Mutual Water Company	(1)	(13)	(18)	(4)	(26)	(5)	(0)	(1)	(1)	(0)	(2)	(0
Glenn-Colusa Irrigation District	(12)	(222)	(292)	(73)	(437)	(74)	(0)	(8)	(11)	(3)	(38)	(6
Maxwell Irrigation District	(2)	(37)	(49)	(12)	(73)	(13)	(0)	(1)	(2)	(0)	(6)	(1
Princeton-Codora-Glenn Irrigation District	(1)	(24)	(32)	(8)	(48)	(8)	(0)	(1)	(1)	(0)	(4)	(1
Provident Irrigation District	(2)	(37)	(48)	(12)	(72)	(12)	(0)	(1)	(2)	(0)	(6)	(1
Reclamation District 1004	(3)	(49)	(65)	(16)	(105)	(18)		(2)	(2)	(1)	(10)	(2
Reclamation District 108	(8)	(148)	(195)	(48)	(327)	(57)	(0)	(6)	(7)	(2)	(31)	(5
Roberts Ditch Irrigation Company	(1)	(13)	(18)	(4)	(26)	(5)	(0)	(1)	(1)	(0)	(2))
Sycamore Mutual Water Company	(4)	(74)	(97)	(24)	(147)	(25)	(0)	(3)	(4)	(1)	(13)	(2
Swenson Farms	(1)	(10)	(13)	(3)	(19)	(3)	(0)	(0)	(0)	(0)	(2)	(c
T&P Farms	(0)	`(7)	(9)	(2)	(13)	(2)	(0)	(0)	(0)	(0)	(1)	(O
Colusa Subtotal	(34)	(655)	(862)	(215)	(1,339)	(229)	(1)	(25)	(33)	(8)	(121)	(19
Glenn												
Glenn-Colusa Irrigation District	(12)	(222)	(292)	(73)	(437)	(74)	(0)	(8)	(11)	(3)	(38)	(6
Princeton-Codora-Glenn Irrigation District	(1)	(24)	(32)	(8)	(48)	(8)	(0)	(1)	(1)	(0)	(4)	(1
Provident Irrigation District	(2)	(37)	(48)	(12)	(72)	(12)	(0)	(1)	(2)	(0)	(6)	(1
Reclamation District 1004	(3)	(49)	(65)	(16)	(105)	(18)	(0)	(2)	(2)	(1)	(10)	(2
Glenn Subtotal	(17)	(332)	(437)	(109)	(663)	(113)	(1)	(13)	(17)	(4)	(59)	(9
Sutter												
Giusti Farms	0	0	0	0	0	0	0	0	0	0	0	
Henle Family LP	0	0	0	0	0	0	0	0	0	0	0	
Natomas Central Mutual Water Company	0	0	0	0	0	0	0	0	0	0	0	
Pelger Mutual Water Company	(1)	(19)	(25)	(6)	(46)	(8)	(0)	(1)	(1)	(0)	(4)	(1
Pelger Road 1700 LLC	0	0	0	0	0	0	0	0	0	0	0	
Pleasant Grove-Verona Mutual Water Company	(5)	(89)	(117)	(29)	(219)	(39)	(0)	(3)	(4)	(1)	(20)	(3
Reclamation District 1004	(3)	(49)	(65)	(16)	(105)	(18)	(0)	(2)	(2)	(1)	(10)	(2
Sutter Mutual Water Company	(7)	(133)	(175)	(44)	(329)	(58)	(0)	(5)	(7)	(2)	(29)	(5
Windswept Land & Livestock	0	0	0	0	0	0	0	0	0	0	0	
Sutter Subtotal	(11)	(201)	(265)	(66)	(481)	(84)	(0)	(8)	(10)	(3)	(44)	(7
L												
Yolo												
Conaway Preservation Group	(8)	(158)	(208)	(52)	(386)	(68)		(6)	(8)	(2)	(35)	(6
Reclamation District 108	(8)	(148)	(195)	(48)	(327)	(57)	(0)	(6)	(7)	(2)	(31)	(5
River Garden Farms	(4)	(74)	(97)	(24)	(181)	(32)	(0)	(3)	(4)	(1)	(16)	(3
Te Velde Revocable Family Trust	(3)	(52)	(68)	(17)	(126)	(22)	(0)	(2)	(3)	(1)	(11)	(2
Yolo Subtotal	(23)	(431)	(567)	(141)	(1,020)	(179)	(1)	(17)	(22)	(5)	(94)	(15
												_
GRAND TOTAL	(85)	(1,620)	(2,131)	(531)	(3,502)	(605)	(3)	(62)	(82)	(20)	(318)	(50

Table E-103, Reduced Exhaust Emissions from Cropland Idling

Water Agency	Groundwater Substitution Cropland Idling/ Crop Shifting GW Pumping Equivalent			Reduced Daily Emissions (lbs/day)						Reduced Annual Emissions (tons/year)					
	(acre-feet/year)	(acre-feet/year)	(acre-feet/year)	VOC	NOx	co	SOx	PM10	PM2.5	VOC	NOx	co	SOx	PM10	PM2.5
Anderson-Cottonwood Irrigation District	4,800	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Baber, Jack et al.	0	2,310	544	0.90	17.09	22.49	5.60	1.35	1.35	0.03	0.65	0.86	0.21	0.05	0.05
Canal Farms	1,000	635	149	0.25	4.68	6.16	1.53	0.37	0.37	0.01	0.18	0.24	0.06	0.01	0.01
Conaway Preservation Group	0	21,350	5,024	8.31	157.83	207.68	51.75	12.46	12.46	0.32	6.04	7.95	1.98	0.48	0.48
Eastside Mutual Water Company	2,230	1,800	424	0.70	13.32	17.53	4.37	1.05	1.05	0.03	0.51	0.67	0.17	0.04	0.04
Giusti Farms	1,000	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glenn-Colusa Irrigation District	11,495	60,000	14,118	23.34	443.53	583.60	145.44	35.02	35.02	0.89	16.97	22.34	5.57	1.34	1.34
Henle Family LP	700	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Maxwell Irrigation District	3,000	5,000	1,176	1.94	36.95	48.61	12.11	2.92	2.92	0.07	1.41	1.86	0.46	0.11	0.11
Natomas Central Mutual Water Company	20,000	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pelger Mutual Water Company	4,670	2,538	597	0.99	18.76	24.68	6.15	1.48	1.48	0.04	0.72	0.94	0.24	0.06	0.06
Pelger Road 1700 LLC	5,200	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pleasant Grove-Verona Mutual Water Company	15,000	12,000	2,824	4.67	88.72	116.74	29.09	7.00	7.00	0.18	3.40	4.47	1.11	0.27	0.27
Princeton-Codora-Glenn Irrigation District	6,600	6,600	1,553	2.57	48.79	64.20	16.00	3.85	3.85	0.10	1.87	2.46	0.61	0.15	0.15
Provident Irrigation District	10,000	9,900	2,329	3.85	73.17	96.27	23.99	5.78	5.78	0.15	2.80	3.68	0.92	0.22	0.22
Reclamation District 1004	7,175	20,000	4,706	7.78	147.84	194.53	48.48	11.67	11.67	0.30	5.66	7.45	1.86	0.45	0.45
Reclamation District 108	15,000	40,000	9,412	15.56	295.69	389.06	96.96	23.34	23.34	0.60	11.32	14.89	3.71	0.89	0.89
River Garden Farms	10,000	10,000	2,353	3.89	73.92	97.27	24.24	5.84	5.84	0.15	2.83	3.72	0.93	0.22	0.22
Roberts Ditch Irrigation Company	4,100	1,800	424	0.70	13.32	17.53	4.37	1.05	1.05	0.03	0.51	0.67	0.17	0.04	0.04
Sutter Mutual Water Company	18,000	18,000	4,235	7.00	133.05	175.06	43.63	10.50	10.50	0.27	5.09	6.70	1.67	0.40	0.40
Swenson Farms	1,300	1,300	306	0.51	9.61	12.65	3.15	0.76	0.76	0.02	0.37	0.48	0.12	0.03	0.03
Sycamore Mutual Water Company	8,000	10,000	2,353	3.89	73.92	97.27	24.24	5.84	5.84	0.15	2.83	3.72	0.93	0.22	0.22
T&P Farms	1,200	890	209	0.35	6.57	8.64	2.15	0.52	0.52	0.01	0.25	0.33	0.08	0.02	0.02
Te Velde Revocable Family Trust	7,094	6,975	1,641	2.71	51.55	67.83	16.90	4.07	4.07	0.10	1.97	2.60	0.65	0.16	0.16
Windswept Land & Livestock	2,000	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	159,564	231,098	54,377	89.91	1,708.31	2,247.78	560.17	134.87	134.87	3.44	65.38	86.03	21.44	5.16	5.16

1 acre-foot of groundwater pumped =

4.25 acre-feet produced by fallowing

Source: Byron Buck & Associates. 2009. "Comparison of Summertime Emission Credits from Land Fallowing Versus Groundwater Pumping."

Pelger Mutual Water District used to estimate emissions for other water agencies.

Engine power rating equal to 250 hp for Pelger Mutual Water District engines.

The Byron Buck memo is based on diesel-fueled engines with sizes ranging from 121 to 225 hp; all engines are noncertified (Tier 0).

Pelger Mutual Water District engines are therefore determined to be a sufficient proxy to estimate the difference in emissions between groundwater substitution and cropland idling.

Fugitive Dust Emissions from Cropland Idling

Table E-104. Land Preparation (Reduced Emissions)

Table E-104. Land Preparation (Reduced E			Daily PM10 Emissions	Annual PM10 Emissions
		Acres	(lbs/day)	(tons per year)
District	County	Rice	Rice	Rice
	Sacramento River	Area of Ana	lysis	
Anderson-Cottonwood Irrigation District	Shasta/Tehama	0	0	0
Baber, Jack et al.	Colusa	700	38	3
Canal Farms	Colusa	192	11	1
Conaway Preservation Group	Yolo	6,470	355	32
Eastside Mutual Water Company	Colusa	545	30	3
Giusti Farms	Sutter	0	0	0
Glenn-Colusa Irrigation District	Glenn/Colusa	18,182	996	90
Henle Family LP	Sutter	0	0	0
Maxwell Irrigation District	Sacramento/Sutter	1,515	83	7
Natomas Central Mutual Water Company	Sutter	0	0	0
Pelger Mutual Water Company	Sutter	769	42	4
Pelger Road 1700 LLC	Sutter	0	0	0
Pleasant Grove-Verona Mutual Water Company	Glenn/Colusa	3,636	199	18
Princeton-Codora-Glenn Irrigation District	Glenn/Colusa	2,000	110	10
Provident Irrigation District	Glenn/Colusa/Sutter	3,000	164	15
Reclamation District 1004	Yolo	6,061	332	30
Reclamation District 108	Colusa/Yolo	12,121	664	60
River Garden Farms	Sutter	3,030	166	15
Roberts Ditch Irrigation Company	Colusa	545	30	3
Sutter Mutual Water Company	Colusa	5,455	299	27
Swenson Farms	Colusa	394	22	2
Sycamore Mutual Water Company	Yolo	3,030	166	15
T&P Farms	Yolo	270	15	1
Te Velde Revocable Family Trust	Sutter	2,114	116	10
Windswept Land & Livestock	Colusa	0	0	0
Total		70,030	3,837	345

Table E-105. Harvesting (Reduced Emissions)

Table 1 Teel Hall reeking (Iveaueea 1 IIIIeele	<u> </u>		Daily PM10 Emissions	Annual PM10 Emissions
		Acres	(lbs/day)	(tons per year)
District	County	Rice	Rice	Rice
	Sacramento Rive	r Area of Ana	lysis	
Anderson-Cottonwood Irrigation District	Shasta/Tehama	0	0	0
Baber, Jack et al.	Colusa	700	3	0
Canal Farms	Colusa	192	1	0
Conaway Preservation Group	Yolo	6,470	30	3
Eastside Mutual Water Company	Colusa	545	3	0
Giusti Farms	Sutter	0	0	0
Glenn-Colusa Irrigation District	Glenn/Colusa	18,182	84	8
Henle Family LP	Sutter	0	0	0
Maxwell Irrigation District	Sacramento/Sutter	1,515	7	1
Natomas Central Mutual Water Company	Sutter	0	0	0
Pelger Mutual Water Company	Sutter	769	4	0
Pelger Road 1700 LLC	Sutter	0	0	0
Pleasant Grove-Verona Mutual Water Company	Glenn/Colusa	3,636	17	2
Princeton-Codora-Glenn Irrigation District	Glenn/Colusa	2,000	9	1
Provident Irrigation District	Glenn/Colusa/Sutter	3,000	14	1
Reclamation District 1004	Yolo	6,061	28	3
Reclamation District 108	Colusa/Yolo	12,121	56	5
River Garden Farms	Sutter	3,030	14	1
Roberts Ditch Irrigation Company	Colusa	545	3	0
Sutter Mutual Water Company	Colusa	5,455	25	2
Swenson Farms	Colusa	394	2	0
Sycamore Mutual Water Company	Yolo	3,030	14	1
T&P Farms	Yolo	270	1	0
Te Velde Revocable Family Trust	Sutter	2,114	10	1
Windswept Land & Livestock	Colusa	0	0	0
Total		70,030	322	29

Table E-106. Windblown Dust (Increased Emissions)

Table E-106. Windblown Dust (increased E			Daily PM10 Emissions	Annual PM10 Emissions
		Acres	(lbs/day)	(tons per year)
District	County	Rice	Rice	Rice
	Sacramento River	Area of Ana	lysis	
Anderson-Cottonwood Irrigation District	Shasta/Tehama	0		
Baber, Jack et al.	Colusa	700	9	1
Canal Farms	Colusa	192	2	0
Conaway Preservation Group	Yolo	6,470	11	0
Eastside Mutual Water Company	Colusa	545	7	1
Giusti Farms	Sutter	0		
Glenn-Colusa Irrigation District	Glenn/Colusa	18,182	241	22
Henle Family LP	Sutter	0		
Maxwell Irrigation District	Colusa	1,515	20	2
Natomas Central Mutual Water Company	Sacramento/Sutter	0		
Pelger Mutual Water Company	Sutter	769	1	0
Pelger Road 1700 LLC	Sutter	0		
Pleasant Grove-Verona Mutual Water Company	Sutter	3,636	4	0
Princeton-Codora-Glenn Irrigation District	Glenn/Colusa	2,000	26	2
Provident Irrigation District	Glenn/Colusa	3,000	40	4
Reclamation District 1004	Glenn/Colusa/Sutter	6,061	56	2
Reclamation District 108	Colusa/Yolo	12,121	88	3
River Garden Farms	Yolo	3,030	5	0
Roberts Ditch Irrigation Company	Colusa	545	7	1
Sutter Mutual Water Company	Sutter	5,455	6	0
Swenson Farms	Colusa	394	5	0
Sycamore Mutual Water Company	Colusa	3,030	39	4
T&P Farms	Colusa	270	3	0
Te Velde Revocable Family Trust	Yolo	2,114	4	0
Windswept Land & Livestock	Sutter	0		
Total		70,030	573	42

Note:

Fraction of PM10 (FRPM10) from wind erosion: 0.50 (PM10 Emissions = PM x FRPM10)

Conversions

1 ton = 2,000 pounds 1 year = 365 days

Project duration = 180 days (assumes 6-month crop idling season)

Legend

Windblown dust emission factor for pasture land used because emission factor for agricultural lands not available.

Windblown dust emission factor for pasture land used because emission factor for agricultural lands not available (for Yolo County only).

Windblown dust emission factor for pasture land used because emission factor for agricultural lands not available (for Sutter County only).

Agricultural Land Preparation

Table E-107. Summary of Crop Profile, Acre-Pass, and Emission Factor

				Emissio	n Factor
Crop profile	Land Preparation Operations	Category	Acre-Pass	Operation (lbs/Acre-pass)	Crop (Ibs/Acre/year)
Alfalfa	Unspecified	Discing	1.25	1.2	4
	Land Maintenance	Land Planing	0.2	12.5	
Almonds	Float	Land Planing	0.25	12.5	3.13
Citrus	Unspecified	Discing	0.06	1.2	0.07
Corn	List & Fertilize	Weeding	1	0.8	6.9
	Mulch Beds	Discing	1	1.2	
	Finish Disc	Discing	1	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
0 "	Stubble Disc	Discing	1	1.2	0.0
Cotton	Land Preparation	Discing	4	1.2	8.9
	Land Maintenance	Land Planing	0.2	12.5	
<u> </u>	Seed Bed Preparation	Weeding	2	0.8	
DryBeans	Land Maintenance	Land Planing	0.2	12.5	7.7
	Chisel	Discing	1	1.2	
	Shaping	Weeding	1	0.8	
	Disc	Discing	2	1.2	
<u> </u>	Listing	Weeding	1	0.8	
Garbanzo	Chisel	Discing	1	1.2	7.7
	Listing	Weeding	1	0.8	
	Shaping	Weeding	1	0.8	
	Disc	Discing	2	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
Garlic	Land Maintenance	Land Planing	0.2	12.5	6.5
	Disc & Roll	Discing	1	1.2	
	Chisel	Discing	1	1.2	
	List	Weeding	1	0.8	
	Shape Beds	Weeding	1	0.8	
Grapes-Raisin	Terrace	Weeding	1	0.8	2.6
	Spring Tooth	Weeding	0.2	0.8	
	Subsoil	Ripping	0.05	4.6	
	Disc & Furrow-out	Discing	1	1.2	
	Level (new vineyard)	Land Planing	0.02	12.5	
Grapes-Table	Subsoil	Ripping	0.05	4.6	0.83
	Disc & Furrow-out	Discing	0.5	1.2	
Grapes-Wine	Level (new vineyard)	Land Planing	0.02	12.5	1.5
	Spring Tooth	Weeding	0.2	8.0	
	Subsoil	Ripping	0.05	4.6	
	Disc & Furrow-out	Discing	0.75	1.2	
Lettuce*	Land Maintenance	Land Planing	0.2	12.5	12.75
	Disc & Roll	Discing	2/2	1.2	
	Chisel	Discing	2/2	1.2	
	List	Weeding	2/2	0.8	
	Plane	Land Planing	1/2	12.5	
	Shape Beds & Roll	Weeding	2/2	0.8	
Melon	Plow	Discing	1	1.2	5.7
	Shape Beds	Weeding	1	8.0	
	Land Maintenance	Land Planing	0.2	12.5	
	Disc	Discing	1	1.2	ļ
No Land Prep.	Unspecified	Discing	0	1.2	0
Onions	List	Weeding	1	0.8	6.5
	Shape Beds	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
	Chisel	Discing	1	1.2	
	Disc & Roll	Discing	1	1.2	

Agricultural Land Preparation

Table E-107. Summary of Crop Profile, Acre-Pass, and Emission Factor

				Emissio	n Factor
Crop profile	Land Preparation Operations	Category	Acre-Pass	Operation (lbs/Acre-pass)	Crop (lbs/Acre/year)
Rice	Chisel	Discing	1	1.2	20
	Land Maintenance	Land Planing	0.2	12.5	
	Post Burn/Harvest Disc	Discing	0.5	1.2	
	Roll	Weeding	1	0.8	
	3 Wheel Plane	Land Planing	1	12.5	
	Harrow Disc	Discing	1	1.2	
	Stubble Disc	Discing	1	1.2	
Safflower	List	Weeding	1	0.8	4.5
	Land Maintenance	Land Planing	0.2	12.5	
	Stubble Disc	Discing	1	1.2	
Sugar Beets	Disc	Discing	1	1.2	22.8
	Land Plane	Land Planing	1	12.5	
	Subsoil-deep chisel	Ripping	1	4.6	
	Stubble Disc	Discing	1	1.2	
	List	Weeding	1	0.8	
	Land Maintenance	Land Planing	0.2	12.5	
Tomatoes	Bed Preparation	Weeding	2	0.8	10.1
	Land Preparation	Discing	5	1.2	
	Land Maintenance	Land Planing	0.2	12.5	
Vegetables	Land Maintenance	Land Planing	0.2	12.5	8.5
	Unspecified	Discing	5	1.2	
Wheat	Stubble Disc	Discing	1	1.2	3.7
	Land Maintenance	Land Planing	0.2	12.5	

Source:

CARB. 2003. Emission Inventory Documentation, Section 7.4: Agricultural Land Preparation. January. Accessed on: January 21, 2015. Available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocresfarmop.htm.

CDFA		17-1-1-1-1	C. C. C.	Emission Factor		
Crop Code		Crop Profile	Assumption	(lbs PM10/acre/yr		
101999	WHEAT ALL	Wheat	Wheat/1	5.8		
104999	RYE FOR GRAIN	Wheat	Wheat/1	5.8		
106199	RICE, FOR MILLING	Rice	Cotton/2	1.68		
106269	FIELD CROP BY PRODUCTS	Cotton	Cotton/20	0.17		
108999	FOOD GRAINS, MISC	Corn	Cotton/2	1.68		
111559	CORN, WHITE	Corn	Cotton/40	0.08		
111991	CORN FOR GRAIN	Corn	Cotton/2	1.68		
111992	CORN FOR SILAGE	Corn	Cotton/20	0.17		
	OATS FOR GRAIN	Wheat	Wheat/1	5.8		
	BARLEY, MALTING	Wheat	Wheat/1	5.8		
	BARLEY, FEED	Wheat	Wheat/1	5.8		
	BARLEY, UNSPECIFIED	Wheat	Wheat/1	5.8		
114991		Wheat	Wheat/1	5.8		
	COTTON LINT, UPLAND	Cotton	Cotton/1	3.37		
	COTTON LINT, PIMA	Cotton	Cotton/1	3.37		
	COTTON LINT, UNSPEC	Cotton	Cotton/1	3.37		
	SUGAR BEETS	Sugar Beets	Cotton/2	1.68		
	COTTONSEED	Cotton	Cotton/1	3.37		
	PEANUTS, ALL	Safflower	Cotton/2	1.68		
	SAFFLOWER	Safflower	Wheat/1	5.8		
	SUNFLOWER SEED, PLANTING	Corn	Wheat/1	5.8		
	SUNFLOWER SEED	Corn	Wheat/1	5.8		
	JOJOBA	Melon	Cotton/40	0.08		
161131		DryBeans	Cotton/2	1.68		
	BEANS, LIMAS, BABY DRY	DryBeans	Cotton/2	1.68		
	LIMA BEANS, UNSPECIFIED	DryBeans	Cotton/2	1.68		
161717		DryBeans	Cotton/2	1.68		
	BEANS, PINK	DryBeans	Cotton/2	1.68		
	BEANS, BLACKEYE (PEAS)	DryBeans	Cotton/2	1.68		
	BEANS, GARBANZO	Garbanzo	Cotton/2	1.68		
	BEANS, FAVA	DryBeans	Cotton/2	1.68		
	PEAS, DRY EDIBLE	DryBeans	Cotton/20	0.17		
			Cotton/2			
	BEANS, UNSPEC. DRY EDIBLE SEED WHEAT	DryBeans Wheat	Wheat/1	1.68		
				5.8		
	SEED RYE	Wheat	Wheat/1	5.8		
	SEED RICE	Rice	Cotton/2	1.68		
	SEED OATS	Wheat	Wheat/1	5.8		
	SEED BARLEY	Wheat	Wheat/1	5.8		
	SEED, COTTON FOR PLANTING	Cotton	Cotton/1	3.37		
	SEED, SAFFLOWER, PLANTING	Safflower	Wheat/1	5.8		
	SEED BEANS	DryBeans	Cotton/2	1.68		
	SEED PEAS	DryBeans	Cotton/20	0.17		
and the second of the second	SEED, MISC FIELD CROP	Corn	Cotton/20	0.17		
and the second second	SEED, VEG & VINECROP	Vegetables	Cotton/20	0.17		
	SEED, ALFALFA	Alfalfa	Zero/1	0		
	CLOVER, UNSPECIFIED SEED	Alfalfa	Zero/1	0		
	SEED, BERMUDA GRASS	Alfalfa	Zero/1	0		
	SEED, SUDAN GRASS	Alfalfa	Zero/1	0		
	SEED, GRASS, UNSPECIFIED	Alfalfa	Zero/1	0		
	SEED, OTHER (NO FLOWERS)	Alfalfa	Cotton/20	0.17		
	HAY, ALFALFA	Alfalfa	Zero/1	0		
	HAY, GRAIN	Alfalfa	Cotton/2	1.68		
	HAY, WILD	Alfalfa	Cotton/2	1.68		
	HAY, SUDAN	Alfalfa	Zero/1	0		
	HAY, OTHER UNSPECIFIED	Alfalfa	Cotton/2	1.68		
	PASTURE, IRRIGATED	No Land	Zero/1	0		
	PASTURE, RANGE	No Land	Zero/1	0		
19/799	PASTURE, MISC. FORAGE	No Land	Zero/1	0		

CDFA				Emission Factor
Crop Code	CDFA Crop Description	Crop Profile	Assumption	(lbs PM10/acre/yr
	SILAGE	Wheat	Cotton/20	0.17
	HAY, GREEN CHOP	Alfalfa	Zero/1	0
	STRAW	Alfalfa	Wheat/1	5.8
	RICE, WILD	Rice	Cotton/2	1.68
	FIELD CROPS, UNSPEC.	Corn	Cotton/20	0.17
	ORANGES, NAVEL	Citrus	Cotton/40	0.08
	ORANGES, VALENCIAS	Citrus	Cotton/40	0.08
	ORANGES, UNSPECIFIED	Citrus	Cotton/40	0.08
	GRAPEFRUIT, ALL	Citrus	Cotton/40	0.08
	TANGERINES & MANDARINS	Citrus	Cotton/40	0.08
	LEMONS, ALL	Citrus	Cotton/40	0.08
	LIMES, ALL	Citrus	Cotton/40	0.08
	TANGELOS	Citrus	Cotton/40	0.08
	KUMQUATS	Citrus	Cotton/40	0.08
	CITRUS, MISC BY-PROD		-	
	CITRUS, WISC BY-PROD	Citrus	Cotton/40	0.08
	The state of the s	Citrus	Cotton/40	0.08
211999		Citrus	Cotton/40	0.08
	PEACHES, FREESTONE PEACHES, CLINGSTONE	Citrus	Cotton/40	0.08
	The second section of the sect	Citrus	Cotton/40	0.08
	PEACHES, UNSPECIFIED	Citrus	Cotton/40	0.08
	CHERRIES, SWEET	Citrus	Cotton/40	0.08
	PEARS, BARLETT	Citrus	Cotton/40	0.08
	PEARS, ASIAN	Citrus	Cotton/40	0.08
	PEARS, UNSPECIFIED	Citrus	Cotton/40	0.08
	PLUMS	Citrus	Cotton/40	0.08
	PLUMCOTS	Citrus	Cotton/40	0.08
	PRUNES, DRIED	Citrus	Cotton/40	0.08
	GRAPES, TABLE	Grapes-Table	Cotton/20	0.17
	GRAPES, WINE	Grapes-Wine	Cotton/20	0.17
	GRAPES, RAISIN	Grapes-Raisin	Cotton/20	0.17
	GRAPES, UNSPECIFIED	Grapes-Wine	Cotton/20	0.17
	APRICOTS, ALL	Citrus	Cotton/40	0.08
218199	NECTARINES	Citrus	Cotton/40	0.08
218299	PERSIMMONS	Citrus	Cotton/40	0.08
218399	POMEGRANATES	Citrus	Cotton/40	0.08
218499	QUINCE	Citrus	Cotton/40	0.08
218839	CHERIMOYAS	Citrus	Cotton/40	0.08
218889	ORCHARD BIOMASS	Almonds	Cotton/40	0.08
218899	FRUITS & NUTS, UNSPEC.	Citrus	Cotton/40	0.08
221999	AVOCADOS, ALL	Citrus	Cotton/40	0.08
	DATES	Citrus	Almonds/20	2.04
	FIGS, DRIED	Citrus	Almonds/20	2.04
	OLIVES	Citrus	Cotton/40	0.08
	GUAVAS	Citrus	Cotton/40	0.08
	KIWIFRUIT	Citrus	Cotton/40	0.08
	BERRIES, BLACKBERRIES	Grapes-Table	Cotton/40	0.08
	BERRIES, BOYSENBERRIES	Grapes-Table	Cotton/40	0.08
	BERRIES, LOGANBERRIES	Grapes-Table	Cotton/40	0.08
	BERRIES, RASPBERRIES	Grapes-Table	Cotton/40	0.08
	STRAWBERRIES, FRESH MKT	Melon	Cotton/40	0.08
	STRAWBERRIES, PROC	Melon	Cotton/40	0.08
	STRAWBERRIES, UNSPECIFIED	Melon	Cotton/40	0.08
	BERRIES, BUSH, UNSPECIFIED	Grapes-Table	Cotton/40	0.08
	ALMONDS, ALL	Almonds	Almonds/1	40.77
	WALNUTS, ENGLISH	Almonds	Almonds/1	40.77
	PECANS	Almonds	Almonds/10	4.08
	WALNUTS, BLACK	Almonds	Almonds/10	40.77
	CHESTNUTS	Almonds	Almonds/10	4.08

Table E-108. Summary of Crop Emission Factor Assumptions

CDFA		(- ") - 1		Emission Factor
Crop Code		Crop Profile	Assumption	(lbs PM10/acre/yr
267999	MACADAMIA NUT	Almonds	Almonds/10	4.08
268079	PISTACHIOS	Almonds	Almonds/10	4.08
	ALMOND HULLS	Almonds	Almonds/1	40.77
301999	ARTICHOKES	Melon	Cotton/40	0.08
302199	ASPARAGUS, FRESH MKT	Melon	Cotton/2	1.68
302299	ASPARAGUS, PROC	Melon	Cotton/2	1.68
302999	ASPARAGUS, UNSPECIFIED	Melon	Cotton/2	1.68
303999	BEANS, GREEN LIMAS	DryBeans	Cotton/2	1.68
304199	BEANS, SNAP FR MKT	DryBeans	Cotton/20	0.17
304299	BEANS, SNAP PROC	DryBeans	Cotton/20	0.17
304399	BEANS FRESH UNSPECIFIED	DryBeans	Cotton/20	0.17
304999	BEANS, UNSPECIFIED SNAP	DryBeans	Cotton/20	0.17
305999	BEETS, GARDEN	Sugar Beets	Cotton/2	1.68
	RAPINI	Sugar Beets	Cotton/40	0.08
307189	BROCCOLI,FOOD SERV	Vegetables	Cotton/40	0.08
	BROCCOLI, FR MKT	Vegetables	Cotton/40	0.08
307299	BROCCOLI, PROC	Vegetables	Cotton/40	0.08
307919	BROCCOLI, UNSPECIFIED	Vegetables	Cotton/40	0.08
308999	BRUSSELS SPROUTS	Melon	Cotton/40	0.08
309999	CABBAGE, CH. & SPECIALTY	Lettuce	Cotton/40	0.08
310999	CABBAGE, HEAD	Lettuce	Cotton/40	0.08
313189	CARROTS, FOOD SERV	Sugar Beets	Cotton/20	0.17
313199	CARROTS, FR MKT	Sugar Beets	Cotton/20	0.17
313299	CARROTS, PROC	Sugar Beets	Cotton/20	0.17
313999	CARROTS, UNSPECIFIED	Sugar Beets	Cotton/20	0.17
314189	CAULIFLOWER, FOOD SERV	Vegetables	Cotton/40	0.08
314199	CAULIFLOWER, FR MKT	Vegetables	Cotton/40	0.08
314299	CAULIFLOWER, PROC	Vegetables	Cotton/40	0.08
314999	CAULIFLOWER, UNSPECIFIED	Vegetables	Cotton/40	0.08
316189	CELERY, FOOD SERV	Lettuce	Cotton/40	0.08
316199	CELERY, FR MKT	Lettuce	Cotton/40	0.08
316299	CELERY, PROC	Lettuce	Cotton/40	0.08
316999	CELERY, UNSPECIFIED	Lettuce	Cotton/40	0.08
318999	RADICCHIO	Lettuce	Cotton/40	0.08
320999	CHIVES	Lettuce	Cotton/40	0.08
322999	COLLARD GREENS	Lettuce	Cotton/40	0.08
323999	CORN, SWEET ALL	Corn	Cotton/40	0.08
	CUCUMBERS	Vegetables	Cotton/40	0.08
	EGGPLANT, ALL	Vegetables	Cotton/40	0.08
	ENDIVE, ALL	Lettuce	Cotton/40	0.08
	ESCAROLE, ALL	Lettuce	Cotton/40	0.08
	ANISE (FENNEL)	Lettuce	Cotton/2	1.68
	GARLIC, ALL	Garlic	Cotton/2	1.68

Table E-108. Summary of Crop Emission Factor Assumptions

CDFA	Land of the state	And the second		Emission Factor		
rop Code		Crop Profile	Assumption			
337999		Lettuce	Cotton/40	0.08		
	KOHLRABI	Lettuce	Cotton/40	0,08		
	LETTUCE, BULK SALAD PRODS.	Lettuce	Cotton/40	0.08		
	LETTUCE, UNSPECIFIED	Lettuce	Cotton/40	0.08		
	LETTUCE, HEAD	Lettuce	Cotton/40	0.08		
	LETTUCE, ROMAINE	Lettuce	Cotton/40	0.08		
342999	LETTUCE, LEAF	Lettuce	Cotton/40	0.08		
343999	MELON, CANTALOUPE	Melon	Cotton/40	0.08		
348999	MELON, HONEYDEW	Melon	Cotton/40	0.08		
354299	MELON, UNSPECIFIED	Melon	Cotton/40	0.08		
354999	MELON, WATER MELONS	Melon	Cotton/40	0.08		
355999	MUSHROOMS	No Land Prep.	Zero/1	0		
356999	MUSTARD	Lettuce	Cotton/40	0.08		
357999	OKRA	Lettuce	Cotton/40	0.08		
358999	ONIONS	Onions	Cotton/2	1.68		
359999	PARSLEY	Lettuce	Cotton/40	0.08		
	PEAS, GREEN, PROCESSING	DryBeans	Cotton/20	0.17		
	PEAS, GREEN, UNSPECIFIED	DryBeans	Cotton/20	0.17		
	PEPPERS, BELL	Tomatoes	Cotton/40	0.08		
	PEPPERS, CHILI, HOT	Tomatoes	Cotton/40	0.08		
	PUMPKINS	Melon	Cotton/20	0.17		
	RADISHES	Sugar Beets	Cotton/40	0.08		
	RHUBARB	Lettuce	Cotton/40	0.08		
	RUTABAGAS	Sugar Beets	Cotton/2	1.68		
	ONIONS, GREEN & SHALLOTS	Onions	Cotton/40	0.08		
	SPINACH, FOOD SERV	Lettuce	Cotton/40	0.08		
	SPINACH, FR MKT	Lettuce	Cotton/40	0.08		
	SPINACH, PROC	Lettuce	Cotton/40	0.08		
	SPINACH UNSPECIFIED	Lettuce	Cotton/40	0.08		
	SQUASH	Melon	Cotton/20	0.17		
	SWISSCHARD	Lettuce	Cotton/40	0.08		
	TOMATOES, FRESH MARKET	Tomatoes	Cotton/40	0.08		
	TOMATOES, PROCESSING	Tomatoes	Cotton/20	0.17		
	TOMATOES, UNSPECIFIED	Tomatoes	Cotton/20	0.17		
	TURNIPS, ALL	Sugar Beets	Cotton/2	1.68		
	GREENS, TURNIP & MUSTARD	Lettuce	Cotton/40	0.08		
	LEEKS	Onions	Cotton/40	0.08		
	POTATOES, IRISH ALL	Sugar Beets	Cotton/2	1.68		
	SWEET POTATOES	Sugar Beets	Cotton/2	1.68		
	HORSERADISH	Onions	Cotton/40	0.08		
	SALAD GREENS NEC	Lettuce	Cotton/40	0.08		
	PEAS, EDIBLE POD (SNOW)		Cotton/20	0.08		
	VEGETABLES, ORIENTAL, ALL	DryBeans Vegetables	Cotton/40	0.17		
	SPROUTS, ALFALFA & BEAN	Lettuce	Cotton/40	0.08		
	CUCUMBERS, GREENHOUSE	No Land Prep.	Zero/1	0.06		
	TOMATOES, GREENHOUSE	No Land Prep.	Zero/1	0		
	TOMATOES, CHERRY	Tomatoes	Cotton/40	0.08		
	TOMATILLO		Cotton/40	0.08		
THE WALLSON OWN		Tomatoes	-			
	CILANTRO	Lettuce	Cotton/40	0.08		
	SPICES AND HERBS	Lettuce	Cotton/40	0.08		
	VEGETABLES, BABY	Vegetables	Cotton/40	0.08		
	VEGETABLES, UNSPECIFIED	Vegetables	Cotton/20	0.17		
	POTATOES SEED NURSERY TURF	Sugar Beets No Land Prep.	Cotton/2 Zero 1	1.68		

Source:

CARB. 2003. Emission Inventory Documentation, Section 7.5: Agricultural Harvest Operations. January. Accessed on: January 21, 2015. Available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocresfarmop.htm.

Windblown Dust - Agricultural Lands

Table E-109. Windblown Dust - Agricultural Lands

Air		Emission	PM		
Basin	County	Factor	Rate	Emissions	
Code	Name	(tons/acre/yr)	(acres)	(tons/year)	
NCC	Monterey	0.020478	279,178.00	5,717.07	
	San Benito	0.015936	50,009.00	796.96	
	Santa Cruz	0.002485	14,873.00	36.97	
SCC	San Luis Obispo	0.006876	109,694.00	754.2	
	Santa Barbara	0.00319	80,732.00	257.56	
	Ventura	0.018418	54,568.00	1,005.02	
SED	Imperial	0.141666	490,409.00	69,474.43	
SJV	Fresno	0.013761	864,164.00	11,891.35	
	Kern	0.008662	408,313.48	3,536.73	
	Kings	0.012856	473,817.00	6,091.62	
	Madera	0.008032	141,617.00	1,137.47	
	Merced	0.013659	364,804.00	4,982.86	
	San Joaquin	0.003527	387,278.00	1,365.96	
	Stanislaus	0.009052	229,805.00	2,080.26	
	Tulare	0.004693	471,664.00	2,213.29	
SV	Butte	0.001154	116,869.00	134.87	
	Colusa	0.004702	229,747.00	1,080.31	
	Glenn	0.004957	186,067.00	922.39	
	Placer	0.002172	6,962.90	15.12	
	Sacramento	0.002479	117,770.00	291.92	

Note:

Fraction of PM10 (FRPM10): 0.50 (PM10 Emissions = PM x FRPM10)

Table E-110. Windblown Dust - Pasture Lands

Air		Emission	Process	PM	
Basin	County	Factor	Rate	Emissions	
Code	Name	(tons/acre/yr)	(acres)	(tons/year)	
NCC	Monterey	0.00110562	1,108,000	1,225.03	
	San Benito	0.00109336	512,000	559.8	
	Santa Cruz	0.0001605	8,000	1.28	
SCC	Santa Barbara	0.00021801	602,913	131.44	
	San Luis Obispo	0.00046964	1,102,500	517.78	
	Ventura	0.00050356	210,918	106.21	
SED	Imperial	0.00867346	158,449	1,374.30	
SJV	Fresno	0.00149089	907,300	1,352.69	
	Kern	0.00082834	1,527,603	1,265.37	
	Kings	0.00146875	142,777	209.7	
	Madera	0.00116178	421,000	489.11	
	Merced	0.00155578	642,700	999.9	
	San Joaquin	0.0005228	167,700	87.67	
	Stanislaus	0.00107875	434,300	468.5	
	Tulare	0.00063424	713,400	452.47	
SV	Butte	0.00014292	288,500	41.23	
	Colusa	0.00046444	181,900	84.48	
	Glenn	0.00048846	256,575	125.33	
	Placer	0.00026499	65,656	17.4	
	Sacramento	0.00019538	118,000	23.05	
	Shasta	0.00034146	459,000	156.73	
	Solano	0.00039453	131,360	51.83	
	Sutter	0.00037084	71,500	26.51	
	Tehama	0.00035146	955,350	335.76	
	Yolo	0.00061919	136,870	84.75	
	Yuba	0.00023892	207,600	49.6	

Note:

Fraction of PM10 (FRPM10): 0.50 (PM10 Emissions = PM x FRPM10)

Table E-111. County Size

Table L-111. Count	Area (a	cres)
County	Non-Pasture	Pasture
Butte	n/a	n/a
Colusa	n/a	n/a
Fresno	n/a	n/a
Glenn	n/a	n/a
Imperial	n/a	n/a
Kern	n/a	n/a
Kings	n/a	n/a
Madera	n/a	n/a
Merced	n/a	n/a
Monterey	n/a	n/a
Placer	n/a	n/a
Sacramento	n/a	n/a
San Benito	n/a	n/a
San Joaquin	n/a	n/a
San Luis Obispo	n/a	n/a
Santa Barbara	n/a	n/a
Santa Cruz	n/a	n/a
Shasta	n/a	n/a
Solano	n/a	n/a
Stanislaus	n/a	n/a
Sutter	n/a	n/a
Tehama	n/a	n/a
Tulare	n/a	n/a
Ventura	n/a	n/a
Yolo	n/a	n/a
Yuba	n/a	n/a
Total	0	0

Source:

CARB. 1997. Emission Inventory Documentation, Section 7.12: Windblown Dust - Agricultural Lands. July. Accessed on: January 21, 2015. Available at: http://www.arb.ca.gov/ei/areasrc/arbmiscprocfugwbdst.htm.

As discussed in Section 3, Environmental Impacts, Figure 1 below shows the CO maintenance area; Figure 2 displays the O₃ nonattainment area; Figure 3 shows the PM₁₀ maintenance area; and Figure 4 displays the PM_{2.5} nonattainment area.

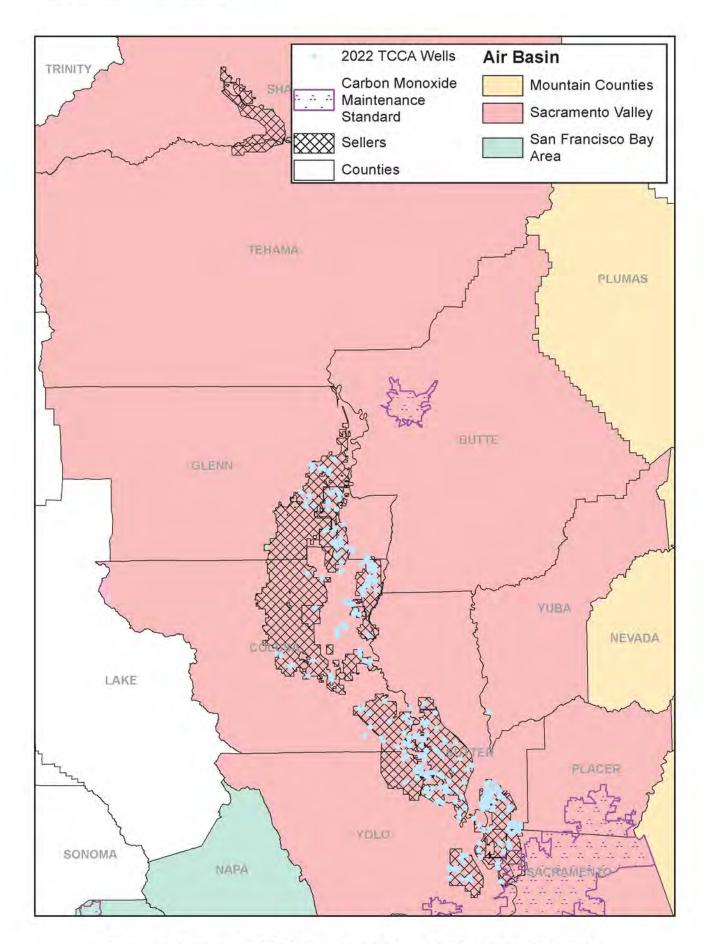


Figure 1. Location of CO Maintenance Area in Seller Service Area

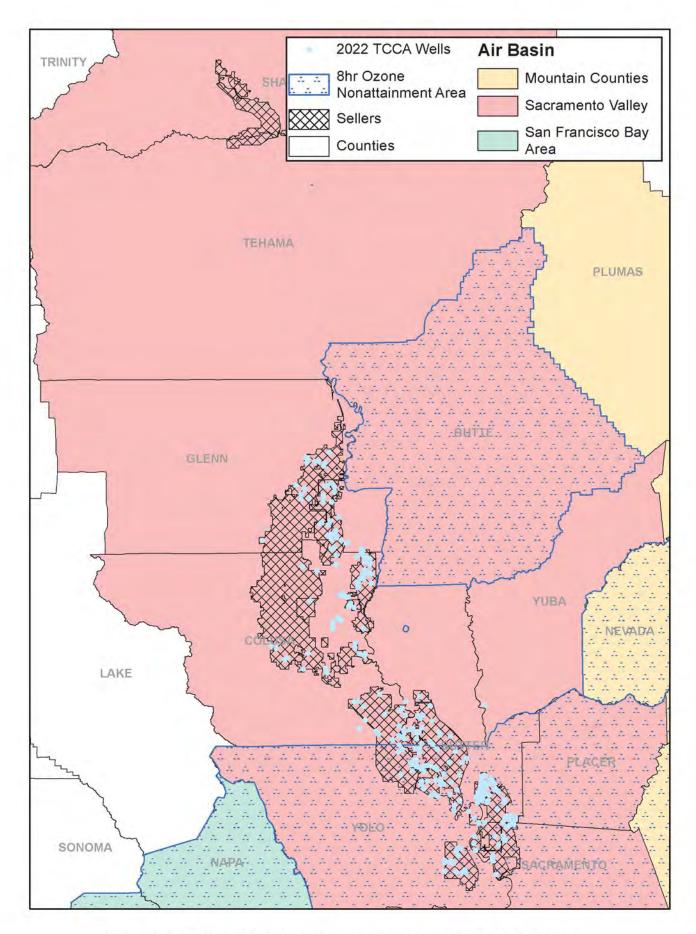


Figure 2. Location of O₃ Nonattainment Area in Seller Service Area
E-81- February 2022

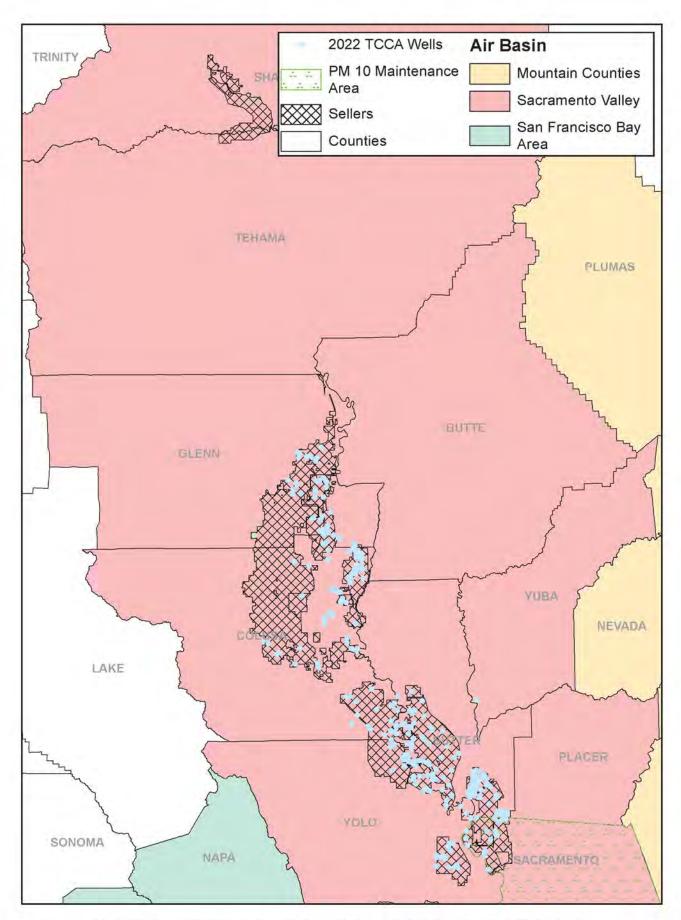


Figure 3. Location of PM₁₀ Maintenance Area in Seller Service Area

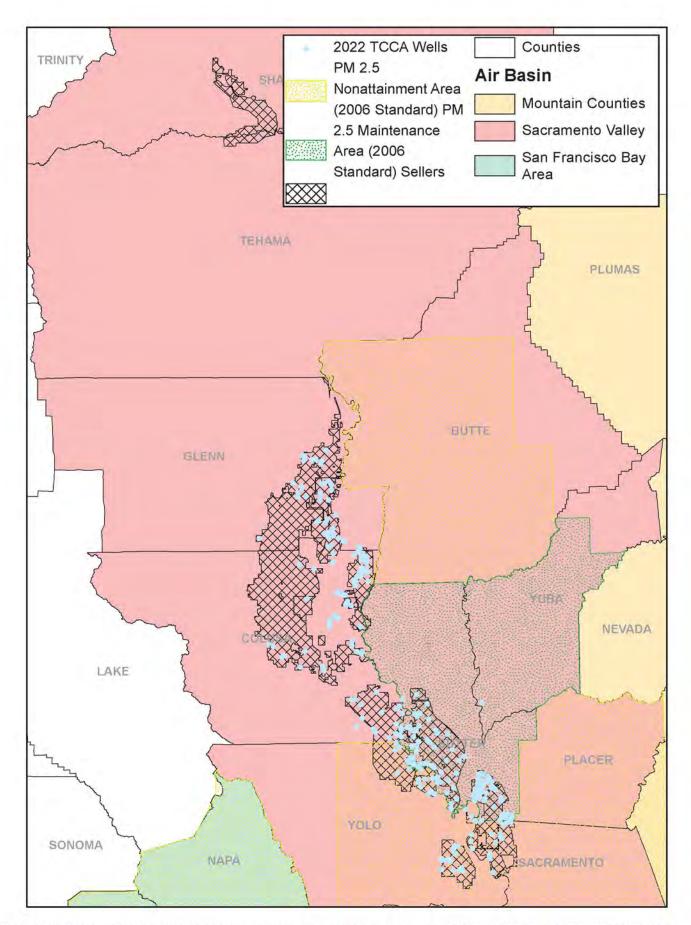
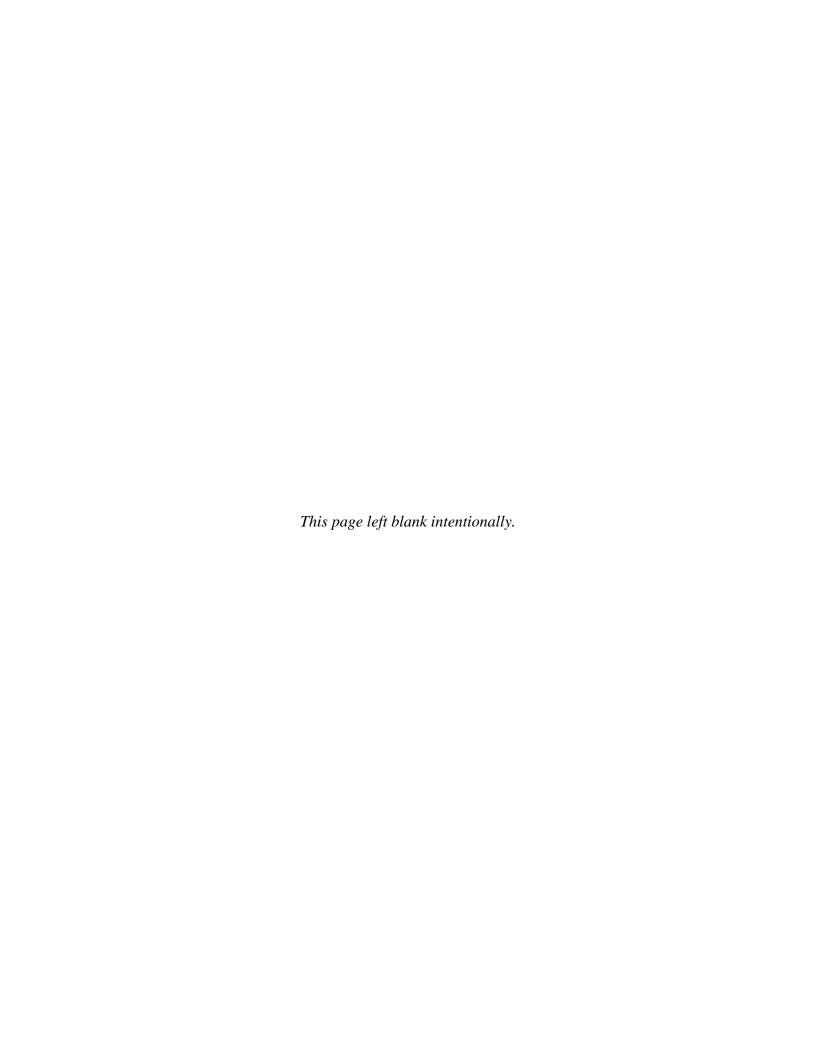


Figure 4. Location of PM_{2.5} Nonattainment and Maintenance Areas in Seller Service Area

Appendix F Greenhouse Gas Emissions Calculations



Summary of Annual Greenhouse Gas Emissions

Table F-1. GHG Emissions from Groundwater Substitution

	Е	missions	(MTCO2e/yea	ır)
Water Agency	CO2	CH4	N2O	Total
Anderson-Cottonwood Irrigation District	70	0	0	71
Baber, Jack et al.	No Gro	undwater S	Substitution	0
Canal Farms	31	0	0	31
Conaway Preservation Group	No Gro	undwater S	Substitution	0
Eastside Mutual Water Company	340	0	1	341
Giusti Farms	41	0	0	41
Glenn-Colusa Irrigation District	1,538	2	4	1,544
Henle Family LP	15	0	0	15
Maxwell Irrigation District	526	1	1	528
Natomas Central Mutual Water Company	1,225	2	4	1,230
Pelger Mutual Water Company	171	0	1	172
Pelger Road 1700 LLC	127	1	1	128
Pleasant Grove-Verona Mutual Water Company	1,159	2	3	1,164
Princeton-Cordora-Glenn Irrigation District	709	1	2	712
Provident Irrigation District	1,628	2	4	1,634
Reclamation District 1004	894	1	2	898
Reclamation District 108	2,121	3	6	2,130
River Garden Farms	250	1	1	252
Roberts Ditch Irrigation Company	185	1	1	187
Sutter Mutual Water Company	3,045	3	8	3,056
Swenson Farms	42	0	0	43
Sycamore Mutual Water Company	86	0	0	87
T&P Farms	15	0	0	15
Te Velde Revocable Family Trust	122	0	1	123
Windswept Land & Livestock	57	0	0	57
Total	14,396	21	42	14,458

Agency Anderson-Cottonwood Irrigation District

Transfer Volume 4,800 acre-feet/year

Table F-2. Anderson-Cottonwood Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Shasta	0	2	0	0	2
Tehama	0	0	0	0	0
Total	0	2	0	0	2

Table F-3. Anderson-Cottonwood Irrigation District GHG Emissions

GHG Emissions Well Transfer Fuel (MTCO2e per year) Location **Power Rating Pump Rate** Volume Operation Consumption (tonnes per year) (County) **Model Year** (% of Total) (AF/year) (hours/year) (kWh/yr) Well Fuel Type (gpm) CO2 N20 CO2 CH4 N20 Total (hp) (gal/yr) CH4 Barney Street 2012 598.578 Shasta Electric 200 5.500 85% 4,062 4.010 n/a 56 0.0090 0.0011 56 0.22 0.32 57 Electric Crowley Gulch Shasta 2012 50 1,000 15% 738 4,010 149,645 14 0.0022 0.0003 14 0.06 0.08 14 n/a 748,223 Total 6,500 100% 4,800 8,021 0 70 0.0112 0.0014 70 0.28 0.40 71

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr 0.855 g/mL (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Canal Farms

Transfer Volume 1,000 acre-feet/year

Table F-4. Canal Farms Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	2	0	1	3
Total	0	2	0	1	3

Table F-5. Canal Farms GHG Emissions

2 3 4 5 9 6 7

	Well						Transfer			Fuel			GH	G Emissio	ns		
	Location			Power Rating	Pum	Rate	Volume	Opera	tion	Consumption	(to	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(MMBtu/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
Dennis Well North	Colusa	Electric	unknown	125	2,500	25%	250	543	50,661	n/a	5	0.0008	0.0001	5	0.02	0.03	5
Dennis Well South	Colusa	Electric	unknown	125	2,500	25%	250	543	50,661	n/a	5	0.0008	0.0001	5	0.02	0.03	5
East Well	Colusa	Propane	unknown	250	5,000	50%	500	543	n/a	345	22	0.0010	0.0002	22	0.03	0.06	22
	_	_	_	Total	10,000	100%	1,000	1,629	101,322	345	31	0.0026	0.0004	31	0.06	0.12	31

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

<u>Legend</u>

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 bhp-hr = 2,542.5 Btu

1 lb = 453.6 g

1 tonne = 1,000 kg

1 tonne = 1,000,000 g

1 MWh = 1,000 kWh

1 GWh = 1,000,000 kWh

1 kW = 1.34 hp

1 hour = 60 minutes

1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Eastside Mutual Water Company
Transfer Volume 2,230 acre-feet/year

Table F-6. Eastside Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	3	0	0	0	3
Total	3	0	0	0	3

Table F-7. Eastside Mutual Water Company GHG Emissions

	2	3	4	5	9						6	7	8				
	Well						Transfer			Fuel			GH	G Emission	ns		
	Location			Power Rating	Pum	p Rate	Volume	Opera	tion	Consumption	(to	nes per y	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
ATW-1	Colusa	Diesel	2006	150	4,720	37%	827	952	n/a	8,012	82	0.003	0.0007	82	0.08	0.20	82
ATW-2	Colusa	Diesel	2002	275	4,000	31%	701	952	n/a	14,689	150	0.006	0.0012	150	0.15	0.37	150
ATW-3	Colusa	Diesel	2010	200	4,000	31%	701	952	n/a	10,683	109	0.004	0.0009	109	0.11	0.27	109
			-	Total	12.720	100%	2.230	2.856	0	33.384	340	0.014	0.0028	340	0.35	0.83	341

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Giusti Farms

Transfer Volume 1,000 acre-feet/year

Table F-8. Giusti Farms Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	0	0	2	2
	0	0	0	0	0
	0	0	0	0	0
Total	0	0	0	2	2

Table F-9. Giusti Farms GHG Emissions

		•														
Well						Transfer			Fuel	GHG Emissions						
Location			Power Rating	Pump	Rate	Volume	Operat	tion	Consumption	(tonnes per year) (MTCO2e per year)						
(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(MMBtu/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
Sutter	Propane	2015	150	3,200	50%	500	849	n/a	324	20	0.0010	0.0002	20	0.02	0.06	20
Sutter	Propane	2015	150	3,200	50%	500	849	n/a	324	20	0.0010	0.0002	20	0.02	0.06	20
			Total	6.400	100%	1 000	1 697	0	647	<i>1</i> 1	0.0019	0.0004	<i>1</i> 1	0.05	0.12	<i>1</i> 1

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide gal/yr = gallons per year

Well

Giusti Well 1

Giusti Well 2

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

2,542.5 Btu 1 bhp-hr =453.6 g 1 lb = 1,000 kg 1 tonne = 1 tonne = 1,000,000 g1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh1 kW = 1.34 hp 60 minutes 1 hour = 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Glenn-Colusa Irrigation District Agency Transfer Volume 11,495 acre-feet/year

Table F-10. Glenn-Colusa Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	10	7	0	0	17
Colusa	5	6	0	0	11
Total	15	13	0	0	28

Table F-11. Glenn-Colusa Irrigation District GHG Emissions

	2	3	4	5	9						6	7	8				
	Well						Transfer			Fuel			GH	G Emissio	ns		
	Location			Power Rating	Pump	o Rate	Volume	Opera	ition	Consumption	(toı	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
33	Glenn	Diesel	unknown	185	3,000	5%	594	1,076	n/a	11,167	114	0.0047	0.0009	114	0.12	0.28	114
34	Glenn	Diesel	unknown	140	4,000	7%	792	1,076	n/a	8,451	86	0.0035	0.0007	86	0.09	0.21	86
62	Glenn	Diesel	unknown	145	3,000	5%	594	1,076	n/a	8,753	89	0.0036	0.0007	89	0.09	0.22	89
80	Glenn	Diesel	unknown	200	2,000	3%	396	1,076	n/a	12,073	123	0.0050	0.0010	123	0.13	0.30	123
81	Glenn	Diesel	unknown	200	2,000	3%	396	1,076	n/a	12,073	123	0.0050	0.0010	123	0.13	0.30	123
83	Glenn	Diesel	unknown	75	1,500	3%	297	1,076	n/a	4,527	46	0.0019	0.0004	46	0.05	0.11	46
165	Glenn	Diesel	unknown	160	3,000	5%	594	1,076	n/a	9,658	98	0.0040	0.0008	98	0.10	0.24	99
185	Glenn	Diesel	unknown	150	3,000	5%	594	1,076	n/a	9,054	92	0.0038	0.0008	92	0.09	0.23	92
187	Glenn	Diesel	unknown	200	3,500	6%	693	1,076	n/a	12,073	123	0.0050	0.0010	123	0.13	0.30	123
15-3-22H-3	Colusa	Diesel	unknown	121	630	1%	125	1,076	n/a	7,304	74	0.0030	0.0006	74	0.08	0.18	75
17-2-6B-1	Colusa	Electric	unknown	121	2,050	4%	406	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
322N	Colusa	Diesel	unknown	250	2,000	3%	396	1,076	n/a	15,091	154	0.0063	0.0013	154	0.16	0.38	154
GRS-22H-1	Glenn	Electric	unknown	121	2,300	4%	456	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
GRS-34N-1	Glenn	Diesel	unknown	121	1,500	3%	297	1,076	n/a	7,304	74	0.0030	0.0006	74	0.08	0.18	75
GRS-35A-2	Glenn	Electric	unknown	121	3,600	6%	713	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
GRS-84A-1	Glenn	Electric	unknown	121	3,000	5%	594	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Haymen	Colusa	Diesel	unknown	121	2,000	3%	396	1,076	n/a	7,304	74	0.0030	0.0006	74	0.08	0.18	75
LaCroix 1	Glenn	Electric	unknown	121	600	1%	119	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
LaCroix 2	Glenn	Electric	unknown	121	600	1%	119	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
LaCroix 3	Glenn	Electric	unknown	121	600	1%	119	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Lagrande	Colusa	Diesel	unknown	121	2,900	5%	575	1,076	n/a	7,304	74	0.0030	0.0006	74	0.08	0.18	75
Reister 1	Colusa	Electric	unknown	121	850	1%	168	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Reister 2	Colusa	Electric	unknown	121	850	1%	168	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Reister 3	Colusa	Electric	unknown	121	850	1%	168	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Reister 4	Colusa	Electric	unknown	121	890	2%	176	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
S2-36T	Glenn	Electric	unknown	121	2,800	5%	555	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Vann 1	Colusa	Diesel	unknown	121	1,500	3%	297	1,076	n/a	7,304	74	0.0030	0.0006	74	0.08	0.18	75
Vann 2	Colusa	Electric	unknown	121	3,500	6%	693	1,076	97,158	n/a	9	0.0015	0.0002	9	0.04	0.05	9
				Total	58,020	100%	11,495	30,127	1,263,057	139,438	1,538	0.0771	0.0139	1,538	1.93	4.15	1,544

Key: AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g1 tonne = 1,000 kg 1 tonne = 1,000,000 g1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) 0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types) 7.13 lb/gal

Agency Henle Family LP
Transfer Volume 700 acre-feet/year

Table F-12. Henle Family LP Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	1	0	0	1
Total	0	1	0	0	1

Table F-13. Henle Family LP GHG Emissions

GHG Emissions Well Transfer Fuel **Power Rating** Location **Pump Rate** Volume Operation Consumption (tonnes per year) (MTCO2e per year) Fuel Type (hours/year) (kWh/yr) **Model Year** Well (County) (hp) (gpm) (% of Total) (AF/year) (gal/yr) CO2 CH4 N20 CO2 CH4 N20 Total Well #2 Electric Sutter unknown 1,056 157,612 0.0003 0.06 0.09 200 3,600 100% 700 15 0.0024 15 15 n/a Total 3,600 100% 700 1,056 157,612 0.0024 0.0003 15 0.06 0.09 15

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000 kWh 1 kW = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

0.855 g/mL 7.13 lb/gal

Agency Maxwell Irrigation District
Transfer Volume 3,000 acre-feet/year

Table F-14. Maxwell Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	2	0	0	0	2
Total	2	0	0	0	2

Table F-15. Maxwell Irrigation District GHG Emissions

	2	3	4	5	9						6	7	8				
	Well						Transfer			Fuel			GH	G Emissio	ns		
	Location			Power Rating	Pumj	Rate	Volume	Operat	tion	Consumption	(to	nnes per y	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
MainWell	Colusa	Diesel	2006	215	3,800	50%	1,500	2,144	n/a	25,857	263	0.0108	0.0022	263	0.27	0.64	264
TuttleWell	Colusa	Diesel	2006	215	3,800	50%	1,500	2,144	n/a	25,857	263	0.0108	0.0022	263	0.27	0.64	264
				Total	7,600	100%	3,000	4,288	0	51,715	526	0.0216	0.0043	526	0.54	1.29	528

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Natomas Central Mutual Water Company Transfer Volume 20,000 acre-feet/year

Table F-16. Natomas Central Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sacramento	2	13	0	1	16
Sutter	2	15	0	4	21
Total	4	28	0	5	37

Table F-17. Natomas Central Mutual Water Company GHG Emissions

Fuel **GHG Emissions** Transfer Volume Consumption (MTCO2e per year) Location **Power Rating** Operation Pump Rate (tonnes per year) (gal/yr) - diesel Well N2O CO2 (County) Fuel Type Model Year (% of Total) (AF/year) (hours/year) (kWh/yr) (MMBtu/yr) - propane 50 0.0024 0.0005 50 0.06 0.14 50 Ameral Sacramento Propane unknown 1,500 2% 428 1,551 n/a 3% 514 1.551 144.642 14 0.0022 0.0003 14 0.05 0.08 TNBC Atkinson Sutter Electric 125 1,800 unknown n/a TNBC Bennett North 2,200 628 1.551 144.642 14 0.0022 0.0003 14 0.05 0.08 Sutter Electric 125 n/a unknown 3% 428 1,551 144,642 TNBC Betts Electric unknown 125 1,500 25 0.0022 0.0003 25 0.05 0.08 2% n/a Sacramento
 50
 0.0024
 0.0005
 50
 0.06
 0.14

 25
 0.0022
 0.0003
 25
 0.05
 0.08

 25
 0.0022
 0.0003
 25
 0.05
 0.08
 Sutter 200 1,500 428 1,551 n/a Bianchi Propane unknown 2% 857 1,551 144,642 Dhaliwal Sacramento Electric unknown 3,000 4% 4% 771 1.551 144.642 Sacramento Flkhorn Electric unknown TNBC Frazer 1,551 144,642 14 0.0022 0.0003 14 0.05 0.08 Sutter 125 2,000 571 Electric unknown Greenbriar 914 1,551 173,571 30 0.0026 0.0003 30 0.06 0.09 Sacramento Electric unknown 150 3,200 5% n/a 0.0001 5 0.01 1,300 371 1,551 Kubo Sacramento Electric unknown 2% L-1 Sutter Diesel 125 1,600 2% 457 1,551 n/a 10,874 111 0.0045 0.0009 111 0.11 0.27 Electric 286 1,551 34,714 L-10 Sutter unknown 30 1,000 1% n/a 3 0.0005 0.0001 3 0.01 0.02 1,551 57,857 5 0.0009 0.0001 5 0.02 0.03 L-11 Sutter Electric unknown 50 1,500 2% 428 n/a 428 1,551 57,857 L-12 Sutter Electric unknown 50 1,500 2% n/a 5 0.0009 0.0001 5 0.02 0.03 L-13 Bolen Pasture Sutter Propane unknown 200 2,800 4% 799 1,551 n/a 788 50 0.0024 0.0005 50 0.06 0.14 L-14 Chappell Sutter Electric 1,800 3% 514 1,551 8 0.0013 0.03 0.05 unknown 0.0001 3 0.01 0.02 1,551 34,714 3 0.0005 Sutter Electric unknown 1,900 542 0.0001 5 0.02 0.03 5 0.0009 1.551 57.857 50 1.300 371 L-3 Sutter Electric unknown L-4 Sutter Electric 75 1,300 371 1,551 86,785 8 0.0013 0.0002 8 0.03 0.05 unknown n/a 2,000 571 1,551 57,857 5 0.0009 0.0001 5 0.02 0.03 L-6 Sutter Electric unknown 3% L-7 Sutter Electric 30 1,200 2% 343 1,551 34,714 3 0.0005 0.01 0.02 4% 799 0.0004 22 0.09 0.13 L-8 Sutter Electric unknown 200 2,800 1,551 231,427 n/a 22 0.0035 Electric 2% 428 1,551 57,857 5 0.0009 0.0001 5 0.02 0.03 Sutter 1.500 n/a L-9 unknown 50 1% 300 1.551 788 50 0.0024 0.0005 50 0.06 0.14 Sutter Propane 1.050 n/a unknown 200 Lauppe 0.0005 50 0.06 0.14 L-MW 514 1,551 n/a 50 0.0024 Sutter Propane unknown 1,800 3% 0.0012 151 0.15 0.37 1,551 14,788 TNBC Lucich North Sutter Diesel unknown 714 n/a 571 125 3% 1,551 144,642 MAP Sacramento Electric unknown 2,000 n/a 1,551 144,642 125 2% 428 TNBC Fisherman's Lake Sacramento Electric 1.500 unknown 177 0.0073 0.0015 177 0.18 0.43 1.551 17.398 Diesel 2013 200 1.800 3% 514 n/a Ose-1 Sacramento 2,400 3% 685 1,551 173,571 30 0.0026 0.0003 30 0.06 0.09 Ose-2 Sacramento Electric unknown 742 25 0.0022 Electric 2,600 4% 1,551 144,642 Perry Sacramento unknown 714 1,551 173,571 Plant 3 Sacramento Electric unknown 150 2,500 4% n/a 30 | 0.0026 | 0.0003 | 30 | 0.06 | 0.09 | 3% 657 1.551 Pond R Sacramento Electric unknown 50 2,300 n/a 10 0.0009 0.0001 10 0.02 0.03 1.551 144.642 TNBC Silva Dair Sacramento Flectric unknown 125 1.000 1% 286 n/a 25 0.0022 0.0003 25 0.05 0.08 0.0001 8 1,551 46,285 Sacramento Electric unknown 1,200 2% 343 n/a 8 0.0007 0.02 0.03 Souza 9 0.0014 0.0002 9 0.03 0.05 1,551 Sutter Electric unknown 2,500 4% 714 n/a Spangler 131 0.0054 0.0011 131 0.13 0.32 1,551 12,874 Sacramento Diesel 2012 148 2,000 3% 571 1,225 0.0799 0.0125 1,225 2 4 1,230 100% 20,000 57,371 2,991,200 59,876 Total 70,050

AF = acre-feet CH4 = methane CO2 = carbon dioxide gal/yr = gallons per year GHG = greenhouse gas gpm = gallons per minute hp = horsepower kW/yr = kilowatt hours per year MTCO2e = metric tons carbon dioxide equivalent N2O = nitrous oxide

Engine power rating not provided; assumed to be equal to max horsepower for all engines operating in the study area for fuel type

Conversion Factors

2,542.5 Btu 1 bhp-hr =1 lb =453.6 g 1,000 kg 1 tonne = 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 CH4 25 N2O 298

<u>Diesel Engine Fuel Consumption</u>

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

7.13 lb/gal

Appendix F Greenhouse Gas Emissions Calculations

F-9- February 2022

Agency Pelger Mutual Water Company Transfer Volume 4,670 acre-feet/year

Table F-18. Pelger Mutual Water Company Summary of Engines by Fuel Type and Location

	County	Diesel	Electric	Natural Gas	Propane	Total
	Sutter	1	3	0	0	4
Г	Total	1	3	0	0	4

Table F-19. Pelger Mutual Water Company GHG Emissions

	2	3	4	5	9						6	7	8				
	Well						Transfer			Fuel			GH	G Emissio	ns		
	Location			Power Rating	Pum	p Rate	Volume	Opera	tion	Consumption	(toı	nes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
PMWC#1	Sutter	Electric	unknown	150	4,800	33%	1,546	1,749	195,796	n/a	18	0.0029	0.0004	18	0.07	0.11	19
Well 1 Tucker	Sutter	Electric	unknown	75	3,100	21%	998	1,749	97,898	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Well 2 Flopet	Sutter	Diesel	2008	125	2,300	16%	741	1,749	n/a	12,266	125	0.0051	0.0010	125	0.13	0.30	125
Well 3 Klein	Sutter	Electric	unknown	150	4,300	30%	1,385	1,749	195,796	n/a	18	0.0029	0.0004	18	0.07	0.11	19
				Total	14,500	100%	4,670	6,996	489,489	12,266	171	0.0124	0.0019	171	0.31	0.57	172

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Pelger Road 1700 LLC
Transfer Volume 5,200 acre-feet/year

Table F-20. Pelger Road 1700 LLC Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	6	0	0	6
Total	0	6	0	0	6

Table F-21. Pelger Road 1700 LLC GHG Emissions

	2	3	4	5	9						6	7	8				
	Well						Transfer			Fuel			GH	G Emission	ons		
	Location			Power Rating	Pum	Rate	Volume	Opera	tion	Consumption	(to	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
North Well	Sutter	Electric	unknown	200	3,500	19%	973	1,510	225,400	n/a	21	0.0034	0.0004	21	0.08	0.12	21
North Well B	Sutter	Electric	unknown	200	3,000	16%	834	1,510	225,400	n/a	21	0.0034	0.0004	21	0.08	0.12	21
South Well	Sutter	Electric	unknown	200	3,000	16%	834	1,510	225,400	n/a	21	0.0034	0.0004	21	0.08	0.12	21
South Well B	Sutter	Electric	unknown	200	3,000	16%	834	1,510	225,400	n/a	21	0.0034	0.0004	21	0.08	0.12	21
Well #3	Sutter	Electric	unknown	200	3,100	17%	862	1,510	225,400	n/a	21	0.0034	0.0004	21	0.08	0.12	21
Well #4	Sutter	Electric	unknown	200	3,100	17%	862	1,510	225,400	n/a	21	0.0034	0.0004	21	0.08	0.12	21
	•	•		Total	18,700	100%	5,200	9,061	1,352,403	0	127	0.0202	0.0025	127	0.51	0.73	128

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

<u>Legend</u>

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Pleasant Grove-Verona Mutual Water Company Agency

Transfer Volume 15,000 acre-feet/year

Table F-22. Pleasant Grove-Verona Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	11	20	0	3	34
Total	11	20	0	3	34

Table F-23. Pleasant Grove-Verona Mutual Water Company GHG Emissions

	2 3 4 5 9									6 7 8							
	Well						Transfer			Fuel			GH	G Emissio			
	Location			Power Rating	Pum	p Rate	Volume	Opera	ition	Consumption	(to	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(qpm)	(% of Total)	(AF/vear)	(hours/year)	(kWh/yr)	(gal/yr) - diesel (MMBtu/yr) - propane	CO2	CH4	N2O	CO2	CH4	N2O	Total
Kelly 190 Field Well #2	Sutter	Electric	unknown	30	2.100	3%	427	1.104	24,713	n/a	2	0.0004	0.0000	2	0.01	0.01	2
Kelly Windmill Field Well #2	Sutter	Electric	2002	62.1	2,000	3%	407	1,104	51,155	n/a	 5	0.0008	0.0001	5	0.02	0.03	5
Kelly Windmill North Field Well	Sutter	Propane	2014	133	1,800	2%	366	1,104	n/a	373	23	0.0011	0.0002	23	0.03	0.07	24
Kellv306	Sutter	Electric	unknown	60	3,500	5%	711	1,104	49,425	n/a	5	0.0007	0.0001	5	0.02	0.03	5
MLF Clubhouse B Well	Sutter	Electric	unknown	300	3,600	5%	732	1,104	247,126	n/a	23	0.0037	0.0004	23	0.09	0.13	23
MLF Marsh Well	Sutter	Electric	unknown	300	3,200	4%	650	1,104	247,126	n/a	23	0.0037	0.0004	23	0.09	0.13	23
MLF Monster Well	Sutter	Electric	unknown	60	3,100	4%	630	1,104	49,425	n/a	5	0.0007	0.0001	5	0.02	0.03	5
MLF Well #1	Sutter	Electric	unknown	30	2,000	3%	407	1,104	24,713	n/a	2	0.0004	0.0000	2	0.01	0.01	2
MLF Well #16	Sutter	Electric	unknown	50	1,700	2%	346	1,104	41,188	n/a	4	0.0006	0.0001	4	0.02	0.02	4
MLF Well#11	Sutter	Diesel	2004	250	1,400	2%	285	1,104	n/a	15,482	158	0.0065	0.0013	158	0.16	0.38	158
MLF Well#12/17	Sutter	Electric	unknown	50	2,200	3%	447	1,104	41,188	n/a	4	0.0006	0.0001	4	0.02	0.02	4
MLF Well#13	Sutter	Electric	2000	215	1,900	3%	386	1,104	177,107	n/a	17	0.0027	0.0003	17	0.07	0.10	17
MLF Well#2B	Sutter	Electric	2000	300	2,800	4%	569	1,104	247,126	n/a	23	0.0037	0.0004	23	0.09	0.13	23
Nicholas 72-Acre Field North	Sutter	Electric	unknown	40	1,700	2%	346	1,104	32,950	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Nicholas 72-Acre Field South	Sutter	Diesel	2002	62.1	2,000	3%	407	1,104	n/a	3,846	39	0.0016	0.0003	39	0.04	0.10	39
Nicholas BBC Well	Sutter	Electric	unknown	30	2,000	3%	407	1,104	24,713	n/a	2	0.0004	0.0000	2	0.01	0.01	2
Nicholas Filipino Camp South	Sutter	Diesel	2002	62.1	800	1%	163	1,104	n/a	3,846	39	0.0016	0.0003	39	0.04	0.10	39
Nicholas Filipino Camp#2	Sutter	Electric	unknown	40	2,300	3%	467	1,104	32,950	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Nicholas Johnston Field Well #2	Sutter	Electric	unknown	40	2,000	3%	407	1,104	32,950	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Nicholas Sand Field Well	Sutter	Diesel	2002	62.1	2,000	3%	407	1,104	n/a	3,846	39	0.0016	0.0003	39	0.04	0.10	39
RiverRanch#19	Sutter	Diesel	2008	99	2,500	3%	508	1,104	n/a	6,131	62	0.0026	0.0005	62	0.06	0.15	63
S&O#16	Sutter	Electric	2014	159	2,000	3%	407	1,104	130,977	n/a	12	0.0020	0.0002	12	0.05	0.07	12
S&O#17	Sutter	Diesel	1999	101	3,000	4%	610	1,104	n/a	6,255	64	0.0026	0.0005	64	0.07	0.16	64
S&O#18A	Sutter	Diesel	1999	101	1,800	2%	366	1,104	n/a	6,255	64	0.0026	0.0005	64	0.07	0.16	64
S&O#19	Sutter	Diesel	2007	215	1,800	2%	366	1,104	n/a	13,314	136	0.0056	0.0011	136	0.14	0.33	136
S&O#20	Sutter	Propane	2014	154	1,800	2%	366	1,104	n/a	432	27	0.0013	0.0003	27	0.03	0.08	27
Willey#1	Sutter	Diesel	2000	168	3,000	4%	610	1,104	n/a	10,404	106	0.0043	0.0009	106	0.11	0.26	106
Willey#3	Sutter	Electric	unknown	75	1,800	2%	366	1,104	61,782	n/a	6	0.0009	0.0001	6	0.02	0.03	6
Willey#4	Sutter	Diesel	1974	150	2,000	3%	407	1,104	n/a	9,289	95	0.0039	0.0008	95	0.10	0.23	95
Willey#5	Sutter	Propane	unknown	180	2,000	3%	407	1,104	n/a	505	32	0.0015	0.0003	32	0.04	0.09	32
Will-Lee Well#31	Sutter	Electric	unknown	50	1,500	2%	305	1,104	41,188	n/a	4	0.0006	0.0001	4	0.02	0.02	4
Will-Lee Well#32	Sutter	Electric	unknown	300	2,500	3%	508	1,104	247,126	n/a	23	0.0037	0.0004	23	0.09	0.13	23
Will-Lee Well#33	Sutter	Electric	unknown	75	2,500	3%	508	1,104	61,782	n/a	6	0.0009	0.0001	6	0.02	0.03	6
Will-Lee Well#4A	Sutter	Diesel	2000	160	1,500	2%	305	1,104	n/a	9,908	101	0.0041	0.0008	101	0.10	0.25	101
				Total	73,800	100%	15,000	37,530	1,866,711	n/a	1,159	0.0688	0.0116	1,159	1.72	3.44	1,164

AF = acre-feet CH4 = methane CO2 = carbon dioxide gal/yr = gallons per year GHG = greenhouse gas gpm = gallons per minute hp = horsepower kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent N2O = nitrous oxide

Conversion Factors

1 bhp-hr = 2,542.5 Btu 1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh1 kW = 1.34 hp1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential CO2 CH4 N2O 25 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) 0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Princeton-Codora-Glenn Irrigation District

Transfer Volume 6,600 acre-feet/year

Table F-24. Princeton-Codora-Glenn Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	2	1	0	0	3
Colusa	1	1	0	0	2
Total	3	2	0	0	5

Table F-25. Princeton-Codora-Glenn Irrigation District GHG Emissions

	Well						Transfer			Fuel	GHG Emissions						
	Location			Power Rating	Pum	p Rate	Volume Operation		Operation Consumption		(to	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
J. Southam	Colusa	Electric	unknown	200	4,000	24%	1,553	2,108	314,694	n/a	29	0.0047	0.0006	29	0.12	0.17	30
Joel Mann	Glenn	Diesel	unknown	180	3,500	21%	1,359	2,108	n/a	21,291	217	0.0089	0.0018	217	0.22	0.53	217
Jones Well	Glenn	Electric	2012	200	3,500	21%	1,359	2,108	314,694	n/a	29	0.0047	0.0006	29	0.12	0.17	30
M. Cota	Colusa	Diesel	unknown	180	3,000	18%	1,165	2,108	n/a	21,291	217	0.0089	0.0018	217	0.22	0.53	217
Zoller A	Glenn	Diesel	unknown	180	3,000	18%	1,165	2,108	n/a	21,291	217	0.0089	0.0018	217	0.22	0.53	217
				Total	17,000	100%	6.600	10.542	629.387	63.874	709	0.0361	0.0065	709	0.90	1.93	712

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Provident Irrigation District Transfer Volume 10,000 acre-feet/year

Table F-26. Provident Irrigation District Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	13	3	0	0	16
Colusa	0	0	0	0	0
Total	13	3	0	0	16

Table F-27. Provident Irrigation District GHG Emissions

	2	3	4	5	9						6	7	8				
	Well						Transfer			Fuel			GH	G Emissio	ns		
	Location			Power Rating	Pumj	p Rate	Volume	Operat	tion	Consumption	(tor	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
Calvert	Glenn	Diesel	unknown	150	3,000	6%	600	1,086	n/a	9,140	93	0.0038	0.0008	93	0.10	0.23	93
D. Alves	Glenn	Diesel	unknown	165	3,000	6%	600	1,086	n/a	10,054	102	0.0042	0.0008	102	0.10	0.25	103
D. Kennedy	Glenn	Electric	unknown	120	3,000	6%	600	1,086	97,269	n/a	9	0.0015	0.0002	9	0.04	0.05	9
E Weller	Glenn	Diesel	unknown	200	2,500	5%	500	1,086	n/a	12,187	124	0.0051	0.0010	124	0.13	0.30	124
G. Clark #1	Glenn	Diesel	unknown	200	3,000	6%	600	1,086	n/a	12,187	124	0.0051	0.0010	124	0.13	0.30	124
K Hansen#1	Glenn	Diesel	unknown	200	2,600	5%	520	1,086	n/a	12,187	124	0.0051	0.0010	124	0.13	0.30	124
K Hansen#2	Glenn	Electric	unknown	120	3,500	7%	700	1,086	97,269	n/a	9	0.0015	0.0002	9	0.04	0.05	9
L Hansen#1	Glenn	Diesel	unknown	200	3,800	8%	760	1,086	n/a	12,187	124	0.0051	0.0010	124	0.13	0.30	124
L Hansen#2	Glenn	Diesel	unknown	200	4,500	9%	900	1,086	n/a	12,187	124	0.0051	0.0010	124	0.13	0.30	124
M. Jones #1	Glenn	Diesel	unknown	275	3,000	6%	600	1,086	n/a	16,757	171	0.0070	0.0014	171	0.17	0.42	171
M. Jones #2	Glenn	Diesel	unknown	250	3,000	6%	600	1,086	n/a	15,234	155	0.0064	0.0013	155	0.16	0.38	156
Perez and Perez	Glenn	Diesel	unknown	200	3,200	6%	640	1,086	n/a	12,187	124	0.0051	0.0010	124	0.13	0.30	124
S. Jones #1	Glenn	Diesel	unknown	170	3,200	6%	640	1,086	n/a	10,359	105	0.0043	0.0009	105	0.11	0.26	106
S. Jones #2	Glenn	Diesel	unknown	170	3,200	6%	640	1,086	n/a	10,359	105	0.0043	0.0009	105	0.11	0.26	106
Weller#4	Glenn	Electric	unknown	120	3,500	7%	700	1,086	97,269	n/a	9	0.0015	0.0002	9	0.04	0.05	9
Weller62V	Glenn	Diesel	unknown	200	2,000	4%	400	1,086	n/a	12,187	124	0.0051	0.0010	124	0.13	0.30	124
				Total	50,000	100%	10,000	17,379	291,807	157,213	1,628	0.0699	0.0136	1,628	1.75	4.07	1,634

Key: AF = acre-feet

CH4 = methane CO2 = carbon dioxide

gal/yr = gallons per year GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

453.6 g 1 lb = 1,000 kg 1 tonne = 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Reclamation District 108 Agency Transfer Volume 15,000 acre-feet/year

Table F-28. Reclamation District 108 Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	6	7	0	2	15
Yolo	1	3	0	1	5
Total	7	10	0	3	20

Table F-29. Reclamation District 108 GHG Emissions

	Well						Transfer			Fuel			GH	G Emissic	ns		
	Location			Power Rating	Pumj	p Rate	Volume	Opera	tion	Consumption	(to	nnes per y	ear)		(MTCO2e	per year)	
	(0.1)			<i>a</i> .			/A=/			(gal/yr) - diesel							
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)		· · ·		` .	(MMBtu/yr) - propane	CO2	CH4	N2O	CO2	CH4	N2O	Total
Field 1	Colusa	Propane	unknown	105	3,420	6%	912	1,448	n/a	387	24	0.0012	0.0002	24	0.03	0.07	24
Field 100H	Colusa	Diesel	unknown	250	2,385	4%	636	1,448	n/a	20,306	207	0.0085	0.0017	207	0.21	0.50	207
Field 100L1 East	Colusa	Electric	unknown	125	1,950	3%	520	1,448	135,060	n/a	13	0.0020	0.0002	13	0.05	0.07	13
Field 100L1 West	Colusa	Diesel	unknown	400	2,500	4%	666	1,448	n/a	32,490	331	0.0135	0.0027	331	0.34	0.81	332
Field 100M	Colusa	Diesel	unknown	240	2,200	4%	587	1,448	n/a	19,494	198	0.0081	0.0016	198	0.20	0.48	199
Field 107F	Colusa	Electric	unknown	200	3,195	6%	852	1,448	216,096	n/a	20	0.0032	0.0004	20	0.08	0.12	20
Field 125A	Colusa	Propane	unknown	200	2,800	5%	746	1,448	n/a	736	46	0.0022	0.0004	46	0.06	0.13	46
Field 4	Colusa	Electric	unknown	200	3,150	6%	840	1,448	216,096	n/a	20	0.0032	0.0004	20	0.08	0.12	20
Field 53E	Yolo	Propane	unknown	250	2,295	4%	612	1,448	n/a	920	58	0.0028	0.0006	58	0.07	0.16	58
Field 65E	Yolo	Diesel	unknown	250	3,195	6%	852	1,448	n/a	20,306	207	0.0085	0.0017	207	0.21	0.50	207
Field 66C	Yolo	Electric	unknown	150	1,620	3%	432	1,448	162,072	n/a	15	0.0024	0.0003	15	0.06	0.09	15
Field 81D	Colusa	Diesel	unknown	400	4,250	8%	1,133	1,448	n/a	32,490	331	0.0135	0.0027	331	0.34	0.81	332
Field 81E	Colusa	Diesel	unknown	400	4,250	8%	1,133	1,448	n/a	32,490	331	0.0135	0.0027	331	0.34	0.81	332
Field 90B	Colusa	Electric	unknown	125	2,295	4%	612	1,448	135,060	n/a	13	0.0020	0.0002	13	0.05	0.07	13
Field 92C	Colusa	Diesel	unknown	250	1,440	3%	384	1,448	n/a	20,306	207	0.0085	0.0017	207	0.21	0.50	207
Well#1 Heidrick	Colusa	Electric	unknown	100	2,550	5%	680	1,448	108,048	n/a	10	0.0016	0.0002	10	0.04	0.06	10
Well #4 Huff	Colusa	Electric	unknown	250	1,250	2%	333	1,448	270,120	n/a	25	0.0040	0.0005	25	0.10	0.15	26
Well #5 RiggsRanch	Colusa	Electric	unknown	150	4,950	9%	1,320	1,448	162,072	n/a	15	0.0024	0.0003	15	0.06	0.09	15
Well #6 CountyLine	Yolo	Electric	unknown	250	3,375	6%	900	1,448	270,120	n/a	25	0.0040	0.0005	25	0.10	0.15	26
Well#7 Tract 6	Yolo	Electric	unknown	250	3,195	6%	852	1,448	270,120	n/a	25	0.0040	0.0005	25	0.10	0.15	26
	•	-	•	Total	56,265	100%	15,000	28,957	1,944,860	179,926	2,121	0.1094	0.0196	2,121	2.74	5.84	2,130

Key: AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 bhp-hr = 2,542.5 Btu 1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh1 kW = 1.34 hp60 minutes 1 hour = 1 acre-foot = 325,851 gallons

 $\underline{\text{http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf}$

Global Warming Potential

CO2 CH4 25 N2O 298

Diesel Engine Fuel Consumption

(Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) 0.4 lb/hp-hr

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Reclamation District 1004
Transfer Volume 7,175 acre-feet/year

Table F-30. Reclamation District 1004 Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Glenn	1	7	0	0	8
Colusa	17	5	0	0	22
Sutter	0	0	0	0	0
Total	18	12	0	0	30

Table F-31. Reclamation District 1004 GHG Emissions

2 3 4 5 9 6 7 8																	
	Well						Transfer			Fuel			GH	G Emissio			
	Location			Power Rating		p Rate	Volume	Operat		Consumption	(toı	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
Barale Well	Colusa	Diesel	TBD	225	4,000	4%	285	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Behring Ranch 10 Field Well No. 496441	Colusa	Diesel	2008	225	5,800	6%	413	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Behring Ranch Club House Well No.496461	Colusa	Electric	unknown	125	3,400	3%	242	387	36,061	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Behring Ranch Nursery Well No. 17N1W10H1	Colusa	Diesel	TBD	225	1,000	1%	71	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Behring Ranch Pearl Well No. 20094	Colusa	Diesel	TBD	225	2,500	2%	178	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Behring Ranch West Well No.97863	Colusa	Electric	unknown	125	2,300	2%	164	387	36,061	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Drumheller Well No.7	Colusa	Diesel	TBD	225	4,000	4%	285	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
East Morgan Well #1 No. 374667 17N01W14N001M	Colusa	Diesel	TBD	225	2,600	3%	185	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
East Morgan Well#2 No. 498195 17N01W15Q001M	Colusa	Diesel	TBD	225	1,300	1%	93	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Gardener No. 374672	Colusa	Diesel	2008	215	3,500	3%	249	387	n/a	4,663	47	0.0019	0.0004	47	0.05	0.12	48
Gardener No. 498178	Colusa	Diesel	2009	215	3,500	3%	249	387	n/a	4,663	47	0.0019	0.0004	47	0.05	0.12	48
Hall Well No. X	Glenn	Electric	TBD	125	4,500	4%	320	387	36,061	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Hall Well No.369428	Glenn	Electric	2011	125	4,500	4%	320	387	36,061	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Mohammad No.e0084085 17N01W02D001M	Colusa	Electric	TBD	125	4,500	4%	320	387	36,061	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Myers Well #1 No.3457	Glenn	Electric	2006	40	2,200	2%	157	387	11,539	n/a	1	0.0002	0.0000	1	0.00	0.01	1
Myers Well #2 No. 340884	Glenn	Electric	1982	100	4,100	4%	292	387	28,849	n/a	3	0.0004	0.0001	3	0.01	0.02	3
Rancho Caleta No. 726883	Colusa	Diesel	2004	170	4,500	4%	320	387	n/a	3,687	38	0.0015	0.0003	38	0.04	0.09	38
Sikes & Parachini Well #1 WS No.93124	Colusa	Diesel	2006	173	4,000	4%	285	387	n/a	3,752	38	0.0016	0.0003	38	0.04	0.09	38
Sikes & Parachini Well #2 WS No. 374682	Colusa	Diesel	2008	150	4,000	4%	285	387	n/a	3,253	33	0.0014	0.0003	33	0.03	0.08	33
Southam Sartain Well 18N01W26D001M	Glenn	Diesel	TBD	225	4,800	5%	342	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Stone Well #6 No.11334	Colusa	Electric	2006	40	1,800	2%	128	387	11,539	n/a	1	0.0002	0.0000	1	0.00	0.01	1
Wilder Farms Well	Glenn	Electric	unknown	125	2,500	2%	178	387	36,061	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Dan Charter Well#1	Colusa	Diesel	unknown	225	2,500	2%	178	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Dan Charter Well#2	Colusa	Diesel	unknown	225	2,500	2%	178	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
GVL Well#1	Colusa	Diesel	unknown	225	2,500	2%	178	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Behring Ranch Well	Colusa	Electric	unknown	125	4,000	4%	285	387	36,061	n/a	3	0.0005	0.0001	3	0.01	0.02	3
Claudia Charter	Colusa	Diesel	unknown	225	2,500	2%	178	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
GVL Well#2	Colusa	Diesel	unknown	225	2,500	2%	178	387	n/a	4,880	50	0.0020	0.0004	50	0.05	0.12	50
Glenn West	Glenn	Electric	unknown	300	4,500	4%	320	387	86,546	n/a	8	0.0013	0.0002	8	0.03	0.05	8
Glenn East	Glenn	Electric	unknown	300	4,500	4%	320	387	86,546	n/a	8	0.0013	0.0002	8	0.03	0.05	8
	•			Total	100,800	100%	7,175	11,597	477,444	83,452	894	0.042	0.008	894	1.05	2.33	898

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

 CO2
 1

 CH4
 25

 N2O
 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency River Garden Farms
Transfer Volume 10,000 acre-feet/year

Table F-32. River Garden Farms Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Yolo	0	10	0	0	10
Total	0	10	0	0	10

Table F-33. River Garden Farms GHG Emissions

Transfer Fuel **GHG Emissions** Operation **Power Rating** Pump Rate Volume Consumption (MTCO2e per year) Location (tonnes per year) **Model Year** Well (County) Fuel Type (hp) (gpm) (% of Total) (AF/year) (hours/year) (kWh/yr) (gal/yr) CO2 CH4 N20 CO2 CH4 N2O Total F-1 Yolo Electric unknown 150 3,400 11% 1,147 1,832 205,105 n/a 19 0.0031 0.0004 19 0.08 0.11 19 Field 104 PW Yolo Electric 2008 200 2,800 9% 945 1,832 273,473 n/a 26 0.0041 0.0005 26 0.10 0.15 26 Field 104-09 PW Yolo Electric 2009 200 3,276 11% 26 0.0041 26 26 1,105 1,832 273,473 n/a 0.0005 0.10 0.15 2009 200 2,800 26 Field 117 PW Yolo Electric 9% 945 1,832 273,473 n/a 26 0.0041 0.0005 26 0.10 0.15 Field 65 PW Yolo Electric 2008 200 3,200 11% 1,080 1,832 273,473 n/a 26 0.0041 0.0005 26 0.10 0.15 26 Field 71 PW Yolo Electric 2001 200 2,200 7% 742 1,832 273,473 n/a 26 0.0041 0.0005 26 0.10 0.15 26 Field 91-09 PW Yolo Electric 2009 200 3,300 11% 1,113 1,832 273,473 n/a 26 0.0041 0.0005 26 0.10 0.15 26 Field 93 PW Yolo Electric unknown 200 2,200 7% 742 1,832 273,473 n/a 26 0.0041 0.0005 0.10 0.15 26 Field 98 PW 200 3,177 1,832 26 26 26 Yolo Electric 1963 11% 1,072 273,473 n/a 0.0041 0.0005 0.10 0.15 Shop PW 2009 200 26 26 0.15 26 Yolo Electric 3,287 11% 1,109 1,832 273,473 0.0041 0.0005 0.10 n/a 29,640 100% 10,000 18,323 2,666,365 250 0.0048 250 252 Total 0 0.0399 1.00 1.44

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Legend

Information on engine not available; engine assumed to be electric based on other engines used by water agency.

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000 kWh 1 kW = 1,300 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) .855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

0.855 g/mL (Based 7.13 lb/gal

F-17- February 2022

Agency Roberts Ditch Irrigation Company
Transfer Volume 4,100 acre-feet/year

Table F-34. Roberts Ditch Irrigation Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	7	0	1	8
Total	0	7	0	1	8

Table F-35. Roberts Ditch Irrigation Company GHG Emissions

		Well			To Value 1			Transfer			Fuel			GH	G Emissic	ns		
		Location			Power Rating Pu	Pum	p Rate	Volume	Opera	tion	Consumption	(to	nnes per ye	ear)		(MTCO2e	per year)	
Description	Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr) - diesel (MMBtu/yr) - propane	CO2	CH4	N2O	CO2	CH4	N2O	Total
nerts Ditch Irrigation CompanyAnd	Andreotti	Colusa	Propane	unknown	200	2,200	11%	447	1,102	n/a	561	35	0.0017	0.0003	35	0.04	0.10	35
berts Ditch Irrigation CompanyA	Ash	Colusa	Electric	unknown	250	1,500	7%	304	1,102	205,653	n/a	19	0.0031	0.0004	19	0.08	0.11	19
erts Ditch Irrigation CompanyHic	Hickel	Colusa	Electric	unknown	250	1,300	6%	264	1,102	205,653	n/a	19	0.0031	0.0004	19	0.08	0.11	19
eerts Ditch Irrigation CompanySte	Stegals	Colusa	Electric	unknown	250	1,800	9%	365	1,102	205,653	n/a	19	0.0031	0.0004	19	0.08	0.11	19
erts Ditch Irrigation CompanyWe	Well #1	Colusa	Electric	unknown	350	4,500	22%	913	1,102	287,915	n/a	27	0.0043	0.0005	27	0.11	0.16	27
erts Ditch Irrigation CompanyWe	Well #2	Colusa	Electric	unknown	350	4,500	22%	913	1,102	287,915	n/a	27	0.0043	0.0005	27	0.11	0.16	27
s Ditch Irrigation CompanyYearxa	Yearxa North	Colusa	Electric	unknown	250	2,200	11%	447	1,102	205,653	n/a	19	0.0031	0.0004	19	0.08	0.11	19
Ditch Irrigation CompanyYearxa	Yearxa South	Colusa	Electric	unknown	250	2,200	11%	447	1,102	205,653	n/a	19	0.0031	0.0004	19	0.08	0.11	19
					Total	20,200	100%	4,100	8,818	1,604,095	561	185	0.0257	0.0032	185	0.64	0.97	187

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Legend

Information on engine not available; engine assumed to be electric based on other engines used by water agency.

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 bhp-hr = 2,542.5 Btu
1 lb = 453.6 g
1 tonne = 1,000 kg
1 tonne = 1,000,000 g
1 MWh = 1,000,000 kWh
1 GWh = 1,000,000 kWh
1 kW = 1.34 hp
1 hour = 60 minutes
1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential CO2

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/ml (Based on MSDS for Hess Diesel Fuel All Types)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)
7.13 lb/gal

Agency Transfer Volume Sutter Mutual Water Company 18,000 acre-feet/year

Table F-36. Sutter Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	27	10	0	7	44
Total	27	10	0	7	44

Table F-37. Sutter Mutual Water Company GHG Emissions

	Well		T	, J	9	•	Transfer	1		Fuel	6			G Emissio	no		
				Dower Beting	Dum	n Doto	Transfer	00000	4ian		/40	nnaa nak 14		G EMISSIC			
	Location			Power Rating	Pum	p Rate	Volume	Opera	tion	Consumption	(to	nnes per y	ear) I		(WITCOZE	per year)	Т
										(gal/yr) - diesel							
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	 (ΔΕ/vear)	(hours/year)	(kWh/vr)	(MMBtu/yr) - propane	CO2	CH4	N2O	CO2	CH4	N2O	Total
Ag Industries - Sioux Creek	Sutter	Diesel	unknown	350	2,800	2%	354	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
Ag Industries - Sutter Basin	Sutter	Diesel	unknown	350	3,000	2%	379	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
BD-1	Sutter	Diesel	unknown	225	2,500	2%	316	686	n/a	8,665	88	0.0036	0.0007	88	0.09	0.22	89
BD-2	Sutter	Diesel	unknown	225	4,000	3%	506	686	n/a	8,665	88	0.0036	0.0007	88	0.09	0.22	89
BD-2	Sutter	Propane	unknown	250	3,000	2%	379	686	n/a	436	27	0.0030	0.0007	27	0.03	0.08	28
DB-1	Sutter	Diesel	unknown	350	4,500	3%	569	686	n/a	13,479	137	0.0016	0.0003	137	0.14	0.34	138
Driver	Colusa	Diesel	unknown	350	2,500	2%	316	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
F4N	Sutter	Diesel	unknown	290	3,500	2%	442	686	n/a	11,169	114	0.0047	0.0009	114	0.12	0.28	114
FG	Sutter	Propane	unknown	250	1,500	1%	190	686	n/a	436	27	0.0017	0.0003	27	0.03	0.08	28
FT5	Sutter	Diesel	unknown	450	5,200	4%	657	686	n/a	17,331	176	0.0072	0.0014	176	0.18	0.43	177
G-16	Sutter	Electric	unknown	250	4,200	3%	531	686	128,075	n/a	12	0.0019	0.0002	12	0.05	0.07	12
G-2	Sutter	Propane	unknown	125	3,500	2%	442	686	n/a	218	14	0.0007	0.0001	14	0.02	0.04	14
H-1	Sutter	Electric	unknown	150	2,600	2%	329	686	76,845	n/a	7	0.0007	0.0001	7	0.02	0.04	7
Hoppin	Sutter	Electric	unknown	250	2,500	2%	316	686	128,075	n/a	12	0.0012	0.0001	12	0.05	0.07	12
L&N Farms	Sutter	Diesel	unknown	170	5,000	4%	632	686	n/a	6,547	67	0.0017	0.0005	67	0.07	0.16	67
L1-1	Sutter	Diesel	unknown	350	4,000	3%	506	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
L1-2	Sutter	Diesel	unknown	350	5,000	4%	632	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
L2-1	Sutter	Diesel	unknown	350	5,500	4%	695	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
LM-11	Sutter	Electric	unknown	150	3,100	2%	392	686	76,845	n/a	7	0.0012	0.0001	7	0.03	0.04	7
LM-53	Sutter	Electric	unknown	150	4,000	3%	506	686	76,845	n/a	7	0.0012	0.0001	7	0.03	0.04	7
Matteoli	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
MB-1	Sutter	Propane	unknown	268	5,300	4%	670	686	n/a	468	29	0.0014	0.0003	29	0.04	0.08	30
ME-1	Sutter	Diesel	unknown	350	1,300	1%	164	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
QHR	Sutter	Propane	unknown	250	5,200	4%	657	686	n/a	436	27	0.0013	0.0003	27	0.03	0.08	28
R-24	Sutter	Diesel	unknown	350	2,500	2%	316	686	n/a	13,479	137	0.0056	0.0011	137	0.14	0.34	138
R-29	Sutter	Diesel	unknown	150	2,500	2%	316	686	n/a	5,777	59	0.0024	0.0005	59	0.06	0.14	59
S-18	Sutter	Electric	unknown	100	2,700	2%	341	686	51,230	n/a	5	0.0008	0.0001	5	0.02	0.03	5
TVN	Sutter	Electric	unknown	75	3,000	2%	379	686	38,423	n/a	4	0.0006	0.0001	4	0.01	0.02	4
VR-57	Sutter	Diesel	unknown	450	5,500	4%	695	686	n/a	17,331	176	0.0072	0.0014	176	0.18	0.43	177
Well #1	Sutter	Electric	unknown	250	2,500	2%	316	686	128,075	n/a	12	0.0019	0.0002	12	0.05	0.07	12
Well #10	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #11	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #12	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #13	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #14	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #15	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #16	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #2	Sutter	Electric	unknown	150	2,500	2%	316	686	76,845	n/a	7	0.0012	0.0001	7	0.03	0.04	7
Well #3	Sutter	Electric	unknown	150	2,500	2%	316	686	76,845	n/a	7	0.0012	0.0001	7	0.03	0.04	7
Well #4	Sutter	Propane	unknown	150	2,500	2%	316	686	n/a	262	16	0.0008	0.0002	16	0.02	0.05	17
Well #5	Sutter	Propane	unknown	180	2,500	2%	316	686	n/a	314	20	0.0009	0.0002	20	0.02	0.06	20
Well #6	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #7	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #8	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
Well #9	Sutter	Diesel	unknown	170	2,500	2%	316	686	n/a	6,547	67	0.0027	0.0005	67	0.07	0.16	67
		•		Total	<u> </u>	100%	18,000	30,892	858,105	277,935	3,045	0.1354	0.0261	3,045	3.38	7.77	3,056

Key: AF = acre-feet CH4 = methane CO2 = carbon dioxide gal/yr = gallons per year GHG = greenhouse gas gpm = gallons per minute hp = horsepower kW/yr = kilowatt hours per year MTCO2e = metric tons carbon dioxide equivalent N2O = nitrous oxide

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 bhp-hr = 2,542.5 Btu 1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp1 hour = 60 minutes

1 acre-foot = 325,851 gallons http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential CO2 CH4 25 N2O 298

<u>Diesel Engine Fuel Consumption</u> 0.4 lb/hp-hr

(Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP) 0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

7.13 lb/gal

Appendix F Greenhouse Gas Emissions Calculations

F-19- February 2022

Sheet Name Swens

Groundwater Substitution Greenhouse Gas Emissions (Unmitigated)

Agency Swenson Farms
Transfer Volume 1,300 acre-feet/year

Table F-38. Swenson Farms Summary of Engines by Fuel Type and Location

		<u>, </u>		<i>7</i> 1	
County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	0	0	0	0
Total	0	0	0	0	0

Table F-39. Swenson Farms GHG Emissions

GHG Emissions Well Transfer Fuel (MTCO2e per year)
CH4 N2O **Power Rating** Volume Pump Rate Operation Consumption Location (tonnes per year) (County) Description Well Fuel Type Model Year (gpm) (% of Total) (AF/year) (hours/year) (kWh/yr) CH4 CO2 Total (hp) (gal/yr) CO2 N20 Well 1 Colusa Electric unknown 300 3,500 100% 1,300 2,017 451,606 42 0.0068 0.0008 42 0.17 0.24 43 n/a 3,500 100% 1,300 2,017 451,606 42 0.0068 0.0008 42 0.17 0.24 43

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

N2O = nitrous oxide

1 bhp-hr = 2,542.5 Btu
1 lb = 453.6 g
1 tonne = 1,000 kg
1 tonne = 1,000,000 g
1 MWh = 1,000,000 kWh
1 GWh = 1,000,000 kWh
1 kW = 1.34 hp
1 hour = 60 minutes
1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential CO2

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)
0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)
7.13 lb/gal

F-20- February 2022

Agency Sycamore Mutual Water Company

Transfer Volume 8,000 acre-feet/year

Table F-40. Sycamore Mutual Water Company Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	5	0	0	5
Total	0	5	0	0	5

Table F-41. Sycamore Mutual Water Company GHG Emissions

	2	3	4	5	9						ь		8				
	Well						Transfer			Fuel			GH	G Emission	ns		
	Location			Power Rating	Pum	p Rate	Volume	Opera	tion	Consumption	(to	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
Well #11	Colusa	Electric	unknown	125	6,409	29%	2,320	1,966	183,356	n/a	17	0.0027	0.0003	17	0.07	0.10	17
Well #14	Colusa	Electric	unknown	125	3,270	15%	1,183	1,966	183,356	n/a	17	0.0027	0.0003	17	0.07	0.10	17
Well #15	Colusa	Electric	unknown	125	3,270	15%	1,183	1,966	183,356	n/a	17	0.0027	0.0003	17	0.07	0.10	17
Well #2a	Colusa	Electric	unknown	125	4,578	21%	1,657	1,966	183,356	n/a	17	0.0027	0.0003	17	0.07	0.10	17
Well #2b	Colusa	Electric	unknown	125	4,578	21%	1,657	1,966	183,356	n/a	17	0.0027	0.0003	17	0.07	0.10	17
	•	•	•	Total	22,104	100%	8,000	9,828	916,778	0	86	0.0137	0.0017	86	0.34	0.50	87

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

 $\underline{\text{http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf}$

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency T&P Farms

Transfer Volume 1,200 acre-feet/year

Table F-42. T&P Farms Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Colusa	0	2	0	0	2
Total	0	2	0	0	2

Table F-43. T&P Farms GHG Emissions

	Well						Transfer			Fuel			GH	G Emissio	ns		
	Location			Power Rating	Pum	o Rate	Volume	Operat	ion	Consumption	(to	nnes per ye	ear)		(MTCO2e	per year)	
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total
NW-1	Colusa	Electric	unknown	125	3,500	58%	700	1,086	101,322	n/a	9	0.0015	0.0002	9	0.04	0.05	10
NW-2	Colusa	Electric	unknown	75	2,500	42%	500	1,086	60,793	n/a	6	0.0009	0.0001	6	0.02	0.03	6
				Total	6,000	100%	1,200	2,172	162,115	0	15	0.0024	0.0003	15	0.06	0.09	15

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Legend

Engine power rating not provided; assumed to be equal to average horsepower for all engines operating in the study area for fuel type

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Agency Te Velde Revocable Family Trust Transfer Volume 7,094 acre-feet/year

Table F-44. Te Velde Revocable Family Trust Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Yolo	0	4	0	0	4
Total	0	4	0	0	4

Table F-45. Te Velde Revocable Family Trust GHG Emissions

	Well					Т				Fuel	GHG F				G Emissions			
	Location			Power Rating	Pum	o Rate	Volume Operation (Consumption	(tonnes per year)			(MTCO2e per year)					
Well	(County)	Fuel Type	Model Year	(hp)	(gpm)	(% of Total)	(AF/year)	(hours/year)	(kWh/yr)	(gal/yr)	CO2	CH4	N2O	CO2	CH4	N2O	Total	
GW1	Yolo	Electric	unknown	150	4,200	32%	2,257	2,919	326,717	n/a	31	0.0049	0.0006	31	0.12	0.18	31	
GW10	Yolo	Electric	unknown	150	3,000	23%	1,612	2,919	326,717	n/a	31	0.0049	0.0006	31	0.12	0.18	31	
GW11	Yolo	Electric	unknown	150	3,000	23%	1,612	2,919	326,717	n/a	31	0.0049	0.0006	31	0.12	0.18	31	
GW4	Yolo	Electric	unknown	150	3,000	23%	1,612	2,919	326,717	n/a	31	0.0049	0.0006	31	0.12	0.18	31	
		•	•	Total	13,200	100%	7,094	11,675	1,306,867	0	122	0.0196	0.0024	122	0.49	0.71	123	

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Legend

Engine power rating not provided; assumed to be equal to maximum horsepower for all engines operating at the water agency with the same fuel type

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california_water_facts_card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

Groundwater Substitution Greenhouse Gas Emissions (Unmitigated)

Agency Windswept Land & Livestock
Transfer Volume 2,000 acre-feet/year

Table F-46. Windswept Land & Livestock Summary of Engines by Fuel Type and Location

County	Diesel	Electric	Natural Gas	Propane	Total
Sutter	0	4	0	0	4
Total	0	4	0	0	4

Table F-47. Windswept Land & Livestock GHG Emissions

7 **GHG Emissions** Well Transfer Fuel (MTCO2e per year) Location **Power Rating Pump Rate** Volume Operation Consumption (tonnes per year) Well **Model Year** (hours/year) (kWh/yr) CO2 CH4 CO2 (County) Fuel Type (hp) (gpm) (% of Total) (AF/year) (gal/yr) N20 CH4 N20 Total Electric NCW-1 Sutter 2013 30% 1,015 151,509 0.0023 0.0003 0.06 0.08 200 3,200 598 n/a 14 14 14 NCW-2 Sutter Electric unknown 200 3.000 28% 561 1.015 151.509 n/a 14 0.0023 0.0003 14 0.06 0.08 14 NCW-3 200 2,500 23% 467 1,015 151,509 0.0003 14 0.08 14 Sutter Electric unknown n/a 14 0.0023 0.06 NCW-4 Sutter Electric 200 2,000 19% 374 151,509 14 14 unknown 1,015 n/a 14 0.0023 0.0003 0.06 0.08 Total 10,700 100% 2,000 4,060 606,037 57 0.0091 0.0011 57 0.23 0.33 57

Key:

AF = acre-feet

CH4 = methane

CO2 = carbon dioxide

gal/yr = gallons per year

GHG = greenhouse gas

gpm = gallons per minute

hp = horsepower

kW/yr = kilowatt hours per year

MTCO2e = metric tons carbon dioxide equivalent

N2O = nitrous oxide

Legend

Engine power rating not provided; assumed to be equal to maximum horsepower for all engines operating at the water agency with the same fuel type

Conversion Factors

1 lb = 453.6 g 1 tonne = 1,000 kg 1 tonne = 1,000,000 g 1 MWh = 1,000 kWh 1 GWh = 1,000,000 kWh 1 kW = 1.34 hp 1 hour = 60 minutes 1 acre-foot = 325,851 gallons

http://www.water.ca.gov/pubs/dwrnews/california water facts card/waterfactscard.pdf

Global Warming Potential

CO2 1 CH4 25 N2O 298

Diesel Engine Fuel Consumption

0.4 lb/hp-hr (Based on spec sheet for John Deere 6068H, 6.8L Engine, 173 HP)

0.855 g/mL (Based on MSDS for Hess Diesel Fuel All Types)

7.13 lb/gal

Engine Size Summary

Table F-48. Engine Power Rating Summary by Fuel Type

Fuel Type	No. Engines	Avg. HP	Max HP	Min HP
Diesel	23	170	250	60
Electric	47	125	300	30
Natural Gas	0	n/a	0	0
Propane	3	180	250	135

GHG Emission Factors

Table F-49. GHG Emission Factors for Electric Pumps

			Emission Factors					
County	Utility Company	CO2 (lbs/MWh)	CH4 (lbs/GWh)	N2O (lbs/GWh)				
Colusa	Pacific Gas & Electric	206.29	33.0	4.0				
Glenn	Pacific Gas & Electric	206.29	33.0	4.0				
Sacramento	Sacramento Municipal Utility District	374.85	33.0	4.0				
Shasta	Pacific Gas & Electric	206.29	33.0	4.0				
Sutter	Pacific Gas & Electric	206.29	33.0	4.0				
Tehama	Pacific Gas & Electric	206.29	33.0	4.0				
Yolo	Pacific Gas & Electric	206.29	33.0	4.0				
Yuba	Pacific Gas & Electric	206.29	33.0	4.0				

Table F-50. Utility-Specific CO2 Emission Factors

	Emission Rates					
		Emission Factor				
Utility	Factor Type	(lbs CO ₂ /MWh)	Year			
Sacramento Municipal Utility District	Retail Power	374.85	2019			
	Self-Consumed Power	527.64	2019			
	Wholesale Power	632.60	2019			
Pacific Gas & Electric	System average	206.29	2018			

Source:

The Climate Registry. 2021. Utility-Specific Emission Factors. Accessed on: December 12, 2021. Available at: https://www.theclimateregistry.org/our-members/cris-public-reports/

Table F-51. Diesel Emission Factors

Pollutant	Emission Factor	Unit	Emission Factor Description
CO2	10.18	kg/gallon	Table 1.1, Distillate Fuel Oil No. 2
CH4	3.00E-03	kg/MMBtu	Table 1.9, Petroleum Products, Industrial
N2O	6.00E-04	kg/MMBtu	Table 1.9, Petroleum Products, Industrial
Heat Content	0.139	MMBtu/gallon	Table 1.1, Distillate Fuel Oil No. 2

Source: The Climate Registry. 2021. 2021 Climate Registry Default Emission Factors. Accessed on: December 12, 2021. https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf

Table F-52. Natural Gas Emission Factors

Pollutant	Emission Factor	Unit	Emission Factor Description
CO2	53.06	kg/MMBtu	Table 1.1, US Weighted Average
CH4	1.00E-03	kg/MMBtu	Table 1.9, Natural Gas, Industrial
N2O	1.00E-04	kg/MMBtu	Table 1.9, Natural Gas, Industrial
Heat Content	1,026	Btu/scf	Table 1.1, US Weighted Average

Source: The Climate Registry. 2021. 2021 Climate Registry Default Emission Factors. Accessed on: December 12, 2021. https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf

Table F-53. Propane Emission Factors

Pollutant	Emission Factor	Unit	Emission Factor Description
CO2	62.87	kg/MMBtu	Table 1.1, Propane (liquid)
CH4	3.00E-03	kg/MMBtu	Table 1.9, Petroleum Products, Industrial
N2O	6.00E-04	kg/MMBtu	Table 1.9, Petroleum Products, Industrial
Heat Content	0.091	MMBtu/gal	Table 1.1, Propane (liquid)

Source: The Climate Registry. 2021. 2021 Climate Registry Default Emission Factors. Accessed on: December 12, 2021. https://www.theclimateregistry.org/wp-content/uploads/2021/05/2021-Default-Emission-Factor-Document.pdf

Table 54. Subregion Output Emission Rates (eGRID2019)

		Total output emission rate (lb/MWh) Non-baseload output emission rates (lb/MWh)														
eGRID subregion	ODID automica nama	000		·		Annual	Ozone Season	200	000	0114	Noo	000-	Annual	Ozone Season		Grid Gross
acronym	eGRID subregion name	CO2	CH4	N2O	CO2e	NOx	NOx	SO2	CO2	CH4	N2O	CO2e	NOx	NOx	SO2	Loss (%)
	ASCC Alaska Grid	1,114.4	0.098	0.013	1,120.8	6.2		0.7	1,333.0	0.123	0.017	1,341.0	6.6		0.8	
	ASCC Miscellaneous	549.3	0.026	0.004	551.3	8.1	7.8	0.7	1,520.2	0.067	0.012	1,525.4	22.6	1	2.0	
	WECC Southwest	952.3	0.068	0.010	956.9	0.6		0.2	1,445.3	0.100	0.014	1,451.9	0.9		0.3	
	WECC California	453.2	0.033	0.004	455.3	0.4	_	0.0		0.058	0.007	967.6	0.8		0.1	5.1%
_	ERCOT All	868.6	0.057	0.008	872.4	0.5		0.6	,	0.083	0.012	1,282.7	0.9		0.9	
	FRCC All	861.0	0.055	0.007	864.5	0.3		0.2	1,029.5	0.054	0.007	1,033.0	0.3		0.2	
_	HICC Miscellaneous	1,185.6	0.143	0.022	1,195.6	8.1	8.4	4.1	1,549.5	0.107	0.018	1,557.6			5.3	
_	HICC Oahu	1,694.5	0.185	0.028	1,707.6	3.7	4.1	7.0		0.158	0.025	1,715.6			8.1	
	MRO East	1,502.6	0.147	0.022	1,512.6	0.8		0.4	1,577.7	0.145	0.021	1,587.4	0.8		0.4	
	MRO West	1,098.4	0.119	0.017	1,106.4	0.8		1.1	1,806.8	0.188	0.027	1,819.6			1.7	
	NPCC New England	488.9	0.077	0.010	493.8	0.3		0.1	839.9	0.089	0.012	845.5	0.4	0.4	0.1	5.1%
	WECC Northwest	715.2	0.068	0.010	719.9	0.6	0.6	0.4	1,617.5	0.156	0.022	1,628.1	1.6	1.5	0.9	5.1%
NYCW	NPCC NYC/Westchester	553.8	0.021	0.002	555.1	0.2	0.2	0.0	1,016.2	0.022	0.002	1,017.5	0.4	0.4	0.0	5.1%
NYLI	NPCC Long Island	1,209.0	0.157	0.020	1,218.9	0.9	0.9	0.2	1,300.6	0.044	0.005	1,303.3	0.8	0.8	0.2	5.1%
NYUP	NPCC Upstate NY	232.3	0.017	0.002	233.0	0.1	0.1	0.0	890.2	0.047	0.006	892.6	0.4	0.4	0.2	5.1%
PRMS	Puerto Rico Miscellaneous	1,537.3	0.084	0.013	1,543.3	3.5	3.9	3.2	1,587.9	0.055	0.010	1,592.3	4.5	5.1	5.0	0.0%
RFCE	RFC East	695.0	0.053	0.007	698.5	0.3	0.3	0.3	1,237.9	0.089	0.012	1,243.8	0.7	0.6	0.7	5.1%
RFCM	RFC Michigan	1,189.3	0.114	0.016	1,197.0	0.7	0.7	1.0	1,766.9	0.177	0.025	1,778.8	1.2	1.2	2.1	5.1%
RFCW	RFC West	1,067.7	0.099	0.014	1,074.4	0.8	0.6	0.7	1,831.6	0.178	0.026	1,843.7	1.5	1.1	1.3	5.1%
RMPA	WECC Rockies	1,242.6	0.117	0.017	1,250.6	0.7	0.6	0.4	1,578.8	0.126	0.018	1,587.3	0.8	0.8	0.4	5.1%
SPNO	SPP North	1,070.0	0.112	0.016	1,077.6	0.6	0.6	0.2	1,958.6	0.200	0.029	1,972.2	1.1	1.2	0.4	5.1%
SPSO	SPP South	1,002.0	0.070	0.010	1,006.7	0.7	0.8	0.8	1,543.7	0.108	0.015	1,550.9	1.2	1.2	1.3	5.1%
SRMV	SERC Mississippi Valley	806.8	0.043	0.006	809.6	0.6	0.6	0.7	1,200.1	0.068	0.010	1,204.7	0.9	1.0	1.4	
	SERC Midwest	1,584.4	0.169	0.025	1,595.9	1.0		2.4	1,960.9	0.216	0.031	1,975.6			2.8	
	SERC South	969.2	0.071	0.010	974.0	0.4	0.4	0.2	1,389.5	0.101	0.015	1,396.4	0.8		0.4	
	SERC Tennessee Valley	949.7	0.087	0.013	955.6	0.5		0.6	,	0.139	0.020	1,574.6		0.8	0.9	
	SERC Virginia/Carolina	675.4	0.058	0.008	679.1	0.3			1,349.2	0.118	0.017	1,356.9			0.4	
U.S.	J	884.2	0.075	0.011	889.2				1,420.2		0.016	1.427.8		0.9	0.9	

Source: U.S. Environmental Protection Agency. 2021. eGRID Summary Tables 2019. February 23. Available online at: https://www.epa.gov/sites/default/files/2021-02/documents/egrid2019_summary_tables.pdf [Accessed on December 12, 2021].

Table F-55. Reduced Exhaust Emissions from Cropland Idling

Water Agency	Groundwater Substitution	Cropland Idling/ Crop Shiftin	g GW Pumping Equivalent									
<u> </u>			1	Annual Emission (MT/year)			Annual Emissions (MTCO2e/year)					
	(acre-feet/year)	(acre-feet/year)	(acre-feet/year)	CO2	CH4	N2O	CO2	CH4	N2O	Total		
Anderson-Cottonwood Irrigation District	4,800	0	0									
Baber, Jack et al.	0	2,310	544	156	0.01	0.00	156	0	1	156		
Canal Farms	1,000	635	149	43	0.00	0.00	43	0	0	43		
Conaway Preservation Group	0	21,350	5,024	1,436	0.10	0.02	1,436	3	5	1,444		
Eastside Mutual Water Company	2,230	1,800	424	121	0.01	0.00	121	0	0	122		
Giusti Farms	1,000	0	0									
Glenn-Colusa Irrigation District	11,495	60,000	14,118	4,036	0.29	0.05	4,036	7	13	4,057		
Henle Family LP	700	0	0									
Maxwell Irrigation District	3,000	5,000	1,176	336	0.02	0.00	336	1	1	338		
Natomas Central Mutual Water Company	20,000	0	0									
Pelger Mutual Water Company	4,670	2,538	597	171	0.01	0.00	171	0	1	172		
Pelger Road 1700 LLC	5,200	0	0									
Pleasant Grove-Verona Mutual Water Company	15,000	12,000	2,824	807	0.06	0.01	807	1	3	811		
Princeton-Codora-Glenn Irrigation District	6,600	6,600	1,553	444	0.03	0.00	444	1	1	446		
Provident Irrigation District	10,000	9,900	2,329	666	0.05	0.01	666	1	2	669		
Reclamation District 1004	7,175	20,000	4,706	1,345	0.10	0.02	1,345	2	4	1,352		
Reclamation District 108	15,000	40,000	9,412	2,691	0.20	0.03	2,691	5	9	2,705		
River Garden Farms	10,000	10,000	2,353	673	0.05	0.01	673	1	2	676		
Roberts Ditch Irrigation Company	4,100	1,800	424	121	0.01	0.00	121	0	0	122		
Sutter Mutual Water Company	18,000	18,000	4,235	1,211	0.09	0.01	1,211	2	4	1,217		
Swenson Farms	1,300	1,300	306	87	0.01	0.00	87	0	0	88		
Sycamore Mutual Water Company	8,000	10,000	2,353	673	0.05	0.01	673	1	2	676		
T&P Farms	1,200	890	209	60	0.00	0.00	60	0	0	60		
Te Velde Revocable Family Trust	7,094	6,975	1,641	469	0.03	0.01	469	1	2	472		
Windswept Land & Livestock	2,000	0	0									
Total	159,564	231,098	54,377	15,545	1.13	0.17	15,545	28	52	15,625		

Notes:

Pelger Mutual Water District used to estimate emissions for other water agencies.

Engine power rating equal to 250 hp for Pelger Mutual Water District engines.

The Byron Buck memo is based on diesel-fueled engines with sizes ranging from 121 to 225 hp; all engines are noncertified (Tier 0).

Pelger Mutual Water District engines are therefore determined to be a sufficient proxy to estimate the difference in emissions between groundwater substitution and cropland idling.

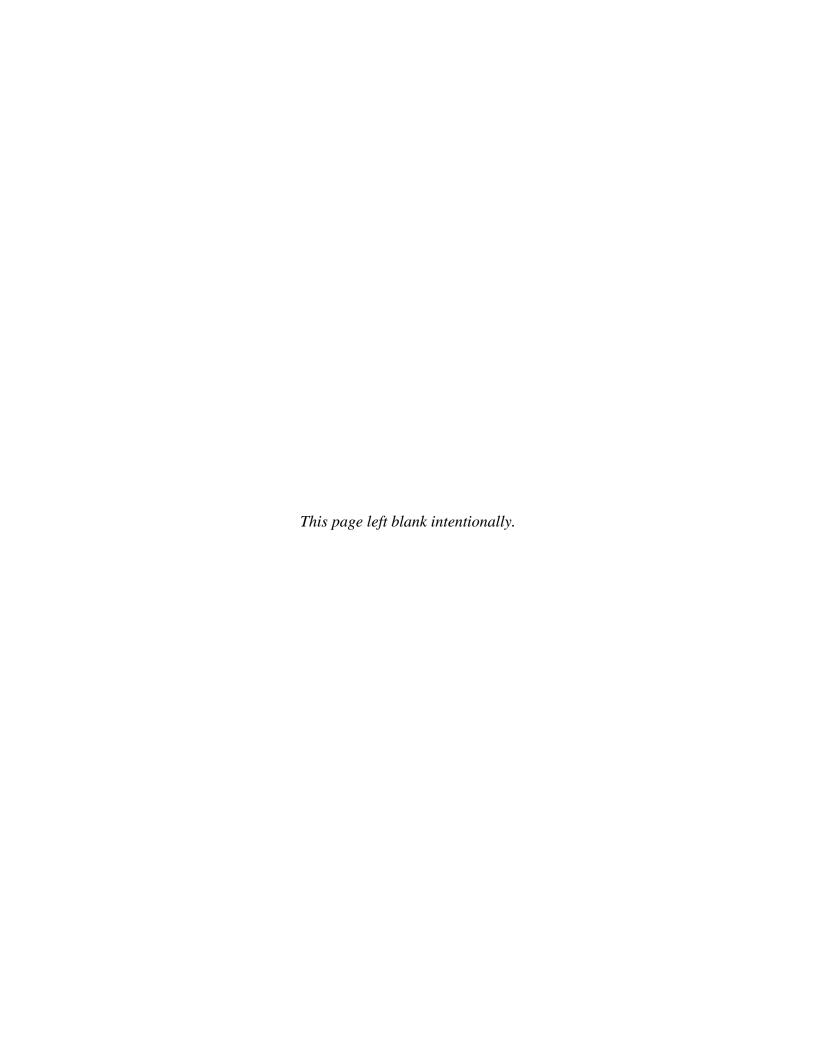
1 acre-foot of groundwater pumped =

4.25 acre-feet produced by fallowing

Source: Byron Buck & Associates. 2009. "Comparison of Summertime Emission Credits from Land Fallowing Versus Groundwater Pumping."

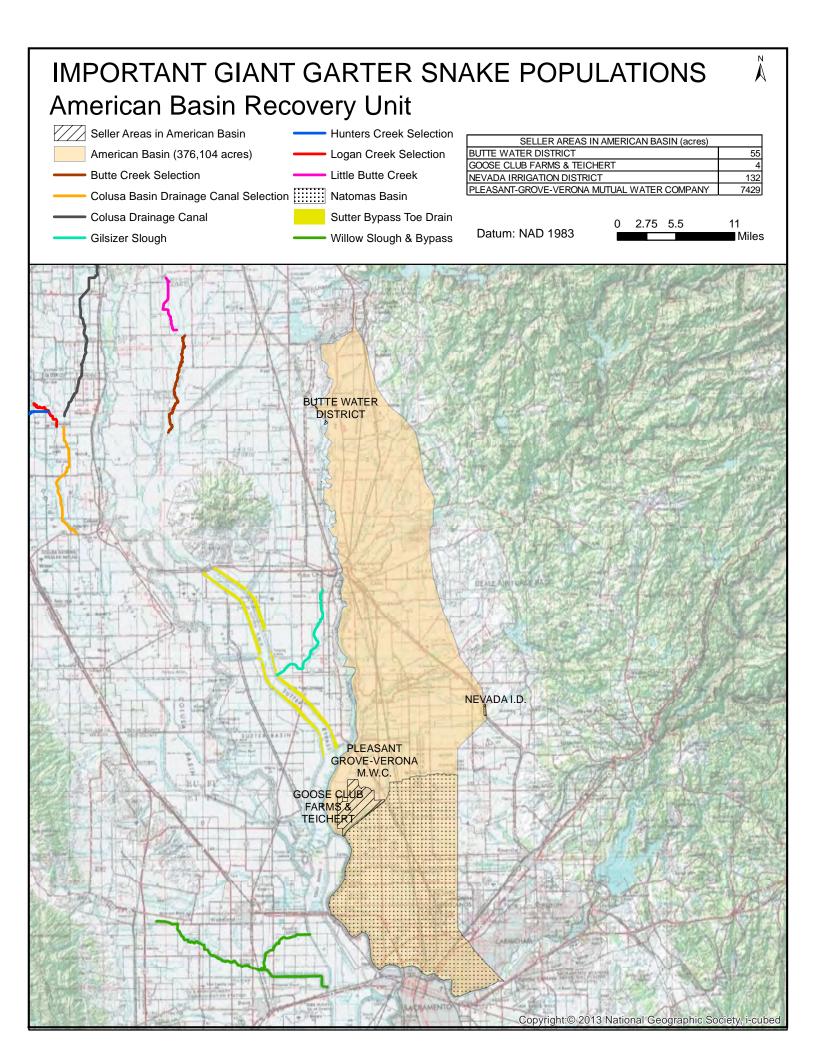
Appendix G

Giant Garter Snake Important Populations Maps



2021 Tehama-Colusa Canal Authority Water Transfers Initial Study/ Environmental Assessment

Appendix G: Giant Garter Snake Important Population Maps



IMPORTANT GIANT GARTER SNAKE POPULATIONS Butte Basin Recovery Unit

Willow Slough & Bypass

Sutter Bypass Toe Drain

Seller Areas in Butte Basin

Butte Basin (479,117 acres)

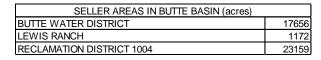
Butte Creek Selection

Little Butte Creek Selection

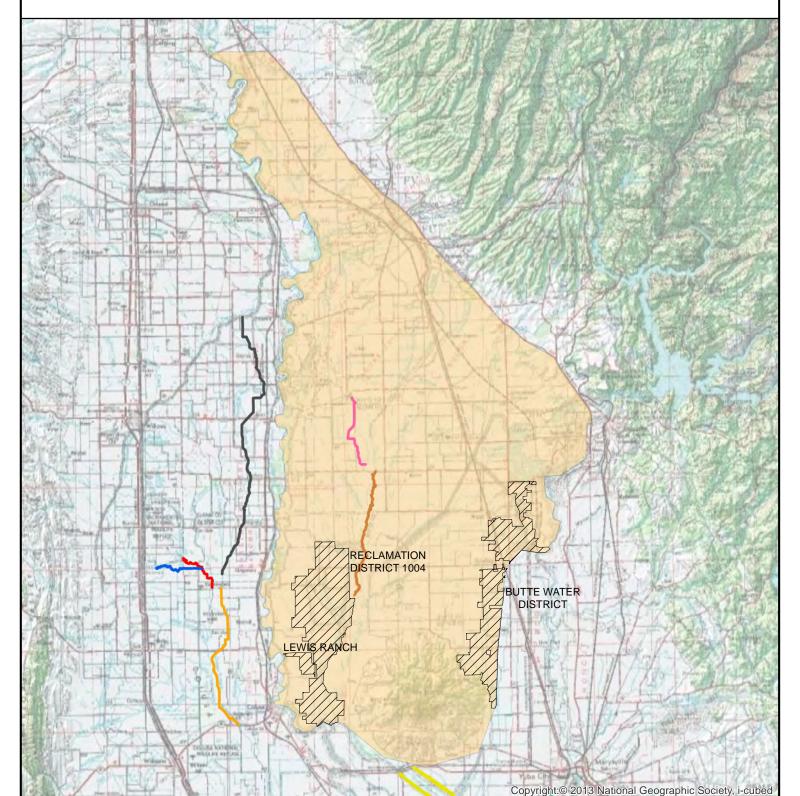
Logan Creek Selection

Colusa Drainage Canal

Gilsizer Slough

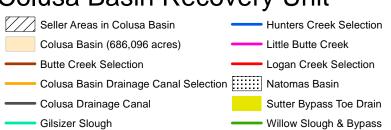


Datum: NAD 1983



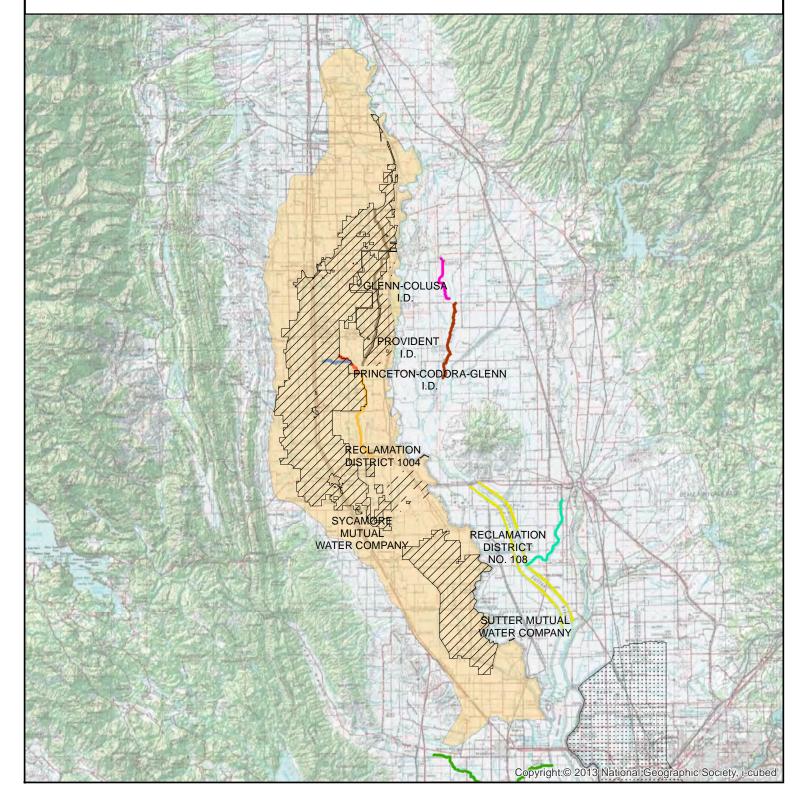
IMPORTANT GIANT GARTER SNAKE POPULATIONS

Colusa Basin Recovery Unit



SELLER AREAS IN COLUSA BASIN (acres)	
GLENN-COLUSA IRRIGATION DISTRICT	174886
PRINCETON-CORDORA-GLENN IRRIGATION DISTRCIT	12112
PROVIDENT IRRIGATION DISTRICT	17019
RECLAMATION DISTRICT 1004	54
RECLAMATION DISTRICT 108	58821
SUTTER MUTUAL WATER COMPANY	33
SYCAMORE MUTUAL WATER COMPANY	8431

Datum: NAD 1983 0 3.75 7.5 15 Miles



IMPORTANT GIANT GARTER SNAKE POPULATIONS Delta Basin Recovery Unit Seller Areas in Delta Basin Hunters Creek Selection Delta Basin (786,268 acres) Little Butte Creek SELLER AREAS IN DELTA BASIN (acres) RECLAMATION DISTRICT 2060 **Butte Creek Selection** Logan Creek Selection Colusa Basin Drainage Canal Selection Natomas Basin Colusa Drainage Canal Willow Slough & Bypass Datum: NAD 1983 Gilsizer Slough Sutter Bypass Toe Drain RECLAMATION DISTRICT 2060 Copyright: 2013 National Geographic Society, i-cubed

IMPORTANT GIANT GARTER SNAKE POPULATIONS

Sutter Bypass Toe Drain

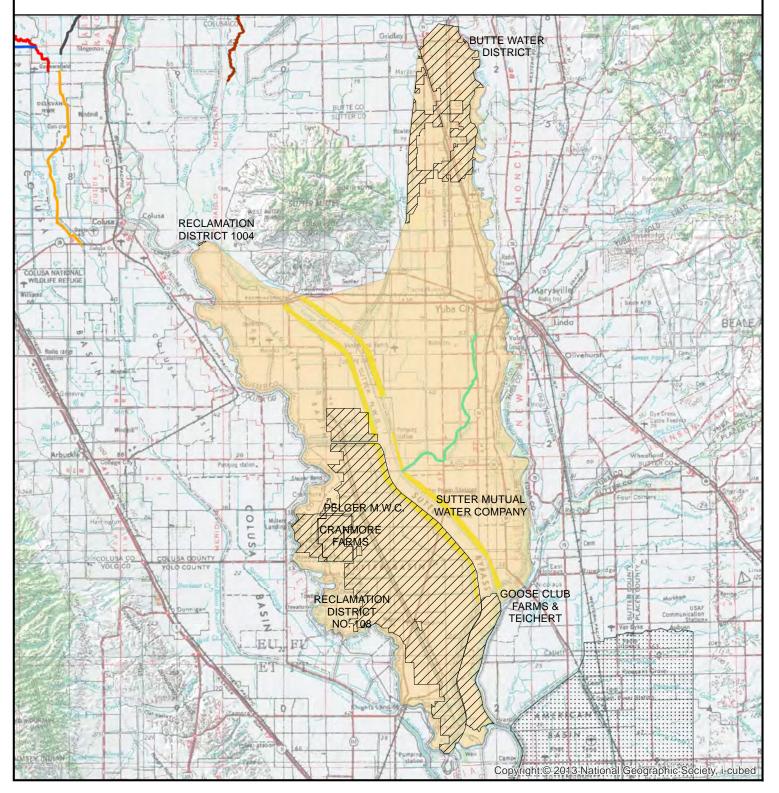
Sutter Basin Recovery Unit

Gilsizer Slough

	<i>J</i>
Seller Areas in Sutter Basin	Hunters Creek Selection
Sutter Basin (239,927 acres)	Little Butte Creek
Butte Creek Selection	Logan Creek Selection
Colusa Basin Drainage Canal Sele	ction Natomas Basin
Colusa Drainage Canal	Willow Slough & Bypass

SELLER AREAS IN SUTTER BASIN (acres)					
BUTTE WATER DISTRICT	14508				
CRANMORE FARMS	2219				
GOOSE CLUB FARMS & TEICHERT	5724				
PELGER MUTUAL WATER COMPANY	2970				
RECLAMATION DISTRICT 1004	23				
RECLAMATION DISTRICT 108	0.02				
SUTTER MUTUAL WATER COMPANY	51085				

Datum: NAD 1983 0 1.75 3.5 7 Miles



IMPORTANT GIANT GARTER SNAKE POPULATIONS

Yolo Basin Recovery Unit

Gilsizer Slough

Seller Areas in Yolo Basin

Hunters Creek Selection

Yolo Basin (410,915 acres)

Butte Creek Selection

Little Butte Creek

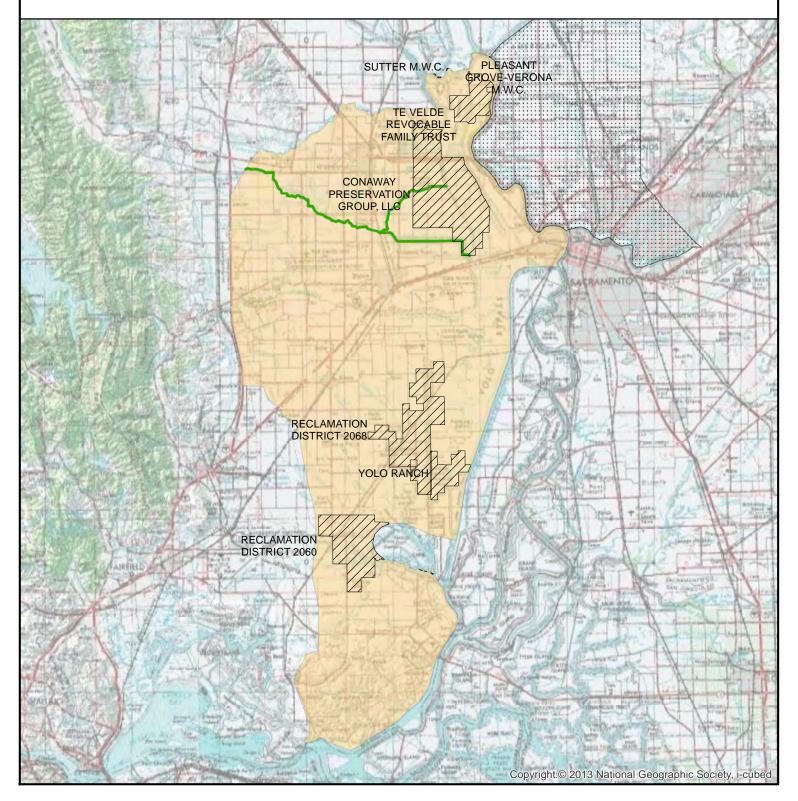
Logan Creek Selection

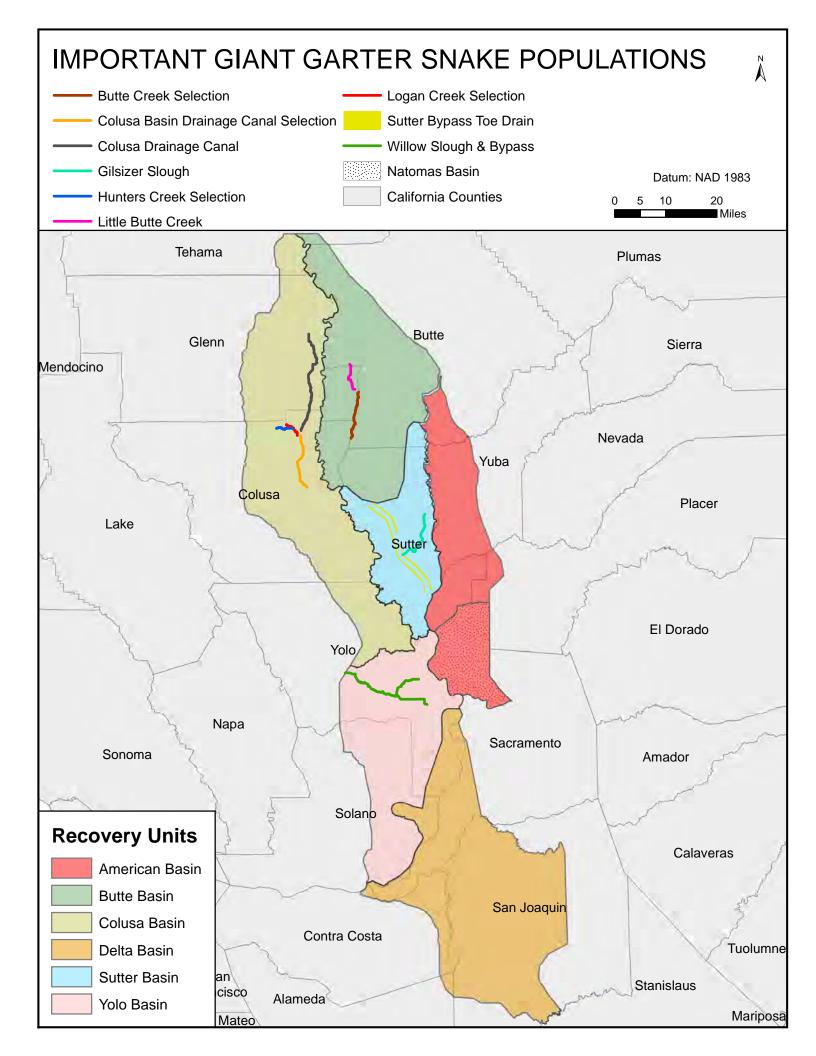
Colusa Drainage Canal Sutter Bypass Toe Drain

Willow Slough & Bypass

SELLER AREAS IN YOLO BASIN (acres)		
CONAWAY PRESERVATION GROUP, LLC	20463	
PLEASANT-GROVE-VERONA MUTUAL WATER COMPANY	3	
RECLAMATION DISTRICT 2060	9982	
RECLAMATION DISTRICT 2068	13262	
TE VELDE REVOCABLE FAMILY TRUST	4406	
SUTTER MUTUAL WATER COMPANY	21	
YOLO RANCH	3350	

Datum: NAD 1983 0 2.25 4.5 9 Miles





Appendix H Groundwater Modeling Results

Appendix H Groundwater Modeling Results

H.1 Numerical Groundwater Modeling Analysis

Numerical groundwater modeling analysis was performed using the Sacramento Valley Finite Element Groundwater Model (SACFEM2013) developed to simulate groundwater conditions in the Sacramento Valley Groundwater Basin. SACFEM2013 was selected as the numerical modeling tool for this analysis based on the state of the model and its capabilities to simulate groundwater conditions at a greater level of detail than other potential modeling tools within the Seller Service Area. Reclamation commissioned a peer review of the SACFEM2013 model in 2010 (WRIME 2011). Revisions were made to the model and the revised model was used for the impacts analysis described here.

SACFEM2013 uses the MicroFEM finite-element numerical modeling code. MicroFEM is capable of simulating multiple aquifer systems in both steady state and transient conditions. The model is capable of simulating groundwater conditions and groundwater/surface water interactions in the valley. SACFEM2013 was also used to estimate how groundwater pumping and recharge affects surface water.

SACFEM2013 covers the entire Sacramento Valley Groundwater Basin from just north of Red Bluff to the Cosumnes River in the south (see Figures H-1 through H-7). The model was calibrated to historic conditions from Water Years (WY) 1970 through WY 2009. This SACFEM2013 model simulation, which includes highly variable hydrology (from very wet periods to very dry periods), was used as a basis for simulating groundwater substitution pumping. Potential water transfers for 2022 were simulated in SACFEM2013 using September 1977 hydrologic conditions because this year represents the driest condition available during the SACFEM2013 simulation period (WY 1970 to WY 2003).

Groundwater drawdown impacts associated with the groundwater substitution pumping from 278 wells that are part of the Proposed Action have been modeled to estimate effects to groundwater resources. The groundwater substitution pumping was modeled to occur from May through September, but groundwater substitution pumping could also occur in October. If groundwater pumping continued into October, groundwater drawdown impacts may also extend into October. However, even if groundwater pumping was extended into October, the total amount of water transferred would be the same quantity that was modeled. Because the same volume of groundwater substitution pumping may occur over a longer period of time, when compared to the shorter groundwater modeling period, impacts to groundwater levels, interaction with surface water, and land subsidence would be less than those modeled. Overall, a longer duration in pumping for the same quantity that was modeled would decrease the depth of the drawdown impacts.

Table H-1 summarizes the pumping details including pumping capacity and the range of screened intervals of the modeled groundwater substitution pumping wells. The locations and depths of these

wells are specified in the model based on data collected from the potential groundwater substitution sellers.

Table H-1. Water Transfers through Groundwater Substitution under the Proposed Action (Potential 2022 Wells)

Potential Seller	Number of Wells	Pumping Rate or Range of Rates (gpm)	Range of Screened Interval(s)(feet bgs)
Redding Area Groundwater Basin ¹			
Anderson- Cottonwood Irrigation District	2	1,000-5,500	150-455
Sacramento Valley Groundwater Basin			
Canal Farms	3	2,500-5,000	210-660
Eastside Mutual Water Company	3	4,000-4,720	160-450
Giusti Farms	2	3,200	160-400
Glenn-Colusa Irrigation District	28	600-4,000	605-945
Henle Family Farms	1	3,600	155-480
Maxwell Irrigation District	2	3,800	150-240
Natomas Central Mutual Water Company	37	1,000-3,200	310-952
Pelger Mutual Water Company	4	2,300-4,800	140-485
Pelger Road 1700 LLC	6	3,000-3,500	340-820
Pleasant Grove-Verona Mutual Water Company	34	800-3,600	205-520
Princeton-Codora- Glenn Irrigation District	13	1,000-4,000	220-380
Provident Irrigation District	16	2,000-4,500	200-450
Reclamation District 108	20	1,250-4,950	358-1,020
Reclamation District 1004	30	1,000-5,800	410-730
River Garden Farms	10	2,200-3,400	365-686
Roberts Ditch Irrigation Company	8	1,300-4,500	150-500
Sutter Mutual Water Company	45	1,300-5,500	270-620
Swenson Farms	1	3,500	100-400
Sycamore Mutual Water Company	5	3,270-6,409	256-906
T&P Farms	2	3,000	185-660
Te Velde Revocable Family Trust	4	3,000-4,200	200-455
Windswept Land & Livestock	4	2,000-3,200	320-580

Note:

icey.

gpm = gallons per minute

bgs = below ground surface

Figures H-1 through H-7 show the simulated drawdown due to the Proposed Action under September 1977 hydrologic conditions. During dry years, surface water resources are limited and users have historically increased groundwater pumping to address shortages. Simulating transfers

¹ Anderson-Cottonwood ID's proposed transfer was not simulated in the Sacramento Valley Finite Element Groundwater Model (SACFEM2013) because the model area does not include the Redding Area Groundwater Basin.

during this period illustrates the potential to compound impacts from dry-year pumping as compared to the No Action Alternative.

- Figures H-1a through H-1c show the simulated drawdown at the water table based on results from the top layer of the SACFEM2013 model. This layer has a depth of up to 35 feet below ground surface (bgs).
- Figures H-2a through H-2c show simulated drawdown at approximately 35 to 200 feet bgs.
- Figures H-3a through H-3c show simulated drawdown at approximately 200 to 300 feet bgs.
- Figures H-4a through H-4c present the simulated drawdown at approximately 300 to 400 feet bgs.
- Figures H-5a through H-5c present the simulated drawdown at approximately 500 to 700 feet bgs.
- Figures H-6a through H-6c present the simulated drawdown at approximately 700 to 900 feet bgs.
- Figures H-7a through H-7c show simulated drawdown at approximately 900 to 1,300 feet bgs.
- Figure H-8 overlays the Indian Trust Assets (ITAs) within the Sacramento Valley Groundwater Basin over the simulated drawdown at the water table.

Drawdown at the water table (Figures H-1, H-2, and H-8) represents the estimated decline in the groundwater surface within the shallow, unconfined portion of the aquifer (i.e., the height of water within a shallow groundwater well). The drawdown in the deeper portions of the aquifer (Figures H-3 through H-7) represents a change in hydraulic head (i.e., water pressure) in a well that is screened in this deeper portion of the aquifer.

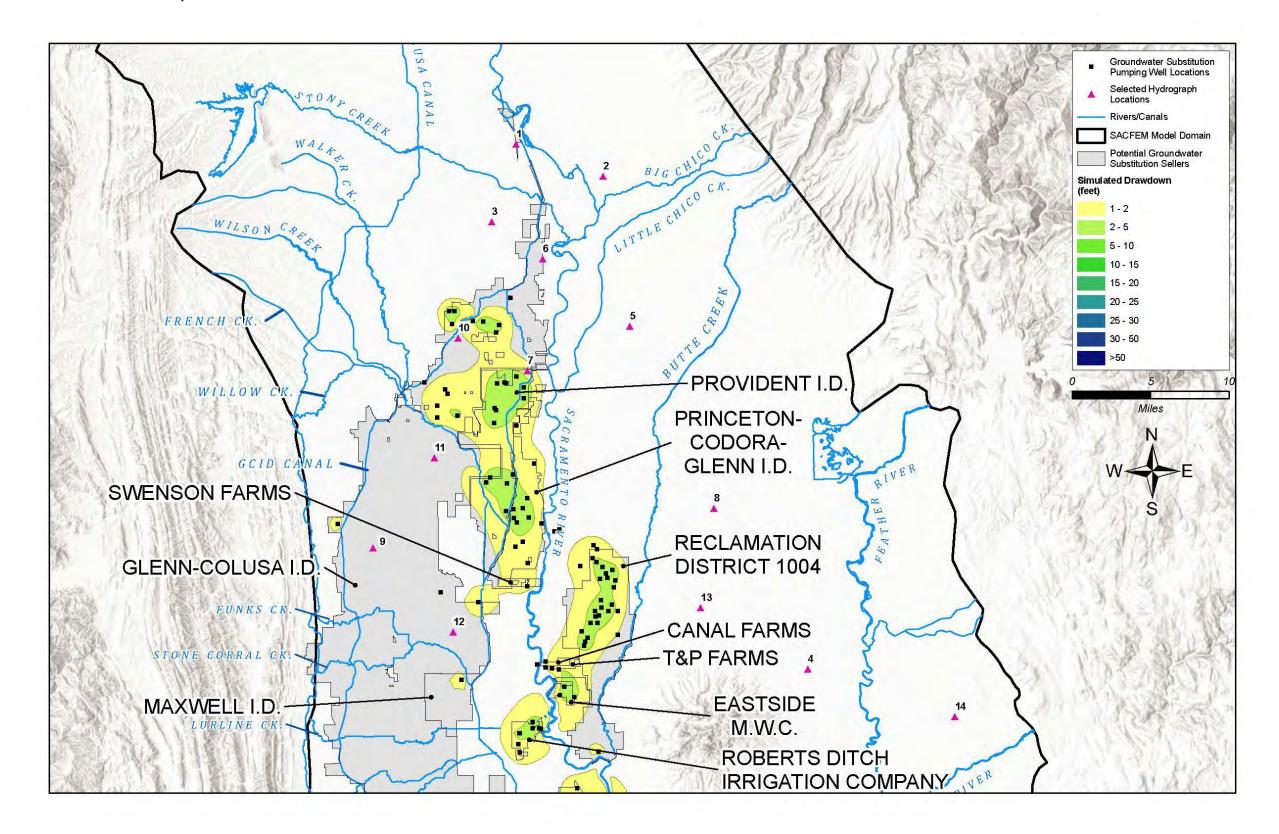


Figure H-1a. Simulated Drawdown in Water Table Elevation (0 to approximately 35 feet bgs), Based on September 1977 Hydrologic Conditions

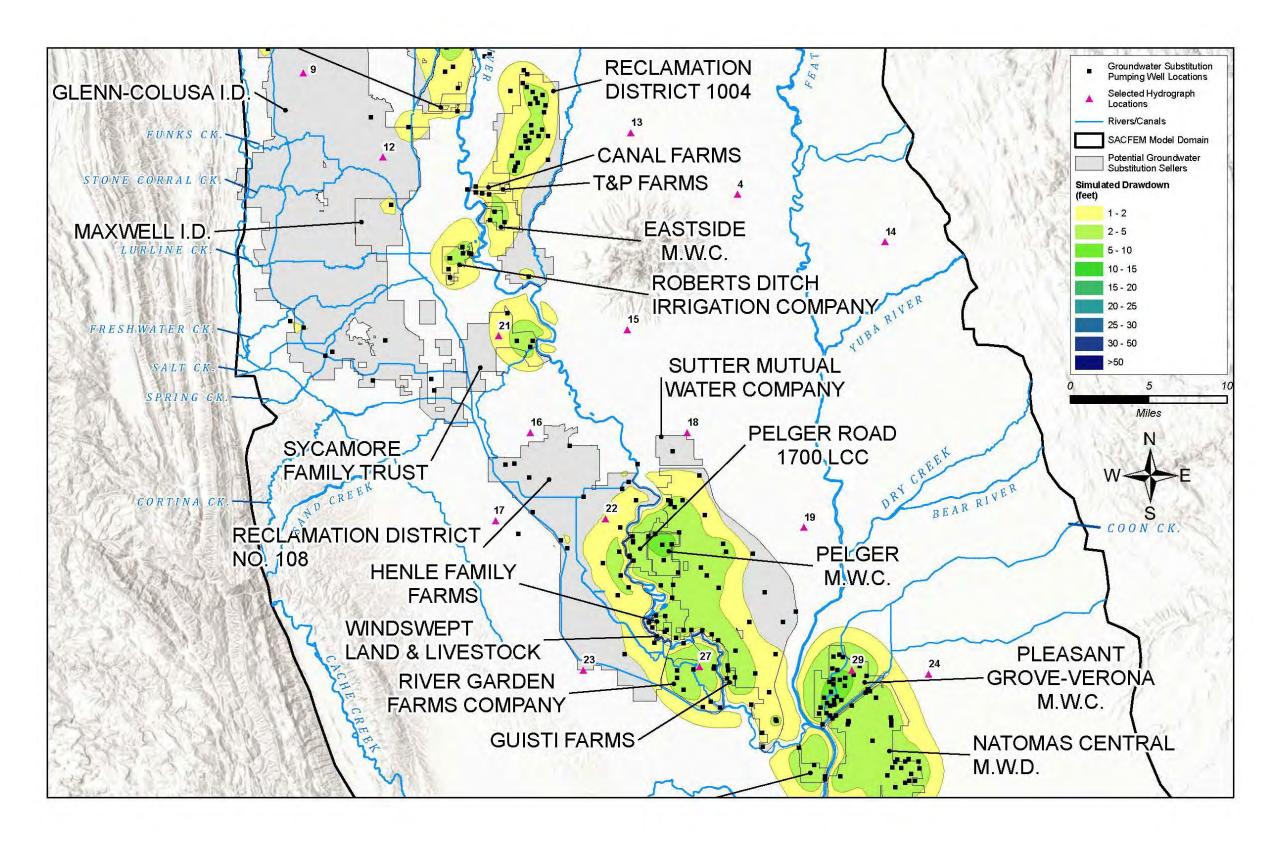


Figure H-1b. Simulated Drawdown in Water Table Elevation (0 to approximately 35 feet bgs), Based on September 1977 Hydrologic Conditions

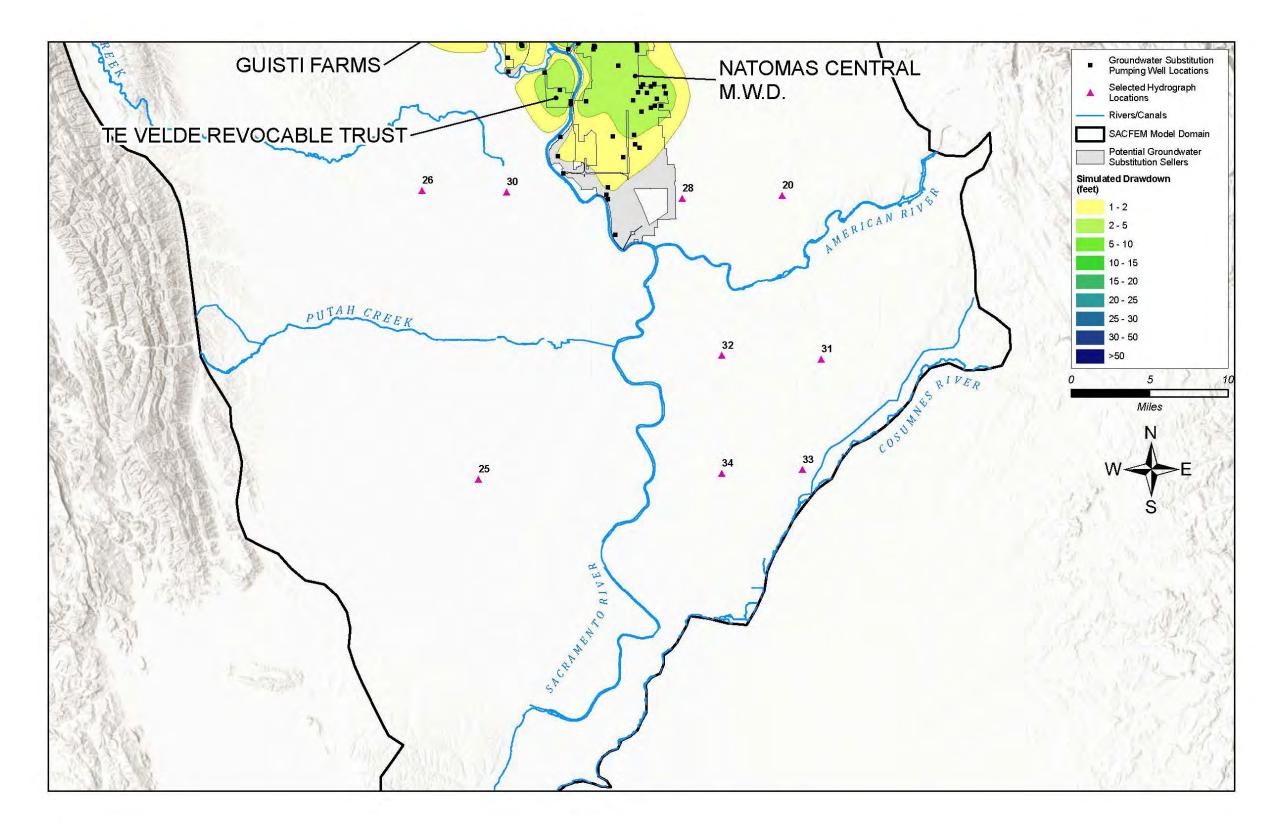


Figure H-1c. Simulated Drawdown in Water Table Elevation (0 to approximately 35 feet bgs), Based on September 1977 Hydrologic Conditions

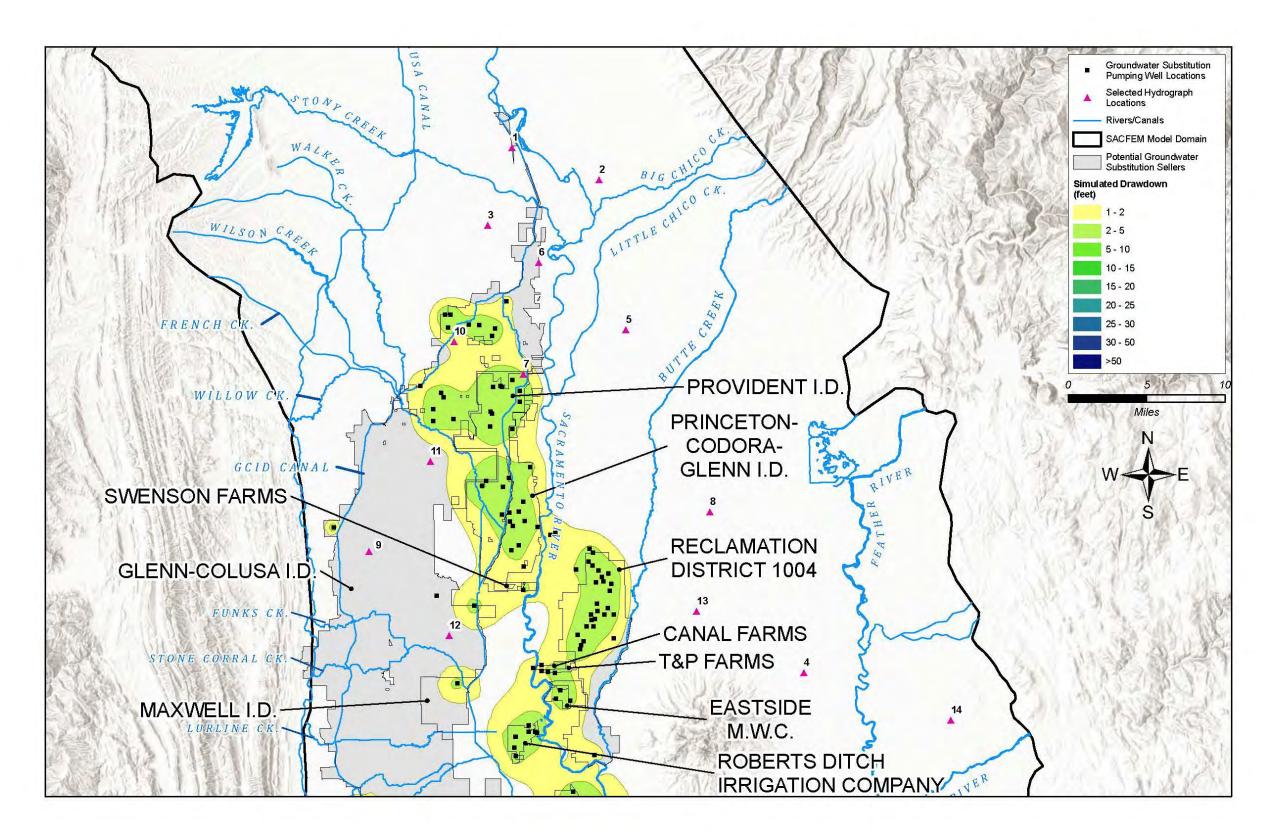


Figure H-2a. Simulated Drawdown in Water Table Elevation (approximately 35 to 200 feet bgs), Based on September 1977 Hydrologic Conditions

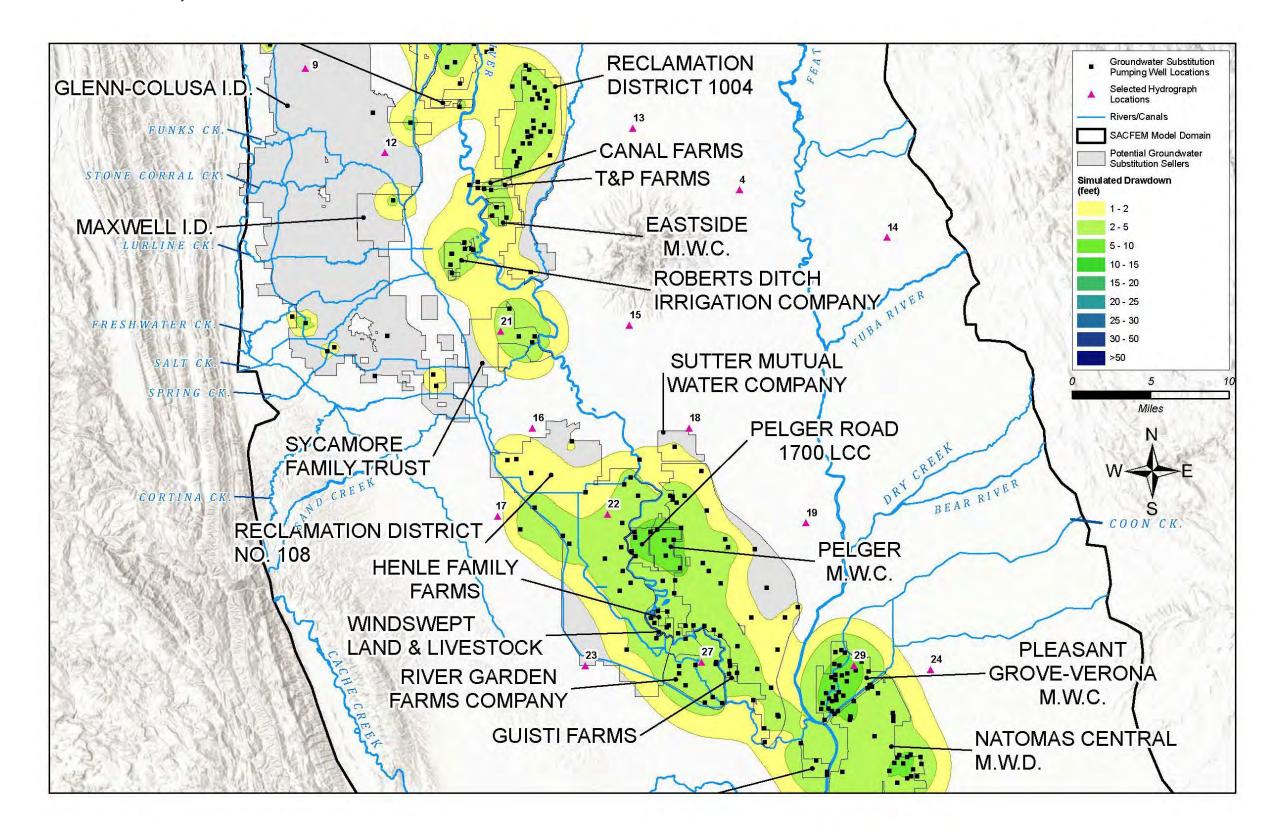


Figure H-2b. Simulated Drawdown in Water Table Elevation (approximately 35 to 200 feet bgs), Based on September 1977 Hydrologic Conditions

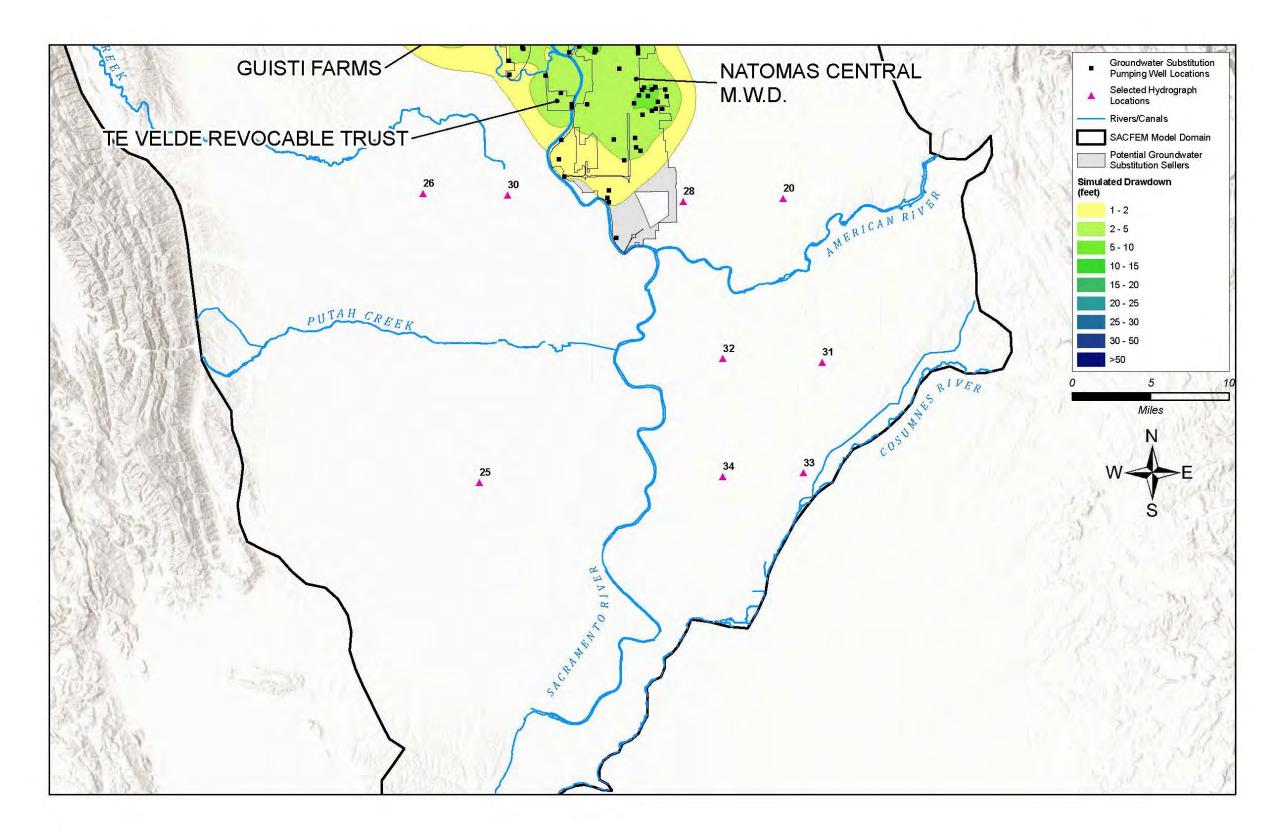


Figure H-2c. Simulated Drawdown in Water Table Elevation (approximately 35 to 200 feet bgs), Based on September 1977 Hydrologic Conditions

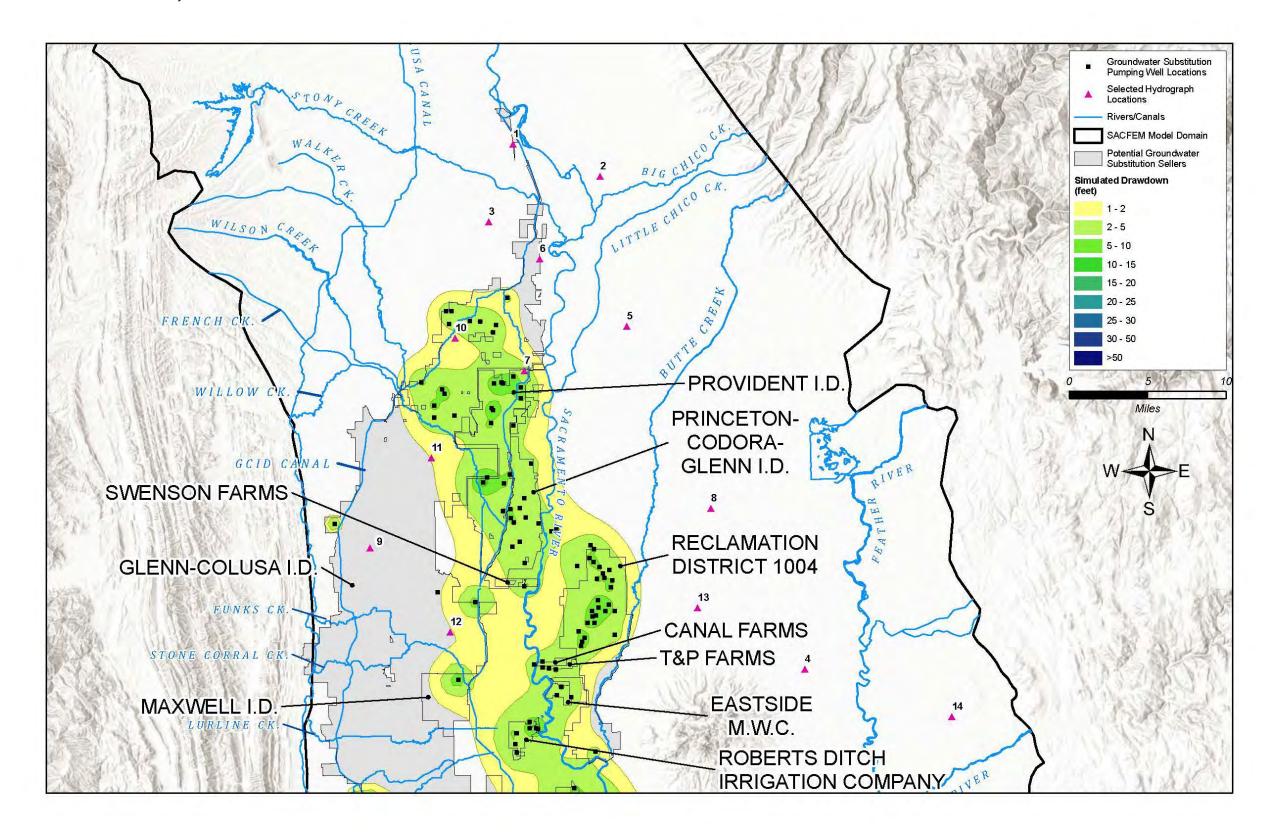


Figure H-3a. Simulated Drawdown in Groundwater Head (approximately 200 to 300 feet bgs), Based on September 1977 Hydrologic Conditions

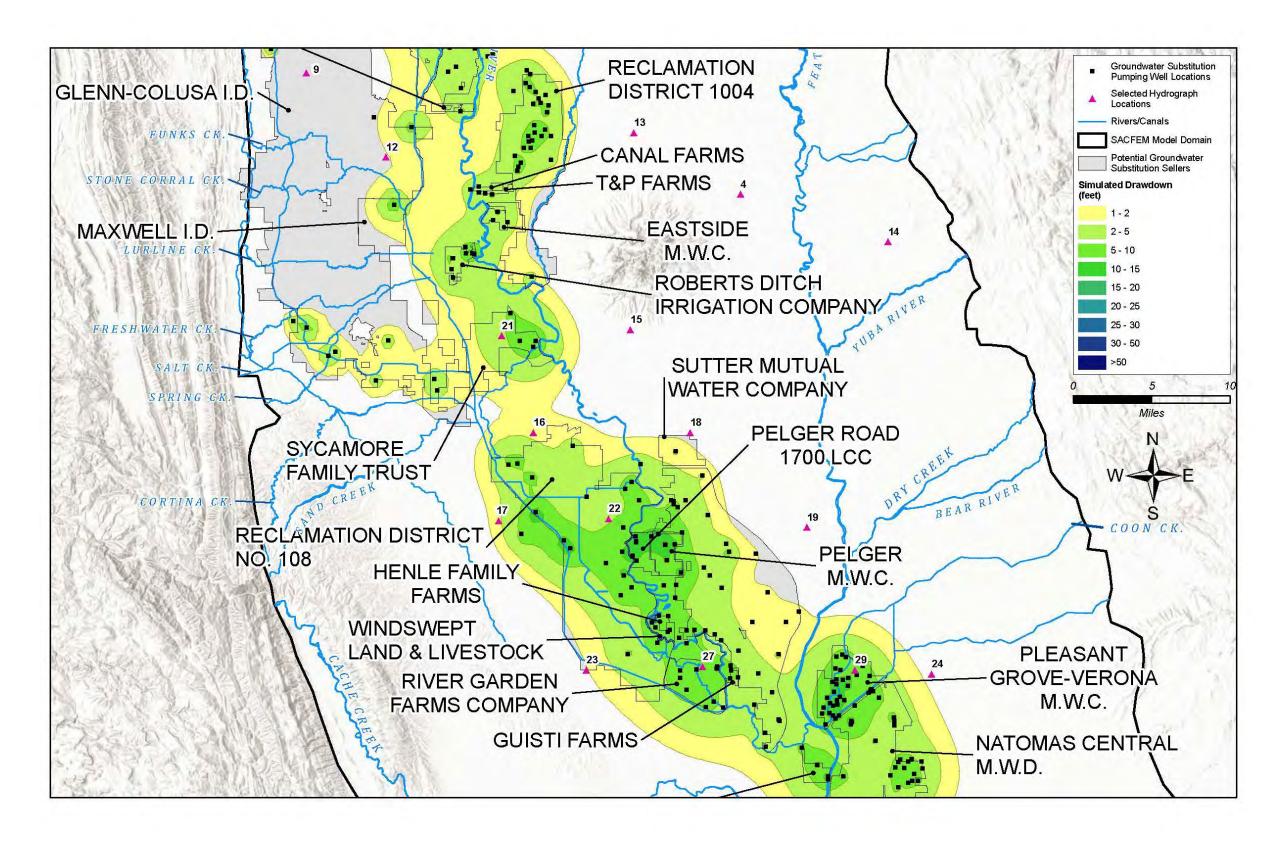


Figure H-3b. Simulated Drawdown in Groundwater Head (approximately 200 to 300 feet bgs), Based on September 1977 Hydrologic Conditions

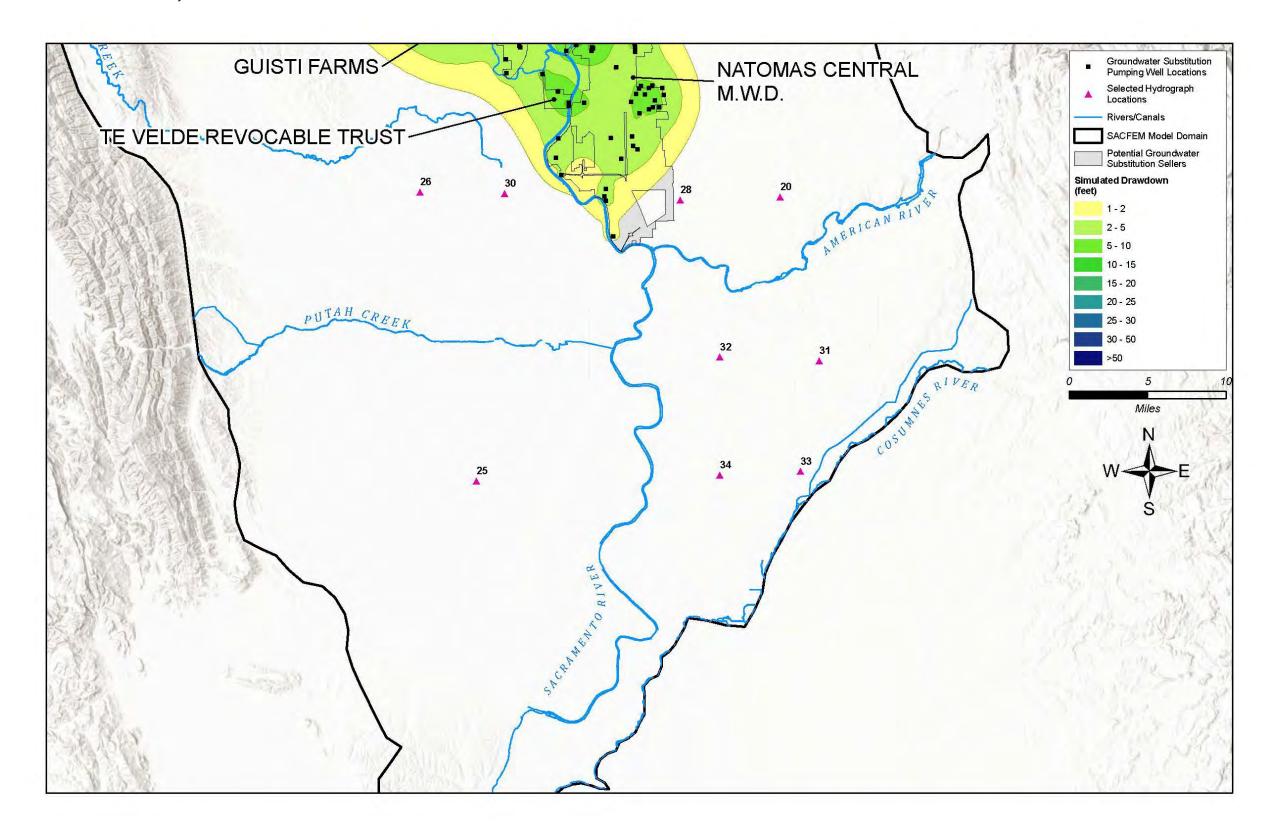


Figure H-3c. Simulated Drawdown in Groundwater Head (approximately 200 to 300 feet bgs), Based on September 1977 Hydrologic Conditions

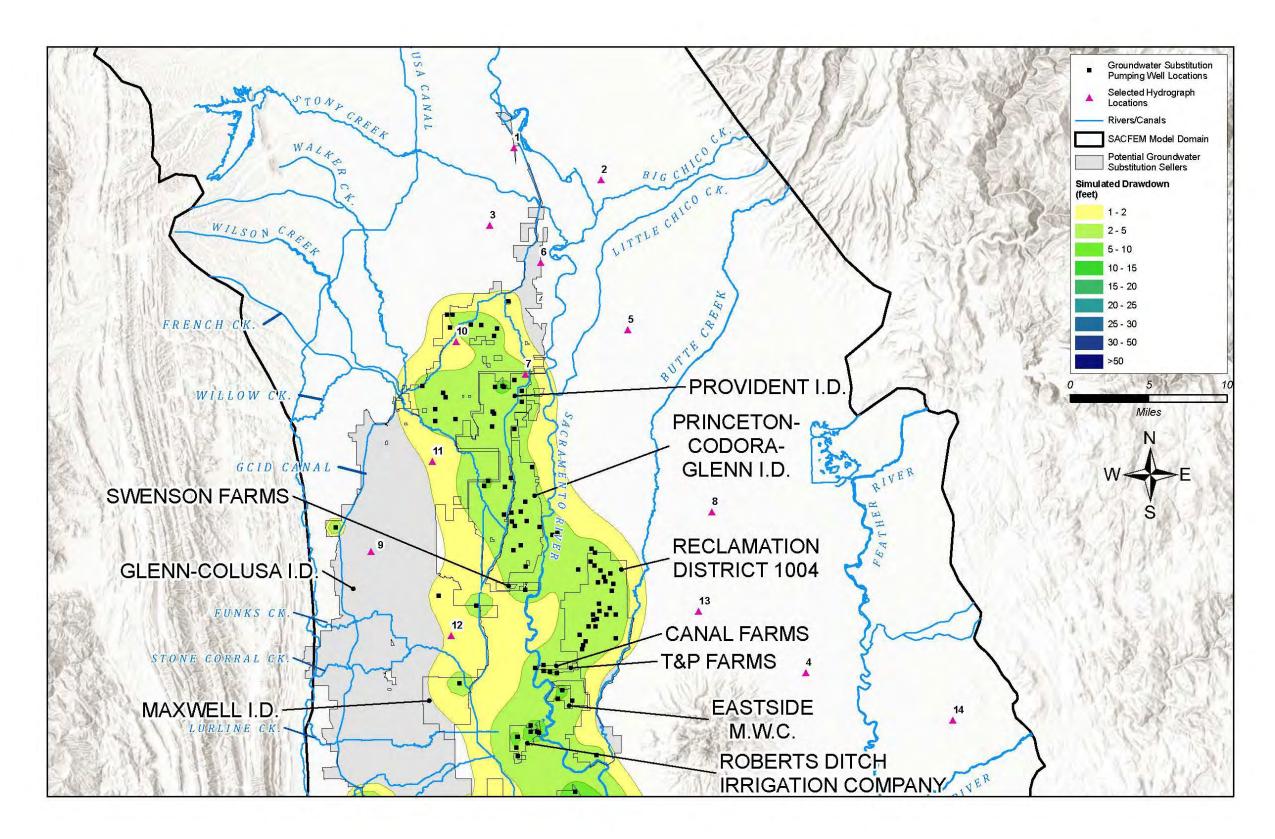


Figure H-4a. Simulated Drawdown in Groundwater Head (approximately 300 to 400 feet bgs), Based on September 1977 Hydrologic Conditions

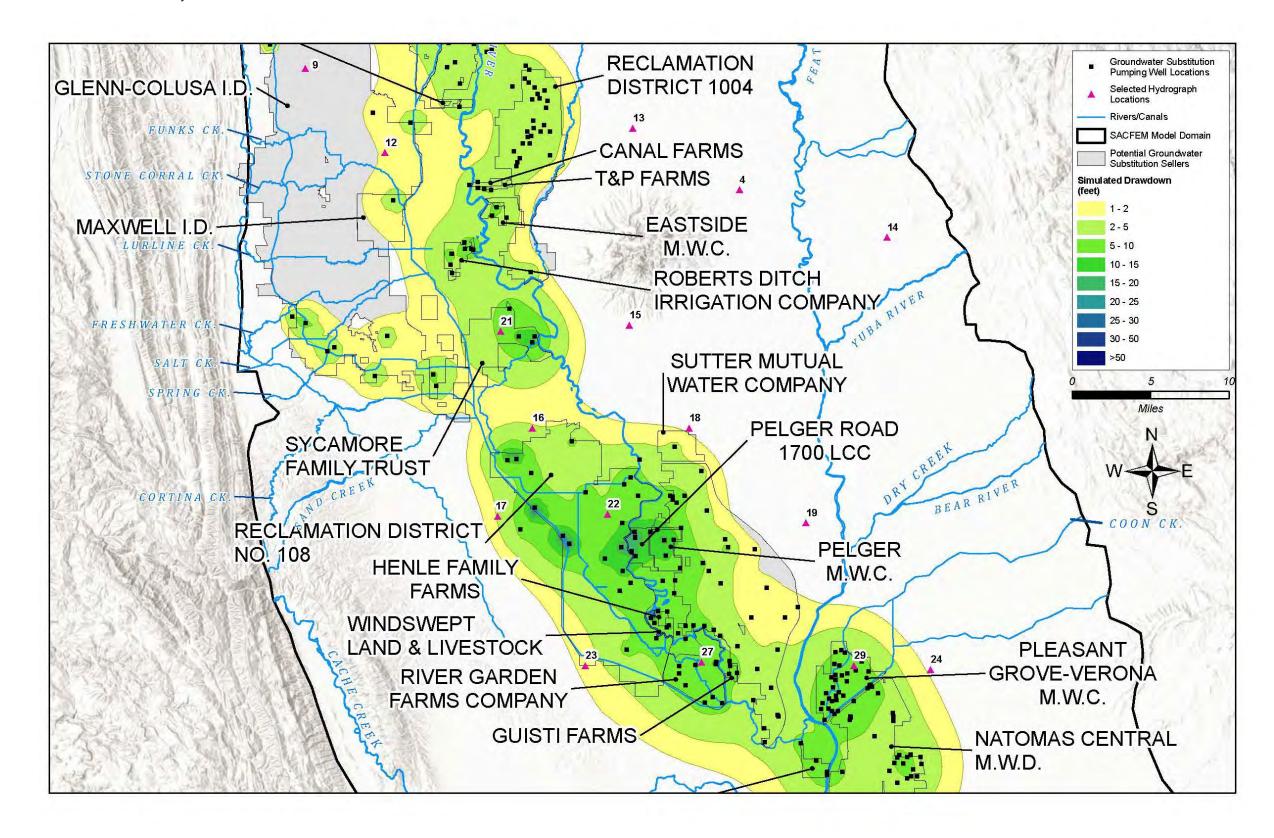


Figure H-4b. Simulated Drawdown in Groundwater Head (approximately 300 to 400 feet bgs), Based on September 1977 Hydrologic Conditions

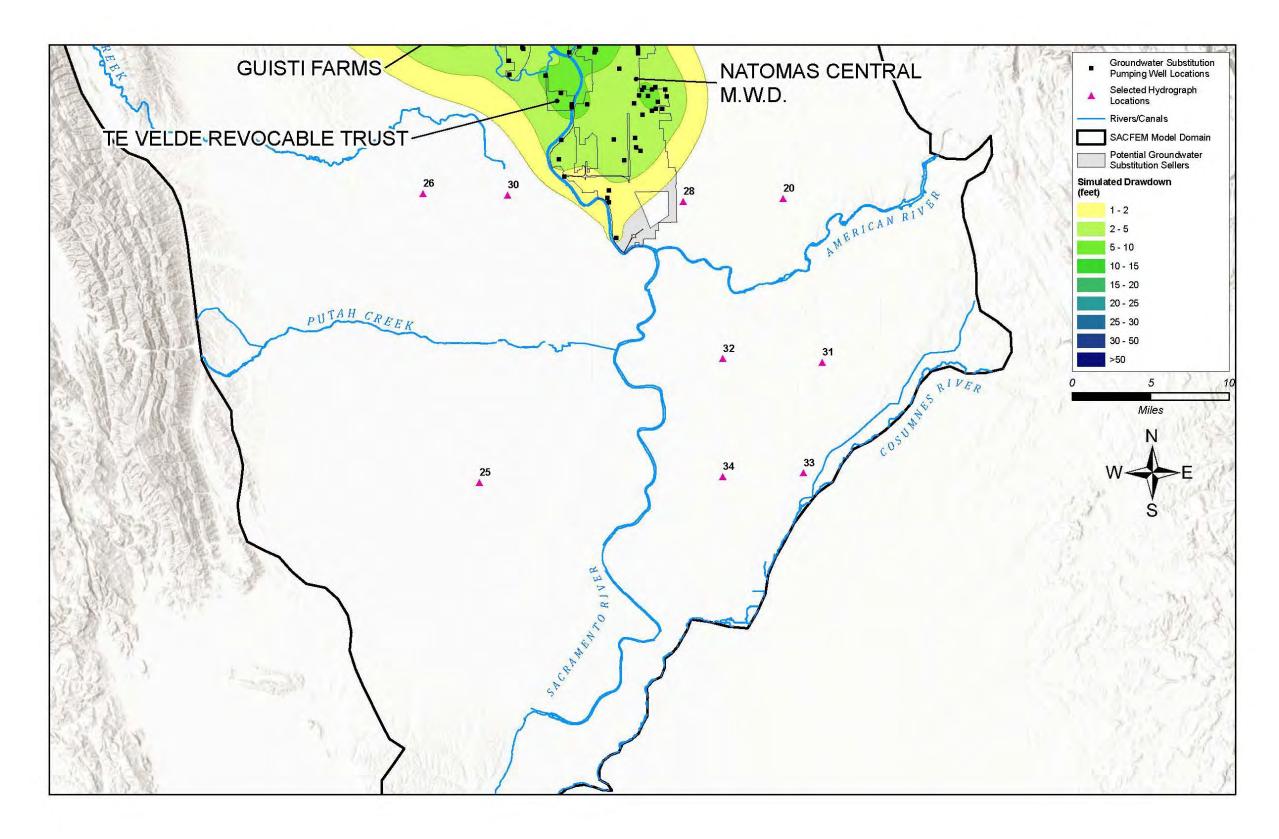


Figure H-4c. Simulated Drawdown in Groundwater Head (approximately 300 to 400 feet bgs), Based on September 1977 Hydrologic Conditions

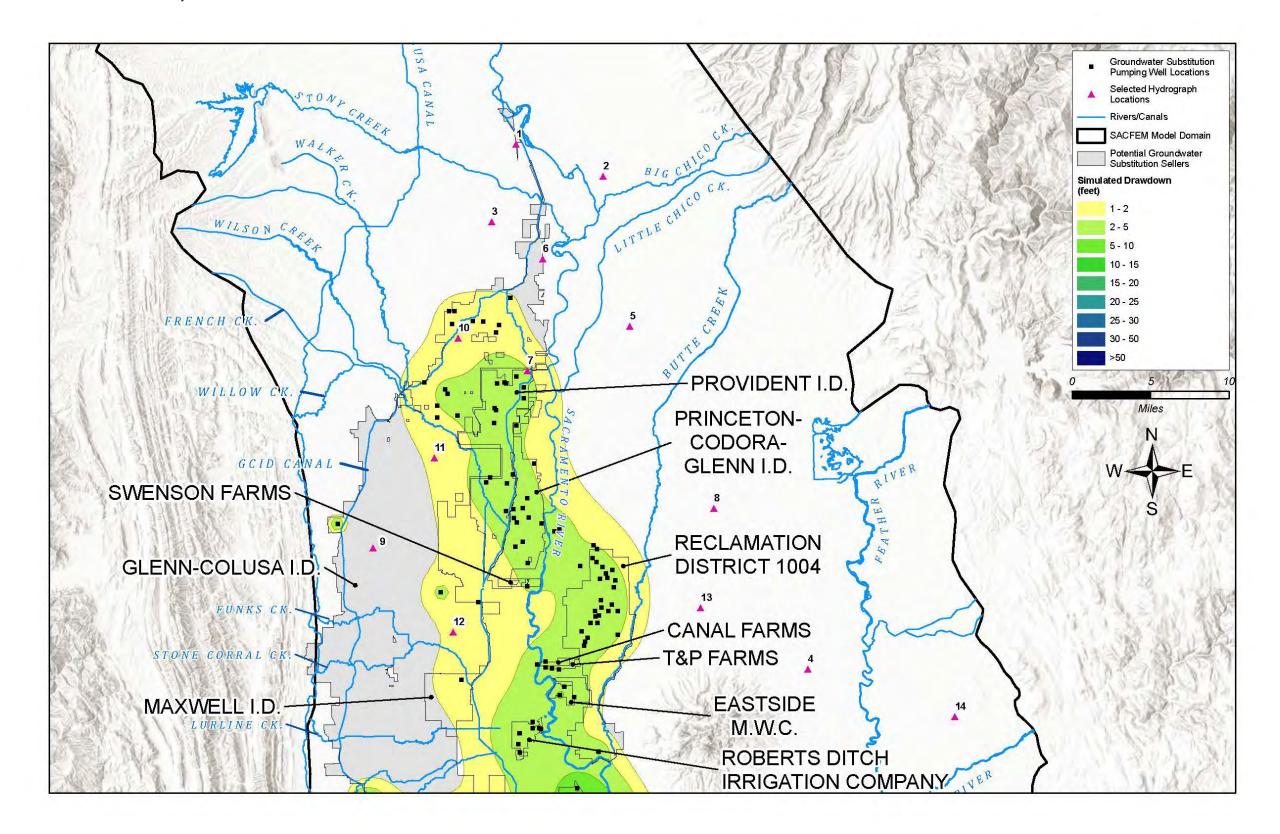


Figure H-5a. Simulated Drawdown in Groundwater Head (approximately 500 to 700 feet bgs), Based on September 1977 Hydrologic Conditions

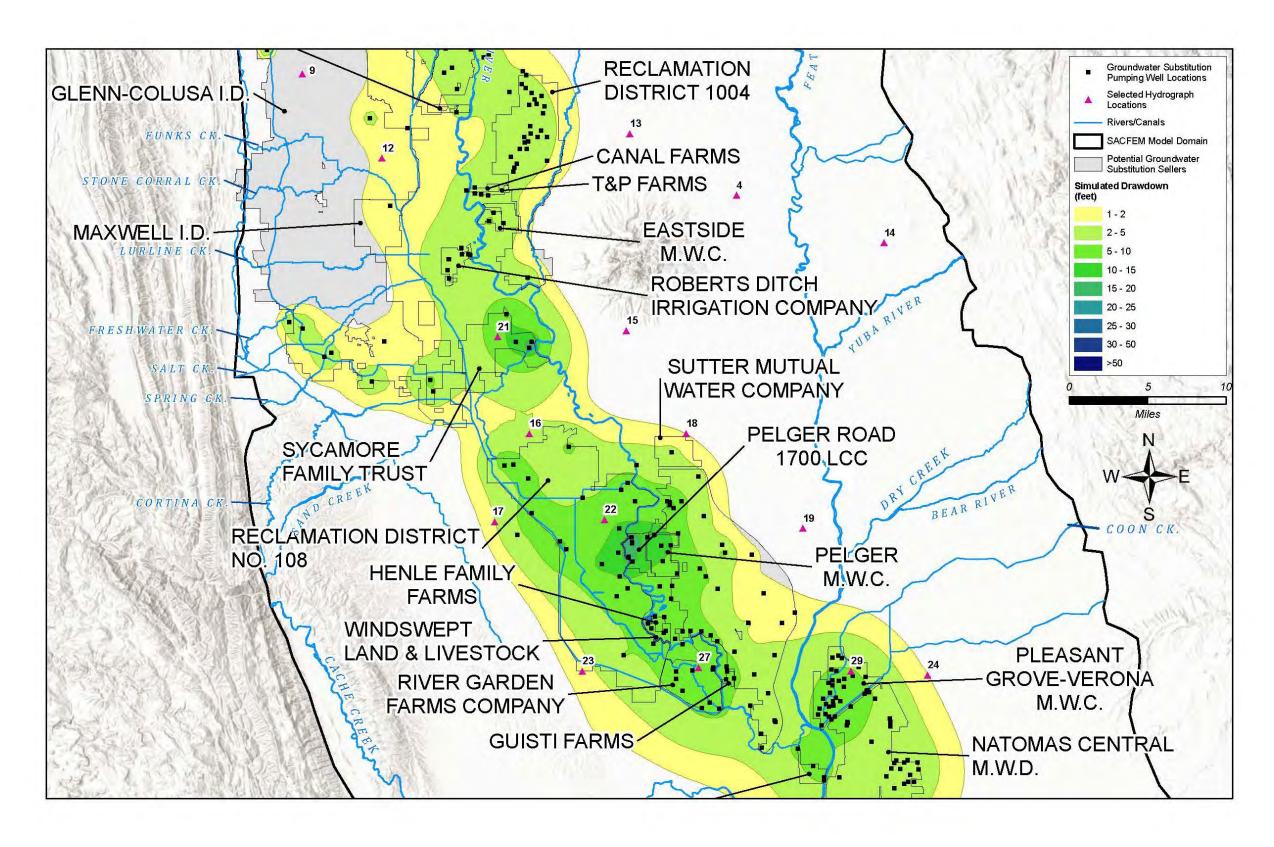


Figure H-5b. Simulated Drawdown in Groundwater Head (approximately 500 to 700 feet bgs), Based on September 1977 Hydrologic Conditions

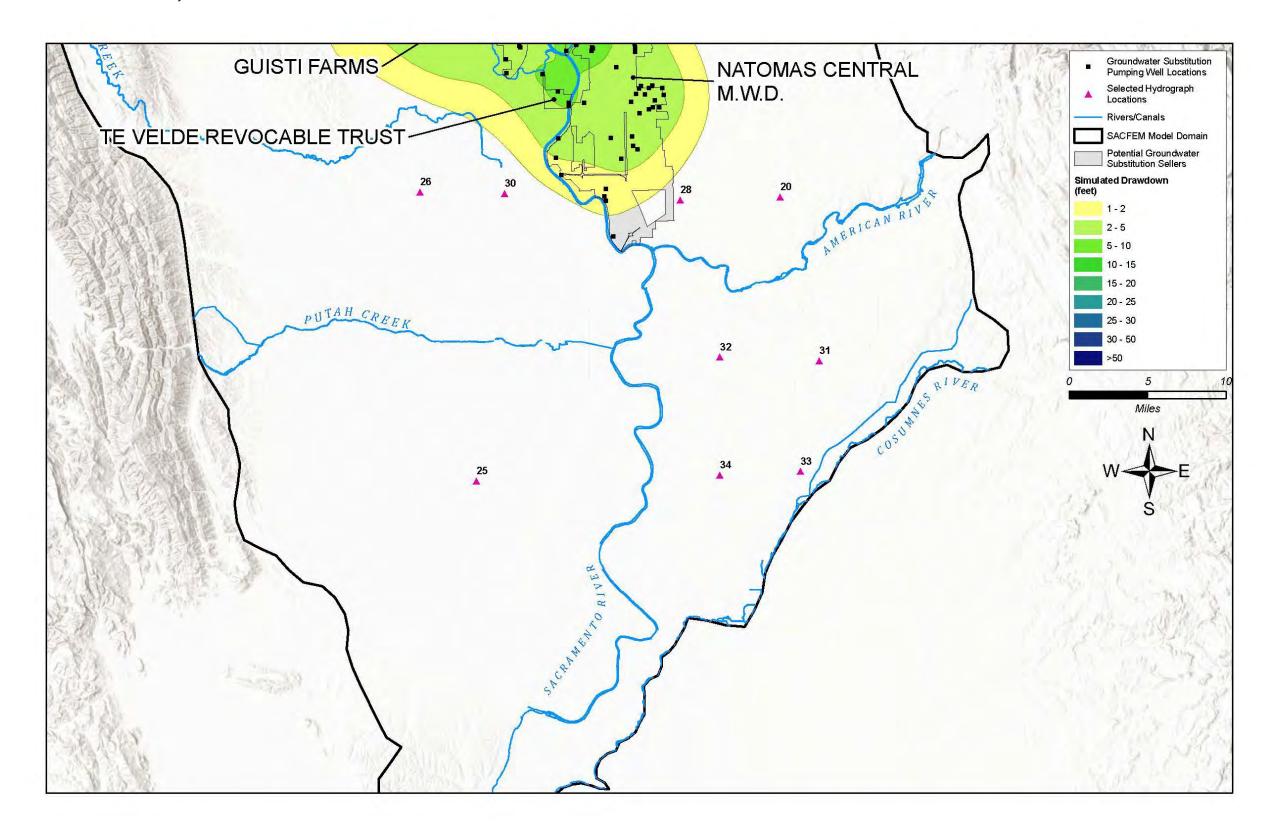


Figure H-5c. Simulated Drawdown in Groundwater Head (approximately 500 to 700 feet bgs), Based on September 1977 Hydrologic Conditions

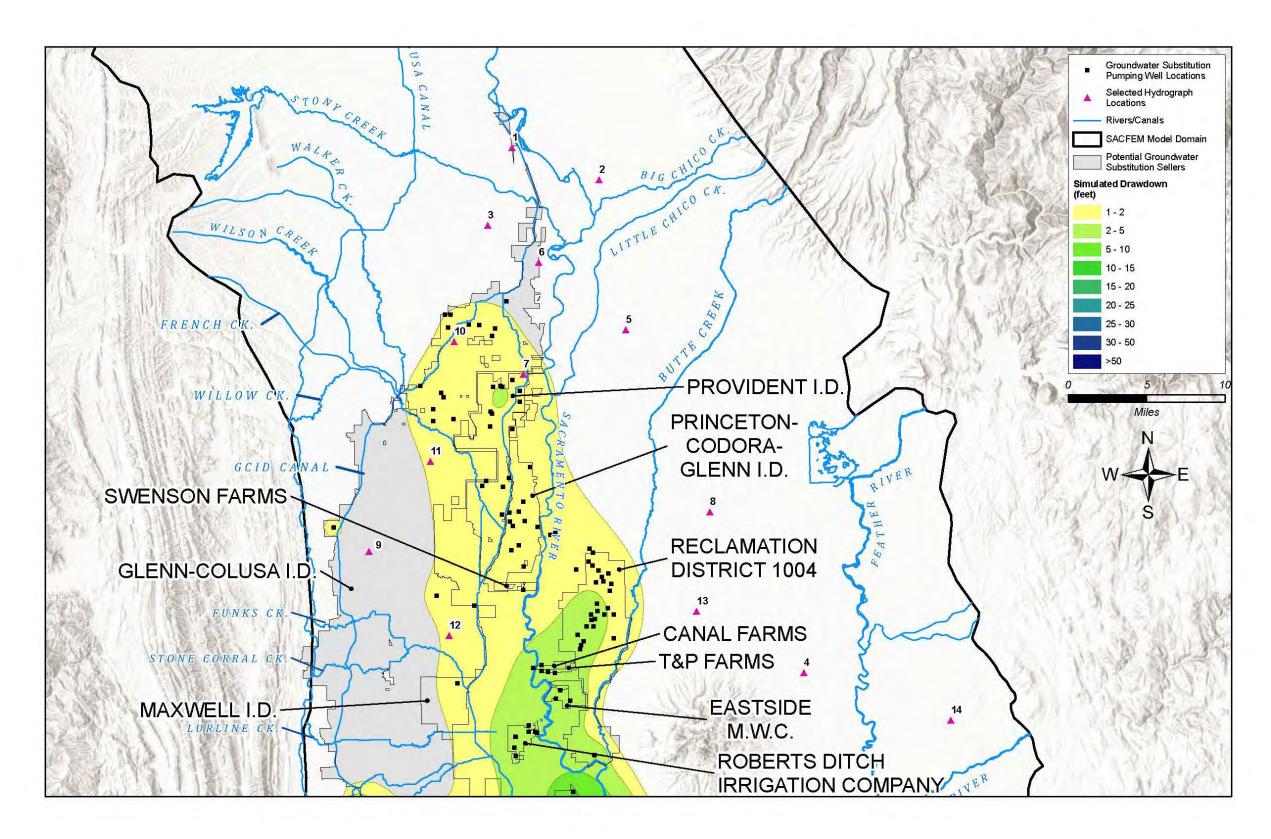


Figure H-6a. Simulated Drawdown in Groundwater Head (approximately 700 to 900 feet bgs), Based on September 1977 Hydrologic Conditions

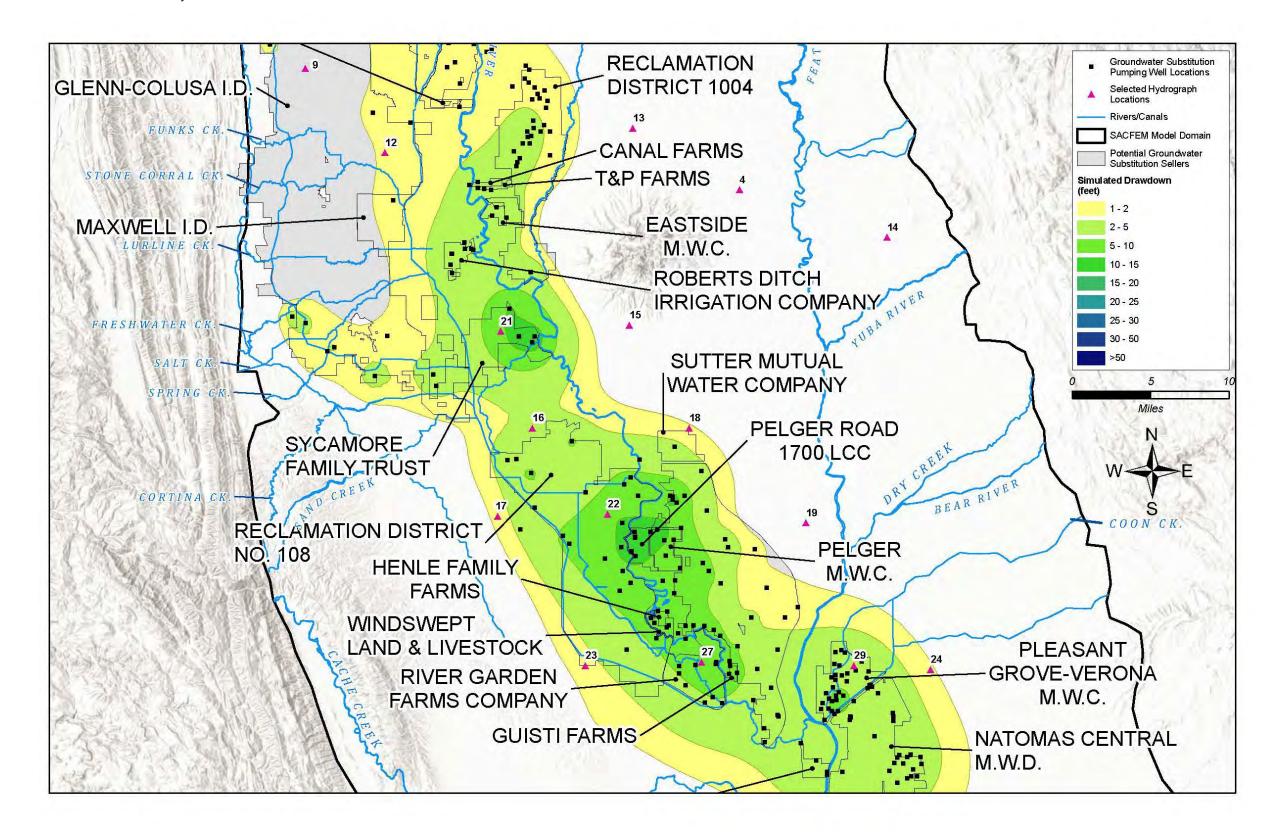


Figure H-6b. Simulated Drawdown in Groundwater Head (approximately 700 to 900 feet bgs), Based on September 1977 Hydrologic Conditions

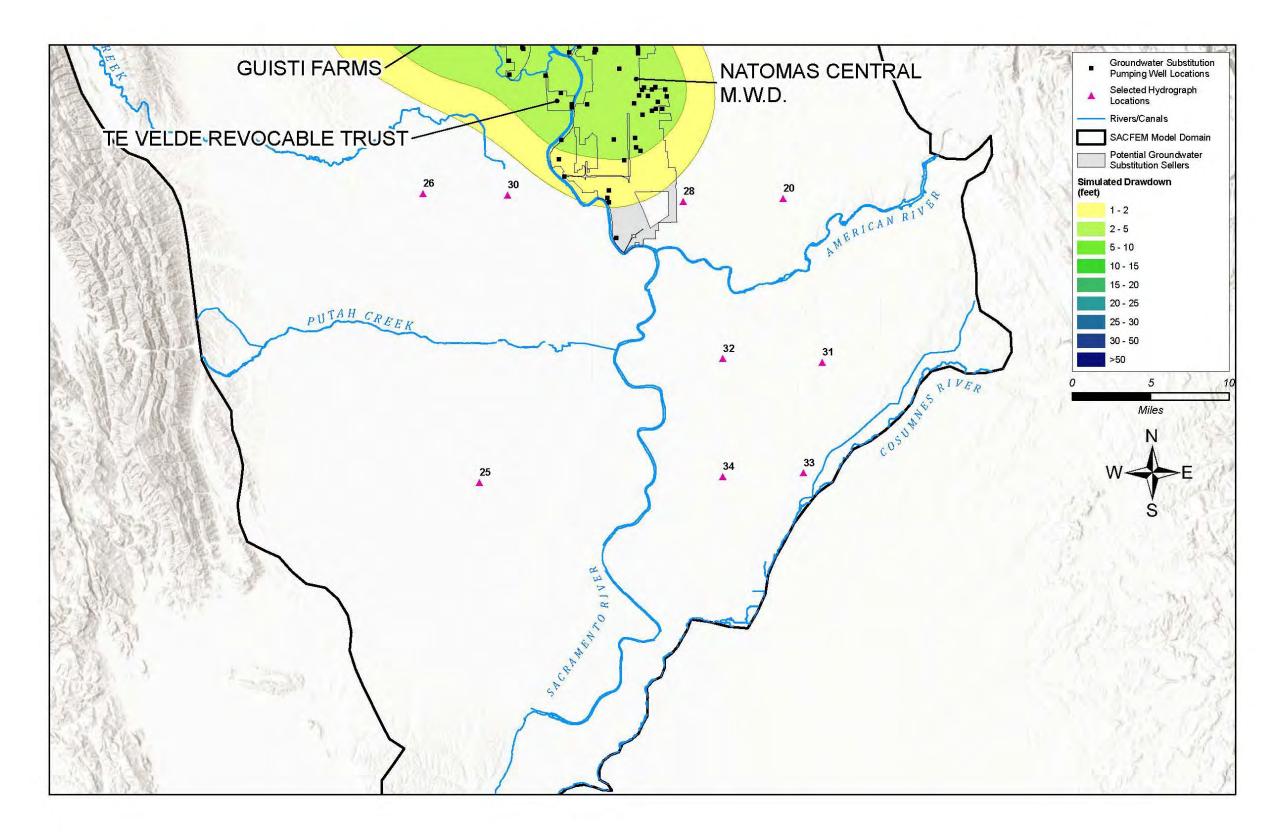


Figure H-6c. Simulated Drawdown in Groundwater Head (approximately 700 to 900 feet bgs), Based on September 1977 Hydrologic Conditions

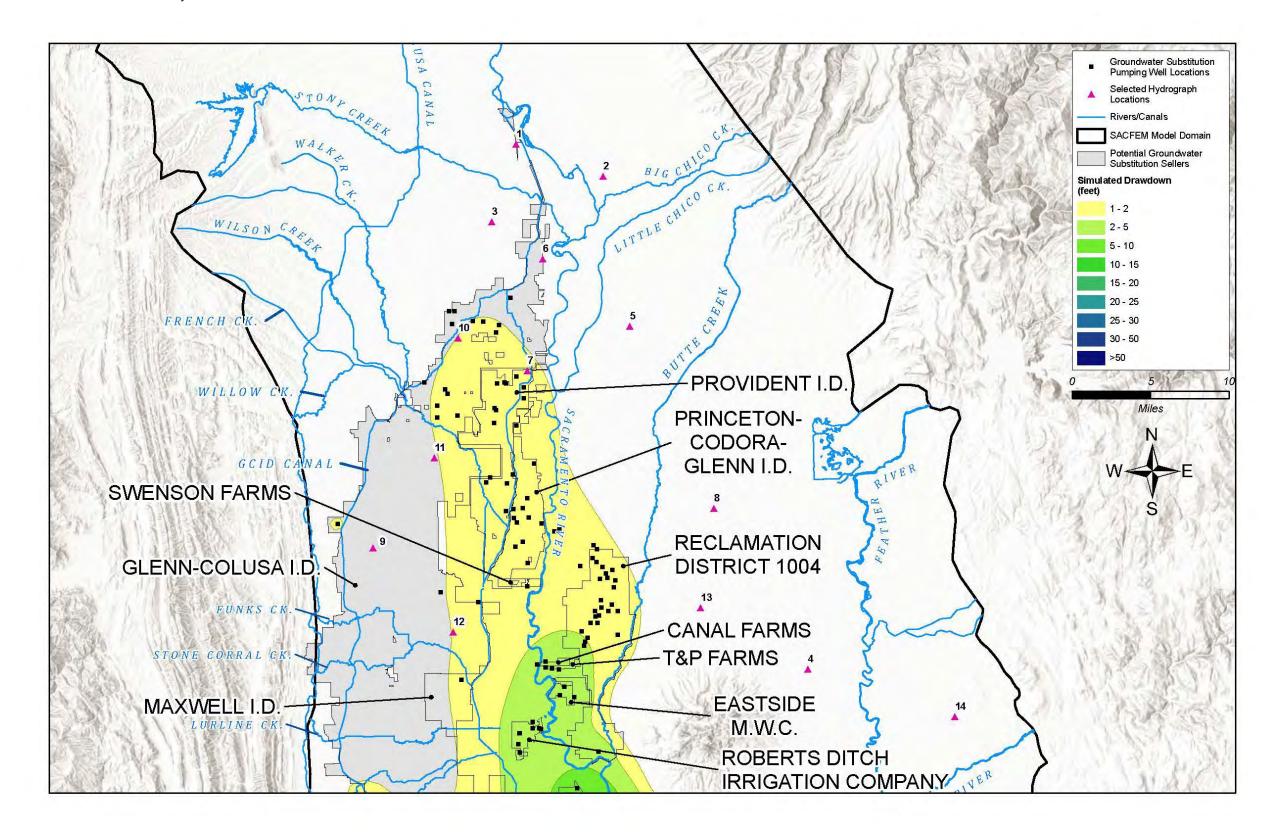


Figure H-7a. Simulated Drawdown in Groundwater Head (approximately 900 to 1,300 feet bgs), Based on September 1977 Hydrologic Conditions

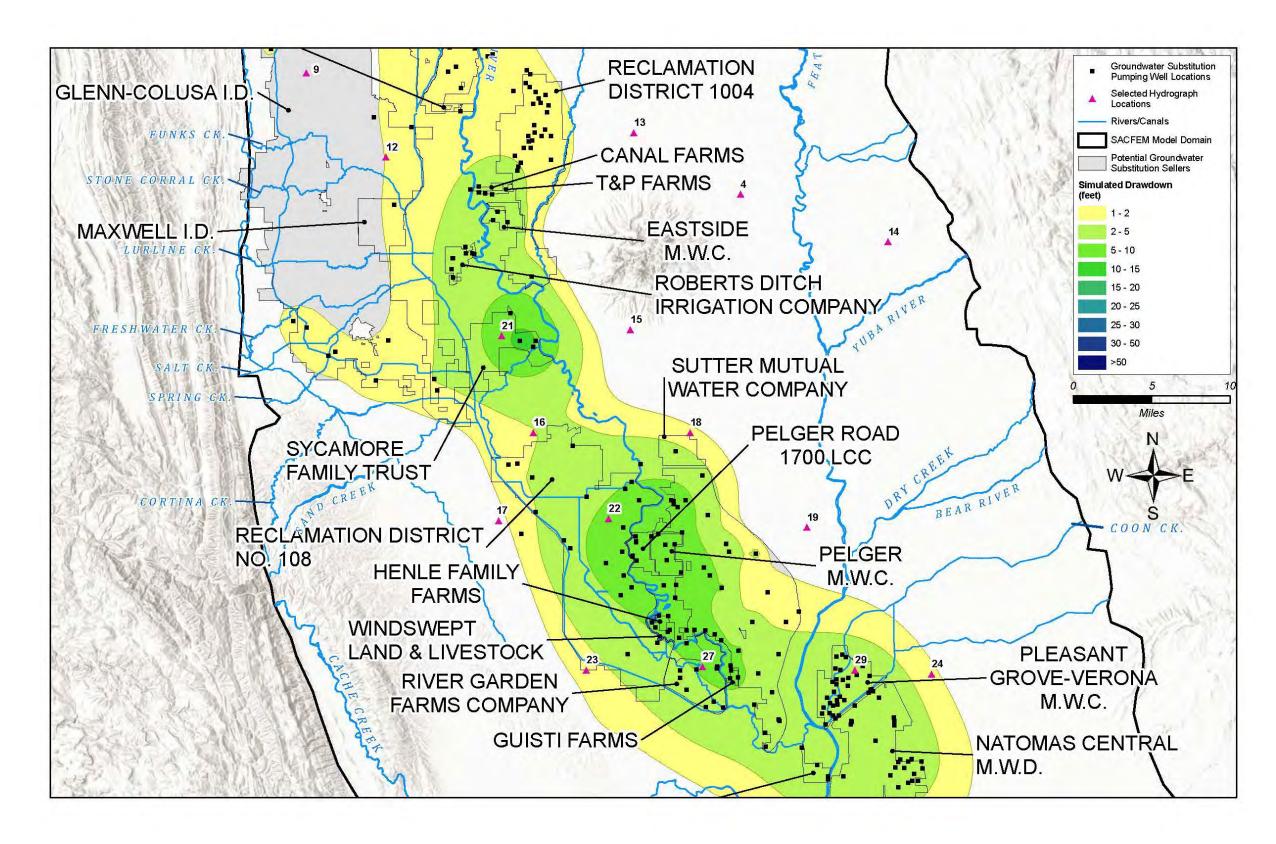


Figure H-7b. Simulated Drawdown in Groundwater Head (approximately 900 to 1,300 feet bgs), Based on September 1977 Hydrologic Conditions

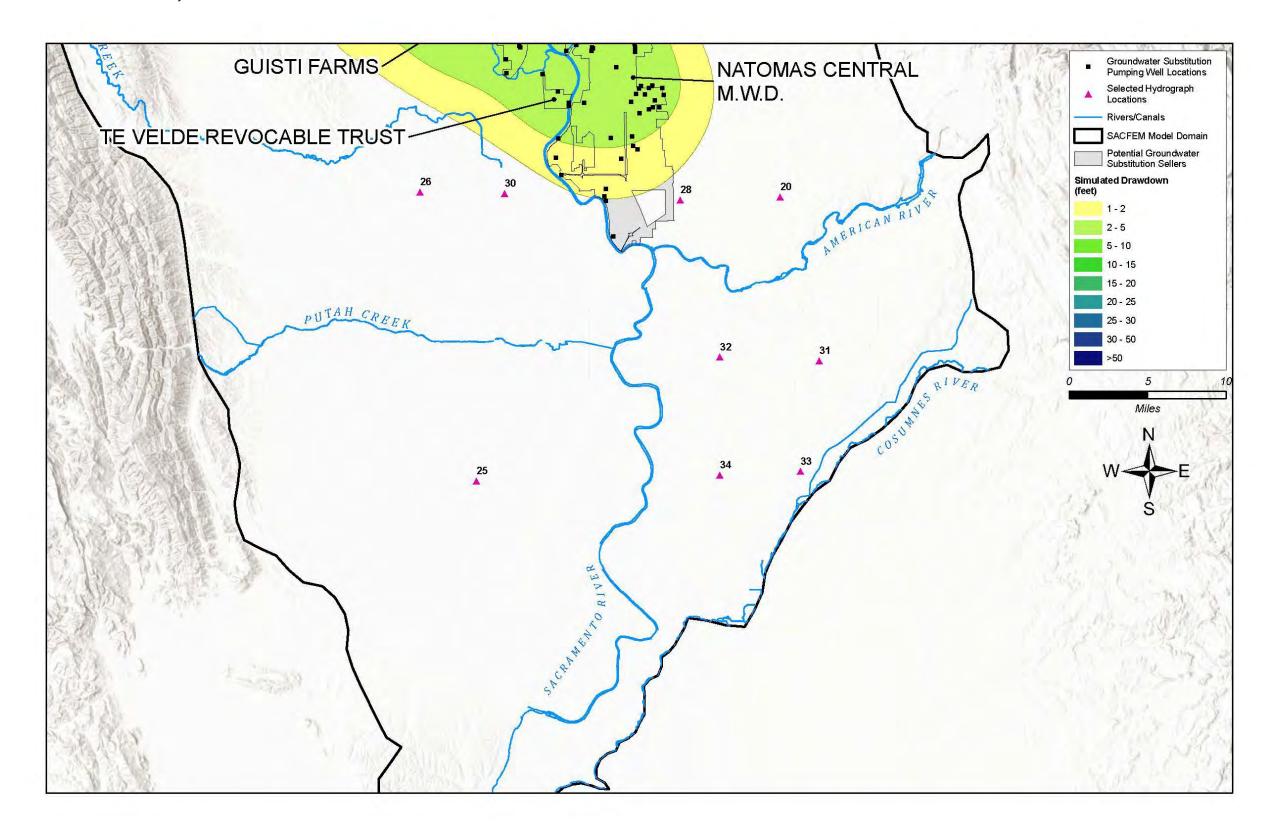


Figure H-7c. Simulated Drawdown in Groundwater Head (approximately 900 to 1,300 feet bgs), Based on September 1977 Hydrologic Conditions

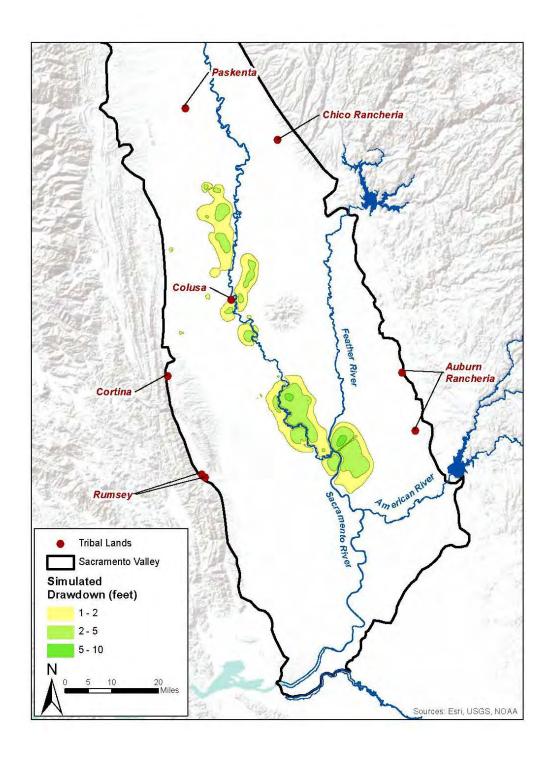
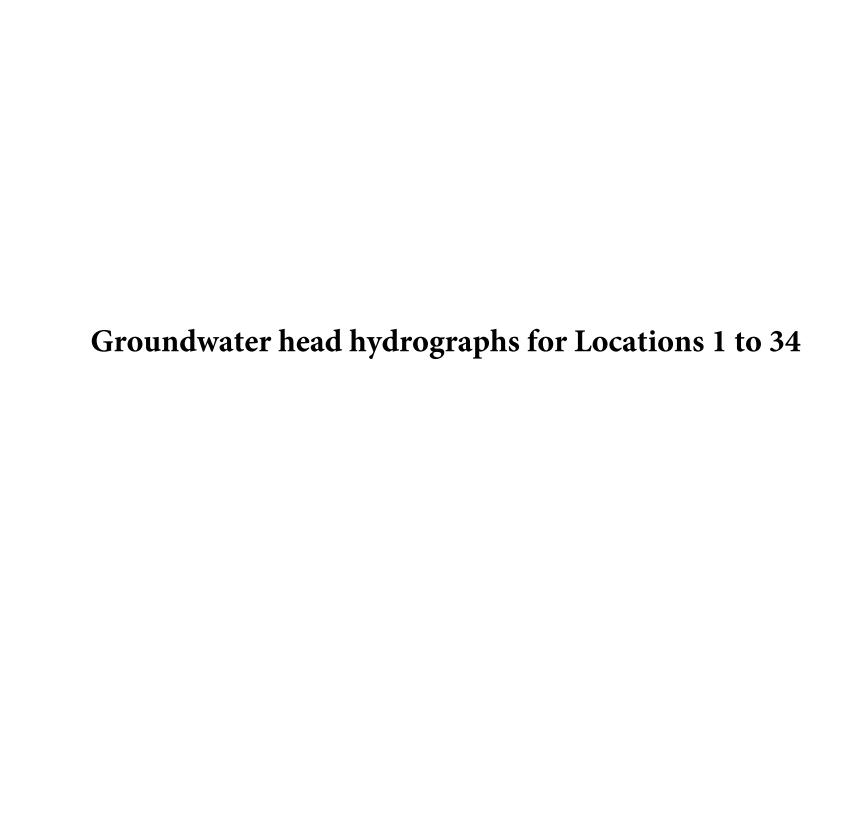
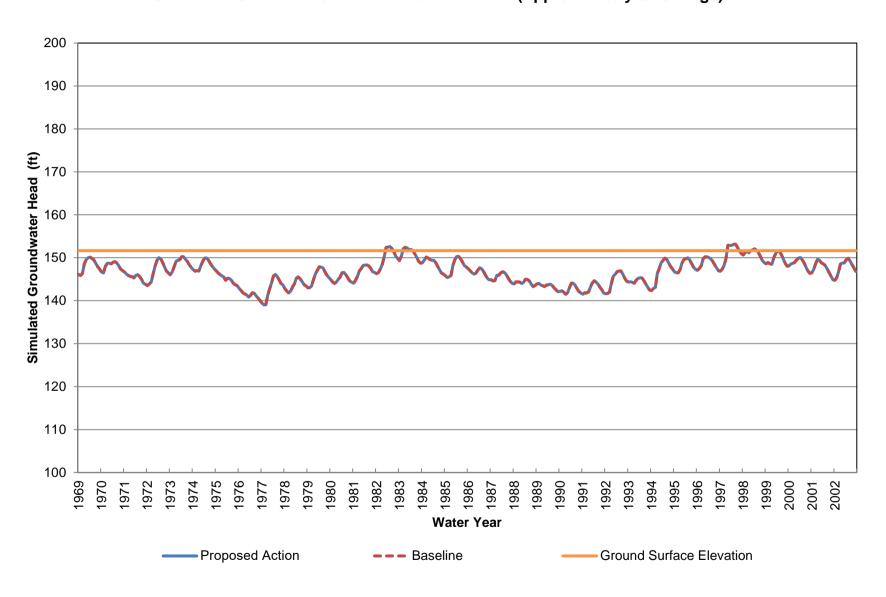


Figure H-8. Groundwater Effects to ITAs in the Sacramento Valley Groundwater Basin (simulated drawdown at the water table)

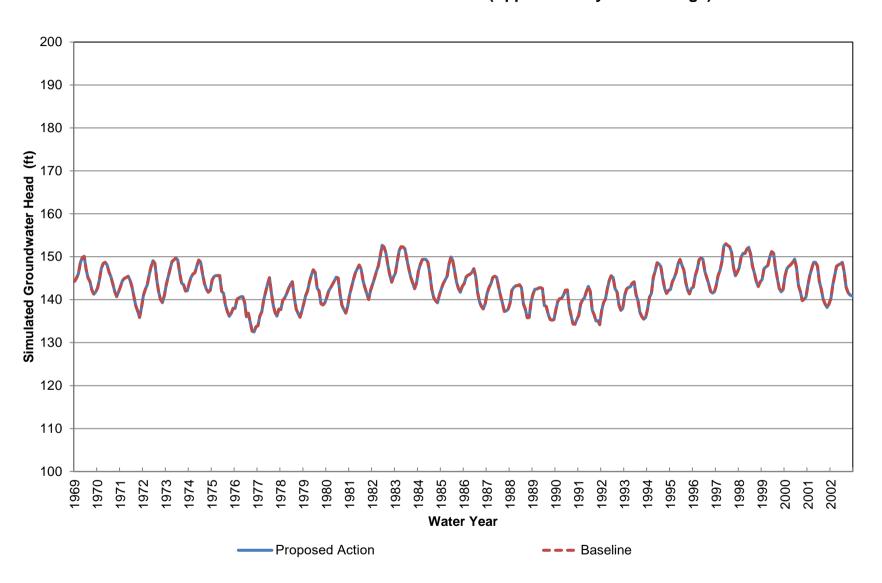
2022 Tehama-Colusa Canal Authority Water Transfers Draft Environmental Assessment/Initial Study	
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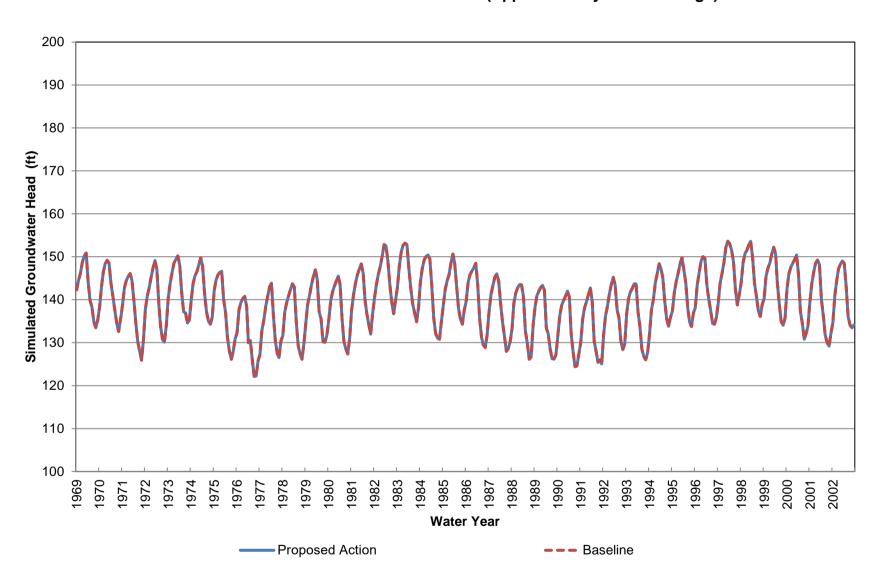
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 1 (Approximately 0-70 ft bgs)



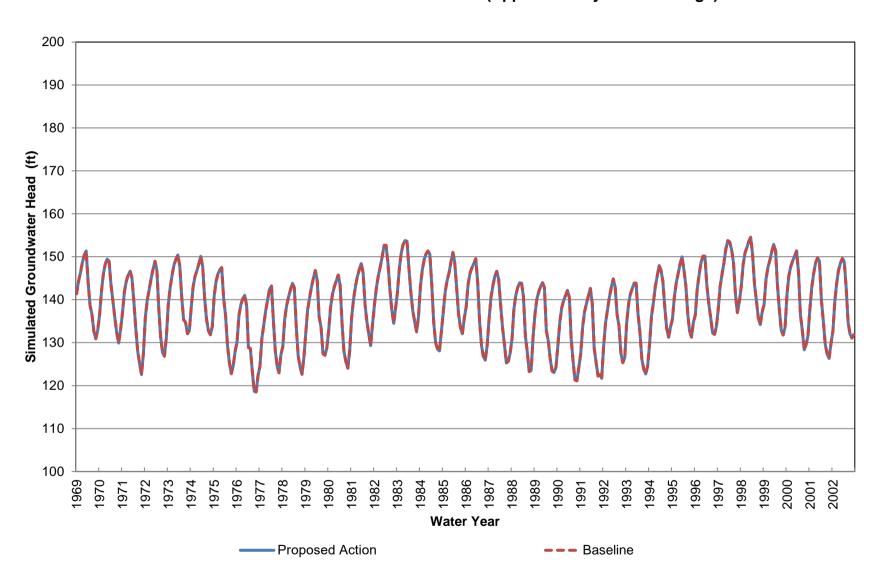
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 1 (Approximately 70-200 ft bgs)



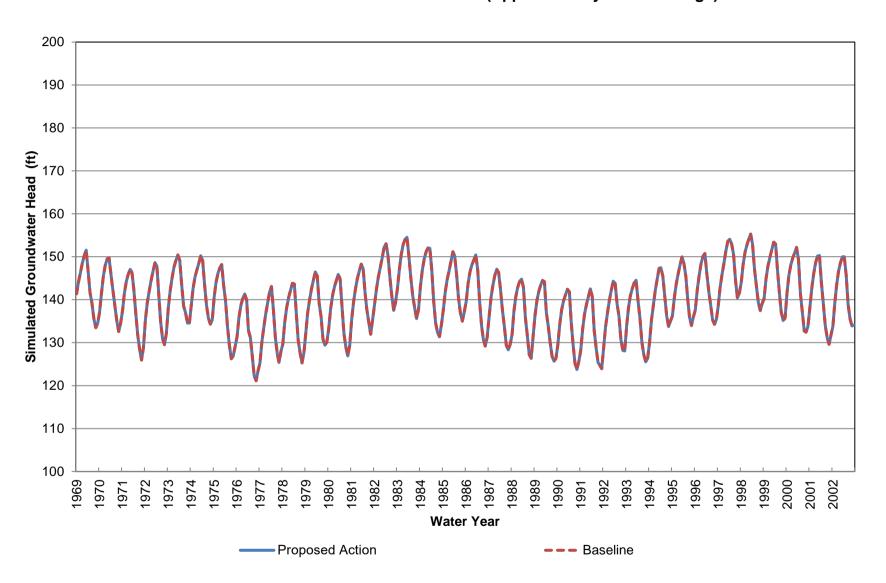
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 1 (Approximately 200-330 ft bgs)



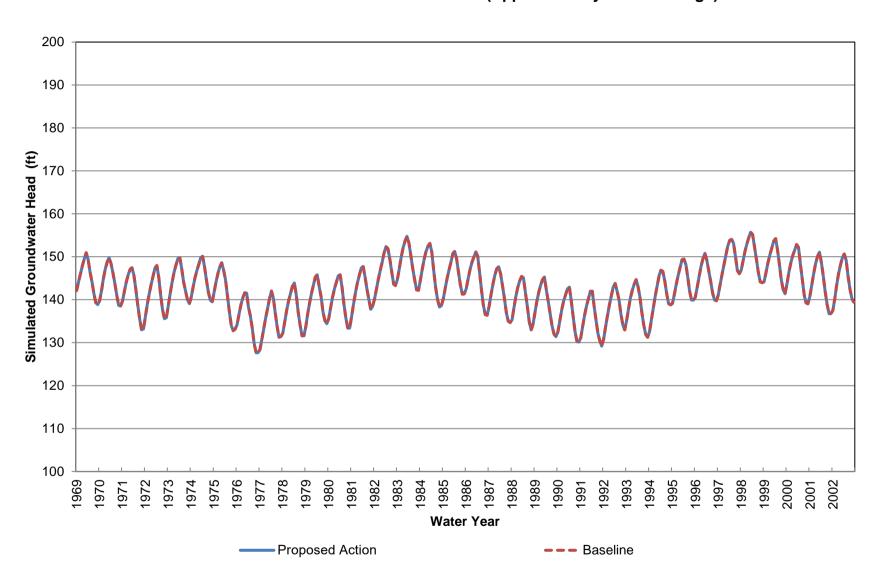
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 1 (Approximately 330-450 ft bgs)



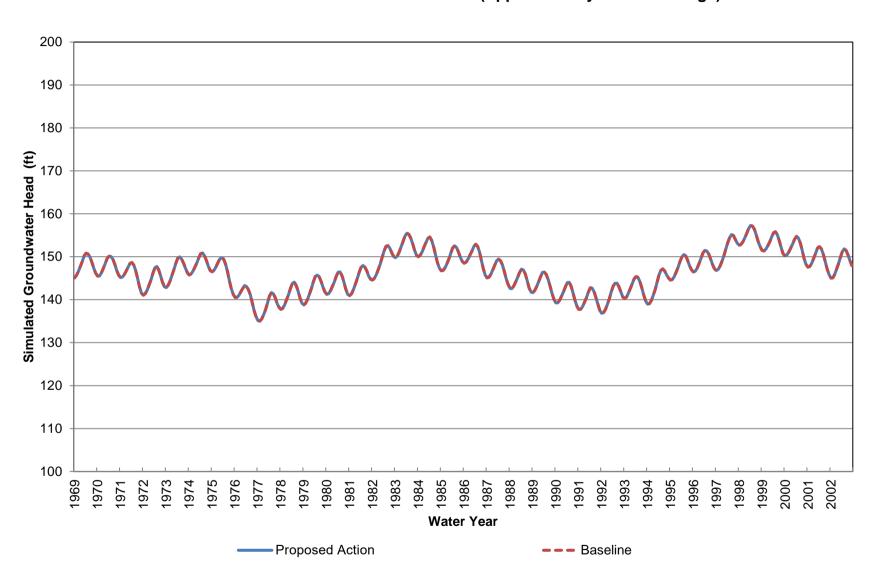
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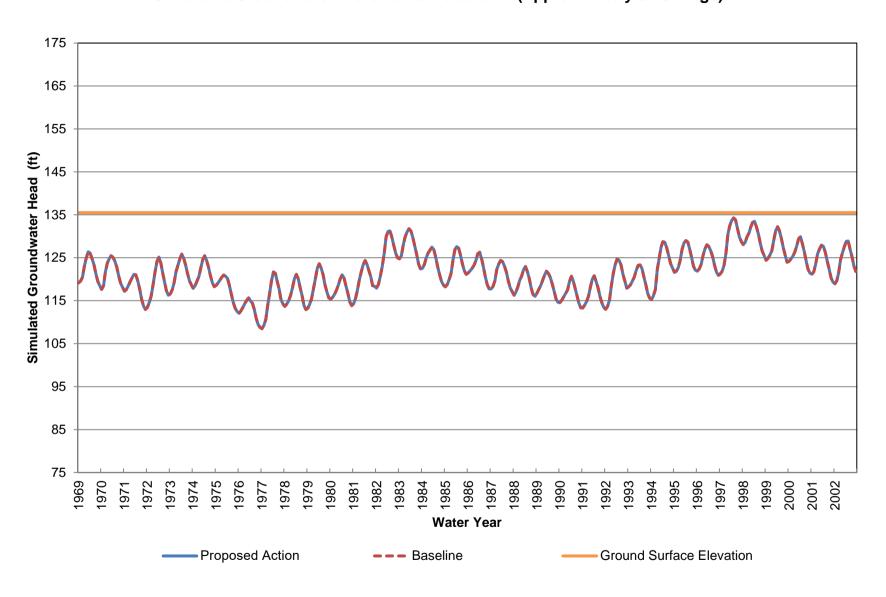
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 1 (Approximately 640-890 ft bgs)



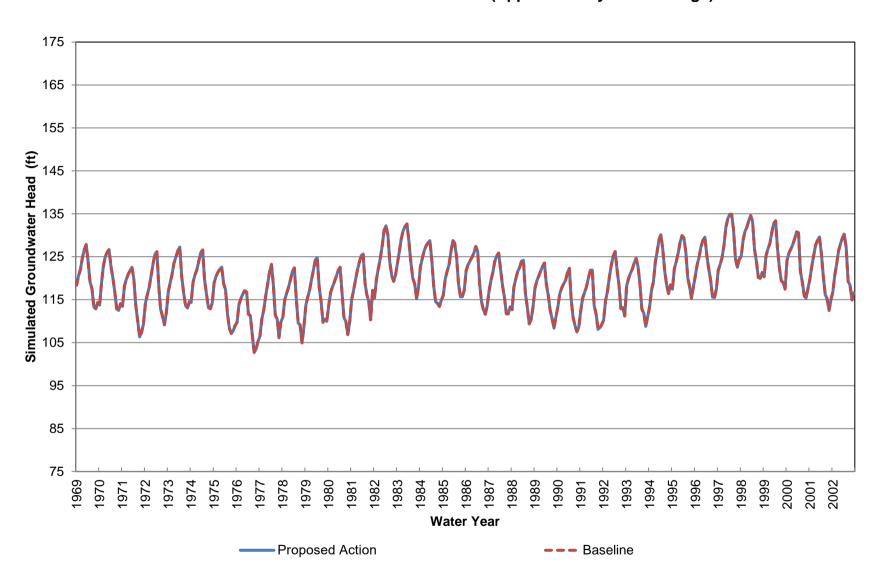
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 1 (Approximately 890-1360 ft bgs)



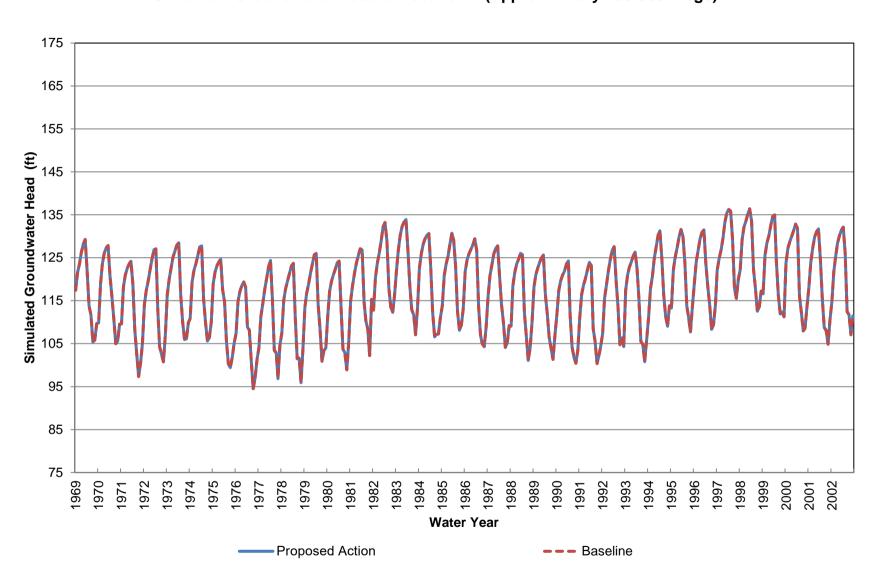
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 2 (Approximately 0-70 ft bgs)



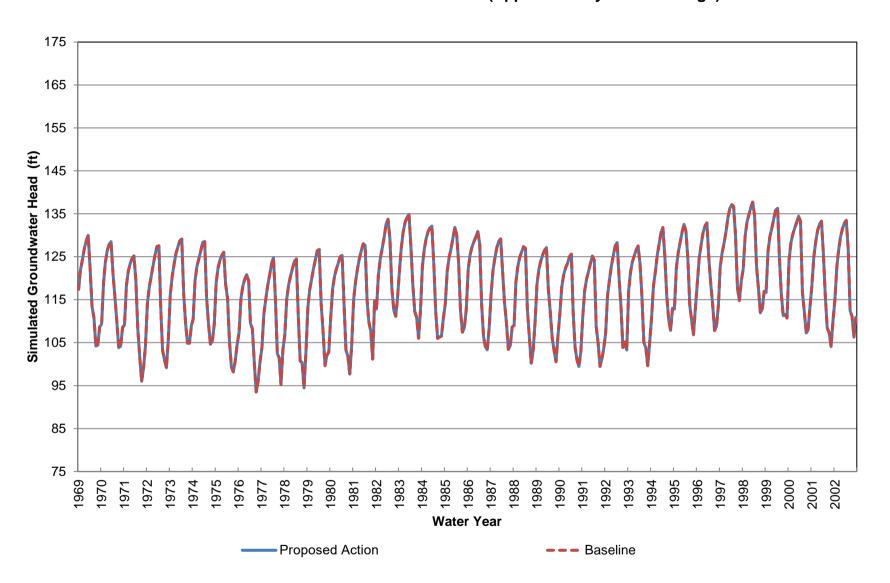
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 2 (Approximately 70-190 ft bgs)



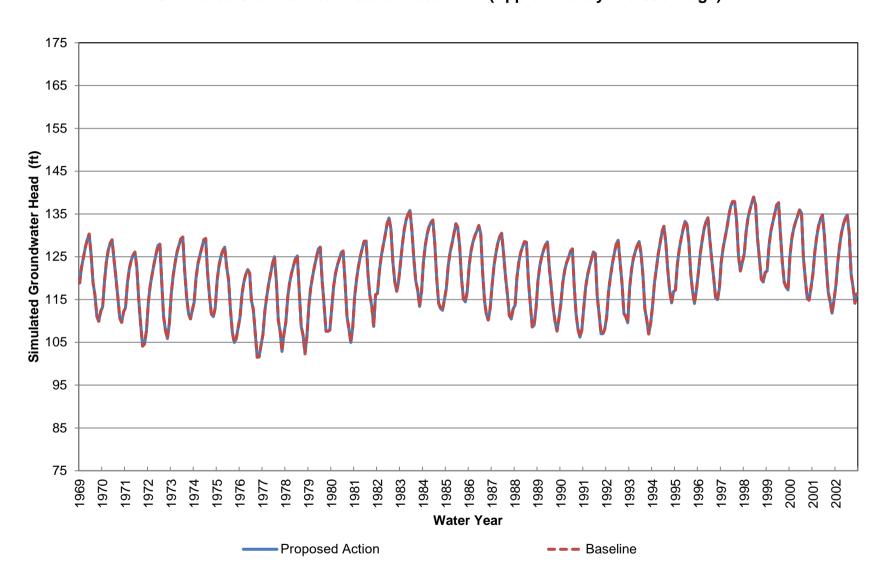
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 2 (Approximately 190-300 ft bgs)



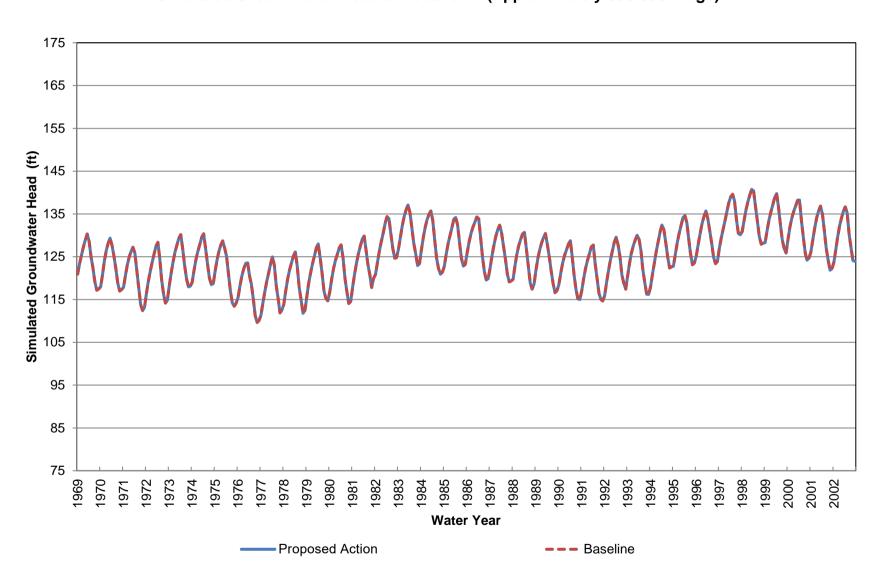
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 2 (Approximately 300-420 ft bgs)



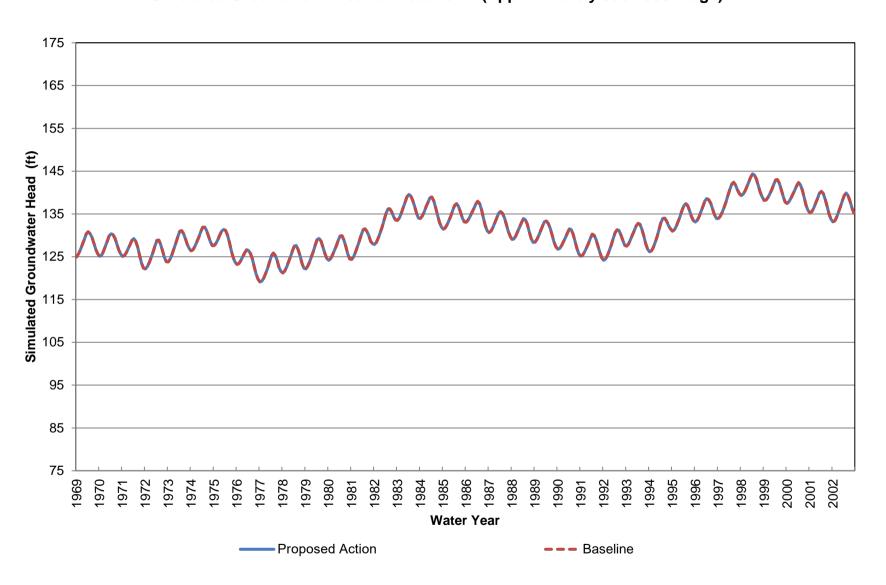
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 2 (Approximately 420-580 ft bgs)



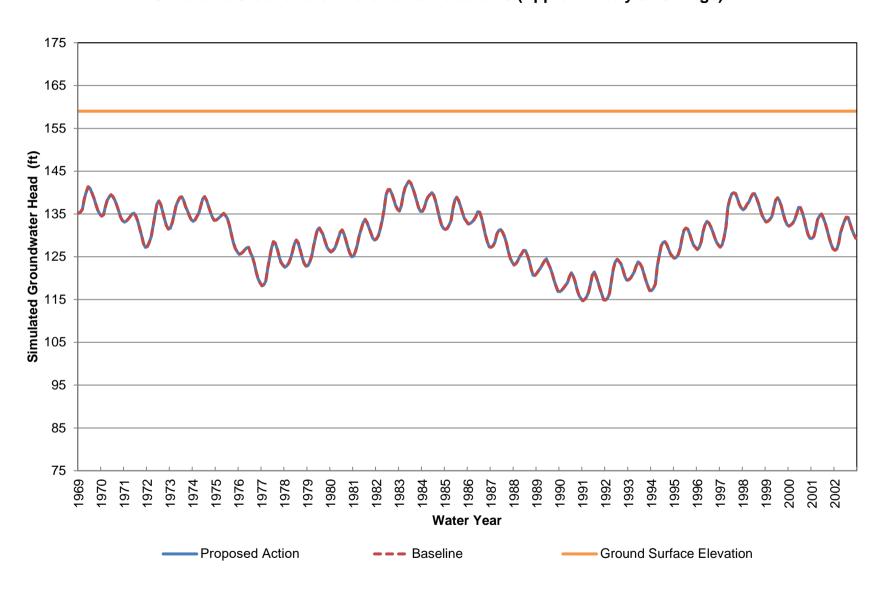
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 2 (Approximately 580-830 ft bgs)



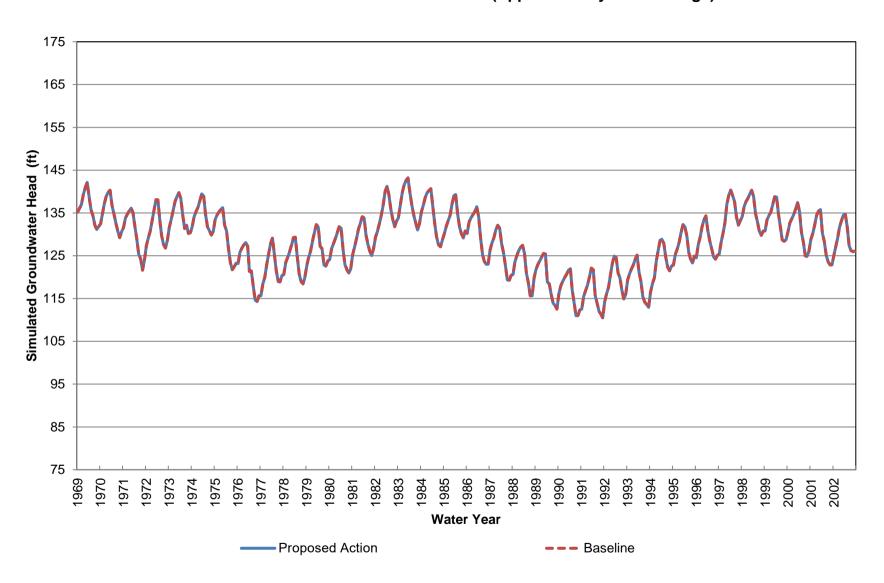
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 2 (Approximately 830-1330 ft bgs)



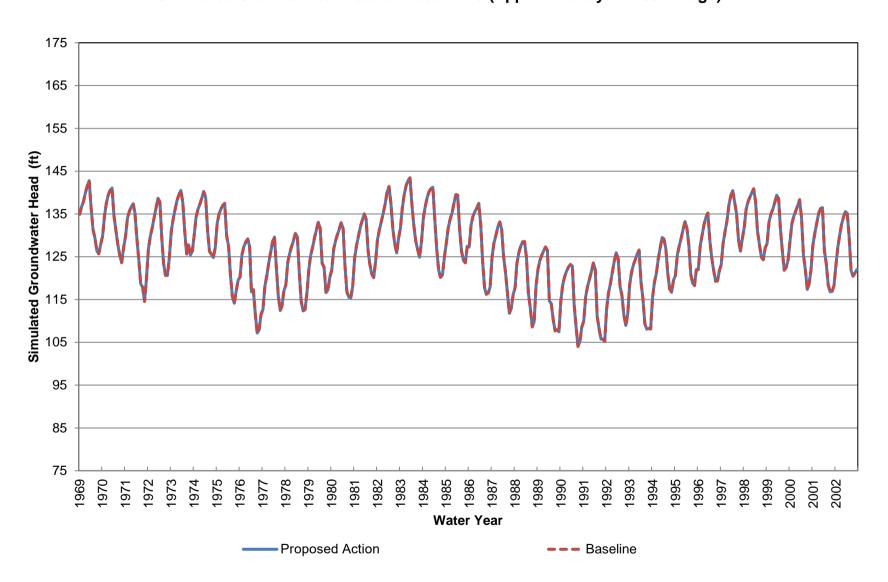
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 3 (Approximately 0-70 ft bgs)



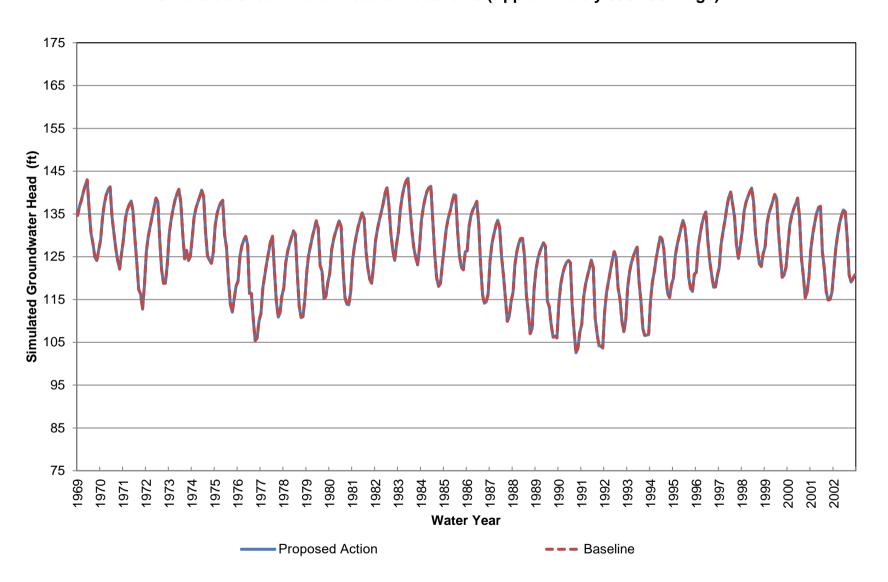
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 3 (Approximately 70-210 ft bgs)



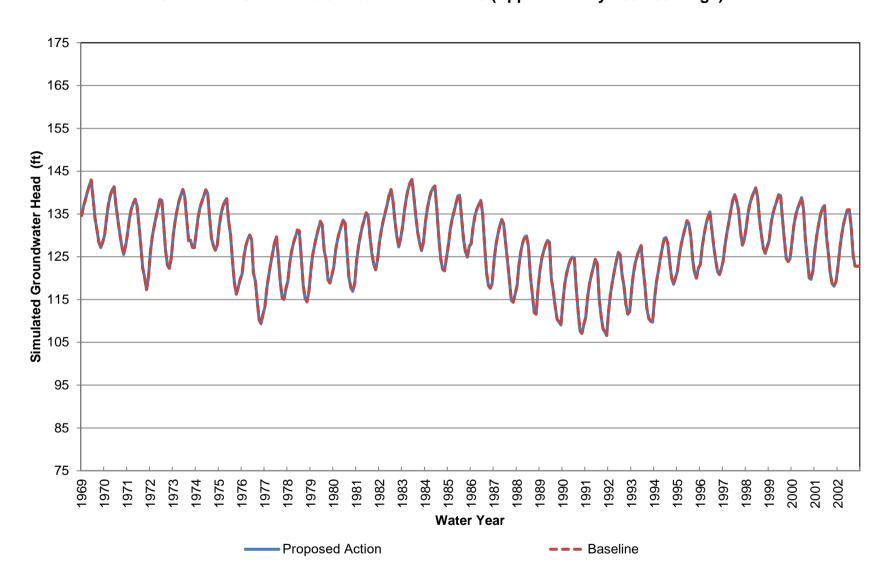
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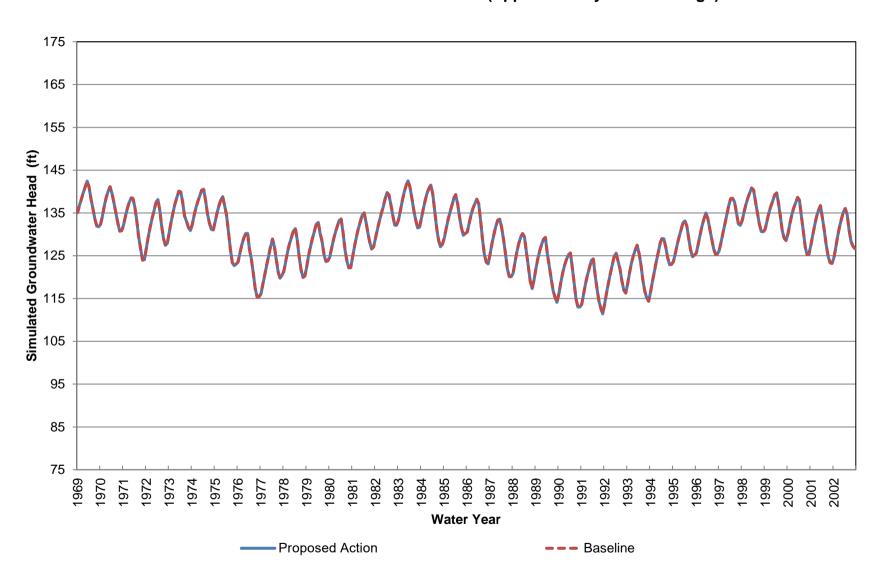
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 3 (Approximately 350-480 ft bgs)



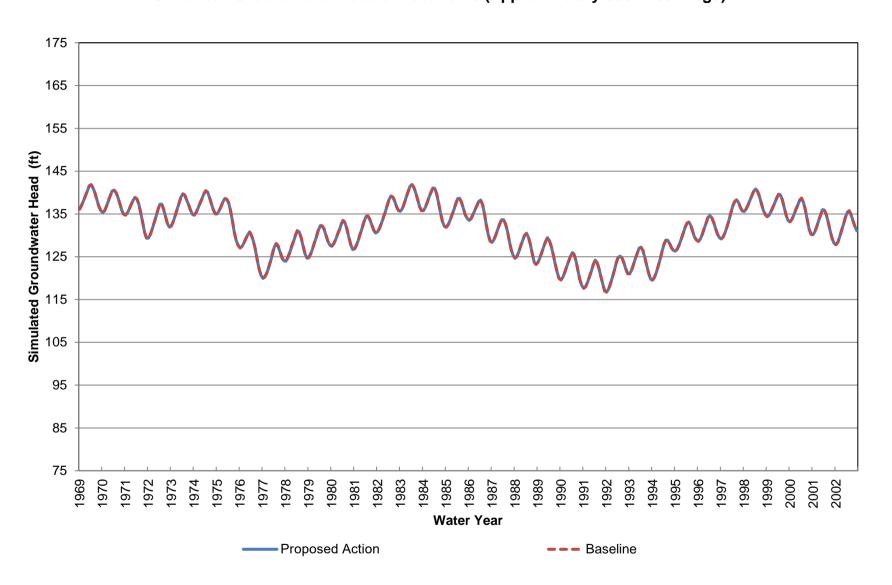
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 3 (Approximately 480-700 ft bgs)



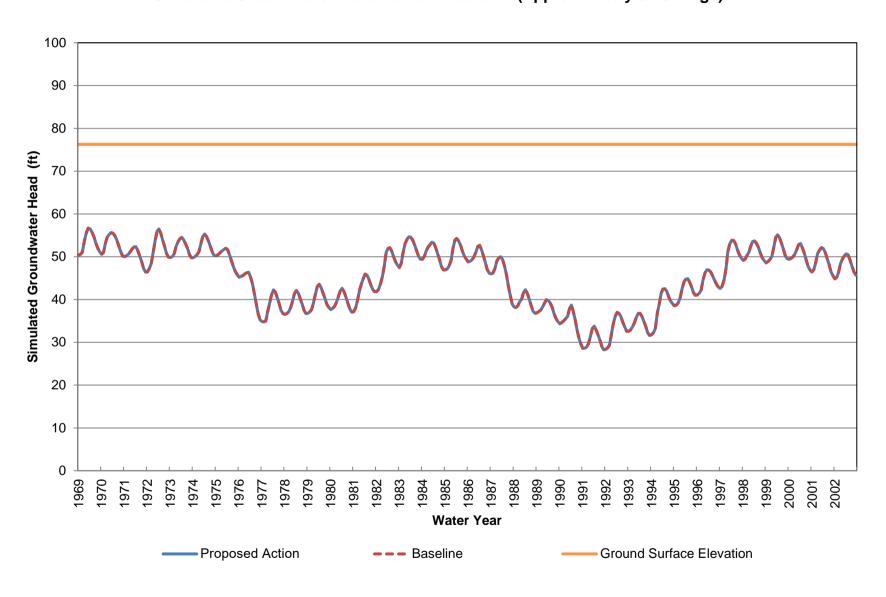
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 3 (Approximately 700-930 ft bgs)



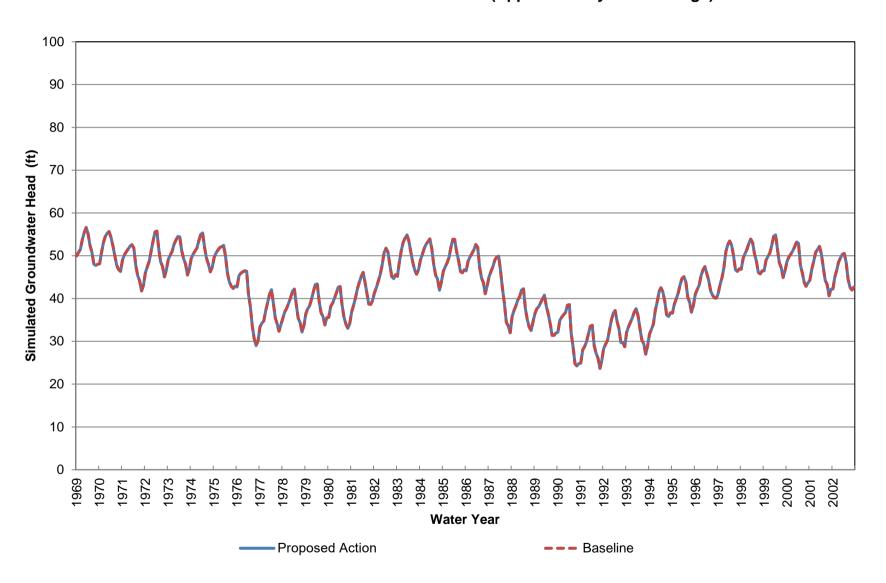
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 3 (Approximately 930-1290 ft bgs)



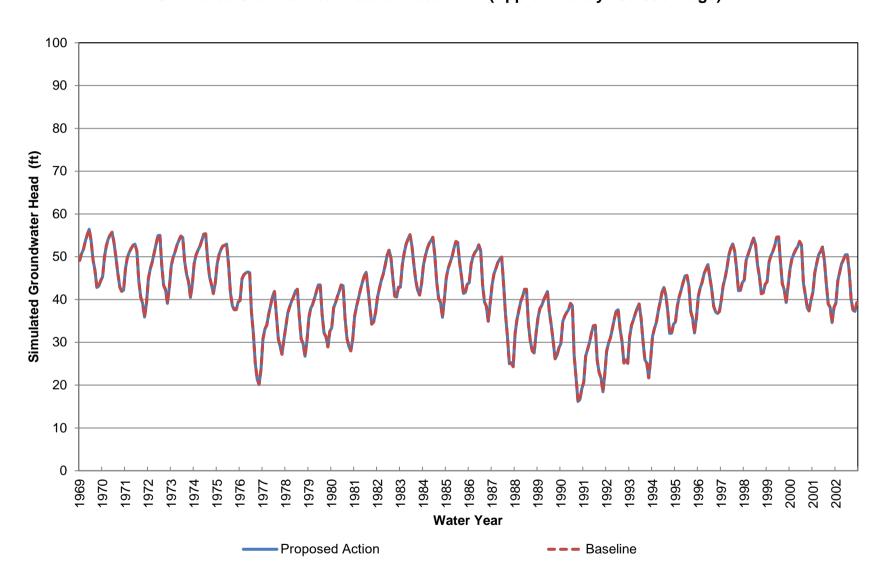
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 4 (Approximately 0-70 ft bgs)



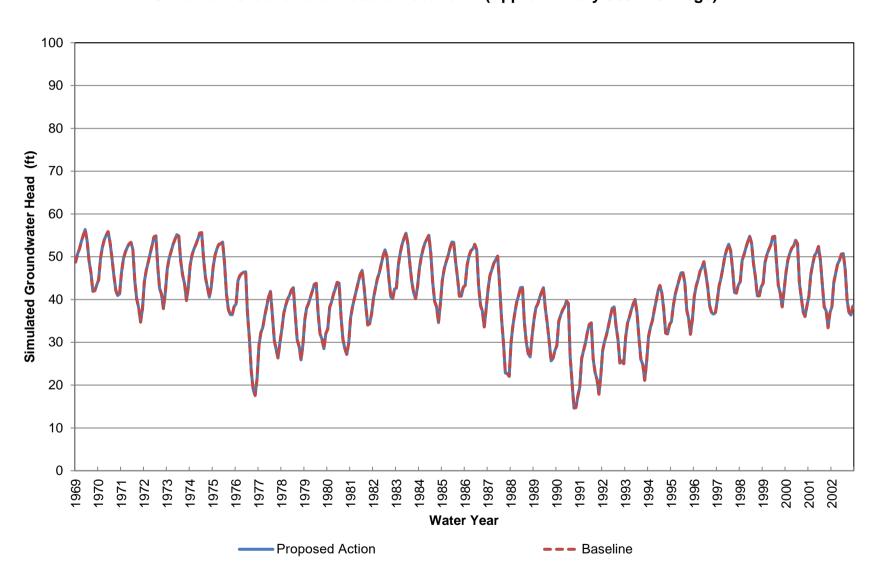
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 4 (Approximately 70-190 ft bgs)



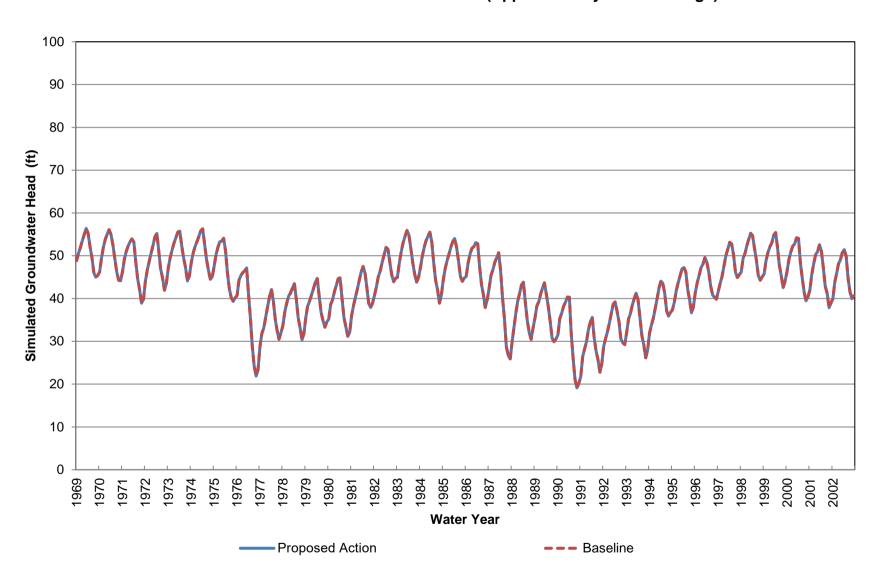
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 4 (Approximately 190-300 ft bgs)



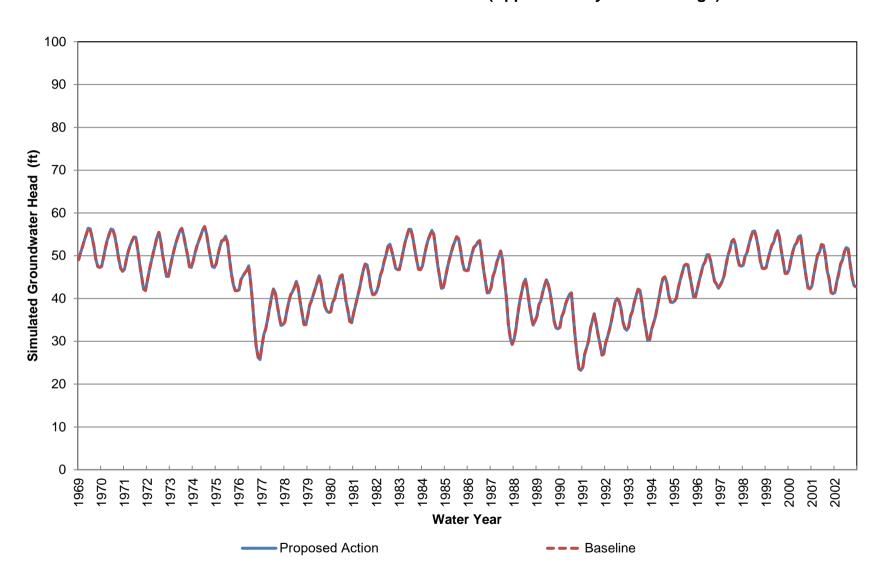
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 4 (Approximately 300-420 ft bgs)



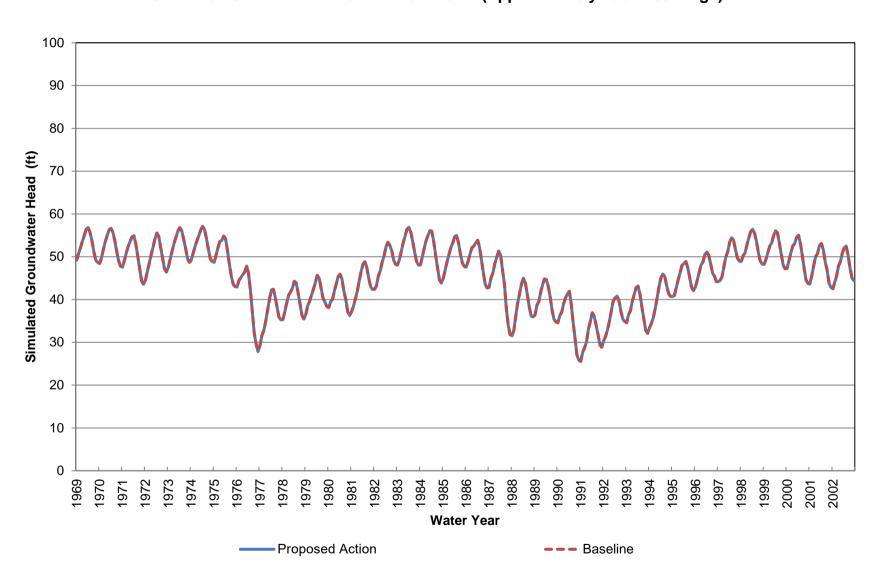
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 4 (Approximately 420-580 ft bgs)



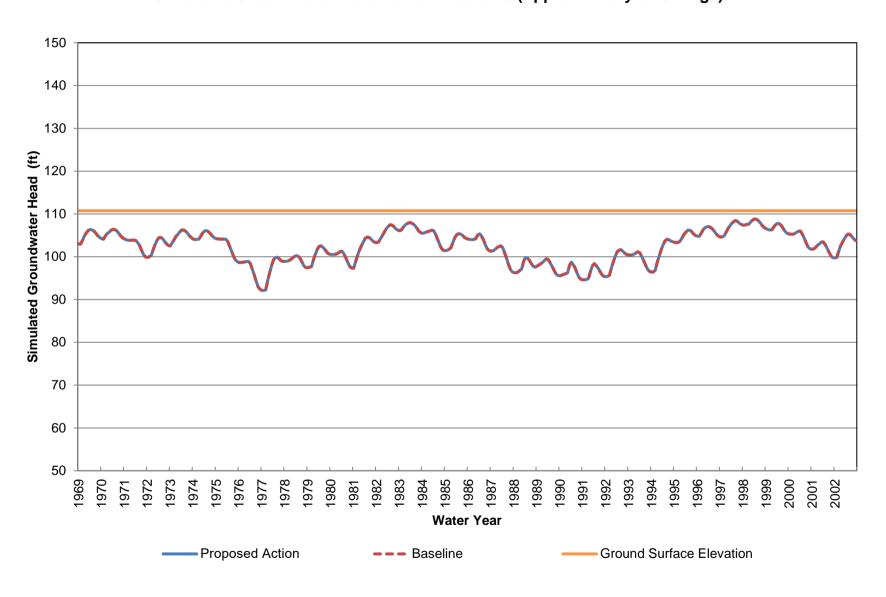
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 4 (Approximately 580-780 ft bgs)



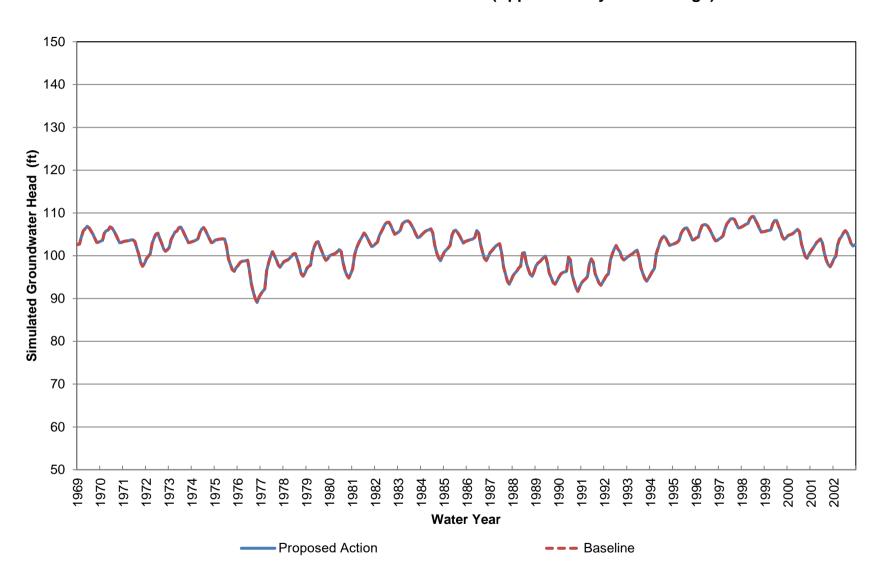
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 4 (Approximately 780-1060 ft bgs)



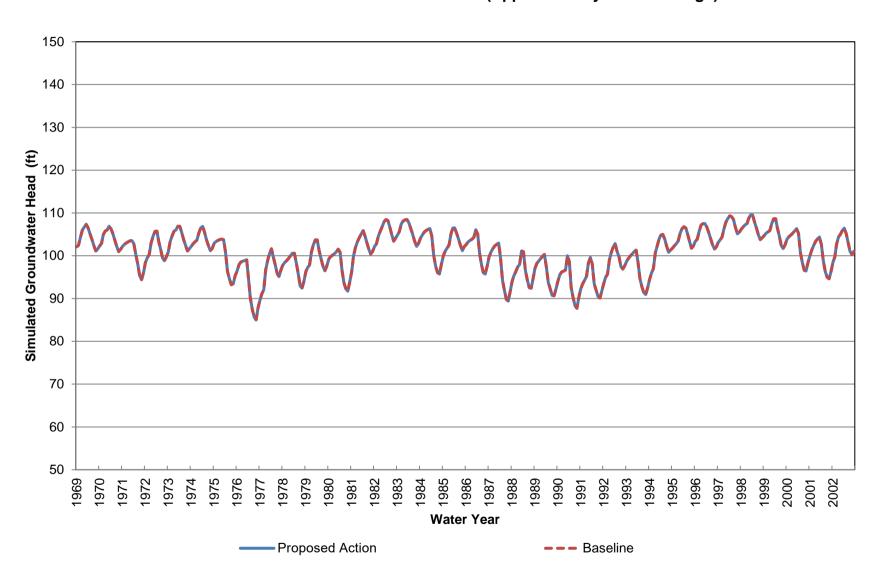
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 5 (Approximately 0-70 ft bgs)



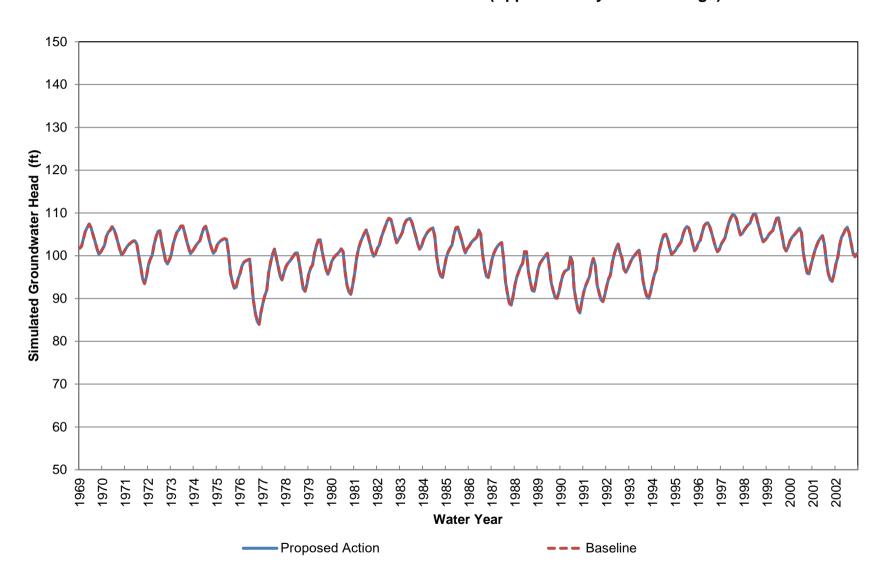
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 5 (Approximately 70-200 ft bgs)



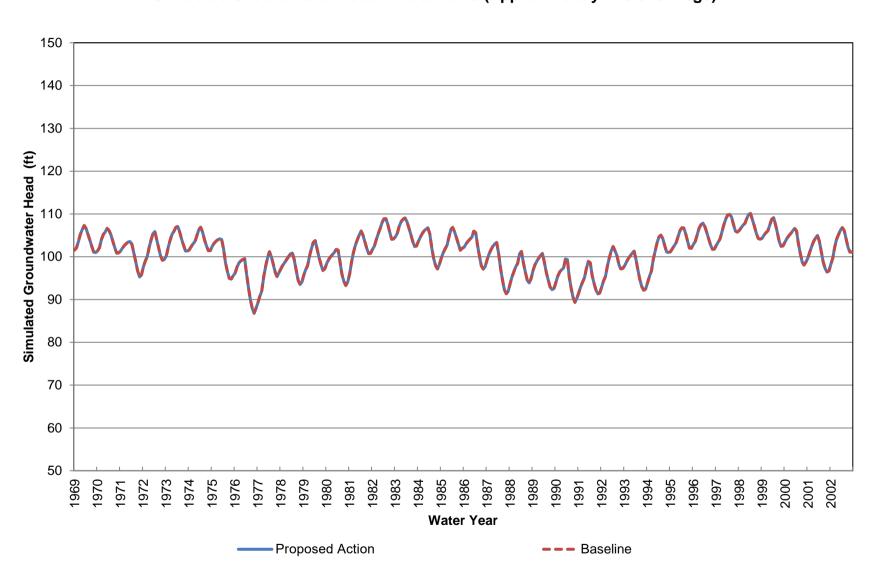
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 5 (Approximately 200-340 ft bgs)



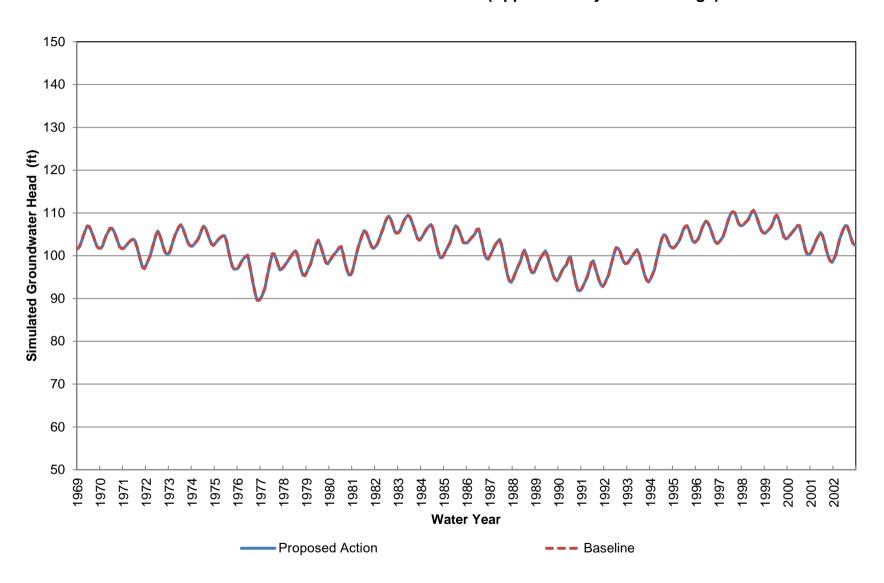
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 5 (Approximately 340-470 ft bgs)



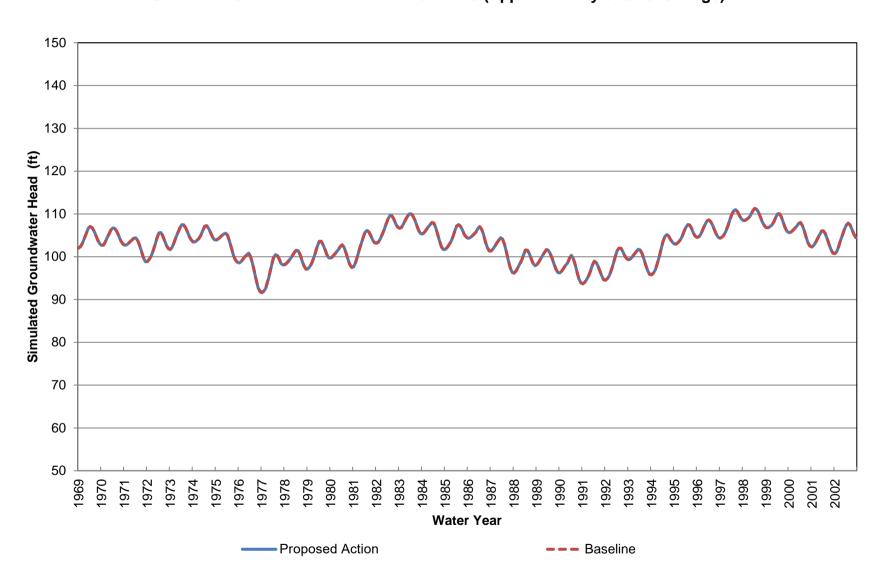
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 5 (Approximately 470-670 ft bgs)



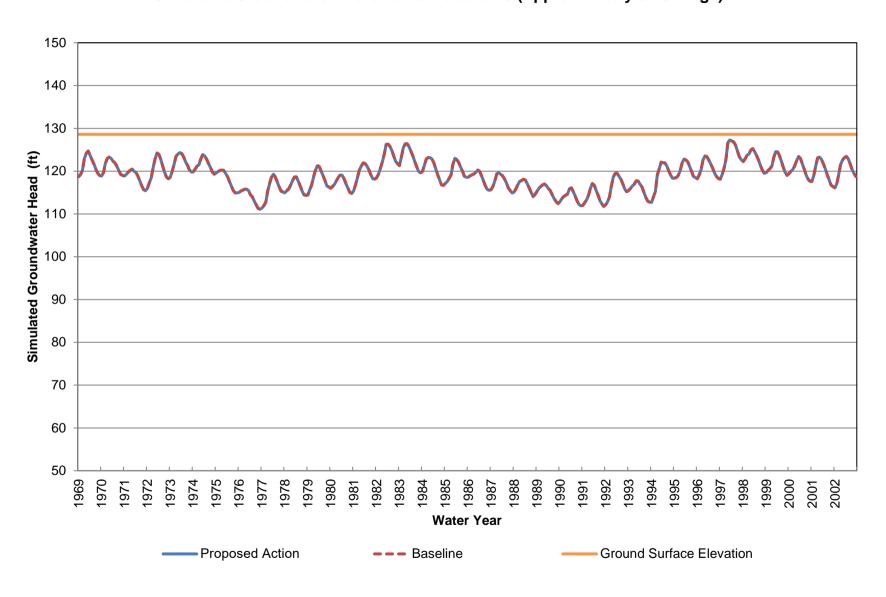
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 5 (Approximately 670-910 ft bgs)



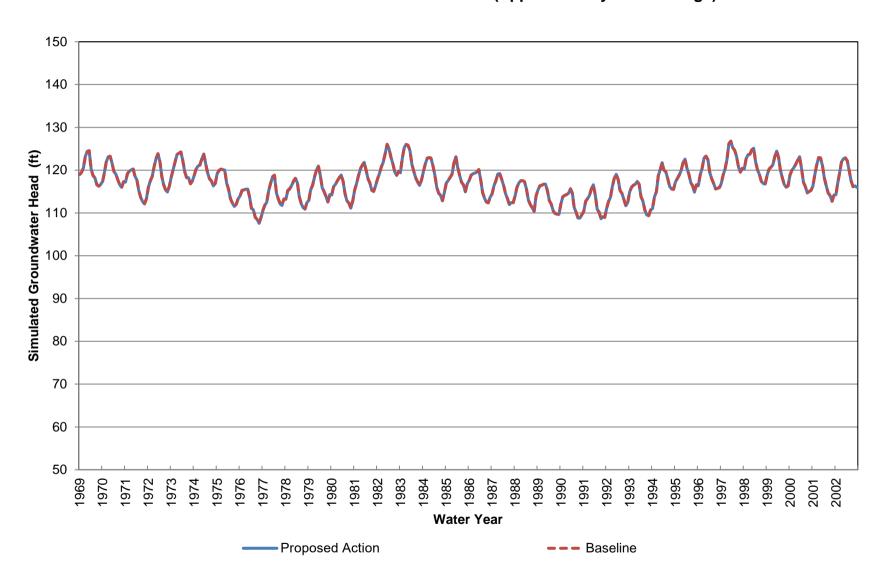
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 5 (Approximately 910-1310 ft bgs)



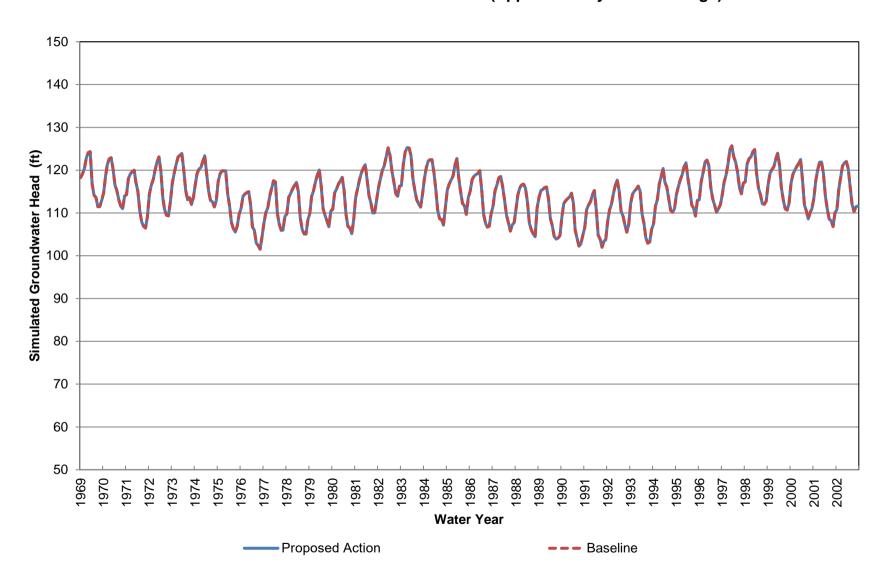
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 6 (Approximately 0-70 ft bgs)



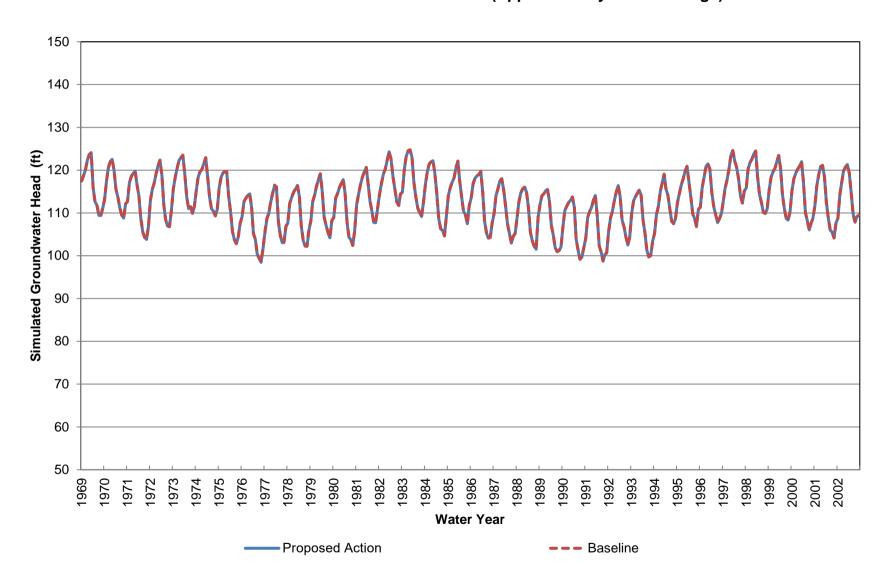
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 6 (Approximately 70-200 ft bgs)



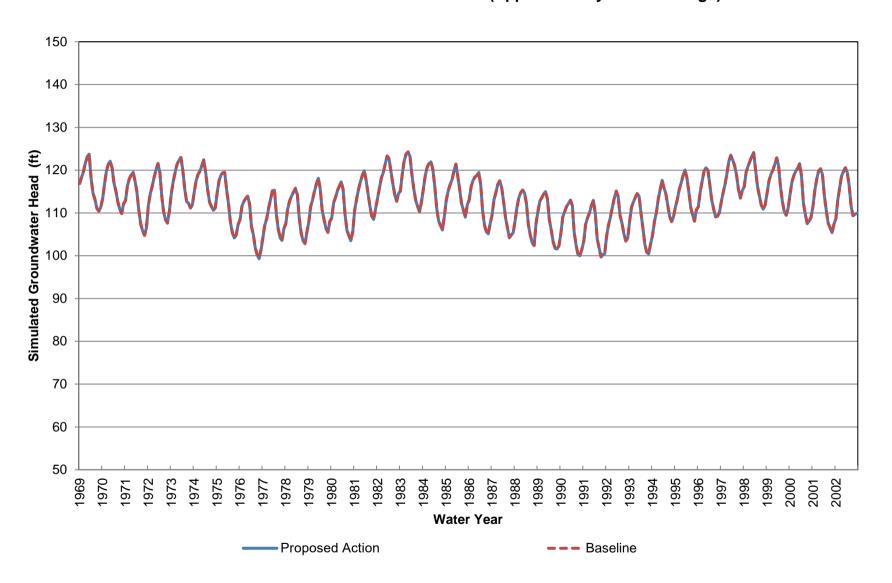
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 6 (Approximately 200-320 ft bgs)



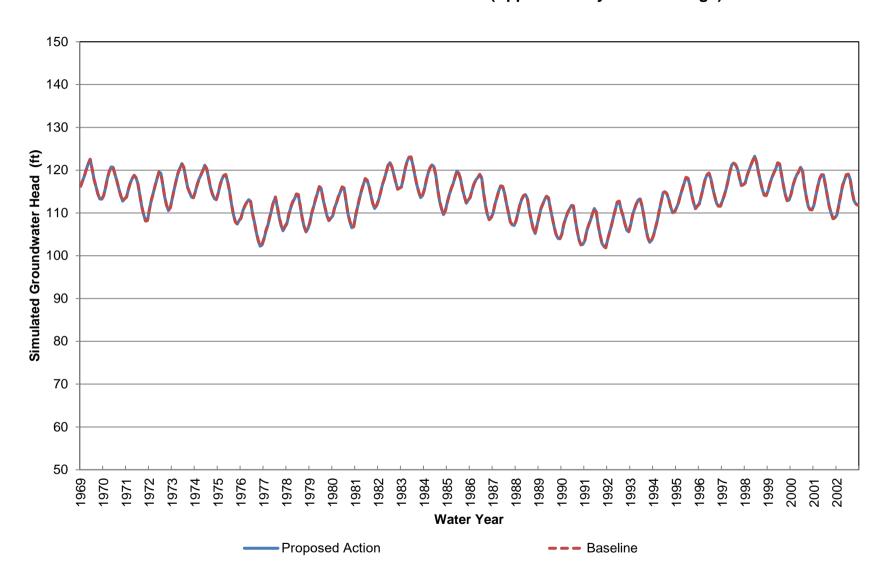
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 6 (Approximately 320-440 ft bgs)



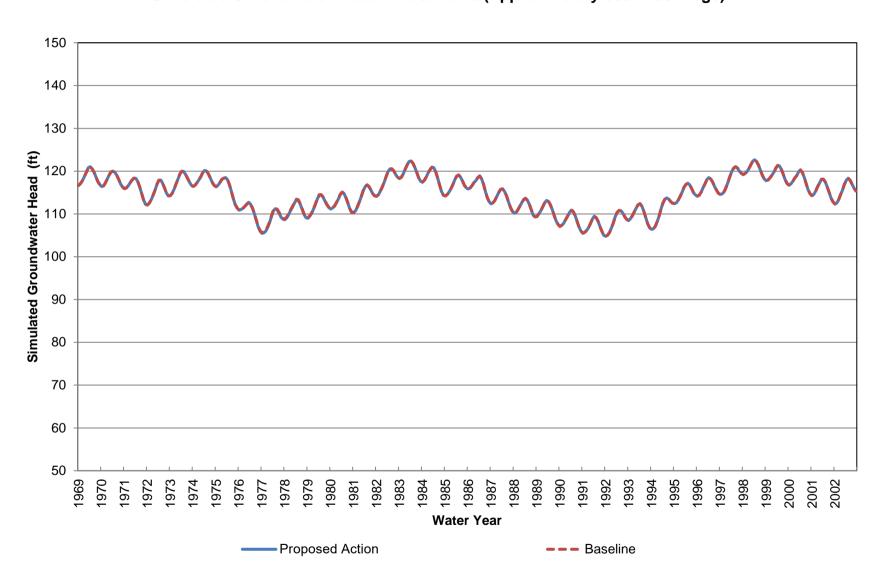
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 6 (Approximately 440-630 ft bgs)



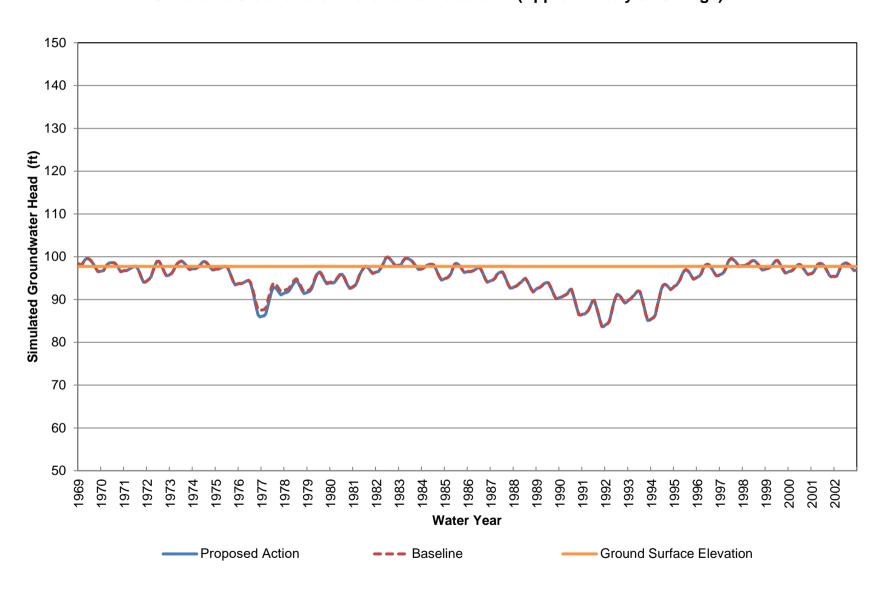
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 6 (Approximately 630-860 ft bgs)



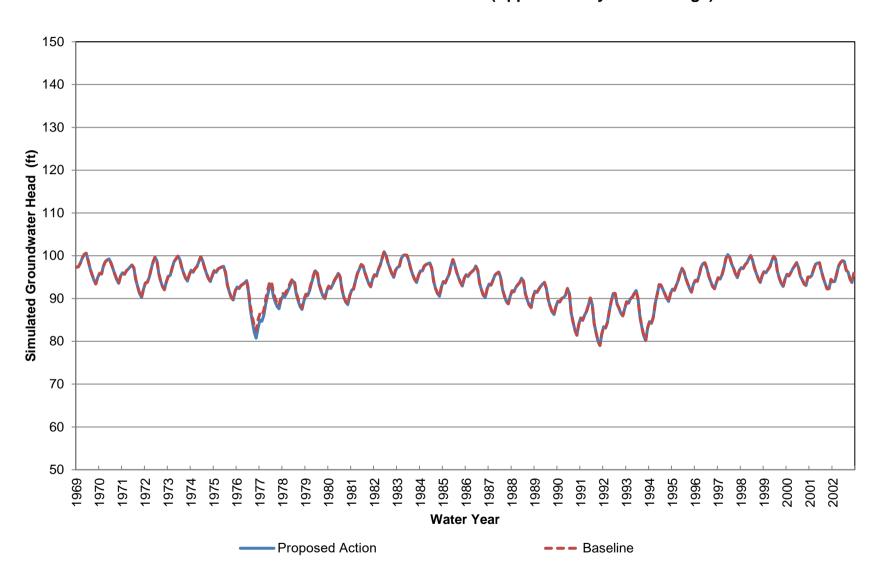
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 6 (Approximately 860-1290 ft bgs)



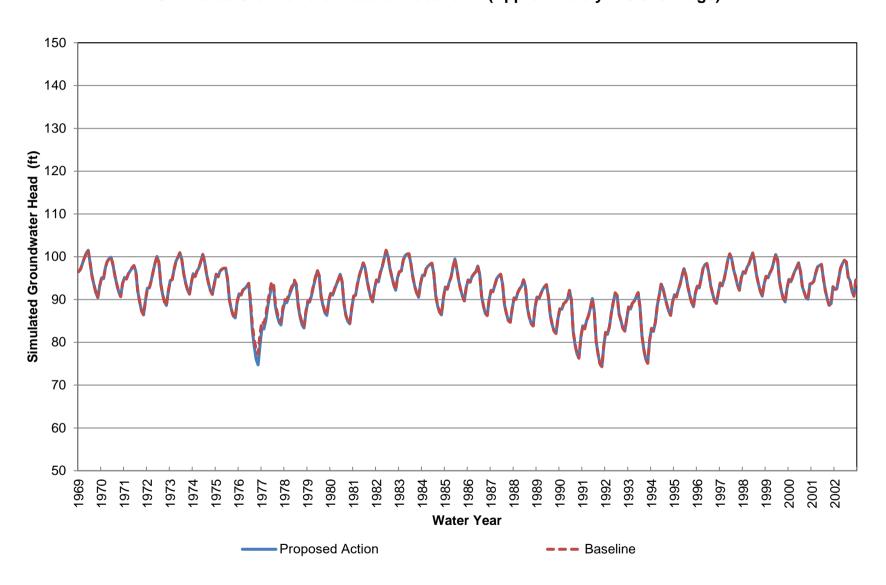
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 7 (Approximately 0-70 ft bgs)



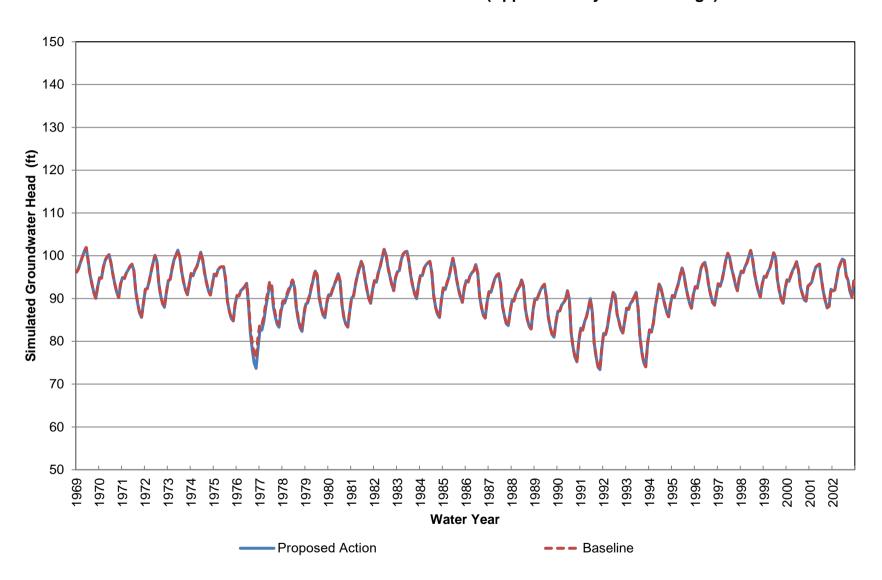
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 7 (Approximately 70-220 ft bgs)



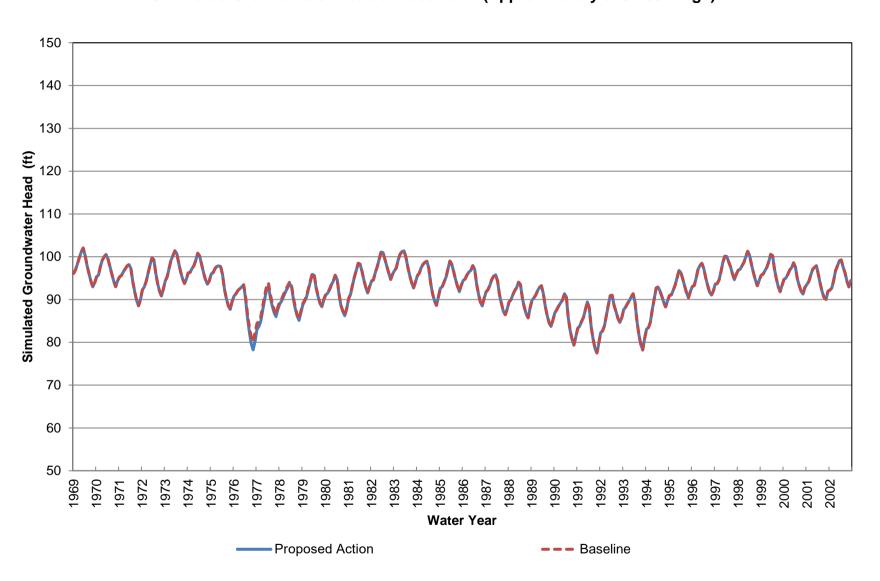
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 7 (Approximately 220-370 ft bgs)



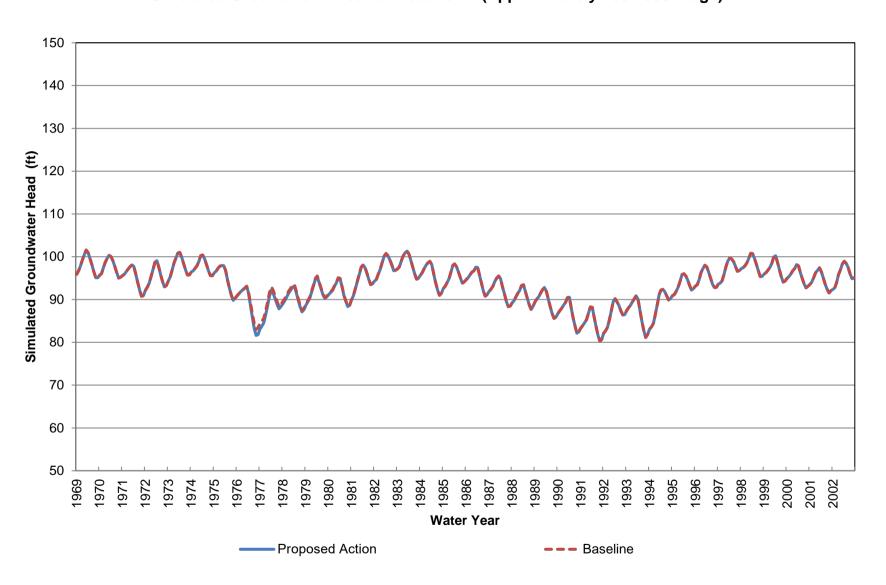
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 7 (Approximately 370-520 ft bgs)



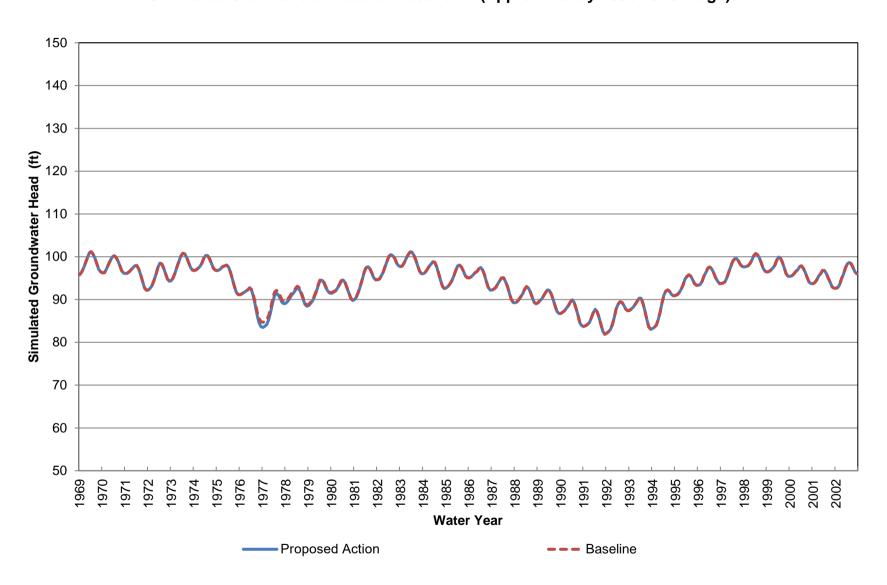
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 7 (Approximately 520-760 ft bgs)



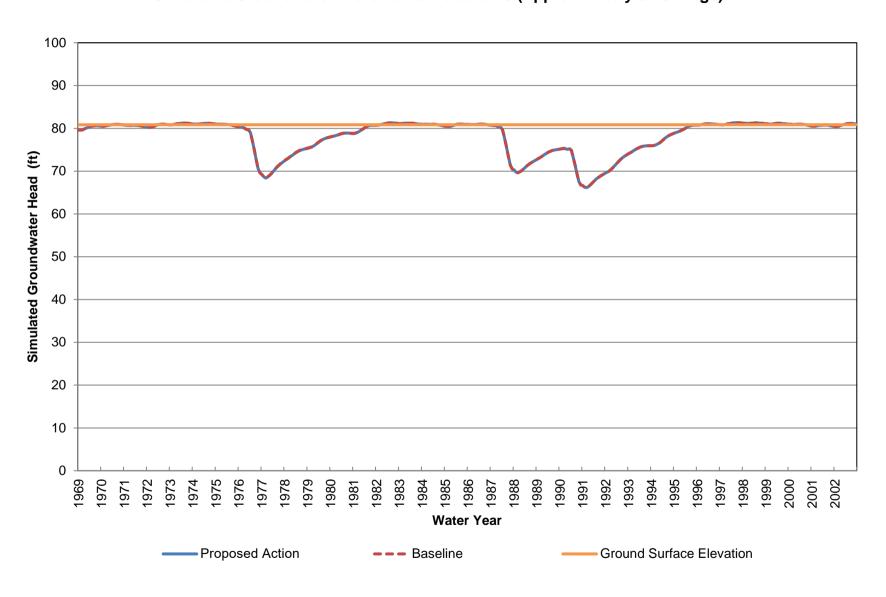
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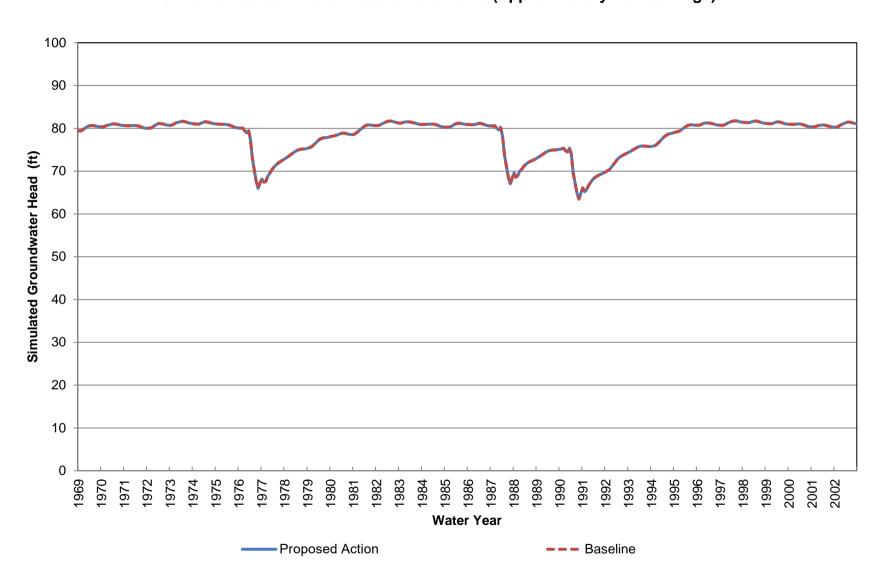
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 7 (Approximately 1030-1520 ft bgs)



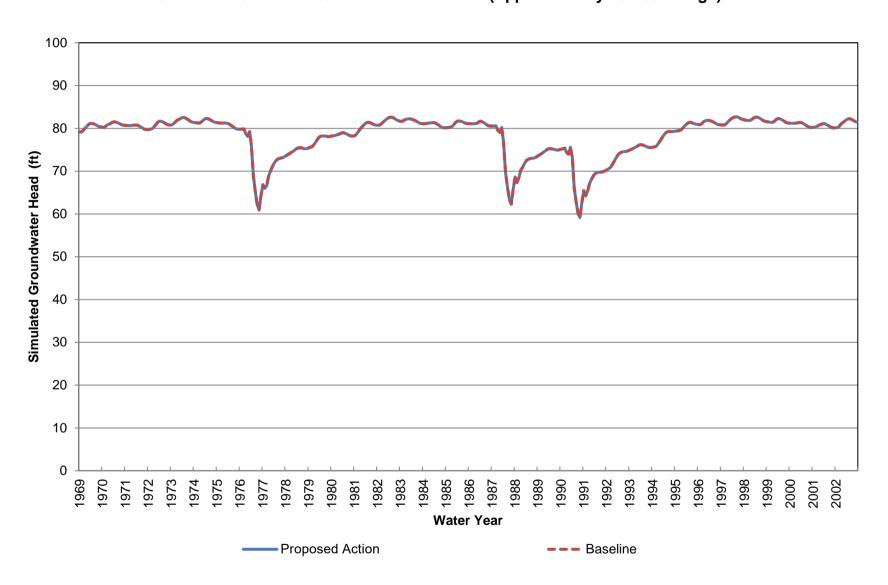
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 8 (Approximately 0-70 ft bgs)



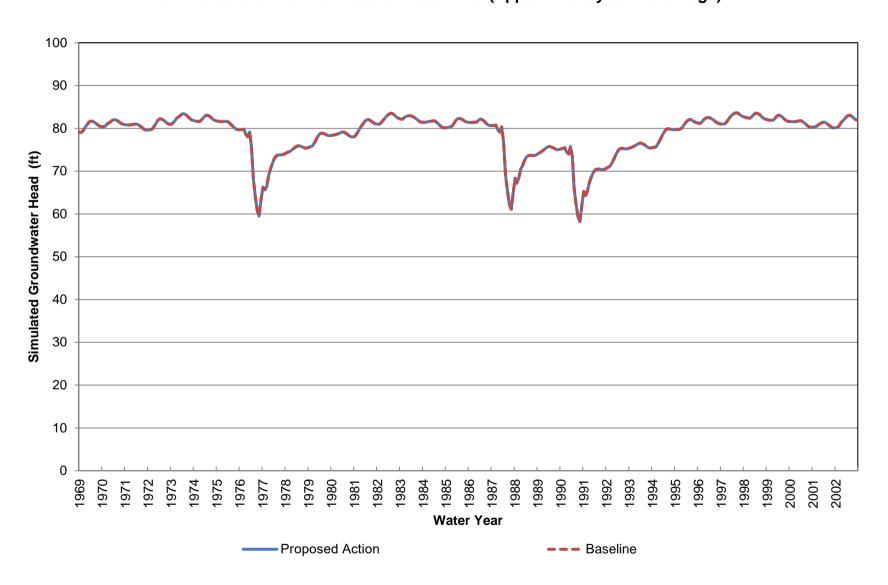
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 8 (Approximately 70-200 ft bgs)



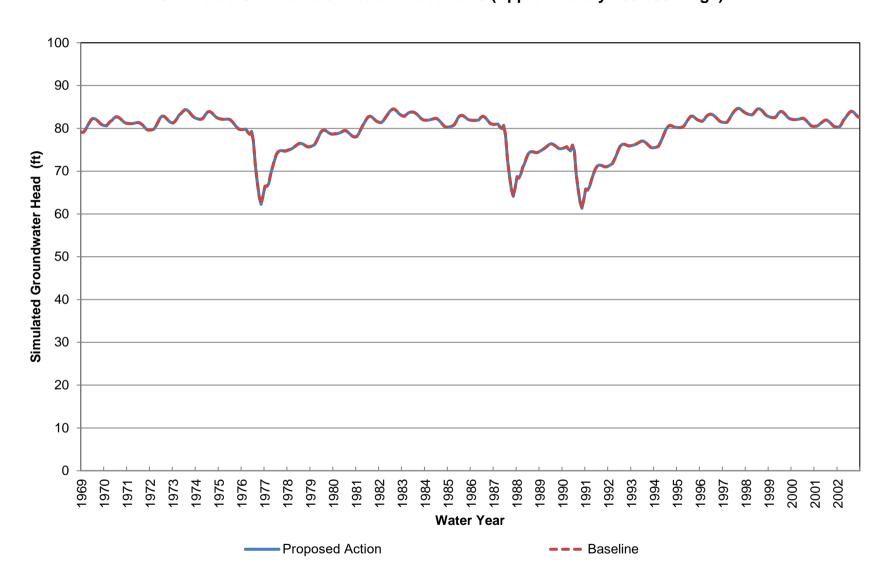
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 8 (Approximately 200-330 ft bgs)



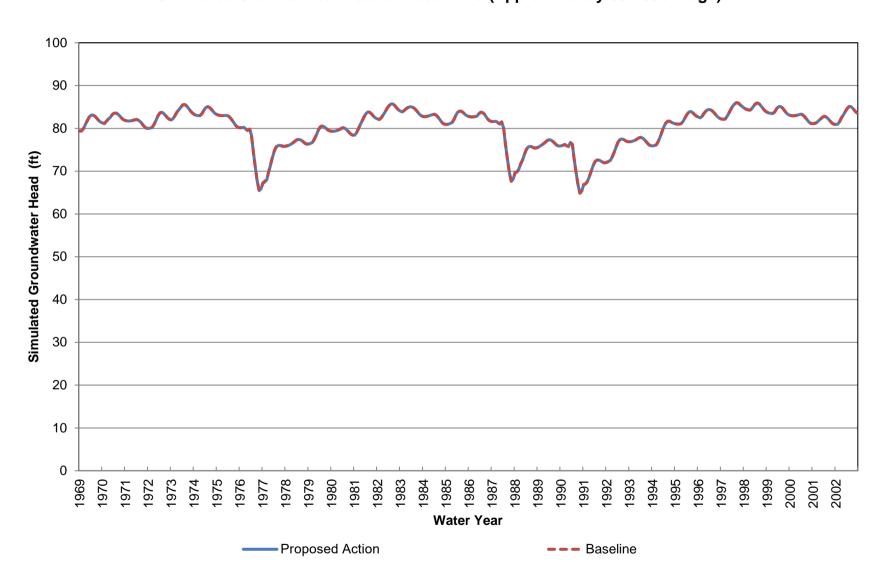
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 8 (Approximately 330-450 ft bgs)



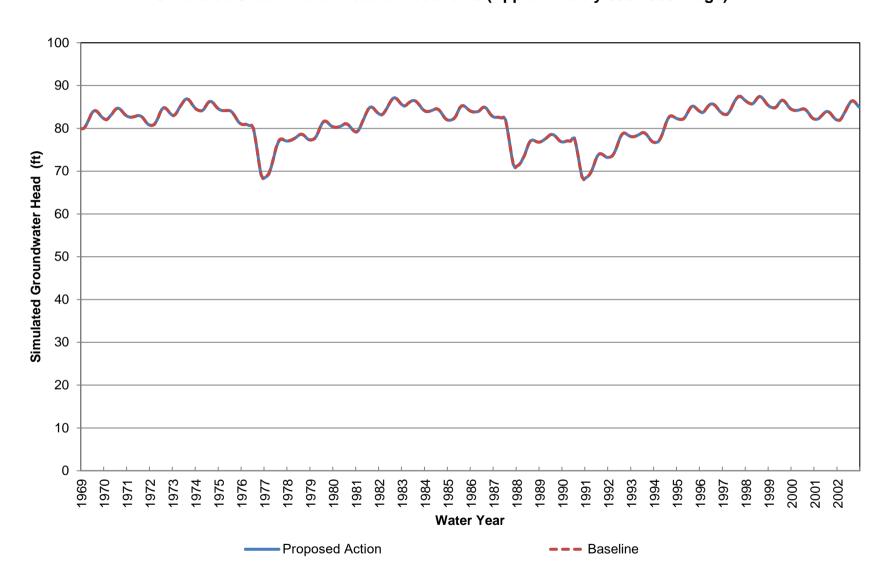
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 8 (Approximately 450-650 ft bgs)



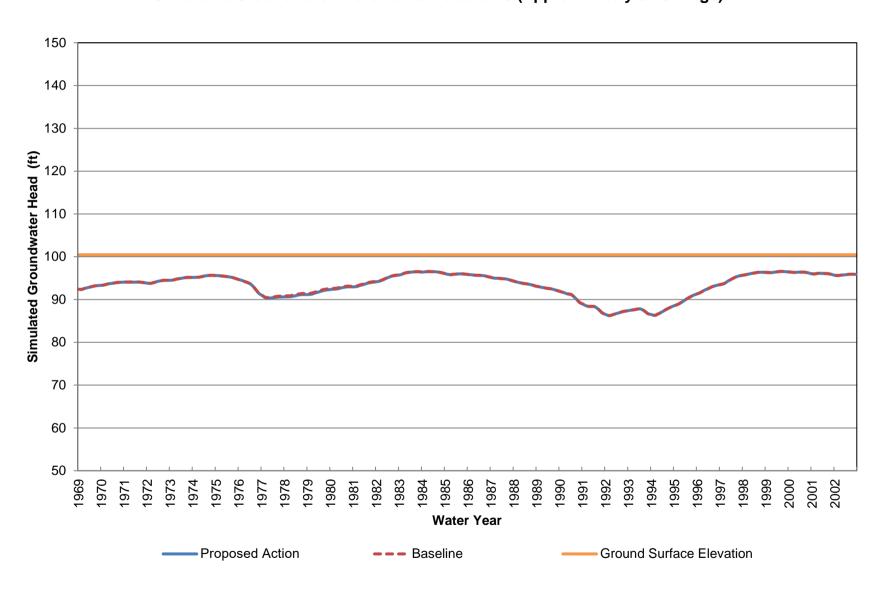
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 8 (Approximately 650-890 ft bgs)



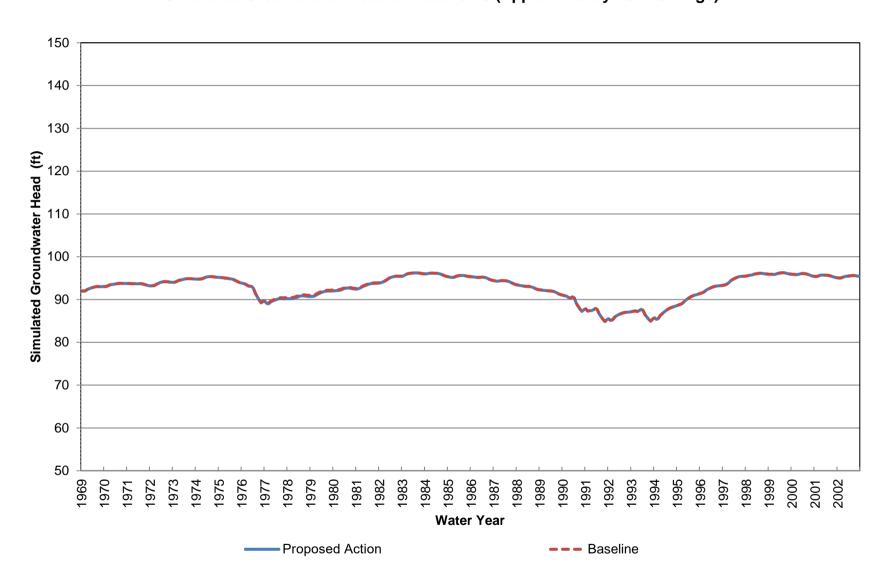
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 8 (Approximately 890-1330 ft bgs)



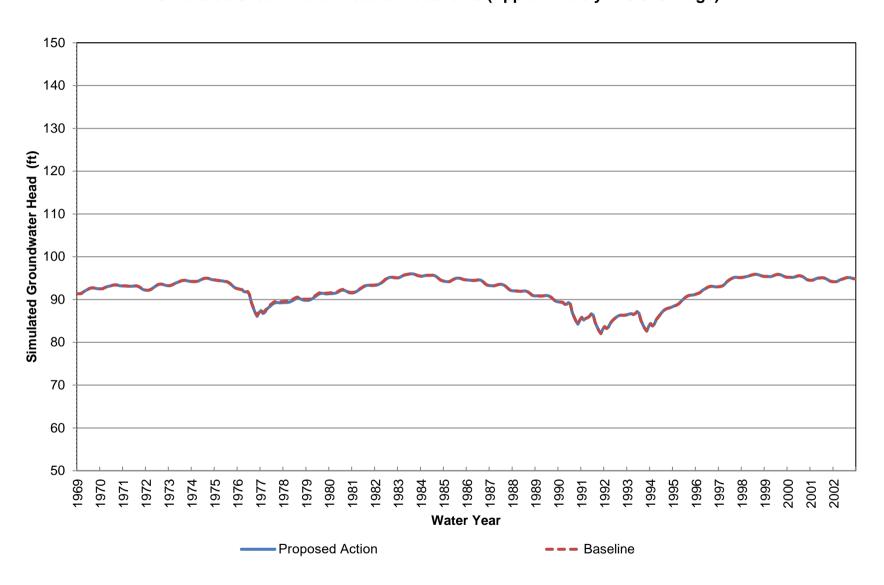
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 9 (Approximately 0-70 ft bgs)



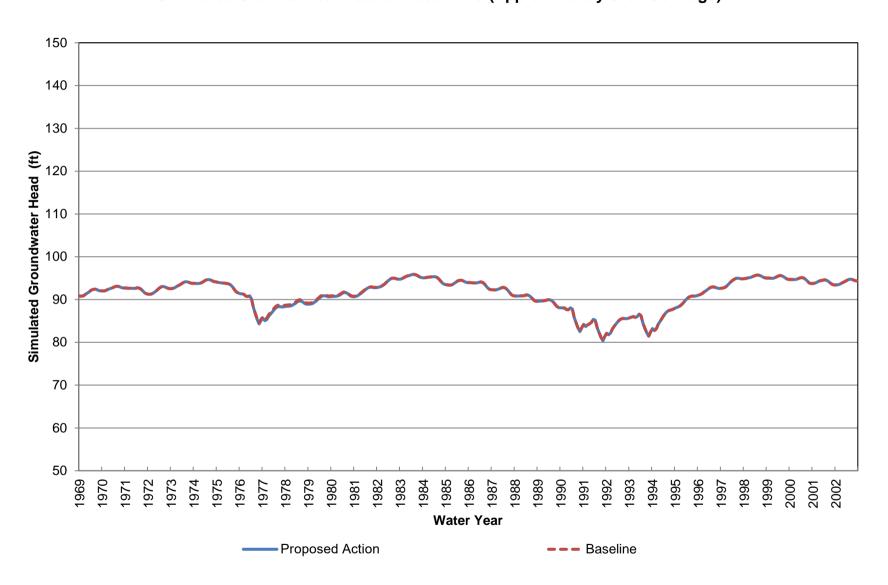
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 9 (Approximately 70-210 ft bgs)



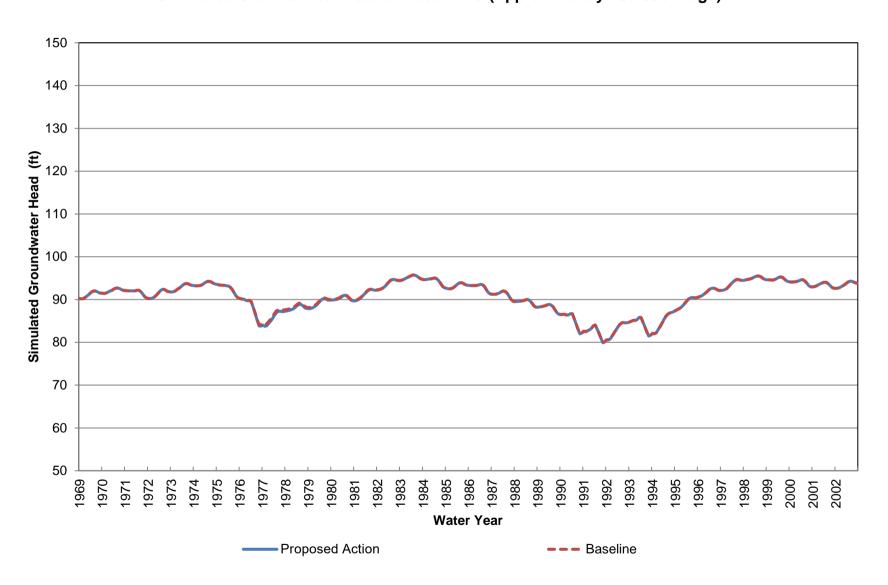
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 9 (Approximately 210-340 ft bgs)



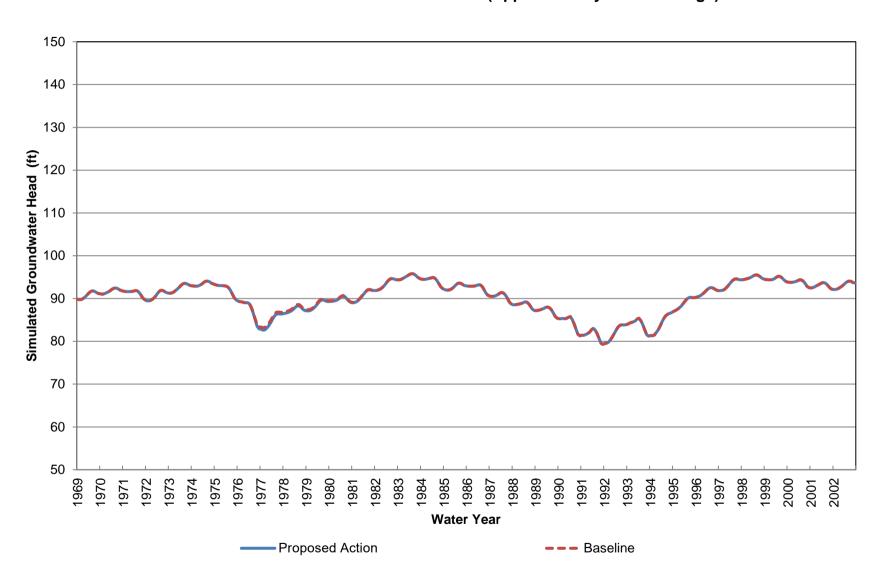
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 9 (Approximately 340-480 ft bgs)



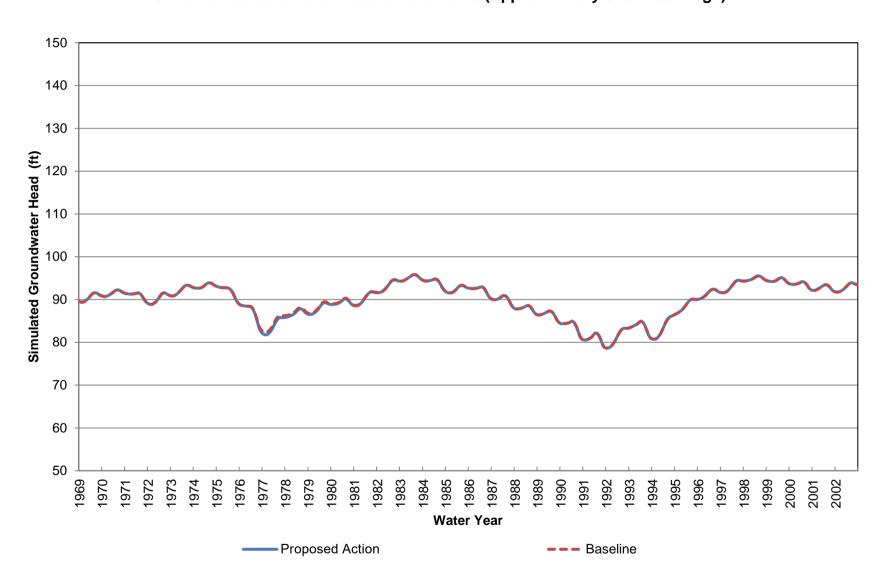
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 9 (Approximately 480-690 ft bgs)



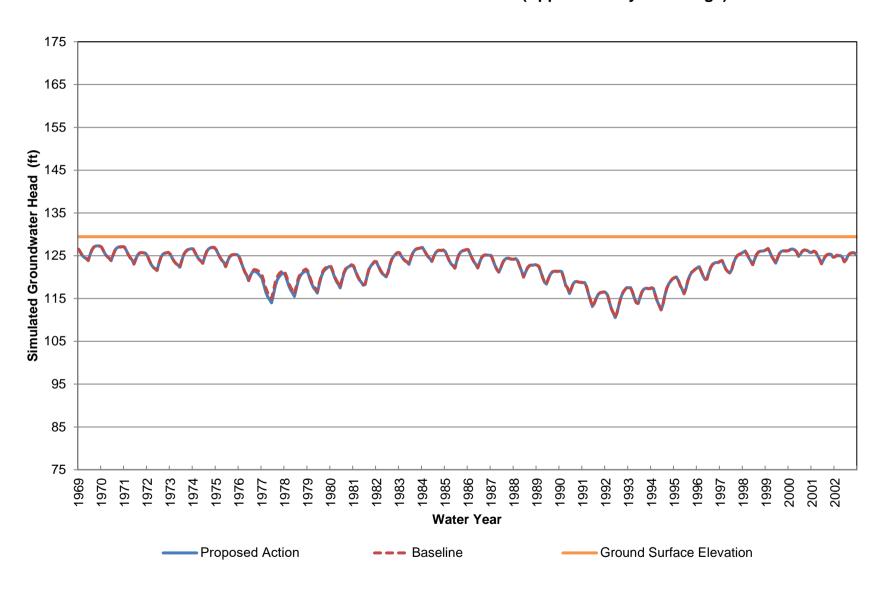
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 9 (Approximately 690-910 ft bgs)



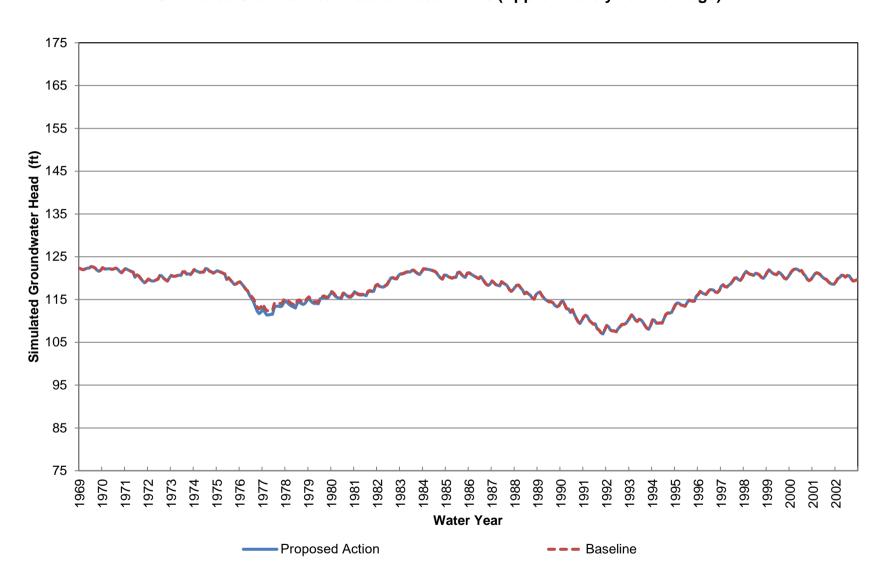
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 9 (Approximately 910-1250 ft bgs)



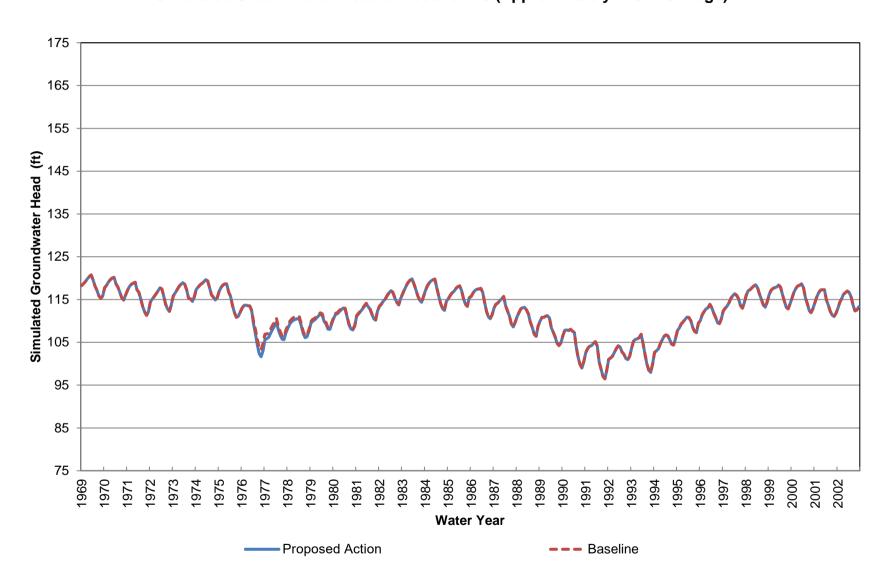
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 10 (Approximately 0-70 ft bgs)



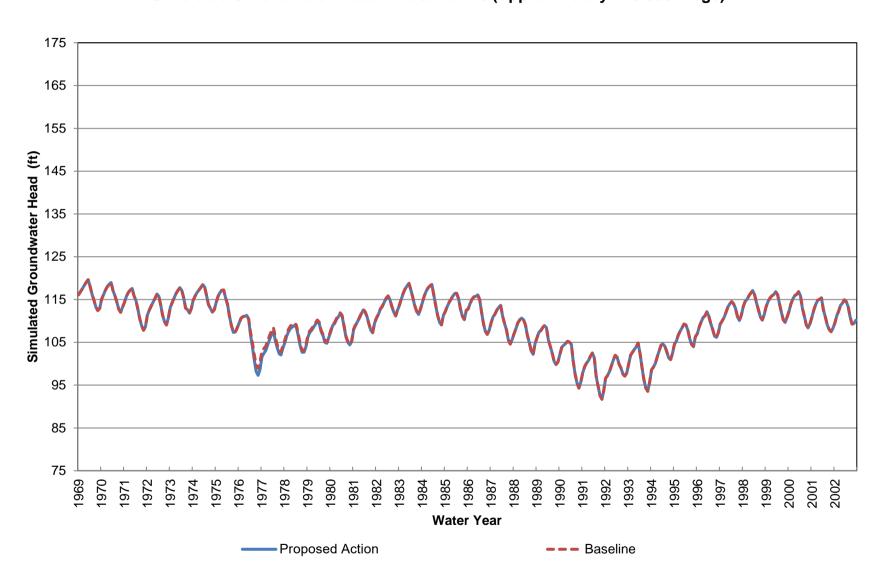
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 10 (Approximately 70-240 ft bgs)



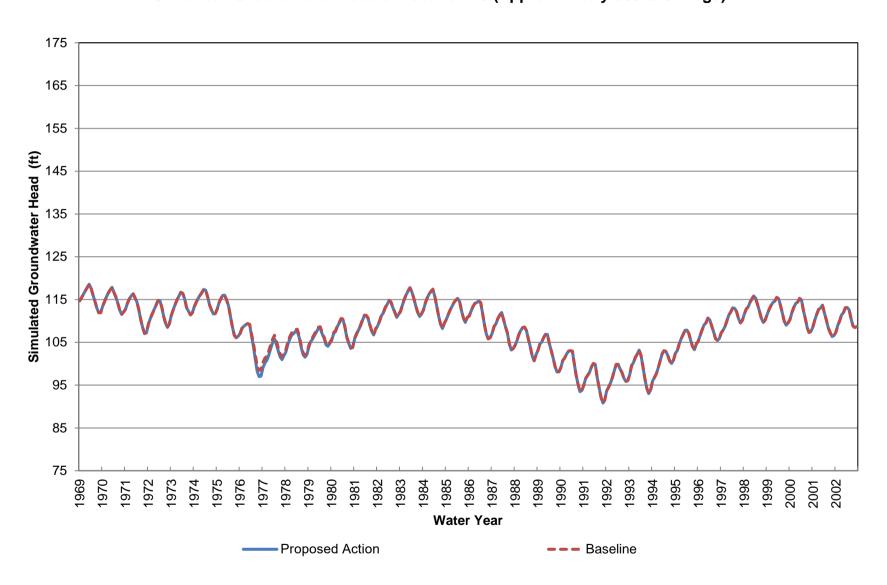
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 10 (Approximately 240-420 ft bgs)



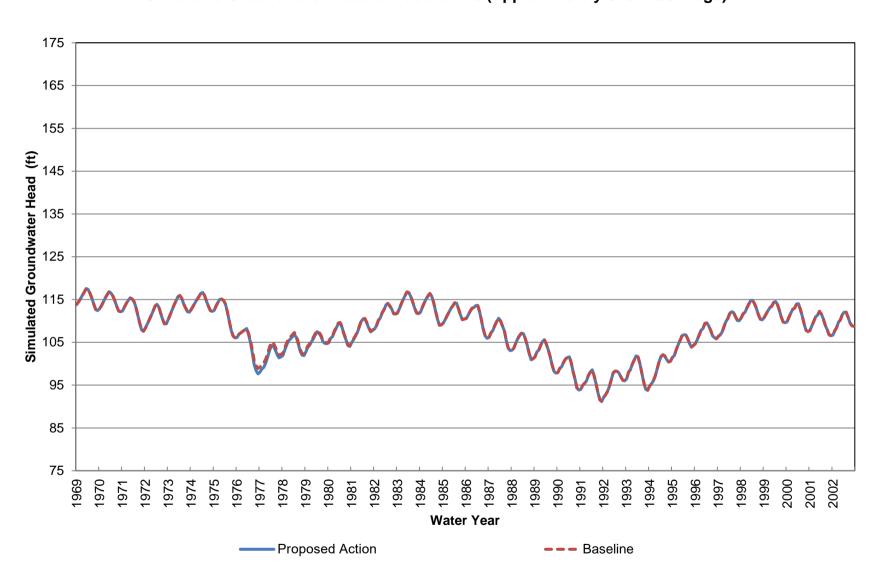
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 10 (Approximately 420-590 ft bgs)



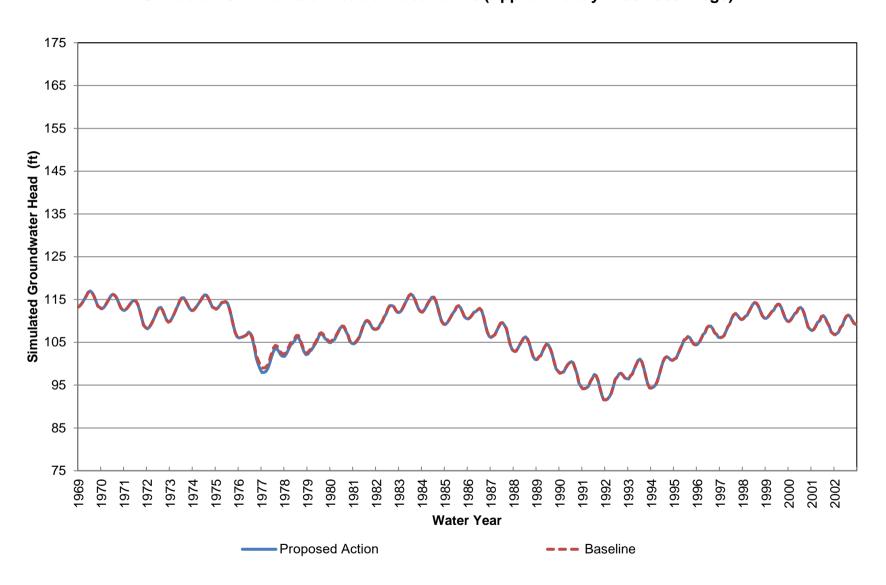
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 10 (Approximately 590-870 ft bgs)



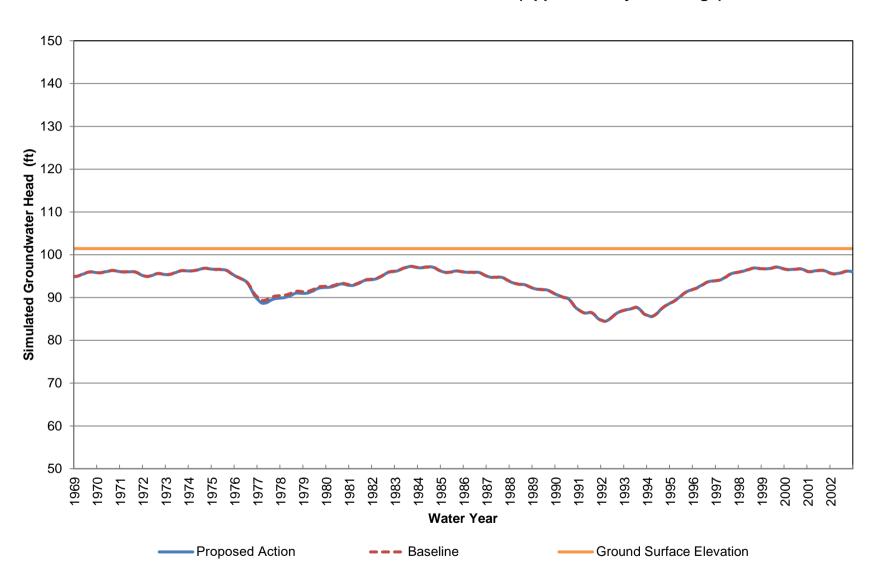
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 10 (Approximately 870-1160 ft bgs)



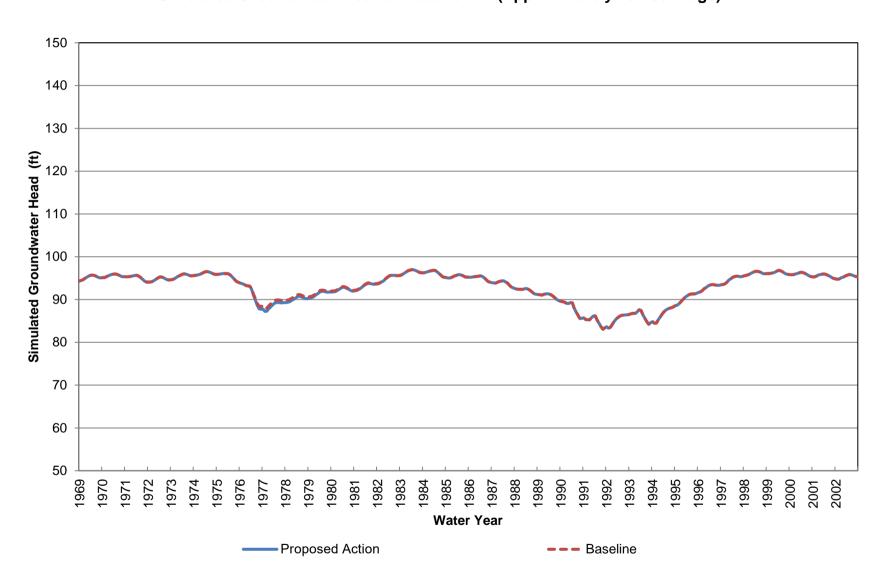
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 10 (Approximately 1160-1590 ft bgs)



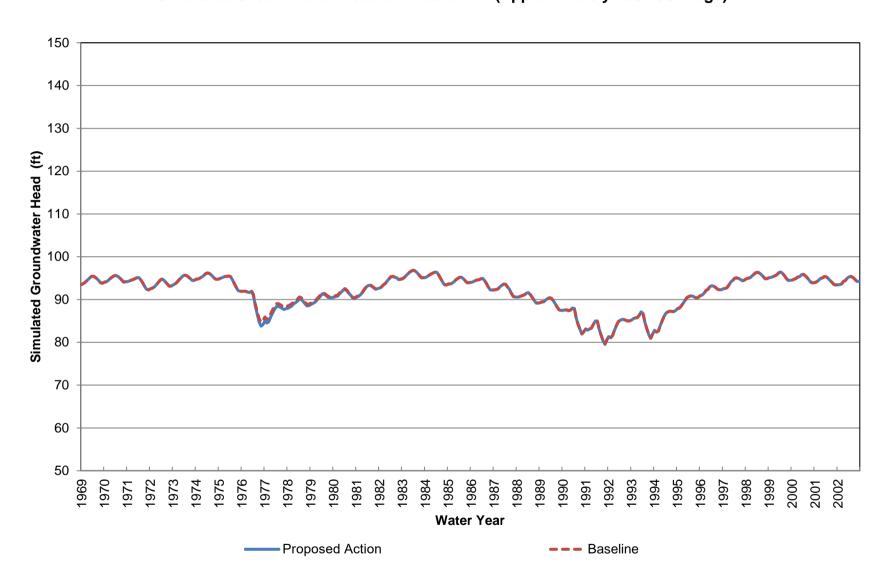
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 11 (Approximately 0-70 ft bgs)



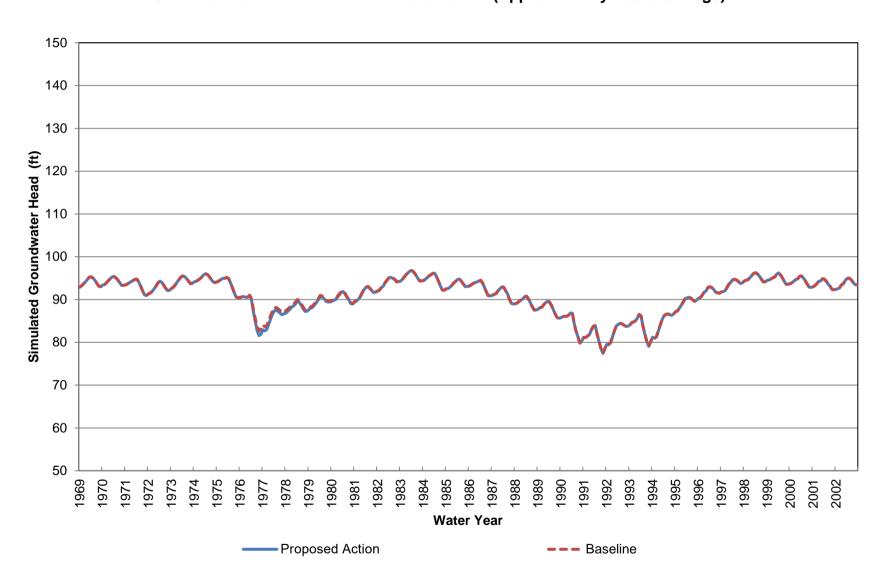
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 11 (Approximately 70-260 ft bgs)



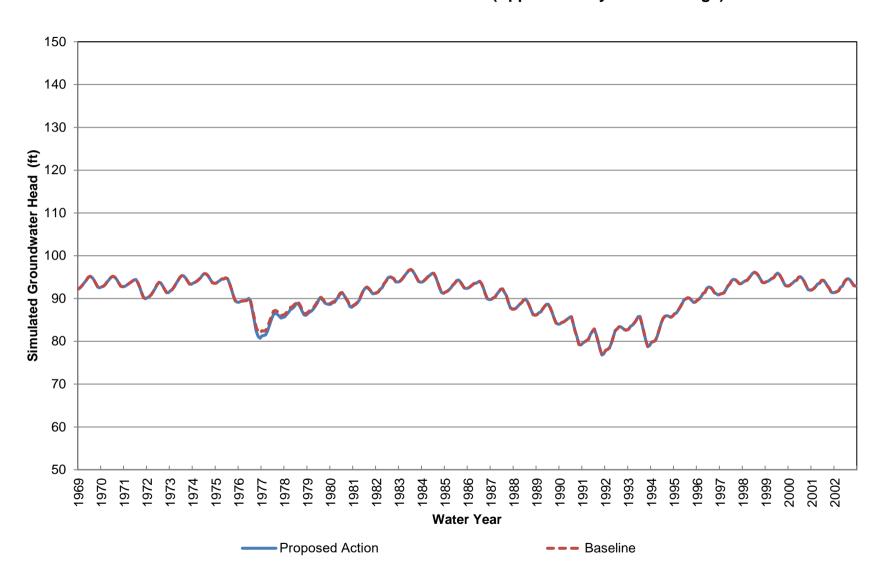
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 11 (Approximately 260-450 ft bgs)



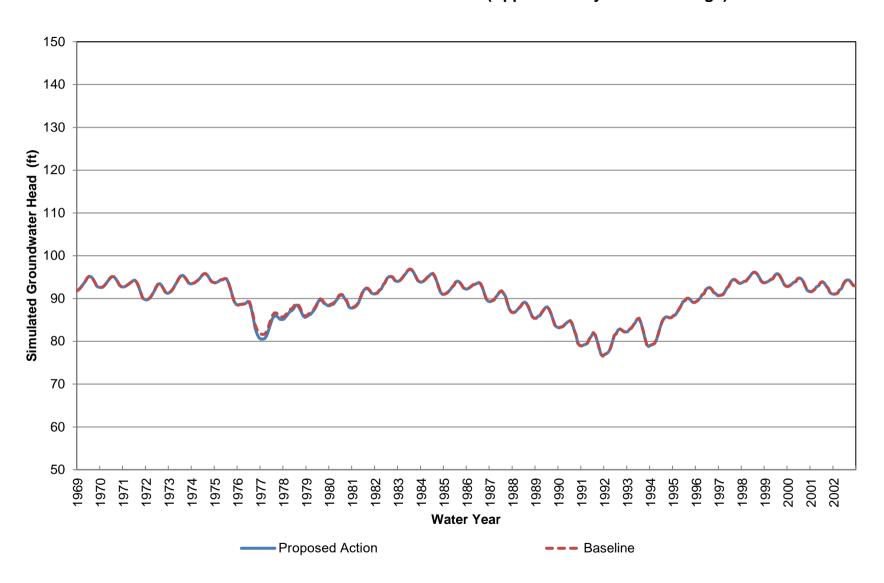
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 11 (Approximately 450-640 ft bgs)



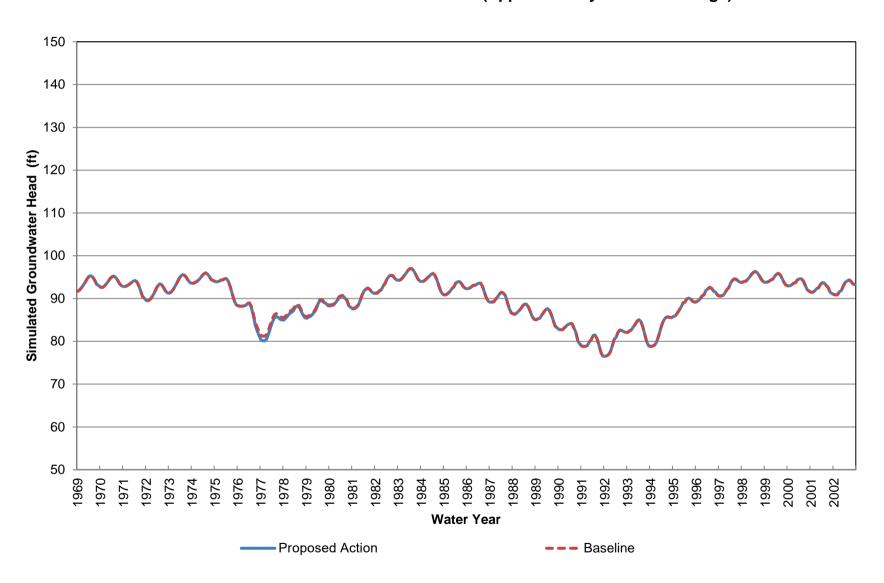
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 11 (Approximately 640-950 ft bgs)



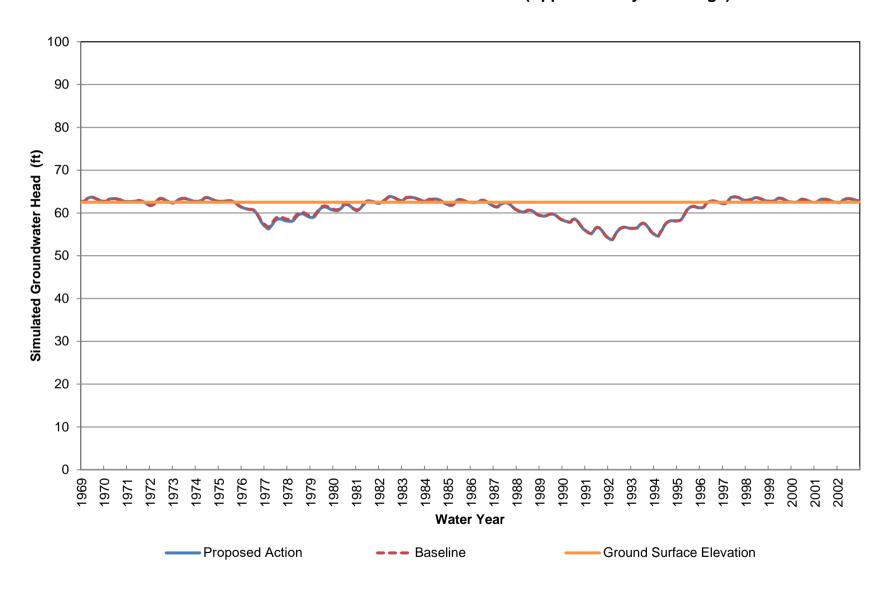
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 11 (Approximately 950-1260 ft bgs)



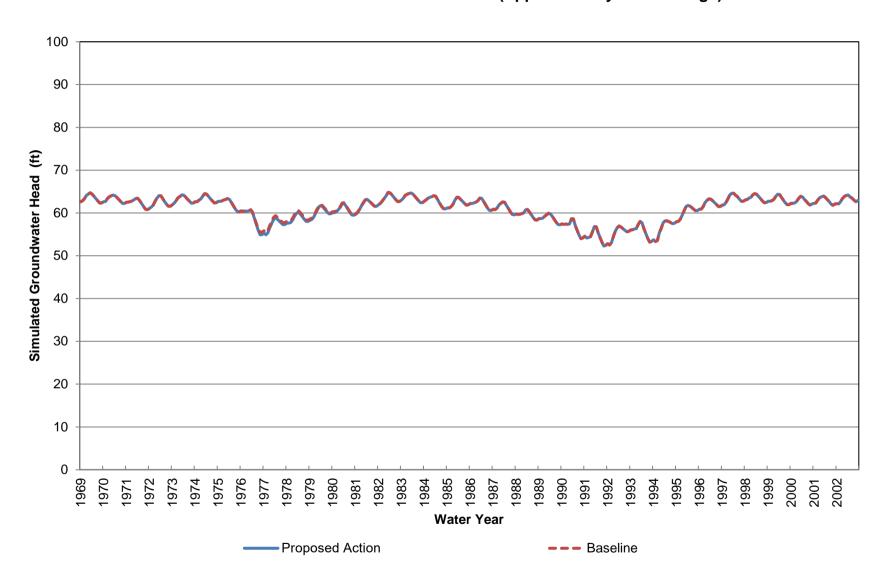
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 11 (Approximately 1260-1740 ft bgs)



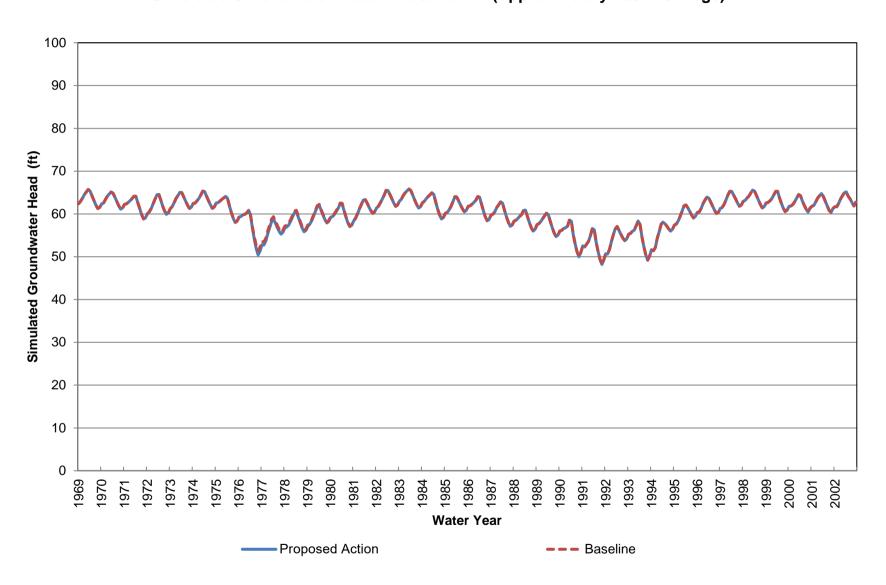
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 12 (Approximately 0-70 ft bgs)



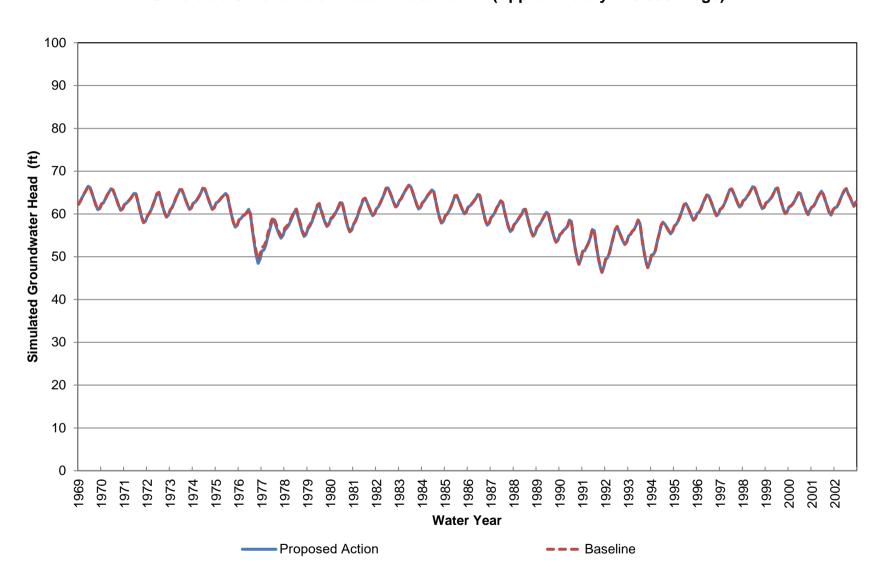
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 12 (Approximately 70-260 ft bgs)



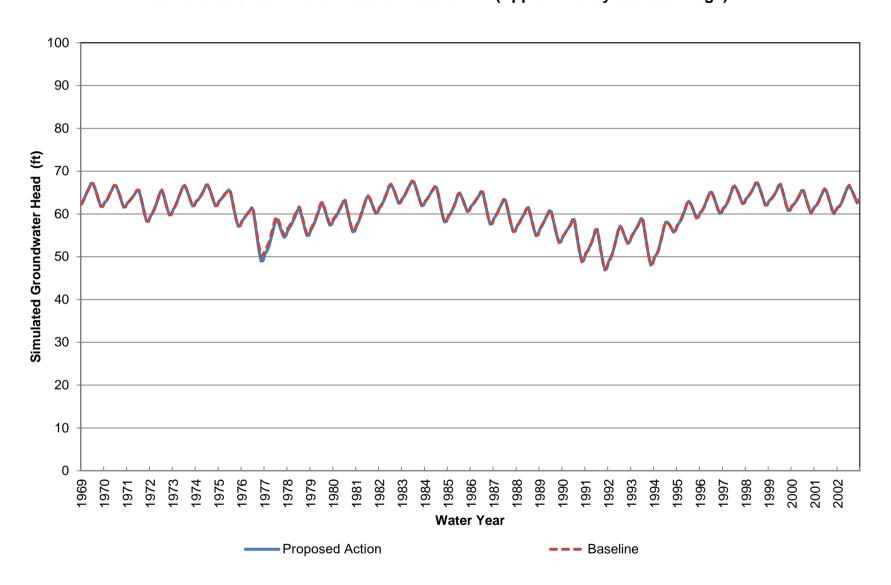
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 12 (Approximately 260-440 ft bgs)



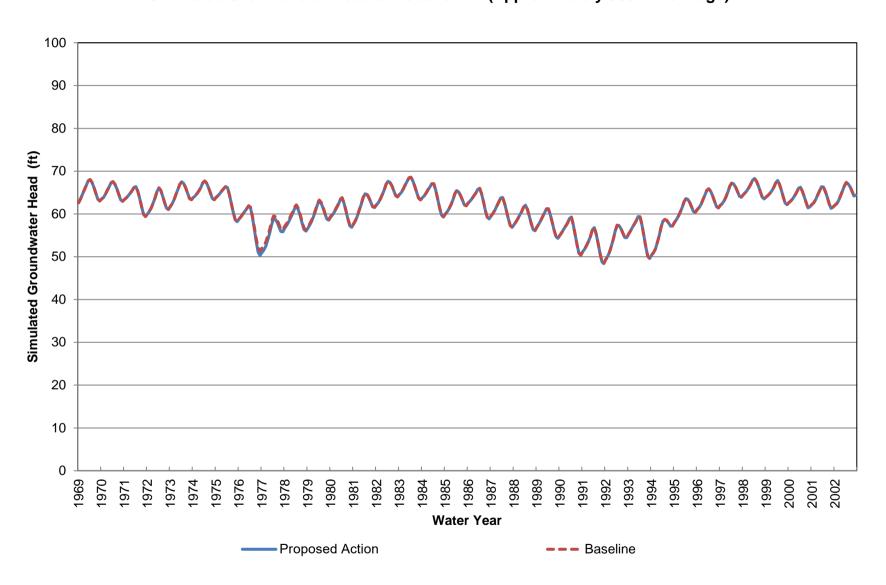
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 12 (Approximately 440-630 ft bgs)



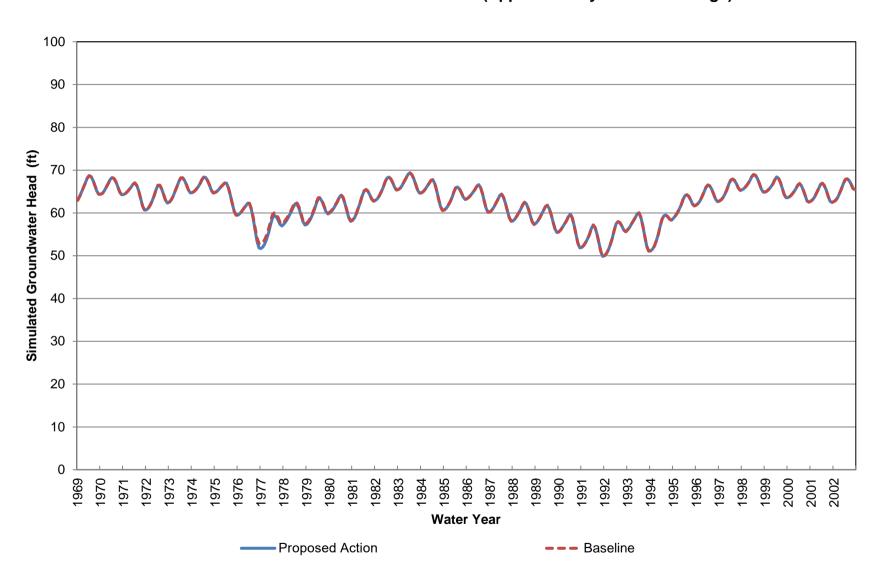
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 12 (Approximately 630-930 ft bgs)



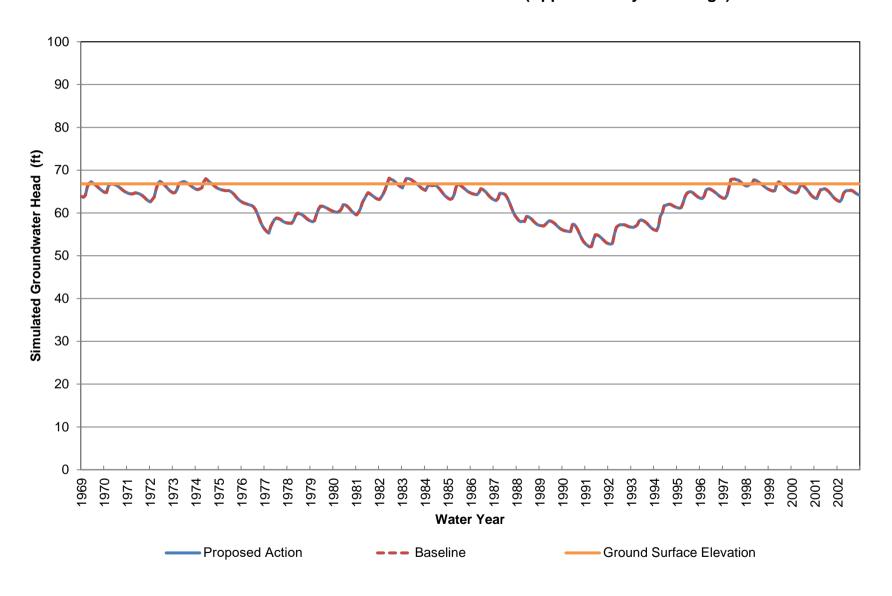
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 12 (Approximately 930-1240 ft bgs)



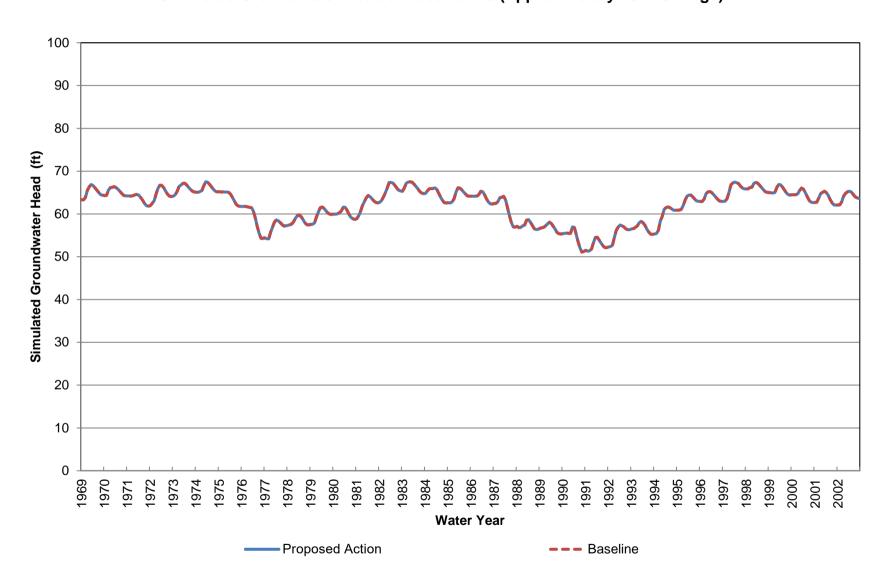
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 12 (Approximately 1240-1700 ft bgs)



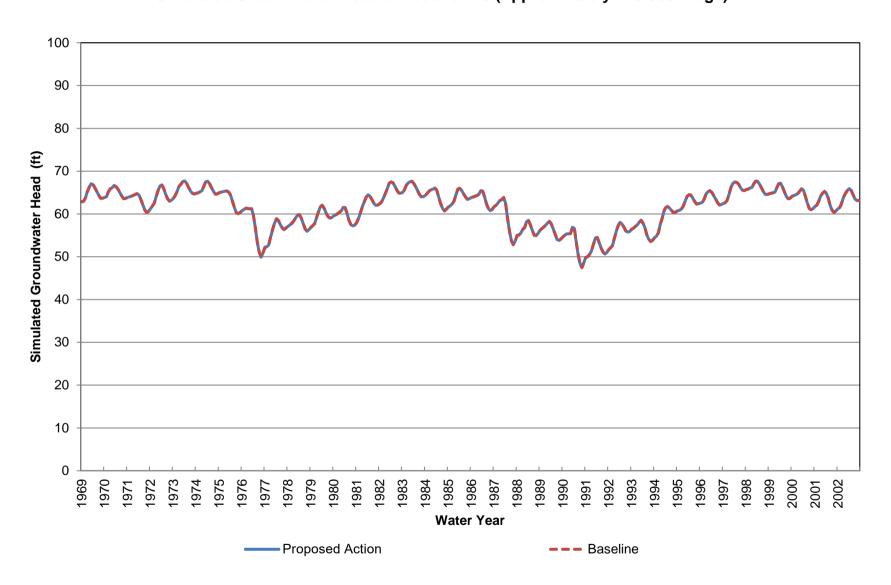
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 13 (Approximately 0-70 ft bgs)



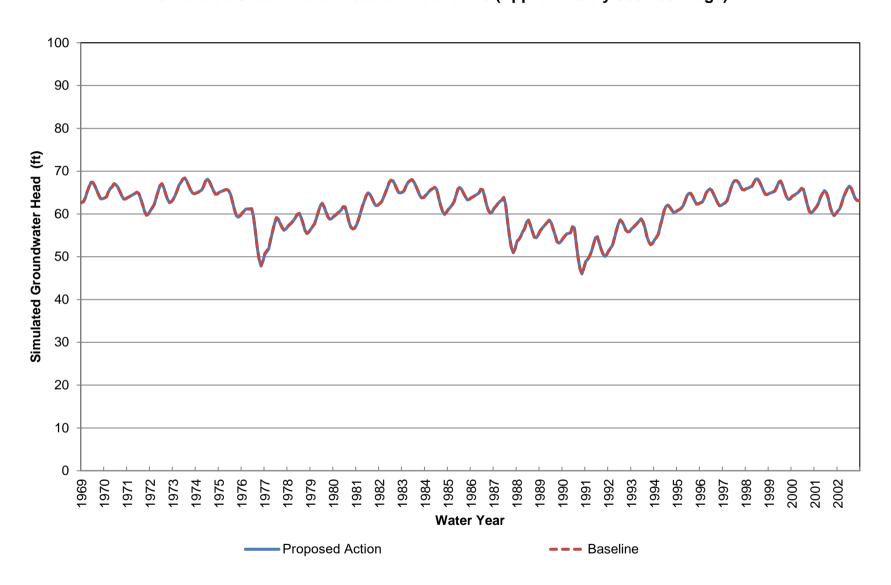
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 13 (Approximately 70-210 ft bgs)



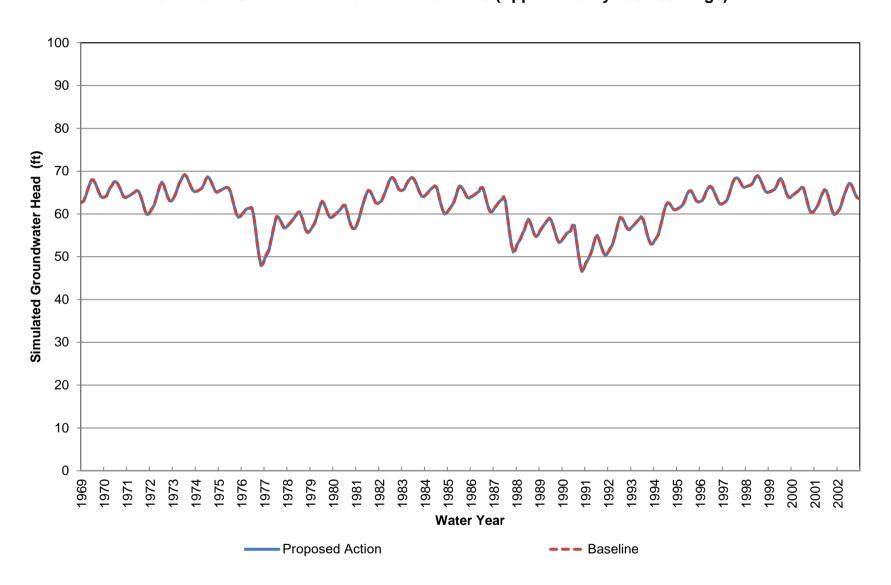
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 13 (Approximately 210-350 ft bgs)



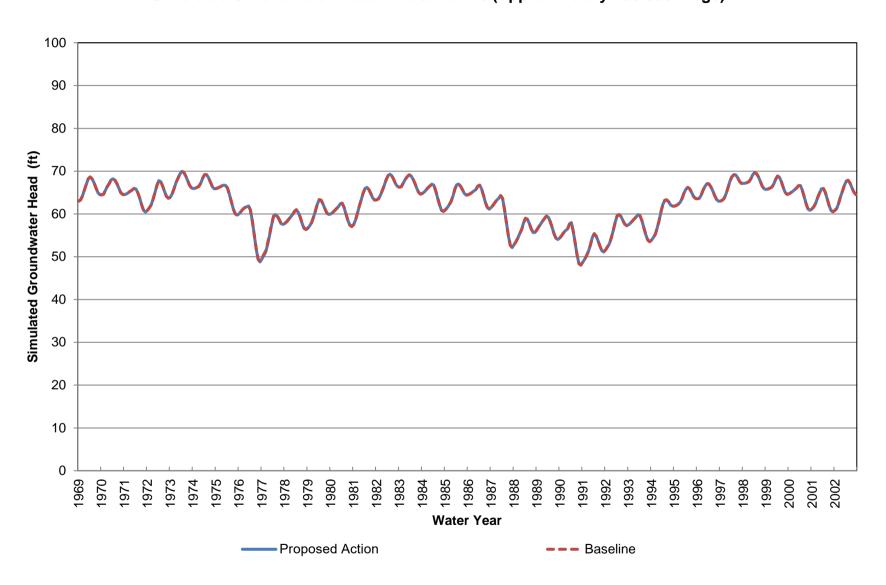
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 13 (Approximately 350-490 ft bgs)



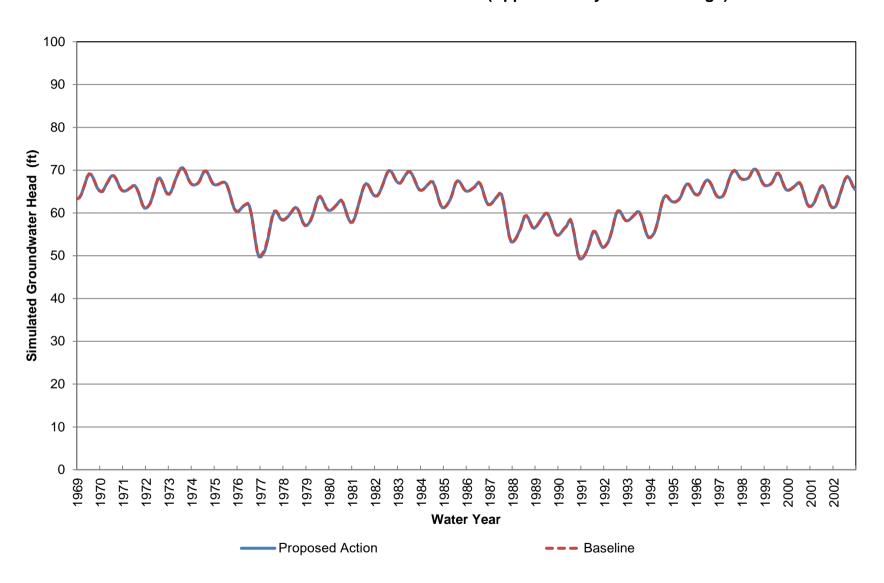
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 13 (Approximately 490-700 ft bgs)



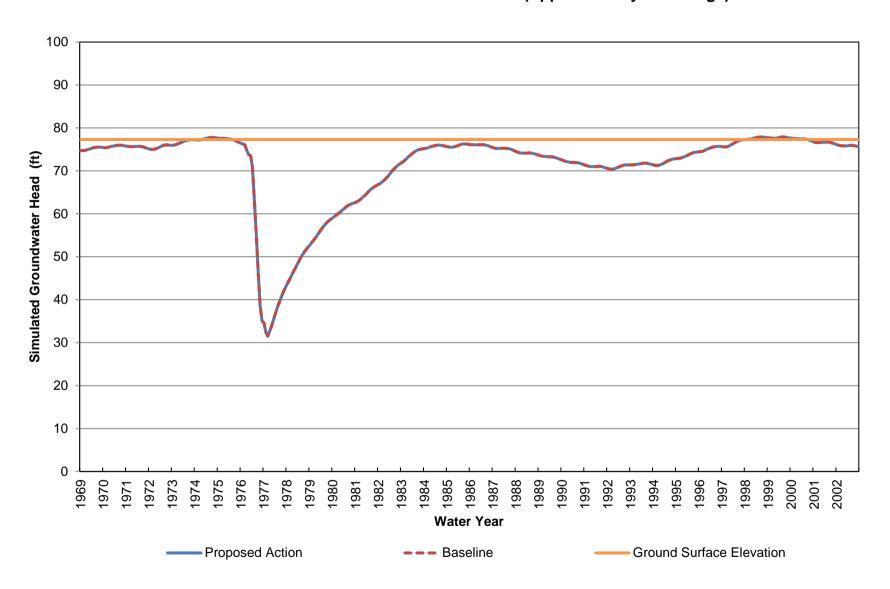
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 13 (Approximately 700-930 ft bgs)



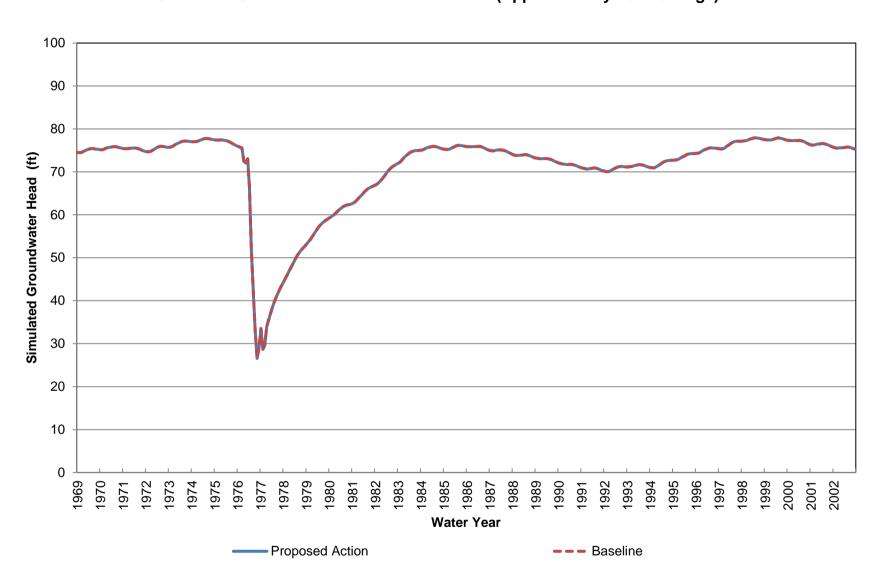
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 13 (Approximately 930-1280 ft bgs)



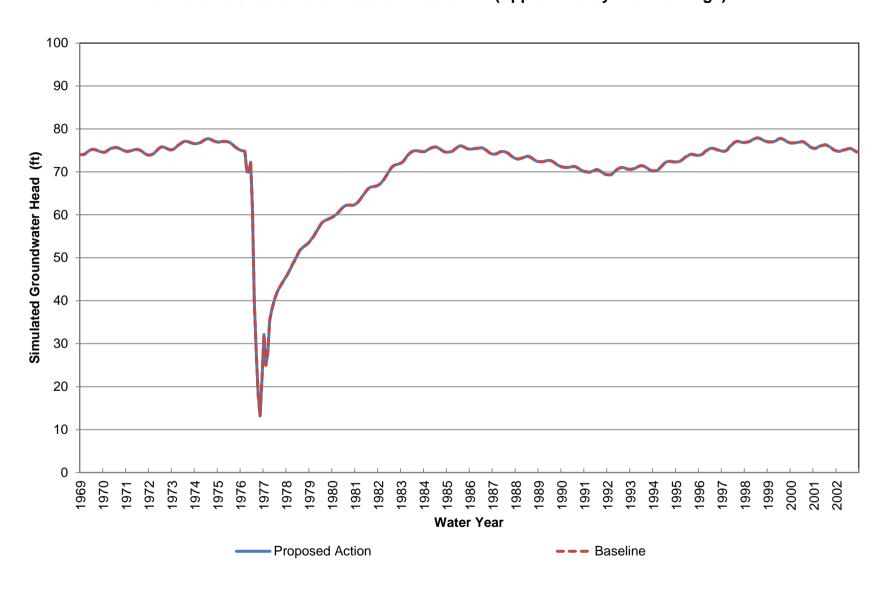
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 14 (Approximately 0-40 ft bgs)



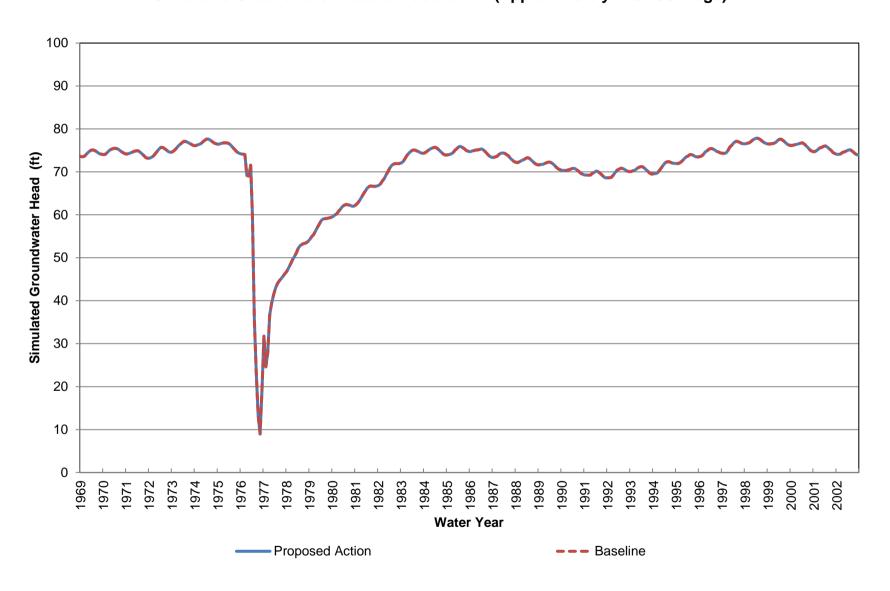
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 14 (Approximately 40-110 ft bgs)



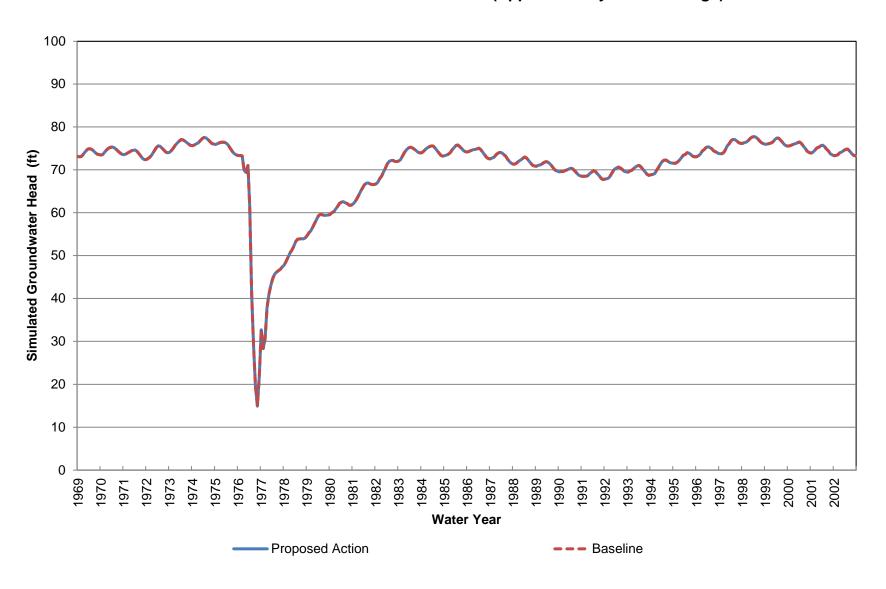
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 14 (Approximately 110-170 ft bgs)



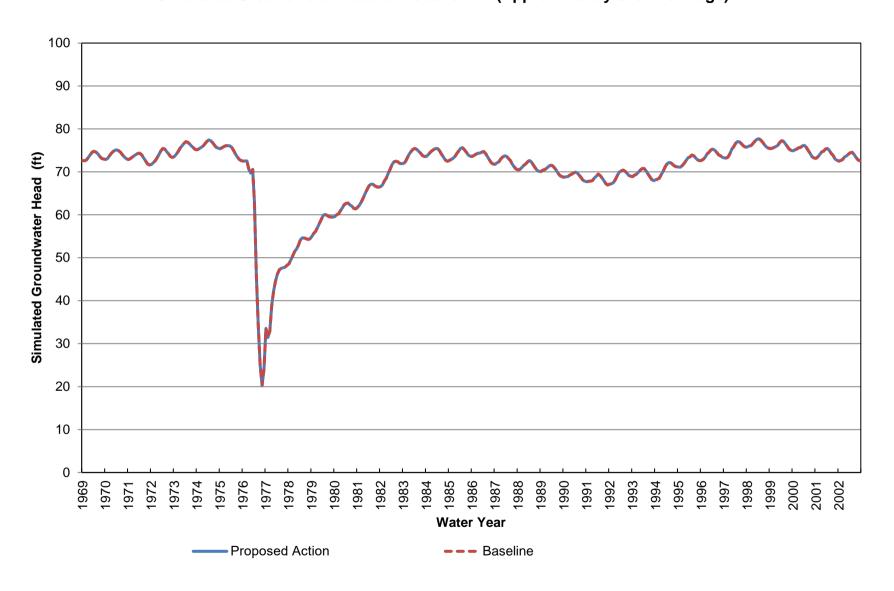
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 14 (Approximately 170-230 ft bgs)



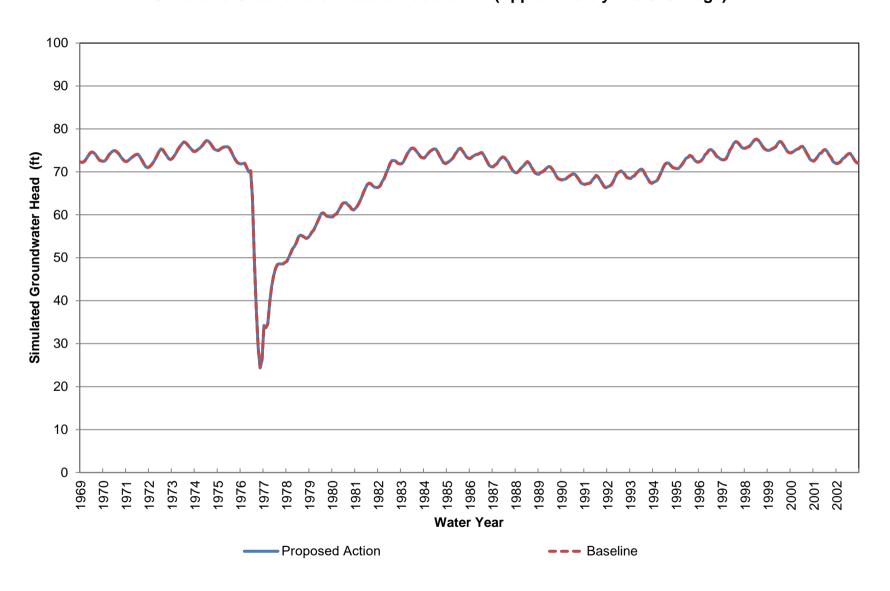
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 14 (Approximately 230-310 ft bgs)



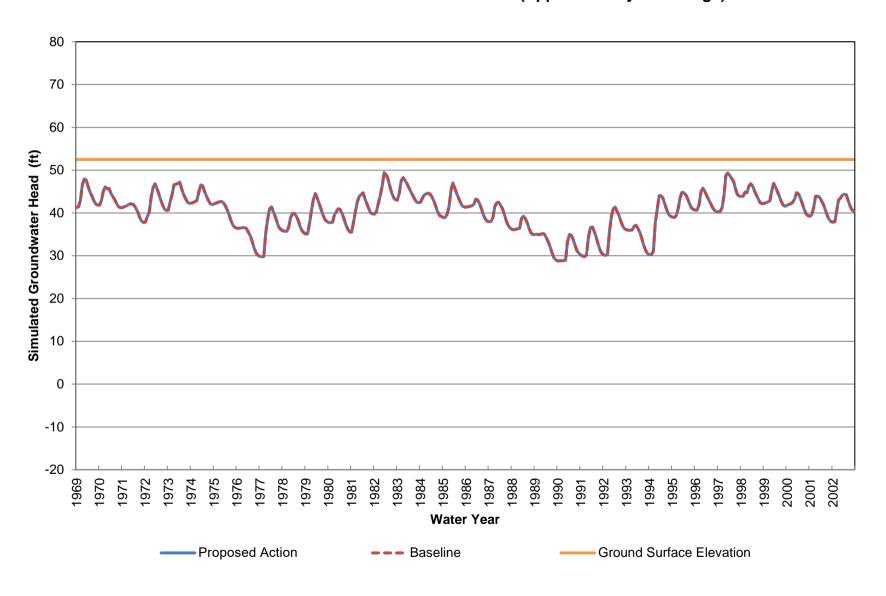
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 14 (Approximately 310-420 ft bgs)



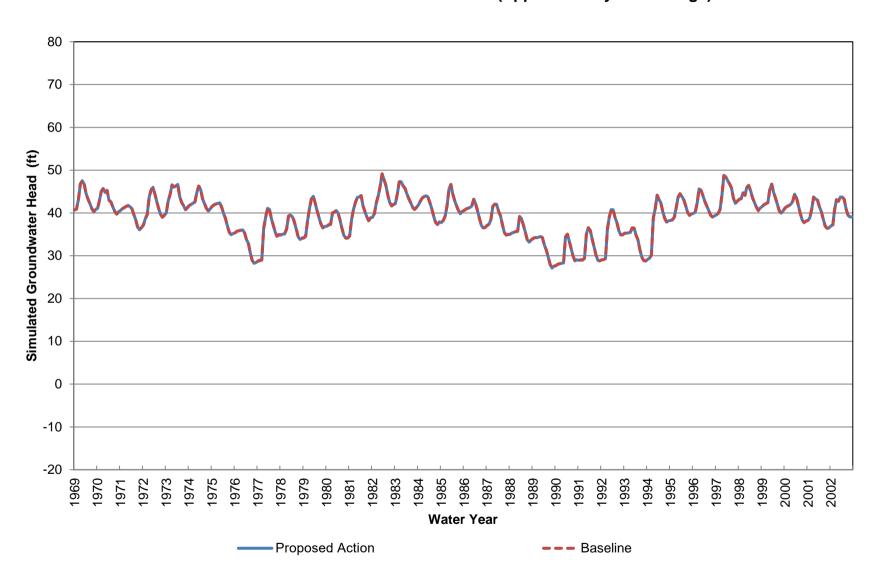
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 14 (Approximately 420-570 ft bgs)



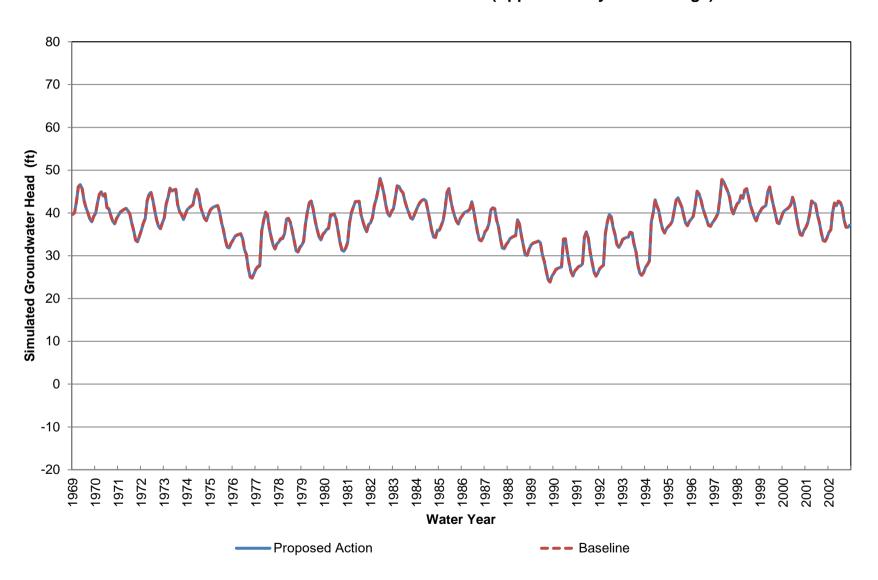
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 15 (Approximately 0-30 ft bgs)



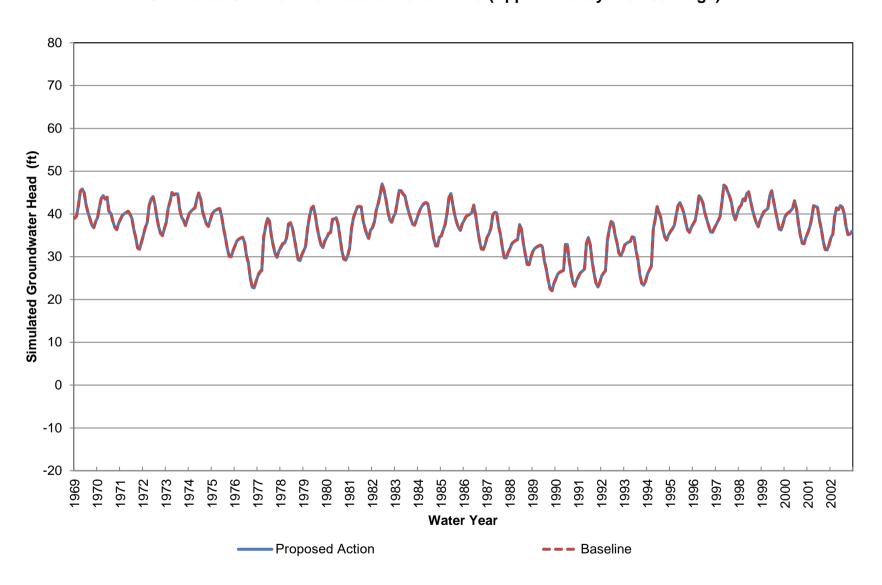
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 15 (Approximately 30-70 ft bgs)



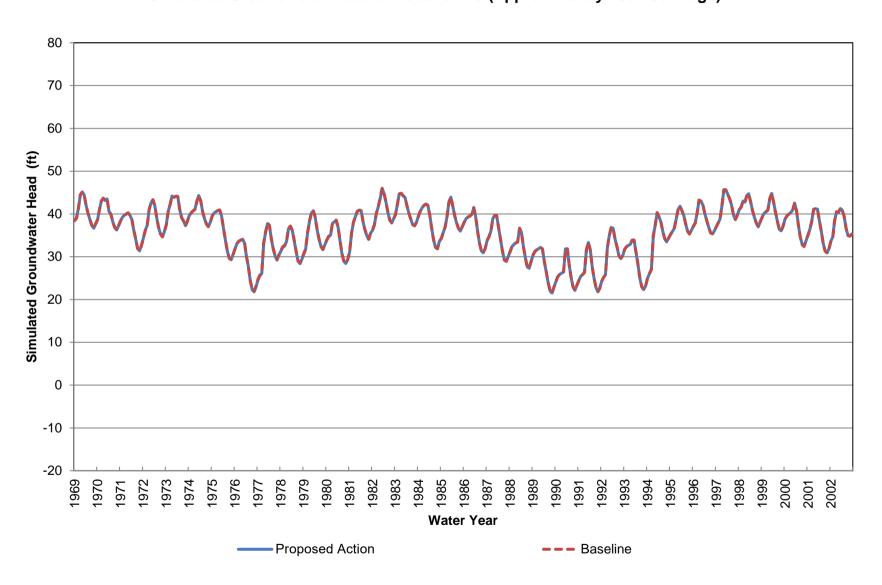
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 15 (Approximately 70-110 ft bgs)



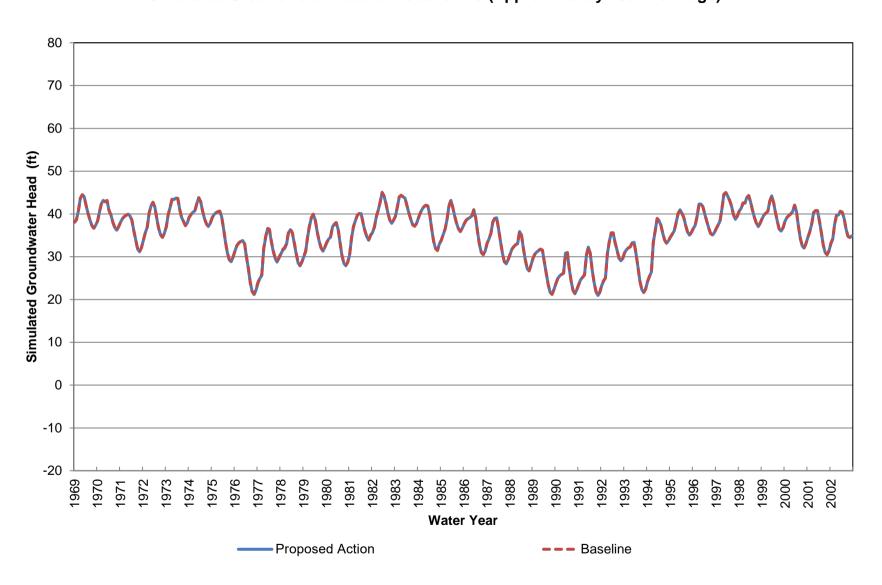
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 15 (Approximately 110-150 ft bgs)



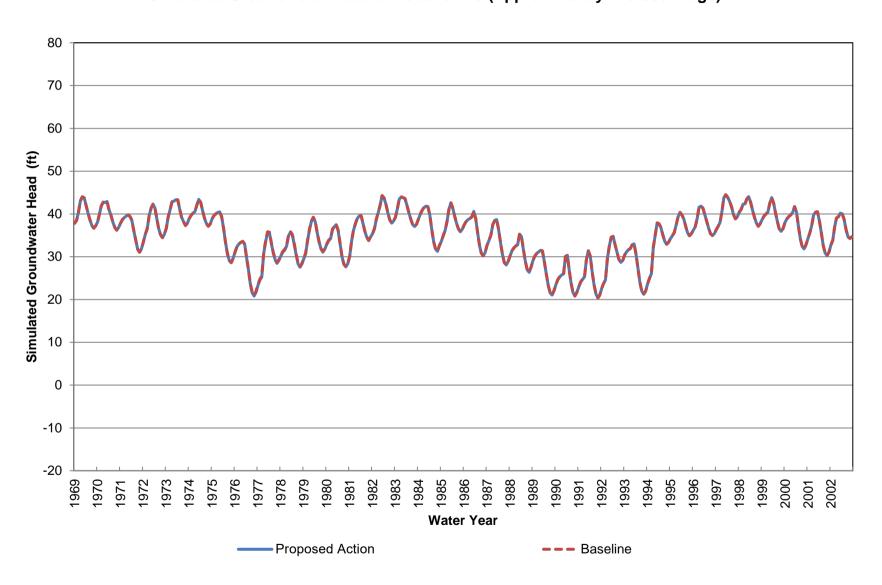
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 15 (Approximately 150-200 ft bgs)



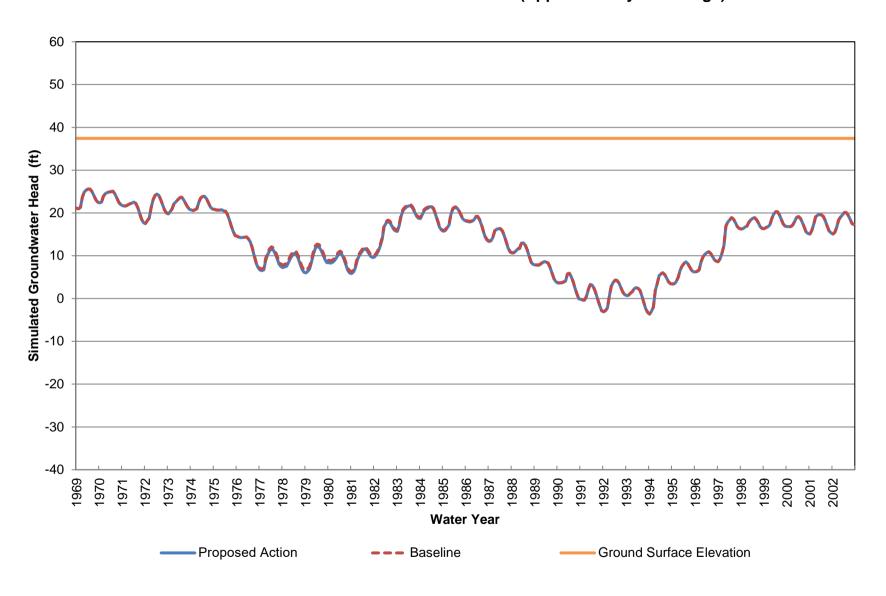
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 15 (Approximately 200-270 ft bgs)



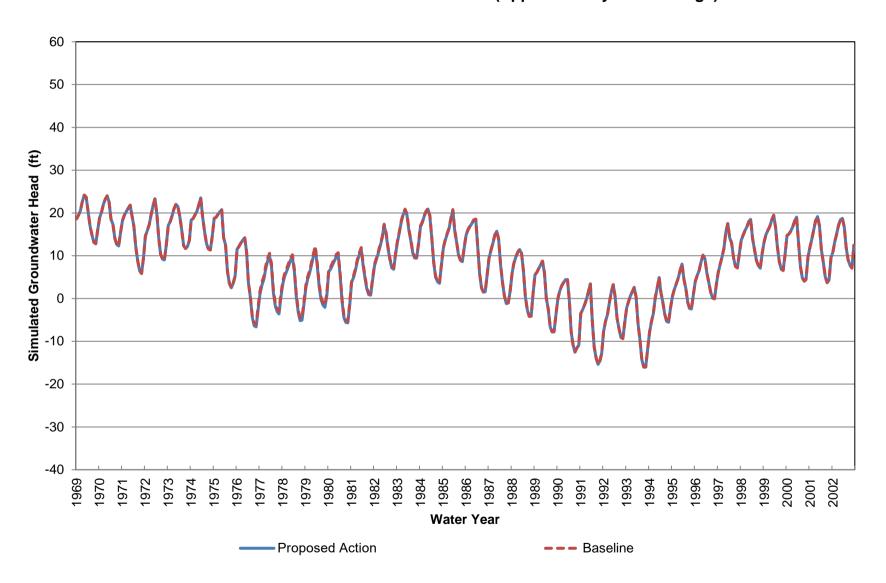
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 15 (Approximately 270-360 ft bgs)



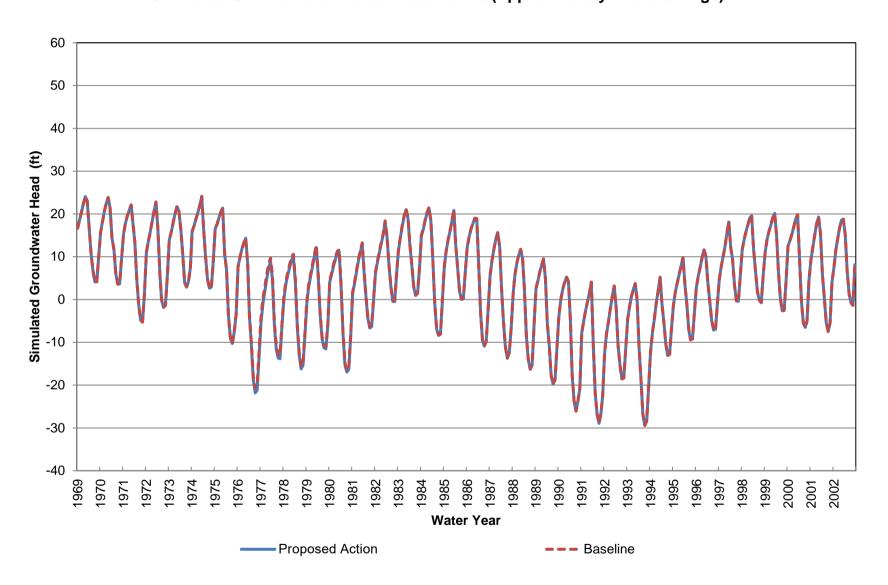
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 16 (Approximately 0-70 ft bgs)



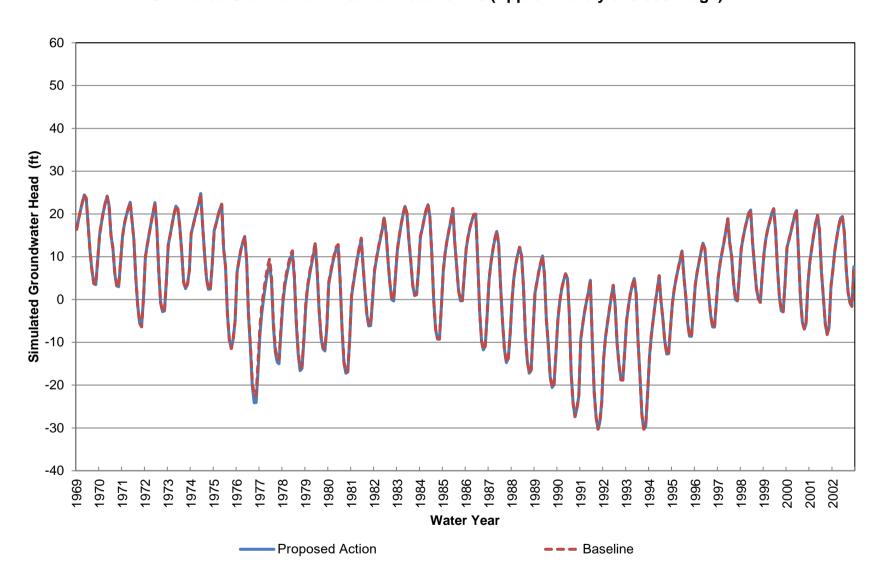
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 16 (Approximately 70-220 ft bgs)



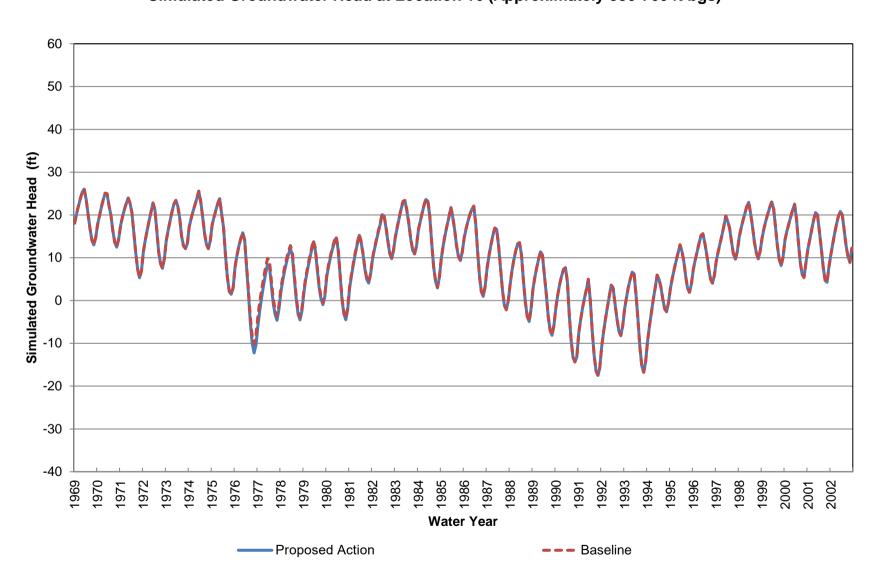
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 16 (Approximately 220-370 ft bgs)



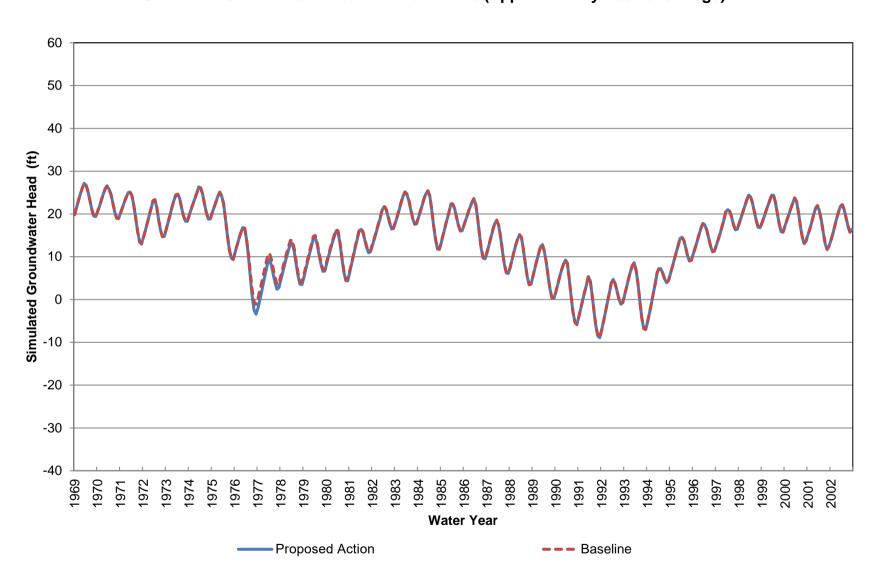
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 16 (Approximately 370-530 ft bgs)



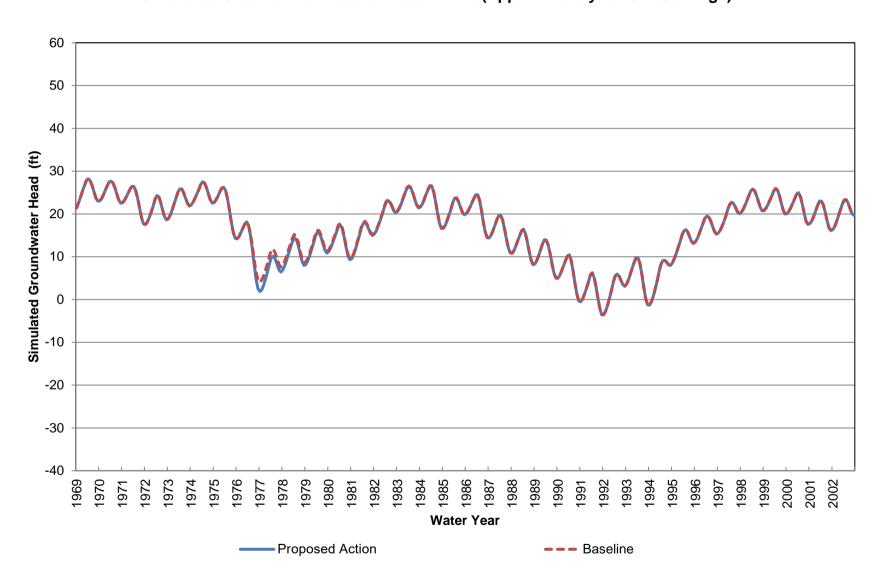
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 16 (Approximately 530-760 ft bgs)



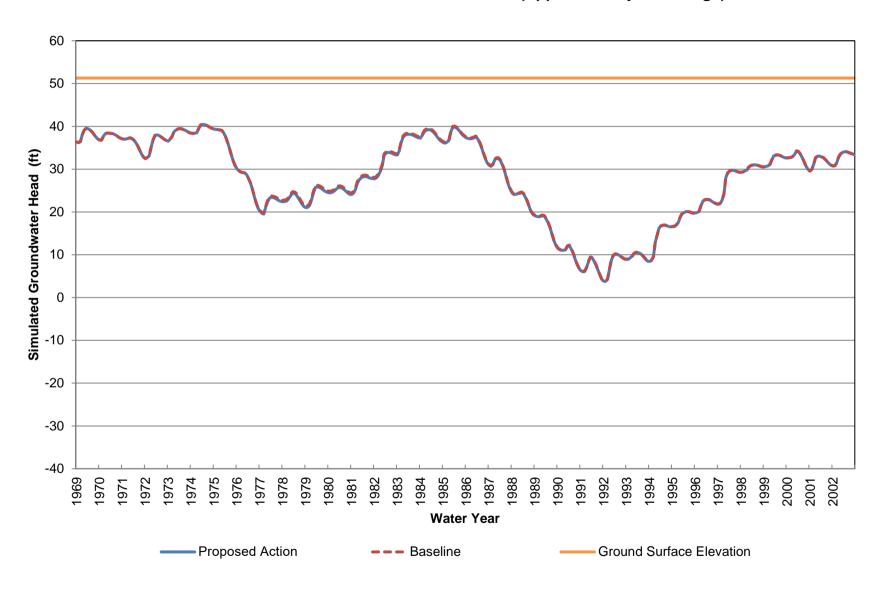
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 16 (Approximately 760-1020 ft bgs)



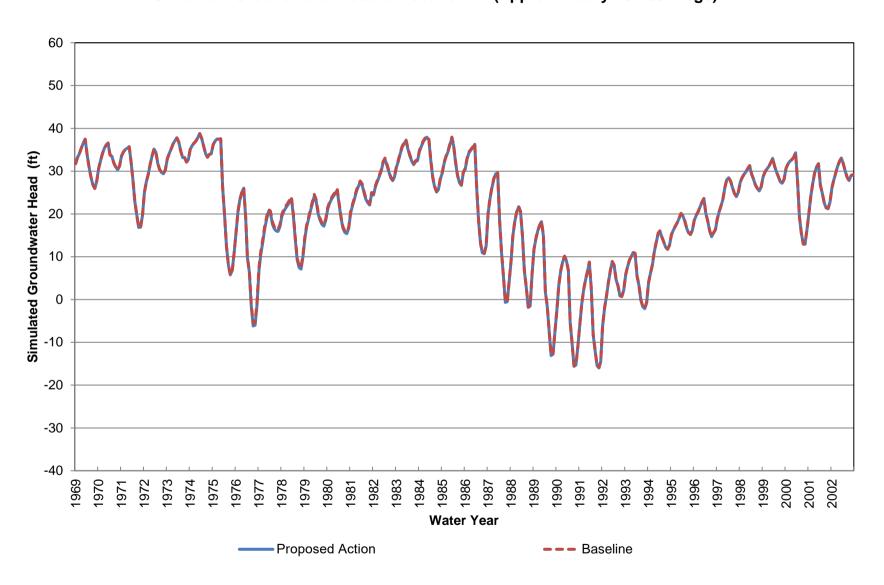
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 16 (Approximately 1020-1390 ft bgs)



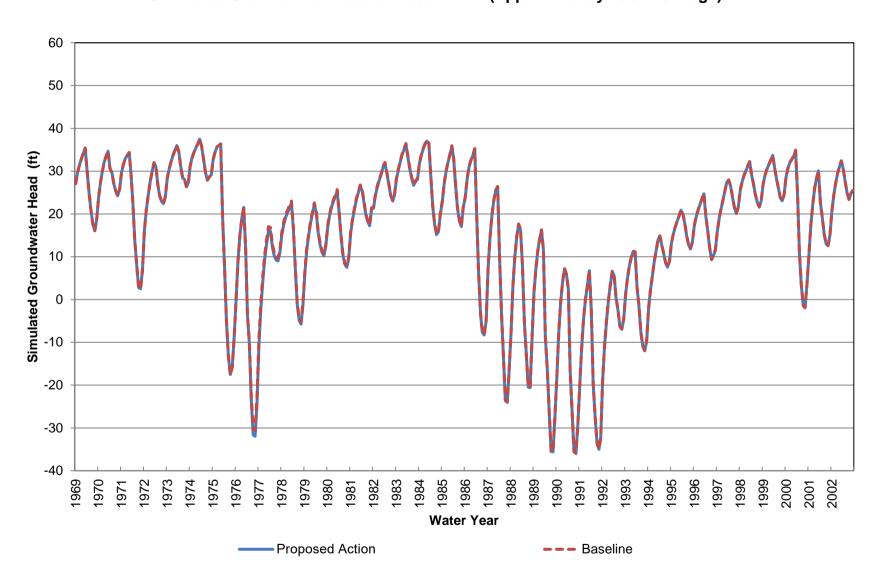
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 17 (Approximately 0-70 ft bgs)



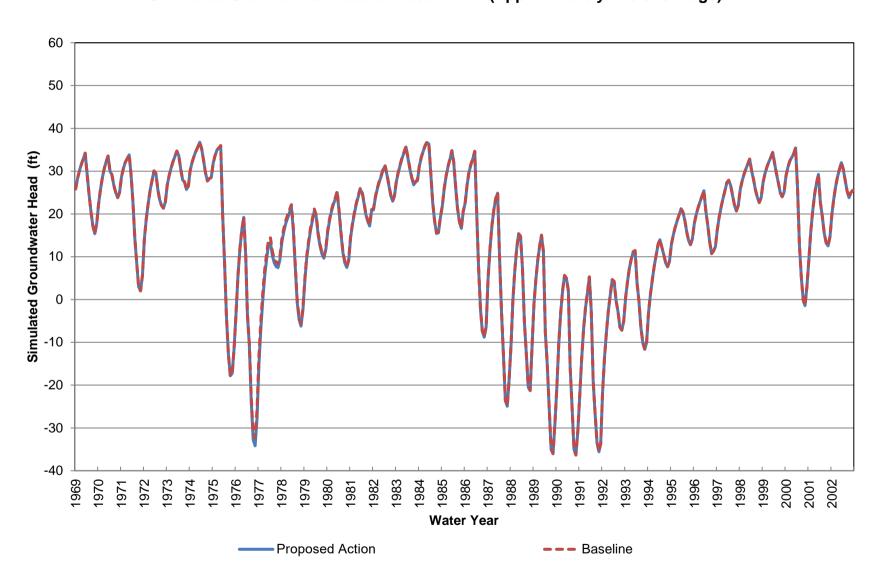
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 17 (Approximately 70-250 ft bgs)



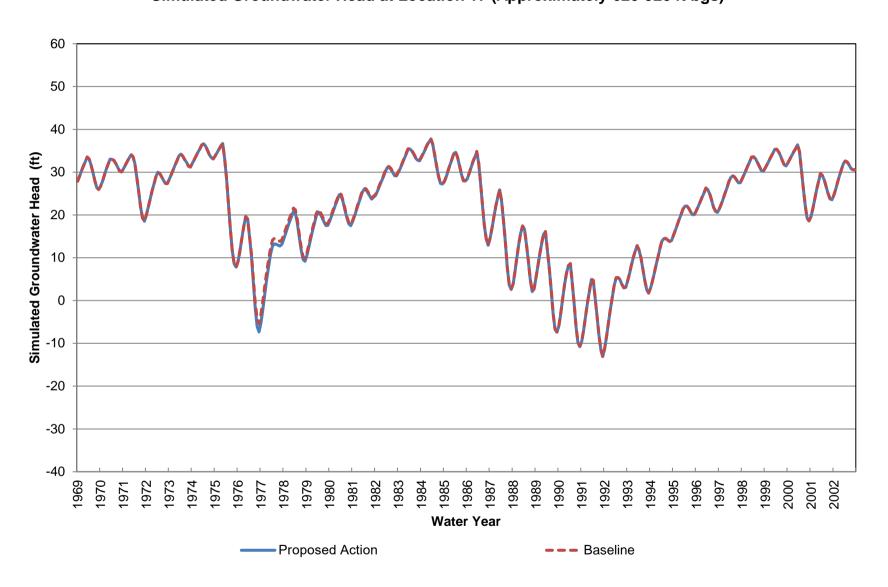
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 17 (Approximately 250-440 ft bgs)



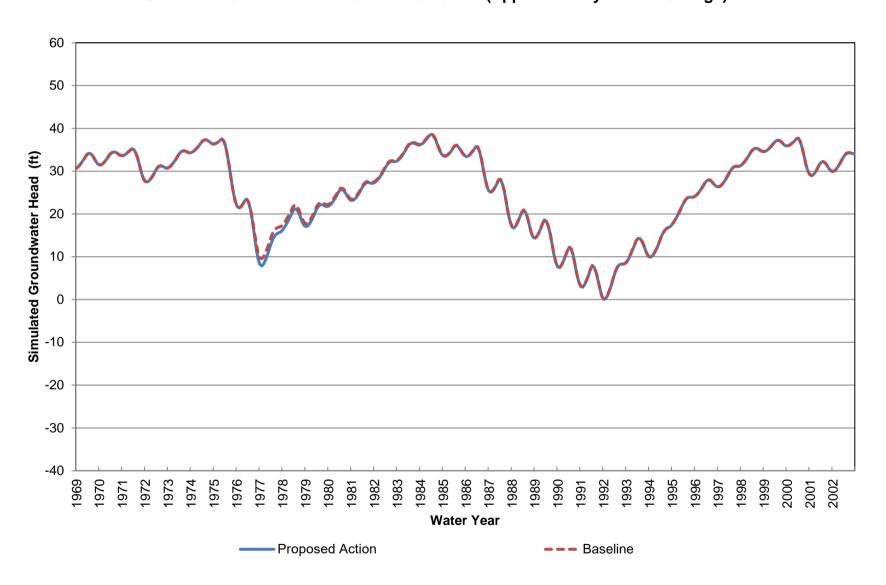
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 17 (Approximately 440-620 ft bgs)



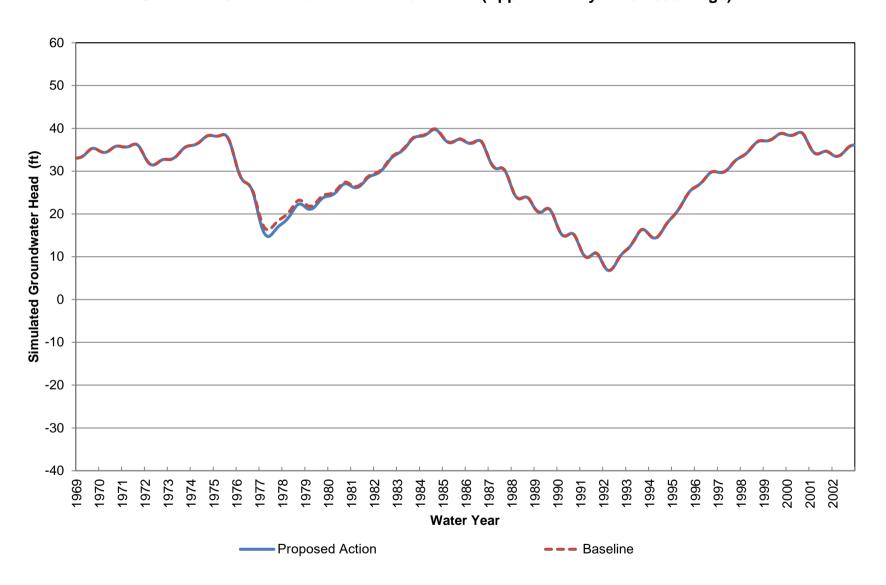
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 17 (Approximately 620-920 ft bgs)



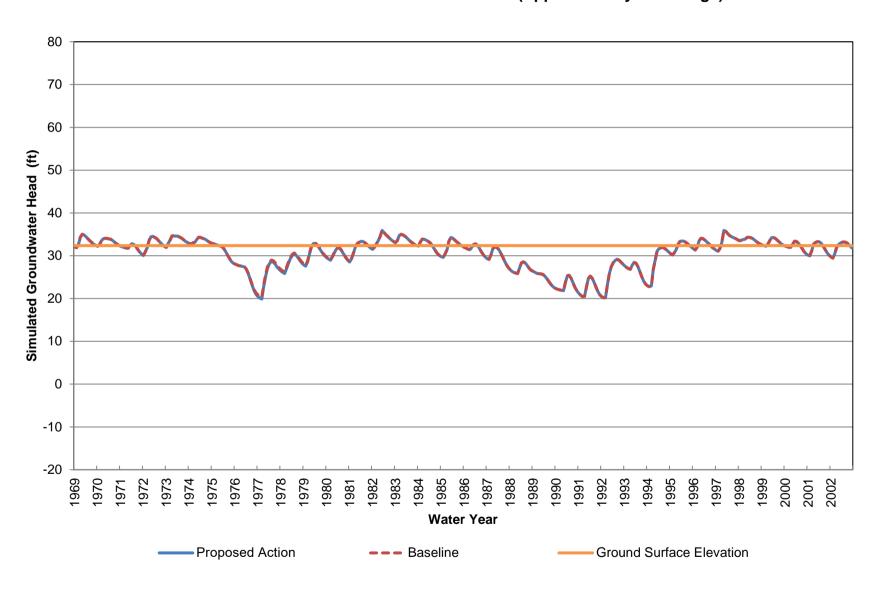
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 17 (Approximately 920-1220 ft bgs)



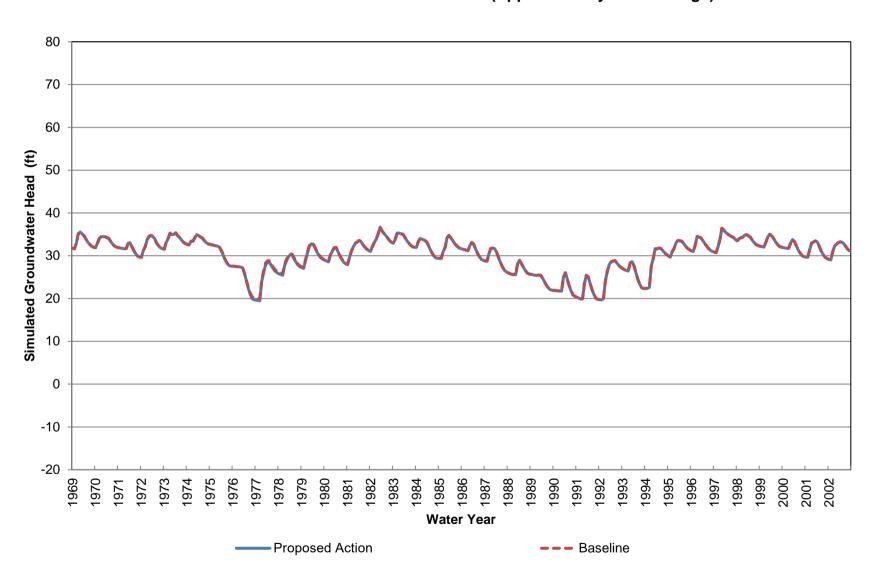
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 17 (Approximately 1220-1680 ft bgs)



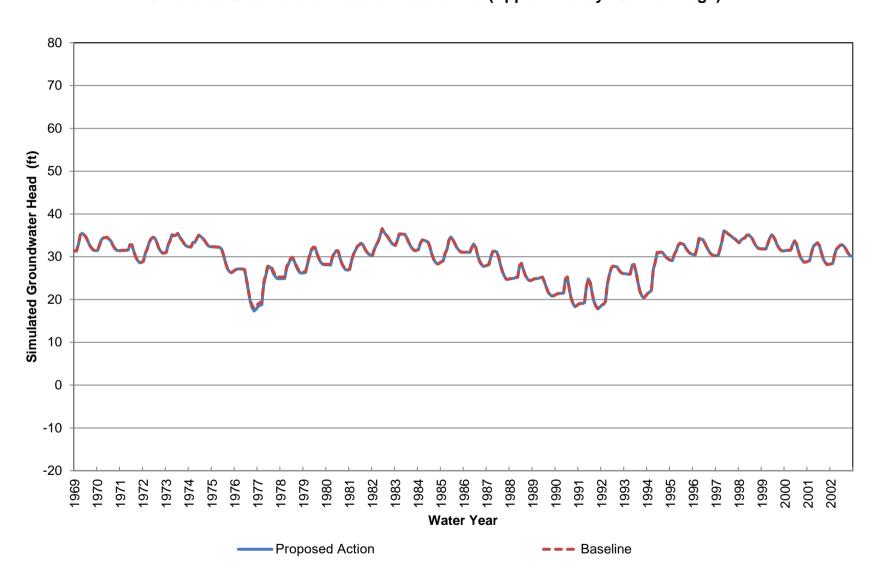
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 18 (Approximately 0-60 ft bgs)



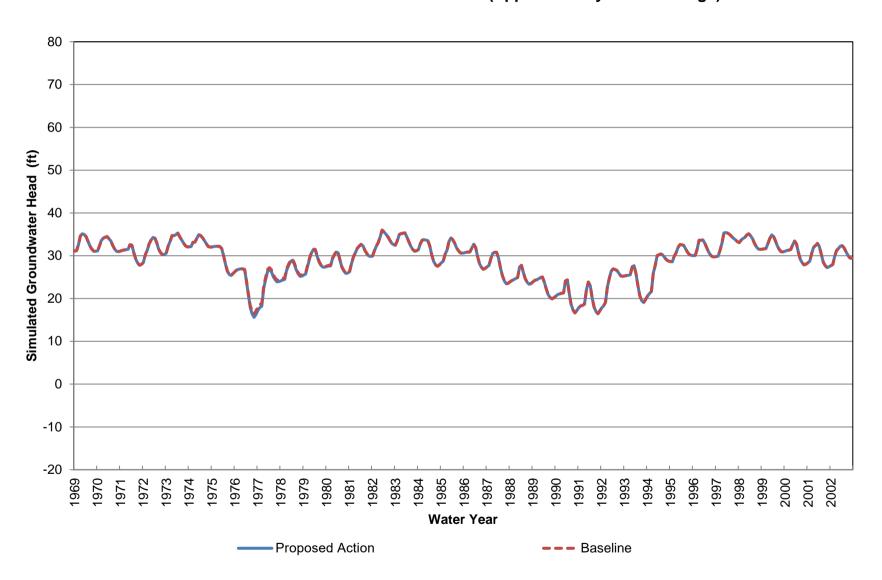
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 18 (Approximately 60-150 ft bgs)



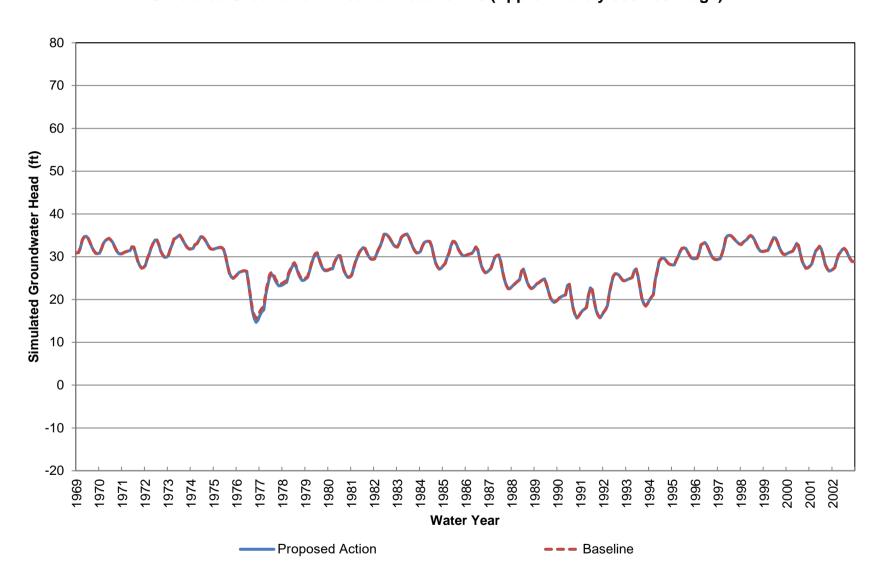
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 18 (Approximately 150-240 ft bgs)



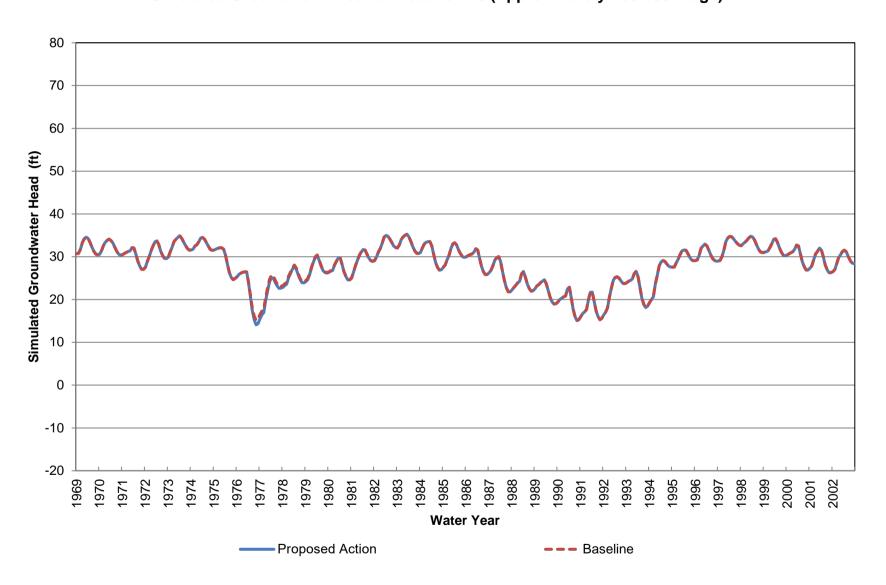
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 18 (Approximately 240-330 ft bgs)



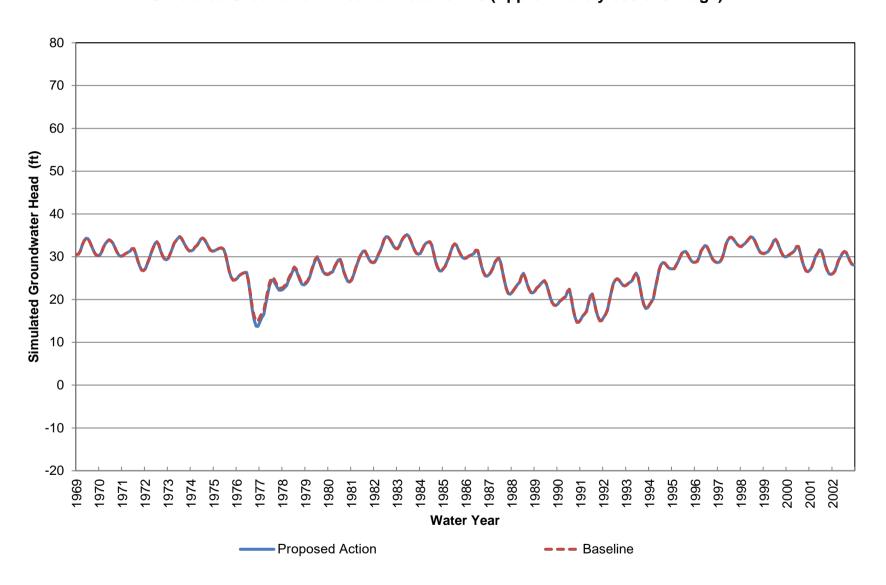
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 18 (Approximately 330-450 ft bgs)



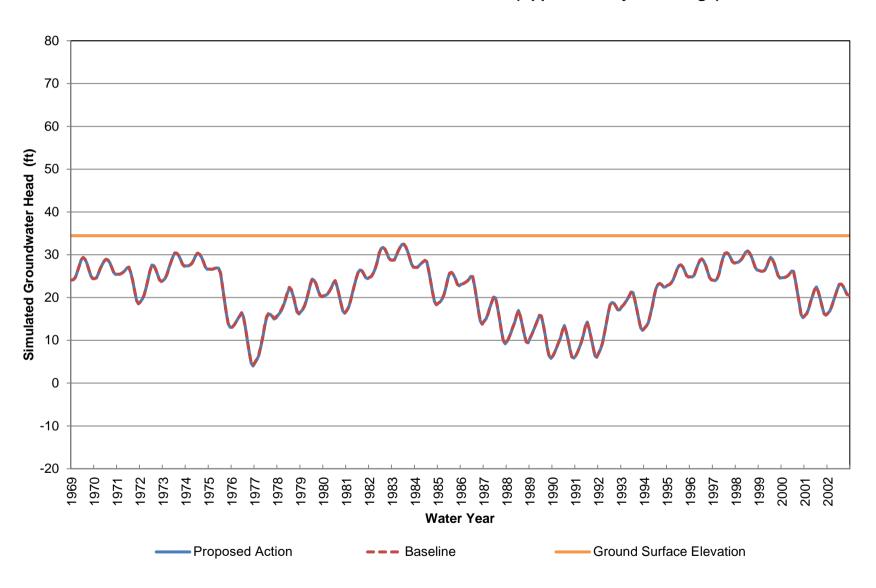
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 18 (Approximately 450-600 ft bgs)



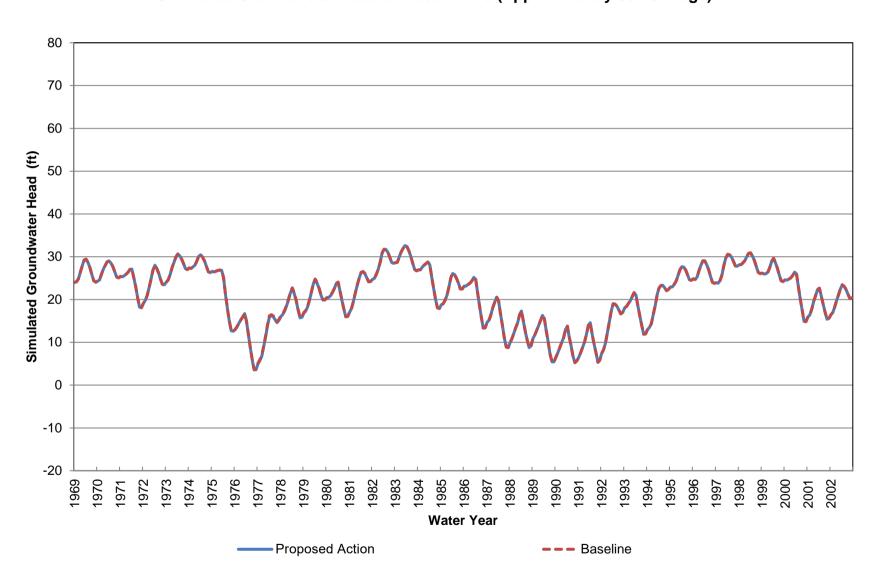
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 18 (Approximately 600-820 ft bgs)



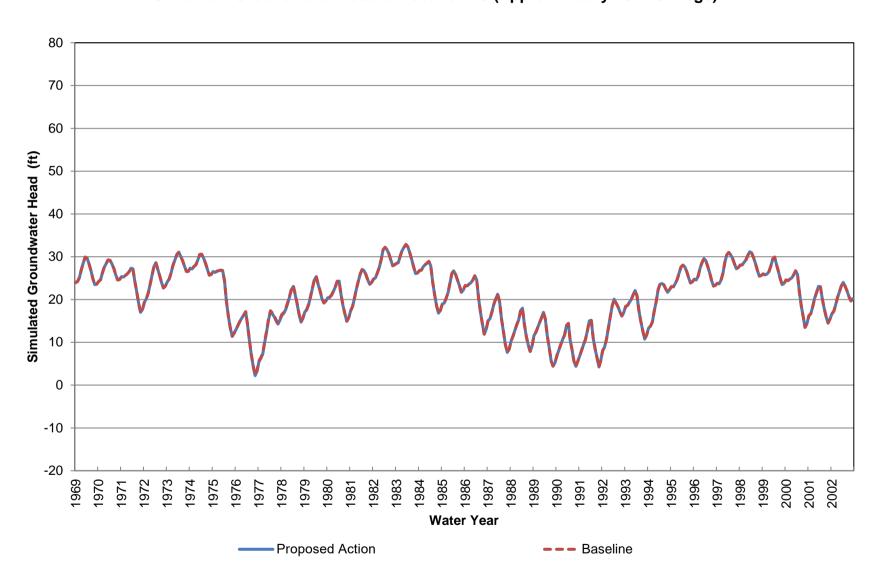
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 19 (Approximately 0-30 ft bgs)



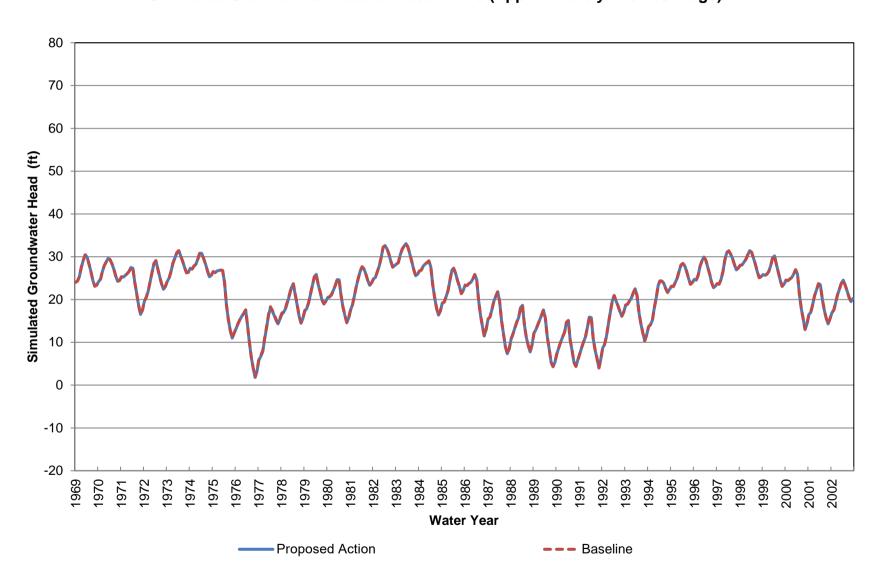
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 19 (Approximately 30-70 ft bgs)



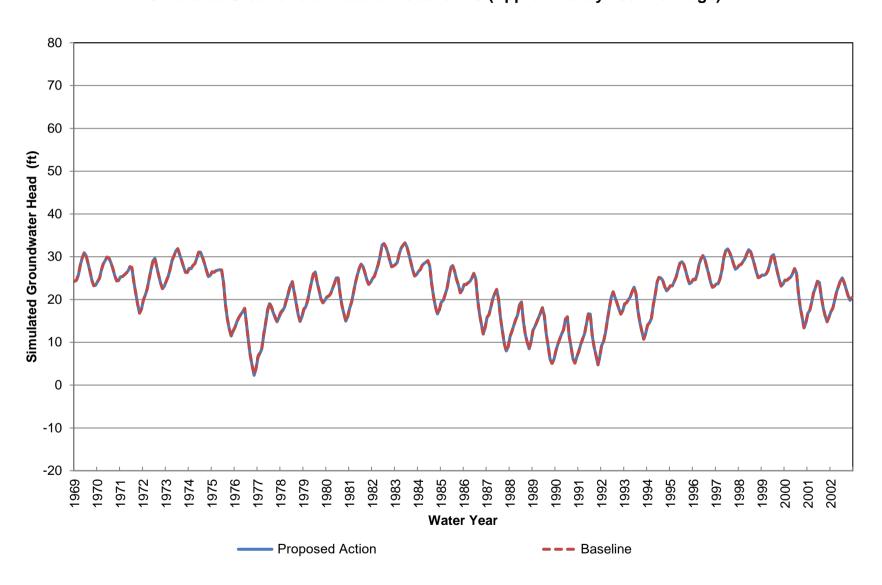
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 19 (Approximately 70-120 ft bgs)



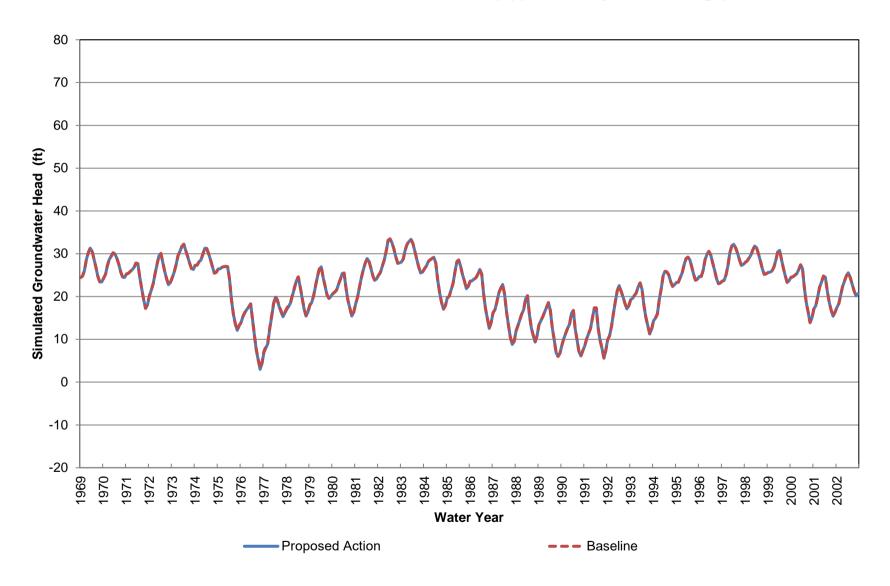
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 19 (Approximately 120-160 ft bgs)



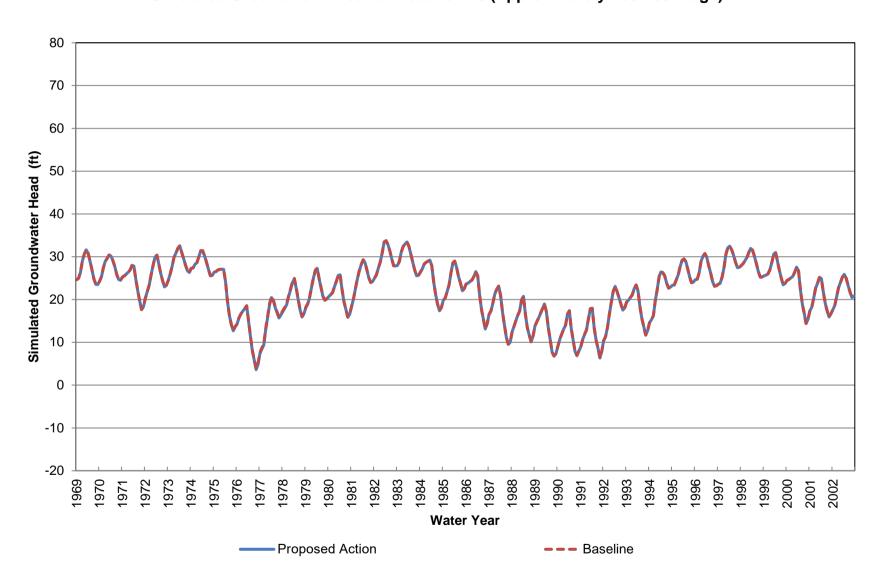
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 19 (Approximately 160-220 ft bgs)



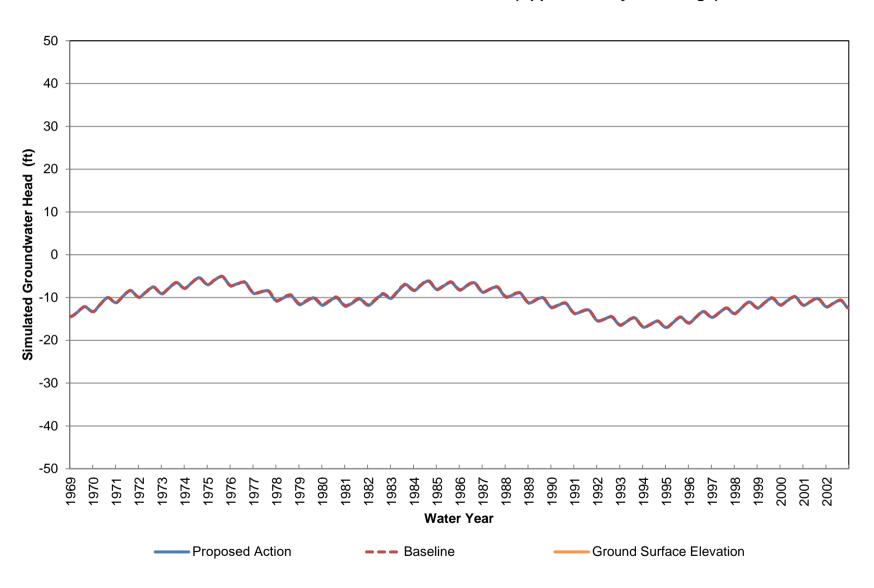




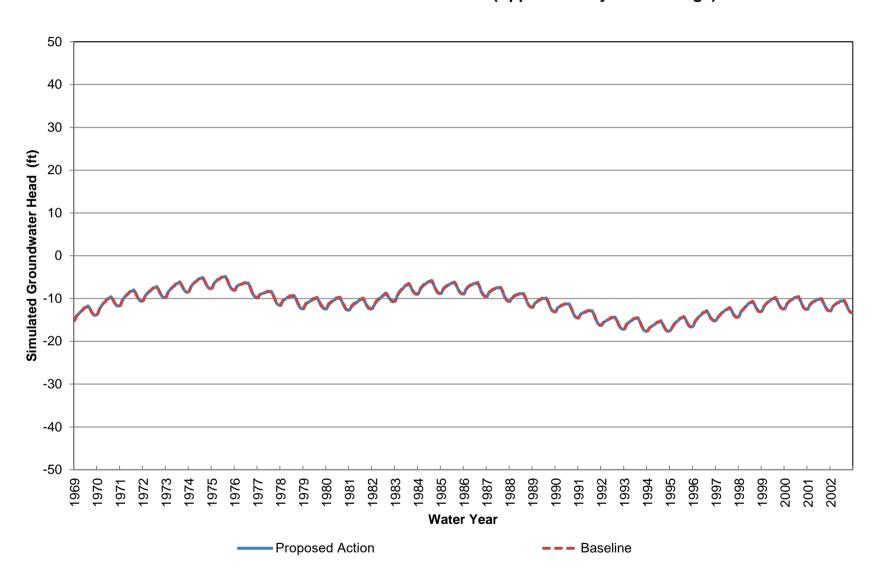
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 19 (Approximately 290-400 ft bgs)



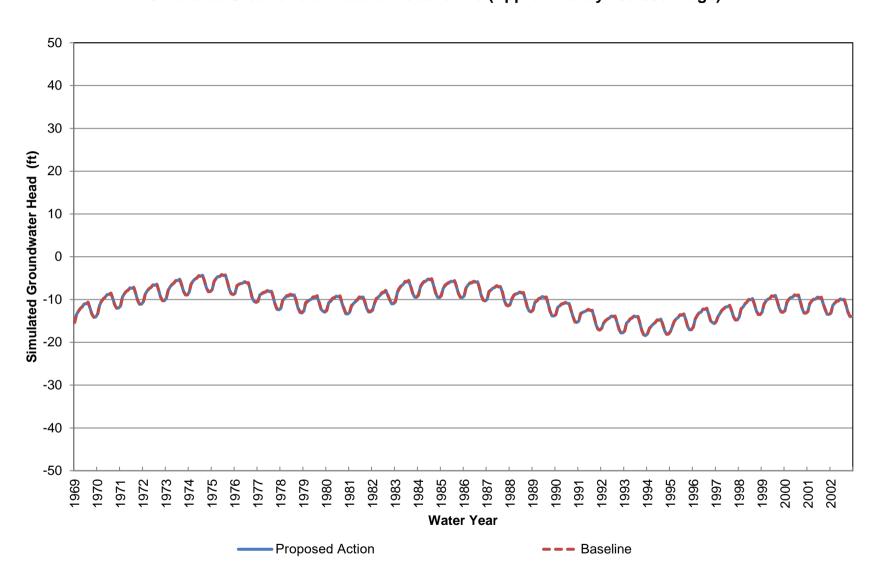
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 20 (Approximately 0-70 ft bgs)



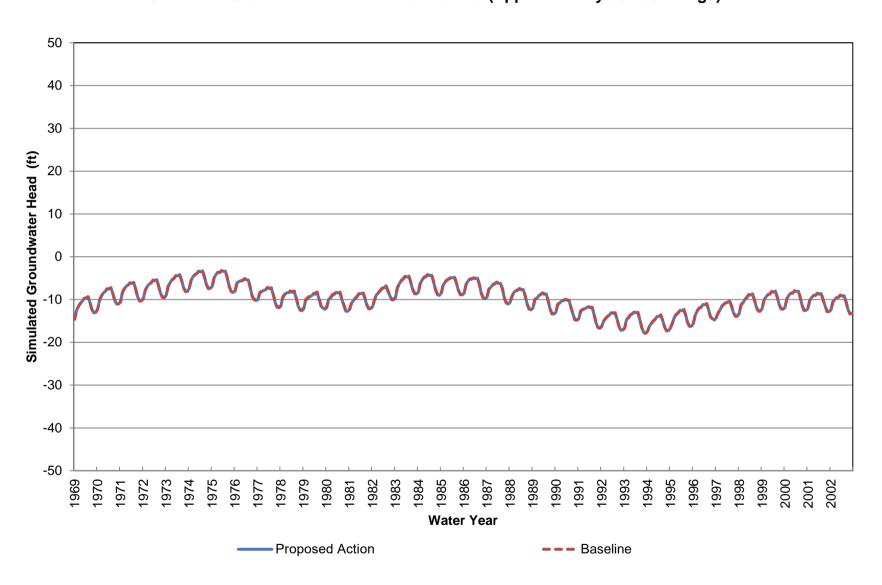
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 20 (Approximately 70-230 ft bgs)



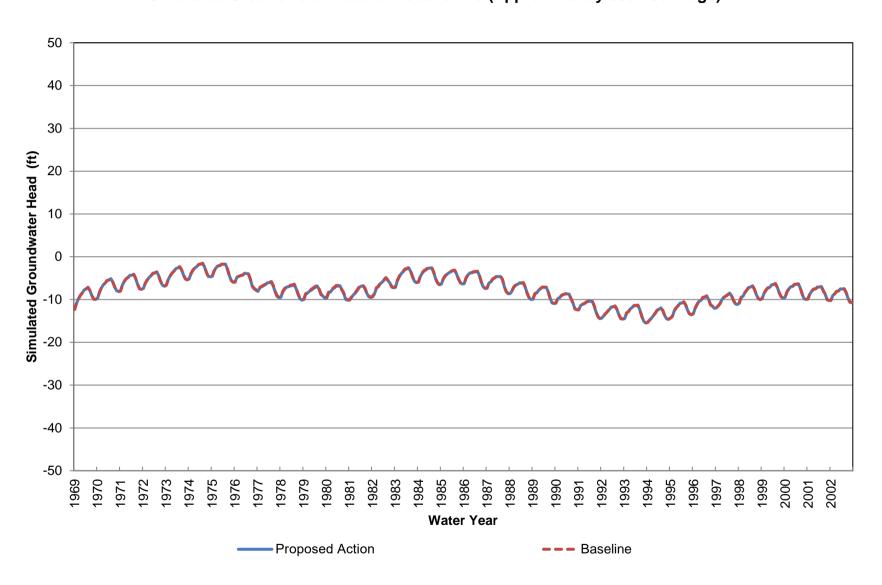
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 20 (Approximately 230-380 ft bgs)



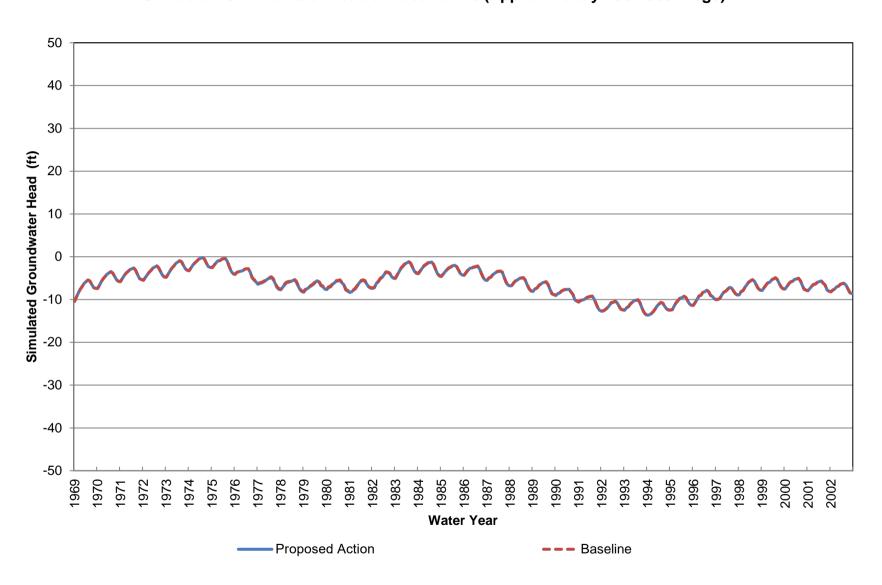
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 20 (Approximately 380-530 ft bgs)



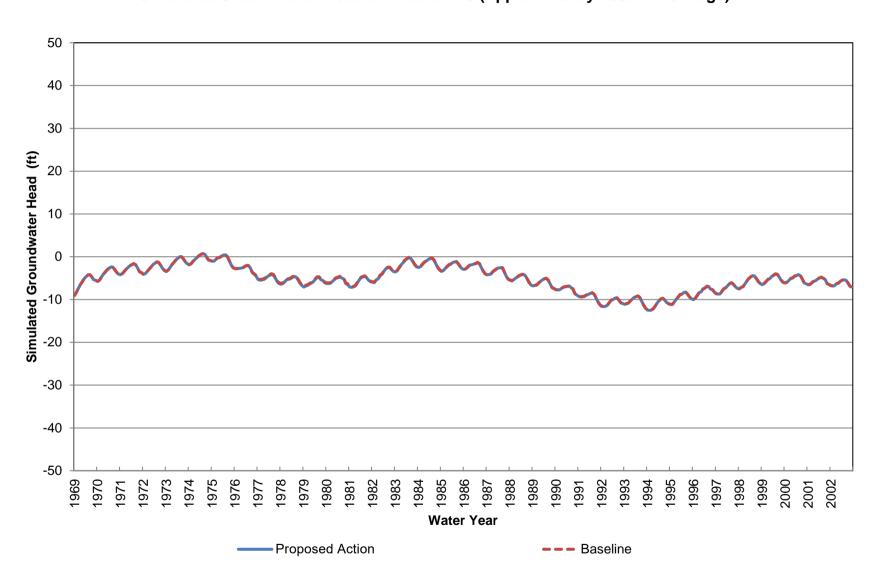
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 20 (Approximately 530-780 ft bgs)



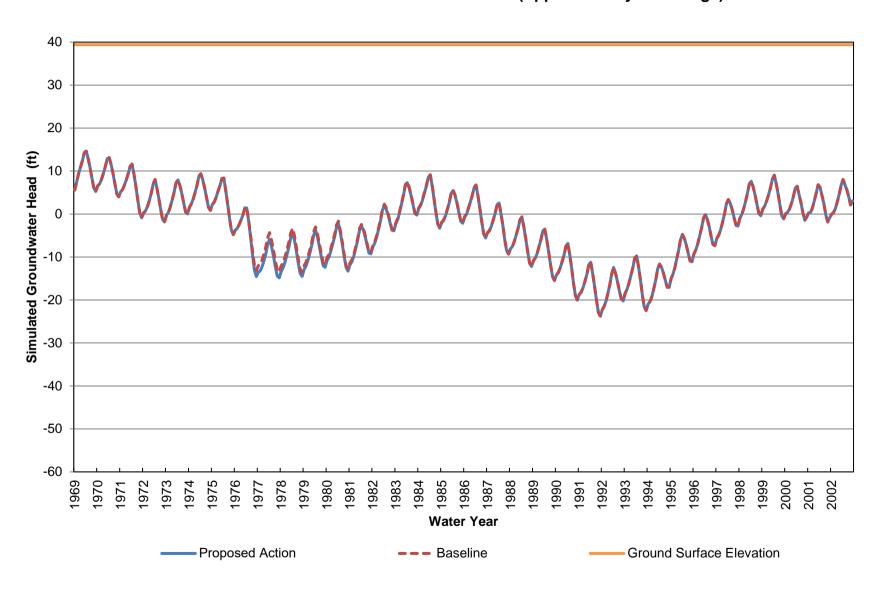
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 20 (Approximately 780-1030 ft bgs)



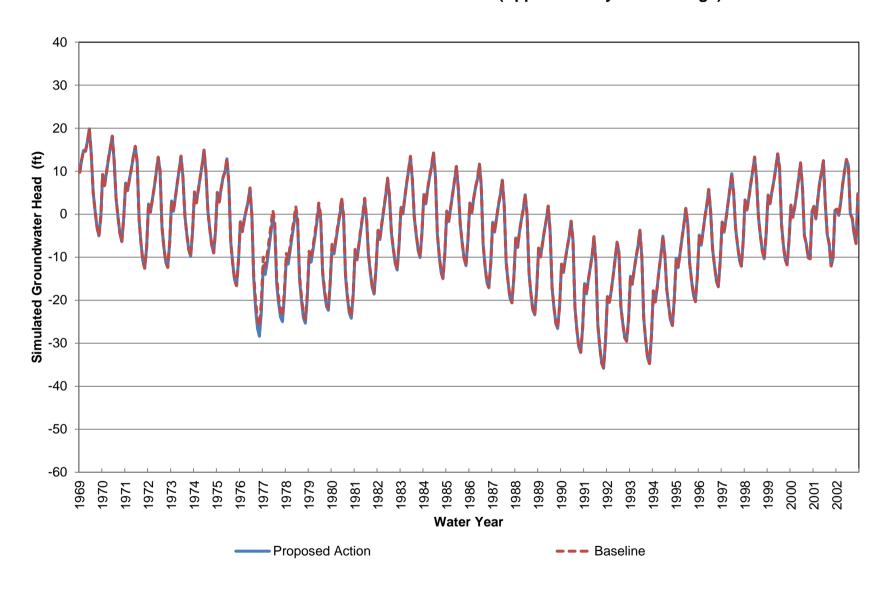
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 20 (Approximately 1030-1420 ft bgs)



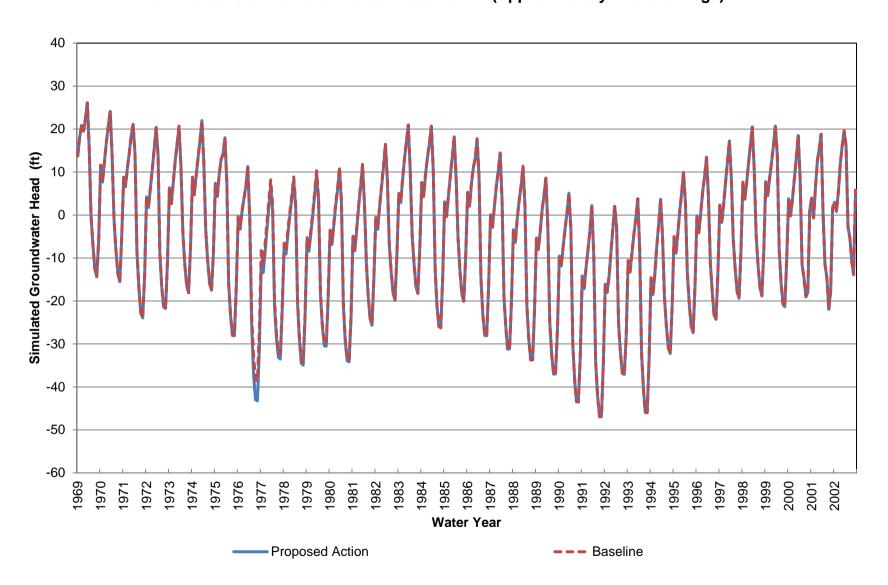
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 21 (Approximately 0-70 ft bgs)



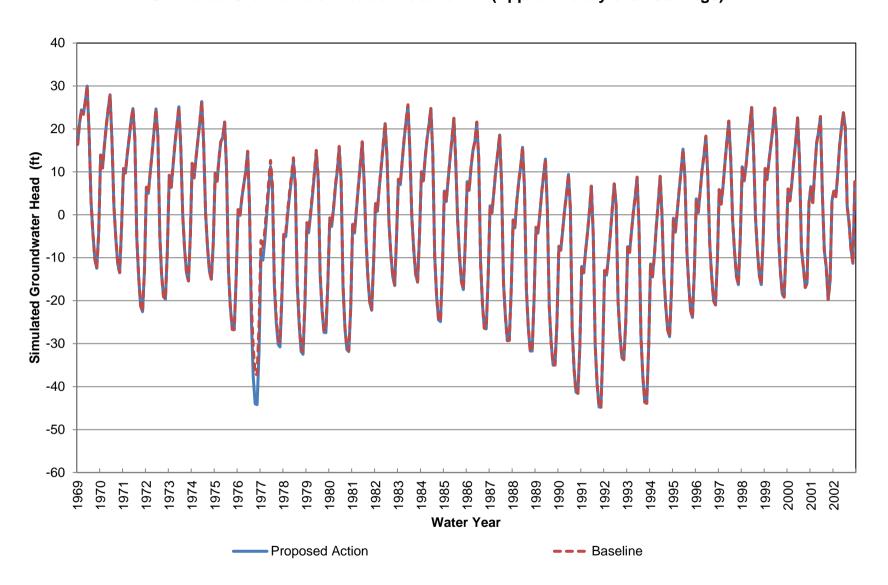
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 21 (Approximately 70-210 ft bgs)



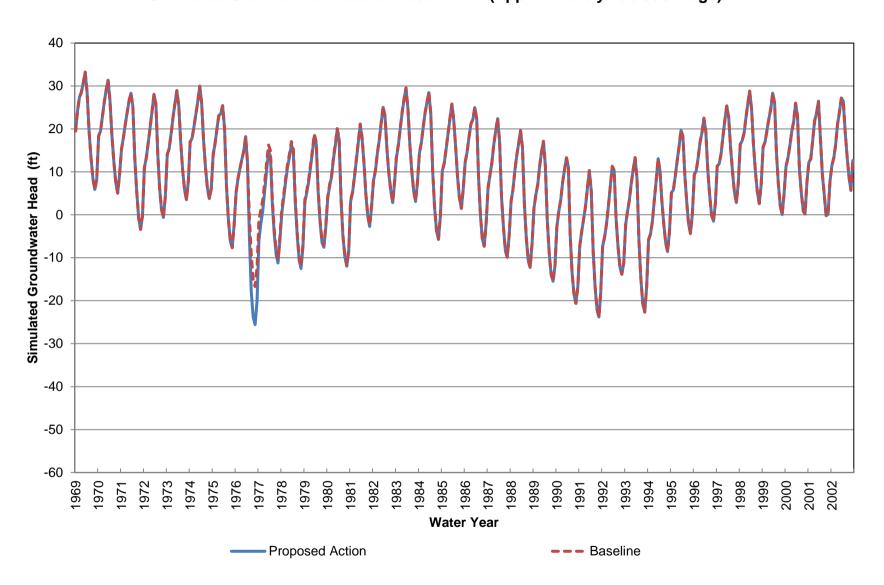
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 21 (Approximately 210-340 ft bgs)



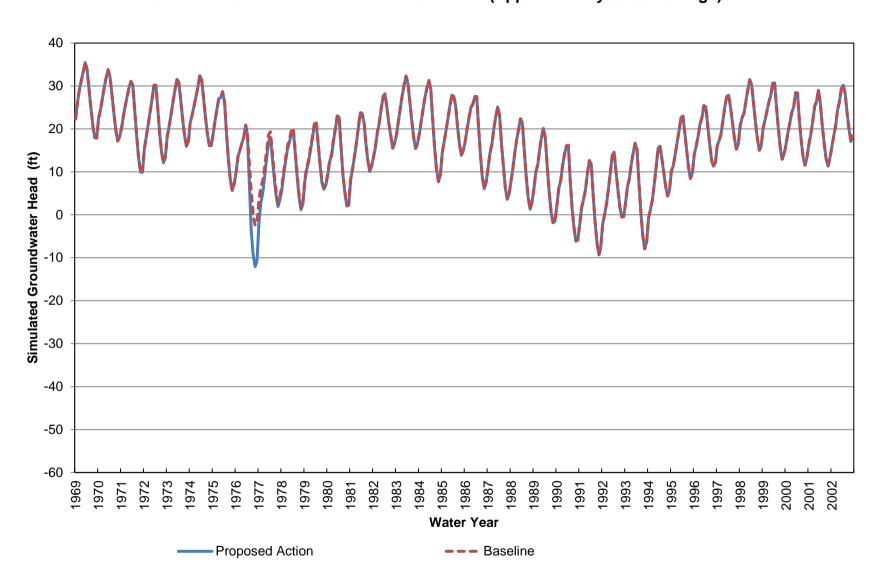
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 21 (Approximately 340-480 ft bgs)



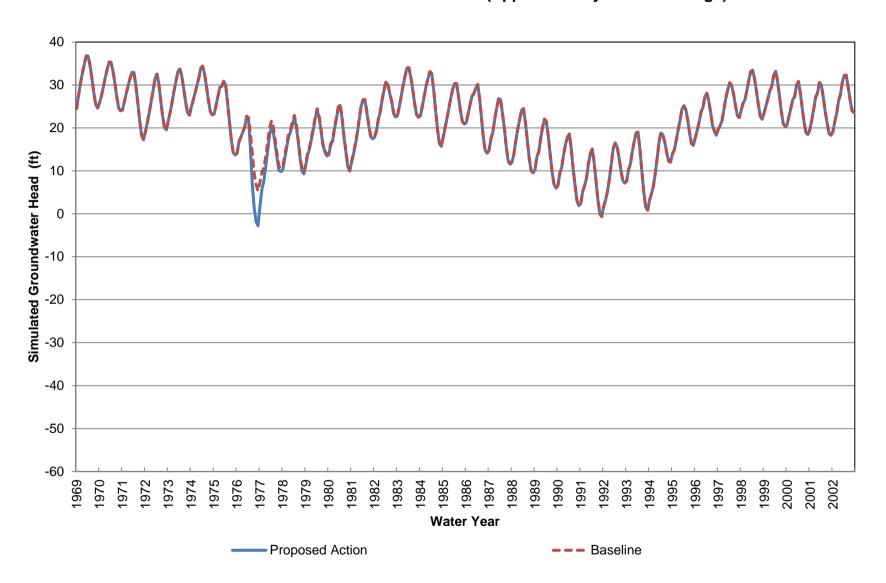
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 21 (Approximately 480-690 ft bgs)



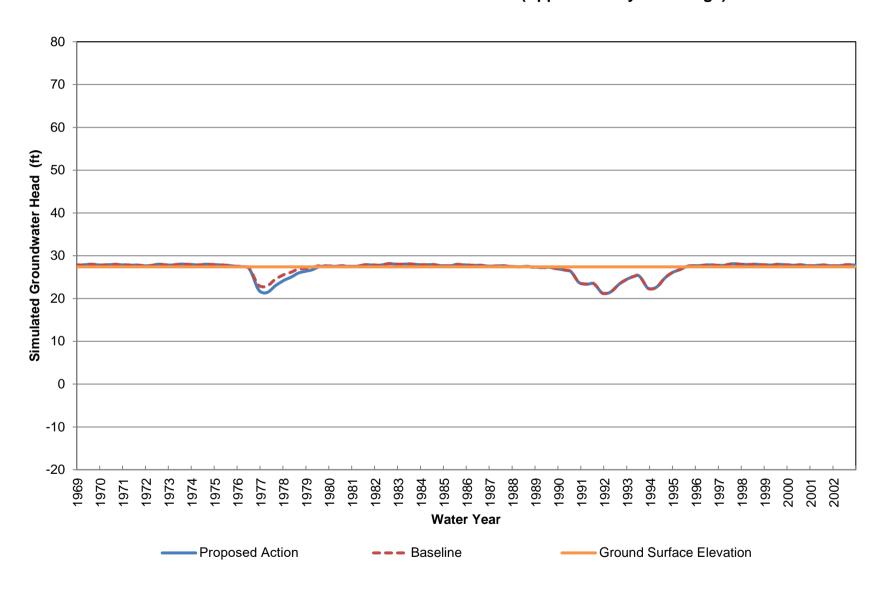
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 21 (Approximately 690-910 ft bgs)



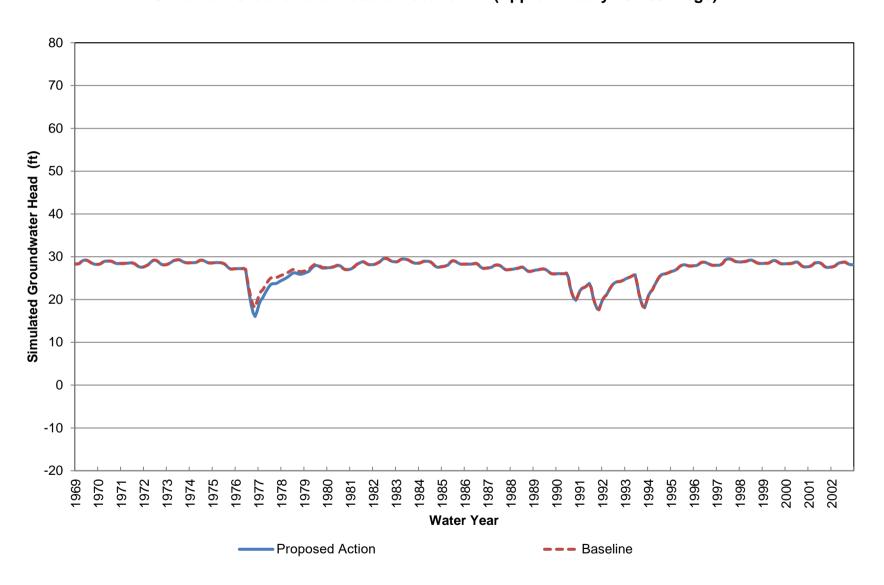
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 21 (Approximately 910-1250 ft bgs)



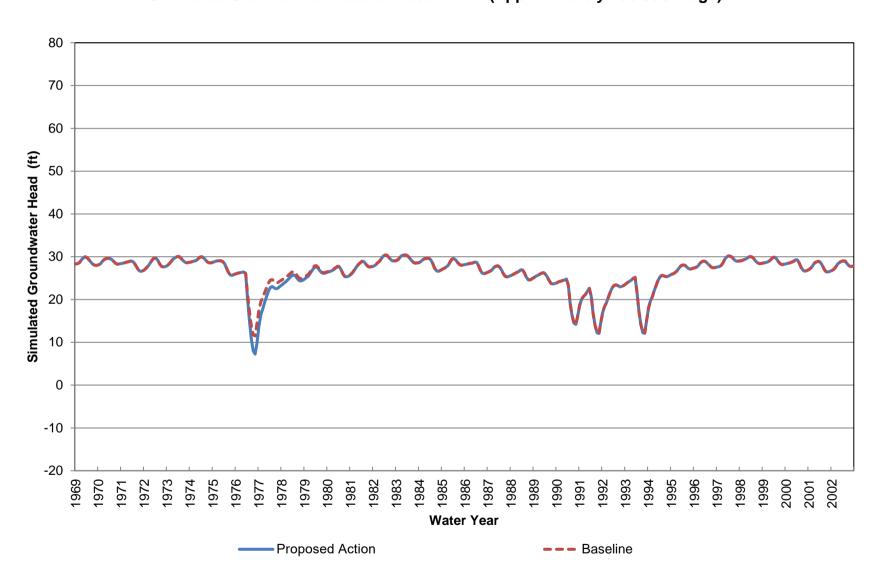
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 22 (Approximately 0-70 ft bgs)



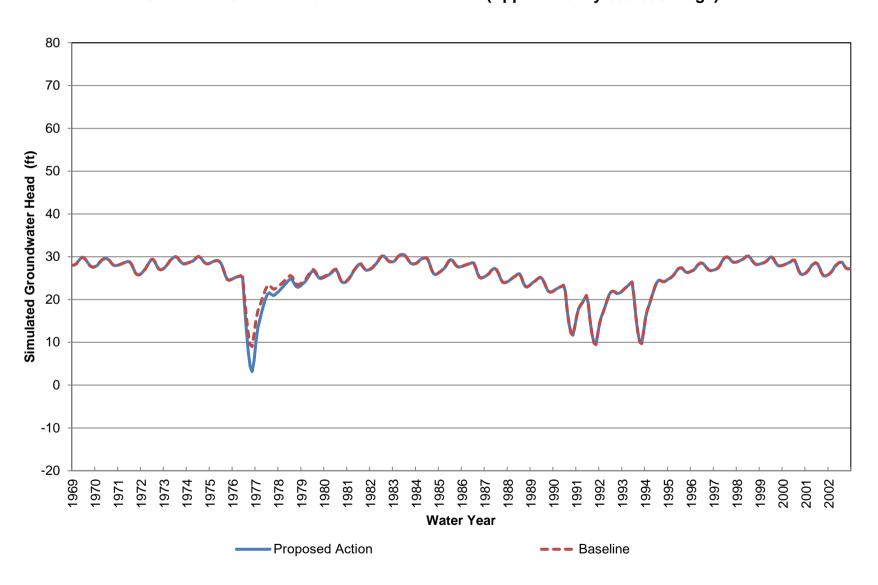
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 22 (Approximately 70-230 ft bgs)



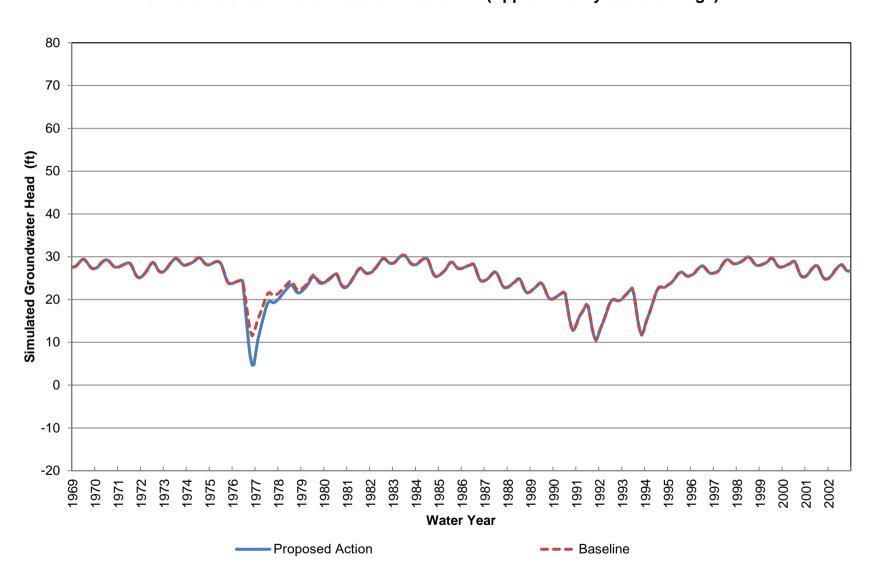
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 22 (Approximately 230-390 ft bgs)



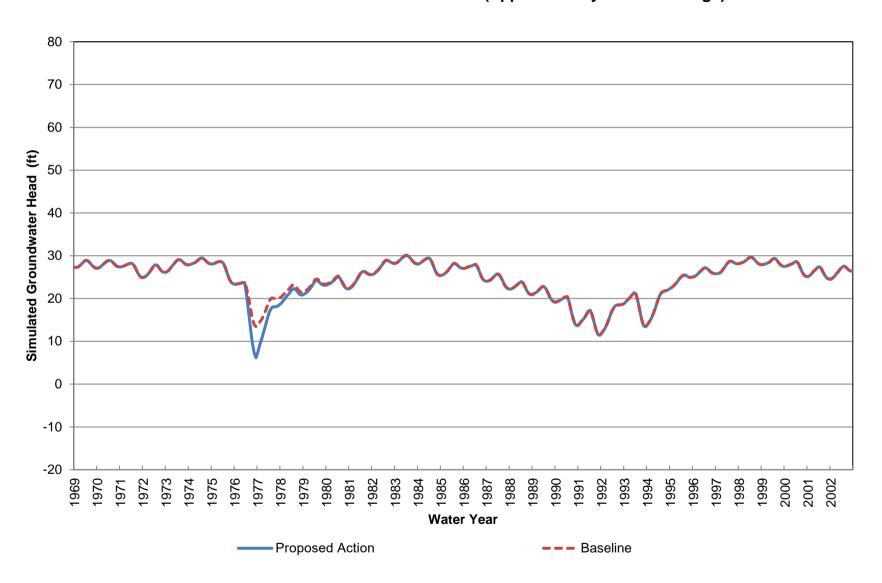
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 22 (Approximately 390-550 ft bgs)



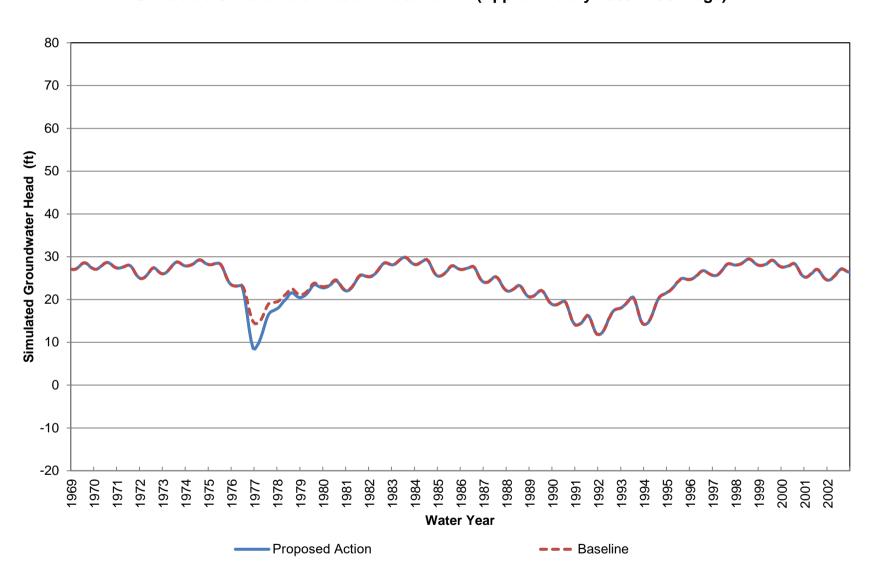
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 22 (Approximately 550-810 ft bgs)



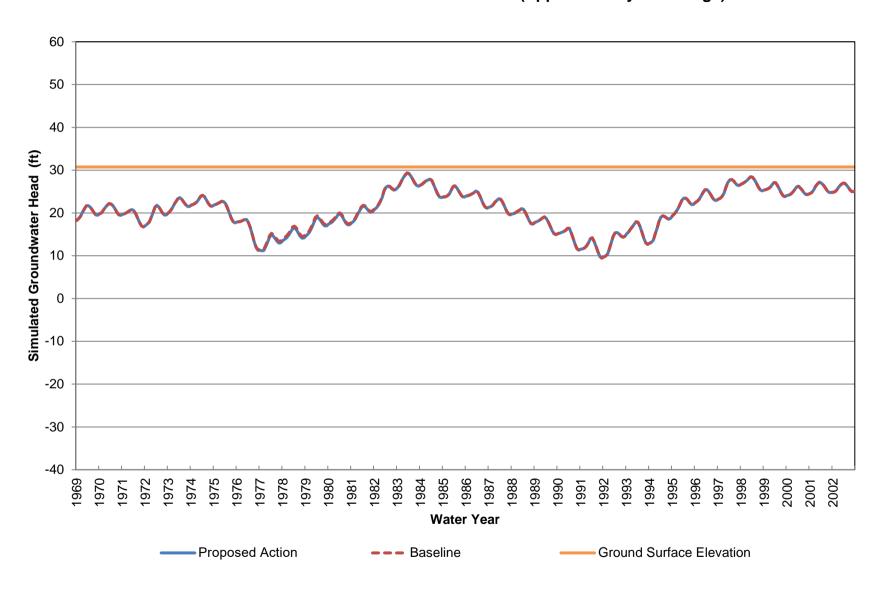
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 22 (Approximately 810-1080 ft bgs)



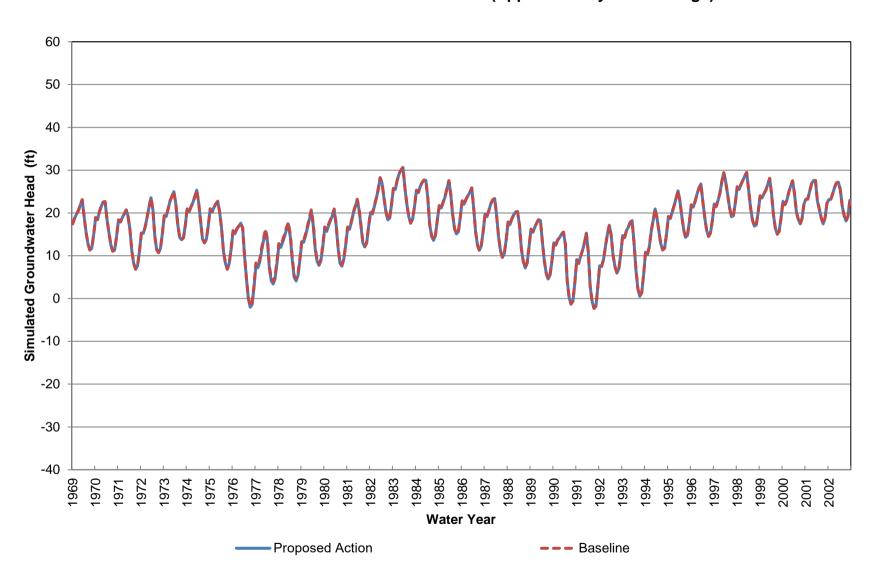
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 22 (Approximately 1080-1480 ft bgs)



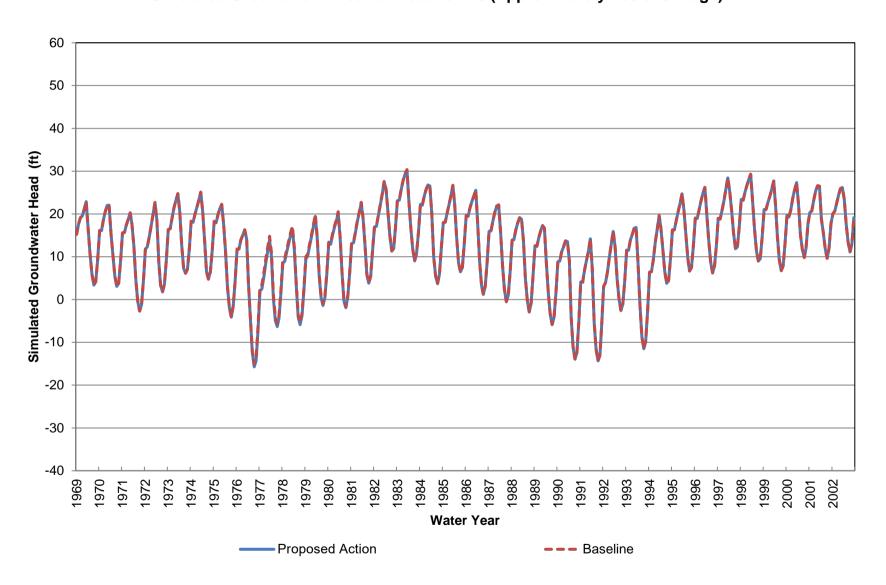
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 23 (Approximately 0-70 ft bgs)



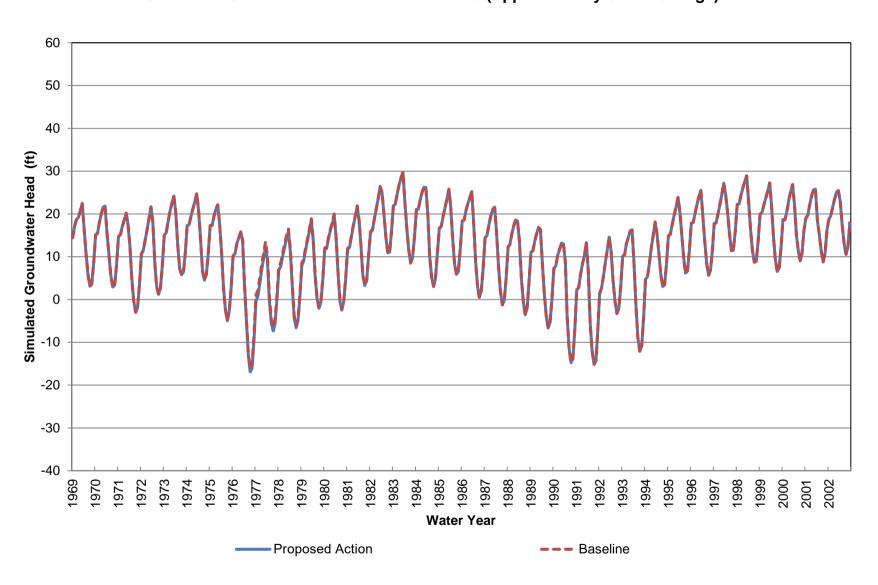
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 23 (Approximately 70-290 ft bgs)



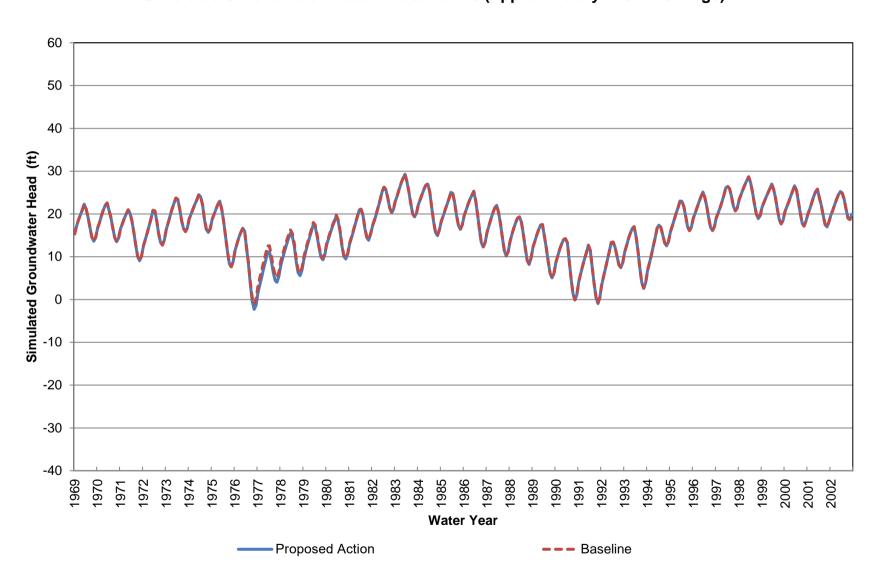
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 23 (Approximately 290-520 ft bgs)



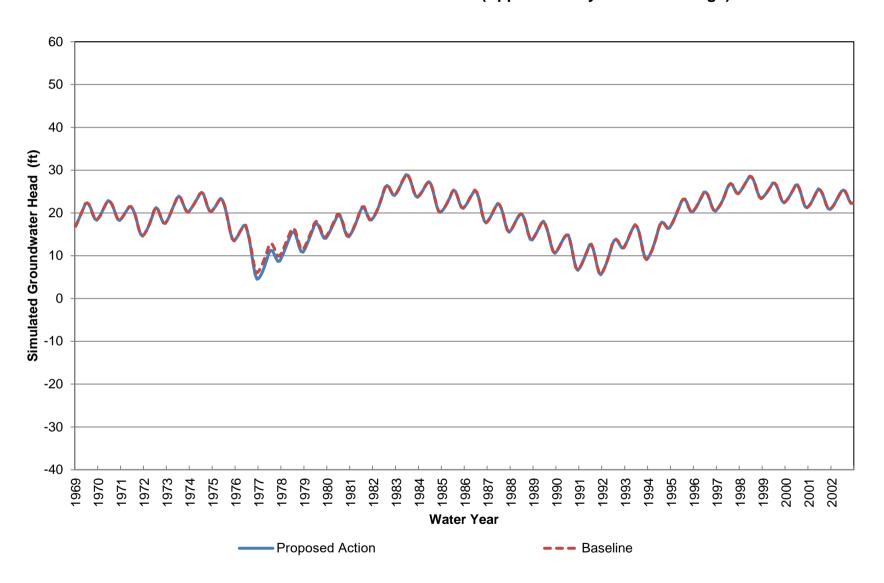
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 23 (Approximately 520-740 ft bgs)



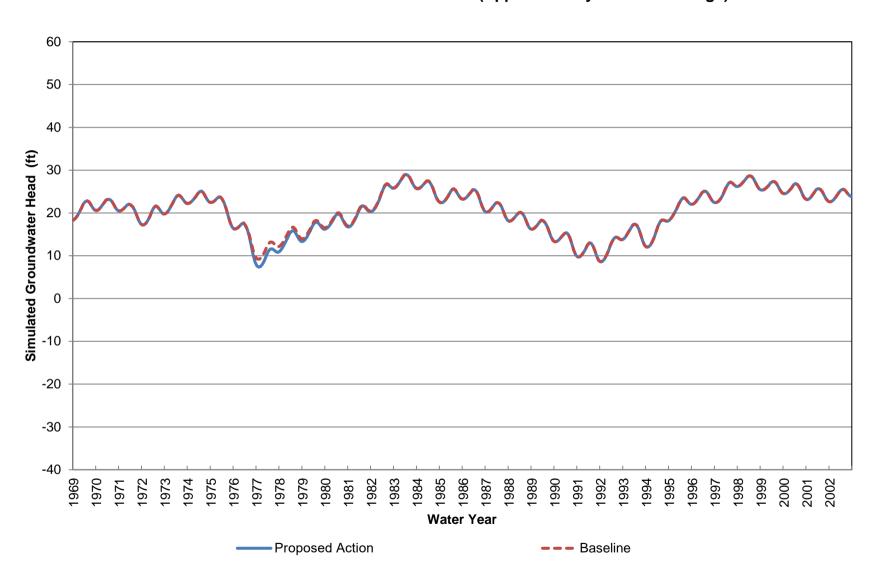
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 23 (Approximately 740-1120 ft bgs)



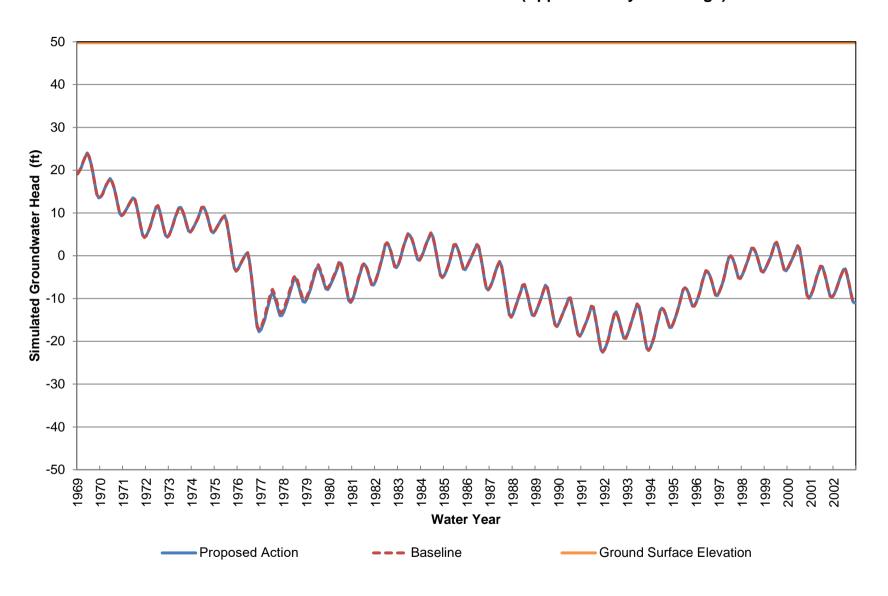
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 23 (Approximately 1120-1500 ft bgs)



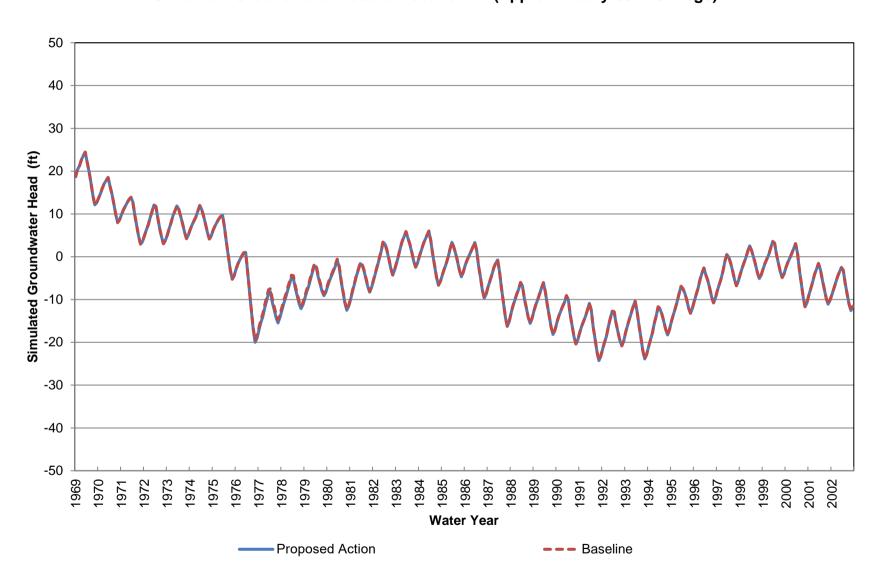
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 23 (Approximately 1500-2050 ft bgs)



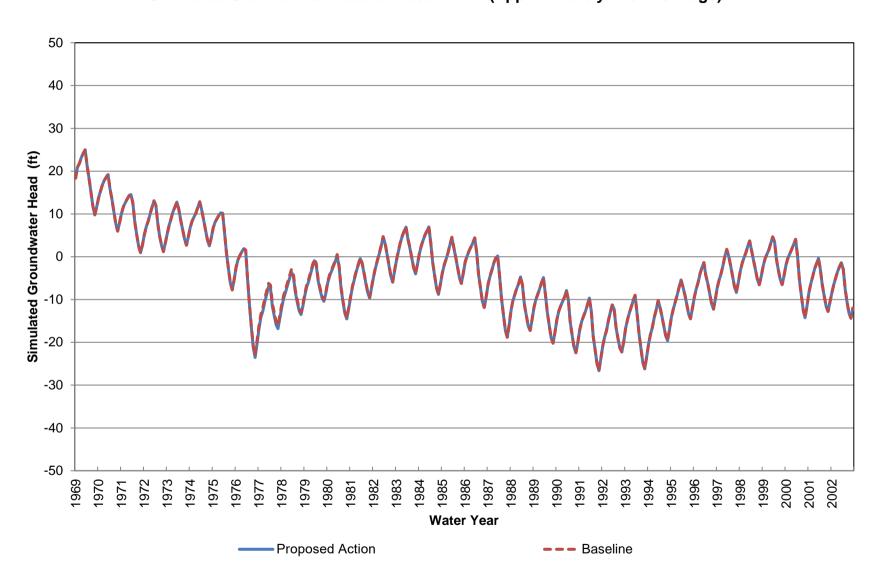
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 24 (Approximately 0-60 ft bgs)



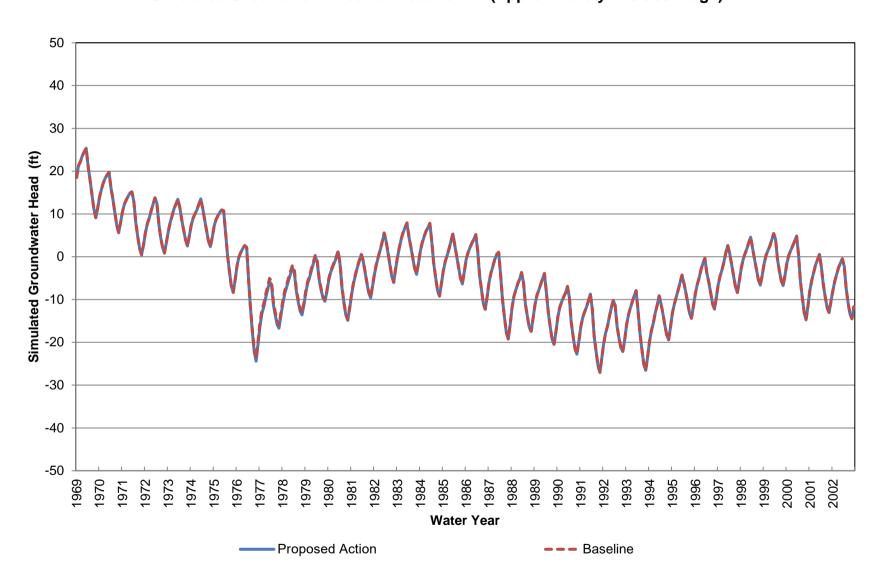
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 24 (Approximately 60-140 ft bgs)



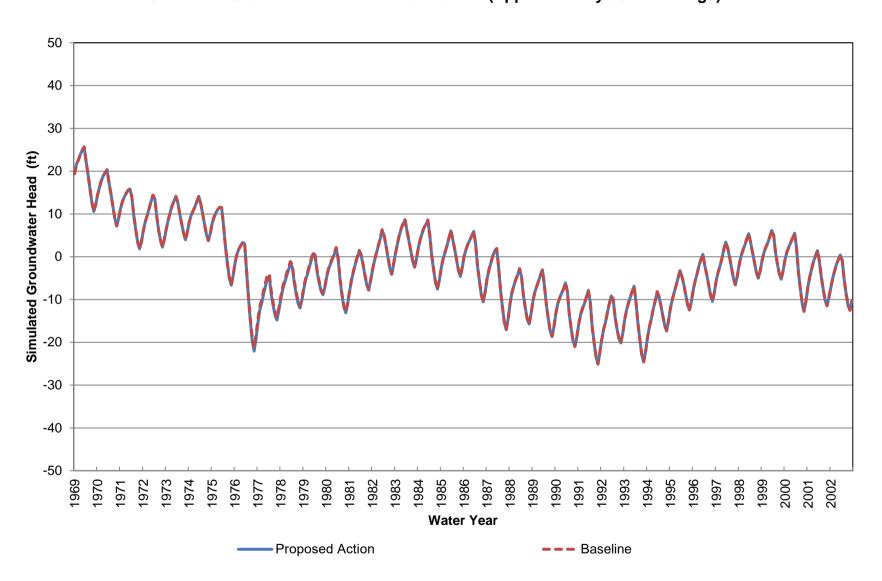
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 24 (Approximately 140-220 ft bgs)



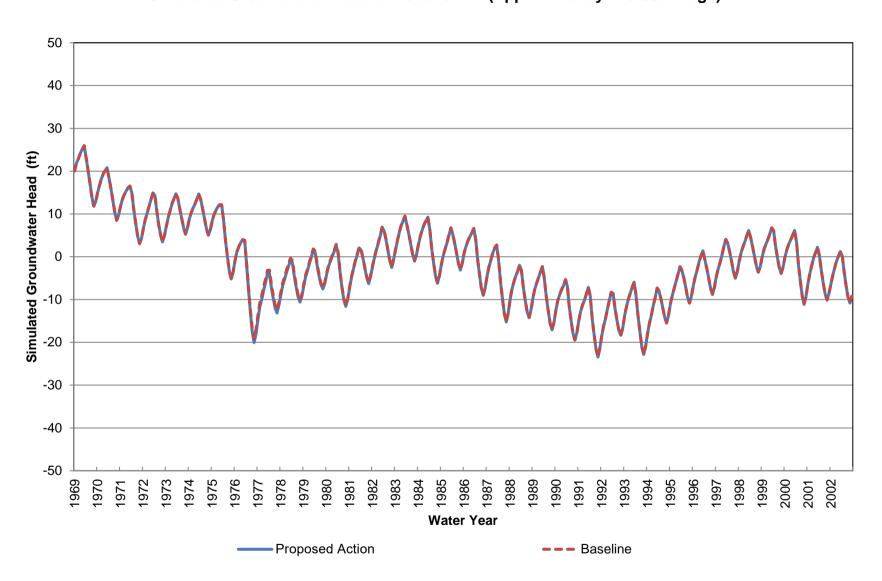
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 24 (Approximately 220-300 ft bgs)



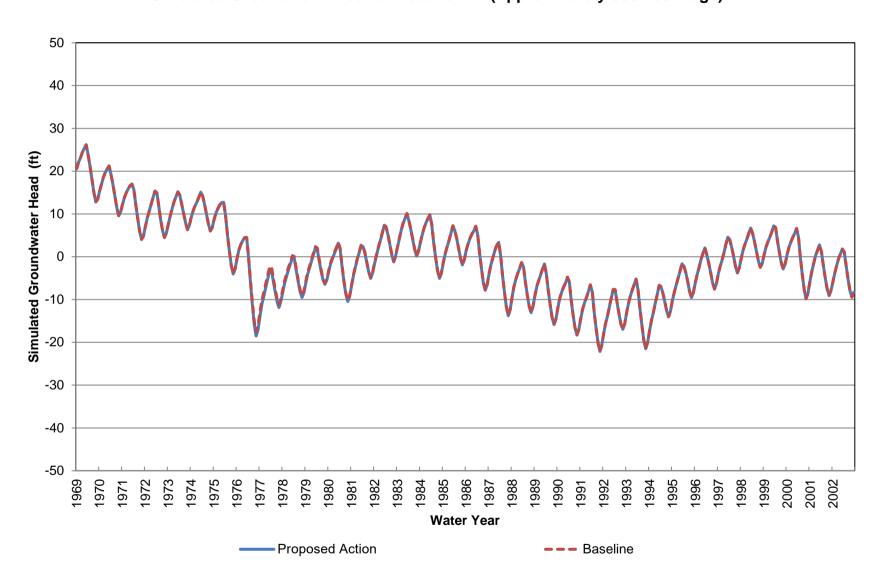
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 24 (Approximately 300-410 ft bgs)



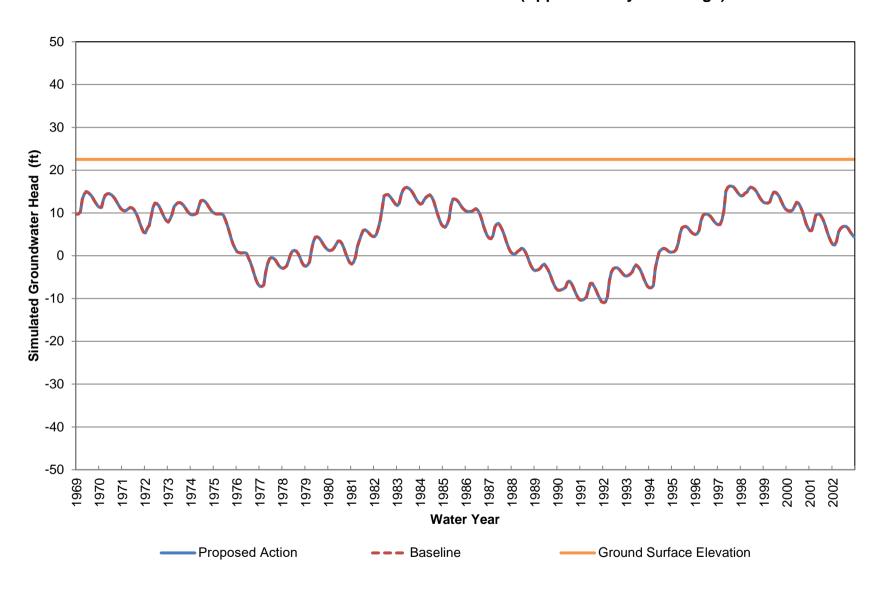
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 24 (Approximately 410-550 ft bgs)



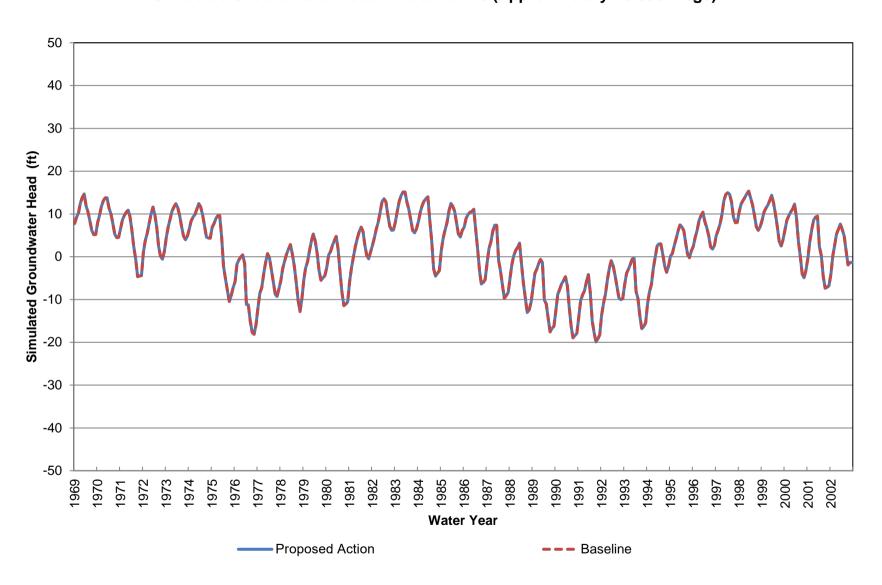
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 24 (Approximately 550-750 ft bgs)



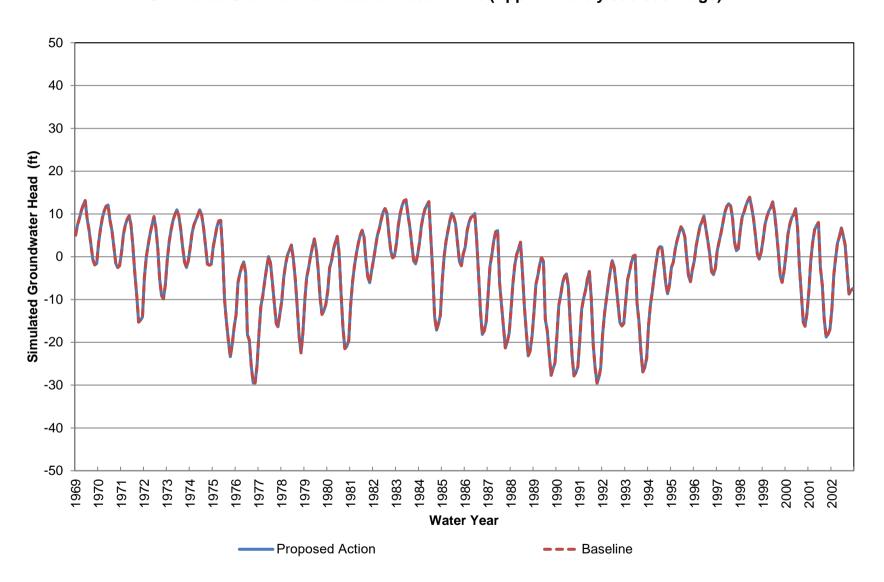
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 25 (Approximately 0-70 ft bgs)



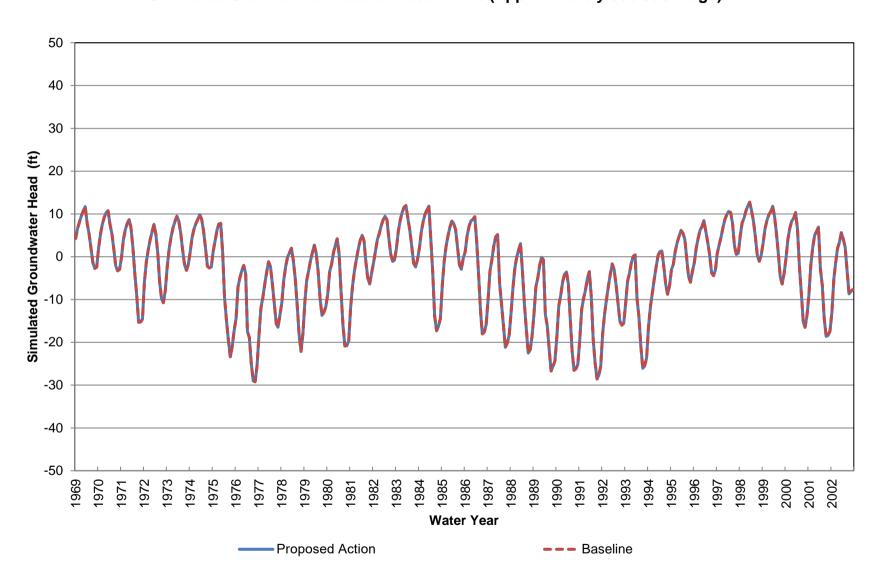
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 25 (Approximately 70-380 ft bgs)



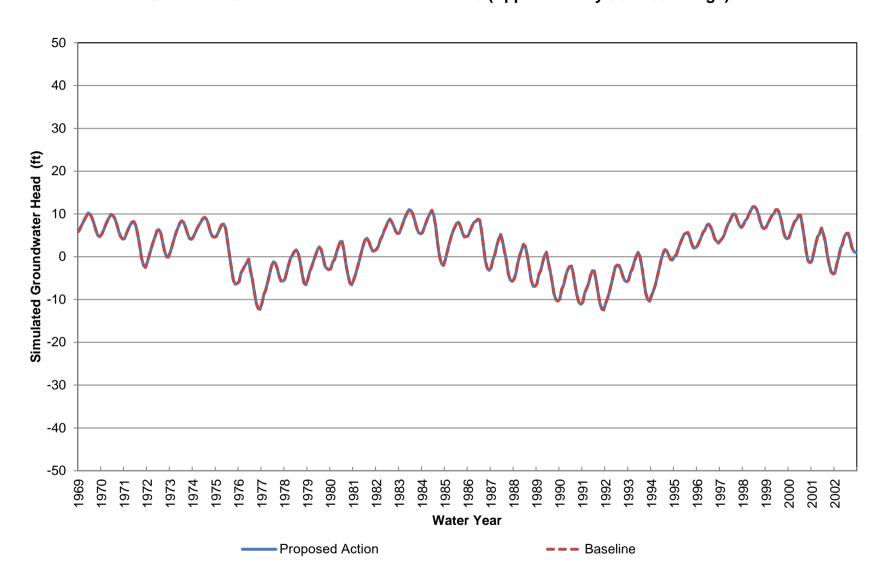
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 25 (Approximately 380-680 ft bgs)



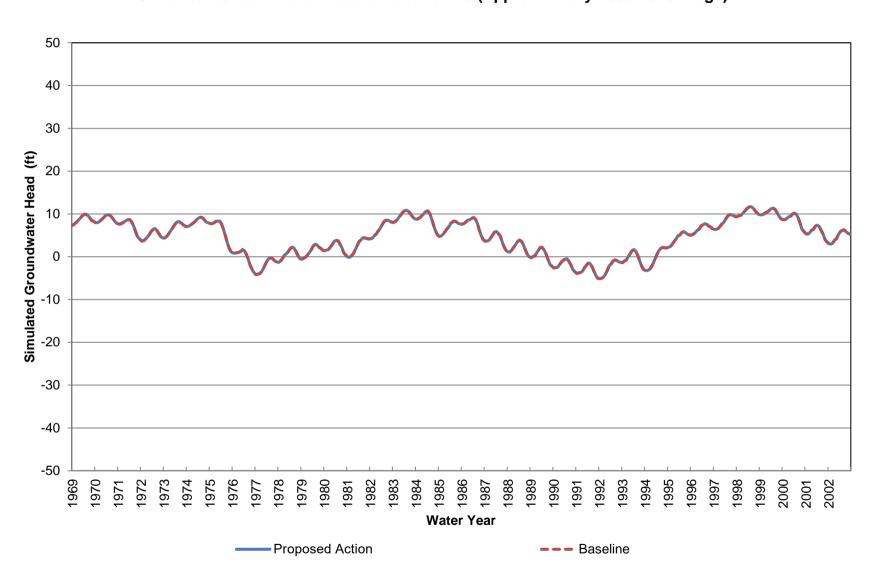
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 25 (Approximately 680-990 ft bgs)



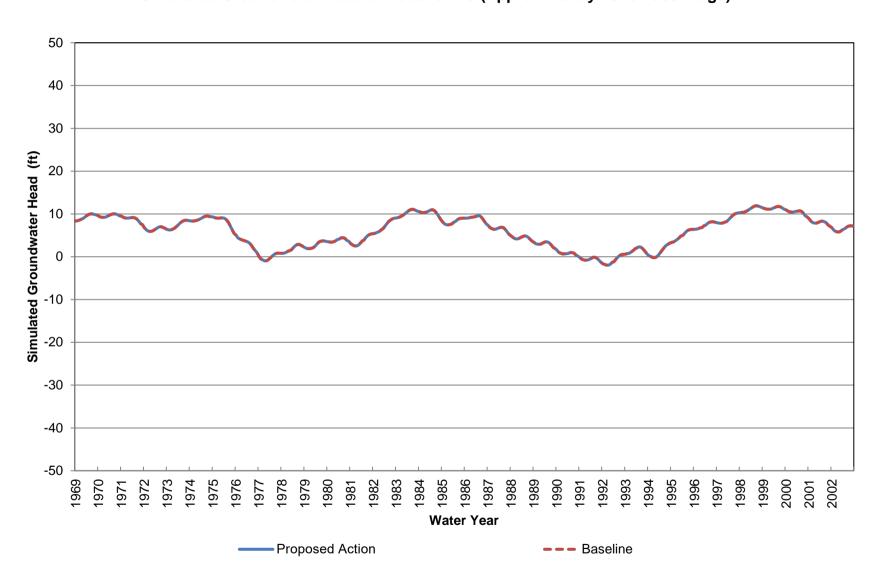
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 25 (Approximately 990-1530 ft bgs)



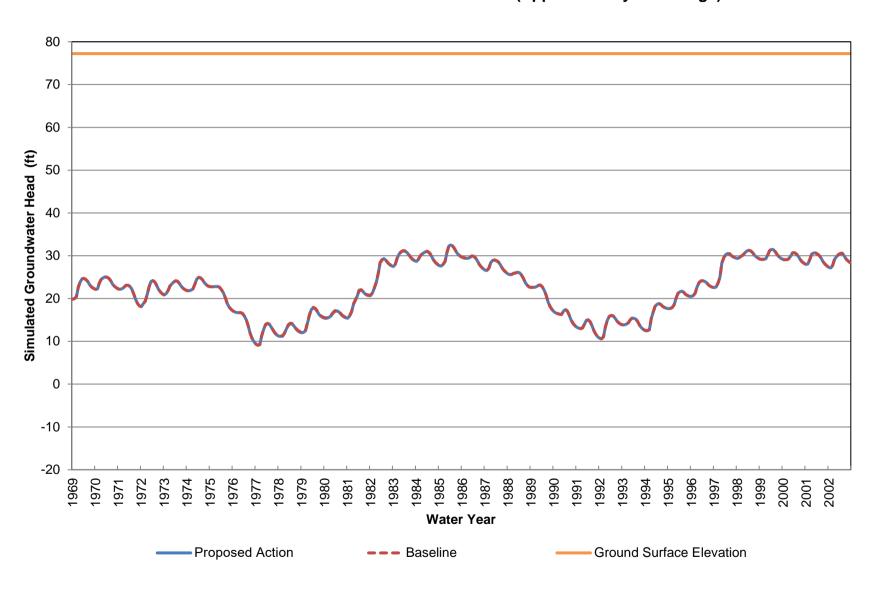
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 25 (Approximately 1530-2040 ft bgs)



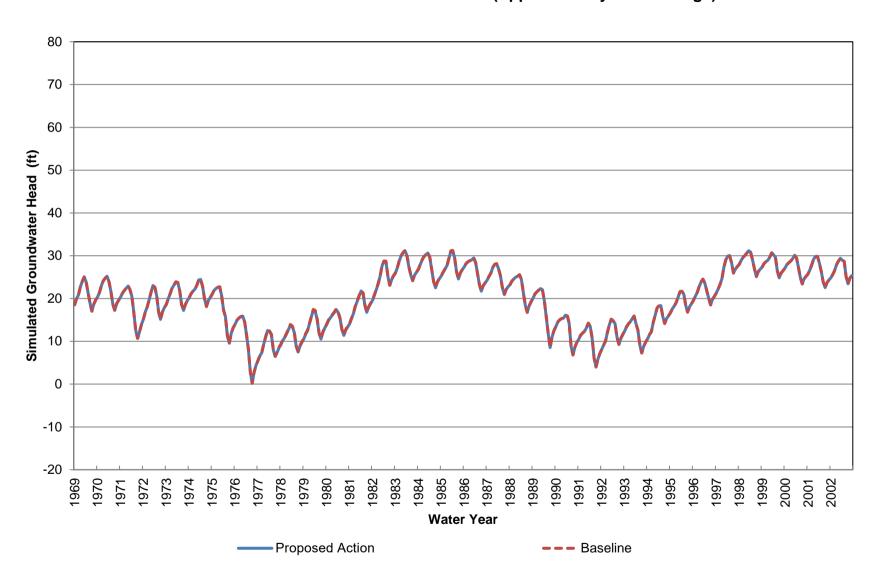
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 25 (Approximately 2040-2800 ft bgs)



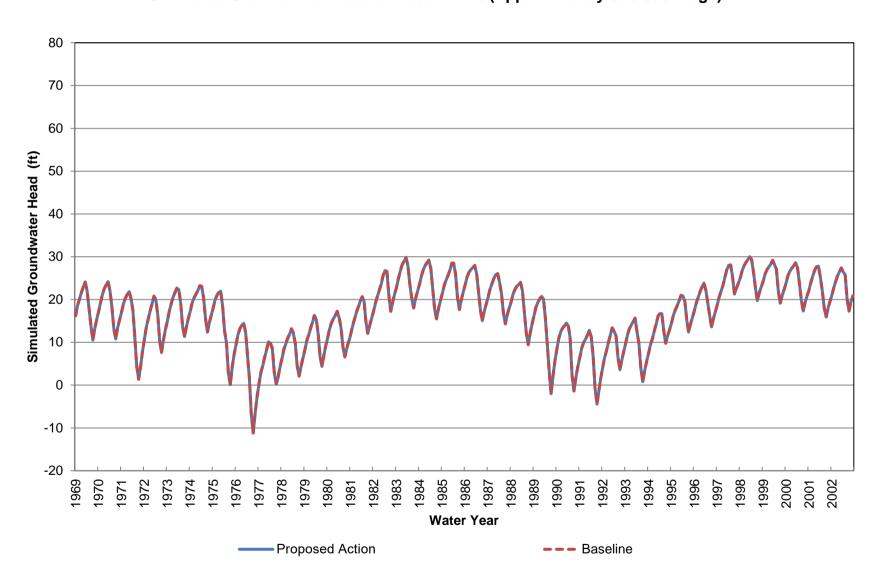
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 26 (Approximately 0-70 ft bgs)



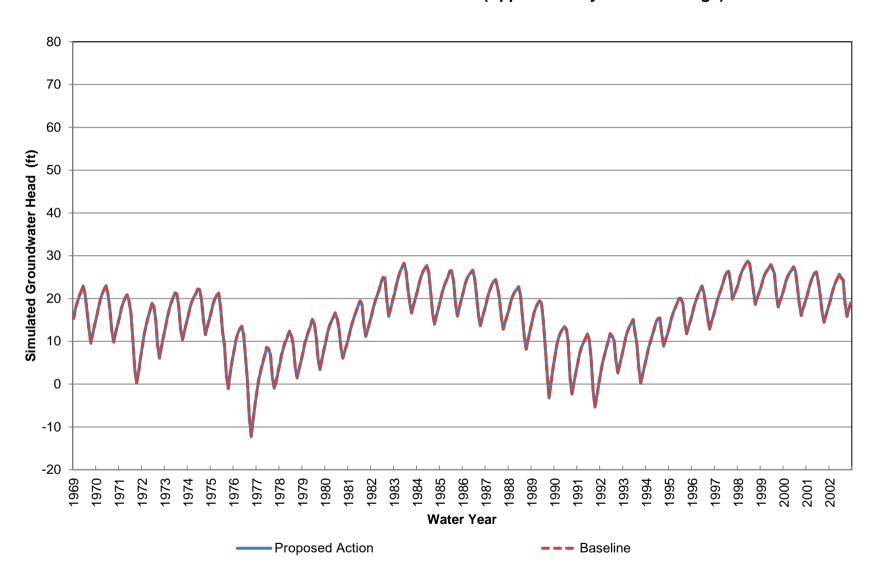
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 26 (Approximately 70-380 ft bgs)



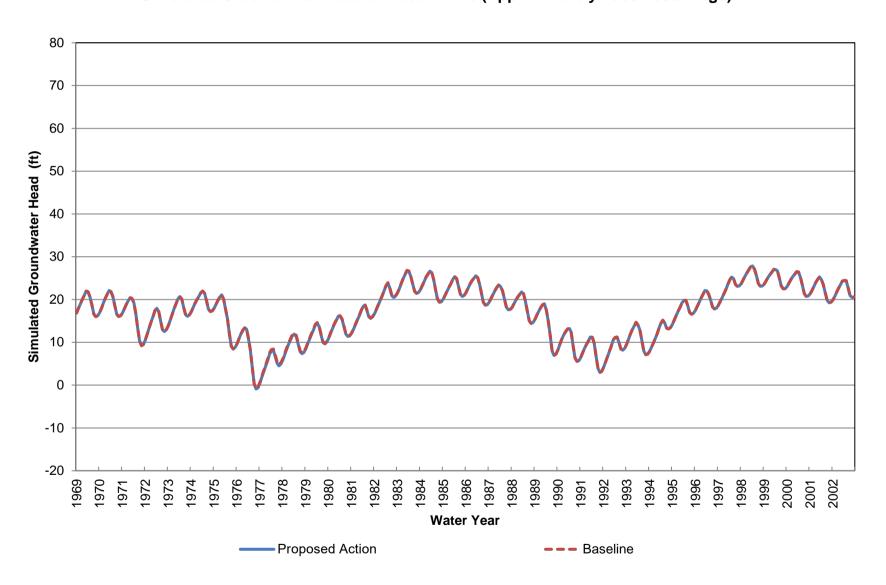
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 26 (Approximately 380-690 ft bgs)



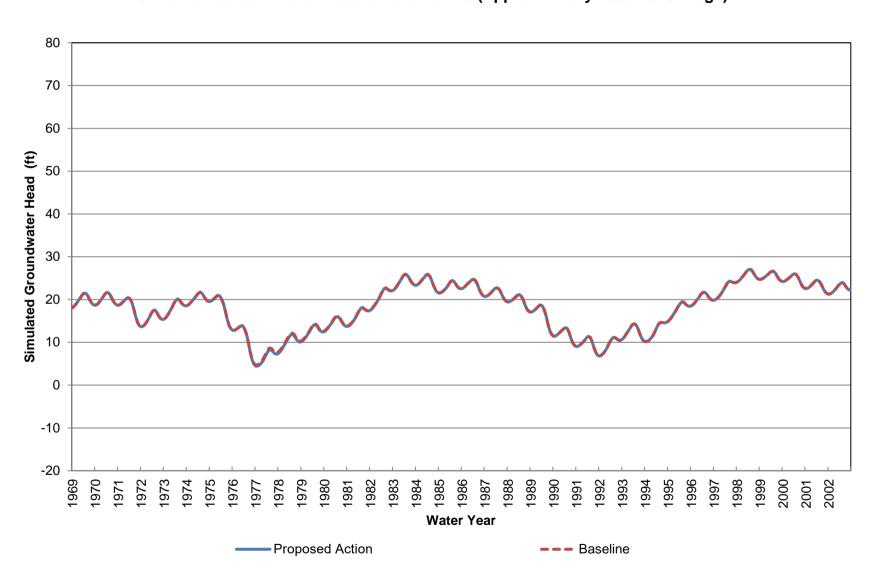
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 26 (Approximately 690-1000 ft bgs)



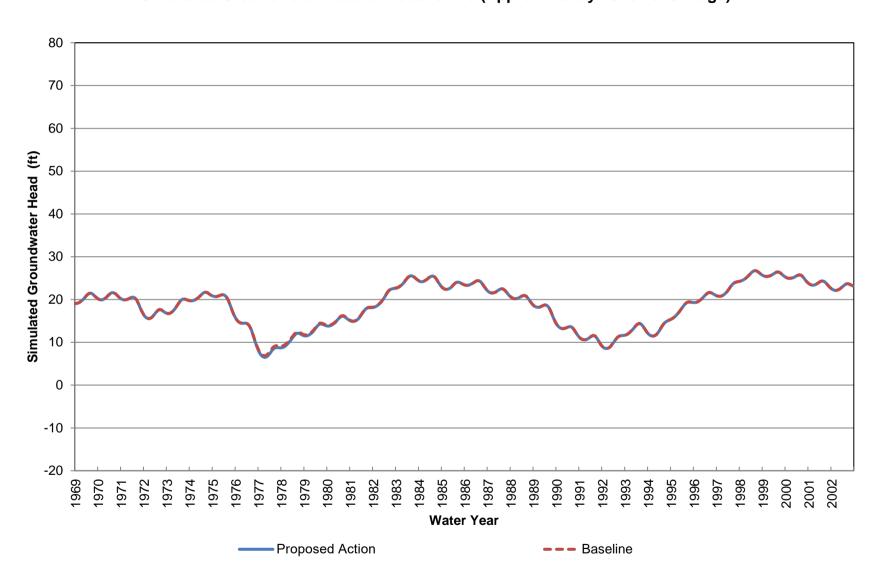
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 26 (Approximately 1000-1550 ft bgs)



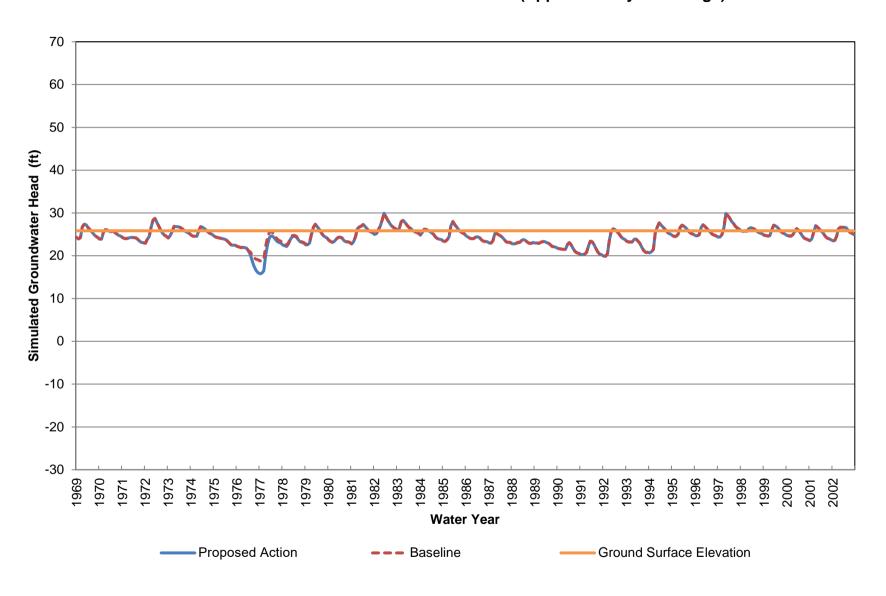
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 26 (Approximately 1550-2070 ft bgs)



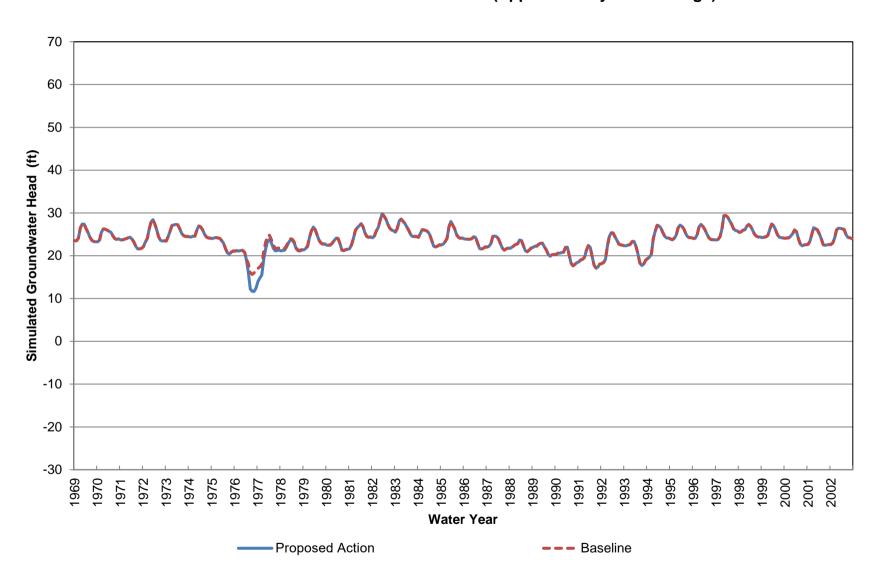
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 26 (Approximately 2070-2840 ft bgs)



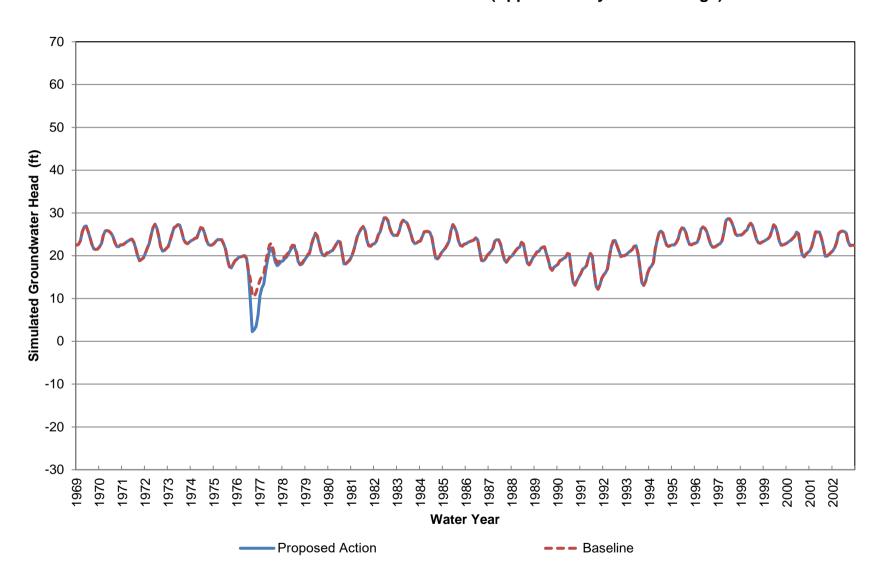
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 27 (Approximately 0-70 ft bgs)



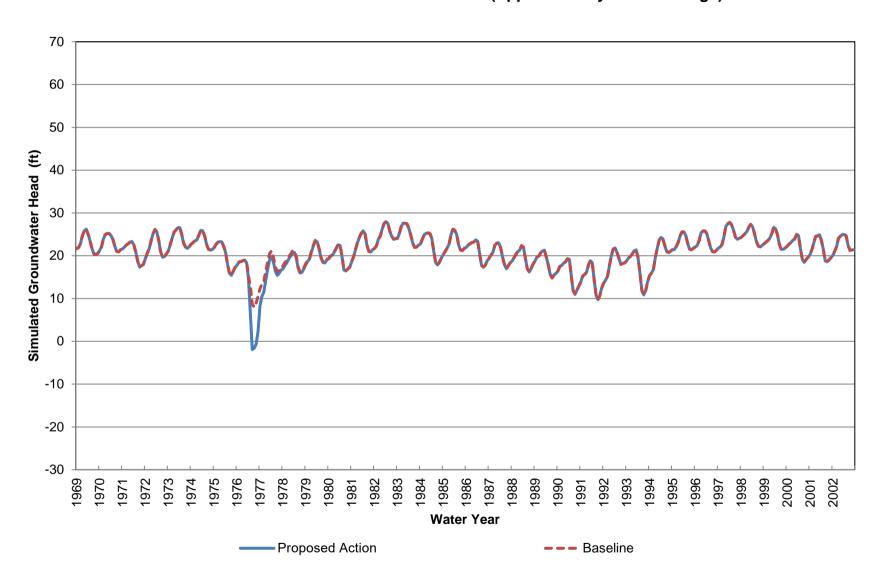
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 27 (Approximately 70-220 ft bgs)



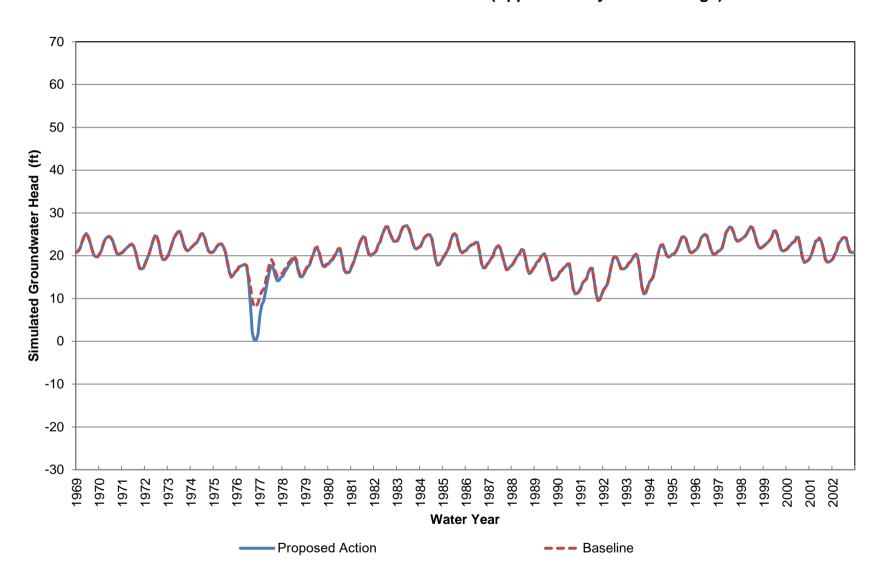
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 27 (Approximately 220-380 ft bgs)



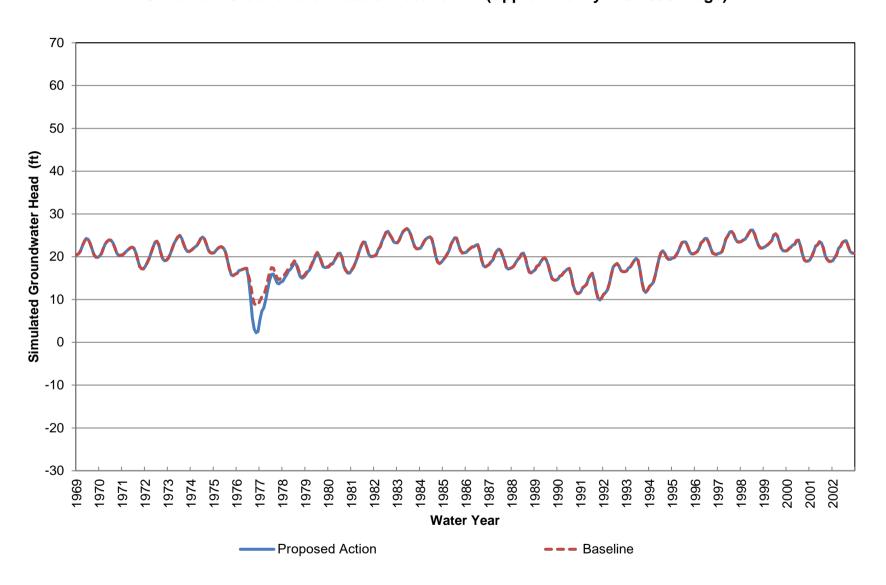
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 27 (Approximately 380-530 ft bgs)



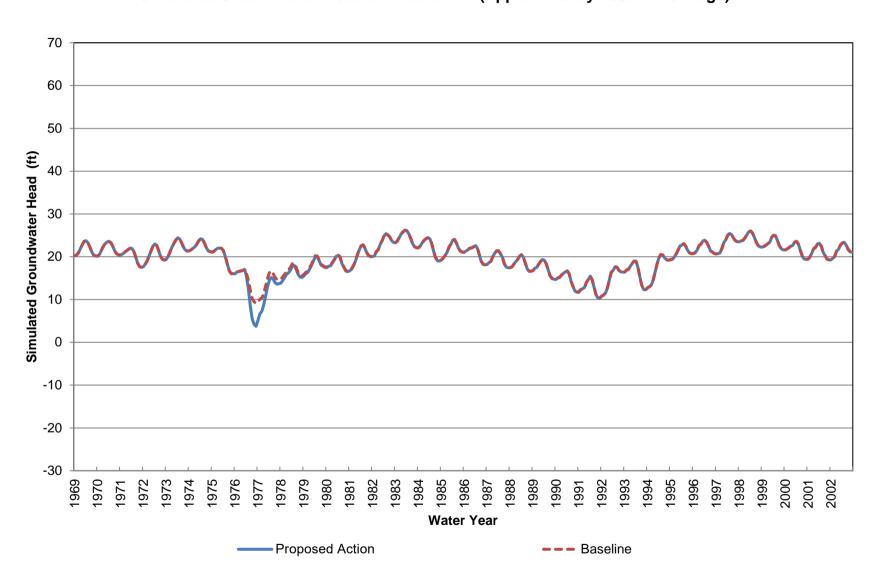
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 27 (Approximately 530-770 ft bgs)



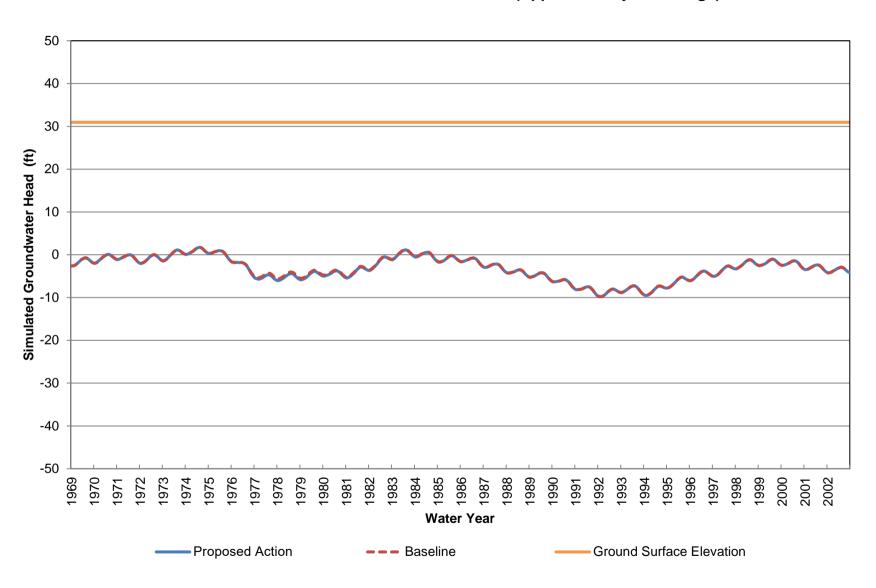
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 27 (Approximately 770-1030 ft bgs)



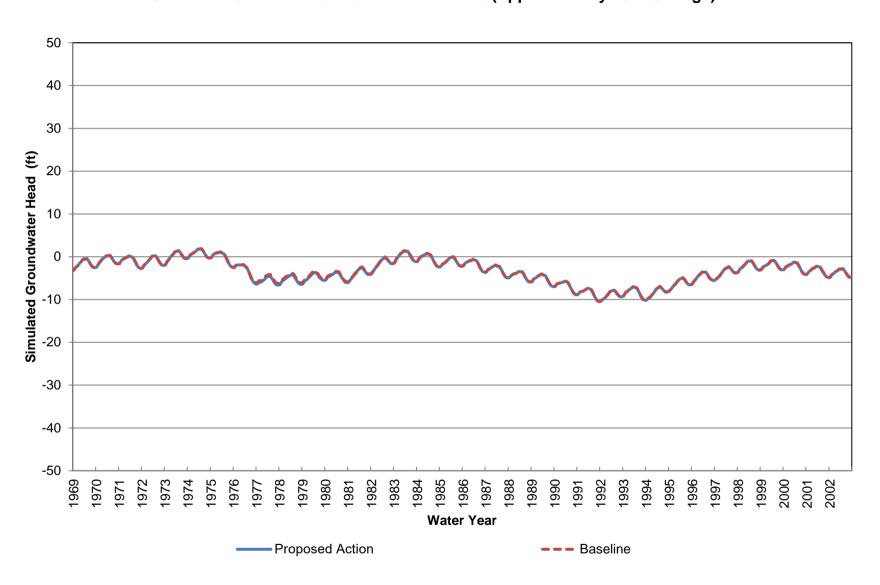
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 27 (Approximately 1030-1410 ft bgs)



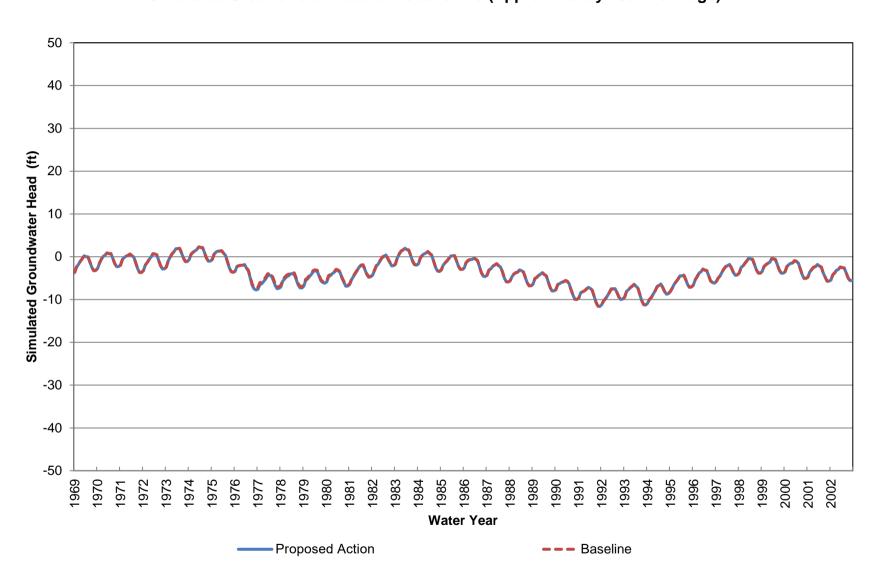
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 28 (Approximately 0-70 ft bgs)



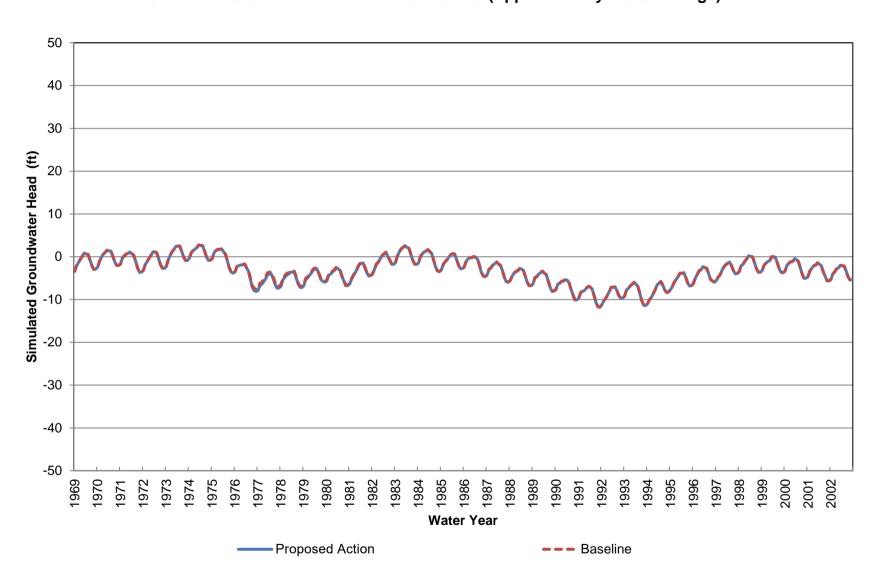
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 28 (Approximately 70-250 ft bgs)



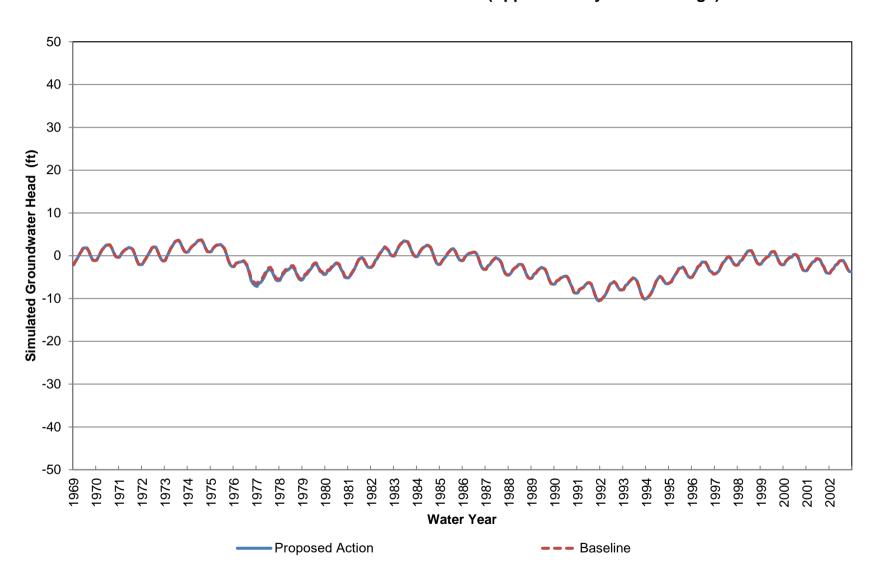
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 28 (Approximately 250-440 ft bgs)



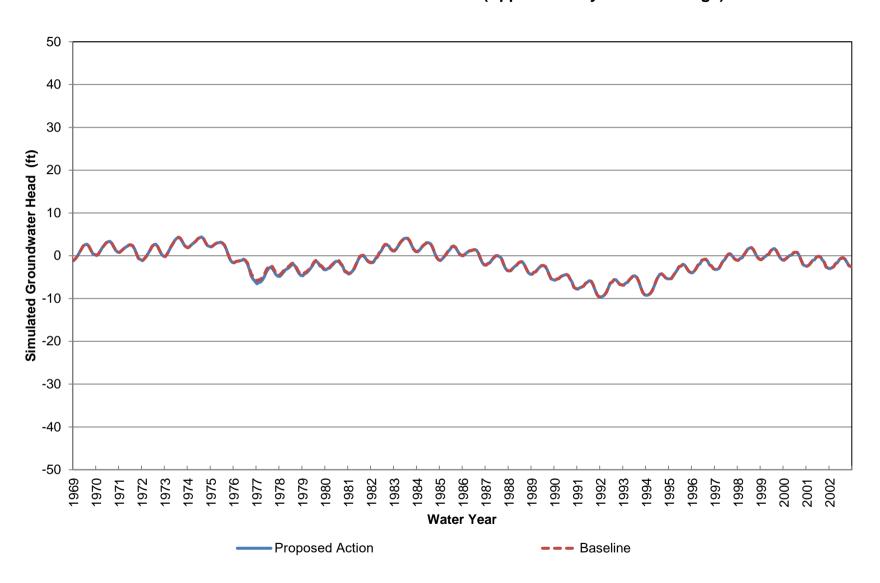
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 28 (Approximately 440-620 ft bgs)



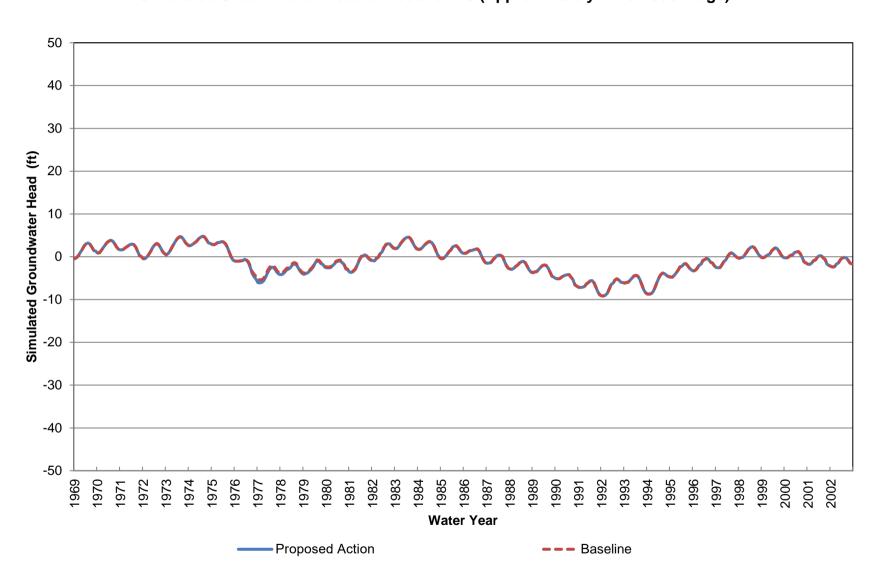
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 28 (Approximately 620-920 ft bgs)



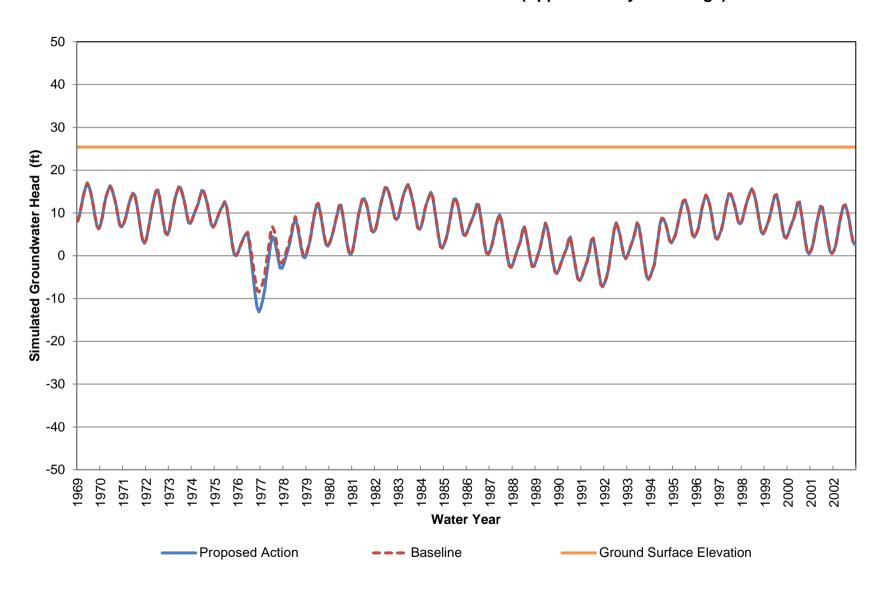
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 28 (Approximately 920-1220 ft bgs)



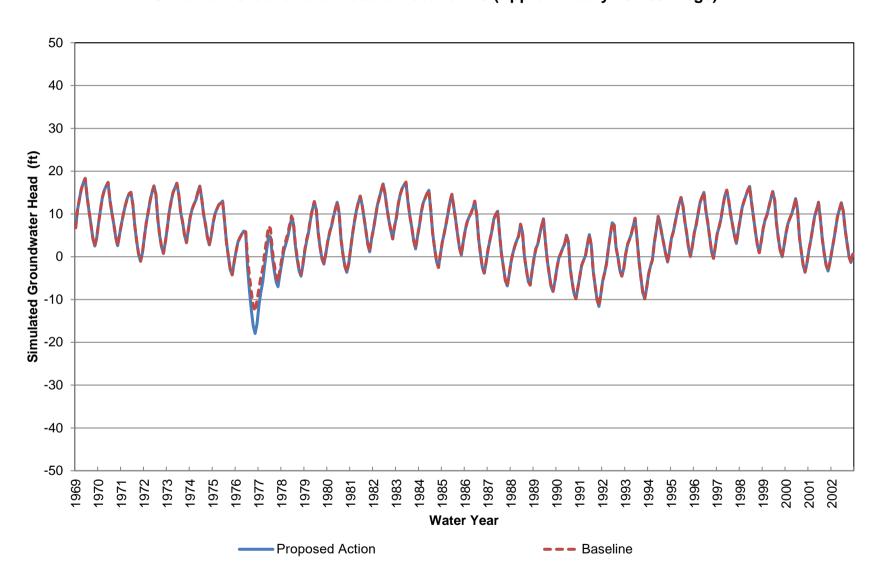
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 28 (Approximately 1220-1680 ft bgs)



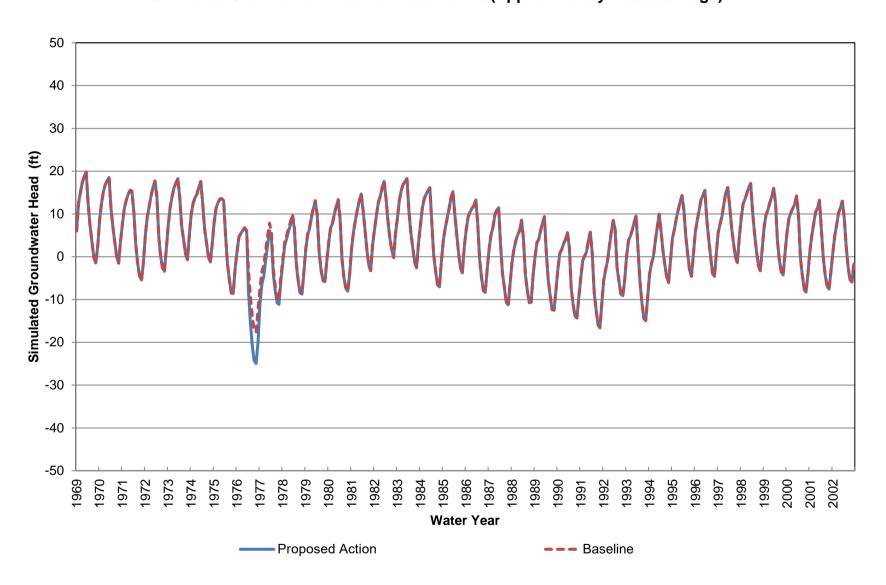
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 29 (Approximately 0-70 ft bgs)



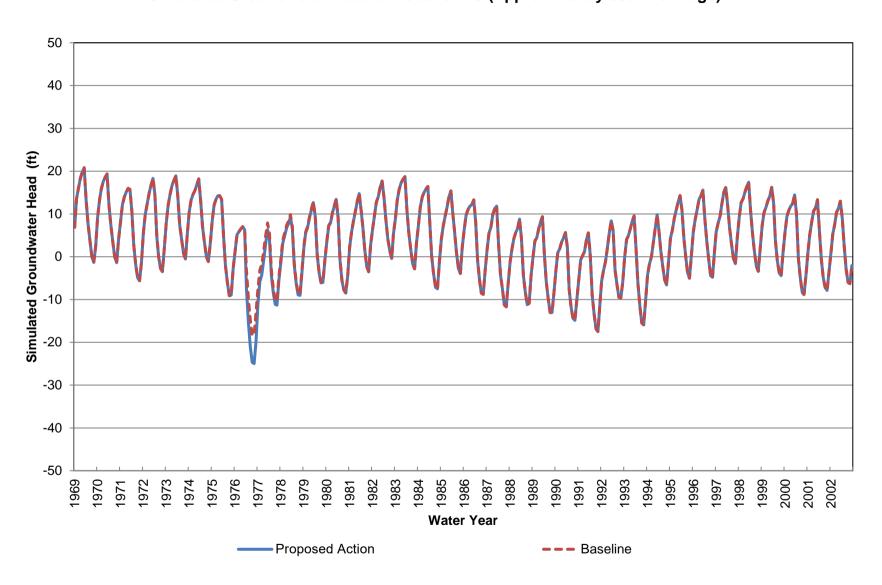
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 29 (Approximately 70-200 ft bgs)



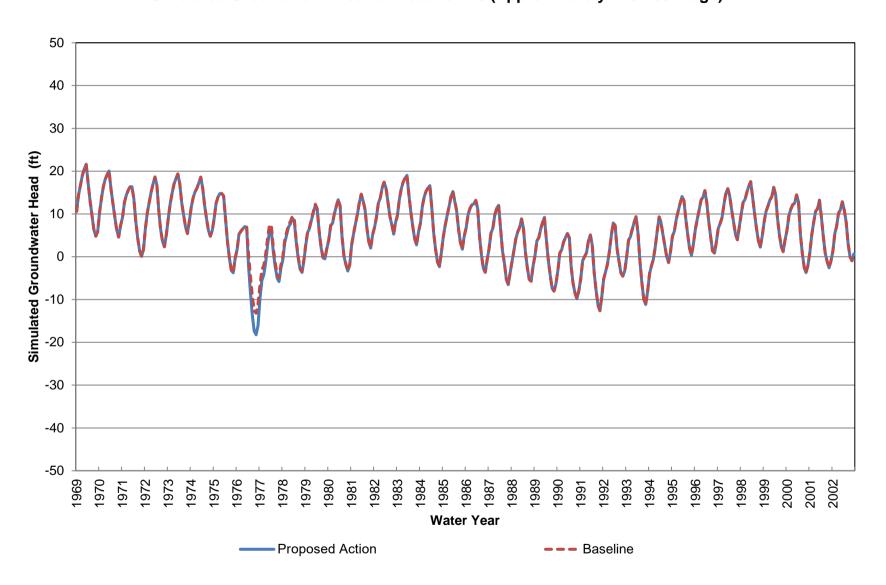
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 29 (Approximately 200-330 ft bgs)



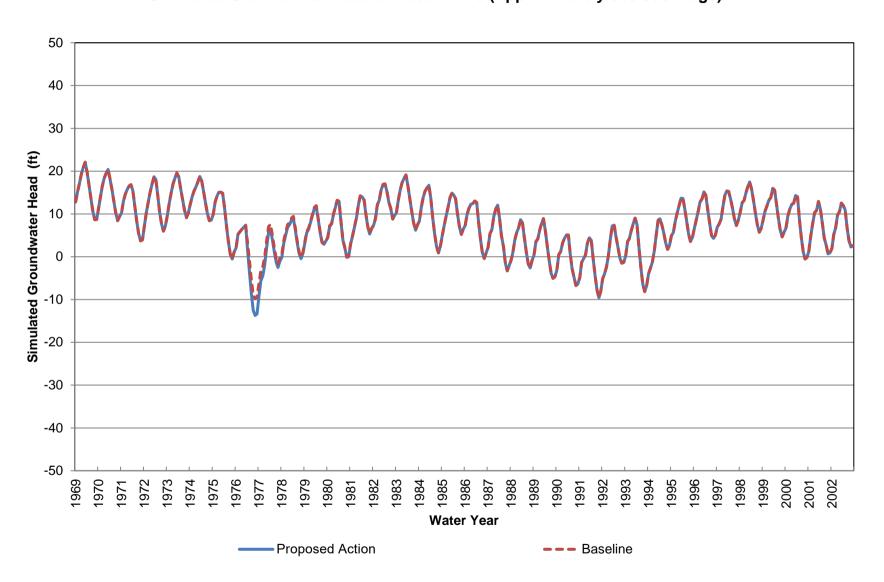
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 29 (Approximately 330-470 ft bgs)



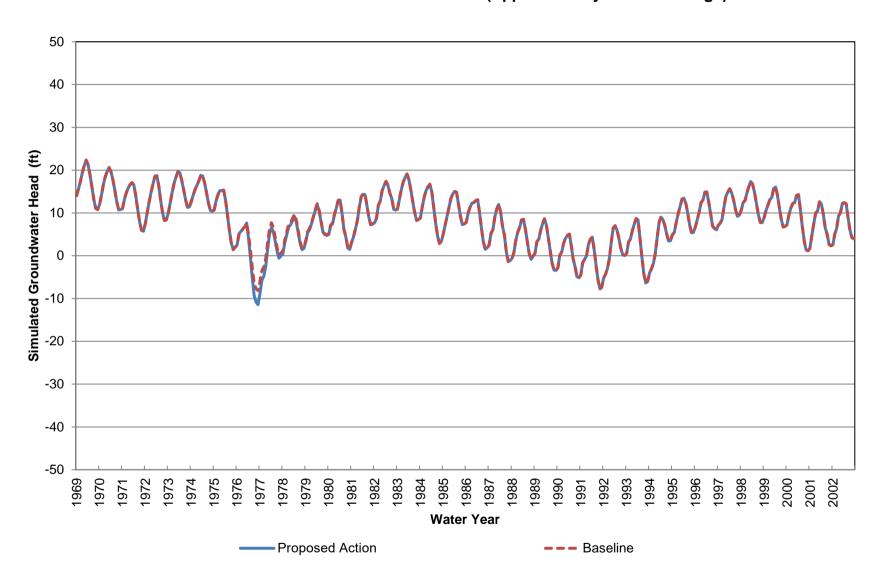
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 29 (Approximately 470-660 ft bgs)



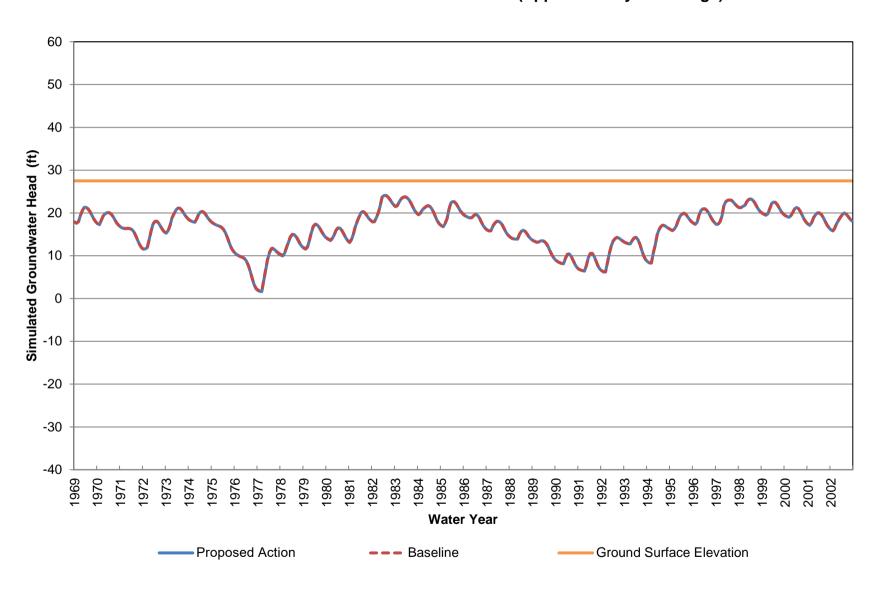
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 29 (Approximately 660-880 ft bgs)



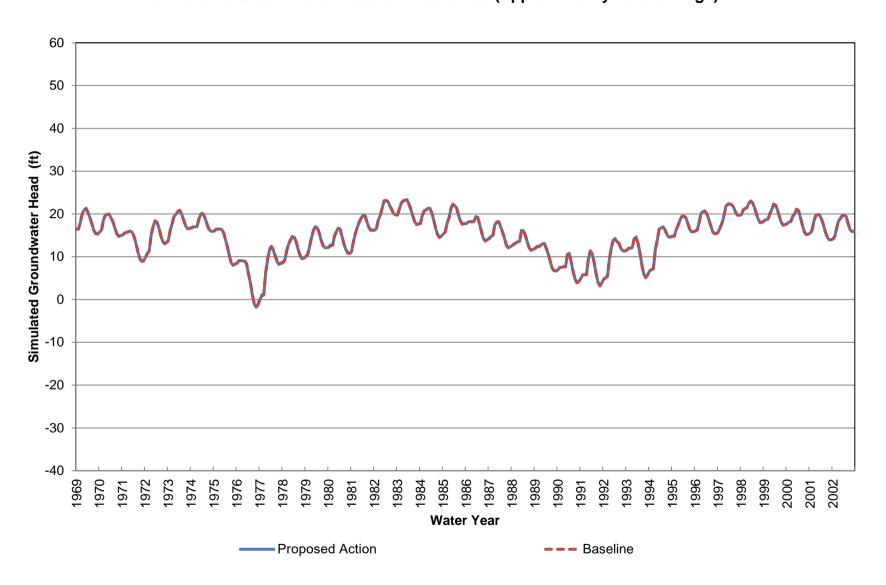
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 29 (Approximately 880-1210 ft bgs)



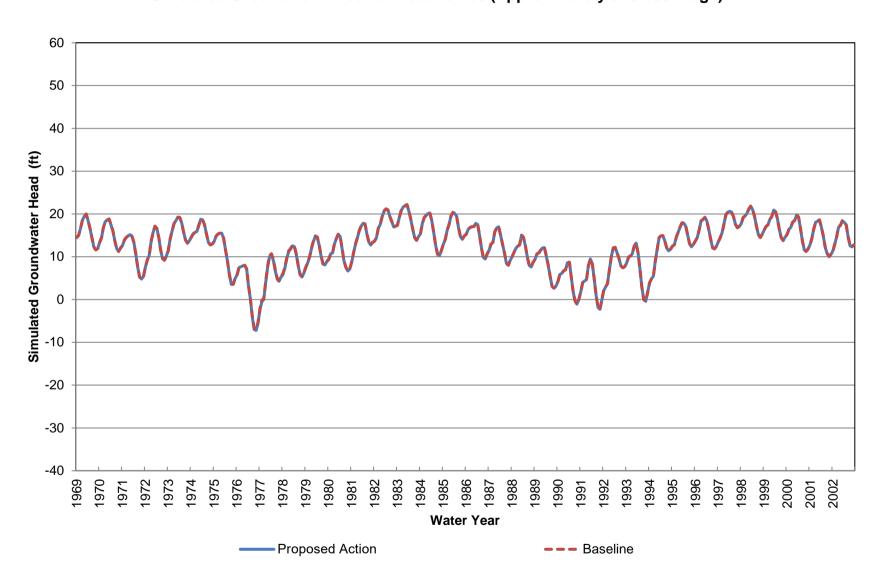
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 30 (Approximately 0-70 ft bgs)



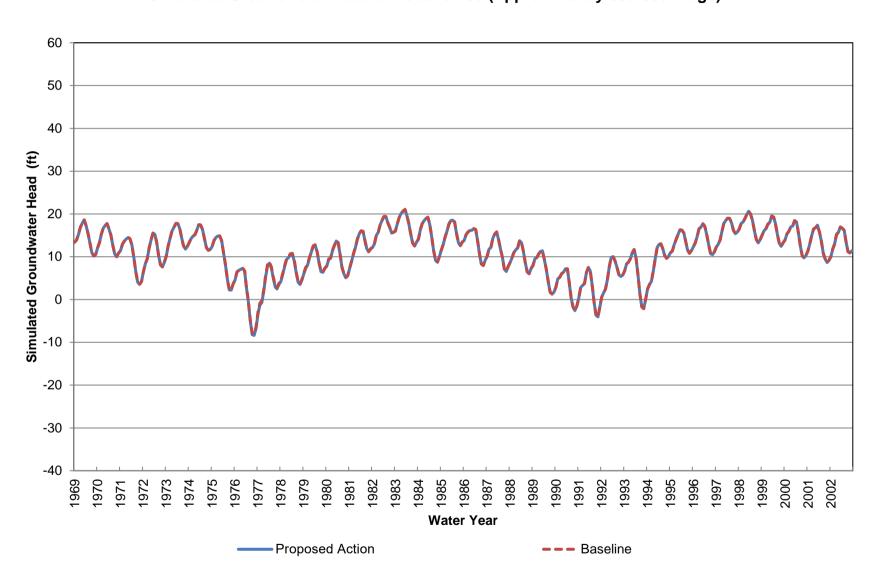
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 30 (Approximately 70-340 ft bgs)



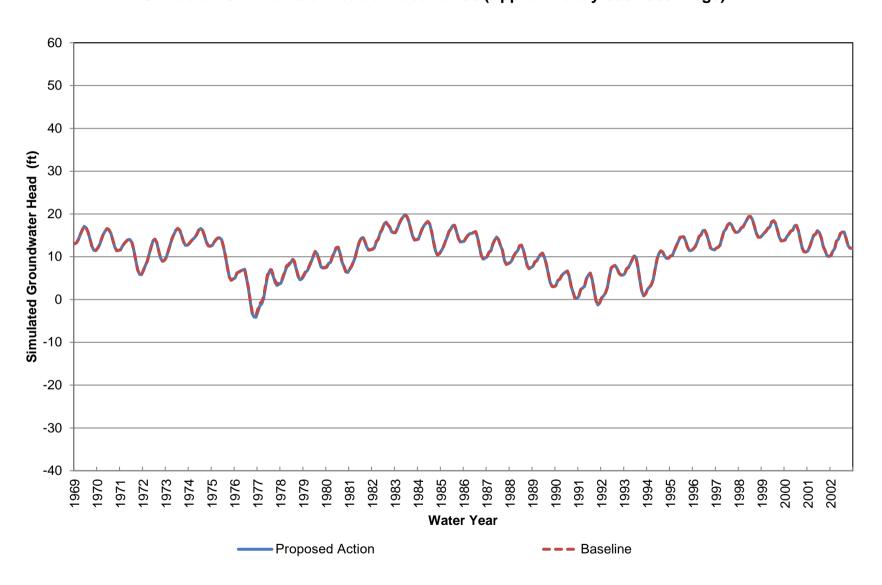
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 30 (Approximately 340-600 ft bgs)



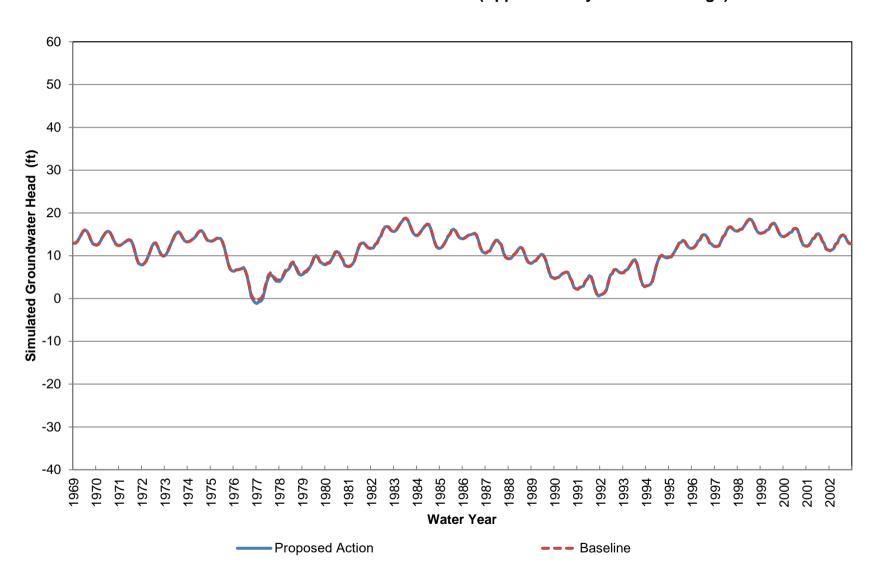
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 30 (Approximately 600-860 ft bgs)



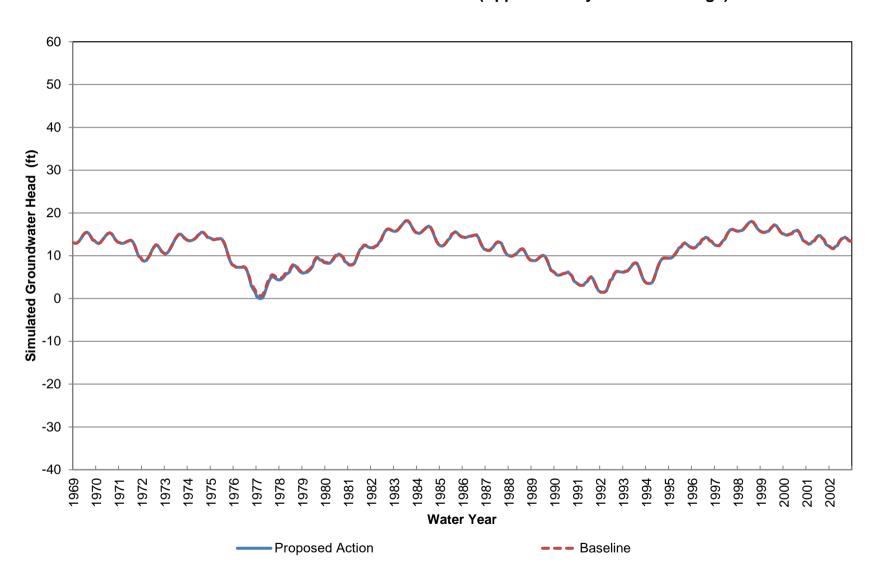
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 30 (Approximately 860-1330 ft bgs)



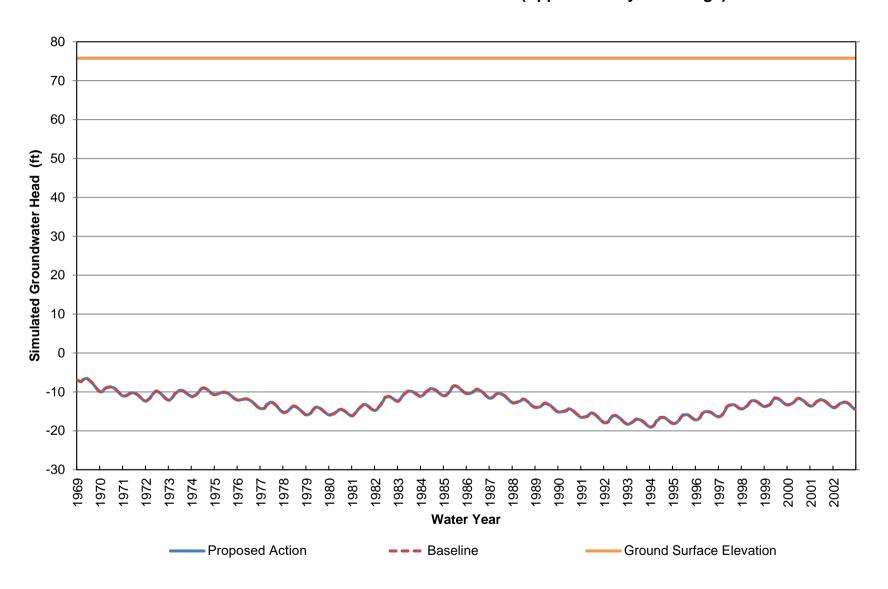
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 30 (Approximately 1330-1770 ft bgs)



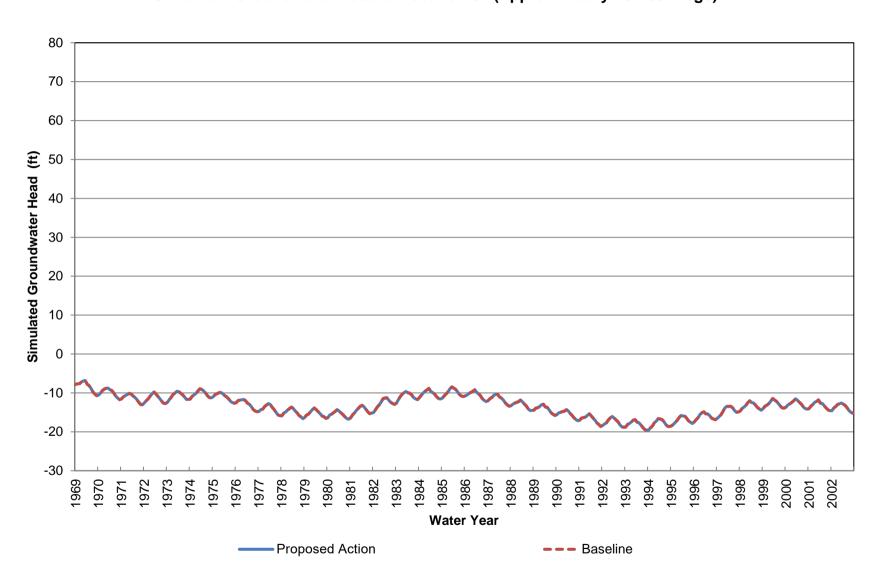
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 30 (Approximately 1770-2430 ft bgs)



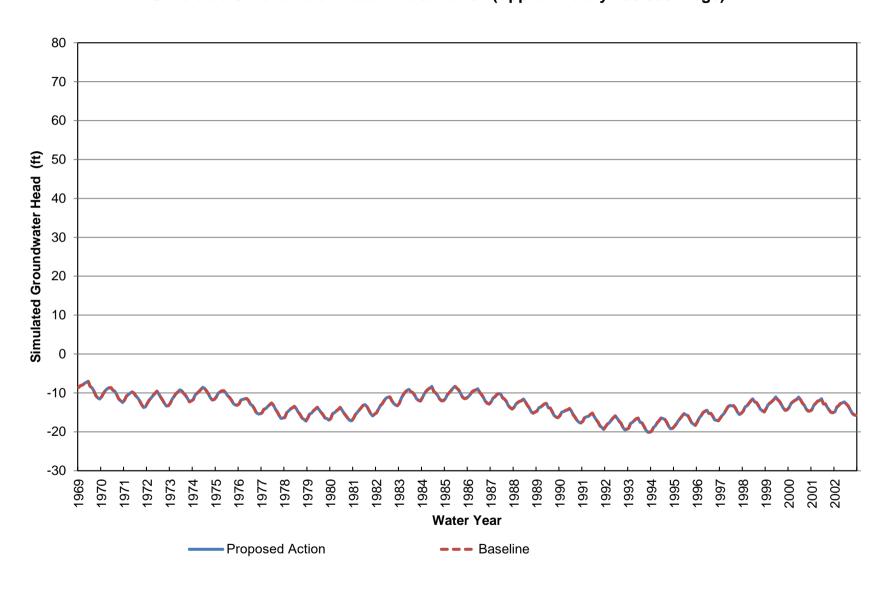
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 31 (Approximately 0-70 ft bgs)



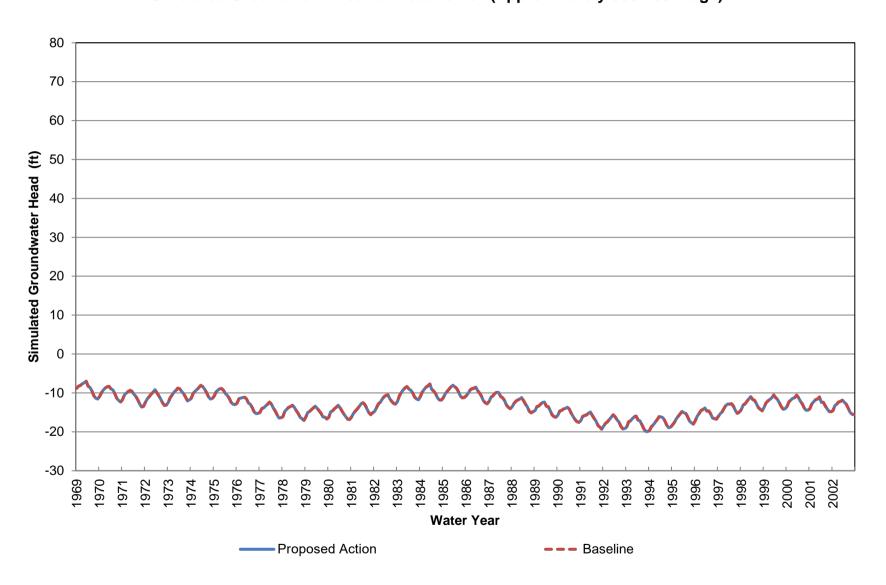
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 31 (Approximately 70-200 ft bgs)



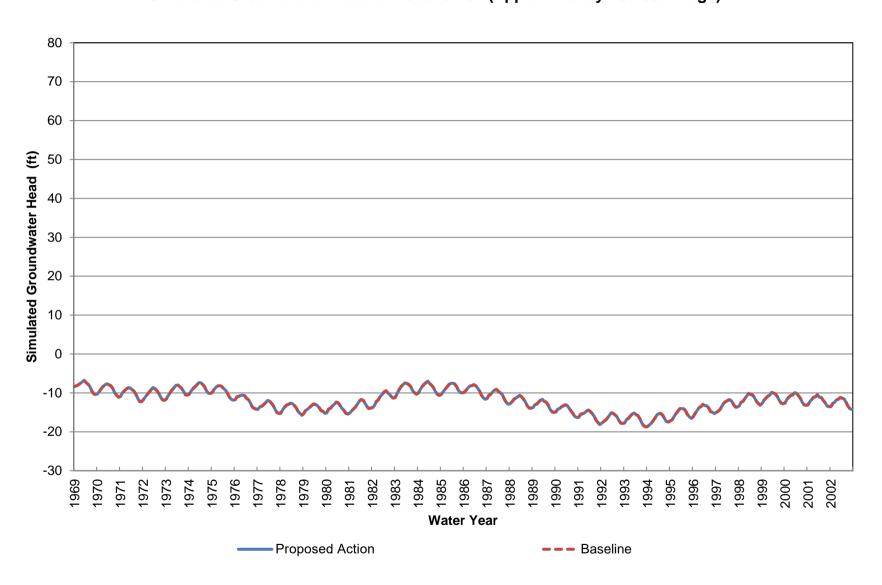
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 31 (Approximately 200-330 ft bgs)



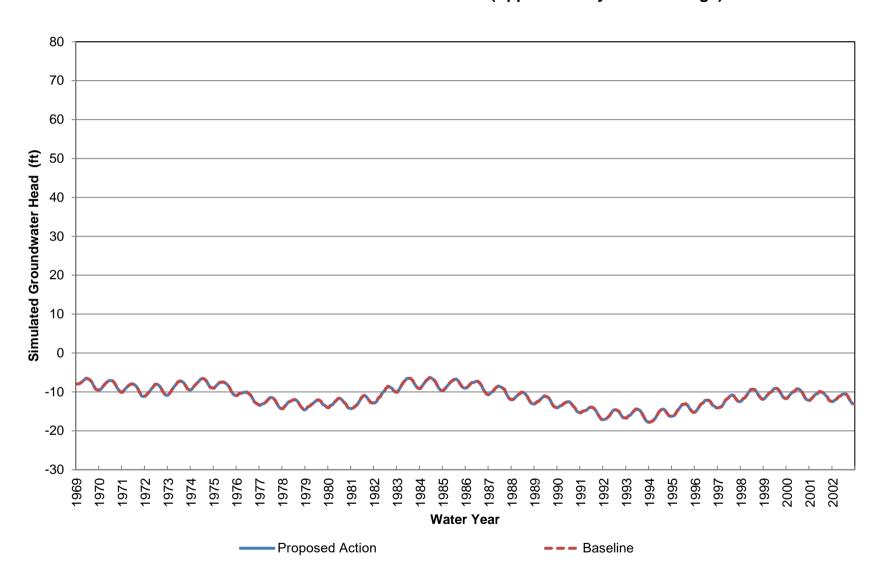
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 31 (Approximately 330-460 ft bgs)



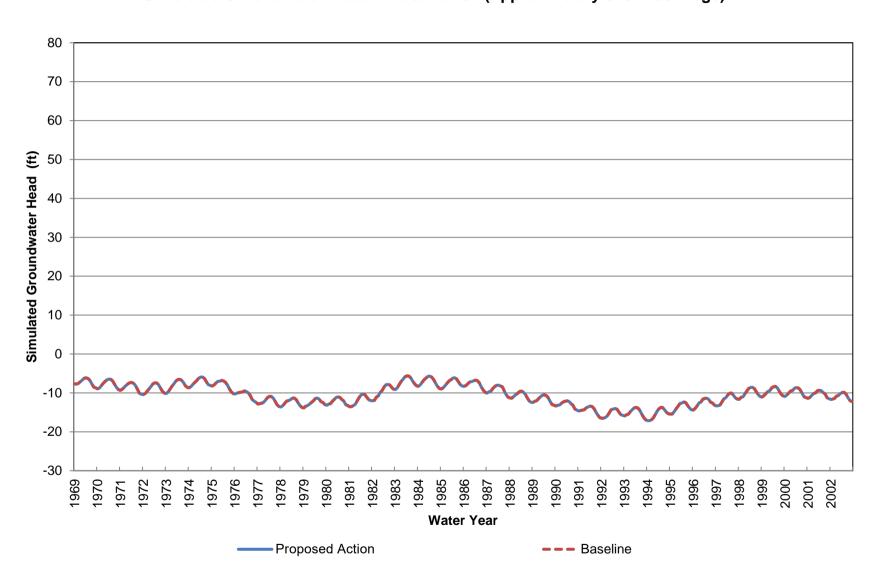
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 31 (Approximately 460-650 ft bgs)



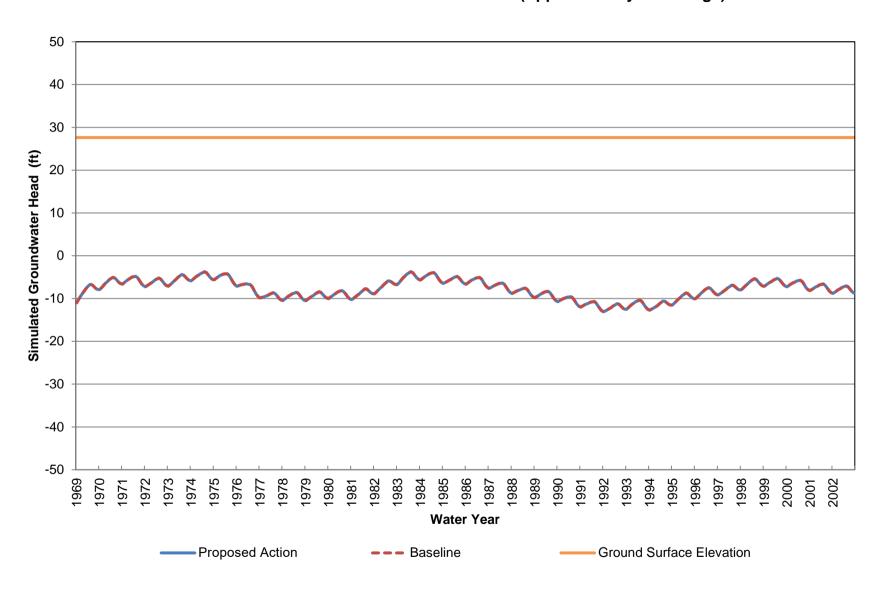
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 31 (Approximately 650-870 ft bgs)



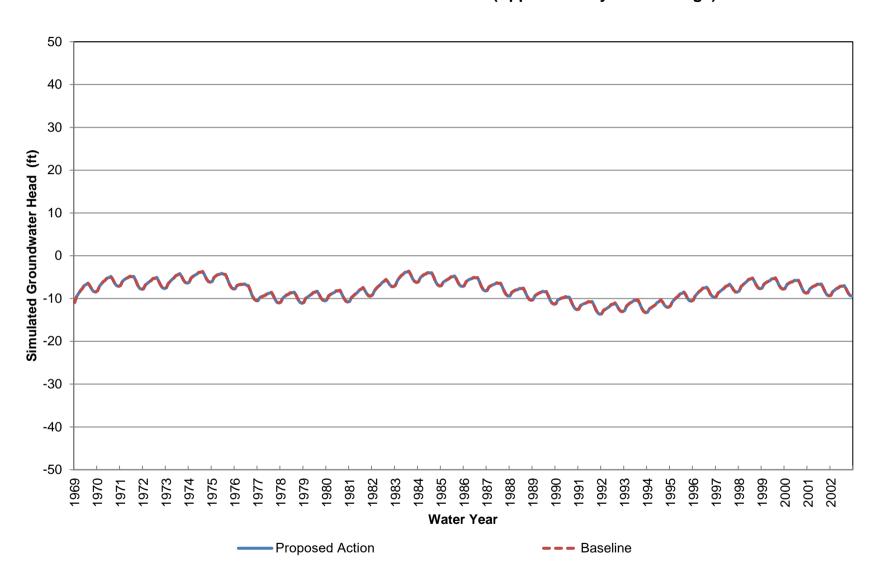
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 31 (Approximately 870-1190 ft bgs)



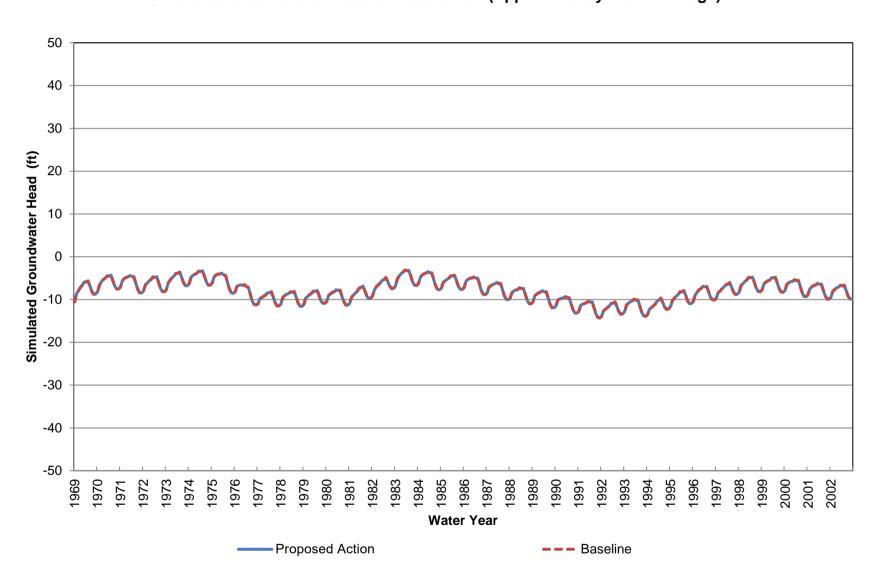
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 32 (Approximately 0-70 ft bgs)



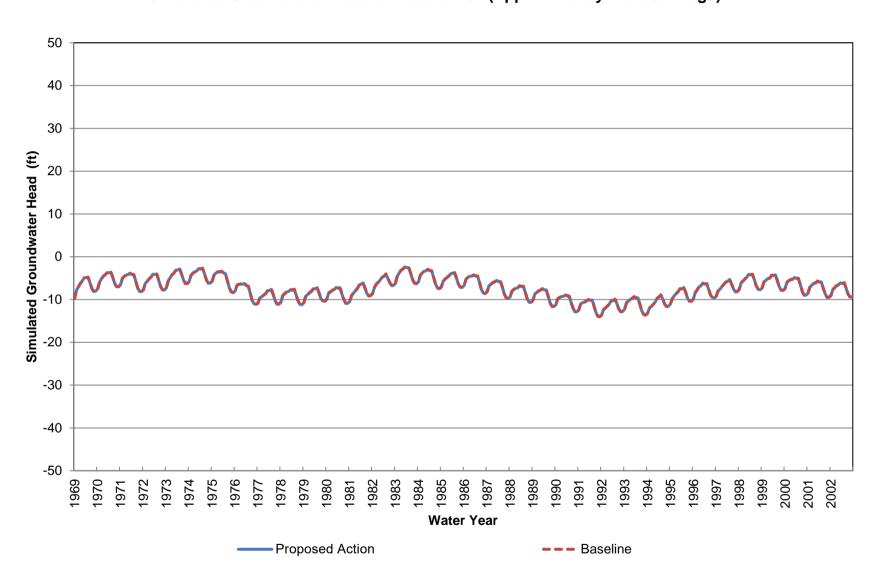
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 32 (Approximately 70-240 ft bgs)



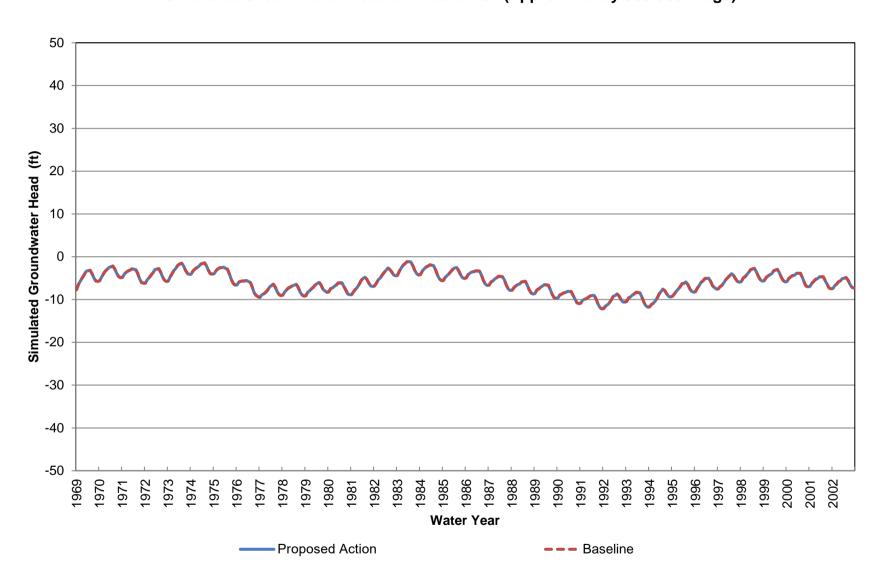
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 32 (Approximately 240-410 ft bgs)



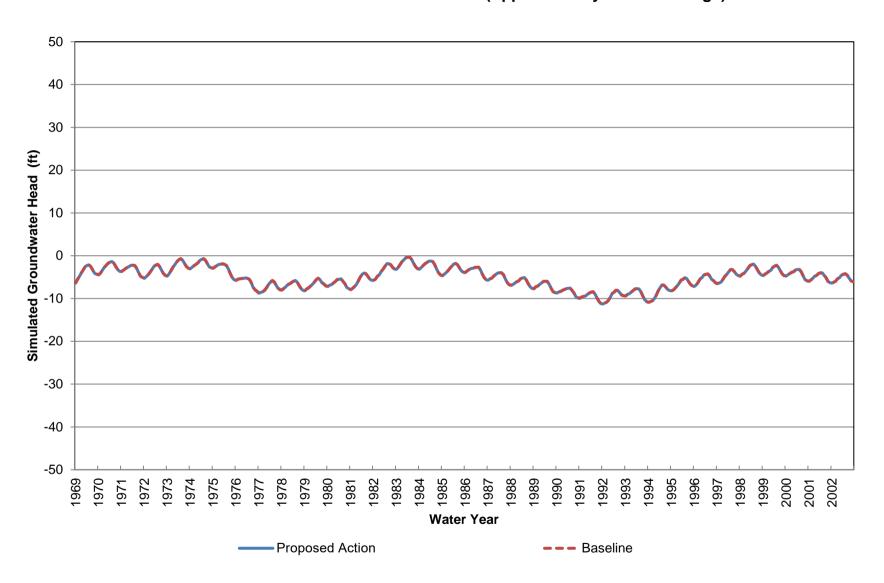
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 32 (Approximately 410-580 ft bgs)



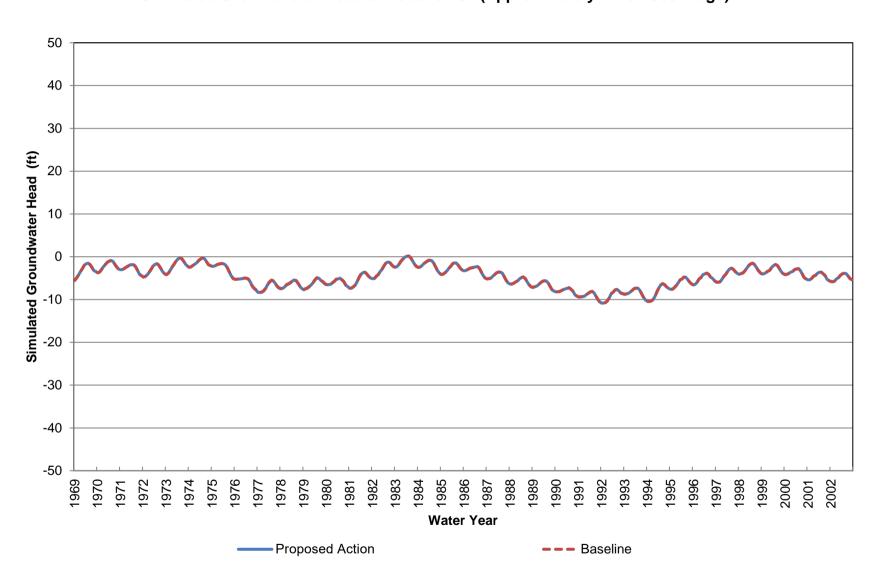
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 32 (Approximately 580-850 ft bgs)



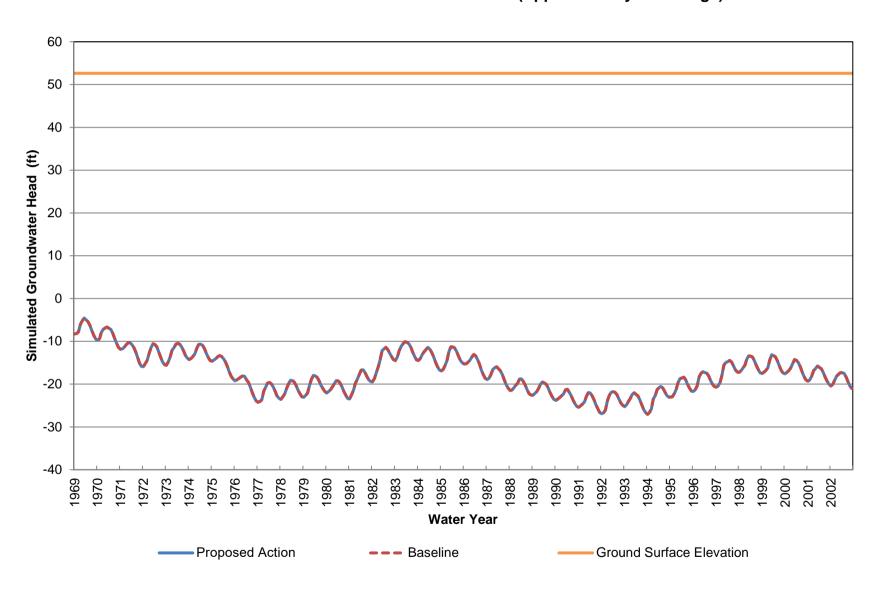
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 32 (Approximately 850-1140 ft bgs)



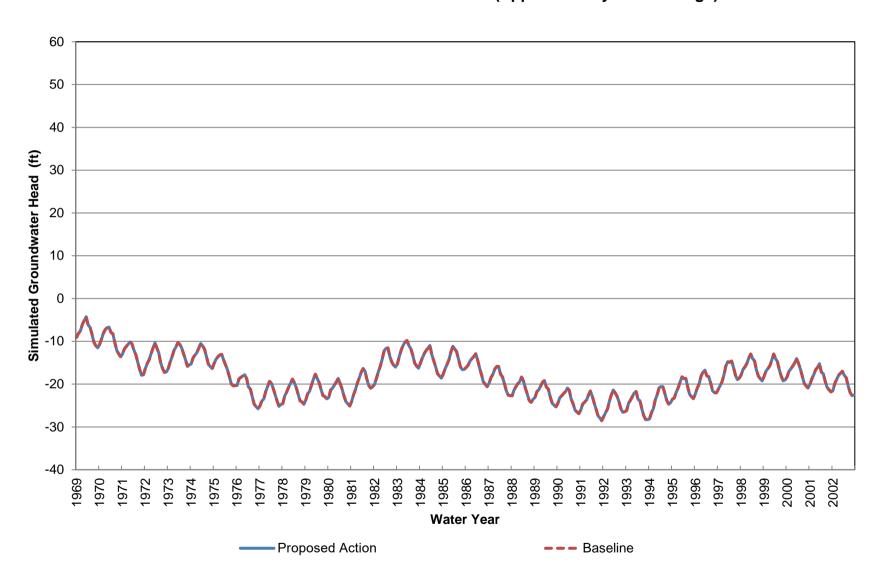
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 32 (Approximately 1140-1560 ft bgs)



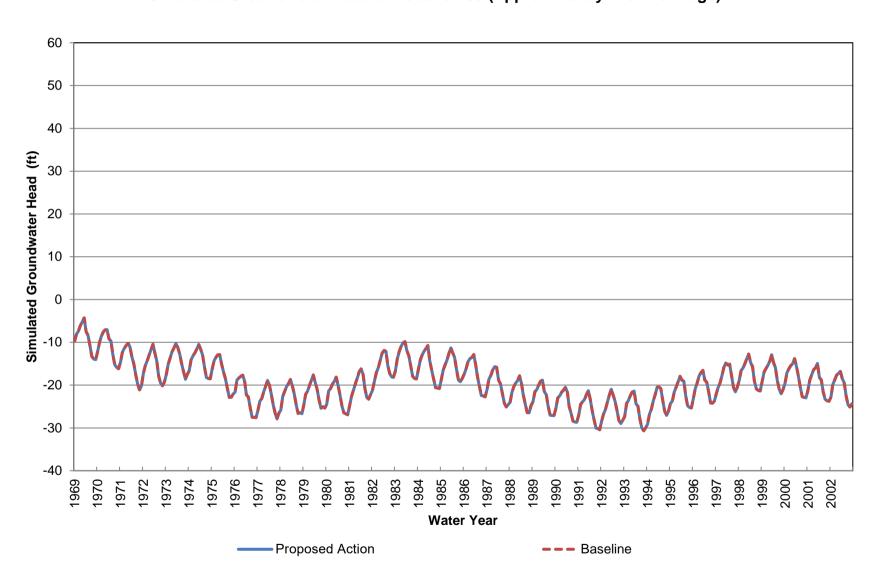
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 33 (Approximately 0-70 ft bgs)



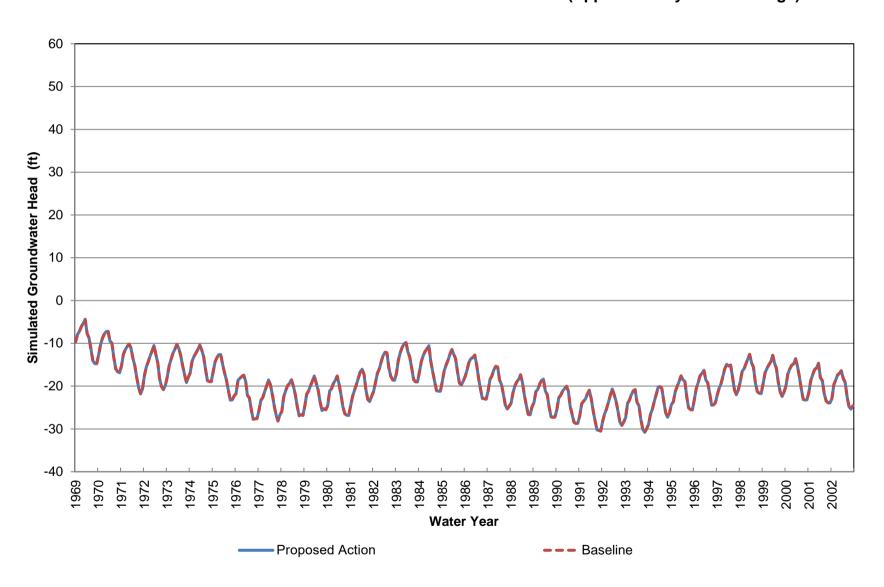
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 33 (Approximately 70-240 ft bgs)



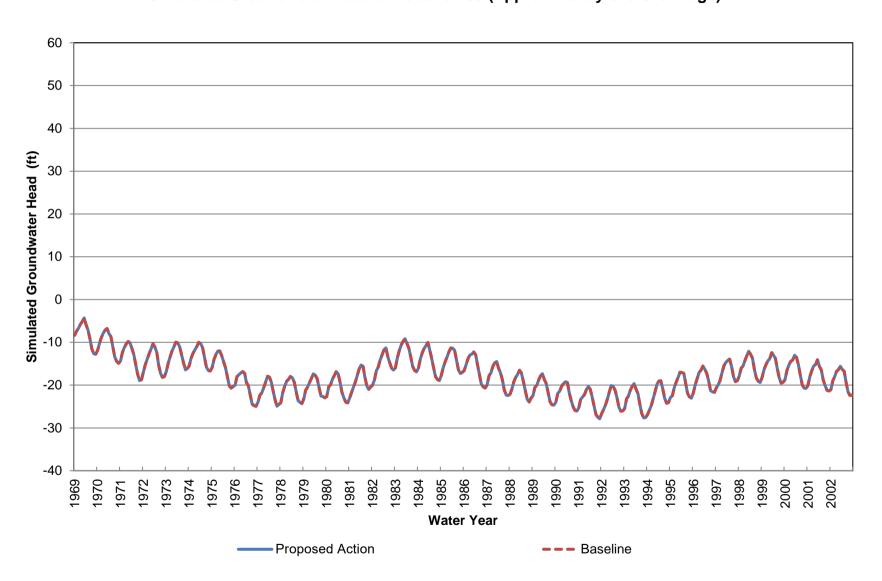
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 33 (Approximately 240-410 ft bgs)



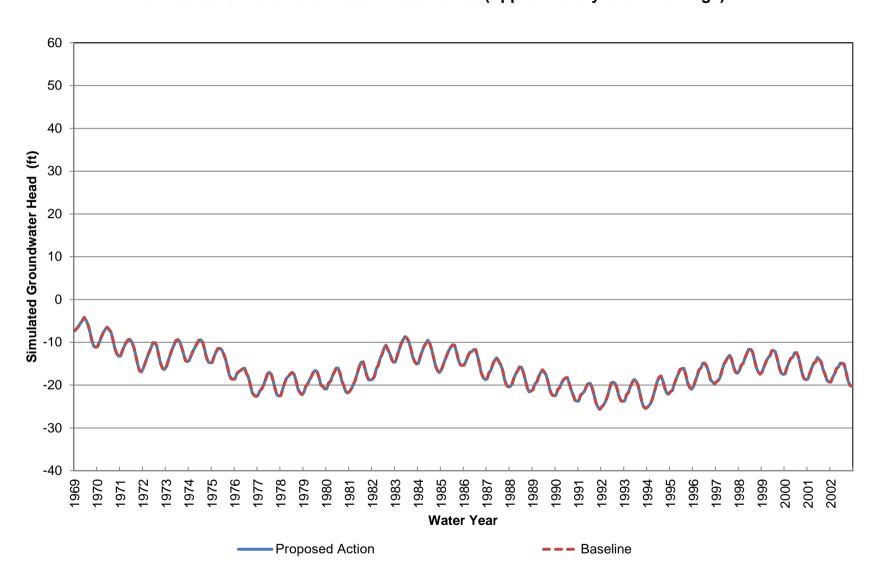
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 33 (Approximately 410-570 ft bgs)



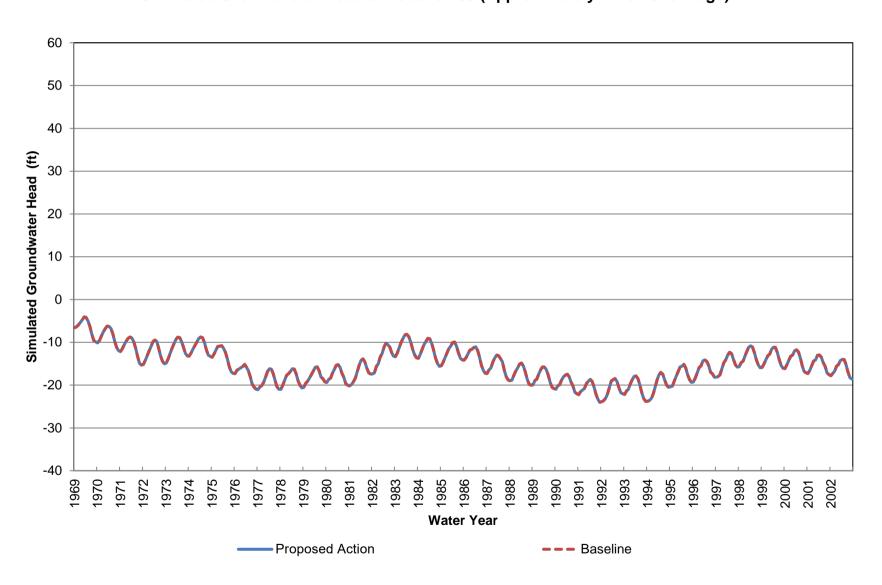
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 33 (Approximately 570-840 ft bgs)



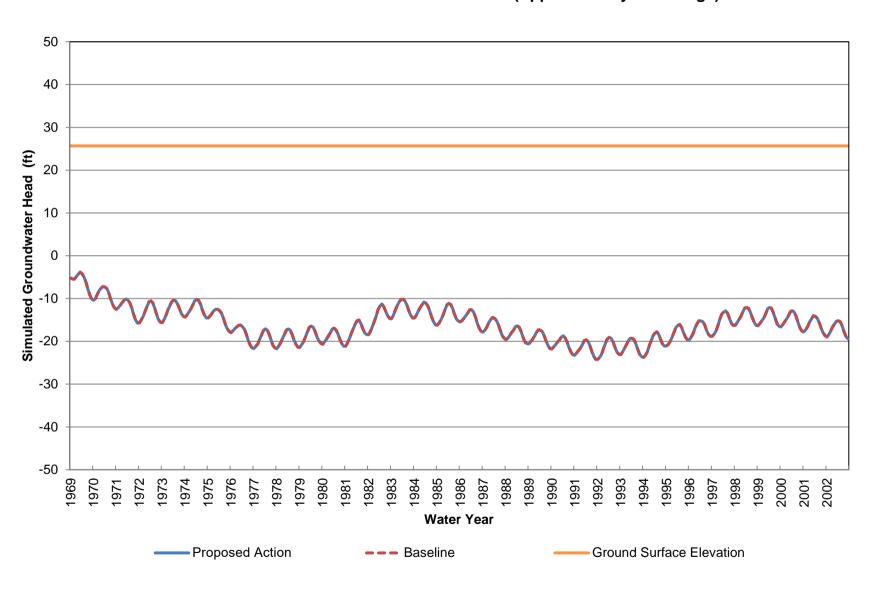
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 33 (Approximately 840-1120 ft bgs)



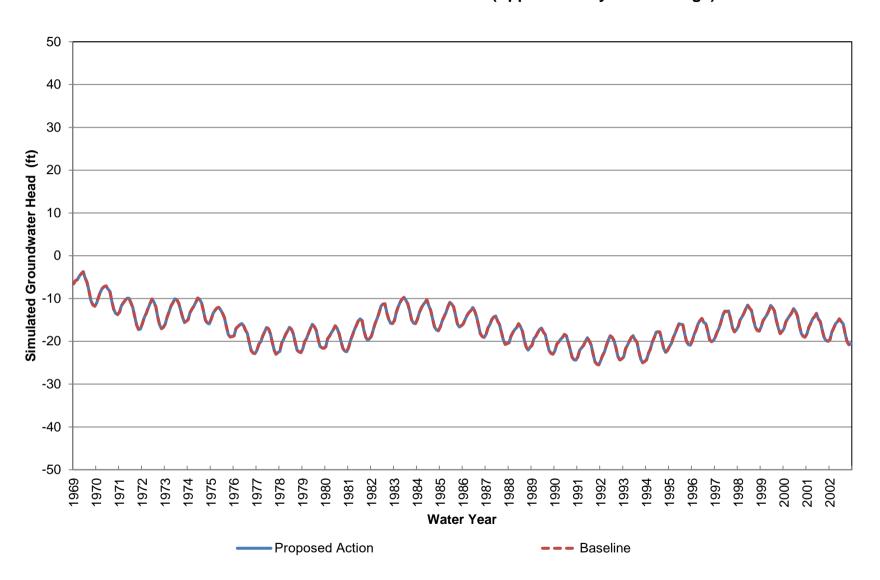
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 33 (Approximately 1120-1540 ft bgs)



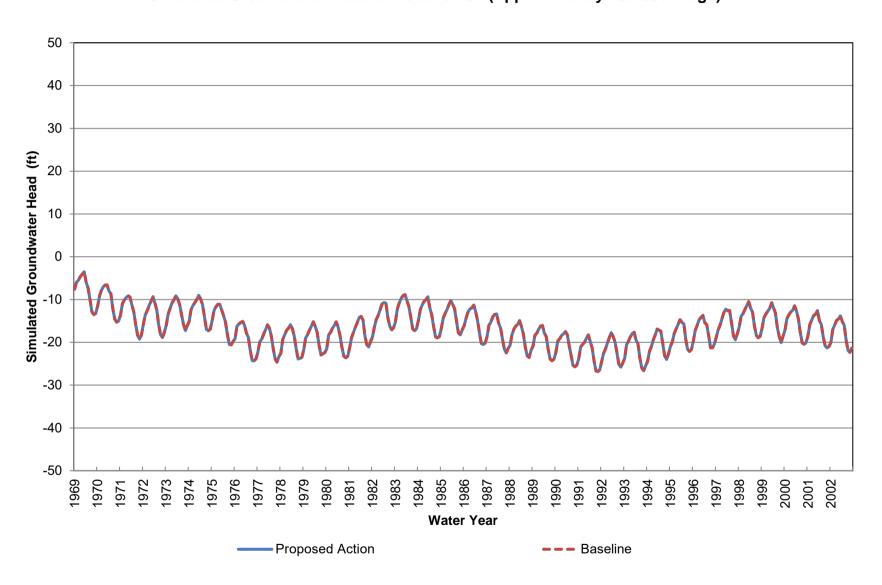
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Elevation at Location 34 (Approximately 0-70 ft bgs)



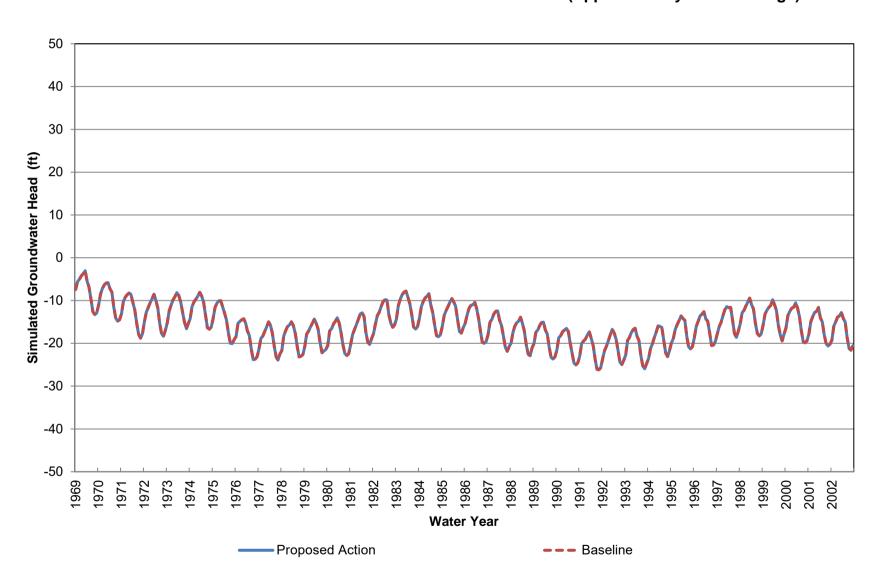
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 34 (Approximately 70-230 ft bgs)



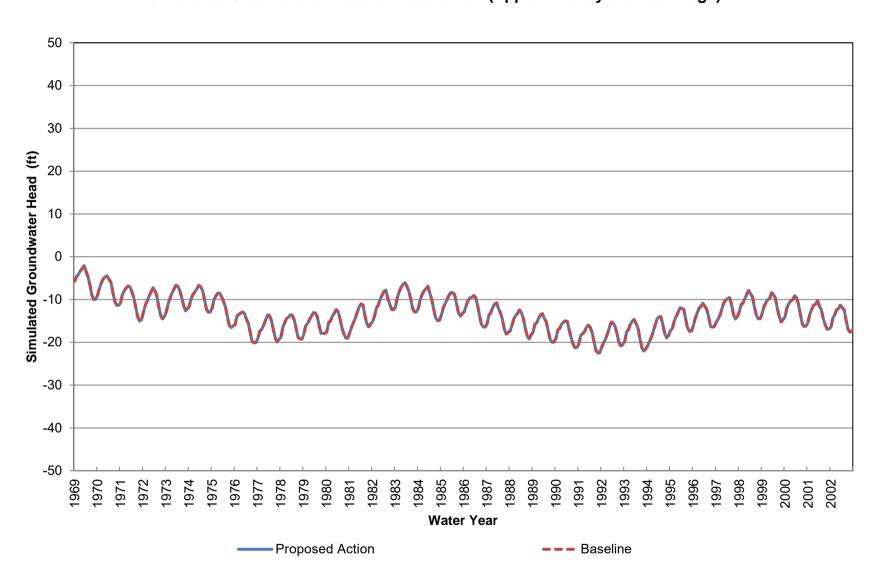
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 34 (Approximately 230-380 ft bgs)



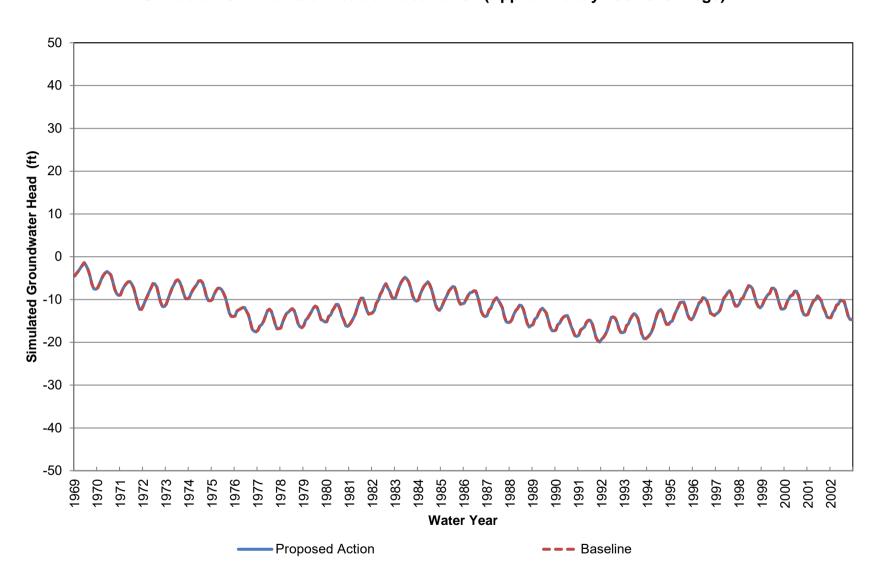
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 34 (Approximately 380-540 ft bgs)



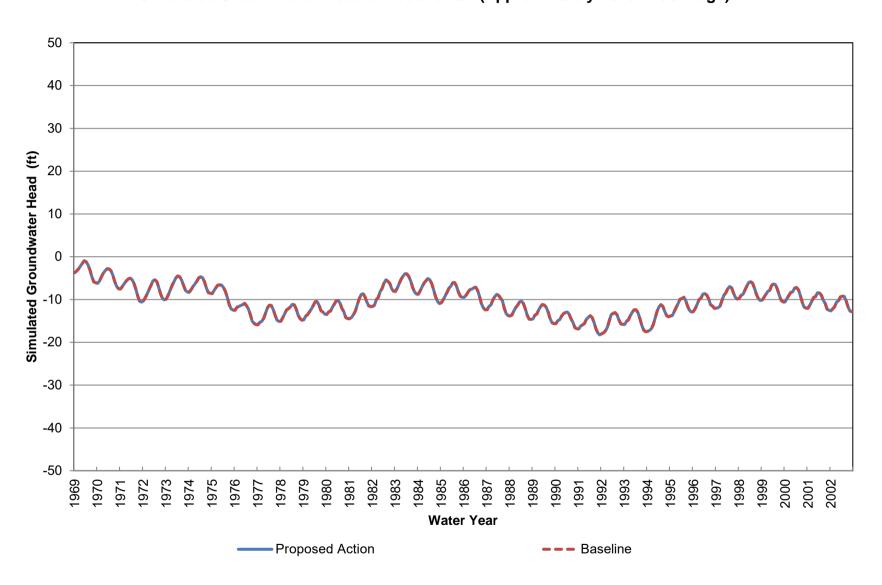
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 34 (Approximately 540-780 ft bgs)



2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 34 (Approximately 780-1040 ft bgs)

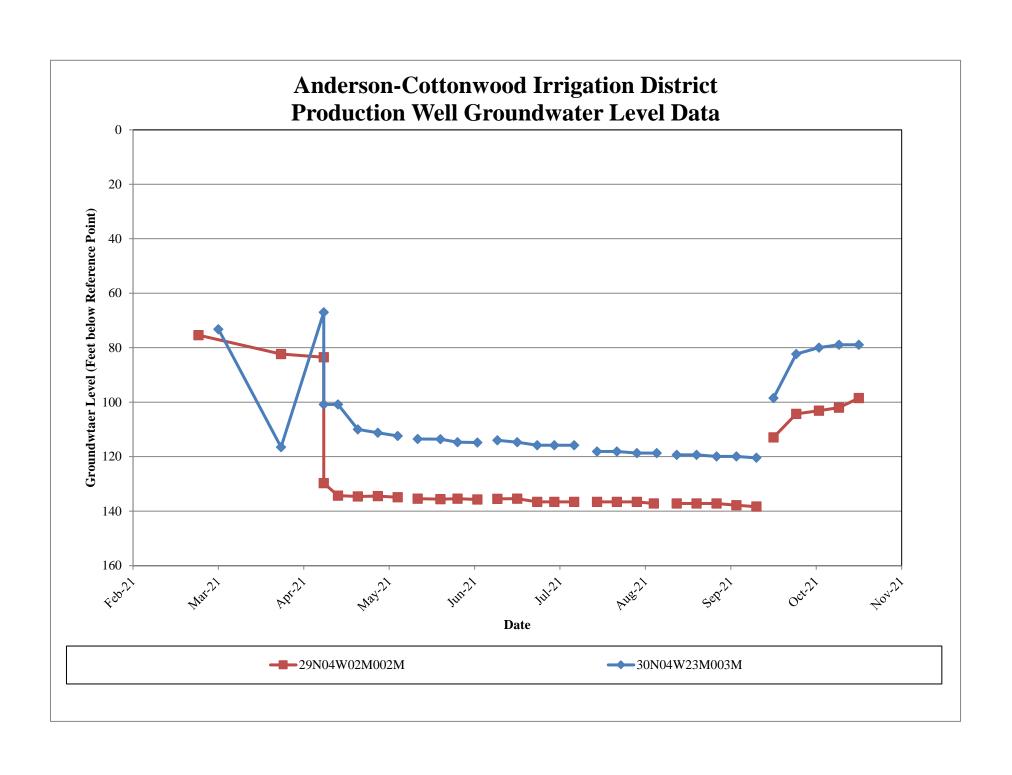


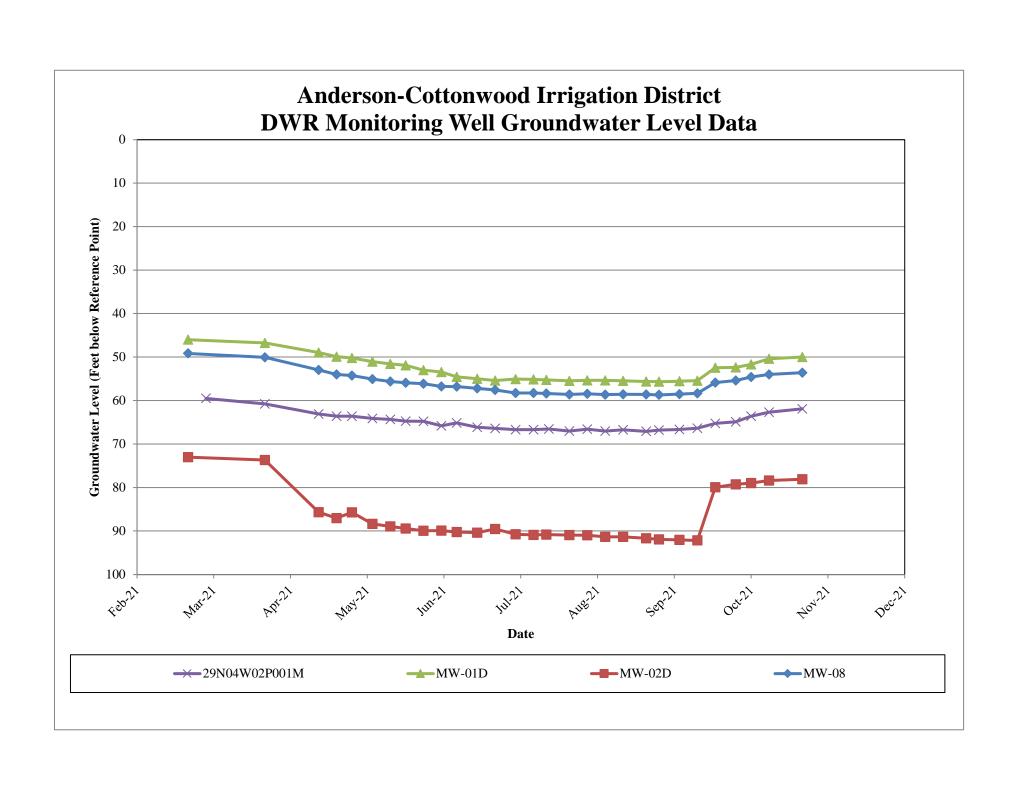
2022 Tehama-Colusa Canal Authority Water Transfers IS/EA Simulated Groundwater Head at Location 34 (Approximately 1040-1430 ft bgs)

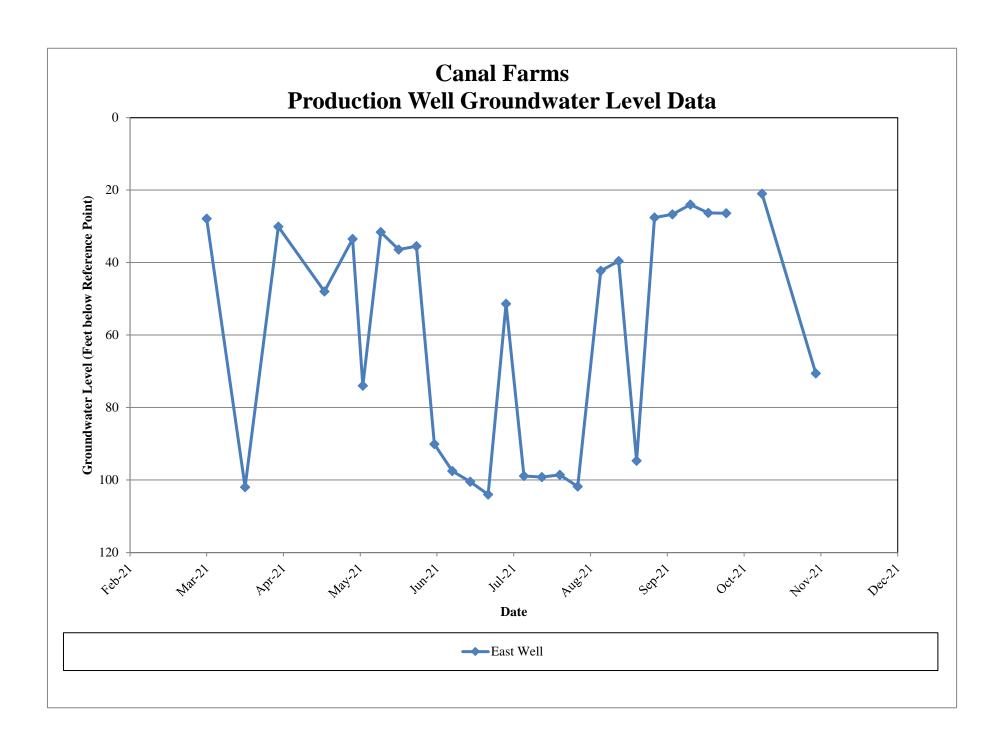


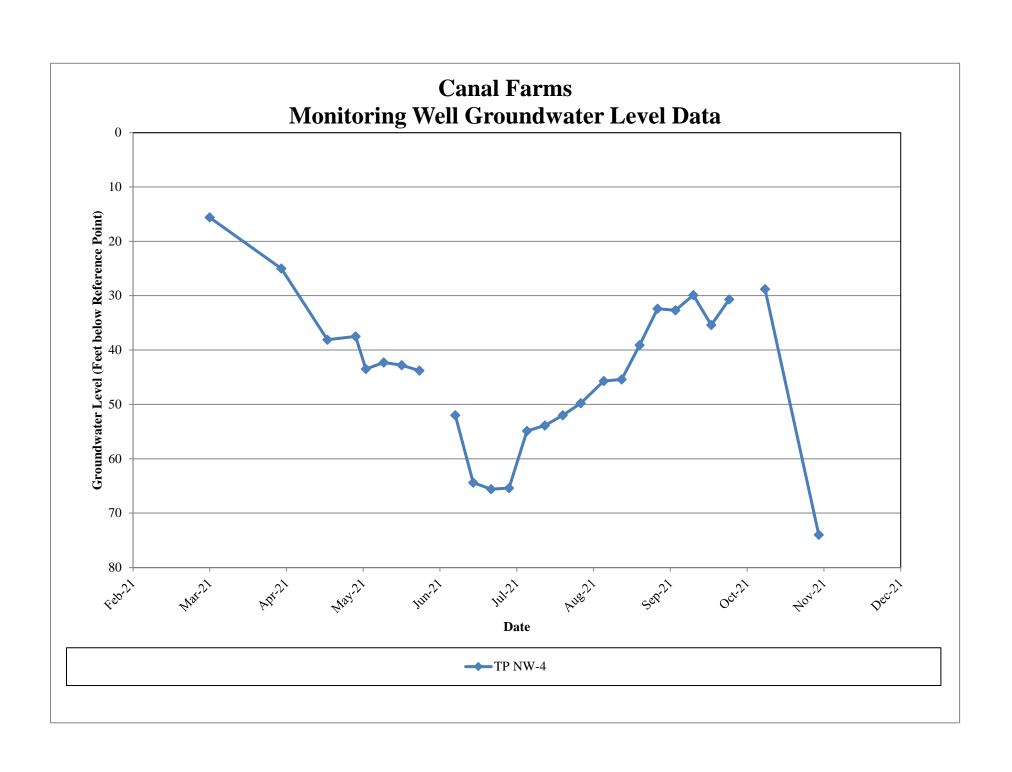
Appendix I1

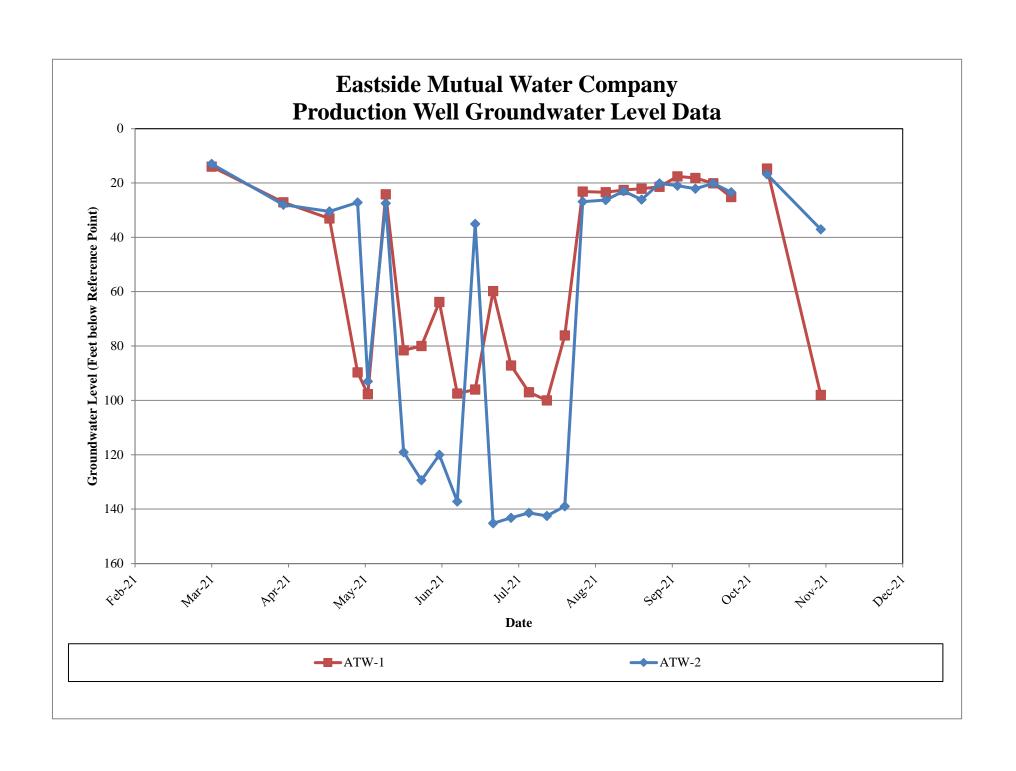
2021 Water Transfers Data Reports

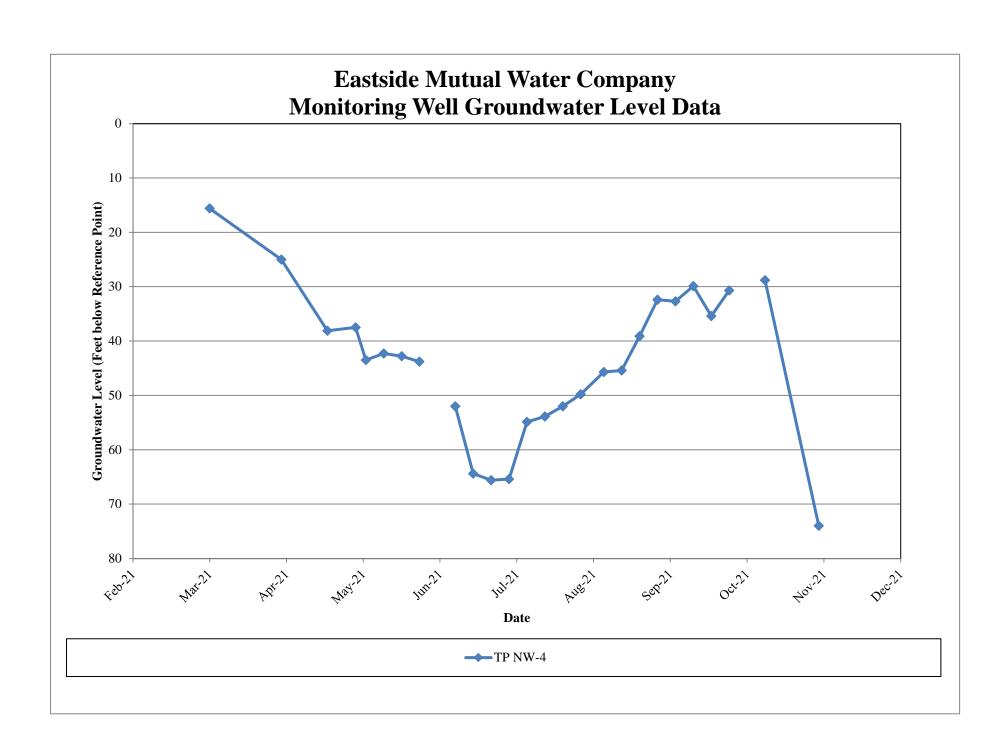


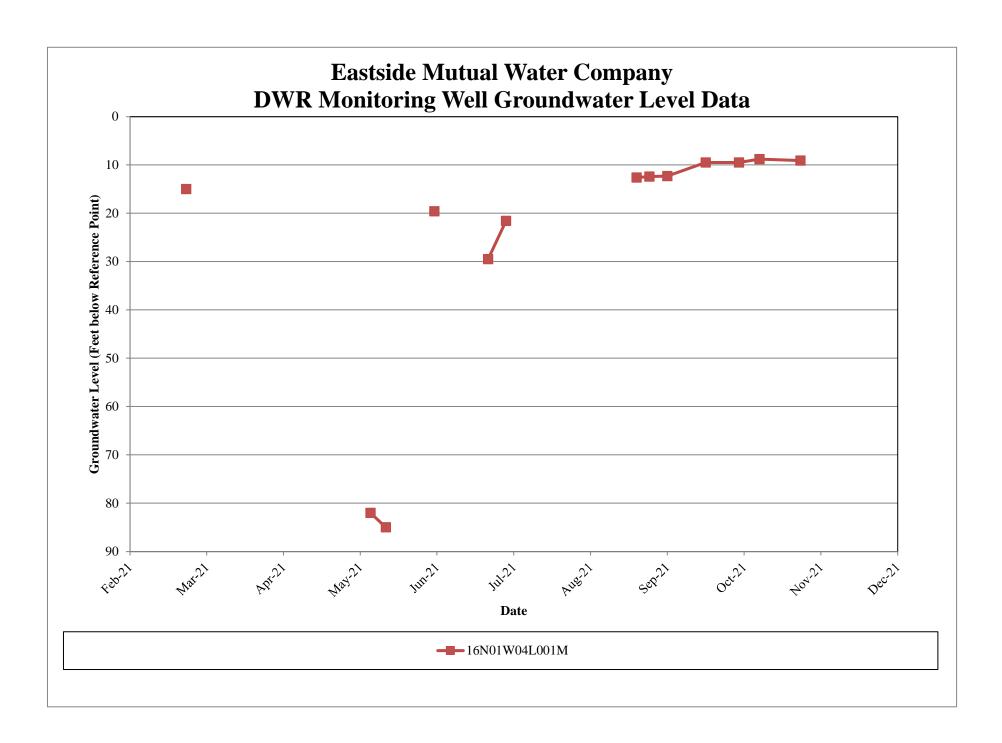


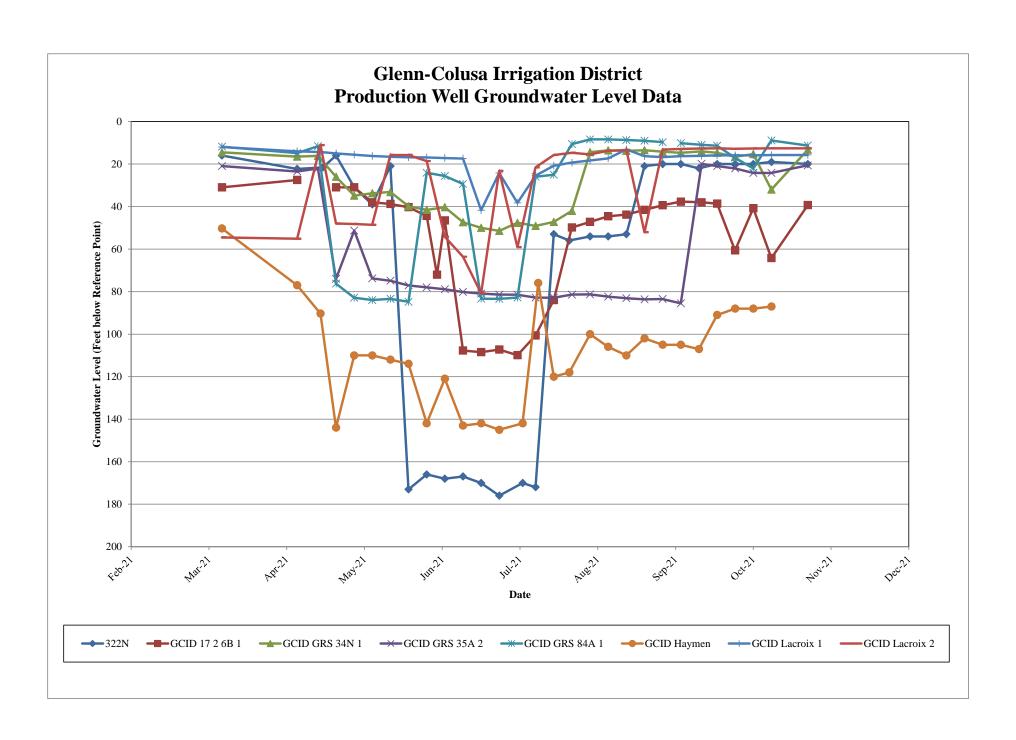


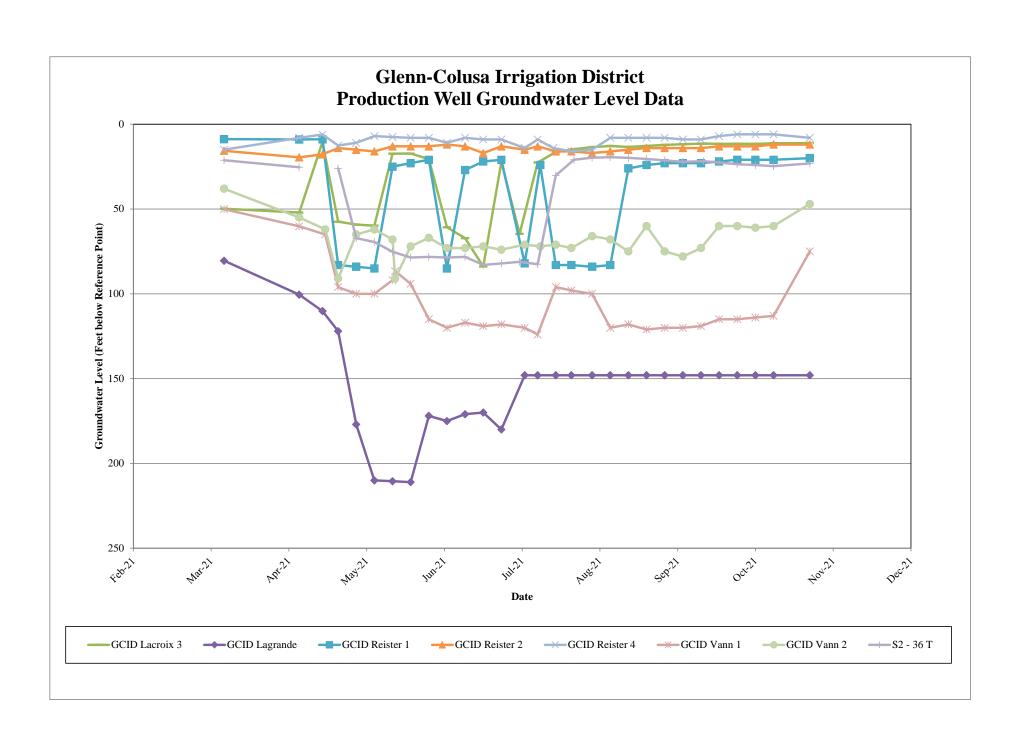


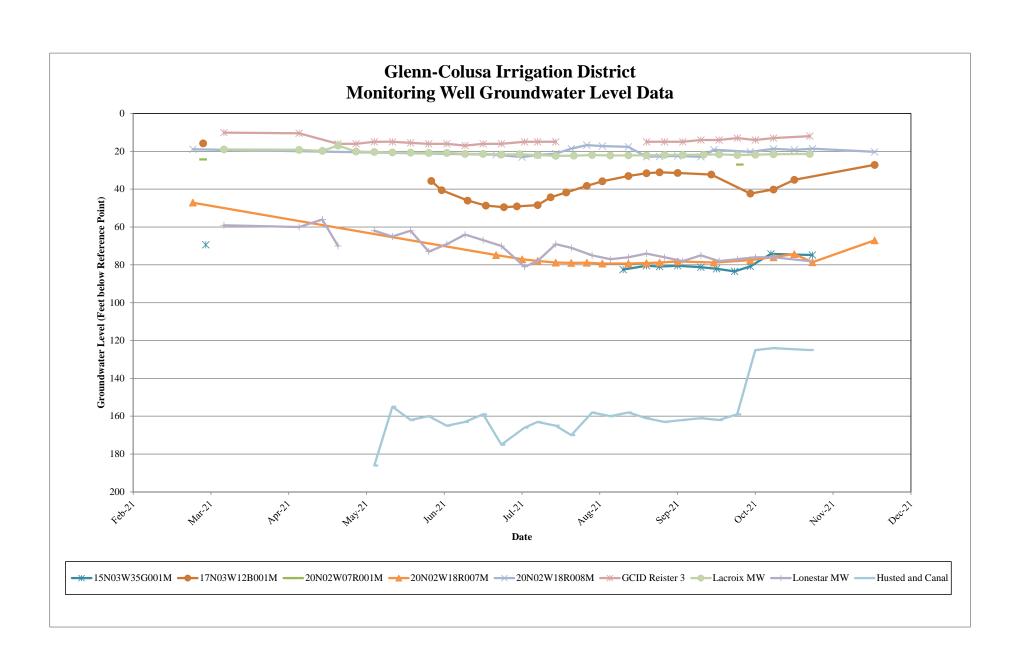


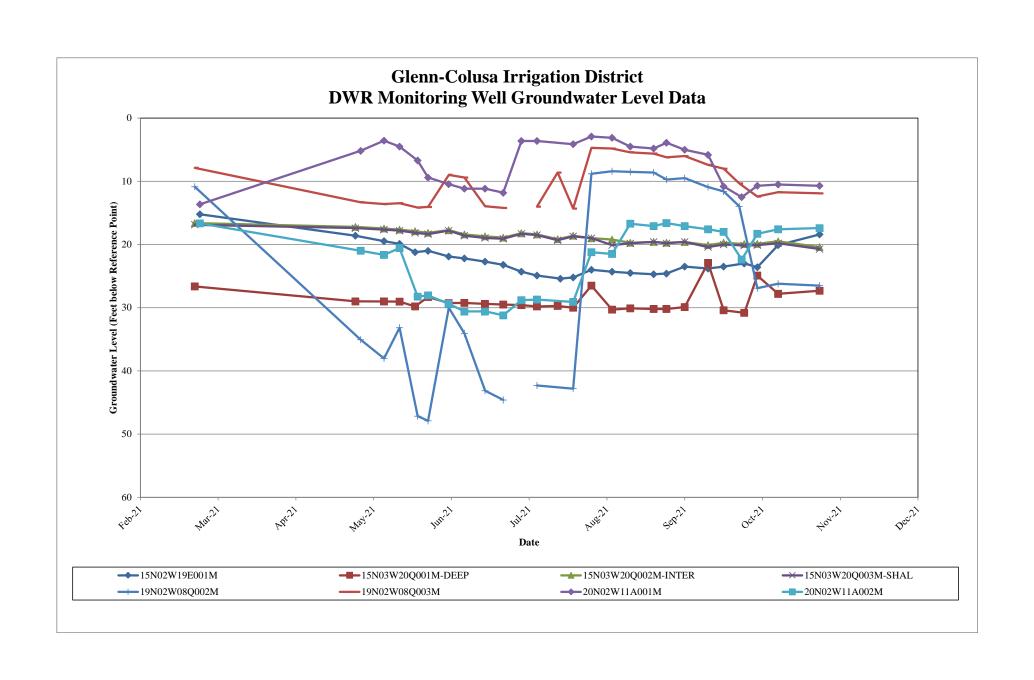


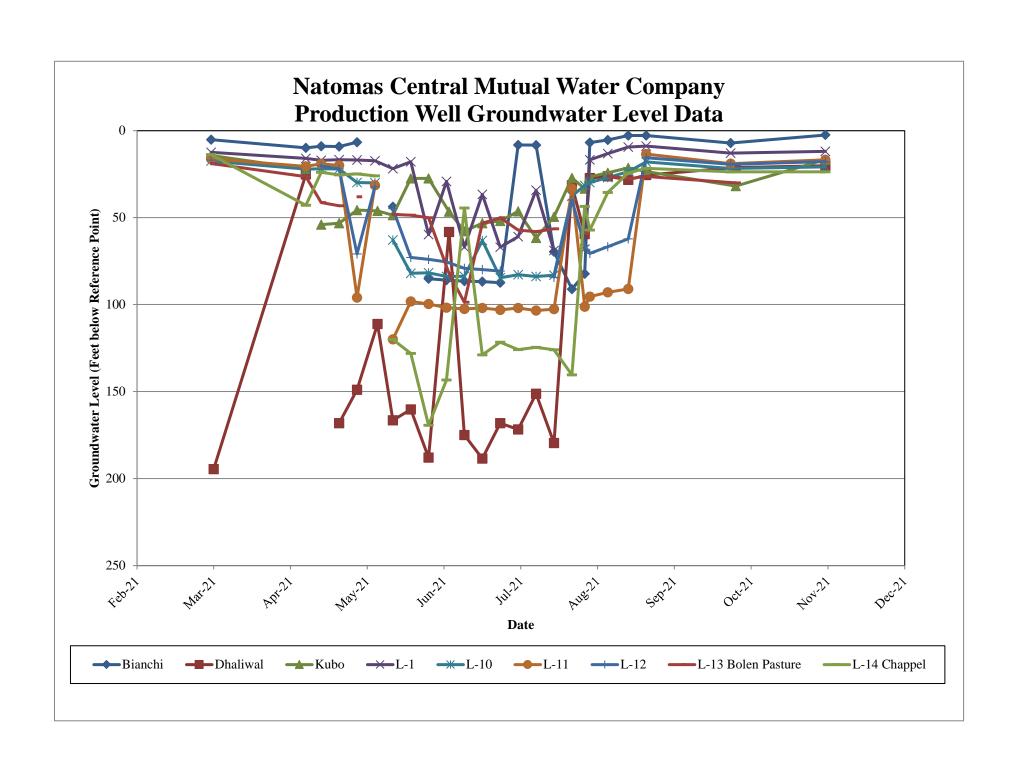


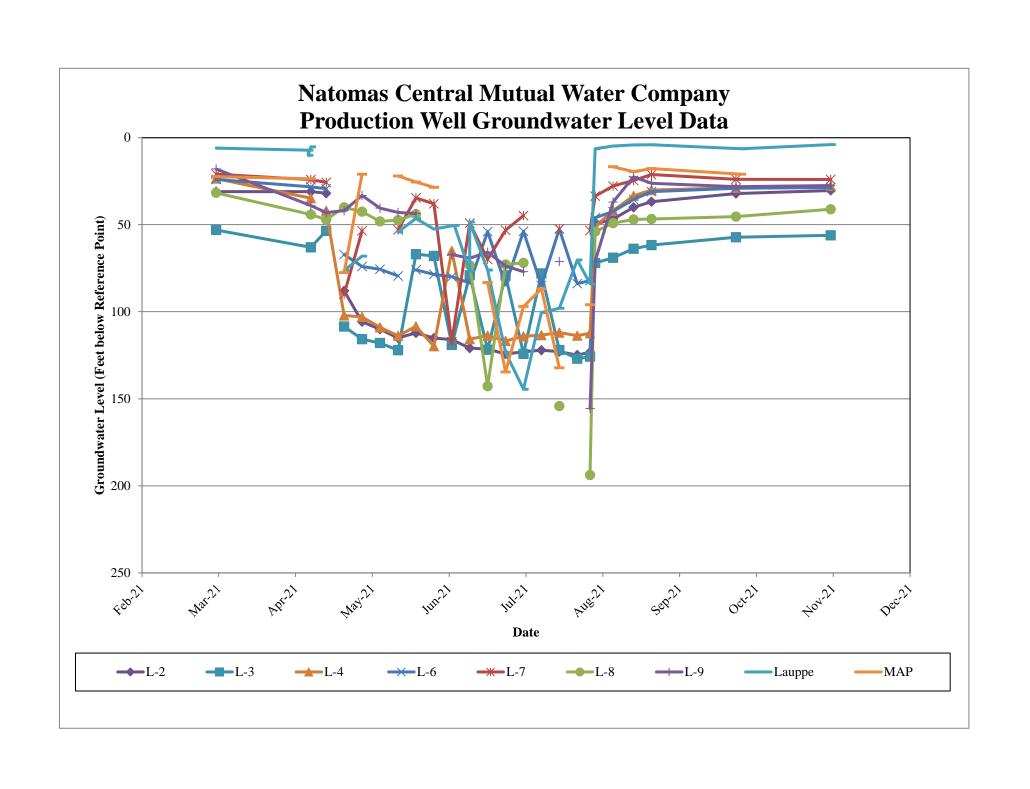


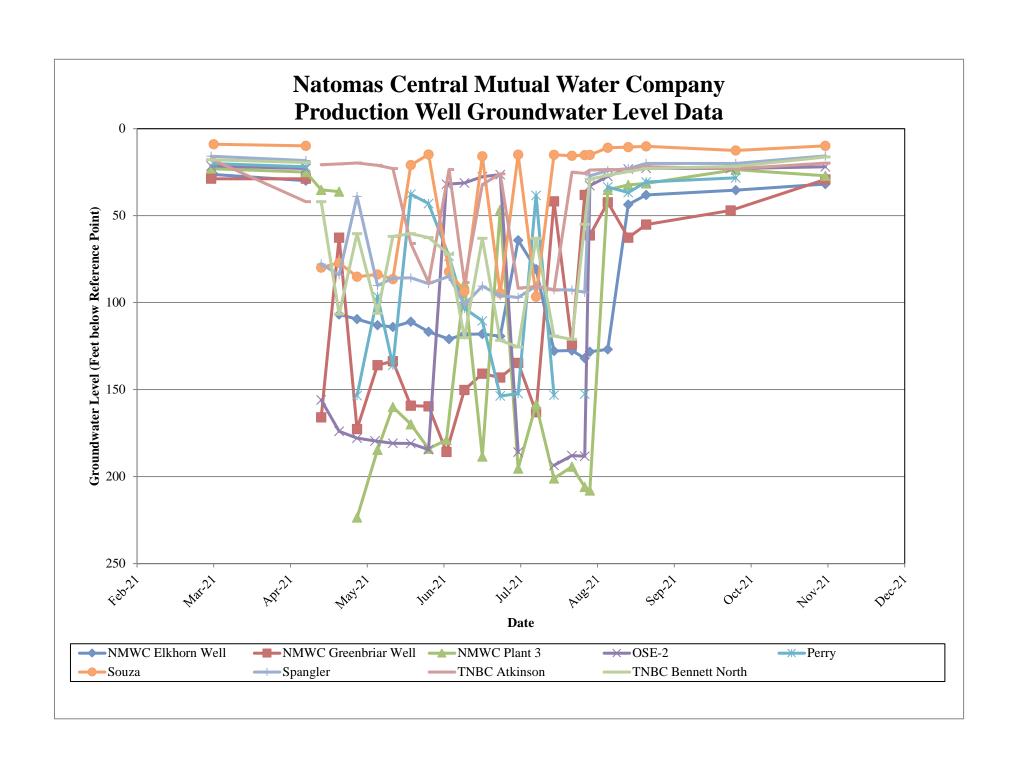


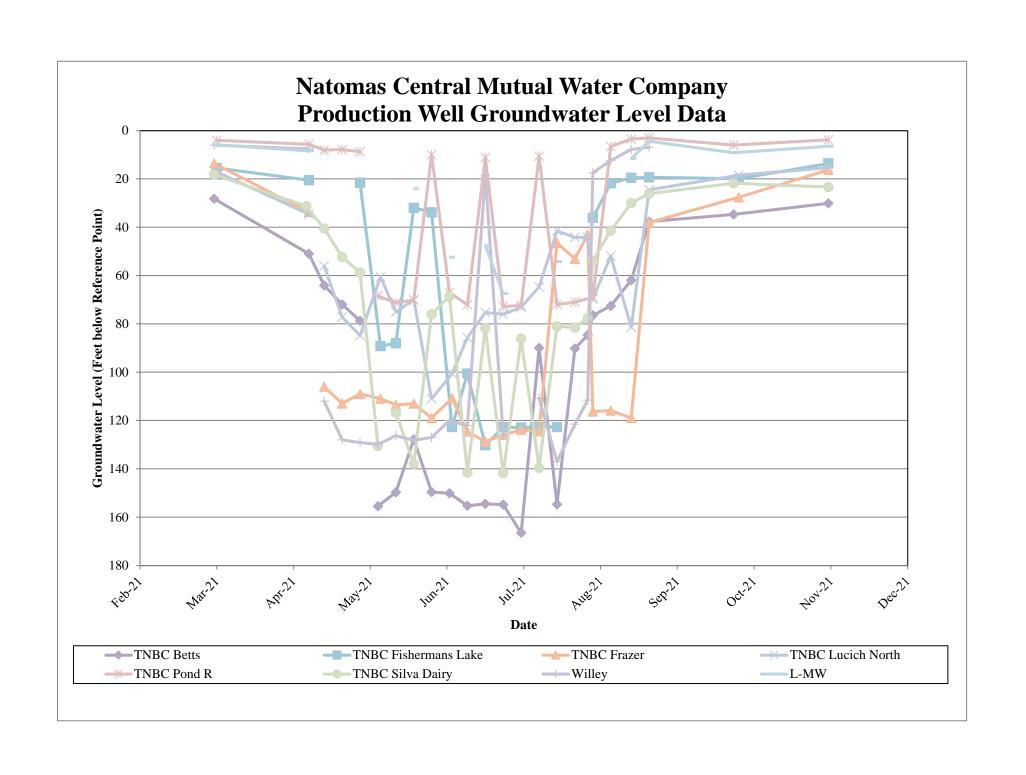


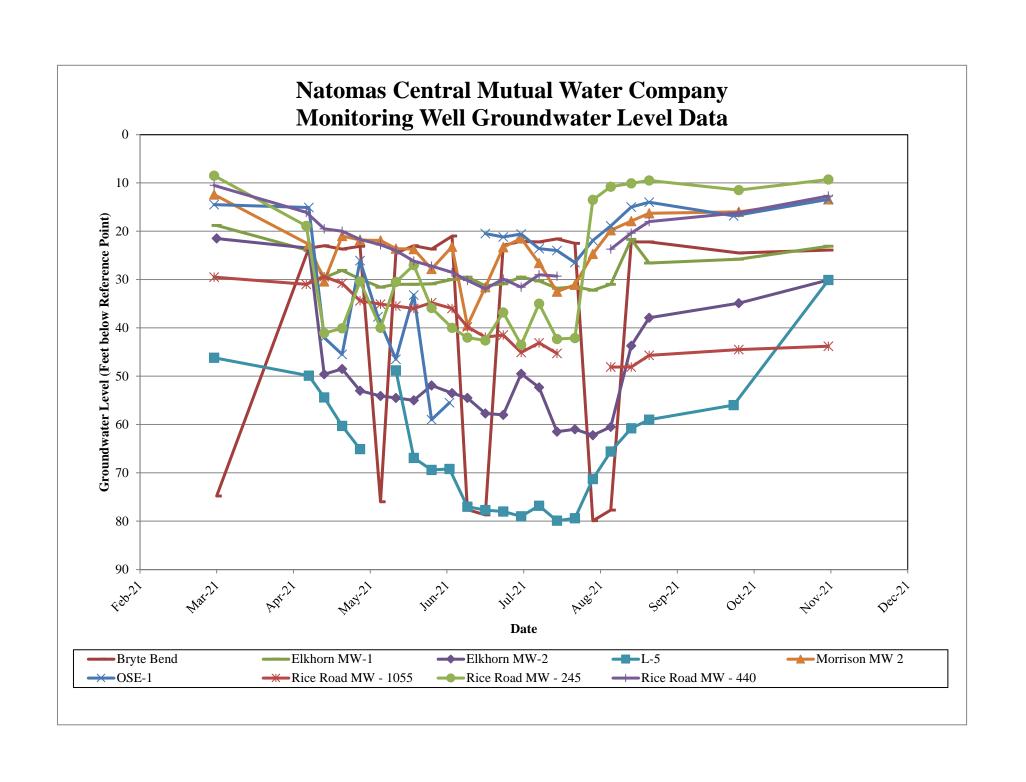


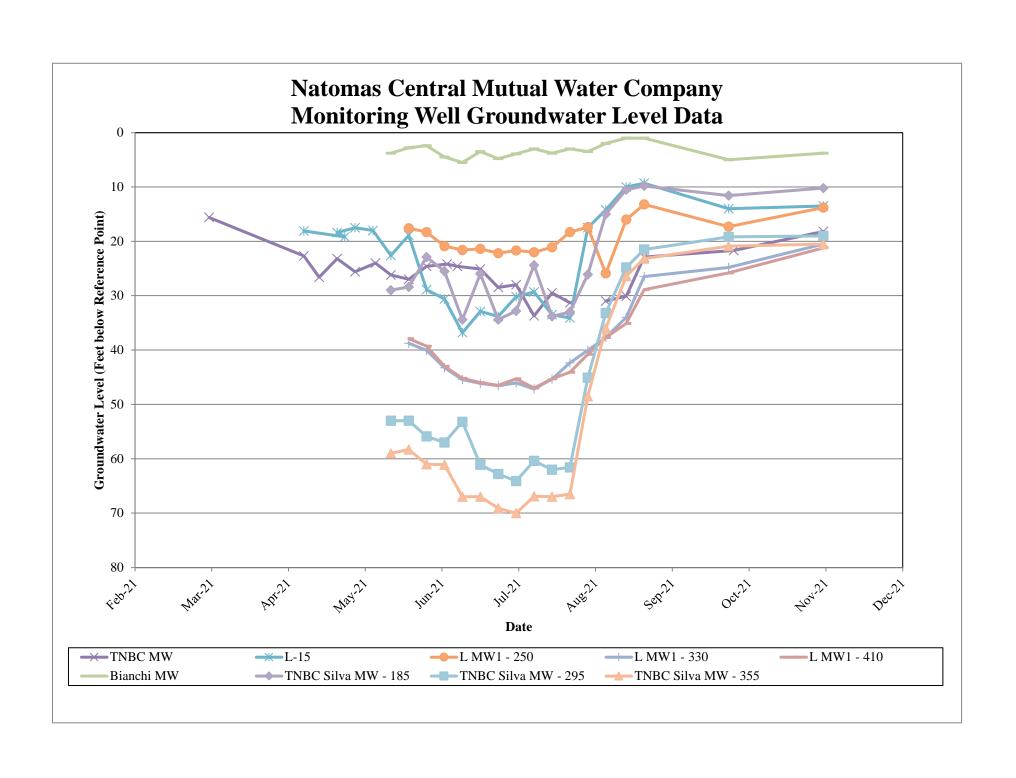


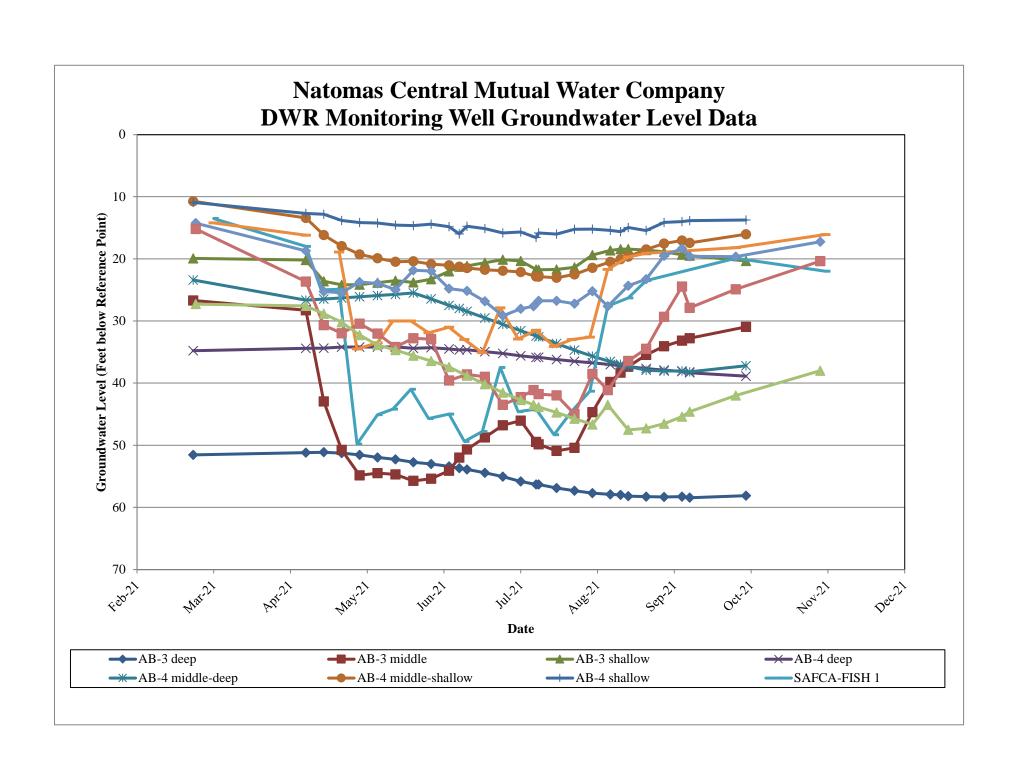


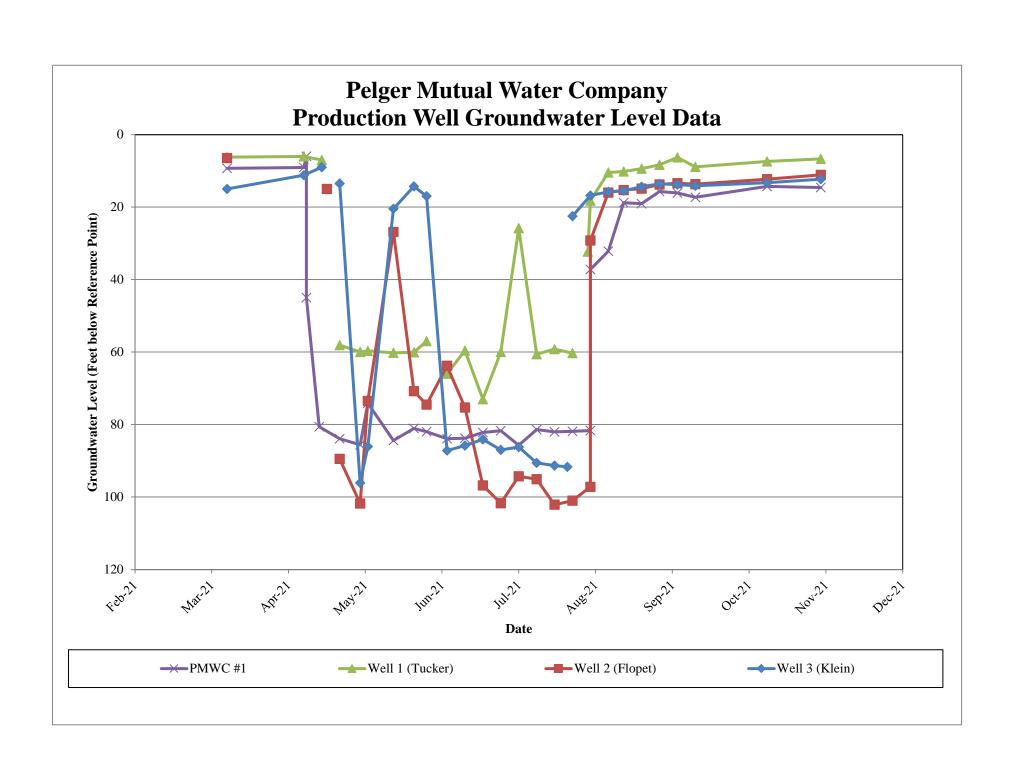


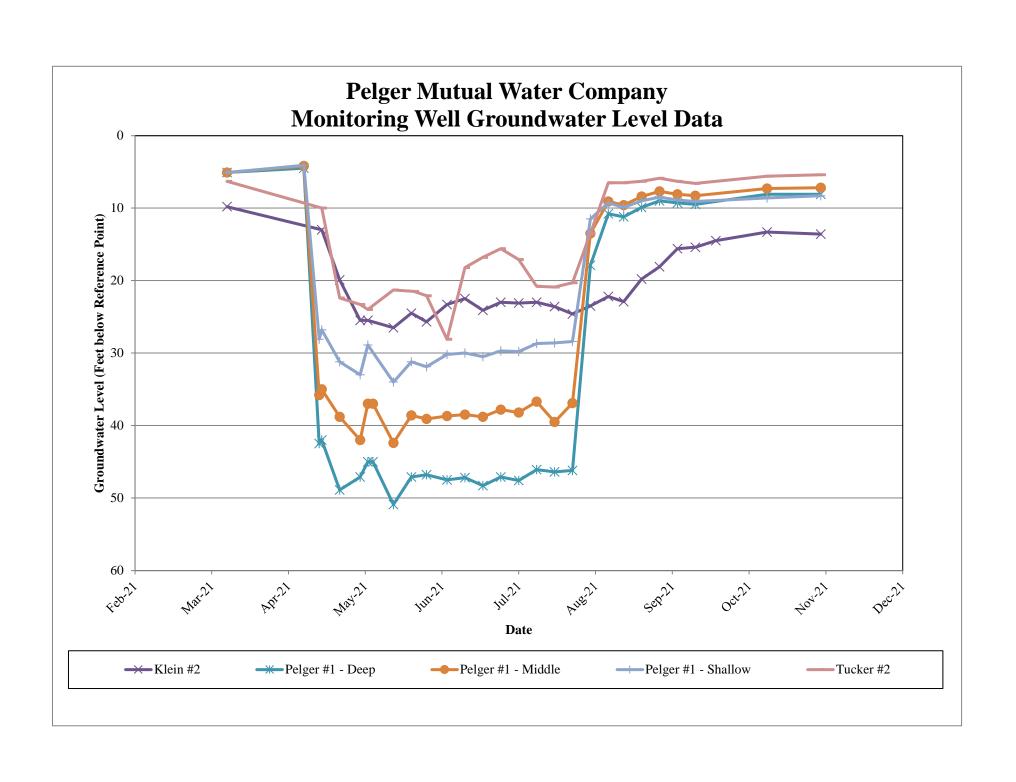


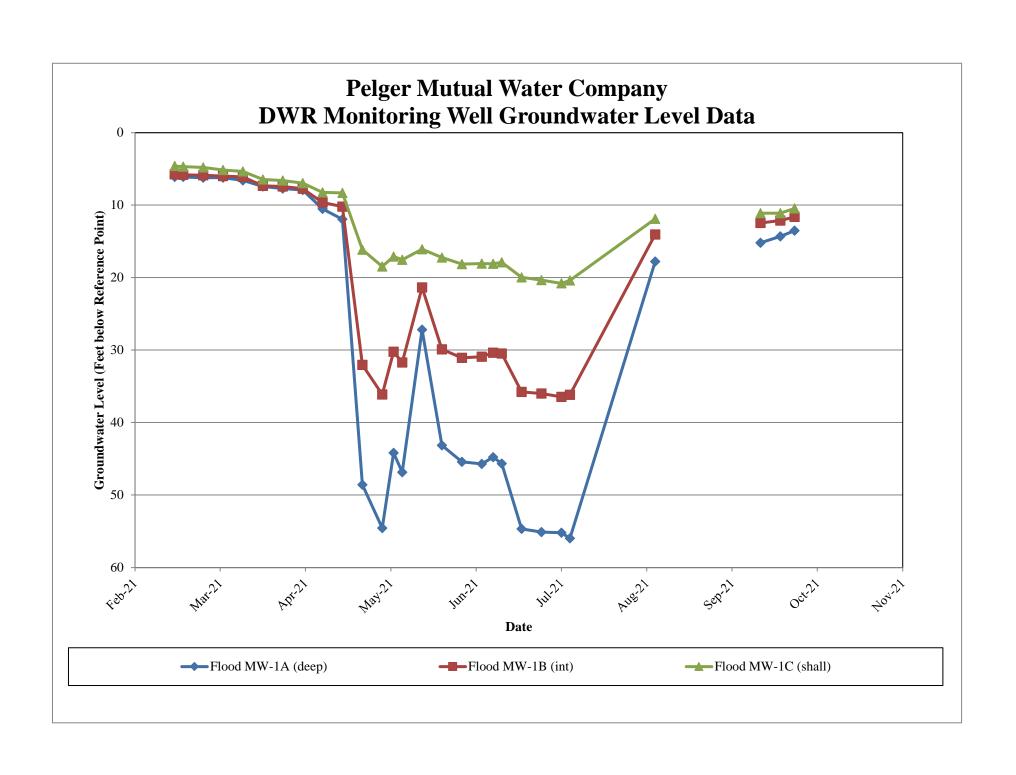


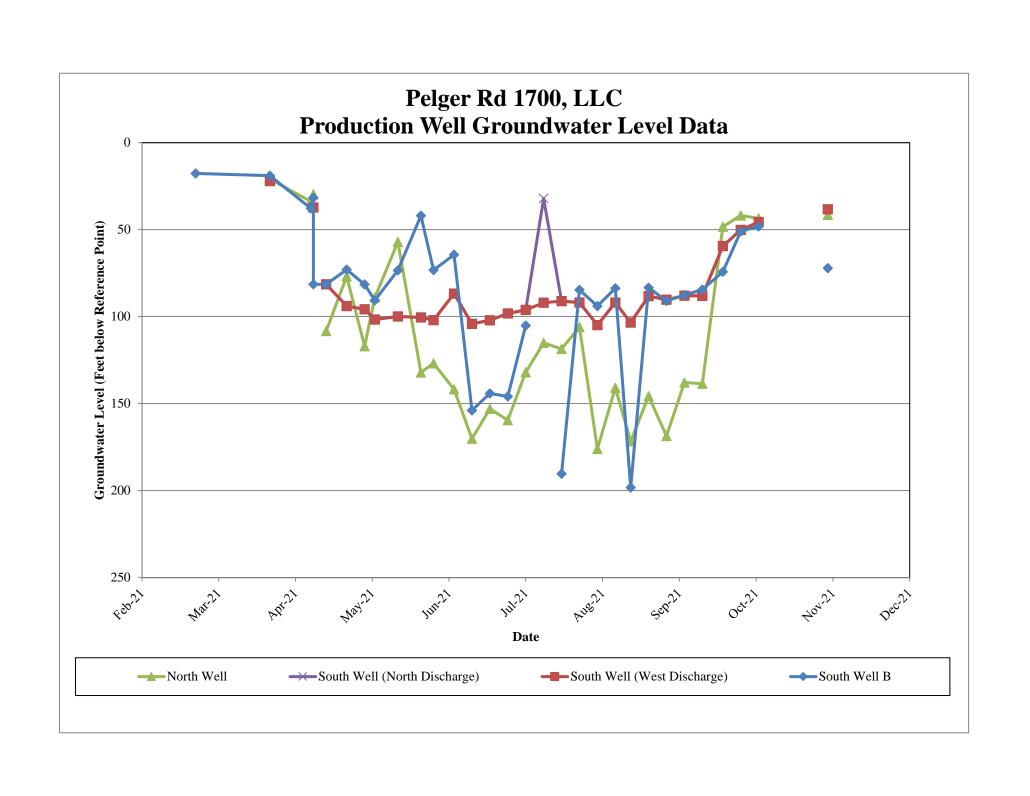


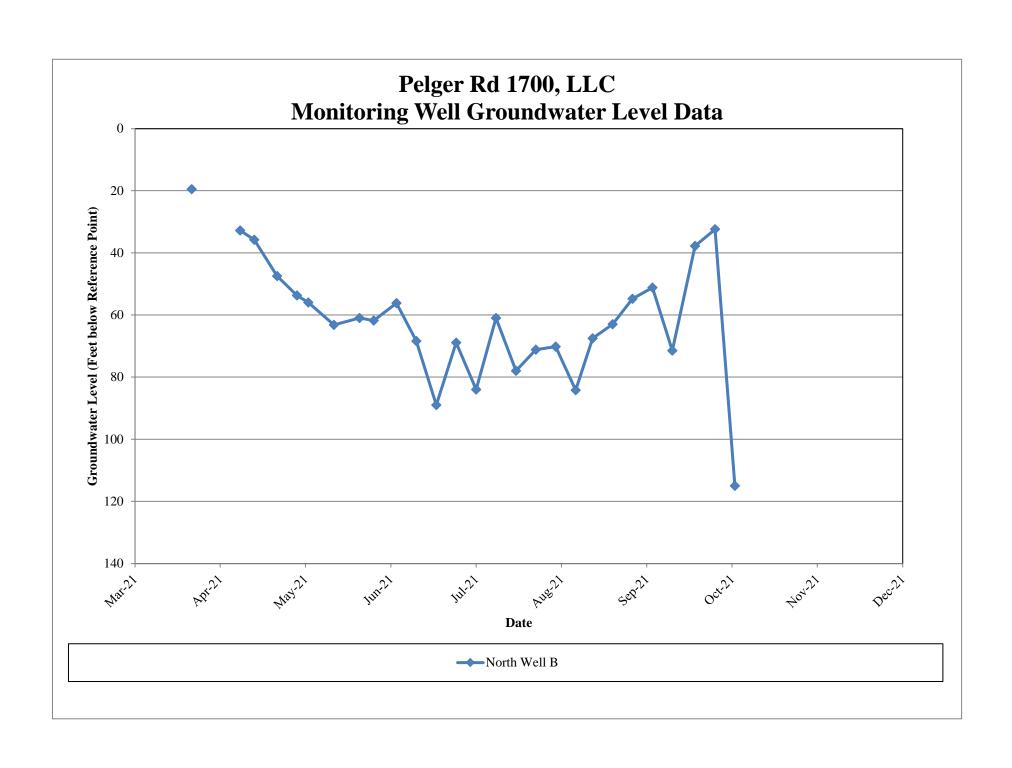


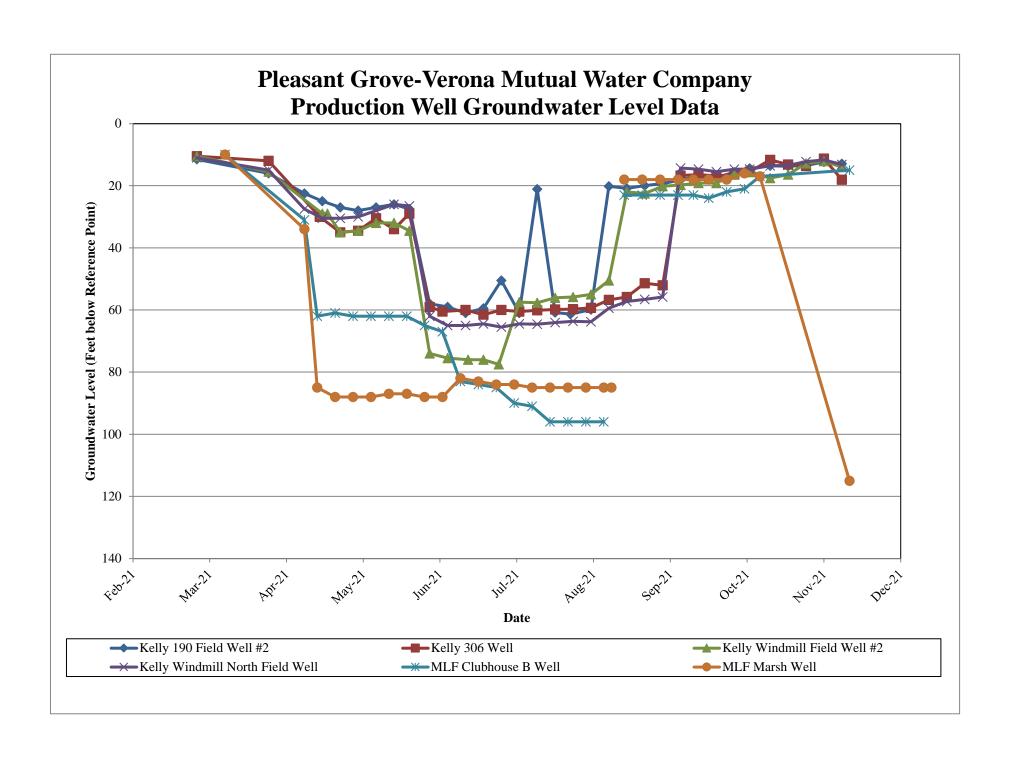


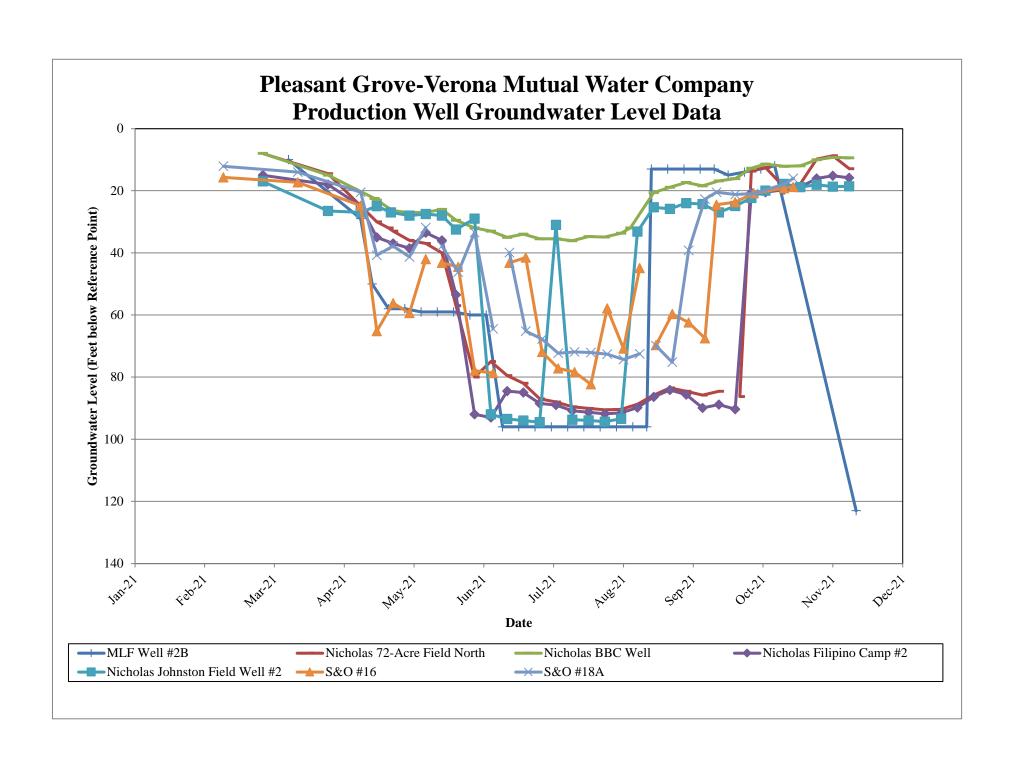


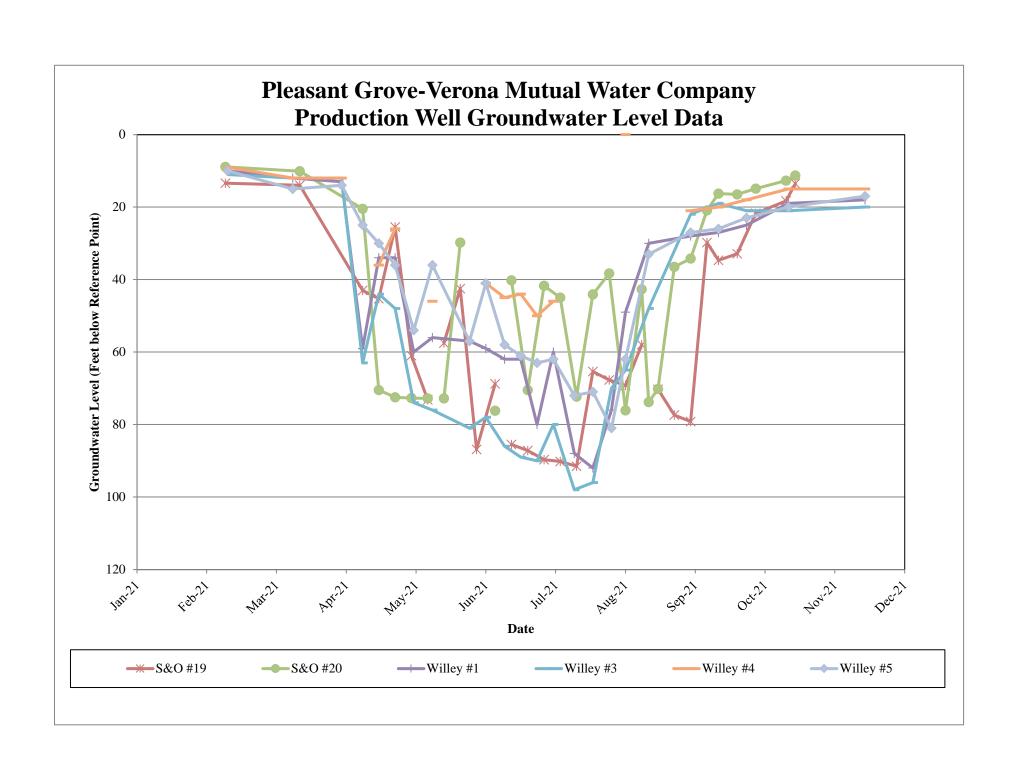


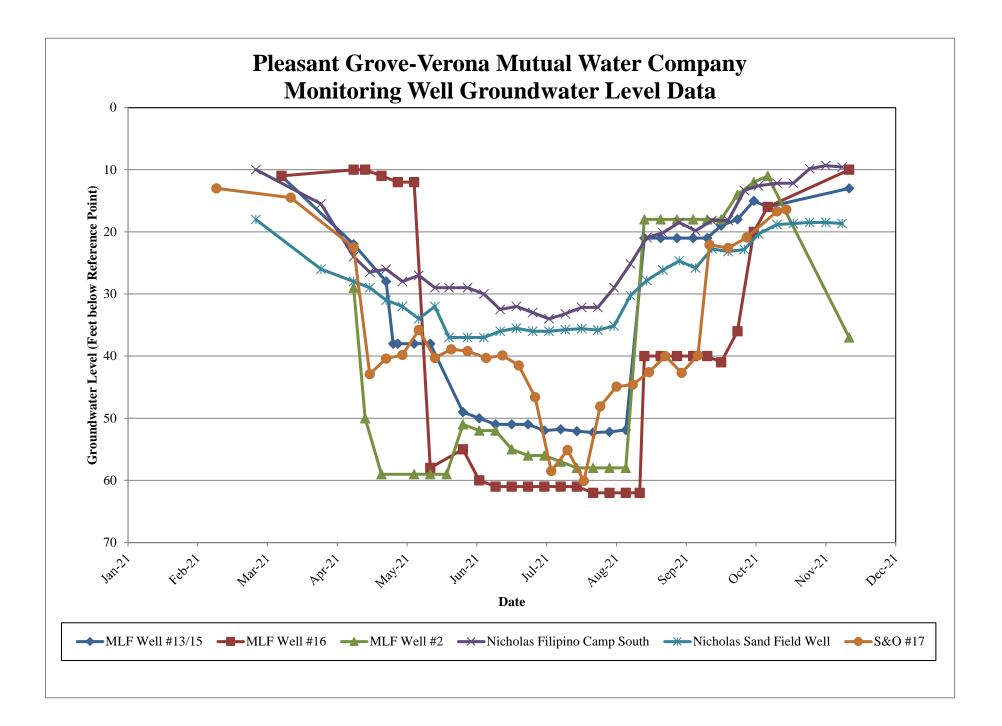


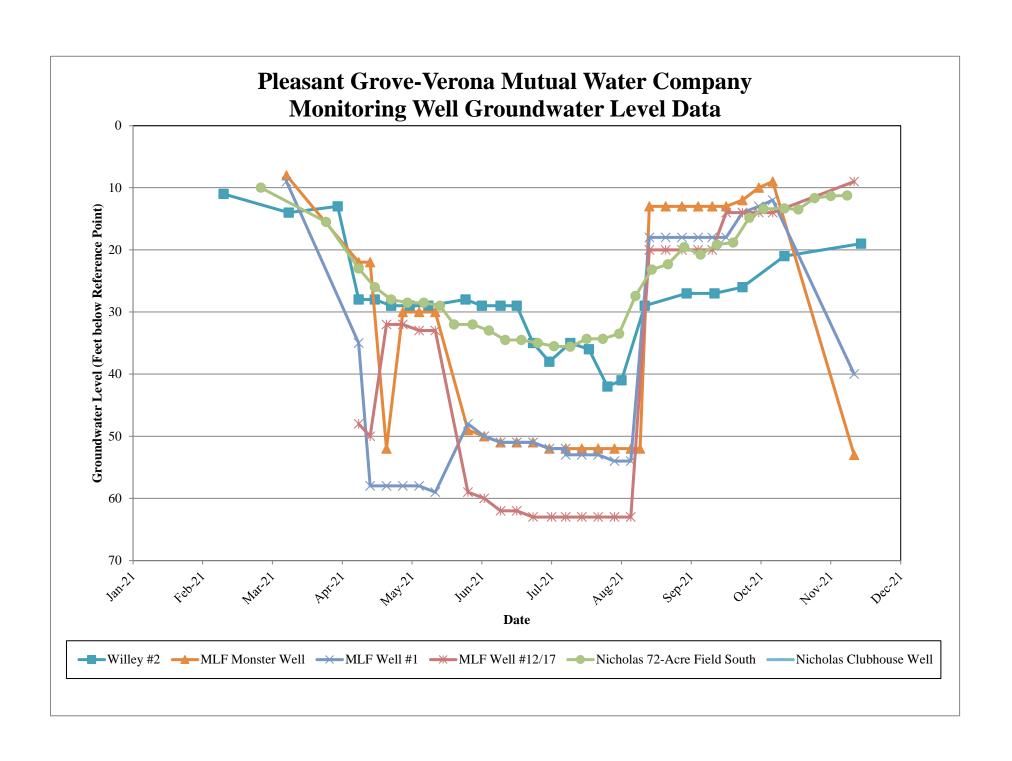


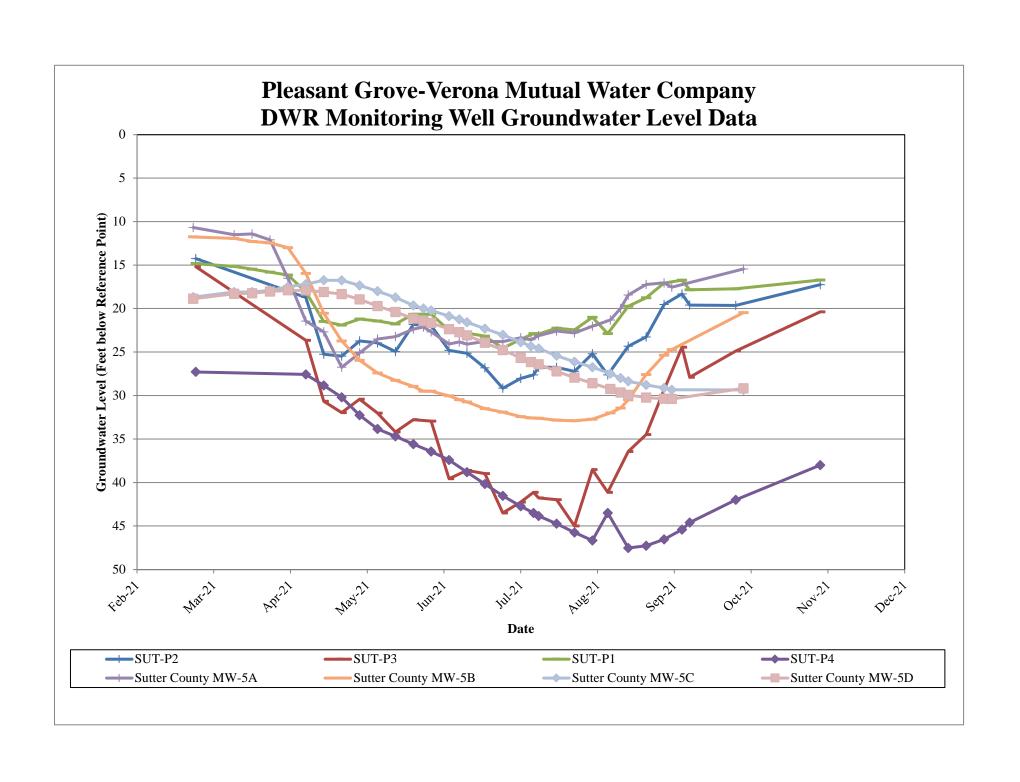


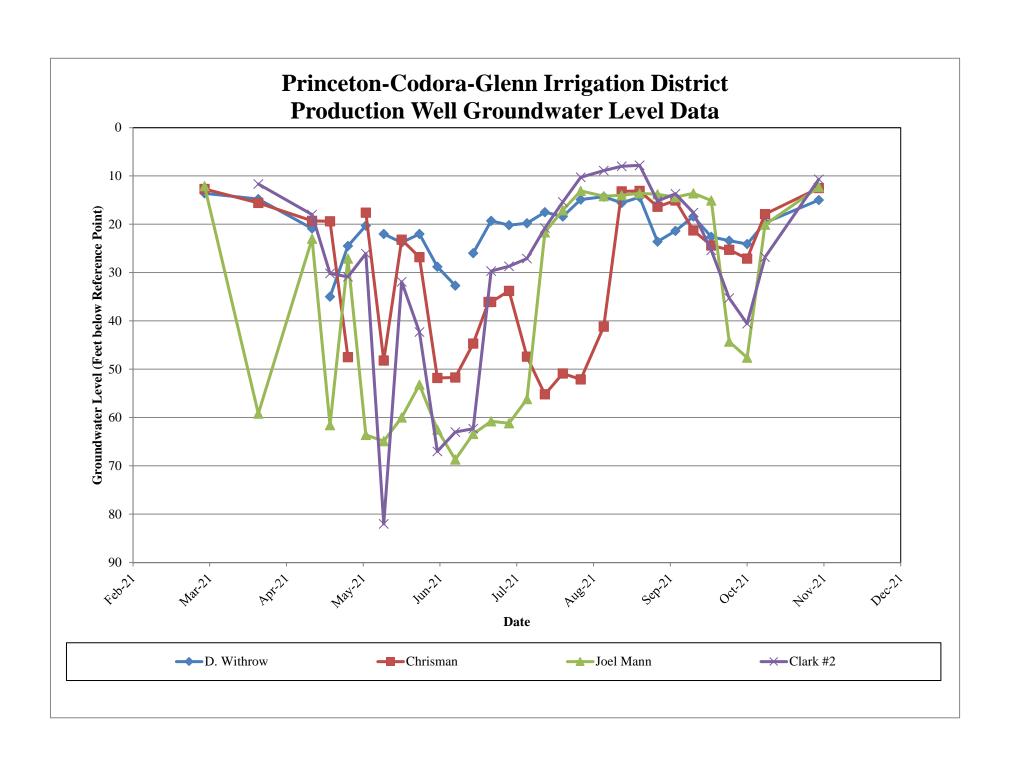


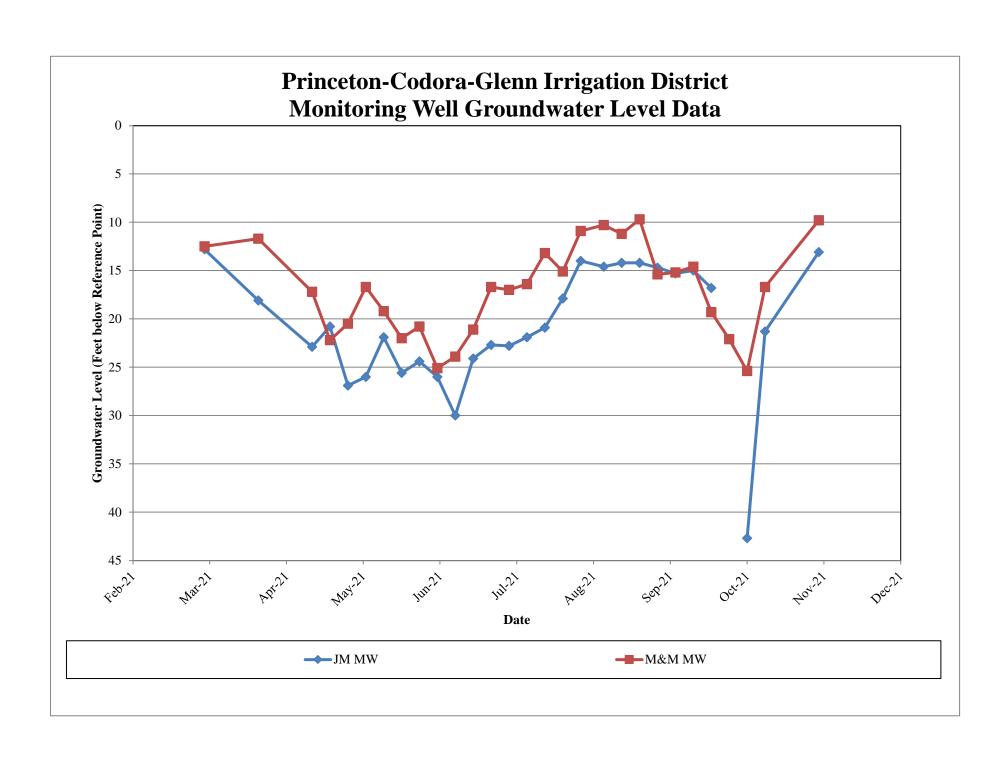


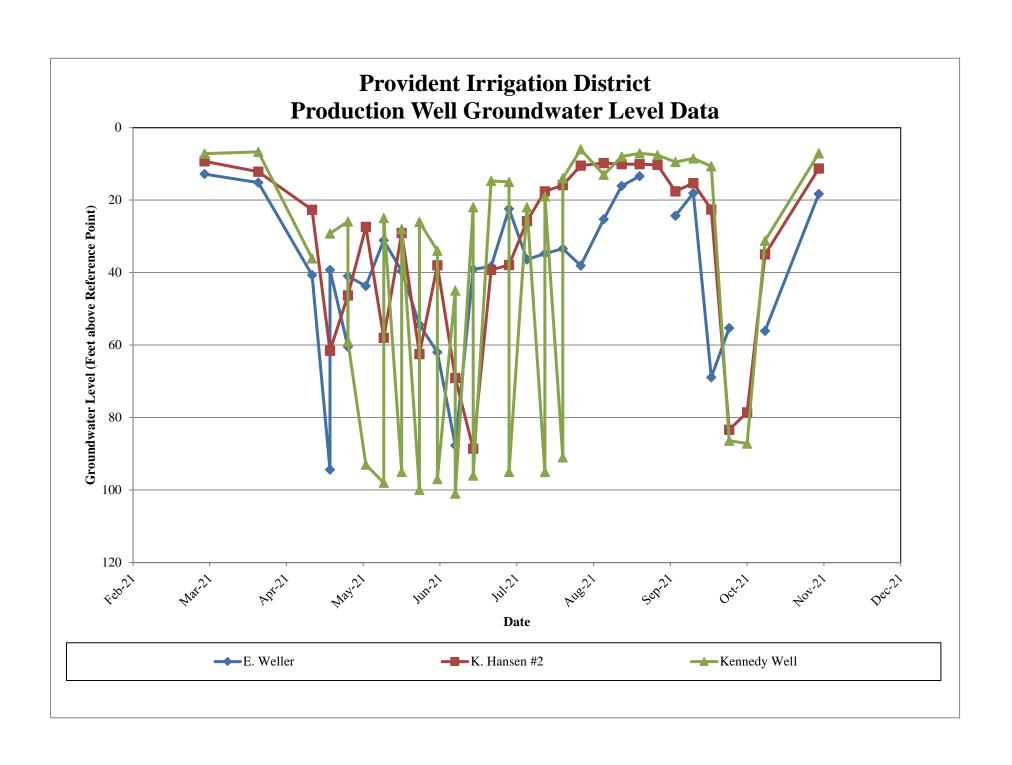


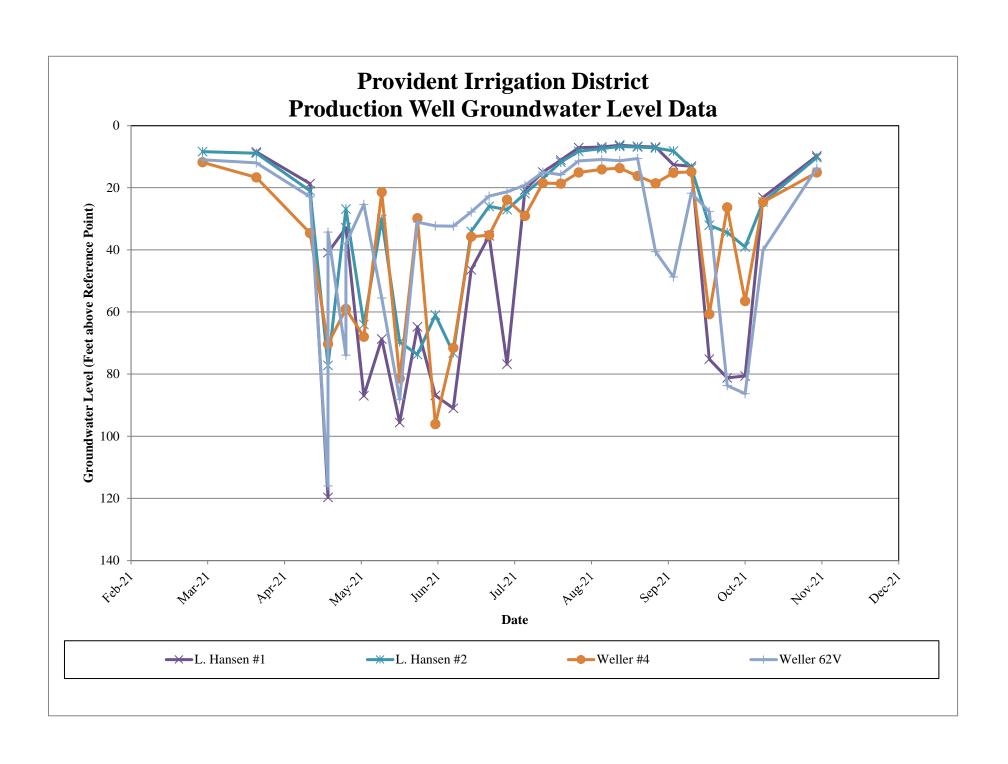


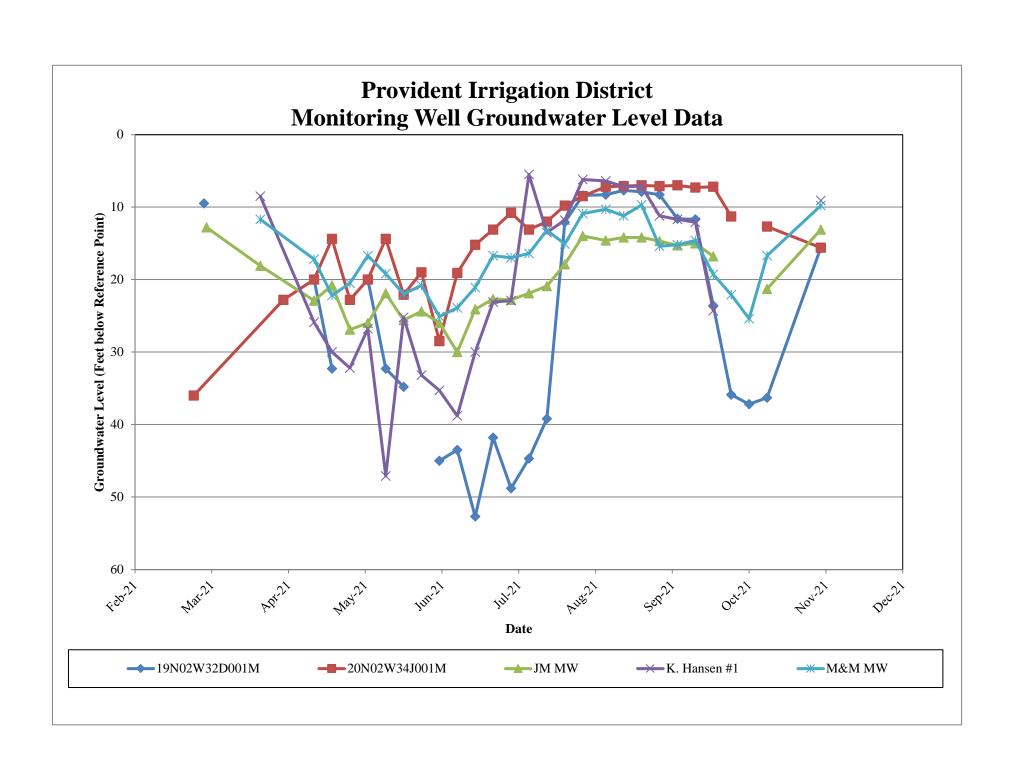


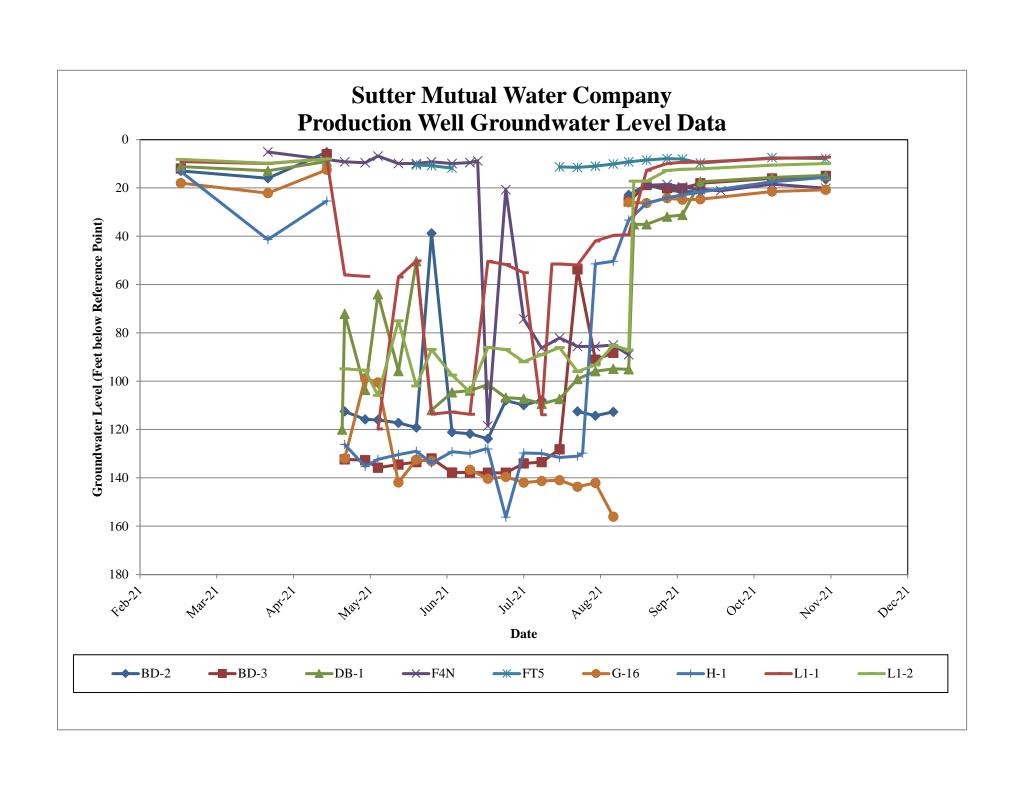


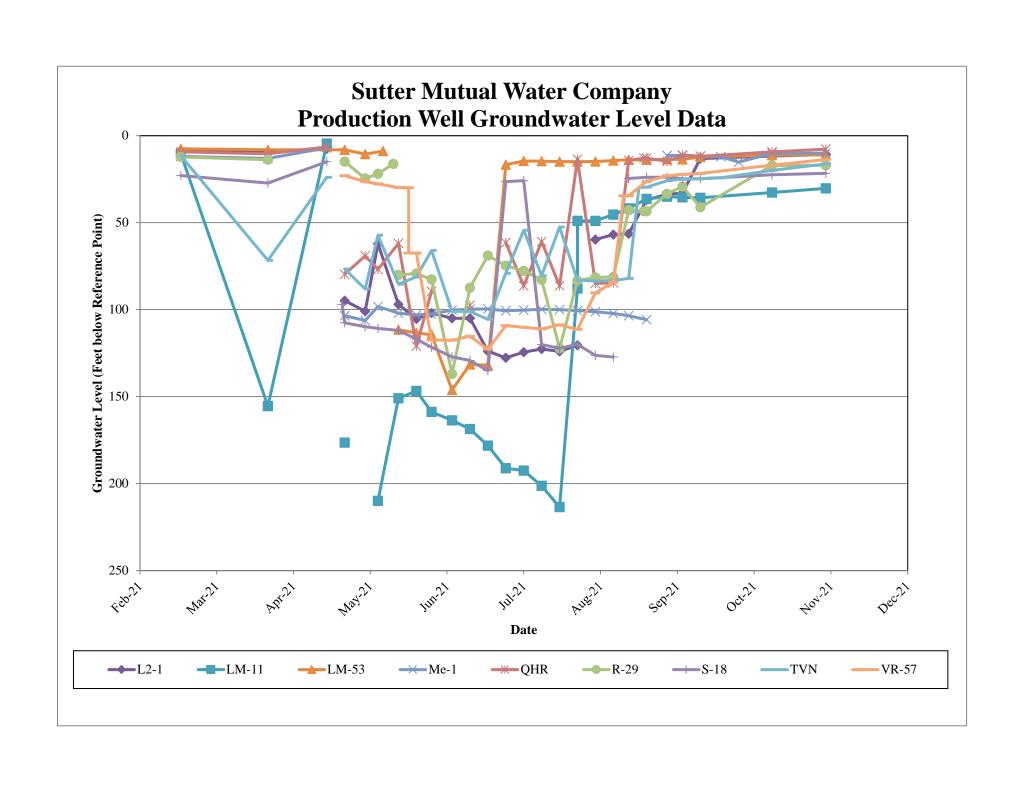


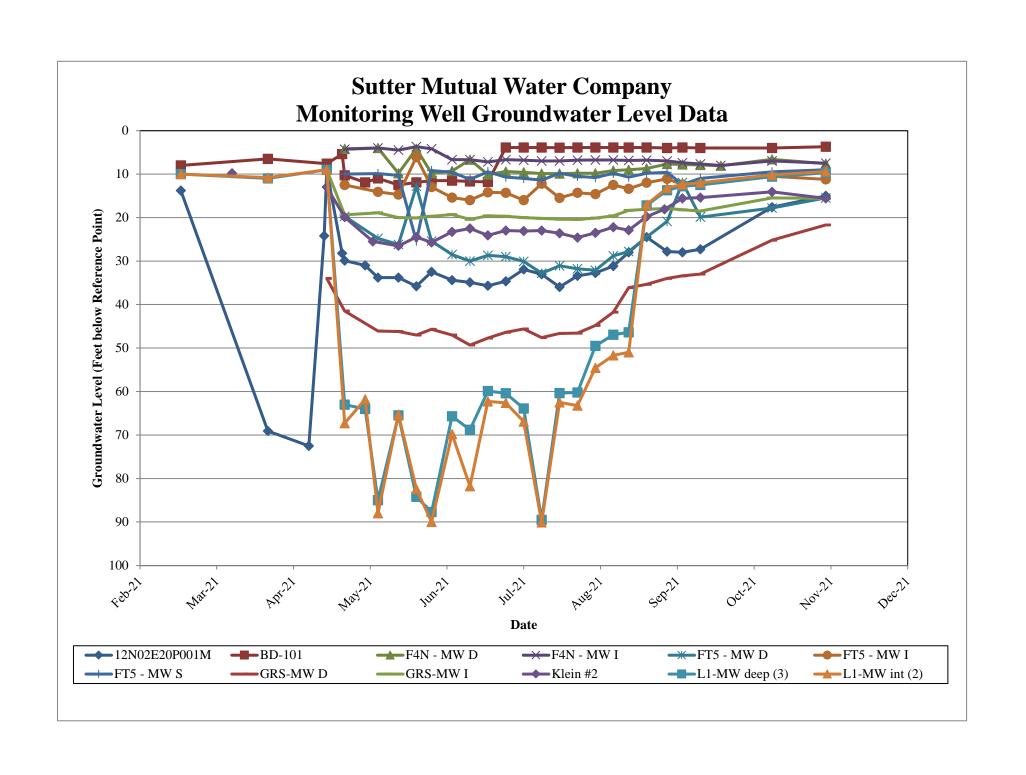


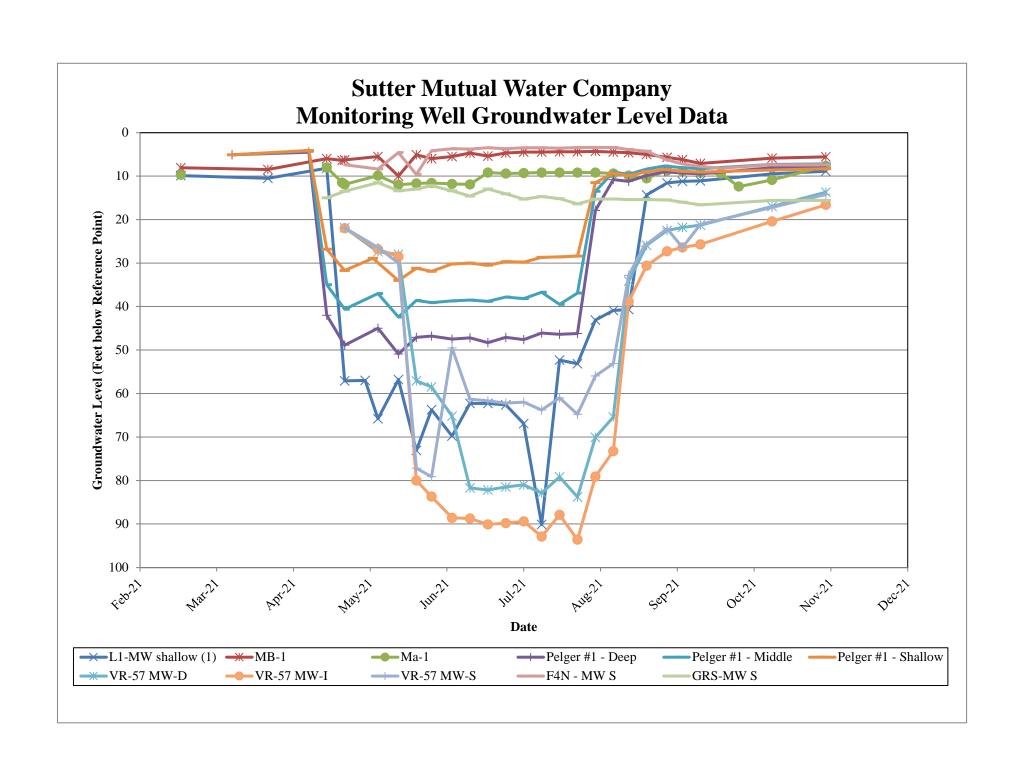


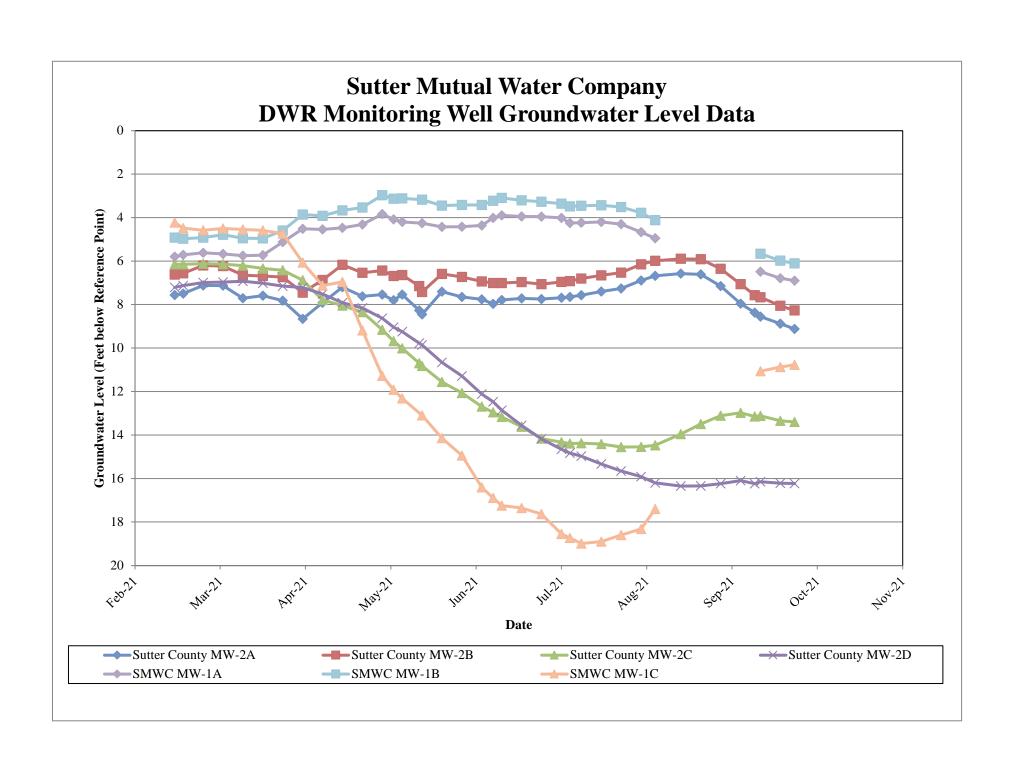


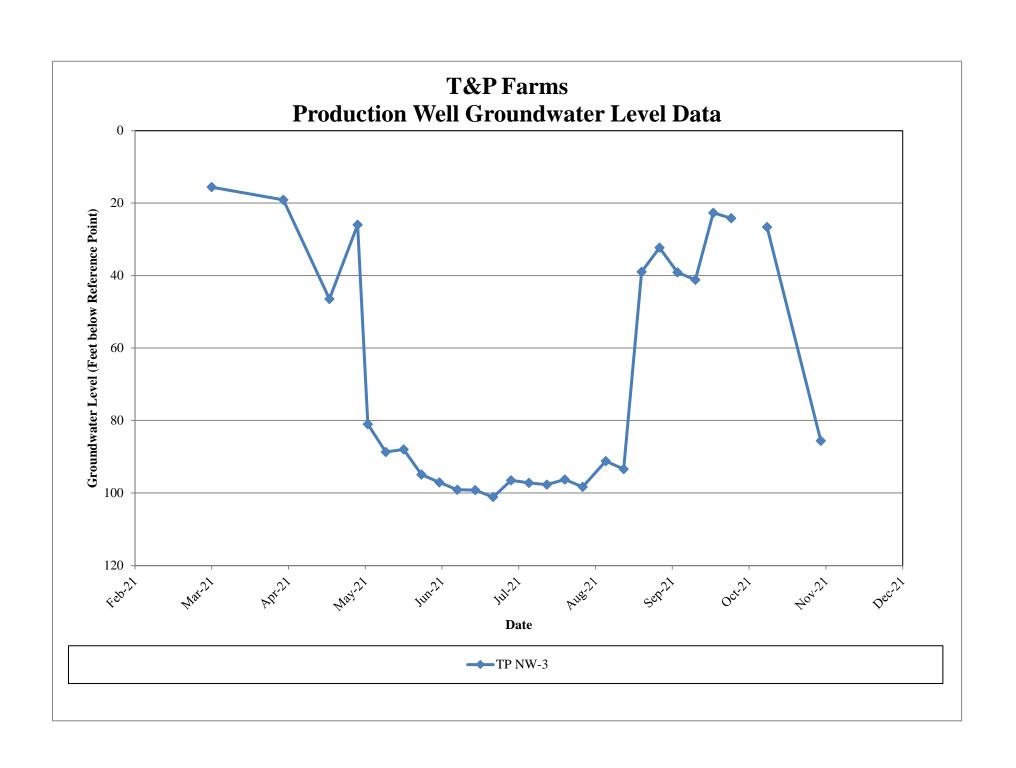


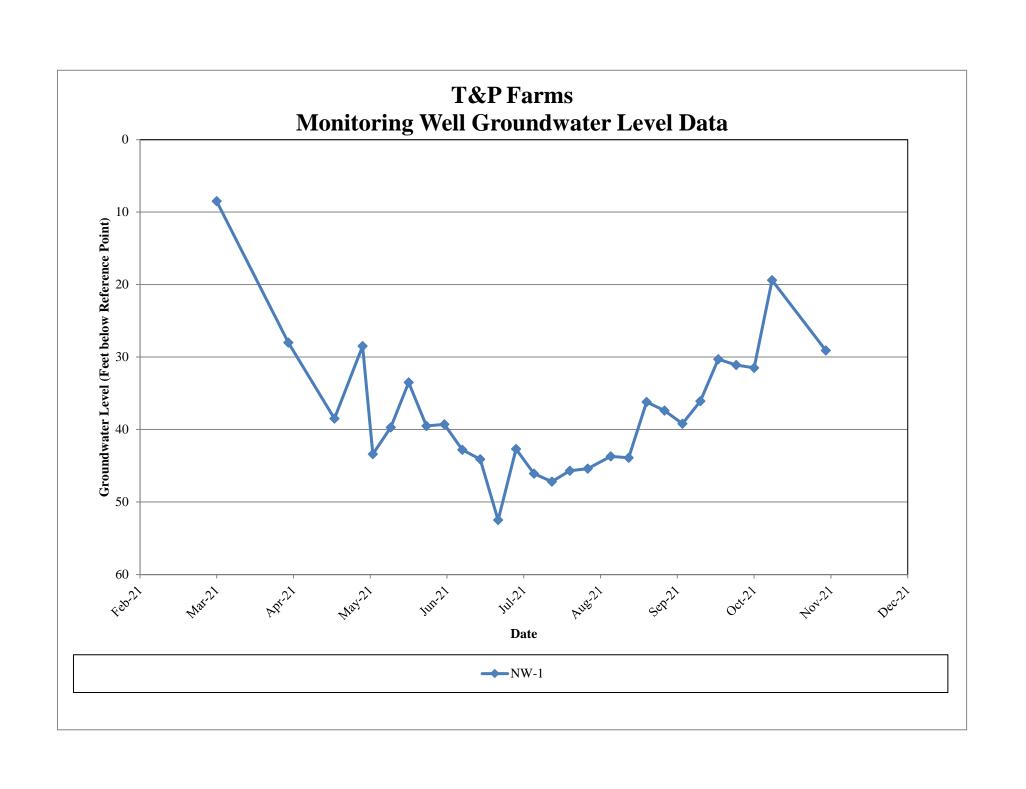


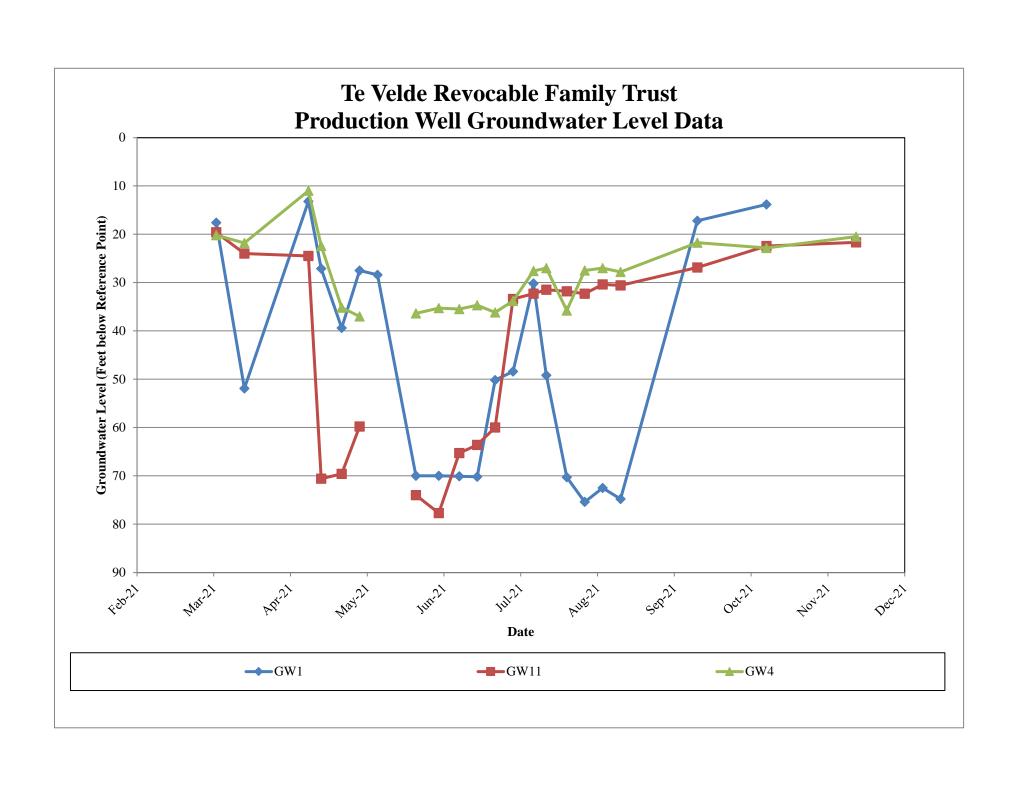


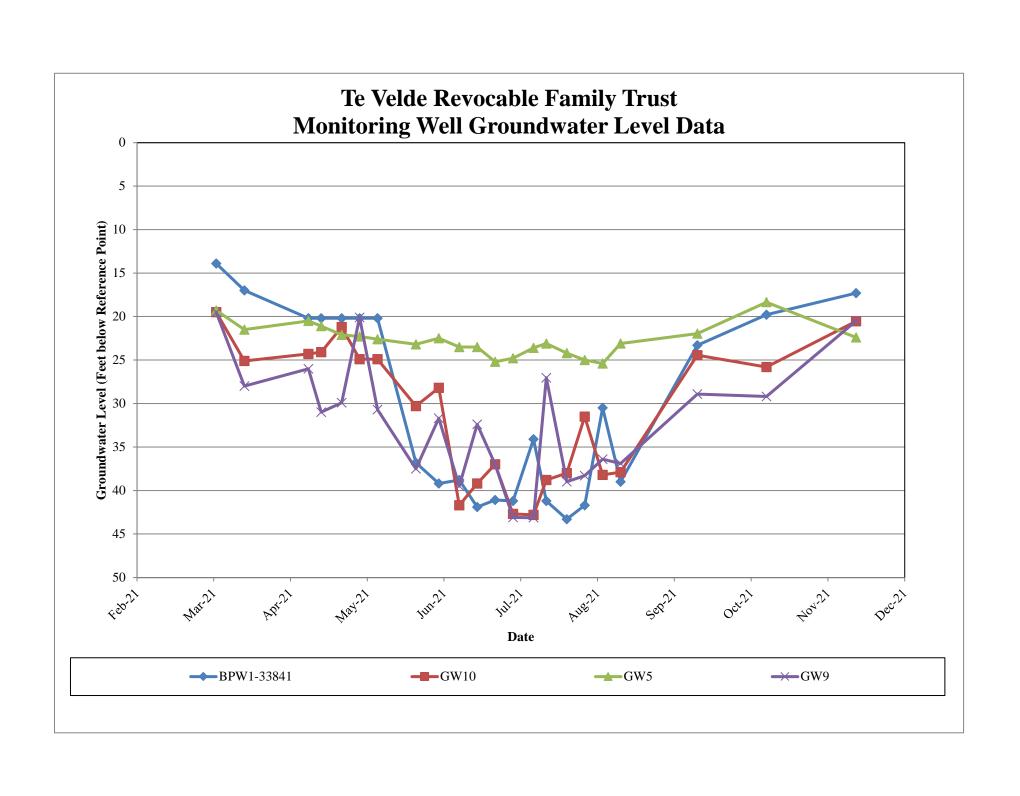


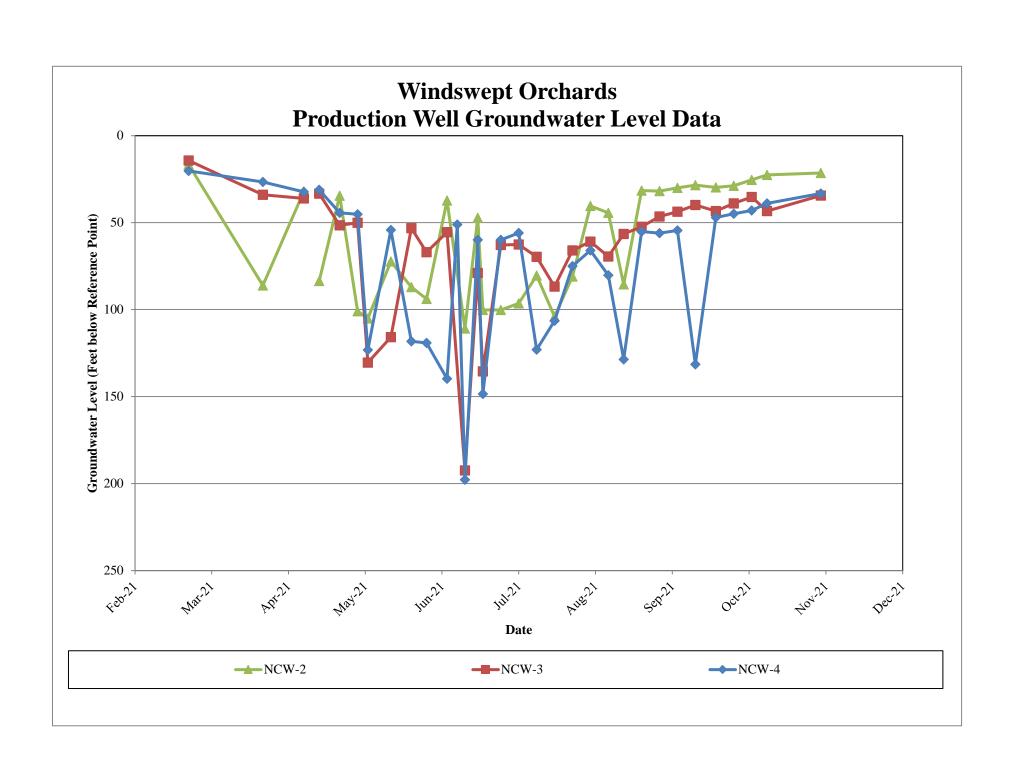


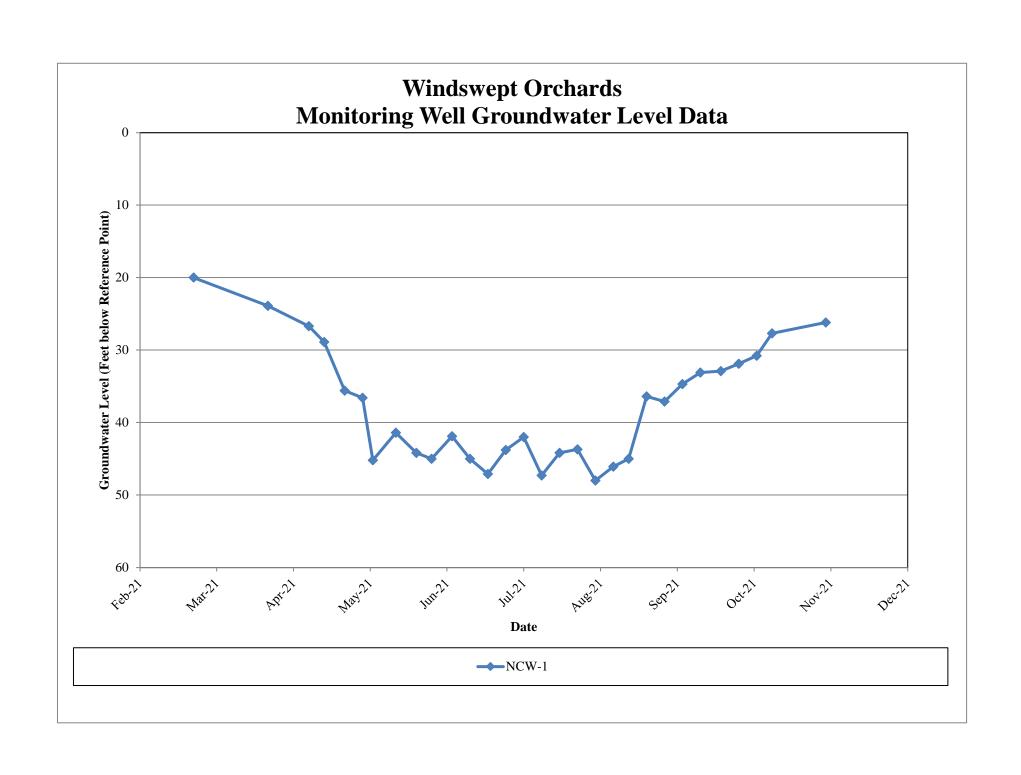






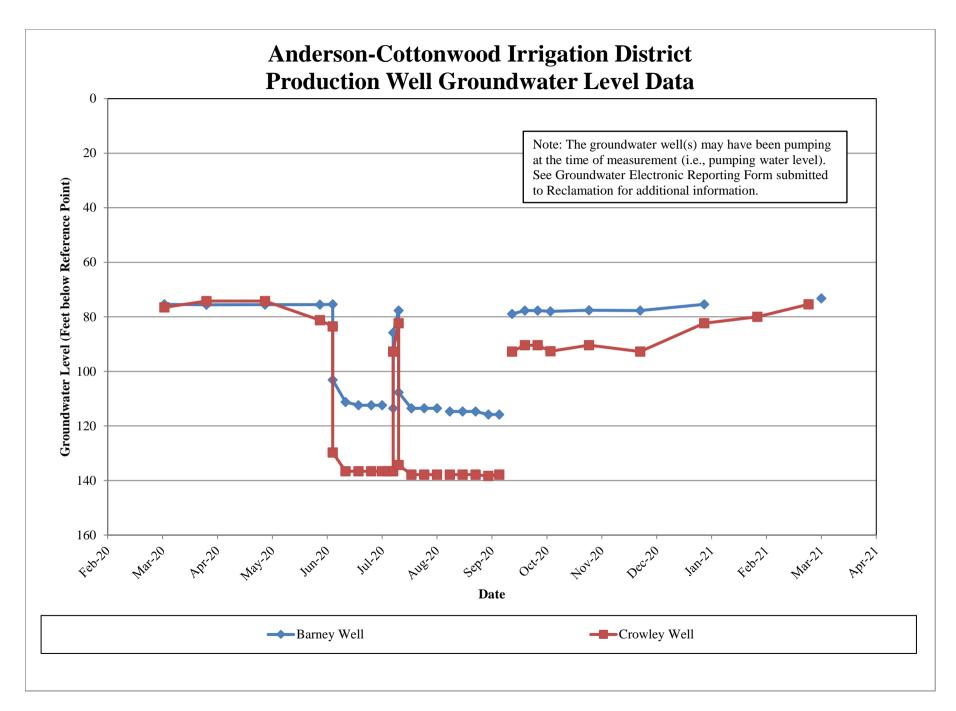


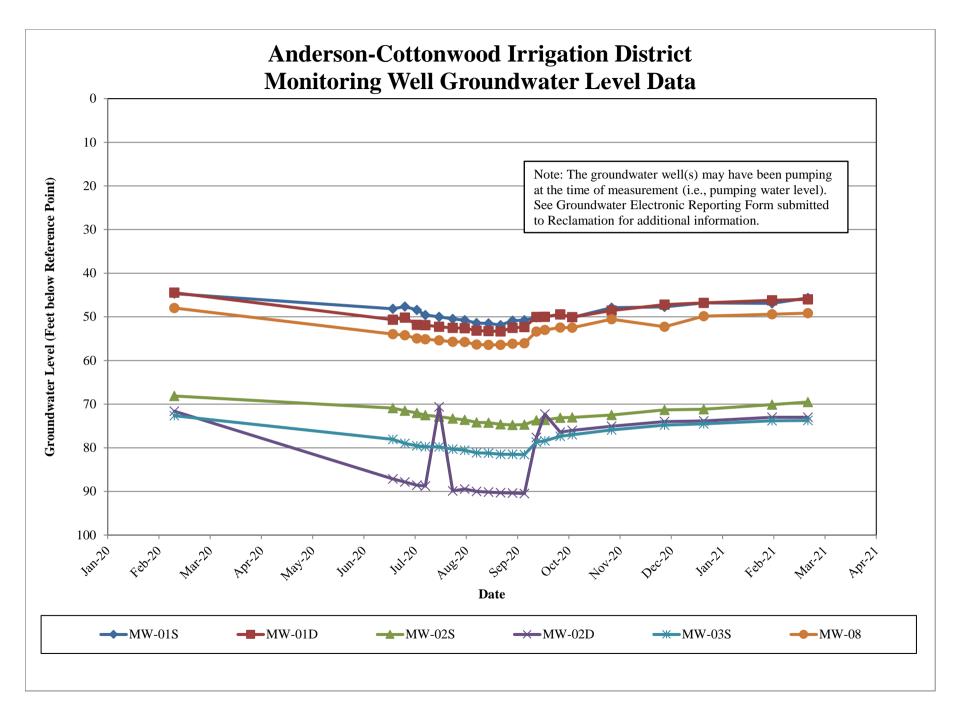


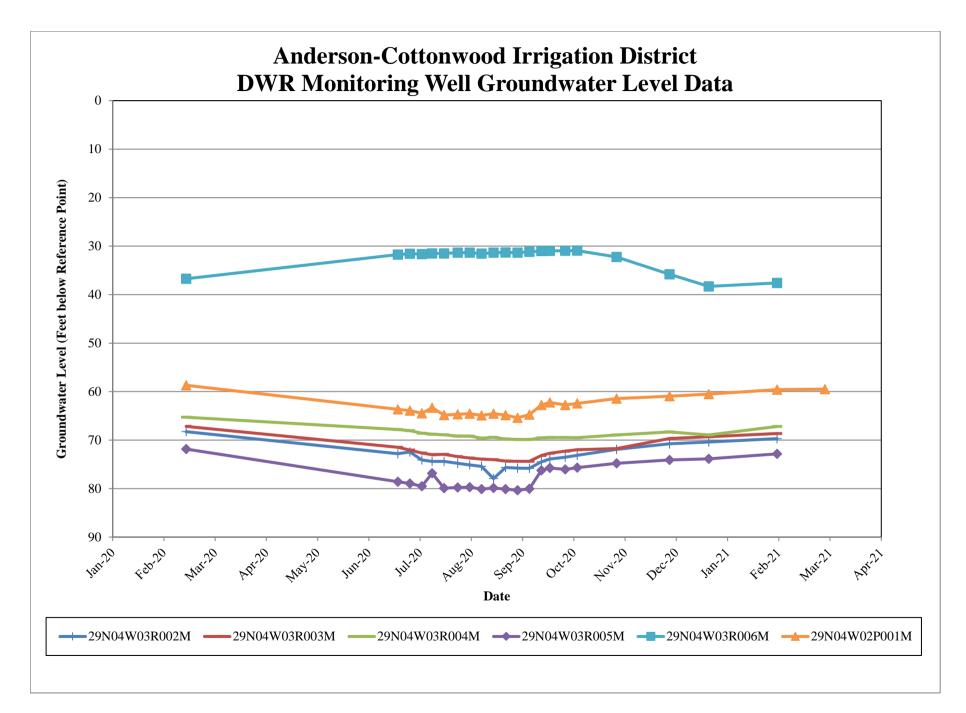


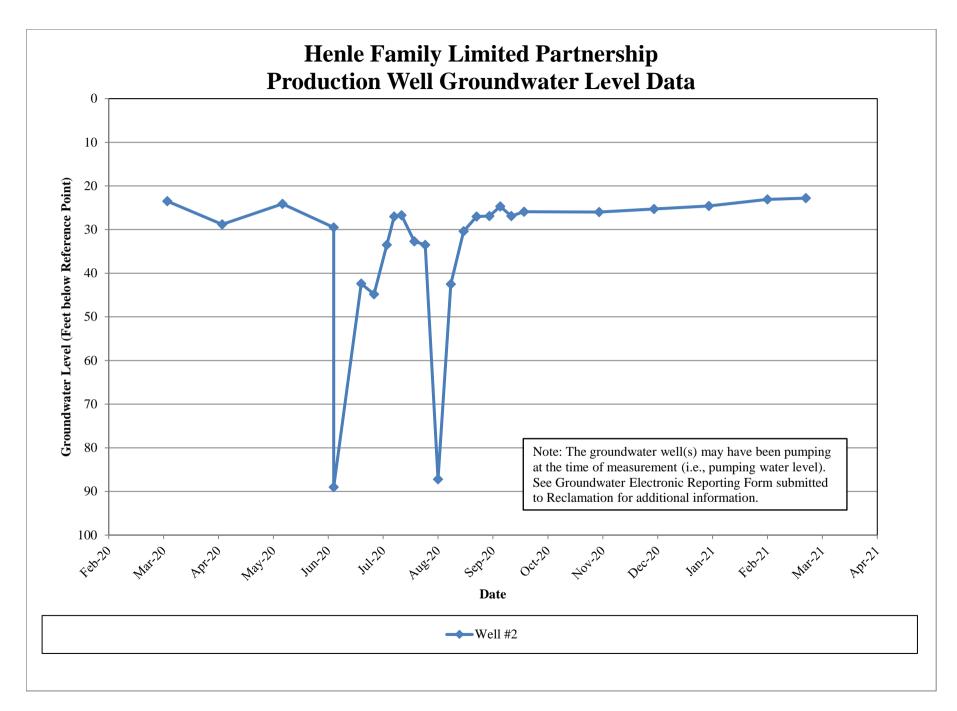
Appendix 12

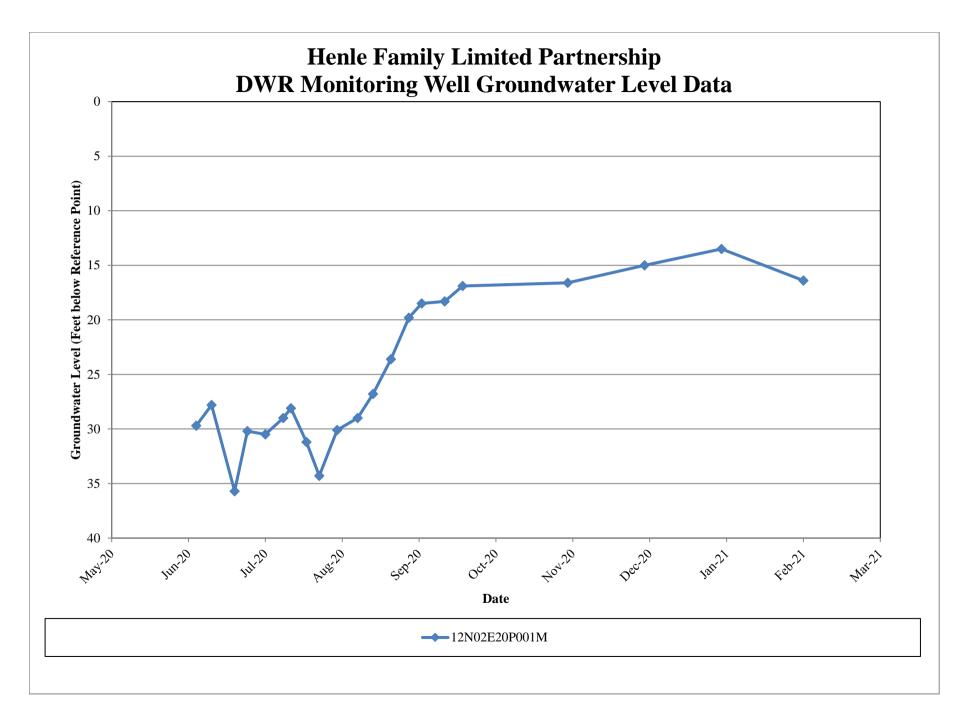
2020 Water Transfers Data Reports

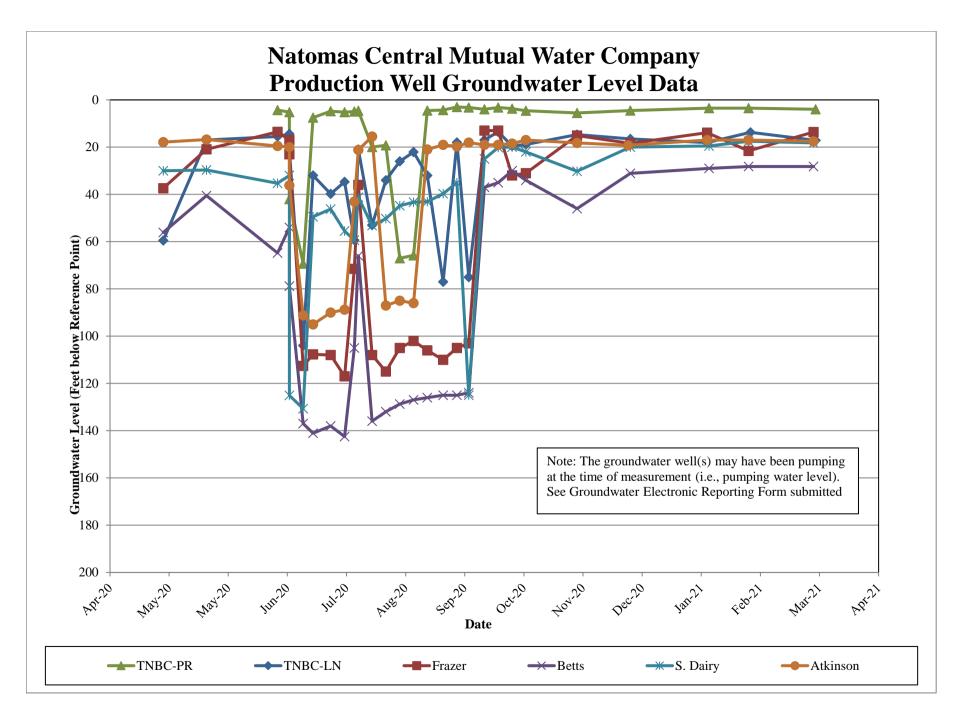


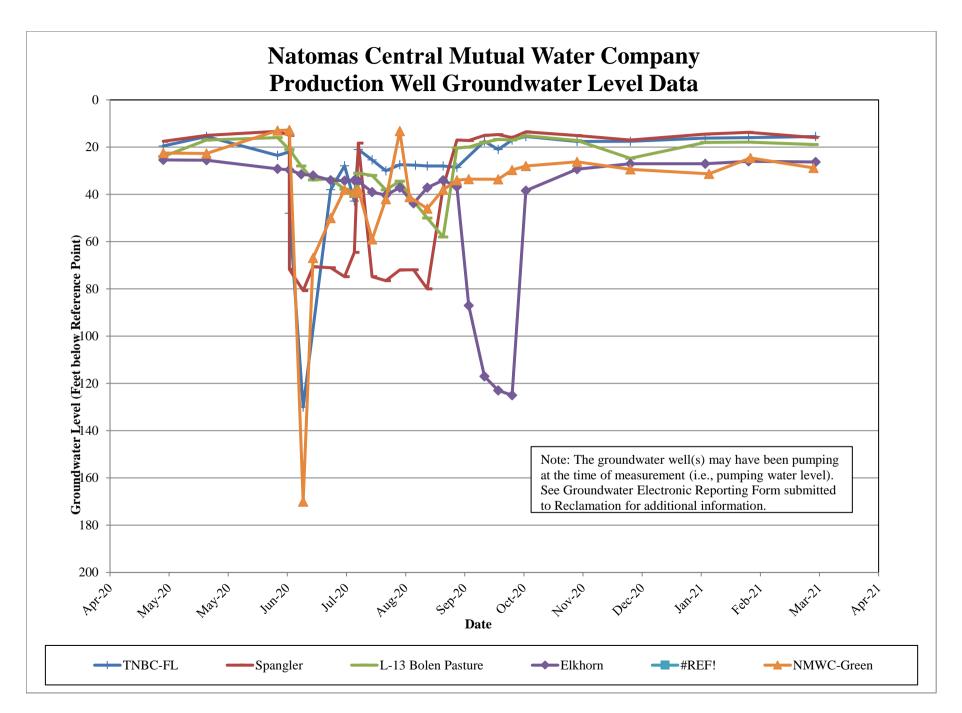


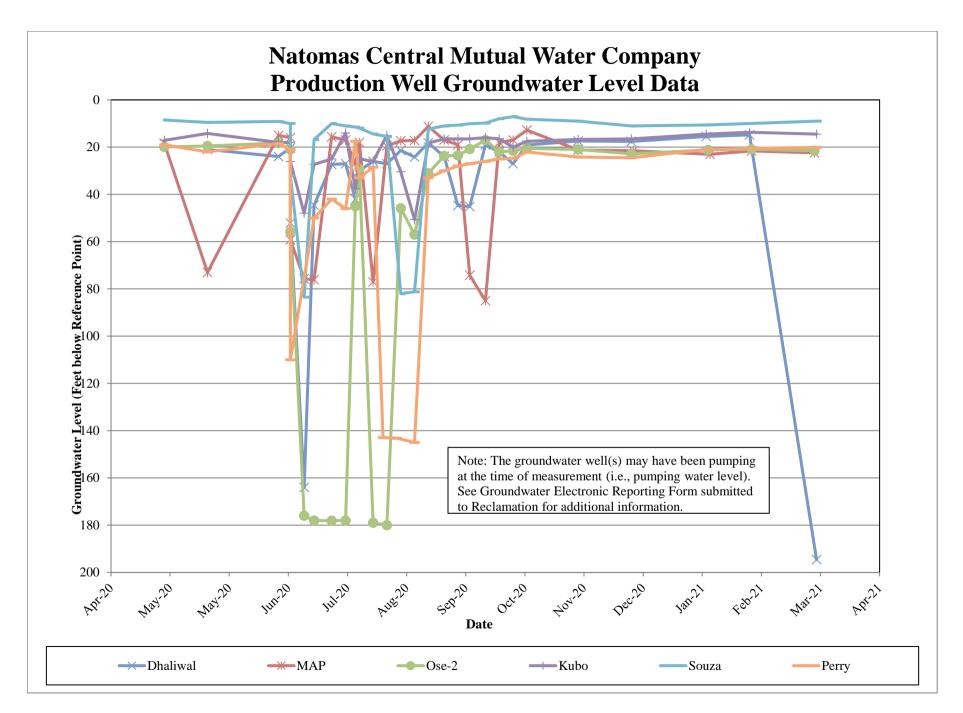


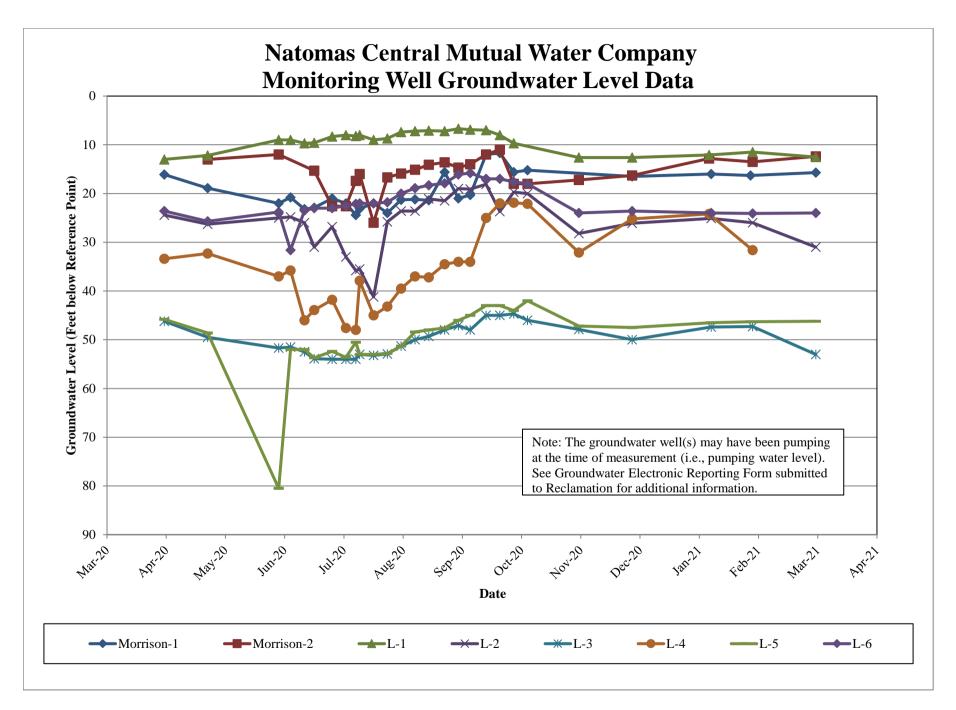


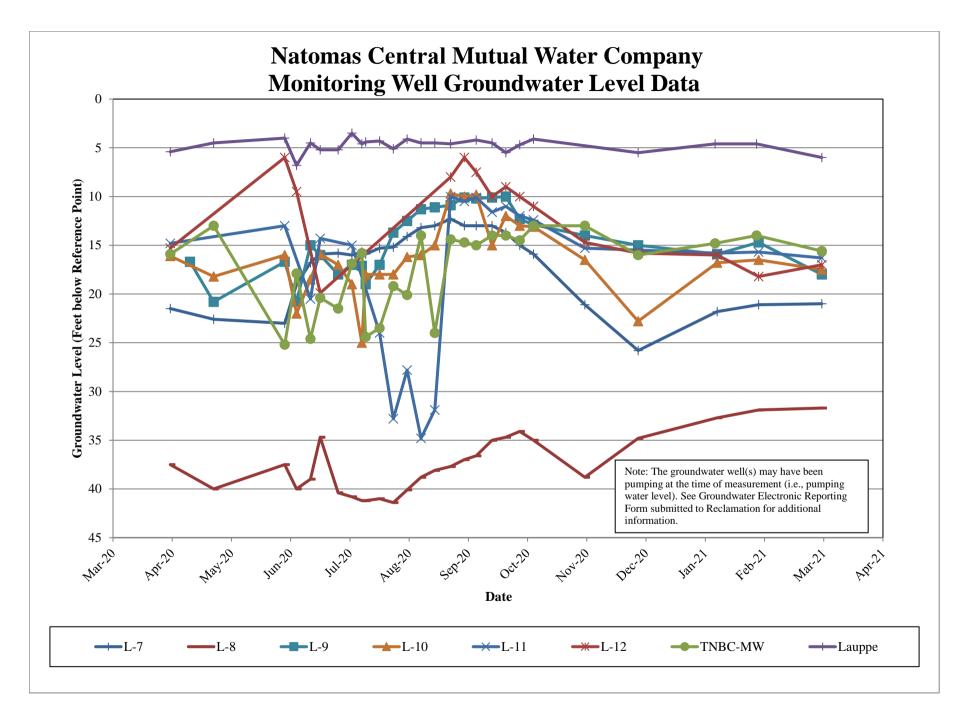


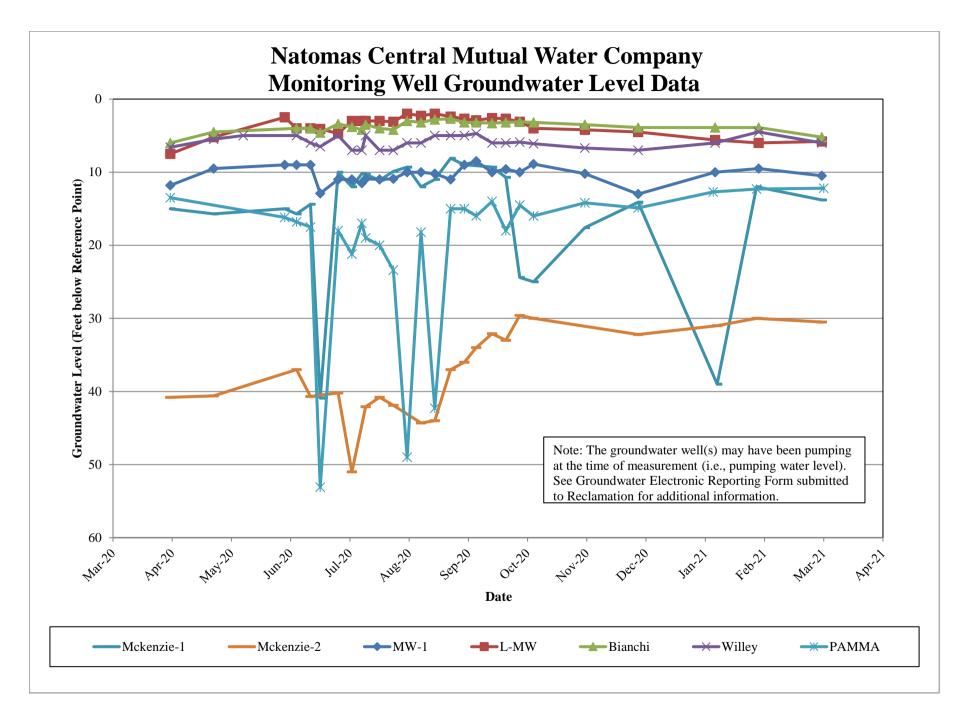


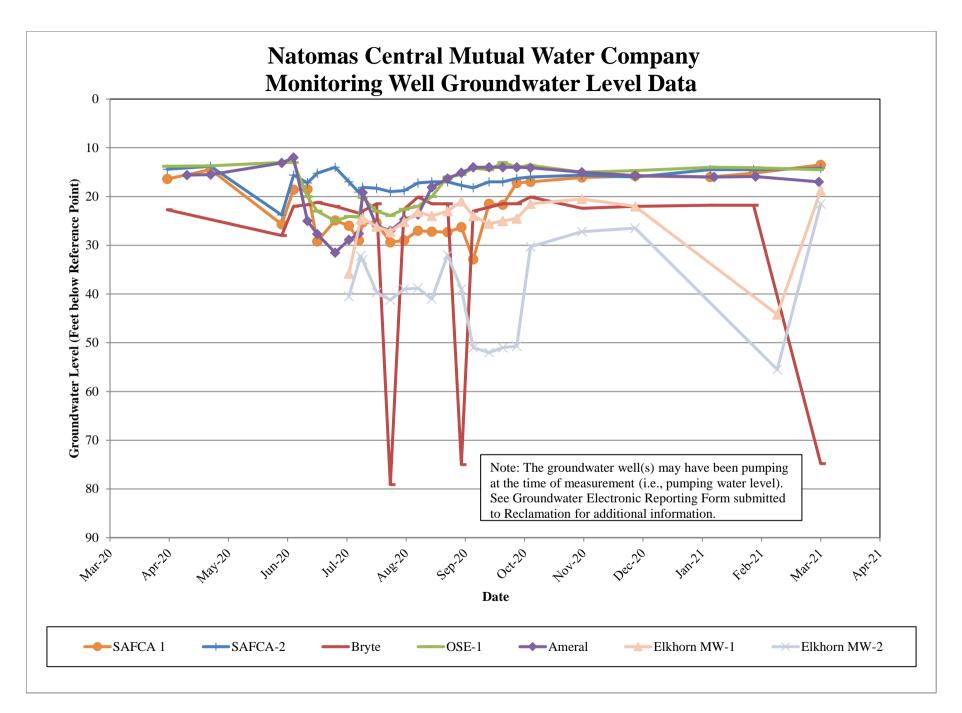


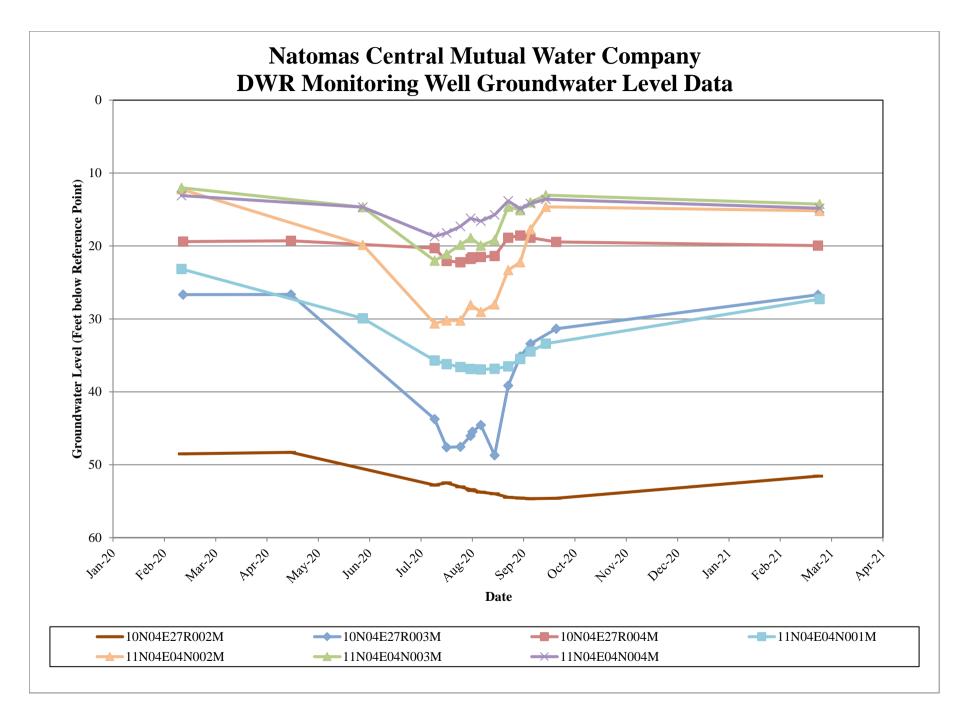


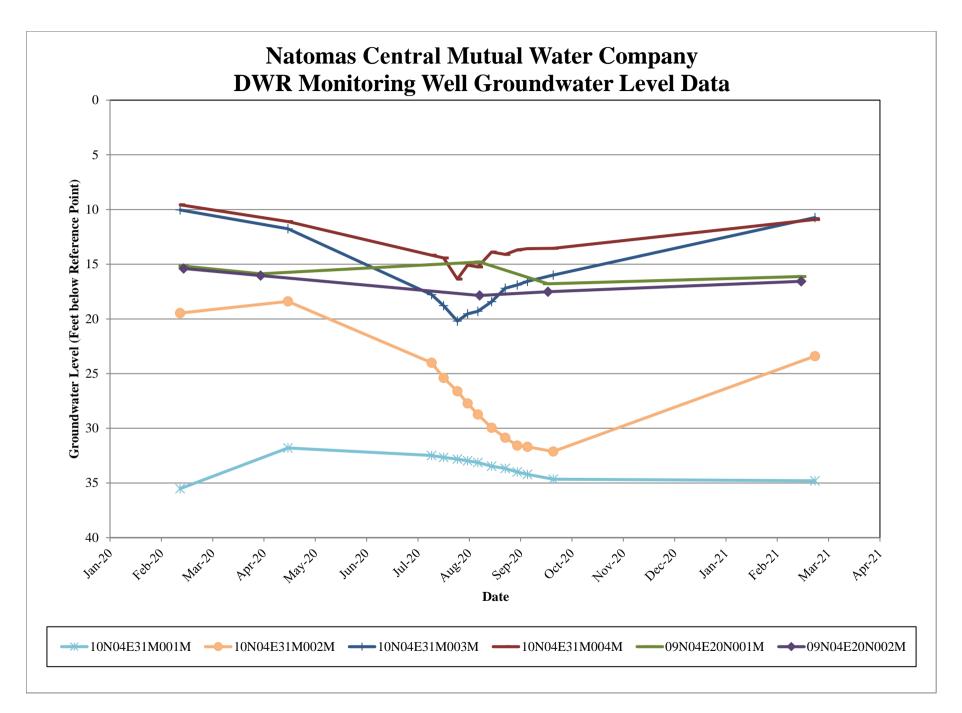


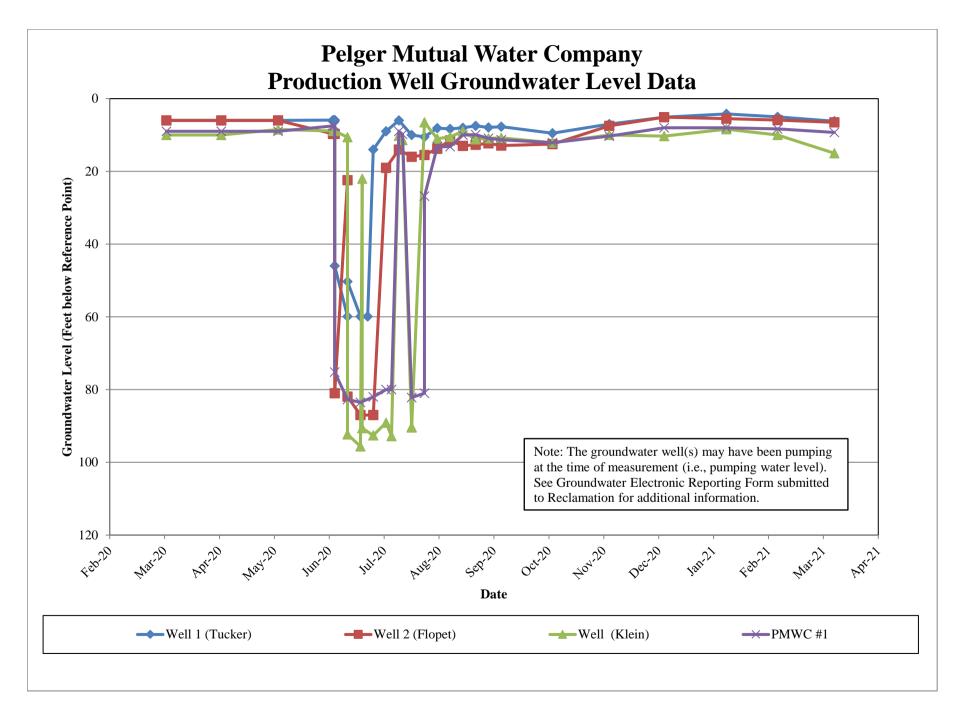


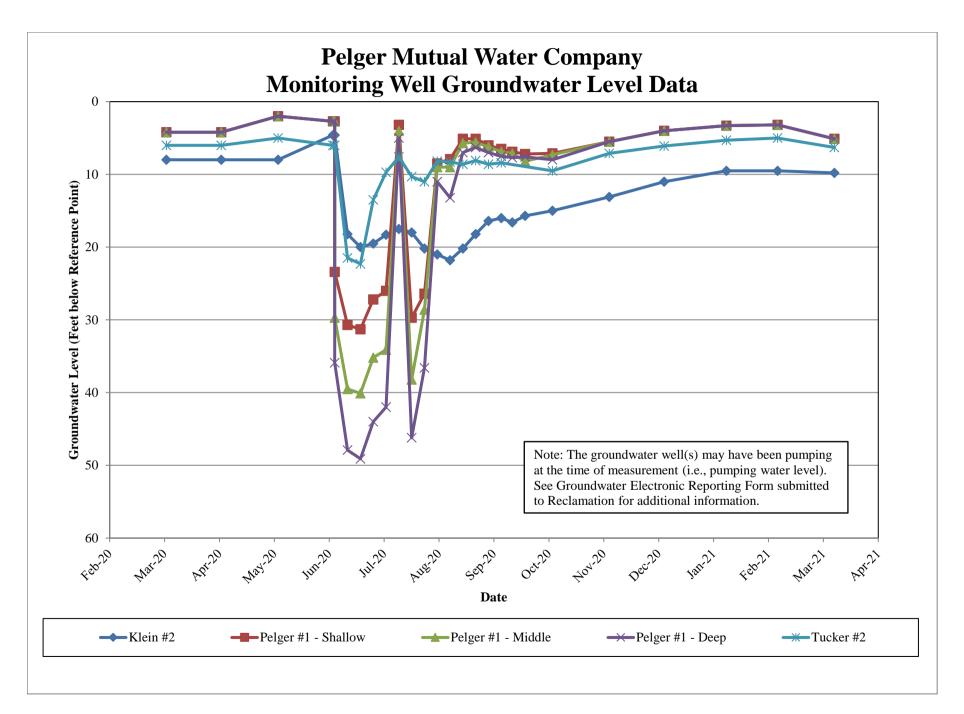


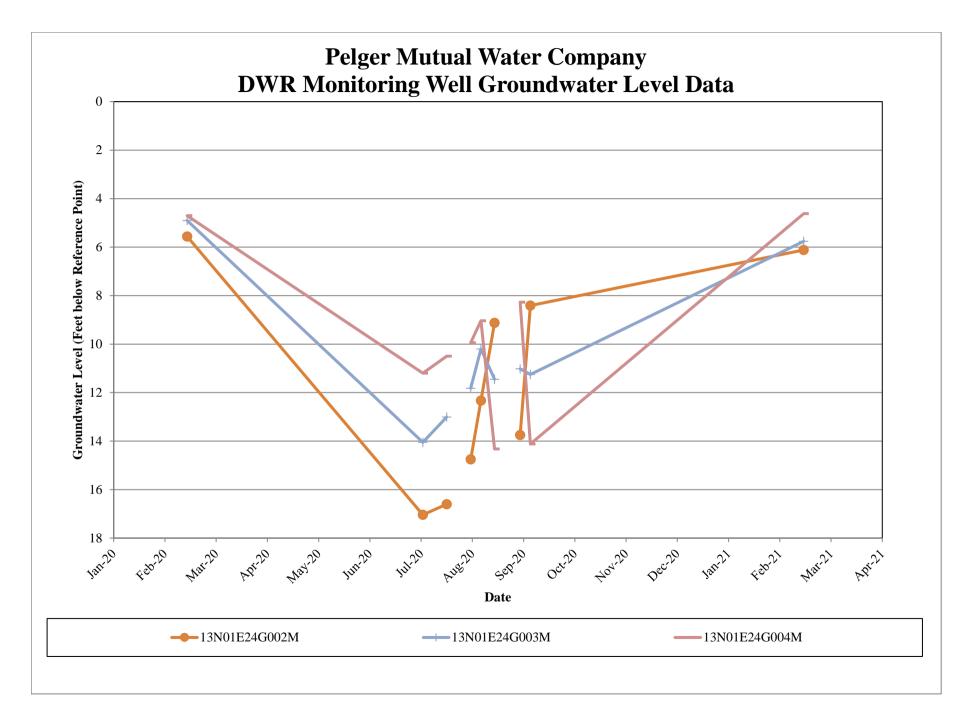


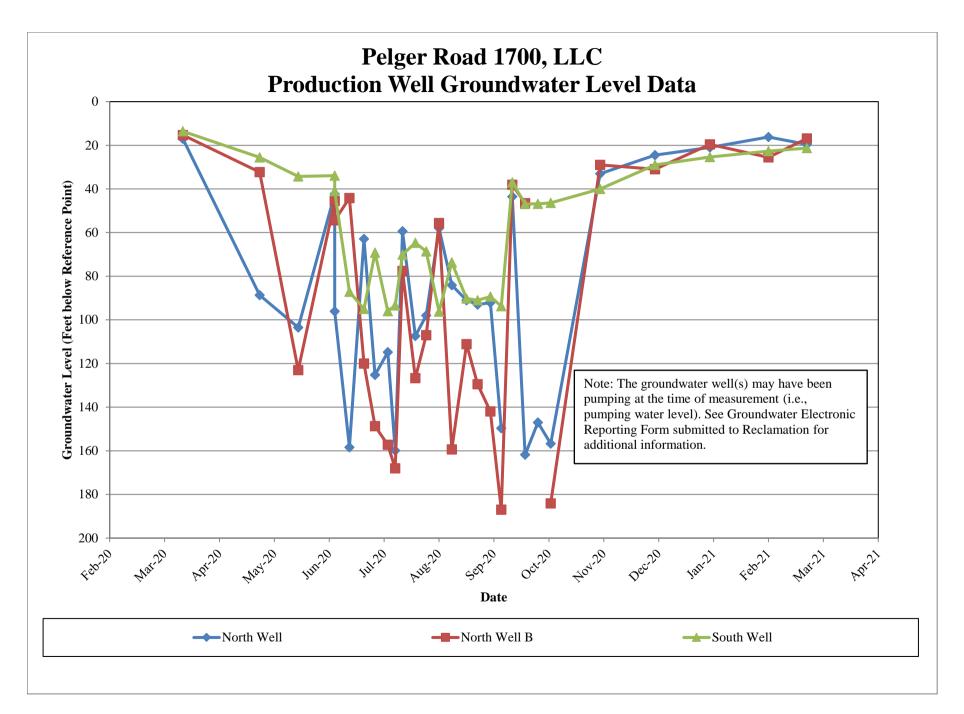


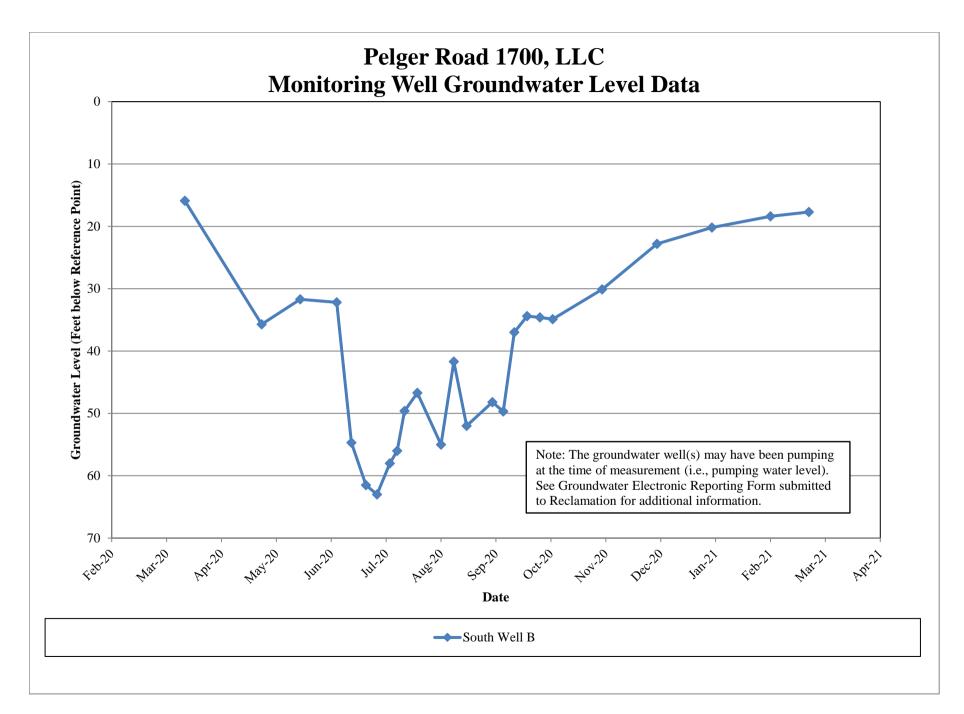


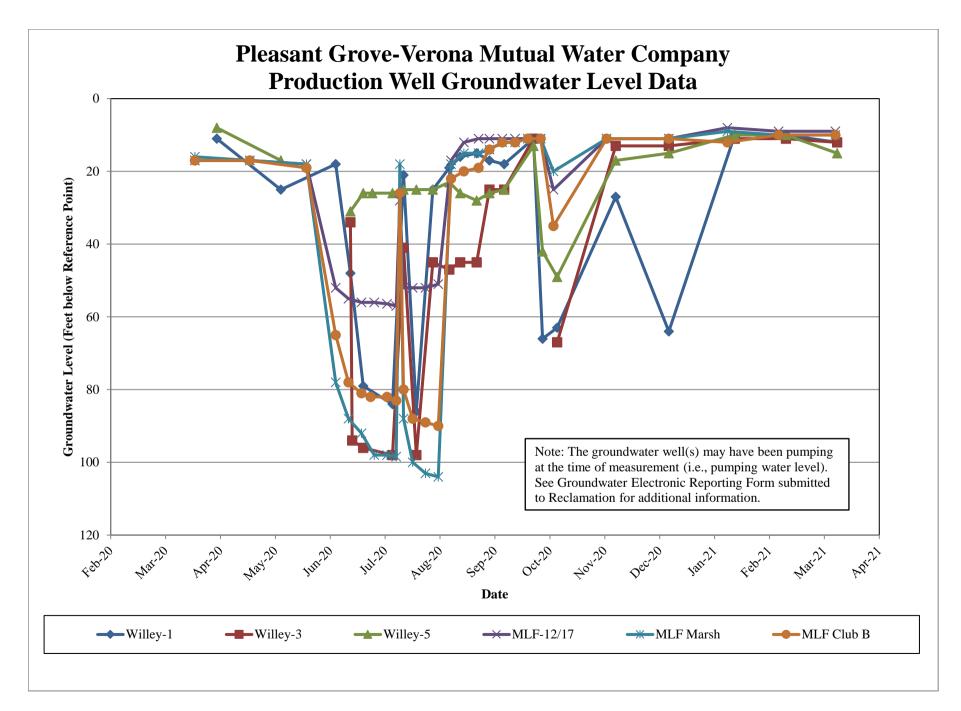


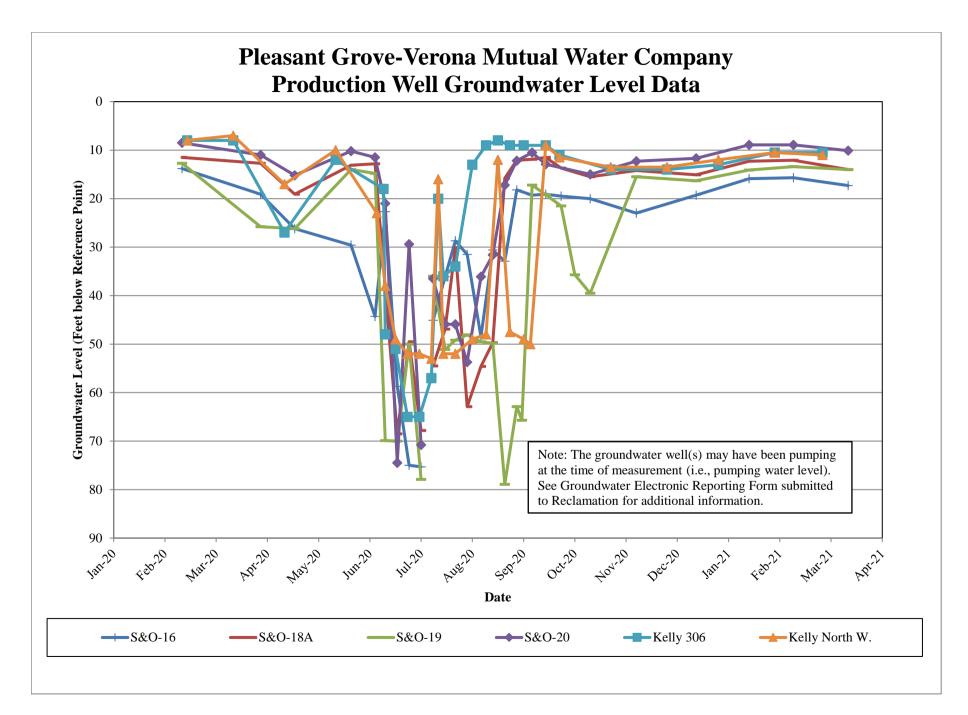


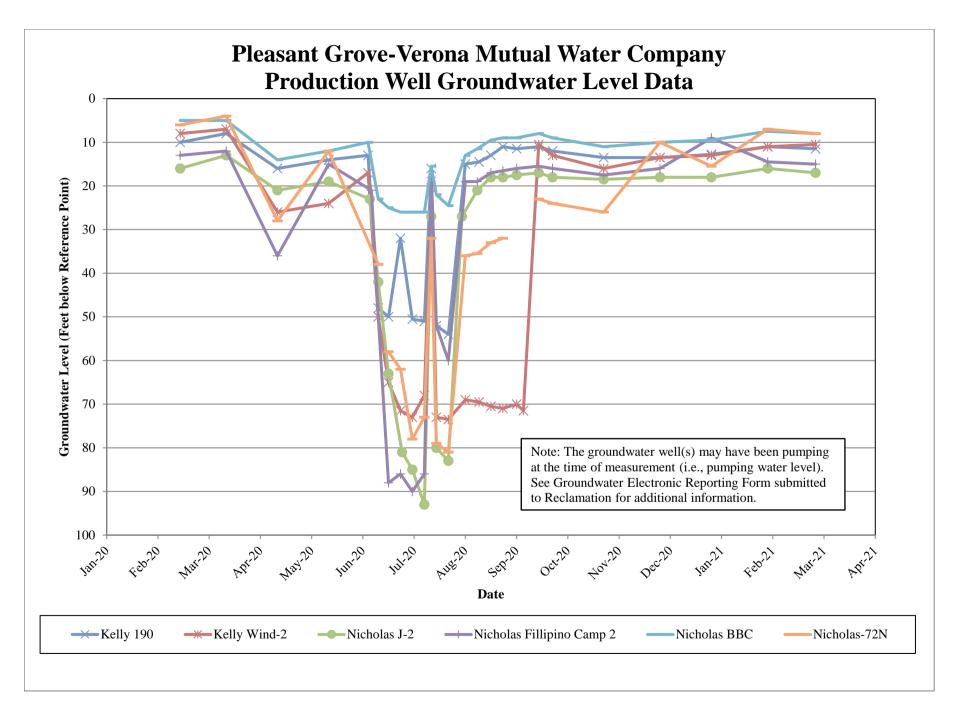


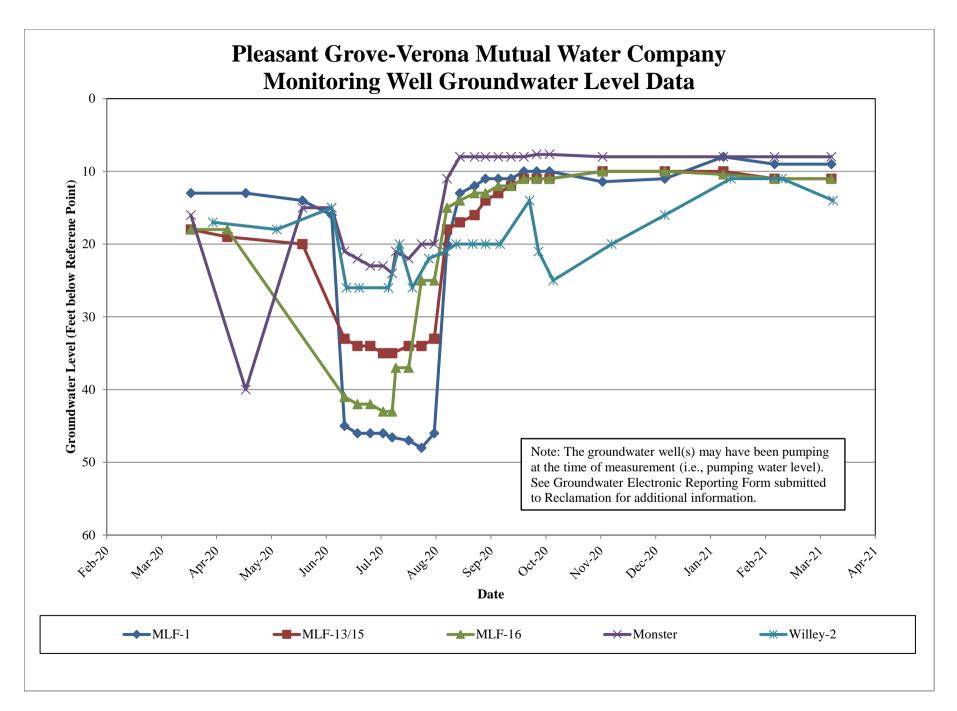


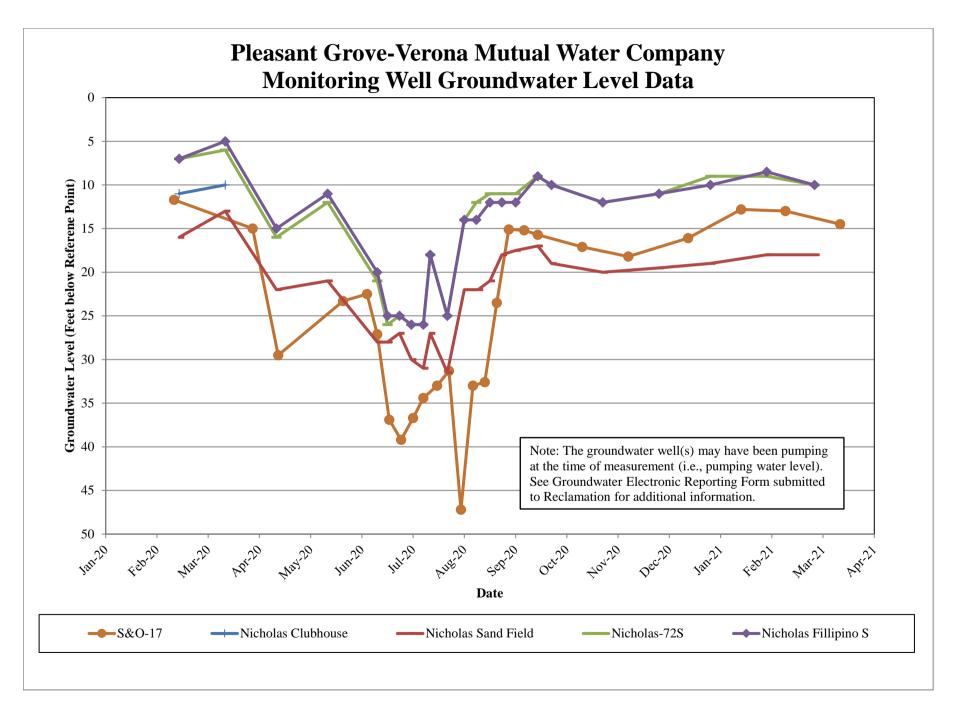


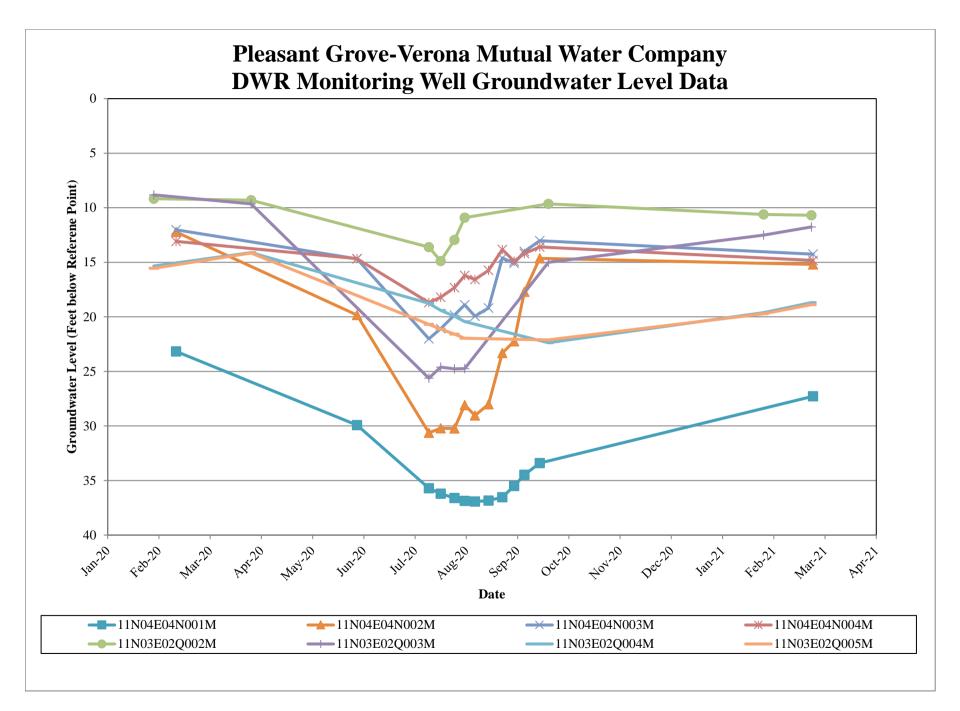


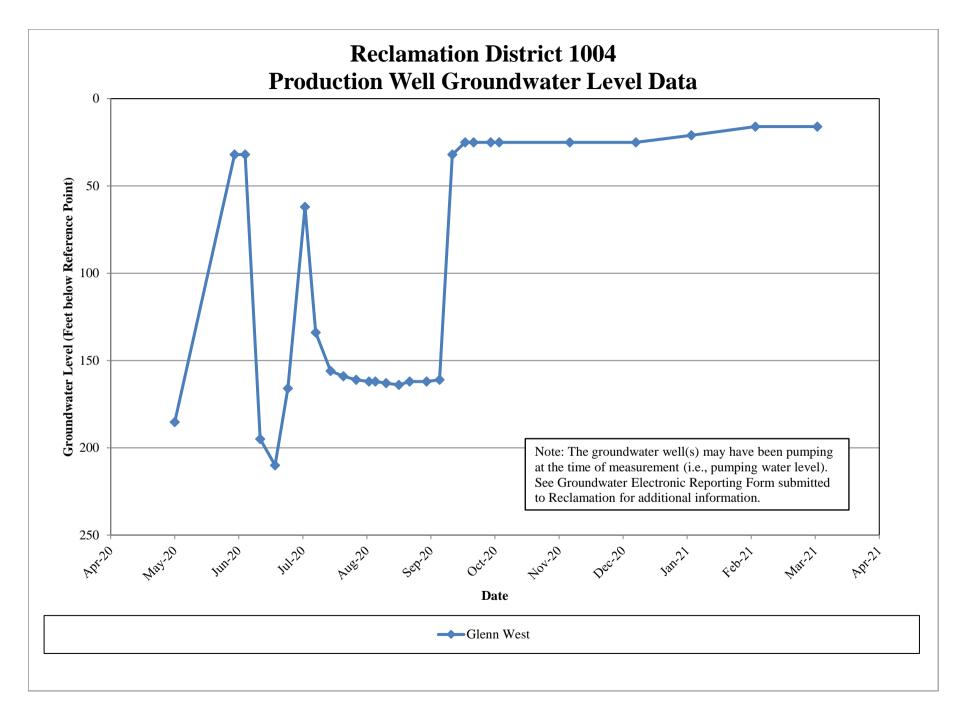


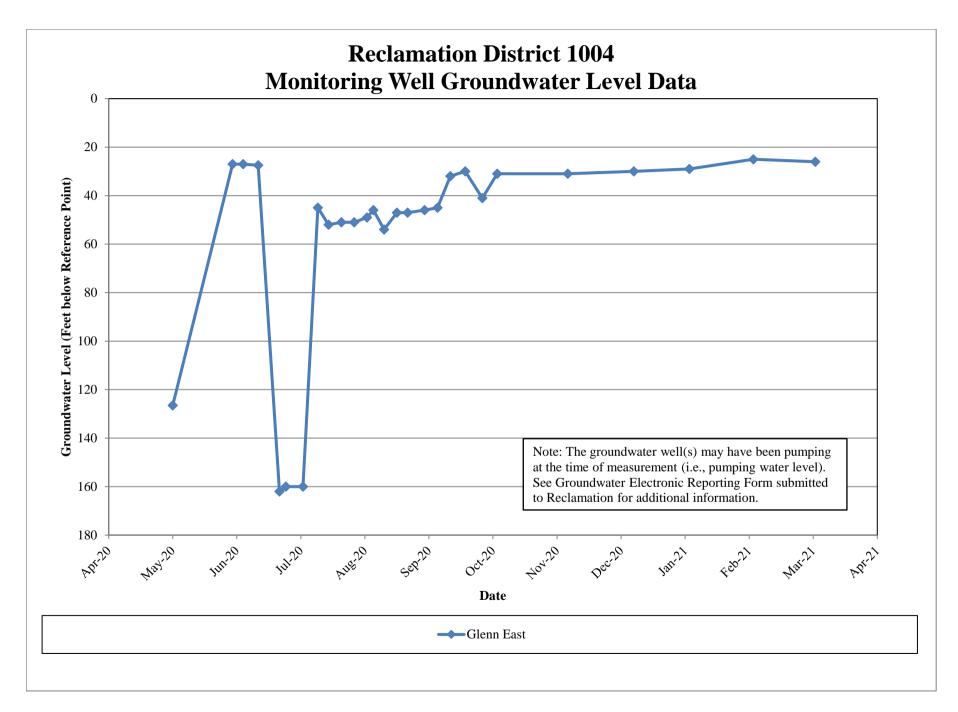


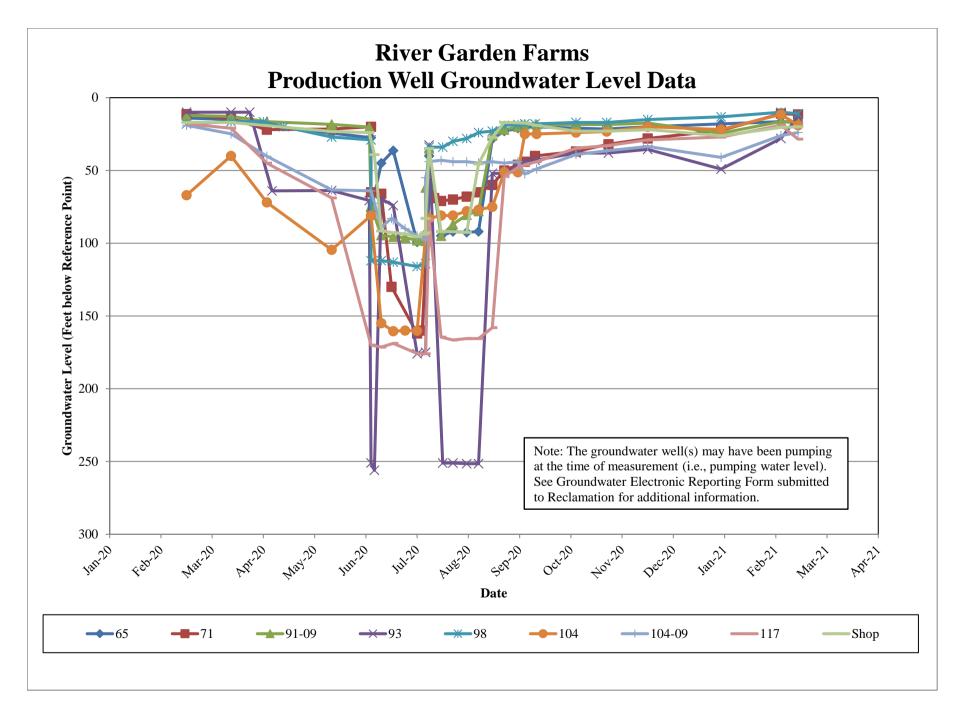


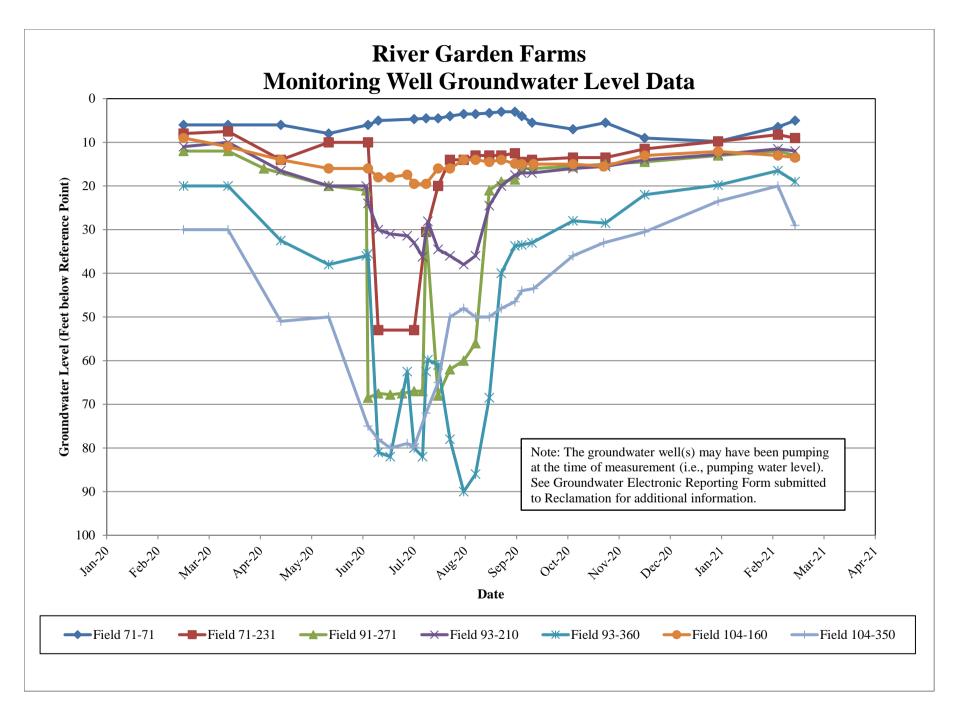


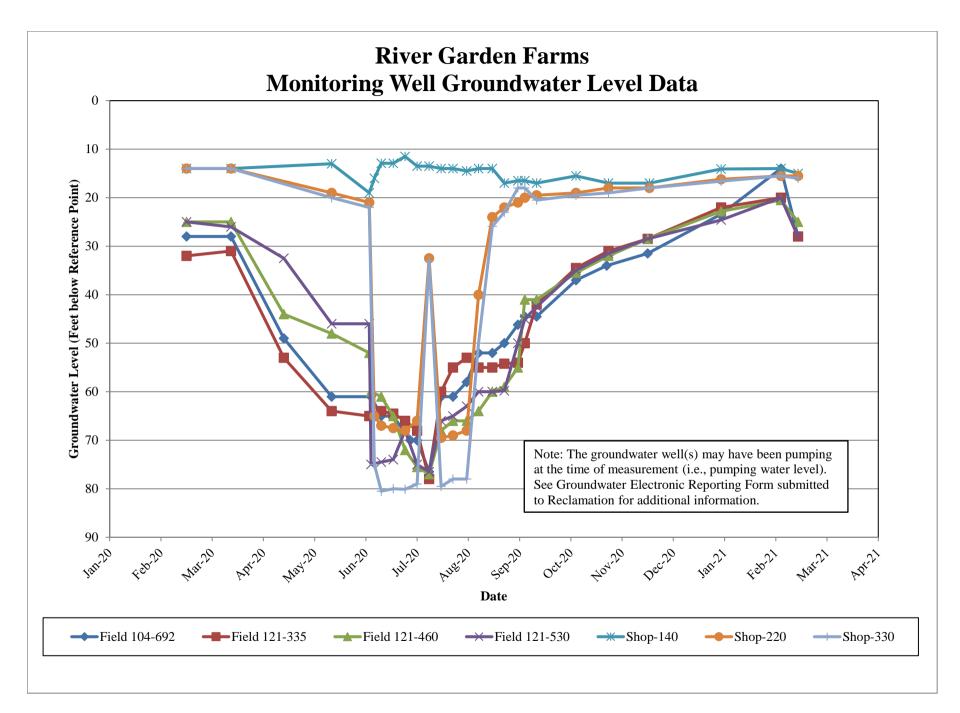


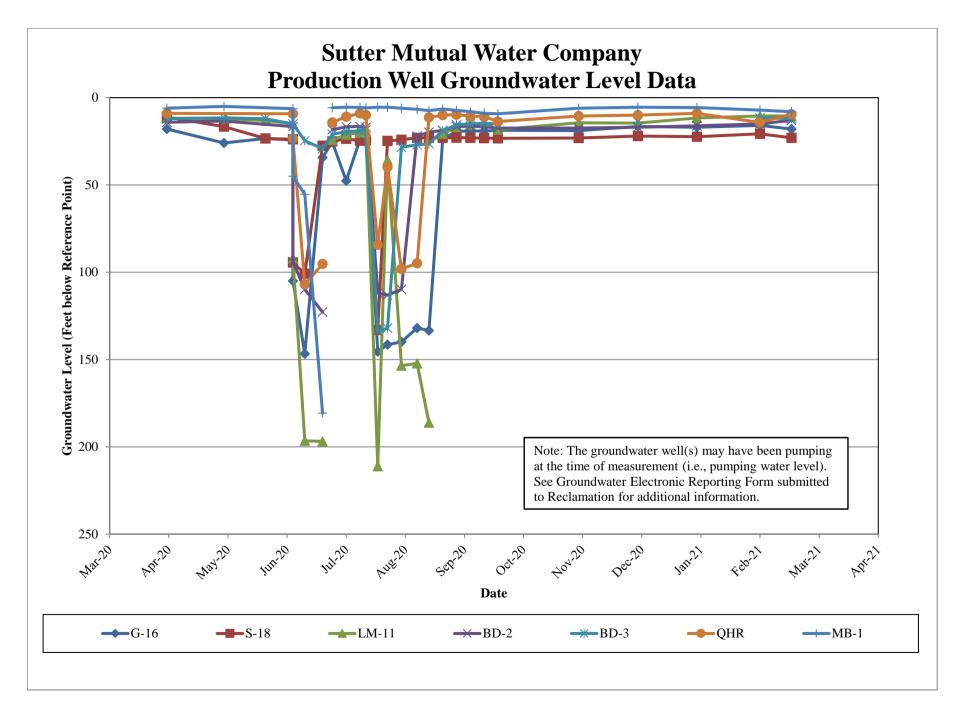


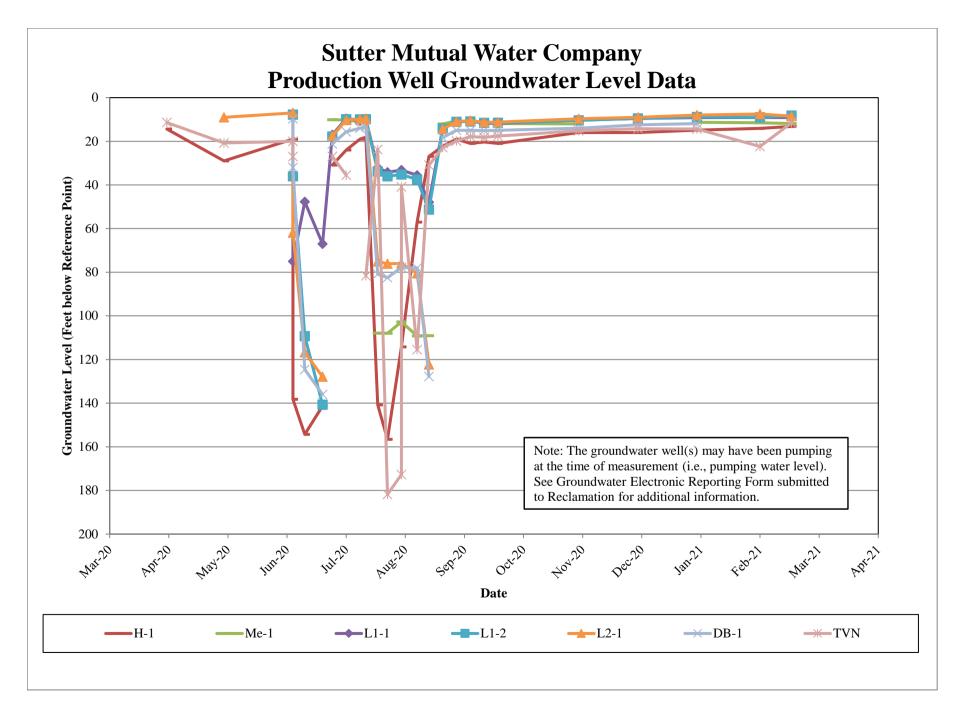


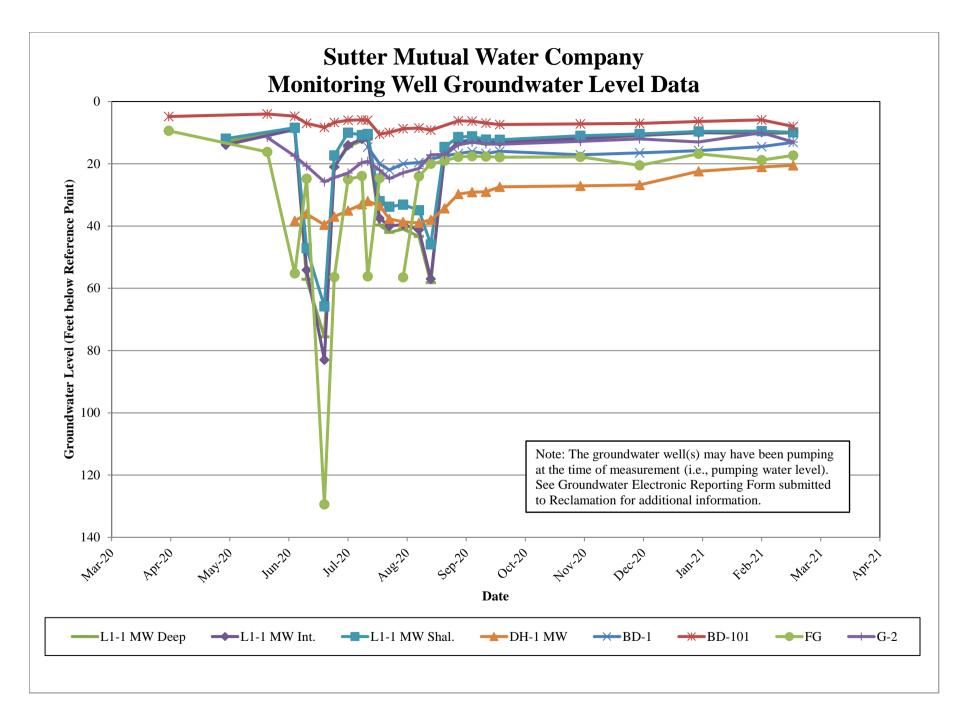


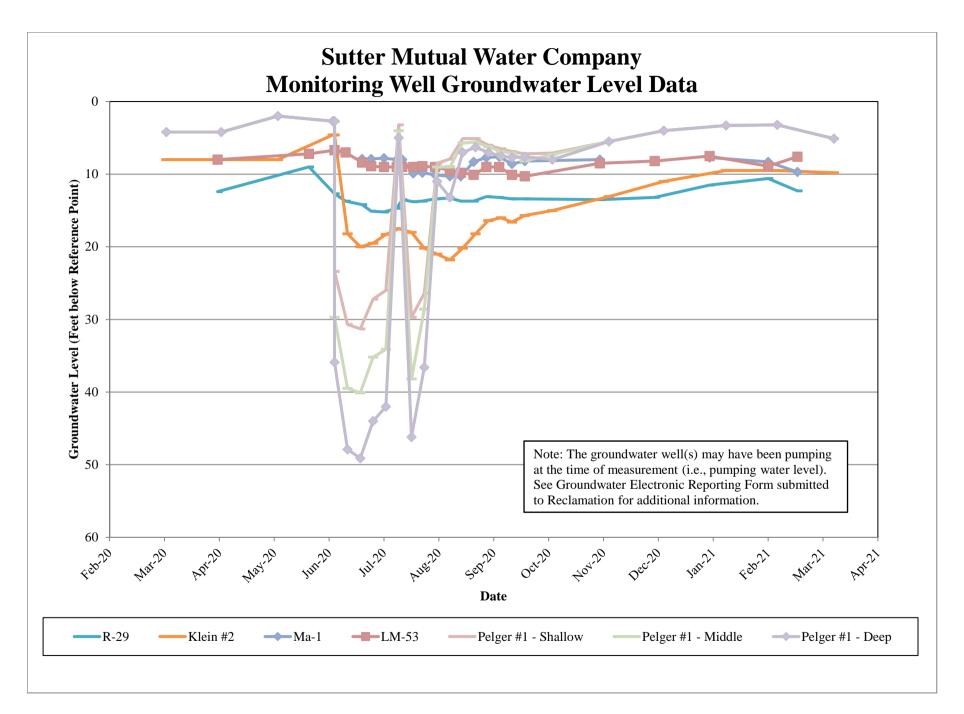


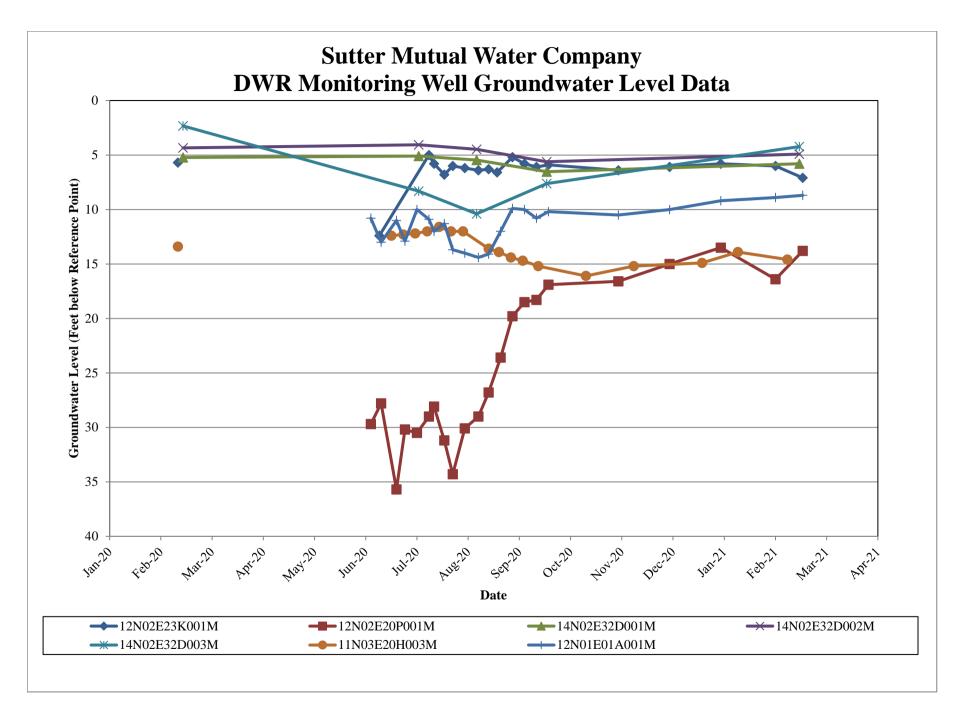


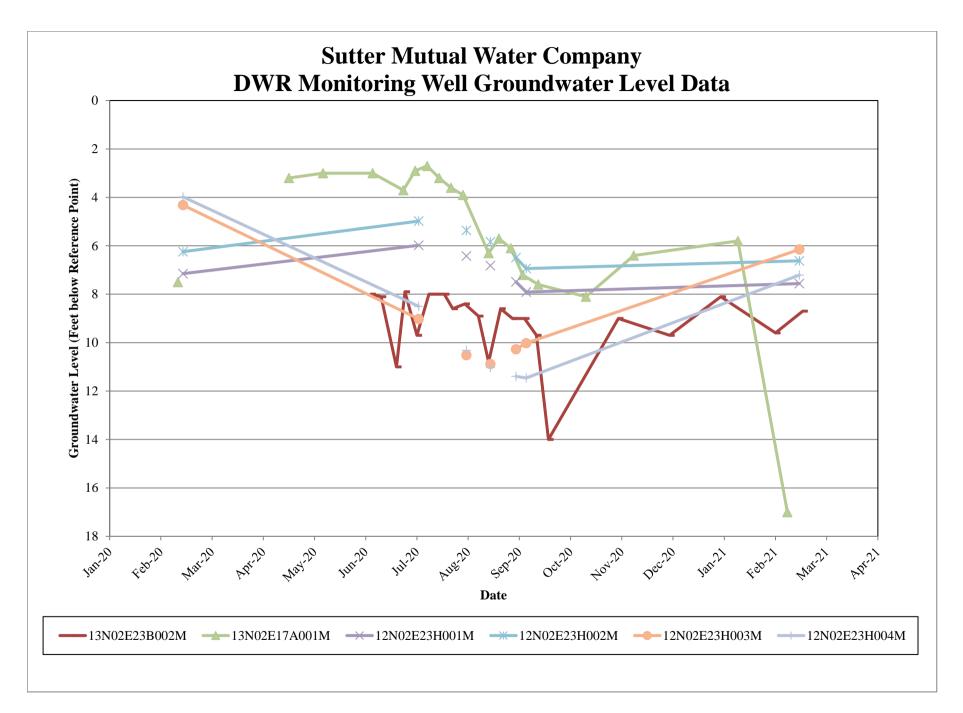


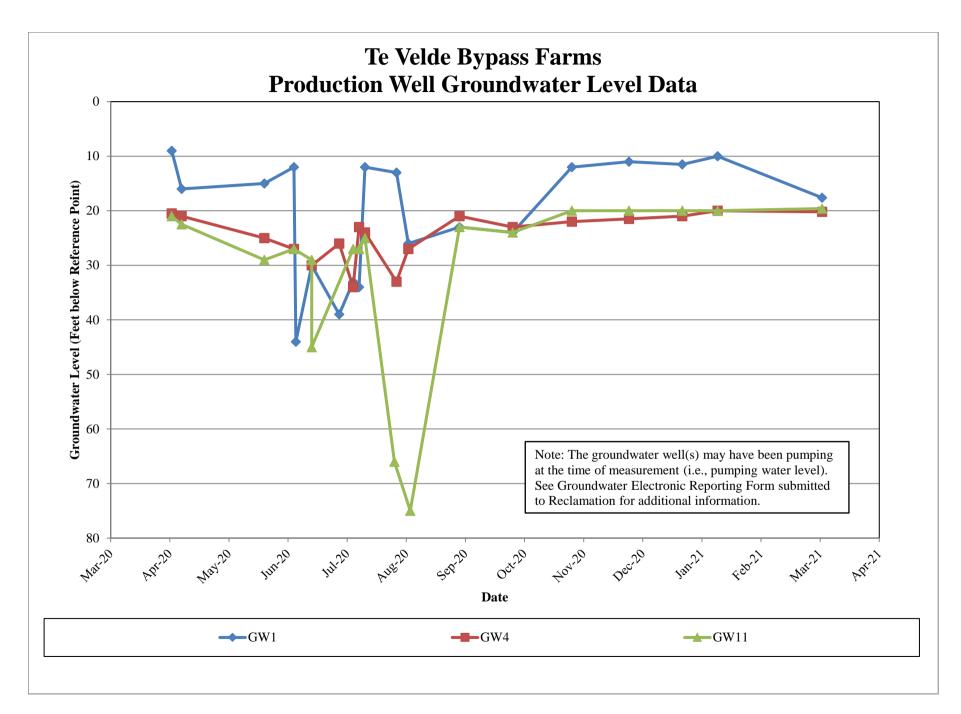


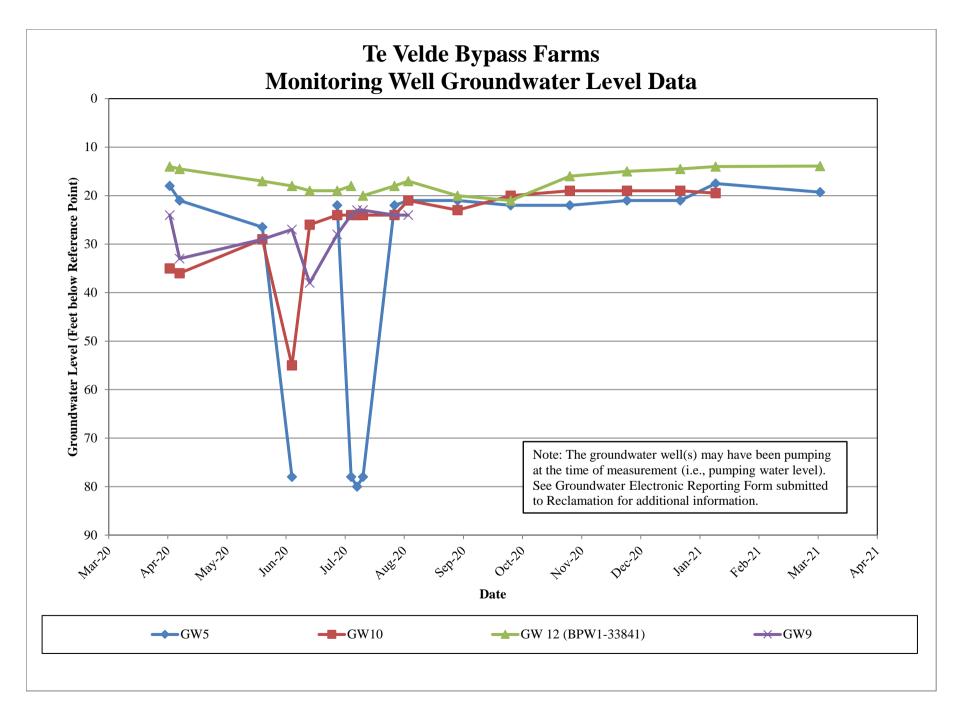


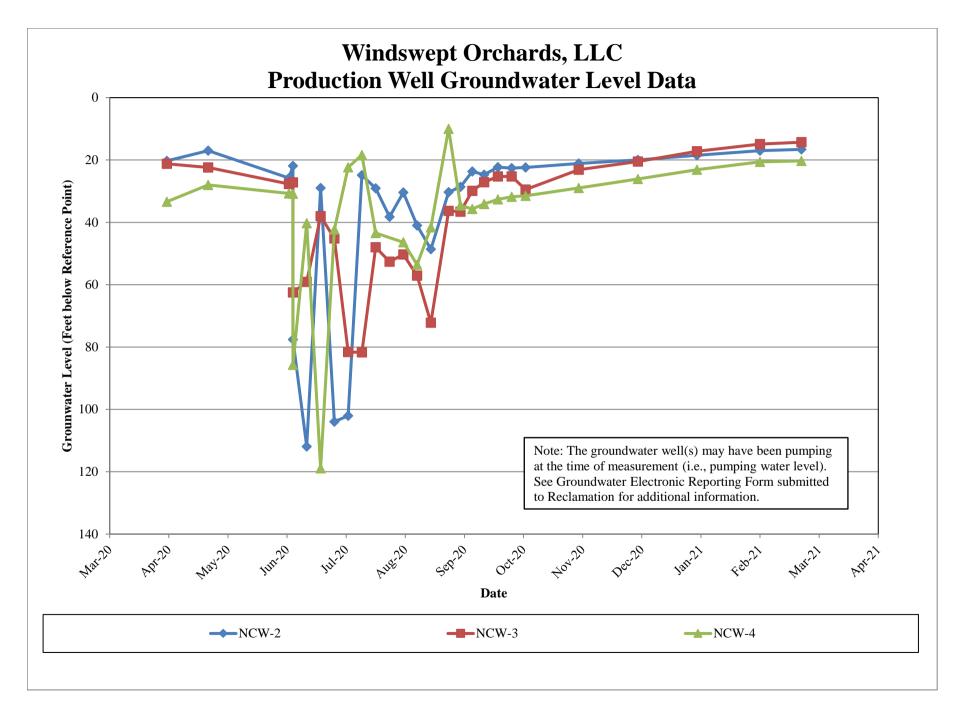


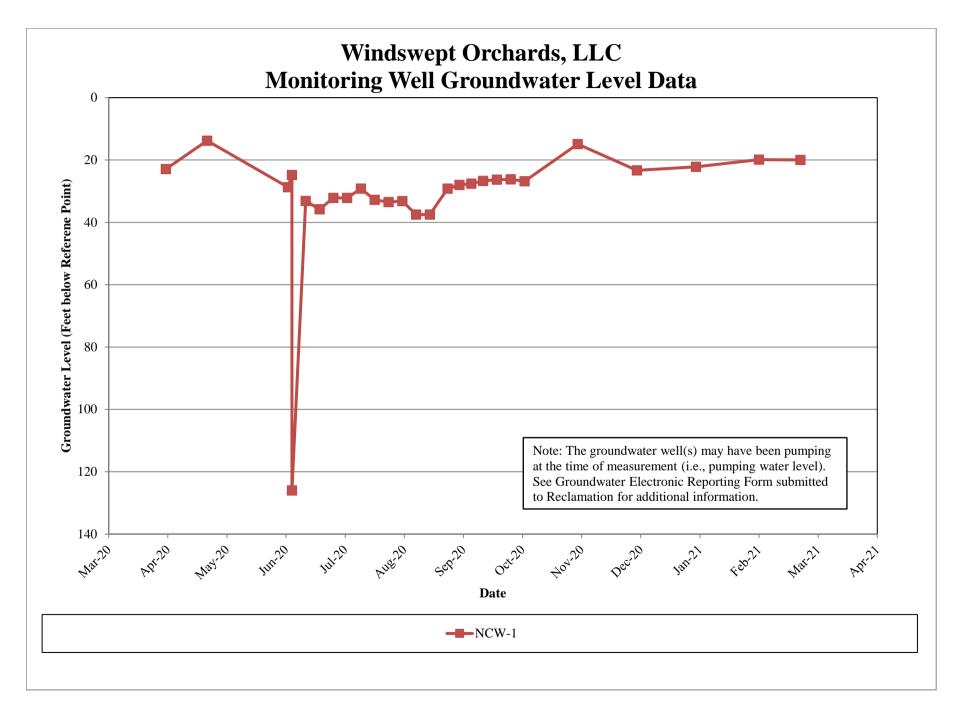


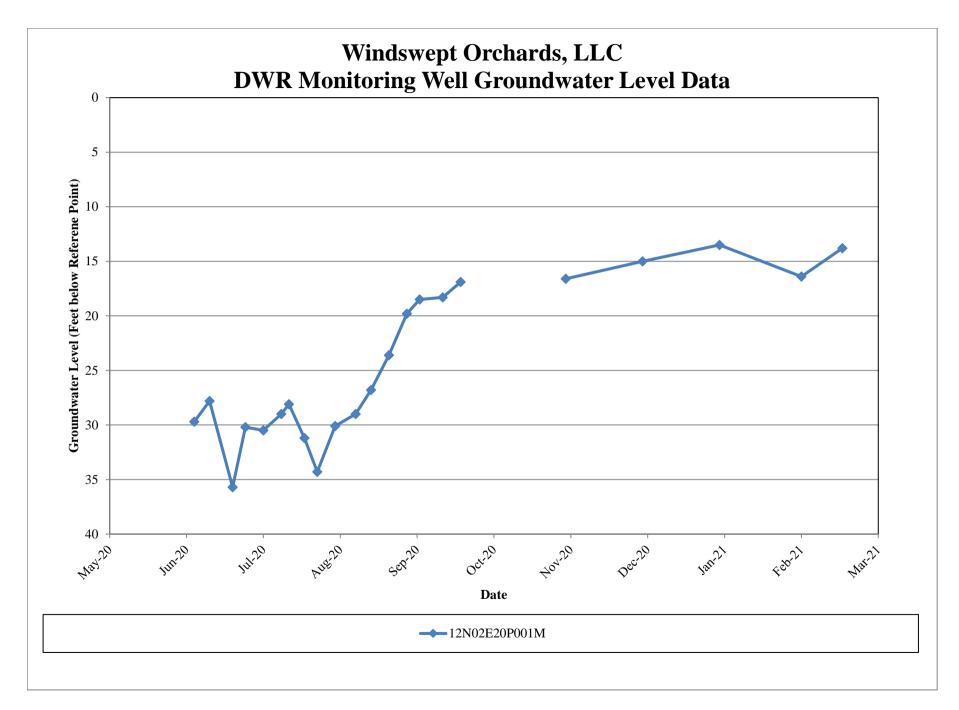












Appendix J Cumulative Projects

Appendix J Cumulative Projects

This appendix provides an analysis of overall cumulative effects of the Proposed Action taken together with other past, present, and reasonably foreseeable probable future projects (or actions) as required by NEPA implementing regulations (40 CFR, Section 1508.7) and CEQA Guidelines (14 CFR, Section 15130). The reasonably foreseeable probable future actions considered in this cumulative effects analysis are actions located within the Seller Service Area that have been identified as potentially having an effect on resources that also may be affected by the Proposed Action. This analysis follows applicable guidance provided by the CEQ in *Considering Cumulative Effects under the National Environmental Policy Act* (1997) and *Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (2005).

J.1 Cumulative Projects

The cumulative analysis considers other potential water transfers that could occur in the 2022 transfer season, including other CVP water transfers, non-CVP water transfers, and additional water transfers. No construction projects within the Seller Service Area were analyzed. Table J-1 lists potential sellers, including those in the Proposed Action, that have indicated interest or have provided water for transfer in the past, including:

- Potential transfers from sellers in the Sacramento River, American River, Yuba River, and north-westerly Delta areas. The majority of these potential sellers, which include the sellers in the Proposed Action, were evaluated in the Long-Term Water Transfers EIS/EIR and subsequent Long-Term Water Transfers Revised EIR/Supplemental EIS prepared by SLDMWA and Reclamation that analyzed potential CVP-related transfers from 2019 to 2024. Additional sellers in the Sacramento River area not evaluated in the EIS/EIR have indicated interest in selling water in 2022 and are also included in Table J-1.
- Potential transfers from sellers in the Feather River Region from entities holding settlement agreements with DWR that could make surface water available for CVP or SWP contractors. These transfers would be approved and facilitated by DWR.

The Lower Yuba River Accord (Yuba Accord) transfers were not included in the cumulative condition analysis in Section 3 because water would be made available for transfer in a different geographical area than the Proposed Action. The Yuba Accord provides for both stored water and groundwater substitution transfers ranging from 60,000 AF per year and up to an additional 140,000 AF for state and federal contractors in drier years. From 2007 through 2014, Yuba Accord transfers averaged approximately 129,000 AF. Transfers under the Yuba Accord historically account for a large portion of the DWR approved water transfers and represented 73 percent of the DWR approved transfers in 2015 (DWR 2015). Water made available for transfer through groundwater substitution actions under the Yuba Accord would occur in the North Yuba and South Yuba subbasins and would not affect groundwater levels near the Proposed Action.

J.1.1 Potential transfers analyzed in the cumulative analysis

The cumulative analysis considers other CVP and non-CVP water transfers that could occur in addition to the Proposed Action. Methods of making water available for transfer under these other transfers could include cropland idling and groundwater substitution (the same as described for the Proposed Action). Other methods of making water available for transfer could also include conservation, where a seller takes a conservation action to reduce irrecoverable water losses, and stored reservoir water releases, which includes releases of water that would have remained in storage in non-CVP or SWP reservoirs absent the transfer action.

Water made available for transfer, shown in Table J-1, could be sold to multiple agencies, including, TCCA, East Bay Municipal Utility District (MUD), SWP contractors receiving water from the North Bay Aqueduct, and south of Delta buyers, including SLDMWA and Metropolitan Water District of Southern California. Unlike transfers of water to TCCA and East Bay MUD that would be diverted off the Sacramento River, transfers of water to south of Delta buyers would be exported through the Delta via Banks or Jones Pumping Plants.

Table J-1. Potential Sellers Analyzed in the Cumulative Analysis (Upper Annual Transfer Volume Limits)

Water Agency	Groundwater Substitution ¹ (AF)	Cropland Idling/ Crop Shifting ¹ (AF)	Stored Reservoir Release ¹ (AF)	Conservation ¹ (AF)	Maximum Potential Transfer (AF)
Sacramento River Area					
Anderson-Cottonwood Irrigation District	5,225				5,225
Baber, Jack, et al.		2,310			2,310
Canal Farms	1,000	635			1,635
Conaway Preservation Group	35,000	21,349			35,000
Cranmore Farms (Pelger Road 1700 LLC)	8,000	2,500			8,000
Eastside Mutual Water Company	2,230				2,230
Giusti Farms	1,000				1,000
Glenn-Colusa Irrigation District	25,000	66,000			91,000
Henle Family Limited Partnership	700				700
Maxwell Irrigation District	3,000	5,000			8,000
Natomas Central Mutual Water Company	30,000				30,000
Pelger Mutual Water Company	4,670	2,538			4,670
Pleasant Grove-Verona Mutual Water Company	18,000	9,000			18,000
Princeton-Codora-Glenn Irrigation District	6,600	6,600			12,100
Provident Irrigation District	10,000	9,900			16,900
Reclamation District 108	15,000	20,000			35,000
Reclamation District 1004	7,175	12,500			19,675

	Groundwater Substitution ¹	Cropland Idling/ Crop Shifting ¹	Stored Reservoir Release ¹	Conservation ¹	Maximum Potential
Water Agency	(AF)	(AF)	(AF)	(AF)	Transfer (AF)
River Garden Farms	10,000	10,000			16,000
Sutter Mutual Water Company	18,000	18,000			18,000
Sycamore Mutual Water					
Company	15,000	10,000			20,000
T&P Farms	1,200	890			1,200
Te Velde Revocable Family Trust	7,094	6,975			7,094
Windswept Land & Livestock	2,000				2,000
American River Area					
City of Sacramento	5,000				5,000
Placer County Water Agency			47,000		47,000
Sacramento County Water Agency	15,000				15,000
Sacramento Suburban Water District	30,000				30,000
Yuba River Area					
Browns Valley Irrigation District			5,000	3,100	8,100
Cordua Irrigation District	12,000				12,000
Feather River Area					
Butte Water District	5,500	11,500			17,000
Garden Highway Mutual Water Company	14,000				14,000
Gilsizer Slough Ranch	3,900				3,900
Goose Club Farms and Teichert Aggregates	10,000	10,000			10,000
South Sutter Water District	·	•	15,000		15,000
Tule Basin Farms	7,320		-		7,320
Biggs-West Gridley Water District ²		32,190			32,190
Richvale Irrigation District ²		22,345			22,345
Plumas Mutual Water Company ²	5,000	1,750			4,550
South Feather Water and Power ²	-,	,	10,000		10,000
Sutter Extension Water District ²	4,000	11,000	.,		15,000
Western Canal Water District ²		37,655			37,655
Total	337,614	330,637	77,000	3,100	661,799

Notes:

Table J-1 lists the transfer method and associated maximum annual transfer quantity potentially available from each seller. The actual quantity of water transferred in a given year, as evidenced by

¹ These totals cannot be added together. Agencies could make water available through groundwater substitution, cropland idling, or a combination of the two; however, they will not make the full quantity available through both methods. The last column reflects the total upper limit for each agency and will not equal the sum of all the individual transfer quantities for each agency.

² Entity holds Settlement Agreement with DWR.

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past dry years, is less than the totals shown in Table J-1 and depends on a number of factors, including hydrologic conditions and available conveyance capacity. Cross Delta transfers to south-of-Delta buyers require pumping at the CVP and SWP south Delta export facilities and historically account for the majority of the transfers from sellers listed in Table J-1. Table J-2 lists the total quantities of cross Delta transfers from 2009 to 2015 that ranged from zero to 414,629 AF from 2009 through 2015, or approximately zero to 55 percent of the maximum total shown in Table J-1. In 2014, Sacramento Valley sellers transferred 35,446 AF to TCCA Member Units. In 2015 and 2021, TCCA Member Units used 23,997 AF and 57,060 AF of transfer water from Settlement Contractors, respectively. TCCA did not engage in water transfers in 2016 – 2020, and cross-Delta water transfers were not implemented.

Table J-2. Historic Cross Delta Water Transfers (2009 – 2015)

Year	Total Acre-Feet
2009	274,551
2010	264,165
2011	0
2012	84,781
2013 ¹	351,515
2014 ¹	414,629
2015 ¹	262,466

Source: DWR and SWRCB 2015

Notes:

Transfers originating from the Sacramento Valley represent a small portion of the Sacramento Valley's overall water supply. In addition to the transfers described in Table J-1, TCCA may also engage in "Project Water" transfers under the Central Valley Project Improvement Act section 3405(a)(1)(M). Transfers or exchanges of Project Water for contract years 2021 through 2025 are expected to be covered by the Reinitiation of Consultation on the Coordinated Long-Term Operation of the Central Valley Project and State Water Project (Reclamation 2019). The EA identified no effect to biological resources and potentially small, beneficial effects to other resources. Because these transfers would not have adverse effects, they are not included in the cumulative conditions analysis in Section 3.

J.1.2 Voluntary Agreements

On December 12, 2018, the State Water Resources Control Board (Board) adopted Resolution 2018-0059, approving an update to the Bay-Delta Water Quality Control Plan (Bay-Delta Plan). The agreement included flow and non-flow measures to improve water quality in the Bay-Delta watershed to support viability of native fishes. On March 1, 2019, several parties, including the Sacramento River Settlement Contractors, entered into the "Planning Agreement Proposing Project Description and Procedures for the Finalization of the Voluntary Agreements to Update and Implement the Bay-Delta Water Quality Control Plan" (Planning Agreement).

¹ Data for 2013, 2014 and 2015 are for quantities made available North of the Delta and include Streamflow Depletion losses (where applicable) but do not include carriage water losses across the Delta. Cross Delta water transfers using facilities operated by DWR in 2014 and 2015 were 305,699 AF and 104,348 AF, respectively and Reclamation 73,930 AF and 157,018 AF, respectively.

The flow measures discussed in the Planning Agreement provide instream flows above existing conditions and in a manner that: (a) does not conflict with the requirements of the Sustainable Groundwater Management Act and (b) maintains reliability of water supply for other beneficial uses, including designated wildlife refuges. These flows above existing conditions will be generated through land fallowing, reservoir reoperation and/or demand reduction, and limited use of groundwater substitution. Table J-3 shows the flow contributions from the Sacramento River watershed.

Table J-3. Contribution of Flow to the Voluntary Agreement in the Sacramento River Watershed

Tributary	Season	Source	Application ²	Flow	<i>C</i> ontri	butions	s (in T	۹F)
				С	D	BN	AN	W
Sacramento	Spring or summer ¹	Land fallowing	Block		100	100	100	
Feather	Spring or summer ¹	Land fallowing	Block		50	50	50	
Yuba	Assume spring likely ¹	Reservoir storage	Block		50	50	50	
American	Spring	Groundwater substitution	Hybrid	10	10			
		Reservoir storage				10	10	
		Reservoir storage and/or groundwater substitution			10			
		Reservoir storage and/or groundwater substitution		20	20			

Key: AN – Above Normal Water Year; C – Critical Water Year; D – Dry Water Year; BN – Below Normal Water Year; TAF – Thousand acre-feet; W- Wet Water Year

Notes

J.1.3 Coordinated Operations Agreement

Reclamation and DWR would continue to operate their respective facilities in accordance with the Agreement between the United States and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project executed in 1986 (Coordinated Operations Agreement, hereinafter referred to as COA). The COA defines the project facilities and their water supplies, sets forth procedures for coordinating operations, and identifies formulas for sharing joint responsibilities for meeting Delta standards and other legal uses of water. COA further identifies how unstored flow is shared, sets up a framework for exchange of water and services between the projects, and provides for periodic review of the agreement.

Implementation of the COA principles has evolved since 1986, as changes have occurred to CVP and SWP facilities, operating criteria, and overall physical and regulatory environment. For example, updated water quality and flow standards adopted by the State Water Resource Control

¹ Flow represents an instream target, Blocks can be scheduled within constraints, and Hybrid represents a combination.

² Subject to coordination with California Department of Fish and Wildlife (DFW) (Yuba) or fisheries agencies (Sacramento, Feather)

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Board (SWRCB), CVPIA, and Endangered Species Act (ESA) responsibilities have affected both CVP and SWP operations. The 1986, COA incorporated the SWRCB Water Right Decision 1485 (D-1485) provisions regarding Delta salinity, outflow, and export restrictions. D-1485 included implementation provisions for the Bay-Delta Water Quality Control Plan (WQCP) that was current at the time but has since been updated with Water Right Decision 1641 (D-1641). COA envisioned and provided a methodology to incorporate future regulatory changes, such as Delta salinity requirements, but did not explicitly envision or address sharing of export restrictions. D-1641 and the 2008 U.S. Fish and Wildlife Service (USFWS) Biological Opinion (BO) and 2009 National Marine Fisheries Service (NMFS) BO included various export restrictions not explicitly addressed in the 1986 COA. However, the available export capacity as a result of these export restrictions was shared between the CVP and the SWP in absence of a formal update to the COA.

In 2018, Reclamation and DWR amended four key elements of the COA to address changes since the COA was signed: (1) in-basin uses, (2) export restrictions, (3) CVP use of Banks Pumping Plant up to 195,000 acre-feet per year (AFY), and (4) periodic review. The COA sharing percentages for meeting Sacramento Valley in-basin uses now vary from 80 percent responsibility of the United States and 20 percent responsibility of the state of California in wet year types to 60 percent responsibility of the United States and 40 percent responsibility of the state of California in critical year types. In a dry or critical year following two dry or critical years, the United States and state of California will meet to discuss additional changes to the percentage sharing of responsibility to meet in-basin uses. When exports are constrained and the Delta is in balanced conditions, Reclamation may pump up to 65 percent of the allowable total exports with DWR pumping the remaining capacity. In excess conditions, these percentages change to 60/40. The COA defines balanced conditions as periods when it is agreed that releases from upstream reservoirs plus unregulated flow approximately equal the water supply needed to meet Sacramento Valley in-basin uses, plus exports. The COA defines excess conditions as periods when it is agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in-basin uses, plus exports.

J.2 References

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