United States Department of the Interior

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In Reply Refer to:
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Memorandum

To: Ernest A. Conant, Regional Director, Interior Region 10, California-Great Basin, Bureau of Reclamation, Sacramento, California

From: Jana Affonso, Acting Field Supervisor, San Francisco Bay-Delta Fish and Wildlife Office, Sacramento, California

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Subject: Planning Aid Memorandum for the North-of-the-Delta Offstream Storage (NODOS)/Sites Reservoir Project

This Planning Aid Memorandum (PAM) is provided under the authority of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq*.). The FWCA requires Federal agencies proposing water resource development projects or involved in issuance of related permits or licenses to consult with the Service and provide equal consideration to the conservation, rehabilitation, and enhancement of fish and wildlife resources with other project purposes. The Bureau of Reclamation (Reclamation) has provided funding under FWCA for the U.S. Fish and Wildlife Service's (Service) involvement in early planning, including participation in interagency meetings, coordination with other resource agencies, review and comment on administrative draft materials of environmental documents, and the preparation of this PAM. The purpose of this PAM is to provide Reclamation with the Service's comments and recommendations on the project pertaining to effects on natural resources for consideration in project planning and preparation of a public revised draft environmental document.

The proposed project would be construction and operation of an offstream reservoir (Sites Reservoir) to be located in Colusa and Glenn counties west of the town of Maxwell. The operating concept for Sites Reservoir is to capture and store flows originating from unregulated tributaries of the Sacramento River downstream of Shasta Dam by pumping them into the reservoir during the late Fall-Spring and releasing from it during the late Spring-early Fall. The proposed project would involve two main dams, seven saddle dams or dikes, and two recreation areas. The reservoir would be filled from Sacramento River sources using existing diversions/canals at Red Bluff (Tehama Colusa (TC) canal) and Hamilton City (Glen Colusa Irrigation District (GCID) canal) that would be pumped into the reservoir through pipelines constructed from existing Funks Reservoir and a new terminal regulating reservoir.

Hydroelectric turbines and appurtenant power lines would also be constructed for both Funks and terminal reservoirs. Releases would be into the Colusa Basin Drain (CBD) (and/or Sacramento River, for one alternative) via a newly constructed Dunnigan pipeline. A new bridge or roadway, depending on alternative, would be constructed to maintain surface transportation access. Some modifications to existing canals and other facilities would also be needed.

Coordination History:

An offstream reservoir at this location has been studied in concept for at least 70 years with various sizings of the reservoir, diversion and release locations, and flows, most recently in a 2017 environmental document. The Service engaged in coordination with Reclamation in 2017, but did not submit an official FWCA document at that time. The design has since been revised based on comments and cost considerations. FWCA coordination on the current revised design, which is the subject of this PAM, began in October 2020, and included Service attendance in at least five interagency meetings organized by Reclamation (October 26, 2020; February 4, April 9, May 14, July 14, 2021). The Service held a coordination meeting with NOAA-Fisheries and the California Department of Fish and Wildlife on July 1, 2021, to informally share and discuss potential effects on resources. This latter coordination meeting was informational only. At this time, the views in this PAM represent those of the Service only, pending official responses by other fish and wildlife agencies after their reviews of the current project have been completed.

In addition to materials presented at meetings, Reclamation provided some administrative draft chapters and appendices of the pending Draft Revised Environmental Impact Statement for our comment and use in preparation of this PAM. Those of particular importance in this PAM include Vegetation and Wildlife (Chapter 9; Appendices 9A-B; 10 A-C), which includes effects on terrestrial habitats; Surface Water (Chapter 5) which summarizes changes in river flow and water operations; and Aquatic Resources (Chapter 11) which summarizes effects on those resources. Due to the limited amount of time to review draft materials, including key sections (i.e, since May 2021; Chapters 5 and 11 in June 2021), the findings in this PAM are preliminary and subject to refinement/revision after the draft environmental document is published.

Alternatives:

Alternative 1 would include a 1.5 million acre foot (MAF) reservoir, a bridge over it to provide road access, and discharge capability into the CBD (connecting to the Sacramento River) enabled by a 4-mile Dunnigan Pipeline that connects the TC/GCID to the CBD. Alternative 1 has water operation options termed Alternative 1A and 1B, which represent 0% and 7% Reclamation investment, respectively. The investment determines Reclamation's share of water stored in Sites that could be used to meet CVP water supply and environmental objectives, with the remainder managed by Sites Storage Partners. Alternative 2 would include a 1.3 MAF reservoir, a road around the reservoir to provide road access, the ability to discharge directly into the Sacramento River with an extended pipeline, and no Reclamation investment. Alternative 3 is the same as Alternative 1 but with 25% Reclamation investment, providing more flexibility to meet CVP water supply and environmental objectives. Although the materials do not state a preference, for the purpose of this PAM, we have assumed that Alternative 1 or some variation

of it would be selected as preferred because it would avoid the cost and additional direct impacts of the extended pipeline and perimeter road construction.

To limit effects on aquatic resources, aimed primarily at salmonid fishes, diversions to Sites would be restricted to when flows exceed 3,250 and 4,000 cubic feet per second (cfs) at Red Bluff and Hamilton City, respectively, and when flows on the Sacramento River at Wilkins Slough are at least 5,000 cfs in most months (8,000 cfs in April/May). Additionally, diversions would cease when outmigration is detected for 7 day periods as a pulse protection measure when tributary flows upstream of Bend Bridge (Cow, Cottonwood, and Battle Creeks) are 2,500 cfs and the Sacramento River flow at Bend Bridge exceeds 8,000 cfs. For reference, diversion capacities are 1,800 and 2,100 cfs for GCID and Red Bluff Diversion Dam (RBDD) diversions, respectively. Finally, flows over the Fremont weir would be reduced no more than 10% when spills are between 600-6000 cfs. Operations would also implement exchanges between Sites and Shasta, Oroville, or Folsom Lakes in order to preserve cold water reserves in these systems.

The alternatives are revised from the 2017 documents by having a smaller reservoir (1.3-1.5 MAF) and eliminating the Delevan pipeline in favor of a shorter, Dunnigan pipeline which connects to the CBD. The CBD will not be available to convey Sites releases in August/September when it is in use to drain rice fields.

General Comments:

The project and its operation will result in a combination of beneficial and adverse impacts to fish and wildlife resources and their habitats. The project has the potential to benefit resources as the result of: greater late summer storage in Shasta in some years - which could conserve cold water and yield benefits to spawning/rearing Federally-endangered Sacramento River Winter-Run Chinook Salmon; increased level 4 water supplies to Refuges in some years - which would benefit migratory waterfowl; and late summer flows into the Yolo Bypass - which could benefit rearing delta smelt and other resources via the dispersal of phyto- and zooplankton into the Delta. The proposed project will incrementally improve the operational flexibility of the Central Valley Project (CVP) and State Water Project (SWP) systems to meet environmental flow objectives.

Introductory materials provided for review only briefly describe recent history leading to the current alternative, referencing a 2006 study that led to the selection of the Sites location, and further refinement based on comments on the 2017 environmental document. Nevertheless, this location has general characteristics that allow, but limit, the ability to store and deliver water as well as limit the ability to mitigate impacts. Foremost, is its position on the west side of the Sacramento Valley. This reservoir site is in a relatively broad flat area but does not capture large quantities of natural runoff. Several smaller creeks, Funks and Stone Corral, are present in the footprint and can flow up to several thousand cfs during intense events, but otherwise have very low natural flows. As such, the proposed project would have more limited direct impacts to anadromous fish spawning habitat, compared to prior or future possible projects constructed on mainstems or major tributaries. Additionally, releases of storage from Sites can be timed to limit effects of export in the Delta on listed fish species including delta smelt.

As the term offstream implies, the overwhelming majority of storage in Sites will depend on filling it from the Sacramento River via the existing GCID and TC diversions. These facilities

have a limited combined capacity (3,900 cfs), which means diversion must occur for extended periods in order to store enough water to make the project feasible. It is this requirement for extended diversion which causes the project to have significant and, we believe, some unavoidable impacts to aquatic resources.

Such diversion durations will subtract from base flows of the Sacramento River during periods when water is not truly in excess. That is, diversion of water to Sites Reservoir is proposed to occur in lower flow ranges of the hydrograph where flow quantity and variation will cause effects on fishery and riparian resources, and includes diverting during critically dry years where natural runoff is more limited. The effects of diversion include: increased impingement mortality at the diversion intake screens as well as increased mortality via mechanisms that are inversely proportionate to flow. Reduced flows in the Sacramento River are also expected to result in a reduced rate of juvenile fish transport and movement that results in an increase exposure to predation risk and lower survival. There are other aquatic resources and functions which will be incrementally diminished, or changed, by the effect of project operation on flows. These include adult attraction, consequences of changes in temperature, effects of exporting Sites water in the Sacramento-San Joaquin Delta (Delta), geomorphic effects of flow reduction in the higher flow range on habitat (cut bank formation, cottonwood seed dispersion/regeneration processes, wood transport) and sensitive species which use it (e.g., bank swallows, yellow-billed cuckoo), reduction in near-channel overbanking/inundation, and effects of exchanges on the American and Feather Rivers.

The project would have direct impacts to over 20 square miles of habitat, albeit mostly grassland, which would be replaced by a relatively shallow, warm reservoir. Hundreds of acres of woodland and wetland would be impacted (see Specific Comments). Properly managed, the reservoir could provide significant recreational benefits, primarily boating-based activities. Certain upland species, especially hawks, golden eagle, burrowing owl, and others, would be adversely affected due to loss of habitat. Others, such as warmwater fish and bald eagle, would benefit from the action. The hydropower element of the project creates a risk of mortality to birds which may contact transmission lines. Reclamation has stated that water quality and temperature are not concerns, but these may be adversely affected depending on storage level, wind, and weather conditions.

Even without the project, aquatic resources - both species and ecological regions such as the Delta - have already been severely stressed and depleted by the combined impact of existing major dams and diversions and their operations, and other factors such as bank protection, and invasive species, due to urban development, agriculture, and associated water demands. The net result of lost habitat and reduced, modified flows, has been a progressive decline in populations of salmonids and native fishes, with several near extinction, and further incremental degradation of the Delta. At risk species are most susceptible to elevated rates of loss in low water years, when the proposed project will continue to operate, and will cause the largest, proportional changes to flows in the Sacramento, Feather, and American Rivers. The proposed project will divert up to an additional 1.4 MAF into storage, of which 0.3+MAF would be delivered to project partners, including an allocation for habitat purposes. The project and its operation will result in a combination of beneficial and adverse natural resource impacts, however, some of those adverse impacts may prove difficult to fully mitigate.

In the Specific Comments below, we describe in greater detail some of the more significant effects, both beneficial and adverse, that project construction and operation would have on fish and wildlife resources and their habitats.

Specific Comments:

Water for National Wildlife Refuges

The National Wildlife Refuges (Refuges) in the Central Valley were established to provide sanctuary and wintering habitat for migratory waterfowl. These Refuges are managed intensively to provide a consistent quantity and quality of habitats for wintering waterfowl to compensate for habitat losses due to agricultural and urban development. These Refuges currently support over 250 species of birds and are known for the large concentrations of waterfowl (in some areas more than 750,000 ducks and geese) that use the Refuges during their winter migrations. Therefore, the acquisition and delivery of sufficient water to these Refuges is a high priority for the Service.

One of the benefits associated with the proposed project is that it could provide a source for Level 4 water supplies to wildlife refuges. Overall, 10-13% of Sites water deliveries would be to Refuges in critically dry and dry years, with more water going to Refuges in the San Joaquin Valley. In general, the timing of Sites releases would be consistent with Refuge needs by providing additional water that could be used by Refuges managing for migratory waterfowl and other species. We consider this benefit, although not well defined at present, to have a relatively high degree of certainty and effectiveness. The Service can assist Reclamation to better identify and evaluate how these water deliveries could benefit Refuges and the wildlife species and habitats they support.

Lake Shasta Storage

One stated benefit of the project and its operation (including exchanges with other reservoirs) is that of increased storage in Shasta Lake. According to materials provided, Shasta storage would be 3-6% greater in August of critically dry years. This translates into around 90,000 ac-ft for storage during an average critically dry year at that time (1.88 MAF) but only a foot or so difference in elevation. The coldwater pool at Shasta is accessed through a temperature control device with intakes at different levels. The frequency of benefit appears in less than 10% of years, and not more than 2°F in the Sacramento River at Keswick or Clear Creek and typically less (Figure F6C-5-17; F6C-6-6; Appendix 6C). Preceding weather, water releases, and lake elevation will affect the precise extent to which this additional storage can yield a thermal benefit. If realized, a 2°F benefit, could allow for higher survival of winter-run Chinook salmon juveniles in critically dry years and increase the success of fall-run Chinook salmon spawning.

Yolo Bypass

The Yolo Bypass can be an important rearing habitat for Chinook salmon and delta smelt. The project operation would reduce flows into the bypass by 2-4% during the November-May project diversion season in all water year types. When water is released from Sites in April-October, a small amount will be allowed to flow into the bypass (up to ~400 cfs in wet years, 200 cfs in critically dry years; Chapter 5, Table 5-21). On the basis of pilot studies,

Reclamation suggests that such flows can stimulate algal production and associated lower trophic level food organisms in the Yolo Bypass Toe Drain, which would provide a food subsidy for delta smelt rearing in the area. The pilot studies were not comparable to the project flows in timing or magnitude, so it is difficult to make direct comparisons or projections from them. At other times of the year, a reduction in flow could have an adverse effect on salmonid rearing habitat. To better evaluate the net effect and benefit potential, we recommend that Reclamation estimate any differences in flooded area and duration as a result of both the winter flow reduction and these small releases from Sites, and consider additional pilot studies that better match the operations proposed.

Footprint Impacts

The project would permanently impact about 14,000 acres of habitat and associated wildlife, with exact amounts depending on the alternative. Most of the impact would be within the inundation zone of the reservoir and reregulating reservoir. It is estimated that the Project would result in the loss of approximately 11,000 acres of annual grassland, 1,000 acres of oak woodlands, 400 acres of seasonal and perennial wetlands, 180 acres of permanent and ephemeral streams, and 50-100 acres of upland riparian vegetation, in addition to small quantities of other vegetation types.

The uplands are known to support raptors such as golden eagle and other raptors. There is also habitat (e.g. riparian, upland, stream, and wetland) that could support special status species including the listed valley elderberry longhorn beetle, red-legged frog, and several rare plants are potentially present within the impact area.

Reclamation has proposed surveys to occur at some point in the future when access is possible. Much of the area has been infrequently examined in the past for lack of access. In the absence of species-specific survey data, Reclamation has proposed avoidance measures. The Service looks forward to working with Reclamation so that appropriate resource protection measures can be identified. Reclamation has also identified the need for compensatory mitigation, because most of the losses cannot be avoided, and has proposed mitigation in terms of a ratio commitment (2:1 or 1:1, depending on the habitat) and a listing of various forms (banks, restoration, conservation). The Service recommends that Reclamation provide greater specificity by identifying the locations of potential mitigation lands or banks for each of the habitat types for which mitigation is proposed.

There are some significant differences between alternatives. Specifically, Alternative 2 would impact a modestly smaller area of grasslands, but a significantly larger area of woodlands, riparian, and wetland, due to the impacts of the perimeter road and extension of the pipeline to the Sacramento River.

Diversions

In general, whenever water diversions occur, there will be an associated loss of food organisms and sediment, incidental mortality of fish at the intake screen(s), and lower survival due to lower flows and related mechanisms (predation exposure, less inundated edge cover, less food production, less suspended sediment). Bypass flow criteria can limit, but cannot entirely avoid this impact.

The proposed project would allow diversion of water to Sites Reservoir whenever flow at Wilkins Slough was at least 5,000 cfs (8,000 cfs in April/May). This bypass flow criterion may not adequately protect downstream migrating salmonids, including the winter-run Chinook salmon, threatened Central Valley Spring-Run Chinook Salmon, threatened Central Valley Steelhead Trout, and Central Valley Fall/Late Fall-Run Chinook Salmon (no Federal status). Chapter 11 and Appendix 11P, as well as materials presented by Reclamation at an April 9, 2021 workshop cite recently published materials about juvenile survival-flow relationships in the Sacramento River (Michel, C., J. Notch, F. Cordoleani, A. Ammann, and E. Danner. 2021. Nonlinear survival of imperiled fish informs managed flows in a highly modified river. Ecosphere. DOI: 10.1002/ecs2.3498). The analysis provided by Michel et al. (2021) indicates juvenile survival decreases dramatically when flows decrease below approximately 11,000 cfs at Wilkins Slough. Chapter 5 indicates the project would reduce flows by 2-11% in critically dry years with lesser reductions in wet years. Because monthly average flows are always below 11,000 cfs in critically dry years, and from May-November of wet years (Table 5-16, Chapter 5), this reduced flow will affect survival. This effect would depend on run and migration timing; although much salmonid movement occurs in April and May, it may also occur earlier, or later, and will vary between years. In June-October of critically dry years, project operation would increase flows at this location because Sites water is being used in lieu of GCID diversion from the river; this may benefit survival of winter-run Chinook salmon which are rearing in the river at this time.

According to the tables in Chapter 5 provided, increased November-May diversions at RBDD to fill Sites would lower flows by 1-9% during critically dry years, which would increase any diversion-associated mortality of affected juvenile fish and loss of rearing habitat. Chapter 11 uses Weighted Usable Area (WUA), to conclude that rearing conditions improve with reduced flows; this is likely a consequence of the habitat suitability curves that show a preference of salmonid fry/juveniles for lower velocity. However, diverting flow can have other effects on habitat volume and available food that are likely more limiting, and not apparent in WUA calculations. Flows differences at Bend Bridge are more limited, as this is upstream of this diversion, but also as much as 1-9% lower in critically dry years and 1-4% lower in wet years.

In addition to anadromous salmonids, the Project may adversely affect other fish in the Sacramento River. For example, white sturgeon spawning in the Sacramento River is generally not seen under Colusa (north of Wilkins Slough) flows of 6,400 cfs, and the fish have been known to stop spawning and drift downstream under 5,300 cfs. Since adults migrate in the winter and spawn in the early spring, and diversions occur whenever flow at Wilkins Slough exceeds 5,000 cfs, its movement could be affected by the project. The conclusion of no impact based on long term averages above 7,500 cfs during sturgeon migration appears incorrect (Chapter 11, p. 11-218). Long term average monthly critically dry flows during the migration season are generally above 7,500 cfs and would be sufficient for migration if this threshold occurred at all times in every year, however, this average may include years, months or days, of lower flow where diversion could coax the sturgeon into spawning less frequently. Since sturgeon have natural mortality and fishing related mortality during each year of life, lower frequency spawning may have implications for population dynamics.

Delta Outflow/Export

Water diversions from the Sacramento River can affect flows into and out of the Delta. Currently, winter diversion at RBDD/GCID is very limited because irrigation water is not

widely needed during this naturally cold and wet time of year. With the project, November-May diversions would increase at RBDD in critically dry years (157-465 cfs, depending on month/alternative), and much more in wet years (up to 1,205 and 494 cfs at RBDD and GCID, respectively; Tables 5-13 and 5-15, Chapter 5). This coincides with a 2-8% reduction in Delta outflow with the project in critically dry years, the combined effect of increased diversion and the tail end of project-related south Delta exports (Tables 5-27 and 5-28; Chapter 5). Information elsewhere in the document collates the data in other ways to suggest there is little effect on exports (i.e., Chapter 11; Table exportss.1; mean March-May south Delta exports; 0-1% differences; all years), or increase Delta outflow (Chapter 11; Table outflowjulsep1; July-September Delta outflow increases with project 1-9%, all years). This suggests the project will have a limited effect on delta smelt and other fishes. A similar timing-based analysis indicates that proposed changes to Old and Middle River (OMR) negative flows do not affect delta smelt. Outflows are reduced and OMR flows are projected to become more negative in July - September with the project, and may affect fish other than delta smelt, that are present in the South Delta at that time.

Simulations in the materials provided indicate a reduction in winter Delta outflow due to project operations that would move X2 east by a 0.3-0.5 km in January-March of critically dry years. This could affect estuarine fish, and Reclamation has proposed 11-15 acres of tidal habitat restoration to compensate for such effects on longfin smelt. The 1-5% increase in July-September Delta outflow noted above could move X2 west by 0.3-1.3 km in July-October of critically dry years. This could incrementally improve Delta conditions related to outflow and position of X2, specifically through food web and other habitat attribute enhancements that are a function of these parameters. The largest project effects are in July-September, corresponding to 23-42% increases in Delta exports. We expect these increased exports to have commensurate increased losses of fish associated with screens and predation at export facilities.

Pulse Flows

Pulse flows on the Sacramento River can produce important ecological benefits. The proposed pulse flow protection consists of halting diversions for 7 days when tributary flows exceed 2,500 cfs, but with limitations for another one contingent on the Sacramento River or tributaries falling below 7,500 or 2,500 cfs, respectively, for seven consecutive days. Language in Chapter 2 suggests that this measure relies on the general concept that natural pulses stimulate juvenile fish to move downstream but this is not a precise relationship. Longer and/or more frequent flows may be necessary to protect downstream-migrating juvenile salmonids. The Service looks forward to working with Reclamation to help identify pulse flows that are of sufficient size and duration to protect downstream-migrating juvenile salmonids and to cue upstream migrations of salmonids, sturgeon, and other native fishes.

Exchange Effects - Folsom/Oroville storage and release

The CVP and SWP have coordinated operations such that if storage is being conserved in one reservoir, other reservoirs may be called upon to make up differences in river flows. We use the term exchange effects to describe this coordinated operation of Central Valley reservoirs. The project could reduce Folsom storage by as much as 3-6%, and Oroville storage by 1-3%, in August of critically dry years, conditions when both of these reservoirs are relatively low. Reduced storage could potentially affect coldwater reserves and raise temperature of releases to

the American or Feather Rivers. With the project, American River flows could increase or decrease, depending on month (-15 to +20%, critically dry years). Feather River flows at the mouth could also change by similar amounts (-14 to + 25%, June-October, critically dry years). Far field analyses in Chapter 11 indicated that such differences could cause redd dewatering of fall-run Chinook salmon redds in the American River and the high flow channel of the Feather River in critically dry years. Chapter 11 also suggested that project-caused flow variations between months may cause juvenile stranding and loss of rearing habitat. Limited time did not permit a thorough evaluation, however, the information provided to us supports the need for a careful further examination of effects of exchanges on other systems, particularly for critically dry water years when reservoir storage is already low.

Cumulative Impacts/Other Projects

Chapter 31 includes a long list of other projects, including several large infrastructure/development projects for diversion and additional storage via dam raises at various locations (e.g., Delta Conveyance Project; Shasta Lake, San Luis, Pacheco dam raises). The extent to which any of these could offer similar benefits to the proposed project, or are higher priority than the proposed project, is not described. We recommend that Reclamation consider the benefits of these other projects, how they would interact with the proposed project, and explain the sequence of construction/completion relative to the proposed project.

The Service appreciates the opportunity to participate in planning for the NODOS project. If you have any questions about this PAM, contact Steven Schoenberg of my staff at Steven_Schoenberg@fws.gov.

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