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Intensities of Implementation and Linkages for
ALTERNATIVE COMPONENTS

Water Quality

BASIC POLLUTANT SOURCE CONTROL consists of actions to reduce discharges of water quality constituents of concern to aquatic habitats of the Bay-Delta system and its tributaries. At the basic level of implementation, this alternative component relies on encouraging voluntary compliance and providing financial incentives for Best Management Practices and other measures that control sources of salinity, selenium, pesticide residues, and heavy metals.

EXTENSIVE POLLUTANT SOURCE CONTROL consists of actions that increase compliance with source control regulations for agricultural drainage, urban and industrial discharges, and abandoned mine drainage. Increased compliance will be obtained by stronger enforcement of existing regulations, better integration of Best Management Practices with source control regulations, and better coordination among agencies that operate programs regulating water quality. The extensive level of implementation also includes increased efforts to retire lands that discharge salinity to Bay-Delta tributaries.

INCREASE FLOWS FOR WATER QUALITY consists of actions that dilute pollutant concentrations in the Bay-Delta and the San Joaquin and Sacramento Rivers to reduce adverse effects of those pollutants on aquatic habitats and other beneficial uses. At the basic level of implementation, this alternative component consists of increasing inflows to the south Delta by acquiring 100 TAF of San Joaquin River water from willing sellers. At the moderate level of implementation, this alternative component consists of constructing new surface storage north of the Delta and operating it for management of water quality in the Sacramento River and Delta. The extensive level of implementation for this alternative component is represented by installation of tidal flow barriers in the south Delta in combination with increased flows from reoperation or construction of upstream reservoirs to improve water quality conditions in the south Delta.

Ecosystem Quality

BAY & DELTA HABITAT RESTORATION consists of a wide variety of actions to improve and increase aquatic and terrestrial habitats in the Bay-Delta system. At the basic level of implementation, this component includes restoring mosaics of shallow tidal, riverine, and riparian habitats along approximately 100 miles of reconstructed levees in the Delta, restoring similar habitat mosaics along the Sacramento River channel through the Delta, and restoring approximately 1,000 acres of diked wetlands to tidal action near Suisun Bay. At the moderate level of implementation, this alternative component implements a similar variety of actions and expands the restoration of tidal habitats near Suisun Bay to approximately 2,000 acres of

presently diked wetlands. The extensive level of implementation further expands the restoration of tidal habitats near Suisun Bay to approximately 5,000 acres of diked wetlands while continuing to restore the kinds of habitat mosaics included in the basic and moderate levels of implementation.

Bay and Delta habitat restoration can be linked with improvements to levees and flood conveyance channels in the Delta. Levee reconstruction can provide great opportunities to restore habitats such as riparian, riverine, and shallow water that occur on the margins of levees in the Delta. Construction of floodways and meander belts to improve flood protection levels offers great opportunities to recreate extensive habitat mosaics and corridors.

SAN JOAQUIN RIVER IMPROVEMENTS consist of restoring riverine channel features in the San Joaquin River upstream of the Delta to improve survival and productivity of anadromous fish by reducing water temperatures and protecting young fish from predation and straying during migration. A single moderate level of implementation is available for this alternative component. San Joaquin River upstream habitat restoration can be included in any alternative to produce a higher level of performance in improving anadromous fish survival and productivity in the San Joaquin River and Bay-Delta ecosystem quality in general.

UPPER SACRAMENTO RESTORATION consists of creating meander belts where feasible along the Sacramento River between Colusa and Red Bluff and restoring riparian vegetation where feasible along the river between Sacramento and Colusa. A single extensive level of implementation is available for this alternative component because of the large investment required for such a restoration program (e.g costs of land purchase and modification of flood control features in addition to habitat restoration efforts). Sacramento River upstream habitat restoration can be included in any alternative to produce a higher level of performance in improving anadromous fish productivity from the Sacramento River.

OBTAIN WATER FOR ENVIRONMENT consists of purchasing 100 TAF of water from willing sellers in the San Joaquin River basin to be used to improve fish transport and water quality in the Delta. This water will be used to provide pulse flows to assist movement of fish from the San Joaquin River and south Delta through the Delta and to improve water quality in the south Delta. A single moderate level of implementation at 100 TAF is available for this alternative component. Because this component helps dilute water quality conditions, it is useful to link to changes to system facilities or operations that might otherwise decrease flows to the south Delta.

STORE WATER FOR ENVIRONMENT consists of constructing surface water storage facilities in the Delta to provide flows to improve fish transport through the Delta and to provide flexibility in managing export diversions to reduce entrainment effects. The stored flows will be used to assist in transporting vulnerable fish away from the existing export pumps and through the Delta. The siphons for diverting water onto the storage facility will be equipped with state-of-the-art fish screens. The leveed margins of the storage facilities will be restored to a mosaic of

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shallow tidal, riverine, and riparian habitat. At the basic level of implementation, this component consists of constructing an in-Delta facility having an approximate 100 TAF storage capacity. The extensive level of implementation consists of in-Delta storage facilities having 300-400 TAF of capacity.

This alternative component can be linked with improvements to levee reliability, Delta habitat restoration, management of salinity levels in Delta water, and reoperation of diversion facilities for the state and federal water projects. Such linkages will improve the overall performance of an alternative in addressing Bay-Delta resource problems.

RELOCATE EXPORT DIVERSION POINT consists of shifting a portion or all of the export diversion capacity to a location upstream of the Delta. The point for diverting water from the Delta for export to the San Joaquin Valley and southern California, currently located in the south Delta, can be partially or fully relocated to reduce entrainment of vulnerable fish species and life stages in the south Delta. Under partial relocation, the relocated diversion will have a capacity of 5,000 - 10,000 cfs. Under full relocation, the relocated diversion will be equivalent to the capacity of the Delta-Mendota Canal, the California Aqueduct, and other conveyance facilities which it might supply (e.g. North Bay Aqueduct, Contra Costa Canal). New diversion locations could range from the northern Delta on the Sacramento River (e.g. near Hood or Freeport), farther upstream on the Sacramento or Feather Rivers, or at upstream reservoirs such as Shasta or Oroville.

Relocating the Delta diversion point will reduce freshwater flows through the Delta and therefore should be linked to improvements in source control for salinity and toxic pollutants to protect Delta water quality. Relocating the Delta diversion point can be linked with moderate or extensive habitat restoration in the Delta to balance the reduction in flows through the Delta. Relocating the Delta diversion point can avoid the need to enlarge the conveyance capacities of Delta channels to carry flows to the existing export location.

SCREEN DIVERSIONS consists of installing or upgrading fish screens on existing diversions (i.e. other than the export pumps) in the Delta, on the Sacramento and San Joaquin Rivers, and on other tributaries. At the basic level of implementation, this alternative component consists of installing screens on the highest priority diversions. Priority is based on the potential extent of loss of juvenile salmon and steelhead, as determined by location, season of diversion, and volume of diversion. At the moderate level of implementation, this alternative component consists of screening moderate and high priority diversions. The extensive level of implementation consists of screening all diversions adversely affecting salmon and steelhead productivity.

Screening of diversions throughout the Delta and its watershed can be linked with all types of alternatives to produce a higher level of performance in improving anadromous fish survival and productivity and Bay-Delta ecosystem quality.

Water Supply

Reduce Demand

Reduced water demand includes various programs that seek to lower the amount of water used in the system. Each alternative includes some level of reduced demand. The core actions include incentives for use of agricultural water conservation practices, incentives for use of municipal and industrial conservation practices, and education of small agencies about conservation and reclamation feasibility. Some alternatives also include demand reduction through more intensive levels of water conservation, rate incentives, fallowing or retirement of agricultural lands, drought rationing, reclamation, and other activities.

Reducing demand leaves water available for other uses. Depending on the intensity and success of reducing demand, water could be available for environmental flows, water quality flows, and/or to better meet the needs of agricultural, municipal, and industrial water users. Reducing demand could result in reduced entrainment of fish through reduced diversion of Delta water. Sizing of potential conveyance and storage facilities, including conjunctive use/groundwater facilities, could be influenced by reduced demand.

Channel Capacity Improvements

Channel capacity improvements (channel enlargements by dredging or setback levees) allow Delta channels to more efficiently convey water through the Delta. Channel improvements in this section are for the prime purpose of moving water to the South Delta export facilities. Channel improvements for flood control are addressed with levee improvements under the System Vulnerability section. Currently, the export pumping facilities are not allowed to operate at the physical capacity due to flow constraints in some channels. Only one level of capacity improvements are included in selected alternatives; channel capacity improvements are included in alternatives that seek to increase the permitted export capacity to 15,000 cfs (actual pumping capacity).

Channel improvements to more efficiently move water to the export facilities can be made in conjunction with channel improvements for flood control. In addition, these channel improvements can coordinated with Delta levee habitat restoration involving setback levees and restructuring of channels to provide specific habitats.

Conjunctive Use/Groundwater Banking

Groundwater banking saves water in the ground for use during drought years. Conjunctive use includes operation of a groundwater basin in combination with a surface water supplies to expand the availability of water and the operational flexibility of the

system. Water is stored in the ground water basin for later use in place of or to supplement surface supplies. Water is stored by intentionally recharging the basin during years of above -average water supply. Conjunctive use/groundwater banking is a valuable tool to increase water supply reliability by reducing water deficiencies during drought periods.

Each alternative includes some improvement with the core actions. Each alternative will establish incentives for conjunctive use and will seek to ease institutional barriers to implementation of an effective program. Some alternatives use more aggressive levels of conjunctive use/groundwater banking. These range from provisions to expand groundwater storage and conjunctive use to specific sizes for the programs in the Sacramento and San Joaquin basins. Some alternatives also include in-lieu groundwater banking program in the San Joaquin basin to further expand system flexibility.

The conjunctive use/groundwater programs directly impact the overall system operation and flexibility. Expansion of these programs allows some reoperation of surface reservoirs to meet environmental, water quality, and water user needs. The programs can allow downsizing of other storage and conveyance features that may be included in a solution to Delta problems.

Water Transfers

Water transfers are voluntary water transactions conducted under state law and in keeping with federal regulations. The agency most involved is the State Water Resources Control Board (SWRCB). Each alternative includes some improvement in the opportunity for water transfers with the core actions. These include easing institutional obstacles to facilitate water transfers, improving procedures for water transfer permitting, and provision for coordinating diversion and conveyance of water transfers. Some alternatives provide for increased opportunity for water transfers through a coordinated CALFED program to expedite and expand the use of water transfers to meet water needs during droughts. Other alternatives provide increased opportunity for water transfers through improved conveyance, expanded storage, and/or system reoperation.

The opportunity for water transfers are directly dependent on the institutional and policy features of an alternative, the physical configuration of the system (storage, conveyance, conjunctive use/groundwater banking, and the system operating constraints.

System Vulnerability

Levee Improvements

Land use, infrastructure, water quality, and water supply reliability are vulnerable to potential failure of Delta levees. Improvements to Delta levee and channels are included

to reduce the risk of failure due to floods, earthquake, and general deterioration of the facilities. All alternatives include a number of core actions to improve the system reliability. These include various actions for levee monitoring, maintenance, planning, and funding.

Two standards for levee/channel improvements are used. Army Corps of Engineers PL 99 standard basically provides handling the 100-year flood with 3 feet of freeboard. The Hazard mitigation Plan (HMP) basically provides for handling the 100-year flood with 1 foot of freeboard. The alternatives use different mixes of PL99 and HMP improvements to provide different levels of protection to Delta functions:

- Basic level of improvement provides PL99 for only critical western island with important regional infrastructure and islands with both valuable habitat and important regional infrastructure. All other levees are improved to at least HMP standards.
- Moderate level of improvement further reduces risk by providing PL99 for all critical western islands and islands with important regional infrastructure. All other levees are improved to at least HMP standards.
- High level of protection further reduces risk by providing PL99 for all critical western islands, islands with important regional infrastructure, and islands with valuable habitat. All other levees are improved to at least HMP standards.

Channel improvements for flood control and buffer zones to manage levee subsidence also increase as the level of levee improvement increases. Levee and channel improvements can be made in conjunction with various habitat restoration activities. Channel improvements for flood control and for conveying water to the South Delta export pumps should be coordinated.

Isolated Conveyance Facility

An isolated conveyance facility transfers water from a new diversion(s) outside the Delta through the Delta to the export pumps in the south Delta. The water in the conveyance facility does not commingle with or kept "isolated" from the Delta water. A small isolated conveyance facility is a facility that would transport about 4,500 to 7,000 cfs (about the capacity of the Mendota Canal) from the new diversion to the existing pumping plants in the south Delta. A medium facility would transport form 7,000 to 15,000 cfs (the existing capacity of both pumping plants). While a large facility would transport from 15,000 to 20,000 cfs (the pumps increased to full capacity). The conveyance facility could be constructed of pipes, tunnels, canals, lakes, or a combination thereof. Siphons would convey the flow under water bodies and infrastructure. The route could be around the eastern side of the Delta, through the Delta or under the western side of the Delta.

At the present location the pumps in the south Delta have impact on all listed ESA fisheries species that reside or pass through the Delta. The new location of the diversion(s) can place all or a portion of the total export diversion in an area where there are less or no impacts on ESA species. A small isolated will move a portion of the export diversion to the less impact area, whereas the large isolated facility would move it all of the export diversion to a new area. Since all of the new diversions would have state-of-art fish screens, all sizes of an isolated facility would have less impact on ESA species. Some are moved to areas where there is less impact on particular species while others would eliminate impacts on all species.

Moving all or a portion of the diversions to an upstream of the Delta location improves the quality of diverted water. The farther up the river system the less chance of the diverted water being exposed to pollutants and to TOC's, Chlorides and Bromides. The greater the portion of the diversions moved farther upstream the better the quality of Delta exports. Because water is being diverted upstream of the Delta actions such as in-Delta storage, purchase of water from the San Joaquin River, and/or salinity barriers were added to insure the water quality in the south and central Delta is maintained. If the isolated facility only diverted a portion of that needed for Delta exports, actions such as purchased environmental water or south in-Delta storage were added to reduce the impacts of the remaining pumpage in the south Delta.

Storage Facilities

Upstream Surface Storage

Upstream storage is that storage that is located upstream of the Delta, such as in the Sacramento San Joaquin River systems. The storage could be on a river or tributary (on-line) or not on flowing tributary (off-line). A diversion and conveyance facility would be included for a off-line reservoir. New storage can also be made enlarging existing storage facilities or reoperating existing facilities to expand storage for particular purposes. Most alternatives use upstream

storage for a combination of environmental and water supply purposes. Environmental purposes such as pulse flows to transport fish through the Delta and/or provide sustained flows for Habitat. Some of the water supplies purposes include both supply and water quality.

Water released form the stored water upstream helps provide the critical riverine habit for fish production. Riverine and shallow water habitats are closely linked to the dry year releases from the reservoirs. Water quality in the upstream river systems and in the Delta are directly linked to storage releases, especially in dry years. The upstream storage can be large enough to offer substantial carry over storage. Thus they are closely linked to drought operations to for environmental, supply and quality purposes..

In-Delta Surface Storage

In-Delta storage consists of converting one or more Delta islands into storage reservoirs. The intakes or diversions into the reservoirs are screened to protect fish. The levees around the reservoirs are improved for protection while integrating and enhancing critical habit for fish production. The reservoirs are filled in wet periods and when critical fishers are not harmed by the diversions. The flows from the reservoirs are released into the directly into the Delta for environmental, water quality, and water supply purposes.

One of the major advantages of in-Delta storage is it proximity to the need. The can be released to transport through the Delta, help make up "X2" water, and improve water quality on the same day it is needed. In-Delta storage can be used to exchange with Delta exporters to curtail pumping at times when critical fish are present for water released form the reservoirs at noncritical times. In construction of the in-Delta reservoirs there is direct linkage to reduced vulnerability because of the reenforcement of the reservoir levees as will as the adjacent levees Extensive aquatic and terrestrial habita will be integrated in the reservoir levees.