State of California **California Natural Resources Agency**

Memorandum

Date: JUL 14 2015

To: Cindy Messer, Deputy Executive Officer
Delta Stewardship Council

From: William Croyle, Deputy Director
Department of Water Resources

Subject: Report on Background and Recent History of Water Transfers in California

Attached is a background document for the Delta Stewardship Council (DSC), "Background and Recent History of Water Transfers in California," dated July 2015. This report was jointly prepared by Department of Water Resources (DWR) and State Water Resources Control Board staff. We plan to send two additional documents on water transfers to the DSC in the near future (a Report on Water Transfers and the Delta Plan, and DSC Questions on Water Transfers). If you have questions related to the attached document, please contact Nancy Quan of DWR's State Water Project Analysis Office at (916) 653-0190 or Linda Ackley of DWR's Office of the Chief Counsel at (916) 653-7485.

Attachment

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Background and Recent History of Water Transfers in California

Prepared for the Delta Stewardship Council
by the Department of Water Resources and the State Water Resources Control Board

July, 2015

Introduction

The purpose of this paper is to provide a basic understanding of water transfers in California with an emphasis on transfers that move water through the Sacramento-San Joaquin Delta (Delta). This paper provides an overview of various types of water transfers, their recent history, and the regulatory setting that governs transfers.

In its 1976 report, the Governor's Commission on Water Rights recognized the importance of water transfers to the future of California's water supply and made recommendations regarding the need for specific changes to the Water Code to facilitate the transfer of water. Many of these changes were accomplished in the following years and are reflected in the discussions below.

Water transfers involve a change in the place of water use, from the water's historic point of diversion and use, to a new location either within or outside the watershed of origin. Water may be transferred from one user to another for a variety of purposes, including agricultural, municipal and industrial uses. It may also be transferred for environmental purposes such as in-stream flow augmentation and wildlife refuges. Water transfers and exchanges can be temporary (up to one year) or long-term (more than one year, but not permanent) or permanent.

Water transfers can be an effective water management tool providing much-needed flexibility in the allocation and use of water in California. Transfers in California are primarily executed to meet dry-year demands rather than to obtain a primary water supply for either agricultural or municipal development. Transfers are particularly useful for meeting critical needs during drought periods. Transfers, however, must be carried out in a responsible manner in order to assure that they do not result in adverse impacts to other water users or unreasonable effects to the environment.

A key component of a water transfer is a determination of the quantity of water available for transfer. This quantity is calculated by determining the amount of "new water" the surface water system will realize as a result of the actions taken by the individual or agency proposing the transfer. This has sometimes in the past been referred as a "real water determination". The baseline for purposes of the analysis is the amount that would have been available downstream of the historic point of diversion or return flow in the absence of the transfer. In other words, the amount of water available for transfer cannot exceed the amount of demonstrated reduction in consumptive use or augmentation of the streamflow by the transferor.

An active transfer market has existed in California for a number of years. The most common through-Delta transfers to date have been short-term (up to one year) transfers from agricultural users within the Sacramento Valley to agricultural and urban users south of the Delta to meet critical dry year

demands. The primary facilities used in exporting through-Delta transfer water are the State Water Project (SWP) Harvey O. Banks Pumping Plant (Banks) and the Central Valley Project (CVP) Jones Pumping Plant (Jones). This paper presents the key role the SWP and CVP (collectively Projects) play in facilitating through Delta water transfers, as well as the limitations resulting from regulatory restrictions governing Project operations.

Access to pumping plants in the Sacramento/San Joaquin Delta and canal capacities is essential to accomplishing water transfers from the northern portions of the State to the central and southern areas of California. (Transfers south of the Delta and transfers and exchanges among state and federal contractors also occur but are not discussed in this paper since they do not result in increased water exported from the Delta.) Water Code Section 1810 *et seq*. encourages water transfers by requiring any state, regional or local agency to allow bona fide transferors[1] the use of available conveyance capacity provided the prospective transferor can show that the transfer will not injure any legal user of water or unreasonably affect fish, wildlife, or other instream beneficial uses or unreasonably affect the overall economy or environment of the county from which the water is diverted.

Types of Water Transfers

Water transfers can be structured as temporary - either short-term or temporary transfers (one year or less) or long-term transfers (more than one year), or as permanent transfers. There are also transfers based on water exchanges, in which water is transferred in one year and returned, either in full (even exchange) or in part (uneven exchange), at a later time. Transfers involve a one-way movement of water, while exchanges involve a commitment to return a negotiated amount of water at a later date, and may include some monetary compensation as well.

The most common types of water transfers are based on reservoir storage releases, substitution of groundwater for surface water diversions, and crop idling. Other methods can be used to make water available for transfer; however, these three methods represent the bulk of water transfers within California to date. Crop shifting and water conservation measures can also be used to develop water for transfer. However, crop shifting and water conservation based transfers are not common.

A basic tenet underlying all water transfers is that they must be based upon the availability of "new water," that is, water that would not be in the watercourse absent the transfer. Each transfer is unique and must be evaluated individually to determine the quantity and timing of new water made available. Unless a transfer is based upon "new water", the water conveyed to the buyer will come at the expense of other water users or the environment. A more in depth discussion on the issue of developing responsible transfers is provided on California Department of Water Resources' (DWR's) website, "Responsible Water Transfers," at http://www.water.ca.gov/watertransfers/.

A key element in evaluating whether a transfer generates new water is establishing what would occur in the absence of the transfer or, the baseline conditions. Establishing the baseline conditions can be difficult and the method for doing so varies with the type of transfer proposed, but is critical in assuring responsible transfers. More detailed information on how DWR and the U.S. Bureau of Reclamation (USBR) evaluate water transfers and assess new water is provided in the Water Transfer White Paper

[1] Section 1811 of the Water Code defines "bona fide transferor" to mean "a person or public agency, as defined in Section 20009 of the Government Code, with a contract for sale of water that may be conditioned upon the acquisition of conveyance facility capacity to convey the water that is the subject of the contract."

formally known as the Draft Technical Information for Preparing Water Transfer Proposals, dated November 2014, prepared by DWR and USBR and available at http://www.water.ca.gov/watertransfers/.

Reservoir Reregulation

Reservoir reregulation involves an increased release of water from a reservoir compared to normal operations. The transfer water is conveyed downstream to a new point of diversion either within or outside the watershed. It is important that storage releases are coordinated with the agency conveying the water to assure that the additional flows can be rediverted at the new downstream diversion point.

The release of additional water from the reservoir for transfer creates a lower "end of season" storage in the reservoir than would have existed absent the transfer. Consequently, more water must be captured the following year to refill the reservoir. If the reservoir operator refills the additional vacated storage at a time when those flows would also have been available to other legal users downstream of the reservoir, the transfer would result in an injury to other downstream legal users in the year(s) following the transfer. To avoid injuring downstream users, sellers must refill the vacated reservoir storage at a time when downstream users would not have otherwise been able to capture the water, either in downstream reservoirs or direct diversion facilities. If refill causes an injury due to its timing, additional water must be released to compensate for the injury. This means that the storage capacity vacated due to the transfer can only be refilled at times when the Delta is in excess conditions or, if there is another reservoir downstream of the transfer reservoir, the storage space can only be refilled after the downstream reservoir fills or reaches its flood control elevations. Reservoir refill criteria are typically included in any reservoir reoperation water transfer agreement to ensure that no other legal users of water are injured by the transfer. These water transfer agreements need to be in place along with any needed changes to water rights before the water transfer begins.

Groundwater Substitution

In a groundwater substitution transfer, a water user with a right to divert surface water forgoes this right and pumps groundwater for the period of the transfer, thereby making the forgone surface diversions available to a user downstream. The quantity of surface water available is based on the quantity of groundwater actually pumped less any streamflow depletion losses.

Additional groundwater pumping will, to some extent, have an effect on the surface water supply, referred to as streamflow depletion. The impacts of the transfer on streamflow can continue to occur long after the transfer has been completed. If the additional streamflow depletion occurs at a time when excess flow is available, downstream users are not affected. However, if the depletion occurs at a time when other downstream users could divert that water, the transfer could have an impact on other legal users.

Accounting for the impact of the transfer on streamflow is essential to determining the amount of new water available for transfer and to avoid injury to downstream water users. The amount and timing of the impacts, however, cannot be directly measured but can be estimated through the use of mathematical models. Although the work required to accurately assess the appropriate streamflow depletion factor for a particular transfer can be time-consuming and costly, the assessment of an appropriate streamflow depletion factor is necessary to protect other legal users of water.

An increase in groundwater pumping has the potential to affect not only the streamflow, but other groundwater users and water quality as well. DWR and USBR require that the transferor implement a monitoring program to assess potential groundwater level and water quality impacts. For transfers conveyed through either the SWP or the CVP, the Seller is required to develop and implement a monitoring and mitigation plan to address any concerns raised by the monitoring data or other potentially affected parties.

Crop Idling

Water can also be made available for transfer through crop idling. In crop idling-based transfers, growers idle fields that would have been planted during the transfer season absent the transfer. The amount of water made available for transfer is based on the reduction in consumptive use, which is calculated as the evapotranspiration of applied water (ETAW). ETAW is the portion of applied water that is evaporated from the soil and plant surfaces and actually used by the crop. ETAW does not include the portion of the applied water that is lost as deep percolation to groundwater or conveyance losses without project specific documentation supporting an alternate method. Unless the acreage overlies an unusable groundwater basin or discharges to a saline sink, these depletions contribute to the overall water supply and are excluded from the calculation of transferable water.

Actual crop water requirements vary by crop, region and growing season. It is not feasible to determine the actual ETAW for the specific conditions of each individual transfer, therefore, average ETAW values are used to estimate transfer water. Historic cropping patterns are used to establish baseline crop acreage. Baseline acreage is important to establish what would have been planted in the absence of the transfer.

Idling agricultural acreage can result in impacts to parties not directly involved in the transfer, such as agricultural workers and seed or equipment suppliers. In order to minimize such potential economic effects in the county resulting from crop idling transfers, crop idling is typically limited to no more than twenty percent of the irrigated acreage within the agency transferring water or within the county from which the water is transferred.

Water made available by crop idling is made available on the actual ETAW pattern during the year. Unless storage is available, export capacity must coincide with the pattern of availability to allow export of the transfer water. The existing window for transfer capacity at the SWP and CVP export facilities in the Delta is currently limited to July through September (discussed below in Regulatory Framework). Depending on the crop, transfer water from crop idling is typically made available May through September. Unless storage capacity upstream of the export location is available, any water made available from crop idling outside the transfer window cannot be exported by either the SWP or CVP Delta pumps. Crop idling water made available from May through June ETAW can represent a significant portion of the transfer water, and the loss of this portion can make crop idling transfers that lack access to storage infeasible. A change in the seasonal restriction on export of transfer water could affect the feasibility of crop idling transfers in areas within the Delta watershed.

Crop Shifting

Water Transfers based on crop shifting involve a change in crops planted by a grower, substituting a lower water using-crop (one with a lower ETAW) for a more water intensive crop. A cropping history is required to establish baseline cropping patterns. The water available for transfer as a result of crop shifting is the difference between the ETAW of the historic crop type and the alternate lower water

intensive crop. Crop shifting transfers are only practical in regions where the agricultural land is suited to multiple crop types, allowing a shift to an alternate crop. The restrictions on export of transfer water noted above under crop idling apply to crop shifting as well.

Water Conservation

Implementation of water conservation measures can result in numerous benefits for an agricultural or municipal user, such as reduction in the discharge of poor quality agricultural drainage, or improved availability of limited supplies within the user's service area. However, only those conservation measures that result in a reduction in the consumptive use of water or prevent water from discharging to an unusable water supply make water available for transfer. Conservation measures such as lining or replacing an unlined ditch may generate water for transfer to the extent that riparian vegetation is reduced or surface or groundwater discharges to an unusable basin are eliminated. Documentation of the conditions, including water diversion and use, before and after the conservation measures were implemented is necessary to demonstrate the amount of transferrable water. Transfers based on implementation of water conservation measures have been limited, because most conservation programs do not meet the above tests.

Regulatory Framework

As discussed above, water transfers can involve both surface and groundwater rights. A basic understanding of both types of water rights is important to understand the legal and regulatory constraints that affect water transfers and their implementation.

One of the primary tests that each prospective transferor must meet is to show that there will be no injury to any other legal user of water from the transfer. This "no injury rule" applies to any proposed change in the historic exercise of a water right regardless of the priority date of the right. The no injury rule is codified in various sections of the Water Code, including Sections 1702, 1706 1810 and others.

The no injury rule protects senior water users (those with the oldest water rights) from junior diverters, while protecting junior water right holders from the expansion of senior water rights. Junior water right holders would be harmed if seniors could increase the amount of water they divert under their senior priority by expanding their service area or transferring water that was historically available to other downstream water users. Likewise, juniors could be hurt if seniors could change their point of diversion, place of use or purpose of use in a manner that reduces the quantity or quality of water relied upon by juniors for their diversion. A more comprehensive discussion of the no injury rule and assuring responsible transfers is provided in "Responsible Water Transfers" posted on DWR's Water Transfers website at http://www.water.ca.gov/watertransfers/.

Surface Water

California recognizes a dual system of water rights comprised of both riparian and appropriative rights. Riparian rights attach to the land abutting a watercourse and are limited to the direct diversion of available natural flow. Riparian rights are generally not transferrable, with the exception of petitions to transfer water for instream flow filed with the State Water Resources Control Board (State Water Board) under Water Code Section 1707. Appropriative rights allow a water user to divert and use water in areas not abutting the stream, including areas outside the watershed. Appropriative rights can also be

obtained to store water. The priority of appropriative rights is based on the date when the user first initiated efforts to put the water to beneficial use. This principle is sometimes referred to as "first in time, first in right". More specific information on water rights, water transfers and the SWRCB process is available on the State Water Board Division of Water Rights website at http://www.waterboards.ca.gov/waterrights/water_issues/programs/water_transfers/.

If the transfer involves a dedication of water for instream purposes, the water right holder should seek a water right change under Section 1707 of the Water Code. This section allows water users, including pre-1914 water right holders, to make changes to their water rights for "preserving or enhancing wetlands habitat, fish and wildlife resources or recreation in or on the water." The benefit in seeking such a change is the protection of this water from forfeiture and the protection of the additional flow from the historic point of diversion to the most downstream point of the transfer for instream enhancement purposes.

The State Water Board may approve an instream flow dedication petition, provided that the State Water Board can make the Water Code Section 1707 findings that the change "will not increase the amount the party is entitled to use, will not unreasonably affect any legal user of water, and otherwise meets the requirements" of the Water Code.

Pre-1914 Appropriative Rights

Prior to 1914, there was no permitting authority responsible for issuing water rights. In some cases, water users could establish a water right by simply putting water to beneficial use according to local mining custom. Between 1872 and 1914, the Civil Code required posting of notice with the county recorder of the location of diversion, quantity, method of diversion, and purpose of use in order to establish an appropriative right. Thus, in some cases a notice was posted at the proposed point of diversion or with the county. Water rights initiated before 1914 are referred to as pre-1914 appropriative rights. The priority date for pre-1914 water rights is based on the date the notice was posted or based on evidence proving the date water was first put to beneficial use and documentation that compliance with the Civil Code was not required. The extent of the pre-1914 appropriative right is limited to the quantities historically put to beneficial use prior to 1914. Pre-1914 appropriators are also prevented from wasting or unreasonably using water consistent with Article 10, Section 2, of the California Constitution.

Pre-1914 water rights holders can change the purpose of use, place of use or point of diversion without notifying the State Water Board, however, the "no injury rule" applies to pre-1914 water rights (Water Code Section 1706). The change cannot result in an increase in the amount of water used under the water right, including changes in timing of the diversions if the changes will result in a reduction in the amount of water that other legal users have come to rely upon.

Pre-1914 water rights holders must comply with the California Environmental Quality Act (CEQA) prior to implementing a water transfer. The lead agency, typically the selling agency, normally prepares an Initial Study, and then either a Negative Declaration or an Environmental Impact Report (EIR) disclosing the potential environmental effects of the water transfer. If the transfer involves any federal action, including use of federal facilities or federal approval of the transfer, compliance with the National Environmental Policy Act (NEPA) is required as well.

Appropriative water rights can be lost through non-use. Specific changes to the Water Code were enacted to protect water rights from forfeiture as a result of transferring water either short-term or long

term. Water Code Sections 1010, 1011, 1011.5, 1244, 1440, 1731, and 1737, 1745.07 were specifically added to provide protection to water right holders who transfer water.

Post-1914 Appropriative Rights

The Water Commission Act of 1913, which went into effect on December 19, 1914, established an administrative process for the permitting of water rights. Those wanting to obtain a water right after 1914 are required to file an application and obtain a permit from the State Water Board prior to diverting water. The permit establishes a quantity of water that may be directly diverted or stored, as well as the authorized place, purpose and season of use. The priority of the water right is based on the date the application was filed. A post-1914 water rights holder proposing to transfer water must file a petition for change with the State Water Board, and receive approval prior to implementing the transfer. As with pre-1914 water rights, these changes are not allowed if they would injure "any legal user of water" (see Water Code Section 1702).

Appropriative water rights can be lost through non-use. Specific changes to the Water Code were enacted to protect water rights from forfeiture as a result of transferring water either short-term or long term. Water Code Sections 1010, 1011, 1011.5, 1244, 1440, 1731, and 1737, 1745.07 were specifically added to provide protection to water rights holders who transfer water.

Temporary Transfers – Water Code Section 1725 *et seq*.

Water Code Sections 1725-1729 provide an expedited process for post-1914 transfers of up to one year in duration. These code sections allow a water rights holder to temporally change the place of use, points of diversion or purposes of use of the established water right in order to allow water delivery outside the original water right. These code sections and all code sections related to changes in water rights do not allow the expansion of the water right in terms of quantity or season of diversion. Water Code Section 1729 exempts short-term/temporary transfers from the requirements of CEQA. The seller must demonstrate that the transfer water would have been consumptively used or stored in the absence of the transfer. The State Water Board must find that the transfer would not injure any legal user of water or unreasonably impact fish, wildlife or other instream beneficial uses, in order to approve the transfer. The water user must file a petition for change with the State Water Board. The Board then issues a notice of the petition and there is a 30-day public review period[2] during which time potentially affected parties can file a comment of the proposed change. Also, the petitioner must provide a copy of the petition to the Department of Fish and Wildlife, the board of supervisors of the county or counties in which the petitioner currently stores or uses the water subject to the petition, and the board of supervisors of the county or counties to which the water is proposed to be transferred. Following a review of the petition and the review of any comments, the State Water Board may issue an order approving the change, provided the Board can make the required findings. No transfer water can move until an order approving the transfer is issued.

All water transfers are limited to the amount of water available under the water right. In 2014 and again in 2015, the State Water Board issued curtailment notices to many water users based on the lack of water supply available to them under the specific conditions of that year. Diversions of water under those water rights, including any water transfers, were advised to stop at that time. This did affect many water transfers in 2015. Any water previously stored prior to the curtailment notice was still allowed to be transferred.

[2] In the Governor's Drought Proclamation issued April 25, 2014, the 30-day comment period was reduced to 15 days.

Long-Term Transfers – Water Code Section 1735 *et seq*.

There is no expedited State Water Board process for long-term transfers. Analysis of a long-term transfer proposal is required to determine if approval of the transfer will result in impacts to other legal users or the environment over the entire term of the transfer. Transfer proponents must comply with CEQA and, if federal action or facilities are involved, compliance with NEPA is also required. A more rigorous analysis than what might be required for a temporary change may be necessary to assess potential accumulation of impacts associated with the transfer over the life of the transfer.

Long-term transfers also must comply with the State Water Board's standard noticing and protest processes. If valid protests to the proposed change cannot be resolved through negotiation between the parties, then a hearing must be held prior to the approval or denial of the requested transfer. The findings, that the change "would not result in substantial injury to any legal user of water and would not unreasonably affect fish, wildlife, or other instream beneficial uses," are necessary before the State Water Board can approve a long-term transfer.

Groundwater

There is no administrative process for permitting extraction of groundwater in California except in the few basins that have been adjudicated. The majority of the adjudicated groundwater basins are located in southern California. Groundwater use in California is analogous to riparian rights. Overlying users have the ability to install a well and use the naturally occurring groundwater for beneficial use on their overlying land. The overlying users share equally in the resource. Users overlying a basin may import water to a basin and retain a right to the imported water, less any losses and, other users within the basin cannot claim a right to imported water.

Groundwater pumping in excess of natural recharge is a significant problem in a number of areas in the state. If the condition persists over a long period of time, areas of overdraft can develop and may affect groundwater pumpers within the basin. Managing groundwater extraction in an overdrafted basin can present significant challenges, and solutions to the issue of overdraft are as varied as the regions within the state.

Extractions of groundwater for transfer must comply with any applicable groundwater management plans, other local plans, and any groundwater ordinances. Compliance with local requirements (including ordinances relating to well drilling, well spacing, and groundwater extraction) and local groundwater management plans, as well as compliance with Water Code Section 1745.10 *et seq*., is required depending on the source of any groundwater substitution transfers. Compliance is usually the responsibility of the entity proposing the groundwater substitution transfer, and would be confirmed by the Project that would be asked to export the water from the Delta.

The approval process associated with a proposed groundwater transfer varies by county. Table 1 provides brief descriptions of the water transfer requirements for those counties in the region north of the Delta that currently have such requirements, in geographic order from north to south.

Table 1. Description of County Ordinances Related to Groundwater Transfers

County	Description	Sources for more information
Shasta	Ordinance pertaining to the Redding Groundwater Basin portion of Shasta County requires a permit for extraction and export of groundwater, either directly or indirectly, for use outside the county. Application for a transfer permit should be submitted to the chief engineer of the Shasta County Water Agency.	Shasta County Water Agency (530) 225-5181 http://www.co.shasta.ca.us/index/pw_index/engineering/water_agency/ab303 plan.aspx
Tehama	Ordinance requires a permit to extract groundwater for off-parcel use, prohibits mining of groundwater, and restricts the radius of influence associated with the operation of a well participating in transfer operations to the parcel on which the well is located, among other requirements.	Tehama County Health Agency, Environmental Health Division (530) 527-8020 http://www.tehamacountypublicworks.ca.gov/Flood/
Butte	Ordinance requires permits for groundwater extraction for use outside the county, and requires a permit for groundwater substitution pumping. Butte County also has a well spacing ordinance. The Butte County Water Commission advises the Board of Supervisors with technical information from the Butte County Water Advisory Committee and Technical Advisory Committee.	Butte County Department of Water and Resource Conservation (530) 538-4343 http://www.buttecounty.net/Water and Resource Conservation.aspx
Glenn	Ordinance uses basin management objectives of groundwater levels, groundwater quality, and land subsidence to help define safe yield and overdraft of the basin. The ordinance is enforced by the Glenn County Board of Supervisors.	Glenn County Department of Agriculture (530) 934-6501 http://www.glenncountywater.org/about_us.aspx
Colusa	Ordinance requires a permit for extraction and export of groundwater, either directly or indirectly, for use outside the county. Application for a transfer permit is filed with the Colusa County Groundwater Commission, through the Department of Agriculture.	Colusa County Department of Agriculture (530) 458-0580 http://www.codepublishing.com/CA/colusacounty/ http://colusagroundwater.ucdavis.edu/index.htm
Sutter	Sutter County has no ordinance governing the extraction and export of groundwater. According to its general plan, Sutter County has a long-term interest in discouraging water transfer/export sales if they result in long-term supply losses.	Chief of Water Resources (530) 822-7450 http://www.co.sutter.ca.us/doc/government/depts/cs/ps/gp/gp_home
Yolo	Ordinance (Title 10, Chapter 7,Groundwater) requires a permit for extraction and export of groundwater, including the extraction of groundwater to replace a surface water supply. Application for a permit should be filed with the Director of Community Development.	Director of Planning and Public Works (530) 666-8775 http://www.yolocounty.org/home/showdocument?id=1899
Sacramento	Ordinance (Title 3 section 3.40.090, Ground and Surface Water Export) requires a permit for groundwater or surface water to be transported in any manner outside the county. Application for a permit must be filed with the director of the Sacramento County Department of Water Resources.	Sacramento County Department of Water Resources (916) 874-6851 http://www.countycounsel.saccounty.net/Documents/sac_017441.pdf
Yuba	At this time, Yuba County has no ordinance governing the extraction and export of groundwater. However, groundwater substitution transfers must be coordinated with Yuba County Water Agency (YCWA).	Yuba County Water Agency (530) 741-5000 http://www.ycwa.com/
Solano	At this time, Solano County has no ordinance governing the extraction and export of groundwater.	Solano County Water Agency (707) 451-6090 http://scwa2.com/

More information on local groundwater management and evaluation of groundwater substitution transfers is provided in the Draft Technical Information for Preparing Water Transfer Proposals, dated November 2014, prepared by DWR and Reclamation and available at http://www.water.ca.gov/watertransfers/.

Precipitation and streamflow are the source of recharge for groundwater basins. A change in the amount of groundwater pumping affects both the groundwater and surface water resources. The timing and magnitude of the impacts to the surface water supply varies from place to place depending on a number of factors, including geology, hydrology, regional groundwater use, and depth and construction of the wells among others. Groundwater pumping will result in some level of streamflow depletion, the effect of which may extend well beyond the area from which transfer is made, depending on the specifics of the transfer. It is important that the impacts to streamflow from increased groundwater pumping are accounted for in the transfer to prevent injury to other legal users of water. Streamflow depletion cannot be directly measured and must be estimated using a technical analysis including groundwater modeling considering the specific conditions of the transfer and hydrogeology.

Transfers of groundwater may involve groundwater substitution (in lieu pumping described below), transfer of groundwater from a banking program or direct transfer of groundwater. Each type of groundwater based transfer presents a unique set of issues and concerns.

In 2014, the California Legislature passed, and the Governor signed, historic groundwater legislation titled, the Sustainable Groundwater Management Act (SGMA). This new legislation requires local agencies to adopt groundwater management plans that are tailored to the resources and needs of their communities. Good groundwater management will provide a buffer against drought and climate change, and contribute to reliable water supplies regardless of weather patterns. California depends on groundwater for a major portion of its annual water supply, and sustainable groundwater management is essential to a reliable and resilient water system. As these programs are developed, they should provide better oversight of all groundwater activities, including groundwater substitution transfers, as well as enhanced monitoring of the status of the groundwater basins from a water management perspective. The California Groundwater website offers links and news from state, local and non-governmental agencies. This website is located at: http://groundwater.ca.gov

Groundwater Substitution

The most common type of groundwater based transfer is groundwater substitution. Groundwater substitution transfers are an option for water users that have access to both surface water and groundwater supplies. In a groundwater substitution transfer, a water user that typically uses surface water switches to groundwater pumping for all or a portion of its demand and allows the surface supply to be delivered to the buyer's service area. The groundwater is used within the existing place of use, and therefore there is no export of groundwater from the basin. Transfer of the surface water must comply with the applicable water rights requirements depending on whether it is diverted under claim of a pre or post-1914 water right.

The amount of water available for transfer is determined by metering the quantity of water pumped and applying a streamflow depletion factor based on an analysis of the specific wells and geology of the groundwater basin.

As noted above, more information on local groundwater management and evaluation of groundwater substitution transfers is provided in the Water Transfer White Paper titled the Draft Technical Information for Preparing Water Transfer Proposals prepared by DWR and Reclamation and available at http://www.water.ca.gov/watertransfers/.

Groundwater Banking Transfer

Groundwater banking involves the conjunctive use of surface and groundwater resources in which surface water supplies in excess of current demands are delivered to groundwater recharge facilities. Groundwater may be recovered directly through groundwater recovery pumping or through in lieu recovery. In lieu recovery can be accomplished where the agency operating the groundwater banking program also has access to surface water supplies which can be delivered in exchange for the previously stored groundwater. In an in lieu exchange, the ownership of the previously stored groundwater changes from the bank depositor to the groundwater banking authority. The amount of water available for recovery may be reduced by the amount of natural losses and in some cases an additional assessment is imposed on the banking operation.

From a water rights perspective, the surface water stored in a groundwater banking program is treated like water stored in a surface reservoir. It retains the water rights limitations specified under the water right, including its place of use. When water is extracted from groundwater storage, it must be used within the authorized place of use specified in the surface water permits. Just as directly diverted or stored surface water may be transferred, surface water stored in a groundwater banking facility may be transferred. Transfers to an area outside the authorized place of use of the water right must comply with the requirements discussed above, depending on whether the stored water was diverted under claim of pre or post-1914 water rights.

Direct Export of Groundwater

As noted earlier, for the most part, appropriation of groundwater is not regulated by the State. Some groundwater basins have been adjudicated and any transfer or change in groundwater use from an adjudicated basin must be in conformance with the adjudication or be approved by the court.

Water users proposing to export groundwater from Delta-Central Sierra Basins must comply with the provisions of Water Code Section 1220 if the groundwater pumping was initiated after January 1, 1985 (see Water Code Section 1215). Water Code Section 1220 prohibits the export of groundwater from the Delta-watershed unless: (1) the pumping is in compliance with an adopted groundwater management plan, and (2) the plan is approved by a vote in the county or portions of counties that overlie the groundwater basin.

Concern over the potential effects of the export of direct groundwater pumping and the requirements enacted for local approval of groundwater extraction transfers have effectively limited the implementation of direct groundwater transfers, particularly from the Delta watershed.

Conveyance through Project Facilities

Water Code Section 1810 *et seq.* Requirements

Export of transfer water from the Delta is primarily accomplished using SWP or CVP facilities. The majority of the available export capacity for transfers is at Banks. DWR and USBR provide capacity for transfers when the export can be done without impacting Project operations, including all regulatory requirements and, in the case of SWP facilities, after making the specific written findings required under Water Code Section 1810(d).

Water Code Section 1810 *et seq*. provides that a public entity may not deny a bona fide transferor of water access to available conveyance capacity if the conveyance of transfer water will not adversely affect the beneficial uses or quality of water in the facility and the conveyance can be provided without injuring any other legal user of water, without unreasonably affecting fish, wildlife, or other instream beneficial uses and without unreasonably affecting the overall economy or the environment of the county from which the water is being transferred. The agency's approval must be supported by written findings.

Complying with Water Code Section 1810 *et seq.* requires that DWR evaluate each individual request for conveyance. That review includes an analysis of the specific transfer proposal and a new water determination. The new water determination is required to support a finding that the transfer will not injure any other legal user of water including the Projects. The methods used by DWR and Reclamation to calculate the new water made available for transfer are detailed in the Water Transfer White Paper titled the "Draft Technical Information for Preparing Water Transfer Proposals" prepared by DWR and Reclamation and available at http://www.water.ca.gov/watertransfers/.

Information sufficient for DWR to make the findings required under Water Code Section 1810 *et seq.* must be provided with the request to DWR for conveyance. The methods detailed in the Water Transfer White Paper noted above are designed to accurately characterize the transfer by identifying the amount of new water developed by the transfer proposal. Compliance with those methods assists DWR in making the required findings. In the case of a transfer of pre-1914 water, the environmental document prepared by the lead agency can be used to support the required environmental findings if the document is sufficiently detailed to address potential areas of concern. In the case of post-1914 based transfers, the information contained in the State Water Board order approving the transfer can be used to support some of the required findings. The conveyance request must include an analysis of the potential economic impacts to the area from which the water is being transferred, to support a finding by DWR under Section 1810 that the transfer will not unreasonably affect the overall economy of the county from which the water is transferred.

Operational Considerations

In determining the availability of excess capacity within the SWP or CVP, Project operators analyze annual hydrology, project operations, contractor requests, and regulatory and operational restrictions among other things to determine whether transfers can be conveyed without affecting water supply or water quality of the Projects.

Project operations are governed by the requirements contained in Water Right Decision 1641 (D-1641). A copy of D-1641 may be viewed at http://waterboards.ca.gov/waterrights/board_decisions/adopted_orders/decisions/d1600_d1641.shtml. D-1641 contains flow and water quality objectives. D-1641 also contains specific provisions relating to the use of Project facilities for conveyance of transfer water including water level and water quality response plans.

Other regulatory requirements (in addition to those described above) affect Project operations and the ability of DWR and USBR to convey transfer water. On December 15, 2008, the U.S. Fish and Wildlife Service (FWS) issued a biological opinion (BiOp) for the protection of delta smelt on the Long-Term Operational Criteria and Plan (OCAP) for coordination of the CVP and SWP (http://www.fws.gov/sfbaydelta/cvp-swp/cvp-swp.cfm). The OCAP project description includes conveyance of water transfers of up to 360,000 AF in most years (the wettest 80 percent of years) and up to 600,000 AF in Critical and some Dry years (approximately the driest 20 percent years). Under the FWS BO, transfer water may be conveyed through project facilities only in the months of July through September without further consultation with the agency.

On June 4, 2009, the National Marine Fisheries Service (NMFS) released its final BO on the long-term operations of the CVP and SWP for the protection of anadromous fisheries, green sturgeon and marine mammal species (http://swr.nmfs.noaa.gov/ocap.htm). The NMFS BO deals with transfers in the same manner as the USFWS BO on delta smelt, namely, allowing transfers during the July through September summer transfer window and requiring additional consultation should transfers be proposed for export during other times of the year. The maximum daily pumping rate at Banks is controlled by a combination of D-1641, the adaptive management process outlined in the BOs, and permits issued by the U.S. Army Corps of Engineers (COE) that regulate the rate of diversion of water into Clifton Court Forebay (CCF) for pumping at Banks. Another operational consideration important for transfers moving through the Delta is carriage water. Carriage water is the additional flow necessary to move transfer water across the Delta for export so as not to exceed the objectives contained in D-1641. DWR and USBR estimate carriage water based on annual hydrology, Project operations and regulatory restrictions among other operational considerations. Carriage water losses are applied to the quantity of transfer water made available above the Delta. This reduces the quantity of water that is actually exported from the Delta. The amount of carriage water required to export transfer water can vary significantly from year to year. In the past, the carriage water requirement has ranged from 20 to 35 percent, depending on that year's specific conditions. In addition to carriage water losses, transfers through Project facilities may also be assessed aqueduct conveyances losses.

Historic Transfer Programs

This section provides a brief overview of water transfer programs in California.

DWR Water Purchase Programs

The first large scale water transfer program in California was the 1991 Emergency Drought Water Bank (1991 DWB). The 1991 DWB was established in response to projected critical water supply shortages following four years of drought conditions. The 1991 DWB team purchased water from willing sellers in the Delta, Sacramento Valley and Feather River basin areas. Water was made available through crop

idling, groundwater substitution and reservoir storage release. The 1991 DWB team executed over 300 contracts with water agencies and individuals to purchase water for critical statewide needs. Water from the 1991 DWB was allocated to 12 municipal and agricultural water users. Drought water banks were implemented again in 1992 and 1994, acquiring water primarily from groundwater substitution.

DWR implemented Dry Year Purchase Programs in 2001 and 2002 in response to dry conditions and reduced SWP and CVP allocations. In 2001, DWR purchased water from willing sellers in Northern California from a combination of crop idling, groundwater substitution and reservoir storage release, for delivery to eight water agencies throughout the State to help offset water shortages. In 2002, DWR acquired water made available through groundwater substitution from Yuba County Water Agency (YCWA) and provided it to four SWP contractors.

DWR implemented a drought water bank in 2009 after a series of three dry years, acquiring about 76,600 acre-feet of transfer water from a combination of crop idling, groundwater substitution and reservoir storage release. An additional 200,000 acre-feet of cross-Delta transfers were executed independently by water agencies and exported through Project facilities. Since 2009, DWR has facilitated water transfers by conveying transfer water through SWP facilities, however, it has not acted as a purchaser or broker.

Federal Water Acquisition Programs

The Central Valley Project Improvement Act of 1992 (CVPIA) amended previous authorizations of the CVP to include fish and wildlife protection, restoration, and enhancement as project purposes having equal priority with agriculture, municipal and industrial, and power purposes. A major feature of CVPIA is that it requires acquisition of water for protecting, restoring, and enhancing fish and wildlife populations. To meet water acquisition needs under CVPIA, the U.S. Department of the Interior (Interior) has developed a Water Acquisition Program (WAP), a joint effort by USBR and the FWS. The major purposes of the WAP are acquisition of water to meet optimal refuge demands and support instream flows. Additional information on USBR's water transfer programs is contained in the CVP Water Transfer Program Fact Sheet which is available at http://www.usbr.gov/mp/PA/water/ and the CVPIA Water Acquisition Program Background Information Sheet, November 2003 USDOI which is available at http://www.usbr.gov/mp/cvpia/3406b3_wap/info/index.html.

Environmental Water Account

The Environmental Water Account (EWA) was established in 2000 to provide protection to at-risk native fish species of the Bay-Delta estuary by supporting environmentally beneficial changes in SWP and CVP operations. EWA funds were used to acquire alternative sources of water, called the "EWA assets," which the EWA agencies used to replace the Project water that was not exported from the Delta because of the voluntary fish actions. The EWA program ended in December 2007.

Yuba River Accord Transfers

In 1989, the State Water Board received a complaint regarding fishery protection and water right issues on the lower Yuba River. The State Water Board held hearings on the issues raised in the complaint, and in 1999, issued a draft decision. At the request of YCWA and the California Department of Fish and Game (DFG, now the Department of Fish and Wildlife), subsequent hearings were postponed in order to provide the parties an opportunity to reach a proposed settlement regarding instream flows and further

studies. The parties failed to reach agreement on a settlement and the State Water Board held additional hearings in the spring of 2000. A draft decision was issued in the fall of 2000, and a final decision was issued as Decision 1644 on March 1, 2001.

Subsequent litigation led to withdrawal of Decision 1644 and issuance of Revised Decision 1644 (RD-1644) in July, 2003. These decisions established revised instream flow requirements for the lower Yuba River and required actions to provide suitable water temperatures and habitat for Chinook salmon and steelhead and to reduce fish losses at water diversion facilities.

After the issuance of Revised Decision 1644 (RD-1644), the parties involved in the State Water Board proceedings expressed a desire to further negotiate the instream flow, flow fluctuation, and water temperature issues on the lower Yuba River. The parties engaged in a collaborative, interest-based negotiation with numerous stakeholders, reaching a series of agreements now known as the Lower Yuba River Accord (Accord). These negotiations resulted in the agreements outlined below and the State Water Board approval of the flow schedules and water transfer aspects of the Accord on March 18, 2008 with Water Right Order 2008-0014. Several technical revisions to the Order were adopted as part of Water Right Order 2008-0025 on May 20, 2008.

Surface water releases are made available for transfer under the Accord, based on the difference between a baseline release rate (the interim flow schedules defined in RD-1644 and in Water Right Order 2008-0014) and the Fisheries Agreement flow schedules. The baseline releases (interim flow schedule in RD-1644) are based on the Yuba River Index as defined in RD-1644. The flow schedules in the Fisheries Agreement are determined based on the North Yuba River Index independent from the Yuba River Index. There are also some conditions when the YCWA-DFG agreement or the current Federal Energy Regulatory Commission (FERC) license control the baseline flows. As a result, there can be a wide range of possible transfer amounts under the various hydrologic conditions that can occur in the Yuba River watershed in any year.

Groundwater substitution water is made available by individual landowners within seven of the eight YCWA member units that are signatory to the Accord (Cordua Irrigation District has not signed the Accord as of this writing). YCWA reduces its surface diversions to those member units from the Yuba River and regulates storage in Bullards Bar Reservoir to accrue and release the groundwater substitution water on a schedule to allow the releases to be exported in the Delta.

Detailed information on the Accord can be obtained from YCWA's website including the Final Environmental Impact Report/Environmental Impact Statement http://www.hdrprojects.com/engineering/ProposedLowerYubaRiverAccord/ and "The Lower Yuba River Accord, From Controversy to Consensus" published by the Water Education Foundation at http://www.ycwa.com/documents/622.

Recent History of Water Transfers

Introduction

The purpose of the section is to provide an assessment of past cross-Delta water transfers. For purposes of this section, cross-Delta transfers are considered to be transfer water that originates upstream of the Delta and flows into the Delta or flows through the Delta to the SWP and CVP export pumps in the Delta.

Hydrologic Effects on Water Transfers

Water deliveries by the SWP and CVP vary with hydrology, upstream consumptive use of water, environmental and regulatory constraints, existing storage and conveyance capacities, and a variety of additional factors.

Historical information reveals certain patterns of water transfers as related to hydrology and project deliveries. Water transfer demand and completed transfers have increased over time and consumptive use of water in California has increased. The transfer demand increases are especially related to drier year types and lower SWP and CVP allocations.

Typically there are few purchases of water from the upstream-of-Delta region in the wetter year types to supplement project supplies, although there may be such purchases for environmental purposes and/or for storage in a groundwater banks or offstream surface storage. For any such transfers, there is a material risk that the water cannot be exported, either because: the Delta could be in excess conditions through the summer, precluding the accounting of any transfers, the CVP and SWP are using all available pumping capacity to move project supplies, or the wetter year types have suppressed local demand, increased local supplies, and project allocations are adequate.

Some water agencies in the export service area have suffered from chronic water supply decreases, especially the San Luis and Delta-Mendota Water Authority (Authority), representing numerous CVP contractors in the export service area. The Authority has contracted for a number of transfers to augment their annual supply, and has focused on areas south of the Delta to avoid reliance on the Delta export pumps to move transfer water except in the driest year types.

In the drier years, the Authority actively seeks cross-Delta transfers in addition to its participation in the Yuba Accord dry year water purchase program. In 2001, it participated in a forbearance program whereby CVP contractors upstream of the Delta did not take certain CVP supplies, allowing them to flow to the Delta and augment CVP exports to the Authority and others.

The SWP contractors have been active participants in water transfers as well in the drier years. DWR has in the past conducted a number of drought water banks and dry year programs to help California water agencies through droughts and dry year sequences.

Recent History of Cross Delta Transfers

Transfer capacity at the Delta export pumps operated by DWR and USBR has historically been a major factor in the ability to move such transfers, and may be a continuing constraint in the future. The potential cross-Delta transfer volume may be limited by the capacity of the export facilities, by regulatory constraints, and by the availability of water for transfer from willing sellers upstream of the Delta. However, those constraints tend to be less in the low allocation years when there is less SWP and CVP water to export.

Currently, the CVP and SWP only account for transfer water released during balanced conditions when the projects are releasing stored water to maintain Delta standards. During excess conditions, there is more Delta inflow than needed to meet Delta standards and support targeted Delta export pumping. Under excess conditions, any new transfer water released to the Delta would merely increase Delta outflow, and would not be considered transfer water because it could not be delivered to any buyers downstream of the export pumps. Transfer water released during balanced conditions can allow the projects to either reduce the amount of water released from storage and thereby benefit from the

increase in water released as transfer water, or increase exports, and account for that water as passing to the downstream buyers when it is exported.

Records of past cross-Delta transfers from 1995-2015 were reviewed to identify the years in which there were spikes in such transfers to estimate the project allocation percentages that tend to stimulate demand for cross-Delta transfers. Table 1 illustrates the hydrologic year types, SWP and CVP allocations, and estimated cross-Delta water transfers.

Table 2 indicates that cross-Delta transfer interest generally accompanies the dry year periods and low allocations. Comparing the years when cross-Delta transfer activity picks up with allocations, and considering Delta export constraints on transfers, SWP demand for cross-Delta transfers increases noticeably at allocations below 50 percent, and CVP demand for cross-Delta transfers increases below 40 percent.

Table -2. Cross-Delta Transfer History, 1995–2015*

Year	Sacramento River Year Type	San Joaquin River Year Type	SWP Percent Allocation	CVP San Joaquin Ag Percent Allocation	Active Cross- Delta Transfer Program	Cross-Delta Transfers Without EWA, AF	EWA Cross-Delta Transfers, AF	All Cross-Delta Transfers With EWA, AF
1995	W	W	100	100	No	0		0
1996	W	W	100	95	No	0		0
1997	W	W	100	90	No	0		0
1998	W	W	100	100	No	0		0
1999	W	AN	100	70	No	0		0
2000	AN	AN	90	65	No	0		0
2001	D	D	39	49	Yes	298,806	105,000	403,806
2002	D	D	70	70	Yes	22,000	142,143	164,143
2003	AN	BN	90	75	EWA Only	0	69,914	69,914
2004	BN	D	65	70	EWA Only	0	118,700	118,700
2005	AN	W	90	85	No	0	6,044	6,044
2006	W	W	100	100	No	0	0	0
2007	D	C	60	50	EWA Only	0	125,000	125,000
2008	C	C	35	40	Yes	169,186		169,186
2009	D	BN	40	10	Yes	274,551		274,551
2010	BN	AN	50	45	Yes	264,165		264,165
2011	W	W	80	80	No	0		0
2012	BN	D	65	40	Yes	84,781		84,781
2013	D	C	35	20	Yes	351,515**		351,515**
2014	C	C	5	0	Yes	414,629**		414,629**
2015	C	C	20	0	Yes	262,466**		262,466**

* Data for years 1995 – 2012 reflect water purchase quantities and so not include any losses. Water transfers in this table do not include any North-to-North or South-to-South water transfers or those made at the EBMUD facilities at Freeport.

** 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. Data for 2015 is preliminary as of May 2015 and may change as the year develops. Cross Delta water transfers using facilities operated by DWR in 2014 and 2015 were 305,699 AF and 104,348 AF respectively and USBR 73,930 AF and 157,018 AF respectively.

The data are shown both with the EWA program cross-Delta transfers and without. The EWA purchased and transferred water to offset Delta export pumping curtailments, transferring water in every year from 2001–2007 regardless of hydrology (except 2006 when Delta conditions were sufficiently wet that excess conditions prevailed all summer, precluding all cross-Delta transfers). The EWA cross-Delta transfers are larger in the drier years due to the increase in Delta pumping capacity available for transfers. In the wetter year types, the EWA purchased more of its transfer water from south of Delta sources.

The EWA is not considered a reliable indicator of cross-Delta demand by the SWP and CVP because export curtailments occurred in all year types to protect fish, and the source (upstream or downstream of the Delta) of the replacement water was dependent on predicted cross-Delta transfer capacity rather than on contractor demand for supplemental water supplies. Therefore the EWA cross-Delta transfers should not be considered in estimating the likely SWP and CVP allocations that triggered cross-Delta demand in the 1995–2015 period.

Based on an analysis of the historic transfer activity, SWP allocations below 50 percent and CVP allocations below 40 percent appear to trigger a significant increase in efforts to secure north-of-Delta transfer water.

It should be noted that, in the 1991 Drought Water Bank, DWR executed contracts for the purchase of 821,000 acre-feet of water, but the actual “new water” made available through these contracts was far less. There has been a significant evolution in the general understanding of how much water can be made available from various types of transfers such as crop idling or groundwater substitution, as well as potential impacts associated with large scale transfers from a single region.

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