DRAFT
Technical Information for Water Transfers in 2012

Information to Parties Interested In Making Water Available for 2012 Water Transfers

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List of Acronyms and Abbreviations

µS/cm	micro Siemens/centimeter
af	acre-feet
bgs	below ground surface
BMPs	best management practices
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
D-1641	State Water Resources Control Board Decision 1641
Delta	Sacramento-San Joaquin River Delta
DWR	California Department of Water Resources
ESA	Endangered Species Act
ETAW	evapotranspiration of applied water
GIS	geographic information system
GPS	global positioning system
NAD	North American Datum
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
PG&E	Pacific Gas and Electric
Projects	Central Valley Project and State Water Project
Project Agencies	California Department of Water Resources and Bureau of Reclamation, Mid-Pacific Region
Reclamation	Bureau of Reclamation, Mid-Pacific Region
SWP	State Water Project
SWRCB	State Water Resources Control Board
USFWS	U.S. Fish and Wildlife Service

Section 1. General Information for Water Transfers in 2012

1.1 Introduction

The California Department of Water Resources (DWR) and Bureau of Reclamation, Mid-Pacific Region (Reclamation), referred to collectively as Project Agencies, prepared this technical information to help facilitate water transfers in 2012 and to optimize the beneficial uses of the State's water resources. This technical information is applicable to all 2012 transfers involving State and federal water contractors, non-project water users, and use of Project (Central Valley Project [CVP] and State Water Project [SWP]) facilities for transfers through the Sacramento-San Joaquin River Delta (Delta). This technical information does not have a regulatory effect, but if followed, will make review of the transfer proposal by the Project Agencies more efficient. Project Agencies will review each water transfer proposal according to the facts provided by the water transfer proponents, and with a view to the proposal's adequacy in addressing the technical information provided herein. Project Agencies may need to refine the information provided in this technical document if new facts arise or new regulatory restrictions develop (see, for example, section 1.2).

The criteria contained in this document were developed consistent with provisions of the California Water Code and Central Valley Project Improvement Act (CVPIA) intended to protect against injury to others not a party to the water transfer. Three fundamental principles the Project Agencies consider when evaluating potential impacts of a transfer proposal are: (1) no injury to other legal users of water, including the Projects; (2) no unreasonable effects on fish, wildlife or other instream beneficial uses of water; and (3) no unreasonable effects on the overall economy or the environment in the counties from which the water is transferred. The Project Agencies will not consider any water transfer for which these basic principles have not been adequately addressed.

The information provided in this document is intended to support implementation of water transfers, while protecting the rights of all legal users of water, the environment, and the economy. The requested information is necessary to assess the amount of water that can be made available, the timing, and the quantities that can be exported. Each water transfer proposal is unique, and there may be site-specific conditions not accounted for in this *Draft Technical Information Document for Water Transfers in 2012*. The Project Agencies may need additional information for a particular proposal in order to evaluate the water transfer proposal's adequacy in addressing the technical information.

Table 1-1 identifies transfers that the Project Agencies will and will not consider in 2012.

Table 1-1 Transfers considered for 2012

Transfers considered in 2012	Transfers not considered in 2012
Stored water — Release of stored water that would remain in storage in the absence of the water transfer. Storage reduction caused by a transfer must be refilled at a time when downstream users would not have otherwise captured the water.	**Direct pumping of groundwater** — The Project Agencies will not approve the direct transfer of groundwater from one area to another. Water Code Section 1220 establishes significant barriers to the export of groundwater outside the Sacramento Delta-Central Sierra Basins.
Cropland idling/crop shifting — Reduction in surface water use resulting from reduced ETAW[1] of agricultural crops that would have been planted in the absence of the water transfer (see Section 2).	**Transfers that injure legal users of water or cause unreasonable effects on the environment** — Water transfers that simply reclassify existing stream flows from one category to another, making these flows no longer available to historic downstream users, have the potential to injure other legal users of water and cause harm to the environment.
Groundwater substitution — Reduction in surface water use that is offset with additional groundwater pumping (see Section 3).	

[1] ETAW = evapotranspiration of applied water.

1.2 Risks and Constraints

Buyers and sellers should be aware of the uncertainty and risk associated with water transfers. The Project Agencies cannot guarantee that a particular transfer will be successful even with adequate planning, regulatory approval, and monitoring due to the uncertainties related to California's hydrologic conditions and regulatory restrictions on Project operations. As the hydrology gets wetter, there is typically less available export capacity to move transfer water through the Delta. Buyers and sellers located in the Delta or the Yolo Bypass should contact DWR for specific risks that may affect their transfer proposal.

Project operations are governed by the criteria contained in State Water Resources Control Board (SWRCB) Decision 1641 (D-1641) and all other regulatory restrictions governing SWP and CVP operations. These include criteria contained in the 2008 U.S. Fish and Wildlife Service (USFWS) Biological Opinion for the coordinated operations of the CVP and SWP and its effects on the listed Delta smelt and 2009 National Marine Fisheries Service (NMFS) Biological Opinion for the coordinated operations of the CVP and SWP and its effects on listed anadromous fish and marine mammals. These restrictions in the early winter to spring months result in the Projects maximizing their exports during the July through September period. The current regulatory restriction limiting export of transfer water through Project facilities to the period of July through September can further limit the available export capacity for water transfers. The buyers and sellers assume the risk that all, or a portion of, the water made available from the water transfer cannot be exported and may be lost.

1.3 Project Review

Figure 1-1 outlines the process for determining which agencies have review authority over the water transfer. The Project Agencies work cooperatively to review water transfers requiring the use of Project facilities. In addition to requirements listed in Figure 1-1, DWR requires the transferor to complete any required California Environmental Quality Act (CEQA) documentation and obtain all necessary California Endangered Species Act (CESA) and federal Endangered Species Act (ESA) compliance, in order to consider the water transfer proposals.

DWR must consent to water transfers involving SWP facilities or SWP water supplies. Reclamation has approval authority over water transfers involving CVP water supplies. Public Law 102-575, the CVPIA, Section 3405(a) outlines the conditions under which CVP water may be transferred. Reclamation has developed interim implementing guidelines for the water transfer provisions of the CVPIA. These interim guidelines can be found at http://www.usbr.gov/mp/cvpia/3405a/docs/int_guide_imp_water_trans.pdf.

Depending on the type of water right held by the seller, a petition to the SWRCB for temporary transfer may be needed. Individual water right holders are responsible for obtaining changes to water rights from the SWRCB as needed. If a transfer requires SWRCB approval, the seller should submit a petition for change to the SWRCB as soon as possible. SWRCB approval must be obtained before any water can be transferred.

1.4 Developing a Water Transfer Proposal

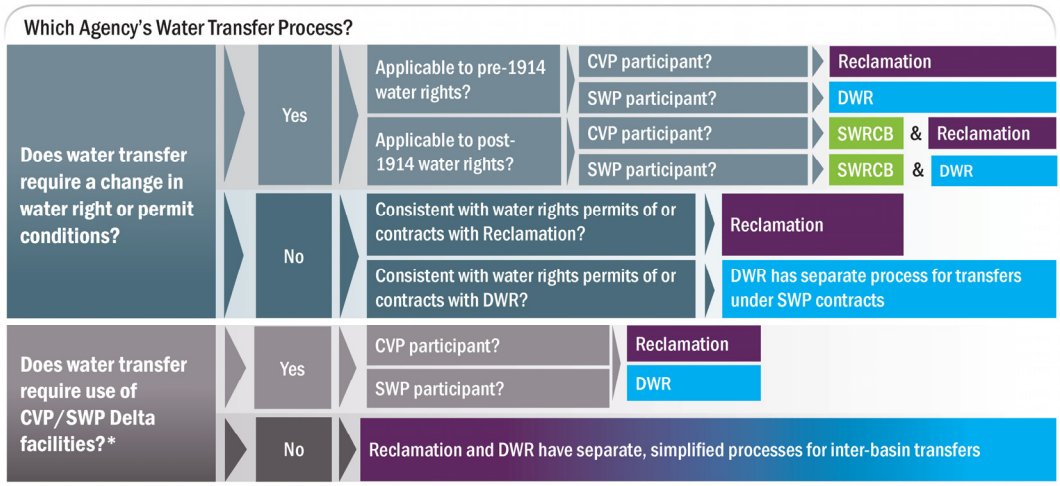
Parties are encouraged to work with local water agencies and districts to develop coordinated water transfer proposals capable of providing substantial quantities of water. The following should be considered in developing a water transfer proposal:

- The types of water transfers that the Project agencies will consider in 2012 are shown in Table 1-1.
- The agencies that may need to be consulted are shown in Figure 1-1.
- The amount of water made available for transfer by the seller is usually determined at the most downstream point of control of the seller. Losses beyond this point, including Delta carriage water losses and conveyance losses, affect the total amount of transfer water delivered and are determined by the Project Agencies.
- Proposals, contract negotiations, and CEQA/National Environmental Policy Act (NEPA) documentation (if required) must be completed before the water can be transferred. Water transfers involving CVP water supplies or CVP facilities (or both) require the approval of Reclamation, and water transfers using SWP water supplies or facilities (or both) require the approval of DWR.

- If SWRCB approval is required, sellers should obtain this approval as soon as possible.

1.5 Environmental Documentation

For 2012, sellers must complete appropriate CEQA documentation or equivalent process (i.e., SWRCB approval for temporary transfers) and obtain all necessary CESA and ESA compliance, for transfers related to State actions. Reclamation has completed NEPA documentation for 2012 through-Delta transfers.



Agency Water Transfer Processes

AGENCY	DWR	Reclamation	SWRCB
How to start agency process?	• Contact DWR with transfer proposal • Agree to cost reimbursement	• Send letter of request for transfer with information on seller, buyer, type, amount, and timing of transfer • Reclamation sends letter back with cost reimbursement requirements • Agencies agree to move forward	File petition for temporary water transfer (1 year or less) or for long-term transfer under the applicable provisions of the Water Code.
What technical information is required in submittal packages?* *See checklists for data requirements	Information as listed in Water Transfer Technical Information (crop shifting/cropland idling and groundwater substitution)	Information as listed in • CVPIA Criteria Checklist for a complete written Transfer Proposal • Water Transfer Technical Information (crop shifting/cropland idling and groundwater substitution)	Information as required for the type of transfer being sought by the appropriate SWRCB form.
What regulatory compliance is required?	CEQA (DWR requires transferor to complete CEQA documentation)	NEPA and ESA (Reclamation has completed NEPA and ESA requirements for 2010-2011 Transfers)	Temporary water transfers are exempt from CEQA. Long-term water transfers require CEQA compliance.
What is acceptance of transfer proposals based on?	• Complete Sumbittal Package • Determination of real water and Project operation considerations • Water Code Section 1810 - use of a water conveyance facility is to be made without injuring any legal user of water and without unreasonably affecting fish, wildlife, or other instream beneficial uses, the overall economy or the environment of the transferor area • CEQA	• Complete Submittal Package • Determination of real water and Project operation considerations • CVPIA section 3405(a) – No adverse impacts on CVP contractors, water supply or operations, fish and wildlife obligations, and groundwater conditions in the transferor area • NEPA – No adverse environmental impacts	Transfer shall not injure any legal user of the water and not unreasonably affect fish, wildlife or other instream beneficial uses.

Figure 1-1 Water transfer process flowchart

1.6 Cost Reimbursement

The buyer or seller will be required to reimburse the costs incurred by the Project Agencies to review and approve the transfer proposal, and administer the water transfer contract. These costs will vary depending on the size and complexity of the transfer proposed.

1.7 Contacts

Parties with general questions on water transfers may contact:

Tom Filler
Chief, Water Transfer Program
DWR (916) 653-5272
TFiller@water.ca.gov

Brad Hubbard
Program Manager
Reclamation (916) 978-5204
BHubbard@usbr.gov

Parties interested in developing water transfer proposals that may require use of SWP facilities may contact:

Nancy Quan
Chief, Program Development and Water Supply Branch
DWR (916) 653-0190
nquan@water.ca.gov

Section 2. Water Transfers Based on Cropland Idling and Crop Shifting

This section provides technical information on water made available for transfer by cropland idling/crop shifting. Cropland idling includes the idling of land that would have been planted in the absence of the transfer. Crop shifting is the shifting from higher-water-intensive crops historically planted to lower water using crops. It does not include land fallowed as part of normal farm operations which does not make water available for transfer. Cropland idling or crop shifting water transfers make water available by reducing the consumptive use of surface water applied for irrigation. Each proposal needs to make a credible case that reduction in surface water diversions will occur consistent with the reductions in consumptive use of applied surface water. Figure 2-1, on the next page, shows the overall cropland idling/crop shifting transfer information required, which is summarized in the subsequent sections.

Figure 2-1 Cropland idling/crop shifting transfers process flow chart

Figure 2-2, on the next page, summarizes the data needs for a cropland idling/crop shifting water transfer proposal. Sellers must submit complete information to facilitate review and processing of the water transfer proposal. The review process will be more efficient for sellers that have the technical aspects of their proposals properly documented to demonstrate that water will be made available for transfer. Parties are encouraged to work with existing water districts and water agencies to develop joint water transfer proposals.

Cropland Idling/Crop Shifting Transfers Technical Information – Proposal Checklist

- ☐ Submit past 5 years data of:
  - ☐ Net crop acreages by crop (acres)
  - ☐ Fallowed land (acres)
  - ☐ Dry farmed land (acres)
  - ☐ Total district acreage (acres)
  - ☐ Total farmable acreage (acres)
- ☐ Maps showing:
  - ☐ District or farm operation boundary
  - ☐ Current fields irrigated
  - ☐ Fields routinely irrigated and not irrigated
  - ☐ Fields to be idled as part of water transfer
- ☐ Basis of right to use surface water during the spring and summer in the year of the proposed water transfer

Figure 2-2 Crop idling technical information submittal proposal checklist

2.1 Estimation of Conditions That Would Occur Absent the Transfer

A key element of a cropland idling and crop shifting water transfer is to determine the conditions that would exist without the transfer. Predicting such conditions accurately is often difficult. The use of historical cropping patterns is currently the best method to estimate conditions that would exist absent the cropland idling/crop shifting transfer. The crop history identifies the type of crops typically grown, the degree of land fallowing that typically takes place, and the crop rotation practices that typically occur.

To estimate conditions that would occur without a transfer, sellers must provide the following information:

- Accurate crop records for the five years preceding the year of the proposed transfer unless otherwise coordinated with the Project Agencies. Crop acreage should be reported in net field acres of the actual farmed and irrigated acres. If only gross field acres are known (i.e., the county parcel acres), then multiply the gross acres by 0.95 to estimate net acres. Crop acreage needs to be included for each crop (include fallowed lands, non-irrigated crops, and total farmable acres) for the water district or individual farm operation.
- Maps showing district or farm operation boundary, current fields irrigated, fields routinely fallowed or not irrigated, and fields to be idled as part of the proposed water transfer, in a format acceptable to the Project Agencies. The Project Agencies will consider information and maps submitted by seller as well as other available information to independently determine field acreage.

Project Agencies' determined acreages will be used to calculate water made available for transfer.

- The basis of right (water right or contract supply) for use of surface water during the transfer period.

The following sections further describe how this information will be used to determine conditions without the transfer.

2.1.1 Large Water Districts

The term water district is used in this paper as shorthand to include any water company, district, agency, or other entity that provides water service to a group of landholders and can enter into a binding contract with a buyer. Large water district is defined as a legal entity serving multiple landowners. If only a few individual landowners within the water district wish to participate in the transfer, they should coordinate with their water district and refer to section 2.1.2 on methods to calculate expected water savings.

A water district's previous year crop acreage is typically the best indication of the next year's crop patterns, provided the market for the particular crops grown remains relatively stable, the water supply has not been affected by droughts, and the acreage of the one or two crops with highest water use is typical of past years. The average acreages for these high-water-use crops in each district needs to be reviewed as follows:

- If acreage values for the crops with the highest water use for the immediate prior year are within 5 percent of the five-year average for these crops and there have been no significant market changes for the crop, then the last year's cropping patterns will be used as the base for calculating changes due to the cropland idling and crop shifting transfers.
- If acreage values for the crops with high water use fall outside this range, then another, more typical, year or an average of cropping patterns and acreages will be used, as mutually agreeable between the applicable Project Agency and the party proposing the water transfer.
- Fallowing a percentage of the total crop acreage is a normal agricultural practice. A significant shift in market prices, as has been seen in the rice market in recent years, can temporarily alter the typical fallowing pattern, resulting in a higher percentage of total acreage in production. The use of the prior year crop acreage as the baseline in this situation may not be appropriate after a series of consecutive years of elevated production. After a series of years, the Project Agencies may elect to use an alternate method to calculate baseline to account for the need to fallow a percentage of the total acreage as part of normal farming practices. Absent a change in market conditions, prior year cropping pattern will be used in 2012 as the baseline if the acreage meets the conditions noted previously in this section. The issue of baseline will be reevaluated in 2012.

The previous year's data may also be used if additional explanation is provided to the Project Agencies, and if the parties proposing the transfer and the Project Agencies agree that this is the best representation of conditions that would exist absent the cropland idling and crop shifting transfer. In this case, five years of crop data may not be needed. If the Project Agencies and the water district cannot reach agreement on an estimate of the conditions that would likely exist absent the cropland idling and crop shifting transfer, then the Project Agencies will not consider the water transfer proposal based on cropland idling or crop shifting.

2.1.2 Individual Farm Operations and Small Water Districts

Small water district is defined as a legal entity that serves one or few land owners. For individual farm operations or small water districts, last year's cropping patterns may be an inappropriate measure of likely future conditions absent the cropland idling/crop shifting transfer because of crop rotation patterns.

Small water districts and individual operations must provide the previous five years of crop history for their entire district or operation to identify significant crop rotation cycles. Where crop rotation cycles are evident for the whole of the farm operation or small water district, either (1) a repeating crop pattern or (2) the five-year average should be used. In these cases, the potential participant has to identify specific fields to be enrolled in the transfer and provide the five-year crop history for these fields, at a minimum. Use of a repeating pattern to characterize routine land idling and crop rotation practices requires the proponent to provide an exact repeating pattern of cropland idling practices for the fields to be involved in the transfer. The lands considered routinely idled would correspond to those in the subsequent year of the pattern. The Project Agencies must agree to use of a repeating pattern.

From this crop history, the proponent must calculate the five-year average of crop evapotranspiration of applied water (ETAW) values, as indicated below, for each field. The five-year average ETAW values for each field would be used as the base for determining changes due to the proposed cropland idling/crop shifting transfer in the year of the transfer. Individual farms or small water districts must provide a statement that the land idled for water transfer is not "shifted" to other operations under their control.

2.2 Use of Evapotranspiration of Applied Water (ETAW)

2.2.1 What is ETAW?

ETAW is defined as the portion of applied water that is evaporated from the soil and plant surfaces and actually used by the crop. The portion of the crop evapotranspiration met by precipitation during the growing season or stored as soil moisture within the root zone before the growing season does not qualify as transferable water. ETAW does not include applied water lost as deep percolation to groundwater or conveyance losses. 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 from one year to the next due to changing climatic conditions. It is not currently feasible to calculate ETAW for the specific conditions of each transfer year; therefore ETAW values used for water transfer calculations are based upon crop water requirements reflecting average rainfall and evaporative demand. The calculation of water made available for transfer is based upon the quantity of surface water conserved for each qualifying idled acre of cropland and the appropriate ETAW associated with changes in the specific crops idled.

2.2.2 Crops Allowed for Cropland Idling or Shifting and ETAW Values

Tables 2-1 and 2-2, on the next page, show the allowable crop ETAW values for the Sacramento Valley for use in 2012 water transfers.

Table 2-1 Estimated ETAW values (in acre-feet/acre) for crops suitable for shifting in 2012

Crop	ETAW (in af/acre)
Alfalfa[1]	1.7 (July-Sept.)
Bean	1.5
Corn	1.8
Cotton	2.3
Melon	1.1
Milo	1.6
Onion	1.1
Pumpkin	1.1
Rice	3.3
Sudan grass	3.0
Sugar beets	2.5
Sunflower	1.4
Tomato	1.8
Vine seed/cucurbits	1.1
Wheat (over wintered)	0.5
Wild rice	2.0

[1] Only alfalfa grown in the Sacramento Valley floor north of the American River will be allowed in 2012 transfers. Fields must be disced on, or prior to, July 1 of the transfer year. Alfalfa acreage in the foothills or mountain areas is not eligible for transfers in 2012.

Table 2-2 Estimated ETAW values (in acre-feet/acre) for crops suitable for idling in 2012

Crop	ETAW (in af/acre)
Alfalfa[1]	1.7 (July-Sept.)
Bean	1.5
Corn	1.8
Cotton	2.3
Melon	1.1
Milo	1.6
Onion	1.1
Pumpkin	1.1
Rice	3.3
Safflower	0.7
Sudan grass	3.0
Sugar beets	2.5
Sunflower	1.4
Tomato	1.8
Vine seed/cucurbits	1.1
Wheat (over wintered)	0.5
Wild rice	2.0

[1] Only alfalfa grown in the Sacramento Valley floor north of the American River will be allowed in 2012 transfers. Fields must be disced on, or prior to, July 1 of the transfer year. Alfalfa acreage in the foothills or mountain areas is not eligible for transfers in 2012.

2.2.3 Rice Idling

Rice idling constitutes the majority of cropland idling transfers. Through 2012, the quantity of transfer water made available has been calculated based on the pattern of ETAW rather than the timing of river diversions. The Project Agencies recognize that due to the unique cultivation requirements of rice, the diversion pattern differs from the ETAW pattern, and they are currently evaluating the technical issues related to selecting the appropriate method for calculating the timing of water availability for rice idling. For the purpose of evaluating transfers in 2012, the Project Agencies will use the ETAW pattern to determine the timing of water available for transfer for rice idling and will continue to work on a resolution of this issue for future transfers.

Acreage eligible for inclusion in a rice idling program is limited to that acreage that would have been planted to rice in the absence of the program. Acreage planted to overwintered crops, such as wheat or barley, are not eligible for inclusion in a crop idling program for the spring/summer immediately following the overwintered crop.

Rice fields and irrigation/drainage ditches can provide temporary or permanent forage and habitat for terrestrial wildlife and waterfowl species, including the giant garter snake. Appendix B lists conservation measures for rice idling to protect the giant garter snake.

2.2.4 Rice Straw Decomposition

The Project Agencies are not currently considering transfer proposals based on potential water savings from rice straw decomposition, including the use of groundwater substitution for rice straw decomposition water or using mechanized or other removal methods. The Project Agencies will continue to investigate possible approaches regarding rice decomposition water transfers but cannot guarantee that an acceptable approach will be developed in time for the 2012 water transfer season.

2.2.5 Limitations on Crops and Lands

Some crops are not eligible for idling or shifting transfers because it is too difficult to determine the real water savings because of a lack of authoritative ETAW values, substantial variability in cultural practices, and other crop-specific reasons. Table 2-3 lists the crops that are not acceptable to Project Agencies for idling or shifting transfers in 2012. The Project Agencies will not consider water transfers that propose idling or shifting of these crops.

Table 2-3 Crops not suitable for shifting or idling in 2012

Crop
Pasture[1]
Mixed grasses
Miscellaneous grasses including Bermuda grass
Alfalfa (in the Delta region)
Orchard
Vineyard

[1] The Project Agencies are evaluating the use of pasture for future cropland idling/crop shifting transfers; however, it will not be allowed in 2012.

Some specific practices and proposals will not be considered for water transfers due to the difficulty in determining the amount of water made available or the uncertainty in what would have happened absent the transfer. These include:

- Removal of permanent crops.
- Fields historically irrigated by groundwater.
- Cropland idling on lands where groundwater is within 5 feet of the land surface or where the crop root zone may extend into the groundwater table. In these areas, cropland idling transfers may be considered if additional monitoring is conducted to determine the water savings and ensure the projected water savings are achieved. Any monitoring program must be approved by the Project Agencies,
- Where increased water use on other lands within the transferring water district or within the control of the transferring party offsets the volume of water conserved through crop shifting or cropland idling.

In order to get the full credit for the expected water savings, idled land cannot be irrigated during the transfer season. The calculation of consumptive use savings for crop idling assumes that the idled field will be kept dry and free of weeds. Seepage from adjacent irrigation and drainage canals or areas with high groundwater can result in consumption of applied water by vegetation growth on idled fields and bare soil evaporation, thus reducing effective water savings from cropland idling.

In 2010, most idled fields were disced and essentially free of excessive vegetation or contained remnant winter vegetation that was essentially dry by mid-June. However, there were isolated fields on which weed growth, due to excessive seepage, was noted. Also observed in 2010 was the use of legumes, such as vetch, as a winter cover crop, an increasingly common practice in organic crops. These winter cover crops provide significant agricultural and environmental benefits. The cover crops may be disced the following spring, or summer, or left in the field to dry out and provide forage and cover for wildlife. The crops are overwinter crops and are not irrigated during the summer irrigation season and therefore do not result in a reduction in the calculation of transfer water.

Landowners must conduct at least one weed abatement prior to the transfer period. Fields with remnant overwintered crops or dry overwinter remnant vegetation, as described above, will be handled on a case-by-case basis to determine if weed abatement efforts are required prior to the transfer period. If areas with excessive vegetation are identified, the Project Agencies may require that the vegetation be disced, or otherwise abated, within two weeks of identification. Landowners participating in water transfers are expected to control seepage onto idled lands to the best of their ability. If lands are included that are subject to high water loss from idled fields, landowners may be required to conduct an extensive measurement and monitoring program to estimate the consumptive use due to excessive weed growth and soil evaporation. Excessive weed growth on idled acreage will lead to a reduction in the verified quantity of water made available for transfer.

2.3 Estimating Water Available for Transfer

2.3.1 Large Water Districts

Large water districts need to evaluate the crop acreage that would have existed absent the transfer using the methods presented in section 2.1.1, including the acreage for each crop, idled lands, and all other district lands. Base-year ETAW values can be calculated using the baseline crop acreages and ETAW values in Tables 2-1 and 2-2. The district should then determine the acreages of each crop, fallowed lands, and other lands expected in the coming year with the water transfer. Using these acreages, the ETAW for the coming year is calculated by the same method used for the base year. The base-year and expected current-year crop acreages for the district should be checked to make sure they match. The difference between the base-year and current-year ETAW is used to estimate the water made available by the cropland idling/crop shifting transfer. Final eligible crop acreage will be determined by the Project Agencies.

2.3.2 Individual Farm Operations or Small Water Districts

As stated in section 2.1.2, individual farm operations and small water districts may exhibit significant crop rotation sequences and may wish to simply enroll specific land parcels into a cropland idling/crop shifting program. For these cases, section 2.1.2 describes the method to establish a baseline cropping pattern that will allow calculation of the baseline ETAW for each parcel. The ETAW for the parcel for the current year with the water transfer is then established. The difference between the base-year and current-year ETAW is used to estimate the water made available by the cropland idling/crop shifting transfer. Final eligible crop acreage will be determined by the Project Agencies.

2.4 Potential Cropland Idling/Crop Shifting Transfers in the Delta/Yolo Bypass Region

The Project Agencies are working to increase options for transferable water via cropland idling/crop shifting, if options result in real water savings that can be made available at times and locations such that it can be exported by the Projects. In 2012, the Project Agencies will evaluate proposals for transfers originating in the Yolo Bypass/Tule Canal or Delta areas on a case-by-case basis. Many uncertainties exist with transfers originating from the Yolo Bypass/Tule Canal or Delta, including how much water can be made available and whether the transfer water can be exported by the projects. The Project Agencies will closely scrutinize each Delta transfer proposal.

The SWRCB must concur in writing that the transfer water can be accounted for separately as meeting the flow-related compliance objectives in D-1641. The Project Agencies must also be assured that hydraulic connectivity with the Delta exists at all times during the transfer period. If written concurrence is obtained from the SWRCB, extensive measurement, monitoring, and reporting requirements, acceptable to the Project Agencies and paid for by the transfer proponents, will be required for all Delta region transfers to determine and verify transferable water. Sellers must contact the Project Agencies for minimum measurement and monitoring requirements. The Project Agencies will work with each seller on a case-by-case basis for any transfers from the Delta region.

2.5 Limitations on Water Made Available for Transfer

See section 1.2 (Risks and Constraints).

2.6 Adjustments for Water Shortage Years

The baseline to determine water available for transfer is typically based on prior-year or five-year average cropping patterns within the water district or individual seller's service area. If hydrologic conditions are sufficiently dry, sellers' water supply allocations may be reduced, making it difficult to establish what the cropping pattern would have been in the absence of the transfer. The following approach will be used to determine baseline acreages in 2012; however, the Project Agencies will analyze the baseline for all transfers based on their unique circumstances.

Is the Seller Facing a Reduced Surface Water Supply During 2012?

1. No: If no, and the seller transferred water in 2011, the baseline for the 2012 transfer is the 2011 baseline unless there are circumstances, such as substantial changes in market conditions that would suggest a change in cropping patterns. If the seller did not transfer water in 2011, an appropriate baseline must be determined. Methods to determine the baselines are described in the previous sections.

2. Yes: If yes, will the reduced supply require reduced consumptive use?

If no, submit data to the Project Agencies to illustrate how the seller will accomplish meeting full consumptive use with reduced surface water supply; include historical diversion data, additional recycling, or other conservation measures. Additional groundwater pumping is an increase to the groundwater baseline for transfer purposes.

If yes, then the baseline for the seller will be based on a calculated ratio of the "district efficiency" or ETAW/diversions.

Under no circumstances will a seller be allowed to transfer more water through cropland idling/crop shifting than the difference between their 2012 surface water allocation and its 2012 actual diversions.

2.7 Reporting

Accurate reporting of the activities undertaken as part of a cropland idling/crop shifting transfer is an essential provision of any water transfer project. Reporting is the responsibility of the seller and needs to be acceptable to the Project Agencies.

2.8 Monitoring and Verification

Verification of the actions taken to make water available in a cropland idling/crop shifting transfer will be conducted by the sellers with the oversight of the Project Agencies. In addition to crop mapping, the following information will need to be provided.

Elements in a cropland idling/shifting monitoring program are listed below.

- Past-year(s) and current-year cropping data.
- Map showing lands participating in the water transfer.
- Field checks by the seller to verify no water leakage onto idled lands, check for excess weed growth on idled fields, and determine change in soil moisture. Verify shift to crop in the proposal.
- If areas with excessive vegetation are identified, the Project Agencies will require that the vegetation be disced, or abated, within two weeks of identification.
- Previous and current-year diversions for district programs.
- In areas subject to high groundwater or excessive seepage, instrumentation adequate to determine soil evaporation and weed transpiration necessary to calculate reductions in conserved water savings and acceptable to the Project Agencies.

- The use of winter cover crops such as vetch (legumes) for the enhancement of soil nitrogen and percolation rates is allowable practice for acreage to be included in a transfer program, if the crop is overwintered and is no longer actively growing before the typical rice planting season and no irrigation is provided to the acreage during the spring/summer transfer period. If the crop is actively evapotranspiring during the typical irrigation season due to such causes as canal seepage or access to groundwater, weed control measures would be required to prevent loss of transfer water. An alternative to conducting weed abatement measures would be the use of instrumentation adequate to determine the cover crop's transpiration and calculate reductions in conserved water savings as noted above.
- Field data that can be used to verify how much water was actually made available by the transfer action(s) and to modify future proposals if warranted.

The seller will provide access to the fields that are part of the cropland idling/shifting transfer so that the Project Agency can perform field checks and determine soil moisture depletion if necessary. The Project Agencies will coordinate verification activities. Buyers and sellers must reimburse Project Agencies for their costs incurred in monitoring and verification in addition to other reimbursable costs.

2.9 Third-Party Effects

Acreage idled for the purpose of a water transfer must be dispersed to minimize impacts on terrestrial wildlife and waterfowl species that may use irrigated croplands or irrigation/drainage ditches for temporary or permanent forage and habitat purposes. Normal farm operations for idled lands are expected to continue. Specific practices that may need to be implemented to transfer water in 2012 can be found in the USFWS Biological Opinion issued to Reclamation for the 2010 and 2012 water transfers (see Appendix B).

Cropland idling/crop shifting transfers have the potential to affect the local economy. Parties that depend on farming-related activities can experience decreases in business if land idling becomes extensive. Limiting cropland idling to 20 percent of the total irrigable land in a county should limit economic effects.

Water districts and others participating in cropland idling/crop shifting transfers need to be sensitive to the possible economic impacts of their actions on their business partners and their neighbors. Sellers should be aware of potential cumulative effects from water transfers in neighboring districts. Geographically distributing the acres that are idled can avoid or minimize possible economic effects.

Water Code Section 1745.05 (b) provides that if the amount of water made available by land fallowing (idling) exceeds 20 percent of the water that would have been applied absent the proposed water transfer, a public hearing by the water supply agency is required. In the past, cropland idling programs have stayed well below the 20 percent water delivery threshold for a hearing. Water supply agencies interested in

participating in cropland idling/crop shifting transfers need to be aware of this Water Code section and conduct a public hearing if they propose a transfer in which cropland idling would exceed the 20 percent threshold.

Section 3. Water Transfers Based on Groundwater Substitution

This section provides technical information to local parties who wish to transfer water in 2012 through groundwater substitution. Groundwater substitution transfers make surface water available for transfer by reducing surface water diversions and replacing that water with groundwater pumping.

The rationale behind a groundwater substitution transfer is that surface water demands are reduced because a like amount of groundwater is used to meet the demands. The resulting increase in available surface water supplies can be transferred to other users. The net amount of additional surface water supply, or transferable water, created through groundwater substitution transfers must account for: (1) the amount of increased pumping that occurs in support of the transfer during the time that export facilities can convey the water, (2) the extent to which transfer-related groundwater pumping decreases stream flow (resulting from surface water-groundwater interaction), and (3) the timing of those decreases in available surface water supply.

A groundwater substitution transfer proposal generally consists of the following components:

- The location and characteristics of the wells that will pump groundwater.
- The proposed volume and schedule of transfer-related groundwater pumping.
- A monitoring plan designed to assess the effects of the transfer.
- A mitigation strategy to alleviate possible third-party impacts.

The detailed requirements for a proposal are included in Figure 3-1 and discussed later in this section in more detail.

Submit the following information to the Project Agencies for review and approval prior to the beginning of the transfer.

- ☐ Surface water source that will be replaced by groundwater pumping
- ☐ Location and construction details of wells that will be pumped
  - ☐ Well Identification: Well owner name and identification number, water district, and district's well identification number
  - ☐ Well Location: Latitude and longitude, Township, Range and Section, map (similar detail to 7.5 minute USGS quad sheet) with well location and all surface water within 2 miles of District boundary
  - ☐ Well Construction: well depth, depth of annular surface seal, gravel pack interval(s), casing size, casing perforation intervals, and well's construction method
  - ☐ Geologic Log
  - ☐ Estimated Well Capacity
  - ☐ Photographic evidence of the calibrated instantaneous reading and totalizing flow meters installed on each participating well
  - ☐ Certification by a Professional Engineer or Professional Geologist for accurate flow meter installation
  - ☐ Estimates of stream flow depletion calculated using approved numerical hydrologic models; or when modeling information is not available, use of the well criteria (Appendix C) and streamflow depletion factor (12%)
  - ☐ Additional Information (If available): PG&E well pump efficiency test, independent well drawdown tests, water quality data, and/or site-specific studies with aquifer properties surrounding the well or extent of the well's hydrologic connection with any surface waters
  - ☐ Pump Power: Verification of an electric source for well, or if diesel pump, verification of compliance with Air Board Regulations
- ☐ Schedule and volume of water to be pumped
  - ☐ Proposed Operations: Description of the well's projected operation and the projected beneficial use of pumped water
- ☐ Baseline from which the additional pumping will be measured
  - ☐ Historic Operations: Operation records indicating the volume of water pumped from each well during July through September 2011. Identify and document area(s) normallyirrigated by wells.

Monitoring program - submit the monitoring plan to the Project Agencies <u>at least two months</u> prior to the groundwater substitution transfer. The seller shall begin the monitoring program at least one month prior to the proposed transfer.

- ☐ A monitoring well network that adequately covers the surface area and aquifer intervals within the affected pumping area
- ☐ Meter readings of instantaneous flow (gpm) and total discharge volume at each of the groundwater substitution wells (at least monthly)
- ☐ Groundwater level measurements (at least monthly)
- ☐ Groundwater quality monitoring (when groundwater pumping is initiated, monthly during the transfer period, and at the termination of pumping)
- ☐ Method to detect land subsidence or that subsidence is unlikely to occur
- ☐ Plans to coordinate data collection and cooperate with regional monitoring efforts
- ☐ Data evaluation, logging and reporting

Mitigation Plan - submit a mitigation plan to the Project Agencies <u>at least two months</u> prior to the groundwater substitution transfer.

- ☐ A procedure for the seller to receive reports of purported environmental or third party effects and to report that information to the Project Agencies and, as required, to local agencies
- ☐ A procedure for investigating any reported effect
- ☐ Development of mitigation options, in cooperation with the affected third parties, for legitimate effects
- ☐ Assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs

Figure 3-1 Groundwater substitution transfers technical information — proposal checklist

3.1 Compliance with Local Groundwater Management Plans and 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 adjudications and with the overdraft protections in Water Code Section 1745 et seq. will be the responsibility of the entity proposing the groundwater substitution transfer.

Individual county requirements vary throughout the Sacramento Valley. The approval process associated with a proposed groundwater substitution transfer varies by county and may take a significant amount of time. Table 3-1 provides brief descriptions of the water transfer requirements for individual counties, in geographic order from north to south. Potential sellers are advised to contact the counties early to discuss the requirements for water transfer approval.

Table 3-1 Description of county ordinances and plans pertaining 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.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%20and%20Resource%20Conservation.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

County	Description	Sources for more information
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 Colusa County Groundwater Commission, through the director of the Planning and Building Department.	County Director of Planning and Building (530) 458-0480 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) 822-3299 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/Modules/ShowDocument.aspx?documentid=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/coswcms/groups/public/@wcm/@pub/@coco/@intra/documents/webcontent/sac_017441.pdf
Solano	At this time, Solano County has no ordinance governing the extraction and export of groundwater.	Solano County Water Agency (707) 451-6090

3.2 Evaluation of Groundwater Substitution Transfer Proposals

Before beginning transfer operations, the water transfer proponent will need to develop a groundwater substitution transfer proposal and provide it to the Project Agencies for evaluation.

The Project Agencies will review groundwater substitution transfer proposals to determine whether they meet the following objectives.

- Transfer will result in providing the agreed-upon amount of transfer water.

- Transfer will not unreasonably affect fish, wildlife, other instream beneficial uses, or the environment and will have no significant unmitigated environmental effects.
- Transfer will not injure other legal users of water.
- Proposal shows that a monitoring and mitigation strategy is in place prior to the transfer.

The Project Agencies need sufficient information to determine whether the transfer will meet the desired objectives. The following sections describe the information to be submitted with the proposal.

3.3 Groundwater Substitution Wells

The Project Agencies will conduct a well review to determine whether the proposed wells are suitable for use in a water transfer operation and meet the above objectives.

Sellers must provide sufficient information, described below, to help the Project Agencies conduct the well review. Wells will be considered ineligible for transfer-related pumping if review of location and construction demonstrates that:

- Sufficient information is not available to estimate a well's potential effects; or
- A well is completed in unconfined aquifers that are likely to be hydrogeologically continuous with a streambed or other surface water feature.

3.3.1 Information Requirements for Water Transfer Wells

The Project Agencies need the information listed below to evaluate a groundwater substitution transfer proposal. (Appendix C lists well acceptance criteria.) In 2012, sellers can resubmit data for wells accepted for recent transfers (2009 through 2011), if there have been no changes to the wells. However, verification of flow meter calibration may need to be submitted annually for each well. Sellers should consult with Project Agencies prior to submitting their proposal. The following information should be included in the water transfer proposal:

1. Well identification: The well owner's name, the well owner's identification number, the water district or agency where the well is located, and the water district or agency's well identification number (if different from the well owner's identification number).
2. Well location:
    a. Latitude and longitude and the township, range and section. The location can be determined with a hand-held global positioning system (GPS) unit or instrument with greater measuring accuracy. GPS coordinates should be given using the current DWR standard coordinate system and datum: Latitude/Longitude in decimal degrees, using NAD83 datum (North American Datum 1983).

   b. A map, with at least as much hydrologic and physical detail as that of a 7.5-minute U.S. Geological Survey quadrangle sheet, showing the location of all production and monitoring wells that will be involved in the transfer and the location of all surface water features within two miles of the district service area boundary.

3. Historic operations: Operation records indicating the volume of water pumped from each well on a monthly basis in 2011. Records of power consumption along with a well pump efficiency test conducted within the last two years may be submitted in place of flow measurements from a totalizing flow meter.
4. Proposed operations:
   a. Description of the wells' projected operations (e.g., is groundwater to be applied to surrounding land, or is groundwater to be pumped into district canals, etc.), and the projected beneficial use of pumped water.
   b. Verification that a totalizing flow meter has been installed and calibrated.
5. Well construction: Provide total well depth, depth of annular surface seal, gravel pack intervals, casing size, casing perforation intervals (or open hole interval), and well's construction method (cable tool, rotary gravel pack well, etc.).
6. Geologic log: Details of geologic materials described on the well log.
7. Estimated well capacity: Identify estimated well capacity and method for determining capacity.
8. Additional information: If available, provide results of a Pacific Gas and Electric (PG&E) well pump efficiency test, independent well drawdown tests, water quality data, and site-specific studies that document aquifer properties surrounding the well or the extent of the well's hydrogeologic connection with any surface waters.
9. Pump power: Wells powered by an electric source are eligible for use in transfers. Wells powered by diesel or gasoline engines are eligible for use in the transfer if the seller complies with applicable air quality regulations and provides appropriate mitigation.

The amount of information submitted for each well will depend on its location relative to surface water features and other areas that may be sensitive to groundwater pumping effects. The Project Agencies will require site access for field verification of the above information, and collection of additional data during the program.

3.4 Determining the Amount of Transferable Water

Transferable water equals the incremental increase in Sacramento River flow to the Delta created by transfer operations during balanced Delta conditions. Balanced Delta conditions occur when the Project Agencies agree that releases from upstream reservoirs plus unregulated flow approximately equal the water supply needed to

meet Sacramento Valley in-basin uses plus exports. Sacramento River flow increases as sellers use groundwater pumped from wells to replace surface water provided by river diversions. The resulting increase in stream flow is reduced by varying degrees as transfer-related groundwater pumping affects stream flow.

Information provided in the water transfer proposal will be used in conjunction with monitoring report data to calculate the amount of water the transfer operations make available. The amount of transferable water credited to a groundwater substitution water transfer operation in 2012 will be determined as follows.

1. Establish the baseline groundwater pumping for a transfer operation.
2. Determine the difference between groundwater pumping in 2012 and the baseline.
3. Determine the reduction in stream flow during balanced Delta conditions resulting from pumping groundwater to make surface water available for transfer.
4. Calculate the difference between 2 and 3, above.
5. The following formula summarizes the above four steps: (2012 Groundwater Pumping) – (Baseline Groundwater Use) – (Estimated Stream Flow Reduction) = (Surface Water Made Available for Transfer).

The next sections describe these steps.

3.4.1 Determining the Baseline Groundwater Pumping

The baseline is the amount of groundwater pumping that would have occurred during the transfer period without the transfer. For water transfers in 2012, the Project Agencies will use the 2011 records of groundwater pumping submitted by the seller to establish the baseline. Sellers are requested to submit the following information for non-transfer pumping years.

- Identify all wells that discharge to the contiguous surface water delivery system within which a well is proposed for use in the transfer program.
- The amount of groundwater pumped in 2011 for each well that discharges to the contiguous surface water delivery system.

The Project Agencies will calculate baseline groundwater pumping based on the total volume pumped from all wells that discharge to a contiguous surface water delivery system in non-transfer years. Newly participating sellers may be allowed to use records of electrical power consumption along with well pump efficiency test data (from a test conducted within the past two years) to estimate baseline groundwater pumping.

To participate in future groundwater substitution transfers, participating wells should be metered through both non-transfer and transfer years so that the baseline can be properly established.

If sellers experience cutbacks of their normal surface water allocation in 2012, the amount of baseline groundwater pumping will be determined on a case-by-case basis after consultation with the seller.

3.4.2 Measuring Groundwater Pumped

Sellers should provide pumping records from all wells that discharge to a contiguous surface water delivery system used in groundwater substitution transfers. An instantaneous reading and totalizing flow meter shall be installed on each well participating in groundwater substitution water transfers. The flow meter shall be installed such that:

- Each flow meter is in good working order and properly sized, positioned, and oriented on the discharge piping to ensure accurate measured flows;
- Discharge piping is configured to ensure that full pipe flow conditions are met where the meter is installed; and
- The manufacturer's standards for sizing, positioning, orientation, and calibration of the meter are followed.

A qualified professional engineer or professional geologist should certify each well flow meter installation for conformance with the manufacturer's specifications prior to use. Sellers shall provide a photograph of each participating well showing the flow meter installation and associated plumbing. Project Agencies may conduct independent field checks of flow meter installations to verify the information provided and manufacturer's standards are met.

An exception to the above accounting method for groundwater substitution transfers applies to districts that can provide water from their own reservoir(s) and replace it with groundwater pumping. If a reservoir controls flow to a stream where gages or weirs are sufficiently accurate, and stream flow is sufficiently low that the Project Agencies can use stream gage or weir data to determine how much water is being provided for transfer, the stream gage or weir data may be used in place of totalizing flow meters on individual wells. In these cases, additional analysis of reservoir operations may be required to determine if transfer operations must consider reservoir refill criteria (see Section 4). Data requirements for transfer proponents that can operate a groundwater basin in conjunction with their own reservoir will be determined on a case-by-case basis.

The development of a water transfer proposal must take into account that a district's total diversion of surface water during the year shall not exceed the maximum amount provided under its water service or settlement contract with the United States, or its water service contract with DWR, or their appropriative water rights, less the total quantity of groundwater provided by wells within a district pumping under a groundwater substitution transfer agreement.

3.4.3 Estimating the Effects of Transfer Operations on Stream Flow

Groundwater pumping for transfer operations will yield water at the expense of future stream flow. Flow reduction in a river, stream, canal, or drain could injure other legal users of water (see section 1.1). However, if transfer-related stream flow losses occur when the Delta is in excess conditions, the effect of the transfer operations does not injure the Projects' water supply.

For water transfers in 2012, the Project Agencies will use the well criteria detailed in Appendix C to evaluate and determine which wells are suitable for transfers and assume that stream flow losses due to groundwater pumping for transfers are 12 percent of the amount pumped for transfer. This depletion factor will be applied to all wells participating in groundwater substitution transfers. The Project Agencies will revise the 12 percent depletion factor in future years as additional technical information becomes available.

Available local hydrologic models may be used to determine effects on stream flow. The Project Agencies must approve use of the model and results. The 12 percent depletion factor will be applied if existing models are not approved by the Project Agencies.

3.5 Monitoring Program

Groundwater substitution has the potential to cause injury to local groundwater users due to the additional groundwater pumping needed to allow the surface water transfer to take place. Injury could also occur to other surface water users if the additional groundwater extraction results in a significant reduction in stream flow when those users need it.

Sellers transferring water in 2012 via groundwater substitution transfers must establish a monitoring program that is capable of identifying any adverse transfer-related effects before they become significant. The Project Agencies will evaluate the monitoring program for its ability to meet the objectives listed below. The regional extent and frequency of monitoring necessary to meet objectives will depend on site-specific factors. For instance, areas that are susceptible to land subsidence may require ground surface elevation surveys, while areas with groundwater quality concerns may require a more comprehensive suite of water quality testing.

In order to provide adequate review time water transfer proponents should provide a monitoring plan to the Project Agencies at least two months prior to the groundwater substitution transfer. In order to properly monitor water transfer project impacts, the groundwater level monitoring program should begin in the month of March prior to the proposed transfer.

3.5.1 Monitoring Plan Objectives

The monitoring plan needs to describe how the seller will collect, evaluate, and report the monitoring data in order to meet the following objectives.

- Accurately account for the quantity of groundwater pumped to replace surface water deliveries.
- Determine the extent of surface water-groundwater interaction in the areas where groundwater is pumped for the transfer.
- Assess the effects of the transfer on the existing groundwater system.
- Determine the direct effects of transfer pumping on the groundwater basin, including any residual effects until full recovery to pre-project water levels occurs or seasonal high levels occur in the spring of the year following the transfer.
- Assess the magnitude and significance of any effects on other legal users of water, instream beneficial uses, the environment, and the economy.
- Comply with federal and State laws and local ordinances consistent with State law.
- Coordinate the monitoring program with other established programs in the area.

Water transfers may not cause significant adverse effects to nearby federally-reserved Indian Trust Assets. Proposed transfers near Indian Trust Assets may require additional monitoring commitments, such as increased frequency of groundwater level measurements.

3.5.2 Monitoring Program Elements

To meet the objectives, a monitoring program will contain the following elements at a minimum.

Monitoring Well Network

The seller will provide documentation that the monitoring well network addresses the location of production wells, the construction of both the monitoring and production wells, the location of third-party wells, the relationship of production wells to surface water bodies, and any contaminated areas that could be affected by pumping. The monitoring program will incorporate a sufficient number of monitoring wells to accurately characterize groundwater levels in the area before, during, and after transfer-related groundwater pumping. Sellers will submit detailed information for monitoring wells which includes the well identification, well location, well construction, and geologic log information as described in section 3.3.1 of this document.

Groundwater Pumping Measurements

All wells pumping to replace surface water designated for transfer shall be configured with a permanent instantaneous and totalizing flow meter (capable of measuring well discharge rates and volumes) as described in section 3.4.2 of this document. Flow meter readings will be recorded just prior to initiation of pumping and at designated times, but no less than monthly and as close as practical to the last day of the month, throughout the duration of the transfer. The seller will report the readings and calculate and report the quantity of water pumped between successive readings. In addition, the seller will record electric meter readings and report them to the Project Agencies as requested.

To participate in future groundwater substitution transfers, participating wells should be metered during both non-transfer and transfer years so that the baseline groundwater pumping can be properly established.

Groundwater Levels

Sellers will collect groundwater level measurements in both production and monitoring wells. Groundwater level monitoring will include measurements before, during, and after transfer-related pumping. The seller will measure groundwater levels as follows:

- Prior to transfer: Groundwater levels will be measured monthly from March of the transfer year until the start of transfer.
- Start of transfer: Groundwater levels will be measured on the same day that the transfer begins, prior to the pump being turned on.
- During transfer: Groundwater levels will be measured weekly throughout the transfer period.
- Post-transfer: Groundwater levels will be measured weekly for one month after the end of transfer pumping, after which water levels will be measured monthly to March of the year following the transfer.

Sellers will submit a proposed monitoring schedule to the Project Agencies. In some cases, groundwater levels may need to be measured more often than noted above.

Groundwater Quality

Municipal water sellers must meet stringent water quality requirements regulated by the California Department of Public Health under the California Code of Regulations, Title 22. The comprehensive water quality testing requirements of Title 22 should be sufficient for the water transfer monitoring program. Project Agencies may request that sellers provide a three-year summary of all specific conductance and TDS results for water samples from each proposed transfer well for review prior to acceptance.

Agricultural water sellers shall measure the field parameter specific conductance in samples from each participating transfer well. Samples shall be collected when the seller first initiates pumping, no later than the day the pump starts, monthly during the

transfer period, and on the day that transfer pumping is terminated. Specific conductance should be measured at the same time that water level measurements are collected. The sellers shall record water quality meter calibration information, water quality measurements, and other site-specific information relevant to water quality on the field log provided by DWR.

Some wells may require a more comprehensive suite of water quality testing. These include wells in areas with known groundwater quality problems, municipal wells producing water exceeding specific conductance of 900 micro Siemens/centimeter (µS/cm), or agricultural wells producing water exceeding specific conductance of 700 µS/cm. Where applicable, sellers should provide a brief discussion of local groundwater quality issues to Project Agencies. Project Agencies and the seller will determine the appropriate level of groundwater quality monitoring prior to the start of transfer pumping in these areas.

Land Subsidence

The extent of required monitoring will depend on the susceptibility of the area to land subsidence. Areas with documented land subsidence will require more extensive monitoring than other areas. The Project Agencies will work with the seller to develop a mutually agreed upon subsidence monitoring program. Monitoring could range from periodic determination of ground surface elevation in strategic locations throughout the transfer area up to installing and monitoring extensometers.

Coordination with Other Monitoring Efforts

The monitoring program will include a plan to coordinate the collection and organization of monitoring data, and communication with the well operators and other decision makers. The monitoring plan will identify a contact person responsible for the monitoring and assembly of data. This contact person should be available to meet with the Project Agencies before the start of the transfer pumping. Together, these parties may visit the production and monitoring wells at least one month prior to the start of pumping to measure pre-pumping groundwater levels, inspect flow meter installations, and record pre-transfer meter readings. Sellers should coordinate their monitoring efforts with other local monitoring programs.

Evaluation and Reporting

The proposed monitoring program will describe the method of reporting monitoring data. At a minimum, sellers will provide data summary tables to the Project Agencies, both during and after transfer-related groundwater pumping. Post-transfer reporting will continue until water levels recover to pre-pumping levels or water levels recover to seasonal highs in the spring of the year following the transfer. Sellers will provide a final summary report to the Project Agencies evaluating the effects of the water transfer program. The final report will identify program-related impacts on groundwater and surface water (both during and after pumping), and the extent and significance, if any, of impacts on local groundwater users. It should include groundwater elevation contour maps for the area in which transfer operations are

located, showing pre-transfer groundwater elevations, groundwater elevations at the end of the transfer, and final recovered groundwater elevations.

3.6 Mitigation Program

Groundwater pumping to support water transfers is very controversial in many Northern California counties. Groundwater substitution transfer proponents need to mitigate local impacts caused by their groundwater substitution transfers. A mitigation plan must be included in the water transfer proposal.

3.6.1 Objectives

The seller must implement an effective mitigation program to investigate and correct problems that could arise due to transfer-related groundwater pumping. A number of potential impacts are sufficiently serious that they must be avoided or mitigated for a project to continue, including:

- Contribution to long-term conditions of overdraft.
- Dewatering or substantially reducing water levels in non-participating wells.
- Land subsidence.
- Degradation of groundwater quality that substantially impairs beneficial uses or violates water quality standards.
- Affecting the hydrologic regime of wetlands or streams to the extent that ecological integrity is impaired.

The seller will design and implement a monitoring and mitigation plan and will be responsible for mitigating any significant third party and environmental impacts that occur. Mitigation actions could include:

- Curtailment of pumping until natural recharge corrects the issue.
- Lowering of pump bowls in third party wells affected by transfer pumping.
- Reimbursement for significant increases in pumping costs due to the additional groundwater pumping to support the transfer.
- Other actions as appropriate.

3.6.2 Mitigation Plan Elements

To ensure that mitigation programs will be tailored to local conditions, the mitigation plan must include the following elements.

1. A procedure for the seller to receive reports of purported environmental or third party effects.
2. A procedure and schedule for investigating any reported effect.

3. A procedure for developing mitigation options for legitimate effects and schedule for implementing those options in cooperation with the affected third parties, including a strategy for conflict resolution.
4. Assurances that adequate financial resources are available to cover reasonably anticipated mitigation needs.

Sellers will submit a mitigation plan to the Project Agencies at least two months prior to the start of the groundwater substitution transfer.

If an effect is identified, the description of the effect and the sellers' proposed response will be submitted to the Project Agencies and, as required, to local agencies.

Mitigation measures will be funded by the transfer proponents, unless an agreement is made otherwise. Selling agencies will provide assurance that adequate financial resources are available to accomplish any required mitigation.

Section 4. Reservoir Storage Release

Water is made available for transfer by reservoir release when the project operators release water in excess of what would be released annually under normal operations. The water must also be released at a time when it can be captured and/or diverted downstream. Each storage facility is unique and therefore, each reservoir storage release (or reservoir re-operation) proposal must be evaluated on a case by case basis. Sufficient information must be provided to establish normal operating conditions and normal end of season storage as well as typical release patterns. Definitively establishing the without project conditions for a reservoir reoperation is difficult because normal conditions can vary substantially depending on things such as annual hydrology, agency demand and instream requirements. Sufficient information must be provided to ensure the water transfer project is providing additional storage withdrawal. Data spanning a variety of hydrologic conditions is necessary to develop without transfer or "normal" operating conditions.

At a minimum the following information is needed to evaluate the without transfer operating conditions:

- Minimum of five years' reservoir operating data, including end-of-month storage.
- End of season reservoir storage.
- Historic and forecast inflows with monthly updates.
- Historic and forecast water demands with monthly updates.
- Historic reservoir releases.
- Instream requirements,
- Flood control diagram.
- End of season target carryover storage, if any.

In addition to the information necessary to establish the without transfer conditions, information will be required during the transfer period to verify delivery of the transfer water. Such information would include independent gage information downstream of the reservoir as well as reservoir release and storage data.

4.1 Refill Criteria

Refill of the reservoir storage space vacated by the water transfer can affect downstream water users if it is done at a time when downstream legal users could have utilized reservoir releases. Refill criteria are required for all reservoir release water transfers to assure that the transfer does not injure other legal users of water. The refill period can span a number of years if the hydrology in subsequent years is insufficient to allow refill. In general, the refill of vacated space from a water transfer will be restricted to periods when the refill quantity is in excess of the needs of any

legal user of water downstream of the point of diversion. For example, if a transfer of reservoir storage originates above another reservoir, refill will not be considered to occur until the downstream reservoir goes into flood control operations. Alternately, if a transfer source directly affects the inflows to the Delta, refill will not be considered to occur until Delta is declared to be in excess conditions as defined in the Coordinated Operations Agreement between Reclamation and DWR. Each transfer is unique; thus, refill criteria must be developed for each project individually and must be tailored to these unique circumstances.

Appendix A. Potential Water Transfer Effects on the Projects

Apart from the interest of the Project Agencies in promoting responsible water transfers, they have another important interest in transfers as well—one which underlies much of what this Technical memorandum is about. Transfers through the Delta or affecting Delta water supply in the summer and fall have the inherent potential to adversely affect the SWP and the CVP. If water that is transferred by others is not new water to the system, it will necessarily come instead out of Project supply. As described more generally below, that is impermissible "legal injury."

The Projects together have the shared responsibility for meeting Delta water quality requirements and are junior to all lawful in-basin water diversions of natural flow under the watershed protection statutes. Because the Projects only export natural flow after all in-basin uses have been met, and must operate to meet Delta flow-related standards, transfers that do not provide new water to the system (or insufficient new water) will require the SWP and CVP to release water from storage or curtail diversions in order to maintain regulatory compliance. This is why the Projects must be assured that the water made available for transfer is new water that would not be in the system but for the transfer activity.

When the Projects contract to convey transferred water through their facilities, or otherwise weigh in on proposed transfers, they must be sure that the water supply to which their Project contractors are legally entitled is not unlawfully diminished by the transfer. If it is diminished, it is effectively an involuntary and uncompensated transfer of someone else's water and constitutes legal injury.

Appendix B. Rice Cropland Idling Program Conservation Measures from the Giant Garter Snake 2010/2011 Reclamation Water Transfer Program Biological Opinion

Conservation Measures. The following actions to reduce the potential of impact to the giant garter snake will be incorporated into transfer actions. As part of the approval process, Reclamation will have access to the land to verify how the water transfer is being made available and to verify that the actions to protect the giant garter snake are being implemented.

In its February 2010 Final Environmental Assessment, Reclamation has made the following commitments to avoid effects on giant garter snake.

- The block size of idled parcels will be limited to 320 acres in size with no more than 20 percent of rice fields idled cumulatively (from all sources of fallowing) in each county. The 320-acre blocks will not be located on opposite sides of a canal or other waterway, and will not be immediately adjacent[1] to another fallowed parcel (a checkerboard pattern is the preferred layout). Having the fallowed/idled rice acreage spread throughout the Sacramento Valley is Reclamation's effort to assure that the total water conveyance system remains in its normal year wetted-up condition.
- Reclamation will provide a map(s) to the Service in June of each year showing the parcels of rice land that are fallowed for the purpose of transferring water during 2010 and 2011. These maps will be prepared to comport to Reclamation's GIS [geographic information system] standards.
- Parcels participating in cropland idling will not include lands in the Natomas Basin.
- Sellers will continue to voluntarily perform giant garter snake best management practices (BMPs), including educating all district personnel to recognize and avoid contact with giant garter snake, clean only one side of a conveyance channel per year, provide rock-basking habitat in the system's water prisms, and raise flail mower blades to at least 6 inches above the canal operation and maintenance road surfaces.
- The water seller will maintain a depth of at least two feet of water in the major irrigation and drainage canals to provide movement corridors.
- A field proposed for a cropland idling transfer cannot be fallow more than two irrigation seasons in a row.

[1] An ecological judgment of reasonably close proximity may be necessary to determine if a parcel is adjacent to another parcel. Parcels separated by a man-made dike or barrier, natural river berm, and the like will be considered adjacent. With this in mind, individual crop idling/substitution proposals will have to be evaluated on a case by case basis.

- As part of a Giant Garter Snake Baseline Monitoring and Research Strategy (Monitoring Strategy) for the development of a Giant Garter Snake Conservation Strategy, in addition to the measures described above, Project Agencies are proposing research goals to help quantify and evaluate the response of the giant garter snake to rice land idling. The focus of the Monitoring Strategy will be in the Colusa, Butte, Sutter, and Yolo Basins.
- To minimize the socioeconomic effects on local areas and to minimize effects on special status species, Reclamation will not approve water transfers via cropland idling if more than 20 percent of recent harvested crop acreage in the county for each eligible crop, including rice, would be idled.

Appendix C. Well Acceptance Criteria

Table C-1 Well acceptance criteria

Well location[1]	Criteria for acceptance
Between one and two miles away from of a **major** surface water tributary to the Delta or a delineated wetland	Well(s) may be accepted if: Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta, or The well perforations are deeper than 50 feet below ground surface (bgs) and sufficient information demonstrates that the well is not connected to the surface water system tributary to the Delta. They do not pose a risk of adversely affecting groundwater quality.
Within one mile of a **major** surface water tributary to the Delta or a delineated wetland	Well(s) may be accepted if: The uppermost perforation start below 150 feet bgs; or The uppermost perforations start between 100 and 150 feet bgs and the well has a surface annular seal to at least 20 feet; a total of at least 50 percent fine-grained materials in the interval above 100 feet bgs; and at least one fine-grained layer that exceeds 40 feet in thickness in the interval above 100 feet bgs; or Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta.
Between one-half and one mile away from a **minor** surface water tributary to the Delta or a delineated wetland	Well(s) may be accepted if: Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta, or The well perforations are deeper than 50 feet bgs and sufficient information demonstrates that the well is not connected to the surface water system tributary to the Delta. They do not pose a risk of adversely affecting groundwater quality.
Within one-half mile of a **minor** surface water tributary to the Delta or a delineated wetland	Well(s) may be accepted if: The uppermost perforations start below 150 feet bgs; or The uppermost perforations start between 100 and 150 feet bgs and the wells has a surface annular seal to at least 20 feet; a total of at least 50 percent fine-grained materials in the interval above 100 feet bgs; and at least one fine-grained layer that exceeds 40 feet in thickness in the interval above 100 feet bgs; or Sufficient information is submitted to demonstrate that the well is not connected to the surface water system tributary to the Delta; or Sufficient information is submitted to demonstrate that the surface water feature does not flow during times when the Delta is in balanced conditions.

Major surface water features tributary to the Delta affected by groundwater pumping are: Sacramento River, Feather River, Big Chico Creek, Cottonwood Creek, Stony Creek, Yuba River, including the Yuba Gold Fields, American River and the Cosumnes River. **Minor** surface water features tributary to the Delta potentially affected by groundwater pumping are: Colusa Basin Drain, Tule/Toe Canal, and Natomas Cross Canal.