4.3.3 Groundwater

4.3.3.1 Delta Region

The conveyance facilities included under Alternative 4A are identical to those included under Alternative 4 and the footprint of the Alternative 4A conveyance facilities in the Delta is identical to the Alternative 4 footprint as described in Section 7.3.3.9 in Appendix A of this RDEIR/SDEIS. Therefore, impacts due to construction of the water conveyance facilities in the Delta would be identical to those described for Alternative 4, as they would occur in the same timeframe.

The effects of the operations under Alternative 4A compared to the No Action Alternative (ELT) are similar to the effects of operations under Alternative 4 as compared to the No Action Alternative (LLT) and described in the Draft EIR/EIS Chapter 7, *Groundwater*. Therefore, the effects on the Delta groundwater resources based on the comparison to each of the No Action Alternatives are similar.

Impact GW-1: During Construction, Deplete Groundwater Supplies or Interfere with Groundwater Recharge, Alter Local Groundwater Levels or Reduce the Production Capacity of Preexisting Nearby Wells

See Impact GW-1 under Alternative 4; construction activities and potential impacts under Alternative 4A would be identical to those under Alternative 4 because both alternatives have the same footprint in the Delta.

NEPA Effects: Dewatering would temporarily lower groundwater levels in the vicinity of the dewatering sites. Three areas could be subject to substantial lowering of groundwater levels: (1) In the vicinity of intake pump stations 2, 3, and 5; (2) in the vicinity of the Intermediate Forebay; and (3) in the vicinity of the expanded Clifton Court Forebay portion that includes the Byron Tract area. Groundwater-level lowering from construction dewatering activities is forecasted to be less than 10 feet in the vicinity of the intakes and the Intermediate Forebay and less than 20 feet in the vicinity of the Byron Tract Forebay. Groundwater levels within 2,600 feet of the areas to be dewatered are anticipated to experience groundwater level reductions of less than 20 feet for the duration of the dewatering activities and up to 2 months after dewatering is completed. The sustainable yield of some wells might temporarily be affected by the lower water levels such that they are not able to support existing land uses. The construction of conveyance features would result in effects on groundwater levels and associated well yields that would be temporary. These effects are considered adverse. It should be noted that the forecasted impacts described above reflect a worst-case scenario as the option of installing seepage cutoff walls during dewatering was not considered in the analysis.

CEQA Conclusion: Construction activities associated with conveyance facilities under Alternative 4A including temporary dewatering and associated reduced groundwater levels have the potential to temporarily affect the productivity of existing nearby water supply wells. Groundwater levels within 2,600 feet of the areas to be dewatered are anticipated to experience groundwater level reductions of less than 20 feet for the duration of the dewatering activities and up to 2 months after dewatering is completed. Nearby wells could experience significant reductions in well yield, if they are shallow wells and may not be able to support existing land uses. The temporary impact on groundwater levels and associated well yields is considered significant because construction-related dewatering might affect the amount of water supplied by shallow wells located near the construction sites.

Mitigation Measure GW-1 identifies a monitoring procedure and options for maintaining an adequate water supply for land owners that experience a reduction in groundwater production from wells within 2,600 feet of construction-related dewatering activities. It should be noted that the forecasted impacts described above reflect a worst-case scenario as the option of installing seepage cutoff walls during dewatering was not considered in the analysis. Implementing Mitigation Measure GW-1 would help address these effects; however, the impact may remain significant because replacement water supplies may not meet the preexisting demands or planned land use demands of the affected party. In some cases this impact might temporarily be significant and unavoidable until groundwater elevations recover to pre-construction conditions which could require several months after dewatering operations cease.

Mitigation Measure GW-1: Maintain Water Supplies in Areas Affected by Construction Dewatering

Please see Mitigation Measure GW-1 under Impact GW-1 in the discussion of Alternative 1A.

Impact GW-2: During Operations, Deplete Groundwater Supplies or Interfere with Groundwater Recharge, Alter Local Groundwater Levels or Reduce the Production Capacity of Preexisting Nearby Wells

See Impact GW-2 under Alternative 4; operations under Alternative 4A fall within the range of operations scenarios analyzed for Alternative 4.

NEPA Effects: The new Intermediate Forebay and the expanded Clifton Court Forebay would be constructed to comply with the requirements of the Division of Safety of Dams (DSD) which include design features intended to minimize seepage under the embankments. In addition, the forebays will include a seepage cutoff wall installed to the impervious layer and a toe drain around the forebay embankment, to capture water and pump it back into the forebay. Any potential vertical seepage under the smaller Intermediate Forebay would also be captured by the toe drain. However, operation of Alternative 4A would result in groundwater level increases in the vicinity of the expanded Clifton Court Forebay portion at Byron Tract due to groundwater recharge, similar to Alternative 1A.

Operation of the tunnel would have no impact on existing wells or yields given the facilities would be located more than 100 feet underground and would not substantially alter groundwater levels in the vicinity.

CEQA Conclusion: The new Intermediate Forebay and the expanded Clifton Court Forebay will include design features intended to minimize seepage under the embankments and a toe drain around the forebay embankment, to capture water and pump it back into the forebay. Any potential vertical seepage under the smaller Intermediate Forebay would also be captured by the toe drain. However, operation of Alternative 4A would result in groundwater level increases in the vicinity of the expanded Clifton Court Forebay portion at Byron Tract due to groundwater recharge, similar to Alternative 1A, which would not reduce the yields of nearby wells.

Operation of the tunnel would have no impact on existing wells or yields given these facilities would be located over 100 feet underground and would not substantially alter groundwater levels in the vicinity.

Therefore, this impact would be less than significant. No mitigation is required.

Impact GW-3: Degrade Groundwater Quality during Construction and Operation of Conveyance Facilities

See Impact GW-3 under Alternative 4; the construction activities under Alternative 4A would be identical to those under Alternative 4, which would be similar to those under Alternative 1A with a lesser magnitude, because only three intakes would be constructed (instead of five). The operations under Alternative 4A fall within the range of operations scenarios analyzed for Alternative 4.

NEPA Effects: Dewatering would temporarily lower groundwater levels and cause small changes in groundwater flow patterns near the intake pump stations along the Sacramento River, Intermediate Forebay, and Byron Tract Forebay. Since no significant regional changes in groundwater flow directions are forecasted, and the inducement of poor-quality groundwater into areas of better quality is unlikely, it is anticipated that there would be no change in groundwater quality for Alternative 4A. Further, the planned treatment of extracted groundwater prior to discharge into adjacent surface waters would prevent significant impacts on groundwater quality. There would be no adverse effect.

CEQA Conclusion: No significant groundwater quality impacts are anticipated during construction activities. Because of the temporary and localized nature of construction dewatering, the potential for the inducement of the migration of poor-quality groundwater into areas of higher quality groundwater will be low. Further, the planned treatment of extracted groundwater prior to discharge into adjacent surface waters would prevent significant impacts on groundwater quality.

No significant groundwater quality impacts are anticipated in most areas of the Delta during the implementation of Alternative 4A, because changes to regional patterns of groundwater flow are not anticipated. However, degradation of groundwater quality near the Suisun Marsh area are likely, due to the effects of saline water intrusion caused by slightly rising sea levels. Effects due to climate change are provided for informational purposes only and do not lead to mitigation. This impact would be less than significant. No mitigation is required.

Impact GW-4: During Construction of Conveyance Facilities, Interfere with Agricultural Drainage in the Delta

See Impact GW-4 under Alternative 4; construction activities under Alternative 4A would be identical to those under Alternative 4, which would be similar to those under Alternative 1A with a lesser magnitude, because only three intakes would be constructed (instead of five).

NEPA Effects: In the absence of seepage cutoff walls intended to minimize local changes to groundwater flow, the lowering of groundwater levels due to construction dewatering would temporarily affect localized shallow groundwater flow patterns during and immediately after the construction dewatering period. For the Byron Tract Forebay site, only a portion of the shallow groundwater flow will be directed inward toward the dewatering operations. Forecasted temporary changes in shallow groundwater flow directions and areas of impacts are minor near the intakes. Therefore, agricultural drainage during construction of conveyance features is not forecasted to result in adverse effects under Alternative 4A. In some instances, the lowering of groundwater levels in areas that experience near-surface water level conditions (or near-saturated root zones) would be beneficial. There would be no adverse effect.

CEQA Conclusion: The forecasted changes in shallow groundwater flow patterns due to construction dewatering activities in the Delta are localized and temporary and are not anticipated

to cause significant impacts on agricultural drainage. This impact would be less than significant. No mitigation is required.

Impact GW-5: During Operations of New Facilities, Interfere with Agricultural Drainage in the Delta

See Impact GW-5 under Alternative 4; operations under Alternative 4A would be similar to those under Alternative 4 from a footprint perspective in the Delta Region.

NEPA Effects: The Intermediate Forebay and the expanded Clifton Court Forebay will include a seepage cutoff wall to the impervious layer and a toe drain around the forebay embankment, to capture water and pump it back into the forebay. These design measures will greatly reduce any potential for seepage onto adjacent lands and avoid interference with agricultural drainage in the vicinity of the Intermediate Forebay. Once constructed, the operation of the forebay would be monitored to ensure seepage does not exceed performance requirements.

However, operation of Alternative 4A would result in local changes in shallow groundwater flow patterns adjacent to the expanded Clifton Court Forebay portion at Byron Tract, where groundwater recharge from surface water would result in groundwater level increases, similar to Alternative 4 and 1A. If existing agricultural drainage systems adjacent to the forebay are not adequate to accommodate the additional drainage requirements, operation of the forebay could interfere with agricultural drainage in the Delta. This effect would be considered adverse.

CEQA Conclusion: The Intermediate Forebay and the expanded Clifton Court Forebay will include a seepage cutoff wall to the impervious layer and a toe drain around the forebay embankment, to capture water and pump it back into the forebay. These design measures will greatly reduce any potential for seepage onto adjacent lands and avoid interference with agricultural drainage in the vicinity of the Intermediate Forebay. Once constructed, the operation of the forebay would be monitored to ensure seepage does not exceed performance requirements.

However, operation of Alternative 4A would result in local changes in shallow groundwater flow patterns adjacent to the expanded Clifton Court Forebay portion at Byron Tract, caused by groundwater recharge from surface water, and could cause significant impacts to agricultural drainage where existing systems are not adequate to accommodate the additional drainage requirements, similar to Alternative 4 and 1A. Implementation of Mitigation Measure GW-5 is anticipated to reduce this impact to a less-than-significant level in most instances, though in some instances mitigation may be infeasible due to factors such as costs that would be imprudent to bear in light of the fair market value of the affected land. The impact is therefore significant and unavoidable as applied to such latter properties.

Mitigation Measure GW-5: Agricultural Lands Seepage Minimization

Please see Mitigation Measure GW-5 under Impact GW-5 in the discussion of Alternative 1A.

Impact GW-6: Deplete Groundwater Supplies or Interfere with Groundwater Recharge Alter Local Groundwater Levels Reduce the Production Capacity of Preexisting Nearby Wells, or Interfere with Agricultural Drainage as a Result of Implementing Environmental Commitments 3, 4, 6–12, 15, and 16

NEPA Effects: Implementation of the environmental commitments under Alternative 4A could result in additional increased frequency of inundation of areas associated with the proposed tidal habitat,

channel margin habitat, and seasonally inundated floodplain restoration actions, which would result in increased groundwater recharge. Such increased recharge could result in groundwater level rises in some areas. More frequent inundation would also increase seepage, which is already difficult and expensive to control in most agricultural lands in the Delta (see Chapter 14, *Agricultural Resources*, of the Draft EIR/EIS). Effects associated with the implementation of those environmental commitments are considered adverse. The implementation of Mitigation Measure GW-5 would help address these effects by identifying areas where seepage conditions have worsened and installing additional subsurface drainage measures, as needed.

CEQA Conclusion: Implementation of the environmental commitments under Alternative 4A could result in additional increased frequency of inundation of areas associated with the proposed tidal habitat, channel margin habitat, and seasonally inundated floodplain restoration actions, which would result in increased groundwater recharge. Such increased recharge could result in groundwater level rises in some areas. More frequent inundation would also increase seepage, which is already difficult and expensive to control in most agricultural lands in the Delta (see Chapter 14, *Agricultural Resources*, of the Draft EIR/EIS). Impacts associated with the implementation of those environmental commitments would result in significant impacts. This impact would be reduced to a less-than-significant level in most instances, with the implementation of Mitigation Measure GW-5 by identifying areas where seepage conditions have worsened and installing additional subsurface drainage measures, as needed. However, this impact is still considered significant and unavoidable.

Mitigation Measure GW-5: Agricultural Lands Seepage Minimization

Please see Mitigation Measure GW-5 under Impact GW-5 in the discussion of Alternative 1A.

Impact GW-7: Degrade Groundwater Quality as a Result of Implementing Environmental Commitments 3, 4, 6–12, 15, and 16

NEPA Effects: The increased inundation frequency in restoration areas from the environmental commitments under Alternative 4A would increase the localized areas exposed to saline and brackish surface water, which would result in increased groundwater salinity beneath such areas. The flooding of large areas with saline or brackish water would result in an adverse effect on groundwater quality beneath or adjacent to flooded areas. It would not be possible to completely avoid this effect. However, if water supply wells in the vicinity of these areas are not useable because of water quality issues, Mitigation Measure GW-7 would help reduce this impact, but the impact would remain significant and unavoidable.

CEQA Conclusion: The increased inundation frequency in restoration areas from the environmental commitments under Alternative 4A would increase the localized areas exposed to saline and brackish surface water, which would result in increased groundwater salinity beneath such areas. The flooding of large areas with saline or brackish water would result in significant impacts on groundwater quality beneath or adjacent to flooded areas. It would not be possible to completely avoid this effect. However, if water supply wells in the vicinity of these areas are not useable because of water quality issues, Mitigation Measure GW-7 is available to address this effect.

Mitigation Measure GW-7: Provide an Alternate Source of Water

Please see Mitigation Measure GW-7 under Impact GW-7 in the discussion of Alternative 1A.

4.3.3.2 SWP CVP Export Service Areas

Impact GW-8: During Operations, Deplete Groundwater Supplies or Interfere with Groundwater Recharge Alter Groundwater Levels or Reduce the Production Capacity of Preexisting Nearby Wells

As described in Chapter 7 in the Draft EIR/EIS, Alternative 4 includes 4 operational scenarios, H1, H2, H3, and H4. Alternative 4A would include total long-term average annual surface water deliveries to the CVP and SWP Service Areas that range between scenarios H3 and H4 deliveries at the early long-term simulation period (see Section 4.3.1, *Water Supply*, of this RDEIR/SDEIS).

Table 4.3.3-1 below shows the long-term average SWP and CVP deliveries for Alternative 4A (ranges of deliveries represent estimates for Alternative 4 scenarios H3 and H4 at early long-term) compared to existing conditions and the No Action Alternative at early long-term.

Table 4.3.3-1. Long-Term State Water Project and Central Valley Project Deliveries to Hydrologic Regions Located South of the Delta at Early Long-Term

	Long-Term Average State Water Project and Central Valley Project Deliveries at Early Long Term(TAF/year)		
Alternative	San Joaquin and Tulare Hydrologic Region	Central Coast Hydrologic Region	Southern California Hydrologic Region
Existing Conditions	2,964	47	1,647
No Action Alternative (ELT)	2,682	43	1,580
Alternative 4A ELT	2,765–2,960	40–50	1,468–1,766

The groundwater resource impacts of Alternative 4A will be similar to those under Alternative 4 compared to the No Action Alternative LLT; but the magnitude of the impacts would be proportional to the change in the quantity of CVP and SWP surface water supplies delivered to the SWP/CVP Export Service Areas compared to the No Action Alternative at ELT. See Table 7-7, in Chapter 7, *Groundwater*, of the Draft EIR/EIS for long-term average SWP and CVP surface water deliveries at LLT.

NEPA Effects: In the San Joaquin and Tulare Hydrologic Region, total long-term average annual water deliveries to the CVP and SWP Service Areas under Alternative 4A ELT are expected to be higher than the exports under the No Action Alternative at early long-term. Increases in surface water deliveries attributable to project operations from the implementation of Alternative 4A are anticipated to result in a corresponding decrease in groundwater use in the San Joaquin and Tulare Export Service Areas as compared to the No Action Alternative (ELT), as discussed in Section 4.2.4, *Water Supply*, of this RDEIR/SDEIS. Higher groundwater levels associated with reduced overall groundwater use would result in a beneficial effect on groundwater levels. Similarly, total long-term average annual water deliveries to the CVP and SWP Service Areas under Alternative 4A at LLT are expected to be higher than the exports under the No Action Alternative at late long-term.

The total long-term average annual SWP deliveries to Southern California areas under Alternative 4A would increase by approximately 186 TAF per year or would decrease by approximately 112 TAF per year depending on the range of spring Delta outflow requirements (see Section 4.1.2, *Description of Alternative 4A*, of this RDEIR/SDEIS) as compared to the No Action Alternative (ELT). A decrease in surface water deliveries could result in an increase in groundwater pumping and a

decrease in groundwater levels, depending on the total water portfolio of the site specific areas. Therefore, decreases in surface water deliveries would result in adverse effects on groundwater levels.

When comparing the total long-term average annual SWP deliveries to Southern California areas under Alternative 4A at LLT with the No Action Alternative (LLT), deliveries would increase by approximately 184 TAF per year or would decrease by approximately 114 TAF per year depending on the range of spring Delta outflow requirements, similar to the comparison at ELT (see Table 7-7 in Chapter 7, *Groundwater*, of the Draft EIR/EIS). Therefore, the effects on groundwater resources would be similar at ELT and at LLT.

However, opportunities for additional pumping might be limited by basin adjudications and other groundwater management programs. Additionally, as discussed in Appendix 5B of the Draft EIR/EIS, *Responses to Reduced South of Delta Water Supplies*, adverse effects might be avoided due to the existence of various other water management options that could be undertaken in response to reduced exports from the Delta. These options include wastewater recycling and reuse, increased water conservation, water transfers, construction of new local reservoirs that could retain Southern California rainfall during wet years, and desalination.

Even if the effect is adverse, feasible mitigation would not be available to diminish this effect due to a number of factors. First, State Water Contractors currently and traditionally have received variable water supplies under their contracts with DWR due to variations in hydrology and regulatory constraints and are accustomed to responding accordingly. Any reductions associated with this impact would be subject to these contractual limitations. Under standard state water contracts, the risk of shortfalls in exports is borne by the contractors rather than DWR. As a result of this variability, many Southern California water districts have complex water management strategies that include numerous options, as described above, to supplement SWP surface water supplies. These water districts are in the best position to determine the appropriate response to reduced imports from the Delta. Second, as noted above, it may be legally impossible to extract additional groundwater in adjudicated basins without gaining the permission of watermasters and accounting for groundwater pumping entitlements and various parties under their adjudicated rights.

CEQA Conclusion*:* For the San Joaquin and Tulare Service Areas, total long-term average surface water deliveries under Alternative 4A at ELT and at LLT would be lower compared to Existing Conditions, largely because of effects due to climate change, sea level rise, and increased water demand north of the Delta. Groundwater pumping under Alternative 4A at ELT is anticipated to be greater than under Existing Conditions, and that groundwater levels in some areas would be lower than under Existing Conditions.

As shown above in the NEPA analysis, SWP and CVP deliveries would increase under Alternative 4A as compared to deliveries under conditions in 2025 without Alternative 4A if sea level rise and climate change conditions are considered the same. For reasons discussed in Chapter 7, *Groundwater*, Section 7.3.1, Methods for Analysis, in the Draft EIR/EIS, DWR has identified effects of action alternatives under CEQA separately from the effects of increased water demands, sea level rise, and climate change, which would occur without and independent of the Alternative 4A. Absent these factors, the impacts of Alternative 4A with respect to groundwater levels are anticipated to be less than significant because groundwater pumping is not anticipated to increase due to Alternative 4A.

Similarly to the NEPA analysis, in Southern California, long-term average surface water supplies would increase by approximately 119 TAF per year or would decrease by approximately 179 TAF per year depending on the range of spring Delta outflow requirements compared to Existing Conditions. A decrease in surface water deliveries could result in an increase in groundwater pumping and a decrease in groundwater levels, depending on the total water portfolio of the site specific areas. Therefore, decreases in surface water deliveries would result in significant impacts on groundwater resources under Alternative 4A. As discussed above in the NEPA conclusion, Southern California water districts may be able to avoid this impact due to various water management options. For reasons also discussed above, no feasible mitigation would be available to mitigate this impact if it is significant. Due to these uncertainties, the overall impact for Alternative 4A considered significant and unavoidable. When comparing the total long-term average annual SWP deliveries to Southern California areas under Alternative 4A at LLT with Existing Conditions, deliveries would increase by approximately 21 TAF per year or would decrease by approximately 277 TAF per year depending on the range of spring Delta outflow requirements, similar to the comparison at ELT (see Table 7-7 in Chapter 7, *Groundwater*, of the Draft EIR/EIS).

Impact GW-9: Degrade Groundwater Quality

NEPA Effects: As discussed under Impact GW-8, surface water deliveries to the CVP and SWP Export Service Areas in the San Joaquin Valley and Tulare Basin under Alternative 4A are expected to increase as compared to the No Action Alternative (ELT) as well as at LLT. Increased surface water deliveries could result in a decrease in groundwater use. The decreased groundwater use is not anticipated to alter regional patterns of groundwater flow in these service areas. Therefore, it is not anticipated this would result in an adverse effect on groundwater quality in these areas because similar groundwater flow patterns would not cause poor quality groundwater migration into areas of better quality groundwater as might occur with increased pumping.

Long-term average annual SWP surface water supplies to Southern California could decrease depending on the range of spring Delta outflow requirements compared to the No Action Alternative at ELT and at LLT.

It is unclear, however, whether such reductions would lead to increased groundwater pumping for reasons discussed in connection to Impact GW-8. If groundwater pumping is increased, there could be resulting changes in regional patterns of groundwater flow and a change in groundwater quality. Due to the uncertainty associated with these effects, this effect is considered adverse. For the same reasons discussed earlier in connection with the possibility of increased groundwater pumping in Southern California, there is no feasible mitigation available to mitigate any changes in regional groundwater quality.

CEQA Conclusion: As discussed under Impact GW-8 above, the impacts of Alternative 4A with respect to groundwater levels are considered to be less than significant in the CVP and SWP Export Service Areas in the San Joaquin Valley and Tulare Basin. Therefore, no significant groundwater quality impacts are anticipated in these areas during the implementation of Alternative 4A because it is not anticipated to alter regional groundwater flow patterns. Therefore, this impact is considered less than significant because groundwater levels and flow patterns would not change compared to Existing Conditions, and similar groundwater flow patterns would not cause poor quality groundwater migration into areas of better quality groundwater.

However, implementation of Alternative 4A at ELT and at LLT could degrade groundwater quality in portions of the Southern California SWP Export Service Areas; this impact is considered significant

due to the possibility of increased groundwater pumping and the resulting effects on regional groundwater flow patterns. As discussed above, there is no feasible mitigation available to address this significant impact. The impact would be considered significant and unavoidable in these areas.

Due to the uncertainties identified in connection with the potential response to Impact GW-8 under Alternative 4A in Southern California, the overall impact for Impact GW-9 Alternative 4A is considered significant and unavoidable.

Impact GW-10: Result in Groundwater Level–Induced Land Subsidence

Groundwater level-induced land subsidence has the highest potential to occur in the San Joaquin and Tulare Export Service Areas, based on historical data, if groundwater pumping substantially increases due to the Alternatives.

NEPA Effects: As discussed under Impact GW-8, surface water deliveries to the CVP and SWP Export Service Areas in the San Joaquin Valley and Tulare Basin under Alternative 4A are expected to increase as compared to the No Action Alternative (ELT) as well as at LLT. Increased surface water deliveries could result in a decrease in groundwater pumping. The decreased groundwater pumping would result in higher groundwater levels, and therefore, the potential for groundwater level-induced land subsidence is reduced under Alternative 4A. Operations under Alternative 4A would not result in an adverse effect on the potential for groundwater level-induced land subsidence in these areas because groundwater levels would not decline such that compaction of unconsolidated materials in the unconfined aquifer would occur.

CEQA Conclusion: As discussed under Impact GW-8 above, the impacts of Alternative 4A with respect to groundwater levels are considered to be less than significant in the CVP and SWP Export Service Areas in the San Joaquin Valley and Tulare Basin. Therefore, the potential for groundwater level-induced land subsidence is anticipated to be less than significant in these areas during the implementation of Alternative 4A because it is not anticipated to result in a decline in groundwater levels such that compaction of unconsolidated materials in the unconfined aquifer would occur.