These revisions are made to ensure that CM2–CM21 are described consistently where needed in the RDEIR/SDEIS and reflect additional detail that may have been developed since publication of the Draft BDCP. A discussion of the conservation measures and AMMs that have been substantively changed and that would potentially affect the characterization of impacts can be found in Appendix D.

The list of environmental commitments incorporated into all of the action alternatives (i.e., all alternatives except for the No Action/No Project Alternative) was updated extensively to account for refined project engineering. Like the formal mitigation measures prescribed in the Draft EIR/EIS, these environmental commitments, which sometimes take the form of best management practices (BMPs), were intended to avoid or minimize potential adverse effects (a NEPA term) and potential significant impacts (a CEQA term). Both DWR and the federal Lead Agencies were aware that, in many instances, the environmental commitments, as well as related "avoidance and minimization measures," functioned as *de facto* mitigation measures. The Draft EIR/EIS is therefore written with a recognition that, where appropriate and necessary, its text should explain how the environmental commitments and avoidance and minimization measures would function, and whether particular commitments or measures would or would not be effective in reducing various significant or adverse effects to less-than-significant or less-than-adverse levels. Despite these efforts in the Draft EIR/EIS, which was issued for public review in December 2013, several commenters have asserted that the document does not comply with the requirements subsequently announced by the California Court of Appeal in a January 2014 decision known as *Lotus v. Department of Transportation*.[2] In response to these comments, Appendix 3B (in Appendix A) has been significantly modified as part of this RDEIR/SDEIS. In addition to the refinements made to some of the environmental commitments, Appendix 3B as modified now includes, after each specific environmental commitment and avoidance and minimization measure, one or more narrative discussions explaining both how it reduces the severity of environmental effects and whether the level of impact reduction is sufficient to render the effects less than significant.

2.5 Analysis of Geotechnical Investigations

As described in Appendix 3B, *Environmental Commitments*, in Appendix A of this RDEIR/SDEIS, DWR will perform a series of geotechnical investigations along both the selected water conveyance alignment and at locations proposed for facilities or material borrow areas. The work to be performed will constitute a subsurface investigation program to provide information required to support the design and construction of the water conveyance facilities. Geotechnical investigations will be conducted to identify surface and subsurface conditions as necessary to complete design of the water conveyance facilities. The potential environmental effects resulting from conducting geotechnical investigations are described in Chapter 31, *Other CEQA/NEPA Required Sections*, Section 31.5.1.1, of the Draft EIR/EIS.

Following publication of the Draft EIR/EIS, DWR developed a Draft Geotechnical Exploration Plan (Phase 2) for the Alternative 4 conveyance alignment. The geotechnical investigation plan provides additional details regarding the rationale, investigation methods and locations, and criteria for obtaining subsurface soil information and laboratory test data (California Department of Water Resources 2014). Because this new information allows for a more detailed assessment of the

[2] 223 Cal.App.4th 645.

potential environmental effects resulting from geotechnical investigations than that which appeared in Chapter 31 of the Draft EIR/EIS, the activities described in the geotechnical plan have been incorporated into the revised impact analysis for Alternative 4 in this RDEIR/SDEIS (see Section 3, *Conveyance Facility Modifications to Alternative 4*, for a description of other revisions to facility design and Appendix A for revised Draft EIR/EIS text).

2.5.1 Draft Geotechnical Exploration Plan

The proposed exploration is designed as a two-part program (Phases 2a and 2b) to collect geotechnical data relevant to engineering issues associated with conveyance facility construction (as opposed to learning more about the environmental impacts of those facilities). The two-part program will allow refinement of the second part of the program to respond to findings from the first part. The proposed subsurface exploration will focus not on environmental impact issues, but on geotechnical considerations of the following aspects of water conveyance facility development: engineering considerations, construction-related considerations, permitting and regulatory requirements, and seismic characterization considerations.

The data obtained during the geotechnical exploration will be used to support the development of an appropriate geologic model, to characterize ground conditions, and to mitigate the geologic risks associated with construction of proposed facilities. The investigations will build on information previously gathered in geotechnical data reports (California Department of Water Resources 2010a, 2010b, 2011, 2013) and conceptual engineering reports (California Department of Water Resources 2009a, 2009b, 2010c, 2010d, 2010e, 2010f, 2010g, 2014, 2015) that supported analysis in the Draft EIR/EIS. A discussion of the environmental compliance efforts associated with previous geotechnical activities is provided in Appendix 4A, *Summary of Survey Data Collection Efforts,* in the Draft EIR/EIS.

Representative samples of subsurface materials will be collected from selected locations along the MPTO alignment and at proposed facility sites, and the collected samples will be tested to support design. The distance from Intake 2 (the northern extent of the MPTO) to the Clifton Court Forebay (the southern extent) is approximately 39 miles. The proposed facilities include river intakes, conveyance pipelines, sedimentation basins, pumping plants, transition structures, forebays, construction and vent shafts, access roads, bridges, and tunnels. The proposed subsurface exploration will consist of field tests and laboratory testing of soil samples. The field tests will consist of soil borings, cone penetration testing (CPT), geophysical testing, pressure meter testing, excavation of test pits, installation of piezometers and groundwater extraction wells, dissolved gas sampling, and aquifer tests. The field exploration program will be planned to evaluate soil characteristics and to collect samples for laboratory testing, which will include soil index properties, strength, compressibility, permeability, and specialty testing to support tunnel boring machine (TBM) selection and performance specification.

The proposed Phase 2a and 2b exploration on land will consist of approximately 1,500–1,550 exploration locations including drilling boreholes and performing CPTs as well as conducting approximately 60 shallow test pit excavations (typically 4 feet wide, 12 feet long, and 12 feet deep) in soils to evaluate bearing capacity, physical properties of the sediments, location of the groundwater table, and other typical geologic and geotechnical parameters. CPT consists of pushing a cone connected to a series of rods into the ground at a constant rate, allowing continuous measurements of resistance to penetration both at the cone tip and the sleeve behind the cone tip.

The resulting information correlates to the nature and sequence of subsurface soil strata, groundwater conditions, and physical and mechanical properties of soils.

Temporary pumping wells and piezometers may be installed at intake, forebay, pump shaft, and tunnel shaft sites to investigate soil permeability and to allow sampling of dissolved gases in the groundwater. Small test pits will be excavated to obtain near-surface soil samples for laboratory analysis. Drilling will take place at project sites that are readily accessible by truck or track-mounted drill rigs.

After each site is explored, the boring, CPTs, and/or piezometers will be backfilled with cement-bentonite grout in accordance with California regulations and industry standards (Water Well Standards, DWR 74-81 and 74-90). Test pits will be backfilled with the excavated material on the same day as they are excavated with the stockpiled topsoil placed at the surface and the area restored as closely as possible to its original condition.

Exploration activities may consist of auger and mud-rotary drilling with soil sampling using a standard penetration test (SPT) barrel (split spoon sampler) and Shelby tubes; cone penetrometer testing; temporary well installation; test pits; and electrical resistivity and other geophysical surveys. All exploration methods will require a drill rig and support vehicle for the drillers and vehicles for the geologists and environmental scientists. Best management practices applicable to geotechnical exploration, such as those set forth in *Draft Geotechnical Exploration Plan – Phase 2*; Draft BDCP Appendix 3.C, *Avoidance and Minimization Measures*; Appendix 3B, *Environmental Commitments,* in Appendix A of this RDEIR/SDEIS, as well as those incorporated as mitigation measures throughout the EIR/EIS, will also apply to the implementation of geotechnical explorations, where applicable (e.g., in-water activities may, in some cases, require application of a different set of commitments than activities taking place on land). Direct impacts to buildings, utilities, and known irrigation and drainage ditches will be avoided during geotechnical exploration activities. The various on-land exploration methods may last from a few hours to several days depending on the exploration method and depth.

Approximately 90–100 overwater geotechnical borings and CPTs are proposed to be drilled in the Delta waterways. These include approximately 30 overwater geotechnical borings and CPTs in the Sacramento River to obtain geotechnical data for the proposed intake structures. Approximately 25–35 overwater borings and CPTs are planned at the major water undercrossings along the planned MPTO tunnel alignment. An additional 30–35 overwater geotechnical borings and CPTs are proposed for the barge unloading facilities and Clifton Court Forebay modifications. The depths of borings and CPTs are planned to range between 100 and 200 feet below the mud line (i.e., river bottom).

DWR plans to conduct overwater drilling only during the period from August 1 to October 31 between the hours of sunrise and sunset. Duration of drilling at each location will vary depending on the number and depth of the holes, drill rate, and weather conditions, but activities are not expected to exceed 60 days at any one location. Overwater borings for the intake structures and river crossings for tunnels will be carried out by a drill ship and barge-mounted drill rigs. Best management practices applicable to construction of conveyance facilities, such as those set forth in Draft BDCP Appendix 3.C, *Avoidance and Minimization Measures*, Appendix 3B, *Environmental Commitments*, in Appendix A of this RDEIR/SDEIS, as well as those incorporated as mitigation measures throughout the EIR/EIS, will also apply to the implementation of geotechnical

explorations, where applicable and feasible (e.g., in-water activities may, in some cases, require application of a different set of commitments than activities taking place on land).

As discussed above, the proposed subsurface exploration has been structured into two major phases: 2a and 2b. The elements of Phases 2a and 2b have been defined to support engineering design and construction as described below.

2.5.1.1 Phase 2a Geotechnical Exploration

Phase 2a exploration will focus mainly on collecting data to support preliminary engineering. This includes overwater and land-based soil borings and CPTs. The overwater explorations are planned to collect subsurface information to support the design of intake structures and the major water crossings along the MPTO. Land-based explorations are planned for the intake perimeter berms, State Route 160 (SR 160), sedimentation basins, pumping plants, forebay embankments, tunnel construction and vent shafts, and other appurtenant facilities proposed for the MPTO. Approximately 600 boring and CPT locations are proposed for the Phase 2a exploration.

For the proposed MPTO tunnels, Phase 2a would entail soil borings approximately every 2,000 feet along the tunnel alignment and CPTs approximately every 2,000 feet midway between the borings. Overwater boreholes and CPTs are planned in Potato Slough, San Joaquin River, Connection Slough, and Clifton Court Forebay. All of the land-based boreholes along the tunnel alignments will be converted into piezometers. CPTs are also proposed to be co-located at every third borehole to enable calibration of the CPT data with the in-situ geology encountered in the boreholes.

For tunnel shaft sites and Clifton Court Forebay pumping plant shaft sites (see Section 3, *Conveyance Facility Modifications to Alternative 4*, of this RDEIR/SDEIS for a description of the revised location for pumping plants under the MPTO), six soil borings and four CPTs will be advanced at each planned shaft location. Once drilling is completed at each shaft site, two of the boreholes will be converted into groundwater extraction wells and the other four boreholes will be converted into piezometers.

Boreholes and CPTs are also proposed for the intake and pumping plant sites, as well as the planned location for the realignment of SR 160 adjacent to each intake. Approximately six of the boreholes at each of the north Delta diversions would be converted into piezometers.

2.5.1.2 Phase 2b Geotechnical Exploration

Phase 2b exploration is proposed to collect geotechnical data to support final design, permitting requirements, and planning for procurement and construction-related activities. In addition to soil borings and CPTs, test pits would be created as part of Phase 2b exploration. Additional explorations may also be carried out before construction to affirm the validity of the data collected during the design phase. The Phase 2b subsurface exploration will aim to collect geotechnical data from those project site areas and facility locations that have been verified by preliminary engineering and other associated studies. Approximately 950 boring, CPT, and test pit locations are proposed for the Phase 2b exploration.

For the proposed MPTO tunnels, the Phase 2b exploration will consist of advancing soil borings near the Phase 2a CPT locations such that a borehole will have been located at approximately 1,000-foot intervals along the entire tunnel alignment. CPTs will be advanced midway between the boreholes. This configuration would provide for a land-based exploratory location (borehole or CPT) spacing of

approximately 500 feet along the tunnel alignment, a spacing that generally conforms to typical design efforts for tunnels such as those proposed as part of the MPTO. The exploration proposed for the construction and ventilation shaft sites in Phase 2a would be expanded to include areas for accessing the TBMs for equipment inspection and maintenance ("safe haven intervention sites") in Phase 2b. Overwater boreholes and CPTs are planned in the Sacramento River, Snodgrass Slough, South Fork Mokelumne River, San Joaquin River, Potato Slough, Middle River, Connection Slough, Old River, North Victoria Canal, and Clifton Court Forebay.

2.5.1.3 Schedule for Geotechnical Explorations

The estimated duration to complete the proposed Phase 2a and 2b land-based explorations is about 24 months, assuming six land-based drill rigs operating concurrently for six days per week. The estimated duration to complete the Phase 2a and 2b overwater explorations is about 14 months, assuming two drill rigs operating concurrently for 6 days per week. However, to maintain the project development schedule, it is likely that 10–15 land-based drill rigs would be used simultaneously for 12–18 months to complete the exploration. The exploration duration will vary depending on the availability of site access, drilling contractors and equipment, permitting conditions, and weather. Most of the proposed explorations are planned to be performed during the first 3 years of implementation.

2.5.2 Methods for Environmental Analysis

Based on information provided in the geotechnical plan and coordination with DWR's engineering workgroup, assumptions were developed to incorporate the proposed geotechnical investigations into the analysis of relevant resource topics in this RDEIR/SDEIS. The geotechnical plan is a draft document that is based on conceptual engineering; consequently, the specific exploration locations shown on figures appended to the plan are approximate, and it is anticipated that they may be revised as engineering efforts are advanced and as access to the proposed exploration sites becomes available.

To account for this uncertainty, several steps were taken to develop assumptions for environmental analysis. First, for analyses based on the geographical extent of an impact, it was assumed that those geotechnical exploration sites will be co-located with or located adjacent to another CM1 surface feature were already considered as an affected area for the purposes of the impact analysis. For example, treating a proposed tunnel shaft location as an impact and then adding an additional impact for a geotechnical exploration proposed for the same location would lead to an overestimate of the overall impacts. However, where sites identified for on-land geotechnical explorations were not positioned with a corresponding conveyance feature or work site, several geotechnical exploration zones (GEZs) were created. These GEZs are located above the tunnel alignment, around Clifton Court Forebay, and at one existing bridge location on Bacon Island (see Mapbook Figure M3-4 for the locations of the GEZs). To account for the potential for surface impacts to take place anywhere within these zones but to avoid implying that the entire area will be affected, a proportional approach was developed to (1) estimate the typical area required for a single geotechnical investigation site (including associated access road), (2) calculate the total acreage required based on the number of sites within the GEZs, and (3) divide the total acreage required for the geotechnical investigation sites in the GEZs by the total acreage of the GEZs. This process allowed for the development of a multiplier (approximately 30%) that could be applied to specific acreage impacts in the GEZs. So, as an example for illustrative purposes, if 100 total acres within the

GEZs are identified as "prime farmland," the impact analysis would assume that geotechnical investigations would affect 30 acres. This acreage estimate would then be included as part of the overall effect reported for the MPTO water conveyance facilities.

For proximity-based analysis (such as noise), relevant "buffers" were simply applied from the outside edges of the GEZs to ensure that any effects on sensitive receptors were included in the impact analysis. For analyses associated with air quality modeling, specific assumptions regarding equipment, vehicle use, and schedule information were incorporated into the existing models used for impact analysis. Finally, it was assumed that the overwater sites identified in the geotechnical plan would be representative of the sites ultimately chosen because it is anticipated that site selection for these investigations is more constrained than sites for on-land activities. Sites for overwater exploration would be chosen at the locations for the three proposed intake structures in the Sacramento River, Clifton Court Forebay, and at major water crossings along the tunnel alignment or areas proposed for barge unloading facilities, including Snodgrass Slough, Mokelumne River, Potato Slough, San Joaquin River, Connection Slough, Middle River, Santa Fe Cut, Woodward Canal, Old River, and Italian Slough.

2.5.3 Applicability to Other Alternatives

If the Lead Agencies ultimately select an alternative that proposes an alignment different from the modified pipeline/tunnel alignment, it is anticipated that a similar plan for geotechnical exploration would be designed and implemented, as described in Appendix 3B, *Environmental Commitments*, in Appendix A of this RDEIR/SDEIS. A discussion of the potential environmental effects resulting from implementation of these activities appears in Chapter 31, *Other CEQA/NEPA Required Sections,* Section 31.5.1.1 in the Draft EIR/EIS. Because additional detail pertaining to the location and extent of these efforts under the modified pipeline/tunnel alignment has been developed since the release of the Public Draft EIR/EIS, the potential effects of these activities have been incorporated into relevant portions of the impact analysis pertaining to construction of the water conveyance facilities.

2.6 References

2.1 Fish and Aquatic Habitat Analyses

None.

2.2 Water Quality Revisions

None.

2.3 Air Quality, Health Risk Assessment, Traffic, and Noise Revisions

None.