Subject:	**Soil Balance (Final Draft)**
Project feature:	Projectwide
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1. Introduction and Purpose

The Delta Conveyance Project (Project) would include intakes along the Sacramento River between the confluences with American River and Sutter Slough, and a tunnel from the intakes to a pumping plant that discharges to a forebay at the downstream terminus of the main tunnel, referred to as the Southern Forebay. Water would either flow by gravity or be lifted by the pumping plant from the tunnel into the Southern Forebay. Discharge from the Southern Forebay would occur at the southern end of the reservoir, through the Southern Forebay Outlet Structure, and flow into the South Delta Conveyance Facilities (SDCF) for connection to the existing State Water Project (SWP) Harvey O. Banks Pumping Plant and possibly the Central Valley Project (CVP) C.W. Bill Jones Pumping Plant (Jones).

The Project would require an extensive amount of soil materials for fill at intakes, tunnel shafts, pumping plant, Southern Forebay, and SDCF. Construction would also produce an extensive amount of excavated soil materials at most of these facilities and through generation of reusable tunnel material (RTM). Traditional construction approaches frequently stockpile excavated materials during the early construction phases for reuse as fill materials to reduce the amount of soil hauled into and out of the construction-site. However, soil balancing can be more complex for long-term construction projects with limited on-site storage areas and for projects where the amount of excavated soils is substantially different than the amount of fill required for each construction site.

Construction of the Project would occur over a period of years at most construction-sites and construction would not start simultaneously at all sites. For example at the tunnel launch shaft sites, soil fill material would be required several months before the tunneling operations that would produce RTM in large volumes; and the RTM volume would be greater than the need for other fill material at most of the tunnel launch shaft sites. The purpose of the soils balance would be to reduce the need for imported construction fill material, hauling of excavated soils to disposal areas, and the extent of long-term storage of RTM at tunnel launch sites following construction.

The soil balance generally excludes consideration of fills required for road and railroad construction or modifications, since these materials are specialty imports that cannot be sourced within the Project. However, for other features such as the Southern Forebay embankment that use a combination of site-sourced fill and specialty imports, the imports are noted in the soil balance for completeness.

1.1 Organization

- Background
- Methodology and Assumptions

- Findings
- References
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1.2 Background

A project-wide assessment and soil balance model (Model) was prepared to understand and improve the balance of the total amount of soil fill material required and produced at the various Project construction-sites. The Model analyzes soil fill material including, structural and non-structural fill, topsoil, peat, and specialty materials including filter sand or riprap as described in the following subsections. The Model does not include other construction materials, such as concrete and asphalt.

An inventory was performed for each construction-site to compile fill requirements and soil generation rates and volumes associated with various earthwork activities. The schedule for each activity was applied based on the Project schedule and the duration of the construction activities. The soil balances were analyzed with respect to:

- Bank Cubic Yards (BCY): pre-excavation in situ soil volumes.
- Loose Cubic Yards (LCY): bulk material placed or piled after excavation.
- Compact Cubic Yards (CCY): compacted volumes created by the construction equipment activities.

The volumes of excavated materials were estimated in BCY (the volume of material being excavated). The BCY values were converted to LCY using a bulking factor to assess volumes for transportation and/or storage needs. The CCY values were calculated using a compaction factor to calculate fill needs throughout the Project. The methods for converting soil volumes for BCY, LCY, and CCY are further discussed in the following sections.

2. Methodology and Assumptions

The Model includes a sitewide inventory of the fill needs of each of the Project features (e.g., intakes, shafts, etc.), and of the source material generated by each of the Project features from earthwork activities. The Model calculates the needs and potential sources of material, including both on-site and import material, on a quarterly basis.

Peat and topsoil would be excavated and stored locally. Excavated peat soil would be placed in stockpiles and covered with five feet of topsoil to limit oxidation of the organic peat material. The engineering team provided information for the construction sites to identify the volume, storage height, and storage area (acres), as well as the expected stockpile duration (for temporary stockpiles) and the locations of permanent stockpiles.

2.1 Bulking and Compaction Factors

Excavated volumes from in situ conditions, as presented in BCY, would be converted to loose volumes, as presented in LCY, using a bulking factor of 1.3. The excavated volumes from in situ conditions, as presented in BCY, could be directly converted to compacted volumes, as presented in CCY, using compaction factors ranging from 0.9 to 0.99 based on several factors.

For RTM, the Model uses a bulking material of 1.3 and a compaction factor of 0.99 based on the in situ material being generally older, more consolidated deposits that are confined at tunnel depths by saturated soil load. The available geotechnical information indicates that a major portion of RTM would

be consolidated fine grained material which would expand when brought to the surface. The RTM material is expected to compact from the loose state by 5 percent due to drying and 80 percent upon compaction resulting in a compaction factor of 0.99.

For the near surface excavated materials, the Model uses compaction factors that range from 0.9 for the softer Deltaic soils to 0.95 for less compressible soils, especially for soils at the intakes and the SDCF. For import materials, the Model assumes published values from the Excavation Handbook (Horace K. Church, 1981, McGraw-Hill). Bulking and compaction factors assumed in the Model are summarized in Table 2-1.

Table 2-1. Bulking and Compaction Factors

Summary of bulking and compaction factors for different Project features

Feature/Material	BCY to LCY (Bulking)	BCY to CCY (Compaction)
Intakes	1.3	0.95
Shafts	1.3	0.9
Levees	1.3	0.9
Southern Forebay	1.3	0.9
South Delta Conveyance Facilities	1.3	0.95
Logistics (Roads, Park-and-Ride)	1.3	0.9
RTM	1.3	0.99
Clay (Damp) imported from Commercial Sources*	1.4	0.9
Gravel (Dry) imported from Commercial Sources*	1.15	0.93
Silt imported from Commercial Sources*	1.36	0.83

*Source: Church, Horace K. Excavation Handbook. McGraw-Hill, 1981

2.2 Intake Assumptions

The Model assumes that no surplus material from the intakes would be available for use on other Delta Conveyance construction sites. To accomplish this, the intake sites would be constructed in a manner that on-site excavated materials would be reused as fill material at the intake site. The material for the embankment clay cores would be imported from commercial sources. No peat is anticipated to be excavated at the intake location.

Based upon the Model input information, on-land excavation depths at the intakes would range from 23 feet to 28 feet at the Sedimentation Basins, 7 feet to 13.5 feet at the Sediment Drying Lagoons, and the range for excavation depths for other structures occurs at the intake ranging from approximately 0 feet to 20 feet on the waterside slope of the existing levee.

2.3 Shaft Assumptions

The Model assumes that the shaft pads would be constructed with fill provided from within the Project. The excavation of shafts would generate excess material that would be permanently stockpiled locally except at launch shafts where shaft excavation soil would be combined with RTM stockpiles. Any topsoil

stripped from the site or peat excavated from the shaft would be used for re-establishing vegetation at the site for post-construction erosion control.

It was assumed that fill material would be provided from the Twin Cities Complex for construction of the following shaft pads:

- Central Corridor: Twin Cities, New Hope Tract, Staten Island, Bouldin Island, Mandeville Island, and Bacon Island.
- Eastern Corridor: Twin Cities, New Hope Tract, Canal Ranch Tract, Terminous Tract, and King Island.

For the Eastern corridor, it was assumed that soil fill from Lower Roberts Island would be used to construct shaft pads at Lower Roberts Island and Upper Jones Tract. For the Southern Complex, excavated material from the Southern Forebay site and SDCF would be used to construct shaft pads for the main tunnel initial launch shaft and working shaft and for the launch shafts for the southern tunnels connecting to the SDCF.

Soil fill for shaft pads would initially be sourced by excavation of borrow at Twin Cities, Lower Roberts, or Southern Complex. Shaft excavation material may not be used for construction of shaft pads because construction of the shaft pads at each site occurs before excavation of the associated shafts. Construction of the shaft pads creates an elevated platform approximately equal to or slightly above the surrounding levee crests, which provides a flood resilient working area and helps to address issues that may arise from artesian conditions during construction of the shafts. On-site borrow areas would be backfilled with RTM from the co-located tunnel launch shaft operations. Once RTM is being generated and available for reuse, structural fill needs will prioritize the use of RTM instead of local borrow. Based upon the Model input information, maximum borrow excavation depths would be approximately 10 feet at the Twin Cities Complex, 5 feet at Lower Roberts Island, and 6 feet at the Southern Forebay.

2.4 Levee Assumptions

The Model assumes that the Twin Cities Ring Levee would be constructed using excavated soil from the Twin Cities Complex. The Model also assumes that excavated soil from the Twin Cities Complex would be used to modify existing levees on Bouldin Island. The Model assumes that that modifications to existing levees on Lower Roberts Island would be constructed using excavated materials from Lower Roberts Island initial construction activities.

2.5 Southern Forebay and Pumping Plant Assumptions

The Model assumes that topsoil stripped from the surface would be excavated to approximately 6 to 12 inches and would be stockpiled and reused on-site.

A portion of the excavated soil would be placed along the footprint of the Southern Forebay eastern embankment to consolidate the soil to improve the strength of the foundation and reduce settlement of the final embankment (referred to as “pre-loading”). The Model assumes that 10 percent of the soil placed for pre-loading would be lost due to settlement and consolidation of the foundation. Therefore, the fill need for this portion of the embankment includes an extra 10 percent to construct a pre-load embankment that matches the final configuration.

The ability to reuse excavated material at the Southern Forebay would vary across the site due to geologic conditions, as summarized in Table 2-2.

Table 2-2. Summary of the Ability to Reuse Excavated Material at the Southern Forebay

Summarizes the reusable material excavated during various activities as the Southern Forebay

Excavation Feature	Reuse Assumption
West Embankment Overcut	Assumes 90% of material would be reusable as structural fill and 10% as non-structural fill.
East Embankment Overcut	Assumes 20% of material would be reusable as non-structural fill and 80% would be waste material.
Southern Forebay Floor	Assumes 90% of material would be reusable as structural fill and 10% as non-structural fill.
6-inch Footprint Stripping	Assumes 5 feet thickness of topsoil would be placed as cover over the permanent peat stockpile.
Spillway Channel & Embankment Overcut	Assumes 20% of material would be reusable as non-structural fill and 80% would be waste material.
Italian Slough Levee Removal for Emergency Spillway	Assumes 100% of material would be reusable as non-structural fill.

As described above, the clay core, gravel, filter materials, and riprap would be imported from off-site commercial sources. Initial excavation depths at the South Delta Pumping Plant (SDPP) would be limited to removal of peat exposed during stripping to the extent practical with conventional earthwork equipment (i.e., 5-10 feet limited by the depth to groundwater). Internal excavation for the SDPP wet well and pump chamber would extend to a depth of approximately 135 feet below existing grade. Excavations of the foundation within the footprint of the Southern Forebay embankment would range from a minimum of 6 feet for removal of near surface soils but could extend to 15 feet for removal of peat deposits. Excavations within interior of the Southern Forebay would range from approximately 0 feet to 6 feet based on the intended finished grading of the forebay floor.

2.6 SDCF Assumptions

The Model assumes that early excavation of soil at the SDCF to elevation (El.) 15 feet (NAVD88) would be performed to contribute soil needed for pre-loading of the Southern Forebay eastern embankment and construction of the shaft pad for the Southern Tunnels. For 7,500 cfs options, which include a connection to CVP facilities, additional early excavation to El. 15 feet would performed and reused at the Southern Forebay, but only for the features on the west side of the Delta Mendota Canal since this material can be delivered to the SWP site using the conveyers within the connecting tunnel. The soil excavated for the bypass facilities on the east side of the Delta Mendota Canal will be stockpiled locally. Topsoil from site stripping would be stockpiled locally and used for post-construction erosion control.

2.7 RTM Assumptions

RTM generation location, timing, and quantities are documented in the Reusable Tunnel Material Technical Memorandum (DCA, 2021a). These details are imported directly into the Model, but with the following assumptions:

- Five percent of all RTM material generated would be unsuitable for reuse as structural fill.
- Approximately 20 percent of the RTM volume generated at the tunnel launch shafts at Bouldin Island (Central corridor) and Lower Roberts Island (Eastern corridor) would not be available for reuse due to settlement of the stockpiled soil.
- Approximately 5 percent of the RTM volume generated at the Southern Forebay would not be available for reuse due to settlement of the stockpiled soil.
- RTM from the Twin Cities Complex will be transported to the Southern Forebay as needed to meet the structural fill needs at that location. In general, Twin Cities Complex generates sufficient RTM to meet the fill requirements at the Southern Forebay for all flow options along Central and Eastern corridors, thus providing a consistent source to be considered in the environmental analyses.
- RTM from Bouldin Island (Central corridor) and Lower Roberts Island (Eastern corridor) would only be used for on-site uses, such as restoring topography in excavated areas at Lower Roberts Island. RTM would not be transferred to other construction sites from Bouldin Island or Lower Roberts Island. Based on the current design concepts for the project, neither site could provide sufficient RTM to meet the fill requirements at the Southern Forebay within the timeframe of construction at the Southern Forebay. For Bouldin Island all exports would be moved by truck because it was shown that use of a barge landing would be difficult due to site conditions and engineering constraints (DCA, 2021b).

3. Findings

3.1 Temporary and Permanent Stockpiles

Below is a summary of peat, topsoil, and excavated material stockpiles developed based on anticipated site conditions, constraints, and conceptual layouts (refer to the Reusable Tunnel Material Technical Memorandum (DCA, 2021a) for information regarding RTM storage). The summary includes stockpile volumes, storage heights, and storage areas (acres), as well as the expected stockpile duration (for temporary stockpiles) and the locations of permanent stockpiles. This information is presented in Table 3-1 for the Central corridor and Table 3-2 for the Eastern corridor.

The stockpile heights in Table 3-1 include an allowance to account for the effects of each stockpile's side slopes on the overall size. It was assumed that the soil would be placed with side slopes similar to the soil's natural angle of repose or as recommended by the project geotechnical engineers. An allowance of 5% was used for shorter stockpiles (less than approximately 20 feet tall) and an allowance of 10% was used for taller stockpiles (greater than approximately 20 feet tall).

For the reception and maintenance shafts the stockpile heights were determined based on the available area at the individual sites. For the launch shafts (i.e. Twin Cities, Bouldin Island, Lower Roberts Island, and the Southern Complex) a fixed height of 15 feet, where possible, was initially considered. At Bouldin Island and Lower Roberts Island that height was reduced to 10 feet to address the presence of compressible soils below the stockpiles. The Twin Cities Complex was site constrained due to flooding concerns and as a result the stockpile heights were increased.

Table 3-1. Stockpile Summary-Central Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
Intake C-E-2 (1500 cfs)	Topsoil	162161	6	10.6	10
Intake C-E-3	Topsoil	202758	6	13.2	10
Intake C-E 5	Topsoil	180272	6	11.7	10
Intake C-E 5 (1500 cfs)	Topsoil	156837	6	10.2	10
Twin Cities Complex (3000 cfs)	Topsoil	509652	11	15.9	22
Twin Cities Complex (4500 cfs)	Topsoil	622908	11	15.9	27
Twin Cities Complex (6000 cfs)	Topsoil	751894	11	15.9	32
Twin Cities Complex (7500 cfs)	Topsoil	860431	11	15.9	37
New Hope Tract (3000 cfs)	Topsoil	11672	9	0.4	23
	Peat	0			
	Excavated Material	23430	Permanent	3.7	4
New Hope Tract (4500 cfs)	Topsoil	11672	9	0.4	23
	Peat	0			
	Excavated Material	30887	Permanent	3.7	5
New Hope Tract (6000 cfs)	Topsoil	11672	9	0.4	23
	Peat	0			
	Excavated Material	36719	Permanent	3.7	6
New Hope Tract (7500 cfs)	Topsoil	11672	9	0.4	23
	Peat	0			
	Excavated Material	42118	Permanent	3.7	7
Staten Island (3000 cfs)	Topsoil	12574	8	0.7	13
	Peat	2037			
	Excavated Material	21808	Permanent	3.4	4
Staten Island (4500 cfs)	Topsoil	12574	8	0.7	14
	Peat	2685			

Table 3-1. Stockpile Summary-Central Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
	Excavated Material	28748	Permanent	3.4	5
Staten Island (6000 cfs)	Topsoil	12574	8	0.7	14
	Peat	3192			
	Excavated Material	34175	Permanent	3.4	6
Staten Island (7500 cfs)	Topsoil	12574	8	0.7	15
	Peat	3661			
	Excavated Material	39201	Permanent	3.4	7
Bouldin Island (3000 cfs)	Topsoil	202903	9	13.2	10
	Peat	7502	9	0.5	9
Bouldin Island (4500 cfs)	Topsoil	251074	9	16.3	10
	Peat	7502	9	0.5	9
Bouldin Island (6000 cfs)	Topsoil	283930	9	17.6	10
	Peat	8107	9	0.5	10
Bouldin Island (7500 cfs)	Topsoil	321296	9	20.9	10
	Peat	8735	9	0.5	11
Mandeville Island (3000 cfs)	Topsoil	14713	6	0.6	18
	Peat	2028			
	Excavated Material	22369	Permanent	3.1	5
Mandeville Island (4500 cfs)	Topsoil	14713	6	0.6	18
	Peat	2674			
	Excavated Material	29488	Permanent	3.1	6
Mandeville Island (6000 cfs)	Topsoil	14713	6	0.6	19
	Peat	3179			
	Excavated Material	35056	Permanent	3.1	7
Mandeville Island (7500 cfs)	Topsoil	14713	6	0.6	19
	Peat	3646			
	Excavated Material	40211	Permanent	3.1	9

Table 3-1. Stockpile Summary-Central Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
Bacon Island (3000 cfs)	Topsoil	15866	5	0.9	14
	Peat	3035			
	Excavated Material	22012	Permanent	3.5	4
Bacon Island (4500 cfs)	Topsoil	15866	5	0.9	15
	Peat	4001			
	Excavated Material	29017	Permanent	3.5	5
Bacon Island (6000 cfs)	Topsoil	15866	5	0.9	15
	Peat	4756			
	Excavated Material	34496	Permanent	3.5	6
Bacon Island (7500 cfs)	Topsoil	15866	5	0.9	16
	Peat	5455			
	Excavated Material	39569	Permanent	3.5	7
Southern Complex Working Shaft	Topsoil	20187	6	1.1	17
	Peat	8032			
SF-6-inch Footprint Stripping-Topsoil Stockpile (3000 cfs)	Topsoil	919931	Permanent	39.7	15
SF-6-inch Footprint Stripping-Topsoil Stockpile (4500 cfs)	Topsoil	919931	Permanent	39.7	15
SF-6-inch Footprint Stripping-Topsoil Stockpile (6000 cfs)	Topsoil	919931	Permanent	39.7	15
SF-6-inch Footprint Stripping-Topsoil Stockpile (7500 cfs)	Topsoil	919931	Permanent	39.7	15
SF-6-inch Footprint Stripping-Used to Cover Peat Stockpile	Topsoil	454831	Permanent	59.2	5
SF-East Embankment Overcut	Peat	835640	Permanent	51	12
SF-Spillway Channel & Embankment Overcut	Peat	69368	Permanent		
SF-Southern Complex Launch Shaft Excavation	Peat	5582	Permanent		
SF-Southern Tunnel Dual Launch Shaft Excavation (E)	Peat	2791	Permanent		

Table 3-1. Stockpile Summary-Central Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
SF-Southern Tunnel Dual Launch Shaft Excavation (W)	Peat	2791	Permanent		
SDCF (SWP) (3000 cfs)	Topsoil	155444	11	4.8	22
SDCF (SWP) (4500 cfs)	Topsoil	155444	11	4.8	22
SDCF (SWP) (6000 cfs)	Topsoil	155444	11	4.8	22
SDCF (SWP) (7500 cfs)	Topsoil	174351	11	5.4	22
SDCF (CVP) (7500 cfs)- East of Delta-Mendota Canal (DMC)	Topsoil	68442	11	2.0	23
	Excavated Material	813681	Permanent	22.9	24
SDCF (CVP) (7500 cfs)- West of DMC	Topsoil	36370	11	0.9	25
	Excavated Material	11135	Permanent	0.3	23

NOTE: Excavated peat soil would be placed in stockpiles and covered with five feet of topsoil to limit oxidation of the organic peat material.

Table 3-2. Stockpile Summary-Eastern Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
Intake C-E-2 (1500 cfs)	Topsoil	162161	6	10.6	10
Intake C-E-3	Topsoil	202758	6	13.2	10
Intake C-E 5	Topsoil	180272	6	11.7	10
Intake C-E 5 (1500 cfs)	Topsoil	156837	6	10.2	10
Twin Cities Complex (3000 cfs)	Topsoil	517517	12	15.9	22
Twin Cities Complex (4500 cfs)	Topsoil	626054	12	15.9	27
Twin Cities Complex (6000 cfs)	Topsoil	751894	12	15.9	32
Twin Cities Complex (7500 cfs)	Topsoil	850993	12	15.9	36
New Hope Tract (3000 cfs)	Topsoil	11210	8	0.6	12
	Peat	0			

Table 3-2. Stockpile Summary-Eastern Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
	Excavated Material	23412	Permanent	3.4	4
New Hope Tract (4500 cfs)	Topsoil	11210	8	0.6	12
	Peat	0			
	Excavated Material	30863	Permanent	3.4	6
New Hope Tract (6000 cfs)	Topsoil	11210	8	0.6	12
	Peat	0			
	Excavated Material	36690	Permanent	3.4	7
New Hope Tract (7500 cfs)	Topsoil	11210	8	0.6	12
	Peat	0			
	Excavated Material	42086	Permanent	3.4	8
Canal Ranch Tract (3000 cfs)	Topsoil	11063	9	0.5	14
	Peat	0			
	Excavated Material	23125	Permanent	3.6	4
Canal Ranch Tract (4500 cfs)	Topsoil	11063	9	0.5	14
	Peat	0			
	Excavated Material	30484	Permanent	3.6	5
Canal Ranch Tract (6000 cfs)	Topsoil	11063	9	0.5	14
	Peat	0			
	Excavated Material	36239	Permanent	3.6	6
Canal Ranch Tract (7500 cfs)	Topsoil	11063	9	0.5	14
	Peat	0			
	Excavated Material	41568	Permanent	3.6	7
Terminous Tract (3000 cfs)	Topsoil	13895	5	0.7	13
	Peat	1018			
	Excavated Material	22533	Permanent	3.4	4

Table 3-2. Stockpile Summary-Eastern Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
Terminous Tract (4500 cfs)	Topsoil	13895	5	0.7	13
	Peat	1342			
	Excavated Material	29704	Permanent	3.4	5
Terminous Tract (6000 cfs)	Topsoil	13895	5	0.7	14
	Peat	1596			
	Excavated Material	35312	Permanent	3.4	7
Terminous Tract (7500 cfs)	Topsoil	13895	5	0.7	14
	Peat	1831			
	Excavated Material	40505	Permanent	3.4	7
King Island (3000 cfs)	Topsoil	12668	6	0.7	12
	Peat	1017			
	Excavated Material	22729	Permanent	3.3	4
King Island (4500 cfs)	Topsoil	12668	6	0.7	12
	Peat	1340			
	Excavated Material	29962	Permanent	3.3	6
King Island (6000 cfs)	Topsoil	12668	6	0.7	13
	Peat	1593			
	Excavated Material	35619	Permanent	3.3	7
King Island (7500 cfs)	Topsoil	12668	6	0.7	13
	Peat	1828			
	Excavated Material	40857	Permanent	3.3	8
Lower Roberts Island (3000 cfs)	Topsoil	242797	10	15.8	10
	Peat	7481	10	1.5	3
Lower Roberts Island (4500 cfs)	Topsoil	294064	10	19.1	10
	Peat	7481	10	1.5	3
	Topsoil	330190	10	21.5	10

Table 3-2. Stockpile Summary-Eastern Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
Lower Roberts Island (6000 cfs)	Peat	8084	10	1.5	3
Lower Roberts Island (7500 cfs)	Topsoil	368738	10	24.0	10
	Peat	8711	10	1.5	4
Upper Jones Tract (3000 cfs)	Topsoil	13748	2	0.8	12
	Peat	2023			
	Excavated Material	22702	Permanent	3.3	4
Upper Jones Tract (4500 cfs)	Topsoil	13748	2	0.8	13
	Peat	2667			
	Excavated Material	29926	Permanent	3.3	6
Upper Jones Tract (6000 cfs)	Topsoil	13748	2	0.8	13
	Peat	3171			
	Excavated Material	35577	Permanent	3.3	7
Upper Jones Tract (7500 cfs)	Topsoil	13748	2	0.8	13
	Peat	3637			
	Excavated Material	40808	Permanent	3.3	8
Southern Complex Working Shaft	Topsoil	20187	6	1.1	16
	Peat	6857			
SF-6-inch Footprint Stripping-Topsoil Stockpile (3000 cfs)	Topsoil	919931	Permanent	39.7	15
SF-6-inch Footprint Stripping-Topsoil Stockpile (4500 cfs)	Topsoil	938157	Permanent	40.5	15
SF-6-inch Footprint Stripping-Topsoil Stockpile (6000 cfs)	Topsoil	951238	Permanent	41.1	15
SF-6-inch Footprint Stripping-Topsoil Stockpile (7500 cfs)	Topsoil	973265	Permanent	42.1	15
SF-6-inch Footprint Stripping-Used to Cover Peat Stockpile	Topsoil	454831	Permanent	51	6
SF-East Embankment Overcut	Peat	835640	Permanent	51	12

Table 3-2. Stockpile Summary-Eastern Alignment

Summarizes the temporary and permanent peat, topsoil, and excavated material stockpiles

Feature	Material	Volume (LCY)	Stockpile Duration (yrs)	Stockpile Area (Acres)	Stockpile Height (ft)
SF-Spillway Channel & Embankment Overcut	Peat	69368	Permanent		
SF-Southern Complex Launch Shaft Excavation	Peat	5582	Permanent		
SF-Southern Tunnel Dual Launch Shaft Excavation (E)	Peat	2791	Permanent		
SF-Southern Tunnel Dual Launch Shaft Excavation (W)	Peat	2791	Permanent		
SDCF (SWP) (3000 cfs)	Topsoil	155444	11	4.8	22
SDCF (SWP) (4500 cfs)	Topsoil	155444	11	4.8	22
SDCF (SWP) (6000 cfs)	Topsoil	155444	11	4.8	22
SDCF (SWP) (7500 cfs)	Topsoil	174351	11	5.4	22
SDCF (CVP) (7500 cfs)- East of DMC	Topsoil	68442	11	2.0	23
	Excavated Material	813681	Permanent	22.9	24
SDCF (CVP) (7500 cfs)- West of DMC	Topsoil	36370	11	0.9	25
	Excavated Material	11135	Permanent	0.3	23

NOTE: Excavated peat soil would be placed in stockpiles and covered with five feet of topsoil to limit oxidation of the organic peat material.

3.2 Feature Summaries

The Model includes a sitewide inventory for each Project feature (e.g., intakes, shafts, etc.) of the fill needs and source material generated from earthwork activities, with the exception of road and railroad fill requirements. Road and railroad fill will generally be specialty base materials that will not be generated on-site and are not included in the Model.

Results of the soil balance are provided for all options (Options 1A/B – 2A/B; Options 5A/B – 10A/B) in the following sections. For each option there are a series of tables that summarize the fill need volumes, sources, and remnant quantities for each feature.

3.2.1 Option 1A – Central Corridor with 6,000 cfs using Intakes C-E-3 and C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 1A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-3 to Table 3-13.

Table 3-3. Intake C-E-3 (Option 1A)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,855,600
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	416,267
Phase 2 Excavation	On-Site	681,809
Phase 3 Excavation	On-Site	702,524
Specialty Material	Import	55,000

Table 3-4. Intake C-E-5 (Option 1A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,684,425
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	352,106
Phase 2 Excavation	On-Site	590,719
Phase 3 Excavation	On-Site	686,600
Specialty Material	Import	55,000

Table 3-5. Twin Cities (Option 1A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-83,168
Twin Cities Ring Levee	On-Site	-217,862
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-92,409
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-242,069
Restore Topo from New Hope Borrow	Export	-50,221
Restore Topo from Staten Island Borrow	Export	-82,473
Restore Topo from Bouldin Pad Borrow	Export	-282,674
Restore Topo from Bouldin Levee Borrow	Export	-195,937
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from Twin Cities Complex (TCC)	On-Site	83,168
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	182,662

Table 3-5. Twin Cities (Option 1A)

Twin Cities Ring Levee Degrade/Stockpile	On-Site	217,862
Twin Cities Shaft Excavation	On-Site	187,596
TCC Reusable RTM	On-Site	5,279,564
Material Export/Reuse		**Volume (CCY)**
RTM to Mandeville for Shaft Pad	Export	-93,951
RTM to Bacon Island for Shaft Pad	Export	-124,077
RTM to Southern Forebay	Export	-1,750,710
Stockpile of Twin Cities Levee Degrade	On-Site	-217,862
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	-2,552,639
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-277,872

Table 3-6. New Hope Tract (Option 1A)

Needs		**Volume (CCY)**
New Hope Tract Shaft-Pad	On-Site	-45,199
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	45,199
New Hope Tract Shaft-Excavation	On-Site	36,719
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-36,719

Table 3-7. Staten Island (Option 1A)

Needs		**Volume (CCY)**
Staten Island Shaft-Pad	On-Site	-74,226
Sources		**Volume (CCY)**
Staten Island Pad Borrow from TCC	Import	74,226
Staten Island Shaft-Excavation	On-Site	34,175
Material Export/Reuse		**Volume (CCY)**
Staten Island Shaft-On Site Stockpile	On-Site	-34,175

Table 3-8. Bouldin Island (Option 1A)

Needs		Volume (CCY)
Bouldin Island Shaft-Pad	On-Site	-254,407
Bouldin Island Levee	On-Site	-264,370
Sources		**Volume (CCY)**
Bouldin Levee Borrow from TCC	Import	176,343
Bouldin Pad Borrow from TCC	Import	254,407
Bouldin Island Shaft-Excavation	On-Site	88,027
Bouldin Reusable RTM	On-Site	1,845,338
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Bouldin Island	On-Site	-1,845,338
Non-Reusable RTM Stockpile at Bouldin Island	On-Site	-123,023

Table 3-9. Mandeville Island (Option 1A)

Needs		Volume (CCY)
Mandeville Island Shaft-Pad	On-Site	-93,951
Sources		**Volume (CCY)**
From TCC -RTM for Mandeville Shaft Pad	Import	93,951
Mandeville Island Shaft-Excavation	On-Site	35,056
Material Export/Reuse		**Volume (CCY)**
Mandeville Island Shaft-On Site Stockpile	On-Site	-35,056

Table 3-10. Bacon Island (Option 1A)

Needs		Volume (CCY)
Bacon Island Shaft-Pad	On-Site	-124,077
Sources		**Volume (CCY)**
From TCC-RTM for Bacon Island Shaft Pad	Import	124,077
Bacon Island Shaft-Excavation	On-Site	34,496
Material Export/Reuse		**Volume (CCY)**
Bacon Island Shaft-On Site Stockpile	On-Site	-34,496

Table 3-11. Southern Complex Working Shaft (Option 1A)

Needs		Volume (CCY)
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-12. Southern Forebay (Option 1A)

Needs		Volume (CCY)
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
TCC RTM	Import	1,750,710
SDCF Excavation	Import	2,292,110
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay Reusable Structural RTM	On-Site	2,307,829
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	562,769
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus RTM at Southern Forebay	On-Site	0

Table 3-13. South Delta Conveyance (Option 1A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-615,539
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,023,897
SDCF Remaining Excavation (SWP)	On-Site	883,752

Table 3-13. South Delta Conveyance (Option 1A)

Material Export/Reuse		Volume (CCY)
Early Excavation to Southern Forebay (SWP)	Export	-2,023,897
Surplus to Southern Forebay (SWP/CVP)	Export	-268,213

3.2.2 Option 1B – Central Corridor with 6,000 cfs using Intakes C-E-3 and C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 1B are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-14 and Table 3-15. See Option 1A for remaining soil balance summary tables associated with Option 1B.

Table 3-14. Intake C-E-3 (Option 1B)

Needs		Volume (CCY)
Intake 3	On-Site	-1,599,912
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	376,641
Phase 2 Excavation	On-Site	648,316
Phase 3 Excavation	On-Site	519,955
Specialty Material	Import	55,000

Table 3-15. Intake C-E-5 (Option 1B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,467,850
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	322,901
Phase 2 Excavation	On-Site	544,159
Phase 3 Excavation	On-Site	545,790
Specialty Material	Import	55,000

3.2.3 Option 2A – Eastern Corridor with 6,000 cfs using Intakes C-E-3 and C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 2A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-16 to Table 3-27.

Table 3-16. Intake C-E-3 (Option 2A)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,855,600
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	416,267
Phase 2 Excavation	On-Site	681,809
Phase 3 Excavation	On-Site	702,524
Specialty Material	Import	55,000

Table 3-17. Intake C-E-5 (Option 2A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,684,425
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	352,106
Phase 2 Excavation	On-Site	590,719
Phase 3 Excavation	On-Site	686,600
Specialty Material	Import	55,000

Table 3-18. Twin Cities (Option 2A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-83,168
Twin Cities Ring Levee	On-Site	-217,862
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-92,409
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-242,069
Restore Topo from New Hope Borrow	Export	-35,387
Restore Topo from Canal Ranch Borrow	Export	-31,922
Restore Topo from Terminous Borrow	Export	-70,233
Restore Topo from King Borrow	Export	-87,176
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from TCC	On-Site	83,168
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	182,662

Table 3-18. Twin Cities (Option 2A)

Twin Cities Ring Levee Degrade/Stockpile	On-Site	217,862
Twin Cities Shaft Excavation	On-Site	186,308
TCC Reusable RTM	On-Site	4,856,268
Material Export/Reuse		**Volume (CCY)**
RTM to Southern Forebay	Export	-1,262,739
Stockpile of Twin Cities Levee Degrade	On-Site	-217,862
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	-3,220,642
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-255,593

Table 3-19. New Hope Tract (Option 2A)

Needs		**Volume (CCY)**
New Hope Tract Shaft-Pad	On-Site	-31,848
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	31,848
New Hope Tract Shaft-Excavation	On-Site	36,690
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-36,690

Table 3-20. Canal Ranch Tract (Option 2A)

Needs		**Volume (CCY)**
Canal Ranch Tract Shaft-Pad	On-Site	-28,730
Sources		**Volume (CCY)**
Canal Ranch Pad Borrow from TCC	Import	28,730
Canal Ranch Tract Shaft-Excavation	On-Site	36,239
Material Export/Reuse		**Volume (CCY)**
Canal Ranch Tract Shaft-On Site Stockpile	On-Site	-36,239

Table 3-21. Terminous Tract (Option 2A)

Needs		**Volume (CCY)**
Terminous Tract Shaft-Pad	On-Site	-63,210
Sources		**Volume (CCY)**
Terminous Pad Borrow from TCC	Import	63,210
Terminous Tract Shaft-Excavation	On-Site	35,312

Table 3-21. Terminous Tract (Option 2A)

Material Export/Reuse		Volume (CCY)
Terminous Tract Shaft-On Site Stockpile	On-Site	-35,312

Table 3-22. King Island (Option 2A)

Needs		Volume (CCY)
King Island Shaft-Pad	On-Site	-78,458
Sources		**Volume (CCY)**
King Pad Borrow from TCC	Import	78,458
King Island Shaft-Excavation	On-Site	35,619
Material Export/Reuse		**Volume (CCY)**
King Island Shaft-On Site Stockpile	On-Site	-35,619

Table 3-23. Lower Roberts Island (Option 2A)

Needs		Volume (CCY)
Lower Roberts Island Shaft-Pad	On-Site	-169,539
Lower Roberts Island Levee	On-Site	-39,424
Restore Topo from Lower Roberts Shaft Pad Borrow	On-Site	-188,377
Restore Topo from Lower Roberts Levee Borrow	On-Site	-43,804
Restore Topo from Upper Jones Shaft Pad Borrow	Export	-71,764
Sources		**Volume (CCY)**
Lower Roberts Shaft Pad Borrow from Lower Roberts	On-Site	169,539
Lower Roberts Levee Borrow from Lower Roberts	On-Site	39,424
Lower Roberts Island Shaft-Excavation	On-Site	89,146
Lower Roberts Reusable RTM	On-Site	1,744,349
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Lower Roberts Island	On-Site	-1,529,549
Non-Reusable RTM at Lower Roberts Island	On-Site	-116,290

Table 3-24. Upper Jones Tract (Option 2A)

Needs		Volume (CCY)
Upper Jones Tract Shaft-Pad	On-Site	-64,588
Sources		**Volume (CCY)**
Upper Jones Shaft Pad Borrow from Lower Roberts	Import	64,588

Table 3-24. Upper Jones Tract (Option 2A)

Upper Jones Tract Shaft-Excavation	On-Site	35,577
Material Export/Reuse		**Volume (CCY)**
Upper Jones Tract Shaft-On Site Stockpile	On-Site	-35,577

Table 3-25. Southern Complex Working Shaft (Option 2A)

Needs		**Volume (CCY)**
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-26. Southern Forebay (Option 2A)

Needs		**Volume (CCY)**
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
TCC RTM	Import	1,262,739
SDCF Excavation	Import	2,292,110
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay Reusable Structural RTM	On-Site	3,424,947
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	624,831
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus Reusable RTM at Southern Forebay	On-Site	-691,209

Table 3-27. South Delta Conveyance (Option 2A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-615,539
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,023,897
SDCF Remaining Excavation (SWP)	On-Site	883,752
Material Export/Reuse		**Volume (CCY)**
Early Excavation to Southern Forebay (SWP)	Export	-2,023,897
Surplus to Southern Forebay (SWP/CVP)	Export	-268,213

3.2.4 Option 2B – Eastern Corridor with 6,000 cfs using Intakes C-E-3 and C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 2B are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-28 and Table 3-29. See Option 2A for remaining soil balance summary tables associated with Option 2B.

Table 3-28. Intake C-E-3 (Option 2B)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,599,912
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	376,641
Phase 2 Excavation	On-Site	648,316
Phase 3 Excavation	On-Site	519,955
Specialty Material	Import	55,000

Table 3-29. Intake C-E-5 (Option 2B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,467,850
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	322,901
Phase 2 Excavation	On-Site	544,159
Phase 3 Excavation	On-Site	545,790
Specialty Material	Import	55,000

3.2.5 Option 5A – Central Corridor with 3,000 cfs at Intake C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 5A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-30 to Table 3-39.

Table 3-30. Intake C-E-5 (Option 5A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,684,425
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	352,106
Phase 2 Excavation	On-Site	590,719
Phase 3 Excavation	On-Site	686,600
Specialty Material	Import	55,000

Table 3-31. Twin Cities (Option 5A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-81,312
Twin Cities Ring Levee	On-Site	-217,862
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-90,347
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-242,069
Restore Topo from New Hope Borrow	Export	-44,036
Restore Topo from Staten Island Borrow	Export	-73,037
Restore Topo from Bouldin Pad Borrow	Export	-276,571
Restore Topo from Bouldin Levee Borrow	Export	-203,233
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from TCC	On-Site	81,312
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	182,662
Twin Cities Ring Levee Degrade/Stockpile	On-Site	217,862
Twin Cities Shaft Excavation	On-Site	173,601
TCC Reusable RTM	On-Site	2,471,094

Table 3-31. Twin Cities (Option 5A)

Needs		Volume (CCY)
Material Export/Reuse		**Volume (CCY)**
RTM to Mandeville for Shaft Pad	Export	-83,620
RTM to Bacon Island for Shaft Pad	Export	-112,423
RTM to Southern Forebay	Export	-1,519,359
Stockpile of Twin Cities Levee Degrade	On-Site	-217,862
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	0
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-130,058

Table 3-32. New Hope Tract (Option 5A)

Needs		Volume (CCY)
New Hope Tract Shaft-Pad	On-Site	-39,633
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	39,633
New Hope Tract Shaft-Excavation	On-Site	23,430
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-23,430

Table 3-33. Staten Island (Option 5A)

Needs		Volume (CCY)
Staten Island Shaft-Pad	On-Site	-65,733
Sources		**Volume (CCY)**
Staten Island Pad Borrow from TCC	Import	65,733
Staten Island Shaft-Excavation	On-Site	21,808
Material Export/Reuse		**Volume (CCY)**
Staten Island Shaft-On Site Stockpile	On-Site	-21,808

Table 3-34. Bouldin Island (Option 5A)

Needs		Volume (CCY)
Bouldin Island Shaft-Pad	On-Site	-248,914
Bouldin Island Levee	On-Site	-264,370
Sources		**Volume (CCY)**
Bouldin Levee Borrow from TCC	Import	182,910
Bouldin Pad Borrow from TCC	Import	248,914
Bouldin Island Shaft-Excavation	On-Site	81,460
Bouldin Reusable RTM	On-Site	973,011
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Bouldin Island	On-Site	-973,011
Non-Reusable RTM Stockpile at Bouldin Island	On-Site	-64,867

Table 3-35. Mandeville Island (Option 5A)

Needs		Volume (CCY)
Mandeville Island Shaft-Pad	On-Site	-83,620
Sources		**Volume (CCY)**
From TCC -RTM for Mandeville Shaft Pad	Import	83,620
Mandeville Island Shaft-Excavation	On-Site	22,369
Material Export/Reuse		**Volume (CCY)**
Mandeville Island Shaft-On Site Stockpile	On-Site	-22,369

Table 3-36. Bacon Island (Option 5A)

Needs		Volume (CCY)
Bacon Island Shaft-Pad	On-Site	-112,423
Sources		**Volume (CCY)**
From TCC-RTM for Bacon Island Shaft Pad	Import	112,423
Bacon Island Shaft-Excavation	On-Site	22,012
Material Export/Reuse		**Volume (CCY)**
Bacon Island Shaft-On Site Stockpile	On-Site	-22,012

Table 3-37. Southern Complex Working Shaft (Option 5A)

Needs		Volume (CCY)
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-38. Southern Forebay (Option 5A)

Needs		Volume (CCY)
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
Supplemental Import	Import	970,182
TCC RTM	Import	1,519,359
SDCF Excavation	Import	2,292,110
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay RTM	On-Site	1,607,885
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	523,883
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus RTM at Southern Forebay	On-Site	0

Table 3-39. South Delta Conveyance (Option 5A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-615,539
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,023,897
SDCF Remaining Excavation (SWP)	On-Site	883,752
Material Export/Reuse		**Volume (CCY)**
Early Excavation to Southern Forebay (SWP)	Export	-2,023,897
Surplus to Southern Forebay (SWP/CVP)	Export	-268,213

3.2.6 Option 5B – Central Corridor with 3,000 cfs at Intake C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 5B are detailed in individual tables summarizing the fill needs and material sources and are presented in Table 3-40. See Option 5A for remaining soil balance summary tables associated with Option 5B.

Table 3-40. Intake C-E-5 (Option 5B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,467,850
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	322,901
Phase 2 Excavation	On-Site	544,159
Phase 3 Excavation	On-Site	545,790
Specialty Material	Import	55,000

3.2.7 Option 6A – Eastern Corridor with 3,000 cfs at Intake C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 6A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-41 to Table 3-51.

Table 3-41. Intake C-E-5 (Option 6A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,684,425
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	352,106
Phase 2 Excavation	On-Site	590,719
Phase 3 Excavation	On-Site	686,600
Specialty Material	Import	55,000

Table 3-42. Twin Cities (Option 6A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-81,312
Twin Cities Ring Levee	On-Site	-217,862
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-90,347
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-242,069
Restore Topo from New Hope Borrow	Export	-30,835
Restore Topo from Canal Ranch Borrow	Export	-27,769
Restore Topo from Terminous Borrow	Export	-63,015
Restore Topo from King Borrow	Export	-77,291
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from TCC	On-Site	81,312
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	182,662
Twin Cities Ring Levee Degrade/Stockpile	On-Site	217,862
Twin Cities Shaft Excavation	On-Site	172,410
TCC Reusable RTM	On-Site	2,247,898
Material Export/Reuse		**Volume (CCY)**
RTM to Southern Forebay	Export	-1,867,824
Stockpile of Twin Cities Levee Degrade	On-Site	-217,862
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	-21,159
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-118,310

Table 3-43. New Hope Tract (Option 6A)

Needs		Volume (CCY)
New Hope Tract Shaft-Pad	On-Site	-27,752
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	27,752
New Hope Tract Shaft-Excavation	On-Site	23,412
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-23,412

Table 3-44. Canal Ranch Tract (Option 6A)

Needs		Volume (CCY)
Canal Ranch Tract Shaft-Pad	On-Site	-24,992
Sources		**Volume (CCY)**
Canal Ranch Pad Borrow from TCC	Import	24,992
Canal Ranch Tract Shaft-Excavation	On-Site	23,125
Material Export/Reuse		**Volume (CCY)**
Canal Ranch Tract Shaft-On Site Stockpile	On-Site	-23,125

Table 3-45. Terminous Tract (Option 6A)

Needs		Volume (CCY)
Terminous Tract Shaft-Pad	On-Site	-56,713
Sources		**Volume (CCY)**
Terminous Pad Borrow from TCC	Import	56,713
Terminous Tract Shaft-Excavation	On-Site	22,533
Material Export/Reuse		**Volume (CCY)**
Terminous Tract Shaft-On Site Stockpile	On-Site	-22,533

Table 3-46. King Island (Option 6A)

Needs		Volume (CCY)
King Island Shaft-Pad	On-Site	-69,562
Sources		**Volume (CCY)**
King Pad Borrow from TCC	Import	69,562
King Island Shaft-Excavation	On-Site	22,729
Material Export/Reuse		**Volume (CCY)**
King Island Shaft-On Site Stockpile	On-Site	-22,729

Table 3-47. Lower Roberts Island (Option 6A)

Needs		Volume (CCY)
Lower Roberts Island Shaft-Pad	On-Site	-169,539
Lower Roberts Island Levee	On-Site	-39,424
Restore Topo from Lower Roberts Shaft Pad Borrow	On-Site	-184,078
Restore Topo from Lower Roberts Levee Borrow	On-Site	-43,804
Restore Topo from Upper Jones Shaft Pad Borrow	Export	-63,371
Sources		**Volume (CCY)**
Lower Roberts Shaft Pad Borrow from Lower Roberts	On-Site	165,670
Lower Roberts Levee Borrow from Lower Roberts	On-Site	39,424
Lower Roberts Island Shaft-Excavation	On-Site	82,495
Lower Roberts Reusable RTM	On-Site	919,762
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Lower Roberts Island	On-Site	-711,005
Non-Reusable RTM at Lower Roberts Island	On-Site	-61,317

Table 3-48. Upper Jones Tract (Option 6A)

Needs		Volume (CCY)
Upper Jones Tract Shaft-Pad	On-Site	-57,034
Sources		**Volume (CCY)**
Upper Jones Shaft Pad Borrow from Lower Roberts	Import	57,034
Upper Jones Tract Shaft-Excavation	On-Site	22,702
Material Export/Reuse		**Volume (CCY)**
Upper Jones Tract Shaft-On Site Stockpile	On-Site	-22,702

Table 3-49. Southern Complex Working Shaft (Option 6A)

Needs		Volume (CCY)
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-50. Southern Forebay (Option 6A)

Needs		Volume (CCY)
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
Supplemental Import Needed	Import	0
TCC RTM	Import	1,867,824
SDCF Excavation	Import	2,292,110
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay Reusable Structural RTM	On-Site	2,196,920
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	556,607
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus Reusable RTM at Southern Forebay	On-Site	-42

Table 3-51. South Delta Conveyance (Option 6A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-615,539
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,023,897
SDCF Remaining Excavation (SWP)	On-Site	883,752

Table 3-51. South Delta Conveyance (Option 6A)

Material Export/Reuse		Volume (CCY)
Early Excavation to Southern Forebay (SWP)	Export	-2,023,897
Surplus to Southern Forebay (SWP/CVP)	Export	-268,213

3.2.8 Option 6B – Eastern Corridor with 3,000 cfs at Intake C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 6B are detailed in individual tables summarizing the fill needs and material sources and are presented in Table 3-52. See Option 6A for remaining soil balance summary tables associated with Option 6B.

Table 3-52. Intake C-E-5 (Option 6B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,467,850
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	322,901
Phase 2 Excavation	On-Site	544,159
Phase 3 Excavation	On-Site	545,790
Specialty Material	Import	55,000

3.2.9 Option 7A – Central Corridor with 4,500 cfs at Intake C-E-3 and Intake C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 7A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-53 to Table 3-63.

Table 3-53. Intake C-E-3 (Option 7A)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,855,600
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	416,267
Phase 2 Excavation	On-Site	681,809
Phase 3 Excavation	On-Site	702,524
Specialty Material	Import	55,000

Table 3-54. Intake C-E-5 (Option 7A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,216,907
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	263,296
Phase 2 Excavation	On-Site	417,991
Phase 3 Excavation	On-Site	480,620
Specialty Material	Import	55,000

Table 3-55. Twin Cities (Option 7A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-81,312
Twin Cities Ring Levee	On-Site	-217,862
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-90,347
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-242,069
Restore Topo from New Hope Borrow	Export	-47,625
Restore Topo from Staten Island Borrow	Export	-78,519
Restore Topo from Bouldin Pad Borrow	Export	-276,571
Restore Topo from Bouldin Levee Borrow	Export	-203,233
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from TCC	On-Site	81,312
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	182,662
Twin Cities Ring Levee Degrade/Stockpile	On-Site	217,862
Twin Cities Shaft Excavation	On-Site	173,601
TCC Reusable RTM	On-Site	3,932,698
Material Export/Reuse		**Volume (CCY)**
RTM to Mandeville for Shaft Pad	Export	-89,625
RTM to Bacon Island for Shaft Pad	Export	-119,209
RTM to Southern Forebay	Export	-2,149,430
Stockpile of Twin Cities Levee Degrade	On-Site	-217,862
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	-809,672
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-206,984

Table 3-56. New Hope Tract (Option 7A)

Needs		Volume (CCY)
New Hope Tract Shaft-Pad	On-Site	-42,863
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	42,863
New Hope Tract Shaft-Excavation	On-Site	30,887
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-30,887

Table 3-57. Staten Island Tract (Option 7A)

Needs		Volume (CCY)
Staten Island Shaft-Pad	On-Site	-70,667
Sources		**Volume (CCY)**
Staten Island Pad Borrow from TCC	Import	70,667
Staten Island Shaft-Excavation	On-Site	28,748
Material Export/Reuse		**Volume (CCY)**
Staten Island Shaft-On Site Stockpile	On-Site	-28,748

Table 3-58. Bouldin Island (Option 7A)

Needs		Volume (CCY)
Bouldin Island Shaft-Pad	On-Site	-248,914
Bouldin Island Levee	On-Site	-264,370
Sources		**Volume (CCY)**
Bouldin Levee Borrow from TCC	Import	182,910
Bouldin Pad Borrow from TCC	Import	254,407
Bouldin Island Shaft-Excavation	On-Site	81,460
Bouldin Reusable RTM	On-Site	1,374,575
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Bouldin Island	On-Site	-1,374,575
Non-Reusable RTM Stockpile at Bouldin Island	On-Site	-91,638

Table 3-59. Mandeville Island (Option 7A)

Needs		Volume (CCY)
Mandeville Island Shaft-Pad	On-Site	-89,625
Sources		**Volume (CCY)**
From TCC -RTM for Mandeville Shaft Pad	Import	89,625
Mandeville Island Shaft-Excavation	On-Site	29,488
Material Export/Reuse		**Volume (CCY)**
Mandeville Island Shaft-On Site Stockpile	On-Site	-29,488

Table 3-60. Bacon Island (Option 7A)

Needs		Volume (CCY)
Bacon Island Shaft-Pad	On-Site	-119,209
Sources		**Volume (CCY)**
From TCC-RTM for Bacon Island Shaft Pad	Import	119,209
Bacon Island Shaft-Excavation	On-Site	29,017
Material Export/Reuse		**Volume (CCY)**
Bacon Island Shaft-On Site Stockpile	On-Site	-29,017

Table 3-61. Southern Complex Working Shaft (Option 7A)

Needs		Volume (CCY)
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-62. Southern Forebay (Option 7A)

Needs		Volume (CCY)
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
TCC RTM	Import	2,149,430
SDCF Excavation	Import	2,292,110
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay Reusable Structural RTM	On-Site	1,930,095
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	541,783
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus Reusable RTM at Southern Forebay	On-Site	0

Table 3-63. South Delta Conveyance (Option 7A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-615,539
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,023,897
SDCF Remaining Excavation (SWP)	On-Site	883,752
Material Export/Reuse		**Volume (CCY)**
Early Excavation to Southern Forebay (SWP)	Export	-2,023,897
Surplus to Southern Forebay (SWP/CVP)	Export	-268,213

3.2.10 Option 7B – Central Corridor with 4,500 cfs at Intake C-E-3 and Intake C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 7B are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-64 and Table 3-65. See Option 7A for remaining soil balance summary tables associated with Option 7B.

Table 3-64. Intake C-E-3 (Option 7B)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,599,912
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	376,641
Phase 2 Excavation	On-Site	648,316
Phase 3 Excavation	On-Site	519,955
Specialty Material	Import	55,000

Table 3-65. Intake C-E-5 (Option 7B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,070,178
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	257,509
Phase 2 Excavation	On-Site	375,616
Phase 3 Excavation	On-Site	382,053
Specialty Material	Import	55,000

3.2.11 Option 8A – Eastern Corridor with 4,500 cfs using Intakes C-E-3 and C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 8A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-66 to Table 3-77.

Table 3-66. Intake C-E-3 (Option 8A)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,855,600
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	416,267
Phase 2 Excavation	On-Site	681,809
Phase 3 Excavation	On-Site	702,524
Specialty Material	Import	55,000

Table 3-67. Intake C-E-5 (Option 8A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,216,907
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	263,296
Phase 2 Excavation	On-Site	417,991
Phase 3 Excavation	On-Site	480,620
Specialty Material	Import	55,000

Table 3-68. Twin Cities (Option 8A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-81,312
Twin Cities Ring Levee	On-Site	-217,862
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-90,347
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-242,069
Restore Topo from New Hope Borrow	Export	-33,474
Restore Topo from Canal Ranch Borrow	Export	-30,177
Restore Topo from Terminous Borrow	Export	-67,214
Restore Topo from King Borrow	Export	-83,034
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from TCC	On-Site	81,312
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	182,662
Twin Cities Ring Levee Degrade/Stockpile	On-Site	217,862
Twin Cities Shaft Excavation	On-Site	172,410
TCC Reusable RTM	On-Site	3,617,389
Material Export/Reuse		**Volume (CCY)**
RTM to Southern Forebay	Export	-1,673,616
Stockpile of Twin Cities Levee Degrade	On-Site	-217,862
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	-1,569,869
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-190,389

Table 3-69. New Hope Tract (Option 8A)

Needs		Volume (CCY)
New Hope Tract Shaft-Pad	On-Site	-30,127
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	30,127
New Hope Tract Shaft-Excavation	On-Site	30,863
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-30,863

Table 3-70. Canal Ranch Tract (Option 8A)

Needs		Volume (CCY)
Canal Ranch Tract Shaft-Pad	On-Site	-27,160
Sources		**Volume (CCY)**
Canal Ranch Pad Borrow from TCC	Import	27,160
Canal Ranch Tract Shaft-Excavation	On-Site	30,484
Material Export/Reuse		**Volume (CCY)**
Canal Ranch Tract Shaft-On Site Stockpile	On-Site	-30,484

Table 3-71. Terminous Tract (Option 8A)

Needs		Volume (CCY)
Terminous Tract Shaft-Pad	On-Site	-60,492
Sources		**Volume (CCY)**
Terminous Pad Borrow from TCC	Import	60,492
Terminous Tract Shaft-Excavation	On-Site	29,704
Material Export/Reuse		**Volume (CCY)**
Terminous Tract Shaft-On Site Stockpile	On-Site	-29,704

Table 3-72. King Island (Option 8A)

Needs		Volume (CCY)
King Island Shaft-Pad	On-Site	-74,730
Sources		**Volume (CCY)**
King Pad Borrow from TCC	Import	74,730
King Island Shaft-Excavation	On-Site	29,962
Material Export/Reuse		**Volume (CCY)**
King Island Shaft-On Site Stockpile	On-Site	-29,962

Table 3-73. Lower Roberts Island (Option 8A)

Needs		Volume (CCY)
Lower Roberts Island Shaft-Pad	On-Site	-165,670
Lower Roberts Island Levee	On-Site	-39,424
Restore Topo from Lower Roberts Shaft Pad Borrow	On-Site	-184,078
Restore Topo from Lower Roberts Levee Borrow	On-Site	-43,804
Restore Topo from Upper Jones Shaft Pad Borrow	Export	-68,245
Sources		**Volume (CCY)**
Lower Roberts Shaft Pad Borrow from Lower Roberts	On-Site	165,670
Lower Roberts Levee Borrow from Lower Roberts	On-Site	39,424
Lower Roberts Island Shaft-Excavation	On-Site	82,495
Lower Roberts Reusable RTM	On-Site	1,299,350
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Lower Roberts Island	On-Site	-1,085,718
Non-Reusable RTM at Lower Roberts Island	On-Site	-86,623

Table 3-74. Upper Jones Tract (Option 8A)

Needs		Volume (CCY)
Upper Jones Tract Shaft-Pad	On-Site	-61,421
Sources		**Volume (CCY)**
Upper Jones Shaft Pad Borrow from Lower Roberts	Import	61,421
Upper Jones Tract Shaft-Excavation	On-Site	29,926
Material Export/Reuse		**Volume (CCY)**
Upper Jones Tract Shaft-On Site Stockpile	On-Site	-29,926

Table 3-75. Southern Complex Working Shaft (Option 8A)

Needs		Volume (CCY)
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-76. Southern Forebay (Option 8A)

Needs		Volume (CCY)
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
TCC RTM	Import	1,673,616
SDCF Excavation	Import	2,292,110
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay Reusable Structural RTM	On-Site	2,762,225
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	588,013
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus Reusable RTM at Southern Forebay	On-Site	-402,546

Table 3-77. South Delta Conveyance (Option 8A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-615,539
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,023,897
SDCF Remaining Excavation (SWP)	On-Site	883,752
Material Export/Reuse		**Volume (CCY)**
Early Excavation to Southern Forebay (SWP)	Export	-2,023,897
Surplus to Southern Forebay (SWP/CVP)	Export	-268,213

3.2.12 Option 8B – Eastern Corridor with 4,500 cfs using Intakes C-E-3 and C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 8B are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-78 and Table 3-79. See Option 8A for remaining soil balance summary tables associated with Option 8B.

Table 3-78. Intake C-E-3 (Option 8B)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,599,912
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	376,641
Phase 2 Excavation	On-Site	648,316
Phase 3 Excavation	On-Site	519,955
Specialty Material	Import	55,000

Table 3-79. Intake C-E-5 (Option 8B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,070,178
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	257,509
Phase 2 Excavation	On-Site	375,616
Phase 3 Excavation	On-Site	382,053
Specialty Material	Import	55,000

3.2.13 Option 9A – Central Corridor with 7,500 cfs using Intakes C-E-2, C-E-3, and C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 9A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-80 to Table 3-91.

Table 3-80. Intake C-E-2 (Option 9A)

Needs		Volume (CCY)
Intake C-E-2	On-Site	-1,596,775
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	342,596
Phase 2 Excavation	On-Site	559,220
Phase 3 Excavation	On-Site	639,959
Specialty Material	Import	55,000

Table 3-81. Intake C-E-3 (Option 9A)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,855,600
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	416,267
Phase 2 Excavation	On-Site	681,809
Phase 3 Excavation	On-Site	702,524
Specialty Material	Import	55,000

Table 3-82. Intake C-E-5 (Option 9A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,684,425
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	352,106
Phase 2 Excavation	On-Site	590,719
Phase 3 Excavation	On-Site	686,600
Specialty Material	Import	55,000

Table 3-83. Twin Cities (Option 9A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-85,044
Twin Cities Ring Levee	On-Site	-251,025
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-94,493
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-278,916
Restore Topo from New Hope Borrow	Export	-52,500
Restore Topo from Staten Island Borrow	Export	-85,940
Restore Topo from Bouldin Pad Borrow	Export	-288,844
Restore Topo from Bouldin Levee Borrow	Export	-188,357
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from TCC	On-Site	85,044
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	215,825
Twin Cities Ring Levee Degrade/Stockpile	On-Site	251,025
Twin Cities Shaft Excavation	On-Site	202,133
TCC Reusable RTM	On-Site	7,350,259
Material Export/Reuse		**Volume (CCY)**
RTM to Mandeville for Shaft Pad	Export	-97,741
RTM to Bacon Island for Shaft Pad	Export	-128,326
RTM to Southern Forebay	Export	-585,093
Stockpile of Twin Cities Levee Degrade	On-Site	-251,025
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	-5,752,181
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-386,856

Table 3-84. New Hope Tract (Option 9A)

Needs		Volume (CCY)
New Hope Tract Shaft-Pad	On-Site	-47,250
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	47,250
New Hope Tract Shaft-Excavation	On-Site	42,118
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-42,118

Table 3-85. Staten Island (Option 9A)

Needs		Volume (CCY)
Staten Island Shaft-Pad	On-Site	-77,346
Sources		**Volume (CCY)**
Staten Island Pad Borrow from TCC	Import	77,346
Staten Island Shaft-Excavation	On-Site	39,201
Material Export/Reuse		**Volume (CCY)**
Staten Island Shaft-On Site Stockpile	On-Site	-39,201

Table 3-86. Bouldin Island (Option 9A)

Needs		Volume (CCY)
Bouldin Island Shaft-Pad	On-Site	-259,960
Bouldin Island Levee	On-Site	-264,370
Sources		**Volume (CCY)**
Bouldin Levee Borrow from TCC	Import	169,522
Bouldin Pad Borrow from TCC	Import	259,960
Bouldin Island Shaft-Excavation	On-Site	94,848
Bouldin Reusable RTM	On-Site	2,350,605
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Bouldin Island	On-Site	-2,350,605
Non-Reusable RTM Stockpile at Bouldin Island	On-Site	-156,707

Table 3-87. Mandeville Island (Option 9A)

Needs		Volume (CCY)
Mandeville Island Shaft-Pad	On-Site	-97,741
Sources		**Volume (CCY)**
From TCC -RTM for Mandeville Shaft Pad	Import	97,741
Mandeville Island Shaft-Excavation	On-Site	40,211
Material Export/Reuse		**Volume (CCY)**
Mandeville Island Shaft-On Site Stockpile	On-Site	-40,211

Table 3-88. Bacon Island (Option 9A)

Needs		Volume (CCY)
Bacon Island Shaft-Pad	On-Site	-128,326
Sources		**Volume (CCY)**
From TCC-RTM for Bacon Island Shaft Pad	Import	128,326
Bacon Island Shaft-Excavation	On-Site	39,569
Material Export/Reuse		**Volume (CCY)**
Bacon Island Shaft-On Site Stockpile	On-Site	-39,569

Table 3-89. Southern Complex Working Shaft (Option 9A)

Needs		Volume (CCY)
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-90. Southern Forebay (Option 9A)

Needs		Volume (CCY)
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
TCC RTM	Import	585,093
SDCF Excavation	Import	2,913,373
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay Reusable Structural RTM	On-Site	2,823,532
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	591,419
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus Reusable RTM at Southern Forebay	On-Site	0

Table 3-91. South Delta Conveyance (Option 9A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-710,695
SDCF-West of DMC (CVP)	On-Site	-14,005
SDCF-East of DMC (CVP)	On-Site	-3,262
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,205,634
SDCF Early Excavation as a Source for Southern Forebay (CVP)	On-Site	156,132
SDCF Remaining Excavation (SWP)	On-Site	1,056,409
DMC and DMC Control Structures-West Excavation (CVP)	On-Site	118,807
DMC and DMC Control Structures-East Excavation (CVP)	On-Site	816,943
RTM from CVP Tunnel Connection	On-Site	112,227
Material Export/Reuse		**Volume (CCY)**
South Delta Excavation Stockpile on West Side of DMC (CVP)	On-Site	-11,135
South Delta Excavation Stockpile on East Side of DMC (CVP)	On-Site	-813,681
Early Excavation to Southern Forebay (SWP)	Export	-2,205,634
Early Excavation to Southern Forebay (CVP)	Export	-156,132
Surplus to Southern Forebay (SWP/CVP)	Export	-551,608

3.2.14 Option 9B – Central Corridor with 7,500 cfs using Intakes C-E-2, C-E-3, and C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 9B are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-92 to Table 3-94. See Option 9A for remaining soil balance summary tables associated with Option 9B.

Table 3-92. Intake C-E-2 (Option 9B)

Needs		Volume (CCY)
Intake C-E-2	On-Site	-1,343,579
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	299,648
Phase 2 Excavation	On-Site	461,220
Phase 3 Excavation	On-Site	527,711
Specialty Material	Import	55,000

Table 3-93. Intake C-E-3 (Option 9B)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,599,912
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	376,641
Phase 2 Excavation	On-Site	648,316
Phase 3 Excavation	On-Site	519,955
Specialty Material	Import	55,000

Table 3-94. Intake C-E-5 (Option 9B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,467,850
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	322,901
Phase 2 Excavation	On-Site	544,159
Phase 3 Excavation	On-Site	545,790
Specialty Material	Import	55,000

3.2.15 Option 10A – Eastern Corridor with 7,500 cfs using Intakes C-E-2, C-E-3, and C-E-5 with Vertical Flat Plate Screens

The results of the soil balance for each feature in Option 10A are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-95 to Table 3-107.

Table 3-95. Intake C-E-2 (Option 10A)

Needs		Volume (CCY)
Intake C-E-2	On-Site	-1,596,775
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	342,596
Phase 2 Excavation	On-Site	559,220
Phase 3 Excavation	On-Site	639,959
Specialty Material	Import	55,000

Table 3-96. Intake C-E-3 (Option 10A)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,855,600
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	416,267
Phase 2 Excavation	On-Site	681,809
Phase 3 Excavation	On-Site	702,524
Specialty Material	Import	55,000

Table 3-97. Intake C-E-5 (Option 10A)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,684,425
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	352,106
Phase 2 Excavation	On-Site	590,719
Phase 3 Excavation	On-Site	686,600
Specialty Material	Import	55,000

Table 3-98. Twin Cities (Option 10A)

Needs		Volume (CCY)
Twin Cities Shaft-Pad	On-Site	-85,044
Twin Cities Ring Levee	On-Site	-248,161
Restore Topo from Twin Cities Shaft Pad Borrow	On-Site	-94,493
Restore Topo from Twin Cities Ring Levee Borrow	On-Site	-275,734
Restore Topo from New Hope Borrow	Export	-37,067
Restore Topo from Canal Ranch Borrow	Export	-33,457
Restore Topo from Terminous Borrow	Export	-72,874
Restore Topo from King Borrow	Export	-90,805
Sources		**Volume (CCY)**
Twin Cities Shaft Pad Borrow from TCC	On-Site	85,044
Franklin Road Borrow (Twin Cities Ring Levee) from TCC	On-Site	35,200
Twin Cities Ring Levee Borrow from TCC	On-Site	212,961
Twin Cities Ring Levee Degrade/Stockpile	On-Site	248,161
Twin Cities Shaft Excavation	On-Site	200,746
TCC Reusable RTM	On-Site	6,811,063
Material Export/Reuse		**Volume (CCY)**
RTM to Southern Forebay	Export	-260,512
Stockpile of Twin Cities Levee Degrade	On-Site	-248,161
Surplus Reusable RTM Stockpile at Twin Cities	On-Site	-6,146,866
Non-Reusable RTM Stockpile at Twin Cities	On-Site	-358,477

Table 3-99. New Hope Tract (Option 10A)

Needs		Volume (CCY)
New Hope Tract Shaft-Pad	On-Site	-33,360
Sources		**Volume (CCY)**
New Hope Pad Borrow from TCC	Import	33,360
New Hope Tract Shaft-Excavation	On-Site	42,086
Material Export/Reuse		**Volume (CCY)**
New Hope Tract Shaft-On Site Stockpile	On-Site	-42,086

Table 3-100. Canal Ranch Tract (Option 10A)

Needs		Volume (CCY)
Canal Ranch Tract Shaft-Pad	On-Site	-30,111
Sources		**Volume (CCY)**
Canal Ranch Pad Borrow from TCC	Import	30,111
Canal Ranch Tract Shaft-Excavation	On-Site	41,568
Material Export/Reuse		**Volume (CCY)**
Canal Ranch Tract Shaft-On Site Stockpile	On-Site	-41,568

Table 3-101. Terminous Tract (Option 10A)

Needs		Volume (CCY)
Terminous Tract Shaft-Pad	On-Site	-65,587
Sources		**Volume (CCY)**
Terminous Pad Borrow from TCC	Import	65,587
Terminous Tract Shaft-Excavation	On-Site	40,505
Material Export/Reuse		**Volume (CCY)**
Terminous Tract Shaft-On Site Stockpile	On-Site	-40,505

Table 3-102. King Island (Option 10A)

Needs		Volume (CCY)
King Island Shaft-Pad	On-Site	-81,725
Sources		**Volume (CCY)**
King Pad Borrow from TCC	Import	81,725
King Island Shaft-Excavation	On-Site	40,857
Material Export/Reuse		**Volume (CCY)**
King Island Shaft-On Site Stockpile	On-Site	-40,857

Table 3-103. Lower Roberts Island (Option 10A)

Needs		Volume (CCY)
Lower Roberts Island Shaft-Pad	On-Site	-173,452
Lower Roberts Island Levee	On-Site	-39,424
Restore Topo from Lower Roberts Shaft Pad Borrow	On-Site	-192,724
Restore Topo from Lower Roberts Levee Borrow	On-Site	-43,804

Table 3-103. Lower Roberts Island (Option 10A)

Restore Topo from Upper Jones Shaft Pad Borrow	Export	-74,851
Sources		**Volume (CCY)**
Lower Roberts Shaft Pad Borrow from Lower Roberts	On-Site	173,452
Lower Roberts Levee Borrow from Lower Roberts	On-Site	39,424
Lower Roberts Island Shaft-Excavation	On-Site	96,054
Lower Roberts Reusable RTM	On-Site	2,221,965
Material Export/Reuse		**Volume (CCY)**
Surplus Reusable RTM at Lower Roberts Island	On-Site	-2,006,639
Non-Reusable RTM at Lower Roberts Island	On-Site	-148,131

Table 3-104. Upper Jones Tract (Option 10A)

Needs		**Volume (CCY)**
Upper Jones Tract Shaft-Pad	On-Site	-67,366
Sources		**Volume (CCY)**
Upper Jones Shaft Pad Borrow from Lower Roberts	Import	67,366
Upper Jones Tract Shaft-Excavation	On-Site	40,808
Material Export/Reuse		**Volume (CCY)**
Upper Jones Tract Shaft-On Site Stockpile	On-Site	-40,808

Table 3-105. Southern Complex Working Shaft (Option 10A)

Needs		**Volume (CCY)**
Southern Complex Working Shaft-Pad	On-Site	-154,676
Sources		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	On-Site	154,676
Southern Complex Working Shaft-Excavation	On-Site	91,859
Material Export/Reuse		**Volume (CCY)**
Southern Complex Working Shaft-On Site Stockpile	On-Site	-91,859

Table 3-106. Southern Forebay (Option 10A)

Needs		Volume (CCY)
Southern Forebay	On-Site	-9,773,366
Sources		**Volume (CCY)**
Planned Import	Import	562,053
TCC RTM	Import	260,512
SDCF Excavation	Import	2,913,373
Southern Forebay Excavation	On-Site	2,360,711
Surplus from Southern Complex Working Shaft	On-Site	91,859
Southern Forebay Reusable Structural RTM	On-Site	4,246,525
Non-Structural Material From Southern Forebay and Reusable Non-Structural RTM	On-Site	670,474
Material Export/Reuse		**Volume (CCY)**
West Embankment OC-Southern Complex Working Shaft Borrow	Export	-154,676
Surplus Reusable RTM at Southern Forebay	On-Site	-1,177,467

Table 3-107. South Delta Conveyance (Option 10A)

Needs		Volume (CCY)
SDCF (SWP)	On-Site	-710,695
SDCF-West of DMC (CVP)	On-Site	-14,005
SDCF-East of DMC (CVP)	On-Site	-3,262
Sources		**Volume (CCY)**
SDCF Early Excavation as a Source for Southern Forebay (SWP)	On-Site	2,205,634
SDCF Early Excavation as a Source for Southern Forebay (CVP)	On-Site	156,132
SDCF Remaining Excavation (SWP)	On-Site	1,056,409
DMC and DMC Control Structures-East Excavation (CVP)	On-Site	118,807
DMC and DMC Control Structures-East Excavation (CVP)	On-Site	816,943
RTM from CVP Tunnel Connection	On-Site	112,227
Material Export/Reuse		**Volume (CCY)**
South Delta Excavation Stockpile on West Side of DMC (CVP)	On-Site	-11,135

Table 3-107. South Delta Conveyance (Option 10A)

Needs		Volume (CCY)
South Delta Excavation Stockpile on East Side of DMC (CVP)	On-Site	-813,681
Early Excavation to Southern Forebay (SWP)	Export	-2,205,634
Early Excavation to Southern Forebay (CVP)	Export	-156,132
Surplus to Southern Forebay (SWP/CVP)	Export	-551,608

3.2.16 Option 10B – Eastern Corridor with 7,500 cfs using Intakes C-E-2, C-E-3, and C-E-5 with Cylindrical Tee Screens

The results of the soil balance for the intakes in Option 10B are detailed in individual tables summarizing the fill needs and material sources and are presented in Tables 3-108 to Table 3-110. See Option 10A for remaining soil balance summary tables associated with Option 10B.

Table 3-108. Intake C-E-2 (Option 10B)

Needs		Volume (CCY)
Intake C-E 2	On-Site	-1,343,579
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	299,648
Phase 2 Excavation	On-Site	461,220
Phase 3 Excavation	On-Site	527,711
Specialty Material	Import	55,000

Table 3-109. Intake C-E-3 (Option 10B)

Needs		Volume (CCY)
Intake C-E-3	On-Site	-1,599,912
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	376,641
Phase 2 Excavation	On-Site	648,316
Phase 3 Excavation	On-Site	519,955
Specialty Material	Import	55,000

Table 3-110. Intake C-E-5 (Option 10B)

Needs		Volume (CCY)
Intake C-E-5	On-Site	-1,467,850
Sources		**Volume (CCY)**
Phase 1 Excavation	On-Site	322,901
Phase 2 Excavation	On-Site	544,159
Phase 3 Excavation	On-Site	545,790
Specialty Material	Import	55,000

4. References

Church, Horace. 1980. Excavation Handbook. McGraw-Hill.

Delta Conveyance Design and Construction Authority (DCA). 2021a. Reusable Tunnel Material Technical Memorandum. Final Draft.

Delta Conveyance Design and Construction Authority (DCA). 2021b. Logistics Strategy. Final Draft.

5. Document History and Quality Assurance

Reviewers listed have completed an internal quality review check and approval process for deliverable documents that is consistent with procedures and directives identified by the Engineering Design Manager (EDM) and the DCA.

Approval Names and Roles			
Prepared by	**Internal Quality Control review by**	**Consistency review by**	**Approved for submission by**
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This interim document is considered preliminary and was prepared under the responsible charge of Matt Weil, California Professional Engineering License GE3093.