30-YEAR CAPITAL IMPROVEMENT PROGRAM 2013

FINAL DRAFT UPDATE

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RD 1000 Background

Reclamation District No. 1000 was created by an act of the State Legislature on April 8, 1911. The purpose was to allow for the reclamation of what was then known as the American Basin for agricultural purposes. The Act gave the District authority and responsibility for flood control and drainage in what has become the Natomas Basin.

The District's mission to provide flood protection to the Natomas area has not changed since its creation. However, the Natomas Basin has slowly evolved over time from an agriculturally based land use to a highly urbanized setting for a portion of the basin. The basin is expected to continue to urbanize in the future. Given the potential for flood damage and threat to public safety from a levee failure, the need for a high level of flood protection and a robust operations and maintenance plan are even more critical. The District currently maintains over 40 miles of Project Levees surrounding the perimeter of the basin to keep floodwaters from the Sacramento River, American River, Natomas East Main Drain Canal, Pleasant Grove Creek Canal and Natomas Cross Canal out of the basin. The District also operates and maintains 10 miles of non-Project Levees (back levees) in the Pleasant Grove area north and east of the District's boundaries. In addition, the District operates and maintains hundreds of miles of canals and seven pump stations in the interior to collect and safely transport and discharge storm water and agricultural runoff that either falls within the Natomas basin as rain or that is pumped into the District back into the adjacent rivers and creeks.

Efforts are currently underway to address deficiencies in the perimeter levee system and mitigate for impacts of the construction on the interior drainage system with the goal of providing Natomas at least 200 year level of flood protection (a 0.5% risk of flooding in any given year) and identifying opportunities to improve the system even beyond this level; particularly as urbanization of the basin continues.

Revenues used to operate and maintain the flood control and drainage system by the District are raised through a special benefit assessment on properties in Natomas who benefit from the flood protection provided. The assessment appears on the annual Sacramento County property tax bill as a direct levy and is designated "RD 1000". The amount of the assessment is determined by the property's use, size and location in the Natomas basin. A "typical" urban single family residential lot pays approximately $25 per year.

Purpose of Capital Improvement Program (CIP)

As part of its long term strategic planning, the District is developing a Capital Improvement Program to provide guidance to the Board of Trustees on future funding needs to meet its mission of flood protection. The purpose is to provide information to, 1) prioritize replacement of aging infrastructure; 2) improve the level of flood protection consistent with a highly urban area (with more development anticipated) by improving system reliability, adding appropriate

redundancy, making O&M more efficient, 3) improve emergency preparedness/response and 4) create a fiscally sound infrastructure replacement fund.

Maintenance of the District's network of pump stations along with its interior drainage and levee system are essential for providing adequate flood protection to the Natomas basin. In addition, as mentioned above, improvements are currently underway to increase the level of protection along the perimeter levee system. These improvements are proposed to be funded through the Federal government (Corps of Engineers or Corps), State (Central Valley Flood Protection Board) and Local (Sacramento Area Flood Control Agency or SAFCA) agencies. Currently 18 miles of levee along the Natomas Cross Canal and Sacramento River have been completed by SAFCA with the Natomas Levee Improvement Project (NLIP) using State and Local funds. The remaining work is to be completed by the Corps as part of a Federal project. Current estimates for completion are 2020 or beyond. Gaps have been left in the levee improvements adjacent to the District's pump stations where mitigation measures including raising discharge pipes, upsizing pumps/motors or relocation of the plants due to physical conflicts with the proposed levee improvements are necessary. It is anticipated these capital improvements will be funded by the Federal project; however we are describing the improvements and documenting their costs as part of this CIP to document the need and develop cost estimates to guide future decisions. Later in this report when funding options are described, it will be noted the anticipated funding source is the Corps/CVFPB/SAFCA project.

All other improvements necessary to maintain or increase the level of flood protection including; pump station operations and maintenance, upgrades and improvements to pump stations, erosion protection, emergency preparedness/response, canal improvements, and improved access are the responsibility of the District with potential funding sources described later in this report. The CIP provides descriptions and estimate costs for capital improvement projects that will be required over the next 30 years within the District. It identifies funding needs to guide decisions on future funding including increases in current assessment rates or the need for new funding sources. Revenues and expenditures for capital improvements will be included in the annual budget approved by the Board.

The map provided in Appendix A shows the overall location of the proposed improvements identified by the District and described in this Capital Improvement Program.

Natomas Levee Improvement Project Impacts

Construction of the Natomas Levee Improvements Project (NLIP) will have direct impacts on the physical layout and operation/maintenance of the District's interior pumping plants. As part of the project along the Sacramento River reach, a new higher levee is being installed adjacent to the existing levee to increase the overall level of flood protection. Impacts to the existing interior pump stations include increasing the pumping head requirements, replacement of outfall pipes so they are above the new design water surface elevation (WSE) and physical impacts to the existing pump station layout. Many of the pump stations will require replacement of discharge pipes, pumps and motors. Other pump stations will need to be reconstructed a distance

away from the levee due to conflicts with the proposed levee improvements. Costs for these improvements are estimated and included in this CIP though the anticipated funding is by outside sources.

Cost Basis Assumptions

Costs provided in this report are in current year (2013) dollars. Costs have been estimated based on recent bids received by the District on similar project improvements and bids on projects from other local agencies. Additional cost breakdowns, assumptions and quotes received during development of this CIP are provided in the Appendices to this report.

Timeline Assumptions (30-year horizon)

Projects described in this report are projected to require completion within the next 30-years. The projects are prioritized based on the existing condition of the facility, the flood risk to the public if the facility is not replaced/repaired, along with the overall costs and the District's financial constraints.

Report Sections

This report is divided into the following sections to describe the proposed improvements:

- Pumping Plant Improvements
- Pumping Plant Maintenance and Replacement Program
- Levee Improvements (other than the NLIP)
- Main Canal Improvements
- Emergency Preparedness
- Other Misc. Improvements
- Priorities/ 30-year CIP Summary
- Potential Funding Sources
- Potential Assessment Fee and Implementation Schedule

Pumping Plant Improvements

Pumping Plant 1A

Pumping Plants 1A and 1B are located along the Garden Highway directly across the street from the District office. Plant 1A was constructed in 1915 as the first pumping plant in the District. The current capacity of the pump station is 621cubic feet per second (cfs) and consists of four 650 HP centrifugal pumps. The pumping plant outlets through the levee into the Sacramento River. The outlet is located directly below the District's main office. The four pipes exiting the pump station transition into two tunnels that ultimately outlet to a structure with four arch tunnels (approximately 6-foot wide by 9-feet in height). The outlets have existing wooden flap gates to prevent reverse flow when the river level is high along with positive closure slide gates.

This pump station is not used often and must be continuously monitored during operation. Additional SCADA monitoring is recommended and discussed under a later section of this report.

Figure 1. View of Pumping Plant 1A

Proposed CIP Projects

It is anticipated the Corps will study this site further as part of the Federal project and address the issue of penetrations through the levee foundation which do not meet their standards.

Appropriate mitigation measures should be included in their project. Replacing the existing outfall tunnels would be cost prohibitive for the District due to its location which would likely require construction of a new pump station, outfall structure, relocation of the District's office and cause significant traffic impacts due to an extended closure of the Garden Highway. However, depending on the schedule for addressing the problem we are including near term mitigation measures in this CIP for consideration.

Figure 2. View of slide gates at Plant 1A

Assuming the Corps determined that the pumping plant and outfall tunnels do not need to be replaced or the timeline for the replacement is more than 10 years, additional capital rehabilitation improvements are recommended to ensure future reliable operations and maintenance of the plant. These are:

Outlet Conduits repair/lining

The concrete tunnels which pass through the levee have deteriorated over time causing them to leak. Additionally the conduits do not meet current Corps of Engineers standards (i.e. penetrations below the design WSE) which could become an issue during on-going certification of the levees. Assuming the conduits can remain in place, the future reliability issue of the conduits can be addressed either with a new lining (grouting) or a new pipeline installed inside the existing conduits that would provide similar hydraulic capacity with the annular spaces between the new and existing conduits grouted. A visual structural evaluation of the outlet was conducted on March 28, 2013. The visual inspection indicated that the basic structure was intact and the cracks were not affecting the overall structural integrity of the tunnels. Based on this visual evaluation it is recommended to repair the cracks (see photo below) and provide a lining. A cost for this option is provided in the cost section below.

The cost assumes that each of the cracks (a total of 10 are estimated) will receive a treatment that includes removing loose material, routing and cleaning out the crack area in preparation for grouting. Each of the larger cracks will then be pressure grouted to fill in any remaining voids. To help seal these areas and prevent cracks telegraphing through the new coating, a 4-ft wide carbon fiber lining will be applied and set in epoxy (see quote from FRP Construction included in Appendix B for additional detail). The cost for this work is estimated at $68,000. Other areas within the tunnel will be abrasive blasted to remove any existing bitumastic coating and provide a clean bonding surface and receive a spray-on epoxy type coating (60-80mils thick) with a primer (3-5mils thick). Tnemec Series 140F is proposed as the primer and Series 406 as the top coat (material data is included in Appendix B). This will provide a somewhat flexible, abrasive resistant coating. Small cracks will be routed out and filled with Tnemec Series 215 Surfacing Epoxy prior to applying the primer and top coat. The costs for the epoxy coating are estimated at $18 per square foot. The entire area of the tunnel is estimated at 21,500 square-feet. The entire area does not require coating. For purposes of this CIP approximately 50% of the tunnel is estimated to require coating at a cost of $193,500.

Additional information on FRP application process and product data can be found in Appendix B.

Figure 3. View of one of the larger existing cracks within the tunnels

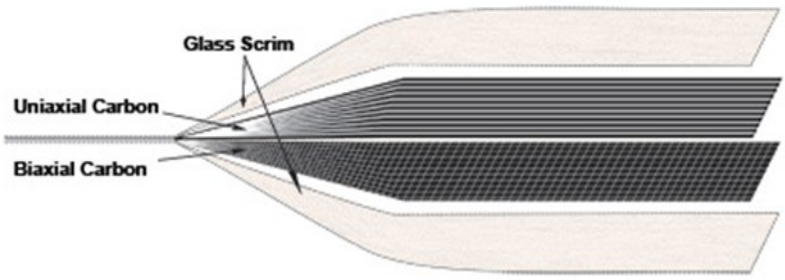

Figure 4. Cross section of Fiber Reinforced Polymer (FRP)

An alternative to line the tunnel with a PVC material that would adhere to the wall using an epoxy material was also considered. The cost for this type of lining would be more than twice the cost of the alternative described above. Costs are estimated to be between $40-50 per square-foot. Additionally, the manufacturer of these types of linings cautions that the lining may become dislodged at high velocities. This alternative is not recommended for this application.

An alternative to install a pipeline in place of the tunnels was considered. However, due to the restrictions of the arch tunnels the largest pipe that could be installed would be a 72-inch diameter. This would greatly restrict the hydraulic capacity of the outlets and therefore this alternative was determined to not be feasible.

Replace positive closure gates

The positive closure gates allow the District to manually shut off flow from the Sacramento River. The slide gates have deteriorated over time and should be replaced within the next 5 to 10-years. There are a total of four slides gates that are 6-foot wide by 9-feet tall. It is recommended to replace the existing cast iron gates with stainless steel gates that weigh less and is expected to reduce installation costs. A cost breakdown for each slide gate would include the following:

- Stainless Steel Gate (installed) = $97,800 (assuming $32,000 in material costs, $40,400 for removal/demolition and $25,400 for installation).
- Motorized actuator (installed) = $30,000

Total estimated costs for each gate are approximately $127,800. This assumes that there will be adequate access during installation (construction to occur when river level is low). Based on visual evaluations to date the concrete structure appears to be in good condition however the channel and stem require replacement. A breakdown of cost assumptions is provided in Appendix B.

Figure 5. View of existing slide gates.

An alternative to replacing the gates would be to remove the existing gates and have them sand blasted and recoated then reinstalled. An evaluation of the gates indicated that they are overall in good condition. As previously mentioned the channel and stems for the gates require replacement. Costs for rehabilitation of the existing gates is estimated to be approximately $100,000 per gate based on a rehabilitation cost of $30,000 per gate (see attached quote in Appendix B from JM Squared) along with removal/installation costs of $70,000. The costs savings from rehabilitation of the gates would be minimal compared to replacement of the gates. It is recommended to replace the gates with new stainless steel gates.

The costs presented for rehabilitation assume that this work would be contracted out through the District's standard bid process. District crews have the equipment and capability to perform a majority of this work. Additionally, the District has local vendors which could be used for the sand blasting and coating of the gates and replacement of the channels/stems. Use of District crews would cut the rehabilitation costs by approximately $200,000. This alternative assumes that the District crews would remove the gates, transport them to a local coating vendor, install the new channels and stems and re-install the gates. A breakdown of assumed costs is provided in the tables in the cost section below.

Replace wooden flap gates

Flap gates located at the outlet to the Sacramento River are constructed of older wooden and steel materials that are recommended for replacement as part of this Capital Improvement Program. There are four existing flap gates that are 6-ft by 9-ft. The flap gates are located at the end of the four tunnels prior to the slide gates. Costs for replacing the flap gates are provided below. These costs assume the use of stainless steel material for the gate. The District would also like to provide safer access to the tunnels as part of the project. This would involve the addition of a manhole structure. The structure would be constructed upstream of the flap gates near the District's main office. The existing structure for the wooden gates has deteriorated and would require improvements in order to attach new gates. Costs for the flap gates assume providing a cable and pulley system for ease in opening the gates for access.

Figure 6. View of existing wooden flap gates

Figure 7. Front view of existing wooden flap gate

Plant 1A Cost Estimate

The costs provided in the tables below were estimated from discussions with material suppliers and contractors. Costs for SCADA and added security measures are provided under a separate section of this report.

Table 1. Plant 1A Closure Gate Replacement Costs

		Plant 1A Positive Closure Gate Replacement		
Element Description	**Units**	**Estimated Quantity**	**Unit Price**	**Estimated Amount**
Install new Stainless Steel Positive Closure gates	EA	4	$ 150,000	$ 600,000
Sub-total				$ 600,000
Construction Contingency	LS	1	25%	$ 150,000
Engineering/Environmental	LS	1	15%	$ 90,000
Construction Management/Bid Services	LS	1	15%	$ 90,000
TOTAL COST =				**$ 930,000**

Table 2. Plant 1A Closure Gate Rehabilitation Alternative Costs (using District crews)

		Plant 1A Positive Closure Gate Rehabilitation		
Element Description	**Units**	**Estimated Quantity**	**Unit Price**	**Estimated Amount**
Rehab Positive Closure gates using District crews	EA	4	$ 90,000	$ 360,000
Sub-total				$ 360,000
Construction Contingency	LS	1	25%	$ 90,000
Engineering/Environmental	LS	1	15%	$ 54,000
Construction Management/Bid Services	LS	1	15%	$ 54,000
TOTAL COST =				**$ 558,000**

Table 3. Plant 1A Tunnel Repair Costs

		Plant 1A Tunnel Repairs		
Element Description	**Units**	**Estimated Quantity**	**Unit Price**	**Estimated Amount**
Outlet Conduit Crack Repair	EA	10	$ 6,800	$ 68,000
Outlet Conduit Coating (50% of surface)	SF	10750	$ 18	$ 193,500
Sub-total				$ 261,500
Construction Contingency	LS	1	25%	$ 65,375
Engineering/Environmental	LS	1	15%	$ 39,225
Construction Management/Bid Services	LS	1	15%	$ 39,225
TOTAL COST =				**$ 405,400**

Table 4. Plant 1A Flap gate Replacement Costs

		Plant 1A Flap Gate Replacement		
Element Description	**Units**	**Estimated Quantity**	**Unit Price**	**Estimated Amount**
Install new Stainless Steel Flap Gates	EA	4	$ 60,000	$ 240,000
Access manhole	LS	1	$ 150,000	$ 150,000
Sub-total				$ 390,000
Construction Contingency	LS	1	25%	$ 97,500
Engineering/Environmental	LS	1	15%	$ 58,500
Construction Management/Bid Services	LS	1	15%	$ 58,500
TOTAL COST =				**$ 604,500**

Previous Studies and Estimates

A report prepared by the Corps in 2010 for the Post-Authorization Change Report (PACR) and Interim General Reevaluation Report (see Appendix D for applicable sections of the report) included a reference to improvements at Plant 1A to include replacement of the positive closure gates and flap gates. Preliminary estimates prepared by Mead and Hunt for Plant 1A included several alternatives including replacement of the gates, complete lining of the tunnels and complete reconstruction of the tunnels (including replacement of the RD 1000 office). These estimates were prepared in 2010 and can be found in Appendix E. They were part of a preliminary draft study for the Corps. The costs are comparable to presented in this section. Based on the inclusion of these improvements in the 2010 PACR from the Corps it is assumed that these improvements will be funded through the Corps (see funding section of this report).

Pumping Plant 1B

Plant 1B was first constructed in 1959 and was later reconstructed in 2003. There have been recent upgrades to the pump station including the addition of a diesel backup generator. The current capacity of the station is 700cfs consisting of 6-400HP pumps. The pump station does not require any additional CIP projects at this time. Costs have been included in another section of this CIP for maintenance and replacement of the parts for the pumps and motors (including bearings, packing or mechanical seal, bowl wear rings, etc.) over the next 30-years. Costs for SCADA and added security measures are provided under a separate section of this report.

Previous Studies and Estimates

Improvements to Pumping Plant 1B were included in the Corps 2010 PACR and a preliminary report prepared by Mead and Hunt for the Natomas Levee Improvement project Conceptual Design Document, December 2009 (see Appendix D and E). The report found that plant 1B may be impacted by the levee improvements requiring that the discharge pipes be raised and positive closure valves installed. The discharge pipes were assumed to be raised by 1.5feet to be above the 200-year water surface elevation of 36.3 NAVD 88. The pumps would also require upgrading under this scenario. The total cost estimated for this alternative in the 2009 report is $2,200,000. Based on recent cost information it is recommended that these costs be revisited prior to the Corps funding these improvements.

Pumping Plant 2

Pumping Plant #2 is located adjacent to the Sacramento River along the Garden Highway between Elverta Road and Riego Road at the end of the North Drain Canal.

Plant 2 was originally constructed in 1917 and reconstructed in 1976. In 2006, Pumping Plant No. 2 was removed due to seepage and boils in the sump which threatened the integrity of the adjacent Sacramento River levee. The sump was filled with a fabric and rock to slow the seepage. Subsequent emergency repairs were completed at the site in the following years. RD 1000 has secured FEMA grant funds to reconstruct the pump station at a safer location farther from the levee. The contract for the Reconstruction of Pumping Plant No. 2 was awarded by the RD 1000 Board of Trustees in June 2012. The project is currently under construction. The work

through the levee was completed in 2012. The remaining work on the landside will be completed in the spring and summer of 2013. The pump station will be operational for the 2013-2014 flood season. The station will replace the previous pumping capacity provided by the removed Plant 2 (80cfs and 40cfs).

No additional CIP projects have been identified for this location. The pumps and motors will have a life expectancy of 30-40 years with proper operation and maintenance program. Costs have been included in the CIP for maintenance and replacement of the parts for the pumps and motors (including bearings, packing or mechanical seal, bowl wear rings, etc.) over the next 30-years.

Pumping Plant 3

Pumping Plant 3 is located along the Sacramento River between Elkhorn Blvd and San Juan Road and was completed in 1939. The plant underwent major modifications and increased capacity in 2001 to accommodate increased runoff from urban development. The current capacity of the pump station is 276cfs which consists of 3-200HP pumps and 1-300HP pump. The pump station will require improvements including upsizing the motor and pumps and adding an emergency generator. Modifications to the facility including the outfall and pump/motor capacity are necessary due to levee improvements completed and proposed as part of the NLIP to provide additional flood protection which requires the discharge pipes be raised above the new 200-year Water Surface Elevation. The current facility has an open bay for a future pump to be added by the developer of the Metro Air Park project to mitigate increased runoff from their project when it is developed.

Figure 8. View of Existing Pumping Plant #3

Proposed CIP Projects

As part of the NLIP a new levee adjacent has been constructed for additional flood protection; however a gap was left in the levee improvements because of conflicts with the Plant 3 layout and operations. The increased levee height will require the outlet pipelines from the pump station be raised above the new design WSE necessitating their replacement along with pump and motors to account for the additional head. The current Plant 3 discharge consists of three pipes that transition to one vault and then a single 60-inch discharge pipe. The plans developed

for this site eliminate the vault and replace the structure with three 42-inch discharge pipes. In addition the District is interested in a connection for a portable emergency generator to provide added protection to the system in the event of a power outage. It is recommended the District purchase a generator that is capable of providing power in the event of an outage that could be moved between pump station sites (see Emergency Preparedness section). Costs have been included for providing a connection for the portable generator and necessary site improvements to support it.

Estimated costs for these improvements are summarized in the table below. Cost for the pump and motor replacement along with the outlet pipe construction were estimated from recent bids on similar projects. Costs for the temporary generator hookup installation are provided and include site improvements to accommodate the generator on site (including a generator pad and grading as necessary). It is anticipated that the costs for the pump and motor replacement, new discharge pipes and outfall structure will be completed as part of the Federal project and/or NLIP.

Table 5. Pump Plant #3 Replacement Cost Estimate

		Plant 3 Replacement		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Pump/Motor Unit 1 (250HP)	EA	3	$ 250,000	$ 750,000
Pump/Motor Unit 2 (350HP)	EA	1	$ 300,000	$ 300,000
Outlet Pipe Replacement (3-42-inch pipelines)	FT	1000	$ 1,575	$ 1,575,000
Temporary Emergency Generator Hook-up Modifications	EA	1	$ 105,000	$ 105,000
Site Improvements for Generator	LS	1	$ 30,000	$ 30,000
Electrical Upgrades (switchgear/MCC, Power Service)	LS	1	$ 250,600	$ 250,600
Sub-total				$ 3,010,600
Construction Contingency	LS	1	25%	$ 752,650
Engineering/Environmental	LS	1	15%	$ 451,590
Construction Management/Bid Services	LS	1	15%	$ 451,590
TOTAL COST =				**$ 4,666,500**

Pumping Plant 4

Plant 4 is located adjacent to the Natomas Cross Canal in Sutter County on the northern perimeter of the District and was originally constructed in 1964 and later reconstructed in 1986. The current capacity of the pump station is 306 cfs and consists of 2-400HP pumps and 1-300HP pump. Improvements to the pump station are required due to the NLIP improvements and the recently completed improvements by the Natomas Central Mutual Water Company's new water supply canal. A low point was left in the levee at this location to accommodate the replacement of the outfall pipes through the levee. The existing pumps and motors were not capable of lifting the water above the new 200-year design WSE as required by the Corps.

Figure 9. View of existing Pumping Plant #4

Proposed CIP Projects

Potential improvements to the pump station include relocating the station approximately 300 to 500 feet from the proposed new levee due to topography at the current site (poor drainage) and geotechnical concerns. Since the height of the levee will be increased the pumps and motors must be replaced to account for the new head requirements. The outfall pipes will be replaced as well to meet the Corps standard of being above the 200-year water surface elevation through the levee.

An alternative to moving the entire pump station would be to raise the electrical equipment and motors by adding a second floor to the existing pump station, along with improving access and site drainage. The cost for this alternative would be less than the alternative for relocating the pump station but would not address the geotechnical concerns at the site and is not the preferred alternative. However, it is being included in the CIP as an alternative should the plant replacement be delayed. A structural evaluation of the site was conducted on March 28, 2013 which included review of the original design plans. The structural evaluation indicated that the alternative to raise the pump station is feasible with minor structural modifications. A cost breakdown is provided below with assumptions listed in Appendix C. It is anticipated that the costs to replace and/or modify Plant 4 will be the responsibility of the Federal flood control project and/or NLIP.

The estimated cost to relocate the pump station is provided in the table below and additional cost assumptions are included in Appendix C. Costs for SCADA and added security measures are provided under a separate section of this report.

Table 6. Pumping Plant #4 Replacement Cost Estimate

		Plant 4 Replacement		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Demolition	LS	1	$ 600,000	$ 600,000
Site Improvements	LS	1	$1,800,000	$ 1,800,000
Dewatering	LS	1	$ 600,000	$ 600,000
Structural Improvements	LS	1	$1,644,000	$ 1,644,000
Trash Rack	LS	1	$ 630,000	$ 630,000
Site Fencing	LF	1500	$ 35	$ 52,500
Pump/Motor Unit (400HP)	EA	1	$ 300,000	$ 300,000
Pump/Motor Unit (500HP)	EA	2	$ 350,000	$ 700,000
Outlet Piping Improvements (assume 2-48inch and 1-42inch)	LF	1000	$ 1,175	$ 1,175,000
Electrical Improvements	LS	1	$1,500,000	$ 1,500,000
Sub-total				$ 9,001,500
Construction Contingency	LS	1	25%	$ 2,250,375
Engineering/Environmental	LS	1	15%	$ 1,350,225
Construction Management/Bid Services	LS	1	15%	$ 1,350,225
TOTAL COST =				**$ 13,952,400**

Table 7. Pumping Plant #4 Raising Existing Structure Alternative

		Plant 4 - Rasing Existing Structure Alternative		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Site Improvements	LS	1	$ 50,000	$ 50,000
Demolition	LS	1	$ 150,000	$ 150,000
Structural Improvements	LS	1	$ 255,000	$ 255,000
Trash Rack	LS	1	$ 630,000	$ 630,000
Site Fencing	LF	1500	$ 35	$ 52,500
Outlet Piping Improvements (assume 2-48inch and 1-42inch)	LF	1000	$ 1,175	$ 1,175,000
Pump/Motor Unit (400HP)	EA	1	$ 300,000	$ 300,000
Pump/Motor Unit (500HP)	EA	2	$ 350,000	$ 700,000
Electrical Improvements	LS	1	$ 850,000	$ 850,000
Sub-total				$ 4,162,500
Construction Contingency	LS	1	25%	$ 1,040,625
Engineering/Environmental	LS	1	15%	$ 624,375
Construction Management/Bid Services	LS	1	15%	$ 624,375
TOTAL COST =				**$ 6,451,900**

Previous Studies and Estimates

Improvements to Pumping Plant 4 were included in the Corps 2010 PACR (see Appendix D). The improvements listed for Pumping Plant 4 include raising the discharge pipes and replacing the existing pumps. Costs for these improvements are included in the Corps' estimates; however a breakdown of the assumptions is not presented. It is recommended that the District review the final scope of work and estimates for this project with the Corps prior to implementation.

Pumping Plant 5

Pumping Plant 5, constructed in 1965, is located along the Sacramento River between Elkhorn Blvd and Elverta Road. It was constructed as mitigation for the increased runoff from Sacramento Metro Airport. The pump station has a capacity of 57cfs and consists of 3-100HP pumps. The pump station's current location physically conflicts with the proposed levee improvements and would need to be relocated approximately 300 to 500 feet from the levee. Interim levee improvements were completed at this site anticipating relocation/modifications to the pump station and outfall structure in the future.

Figure 10. View of existing Pumping Plant #5

Proposed CIP Projects

The relocated station would require new pumps and motors due to the increased head and longer pumping distance. In addition, the discharge pipes would be replaced and installed above the 200-year design WSE. The new station would be set up to accommodate a portable emergency generator in the future.

Additional capacity for Airport expansion mitigation and FAA requirements

In addition to the relocation requirements necessary for the new levee location, the District is discussing potentially increasing the capacity of Pump Plant #5 with Sacramento County Airport staff to mitigate for additional runoff created by the airport expansion and new FAA guidance and requirements. Under the existing agreement with Sacramento County, during a large storm event the District can require the airport to temporarily store storm water for up to five days on airport property and limit the discharge into the District's West Drain. New FAA guidance require that standing water on airport property be removed within 48 hours to avoid attracting waterfowl that can result in bird-strikes for aircraft landing and/or taking off. Also, with the recent airport expansion, the District believes the storm water rate and volume has increased. The airport is required to study this issue and provide a report identifying impacts of the expansion and proposing mitigation measures. These impacts could be mitigated by increasing the existing pump station capacity at Plant 5 by approximately 50 to 100cfs. With the proposed relocation and/or modifications to the plant it would be cost effective to include the capacity increase at that time. It is assumed that the existing canal system has the capacity to convey this additional storm water. It is anticipated that the costs to replace the existing capacity would be

funded as part of the Federal project and/or NLIP while the costs for the increase in pumping capacity beyond the existing would be funded by Sacramento County.

The estimated cost to relocate the pump station is provided in the table below. The costs to add additional capacity for the airport are also included as a separate line item. These costs assume that the increase in capacity would be added concurrent with the pump station improvements. These costs assume providing three pumps and motors with the same capacity and horsepower (assume 200HP). During final design of the project the District should consider the use of varying capacity and horsepower to provide additional flexibility in the system.

Table 8. Pumping Plant #5 Replacement Cost Estimate

		Plant 5 Replacement		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Demolition	LS	1	$ 300,000	$ 300,000
Site Improvements	LS	1	$ 915,000	$ 915,000
Dewatering	LS	1	$ 450,000	$ 450,000
Structural Improvements	LS	1	$ 894,000	$ 894,000
Trash Rack	LS	1	$ 300,000	$ 300,000
Site Fencing	LF	750	$ 35	$ 26,250
Pump/Motor (200HP)	EA	3	$ 150,000	$ 450,000
Outlet Piping Improvements (assume 3-36inch)	LF	1000	$ 750	$ 750,000
Electrical Improvements	LS	1	$ 750,000	$ 750,000
Sub-total				$ 4,835,250
Construction Contingency	LS	1	25%	$ 1,208,813
Engineering/Environmental	LS	1	15%	$ 725,288
Construction Management/Bid Services	LS	1	15%	$ 725,288
TOTAL COST =				**$ 7,494,700**

Table 9. Cost estimate for adding additional capacity to Pumping Plant #5

		Plant 5 - Added Capacity		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Additional Site Improvements	LS	1	$ 200,000	$ 200,000
Additional dewatering	LS	1	$ 100,000	$ 100,000
Additional Structural	LS	1	$ 300,000	$ 300,000
Added Pump/Motor Unit (100cfs total)	EA	1	$ 100,000	$ 100,000
Outlet Piping Improvements (assume 1-48inch)	LF	1000	$ 750	$ 750,000
Electrical Improvements	LS	1	$ 50,000	$ 50,000
Sub-total				$ 1,500,000
Construction Contingency	LS	1	25%	$ 375,000
Engineering/Environmental	LS	1	15%	$ 225,000
Construction Management/Bid Services	LS	1	15%	$ 225,000
TOTAL COST =				**$ 2,325,000**

Pumping Plant 6

Pumping Plant 6, completed in 1974, is located on the eastern side of the Natomas basin on the Natomas East Main Drain Canal north of Elkhorn Blvd. The plant underwent modifications in 1997 and has an existing capacity of 180cfs provided by 1-125HP, 1-200Hp, 1-250HP and 1-300HP pumps. It should be noted that the District only operates this pump station during very large storm events or when nearby rice fields drain during harvest (late summer). Future levee improvements as part of the Federal project are anticipated in the area. Preliminary plans indicate the levee improvements could conflict with the existing pump station suggesting it may also need to be relocated/modified. However, the impact and required mitigation will not be known until more detailed studies and plans are available.

Figure 11. View of existing Pumping Plant #6

Proposed CIP Projects

As previously mentioned future planned improvements may require relocation of the pump station. Depending on the timing of the levee improvements the District may consider replacing the existing plant trash rack prior to the levee improvements. Costs for relocating the entire station and replacing the trash rack separately are provided below.

Replace and relocate for new levee

Potential improvements to the pump station include relocating the station approximately 300 feet from the proposed levee improvements to avoid conflicts with the modifications. It is not anticipated the levee will be raised in this area; however to meet Corps of Engineers (COE) standards, the discharge pipes may need to be raised above the new 200-year design WSE requiring the pumps and motors be replaced to account for the new head requirements.

Estimated costs for relocating the pump station are provided in the table below. Additional assumptions and cost breakdown are provided in Appendix C.

Previous Studies and Estimates

Based on the latest report from the Corps the NLIP plans to fund the outfall pipeline replacement (see Appendix D). All other improvements would require funding from the District.

Improvements to Pumping Plant 6 were included in the preliminary report prepared by Mead and Hunt for the Natomas Levee Improvement project Conceptual Design Document, December 2009 (see Appendix E). The report looked at alternatives including rasing the discharge pipes and relocating the pumping plant. The alternative selected depends on the final footprint of the levee improvements. At this time it is assumed that the levee footprint would not affect the pump station enough to require complete relocation. The estimate presented in the Mead and Hunt report for complete replacement is significantly lower than the estimate presented above. The estimate was completed in 2009 and does not include impacts due to dewatering and electrical improvements found during the construction of Pumping Plant 2.

Replace trash rack and site improvements

If the levee improvements do not take place within the next 5 years, at a minimum, the District is interested in replacing the trash racks. The costs for replacing the trash racks are approximately $300,000 each based on the recent bids received. The trash racks at this location would require additional structural improvements at an estimated cost of approximately $100,000. Additionally, since the Corps does not plan to fund replacement of the complete pump station it is recommended that the District implement site improvements including replacement of the building, improved site access and improved site fencing. Costs for these improvements have been estimated below.

Costs for the proposed improvements to Pumping Plant #6 are provided below. Costs for SCADA and added security measures are provided under a separate section of this report.

Table 10. Pumping Plant #6 Replacement Cost Estimate

		Plant 6 Relocation		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Demolition	LS	1	$ 600,000	$ 600,000
Site Improvements	LS	1	$2,065,000	$ 2,065,000
Dewatering	LS	1	$ 600,000	$ 600,000
Structural Improvements	LS	1	$2,225,000	$ 2,225,000
Trash Rack	LS	1	$ 630,000	$ 630,000
Site Fencing	LF	2000	$ 35	$ 70,000
Pump/Motor Unit 1 (225HP)	EA	1	$ 200,000	$ 200,000
Pump/Motor Unit 2 (300HP)	EA	1	$ 250,000	$ 250,000
Pump/Motor Unit 3 (350HP)	EA	1	$ 300,000	$ 300,000
Pump/Motor Unit 4 (400HP)	EA	1	$ 350,000	$ 350,000
Outlet Piping Improvements (assume 3-42inch and 1-30inch)	LF	1000	$ 725	$ 725,000
Electrical Improvements	LS	1	$1,500,000	$ 1,500,000
Sub-total				$ 9,515,000
Construction Contingency	LS	1	25%	$ 2,378,750
Engineering/Environmental	LS	1	15%	$ 1,427,250
Construction Management/Bid Services	LS	1	15%	$ 1,427,250
TOTAL COST =				**$ 14,748,300**

Table 11. Cost Estimate for replacing trash racks at Pumping Plant #6

		Plant 6 - Trash Rack and Site Improvements		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Trash Rack Replacement	EA	2	$ 300,000	$ 600,000
Structural Improvements	LS	1	$ 100,000	$ 100,000
Building and site improvements	LS	1	$ 400,000	$ 400,000
Sub-total				$ 1,100,000
Construction Contingency	LS	1	25%	$ 275,000
Engineering/Environmental	LS	1	15%	$ 165,000
Construction Management/Bid Services	LS	1	15%	$ 165,000
TOTAL COST =				**$ 1,705,000**

Pumping Plant 8

Pumping Plant 8 is located on the eastern side of Natomas along the Natomas East Main Drain Canal north of I-80 adjacent to Northgate Blvd. Plant 8 was constructed in 1983 and later modified in 2001 to include increased capacity and new trash racks. The increase capacity was mitigation for North Natomas development by the City of Sacramento. The pump station has a current capacity of 779 cfs and consists of 4-700HP, 2-500HP, 2-300HP and 1-200HP pumps and is the District's most used pump station. As with Plant 6, the extent of levee improvements (if any) as part of the Federal project are not known at this time. Preliminary plans indicate the landside levee slope may need to be modified but because the pump station is set back from the levee it is not expected they would physically affect the pump station. More detailed design studies are needed to determine any impacts on the pump station or outfall pipes and structure. Since the levee improvements will not likely affect the pump station, the District wants to include improvements to this facility as part of this CIP. The main improvements to this station include electrical service improvements and replacing some of the electric motors with diesel or natural gas motors for additional backup during a potential power outage.

It should be noted that air quality restrictions for diesel motors are becoming increasingly restrictive. During final design of this system the District should consider the potential for a natural gas connection and use of a natural gas generator. This alternative would add additional costs for connection to a natural gas pipeline, however long term permitting issues would be reduced.

Figure 12. View of existing Pumping Plant #8

Figure 13. Additional view of existing Pumping Plant #8

Proposed CIP Projects

The existing pump station provides service using electric motors at each of the pumps. The District would like to consider replacing two of the existing electric motors with diesel motors in order to provide emergency pumping capacity of the station at this site in the event of an electrical outage. This assumes replacing the motors at the two largest pumps (700HP each). The estimated cost for motor replacement is $250,000 each. This includes the costs for fuel storage on-site.

The District is also considering an alternative to diesel backup using natural gas. As air quality regulations have changed the use of diesel fuel is becoming more restricted with the goal of eventually phasing out its use. PG&E was contacted to determine the availability of natural gas in the area. There is an existing 6-inch high pressure gas line along Northgate Blvd that could be utilized. The costs for connection to PG&E's system must be included in the cost estimates below. Based on the existing configuration of the pumps replacing the motors with a natural gas motor would require changes to the pump shafts and added structural supports. These added

costs are included in the estimate provided below. Additionally, it should be noted that converting to a natural gas motor reduces the efficiency of the pump by approximately 10%.

An alternative to include a permanent natural gas generator is also included. While these costs are higher than the other alternatives the system would be more flexible as the generator could be used to power any of the pumps on site while replacing the motors limits the pumps that could be used in an emergency.

Additionally the District is interested in replacing the existing 480V electrical service with a 2400V service to reduce maintenance, improve efficiency and reduce power costs based on the District's experience at it other facilities with 2400V service. The total cost for this upgrade is estimated to be $3,500,000. These costs include upgrades/modifications to the existing electrical service along with all modifications necessary for each of the motors. This cost is considered high for the overall benefit to the District.

An alternative to upgrading the electrical service would be to replace the existing Square D electrical equipment with Alan Bradley (AB) equipment which is the standard throughout the rest of the District. This project is currently taking place and has been budgeted for.

Costs below are estimated based on discussions with motor suppliers along with recent bids. Costs for SCADA and added security measures are provided under a separate section of this report.

Table 12. Pumping Plant #8 Motor Replacement Cost Estimate

		Plant 8 Motor Replacement		
Element Description	**Units**	**Estimated Quantity**	**Unit Price**	**Estimated Amount**
Replace electric motors with diesel motors	EA	2	$ 250,000	$ 500,000
Temporary Emergency Generator Hook-up Modifications	EA	1	$ 105,000	$ 105,000
Site Improvements for Generator	LS	1	$ 30,000	$ 30,000
Sub-total				$ 605,000
Construction Contingency	LS	1	25%	$ 151,250
Engineering/Environmental	LS	1	15%	$ 90,750
Construction Management/Bid Services	LS	1	15%	$ 90,750
TOTAL COST =				**$ 937,800**

Table 13. Pumping Plant #8 Natural Gas Motor Replacement Alternative Cost Estimate

		Plant 8 Motor Replacement - Gas		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Replace electric motors with natural gas motors	EA	2	$ 300,000	$ 600,000
Structural improvements for new motors	EA	2	$ 100,000	$ 200,000
PG&E Natural Gas Pipeline Connection	LS	1	$ 75,000	$ 75,000
Temporary Emergency Generator Hook-up Modifications	EA	1	$ 105,000	$ 105,000
Site Improvements for Generator	LS	1	$ 30,000	$ 30,000
Sub-total				$ 980,000
Construction Contingency	LS	1	25%	$ 245,000
Engineering/Environmental	LS	1	15%	$ 147,000
Construction Management/Bid Services	LS	1	15%	$ 147,000
TOTAL COST =				**$ 1,519,000**

Table 14. Pumping Plant #8 Natural Gas Generator Alternative Cost Estimate

		Plant 8 Natural Gas Alternative		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Connect to PG&E Gas Line	LS	1	$ 75,000	$ 75,000
Natural Gas Emergency Generator	EA	1	$ 900,000	$ 900,000
Emergency Generator Hook-up Modifications	EA	1	$ 105,000	$ 105,000
Site Improvements for Generator	LS	1	$ 30,000	$ 30,000
Sub-total				$ 1,080,000
Construction Contingency	LS	1	25%	$ 270,000
Engineering/Environmental	LS	1	15%	$ 162,000
Construction Management/Bid Services	LS	1	15%	$ 162,000
TOTAL COST =				**$ 1,674,000**

Previous Studies and Estimates

Improvements to Pumping Plant 8 were included in the latest Corps report and a preliminary report prepared by Mead and Hunt for the Natomas Levee Improvement project Conceptual Design Document, December 2009 (see Appendix D and E). The report found that plant 8 may be impacted by the levee improvements requiring that the discharge pipes be replaced to current standards (at existing grade) and positive closure valves installed. The total cost estimated for this alternative in the 2009 report is $700,000. Based on recent cost information it is recommended that these costs be revisited prior to the Corps funding these improvements.

Pumping Plant SCADA and Security system

A priority for the District includes providing a Supervisory Control and Data Acquisition (SCADA) system at all its pump stations. The purpose of this system would be to allow remote monitoring of canal levels and pump operations; increased security; and the potential for future remote operations of the plants. The summary of costs below is based on previous discussion with the District on specific SCADA needs at District pump stations. Costs also include setup of a master SCADA system. Costs were provided by WAVE Electrical Engineers, consultants to the District, who are familiar with each of the pump stations. The costs were also compared to other similar systems. The District has existing Remote Terminal Units (RTU's) at Plants 2, 3 and 8.

Table 15. SCADA Improvements Cost Estimate

		SCADA Improvements			
Element Description	Units	Estimated Quantity	Material Cost	Labor Cost	Total
SCADA software (1000 points)	LS	1	$ 47,000	$ 71,720	$ 118,720
Master SCADA Hardware	LS	1	$ 53,200	$ 27,280	$ 80,480
Pumping Plant 1B (Field wiring to TB existing)	LS	1	$ 33,850	$ 32,120	$ 65,970
Pumping Plant 2 (RTU partial existing)	LS	1	$ 20,750	$ 22,880	$ 43,630
Pumping Plant 3 (Field wiring to TB existing)	LS	1	$ 33,850	$ 32,120	$ 65,970
Pumping Plant 4 (No SCADA feature existing)	LS	1	$ 34,850	$ 40,920	$ 75,770
Pumping Plant 5 (No SCADA feature existing)	LS	1	$ 34,850	$ 40,920	$ 75,770
Pumping Plant 6 (No SCADA feature existing)	LS	1	$ 34,850	$ 40,920	$ 75,770
Pumping Plant 8 (Field wiring to TB existing)	LS	1	$ 33,850	$ 32,120	$ 65,970
Sub-total			**$ 327,050**	**$ 341,000**	**$ 668,050**
Material Tax	LS	1	8%		$ 49,058
Construction Contingency	LS	1	25%		$ 167,012.50
Engineering/Environmental	LS	1	15%		$ 100,207.50
Construction Management/Bid Services	LS	1	15%		$ 100,208
TOTAL COST =					**$ 1,084,600**

Additionally the District is interested in upgrading their security system for all pump stations. The added security would consist of closed circuit television with recording and transmitting capabilities to a remote manned location. District personnel, security patrols and law enforcement would be notified when unauthorized personnel are detected inside a pump station site. Costs for upgrading the security for each site are provided below. Intrusion alarms exist at Plants 1B, 2, 3, 5, and 8, however these locations would still require a remote station to make them remotely accessible.

Additionally, the District has completed a risk assessment of their facilities which identified the need for added security measures at a cost of approximately $400,000.

Table 16. Security System Cost Estimate

		Security Improvements		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Master Station	LS	1	$ 60,000	$ 60,000
Remote Stations (each pump station)	LS	7	$ 50,000	$ 350,000
Intrusion alert (each station)	LS	3	$ 10,000	$ 30,000
Additional recommended security measures	LS	1	$ 400,000	$ 400,000
Sub-total				$ 840,000
Construction Contingency	LS	1	25%	$ 210,000
Engineering/Environmental	LS	1	15%	$ 126,000
Construction Management/Bid Services	LS	1	15%	$ 126,000
TOTAL COST =				**$ 1,302,000**

Pump Station Maintenance

Pump station maintenance is essential to extend the life expectancy of the pumps and motors. The annual maintenance for each pump station consists of but is not limited to; drain and replace motor oil, meggar test motor and all in coming electrical power, checking the mechanical seal and performing other general maintenance including replacing any parts necessary. Additionally, it is recommended that once every 5-10 years each pump/motor is pulled to provide a more detailed inspection. At that time the pump and motor should be disassembled, cleaned, checked for any issues, and the motors baked and coated with an epoxy style paint. At that time the bearings, gaskets, seals, O-rings, couplers, wear rings, the shaft sleeve and packing/mechanical seal should be checked to determine if replacement is necessary. The shaft, impeller, column and bowls will also be inspected to ensure they continue to meet industry tolerances and replaced as needed. This will greatly extend the life expectancy of the pumps and motors. The cost for this inspection and maintenance is approximately $30 per HP (based on discussions with All-Electric, Inc.). The District has a total of 35 pumps at seven pump stations with a total horsepower of 13,325 (see summary table below). This cost includes pulling the pump/motor, inspection and transportation, but does not include replacing parts or machining if necessary. An additional cost of $20,000 per year should be included for replacement and machining of pump/motor parts as necessary.

It is recommended that the pump stations that are used most often be placed on a 5-year rotation program and all other pump stations be placed on a rotation of 10-years. Based on conversations with the operations staff the following Table 16 provides the pumps that operate most often and therefore should be on a 5-year maintenance plan rotation. Table 17 provides a summary of all other pumps. Based on the usage and rotation schedule the average annual cost for maintenance is approximately $60,800. A total budget of approximately $80,800 per year is recommended for maintenance and replacement parts as necessary.

Table 17. Estimated Pump/Motor Maintenance Costs (Recommended Every 5-years).

Pumping Plant	Pump Number	Total HP	Estimated Maintenance Cost ($30/HP)
Plant 3	1	300	$ 9,000
Plant 3	2	200	$ 6,000
Plant 3	3	200	$ 6,000
Plant 3	4	250	$ 7,500
Plant 4	1	300	$ 9,000
Plant 4	2	400	$ 12,000
Plant 5	1	100	$ 3,000
Plant 8	3	300	$ 9,000
Plant 8	4	200	$ 6,000
Plant 8	5	300	$ 9,000
TOTAL COST =		**TOTAL COST =**	**$ 77,000**
Contingency (25%)			**$ 19,250**
TOTAL MAINTENANCE COST (Every 5 years) =		**TOTAL COST =**	**$ 97,000**
Average Cost per year =			**$ 19,400**

Table 18. Estimated Pump/Motor Maintenance Costs (Recommended Every 10 years).

Pumping Plant	Pump Number	Total HP	Estimated Maintenance Cost ($30/HP)
Plant 1A	1	600	$ 18,000
Plant 1A	2	650	$ 19,500
Plant 1A	3	650	$ 19,500
Plant 1A	4	600	$ 18,000
Plant 1 B	1	400	$ 12,000
Plant 1 B	2	400	$ 12,000
Plant 1 B	3	400	$ 12,000
Plant 1 B	4	400	$ 12,000
Plant 1 B	5	400	$ 12,000
Plant 1 B	6	400	$ 12,000
Plant 2	1	400	$ 12,000
Plant 2	2	200	$ 6,000
Plant 3	4	250	$ 7,500
Plant 4	3	400	$ 12,000
Plant 5	2	100	$ 3,000
Plant 5	3	100	$ 3,000
Plant 6	1	300	$ 9,000
Plant 6	2	200	$ 6,000
Plant 6	3	250	$ 7,500
Plant 6	4	125	$ 3,750
Plant 8	1	700	$ 21,000
Plant 8	2	700	$ 21,000
Plant 8	6	700	$ 21,000
Plant 8	7	700	$ 21,000
Plant 8	8	500	$ 15,000
Plant 8	9	500	$ 15,000
TOTAL COST =		**TOTAL COST =**	**$ 331,000**
Contingency (25%)			**$ 82,750**
TOTAL MAINTENANCE COST (Every 10 years) =		**TOTAL COST =**	**$ 414,000**
Average Cost per year =			**$ 41,400**

Final Pump Station Recommendations

Once decisions are made about the work to be done at the various pump stations as part of the Federal project and/or NLIP, it is recommended that the District re-visit the proposed projects included above for each of the facilities to re-prioritize the work.

Emergency Operations and Preparedness

The following projects are intended to enhance the District's ability to monitor levee conditions and respond during a flood emergency. This includes improving access at key locations, adequate flood fighting materials with a suitable storage location and backup power supply for District use during an emergency situation. A description of each site is provided below with a summary of the costs provided at the end of this section.

American River Improvements

The American River levee is located along the southern border of the District. Currently access to the levee is limited during storm events due to lack of an all-weather roadway near the landside levee toe to monitor for boils, seepage or other signs of levee distress. The District also experiences seepage during high water events. Improvements along this stretch of levee include the addition of an all-weather landside access road (approximately 2.0 miles in length from Interstate 5 to Northgate Blvd) to improve access for levee patrols, flood fighting and maintenance activities.

Natomas East Main Drain Canal Improvements

The Natomas East Main Drain Canal is located along the eastern border of the District. Currently access to the landside toe is limited during storm events due to lack of all-weather access. Recommended improvements along this canal include the addition of an all-weather access road at the landside levee toe to facilitate levee patrols, emergency response and maintenance activities (approximately 5.0 miles in length from Northgate Blvd to Main Avenue).

Sacramento River Improvements

As mentioned previously the NLIP is currently making improvements to the Sacramento River levee. Work along the Sacramento River from the NCC to Powerline Road have essentially been completed under the NLIP. Levee improvements downstream of Powerline Road will be done as part of the Federal project; however the work may not be done for a number of years. Certain areas along this reach of the Sacramento River levee have poor access at the landside levee toe during storm events because of the Natomas Central Mutual Water Company's irrigation ditch located at the landside toe or on the levee slope. The main area without landside access is the five mile reach from south of San Juan Road to the City Limits near Orchard Lane. South of the City Limits the levee is wider and adjacent urban development allows for better access near the levee toe. Adding all weather access along the landside toe would improve the District's ability to monitor levee conditions, respond to a flood emergency and improve maintenance. However, implementation would require relocation and/or abandonment of the NCMWC facility and removal of properties as shareholders in the water company.

The levee improvement in all the above reaches under the Federal project will address the access problem and provide all weather access at the toe of the new levee. However, if the Federal project is delayed for a significant time, it is recommended the District implement one or more of

the access improvements to improve its levee monitoring, emergency response and maintenance activities.

Costs estimated below assume that the access road will be 15-foot wide and does not require additional right-of-way. The costs below include preparation and providing an aggregate base (AB) finished surface for all weather access.

Table 19. Levee Access Improvements Cost Estimate

		All Weather Access Improvements		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
American River Improvements	SF	158,400	$ 5	$ 792,000
Natomas East Main Drain Canal	SF	396,000	$ 5	$ 1,980,000
Sacramento River Improvements	SF	396,000	$ 5	$ 1,980,000
Sub-total				$ 4,752,000
Construction Contingency	LS	1	25%	$ 1,188,000
Engineering/Environmental	LS	1	15%	$ 712,800
Construction Management/Bid Services	LS	1	15%	$ 712,800
TOTAL COST =				**$ 7,365,600**

Flood fight material storage site (out of floodplain)

The District is interested in adding material storage areas that are outside of the existing floodplain or elevated above the anticipated flood levels. These areas would be used to store flood fighting materials and would include all weather access during flood events. Three areas have been identified by the District as potential future locations (see attached map).

1. Near the intersection of the Sacramento River and the Cross Canal (North-west area of the District).
2. Southeast end of the Pleasant Grove Creek Canal
3. Area near Rosin Court just south of I-80 (currently owned by the District)

Each storage area, except the last, would require property acquisition of approximately 5acres which should provide sufficient area to store materials necessary for flood fighting. The areas should be enclosed with fencing for security, have an all-weather surface and paved access. This assumes that only minor site work would be necessary. The costs provided in the table below are per site location.

Table 20. Material Storage Site Cost Estimate

		Material Storage		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Property Acquisition	AC	5	$ 40,000	$ 200,000
Provide AB (aggregate base) for 3 acres of site	SF	130,680	$ 2	$ 261,360
Misc. Site Improvements	LS	1	$ 100,000	$ 20,000
Grading (including any fill necessary)	LS	1	$ 75,000	$ 75,000
Fencing	LS	1	$ 60,000	$ 60,000
Sub-total				$ 616,360
Construction Contingency	LS	1	25%	$ 154,090
TOTAL COST =				**$ 770,500**

The table below summarizes the total costs for added material storage.

Table 21. Storage area cost summary

Property Location	Estimated Cost
1 - Sacramento River and Cross Canal	$ 770,500
2 - Southeast end of PGCC	$ 770,500
3 - Rosin Court	$ 520,450
TOTAL COST =	**$2,061,450**

Portable Emergency Generators

With additional development in the Natomas basin, it is recommended the District improve flood protection by developing the capability to pump storm water drainage during a power outage. Anticipated power outages may last from several hours to few days depending on location. Additionally, the pump stations are distributed among several different energy grids which would decrease the likelihood of multiple pump station outages. Plant 1B already has a permanently housed portable 2.0 MW generator. Rather than have a permanent generator at each additional pump station it is recommended the District provide a connection for a temporary portable generator at each of its pumping facilities and purchase two portable diesel generators. Costs for providing the hook up will be included with each individual pump station improvements. Costs for purchasing two portable generators (1-1MW and 1-0.5MW) are provided below. The portable generators will be stored at the District's corporation yard and transported to individual sites as needed. Hydraulic studies can be done at a later date to determine the most efficient placement of the generators depending on what pump station(s) have lost power. Specially equipped trailers would need to be purchased to hold the generators and support equipment.

Table 22. Temporary Generators Cost Estimate

		Portable Generators		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
1MW generator with trailer	LS	1	$ 738,000	$ 738,000
0.5MW generator with trailer	LS	1	$ 518,000	$ 518,000
Additional fuel storage	EA	2	$ 75,000	$ 150,000
Pump Station modifications	EA	5	$ 105,000	$ 525,000
Sub-total				$ 1,931,000
Contingency	LS	1	25%	$ 482,750
TOTAL COST =				**$ 2,413,800**

Levee Improvements (other than the NLIP)

Pleasant Grove Creek Canal (PGCC) and Natomas Cross Canal (NCC) Improvements

The Pleasant Grove Creek Canal (PGCC) is located along the north-east border of the District and the Natomas Cross Canal (NCC) is located along the District's north boundary. Over the years, this area has been prone to beaver activity including burrowing into the canal banks and levee section. Proposed improvements along these canals downstream of Highway 99 Bridge include barriers to prevent beaver and other rodents from burrowing into the bank and levee providing a potential seepage path for water and eventual failure of the levee. Beaver barriers could consist of concrete slurry walls, large rock place on the slope (RSP), buried sheet piles, and wire mesh barriers, or a combination thereof along the canal bank and/or levee section to deter intrusion by beaver and other rodents. This system, especially the rock, would also provide ancillary benefits by armoring the slope protecting it from erosion as well. The length of the canal requiring improvements is approximately 3 miles. The costs presented in Table 23 are for a rock placement alternative and assume the rock placed would be 1.8-ft thick for approximately 5-ft along the side of the canal. The costs include RSP fabric, preparation, mobilization, etc. Costs for a slurry wall alternative are provided in Table 24. The slurry wall alternative assumes a 4-ft slurry wall along the entire length of the canal.

As with other improvements, the rodent barrier could be incorporated into the Federal project; however depending on the timing of construction, the District may wish to advance some of these measures.

Table 23. PGCC and Natomas Cross Canal Improvements (RSP alternative)

		Levee Improvements - RSP		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Pleasant Grove Creek Canal and Natomas Cross	CY	5,280	$ 200	$ 1,056,000
Sub-total				$ 1,056,000
Construction Contingency	LS	1	25%	$ 264,000
Engineering/Environmental	LS	1	15%	$ 158,400
Construction Management/Bid Services	LS	1	15%	$ 158,400
TOTAL COST =				**$ 1,636,800**

Table 24. PGCC and Natomas Cross Canal Improvements (Slurry Wall Alternative)

		Levee Improvements - Slurry Wall		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Pleasant Grove Creek Canal and Natomas Cross	CY	4693	$ 500	$ 2,346,667
Sub-total				$ 2,346,667
Construction Contingency	LS	1	25%	$ 586,667
Engineering/Environmental	LS	1	15%	$ 352,000
Construction Management/Bid Services	LS	1	15%	$ 352,000
TOTAL COST =				**$ 3,637,400**

Canal and Drain Improvements

On-Going Canal Maintenance

The District operates and maintains approximately 30 miles of main drainage canals and 150miles of drainage ditches. Over the years, the District has experienced erosion of the canal slopes which eventually results in loss of the access roads and right of way. To address this chronic problem, the District has implemented an on-going program to provide erosion protection along their main canals by installing RSP along the toe and partially up the slope face to stabilize the banks. In addition, the District is requiring new drainage canals for which they will provide operations and maintenance to have side slopes of 3 to 1. The figure provided in Appendix A shows the locations where the RSP program has been completed and sections that are remaining. The District's current program for erosion control provides approximately 2,000 feet of RSP along canals at a cost of approximately $260,000 per year. It is anticipated that the District will continue this program at approximately the same rate and costs over the next 30-years. However, due to future development increasing the volume of storm water runoff, the District may need to accelerate the RSP program to mitigate for this impact. The cost estimate provided below assumes that the project would be completed by an outside contractor.

The following table shows the sections and lengths of canals that require completion of the RSP program. The sections are listed in the priority provided by the District. These costs assume that all sections would be completed as a single project. These costs include all mobilization/demobilization, preparation and all permitting costs.

Table 25. Priority Sections for RSP Placement

		RSP Program		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Pumping plant #8 to East drainage Canal	CY	10,450	$ 200	$ 2,090,000
Pumping plant #4 to Sankey Road along the North Drainage Canal	CY	12,320	$ 200	$ 2,464,000
Near Pumping plant #2 to Powerline Road along the North Drainage Canal	CY	10,120	$ 200	$ 2,024,000
East Drainage Canal Section	CY	7,150	$ 200	$ 1,430,000
Sub-total				$ 8,008,000
Construction Contingency	LS	1	25%	$ 2,002,000
TOTAL COST =				**$ 10,010,000**

Dredging the Main Drain from Plant 1B to West El Camino and providing bank stabilization

Portions of the District's Main Drain Canal between Garden Highway and El Camino Avenue require improvements for bank stabilization. The Main Drain which runs from the confluence of the East and West Drains to Plants 1A and 1B along Garden Highway serves as a major drainage canal for the Natomas Basin. This portion of the Main Drain has banks that are currently

overgrown with trees that fall into the canal, eroding the bank and has reaches of extensive plant growth along the water surface. Sediment from storm water and agricultural runoff has accumulated in the Main Drain causing reduced hydraulic capacity. The reach from W. El Camino to I-80 was previously cleaned in 1997 as part of the Natomas Community Drainage Plan (NCDP). The reach from El Camino to the pumping plants has not been cleaned since the 1970's except for the area adjacent to Pumping Plant 1B which was cleaned as part of the Plant Construction in 2003 when the site was de-watered. The canal has near vertical banks consistent with its initial construction based on historic photos; however problem has exacerbated along both sides from erosion and sloughing over the years. The continued bank erosion has resulted in trees falling into the canal, added sediment and loss of bank material to the point of the canal encroaching onto adjacent properties which limits access for operations and maintenance from the west bank.

Figure 14. View of District's Main Drain

Proposed improvements include dredging the bottom of the canal using a combination of clam-shell and hydraulic suction type dredging equipment to remove sediments and restore hydraulic capacity. It is estimated approximately 3 to 5 feet of sediment needs to be removed. Costs associated with the dredging are shown below. These costs assume that the material will be tested and determined not to be hazardous and can therefore be disposed of on adjacent land or used for fill. Costs also include all mobilization/demobilization, dewatering, disposal and permitting.

Table 26. Main Drain Dredging Cost Estimate

		Main Drain Dredging		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Downfall and vegetation removal	LS	1	$ 100,000	$ 100,000
Clamshell dredging, dewatering and Disposal	CY	3950	$ 40	$ 158,000
Hydraulic suction dredging, dewatering and disposal	CY	16324	$ 45	$ 734,580
Revegetation Costs	LS	1	$ 50,000	$ 50,000
Sub-total				$ 1,042,580
Construction Contingency	LS	1	25%	$ 260,645
Engineering/Environmental	LS	1	15%	$ 156,387
Construction Management/Bid Services	LS	1	15%	$ 156,387
TOTAL COST =				**$ 1,616,000**

Main Drain Bank Stabilization

In addition to dredging, it is recommended the District implement bank stabilization to reduce erosion, prevent tree failures, and improve access for channel maintenance. The existing bank slope is steep and prevents maintenance access. The recommended bank stabilization method is to use rock slope protection (RSP) to create a mild armored slope to the top of bank.

Additionally, an alternative to add a rock berm and cut back the slope for added protection was considered and the costs provided in the estimates below. Further stability can be achieved by adding a rock bench at the toe of the RSP. The RSP will be Caltrans Facing, with larger rocks used at the toe of the RSP to provide a stable foundation.

Cross sections showing both of these alternatives were created for a separate alternatives report provided to the District and are included in Appendix F for reference. These cross sections were used to estimate quantities provided in the tables below.

Another option is to use the additional rock bench to provide extra support in critical areas only, in order to save costs. Critical areas need additional slope protection and stability at the slope toe. The District may consider the use of this additional rock bench along the west bank, where the greatest level of erosion and sloughing has occurred.

Bank Stabilization Cost Estimate

The cost to construct the bank stabilization depends on the amount of material to be used. Estimates based on providing the erosion control along with the access bench are provided below.

Table 27. Main Drain Bank Stabilization Cost Estimate

		Main Drain Improvements		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
East Bank RSP with Bench	CY	45,000	$ 180	$ 8,100,000
West Bank RSP with Bench	CY	42,000	$ 180	$ 7,560,000
Sub-total				$ 15,660,000
Construction Contingency	LS	1	25%	$ 3,915,000
Engineering/Environmental	LS	1	15%	$ 2,349,000
Construction Management/Bid Services	LS	1	15%	$ 2,349,000
TOTAL COST =				**$ 24,273,000**

Table 28. Main Drain Bank Stabilization Alternative Cost Estimate

		Main Drain Bank cut back alternative		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
East Bank Cutback Bank	CY	25000	$ 30	$ 750,000
East Bank RSP with bench	CY	45000	$ 180	$ 8,100,000
West Bank RSP with Bench	CY	42000	$ 180	$ 7,560,000
Sub-total				$ 16,410,000
Construction Contingency	LS	1	25%	$ 4,102,500
Engineering/Environmental	LS	1	15%	$ 2,461,500
Construction Management/Bid Services	LS	1	15%	$ 2,461,500
TOTAL COST =				**$ 25,435,500**

Main Drain Reduced Project Scope

Based on the funding scenarios presented later in this document it has been determined that the costs for the main drain stabilization project presented above will be difficult to fund. In order to present a more reasonable funding scenario an alternative project scope was considered which would reduce the scope of the stabilization improvements. The reduced project would identify specific locations along the east and west banks that would require stabilization and the quantity of rock placed would be reduced. The table below presents the reduced quantities. This equates to approximately 1,000 feet or one-third of the length along the east bank and approximately 500 feet along the west bank. Additional studies are recommended to identify the highest priority locations for stabilization.

Table 29. Reduced scope estimate for the Main Drain Stabilization

		Main Drain Improvements - Reduced scope		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
East Bank RSP with Bench	CY	15,000	$ 180	$ 2,700,000
West Bank RSP with Bench	CY	7,000	$ 180	$ 1,260,000
Sub-total				$ 3,960,000
Construction Contingency	LS	1	25%	$ 990,000
Engineering/Environmental	LS	1	15%	$ 594,000
Construction Management/Bid Services	LS	1	15%	$ 594,000
TOTAL COST =				**$ 6,138,000**

Miscellaneous/Other Improvements

Studies and Plan Development

Studies, plans and standards used by the District to determine development impacts and mitigation will require updating as development increases within the Basin and land use changes. The costs associated with these updates are estimated below along with a brief description of the need for each type of plan.

Hydrologic and Hydraulic Model and Standards Update

The District has a current hydrologic and hydraulic model of the Basin which was developed previously by Ensign and Buckley (now Mead and Hunt). As land use changes occur the model will need to be updated and modified to meet current modeling industry standards. The primary purpose of the model is to guide the District on impacts to the District's drainage system and to assess effectiveness of proposed mitigation measures. In the past the District assumed 90% of the benefits of the model were allocated to new development and 10% was for general benefit to the District. It is anticipated this same split of benefits will be applied going forward.

Additionally, the District Improvements Standards will need to be developed and/or updated. The Improvement Standards will define the requirements for new development to mitigate for the increase in peak runoff flow due to added impervious areas and to address technical issues where urban improvements and mitigation features impact existing District facilities such as road crossings, culverts and recreational amenities. It is assumed that the cost for improvements to the Standards will be shared 50-50 between the District and new development.

The cost to have a consultant update the District's Hydrologic and Hydraulic Standards is estimated to be $250,000 and update the Improvement Standards is estimated to $200,000.

Table 30. Summary of Anticipated Study Costs

Study Type	Estimated Cost	Estimated CIP Share of Cost
Hydrologic and Hydraulic Model/Standards Update	$ 250,000	$ 25,000
Improvement Standards Update	$ 200,000	$ 100,000
TOTAL COST =	**$450,000**	**$125,000**

Site improvements to District Corporation Yard (Get ROW from SAFCA)

Improvements to the District's existing Corporation Yard include:

- Adding 1-2 acres of improved area
- Adding fencing to include new area
- Extending AB area for added storage

- Moving existing lean-to structure
- Improvements to the existing office
- Grading and rocking for improved drainage

Costs for these improvements are estimated below.

Table 31. Corporation Yard Improvements Cost Estimate

		Corp Yard Improvements		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
Additional Fencing	LF	1000	$ 35	$ 35,000
Additional Paving/AB (assume 0.5 acres)	SF	21780	$ 10	$ 217,800
Improvements to office	LS	1	$ 50,000	$ 50,000
Moving/Improving Existing lean-to	LS	1	$ 20,000	$ 20,000
Grading and rocking for drainage	LS	1	$ 50,000	$ 50,000
Sub-total				$ 372,800
Construction Contingency	LS	1	25%	$ 93,200
TOTAL COST =				**$ 466,000**

Culvert Replacement under PGCC and NEMDC

Improvements to the Pleasant Grove Creek Canal (PGCC) levees as well as the Natomas East Main Drain Canal Levees are necessary to meet 200-year flood protection requirements. The improvements (part of the NLIP) will impact five existing drainage culverts. A report prepared by Wood Rodgers has previously considered options for mitigating the impacts to these culverts including replacing them or abandoning them and providing a pump station instead. They concluded that replacing the culverts would be the most cost effective solution. However, if they are replaced in-kind the District would need a variance from the Corps standards as they would be penetrations through the levee below the design WSE. A map showing the location of the culverts is provided in the Appendix F of this report. Estimated costs assume that the project would be done separate from the Federal project and are provided in the table below.

Table 32. PGCC and NEMDC Culvert Replacement Cost Estimate

		PGCC/NEMDC Culvert Replacement		
Element Description	Units	Estimated Quantity	Unit Price	Estimated Amount
12" Reinforced Concrete Pipe (RCP) CLASS III	LF	20	$ 135	$ 2,700
24" RCP CLASS III	LF	784	$ 225	$ 176,400
36" RCP CLASS III	LF	194	$ 330	$ 64,020
48" RCP CLASS III	LF	163	$ 450	$ 73,350
12" Welded Steel Pipe	LF	127	$ 900	$ 114,300
Sub-total				$ 430,770
Construction Contingency	LS	1	25%	$ 107,693
Engineering/Environmental	LS	1	15%	$ 64,616
Construction Management/Bid Services	LS	1	15%	$ 64,616
TOTAL COST =				**$ 667,700**

Priorities/30-year CIP List

Priorities will depend on the type of project and the funding source. The following list of priorities is divided into the following categories:

- Plant 1A Improvements (if Corps does not construct within the next 10-years)
- Pumping Plant Improvements (anticipated to be constructed under the NLIP)
- Other Improvements
- On-going maintenance

Plant 1A Improvement Priorities

Priority #	Description	Estimated Costs
1	Tunnel Lining/Repair	$405,400
2	Flap Gate Replacement	$604,500
3	Positive Closure Gate Replacement	$930,000

Pumping Plant Improvements (Funded through NLIP)

Priority #	Description	Estimated Costs
1	Plant 4 Replacement	$13,952,400
2	Plant 3 Improvements	$4,666,500
3	Plant 5 Replacement	$7,494,700
4	Plant 6 Replacement	$14,748,300

Other Improvements

Priority #	Description	Estimated Costs
1	SCADA	$1,084,600
2	Security Improvements	$1,302,000
3	Main Drain Dredging	$1,636,800
4	Levee Access Improvements	$7,365,600

5	Flood Fight Material Storage	$2,061,450
6	Plant 6 Trash Rack Improvements	$1,085,000
7	Plant 8 Motor Replacement (Electric to Diesel)	$937,800
8	Portable Generator Purchase	$2,413,800
9	PGCC & Natomas Cross Canal Improvements	$1,636,800
10	Main Drain Bank Stabilization	$24,273,000
11	Corporation Yard Improvements	$466,000
12	PGCC Culvert Replacement	$667,700

On-Going Maintenance Program

Priority #	Description	Estimated Costs
1	RSP Canal Maintenance Program	$260,000
2	Pump/Motor Maintenance	$80,800

Funding Options

In order to fund the Capital Improvement Projects described in this report the District is considering multiple funding sources. Potential funding sources include:

- Construction and/or funding as part of NLIP Capital Improvements or subsequent anticipated Federal flood control project
- Funding from the District's current Operations and Maintenance Assessment or through an increase District's benefit assessment rate on current and future rate payers (requires Proposition 218 voter approval)
- Adoption of a District Capital Assessment (require Proposition 218 voter approval)
- District adopted Development Impact Fee for capital improvements or operational improvements with a nexus to new development
- Funding from the approved SAFCA Development Impact Fee
- Funding from SAFCA's current O&M Assessment and/or their Consolidated Capital Assessment which included an O&M component for NLIP improvements
- Grants

Each of these potential funding sources is described briefly below.

Natomas Levee Improvements Project Funding

The District believes most of the pump station improvements included in this CIP should be funded and constructed as part of the NLIP or subsequent Federal project because of the direct physical and/or operation impacts of the proposed levee improvements on these facilities. The necessary levee and plant improvements at several sites have not been completed and the existing facilities do not meet current Corps' standards. The improvements to the pump stations have been delayed due to SAFCA funding constraints and have been deferred to the anticipated Federal project with construction by the Corps. As an additional measure to ensure SAFCA's funding of these pumping plant improvements, a separate agreement between the District and SAFCA was executed further committing SAFCA's efforts to fund the improvements should the Federal project not fully fund them.

Projects the District anticipates to be funded through the NLIP are listed below.

- Plant 1A – Positive Closure gate Replacement
- Plant 1A – Flap Gate Replacement
- Pump Station No. 3 Improvements – Relocation of Pump Station
- Pump Station No. 4 Improvements – Replacement of levee pipe penetrations and pumps
- Pump Station No. 5 Improvements – Relocation of Pump Station
- Pump Station No. 6 Improvements – Replacement of levee pipe penetrations
- Pleasant Grove Creek Canal Beaver barrier and east side culvert Improvements
- American River, NEMDC and Sacramento River Access Improvement

Even though the District anticipates funding of these improvements by outside sources we are including it in this CIP for cost and fund estimating purposes and to ensure they are not overlooked as we prioritize improvements.

Funding from District's Operations and Maintenance Assessment

Currently the District raises funds for its activities through an Operations and Maintenance Benefit Assessment on properties in the District. Assessments are based on the relative benefit to each property. Factors in determining the assessment are the parcel's land use, size, and location in the District. Of the approximately $2.4 million collected through the assessment, only a small percentage is allocated to Capital Projects and most of them are small projects. The majority of the annual assessment is spent on normal operations and maintenance activities or used for a contingent Emergency Flood Fight Fund. Many of the improvements described in this CIP would require an increase in the annual assessment to fund them. This would require a vote of the property owners in the District under Proposition 218. Part of doing a CIP is to determine the District's future capital fund needs so it can be presented to the voters as part of the potential election process.

Projects the District would likely fund from its current O&M Assessment (with anticipated future increases) are:

- Pump Station No. 6 Trash Rack Replacement
- Pump Station Annual Maintenance
- Canal Erosion Control RSP Program
- Flood Fight Material Storage Areas
- Portable Emergency Generators
- Main Drain Dredging
- Main Drain Bank Stabilization
- Site Improvements to District Corporation Yard

Funding from a District Capital Assessment

Similar to the funding method SAFCA used for the Natomas Levee improvements, the District could use this CIP to develop a list of capital improvements, and provide a schedule and funding plan to present to the Natomas property owners for their approval through a Capital Assessment Proposition 218 election. The Capital Assessment could be collected over a number of years. Projects could be completed on a "pay as you go" basis or more urgent projects could be funded immediately by selling bonds secured by the future annual assessments. Though a reasonable option, it would follow closely after two similar capital assessments approved by the property owners in Natomas for the current levee improvements.

Projects the District could fund from a District Capital Assessment are:

- Pump Station No. 3 Improvements

- Pump Station No. 4 Improvements
- Pump Station No. 5 Improvements
- Pump Station No. 6 Improvements
- Pump Station #6 Trash Rack Replacement
- Pleasant Grove Creek Canal Beaver barrier and east side culvert Improvements
- American River, NEMDC and Sacramento River Access Improvement
- Flood Fight Material Storage Areas
- Main Drain Dredging
- Main Drain Bank Stabilization

Funding from a District adopted Development Impact Fee

The District has the authority to adopt a development impact fee for capital projects or other reasonable improvements to the system for impacts due to new development. The District would need to prepare and approve a nexus study which demonstrates the impact of the new development and specific projects and/or other improvements which reasonably mitigate the impacts. A fee would be calculated by spreading the costs among the anticipated future development in proportion to its benefits. The fee would be collected by the land use agencies in Natomas on behalf of the District.

Projects or improvements which could reasonably be funded by a Development Impact Fee because of the nexus to new development are:

- American River, NEMDC and Sacramento River Access Improvement
- Pump Station Annual Maintenance
- Canal Erosion Control RSP Program
- Flood Fight Material Storage Areas
- Portable Emergency Generators

Funding from SAFCA Development Impact Fee

SAFCA has approved a development impact fee. The purpose of the fee is to provide funds for the NLIP if the existing benefit assessment is not sufficient to cover SAFCA's share of the project costs. It can also be used to fund system improvements that increase the level of flood protection for Natomas. It is widely recognized that with completion of the levee improvements, more development is likely to occur in the Natomas basin. Without mitigation, this would increase the level of expected annual flood damages since there would be more damageable property at risk. Through the development impact fee, the level of flood protection could be improved so that the net annual flood damages would not increase even with more development. Most of the projects included in this CIP will increase the level of flood protection in Natomas and therefore could reasonably be funded using some of the development impact fee. The agreement between the District and SAFCA relative to funding future pump station improvements, should the Corps not provide adequate funding, specifically mentions the development impact fee as a potential funding source.

Additionally, an adjustment could be made to the District's O&M Assessment for areas of new of new development to fund improvements.

Projects and or improvements which could reasonably be funded by SAFCA's Development Impact Fee are:

- Pump Station No. 3 Improvements
- Pump Station No. 4 Improvements
- Pump Station No. 5 Improvements
- Pump Station No. 6 Improvements
- Pump Station #6 Trash Rack Replacement
- American River, NEMDC and Sacramento River Access Improvement
- Pump Station Annual Maintenance
- Canal Erosion Control RSP Program
- Flood Fight Material Storage Areas
- Portable Emergency Generators
- Site Improvements to District Corporation Yard

Funding from SAFCA's current O&M Assessment and/or Consolidated Capital Assessment

SAFCA currently has an O&M Assessment which is used to fund their administrative and planning efforts as well as some limited operation and maintenance contracts they have with outside entities including American River Flood Control District (ARFCD) and Sacramento County. Some of the improvements included in this CIP could reasonably be funded by the SAFCA O&M Assessment. New development in Natomas will increase the amount collected in this Assessment. Since the increase will be collected from new development in Natomas, it is reasonable to conclude the funds should likewise be used to the benefit of properties in Natomas.

In addition, the Consolidated Capital Assessment (CCAD) approved by the voters to fund the NLIP capital improvements included an operations and maintenance component. Currently, SAFCA is reimbursing the District an agreed amount from this Assessment District for operations and maintenance on an annual basis. However, depending on actual costs, the amount of the reimbursement can be adjusted. Also, just as with the SAFCA O&M Assessment, as new development occurs in Natomas, the total O&M funds will increase and should reasonably be used to benefit properties in Natomas by funding improvements included in this CIP.

In addition some or all of these improvements could be included as an element of the NLIP and funded through any future increase in the CCAD or NBLAD. Alternatively there could be an added capital improvement component of any future CCAD/NBLAD increases.

Projects and or improvements which could reasonably be funded by SAFCA's O&M Assessment or Consolidated Capital Assessment are:

- Pump Station #6 Trash Rack Replacement
- American River, NEMDC and Sacramento River Access Improvement
- Pump Station Annual Maintenance
- Canal Erosion Control RSP Program
- Flood Fight Material Storage Areas
- Portable Emergency Generators
- Main Drain Dredging
- Main Drain Bank Stabilization
- Site Improvements to District Corporation Yard

City of Sacramento North Natomas Drainage Assessment (NNDA)

The City of Sacramento has a Drainage Assessment District which funds drainage improvements required as part of the North Natomas Development. These improvements included the funding of Plant 1B construction, Plant 3 modifications as well as improvements to a number of the District's canals and drains. Included in the improvements was the removal of sediment from the Main Drain. However, due to cost overruns on other facilities, the removal of sediment was not completed, except for the section by Plant 1B as noted in this report. Therefore the sediment removal for the Main Drain canal should be done using future funds collected as part of the NNDA.

Grants

Grant funds are typically available through the Federal and State for a variety of beneficial projects. Grants for drainage or flood control improvements are usually teamed with other benefits such as recreation, water quality or environmental enhancements. It is recommended the District monitor available grant programs for compatibility with our flood control and drainage mission. It would also be beneficial for the District to develop relationships with non-profits or other community groups who could be partners on grant proposals.

Projects and or improvements which are candidates for funding through grants are:

- American River, NEMDC and Sacramento River Access Improvement
- Canal Erosion Control RSP Program
- Main Drain Dredging
- Main Drain Bank Stabilization

Potential Assessment Fee and Implementation Schedule

Assessment Fee

The following projects have been identified as requiring some funding through the District Capital Fund. A portion of these projects may include cost sharing from other sources including grants, the NLIP and a District Development Impact Fee (DIF).

Table 33. CIP Project Priorities and Assessment Fee Calculation

Capital Project	Total Estimated Costs	District Capital Fund portion	District Capital Fund portion (Future cost in 20-years with inflation)
Security Improvements	$1,302,000	100% = $1,302,000	$2,167,200
SCADA	$1,253,100	50% = $626,550	$1,131,549
Plant 1A Tunnel Repairs	$217,000	100% = $217,000	$391,902
Flood Fight Material Storage	$2,061,450	50% = $1,030,725	$1,861,489
Plant 6 Trash Rakes and site improvements	$1,705,000	100% = $1,705,000	$3,079,230
Plant 8 Motor Replacement (Diesel)	$937,800	50% = $468,900	$846,833
Portable Generator Purchase	$2,413,800	50% = $1,206,900	$2,179,661
Main Drain Stabilization	$24,273,000	Reduced project = $6,000,000	$10,836,000
Corporation Yard Improvements	$466,000	100% = $466,000	$841,596
H/H Model Update	$250,000	10% = $25,000	$45,150
Improvement Standards P&S	$200,000	50% = $100,000	$180,600
Total:		**$13,148,075**	**$23,745,423**

In order to determine the annual assessment the projects were assumed to be completed by year 20 (at 3% increase a year due to inflation). Those costs were then annualized using an assumed interest rate of 0.5% (based on average savings/investment interest rate). Using these assumptions the annual rate of the District's Capital Fund is $1,132,657 and over 20-years would generate a total of approximately $23,517,215. This fee would be in addition to the current District Assessment Fee.

Implementation Schedule

The following proposed schedule for implementation assumes that the majority of the projects will be implemented using a "pay as you go" philosophy. One of the largest costs identified in the CIP is the main drain stabilization. Under this scenario a reduced project would be implemented. It is recommended that this project start prior to the fee accumulating sufficient

funds. A preliminary assessment of the main drain slopes indicates that the issues with the slope stabilization will continue to be a problem and may eventually encroach onto adjacent property. It is recommended that the District look into funding sources for this project (including a low interest loan) to implement the program in the next 10-years. The funds from the fee could be used to pay off the loan over the following 10-years. It is also recommended that further assessment of the main drain stabilization needs be conducted in the next few years to ensure that the stabilization issues are not getting worse.

The funding for the flood fight material storage, plant 8 motor replacement and corporation yard improvements should be paid for as funding permits unless significant development within the District takes place. It is recommended that these projects, which are needed for improved flood fighting capabilities, be reprioritized as development takes places within the District. Additionally, the fee and implementation schedule above assumes that some of these projects will receive funding from a Development Impact Fee. The District may consider funding these improvements through a loan or other method and obtaining reimbursement from the DIF.

The implementation schedule below provides a single funding scenario and should be used for planning purposes.

Table 34. Potential Project Implementation Schedule

Inflation (%) =	3%
Interest (%) =	0.5%
Annual Assessment =	$ 1,300,000
Annual Assessment Increase (%) =	0%

Priority	Projects	2014 Cost	Start Year	Year 2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
1	Security Improvements	$ 1,302,000	2016		$ 1,381,294	$ 2											
2	SCADA	$ 626,550	2017			$ 684,651											
3	Plant 1A Tunnel Repairs	$ 217,000	2017			$ 237,125											
4	Portable Generator Purchase	$ 1,206,900	2018				$ 1,358,381										
5	Flood Fight Materials Storage	$ 1,030,725	2019					$ 1,194,898									
6	Plant 6 Trash Rack and Other	$ 1,705,000	2021							$ 2,096,943							
7	Plant 8 Motor Replacement (diesel)	$ 468,900	2022								$ 593,997						
8	Main Drain Stabilization	$ 6,138,000	2023									$ 2,002,177	$ 2,082,264		$ 2,333,447	$ 1,297,994	$ 1,568,411
9	Corp Yard Improvements	$ 466,000	2025											$ 645,066			
10	H/H Model Update	$ 25,000	2015	$ 25,751													
11	Improvement Standards P&S	$ 100,000	2015	$ 103,001													
			Yearly Cost	$ 128,752	$ 1,381,294	$ 921,778	$ 1,358,381	$ 1,194,898	$ -	$ 2,096,943	$ 593,997	$ 2,002,177	$ 2,082,264	$ 645,066	$ 2,333,447	$ 1,297,994	$ 1,568,411
			Cummulative Cost	$ 128,752	$ 1,510,046	$ 2,431,824	$ 3,790,205	$ 4,985,103	$ 4,985,103	$ 7,082,045	$ 7,676,043	$ 9,678,220	$ 11,760,484	$ 12,405,550	$ 14,738,996	$ 16,036,990	$ 17,605,401
			Annual Assessment	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000	$ 1,300,000
			Balance	$1,171,248	$1,089,954	$1,473,626	$1,422,613	$1,534,828	$2,842,502	$2,059,772	$2,776,074	$2,087,777	$1,315,952	$1,977,466	$953,906	$960,682	$697,074

APPENDIX A – FIGURE SHOWING LOCATION OF IMPROVEMENTS

APPENDIX B – BACK-UP COST DATA FOR PLANT 1A

APPENDIX C – BACK-UP COST DATA FOR PUMP STATION IMPROVEMENTS

APPENDIX D – UNITED STATES ARMY CORPS OF ENGINEERS – POST AUTHORIZATION CHANGE REPORT (PACR) AND INTERIM GENRAL REEVALUATION REPORT – AMERICAN RIVER WATERSHED

APPENDIX E – NATOMAS LEVEE IMPROVEMENT PROJECT CONCEPTUAL DESIGN DOCUMENT – MEAD AND HUNT

APPENDIX F – BACK-UP COST DATA FOR OTHER IMPROVEMENTS