SOUTH FLORIDA WATER MANAGEMENT DISTRICT

Audit of Operations and Maintenance Capital Program

Project #17-06

Prepared by
Office of the Inspector General

J. Timothy Beirnes, CPA, Inspector General
Jankie Bhagudas, CPA, Lead Consulting Auditor

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SOUTH FLORIDA WATER MANAGEMENT DISTRICT

April 12, 2018

Governing Board Members

Re: Audit of Operations and
Maintenance Capital Program
Project No. 17-06

This audit was performed pursuant to the Inspector General's authority set forth in Chapter 20.055, F.S. Our objective primarily focused on assessing whether the Operations and Maintenance Capital Program is meeting the District's flood control mission. Jankie Bhagudas and I prepared this report.

Sincerely,

J. Timothy Beirnes, CPA
Inspector General

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BACKGROUND

In accordance with the Office of Inspector General's Fiscal Year 2017 Audit Plan, we conducted an Audit of the Operations and Maintenance Capital Program to assess whether the District is meeting the flood control mission.

Water control structures are a vital part of District operations, and serve the District's multi-faceted mission of balancing and improving flood control, water supply, water quality, and restoration. To meet its objective, the District performs structure inspections to ensure operational integrity, avoid total or partial failure of structures that could endanger lives and public safety, cause substantial property damage, affect water supply, and negatively impact the environment. In addition, some inspections are required to meet Florida Department of Environmental Protection permit compliance requirements and the U.S. Army Corps of Engineers Rehabilitation Inspection Program requirements.

The Operations, Engineering and Construction Division's Infrastructure Management Section (IMS) is responsible for administering the Structure Inspection Program (SIP) and providing engineering support to the field stations on issues that require immediate attention. The Engineering and Construction Bureau's responsibilities include the development, design, and construction of Operations and Maintenance (O&M) capital program projects. On a five-year cycle, IMS staff perform a comprehensive above-water inspection while contractors perform the necessary under-water inspection of each District water control structure to ensure the operational integrity of District infrastructure in order to access their conditions and prioritize repairs, refurbishments, and/or replacements. SIP inspections cover culverts, weirs, spillways, navigation locks, pump stations, and other assets. As part of the structure inspection process, IMS engineers perform a multidiscipline engineering inspection which includes the following: civil, structural, mechanical, and electrical. The structure inspection results are used by field stations to develop their annual work plans and by IMS to identify O&M capital program projects.

The District has a total of 760 structures, which are shown in the following table by type and responsible field station.

District Structures by Field Station Location, as of June 2017						
Field Station	**Culverts**	**Weirs**	**Spillways**	**Locks**	**Pump Stations**	**Total**
Saint Cloud	18	2	8	3	1	**32**
Okeechobee	33	13	21	7	11	**85**
Clewiston	163	2	7	1	23	**196**
West Palm Beach	207	2	32	0	16	**257**
Fort Lauderdale	24	1	11	0	7	**43**
Miami	22	0	14	0	5	**41**
Homestead	30	1	13	0	13	**57**
Big Cypress Basin	6	29	11	0	3	**49**
Total	**503**	**50**	**117**	**11**	**79**	**760**

The District is also responsible for operating and maintaining more than 2,100 miles of canals and 2,000 miles of levees/berms in the 16 counties from Orlando to the Florida Keys.

In addition to the inspecting water control structures, IMS is also responsible for ensuring other District assets are inspected.[1] These inspections are mostly conducted by contractors, for example:

- *Microwave Towers Inspections*: The District has 65 microwave towers that are part of its communication network to connect the flood control structures and field stations to the District's Operations Control Center. Inspections are performed every five years.
- *Roof Inspections*: The District's inventory includes administrative buildings, field stations, water control structure equipment rooms, and support facilities. Roof inspections are generally performed every seven years.
- *Bridge Inspections*: Routine inspections are performed every two years. Some inspections are performed by the Florida Department of Transportation; however, the District is responsible for repairs.

[1] It should be noted that our audit focused on water control structures, canals, and levees.

- *Overhead Crane and Hoist Inspections*: All pump station and field station cranes are inspected annually to ensure compliance with OSHA and ASME requirements.
- *Vibration Pump Analysis*: Performed annually to monitor pump operations, establish baseline analysis, identify issues, develop strategies to forecast future maintenance and repair cost estimates, and reduce operating costs.

Inspection results are detailed in written reports that also include photographs that identify deficiencies and the rating of each deficiency; for example, structural, mechanical, electrical, and underwater, probable causes, and recommended corrective actions. IMS inspectors determine whether deficiencies should be addressed by field station staff or by Engineering and Construction Bureau as capital projects. Field station repairs are forwarded to field station for repairs. In addition to inspection repairs, field stations are responsible for certain O&M recurring projects; for example, gate overhauls, pump engine overhauls, project culvert replacements, and generator replacements. Capital projects are forwarded to the Engineering and Construction Bureau for assessment, project development, design and construction.

Each inspected structure receives an overall rating ranging from C-1 to C-5 Critical, with C-1 being the best rating and C-5 Critical being the worse rating. In addition, structure components are rated using the same rating scale.

The following chart describes the overall structure and structure component deficiencies.

Inspection Rating	Overall Structure Rating Description	Structure Component Description
C-1	All old deficiencies noted from the previous inspection have been corrected	No deficiencies noted
C-2	Most old deficiencies noted from the previous inspection have been corrected	Monitor condition at next maintenance cycle or inspection
C-3	Deficiencies have been identified and/or several old deficiencies noted in the last inspection have not been corrected	Schedule repair/replacement
C-4	Serious deficiencies exist that if not immediately corrected may lead to or cause deterioration of the structure	Schedule repair/replacement - for safety items, or items that will hinder operation if not corrected
C-5	Major deficiencies exist that if not immediately corrected may lead to or cause deterioration of the structure	Repair/replace immediately - for structural items
C-5 Critical	Emergency deficiencies exist that must be addressed immediately. Deficiencies include those that impede operation of the structure or jeopardize public safety	Repair/replace immediately - for operational items

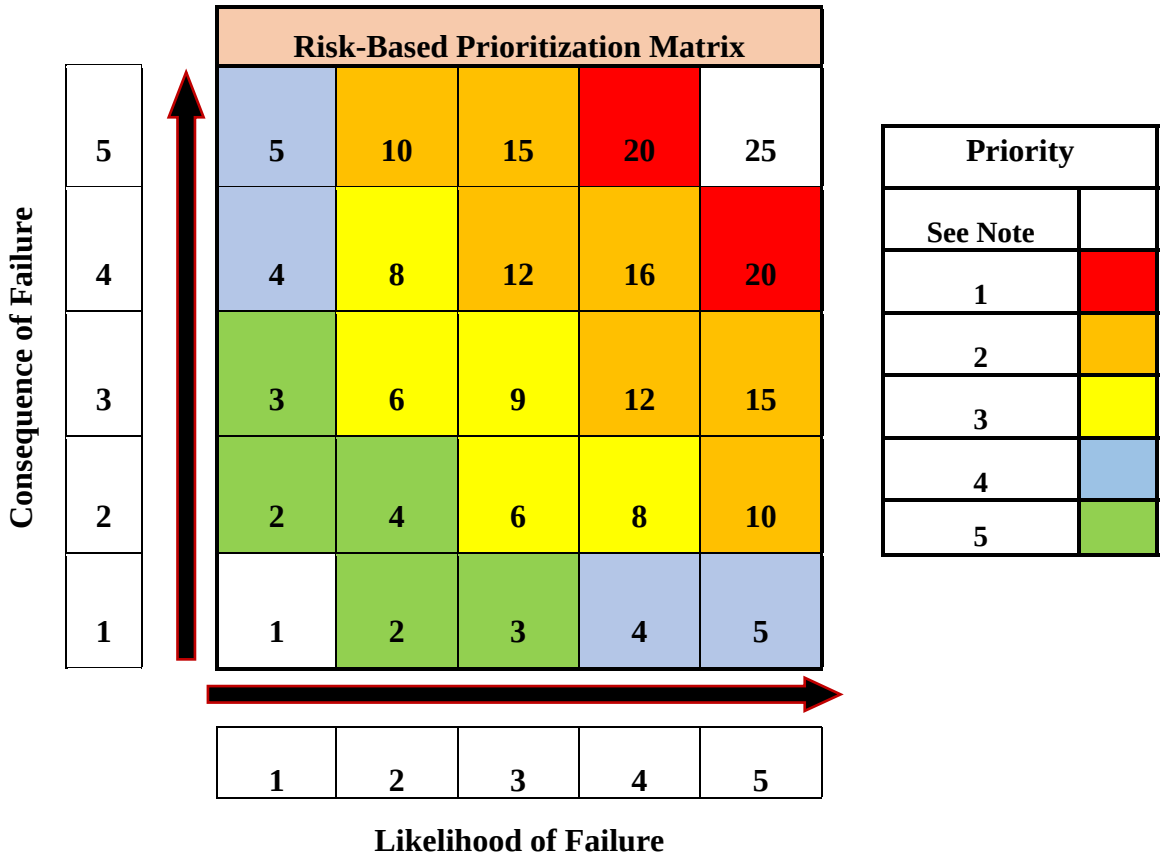
In instances where IMS recommends a project to the Engineering and Construction Bureau for project development, an Inspection Summary / Issue Identification is prepared which includes the following information: structure data, risk score, summary of issues, probable causes, and recommended actions. The risk score is determined based on a risk-based prioritization matrix and is one of the factors used by the Engineering and Construction Bureau in developing project ranking for structure repair, refurbishment, or replacement.

The risk score determination for water control structures is summarized in the following table.

Factors Considered in Determining Impact Risk Scores and Priority Levels				
Risk Score	**=**	**Likelihood of Failure Score**	**X**	**Consequence of Failure Score**
Components		• Physical Condition (C-Rating) • Impacts to Operations and Maintenance • Frequency of Operation		• Public Health, Safety, Security & Service • Financial Impact • Vulnerability • Legal Implication
Calculations		Each of the above item is assigned a percentage weight and rated one to five (low to high probability). Scores are averaged to determine likelihood of failure		Each of the above item is assigned a percentage weight and rated one to five (no to high impact). Scores are averaged to determine consequence of failure

It should be noted the components for determining the risk scores for District facilities are slightly different.

The following matrix shows the risk scores and the corresponding priority levels.



***Note*:**
Matrix scores of 1 or 25 are inherently unlikely. Structures with scores of 25 would most likely require emergency action.

OBJECTIVE, SCOPE, AND METHODOLOGY

Our objective primarily focused on assessing whether the Operations and Maintenance (O&M) Capital Program is meeting the District's flood control mission.

To accomplish our objectives, we obtained an understanding of the District's annual structure inspection program by interviewing IMS staff. We also interviewed Engineering and Construction Bureau staff to understand the process for determining which water control structures, canals, and levees are repaired, refurbished, or replaced. In addition, we reviewed relevant water control structure, canal, and levee information maintained on the District's website.

We determined whether IMS staff inspect structures in accordance with the frequencies specified in its policies and procedures and whether inspection results are adequately documented. Further, we determined whether the field stations and Engineering and Construction Bureau are notified by IMS of recommended actions they should take to resolve the deficiencies. We also determined how the deficiencies are addressed.

Further, we determined whether the annual budget allocated to O&M capital program projects is sufficient to ensure that structures including canals and levees needing repairs, refurbishment, or replacement are being addressed timely. In addition, we determined whether there is a process in place for prioritizing projects.

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

AUDIT RESULTS

Executive Summary

The Operations and Maintenance capital program budget has averaged $53 million annually for the repair, refurbishment, or replacement of water control structures, canals, and levees to ensure the integrity and reliability of south Florida's water management system. However, this annual funding level appears insufficient to address the large number of outstanding water control structures, canals, and levees with deficiencies all at the same time. As a result, the Operations, Engineering, and Construction Division takes a risk based approach with a process in place to prioritize structure deficiencies that pose the highest risk the public, can cause substantial damage to public and private properties, and result in failure of critical structures. Further, decisions to proceed with specific projects are not based on cost of the projects; instead, decisions are based on the degree of risk and the consequences if the deficiencies are not resolved. Further, the District's emphasis has been more on water control structures and less on canals and levees restoration projects.

Our review of the 209 ranked projects on the O&M capital program priority project list disclosed that 32 projects (15%) are in the construction phase, 60 projects (29%) are in some aspect of the design phase; and no action has been taken on 117 projects (56%). It should be noted that for the projects in the design phase, the procurement process for some of these projects may not necessarily begin soon since the design phase can be lengthy and/or complex. Further, funding availability could also impact the procurement process. Increased funding levels could also reduce the number of projects with no project development actions.

Based on District assessments approximately $88.5 million is needed annually over the next several years to maintain, replace / refurbish the District's aging water control structures, restore canals, and rehabilitate levees that pose the highest risk. Specifically, $60 million would be required annually for ten years to maintain, replace / refurbish water control structures, $18.5 million would be required annually for 20 years to restore canal banks, and $10 million would be required annually for five years to rehabilitate levees. Although the assessments conclude that additional funding is required to address more high risk projects, the District has a process in place to ensure

that the water control structures, canals, and levees posing the highest risk to the regional water management system risk are rehabilitated, replaced, and / or restored.

Based on the infrastructure assessment, during 2016 to 2026, a spike in funding would be required due to the number of structures requiring replacement/rehabilitation and the $60 million in annual funding over a period of ten years would complete the higher risk projects and minimize the number of past due projects; for example, C-5 structures will be eliminated within two years, C-4 structures within eight years, and C-3 structures will be reduced within six years. Regarding canal bank assessment, staff estimated $18.5 million would be required annually for 20 years to restore 138 miles of high-risk canal banks. Further, staff identified the top 10 canals with the highest flood risk if the canal banks are not restored. These canal banks cover about 76 miles and the projected restoration cost is $360 million. Regarding levee rehabilitation assessment, staff estimated $10 million would be required annually for five years to restore 88 miles of high-risk levees. Further, staff identified the top 10 levees posing the highest risk if not restored. These levees cover about 67 miles and the projected restoration cost is $44 million. It should be noted that these assessments do not include cost for canal dredging. A canal dredging assessment was performed during 2006 to 2008. After reviewing and discussing the results, Operations and Field Station staff concluded that further analysis was needed to determine whether the actual levels of flood protection were being impacted based on the reduction in canal depths. District Hydrology and Hydraulics Bureau staff are currently analyzing canals in Miami-Dade County and the Big Cypress Basin to determine whether any reduction in flood protection has occurred and whether dredging should be planned.

We analyzed the O&M capital program budget and expenditures for Fiscal Year 2013 to Fiscal Year 2017 to determine whether contract budgeted amounts have been adequately administered. Our analysis of funds allocated for contract expenditures disclosed that rollover amounts ranged from about $3 million to $14.4 million during Fiscal Year 2013 to Fiscal Year 2017. However, the rollover amount from Fiscal Year 2017 to Fiscal Year 2018 was $6 million,[2] a decrease of $8.4 million from the previous

[2] This amount does not include accrual and budget transfer adjustments.

year's rollover amount. Large carry over amounts are due to several reasons; for example, permitting and contract delays, and may indicate that work planned for the fiscal year is not accomplished. For example, in Fiscal Year 2017, the contract budget was about $47 million compared to the consumable budget of about $61 million, which was due to $14 million rollover from Fiscal Year 2016.

Overall, IMS inspects water control structures owned and operated by the District on a five-year cycle, documents the inspection results in inspection reports, identifies deficiencies that should be repaired by field station staff, and identifies and forwards deficiencies that should be addressed as capital project to the Engineering and Construction Bureau. However, we noted that a few areas need improvement. IMS is required to forward issues identified during inspections and the recommended actions to the responsible field station for repairs. Initially, IMS could not provide some of the spreadsheets documenting that issues were forwarded to the field stations. This was due to staff turnover. Subsequently, IMS provided the supporting documentation and improved the process by maintaining all spreadsheets in Documentum. In addition, the inspection reports for Fiscal Year 2014 indicated whether repairs from the prior inspections were addressed. However, we noted that the inspection reports for Fiscal Year 2015 and Fiscal Year 2016 did not indicate whether unresolved deficiencies from the prior inspections were addressed. Including this information would be helpful in determining whether required repairs are addressed in a timely manner.

IMS notifies field station staff of C-3, C-4, and C-5 structure deficiencies identified in the SIP inspection reports as field station repairs. Field Operations Bureau staff explained that not all C-3 deficiencies require repairs; for example, some are deemed minor / low priority and cannot be addressed due to staff and budget issues. In addition, Field Operations Bureau staff may determine that some of the C-3 repair items are fully operational despite appearances; for example, rusted fencing. In these instances, no field station action is required. However, we concluded that there is no adequate process in place to document the field stations' review of the deficiencies and actions needed to address the specific C-3 deficiencies identified in the inspection reports; for

example, whether specific deficiencies would be repaired, deferred, or required no action by the field station. For example, based on the Fiscal Year 2015 inspections, there are no indications whether repairs were made to 57 structures identified by IMS as requiring field stations repairs. Specifically, C-3 issues for these structures ranged from one repair per structure to 45 repairs per structure for a total of 700 deficiencies. Our review of SAP for SIP work orders for these structures did not disclose any repairs. Some repairs may have been resolved but were not adequately documented in SAP as SIP repairs. In addition, since there is no adequate process in place to identify how many of these deficiencies required repairs by the field stations, we could not determine which deficiencies would be addressed by the field stations. Further, some C-4 and C-5 deficiencies are also required to be addressed by the field stations. However, based on our review, we were also unable to determine whether all these deficiencies were resolved. Thus, we concluded that improvements are needed to adequately document the resolution of structure repairs classified as IMS as field station repairs. Lack of an adequate process to track the status of required repairs may lead to repairs remaining unresolved, structure deterioration, and increased repair costs. However, during our audit, Field Operations Bureau staff have implemented a process to address this issue. Specifically, field station repairs recommended as a result of the Fiscal Year 2017 SIP inspections were analyzed, required actions were documented, and items requiring repairs will be tracked to ensure completion. In addition, field station staff will continually be reminded to ensure SIP repairs are labelled in SAP.

Adequate Process to Address High Priority O&M Capital Program Projects

The District has budgeted an average of $53 million each fiscal year to the O&M capital program for repair, refurbishment or replacement of water control structures including canals and levees. As part of our audit, we determined whether this funding level was adequate to address O&M capital program projects and the process for prioritizing projects. We concluded that this annual funding level appears insufficient to address the large number of outstanding water control structures, canals, and levees with deficiencies all at the same time. As a result, the Operations, Engineering, and Construction Division takes a risk based approach with a process in place to prioritize structure deficiencies that pose the highest risk to the public, can cause substantial damage to public and private properties, and result in failure of critical structures. Further, decisions to proceed with specific projects are not based on cost of projects; instead, decisions are based on the degree of risk and the consequences if the deficiencies are not resolved. The Engineering and Construction Bureau maintains O&M capital project prioritization spreadsheets (includes structures, canals and levees, and District facilities) which includes project recommendations / requests originating from several sources; for example,

- IMS' recommendations for corrective actions resulting from above and under water structure inspections. Structure deficiencies are summarized as Issue Identifications and assigned risk scores.
- Input and requests from Field Operations and Land Management Division and other District areas; for example, Operations, and Hydrology and Hydraulics Bureau.
- Recommendations from the U.S. Army Corps of Engineers resulting from canal and levee inspections.

Projects are prioritized / ranked on the capital project priority spreadsheets based on the risk scores assigned to each project by IMS and other factors. Specifically, staff from all areas within the Operations, Engineering, and Construction, and the Field Operations and Land Management Divisions meet at least twice a year to review status of projects on the lists and discuss new issues. These meetings may result in the following:

- Project additions and re-prioritizations based on management, water managers, and field station staff recommendations.
- Projects combinations or splits to address critical deficiencies in a timely and cost effective manner.
- Additional hydrology and hydraulic (modeling) studies.

The Engineering and Construction, and Budget Bureaus allocate capital project funds to projects primarily in the following order:

- Project already in progress with construction continuing into the next fiscal year. Amount allocated are based on the contract amount budgeted for the year.
- Recurring projects assigned to field stations; for example, gate overhauls, pump engine overhauls, culvert replacements, and generator replacements.
- IMS' structure inspection staff and Engineering and Construction Bureau staff who work on O&M capital program projects
- New construction work based on completed designs and permits.
- Projects in the design phase and new projects planned for design.

An overall high risk score is not the only factor that determines whether an O&M capital project is funded; other factors are considered as well. Specifically, some projects with lower risk scores can take precedence over other higher risk scores; for example, in Fiscal Year 2014, IMS found that the electrical panels and switchboards at most structures and pump stations were not field marked with Arc Flash Hazard Warning labels as required by National Electric Code. This issue could potentially expose employees to injury and the District to health and safety non-compliance. Based on the risk-based matrix, this project was scored 7.44 and classified as a priority three; however, since employees' health and safety are at risk it has been prioritized above other projects with higher risk scores. As of June 2017, the project is in the design phase. In addition,

lower ranked projects or components of lower ranked projects may be combined with higher ranked projects with similar scopes to reduce design and construction costs. Our audit concluded that a process is in place to ensure that high risk projects are addressed within the funding constraints.

Increased Annual Funding Needed to Address Structures, Canals, and Levees Deficiencies

Our analysis of the O&M capital program priority project list and our review of the District's assessments of its water control structures, canals, and levees disclosed that increased funding should be considered for replacing / restoring / rehabilitating the District's water control structures, canals, and levees to ensure that integrity and reliability of south Florida's water management system. Specifically, the annual adopted budget for the O&M capital program, from Fiscal Year 2013 to Fiscal Year 2017, averaged about $53 million per year and is allocated to high risk projects. Our review of the O&M capital program priority project list disclosed that, at the current funding levels, no action has been taken on 117 of the 209 (56%) projects. Further, based on District assessments, about $88.5 million is needed annually needed to maintain, replace / refurbish the District's aging water control structures ($60 million), restore canals ($18.5 million), and rehabilitate levees ($10 million), which are considered high risk / high priority.

It should be noted that canal dredging assessment was previously performed; thus, dredging was not reassessed. Specifically, from 2006 to 2008, a District contractor assessed the overall condition of the canal systems District-wide. This assessment, referred to as the Canal Conveyance Capacity Program (CCCP), included an evaluation of canal bank conditions as well as the amount of sediment that accumulated since the original construction of the canals. After reviewing and discussing the results regarding the need for dredging, Operations and Field Station staff concluded that further analysis was needed to determine whether the actual levels of flood protection were being impacted based on the reduction in canal depths (due to sediment buildup). Currently, canals in Miami-Dade County and the Big Cypress Basin are being assessed to determine whether any reduction in flood protection has occurred and whether dredging should be

planned. It should be noted that the District owns a dragline mechanical dredger that is being used for canal dredging**.**

The basis of our conclusion that additional funding should be considered for the O&M capital projects are detailed in the following sections.

Analysis of O&M Capital Program Priority Project

Our analysis of the Engineering and Construction Bureau's O&M capital program project spreadsheet and discussions with staff disclosed that the focus has been on rehabilitating / replacing water control structures. Specifically, 71 of the 123 (58%) water control structures projects are in the construction or design phase while only 18 of the 57 (32%) canal/levees projects and 3 of the 29 (10%) facilities projects are in these same phases. The District's emphasis has been more on water control structures and less on canals and levees restoration projects. However, failure to maintain canals and levees could result in obstructions during heavy rainfall and storm events that could block drainage and cause flooding, as well as interference with emergency flooding response. According to staff, there are plans to include about three canal tree removal projects per year in different canal systems and canals posing the highest flood risk are being addressed.

The results are summarized in the following table.

Population of Operations and Maintenance Capital Program Projects December 2013 to June 2017								
Project Status	**Structures & Other**		**Canals and Levees**		**Field Station Facilities**		**Total**	
Completed Projects								
Closed / Completed	43	*83%*	9	*17%*	0		**52**	***100%***
Pending Projects								
Construction	29	*24%*	3	*5%*	0		**32**	***15%***
Design	33	*27%*	6	*11%*	2	*7%*	**41**	***20%***
Pre-Design	4	*3%*	3	*5%*	0		**7**	***3%***
Project Design Report	5	*4%*	6	*11%*	1	*3%*	**12**	***6%***
No Action; e.g., Issue Identification	52	*42%*	39	*68%*	26	*90%*	**117**	***56%***
Total	**123**	***100%***	**57**	***100%***	**29**	***100%***	**209**	***100%***

Notes

- *The number of projects and project statuses on the O&M capital program priority project spreadsheet can change as project components / entire projects are combined into a single project or management may decide to address a specific segment of a project due to the severity of the deficiencies. It should be noted that certain routine projects performed by field station staff are not tracked by the Engineering and Construction Bureau.*

- *A single project may be comprised of multiple components; for example, several different pump refurbishments or multiple phases.*

- *Closed projects mean construction has been completed and projects have been closed out in SAP. Completed projects mean construction has been completed but not closed out in SAP.*

- *Design includes various phase; for example, project design report, pre-design, and design. The design phase can be delayed by several factors; for example, easement, environmental, permitting, and staffing issues.*

- *No action means that the Engineering and Construction Bureau has not taken any project development action. These project requests were reviewed and ranked to ensure that the deficiencies will not result in failure that could pose a high risk to the public, result in damage to public and private properties and increase the damages to critical infrastructure.*

Based on our analysis of the O&M capital program priority project lists, we concluded the following:

Projects in Construction Phase

A total of 32 of the 209 projects (15%) on the O&M capital program priority project list are in the construction phase. It should be noted that 29 are water control structures projects and three are canals/levees projects. Several of these projects are multi-year projects and include structure refurbishments and replacements, generator replacements, microwave tower repairs, and canal dredging and bank improvement. The following are two examples of structures that were under construction in June 2017.

S-141 Weir

Replacement of this structure was recommended by IMS in Fiscal Year 2007 and again in 2014. According to IMS staff, replacement was not initiated in 2007 because of other higher priority projects. However, as of June 2017, the replacement is in process. Due to extensive corrosion of the steel structure, the structure was not functional and impeded access to the levee around WCA 2B. In addition, the equipment platform was unsafe due to deterioration of the structural joints, about 30% of the platform was missing, and the flashboard risers were heavily rusted. In addition, the old structure was not designed for pedestrian traffic and was frequently trespassed. The replacement structure incorporates pedestrian traffic. An example of the structure's original condition is shown in the following photograph.

S-141 Weir
Unsafe Structure Condition

S39A Structure Replacement and Automation

This structure together with S-38B, controls the seepage rate from Conservation Area 2A by regulating the water level in the north half of the Levee 36 borrow canal. This structure was rated C-5 in 2014 because it was dilapidated; for example, the culvert barrels were heavily rusted, the platform was unstable, and the flashboard risers were rusted through. This structure was also rated C-5 in 2007 and replacement of the entire structure was recommended to restore normal operations and for personnel safety. According to IMS staff, the 2007 issues were not addressed because the Army Corps of Engineers planned to include this structure in the Site 1 Reservoir project; however, the project has been delayed. As a result, the District proceeded with replacement. As of June 2017, this structure is being replaced and automated. An example of the structure's original condition is shown in the following photograph.

S-39A Culvert
Rusted Platform Support

Projects in Design Phase

A total of 60 of the 209 projects (29%) on the capital program project priority list are in different phases of design[3] (projects include 42 water control structures, 15 canals/levees, and 3 field station facilities). The design phase can be a lengthy process depending on the scope of the project and whether there are delays. Design can be delayed by several factors; for example, design, real estate, environmental, permitting, and staffing issues. Thus, due to the timeframe uncertainty in the design phase, project designs are initiated for the high ranked projects to ensure the designs are completed and the procurement process can start once design is completed. It should be noted that even after design is completed and a project in the procurement phase contract award may be further delayed due to several factors; for example, bid cancellations, rebids, and bid protests.

No Action Taken to Address Certain Priority Projects

The Operations, Engineering, and Construction Division has not taken any project development action on 117 of the 209 projects (56%) on the capital program project priority list because staff concluded that the level of risk associated with these project issues are not as critical compared to those projects currently in the design or construction phases. Specifically, these projects issues have only been reviewed by the Operations, Engineering and Construction Division and the Field Operations and Land Management Division and ranked primarily by the risk-based prioritization matrix. Engineering and Construction Bureau staff stressed that the projects posing the highest risk are being addressed and are either in the construction or design phase.

[3] Cost estimates are not available for all projects since they may be in different design phases. Cost estimates are available when design is completed and actual projects costs are available when contracts are awarded.

The following are examples of O&M capital projects which have not been addressed.

- Structures with issues resulting from Fiscal Year 2012 SIP inspections.
- Several structures requiring half-life repairs.
- Risk factors for water control structures ranged from 2.60 (priority 5) to 22.50 (priority 1).
- Canals deficiencies that the U.S. Army Corps of Engineers identified during its 2011 inspection reports that the District is required to address.
- Canal rehabilitations; for example, repair bank erosion and dredging required for specific canal segments.
- Several field station facilities with risk factors ranging from 7.80 (priority 4) to 18.00 (priority 3).

These projects will gradually be funded for design as projects in design phase progress to the procurement phase. However, costs and risks will continue to increase the longer deficiencies remain unresolved.

Assessment of Structures, Canals, and Levees

A majority of the District's water control structures were originally constructed by the U.S. Army Corps of Engineers in the mid-1900s and by the District as part of its Everglades restoration initiatives. The structures are aging and need maintenance, refurbishment, or replacement. District management recognized the need to determine the capital cost for future refurbishment and replacement of water control structures including canals and levees so that future funding needs are anticipated and addressed beforehand to ensure that the integrity of south Florida's water management system is not impacted.

In 2014, the District hired a consultant to implement a life cycle assessment application[4] (Infrastructure Life Cycle Assessment Application) to forecast costs, timeframe for minor / major refurbishments, and replacements. District staff assisted in compiling all relevant data, which included but not limited to the following: structure inventory, inspection ratings, historical cost for minor / major refurbishments and replacements, and structures resulting from projects in various phases of construction. Using this data, the consultant developed the application. Specifically, the application can generate various reports; for example, annual evaluation of which structure needs replacement, major refurbishment, or minor refurbishment and the corresponding costs.

The following sections summarize the results of the structure, canal, and levee assessments.

Assessment of Water Control Structures

Based on an assessment of over 700 water control structures (spillways, culverts, weir, locks, and pump stations) it was estimated that $60 million[5] would be needed annually during 2016 to 2026 to replace/rehabilitate high risk structures and minimize the backlog of overdue projects. This amount also includes annual programmatic expenses; for example, staff salaries, Structure Inspection Program, and several replacement programs (culverts, SCADA, generators, and engine refurbishments). During 2016 to 2026, a spike in funding would be required due to the number of structures requiring replacement/rehabilitation and the $60 million in annual funding over a period of ten years would complete the higher risk projects and minimize the number of past due projects; for example, C-5 structures will be eliminated within two years, C-4 structures within eight years, and C-3 structures will be reduced within six years.

[4] There were three phases of this project. Phase 1 included research of data sources and requirements. Phase 2 included implementation of the assessment database for spillways, culverts, weirs, locks, and pump stations. Phase 3 included data for canals and levees, and other improvements, e.g., risk score based prioritizations.

[5] The application software was used to forecast the $60 million needed annually for water control structures. Other scenarios were analyzed; however, $60 million was considered optimal.

It should be noted that several different funding scenarios were assessed; however, the $60 million was considered the best option to ensure the District's water control structures operational capability. Further, this scenario does not include the cost to rehabilitate canals and levees (these assessments are discussed in the following sections), microwave towers, and building facilities. It also does not include dredging costs. These are solely project costs for water control structures.

The number of structures has been increasing as the District completes restoration projects. As a result, more SIP inspections and maintenance will be required. The budget for O&M capital program averaged $53 million per year during Fiscal Year 2013 to Fiscal Year 2017. It should be noted that the annual approved budget has been gradually increasing. However, based solely on the assessment of water control structures, it appears that future funding levels for the O&M capital program would have to be further increased to maintain, replace/refurbish the District's aging water control structures, and restore canals and levees.

Assessments of Canals and Levees

The U.S. Army Corps of Engineers and the District staff inspect canals and levees to ensure water can properly flow and drain to ensure maximum flooding protection. Vegetation and structures along a canal right-of-way may end up in the canal and cause blockages around downstream water control structures. These obstructions can prevent water from properly draining and could result in flooding that endangers the safety of residents. Field station staff perform routine maintenance, repair, and debris removal to ensure adequate water conveyance. During times of disaster and emergency recovery, access becomes even more important as recovery teams must be able to navigate through the canal system to perform emergency maintenance tasks. Although, the District is prioritizing high risk projects, funding levels for O&M capital program projects have resulted in a backlog of canals and levees requiring restoration.

Canal Assessments

The Operations, Engineering, and Construction Division staff performed of a detailed assessment of canal bank restoration in 2015 and assigned risk levels to each canal. Overall, an estimated $1.5 billion would be required to restore about 741 miles of canal banks by primarily removing trees and stabilizing the banks. However, about 138.53 miles of the 741 miles (19%) were rated high risk. Further, staff estimated that $18.5 million would be required annually for 20 years to restore these high-risk canal banks. More importantly, staff identified the top 10 canals with the highest flood risk. These canals cover about 76 miles with a projected restoration cost of $360 million. It should be noted that canal bank restorations are being addressed using the risk based approach, i.e., canals with the highest risk are being addressed. Tree removal is the first step in the canal restoration process followed by an assessment to determine whether stabilization is required.

The District's analysis is summarized in the following table.

Canal Bank Restoration Cost Analysis (*as of 2015*)			
Canal Risk Rating	**Total Number of Miles**		**Estimated Cost to Complete**
Low	371.95 miles	*50%*	$600 million
Medium	230.35 miles	*31%*	$440 million
High	138.53 miles	*19%*	$420 million
Total	**740.83 miles**		**$1.46 Billion**
10 canals banks identified as highest risk and top priority	***75.78 miles (10%)***		***$360 million - ranging from approximately $108,000 to $114 million per canal bank***
Status of the 10 High-Risk Canals, as of September 2017			
➢ One canal is in tree removal phase. Specifically, tree removal on a segment of C-100A. Currently, on 2nd segment of a 7-mile project (one mile per segment). Work involves only tree removal. The completed mile cost about $520,000. ➢ One is in the design phase (C-17). ➢ Six canals (segments) are on the O&M capital program project list; however, no action has been taken. ➢ Two canals are not on the O&M capital program project list. Thus, no action has been taken.			

Notes

- *The canal bank analysis took various factors and costs into consideration; for example, canal condition, access to canal, flood risk (e.g., urban, rural, urban/rural mix), number of canal miles, method (barge and land) of tree removal, and material needed for bank stabilization.*

- *Canal risk factor = Likelihood of Failure (takes the following factors into consideration: canal bank condition, access along right of way (barge / land), and tree coverage (light, medium, heavy)) * Consequence of Failure (flood risk if canal is blocked).*

- *Cost estimates per mile of canal bank rehabilitation was determined primarily from other similar District projects and historical costs maintained by the District.*

- *The canal work on the O&M capital program project list may only include rehabilitating a segment of the canal and not the total miles / scope reflected in the District's assessment.*

The following are before and after photos of tree removal along a section of the C-100A canal in Miami-Dade County. As evidenced by the photos, the unobstructed canal will provide improved flood protection to residents.

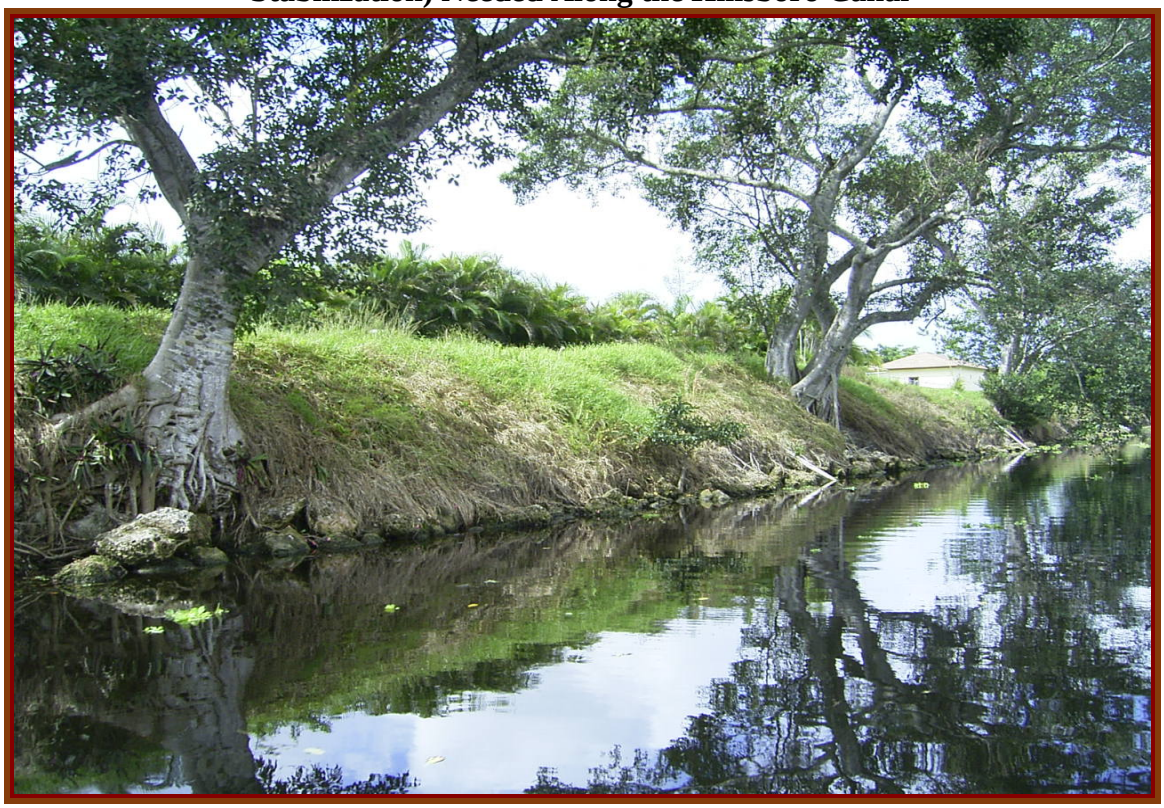
C-100A Canal in Miami-Dade County
September 2016 – Before Vegetation Removal

C-100A Canal in Miami-Dade County
February 2017 – After Vegetation Removal

According to Engineering and Construction Bureau staff, in the past there has been more emphasis on rehabilitating water control structures than canals; however, more canal rehabilitations are planned in Fiscal Year 2018 and in subsequent years. Further, certain canals posing high flood risks have been or are currently being restored by the District. The District is performing canal restoration in phases / segments and using field station staff in some instances. Examples of major canal projects are as follows:

- ***Hillsboro Canal:*** This canal flows along the county line between Palm Beach and Broward counties. Through inspections, the District identified the need for major repairs due to bank erosion, sediment buildup, and heavy vegetation. As a result, a multi-year effort is underway to ensure a 10.5-mile section of the canal will effectively move water for a 50-year period. The District has spent $14.3 million to complete two of the three phases of this project which included bank stabilization and dredging a one-mile section. The design for the remaining phase (three miles) has been completed and construction cost is estimated at about $7 million; however, the Engineering and Construction Bureau is assessing whether to complete this phase because it does not pose a high risk to the public. Further, this segment may be incorporated as part of the Site 1 Impoundment project.

Example of Canal Segment to be Rehabilitated (Tree Removal and Bank Stabilization) Needed Along the Hillsboro Canal



- ***C-40 Canal:*** A multi-year project that includes in-house dreading (Okeechobee Field Station staff) to remove about 760,000 cubic yards of sediments to restore canal design and reestablish conveyance capacity, canal bank repair, and some tree removal. During Fiscal Year 2014 to Fiscal Year 2016, the cost to dredge about six miles of canal was $622,897. An additional six miles remains to be dredged. Completion is projected for Fiscal Year 2019.

- ***C-4 Canal:*** This canal bank flood improvement project has been ongoing for several years and is anticipated to cost about $10 million upon completion. Six phases of this seven-phase project have been completed and the final phase is anticipated to begin sometime in Fiscal Year 2018.

Levee Assessments

Operations, Engineering, and Construction Division staff also performed a detailed assessment of levee rehabilitation in 2015 and assigned risk levels to each of the levees. Overall, an estimated $389 million would be required to rehabilitate about 938 miles of levees. However, about 88 miles of the 938 miles (9%) were rated high risk and an estimated $10 million would be required annually for five years for rehabilitation. More importantly, staff identified the top 10 levees posing the highest risk. These levees cover about 67 miles with a projected restoration cost of $44 million. According to staff, levee restorations are being addressed using the risk based approach, i.e., levees with the highest risk are being addressed.

The analysis is summarized in the following table.

Levee Rehabilitation Cost Analysis (*as of 2015*)			
Risk Level	**Total Number of Miles**		**Estimated Cost to Complete**
Low	515.54 miles	*55%*	$197 million
Medium	334.97 miles	*36%*	$140 million
High	87.81 miles	*9%*	$52 million
Total	**938.32 miles**		**$389 Million**
10 levees identified as highest risk and top priority	***66.57 miles (7%)***		***$44 million - ranging from approximately $266,700 to about $14 million per levee***
Status of the 10 High-Risk Levees, as of September 2017			
➢ One of the levees is in the design phase. ➢ Four levees are on the O&M capital project list; however, no action has been taken. ➢ Five levees are not on the O&M capital project list. Thus, no action has been taken.			

Notes

- *The levee analysis took various factors and costs into consideration; for example, canal and levee length, U.S. Army Corps of Engineers embankment condition assessment, seepage and structure condition, consequence of failure, and cost to complete canal bank stabilization and levee rehabilitation costs.*

- *Levee risk factors = Likelihood of Failure (takes the following factors into consideration: U.S. Army Corps of Engineers levee bank condition rating, SIP structure rating of C-4/C-5, PC replacement rating, known seepage issues, and vegetation coverage) * Consequence of Failure (priority ranking – risk to population/highway/agriculture).*

- *Cost estimates per mile of levee rehabilitation was determined primarily from other similar District projects and historical costs maintained by the District.*

- *The levee work on the O&M capital program project list may only include rehabilitating a segment of the levee and not the total miles / scope reflected in the District's comprehensive assessment.*

While we found that project development action has not been taken on nine of the ten levees deemed high risk, we also found that other levees posing high flood risks have been or are being restored by the District. The District has been performing levee restoration in phases / segments. The following is an example of a major completed project.

- ***East Coast Protective Levee (ECPL):*** The District completed a multi-year rehabilitation program of the ECPL, protecting 105 miles of some of the region's most populated areas located in western Palm Beach, Broward, and Miami-Dade counties. This rehabilitation project cost about $30 million and addressed concerns identified by the U. S. Army Corps of Engineers and District staff. The levee system has been accredited by FEMA. Accredited levees provide the most robust level of flood protection on flood insurance rate maps. Further, regular maintenance performed by field station staff will ensure the ECPL will continue to protect residents and businesses in South Florida

Based on the District's cost assessments for replacing / restoring / rehabilitating its water control structures, canals, and levees, it is apparent that the District must explore the option of further increasing funding for O&M capital program projects. The annual average adopted budget for O&M capital projects of $53 million from Fiscal Year 2013 to Fiscal Year 2017 does not appear sustainable to ensure the integrity and reliability of south Florida's water management system. The District has been increasing annual funding amounts for the O&M capital program projects over the last few years. Specifically, $61.8 million has been budgeted for Fiscal Year 2018 for the O&M capital program. However, based on the District's assessments, over the next few years about $88.5 million is needed annually to maintain, replace / refurbish the District's aging water control structures ($60 million annual for ten years), restore canals banks ($18.5 million annually for 20 years), and rehabilitate levees ($10 million for five years).

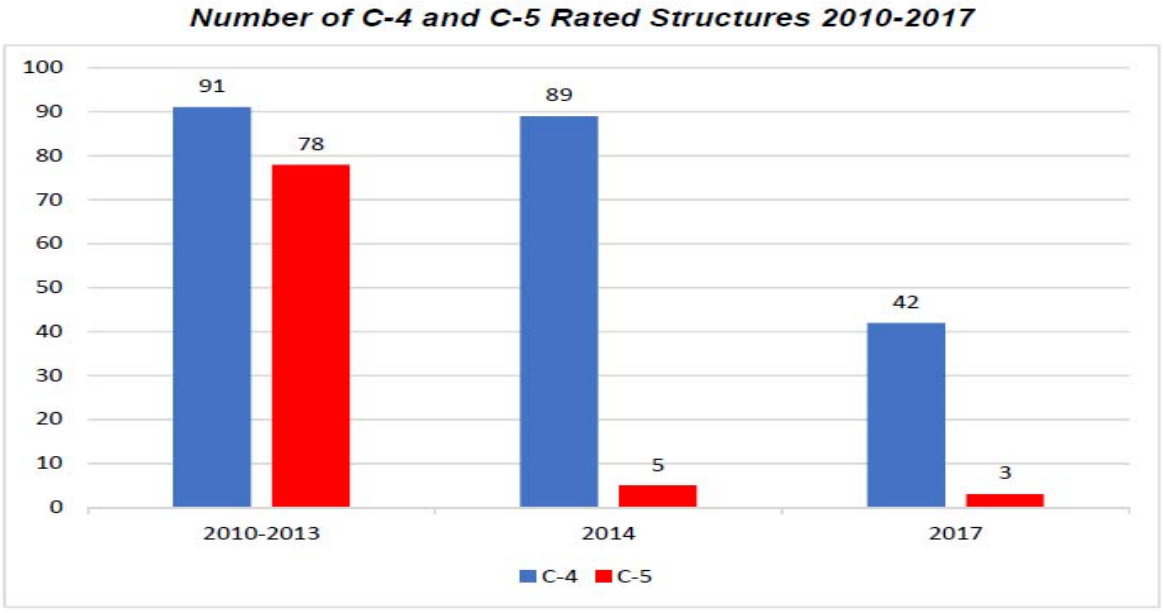
Although the assessments conclude that additional funding is required to address more high risk projects, the District has a process in place to ensure that the water control structures, canals, and levees posing the highest risk to the regional water management system risk are rehabilitated, replaced, and / or restored. To ensure that more projects are addressed, we recommend that the District should consider future funding increases to adequately maintain, replace / refurbish its aging water control structures, canals, and levees. Further, increased funding should include increased staff levels to address project workloads.

In addition, the District should monitor the progress of the Federal Infrastructure Plan, which was proposed by the President in February 2018. If the approved bill provides any grant funding opportunities, the District should coordinate with the State and consider applying.

Recommendations

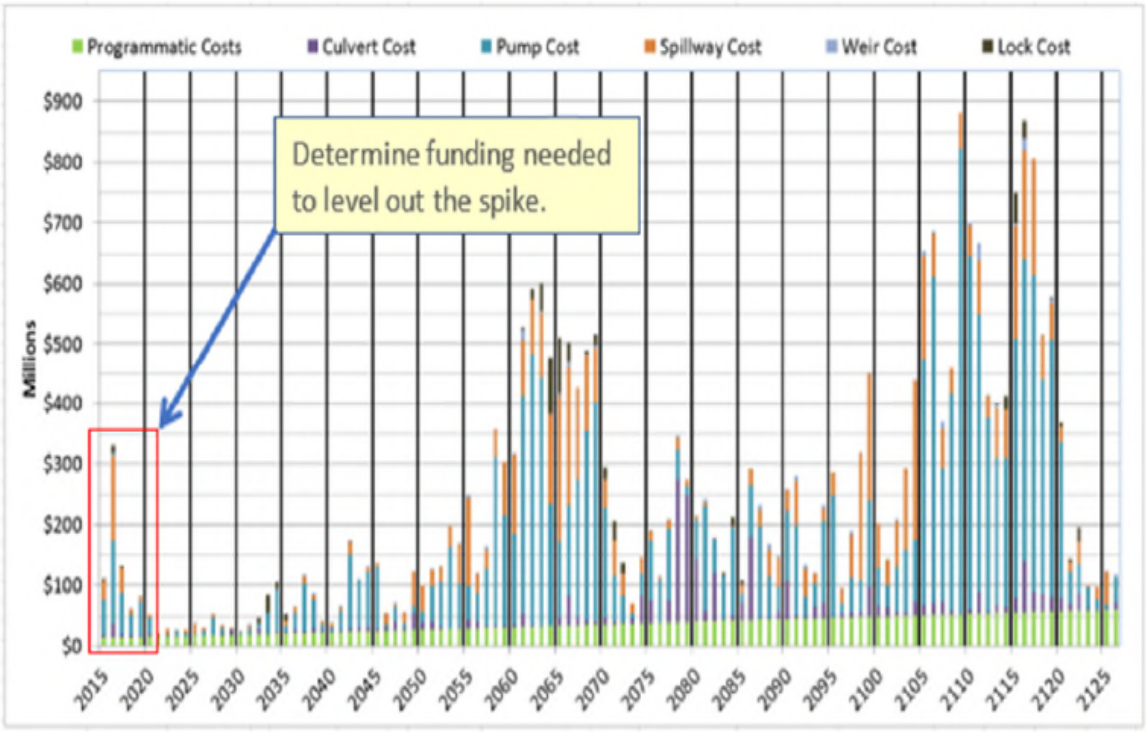
1. **Consider continuing to increase the annual funding allocated to O&M capital program projects to address more of the O&M capital projects and the results of the water control structure, canal, and levee assessments.**

   Management Response: During the development of the FY2011-2012 budget the level of funding was reduced with the downturn in Ad Valorem collections, to approximately $50M under the premise that the program would be able to adequately maintain District infrastructure without allowing the current number of backlog projects, that were in need of repairs, to increase. As can be seen in the graphic below the program was able to successfully accomplish this.



In 2015, the District hired a consultant to assist District staff in developing a Capital Program Infrastructure Lifecycle Assessment Model to forecast costs and timeframes for refurbishment and replacement of more than 700 District water control structures. The model uses historical cost data and timeframes for refurbishment and replacement of each type of water control structure and then uses the inspection condition rating (i.e., "C" rating) to give priority to completing those projects first that received inspection ratings that indicate major deficiencies exist. The model output provides annual rollup costs for refurbishment and replacement of water control structures based on scenario analysis of different funding levels for the capital program. The initial analysis focused on determining the annual funding level needed to complete the scheduled projects by spreading out the current life cycle cost spike. Once the initial spike has passed, the model indicates that less than $50 million will be needed through 2034.

Capital Program Infrastructure Life Cycle Assessment Model Output



Phase two of the Lifecycle Assessment model included the addition of the Canal and Levee assessment and expanding all prioritization from condition-based to risk-based by including both the likelihood of failure (Physical Condition "C" rating) multiplied by the consequence of failure (percentage of urbanization of the drainage basin the facility serves). The canal physical condition assessment was based on canal bank condition, access along right-of-way and vegetation coverage. The levee physical condition assessment was based on slope stability, settlement, erosion/bank caving, depressions/rutting, cracking, seepage, animal control and vegetation coverage. Although the canal and levee assessment did identify that $18.5 million may be needed annually for 20 years to restore canal banks, and $10 million may be needed annually for five years to rehabilitate levees, these programs were never considered to be part of the original Operations and Maintenance Capital Program and instead the costs of such improvements were funded by other District initiatives.

Please note the canal and levee assessment did not consider capacity reduction, which was performed under the Canal Conveyance Capacity Program (CCCP), undertaken from 2006 to 2008. Currently canals in Miami-Dade County and the Big Cypress Basin, are being further evaluated under the level of service investigation to determine if any reduction in flood protection has occurred and, therefore, if dredging should be planned. Of the initial canals evaluated to date in Miami-Dade County, it was determined that additional dredging was not needed.

In summary District Management agrees that the Operations and Maintenance Capital Program needs additional funding in the coming years, however District Management disagrees with the recommended amount of $88.5M. If the District were to increase the funding of the Operations and Maintenance Capital Program to $88.5M in the FY2018–2019 budget this would directly contradict the audit's recommendations under Recommendation #4 below pertaining to reducing the annual rollover amounts. Increasing the level of funding for the program also necessitates "ramping up" the program to be able to execute at the higher funding levels. A look back at FY2009–2010 illustrates how sudden increases in funding does not equate to higher levels of program execution as it takes time to develop the design plans and specs that result in additional construction activities.

In consideration of this, District Management has been working towards increasing the amount of funding allocated to the Field Station Maintenance program as well as the Operations and Maintenance Capital Program as evidenced by the Governing Board approval to increase the amount of funding in the FY2017-2018 budget for the Operations and Maintenance Capital Program by an additional $3M. Currently, the proposed FY2018-2019 budget, which is subject to Governing Board approval, incorporates an additional $1M for the Operations and Maintenance Capital Program and $1M for the Field Station Maintenance Program. Together, this represents a $5M increase over the audited period if approved by the Governing Board.

Responsible Division: Operations, Engineering & Construction; Field Operations & Land Management; and Administrative Services

Estimated Completion: $3M increase was already approved in the FY2017-2018 budget. An additional $2M increase is proposed for consideration by the Governing Board in the development of the FY2018-2019 budget. In the near term, it is the intent of District Management to increase the budget of the Operations and Maintenance Capital Program by an additional $5M through FY 2020-2021. All future year increases are subject to Governing Board approval.

2. Ensure that planned canal and levee related projects are performed.

Management Response: In support of the Capital Program Infrastructure Lifecycle Assessment Model, District staff quantified and completed a risk-based prioritization of District canals and levees. The canal and levee related projects are prioritized in a similar manner to water control structures and each year at least two new reaches will be identified and moved into either design or construction depending on specific project needs and on total program funding discussed in Recommendation #1.

The canal assessments evaluated the canal bank condition and vegetation density in the canal right of way. Canal conveyance is at its highest risk of blockage from large vegetation along canal banks because of the effects of wind and rain,

which can break limbs or loosen root zones and eventually fall into the canal. Due to past experiences with hurricane events, the District therefore determined that tree removal in highly populated urban areas would provide the best risk reduction and have been focusing on tree removal projects in both Miami-Dade and Broward Counties (C100A and North New River canals respectively).

District staff evaluated canal conveyance in 2006 – 2008 and determined that further evaluations in the lower east and west coasts would be necessary due to development changes from the original design and sea level rise. The inception of the Flood Protection Level of Service Program began in Fiscal Year 2013-2014 and was created to identify and prioritize the current and future infrastructure needs of the District. This is a multi-year effort implemented through local flood studies that assess and prioritize flood protection needs and are followed by project implementation. The assessment identifies flood issues, generates an updated water operations atlas, examines the impact of sea level rise on coastal structures, examines coastal flow and stage data to update structure design criteria, and when necessary, develops a flood model of the primary canal conveyance system. The flood model is used to determine the current and future level of flood protection. Flood studies have been completed for the C-4 and C-7 basins in Miami-Dade and a study of the watersheds in the Big Cypress Basin is nearing completion.

In contrast the previous Canal Conveyance Capacity Program (2006 – 2008) and identified segments of District canals that are deficient with respect to the original design characteristics and recommended remedial measures that would, at a minimum, restore them to their design criteria. This was primarily accomplished by identifying canal reaches where, (i) bottom elevations exceeded their design elevations by more than two feet, or (ii) the design depths have decreased by more than 10%. In addition to these efforts, Field Station staff and Water Managers were interviewed to determine which canal systems exhibited either visual constrictions or limited canal capacity and staff began analyzing nine separate canals in the north and south ends of the system.

The current program essentially maintains the same objectives, except that a more comprehensive engineering approach to evaluating canal capacities is included.

Canal capacities are evaluated by their original design flows, current design flows, design water surface profiles and available freeboard. Water surface profiles at design discharges under current conditions will be compared to those pertaining to original design conditions. This approach will allow for the accounting of factors other than canal conditions that may influence system capacity (e.g. structure capacities and operations), leading to more reliable remedial measures. Canals that may require dredging will be identified through this process. The District has not waited for this process to be complete and started an in-house dredging program utilizing a team assembled from Field Station staff with specific expertise. This team has performed dredging/bank stabilization projects starting with the Deer Fence Canal in Hendry County in Fiscal Year 2012-2013 to increase its conveyance capacity, to the ongoing C40 Canal work in Glades County that began in Fiscal Year 2013-2014.

For levees, the District began its risk-based program starting in 2009 when the USACE began its inspection of the District's levee inventory. Because the East Coast Protective Levee (ECPL) provides protection to the highest populated areas from West Palm Beach south to Miami, evaluation and refurbishment of the ECPL became our highest priority. Evaluation, design and construction for multiple segments of the ECPL began in 2009 and were completed in 2015. As requested by both Palm Beach and Broward County, the District provided documentation to FEMA that these levees provide protection from the base flood and are in full compliance with regulations established in 44 CFR 65.10. The District has also been working on clearing vegetation along levees and requiring removal of encroachments impacting the levee prism through the District Right of Way Program. The District has also been prioritizing replacements of C-5 and C-4 rated structures that are in levee systems higher than in canal systems as part of our risk-based approach.

Responsible Division: Operations, Engineering & Construction; Field Operations & and Management; and Administrative Services

Estimated Completion: Complete, subject to the outcome of future budget formulation cycles.

3. **Coordinate with the State and apply for any available grant infrastructure funding that may become available if the Federal Infrastructure Bill is passed.**

   Management Response: Once the Federal Infrastructure Bill is passed, Operations, Engineering & Construction will work with Administrative Services to identify available funding and apply for the appropriate grants to secure for the program where possible.

   Responsible Division: Operations, Engineering & Construction; and Administrative Services

   Estimated Completion: This will be completed on or prior to the grant application deadline(s) published under the Federal Infrastructure Program.

O&M Capital Program Budget Analysis

Annual funds budgeted for O&M capital program projects are allocated to two categories for tracking purposes:

- external contracts and operating expenses, and
- internal labor expenses.

The annual approved budget allocated to the O&M capital program for external contracts and other operating expenses to address repair, refurbishment or replacement of water control structures, including canals and levees, has averaged $46.2 million per year from Fiscal Year 2013 to Fiscal Year 2017. Budgeted amounts encumbered but not expended at the end of the fiscal year are rolled over to the next fiscal year. In addition, an average of $6.9 million per year, from Fiscal Year 2013 to Fiscal Year 2017, has been expended on salaries expenses for District employees working on O&M capital program projects. We used the actual amount expended for labor since unexpended amounts allocated to specific projects are not rolled over to the next fiscal year but transferred to fund balance at the end of the year. Thus, about $53 million is budgeted for contracts and expended on internal labor annually. It should be noted that $61.8 million has been budgeted for Fiscal Year 2018 for the O&M capital program (contracts and internal labor

expenses). The Fiscal Year 2018 budget includes an additional $3 million for increased projects and activities critical to the strength and condition of the Central and South Florida system, stormwater treatment areas, and projects in the Big Cypress Basin. As part of our audit, we analyzed the budget and expenditures for Fiscal Year 2013 to Fiscal Year 2017 to determine whether the amounts budgeted for contract activities have been adequately administered.

Our analysis of the budget and expenditures for Fiscal Year 2013 to Fiscal Year 2017, provided by the Budget Bureau, disclosed large rollover amounts.

The following table summarizes the budget and expenditures for the O&M capital program from Fiscal Year 2013 to Fiscal Year 2017. Following the table are notes and explanations for certain terms.

O&M Capital Program Summary of Budget and Expenditures for Fiscal Year 2013 – Fiscal Year 2017					
Activities	**2013**	**2014**	**2015**	**2016**	**2017**
Contract Budget and Expenditures					
Adopted Budget (New Funds) (A)	$ 45,900,000	$ 45,900,000	$ 45,567,660	$ 46,891,903	$ 46,951,160
Rollover from Prior Year Net of Accruals and Transfers (B)	$ 3,761,544	$ 3,033,316	$ 7,200,062	$ 9,196,217	$ 14,379,334
Consumable Budget (A+B)	$ 49,661,544	$ 48,933,316	$ 52,767,722	$ 56,088,120	$ 61,330,494
Contract Expenditures	$ 46,606,242	$ 41,459,739	$ 41,730,243	$ 40,453,750	$ 55,325,762
Internal Labor Expenditures					
Internal Labor Expenditures	$ 7,050,229	$ 6,353,473	$ 7,264,183	$ 7,128,646	$ 6,578,519
Total Contract and Internal Labor Expenditures					
Contract	$ 46,606,242	$ 41,459,739	$ 41,730,243	$ 40,453,750	$ 55,325,762
Salary	$ 7,050,229	$ 6,353,473	$ 7,264,183	$ 7,128,646	$ 6,578,519
Total Expenditures	$ 53,656,471	$ 47,813,212	$ 48,994,426	$ 47,582,396	$ 61,904,281

Notes

- *Rollover from Prior Fiscal Year Less Accruals and Transfers: **1)** The rollover amount is the prior year's amount encumbered for goods and services that have not been received. This amount is rolled over to the next fiscal year and becomes part of the consumable budget. **2)** Accrual amounts are for services received in the prior year; however, payments were made in the following fiscal year, which reduces the initial rollover amounts. **3)** Transfers include various types of transfers, e.g., transfers to reserves and Governing Board approved transfers.*

- *Internal Labor Expenditures: Salaries and benefits for staff (e.g., Operations, Engineering, and Construction, and Field Operations and Land Management Divisions) assigned to O&M capital program projects. It should be noted that internal labor amounts are budgeted for each year and allocations can be revised throughout the year to reflect changes in program needs and District priorities. Budgeted labor costs can be affected by various factors, e.g., staff vacancies due to shortages, retirements, project delays, and staff transfers to other projects. Further, budgeted labor amounts are accounted for differently than budgeted contact amounts. Committed contract funds are carried forward to the next fiscal year; however, unexpended labor budget cannot be carried forward to the next fiscal year. Thus, we used only actual labor expenditures in our analysis.*

The Budget Bureau and the Operations, Engineering, and Construction Division closely monitor, discuss, and revise the contract budget throughout the fiscal year, as necessary. Based on our review of the budget and expenditure data obtained from the Budget Bureau and discussions with staff, we concluded the following:

- Encumbrances / rollover from prior fiscal year (net of accruals and budget transfers) for contracts and operating expenses ranged from about $3 million to $14.4 million during Fiscal Year 2013 to Fiscal Year 2017. The rollover amount from Fiscal Year 2017 to Fiscal Year 2018 was $6 million[6], a decrease of $8.4 million compared to the $14.3 million rollover from Fiscal Year 2016 to Fiscal Year 2017. Large carryover amounts may indicate that planned work for the fiscal year is not being accomplished and overstates the consumable budget amount for the subsequent year; for example, the contract budget was about $47 million compared to the consumable budget of about $61 million in Fiscal Year 2017. According to staff, there are various reasons why contract funds are carried over; for example,
  - Planned project constructions were not completed by the end of the fiscal year; for example, contract executions were delayed and contractors may have been behind construction schedule.
  - Staff shortages and the loss of experienced staff across the District have impacted project progress since staff from various resource areas across the District are involved in the procurement / construction process.
  - Other issues such as permitting and procurement delays; for example, contract rebids due to an insufficient number of bids from contractors.

According to Budget Bureau staff, steps have been taken to address the trend of large rollover amounts; for example, contract schedules are closely reviewed, and encumbrances are made based on work anticipated to be completed during the fiscal year to ensure that budgeted funds could be expended during the year.

[6] This amount does not include accrual and budget transfer adjustments.

Recommendations

4. Continue to take appropriate steps to reduce rollover amounts at the end of the fiscal year.

Management Response: The Operations and Maintenance Capital Program rollover amounts are subject to change due to many factors. As mentioned in the auditor's report, permitting and construction delays can cause changes in the planned spending schedule. USACE Regulatory permits are subject to receiving a 408 Approval and the USACE has no specific timeframe or federal budget available for completing these reviews. Construction delays can occur during the bid process or during construction. A specific example for a bid process delay is the S-5A Pump Station Refurbishment project. This project was advertised for bid twice because the first responses for bid were higher than estimated. Time was spent on negotiations with the contractor in an attempt to reduce the cost, however this path was not successful. Therefore, staff evaluated and adjusted the schedule requirements for the project and rebid the project to achieve a lower bid response. It was this delay that directly contributed to the highest rollover amount during FY 2015-2016.

The Engineering and Construction Bureau will continue to closely review contract schedules, create encumbrances based on work anticipated to be completed during the fiscal year, and establish a larger backlog of projects whose design and permitting are completed and are simply awaiting funding for bidding and construction. The team performed very well this past fiscal year in reducing the rollover amount to the second lowest since the Operations and Maintenance Capital Program's inception in 2010.

Responsible Division: Operations, Engineering & Construction; Field Operations & Land Management; and Administrative Services.

Estimated Completion: Complete

5. **Assess whether additional staff is needed to administer O&M capital program projects.**

Management Response: Current staffing level, combined with current vacancies in the process of recruitment, are sufficient to handle the volume of work corresponding to the program's current budget level. If the budget level is increased over time, then the volume of work that can be executed during a given year will increase, necessitating a reassessment of the staffing levels. To accomplish this District Management is constantly assessing FTE positions across the District and balances needs accordingly so that resources are allocated to the highest District priorities. Therefore, increasing the number of resources dedicated to implementing the Operations and Maintenance Capital Program doesn't equate to increasing the overall FTEs within the agency.

Responsible Division: Operations, Engineering & Construction

Estimated Completion: Complete

Field Station Repairs Identified by Structure Inspections

Overall, we found that IMS adequately complies with District policies and procedures relating to structure inspections; for example, IMS staff:

- Inspected water control structures owned and operated by the District on a five-year cycle.
- Documented the inspection results in detailed inspection reports.
- Identified deficiencies that should be repaired by field station staff or other parties.
- Identified and forwarded deficiencies that should be addressed as capital project to the Engineering and Construction Bureau.

However, we noted that a few areas could be improved. Specifically, IMS is required to forward issues identified during structure inspections and the recommended actions to the responsible field station for repairs. Initially, IMS could not provide some of the spreadsheets documenting that issues were forwarded to the field stations. This was due to staff turnover. Subsequently, IMS provided the supporting documentation and improved the process by maintaining all spreadsheets in Documentum. IMS should continue to ensure that future field repairs spreadsheets are maintained in Documentum. Further, all inspection reports are maintained in the District's SIP Archival Tool Database for easy access, update and overall structure information management. However, during our review, we noted that a few reports were not loaded in the database.

In addition, the inspection reports for Fiscal Year 2014 indicated whether repairs from the prior inspections were addressed. However, we noted that the inspection reports for Fiscal Year 2015 and Fiscal Year 2016 did not indicate whether there were unresolved deficiencies from the prior inspections. IMS and Field Operations Bureau staff acknowledged that improvements could be made to the SIP inspection process by indicating in the reports whether issues cited during the prior inspection were still outstanding. This would be helpful in determining whether required repairs are addressed in a timely manner.

Further, based on the inspection reports, repair responsibilities are classified as field station, capital project, SCADA, and other. According to IMS staff, certain non-field station repairs have been listed as field station repairs with the expectation that the field stations would forward the repairs to the relevant area for resolution; for example, certain SCADA issues would be forwarded to the SCADA Section for resolution. However, IMS plans to revise the inspection reports and the reporting process to ensure that repairs are addressed directly to the responsible areas.

Structure Inspection Repairs Assigned to Field Stations

According to IMS staff, field station staff are notified of C-3, C-4, and C-5 structure deficiencies identified in the SIP inspection reports as field station repairs. Field Operations Bureau staff explained that not all C-3 deficiencies require repairs; for example, some are deemed minor / low priority and cannot be addressed due to staffing priorities. In addition, Field Operations Bureau staff may determine that some of the C-3 repair items are fully operational despite appearances; for example, rusted fencing. In these instances, no field station action is required.

However, we concluded that there is no adequate process in place to document the field stations' review of the deficiencies and the planned actions to address the specific C-3 deficiencies identified in the inspection reports; for example, whether specific deficiencies would be repaired, deferred, or required no action by the field station. As a result, we were unable to determine whether all deficiencies requiring repairs were resolved. Lack of an adequate process to track the status of required repairs may lead to repairs remaining unresolved, structure deterioration, and increased repair costs. Further, some C-4 and C-5 deficiencies are required to be addressed by the field stations. However, based on our review, we were also unable to determine whether all these deficiencies were resolved. Some may have been resolved but were not adequately documented in SAP as SIP repairs. Thus, we concluded that improvements are needed to adequately document the resolution of structure repairs classified as field station repairs in the SIP inspection reports.

During our audit, Field Operations Bureau staff have implemented a process to address this issue. Specifically, field station repairs recommended as a result of the Fiscal Year 2017 SIP inspections were analyzed, required actions were documented, and items requiring repairs will be tracked to ensure completion. In addition, field station staff will continually be reminded to ensure SIP repairs are labelled in SAP.

Based on a Field Operations Bureau's Plant Maintenance Business Rule, work order headers for SIP repair work orders should begin with the words "SIP Repair." As part of our audit tests, for Fiscal Year 2014 to Fiscal Year 2016, we determined which inspected structures IMS identified as requiring field station repairs. We then reviewed SAP for all work orders with the keyword "SIP" processed during Fiscal Year 2014 to Fiscal Year 2017 (March 2017) to determine whether SIP repairs recommended by IMS inspection staff were being made. Specifically, based on our review it initially appeared that 343 structures needed field station repairs; however, based on SAP data, SIP repairs were made to only 49 structures (14%). In addition, we concluded that repairs were not required for 120 structures (35%) for various reasons; for example, we excluded structures that were on Engineering and Construction Bureau's O&M capital program project list since the repairs may be addressed by capital projects. After these exclusions and taking into consideration that there is no system in place to determine how field station repairs would be addressed, it appeared that SIP repairs identified by IMS as field station repairs were not made to 174 structures (51%). However, based on discussions with IMS and Field Operations Bureau staff, we further determined some reasons why certain structures were not repaired by the field stations.

The results of our review are summarized in the table below followed by detailed explanations provided by staff why certain structures were not repaired.

Analysis of SIP Repairs Assigned to Field Stations *(Note 1)*							
Fiscal Year 2014							
		Field Station Repairs Required – Per SIP Report			**Structure Repairs by Field Station – Per SAP**		
Regions	**Structures Inspected**	**Yes**	**No**	**NA** *(Note 2)*	**Yes**	**No**	**NA** *(Note 3)*
C&SF	62	48	14	0	15	25	8
STA1W	87	77	10	0	0	0	77
Total	**149**	**125**	**24**	**0**	**15**	**25**	**85**
Fiscal Year 2015 *(Note 4)*							
C&SF	54	48	0	6	26	15	7
STA5-6	14	14	0	0	4	10	0
STA1E	51	33	0	0	0	32	1
STA1W	2	2	0	0	0	0	2
Total	**121**	**97**	**0**	**6**	**30**	**57**	**10**
Fiscal Year 2016							
C&SF	58	54	2	2	4	27	23
STA5-6	71	64	7	0	0	63	1
STA2	4	3	1	0	0	2	1
Total	**133**	**121**	**10**	**2**	**4**	**92**	**25**
Total	**403**	**343**	**34**	**8**	**49**	**174**	**120**

Notes

- ***Note 1:*** *Reflects inspections for all District field stations except the Big Cypress Basin (BCB). We did not review these inspection results. In Fiscal Year 2014, only 16 BCB structures were inspected. There were no BCB inspections in Fiscal Year 2015 and Fiscal Year 2016.*
- ***Note 2 – NA (Field Station Repairs Not Required per SIP Report):*** *Based on the SIP inspection reports, field station repairs were not required to be performed for various reasons; for example, the repairs will be addressed by a capital project or the repairs were the responsible of another entity. Thus, not applicable (NA).*
- ***Note 3 – NA (Repairs Required per SIP Report, but Not Required to be Made by Field Station):*** *According to IMS staff, in certain instances although the inspection reports identified field station repairs, repairs are not required to be made for various reasons; for example, repairs are not made for structures on the capital project list in the following instances: 1) Deficiencies will be addressed by the capital project, 2) Structure is scheduled for removal, or 3) Repairs are another public entity's responsibilities.*

- ***Note 4 – Fiscal Year 2015:*** *IMS inspection list indicated that 121 structures were planned to be inspected. However, we noted that the list included 18 structures located in STA1E that were not inspected by IMS. These structures were refurbished by the U.S. Army Corps of Engineers in 2014 and 2015.*

Fiscal Year 2014 – Field Station Recommended Repairs

- *Central & South Florida – Based on SIP Inspections - Field Station Repairs Recommended for 48 Structures*: IMS recommended repairs to 48 structures. However, repairs were not required for eight structures for various reasons; for example, structures were on the capital project list and repairs may be addressed as part of the capital project. These structures were not included in our analysis. Our review of SIP work orders[7] in SAP disclosed that SIP repairs were made to 15 of the 40 remaining structures. We noted that partial SIP repairs (electrical) were made to three structures. However, there were no indications that SIP repairs were made to 22 of the 25 remaining structures. In addition, several structures had C-4 issues that appeared unresolved. Further, our review of the inspection reports for the 25 structures with outstanding repairs disclosed that nine of the structures still had unresolved deficiencies that were identified in the 2007 and 2008 inspection reports. Some of these repairs were identified as C-4 repairs. Since we could not determine whether SIP repairs were made, we concluded that some repairs may have been outstanding for about ten years. Field Operations Bureau stated that some of these repairs may have been addressed but not classified as SIP repairs in SAP and some may not have required field station action.
- *STA 1 West – Required Field Station Repairs Not Applicable to 77 Structures for Various Reasons*: IMS staff inspected 87 structures (78 culverts, 5 spillways, and 4 pumps) and concluded that the West Palm Beach field station was required to make above water repairs for 77 of the 87 structures. It should be noted that several structures had substantial underwater deficiencies and required total structure replacement. Specifically, 19 of the 77 structures were rated C-4s. As a result, in October 2014, IMS recommended that capital project and a small project (for structures that did not require engineering design) to address these issues. However, according to IMS staff, no repairs / refurbishments were made at the time because of

[7] It should be noted that we reviewed SAP for SIP repair work orders in March 2017.

tentative plans for STA 1 West to be part of an expansion project. Thus, there was no need to address the deficiencies. Subsequently, it was determined that STA 1 West would not be included in the project and the structural issues would have to be addressed. As a result, a capital project for STA 1 West refurbishment was recommended; however, as of August 2017, no project development action has been taken by the Engineering and Construction Bureau. It should be noted that in 60 of the 77 SIP inspection reports for Fiscal Year 2014, IMS staff indicated that deficiencies found during the 2008 inspections were not addressed. Thus, some repairs have been outstanding for over nine years. According to Field Operations Bureau staff, the current structure conditions do not impact operations. Further, there are no immediate plans to address the issues since they will be addressed by a capital project.

Fiscal Year 2015 – Field Station Recommended Repairs

Based on the Fiscal Year 2015 structure inspections, IMS recommended field station repairs for 97 structures. However, repairs were not required for ten structures due to various reasons; for example, structures were on the capital project list and repairs may be addressed by the capital project. These structures were not included in our analysis. Our review of SAP for SIP related work orders for the remaining 87 structures disclosed that SIP work order repairs were made for 30 of the 87 structures. However, there are no indications in SAP of SIP work orders for the remaining 57 structures requiring repairs. Based on the inspection reports, the number of C-3 issues for the 57 structures ranged from one repair per structure to 45 repairs per structure for a total of 700 deficiencies. It should be noted that since there is no adequate process in place to identify how many of these deficiencies required repairs by the field stations, we could not determine how many of these 700 deficiencies required repairs. Further, 20 of the 57 structures had 33 C-4 deficiencies, meaning the safety and /or operations could be hindered if not addressed, and three had C-5 deficiencies, meaning deficiencies should be immediately addressed. Based on the inspection reports, some of the C-4 and C-5 deficiencies relating to nine of the 20 structures were resolved; however, there were no

indications of repairs in the inspection reports or SAP for the remaining 11 structures. Thus, we were unable to determine all C-4 and C-5 deficiencies were resolved.

Fiscal Year 2016 – Field Station Recommended Repairs

Based on the Fiscal Year 2016 structure inspections, IMS recommended repairs to 121 structures. However, repairs were not required for 25 of the 121 structures for various reasons; for example, structures were on the capital project list and repairs may be addressed by the capital project. These structures were not included in our analysis. Thus, repairs were required for 96 structures. Our review of SAP for SIP work orders disclosed that SIP repairs were made to only four structures. Specifically, there are no indications in SAP of SIP work orders for the remaining 92 structures requiring repairs. Based on the inspection reports, the number of C-3 issues for the 92 structures ranged from one repair per structure to 29 repairs per structure and totaled 773 deficiencies. It should be noted that since there is no adequate process in place to identify how many of these deficiencies required repairs by the field stations, we could not determine the how many of these 773 deficiencies required repairs. Further, 11 of the 92 structures had 15 C-4 deficiencies. We could not determine whether any of these C-4 repairs were made. According to Field Operations Bureau staff, some repairs may be required but have not yet been scheduled because the inspections were completed in 2016 and it takes time for the field station to plan and budget for SIP repairs.

Overall Conclusion re: Fiscal Year 2014 to Fiscal Year 2016 Recommended Repairs

Based on our review of SIP inspection reports for Fiscal Year 2014 to Fiscal Year 2016 maintained in the SIP Archival Tool Database, SAP for repair work orders resulting from structure inspections, and discussions with IMS and Field Operations Bureau staff, we concluded that field station staff may have taken certain actions or made certain determinations about C-3 structure deficiencies identified as field station repairs; for example,

- Some did not require repairs by the field stations, e.g., repairs will be addressed as part of a capital project (refer to Fiscal Year 2014 inspections - STA 1West).
- Some may have been made but not reflected in SAP as SIP repairs. As a result, we recommend that Field Operations Bureau staff take step to ensure that field station staff properly labeled SIP related work orders. This would easily identify SIP related repairs.
- Some may be required but have not yet been scheduled. According to IMS and Field Operations Bureau staff, C-3 deficiencies resulting from the Fiscal Year 2016 inspections that require repairs have not been corrected because the inspections were completed in 2016 and it takes time for the field station to plan and budget for structure inspection repairs.
- Some items are fully operational despite appearances; for example, rusted fencing. In these instances, no field station action is required.
- Some only required monitoring.
- Some were minor and did not need immediate attention.
- Some may be required but have not been made due to several other issues; for example, lack of staffing, and the need to prioritize other field station maintenance work over SIP repairs. Still, delays in addressing deficiencies may lead to structure deterioration and increased repair costs.

Improvements are needed to ensure that deficiencies classified as field station action items are categorized (e.g., repairs, no repairs, and monitor) and those requiring actions are tracked to ensure that deficiencies requiring repairs are addressed. During our audit, Field Operations Bureau staff have implemented a process to address this issue.

Specifically, field station repairs recommended as a result of the Fiscal Year 2017 SIP inspections were analyzed, required actions were documented, and items requiring repairs will be tracked to ensure completion. In addition, field station staff will continually be reminded to ensure SIP repairs are labelled in SAP.

Discrepancies Between Information in the SIP Inspection Reports and SIP Database

Our audit disclosed numerous discrepancies between the issues reported in the Fiscal 2015 and Fiscal Year 2016 SIP inspection reports and the issues reflected in the SIP Archival Tool Database. Specifically, we compared the C-3, C-4, and C-5 issues indicated in the inspection report to the service request issues listed in the database. Both sources should reflect the same data; however, we found structure repairs discrepancies between the two sources for 40 of the 103 Fiscal Year 2015 reports and 51 of the 133 Fiscal Year 2016 reports. The common discrepancies we found are as follows:

- Repairs identified in the inspections reports were not reflected in the database and repairs reflected in the database were not in the inspection reports.
- Rating discrepancies between the reports and the database.

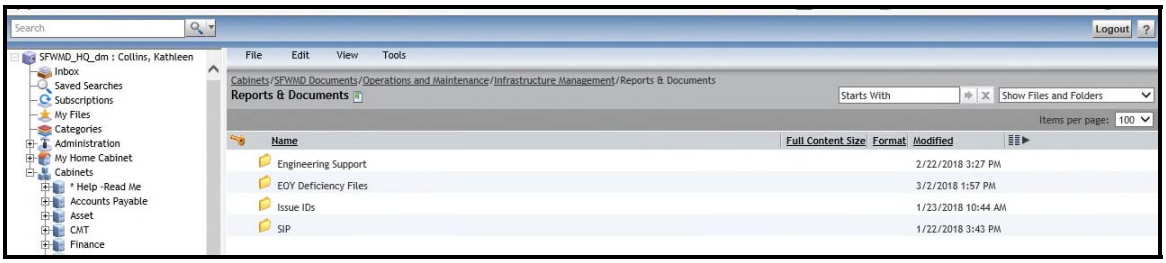
It is important that the two sources of repair data correspond since the field stations use this data to develop their annual work plans, which includes repairs of structure deficiencies. During inspections staff used checklists to manually record their observations and the completed checklists were used to prepare the inspection reports and update service requests in the database. Thus, increasing the possibility of discrepancies and an inefficient use of resources. IMS staff acknowledged that there are discrepancies between the reports and the database. As a result, IMS worked with the Information Technology Division to increase automation; thereby, improving consistency and decreasing time spent preparing the inspection reports and updating the database. Specifically, the checklist results will be entered in excel and then loaded to the inspection report and the database. This process is expected to be fully implemented in Fiscal Year 2018. In addition, IMS is exploring the possibility of automating the inspection checklists so that the results can be recorded using tablets during the inspection instead of recording the results on paper checklists.

Recommendations

6. **Ensure that deficiencies forwarded to field stations for action are maintained in Documentum and accessible by relevant District staff.**

   Management Response: A specific staff member has been assigned to compile each year's SIP Annual Deficiency Report from the Structure Inspection Program – Archival Tool. Staff's supervisor will check to ensure information was loaded. The responsibility is part of their KRO. Link is below.

   http://documentum.sfwmd.gov/webtop/drl/objectId/0b00eeea8a2fbd1a



   Responsible Division: Operations, Engineering & Construction

   Estimated Completion: Completed

7. **Ensure that all structure inspection reports are loaded in the SIP Archival Tool database in a timely manner.**

   Management Response: With the upgrade to the Structure Inspection Program – Inspection application completed in November 2017 reports have been automated to be produced directly from the Structure Inspection Program Checklist and automatically loaded to the Structure Inspection Tool - Archival Tool. The manual process of loading reports no longer exists. Additionally, the staff member running the Structure Inspection Program will be responsible to check that all reports are online each year. The responsibility is part of the staff member's KRO.

   Responsible Division: Operations, Engineering & Construction

   Estimated Completion: Completed

8. **Consider requiring IMS inspection staff to include unresolved deficiencies identified during prior inspections in the future inspection reports.**

   Management Response: The Structure Inspection Program Guidance has been updated to include noting if a deficiency was on the prior report. This has been implemented for all inspections going forward as of March 2018 meeting.

   Responsible Division: Operations, Engineering & Construction

   Estimated Completion: Complete

9. **Enhance the SIP inspection reports by specifying the bureau / section responsible for the addressing specific issues and ensure that the relevant bureau / section staff are notified.**

   Management Response: Structure Inspection Program Reports options are field station or capital. Field stations will need to identify how they plan to handle the deficiencies. The SIP Annual Deficiency Report from the Structure Inspection Program – Archival Tool will provide a column for the field station to provide this information. At the Annual meeting with the field stations, these items will be discussed, and the spreadsheet will be provided back to the Infrastructure Management Section for filing in Documentum as stated in Recommendation #6. Should a change occur, the field station will notify Infrastructure Management Section staff of the change and an update will be made.

   Responsible Division: Operations, Engineering & Construction

   Estimated Completion: Complete

10. **Implement procedures to ensure that SIP inspection repairs forwarded to the field stations are tracked and planned actions and resolutions are adequately documented.**

    Management Response: **S**ame as Recommendation #9 and the field stations have been instructed to include "SIP Repair" in the SAP Work Order Header when addressing SIP deficiencies.

    Responsible Division: Operations, Engineering & Construction**;** Field Operations and Land Management

    Estimated Completion: Complete

11. **Ensure that all SIP work order repairs made by field station staff are correctly labeled as SIP repairs in SAP.**

    Management Response: Field Station Bureau Chiefs will cover the requirement of "SIP Repair" in SAP work order headers during meetings with field station managers and the following STAN Teams: SAP Plant Maintenance, Pump Station, Electrical and Structure Maintenance. Periodic review of work order headers and comparison with the SIP Annual Deficiency Report from the Infrastructure Management Section to ensure compliance with the Plant Maintenance Business Rule on work order headers.

    Responsible Division: Field Operations and Land Management

    Estimated Completion: Complete for meeting with all groups listed above, ongoing for SAP work order header review.

12. **Increase efforts to address C-4 and C-5 structure deficiencies addressed to field stations in a timely manner and ensure that resolutions are adequately documented in SAP.**

    Management Response: In cases where the field station can perform the necessary C-4 or C-5 repair, the corresponding Field Station Bureau Chief will cover the importance of making the necessary repairs during monthly meetings with the appropriate field station. Monitoring of the SIP Annual Deficiency Report and SAP work order headers will be conducted on a quarterly basis to ensure C-4 and C-5 deficiencies are being resolved. This information will be distributed at the same meetings as Recommendation #11.

    Responsible Division: Field Operations and Land Management

    Estimated Completion: Complete for meeting with all groups listed in Recommendation #11, ongoing for monitoring completion of C-4 and C-5.

13. **Take steps to ensure that IMS inspection staff accurately enter structure inspection results on the spreadsheets under the new reporting streamlined system.**

    Management Response: With the automation discussed in Recommendation #7, information is only loaded once which will eliminate inconsistencies between the Structure Inspection Program – Archival Tool database and the reports generated.

    Responsible Division: Infrastructure Management Bureau

    Estimated Completion: Complete