



# DISTRICT OF COLUMBIA WATER AND SEWER AUTHORITY

## Board of Directors

*Audit Committee*

*Thursday, January 23, 2020*

9:30 a.m.

1. **Call to Order**..... Mr. Floyd Holt, Committee Chairperson
2. **FY 2019 Financial Statements**..... Genes Malasy, Manager Financial Reporting
3. **External Audit Results**.....KPMG
4. **Internal Audit Update**..... Dan Whelan, RSM, Auditor General
  - A. FY 2020 Internal Audit Plan Status Update
  - B. Status Update on Prior Audit Findings
  - C. **Asset Management Assessment**
  - D. Hotline Update
5. **Executive Session\*** ..... Mr. Floyd Holt, Committee Chairperson
6. **Adjournment**..... Mr. Floyd Holt, Committee Chairperson

\* The DC Water Board of Directors may go into executive session at this meeting pursuant to the District of Columbia Open Meetings Act of 2010, if such action is approved by a majority vote of the Board members who constitute a quorum to discuss: matters prohibited from public disclosure pursuant to a court order or law under D.C. Official Code § 2-575(b)(1); contract negotiations under D.C. Official Code § 2-575(b)(1); legal, confidential or privileged matters under D.C. Official Code § 2-575(b)(4); collective bargaining negotiations under D.C. Official Code § 2-575(b)(5); facility security under D.C. Official Code § 2-575(b)(8); disciplinary matters under D.C. Official Code § 2-575(b)(9); personnel matters under D.C. Official Code § 2-575(b)(10); proprietary matters under D.C. Official Code § 2-575(b)(11); decision in an adjudication action under D.C. Official Code § 2-575(b)(13); civil or criminal matters where disclosure to the public may harm the investigation under D.C. Official Code § 2-575(b)(14), and other matters provided in the Act.



# **Audit Committee Briefing on FY 2019 Financial Statements**

**January 23, 2020**



# Purpose

**Review DC Water's fiscal year 2019  
audited financial statement performance  
and results of operations**



# Financial Overview

## **The Authority's financial position remains strong and is growing**

- 💧 Net position increased to \$2.3 billion - increase of \$165.3 million, or 7.9%, over 2018
- 💧 Operating revenues increased to \$705.1 million – increase of \$20.6 million, or 3.0%, over 2018
- 💧 Operating expenses increased to \$460.9 million – increase of \$21.4 million, or 4.9%, over 2018



## Other Highlights

- The Authority received an unmodified (“clean”) audit opinion from our external auditors, KPMG
- The Authority received the Government Finance Officers Association (GFOA) Certificate of Achievement for Excellence in Financial Reporting for the 22nd consecutive year for our 2018 Comprehensive Annual Financial Report
- Fitch ratings upgraded DC Water's credit rating for senior lien revenue bonds to AA+



# Net Position

- 💧 The difference between Assets and Liabilities constitutes Net Position
  
- 💧 Net position is broken down into three categories as follows:

	2019	2018
Net investments in capital assets	1,935,786	1,808,622
Restricted for debt service	43,762	38,907
Unrestricted	270,907	237,672
<b>Total net position</b>	<b>\$ 2,250,455</b>	<b>\$ 2,085,201</b>



# Debt Administration

- 💧 At the end of fiscal year 2019, the Authority had a total of \$3.5 billion in long term debt outstanding, a decrease of \$48.9 million, or 1.4%, over fiscal year 2018
  
- 💧 No new debt issuance during fiscal 2019
  
- 💧 October 2019 the Authority issued \$600 million of four separate bond series, including \$343.2 debt refunding resulting in Present Value (PV) of \$50.8 million economic saving

Description	Balance 9/30/2018	Increases	Decreases	Balance 9/30/2019
Outstanding bonds and notes	\$ 3,273,034	\$ 93	\$ (36,038)	\$ 3,237,089
Unamortized bond premiums	259,578	-	(13,118)	246,460
Unamortized bond discounts	(1,964)	-	129	(1,835)
Total bonds and notes	\$ 3,530,648	\$ 93	\$ (49,027)	\$ 3,481,714



# Change in Net Position

The Authority's net position increased by \$165.3 million (or 7.9%) to \$2.3 billion

	Fiscal Year	
	2019	2018
Operating revenues	\$ 705,147	\$ 684,502
Operating expenses	460,883	439,470
Net non-operating revenues (expenses)	(95,323)	(88,090)
Change in net position before capital contributions	148,941	156,942
Capital contributions	16,313	30,419
Change in net position	165,254	187,361
Net position - beginning of year	2,085,201	1,897,840
Net position - end of year	\$ 2,250,455	\$ 2,085,201





# Operating Revenues

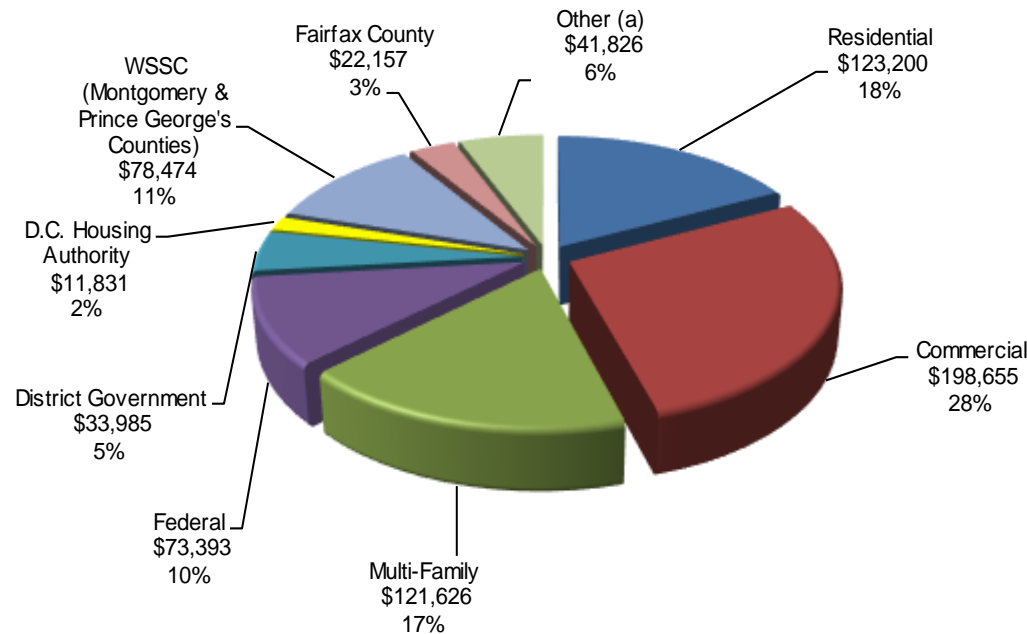
The Authority's operating revenues increased by \$20.6 million (3.0%) to \$705.1 million

			Variance	
	FY 2019	FY 2018	\$	%
Residential, commercial and multi-family customers	\$ 443,481	\$ 425,492	\$ 17,989	4.2%
Federal government	73,393	73,551	(158)	-0.2%
District government and D.C. Housing Authority	45,816	42,710	3,106	7.3%
Charges for wholesale wastewater treatment	114,766	121,961	(7,195)	-5.9%
Other	27,691	20,788	6,903	33.2%
<b>Total operating revenues</b>	<b>\$ 705,147</b>	<b>\$ 684,502</b>	<b>\$ 20,645</b>	<b>3.0%</b>



# Operating Revenues

The Authority's operating revenues remain well diversified and stable



(a) Other revenues include \$11.5 million from Loudoun County and \$2.6 million from Potomac Interceptor



# Operating Expenses

The Authority's operating expenses increased by \$21.4 million (4.9%) to \$460.9 million

			Variance	
	FY 2019	FY 2018	\$	%
Personnel services	\$ 141,040	\$ 142,342	\$ (1,302)	-0.9%
Contractual services	75,818	74,627	1,191	1.6%
Chemicals, supplies and small equipment	36,579	31,152	5,427	17.4%
Utilities and rent	25,813	26,163	(350)	-1.3%
Depreciation and amortization	127,501	115,453	12,048	10.4%
Water purchases	32,430	28,357	4,073	14.4%
Payment in lieu of taxes and right of way fee	21,702	21,376	326	1.5%
<b>Total operating expenses</b>	<b>\$ 460,883</b>	<b>\$ 439,470</b>	<b>\$ 21,413</b>	<b>4.9%</b>

Biggest drivers are chemicals, depreciation, and water purchases



# Cash Overview

## 💧 Unrestricted cash & investments

- 💧 Can be used for routine operations and have no external restrictions
- 💧 Increased to \$256.7 million vs. \$232.0 million in FY18

## 💧 Restricted cash & investments

- 💧 Use is externally restricted by debt covenants, federal mandates, etc.
- 💧 Decreased to \$228.6 million vs. \$423.6 million in FY18



# Net Capital Assets

The Authority's net capital assets, including construction in progress and less depreciation, increased by \$264.3 million, or 3.8%, to \$7.2 billion

	As of September 30,		
	2019	2018	2017
Wastewater treatment plant	\$ 3,233,698	\$ 3,213,907	\$ 3,010,074
Wastewater collection facilities	937,315	858,060	856,859
Water distribution system	1,138,598	1,125,358	1,112,458
Deep tunnel system	1,027,954	1,171,226	—
Purchased capacity	375,164	364,211	356,850
Capital equipment	314,667	296,295	253,437
Construction in progress	1,966,037	1,574,081	2,489,255
Less accumulated depreciation	(1,769,310)	(1,643,270)	(1,535,833)
Net capital assets	\$ 7,224,123	\$ 6,959,868	\$ 6,543,100



# Conclusion

- Clean audit opinion for the 22<sup>nd</sup> year in a row
- Net position is increasing – DC Water is growing
- Series 2019D refunding generated significant debt service saving for DC Water ratepayers
- Credit rating upgrade from Fitch (AA+ for Sr.;AA for Sub.) and affirmations from Moody’s Investors Service (Aa1 for Sr.; Aa2 for Sub.) and Standard & Poor’s (AAA for Sr.;AA+ for Sub.)



# DC Water and Sewer Authority

## Audit results

**Financial Statement and Uniform Guidance audits for the year ended September 30, 2019**

January 23, 2020

# Agenda

- 1. Financial statement audit results**
- 2. Significant accounting policies**
- 3. New accounting standards**
- 4. Audit misstatements**
- 5. Internal control related matters**
- 6. Required communications and other matters**
- 7. Independence**
- 8. Uniform Guidance Compliance Audit**
- 9. Appendix**



# Financial statement audit results

## Scope of Financial Statement Audit

- Perform an audit of the Authority’s financial statements as of and for the year ended September 30, 2019 and 2018, in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*
- Form and express an opinion about whether the financial statements that have been prepared by management with the oversight of the Audit Committee are prepared, in all material respects, in accordance with U.S. GAAP

## Opinion on the Basic Financial Statements

- Unmodified opinion

## Report on Internal Control Over Financial Reporting and on Compliance with Laws, Regulations, Contracts and Grants in Accordance with *Government Auditing Standards*

- No material weaknesses or significant deficiencies reported
- No instances of non-compliance reported



# Significant accounting policies

## **Significant accounting policies**

- Described in Note 2 to the financial statements
- No new or changed accounting policies in FY 2019
- See next slide for new GASB pronouncements implemented in FY 2019

## **Significant accounting estimates**

- Although accounting estimates are used by management to prepare the financial statements, no significant accounting estimates were noted

## **Significant financial statement disclosures**

- None noted



# New accounting standards

## GASB Standards Implemented in FY 2019

No.	Title	Impact on the Financial Statements
83	Certain Asset Retirement Obligations	None
88	Certain Disclosures Related to Debt, including Direct Borrowings and Direct Placements	Additional disclosures related to debt, included in Notes 10 and 11

## GASB Standards to be Implemented in Future Years

No.	Title	Required implementation date (Period beginning after)	Authority fiscal year
84	Fiduciary Activities	December 15, 2018	2020
87	Leases	December 15, 2019	2021
89	Accounting for Interest Cost Incurred before the End of a Construction Period	December 15, 2019 (Authority has developed position paper)	2021
90	Majority Equity Interests	December 15, 2018 (Authority has developed position paper)	2020
91	Conduit Debt Obligations	December 15, 2020	2022



# Audit misstatements

## Uncorrected Audit Misstatements

Description of misstatement	Quantitative effect on Net Position (Debit (Credit)) (in \$ thousands)	Quantitative effect on Change in Net Position (Debit (Credit)) (in \$ thousands)
1. To correct the overstatement of capital accounts payable accrual based on actual invoices received subsequent to recording the accrual, which were less than the accrued amount by \$4.1 million.	-	-
2. To record an adjustment to beginning net position for the small meters that were taken out of service in FY 2019 before the end of their useful life; to reclassify the loss on disposal to depreciation expense; and to record an adjustment to the net book value of the remaining water meters that are not planned to be replaced down to their net realizable value based on recent experience.	\$2,837	(\$6,388)
3. To correct the overstatement of interest expense and understatement of capitalized interest related to assets that were incorrectly transferred from construction in progress (CIP) to capital assets in-service in FY 2018, and transferred back to CIP in FY 2019.	\$(7,447)	\$(7,447)
Total	\$(5,060)	\$(13,835)
Net Position/Change in Net Position	\$(2,250,455)	\$(165,254)
Percentage	(0.22%)	(8.37%)

Note: Refer to the management representation letter for the detailed schedule of uncorrected audit misstatements.



# Audit misstatements *(continued)*

## Presentation and Disclosure Misstatements – Uncorrected

Description	Amount (in \$ thousands)
<p>In FY 2018, DC Water incorrectly transferred \$222 million of the CIP balance to capital assets in-service. In FY 2019, DC Water transferred \$222 million back into CIP, which resulted in a misclassification of the transfer activity presented in Note 4 to DC Water's financial statements as of September 30, 2019.</p>	<p>\$222,261</p>

## Corrected Audit Misstatements

— No matters to report.

# Significant deficiencies and material weaknesses in internal control

## Scope of Internal Control Testing

- Our audit included consideration of internal control over financial reporting in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of internal control
- Report significant deficiencies and material weaknesses in internal control in the Report on Internal Control Over Financial Reporting and on Compliance with Laws, Regulations, Contracts and Grants in Accordance with *Government Auditing Standards*

## Control deficiencies

- No significant deficiencies or material weaknesses reported
- All other control deficiencies identified during our audit that are of sufficient importance to merit management's attention have been communicated in the management letter

# Required communications and other matters

Communication topic	Response
<b>Changes to our planned risk assessment and planned audit strategy</b>	There were no significant changes to our planned risk assessment and planned audit strategy.
<b>Significant risks and other significant audit matters</b>	None noted.
<b>Related parties</b>	No significant findings or issues arose during the audit in connection with the Authority's related parties.
<b>Other information in documents containing audited financial statements</b>	<ul style="list-style-type: none"> <li>• Certain other information (introductory and statistical information) is included in the Authority's Consolidated Annual Financial Report (CAFR), which also contains the Authority's audited financial statements.</li> <li>• Our responsibility with respect to information in a document does not extend beyond the financial information identified in our report, and we have no obligation to perform any procedures to corroborate other information contained in a document.</li> <li>• However, we do have a responsibility to read the other information and consider whether such information, or the manner of its presentation, is materially inconsistent with information, or the manner of its presentation, appearing in the financial statements.</li> <li>• As a result of our consideration of the other information, no material inconsistencies or material misstatements of facts were identified related to other information.</li> </ul>

# Required communications and other matters

(continued)

Communication topic	Response
<b>Illegal acts or fraud</b>	No actual or suspected fraud involving management, employees with significant roles in internal control, or others when fraud results in a material misstatement in the financial statements were identified during the audit.
<b>Noncompliance with laws and regulations</b>	No matters to report.
<b>Going concern</b>	No matters to report.
<b>Non-GAAP</b>	No matters to report.
<b>Subsequent events</b>	No matters to report.
<b>Other findings or issues</b>	No matters to report.
<b>Significant difficulties encountered during the audit</b>	No matters to report.

Communication topic	Response
<b>Disagreements with management</b>	No matters to report.
<b>Significant findings or issues discussed, or the subject of correspondence, with management</b>	No matters to report.
<b>Management's consultation with other accountants</b>	No matters to report.
<b>Material written communications</b>	Engagement letter, management representation letters, including summary of uncorrected misstatements, and management letter were distributed under separate cover.



# Independence

## **Non-audit services or other relationships that may reasonably be thought to bear on independence include:**

- Green bond report attestation
- 2nd Quarter 2019 agreed-upon procedures
- Allowable advisory services to assist with the requirements definition, business process analysis, and vendor selection activities for modernization of the Enterprise Resource Planning system

**In our professional judgment, we are independent with respect to the Authority, as that term is defined by the professional standards.**



# Uniform Guidance Compliance Audit

## Scope of compliance audit

- Forming and expressing an opinion on compliance for each of the Authority’s major federal programs based on our audit of the types of compliance requirements described in the OMB Compliance Supplement

## Major programs tested

- CFDA# 66.418, Construction Grants for Wastewater Treatment Works
- CFDA# 66.468, Safe Drinking Water Act Program

## Compliance Audit Results

- Audit is currently in progress; we will provide a verbal update





# Appendix

<b>Contents</b>	<b>Page</b>
Responsibilities	14
Internal Control Related Matters	17

# Responsibilities

<b>Management responsibilities – Financial statements</b>	<ul style="list-style-type: none"> <li>— Preparation and fair presentation of the financial statements, including disclosures in conformity with U.S. GAAP</li> <li>— Adjusting the financial statements to correct material misstatements and affirming in the representation letter that the effects of any uncorrected misstatements aggregated by the auditor are immaterial, both individually and in the aggregate, to the financial statements taken as a whole</li> </ul>
<b>Management responsibilities – ICFR</b>	<ul style="list-style-type: none"> <li>— Design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error</li> </ul>
<b>Management responsibilities – Other</b>	<ul style="list-style-type: none"> <li>— To provide the auditor with:                             <ol style="list-style-type: none"> <li>1) access to all information of which management is aware is relevant to the preparation and fair presentation of the financial statements, such as records, documentation, and other matters;</li> <li>2) additional information that the auditor may request from management for the purpose of the audit; and</li> <li>3) unrestricted access to persons within the entity from whom the auditor determines it necessary to obtain audit evidence</li> </ol> </li> <li>— Identifying and ensuring that the Authority complies with laws and regulations applicable to its activities, and for informing the auditor of any known material violations of such laws and regulations</li> <li>— Providing the auditor with a letter confirming certain representations made during the audit, that includes but is not limited to management's:                             <ol style="list-style-type: none"> <li>1) disclosure of all significant deficiencies, including material weaknesses, in the design or operation of internal controls that could adversely affect the Authority's financial reporting</li> <li>2) acknowledgement of their responsibility for the design, implementation, and maintenance of internal controls to prevent and detect fraud</li> </ol> </li> </ul>
<b>Management responsibilities – Compliance Audit</b>	<ul style="list-style-type: none"> <li>— Identifying the Authority's government programs and understanding and complying with the compliance requirements.</li> <li>— Establishing and maintaining effective controls that provide reasonable assurance that the Authority administers government programs in compliance with the compliance requirements</li> <li>— Evaluating and monitoring the Authority's compliance with the compliance requirements</li> <li>— Taking corrective action when instances of noncompliance are identified, including corrective action on audit findings of the compliance audit</li> <li>— Preparation of the SEFA in accordance with the applicable criteria</li> </ul>

The audit does not relieve management or the Audit Committee of their responsibilities.

# Responsibilities *(continued)*

<b>Audit Committee responsibilities</b>	<ul style="list-style-type: none"> <li>— Oversight of the financial reporting process and ICFR</li> <li>— Oversight of the establishment and maintenance by management of programs and controls designed to prevent, deter, and detect fraud</li> </ul>
<b>Management and the Audit Committee responsibilities</b>	<ul style="list-style-type: none"> <li>— Setting the proper tone and creating and maintaining a culture of honesty and high ethical standards</li> <li>— Ensuring that the authority’s operations are conducted in accordance with the provisions of laws and regulations, including compliance with the provisions of laws and regulations that determine the reported amounts and disclosures in the authority’s financial statements</li> </ul>
<b>KPMG – Audit objectives</b>	<ul style="list-style-type: none"> <li>— Forming and expressing an opinion about whether the financial statements that have been prepared by management with the oversight of the Audit Committee are prepared, in all material respects, in accordance with U.S. GAAP</li> </ul>
<b>KPMG responsibilities – Audit</b>	<ul style="list-style-type: none"> <li>— Performing the audit in accordance with U.S. GAAS and that the audit is designed to obtain reasonable, rather than absolute, assurance about whether the financial statements as a whole are free from material misstatement</li> <li>— Performing an audit of financial statements includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the authority’s internal control over financial reporting</li> </ul>
<b>KPMG responsibilities – Other information in documents containing financial statements</b>	<ul style="list-style-type: none"> <li>— The auditors’ report on the financial statements does not extend to other information in documents containing audited financial statements, excluding required supplementary information</li> <li>— The auditor’s responsibility is to make appropriate arrangements with management or the Audit Committee to obtain information prior to the report release date and to read the other information to identify material inconsistencies with the audited financial statements or misstatement of facts</li> <li>— Any material inconsistencies or misstatement of facts that are not resolved prior to the report release date, and that require revision of the other information, may result in KPMG modifying or withholding the auditors’ report or withdrawing from the engagement</li> <li>— Communicate any procedures performed relating to the other information and the results of those procedures</li> </ul>
<b>KPMG responsibilities – Compliance Audit</b>	<ul style="list-style-type: none"> <li>— Forming and expressing an opinion on compliance for each Authority’s major federal programs based on our audit of the types of compliance requirements described in the OMB Compliance Supplement</li> <li>— Performing our audit of compliance in accordance with auditing standards generally accepted in the United States of America; <i>Government Auditing Standards</i> and the Uniform Guidance</li> <li>— Considering internal control over compliance with the types of compliance requirements that could have a direct and material effect on each major federal program as a basis for designing audit procedures that are appropriate in the circumstances for the purpose of expressing an opinion on compliance for each major federal program and to test and report on internal control over compliance in accordance with the Uniform Guidance, but not for the purpose of expressing an opinion on the effectiveness of internal control over compliance.</li> </ul>



# Responsibilities *(continued)*

<p><b>KPMG responsibilities – Communications</b></p>	<ul style="list-style-type: none"> <li>— Communicating significant matters related to the financial statement audit that are in our professional judgment, relevant to the responsibilities of the Audit Committee in overseeing the financial process. U.S. GAAS does not require us to design procedures for the purpose of identifying matters to communicate to the Audit Committee</li> <li>— Communicating if we suspect or identify noncompliance with laws and regulations exist, unless matters are clearly inconsequential</li> <li>— Communicating to management and the Audit Committee in writing all significant deficiencies and material weaknesses in internal control identified during the audit, including those that were remediated during the audit and reporting to management in writing all deficiencies noted during our audit that, in our professional judgment, are of sufficient importance to merit management’s attention. The objective of our audit of the financial statements is not to report on the Authority’s internal control</li> <li>— Conducting the audit in accordance with professional standards and complying with the rules and responsibility of the Code of Professional Conduct of the American Institute of Certified Public Accountants and the official standards of relevant CPA Societies, and relevant state boards of accountancy</li> <li>— Communicating to the Audit Committee circumstances, if any, that affect the form and content of the auditors’ report</li> <li>— Communicating if we plan to withdraw from the engagement and the reasons for the withdrawal</li> <li>— Communicating to the Audit Committee if we conclude no reasonable justification for a change of the terms of the audit engagement exists and we are not permitted by management to continue the original audit engagement</li> <li>— When applicable, we are also responsible for communicating particular matters required by law or regulation, by agreement with the authority, or by additional requirements applicable to the engagement</li> <li>— Communicating if we have identified or suspect fraud involving; (a) management, (b) employees who have significant roles in internal control, (c) others, when the fraud results in a material misstatement in the financial statements, and (d) other matters related to fraud that are, in the auditors’ professional judgment, relevant to the responsibilities of the Audit Committee</li> <li>— Communicating significant findings and issues arising during the audit in connection with the authority’s related parties</li> <li>— Communicating conditions and events, considered in the aggregate, that raise substantial doubt about an authority’s ability to continue as a going concern for a reasonable period of time</li> <li>— Communicating significant matters related to the audit of compliance that are, in our professional judgment, relevant to the responsibilities of the audit committee in overseeing the financial reporting process. We are not required to design procedures for the purpose of identifying other matters to communicate to you</li> </ul>
--	--

# Internal control related matters

## **KPMG responsibilities**

- The purpose of our audit was to express an opinion on the financial statements
- Our audit included consideration of internal control over financial reporting in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of internal control
- We are not expressing an opinion on the effectiveness of internal control
- Our consideration of internal control was not designed to identify all deficiencies in internal control that might be material weaknesses or significant deficiencies, and therefore, material weaknesses or significant deficiencies may exist that were not identified

## **Material weakness**

A deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected, on a timely basis. A reasonable possibility exists when the likelihood of an event occurring is either reasonably possible or probably. Reasonably possible is defined as the chance of the future event or events occurring is more than remote but less than likely. Probable is defined as the future event or events are likely to occur

## **Significant deficiency**

A deficiency, or a combination of deficiencies, in internal control over financial reporting that is less severe than a material weakness yet important enough to merit attention by those charged with governance



[kpmg.com/socialmedia](https://kpmg.com/socialmedia)

© 2019 KPMG LLP, a Delaware limited liability partnership and the U.S. member firm of the KPMG network of independent member firms affiliated with KPMG International Cooperative (“KPMG International”), a Swiss entity. All rights reserved. NDPPS 737802

The KPMG name and logo are registered trademarks or trademarks of KPMG International.



# DC WATER

## Audit Committee Meeting



January 23, 2020

# Agenda

- FY 2020 Internal Audit Plan Status Update
- Status Update on Prior Audit Findings
- Report on Completed Audits
  - Asset Management Assessment
- Hotline Update

# AUDIT PLAN STATUS UPDATE

# Internal Audit Plan Status Update

Audit	Status
<b>FY 2019</b>	
Asset Management Assessment	<b>Report Complete</b>
<b>FY 2020</b>	
Work Order Planning Assessment	Reporting in Progress
Phase 2: Physical Security Penetration Testing	Fieldwork in Progress
Facilities Maintenance Audit	Planning in Progress
Benefits and Compensation Audit	Planning in Progress
Cybersecurity Incident Response Tabletop Exercise	Not Started
Oracle Embedded Risk Assurance	Not Started
Procurement Pre-Award & Selection Audit	Not Started
Engineering Change Order Assessment	Not Started
Industrial Control System (ICS) Review	Not Started
Recruiting Alignment Assessment	Not Started
Remediation Follow Up Procedures	On-going
Hotline Management	On-going

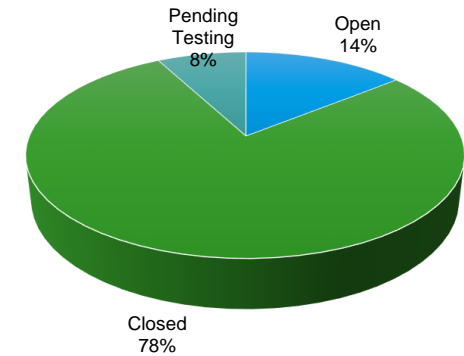


# PRIOR AUDIT FINDINGS – FOLLOW UP STATUS

# Status Update on Prior Audit Findings

Audit Report/Subject	Report Issue Date	Corrective Actions			
		Total	Open	Closed	Pending Testing <sup>1</sup>
<b>Prior to FY19 Audit Findings</b>					
Training, Licensing & Certification	7/28/2016	7	1	6	0
Business Development Plan	2/14/2017	10	1	9	0
Annual Budgeting and Planning	4/27/2017	1	1	0	0
DMS Work Order Management (Blue Plains)	4/27/2017	4	0	1	3
HR/Employee Privacy Review	4/27/2017	7	3	4	0
Entity Level Assessment	10/26/2017	7	4	3	0
Vulnerability Management and Platform Technical Audit (Windows/UNIX)	10/26/2017	2	1	0	1
Materials Management Operations and Inventory	10/26/2017	4	1	2	1
Fleet – Accident and Incident Reporting	1/25/2018	3	1	2	0
Contract Monitoring & Compliance	7/26/2018	3	2	1	0
Crisis Management/Business Continuity	7/26/2018	3	2	1	0
Payroll & Timekeeping	10/25/2018	4	1	3	0
Accounts Payable	10/25/2018	5	0	4	1
Integrated Work Order Management	1/24/2019	10	2	3	5
<b>Total</b>		<b>70</b>	<b>20</b>	<b>39</b>	<b>11</b>

**FY16 – FY18 Prior Audit Findings Status**



<sup>1</sup>“Pending Testing” indicates that Management represents that the Action Plan is Completed, but Internal Audit has not yet performed testing to validate the status.

Note that the audit findings reported above only represent findings prior to FY19 with the status of “Pending Testing” or “Open”. Audits conducted prior to FY19 for which all findings have been closed are not represented in this table. However, the pie chart to the right includes status of all audit findings FY16 - FY18.

7

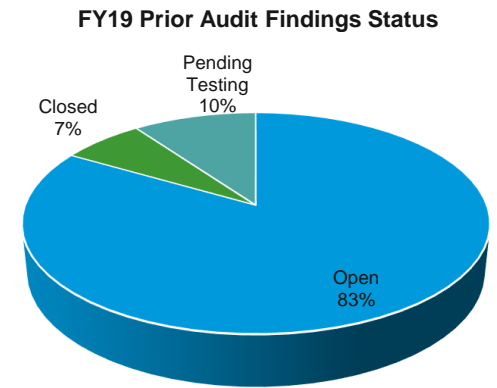
© 2019 RSM US LLP. All Rights Reserved.

Color Key	
<span style="color: blue;">■</span>	At least 1 original remediation target date has been extended



# Status Update on Prior Audit Findings

Audit Report/Subject	Report Issue Date	Corrective Actions			
		Total	Open	Closed	Pending Testing <sup>1</sup>
<b>FY19 Audit Findings</b>					
Fleet Management	4/25/2019	3	2	0	1
Legal Operations	4/25/2019	4	2	0	2
Occupational Safety and Health	4/25/2019	4	3	1	0
Active Directory Assessment	10/24/2019	5	5	0	0
Purchasing Card Internal Audit	7/25/2019	3	2	1	0
Wifi Security Testing	10/24/2019	1	1	0	0
CIS Application Security SOD Review	10/24/2019	4	4	0	0
Asset Management Assessment	1/23/2020	2	2	0	0
Physical Security and Social Engineering	7/25/2019	4	4	0	0
	<b>Total</b>	<b>30</b>	<b>25</b>	<b>2</b>	<b>3</b>



<sup>1</sup>“Pending Testing” indicates that Management represents that the Action Plan is Completed, but Internal Audit has not yet performed testing to validate the status.

Color Key	
	At least 1 original remediation target date has been extended



## Action Deferred Update

The following items are considered “action deferred” items that are contingent on other action occurring and not included in the Prior Audit Findings Update slides above:

### 1. Intellectual Property Personnel Policy

- Under review by management based on strategic initiatives. A new Innovation/IP program will be implemented this fiscal year. Management is in the process of selecting a vendor to assist in reviewing the innovation program as a whole, including the related policy / SOP.

# ASSET MANAGEMENT

# Asset Management

## Purpose

The purpose of this assessment is to identify opportunities to improve the processes and data used across the Authority in the management of its assets and infrastructure.

## Scope

The scope of our work is based on the following objectives, as they relate to the Authority's enterprise-wide asset management program:

- To document the process, and identify improvement opportunities within:
  - Time entry processes
  - Materials management processes
  - Tool management processes
  - Geographic information system processes
- To identify critical data elements needed to drive effective monitoring of key asset management performance indicators (KPI)
- To assess the capabilities of existing technology system(s), and to evaluate their alignment with critical data elements and KPI requirements
- To recommend strategies for improving data entry processes and technology application infrastructure, to support the Authority's mission of proactive and predictive asset management

# Asset Management

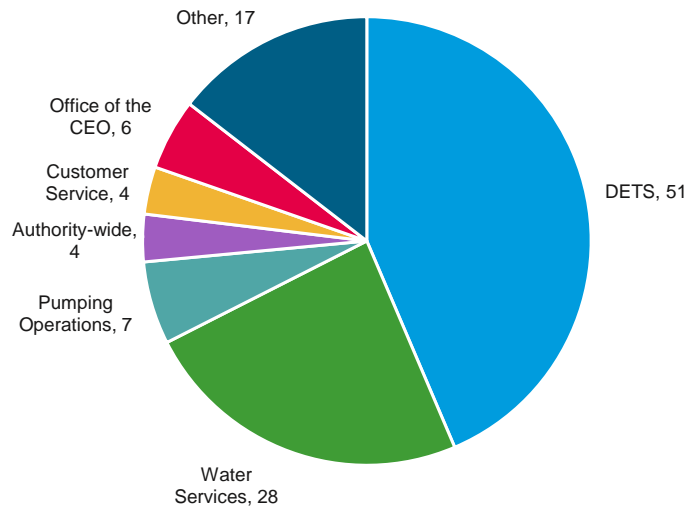
Observations	Risk Rating
1. GIS Data Table & Map Accuracy	High
<p><b>Management Action Plan:</b></p> <ul style="list-style-type: none"> <li>The GIS team is in the process of finalizing hiring one staff in February 2020. A discussion will be initiated with People and Talent to have a pipeline of qualified staff to fill any future vacancies expediently, as well as with Procurement to have an on-call staffing contract for qualified GIS staff.</li> <li>The asset library needs to be complete, and attributes fully documented. The attributes for linear assets are incomplete, and several assets e.g. service lines need to be added to the database.</li> <li>A work plan will be developed to quantify required labor effort to complete legacy work along with estimating GIS technician hours for on-going projects to prevent backsliding. The most efficient method of completing legacy work (contract labor and/or interns) will be determined along with a projection of required skilled GIS staff to keep up with on-going workload.</li> <li>Due to the specialized skills needed with GIS, the one recommendation to re-purpose staff to help with overcoming the backlog is not easily implementable without significant re-training.</li> </ul> <p><b>Target Date:</b> July 31, 2020</p> <p><b>Responsible Parties:</b> Salil Kharkar, SVP Operations and Engineering</p>	

# HOTLINE UPDATE AND SEMI-ANNUAL ANALYSIS

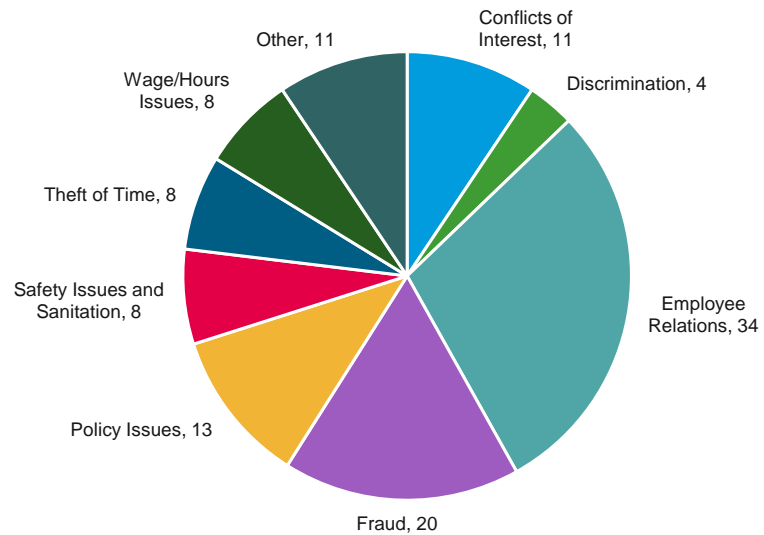
# Hotline Call Analysis

We conducted an analysis of the 117 hotline calls that have been received since FY 2016 to date, to determine if there are any trends, evaluate the quantity of calls (allegations) that were substantiated, and other matrices. The following charts represent the breakdown of calls by Department and case type.

**Calls by Department**

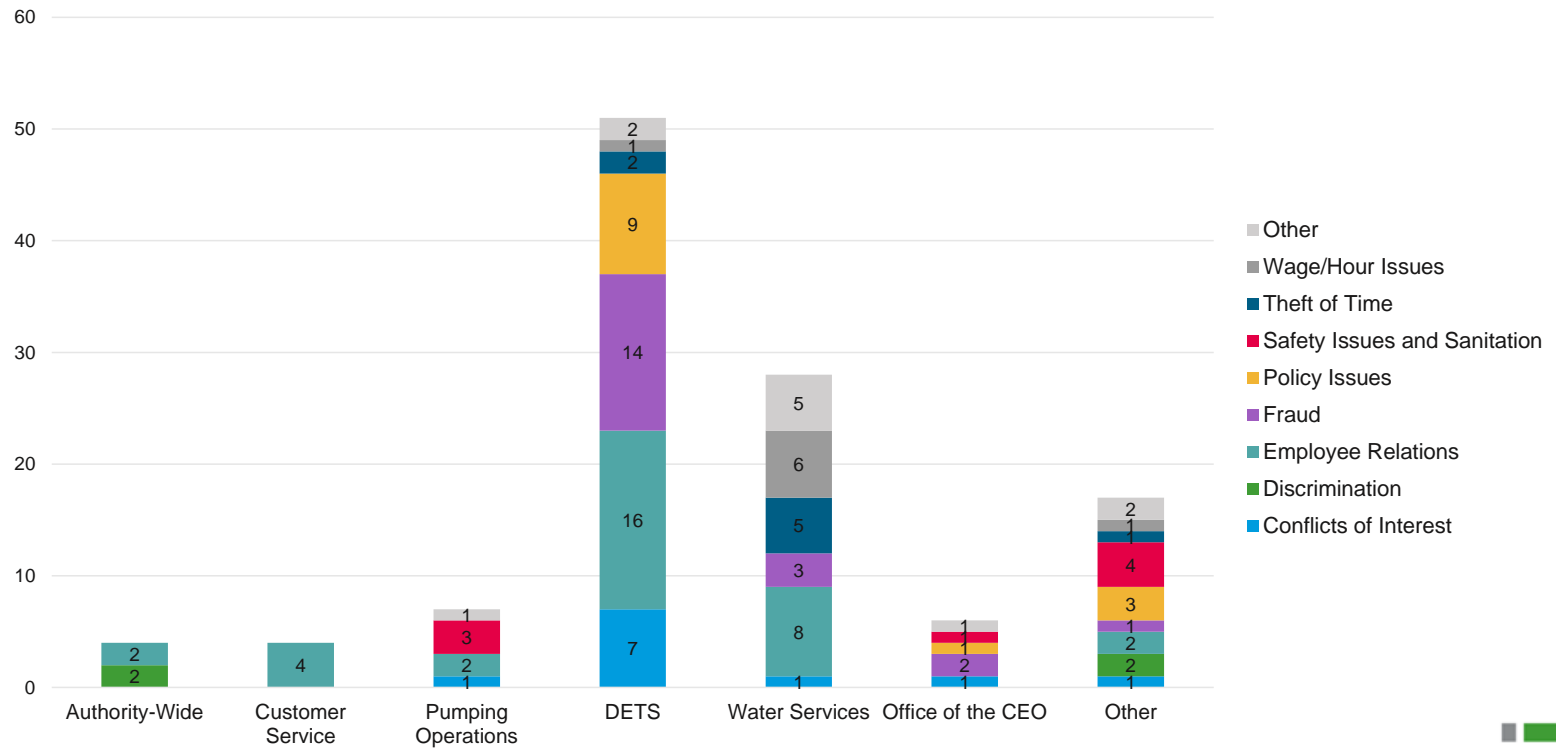


**Calls by Case Type**

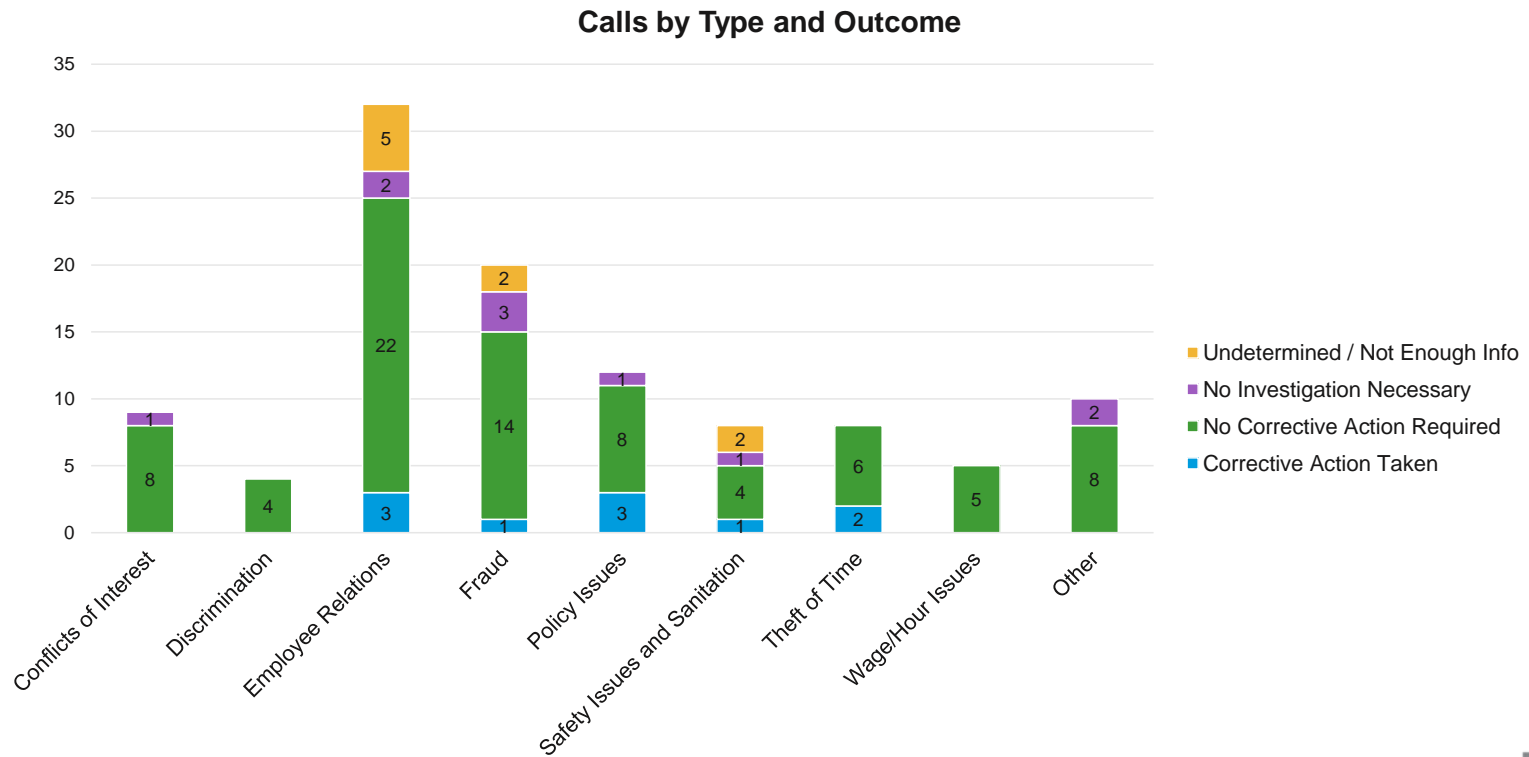


# Hotline Call Analysis (continued)

**Calls by Type and Department**



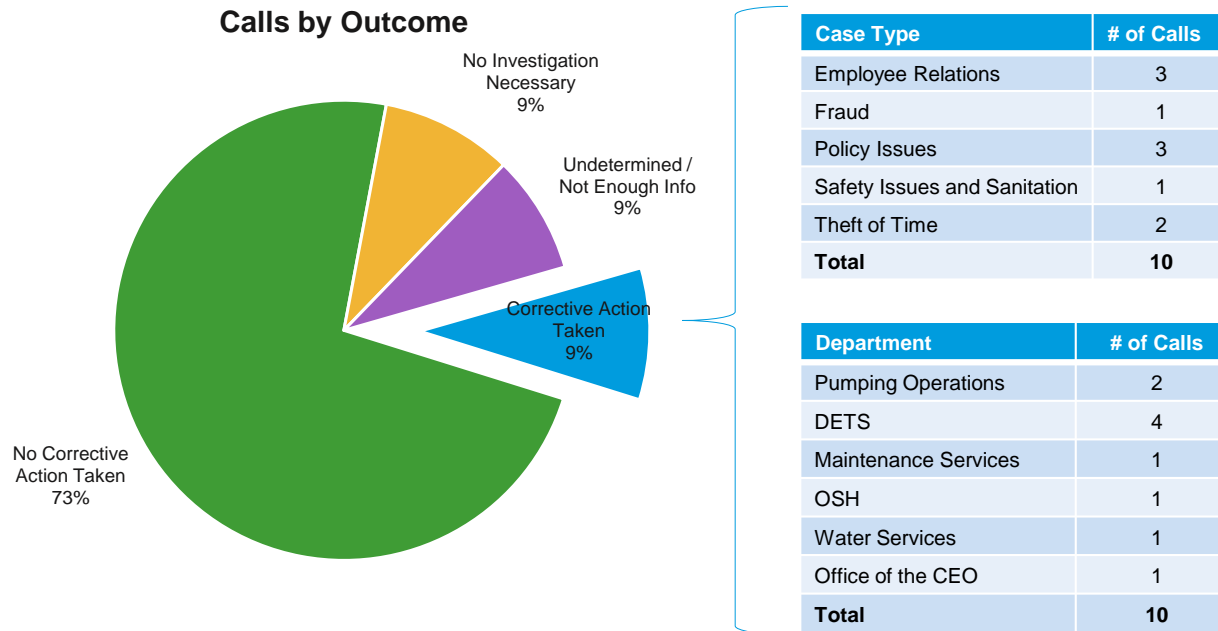
# Hotline Call Analysis (continued)





## Hotline Call Analysis (continued)

The following tables represent the breakdown of hotline calls that were substantiated and required corrective action. Of the 108 cases closed, 9% or 10 calls resulted in corrective action.



# Hotline Update

As of 1/16/2020:

FY 20 Hotline Call Summary	
FY 20 Calls Received	1
FY 20 Cases Closed	0
FY 20 Calls Open	1
FY 20 Open Call Breakdown	
Open Non-Fraud Claims:	
<i>Job Qualifications</i>	1

FY 19 Hotline Calls	
FY19 Calls Received	28
FY19 Calls Closed	25
FY19 Calls Open	3
FY 19 Open Call Breakdown	
Open Fraud Claims:	
<i>Conflicts of Interest</i>	3

Total calls by Fiscal Year:

Year	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	FY19	FY20
# of calls	10	20	16	36	31	21	28	1
Action Taken	0	2	7	7	2	0	1	0



# QUESTIONS AND ANSWERS

**RSM US LLP**

1250 H St NW  
Washington, DC 20005

+1 800 274 3978  
[www.rsmus.com](http://www.rsmus.com)

This document contains general information, may be based on authorities that are subject to change, and is not a substitute for professional advice or services. This document does not constitute audit, tax, consulting, business, financial, investment, legal or other professional advice, and you should consult a qualified professional advisor before taking any action based on the information herein. RSM US LLP, its affiliates and related entities are not responsible for any loss resulting from or relating to reliance on this document by any person. Internal Revenue Service rules require us to inform you that this communication may be deemed a solicitation to provide tax services. This communication is being sent to individuals who have subscribed to receive it or who we believe would have an interest in the topics discussed.

RSM US LLP is a limited liability partnership and the U.S. member firm of RSM International, a global network of independent audit, tax and consulting firms. The member firms of RSM International collaborate to provide services to global clients, but are separate and distinct legal entities that cannot obligate each other. Each member firm is responsible only for its own acts and omissions, and not those of any other party. Visit [rsmus.com/aboutus](http://rsmus.com/aboutus) for more information regarding RSM US LLP and RSM International.

RSM, the RSM logo and *the power of being understood* are registered trademarks of RSM International Association.

© 2019 RSM US LLP. All Rights Reserved.





---

# Internal Audit Report Asset Management Process Design Review

January 2020



---

## TABLE OF CONTENTS

<b>Transmittal Letter</b> .....	1
<b>Executive Summary</b>	
Background .....	2
Objective and Scope .....	2
Overall Summary / Highlights .....	2
Improvement Opportunities Summary .....	3
<b>Background, Objectives and Approach</b>	
Background .....	5
Objectives and Approach .....	13
<b>Detailed Observations</b> .....	14
<b>Process Improvement Opportunities</b> .....	19
<b>Appendix A – Time Entry Flowcharts &amp; Analysis</b> .....	20
<b>Appendix B – GIS &amp; Material Requests Flowcharts</b> .....	24
<b>Appendix C – GIS Data Analysis</b> .....	32

**Asset Management Process Design Review**  
Internal Audit Report  
Issued: January 2020



---

## TRANSMITTAL LETTER

January 2020

The Audit Committee of DC  
Water 1385 Canal Street, SE  
Washington, DC 20003

Pursuant to the approved fiscal year 2019 internal audit plan for the District of Columbia Water and Sewer Authority (“DC Water” or the “Authority”), we hereby present our process design assessment of DC Water’s Asset Management program. We will be presenting this report to the Audit Committee of DC Water at the next scheduled meeting on January 23, 2020. Our report is organized in the following sections:

<b>Executive Summary</b>	This section provides a summary of the observations and ratings related to our process design assessment of DC Water’s Asset Management program.
<b>Background</b>	This section provides an overview of the DC Water asset management program.
<b>Objectives and Approach</b>	The internal audit objectives and focus are expanded upon in this section, as well as a review of the various phases of our approach.
<b>Detailed Observations</b>	This section gives a description of the observations noted during our work and recommended actions as well as management’s response, responsible party, and estimated completion date.

We would like to thank the staff and all those involved in assisting the Internal Auditors in connection with this review.

Respectfully Submitted,

**Internal Auditors**



## EXECUTIVE SUMMARY

### Background

For the purposes of this audit, we define an asset as the equipment and parts that collectively make up the infrastructure providing the DC community with wastewater and sewer services, such as pumps, pipes, valves, and operational equipment.

DC Water provides retail water and wastewater (sewer) service to more than 681,000 residents in the District, as well as wastewater treatment for approximately 1.6 million people in parts of Maryland and Virginia. The systems that support these services include 1,350 miles of interconnected pipes, 9,150 fire hydrants, 1,900 miles of sanitary and combined sewers, 9 wastewater pumping stations, 16 storm water pumping stations, the largest advanced wastewater treatment facility in the world, along with thousands of other assets to create the massive infrastructure under the Authority’s purview.

The monitoring, maintenance, and periodic repair of these systems is an on-going task that must not only focus on current state, and the ability to provide continuous service, but also a plan for the future.

A superior asset management program is of the highest priority to DC Water, and is paramount in achieving the mission of the Authority: “Exceed expectations by providing high quality water services in a safe, environmentally friendly, and efficient manner”.

### Objective and Scope

Our procedures were performed in accordance with the internal audit scope and approach set forth in our audit notification letter, dated July 11, 2019, and were limited to those procedures described therein. Our scope was based on the following objectives:

- Document the process, and identify improvement opportunities within:
  - Time entry processes;
  - Materials management processes;
  - Tools management processes; and,
  - Geographic information system processes.
- Identify critical data elements needed to drive effective monitoring of key asset management performance indicators (KPI);
- Assess the capabilities of existing technology system(s), and to evaluate their alignment with critical data elements and KPI requirements; and,
- Recommend strategies for improving data entry processes and technology application infrastructure, to support the Authority’s mission of proactive and predictive asset management.

Fieldwork was performed July 2019 through September 2019

### Overall Summary / Highlights

The observations identified during our assessment are summarized on the next few pages. We have assigned relative risk or value factors to each observation. Risk ratings are the evaluation of the projected severity of the concern and the potential impact on the operations of each item. Observations will require management action plans with estimated completion dates that will be included in the routine follow up of internal audit observations.

### Summary of Observation Ratings *(See Appendix B for definitions)*

	Number of Observations by Risk Rating		
	High	Moderate	Low
Asset Management	1	-	1

***We would like to thank all DC Water team members who assisted us throughout this review.***





## EXECUTIVE SUMMARY

### Ratings and conclusions

Following is a summary of all observations noted in the areas reviewed (see “Detailed Observations” section for additional information). Definitions of the rating scales are included in the Appendix.

Summary of Observations	
Observations	Rating
<p><b>1. GIS Map and Data Table Accuracy</b></p> <p>The Geographic Information Systems (“GIS”) map is a key driver of an efficient, effective, and proactive system of managing assets. DC Water field workers rely on the information within the map when responding to emergencies, corrective maintenance, or planned maintenance to quickly locate the site in question and begin their work. Additionally, management relies on GIS data to make business decisions related to repair and/or replacement plans. Due to the number of projects, reliance on third parties, and the manual nature of the mapping update process, the GIS map and data table are not complete and accurate. Without an accurate and reliable GIS map and data table, the efficiency of field workers can be negatively impacted as well as the confidence of management in its use for decision making.</p>	<b>High</b>
<p><b>2. Centralized Tools Management</b></p> <p>DC Water does not have a centralized tool management system in place. An effective and organized system for tracking items that are intended for repeated use such as wrenches, screwdrivers, drills, and other items of similar nature provides an opportunity to reduce costs, increase efficiency, and provide management with an understanding of when and why new requests are submitted.</p>	<b>Low</b>



---

## EXECUTIVE SUMMARY (CONTINUED)

### Improvement Opportunities Summary

The following is a summary of all process improvement opportunities noted in the areas reviewed (see *“Process Improvement Opportunities”* section of this report for more detailed descriptions and recommendations).

#### Summary of Process Improvement Opportunities

##### Process Awareness and Consistency

Through discussion with management personnel, as well as field workers within Maintenance, Sewer, Pumping, and Water, we gathered an understanding of how Maximo is utilized from identification of required repair or maintenance, initiation of a work order, through data entry, review, and closeout. The processes varied across departments, and even branches within departments based upon the expectations of management and knowledge of field workers on how Maximo can and should be utilized. We previously noted the inconsistent use of Maximo in our integrated Work Order Management report. Some departments have established new processes that could potentially be implemented across the Authority to streamline the use of mobile technologies and capture more accurate, timely and complete data.



---

## BACKGROUND, OBJECTIVES AND APPROACH

### Background

DC Water provides retail water and wastewater (sewer) service to more than 681,000 residents in the District, as well as wastewater treatment for approximately 1.6 million people in parts of Maryland and Virginia. The systems that support these services include 1,350 miles of interconnected pipes, 9,150 fire hydrants, 1,900 miles of sanitary and combined sewers, 9 wastewater pumping stations, 16 storm water pumping stations, the largest advanced wastewater treatment facility in the world, along with thousands of other assets to create the massive infrastructure under the Authority's purview.

The monitoring, maintenance, and periodic repair of these systems is an on-going task that must not only focus on current state and the ability to provide continuous service, but also a plan for the future.

A superior asset management program is of the highest priority to DC Water, and is paramount in achieving the mission of the Authority: "Exceed expectations by providing high quality water services in a safe, environmentally friendly, and efficient manner".

### Asset Management Overview

Asset management refers to the processes that water and wastewater utilities utilize to facilitate the performance of planned or predictive maintenance in manner, and that sufficient funds exist for capital asset (pumps, motors, pipes, etc.) repair, replacement, and upgrades within the planned life cycle. Overall, effective asset management is the practice of managing infrastructure capital assets to minimize the total cost of owning and operating these assets, while delivering the desired service levels. Many utilities use asset management programs to pursue and achieve sustainable infrastructure.

Each utility is responsible for maintaining a system in good working order, regardless of the age of its components or the availability of additional funds. Collecting and maintaining the integrity of data is a critical component to administering a successful program for asset management. Data can include, but should not be limited to: asset attributes (e.g., age, condition, and criticality), life-cycle costing, proactive operations and maintenance, and capital replacement plans based on cost-benefit analyses.

A high-performing asset management program can provide extensive benefits, such as:

- Prolonging asset life and improving decisions about asset rehabilitation, repair, and replacement;
- Meeting consumer demands with a focus on system sustainability;
- Setting rates based on sound operational and financial planning;
- Budgeting focused on critical activities for sustained performance;
- Meeting service expectations and regulatory requirements;
- Improving responses to emergencies;
- Improving the security and safety of assets; and,
- Reducing overall costs for both operations and capital expenditures.



## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Common Challenges

The benefits described above are also coupled with challenges that must be addressed by management and staff to promote and maintain an effective asset management program. The challenges are not only related to the maintenance and repair of assets, but also ensuring that all costs and asset-specific characteristics and location information are captured and employees understand the importance of these practices, identifying the optimal time to replace aging assets, complying with increased regulation, all while supporting increased demands and expectations of service from customers. The Authority has developed a plan to address these challenges, while implementing best practices and keeping ratepayers best interest in mind.

### Current State

The Authority addresses asset management with an integrated business approach, through cross-functional collaboration that relies on well-devised processes, knowledgeable staff, sufficient resources, and communications with stakeholders to deliver established levels of service. As part of the Blue Horizons 2020 Strategic Plan, the Authority set forth a goal of optimally managing infrastructure, with an underlying initiative of completing the development of, and implementing a comprehensive asset management program. These efforts are guided by nine key principles for managing the Authority's assets.

<p><b>Customer Focused</b></p> <ul style="list-style-type: none"> <li>- Meet levels of service based on ratepayer and community preference</li> </ul>	<p><b>Whole Life-Cycle Based</b></p> <ul style="list-style-type: none"> <li>- Consider asset resources and financial requirements from planning, design, construction/acquisition and commissioning, through operation, maintenance and renewal, to retirement and disposal.</li> </ul>	<p><b>Sustainable and Forward Looking</b></p> <ul style="list-style-type: none"> <li>- Consider social, environmental, and financial aspects of present and future service commitments.</li> </ul>
<p><b>System View</b></p> <ul style="list-style-type: none"> <li>- Manage assets as interrelated components in a unified system rather than as stand-alone assets.</li> </ul>	<p><b>Innovative</b></p> <ul style="list-style-type: none"> <li>- Continually improve asset management processes and procedures using innovative tools, techniques and solutions.</li> </ul>	<p><b>Reliability Focused</b></p> <ul style="list-style-type: none"> <li>- Understand consequences of asset failure and implement appropriate maintenance processes to reduce likelihood of asset failure.</li> </ul>
<p><b>Managed Risk</b></p> <ul style="list-style-type: none"> <li>- Direct resources and priorities to achieve established levels of service while minimizing life cycle costs at an acceptable level of risk.</li> </ul>	<p><b>Regulatory Driven</b></p> <ul style="list-style-type: none"> <li>- Ensure compliance with laws, regulations, permits, Consent Decrees, Administrative Orders and other legal requirements.</li> </ul>	<p><b>Transparent and Defensible</b></p> <ul style="list-style-type: none"> <li>- Use formal, consistent, scalable, and repeatable approaches.</li> </ul>



## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Current State

More recently the Authority has expanded on their focus of asset management within the Blueprint Strategic Plan through the resilience, readiness and enterprise risk management strategic program. This program has set forth a mission to protect and maintain the resources, systems and operations necessary to deliver safe and reliable services to customers with the underlying initiative of asset management for all linear and vertical assets. Specifically, this group will be standardizing asset classifications and attributes across DC Water vertical assets, as well as the templates for use in capital projects, and workflows to capture these attributes and incorporate them into Maximo. Specifically, this initiative will yield:

- Asset classifications definitions and guidelines
- Asset classification attribute data templates and a standard upload method for IT
- Standard operating procedures for capital improvement projects

Thus far over 140 asset classifications have been reviewed and unused or duplicate classifications have been removed. A consensus has been created for asset classification definitions and uses, accompanied by draft guidelines.



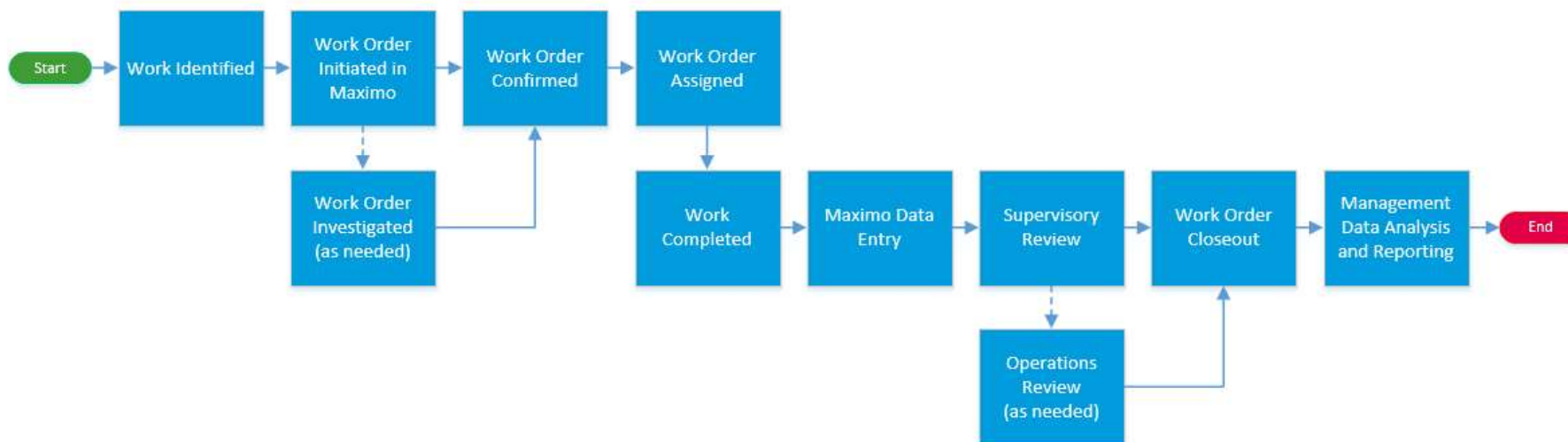


## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Maximo

A key component of asset management is capturing costs related to periodic maintenance and necessary repairs to assets. In order to successfully capture these costs and identify which asset these costs are to be applied to, a work order management system must be in place. DC Water utilizes Maximo, a Computerized Maintenance Management System (CMMS) by IBM to generate work orders and capture the related costs. CMMS combines asset management and maintenance into an integrated tool. Maximo is a data management software that allows each department to share and enforce best practices, inventory, resources and personnel, as well as provide management with a tool to analyze and track work order processes on a regular basis, including review of work orders through a built-in work flow, and development of key-performance indicators through enhanced management modules.

The work order process is illustrated at a high-level below. Based upon the department and work order type, the work flow may have additional steps such as scheduling, material requisition, or vendor involvement. Additionally, some departments may not follow all of the steps identified below based upon business needs and/or resources. More detailed process maps are included in the Appendix of this report.





## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Geographical Information System (GIS)

As infrastructure ages, public utilities face escalating costs to repair, replace, or rehabilitate critical networks. A proactive asset management program can stretch the useful life of utility systems while reducing operating costs. Utilities such as DC Water can take advantage of the power of GIS to assist in asset management by collecting field data, analyzing networks, and financially optimizing maintenance programs.

A key component of asset management is the knowledge of where assets are located, especially when a large number of them are sewer mains and water pipes that are underground. Geographical Information Systems, or “GIS”, is a tool that is designed to manipulate, visualize, capture, analyze and store geographical data. In essence, it is an interactive map of the full DC Water infrastructure that can be utilized by field workers to locate assets requiring maintenance or repair, and to provide important information about the asset.

GIS mapping can drive the improvement of asset management practices in the way it configures and collects data. Without a way to collect asset data, organizations can struggle to effectively strategize for future decisions related to infrastructure improvement. The impact a GIS program with accurate and up to date information includes:

- Increased accuracy of estimated useful life of assets
- Early identification of preventative maintenance needs
- Early identification of asset breakdown

DC Water has a team of 4 full-time employees dedicated to maintaining and improving the capabilities of the GIS map. Various processes have been developed to collect data regarding additions or changes to the infrastructure through projects from developers, DDOT, and CIP. It is encouraged that field workers from Sewer Services and Water Services notify the GIS technicians of any variance between actual location and details of an asset versus the information within the GIS map. The GIS data is separate from Maximo, and aggregation of individual asset data can be challenging. Improvements in this area are on-going.



The processes of how information is gathered and updates to the map are incorporated are detailed further within the Appendix of this report.

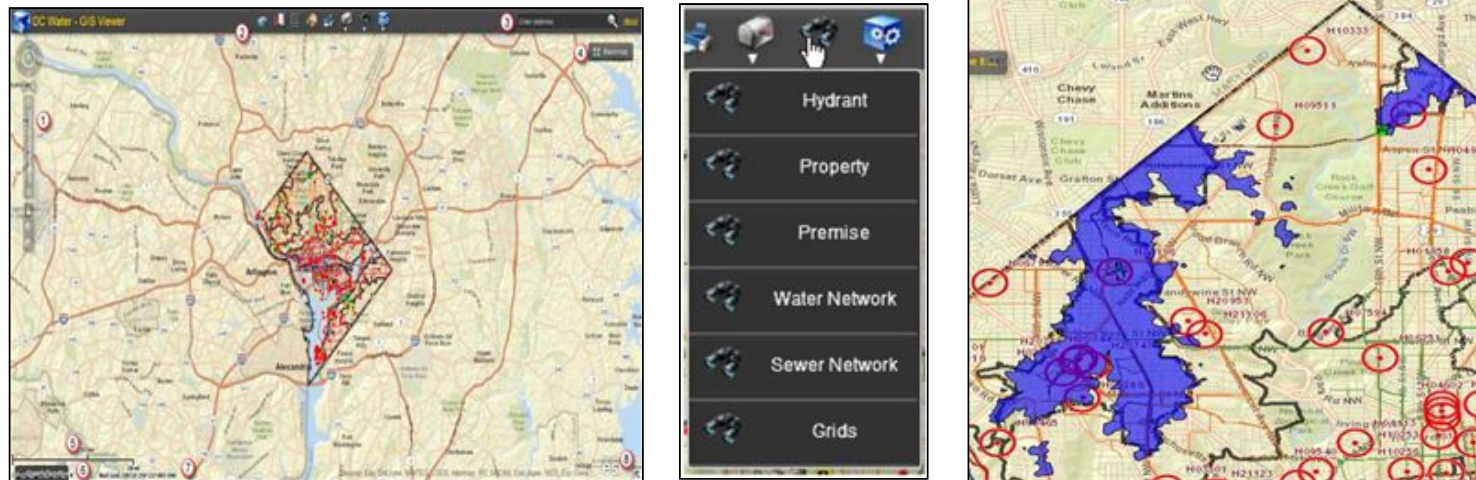


## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Geographical Information System (GIS) (Continued)

The GIS viewer gives field workers a topographical view of the entire DC Water infrastructure. Field workers are able to drill down by selecting an area within the map for further detail on assets. GIS not only provides field workers with the ability to locate the assets, but also assist them when performing maintenance.

Additionally, GIS functions as a database for all asset information that is needed for field workers to perform their assigned work. This information includes model, serial number, size, history of prior maintenance or repair, number of turns, etc.



Valve ID	Old Valve I	Owner	JOBNUM	Install Date	Diameter	Class	Function	Close direction	Number of Turns	Normal Pos	Final Pos	Valve Orientation	Operator Type	Housing	Valve Card
V020834	00045001N	WASA		08/29/1910	6"										Intersec
V020833	00045001E	WASA		08/29/1910	6"										Intersec
V020835	00045001S	WASA		08/29/1910	6"										In 3
V010170	00045002	WASA	A70472	05/20/1973	16"										Intersec





## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Future Considerations and CIP

Asset management is the driving force of decision making related to replacement of current infrastructure through the capital improvement plan. Proactivity in maintenance and repairs, as well as utilizing the information gathered from day to day asset management can provide key information on where and when these improvements should be made. As a result of asset assessments performed over the past five years, the Authority is transitioning to a more proactive approach to managing assets, with a focus on identifying the causes of asset failure and creating a plan to mitigate the risk of a failure occurring. The following risk framework has been developed by C2HM Hill following a risk assessment conducted for all DC Water owned assets to identify the weight of the various consequences along with likelihood of failure, in order to prioritize the administration of repair and replacement activities.

Consequence of Failure Category	Weight
Health and Safety <ul style="list-style-type: none"> <li>Employee Hazards</li> <li>Public Hazards</li> </ul>	25%
Public Confidence <ul style="list-style-type: none"> <li>Media Attention</li> <li>Transportation</li> <li>Community/Business/Environment</li> <li>Critical Customers</li> <li>Complaints</li> </ul>	15%
System Reliability	20%
Regulatory Compliance and Environmental Impact	25%
Fiscal Impacts <ul style="list-style-type: none"> <li>O&amp;M</li> <li>Capital</li> </ul>	15%

Likelihood of Failure Category	Weight
Physical Condition <ul style="list-style-type: none"> <li>Condition assessment results</li> <li>Main break history</li> <li>Remaining useful life</li> <li>Corrosive environment</li> </ul>	55%
Performance <ul style="list-style-type: none"> <li>Mains with water quality, fire flow, or O&amp;M issues</li> <li>Sewers with hydraulic capacity issues</li> </ul>	35%
Maintenance History <ul style="list-style-type: none"> <li>Hydrant flushing and/or valves break history</li> <li>Maintenance defects identified</li> </ul>	10%

Because Maximo cannot automatically assign asset priority codes based upon pre-set criteria, the Authority will be using InfoAsset to create this prioritization model using the risk framework above, but also various other inputs such as CCTV inspections and defects, acoustic analysis, visual inspections, hydraulic model results, Maximo work orders, and other operational information to assign a prioritization risk score to every water and sewer main asset in the system. The framework of assigning prioritization risk scores can be adjusted as goals of the Authority change over time.



---

## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Future Considerations and CIP

A larger initiative related to the achievement of asset management was introduced at the Authority by management in 2018, titled the *Path to Achieve Asset Management*. The purpose of this initiative was to conduct a collaborative effort by residents and ratepayers, the Board, and DC Water executive team to identify how to appropriately manage assets and make educated decisions on repair and replacement plans for the existing infrastructure. This plan was presented to the Environmental Quality & Operations Committee in March of 2018, where the key considerations were discussed.

- Explore investment in infrastructure:
  - What is needed to fully meet asset management principles?
  - What are our peer utilities doing?
  - What is the cost of pro-active investment, as compared with addressing issues as they arise?
- Exploration of alternative revenue sources:
  - What funds could be available, other than from ratepayers?
- Community outreach and education:
  - Explain infrastructure investment, and consequences of investment;
  - Gather ideas about addressing affordability.
- Impact on financial plan:
  - What is the impact on the operating budget, and what is the impact of proactive investment as compared with addressing issues as they arise?
  - What could be financed through debt?
  - What are the appropriate levels of PAYGO?
- Customer affordability:
  - What ways can we help ensure affordability?
  - What are our peer utilities doing to meet this challenge?

To address each of these considerations, peer utility comparisons, a current state assessment, and a cost-benefit analysis was performed to compare proactive investment versus reactive maintenance as issues arise.

---

## BACKGROUND, OBJECTIVES AND APPROACH (CONTINUED)

### Objectives and Approach

#### Objectives

The purpose of this assessment was to identify opportunities to improve the processes and data used across the Authority in the management of its assets and infrastructure. The scope of our work was based on the following objectives, as they relate to the Authority's enterprise-wide asset management program:

- Document the process, and identify improvement opportunities within:
  - Time entry processes;
  - Materials management processes;
  - Tools management processes; and,
  - Geographic information system processes.
- Identify critical data elements needed to drive effective monitoring of key asset management performance indicators (KPI);
- Assess the capabilities of existing technology system(s), and to evaluate their alignment with critical data elements and KPI requirements; and,
- Recommend strategies for improving data entry processes and technology application infrastructure, to support the Authority's mission of proactive and predictive asset management.

#### Approach

Our audit approach consisted of the following procedures:

- Obtained an understanding of the Authority's program for managing assets through interviews with various personnel from Sewer Services, Water Services, Pumping, and Maintenance;
- Reviewed documented policies and procedures, organizational charts, and any other key process information available to further our understanding of the program; and,
- Utilizing the results from our interviews and review of policies, we identified key areas and developed process improvement recommendations based upon best practices.

#### Reporting

At the conclusion of this internal audit, we summarized our recommendations into this final report. All contents of this report were distributed to and discussed with relevant stakeholders, and presented to DC Water's Audit committee. Management responses are included.



## DETAILED OBSERVATIONS

Asset Management Process Design Review Internal Audit		
1. <u>GIS Map and Data Table Accuracy</u>	<u>Recommendation</u>	<u>Management's Action Plan</u>
<b>Observation Rating: High</b>		
<p>The Geographic Information Systems (“GIS”) map is a key driver of an efficient, effective, and proactive system of managing assets. DC Water field workers rely heavily on the details within the map when responding to emergencies, corrective maintenance, and even planned maintenance to quickly locate the site in question and begin their work.</p> <p>The Authority employs a team of four (4) full-time employees dedicated to maintaining and updating the contents within the GIS map for the hundreds of projects on-going or recently completed. As of August 13<sup>th</sup>, 2019, there were 1,412 on-going projects Authority-wide that in some way impacted the Authority’s infrastructure, and thus the GIS map and asset data table.</p> <p>As a tool to aide in updating GIS information, the GIS team can request surveyors (when available) to perform surveys of areas in which the GIS map is least accurate, as surveys are an effective way to provide accurate information to the GIS team.</p> <p>Due to the number of projects, reliance on third parties, and the manual nature of the mapping update process, the GIS maps and asset data sets are not complete and accurate.</p> <p>We performed analysis on 11 of the 31 asset classes across the sewer and water networks. Each asset class has data fields that are identified as “required” with the expectation that this information has been populated and is available to a GIS user. The number of required fields for the 11 asset classes reviewed ranged from fourteen (14) to twenty-seven (27) fields. Based on our analysis, we noted the following:</p> <ul style="list-style-type: none"> <li>• Across the 11 asset classes analyzed, 1,271,401 (25.86%) required fields are lacking data out of a total 4,916,638 required fields. Impacts of incomplete data and examples are included on the next page.</li> </ul> <p>Further detail regarding each required field is included in Appendix C.</p>	<p>We recommend repurposing available resources to the GIS team to obtain a higher level of accuracy on areas of priority within the map. Priority areas should be based upon activity, including water and sewer use by customers, as well as maintenance and repairs through the use of Maximo work order information.</p> <p>Additionally, we recommend a stronger emphasis be placed on the importance of field workers providing information to the GIS team when a deviation or omission is identified. There may be opportunities for increased automation within this process with the inclusion of additional work order types that automatically route to the GIS team due to their impact on the map.</p> <p>Similarly, expanding preventative maintenance programs will support data collection/reconciliation and address missing assets. Preventative Maintenance programs are the cornerstone of asset management and provide countless benefits including: up-to-date information on the condition/remaining service life of assets, confirms attribute information, and extends the useful life of assets.</p>	<p><b>Response:</b> The GIS team has been operating without full staffing for over a year, further increasing the backlog of tasks that need to be completed. They are in the process of finalizing hiring one staff in February 2020, but the actual needs of the group to remain current with workload is likely higher and will be evaluated as part of this response. GIS as an area of work is in high demand across all range of industries, and there is active competition for qualified staff. The probability for staff to be transient is therefore high. A discussion will be initiated with People and Talent to have a pipeline of qualified staff to fill any future vacancies expediently, as well as with Procurement to have an on-call staffing contract for qualified GIS staff. As documented in the audit, the work requiring GIS staff is on-going and continuous, and disruptions from reduced staffing result in building backlogs that cannot be overcome with current level of full-time staff complement. This results in prioritization of critical work leading to a large increase in backlog as documented in the audit.</p>



## DETAILED OBSERVATIONS

Asset Management Process Design Review Internal Audit		
1. <u>GIS Map and Data Table Accuracy (continued)</u>	<u>Recommendation</u>	<u>Management's Action Plan</u>
<b>Observation Rating: High</b>		
<p>Based on discussion with the GIS Supervisor, there are processes in place to gather new information and update the map and data table as they are able. The significant issue with these processes is a heavy reliance on receipt of information from third parties such as developers, DDOT, and from field workers identifying deviations in asset location/details when performing tasks. The process for field workers to provide information is relatively manual, with a few work order types, such as CIPP lining, being automatically routed to the GIS Supervisor. During our discussions, the GIS team noted that additional work order types could be routed as well, but these functions have not been activated within Maximo. We do not believe there is a cost associated with activating those activities within the system.</p> <p>Without an accurate and reliable GIS map and data table, the efficiency of field workers can be compromised as they attempt to search for the true location of an asset requiring service. Not only is the asset location an important piece of information, but also other asset details such as serial number, manufacturer, size (e.g., pipe length or valve diameter), and history of prior maintenance or repair (e.g., valve diameter alters the work plan for a DWS field worker, as larger valves require additional turns to open and close the water main).</p> <p>The productivity cost of maintenance workers having unreliable location data cannot be fully measured. However, assets and subsequent work orders with incorrect or incomplete information, requires additional coordination and effort on the part of staff.</p>	<p>Lastly, management should revisit asset characteristics identified as "required" in the GIS system. Based upon the information included in Appendix C, many of the fields identified as required are not populated. This may provide an opportunity to remove unnecessary fields.</p> <p>Dedicated IT resource(s) should be identified to work with linear operations in the development and implementation of process improvements to help streamline asset updates and ensure data accuracy is built into business processes.</p>	<p>The other deficiency identified in the audit is the need for data sufficiency to improve the Authority's efficiency in planning projects and executing work in support of an asset management approach. The asset library needs to be complete, and attributes fully documented. As documented in the audit, the attributes for linear assets are incomplete, and several assets e.g. service lines need to be added to the database. Work orders presently written against premises need to be written against assets and the failures documented to inform decisions on asset replacements.</p> <p>Using audit findings in conjunction with additional investigations, a work plan will be developed to quantify required labor effort to complete legacy work along with estimating GIS technician hours for on-going projects to prevent backsliding. The most efficient method of completing legacy work (contract labor and/or interns) will be determined along with a projection of required skilled GIS staff to keep up with on-going workload.</p>



## DETAILED OBSERVATIONS

Asset Management Process Design Review Internal Audit		
1. <u>GIS Map and Data Table Accuracy</u> (continued)	<u>Recommendation</u>	<u>Management's Action Plan</u>
<b>Observation Rating: High</b>		
		<p>The overall recommendations of the audit are accepted and will be implemented. Due to the specialized skills needed with GIS, the one recommendation to re-purpose staff to help with overcoming the backlog is not easily implementable without significant re-training.</p> <p><b>Responsible Party:</b> Salil Kharkar, Operations &amp; Engineering</p> <p><b>Target Date:</b> 7/31/2020</p>



## DETAILED OBSERVATIONS (CONTINUED)

Asset Management Process Design Review Internal Audit		
2. <u>Centralized Tools Management</u>	<u>Recommendation</u>	<u>Management's Action Plan</u>
<p><b>Observation Rating: Low</b></p>		
<p>DC Water does not have a centralized tool management system in place. Currently, tools are purchased utilizing administrative or commodity work orders, blanket purchase orders, or with P-Cards. Dating back to FY 2014, a total of \$3.6 million has been purchased through work orders on items identified as “tools”.</p> <p><i>Note: We were not able to obtain tools purchases made through P-Card.</i></p> <p>An effective and organized system for tracking items that are intended for repeated use such as wrenches, screwdrivers, drills, and other items of similar nature provides an opportunity to prevent losses, better determine when to repair or replace tools, and maintain the condition of the tools.</p> <p>Without proper oversight on tool utilization and management, management may be unaware of the total cost and frequency of tool purchases. Additionally, periodic rolling truck stock inventories would help to ensure that field workers have the proper tools needed, and in working condition, for the work orders to be performed.</p>	<p>We recommend the Authority implement a system for tracking the purchase and assignment of tools. As an example, tool kit can be created based on the specific responsibilities of a position, and assigned to each field worker upon hire (or upon inception of this system for current workers). A log of kit assignments would be maintained, and specific requests for replacement tools would be submitted by the workers, with justification for the replacement. If an employee were to leave the Authority, management will have the ability to track these kits to validate that all tools within the kit were returned by the departing employee.</p> <p>A system such as this would provide DC Water with increased efficiencies and productivity while in the field, expanded awareness of how tools are utilized and managed, and create a culture of accountability and understanding of the importance of properly maintaining these items. Additionally, while the fiscal impact is not significant, cost savings are likely with reduced requests for replacements and less downtime due to not having the proper tools needed.</p>	<p>This topic crosses multiple departments and is not restricted to a single Maintenance team. Departments impacted include Blue Plains Maintenance, Pumping Operations Maintenance, Water Operations Maintenance, Sewer Operations Maintenance, Facilities Maintenance, and Fleet Maintenance. Each of these report to various Executive Vice Presidents and cross multiple unions. Due to the various departments engaged in this effort, responsibility for coordinating implementation will reside with a single entity separate from the impacted departments. The department that will be tasked with leading this effort is Material Management.</p>



**DETAILED OBSERVATIONS (CONTINUED)**

Asset Management Process Design Review Internal Audit		
2. <u>Centralized Tools Management</u> (continued)	<u>Recommendation</u>	<u>Management's Action Plan</u>
<b>Observation Rating: Low</b>		
		<p>The first step in this effort is creating a Change Management team from the affected departments who can lead this change. The goal of the effort is to standardize on tool kits provided to employees that is specific to the department they work in and the type of work they are expected to execute, streamline tool purchases, create a process for tagging high value tools, and require all DC Water wide tool purchases to be made through Material Management and follow an established set of rules.</p> <p><b>Responsible Party:</b> Scott Perry, Materials Management</p> <p><b>Target Date(s):</b> 12/31/2020</p>



## PROCESS IMPROVEMENT OPPORTUNITIES

### Asset Management Process Design Review Internal Audit

#### Process Awareness and Consistency

Through discussion with management personnel, as well as field workers within Maintenance, Sewer, Pumping, and Water, we gathered an understanding of how Maximo is utilized from identification of required repair or maintenance, initiation of a work order, through data entry, review, and closeout. The processes varied across departments, and even branches within departments based upon the expectations of management and knowledge among field workers of how Maximo can and should be utilized. These processes followed by each department, as well as additional analysis on the time entry processes, are detailed further within the Appendix of this report. Specific differences among processes included:

- Use of mobile capabilities such as tablets and field laptops
- Transposing hand-written notes from paper work orders into Maximo via work stations versus immediate entry into Maximo
- Performance metrics related to total labor hours applied to work orders

Within a prior internal audit report related to work order management, we identified inconsistencies related to work order data entry, including labor hours and field notes regarding work performed. In general, we noted the departments that exhibit more defined and specific processes also had fewer exceptions related to data entry within individual work orders. These departments have advanced technologies to streamline the data entry process.

For example, the Department of Maintenance Services (DMS), has begun deployment of a mobile application, InterLock/Maximo Mobile, which will allow field workers to receive all work order assignments and the job plans that accompany the assigned work orders, directly on a tablet provided by the Authority. Additionally, multiple mandatory training programs have been provided to inform field workers of the importance of entering all required information into each work order, and the impact that having accurate information can have on future initiatives and infrastructure improvement.

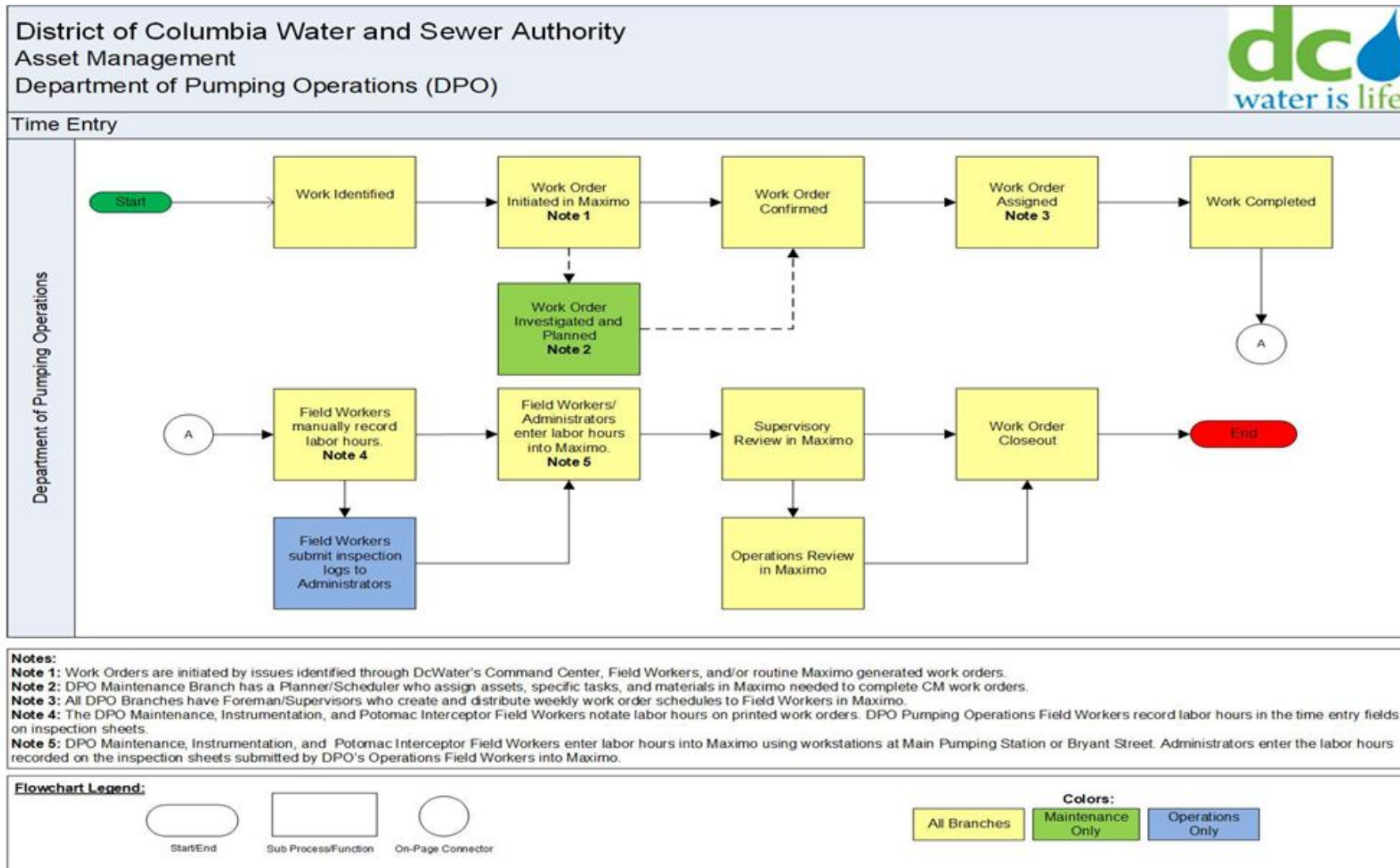
We understand that other departments are exploring / implementing similar initiatives such as mobile technologies and training programs to streamline the work order process, in order to obtain a more complete set of data for the Authority to utilize for future decision making. One of the key components of the asset management risk framework is work order history and capturing more consistent and accurate data will assist the Authority in employing this framework, and help management make educated decisions related to managing, maintaining, and repairing higher priority assets. The status and timeline for further implementation / training is below.

- Past training:
  - Reliability shop: multiple 2-hour sessions and various check-ins for a total of 16 training hours;
  - Instrumentation shop: multiple 2-hour sessions and various check-ins for a total of 13 training hours;
  - Operations: multiple 2-hour sessions and various check-ins for a total of 13 training hours; and,
  - Electrical shop: multiple 2-hour sessions and various check-ins for a total of 24 training hours.
- Future training:
  - January 2020: Estimated 30 hours of training for the Mechanical group; and,
  - March 2020: Estimated 54 hours of training for Operators.

There is a phased approach due to cost of implementation and varying needs and use requirements of each group. The total costs incurred for this effort are related to the purchase of tablets, a one-time licensing fee, and an annual maintenance fee.

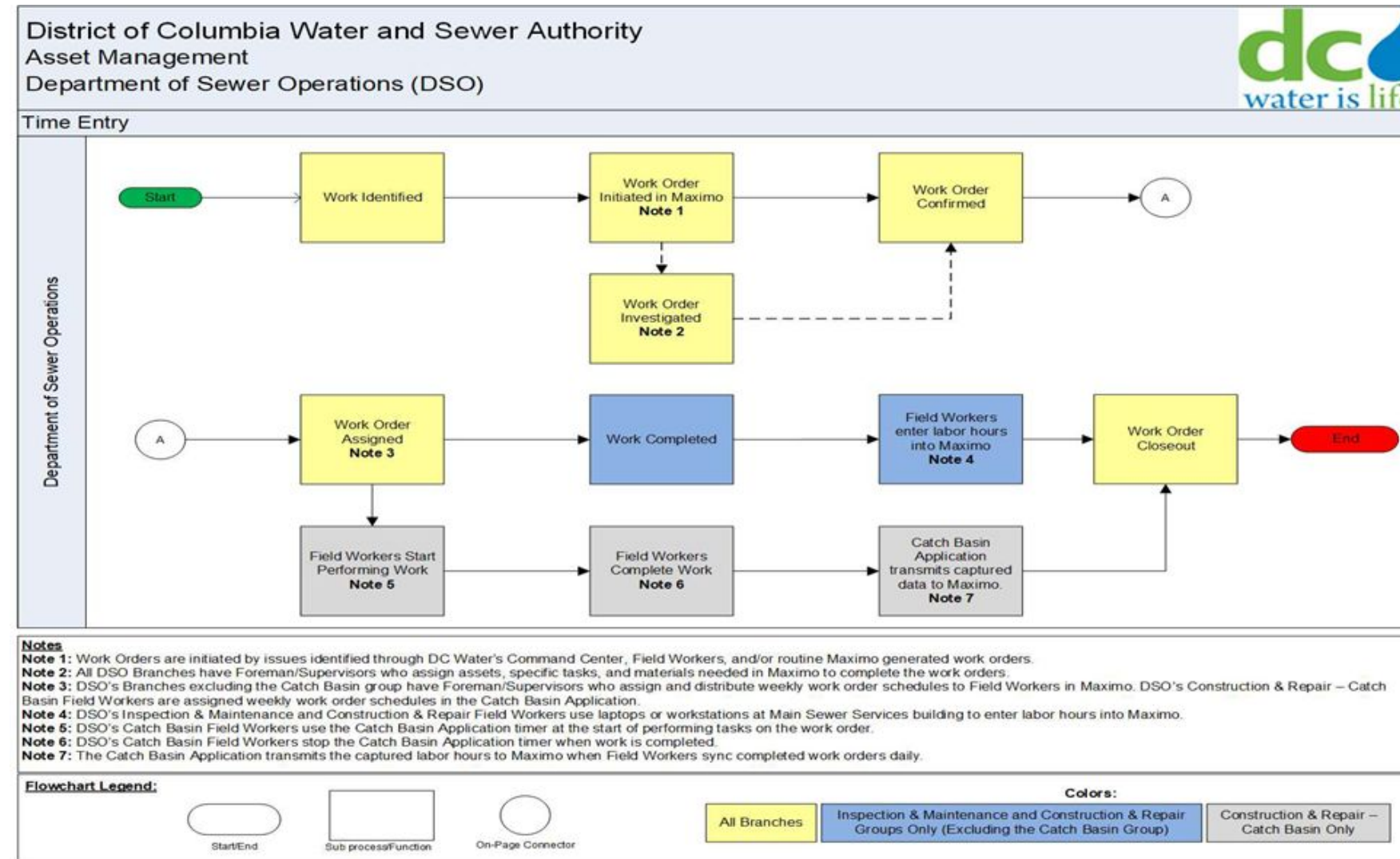


## APPENDIX A – TIME ENTRY FLOWCHARTS & ANALYSIS



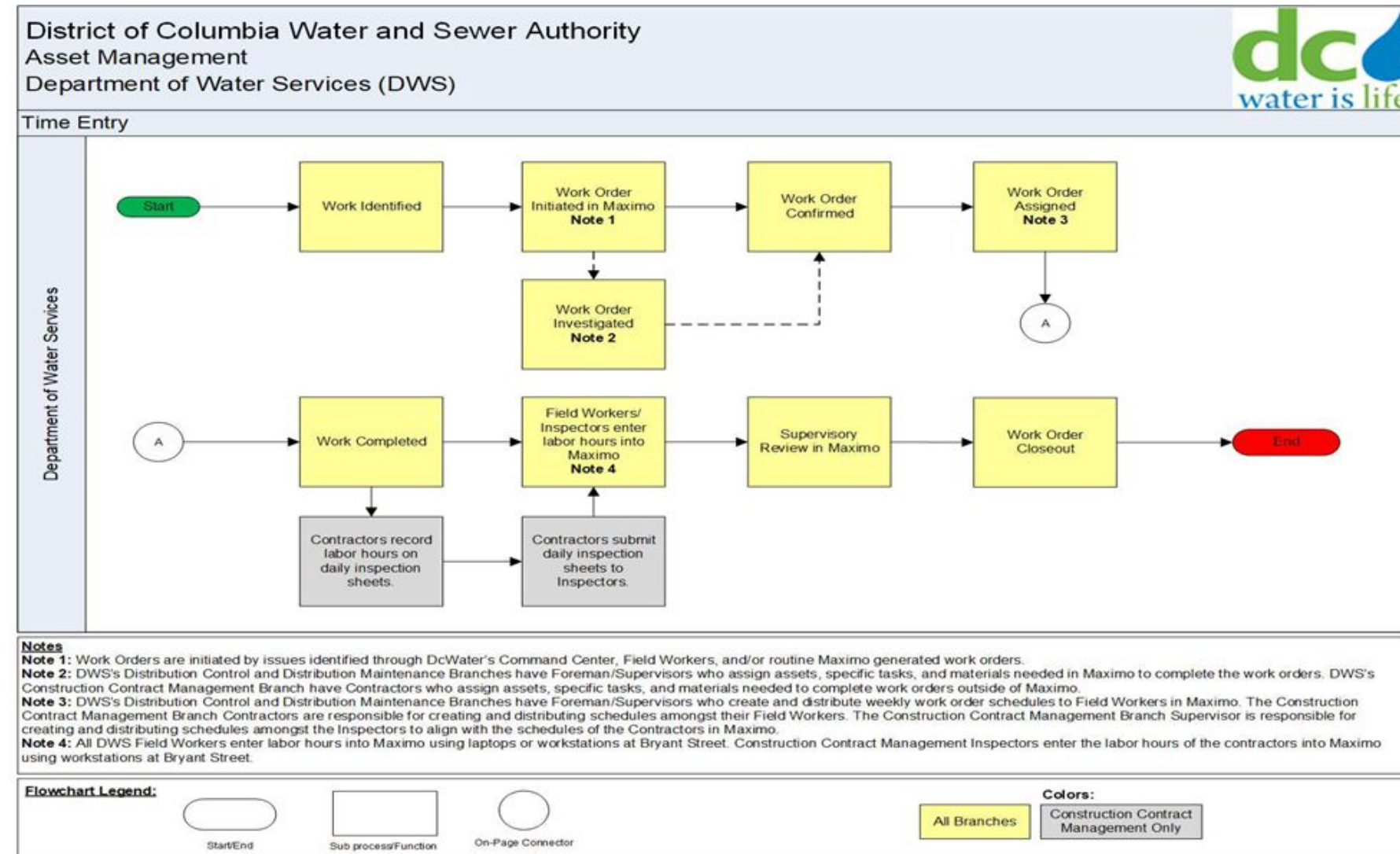


**APPENDIX A – TIME ENTRY FLOWCHARTS & ANALYSIS (CONTINUED)**





**APPENDIX A – TIME ENTRY FLOWCHARTS & ANALYSIS (CONTINUED)**



**Asset Management Process Design Review**  
**Internal Audit Report**  
**Issued: January 2020**



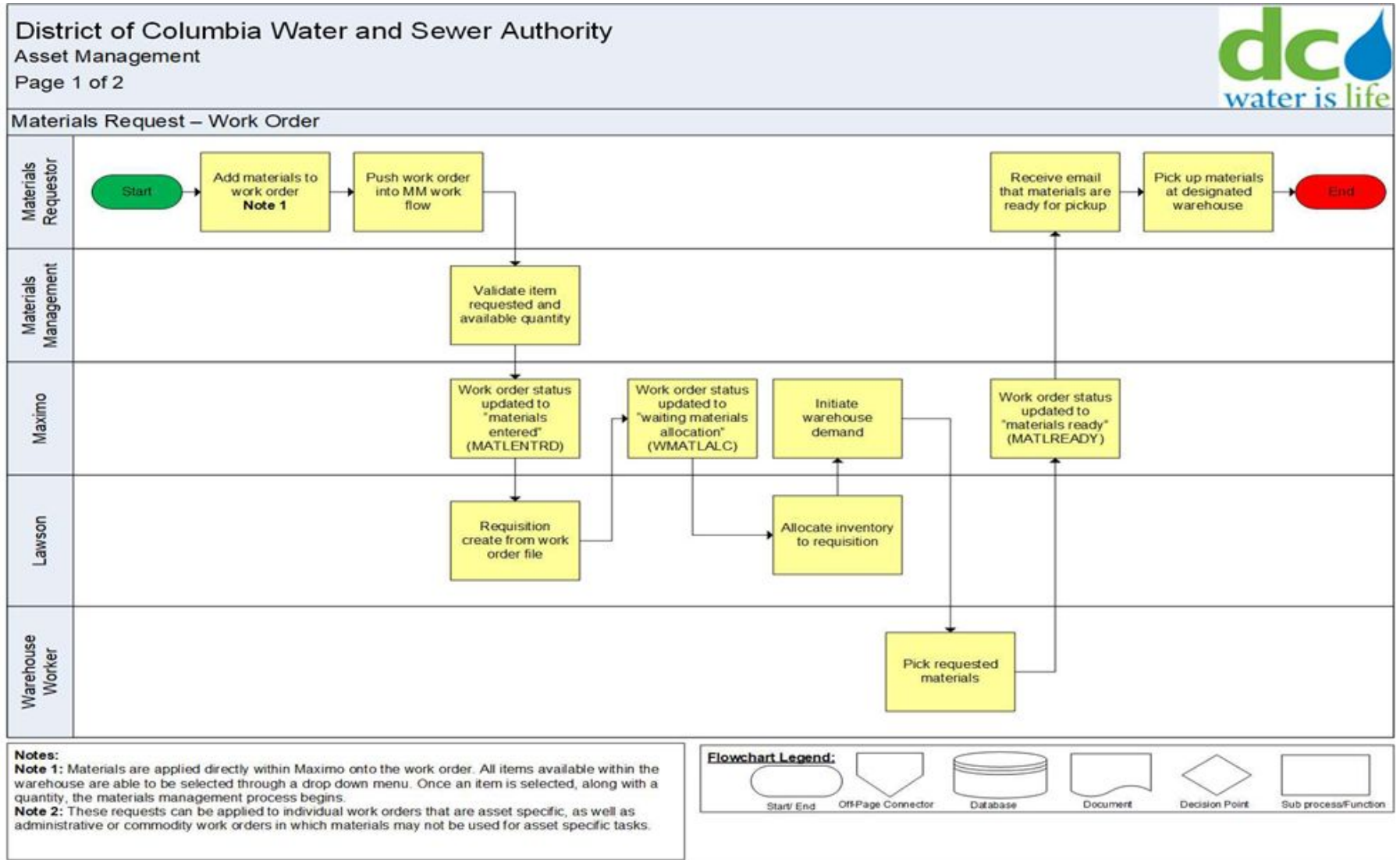
**APPENDIX A – TIME ENTRY FLOWCHARTS & ANALYSIS (CONTINUED)**

Department	Time Entry Process Summary	Analysis	
<b>DPO</b>			
Maintenance Branch	Maintenance field workers enter their time directly into Maximo using a workstation at Bryant Street upon completion of work shifts. Each worker is required to have 40 hours applied to work orders each week.	Primary differences within DPO are related to the use of Maximo by field workers. The Operations branch utilizes an administrative function to enter hours, while all others require field workers are knowledgeable of time entry within Maximo. Additionally, Maintenance and Potomac Interceptor require a minimum number of hours to be captured via Maximo, which supports stronger data entry from field workers. In general, the processes within DPO are not as supported by technology as the other departments, however management expectations have improved cost capture and work order completion.	
Pumping Operations Branch	Operations field workers record their time manually on logs and submit to Administrators upon completion of work shifts. The Administrators enter the data recorded on the logs into Maximo. The logs are attached to work orders in Maximo.		
SCADA & Process Control Branch	SCADA field workers manually record time on printed work orders and use workstations at Bryant Street to enter hours into Maximo.		
Potomac Interceptor Branch	Potomac Interceptor field workers enter their time directly into Maximo using a workstation at Main Pumping Station upon completion of work shifts. Field workers are expected to perform the scheduled estimated labor hours per each work order.		
<b>DSS</b>			
Inspection & Maintenance Branch			
Investigation & Cleaning	Inspection and maintenance branch field workers use laptops on site to enter time directly into Maximo upon completion of individual work orders.	An awareness of the need for data entry has been introduced across all of Sewer Services. All field workers within DSS are familiar with utilizing Maximo on laptops, or at work stations at O Street. Mobile tools such as the Catch Basin application have streamlined the time entry and overall work order completion process. The required fields validate that all necessary information is captured and processes directly into Maximo. DSS supports the use of technology and is working on expanding the tools available to field workers.	
CCTV, Floatables & Structure			
Construction & Repair Branch			
Catch Basins	Catch Basin field workers use the Catch Basin application which automates the time spent performing work through a timer. The time begins when the field worker selects the work order and starts the timer. Once the cleaning is finished the timer is manually stopped and the total time is captured on the work order.		
Sewer Inspection & Assessment	Construction and Repair field workers use laptops while in the field to enter time directly into Maximo upon completion of individual work orders. Field workers have the option to use workstations at the Main Sewer Services building to enter time directly into Maximo upon completion of work.		
Utility Services: Construction			
<b>DWS</b>			
Distribution Control Branch	DCB field workers use laptops while in the field to enter time directly into Maximo upon completion of individual work orders. They also have the option to use workstations at Bryant Street.	Processes within Water Services are similar across the three internal branches. Most field workers utilize paper documentation to note relevant work order data which is then subsequently entered into work stations at Bryant Street. The hydrant repair group utilizes a Hydrant application which streamlines the work order data entry processes similar to that of the Catch Basin group within Sewer Services. Technology is not as widely adopted as within other departments.	
Distribution Maintenance Branch	DMB field workers enter their time directly into Maximo using workstations at Bryant Street.		
Construction Contract Management Branch	CCM inspectors receive daily reports from Contractors outlining time spent on work orders. The Inspectors enter the time recorded on the reports, as well as their own time required to perform the inspection into Maximo upon completion of work.		
<b>DMS</b>			
Electrical	Field Workers use laptops on-site to enter time into Maximo upon completion of individual work orders.  Note: DMS is rolling out Maximo mobile which provides mobile accessibility to enter hours and other required information. The Reliability group is utilizing the software now, and an incremental roll out to the other groups within DMS is on-going.	Maintenance Services has adopted technology for the work order process more so than other departments. Specifically, DMS has begun rolling out Maximo Mobile which automates the work order processes from initiation, assignment, data entry, review and closure. Until full roll-out, field workers will continue to utilize their laptops or work stations at Blue Plains.	
Industrial Equipment			
Power Distribution			
Reliability			

Legend
Mobile (Laptop, Tablet) Capabilities Utilized by Field Workers
Some Field Workers Utilize Mobile Capabilities
Field Workers Do Not Use Mobile Capabilities

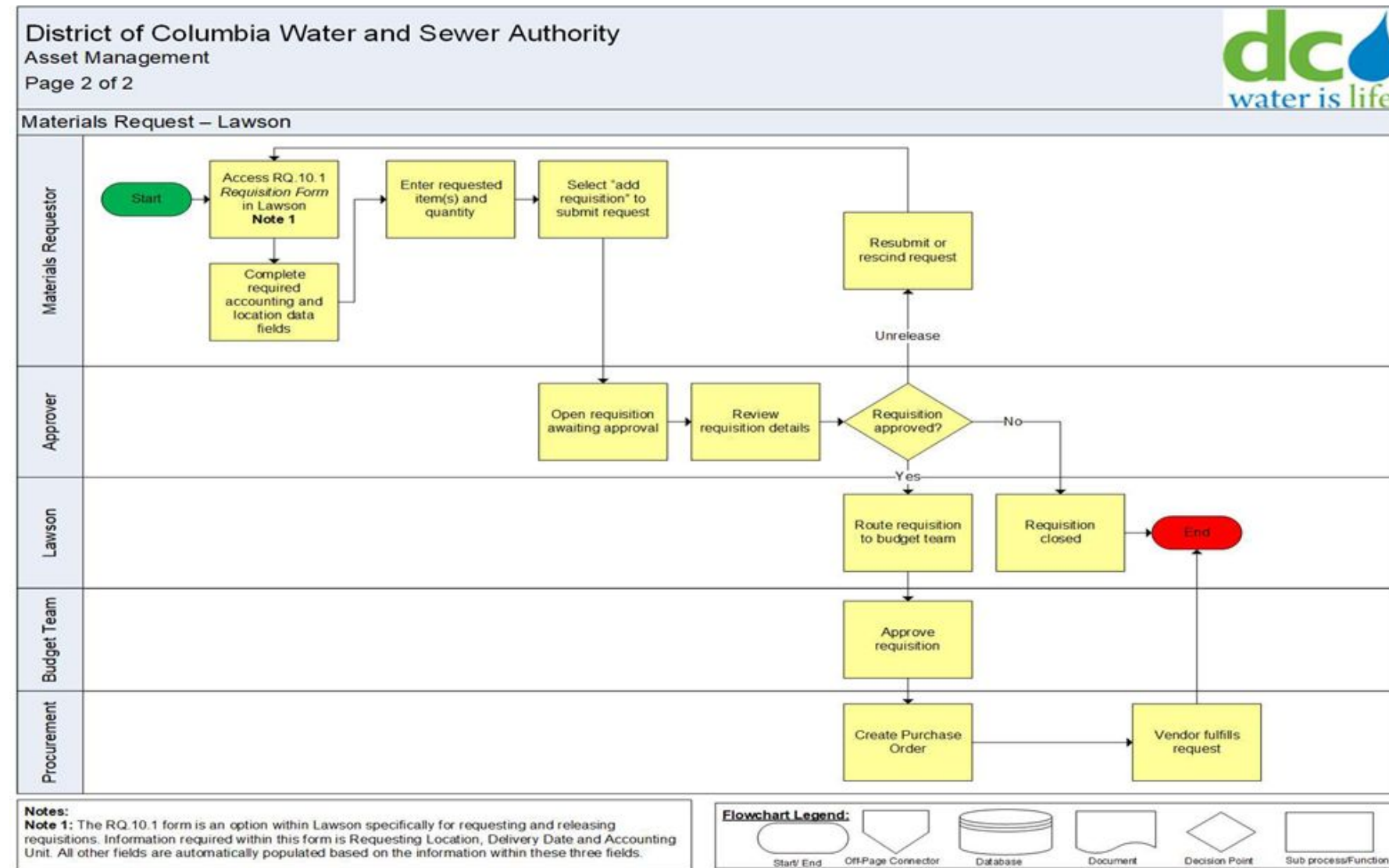


**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS**



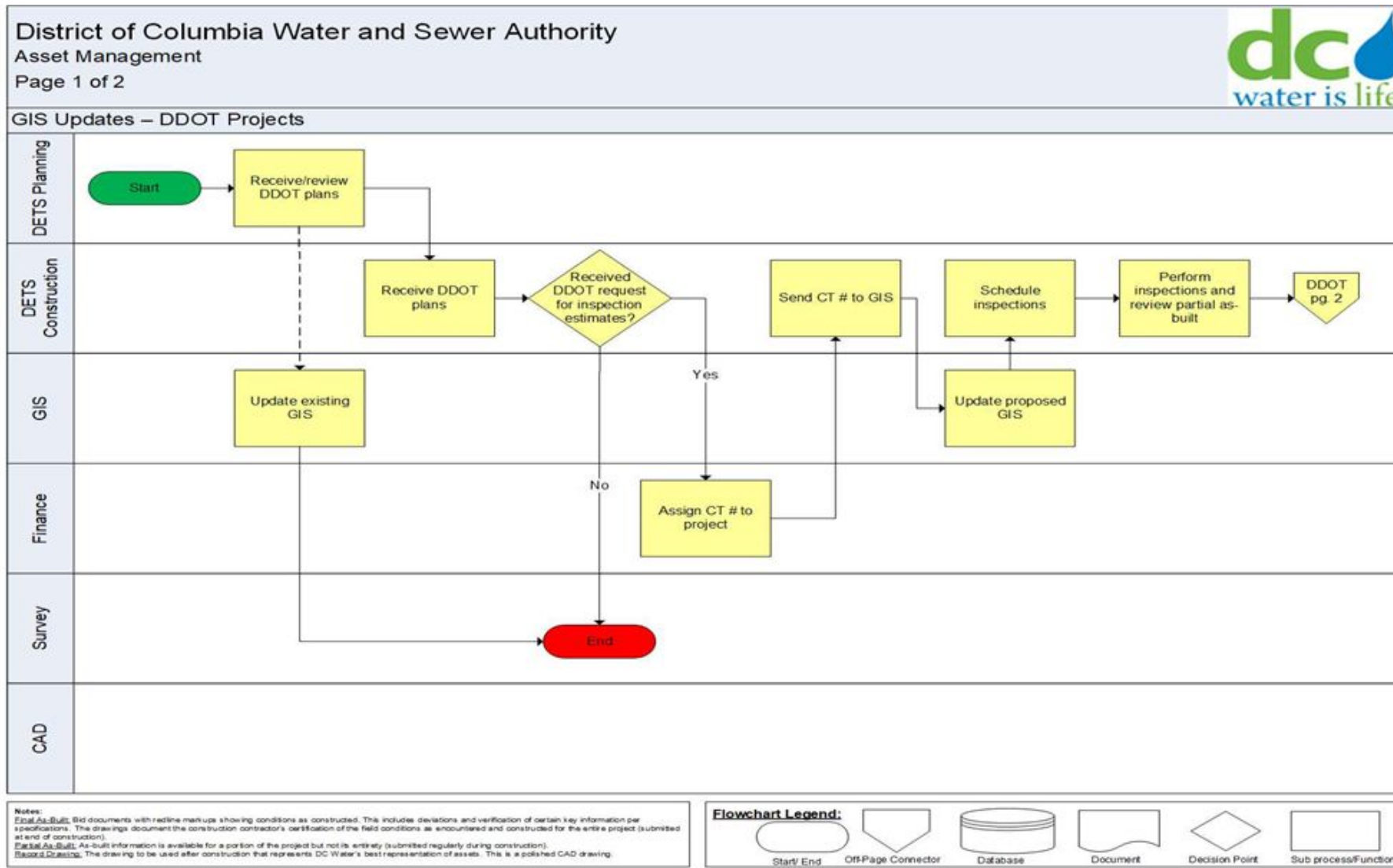


**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS (CONTINUED)**





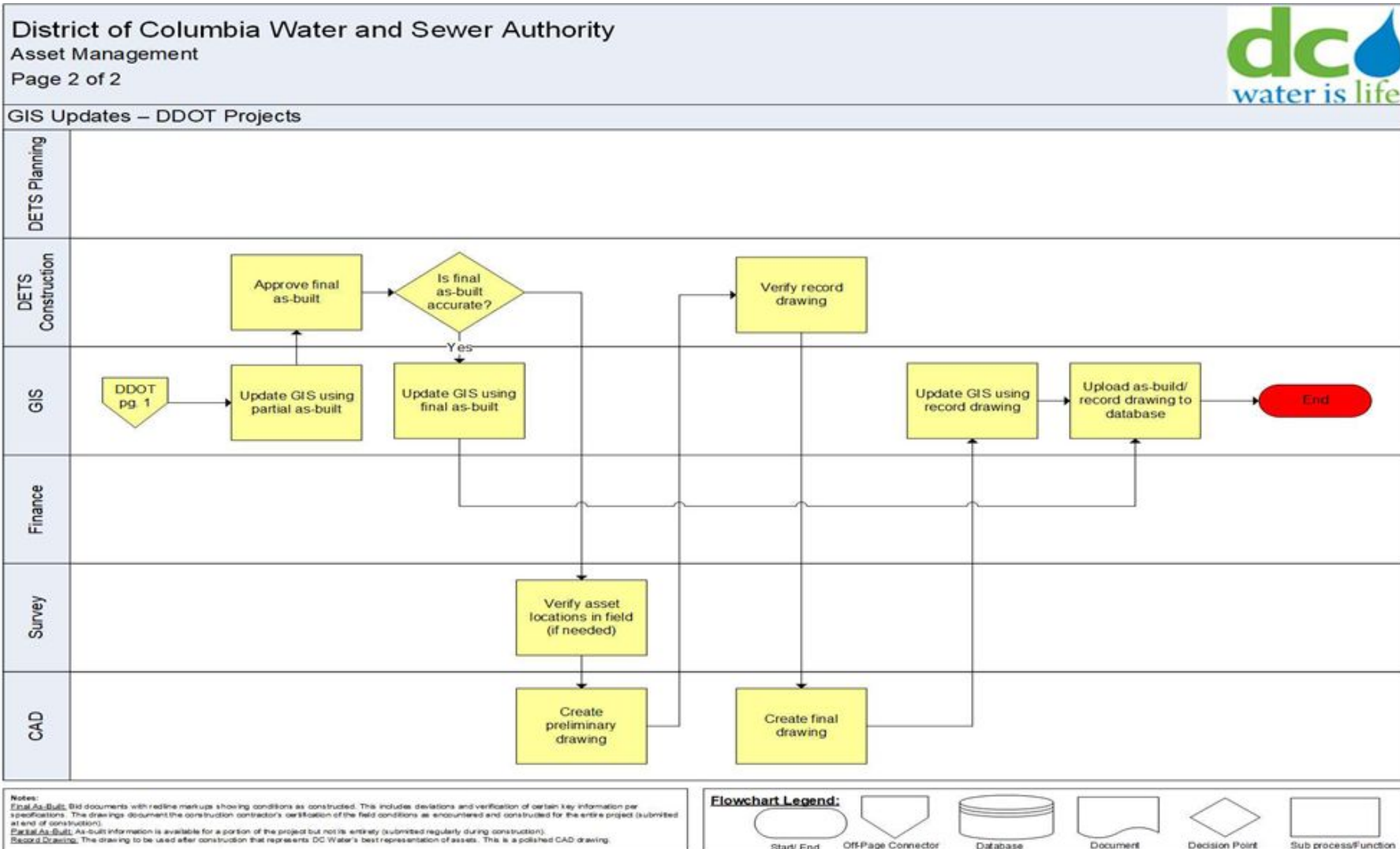
**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS (CONTINUED)**





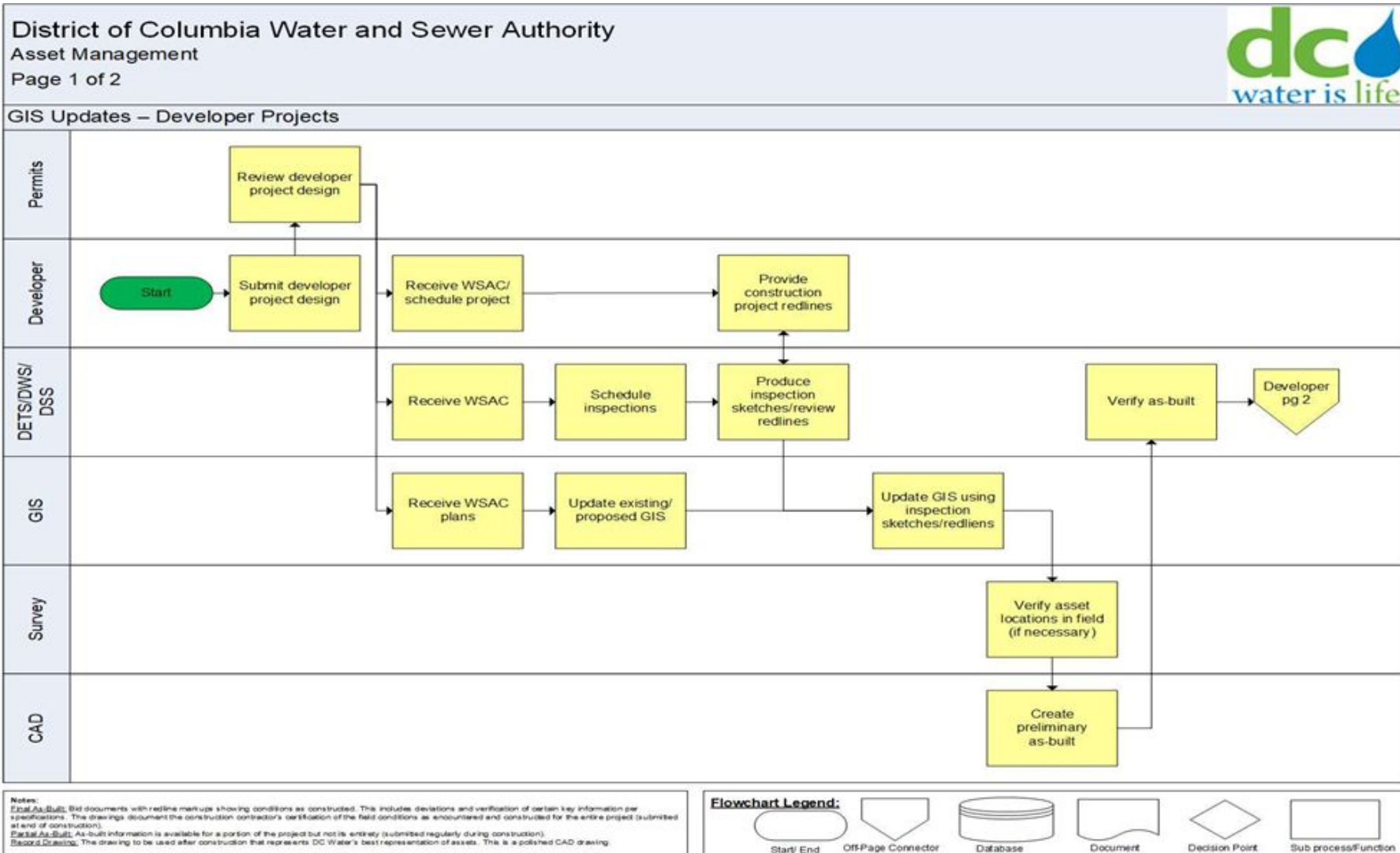


**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS (CONTINUED)**



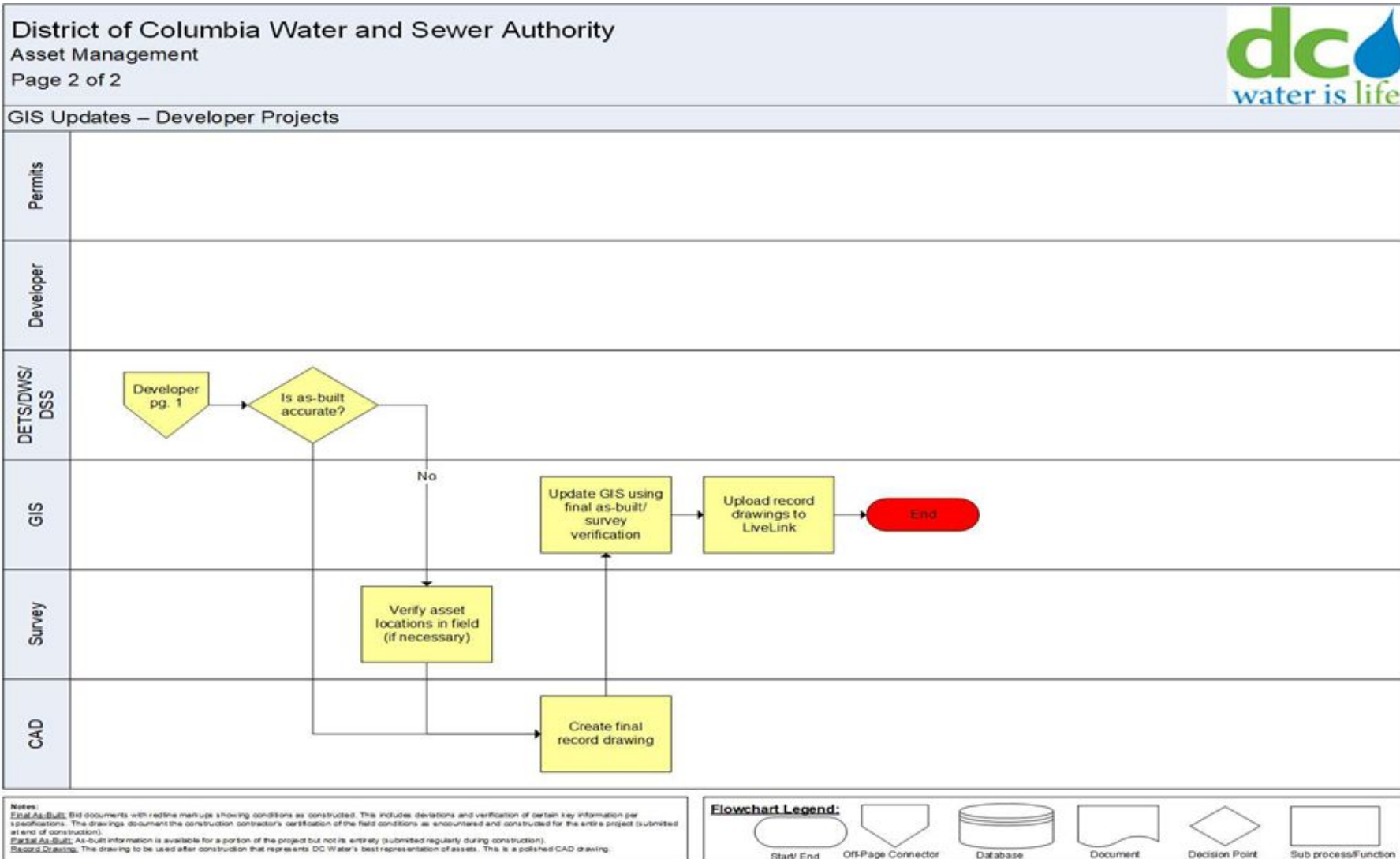


**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS (CONTINUED)**



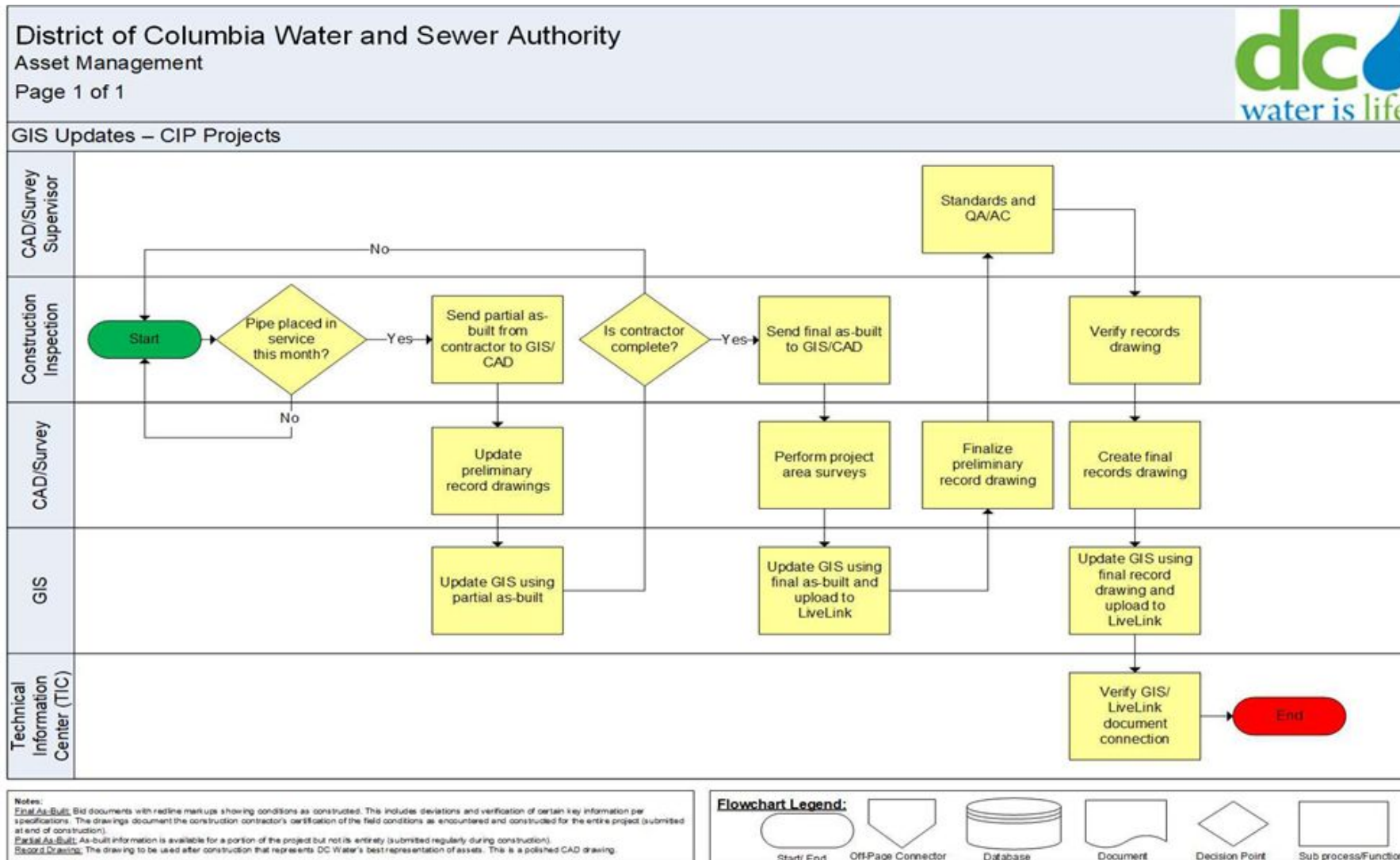


**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS (CONTINUED)**



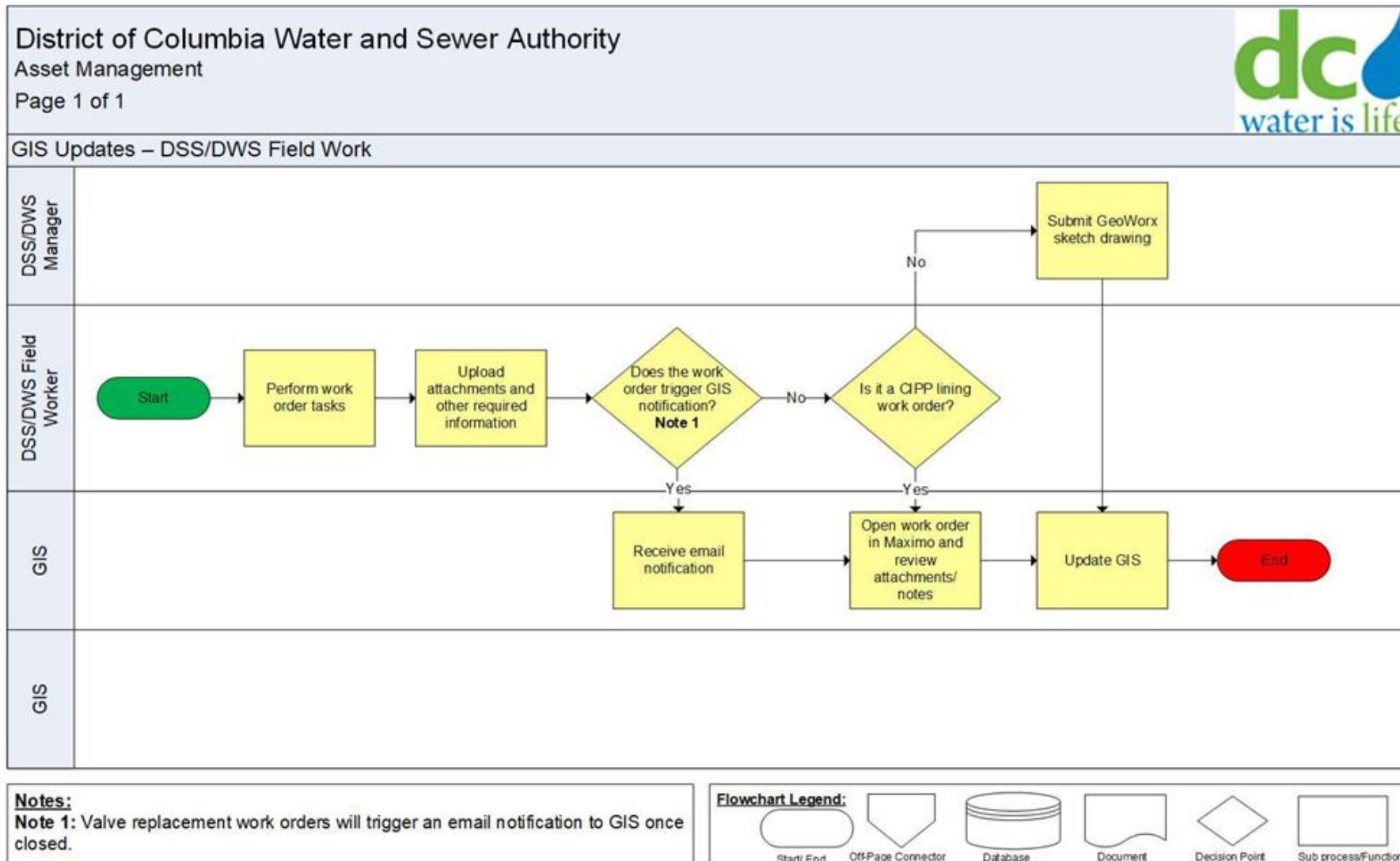


**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS (CONTINUED)**





**APPENDIX B – GIS & MATERIALS REQUEST FLOWCHARTS (CONTINUED)**





**APPENDIX C – GIS DATA ANALYSIS**

Asset Class	Network	Total Assets	Required* Fields Lacking Data	Total Assets Lacking Data	Data Omission %
Control Valve	Water	6654	MANUFACTURER	5745	86.34%
			ANCILLARYROLE	4287	64.43%
			VLVFNCT	2771	41.64%
			FLUSHZON	925	13.90%
			DIAMT	635	9.54%
			ROTATION	169	2.54%
			WARD	12	0.18%
			LOCTNPRECS	4	0.06%
			OWNER	1	0.02%
Gravity Main	Water	2211	WIDTH	1782	80.60%
			DIAHT	1728	78.15%
			LENST	1283	58.03%
			LENGTH	1269	57.39%
			FLUSHZON	277	12.53%
			MATRL	276	12.48%
			ISTOPLGARTEF	10	0.45%
			WARD	4	0.18%
			PRESRZON	4	0.18%
			OWNER	2	0.09%
			INFORSRC	1	0.05%
			LOCTNPRECS	1	0.05%



**APPENDIX C – GIS DATA ANALYSIS (CONTINUED)**

Asset Class	Network	Total Assets	Required* Fields Lacking Data	Total Assets Lacking Data	Data Omission %
Pressure Main	Water	75849	INCASNG	53696	70.79%
			BRIDGCROSN	53548	70.60%
			LENST	35102	46.28%
			LENGTH	34693	45.74%
			ISTOPLGARTEF	10	0.0132%
			WARD	4	0.0053%
			PRESRZON	4	0.0053%
			OWNER	2	0.0026%
			INFORSRC	1	0.0013%
			LOCTNPRECS	1	0.0013%
Service Line	Water	29660	MATRL	3943	13.29%
			FLUSHZON	2694	9.08%
			DIAMT	1750	5.90%
			WARD	95	0.32%
			INFORSRC	9	0.03%
			LOCTNPRECS	9	0.03%
			PRESRZON	7	0.02%
			ISTOPLGARTEF	1	0.00%
			QUAD	1	0.00%
Fitting	Water	41648	ANCILLARYROLE	20558	49.36%
			FLUSHZON	3620	8.69%
			ROTATION	1062	2.55%
			FITNGSIZE	334	0.80%
			WARD	93	0.22%
			PRESRZON	10	0.02%
			LOCTNPRECS	9	0.02%
			INFORSRC	7	0.02%
			QUAD	2	0.00%



**APPENDIX C – GIS DATA ANALYSIS (CONTINUED)**

Asset Class	Network	Total Assets	Required* Fields Lacking Data	Total Assets Lacking Data	Data Omission %
Control Valve	Sewer	114	HASBPVLV	112	98.25%
			WARD	24	21.05%
			VERTICALDATUM	4	3.51%
Gravity Main	Sewer	95156	XCONST	95085	99.93%
			INTRCNAME	92192	96.89%
			HASCONFL	89663	94.23%
			ISXCON	58929	61.93%
			VERTICALDATUM	57849	60.79%
			FLOWSTOCSS	48373	50.84%
			ISTOPLGARTEF	44712	46.99%
			LENST	39650	41.67%
			WIDTH	17160	18.03%
			DIAHT	17077	17.95%
			XSECTSHPL	16838	17.70%
			LENGTH	670	0.70%
			WARD	637	0.67%
			DISPLAYID	542	0.57%
			INFORSRC	16	0.02%
			LOCTNPRECS	14	0.01%
			FLOWTYPE	7	0.01%
			FROMNODE	6	0.01%
OWNER	4	0.00%			
USNGPREFIX	4	0.00%			
TONODE	4	0.00%			
ASSETTAG	1	0.00%			





**APPENDIX C – GIS DATA ANALYSIS (CONTINUED)**

Asset Class	Network	Total Assets	Required* Fields Lacking Data	Total Assets Lacking Data	Data Omission %
Lateral	Sewer	4628	INTRCNAME	4627	99.98%
			VERTICALDATUM	2147	46.39%
			MATRL	1209	26.12%
			DIAMT	1106	23.90%
			LENGTH	738	15.95%
			FLOWSTOCSS	664	14.35%
			LENST	422	9.12%
			WARD	369	7.97%
			FLOWTYPE	346	7.48%
			ENABLED	102	2.20%
			QUAD	8	0.17%
			INFORSRC	4	0.09%
			LOCTNPRES	4	0.09%
Pressure Main	Sewer	121	VERTICALDATUM	95	78.51%
			ISOUTDIA	62	51.24%
			INTRCNAME	44	36.36%
			MATRL	17	14.05%
			WARD	12	9.92%
			FLOWSTOCSS	5	4.13%
			DIAMT	1	0.83%
			LENGTH	1	0.83%
			ISTOPLGARTEF	1	0.83%
			USNGPREFIX	1	0.83%
			ASSETTAG	1	0.83%
DISPLAYID	1	0.83%			



**APPENDIX C – GIS DATA ANALYSIS (CONTINUED)**


Asset Class	Network	Total Assets	Required* Fields Lacking Data	Total Assets Lacking Data	Data Omission %
Fitting	Sewer	3013	ROTATION	718	23.83%
			VERTICALDATUM	454	15.07%
			FITNGSIZE	419	13.91%
			ANCILLARYROLE	340	11.28%
			WARD	146	4.85%
			FLOWTYPE	113	3.75%
			USNGPREFIX	30	1.00%
			SUBTYPE	6	0.20%
			INFORSRC	2	0.07%
			LOCTNPRECS	1	0.03%
Manhole	Sewer	54106	WIDTH	54097	99.98%
			DIALEN	54094	99.98%
			INDROP	50010	92.43%
			OUTDROP	49997	92.41%
			ACCESTY	42246	78.08%
			VERTICALDATUM	37464	69.24%
			INTERCON	32430	59.94%
			FLOWSTOCSS	31229	57.72%
			SHEDDVPT	30627	56.61%
			ISHIGHT	30217	55.85%
			ISVISBL	29745	54.98%
			ROTATION	1344	2.48%
			ANCILLARYROLE	665	1.23%
			WARD	597	1.10%
			FLOWTYPE	111	0.21%
			QUAD	105	0.19%
NBOUTPIP	77	0.14%			



**APPENDIX C – GIS DATA ANALYSIS (CONTINUED)**

Asset Class	Network	Total Assets	Required* Fields Lacking Data	Total Assets Lacking Data	Data Omission %
Manhole	Sewer	54106	USNGPREFIX	51	0.09%
			NBINPIP	30	0.06%
			INFORSRC	14	0.03%
			LOCTNPRECS	9	0.02%
			DISPLAYID	1	0.00%
			ENABLED	1	0.00%

\*Management determined these fields are required for each asset within the identified asset class.



RSM US LLP  
1250 H Street NW Suite 650  
Washington, D.C., 20005  
[www.rsmus.com](http://www.rsmus.com)

This document contains general information, may be based on authorities that are subject to change, and is not a substitute for professional advice or services. This document does not constitute audit, tax, consulting, business, financial, investment, legal or other professional advice, and you should consult a qualified professional advisor before taking any action based on the information herein. RSM US LLP, its affiliates and related entities are not responsible for any loss resulting from or relating to reliance on this document by any person.

RSM US LLP is a limited liability partnership and the U.S. member firm of RSM International, a global network of independent audit, tax and consulting firms. The member firms of RSM International collaborate to provide services to global clients, but are separate and distinct legal entities that cannot obligate each other. Each member firm is responsible only for its own acts and omissions, and not those of any other party. Visit [rsmus.com/aboutus](http://rsmus.com/aboutus) for more information regarding RSM US LLP and RSM International.

RSM® and the RSM logo are registered trademarks of RSM International Association. **The power of being understood®** is a registered trademark of RSM US LLP.

©2019 RSM US LLP. All Rights Reserved.