2025 Strategic Plan:

from Growth to Reliability

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Message from the Chairman:

To the dedicated Loxahatchee River District team:

On behalf of the Governing Board, I want to express our appreciation for the extraordinary work you do each day to protect our community, the Loxahatchee River Watershed, and uphold the legacy of environmental stewardship that defines this organization. Your expertise, professionalism, and commitment have earned the trust of the public and positioned the District as a leader in innovative, sustainable wastewater management.

As we launch this Strategic Plan, we do so with confidence – because we know it will be carried forward by people who care deeply about our mission. This plan reflects our long-standing values and our shared aspirations for the future. It provides a clear roadmap for strengthening our operations, expanding our capabilities, and continuing to protect our community and the natural resources we all cherish.

I encourage each of you to read, understand, and embrace this plan. Bring your ideas and inquiring minds and lean into execution with the same passion and teamwork that have always defined the District. Your engagement and follow-through will turn strategy into results and ensure that our work continues to make a lasting difference.

Thank you for everything you do – and for the excellence you bring to it every day."

Gordon Boggie

Message from the Executive Director:

To the Governing Board and the entire LRD Team, each day, the work we do makes a difference in our community and our environment. Our mission requires expertise, diligence, and commitment. Our 2025 Strategic Plan reflects the quality work you have achieved, and it highlights the improvements we intend on achieving.

This Strategic Plan provides a roadmap to a better future, and I am excited to work hand-in-hand with you as we work diligently to achieve these noble goals!

Thank you for your continued commitment to the District, our customers, and this truly important work. Your personal efforts make a significant difference in who we are and what great things we are able to accomplish.

D. Albrey Arrington, Ph.D.

FY2025 by the NUMBERS

7 Consecutive years GFOA Achievement for Excellence in Financial Reporting

88 Full-time Employees

2.5 BILLION Gallons of Irrigation Quality Water Recycled

100% Regulatory Compliance 4 Consecutive Years

0 OSHA Recordable Injuries

99.9993% Collection & Transmission Reliability

99.4673% IT Systems Reliability

$34,377,192 Annual Budget

$113 MILLION Depreciable Assets

1,210 Purchase Orders

12K TONS Biosolids Recycled as Fertilizer

9,237 Water Samples Analyzed

125K PAYMENTS PROCESSED

16K PARTICIPANTS EDUCATED

RESTAURANT GREASE INSPECTIONS 1,235 INSPECTIONS

811 Locate Tickets **8,739**

43,250 ITEMS IN INVENTORY

Mission: We are dedicated to protecting public health and preserving the Loxahatchee River watershed and its natural habitats through innovative wastewater solutions, research, and environmental stewardship.

Vision: To inspire and achieve a healthy environment

Core Values:

Spirit of service to our community and the environment: We willingly work with a sense of diligence and devotion, because we understand the importance of our work.

Integrity: Our actions are intentionally honest and morally upright.

Innovation: We actively seek better ways to do things and embrace the possibility of new ideas and novel approaches.

Positive attitude: We bring a positive frame of mind to each challenge, task, or appointment.

Respect for others: We regard others as equals, and we treat others as we would like to be treated.

Positive Work Environment: We encourage and support our colleagues, and we promote an open, constructive dialog to identify solutions.

Lean: We seek to be effective and efficient in all we do. We value nimble and streamlined processes and seek to minimize bureaucracy. We share our ideas to fuel improvement.

Collaboration: Our greatest successes come when we work as a team. We eagerly collaborate with colleagues throughout the District, sister governments, and others to advance our mission.

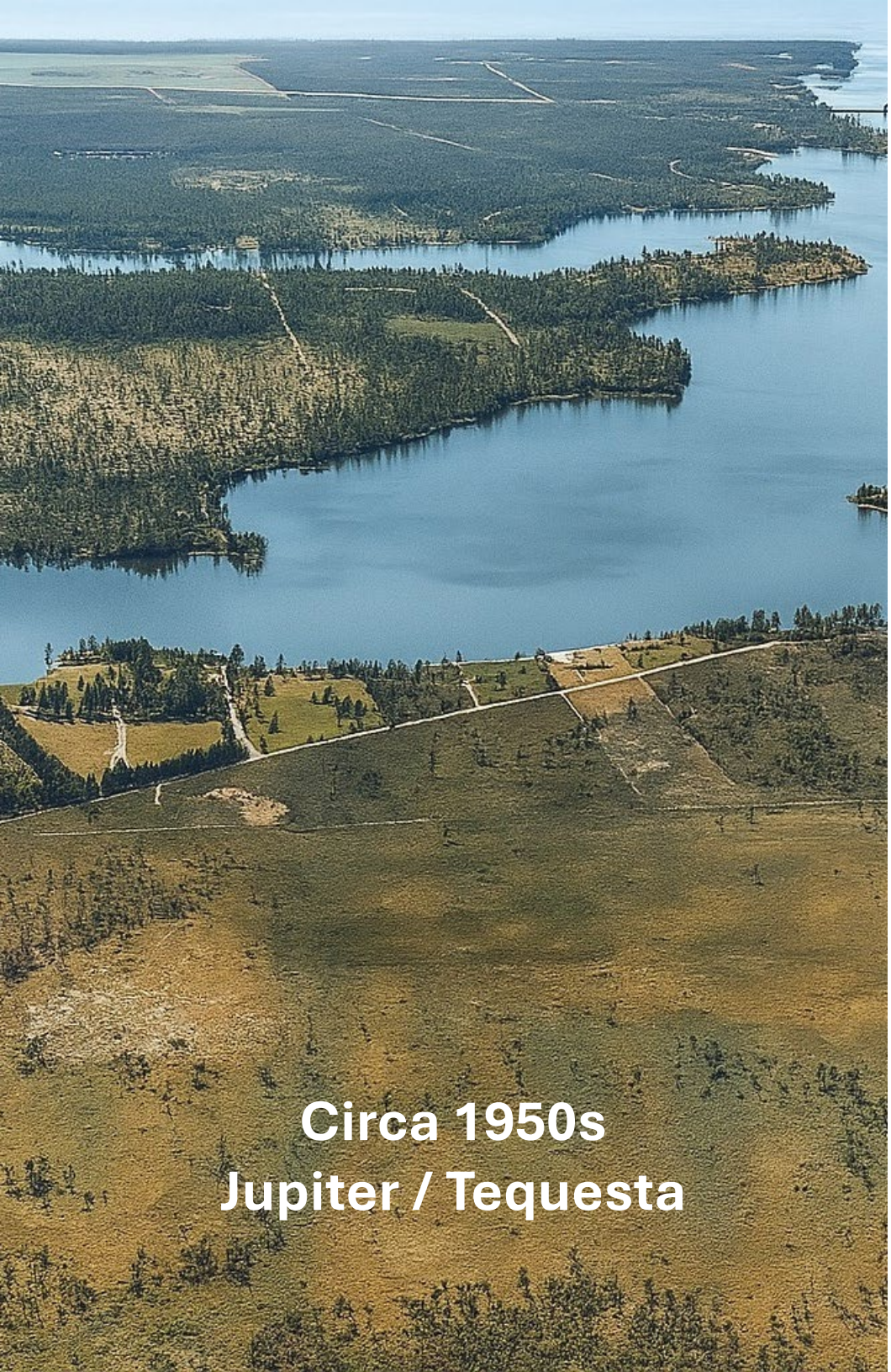
Safety: Our conduct is shaped by a personal commitment to protect the health and safety of ourselves, our colleagues, and the public. Safety is driven through education, training, planning, protective equipment, and individual accountability.

These values shape and guide our day-to-day actions and our relationships with co-workers, customers, partners, and stakeholders.

Core Competencies

These are the unique strengths and capabilities that give LRD a competitive advantage. They represent what we do exceptionally well and are difficult for a competitor to imitate.

- **Quality Staff** - Attitude, diverse knowledge, motivation, tenure, willingness to accept change, Team Mentality
- **Leadership & Direction**
- **Reliable Systems**
- **Regulatory Compliance** – we strive to be compliant with all relevant regulatory and statutory requirements, including sister governments.
- **Quality services and products** - wastewater transmission, treatment, IQ, environmental monitoring, research, environmental education, biosolids
- **Customer service mentality** - Internal & External
- **Management of Technology**
- **Fiscally Prudent**
- **Ethical Practice**
- **Equitable & Transparent Organization**
- **Data Rich, Data Driven, & Not Politically Driven**
- **Transparent Problem Solving** - Openness & Healthy Disagreement
- **Organizational Flexibility & Agility** – within the confines of laws, rules, policies, and procedures.



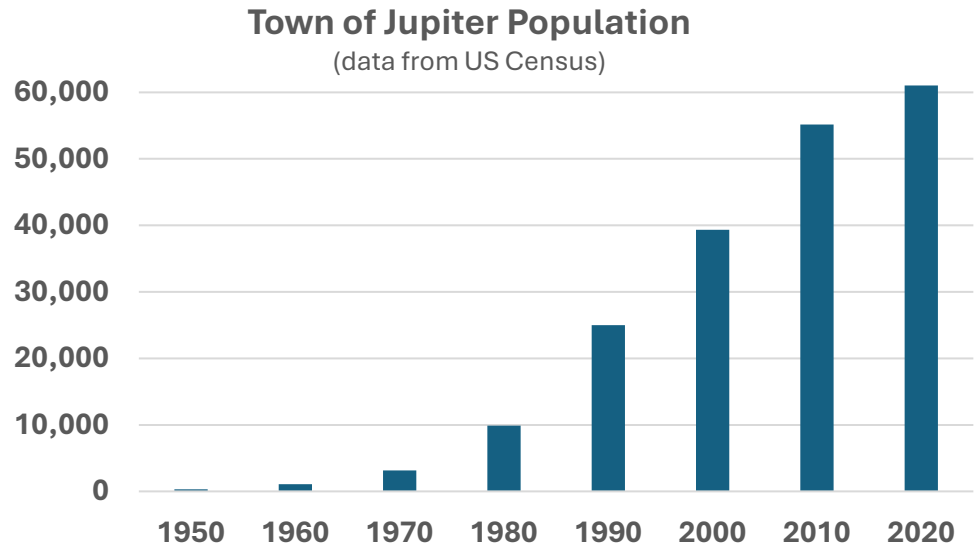
Development in our service area has grown explosively over the last 50 years! Growth accelerated in the 1960s and 1970s as economic growth (major employers such as Pratt & Whitney, RCA) spurred new residential development. In the late 1980s, the missing link of I-95, from Ft. Pierce to PGA Blvd, was completed, and the population more than doubled between 1980 and 1990 and then doubled again from 1990 to 2010. This strong growth reflects the area's appeal as a desirable coastal community with appealing recreational amenities tied to a healthy local environment. Throughout all this development, the Loxahatchee River District has worked diligently to preserve our local environment, the inherent appeal of our community, by providing innovative wastewater solutions, research, and environmental stewardship.

1950 Jupiter/Tequesta

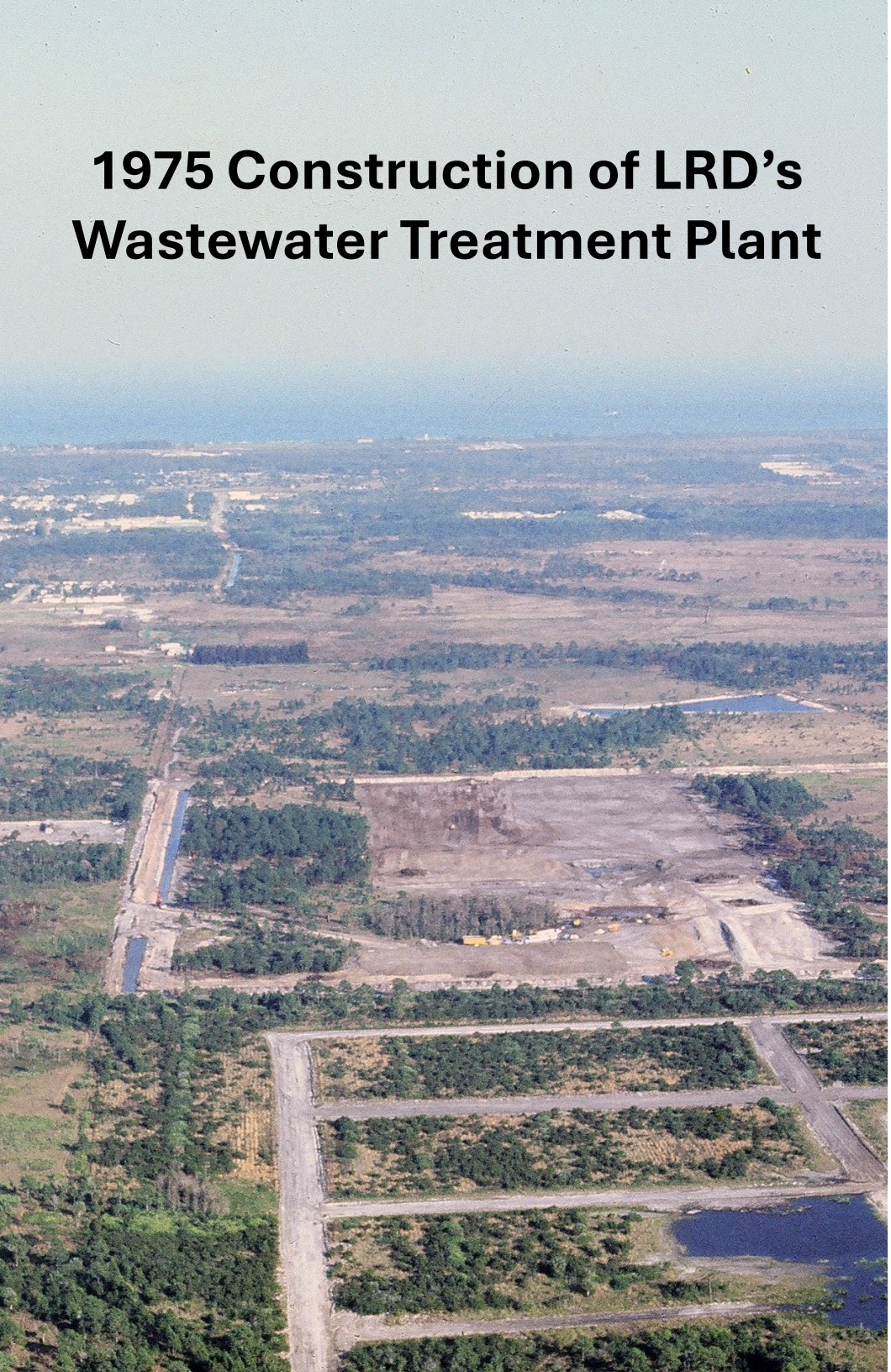
- Population ~ 950
- Pennock Plantation was largest employer.
- There was 1 small grocery store and a couple general stores.
- There were a few small motels on US1 from the drawbridge to just north of the county line.
- Jupiter's white school had fewer than 100 students and graduating class of 3.

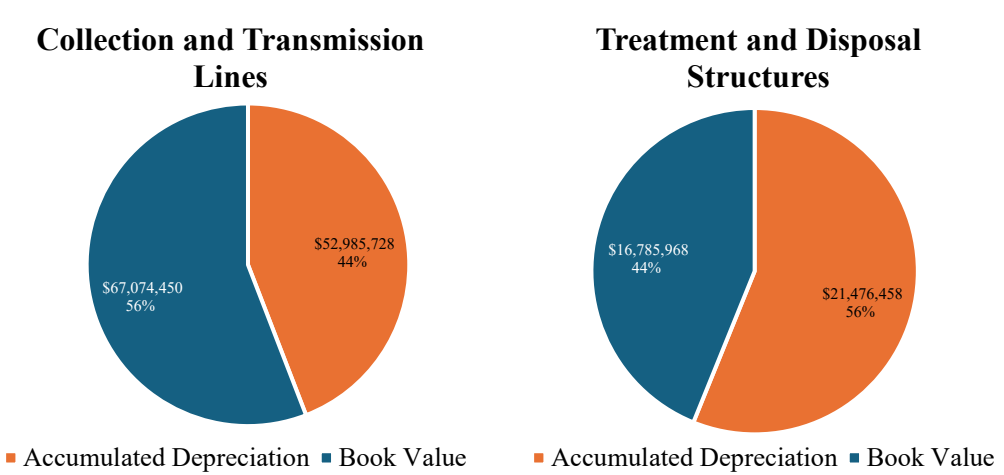
1960s Jupiter/Tequesta

- Population ~ 2,000
- Pratt & Whitney & RCA (PB Gardens) were largest employers
- School had 630 students with graduating class of 27.

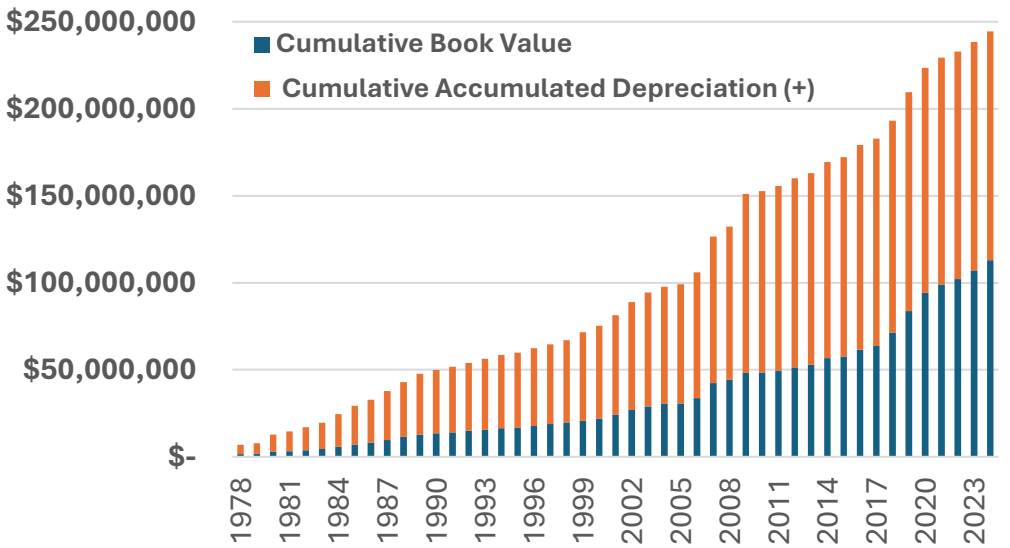


1975 Construction of LRD's Wastewater Treatment Plant





The District is in an asset intensive industry. We rely on ~$250 million in assets to accomplish our important work. Some of these assets have been in service since construction of the District's wastewater treatment facilities in 1975. Our critical assets require condition assessments so that they can be proactively rehabilitated or replaced before failure leads to loss of service and other unintended consequences, e.g., sewer overflows.



District assets are depreciated using a straight-line method with life expectancy defined per asset type. A fully depreciated asset, i.e., an asset that has served its full expected lifespan, has no book value and the total initial cost is shown as accumulated depreciation.

2025 Strategic Framework

1. **Establish the Foundation**
   - **A. Mission** – the purpose or reason LRD exists
   - **B. Vision** – desired future state
   - **C. Core Values** – daily behaviors that demonstrate organizational culture
2. **Assess the Current State of LRD**
   - **A. SWOTs** – review and rank key strengths & weaknesses (internal) and opportunities & threats (external)
   - **B. White papers** – expert review of current conditions
   - **C. Surveys** – quantitative stakeholder input
   - **D. General input** – qualitative stakeholder input
   - **E. Leftover initiatives** – initiatives not prioritized or completed from the prior strategic plan
3. **Establish Strategy Map**
   - A. Confirm strategic perspective (financial stewardship, employee learning & growth, operational excellence, and stakeholder focus)
   - B. Define achievable strategic objectives within each strategic perspective
4. **Identify & Prioritize Strategic Initiatives (improvement projects)**
   - A. Articulate strategic initiatives to address each prioritized SWOT element.
   - B. Rank each strategic initiative as P1 (top priority), P2 (secondary priority), or P3 (lowest priority)
5. **Execute for Success**
   - A. Assign an executive sponsor for each strategic initiative
   - B. Communicate the plan
   - C. Develop and maintain project initiatives to secure funding in Rate Study and Annual Budget
6. **Evaluate Success**
   - A. Track Key Performance Indicators (KPIs) for each initiative
   - B. Review Progress (monthly & annually)


1970s Installation of Key
Underground Assets


2025 Asset Replacement
& Asset Maintenance (below)


1975 Asset Creation via
Neighborhood Sewering
LOXAHATCHEE RIVER ENVIRONMENTAL
CONTROL DISTRICT

2025 LRD Strategy Map

A strategy map illustrates cause-and-effect relationships between strategic areas, strategic goals, and strategic initiatives. An effective strategy map creates a clear, shared understanding, throughout the District, of how our strategic goals fit together and where we need to focus our efforts to accomplish our mission.

The District's Strategy Map includes seventeen strategic goals within four strategic areas (e.g., financial stewardship, employee learning and growth, operational excellence, and stakeholder focus). Each strategic goal contains one or more strategic initiatives, i.e., specific projects that have been prioritized and assigned. The number in parentheses next to each goal indicates how many initiatives support it.

This strategy map reflects our belief that success begins with financial stewardship. Adequate and reliable funding is essential to support all other priorities. Investment in resources flows into our workforce, because skilled, engaged employees are essential to achieving our goals. A capable and supported workforce drives operational excellence, i.e., the quality, efficiency, and reliability of the work we do every day to maintain and improve our systems. Strong operations, in turn, result in positive outcomes for our customers, partners, and community.

If we successfully execute our strategy map, we will create value for our customers and stakeholders and achieve our mission.

LRD MISSION

"We are dedicated to protecting public health and preserving the Loxahatchee River watershed and its natural habitats through innovative wastewater solutions, research, and environmental stewardship"

1. Stakeholder Focus

- 1.1 Improve Customer Satisfaction (2)
- 1.2 Improve Stakeholder Satisfaction (1)
- 1.3 Safeguard Legal & Regulatory Compliance (1)

2. Operational Excellence

- 2.1 Increase System Reliability (2)
- 2.2 Advance Understanding of Watershed Conditions (3)
- 2.3 Develop & Improve Master Planning Docs (1)
- 2.4 Systematize & Improve Procedures & Project Mgmt (1)
- 2.5 Optimize the Use of Technology and Equipment (2)
- 2.6 Elevate the Analytical Use of Data (1)
- 2.7 Improve Environmental Stewardship (2)
- 2.8 Improve Safety & Security (5)
- 2.9 Improve Communications (2)

3. Employee Learning & Growth

- 3.1 Actively Address Staffing Needs (6)
- 3.2 Improve Employee Skills & Abilities (6)
- 3.3 Ensure Healthy Culture & Morale (5)

4. Financial Stewardship

- 4.1 Ensure Prudent Financial Stewardship (2)
- 4.2 Optimize Processes (5)

2025 Top Level Balanced Scorecard & High Priority Initiatives

Area	Objectives	Initiatives	Lead; Contributing Staff	Initiative Priority
1. Stakeholder Focus				
	1.1 Improve Customer Satisfaction			
	1.1a	Improve name recognition within the community.	Jocelyn; Bud	P2
	1.1b	Increased access and functional pathways around or over reclaimed water lakes (dependent upon 2.8e).	Board	P3
	1.2 Improve Stakeholder Satisfaction			
	1.2a	Negotiate win-win with Town of Jupiter on nano concentrate agreement to replace expiring agreement.	Albrey; Kris	P1
	1.3 Safeguard Legal & Regulatory Compliance			
	1.3a	Need proactive process to flag changes to state/federal regs (building code, statutes).	Curt; Albrey	P3
2. Operational Excellence				
	2.1 Increase System Reliability			
	2.1a	Catalog, assess condition, and rehab aging infrastructure, including WWTP, collection, transmission, and IQ distribution systems.	Jim N & Jason; EAM committee	P1
	2.1b	Continue on path with 2500 Jupiter Park Drive Site Improvements – Phase 1 including the overall stormwater plan.	Kris	P1
	2.2 Advance Understanding of Watershed Conditions			
	2.2a	Greater engagement in stormwater activities (pollution source).	Bud	P2
	2.2b	Need to improve understanding of magnitude of western area pollution derived from septic effluent (ArcNLET).	Bud; Lab	P2
	2.2c	Evaluate cost-effective opportunities to improve water quality west of I-95. Need to understand alternative solutions to address western area pollution (biochar, stormwater treatment).	Bud; Albrey	P3
	2.3 Develop & Improve Master Planning Documents			
	2.3a	Develop overall, long-term District Master Plan, including collections, transmission, treatment, distribution, physical security, cyber security, and environmental education facilities.	Kris; Courtney, Jason, Jim, Joe, Bud, Jocelyn, Kara	P1
	2.4 Systematize and Improve Procedures and Project Management			
	2.4a	Identify and improve EAM inefficiencies (excessive clicks, redundant data requirements, prioritization process, operator efficiency, real-time analytics).	Jim N; EAM committee	P1

2025 Top Level Balanced Scorecard & High Priority Initiatives

Area	Objectives	Initiatives	Lead; Contributing Staff	Initiative Priority
	2.5 Optimize the Use of Technology and Equipment			
	2.5a	Evaluate opportunities to leverage AI or automation for customer service, process improvements, continuous threat response, emergency response optimization, and understanding regulatory/legislative changes.	Bud; Joe C., Albrey	P1
	2.5b	Improve computer training among staff, e.g., EAM, Word, Excel, Collector App, GIS.	Bud & Joe	P1
	2.6 Elevate the Analytical Use of Data			
	2.6a	Develop tools and processes to better track change of tenant for food service establishments, e.g., collaborate with Department of Business & Professional Regulation.	Courtney; Jason & Bud	P2
	2.7 Improve Environmental Stewardship			
	2.7a	Evaluate and implement targeted treatment upgrades (filamentous control, sludge bulking) to improve WWTP process robustness.	Jason P	P1
	2.7b	Improve customer understanding of sewer systems, e.g., flushing guidance, LP system information.	Courtney	P2
	2.8 Improve Safety & Security			
	2.8a	Implement “low hanging fruit” identified in the RRA and Technical Memorandum, eg, SCADA inventory, SCADA governance policy, Register with Cybersecurity and Infrastructure Security Agency, Develop a Cybersecurity Call List, Verify manual system operations, Perimeter fence maintenance, Perimeter fence to isolate public access areas (dependent upon 2.8e).	Kris;	P1
	2.8b	Move forward with preliminary design report (initial engineering) for physical and electronic security at Admin and Wildpine.	Kris	P1
	2.8c	Address cybersecurity threats (ransomware, SCADA breaches, state-sponsored bad actors).	Bud; Joe C.	P1
	2.8d	Expand electrical safety training beyond lockout tagout	Jorge; Directors	P1
	2.8e	Balance site security requirements with public access (informs 1.1b, 2.8a)	Board	P2
	2.9 Improve Communications			
	2.9a	Improve dissemination of changes within EAM to relevant staff.	EAM Committee	P1
	2.9b	Continue to increase the availability of customer contact info (phone numbers, email address) for emergency communications and outreach.	Bud	P1

2025 Top Level Balanced Scorecard & High Priority Initiatives

Area	Objectives	Initiatives	Lead; Contributing Staff	Initiative Priority
3. Employee Learning & Growth				
	3.1 Actively Address Staffing Needs			
	3.1a	Retain Quality Staff	Albrey	P1
	3.1b	Develop and implement succession planning process for key positions.	Albrey; Directors	P1
	3.1c	Develop on-ramps for new employees, e.g., actively engage trade schools and high schools to improve recruiting opportunities (apprenticeships, internships, externships).	Mike; Directors	P1
	3.1d	Improve recruiting for key technical positions (GIS, reliability engineer, maintenance foreman, SCADA support).	Mike; Directors	P2
	3.1e	Evaluate staffing needs among Departments (Workload is very high).	Directors; Mike	P2
	3.1f	Develop or expand agency partnerships for training and collaboration.	Mike; Jorge	P2
	3.2 Improve Employee Skills & Abilities			
	3.2a	Evaluate readiness to implement emergency response plans through ‘fire’ drills.	Jorge; Directors	P1
	3.2b	Improve employee skill sets via cross-training	Directors	P1
	3.2c	Implement Skills Matrix review as part of performance reviews, use skills matrix to identify and implement key training needs, and leverage technology (e.g., GIS, EAM) to capture legacy knowledge and train employees.	Albrey;	P1
	3.2d	Develop stronger in-house capacity to use process improvement tools including failure analysis and troubleshooting.	Albrey; Directors	P1
	3.2e	Increase use of staff-led training (train the trainer).	Jorge; Directors	P2
	3.2f	Maintain Shout-out reward program to positively encourage demonstrated safety behavior.	Jorge; Albrey	P3
	3.3 Ensure Healthy Culture & Morale			
	3.3a	Ensure our retirement benefit is adequate to support employees in retirement	Admin. Committee	P1
	3.3b	Maintain District pay as competitive with COLA and merit increases, and improve relevant communications with employees	Albrey;	P1
	3.3c	Evaluate hazard pay policy for staff routinely exposed to hazards.	Mike; Albrey	P2
	3.3d	Evaluate LRD's participation in mental health awareness programs.	Mike	P2
	3.3e	Evaluate pros and cons of developing a sick leave pool that allows employees to donate leave to other employees. Such assessment would be conducted in the context of a paid time off policy (rather than our current leave policy).	Albrey; Mike	P3

2025 Top Level Balanced Scorecard & High Priority Initiatives

Area	Objectives	Initiatives	Lead; Contributing Staff	Initiative Priority
4. Financial Stewardship				
	4.1 Ensure Prudent Financial Stewardship			
	4.1a	Ensure financial planning anticipates inflation and other financial headwinds.	Kara; Albrey, Directors	P1
	4.1b	Address inflationary concerns by working expediently to execute high-priority projects.	Kris	P1
	4.1c	District faces build-out of service area → limited capital revenues; use Rate Study to evaluate the need for grants, state revolving funds, reassessments to manage long-term capital expenditures.	Albrey; Board	P2
	4.2 Optimize Processes			
	4.2a	Develop and implement process to identify which materials and equipment to maintain in inventory as well as inventory levels to address routine and emergency responses.	Jim N; Kara, Directors	P1
	4.2b	Vehicle procurement/repairs take too long; consider onsite vehicle maintenance technician. Also, evaluate need for key spare vehicle(s) with tools.	Jason P	P1
	4.2c	Implement warehouse process improvements (labels, guides, scanner).	Kara;	P1
	4.2d	Continuously improve the Rate Study	Albrey; Directors	P1
	4.2e	Improve Rule 31-10 to specify fees to offset redevelopment review, so revenues are captured for engineering services even when equivalent connections are unchanged. Also, evaluate need to improve Rule text (e.g., 31-10, 31-13) to include clear penalty provisions including fines.	Courtney; Albrey	P2

The Top Level Balanced Scorecard is structured based on the Strategy Map. Initiatives were sorted among strategic areas and strategic goals, voted on relative to importance (more votes = more important), and prioritized (where P1 is the highest priority and P3 is the lowest priority) by strategic planning participants. Each initiative has been assigned to a lead staff member and contributing staff members. We are working to define metrics for each initiative.

LRD's Executive Dashboard

This dashboard is reviewed monthly by the Governing Board to monitor organizational performance and ensure that operations are aligned with our strategic goals. This dashboard allows the Governing Board to quickly assess whether key metrics are on track, identify trends, detect emerging risks or issues, and determine if corrective action or additional direction is needed.

LOXAHATCHEE RIVER DISTRICT'S EXECUTIVE DASHBOARD

		Stewardship	Pre-Treatment	Collection & Transmission		Wastewater Treatment			Reclaimed Water	EHS	General Business					River Health		
		# People educated at RC	Grease Interceptor Inspections	Customer Service	Unauthorized Discharge of Sewage	Mean Daily Incoming Flow	Permit exceedance	NANO Blend to Reuse (@ 511)	Delivery of Reclaimed Water	Employee Safety	Cash Available	Revenue (excluding assessment & capital contrib.)	Operating Expenses	Capital Projects		Minimum Flow Compliance	Salinity @ NB seagrass beds	River Water Quality
Units		% of Target	% requiring pump out	# blockages with damage in home	Gallons; # impacting surface waters	million gallons/day	# occurrences	Max Specific Conductance (umhos/cm)	# days demand not met	# of OSHA recordable injuries	$	% of Budget	% of Budget	% within budget	average # days behind schedule	# Days MFL Violation	Min ‰	Fecal Coliform Bacteria (cfu/100ml)
Green Level		≥ 90%	≤ 15	Zero	<704; 0	< 7.7	Zero	<1542	<2	Zero	≥ $15,609,500	≥ 95%	≥ 85% but ≤ 105%	≥80%	≤ 30	0	min ≥ 20 ‰	≤ 1 site > 200
Yellow		< 90%	≤ 25	1	≤1,500; 0	< 8.8	1	≤1875	≥ 2	-	< $15,609,500	≥ 90%	≥ 80%	≥60%	≤ 60	1	min ≥ 10 ‰	≤ 3 sites >200
Red		<75%	> 25	≥ 2	>1,500; ≥1	≥ 8.8	≥ 2	>1875	≥ 9	≥ 1	< $10,406,330	< 90%	< 80% or > 105%	< 60%	> 60	≥ 2	min < 10 ‰	≥ 4 sites > 200
2022 Baseline		1,319	12	0.1	395	6.8	0	1,268	3	0	$ 44,372,235	101%	91%	83%	51	1	22.6	3
2023 Baseline		1,451	13	0.0	1,124	7.0	0	1,296	6	0	$ 44,656,875	106%	94%	90%	39	2	23	4
2024 Baseline		1,433	14	0.3	863	6.9	0	1,136	4	2	$ 41,441,586	100%	95%	72%	52	5	22	2
2024	Oct	1,250	12	3	69; 0	7.5	0	1,159	4	0	$ 40,298,745	89%	96%	see Kris' new Project Report		0	4.5	1
	Nov	1,007	14	0	81; 0	6.9	0	1,089	0	0	$ 41,266,064	92%	110%		26	0	14.5	1
	Dec	841	18	0	60; 0	6.9	0	1,130	1	0	$ 41,363,495	96%	101%		23	0	31.5	0
2025	Jan	1,363	14	0	57; 0	7.1	0	1,127	0	0	$ 41,057,266	99%	99%	85%	30	6	30.7	1
	Feb	1,208	14	0	51; 0	7.1	0	1,162	0	0	$ 42,294,246	98%	95%	88%	26	9	32.3	2
	Mar	1,608	11	0	283; 1	7.1	0	1,159	1	0	$ 41,731,365	100%	93%	76%	23	22	33.7	0
	Apr	1,375	12	0	43; 0	6.9	0	1,138	3	0	$ 42,085,576	98%	92%	66%	23	10	29.0	0
	May	1,193	12	0	0; 0	6.5	0	1,142	0*	0	$ 42,563,898	97%	95%	68%	22	22	31.4	7
	June	2,205	14	0	277; 1	6.3	0	1,283	0*	0	$ 40,602,108	98%	95%	67%	28	11	33.2	3
	July	2,400	15	0	602; 0	6.3	0	1,193	0*	0	$ 40,185,835	98%	94%	60%	33	18	31.8	4
	Aug	1,381	15	0	54; 0	6.3	0	1,208	0*	0	$ 40,840,194	97%	93%	60%	34	0	30.0	4
	Sept	705	12	0	0; 0	6.5	0	1,221	0*	1	$ 38,013,832	97%	93%	88%	31	0	16.8	7
	Oct	1,518	14	0	500;0	7.4	0	1,078	0	0	$ 37,208,829	95%	86%	99%	26	0	7.0	3
Consecutive Months at Green		1	10	12	4	197	53	180	6	1	193	11	11	2	1	3	0	0
Metric Owner		O'Neill	Pugsley	Dean	Dean	Pugsley	Pugsley	Pugsley	Dean	Alvarez	Fraraccio	Fraraccio	Fraraccio	Dean	Dean	Howard	Howard	Howard

Metric	Explanation
Salinity	We received 11.3-inches of rainfall in October, with 4.6-inches falling on Oct. 9 & 10 and 3.1-inches falling on Oct 26 & 27. These rainfall events led to significant stormwater runoff, e.g., flood control releases through S-46 peaked at 1,253 cubic feet per second on Oct 10 and drove salinity down significantly throughout the estuary, even in downstream portions where seagrasses typically flourish. See Bud's report for more information.
Fecal Coliform Bacteria	High fecal coliform bacteria (>200 cfu/100 ml) were observed at Stations 72 (Loxahatchee River Rd bridge), 95 (Jupiter Farms), and 100 (Cypress Creek mouth). Given the significant rainfall that occurred in October, these high values are not surprising. See Bud's report for additional details.

LRD's Annual Dashboard

This dashboard is reviewed annually by the Governing Board and provides a provides a high-level, data-driven basis for oversight, informed decision-making, and organizational accountability to our rate payers. This dashboard was implemented pursuant to Florida Statutes 189.0694 relates to programs, activities, goals, objectives, and performance measures derived from LRD's enabled powers as provided in our enabling act (Chapter 2021-249, Laws of Florida as amended).

LOXAHATCHEE RIVER DISTRICT'S ANNUAL DASHBOARD

			Standards			Actual Performance		
Goal	**Performance Measure**	**Units**	**Green**	**Yellow**	**Red**	**FY2023**	**FY2024**	**FY2025**
Regulatory Compliance	Regulatory Compliance	% of days in full compliance	100%	<100%	<99%	100%	100%	100%
	Unauthorized Discharge of Sewage	gallons spilled per million gallons handled	<3.4	≥3.4	>6.8	2.9	2.9	0.6
	Max 3-month Mean Daily Influent Flow	% of permitted capacity	≤75%	>75%	>90%	65%	67%	65%
	Industrial Pretreatment Inspections	% of inspections completed on time	≥95%	<95%	<90%	98%	99%	95%
Water Reuse	Water Reuse Efficiency	# of days treated effluent not available to be recycled	≤9	>9	>18	4	0	0
Customer Service	Customer Service	# blockages with damage in home per 10,000 customers	≤1	>1	>2.1	0.0	0.0	0.9
	Timely Engineering Plan Review	average response time (# business days)	≤5	>5	>7	1.7	1.5	2.1
Asset Management	Planned vs. Unplanned Maintenance	planned maintenance (# of work orders) ÷ total maintenance (# of work orders)	≥60%	<60%	<50%	73%	67%	70%
	Wastewater Treatment Plant (WWTP) Rehabilitation Rate	WWTP renewal & replacement expenditures as a proportion of total WWTP asset value, based on 5-year moving average	≥1.7%	<1.7%	<0.7%	0.8%	0.8%	1.0%
	Wastewater Pump Stations Rehabilitation Rate	pump station renewal & replacement expenditures as a proportion of total pump station value, based on 5-year moving average	≥2.0%	<2.0%	<1.9%	5.5%	4.8%	5.7%
	Gravity Sewer System Condition	% of gravity lines and manholes inspected and in good condition (SL-RAT score ≥7), based on most recent 5-years	≥90%	<90%	<80%	94%	96%	96%
Financial Stability	Affordability of Wastewater Fees	Percentile of Surveyed Wastewater Rates	<50th	≥50th	≥75th	5th	5th	5th
	Revenue†	% of budget	≥95%	<95%	<90%	110%	102%	97%
	Operating Expenses	% of budget	≥90%	<90%	<80% or >100%	92%	90%	93%
Public Engagement	Annual Audit	annual comprehensive financial report completed and posted in a timely manner	Yes	-	No	Yes	Yes	Yes
	People Educated by LRD	number of people	≥17,000	<17,000	<15,000	18,706	19,841	18,369
Workforce	Effective Staffing	% of employee turnover	<10%	≥10%	≥20%	9.5%	12.5%	17.0%
	Employee Safety	total recordable injury rate (TRIR)	≤1.8	>1.8	>3.5	0.0	2.5	1.0
Accessible Environmental Data	WildPine Lab NELAC Certification	certified for non-potable water: general chemistry and microbiology	Yes	-	No	Yes	Yes	Yes
	Conduct, analyze, and report on environmental sampling	% of all relevant data accessible online through data visualizations and interactive reports	≥95%	<95%	<80%	100	100	100

† *excludes revenue from assessements and capital contributions*

Goal	Performance Measure	Explanation
Asset Management	WWTP Rehabilitation Rate	Renewal and replacement spending for wastewater treatment plant assets in FY2025 increased but remained below the benchmark. This is due to the relatively young age and good condition of these assets. In the future, we anticipate replacing this metric with a metric focused on condition assessment (e.g., like SL-RAT for the gravity collection system). Prudently managing our resources includes not prematurely replacing assets that are in good condition and functioning as designed.
Workforce	Employee Staffing	For the second consecutive year, we experienced higher than desired staff turnover. Of all departures, 33% involved employees with less than one year of service, 27% were due to retirements, and 20% resulted from employees relocating out of the area because of the cost of living.

Successful Execution of the Strategic Plan

To bring our Strategic Plan to life, we will actively track our progress and stay focused on what matters most. Our Executive and Annual Dashboards will give us a clear, high-level view of key performance indicators and the status of our priority initiatives. By continuously monitoring our progress, we can quickly see where we are succeeding and where we need to adjust. Each strategic initiative will have a clear charter that outlines its purpose, scope, timeline, and ownership, ensuring shared understanding and accountability.

We will publish and review our dashboards. The Executive Dashboard is published monthly in the Board Notebook, while the Annual Dashboard is published annually at the close of the fiscal year. We will celebrate progress, solve challenges, and work to keep on track. By leaning into this process—with communication, collaboration, and commitment—we strengthen our ability to deliver meaningful results for our community and our environment.

Let's execute with focus and pride.

Appendix A. 2025 Balanced Scorecard with Low Priority Initiatives

Strategic Area	Strategic Goal	Initiative #	Initiatives	Votes
1. Stakeholder Focus	1.1 Improve Customer Satisfaction	1.1c	Evaluate options to implement with existing or new vendor to improve ongoing payment system issues (autopay setup, card storage, failed transaction visibility, payment plans, downtime, data file issues).	3
		1.1d	Address customer confusion created by DOXO, which creates need to refund monthly payments.	3
		1.1e	Social media presence entirely focused on LRD vs slightly expanding general LRD postings on River Center accounts	2
		1.1f	Remit Plus: significant work to correct account numbers due to new format.	0
	1.2 Improve Stakeholder Satisfaction	1.2b	Assure that IQ (reuse) water is available to fulfill contracted quantities for existing customers and develop new supplies and opportunities where economically feasible.	1
2. Operational Excellence	2.1 Increase System Reliability	2.1c	Move forward with 2500 Jupiter Park Drive Site Improvements – Phase 2 (Biosolids).	4
		2.1d	Implement WWTF Critical Process Evaluation to determine specific deficiencies in each critical treatment process resulting in increased risk from Hurricanes, Tornadoes, Lightning andFlood. Follow with PDR, Design-Bid, Construction.	4
		2.1e	Finalize comprehensive list of IT assets with criticality score, replacement schedule.	2
		2.1f	Maintain reliability of key software systems.	2
		2.1g	Standards do not address IQ/plant-specific items.	0
		2.1h	Prioritize Hazard specific mitigation plans	0
		2.1i	Move forward with PDR for physical and electronic security at C18 and other watercrossings.	0
	2.2 Advance Understanding of Watershed Conditions	2.2d	Improve data sharing & integration with other agencies during plan reviews.	4
		2.2e	Evaluate environmental monitoring programs (why, where, how often) to confirm sampling program is achieving desired results.	3
		2.2f	Stormwater impacts to water quality and needed stormwater system improvements	1
	2.3 Develop & Improve Master Planning Documents	2.3b	For critical assets, develop emergency response plans that include equipment, materials and contracts to achieve resilient system functionality.	0
	2.4 Systematize and Improve Procedures and	2.4b	Develop standardized task plans and review periodically.	4
		2.4c	Some SOPs outdated; need updates.	2
	2.5 Optimize the Use of Technology and Equipment	2.5c	Monitor and evaluate suitability of new technologies (analytical methods, monitoring devices, etc).	4
		2.5d	Use of the latest technology to facilitate process workflow improvements for staff.	1
		2.5e	Facilitate the use of automation organization-wide.	1
		2.5f	New technology needs simple interface so technical competency of staff is not burdensome	1
		2.5g	Evaluate technologies to implement remote monitoring at all low pressure stations	0
		2.5h	Older collection systems in GIS need to be QA/QC'd through record drawing review. Summer interns have been working on this project. Goal is to update GIS and EAM simultaneously as data is available.	0
		2.5i	Partnerships with top tier consultants and vendors (e.g., Palo Alto, HPE, Microsoft) to supplement internal capacity.	0
	2.6 Elevate the Analytical Use of Data	2.6b	Maintain Integration of Technology	3
		2.6c	Maintain rigorous sampling for potential future PFAS/nutrient regs.	3
		2.6d	Summary & synthesis of data for EPA/DEP reporting and scientific publications.	2
		2.6e	Improve use & integration of databases	1
		2.6f	Could benefit from full-time QC Officer position.	1
		2.6g	Establish uniform Departmental dashboards	0

Appendix A. 2025 Balanced Scorecard with Low Priority Initiatives

Strategic Area	Strategic Goal	Initiative #	Initiatives	Votes
2. Operational Excellence	2.7 Improve Environmental Stewardship	2.7c	Enhance PFAS source control and industrial pretreatment programs.	2
	2.8 Improve Safety & Security	2.8f	Improving site security at 2500 Jupiter Park Drive (limiting site access)	4
		2.8g	Standardizing on a single truck crane (make/model) would be helpful for staff training, operation, troubleshooting, and maintenance.	3
		2.8h	Disaster recovery & business continuity planning needs improvement.	2
		2.8i	Inventory and maintenance of safety kits (buildings & vehicles).	1
	2.9 Improve Communications	2.9c	Improved collaboration and communication between engineering and finance regarding change orders.	4
		2.9d	Develop a formal process to obtain and maintain gate codes.	3
		2.9e	Improve communication of MOT plans to staff working in roadways.	2
		2.9f	Proactive communications to improve customer service.	1
		2.9g	We need improved integration between Engineering and Customer Service (e.g., estoppel, compliance).	0
3. Employee Learning & Growth	3.1 Actively Address Staffing Needs	3.1g	Imposing and managing ever-increasing technological requirements on staff.	2
	3.2 Improve Employee Skills & Abilities	3.2g	New equipment/certifications create challenges for staff (training & experience).	1
		3.2h	Limited staff with advanced computer skills	0
	3.3 Ensure Healthy Culture & Morale	3.3f	Physically demanding jobs (dirty & hot work).	4
		3.3g	The District's use of technology (telemetry, SCADA, EAM, Power BI, AI, ML, automation) is rapidly increasing, raising required staff competencies.	3
4. Financial Stewardship	4.1 Ensure Prudent Financial stewardship	4.1c	Explore business collaborations (e.g., cell tower lease) for revenue.	4
		4.1d	Expand service territory.	4
		4.1e	Budget impacts of AI implementation.	0
	4.2 Optimize Processes	4.2f	Financial analytics delayed; need real-time reporting.	1

This Balanced Scorecard, structured based on the Strategy Map, shows low priority initiatives sorted among strategic areas and strategic goals. The number of votes is proportional to importance (more votes = more important). These initiatives were deemed low priority because they received fewer than 5 votes, and as such they were not assigned a priority score (e.g., P1) nor were they assigned a lead or contributing staff members.

Appendix B. Photos from 2025 Strategic Planning at LRD & the River Center.

South Florida Labor Market and Utility Workforce

Introduction

Nationally, objective macroeconomic measures suggest we are experiencing a healthy labor market. The supply of and demand for labor appear to be, relatively, balanced – the labor market has cooled and we have avoided a recession (so far). In South Florida, a growing population and aging infrastructure have created an increasing demand for skilled utility workers. This report explores the current state of the U.S. labor market, with a particular focus on utility workers in South Florida, examining major trends, the long-term outlook, and economic implications.

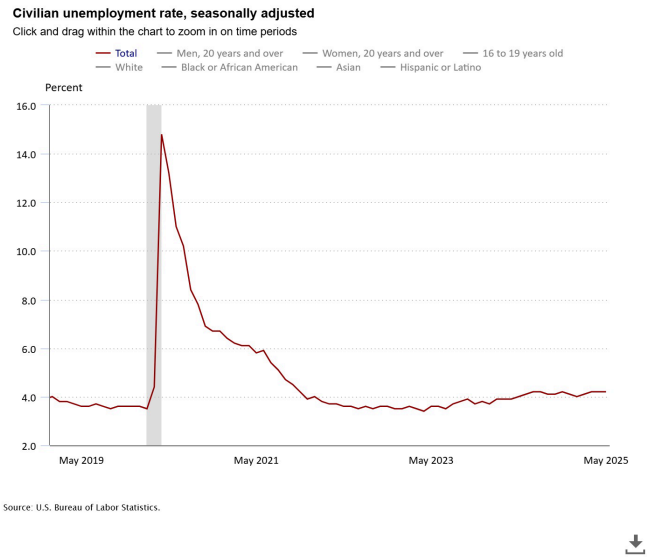
1. National Labor Market Overview

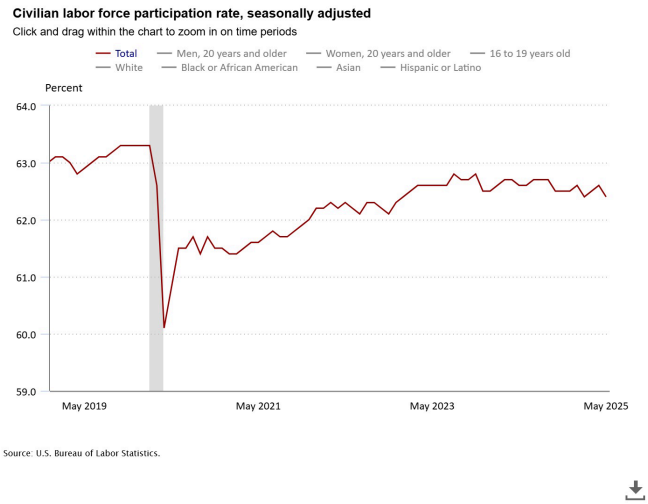
1.1 Employment Growth and Wage Trends

Currently, the United States labor market is expanding. National job growth is approximately 1% year-over-year. Florida mirrors this trend with a slightly higher rate of 1.25% due to population influx and increased demand for services. Despite relatively low unemployment (4.2%), labor force participation remains historically low at <64% (see Figure 1 below for visualization of these metrics from pre-pandemic to current).

Retiring baby boomers, a decline in immigration, and The Great Resignation (i.e., lifestyle changes spurred by the pandemic) are key contributors to the labor force participation rate remaining lower than expected. In addition, across South Florida wage growth generally has not kept pace with inflation, which has been driven in large part by disproportionate increases in housing costs (i.e., median home price in Jupiter was $703,000 in January 2025 vs $280,000 in January 2015).

Figure 1: US Labor force unemployment rate and participation rate, seasonally adjusted (1/1/2019–5/31/2025)



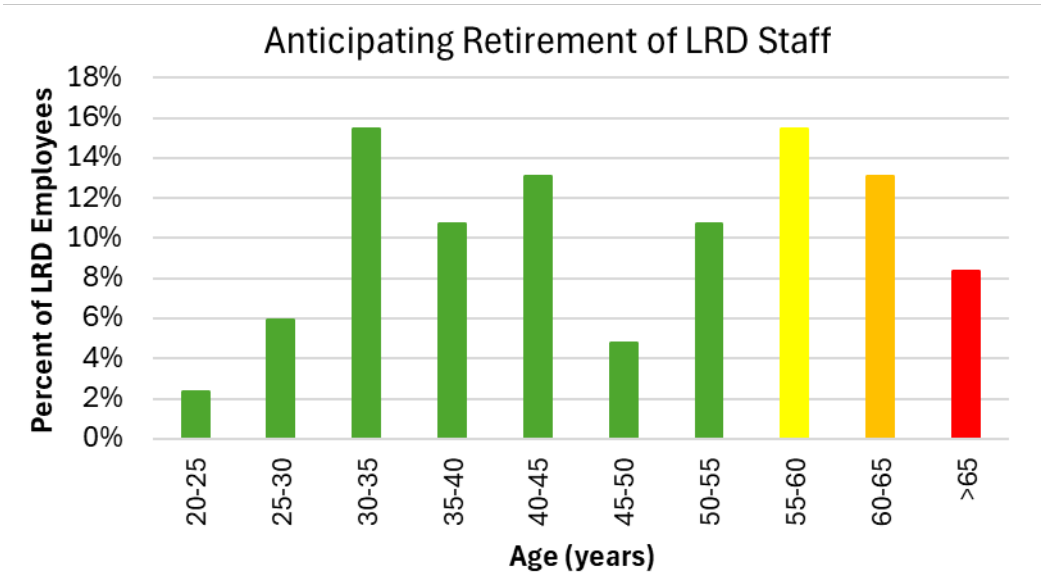


1.2 Skills Mismatch and Workforce Gaps

One of the most pressing issues is the growing gap between the skills required by employers and those possessed by job seekers. This mismatch is especially pronounced in skilled trades, including utility work, which often requires licenses, certifications, or on-the-job training. Creation of utility jobs is outpacing the availability of trained workers. Nationwide, there are tens of thousands of unfilled positions in water treatment, electric utilities, and telecommunications. Many regional utility departments are struggling to fill positions ranging from field technicians to control room operators. The District's efforts to close this skills gap will likely require continued investments in on-the-job training and education to develop and sustain a qualified, effective workforce.

1.3. Challenging Utility Workforce Demographics

The utility sector's workforce is aging. Nearly 50% of current utility employees nationwide are eligible for retirement within the next decade (48% at LRD, see chart below). South Florida reflects this trend, and many utilities report difficulty recruiting younger workers into careers often seen as physically demanding or less glamorous. The South Florida Regional Planning Council's 2024 Annual Progress Report found utilities (including transportation and warehousing) consistently experienced the highest percentage of job openings throughout the region for the period 2021 - 2024.



2. Five- to Ten-Year Outlook for Utility Workers

2.1 Projected Demand

The next decade will see continued growth in demand for utility workers in South Florida. Key drivers include:

- **Infrastructure Investment**: Federal, state, and local governments are investing heavily in aging infrastructure, including water mains, sewer systems, stormwater management and flood control, as well as energy grid modernization.
- **Climate Resilience Projects**: Rising sea levels, saltwater intrusion, and storm intensity will require major retrofits to various utilities across South Florida.

According to U.S. Bureau of Labor Statistics and industry forecasts, jobs in water and wastewater treatment are expected to grow by 6–8% nationally through 2033. In South Florida, where these utilities serve a rapidly growing population, the growth rate is likely to exceed that.

2.2 Technology and Smart Infrastructure

While job demand is rising, utilities are also increasing investments in technology:

- **SCADA (Supervisory Control and Data Acquisition)** systems reduce the need for manual monitoring.
- **Drones and robots** are increasingly used for inspecting sewer lines and electrical equipment.
- **AI and machine learning** can predict maintenance needs and optimize resource allocation.

Rather than replacing workers, these technologies will shift the demand toward more technical and data-driven roles, which are often higher paid roles. Utility workers of the future will need hybrid skill sets: mechanical know-how and digital fluency. Already, the District's staff members possess a significantly greater digital skill set than we did twenty or even ten years ago.

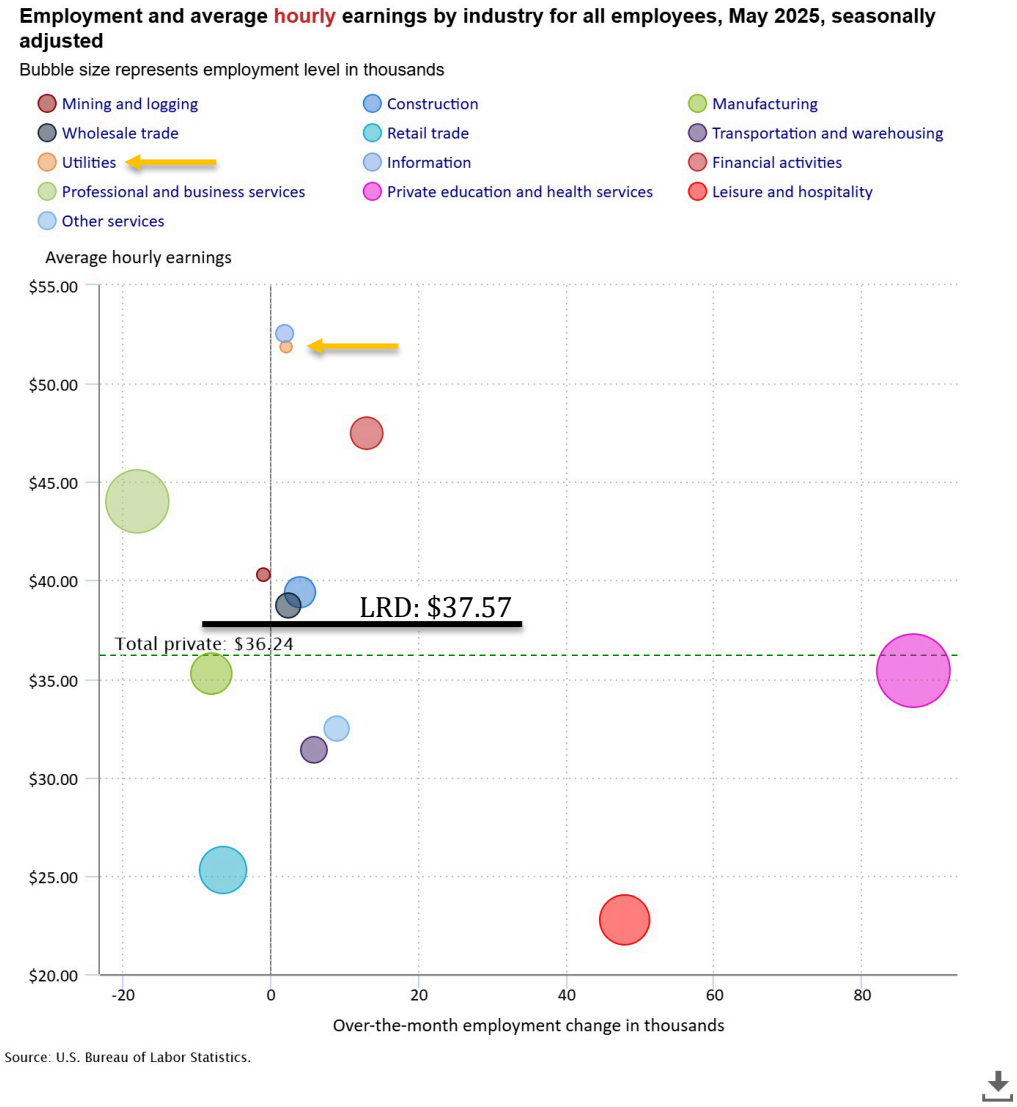
3. Economic Impacts of Utility Labor Trends

3.1 Rising Labor Costs and Rate Pressures

Research by Bluefield shows the combined water and sewer bills across the USA increased by 4.6% from 2023 to 2024, while their core benchmark show combined water and sewer bills increased by 24.1% over the five year period 2019 to 2024. Increasing wages, which drive costs for contractual services as well as utility staff personnel costs, are contributing to these higher operational costs. Utilities are experiencing double-digit increases in payroll expenses, particularly for skilled trades.

Factor	Impact on Utility Budgets
Wage Increases	+8–12% in South Florida
Training/Onboarding	Longer lead time & higher costs
Overtime	Increased due to labor gaps
Contractor Premiums	External firms cost 20–40% more

Figure 2. USA Seasonally adjusted employment turnover and average hourly earnings by sector. LRD median earnings (annual salary $78,135.20; hourly rate $37.57) are provided to compare with other sectors, especially Utilities (orange circle).



3.2 Ripple Effects on the Regional Economy

Infrastructure investment generates broad economic benefits:

- Every $1 million spent on water/wastewater infrastructure supports approximately 15 jobs.
- Utility construction supports a wide array of industries, from engineering and surveying to materials supply and environmental consulting.

In addition, high-paying utility jobs help anchor the regional middle class. These positions typically offer benefits, pensions, and long-term stability, making them an essential part of economic equity and resilience.

4. Environmental and Occupational Health Challenges

4.1 Heat Stress and Productivity Losses

South Florida is experiencing more frequent days above 95°F, and severe heat has been documented to reduce worker productivity (https://www.science.org/doi/10.1126/science.aal4369). Outdoor utility workers, including those in sewer inspection, repair, and replacement, are among the most affected.

4.2 Storm Recovery and Emergency Response

Utility workers are essential to the recovery from disruptive tropical storms and hurricanes. Post-storm recovery often involves long hours, dangerous conditions, and high stress. With storms projected to increase in frequency and severity, labor demands during recovery periods will surge. Ensuring adequate staffing and training is essential to future response capabilities.

5. Policy and Planning Implications

5.1 Workforce Development

For the utility industry to meet expected labor demands, Florida must expand its pipeline of trained utility workers. Key elements affecting the availability of trained employees are:

- **Vocational programs** in water treatment, electrical tech, and instrumentation
- **High school apprenticeships** and partnerships with community colleges
- **On-the-job training** supported by utilities and unions
- **Outreach** raising awareness of these meaningful and stable careers, often overlooked, can help shift perceptions and draw in younger talent.

5.2 Labor Retention and Quality of Work

Retention is just as important as recruitment. Utilities can improve retention by:

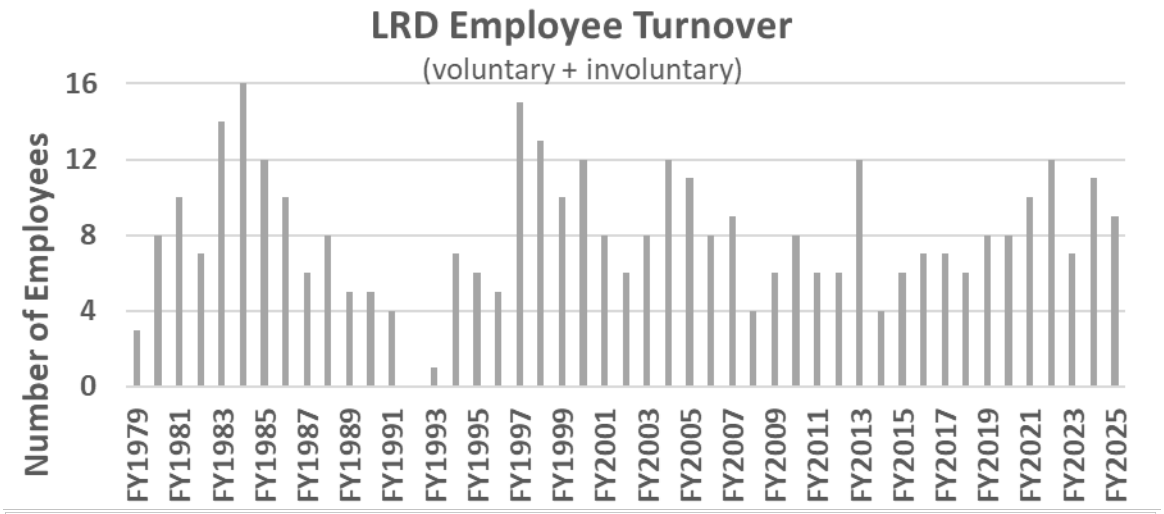
- Creating career pathways
- Support employees pursuing professional development (e.g., certification, license, diploma, degree, advanced degree)
- Help employees manage work/life balance
- Incentivize knowledge sharing across and among employees (e.g., cross-training)
- Recognize and reward performance

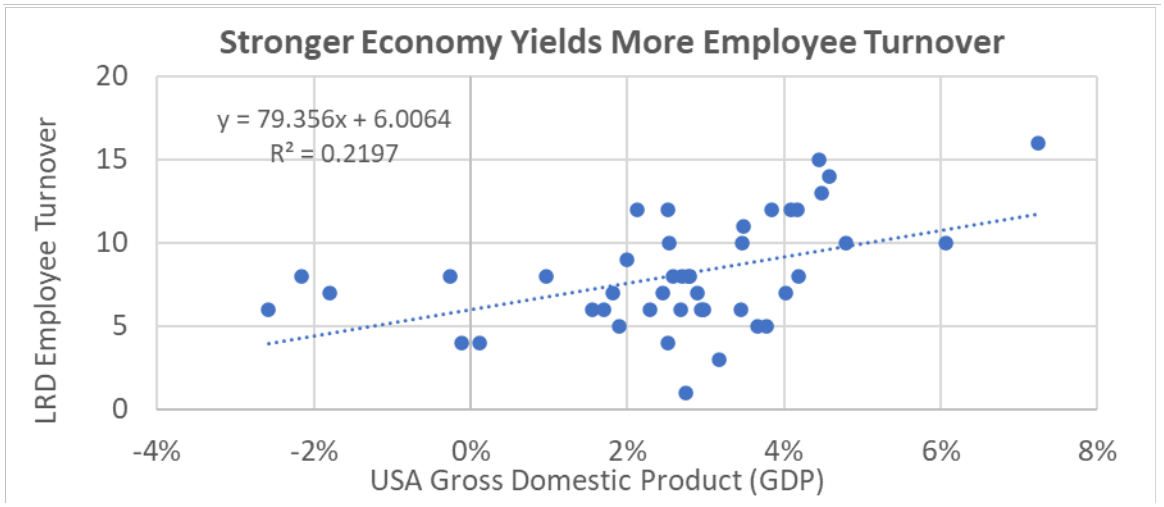
5.3 Rate Planning and Fiscal Resilience

Because labor costs are a large (50-60%) fraction of operating costs, and because critical utility work cannot get completed without effectively trained and motivated staff, it is imperative that the District continue to anticipate future labor costs and incorporate them into the Rate Study and annual budgeting efforts.

Conclusion

South Florida's utility workforce is being stressed by inflation, rapidly increasing housing costs, and a shrinking supply of trained and available workers. As demand for quality utility workers grows, the District could struggle to effectively fill important positions. For the District to meet future labor demands, we must improve the effectiveness of our recruiting program while also investing in our pipeline of trained utility workers, i.e., vocational programs, apprenticeships, on-the-job training, and outreach. In addition to developing a homegrown workforce, paying a competitive wage, managing a reasonable work/life balance, and rewarding excellent performance are all important elements of retaining our skilled and effective workforce. The economic impacts of inaction would be severe: rising utility costs, service disruptions, ecological impacts to our watershed, and quality of life impacts to our community. Nonetheless, effectively developing and managing our workforce, including investing in training and technology, will allow us to continue to achieve our mission and vision.





Definitions:

Labor Force Participation Rate: the number of people who are either working or actively seeking work as a share of the working age population. Children, students, retirees, and stay-at-home parent are not included in this metric. A rising rate indicates more people are working or looking for work.

Unemployment Rate: the percentage of people in the labor force who don't have jobs but are actively seeking work.

Utilities (NAICS 221):

- **Electric Power Generation, Transmission and Distribution** (NAICS 2211): This covers the entire process of providing electricity, from generating it to delivering it to consumers.
- **Natural Gas Distribution** (NAICS 2212): This focuses on the distribution of natural gas.
- **Water, Sewage and Other Systems** (NAICS 2213): This includes the services related to water treatment and distribution, as well as sewage collection, treatment, and disposal.

Labor Market & Workforce SWOT Analysis

Strengths: (internal)

a. The District has employees that understand and are committed to our mission.
b. The District offers excellent benefits (e.g., retirement, medical insurance, paid leave)
c. The District is a stable place to work.
d. The District generally offers a reasonable work/life balance.
e. The District invests in skills development for existing staff, e.g., on-the-job training, Tuition Reimbursement Policy.
f. The District's annual COLA and merit increase
g. The District's ever-increasing use of technology (telemetry, SCADA, EAM, Power BI, artificial intelligence) should improve efficiencies.

Weaknesses: (internal)

a. Relatively high ongoing turnover rate
b. Anticipated wave of retirement of skilled and knowledgeable staff
c. Recruiting for key technical positions (e.g., GIS application support administrator)
d. Lack of vocational programs or apprenticeships
e. The District's use of technology (telemetry, SCADA, EAM, Power BI, artificial intelligence) increases the required technology competency for District staff.
f. Physically demanding, outside jobs (i.e., dirty & hot work)

Opportunities: (external)

a. Recent high school graduates are showing an increased interest in skilled trades and growing skepticism toward traditional four-year college degrees.
b. Developing better engagement with local or regional technical and vocational training programs.

Threats: (external)

a. Local housing costs and availability
b. High local, regional, and national inflation
c. Tight labor market (high demand for quality workers and low unemployment rate)

Loxahatchee River Environmental Control District Financial Conditions White Paper
June 2025

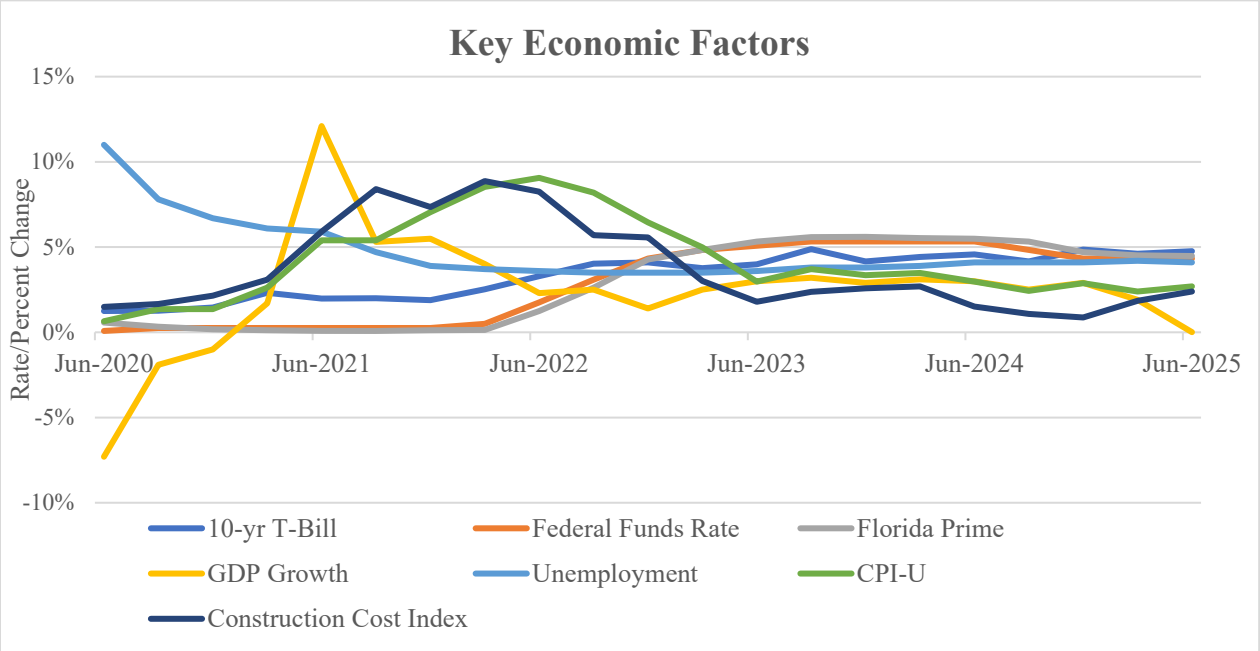
Executive Summary

This white paper provides an integrated summary of the financial and economic landscape shaping the Loxahatchee River District (LRD) to use during the 2025 Strategic Plan. This report consolidates current financial, audit, and labor data to support forward-looking financial planning.

Overall Financial Health

The District is fiscally stable, with strong cash reserves, and no outstanding debt. The District continues to maintain disciplined financial practices and continuously receive clean audit reports. Total investment yields slightly lag market benchmarks due to intentional investment constraints to maintain needed security and liquidity. Capital spending appears over budget due to accounting for encumbrances. Looking ahead, rising labor costs and significant planned capital expenditures present key strategic challenges that will require focused attention and proactive planning.

Key Economic Factors

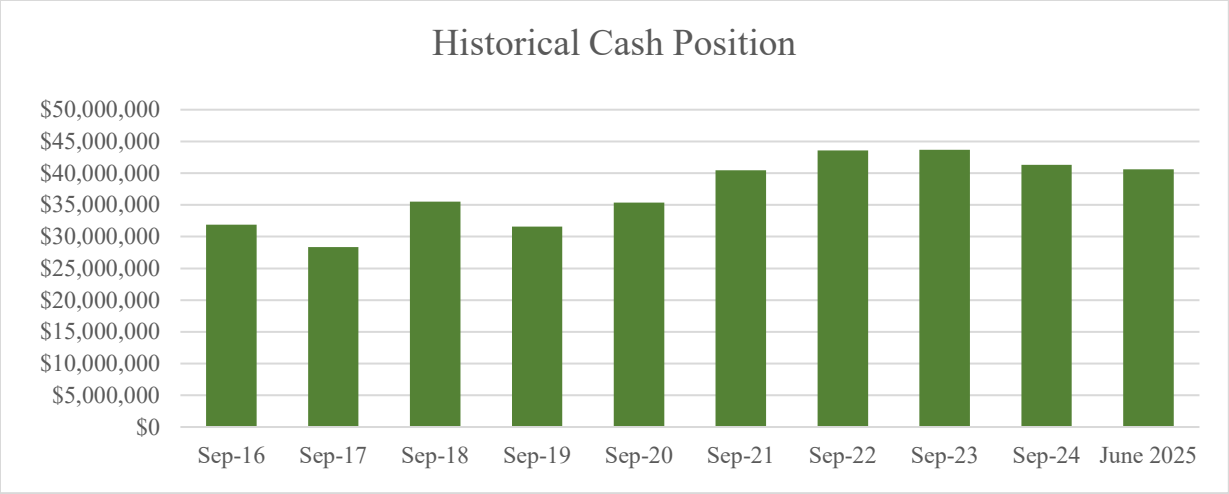


***10-Year Treasury Bill, Federal Funds Rate, Florida Prime, and Unemployment Rate** are shown as actual rates as of each respective date.

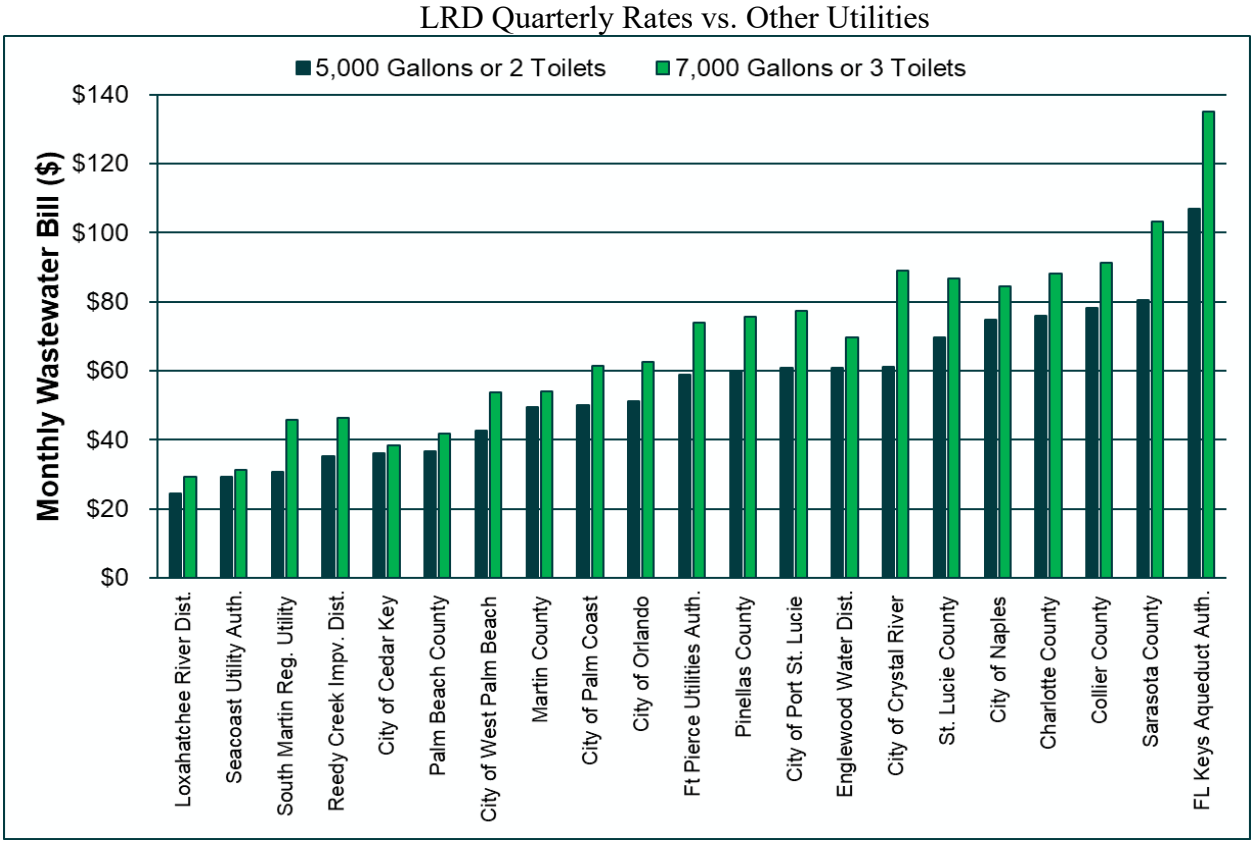
****GDP Growth, CPI-U, and the Construction Cost Index** are shown as the **annual rate of change** (i.e., year-over-year change) as of the respective date.

	Current Rate
• Interest Rates 10-year T-Bill	4.76%
• Federal Funds Rate	4.33%
• Florida Prime Interest Rate (30-Day SEC Yield)	4.47%
• GDP Growth	1.90%
• Unemployment	4.10%
• CPI-U	2.70%
• Construction Cost Index	2.39%

- **Cash Position (June 2025):** $40.6 million
- **Average Investment Yield:** 4.18%
    - **Benchmark Comparison:** 3-month Treasuries at 4.24%, Fed Fund Rate at 4.33%
    - **Note:** $4.5M in business checking earning under 3% is holding down yield.



- **District maintains low quarterly sewer service charges compared to other utilities**



Data as of 10/31/24

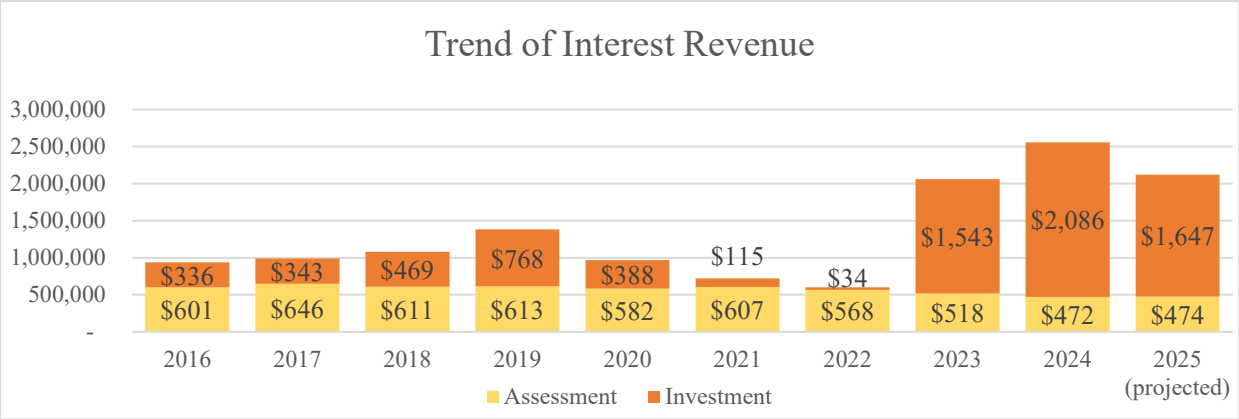
Revenue

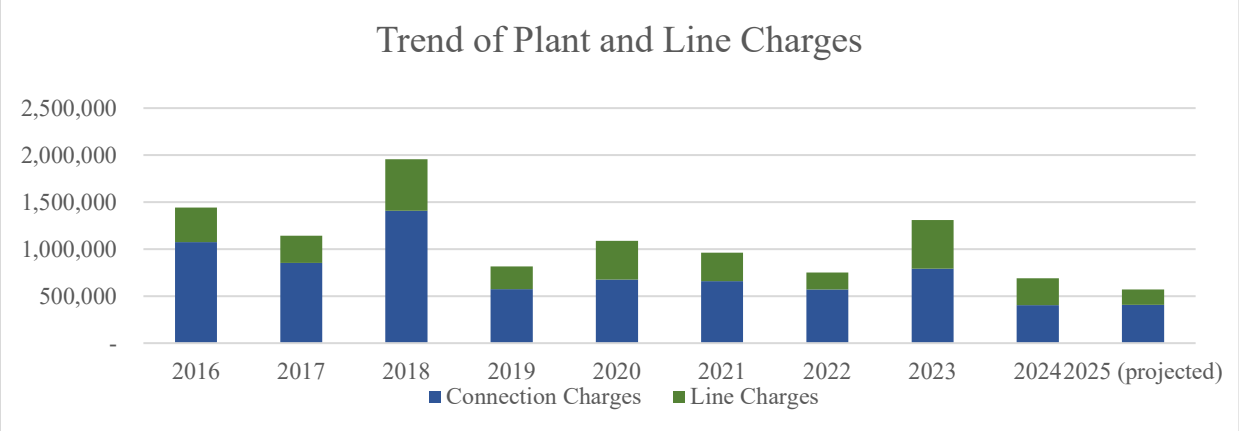
FY2024 Audit Findings:

- **Operating Revenues**: $21.9M (+4.2% YoY)
- **Capital Contributions**: $1.3M (↓59% from FY2023)
- **Interest Income**: $2.45M (↑21.6%)

FY2025 Budget:

- **Total Revenues**: $34.4M (+3.75%)
  - Operating: $22.2M (↑2.6%)
  - Capital: $2.07M (↓16.7%)
  - Grants/Interest: $2.44M (↑25.3%)
  - Carryforward Surplus: $7.7M (↑8.4%)





Strengths:

- **Strong investment returns** continue to support operations.
- **Grants and surplus funds** are being effectively leveraged.

Concerns:

- **Capital revenues are declining**, primarily due to lack of developable land in our service area, so new development will be primarily limited to redevelopment.
- **Long-term growth potential is limited**, as most developable land is already served.

Operating Expenses

FY2024 Audit Findings:

- **Operating Expenses**: $18.5M (↑6%) (excludes depreciation)
  - Repairs & maintenance: ↑43.7%
  - Personnel: ↑4.1%
  - Contracted services (e.g., PFAS testing): ↑8.4%
- **Net Position Change**: ↓$115,461 (small deficit)
- **Operating Income (before depreciation)**: $3.39M

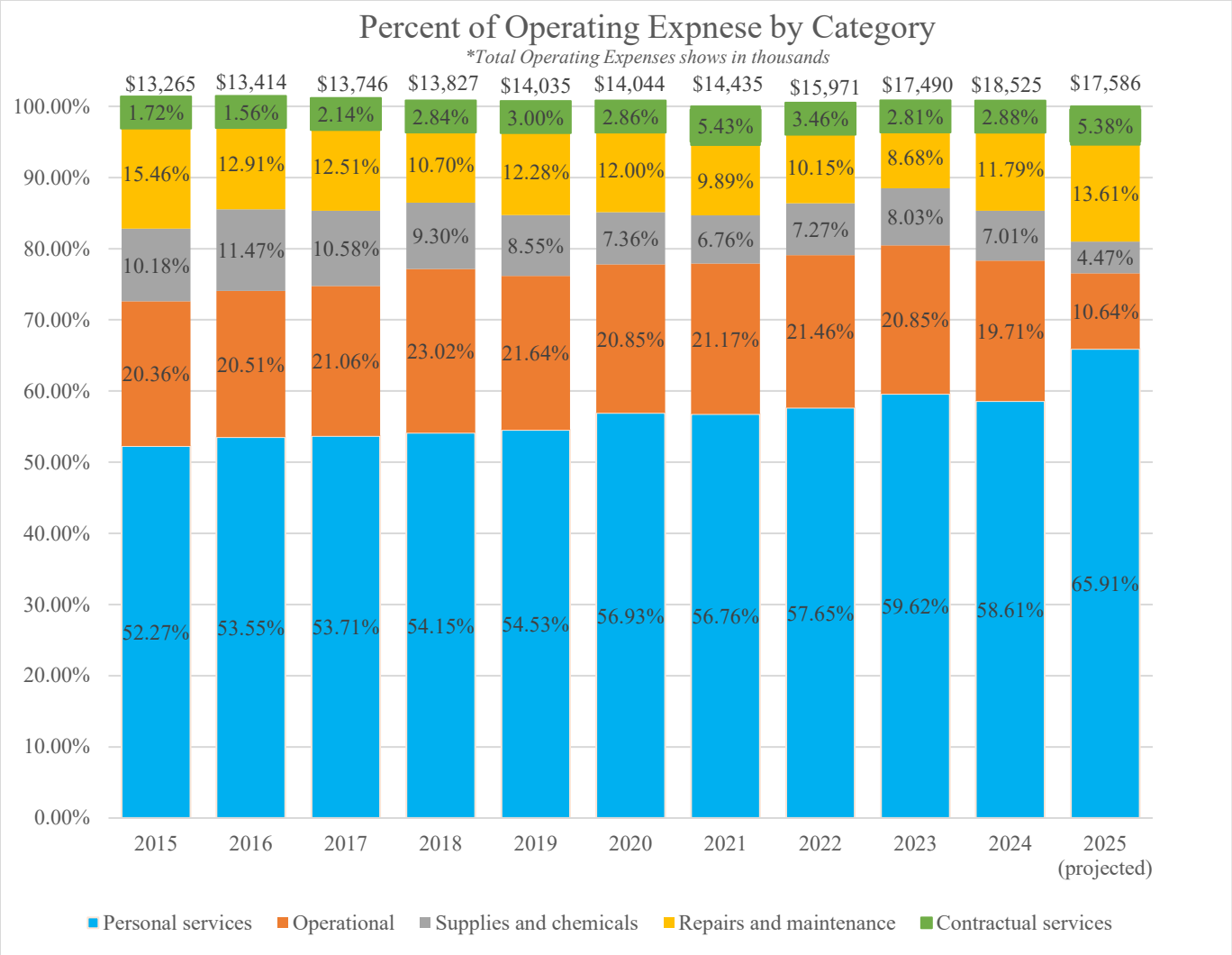
FY2025 Budget Highlights:

- **Operating Expenses**: $21.46M (↑5%)
- **Capital Improvements**: $12.9M (↑1.7%)
- **Labor costs** and **maintenance** are primary cost drivers of operating expenses.

Labor and Retirement Plan Considerations

- **Regional Labor Cost Growth:** 8–12% annually
- **Retirement Plan Participation:** 69 active members

Operating income (loss) reflects the difference between operating revenues and operating expenses, representing the financial results of the District's core operations. The District's operating revenues primarily come from charges for services. Operating expenses include the costs associated with the operation of the treatment plant and collection systems, as well as related administrative functions. While depreciation is typically considered an operating expense, it is excluded from the chart above. Operating income does not include items non-operating items such as, connection charges, assessment revenue, interest income, contributed capital or capital expenditures.



Strengths:

- Budget is aligned with inflation and maintains conservative assumptions.
- Major investments in equipment, vehicles, reuse systems, and force mains indicate strategic capital deployment.

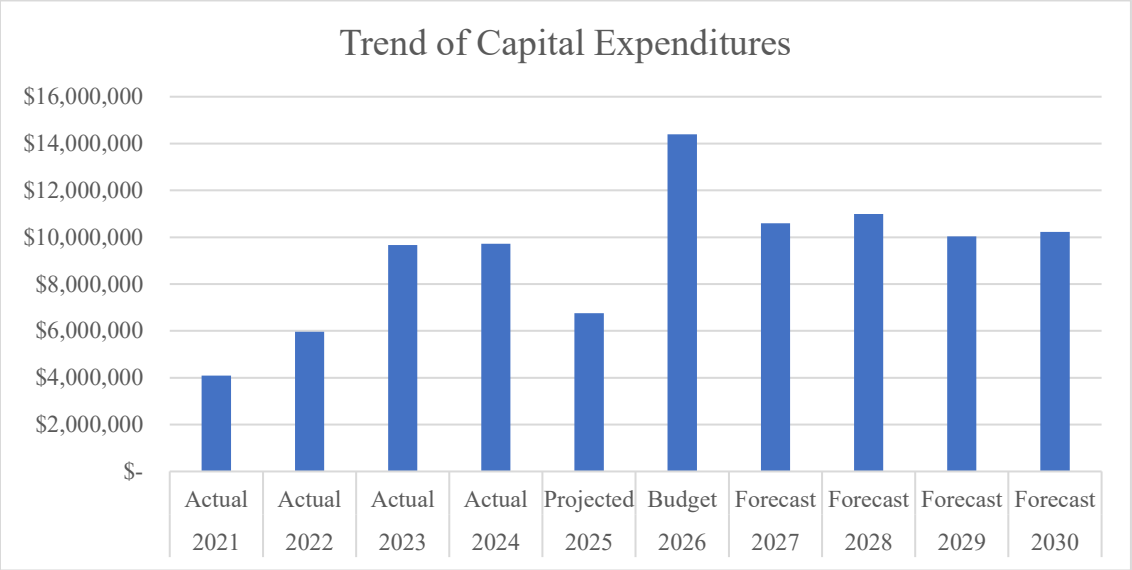
Concerns:

- **Ongoing decline in operating income** will eventually require non-operating revenue (e.g., investment income, contributed capital) to balance the books.
- **Increase in the cost of personnel services** reflects ongoing labor market pressures, including higher wages needed to attract and retain qualified, skilled workers in a competitive environment.
- **Rising costs for maintenance and infrastructure repairs** reflect aging assets and inflation.

Capital Expenses

FY25 Capital Investment

- **Capital Budget:** $12.9 million
- **Capital Encumbered/Expensed (YTD):** $15.19 million (117.58%)
- **Explanation:** Encumbrances reflect entire project amounts upon contract execution, including multi-year projects.
- Significant planned investments include:
  - **Machinery & Equipment**: $2.24M (↑108%)
  - **Vehicles**: $1.01M (↑97%)
  - **Force Main Projects**: $2.03M (↑35%)
  - **Reuse Projects**: $1.57M (↑500%+)



Strengths:

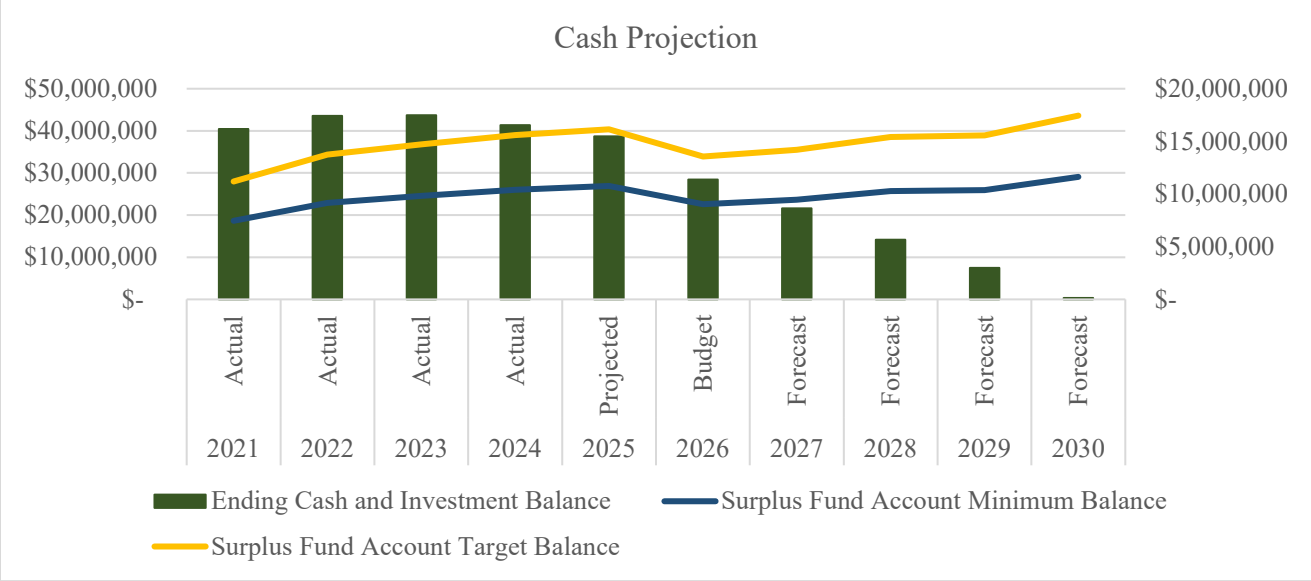
- The District is **proactively reinvesting in its systems**, focusing on long-term resiliency and modernization.
- **Reuse and reliability-oriented projects** are consistent with sustainability goals.

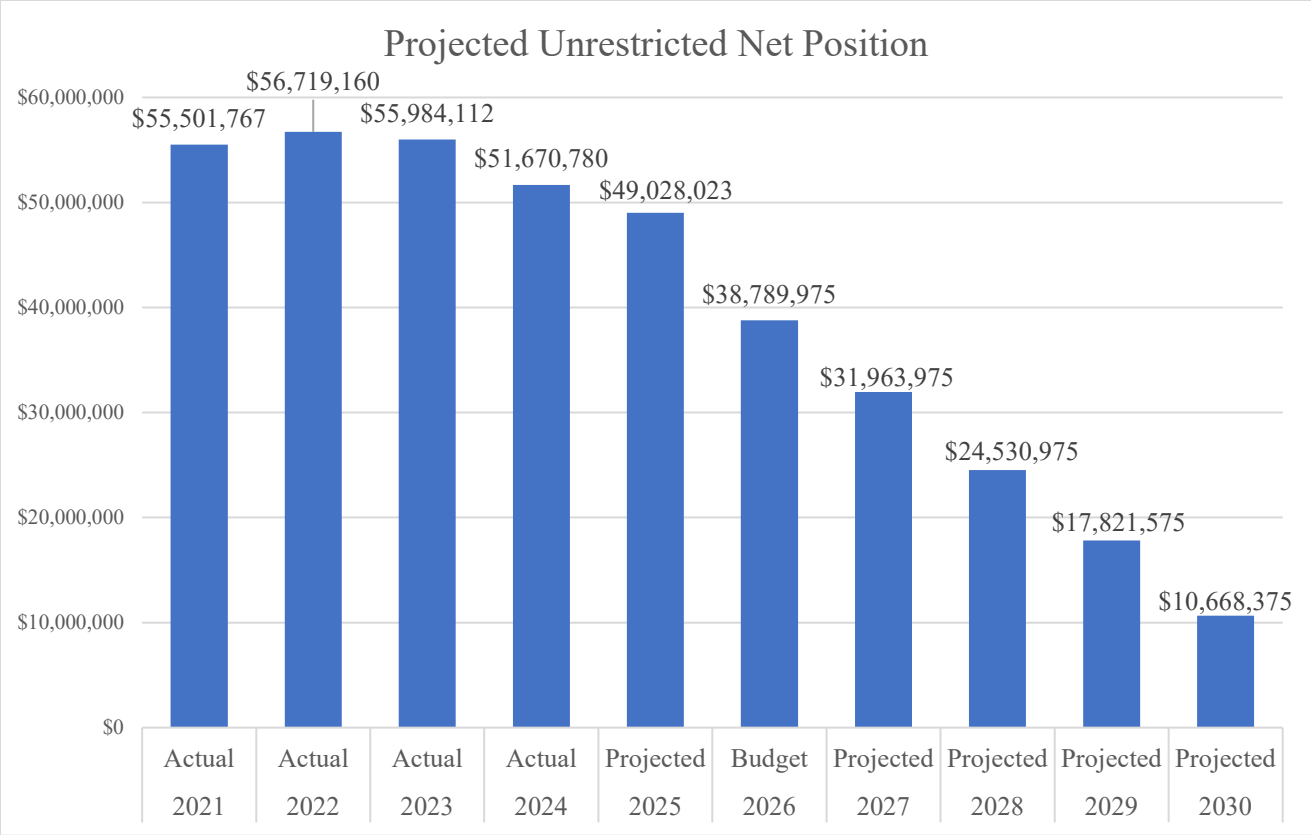
Concerns:

- **Delays of significant capital projects** impacts projected spending and could increase risks to system integrity.
- **Declining capital revenues** may require consideration of increased rates and/or long-term debt to cover rising capital expenses.

Reserves, Debt, and Liquidity

- **No long-term debt**—a major strength for a capital-intensive utility.
- **$40.6M in cash and investments** as of June 2025.
- **Unrestricted net position declined 7.7%** year-over-year, from $56M to $51.7M.





The Rate Study is intentionally conservative in projecting anticipated future costs, especially large capital costs, so the precipitous decline in Cash and Investments and in Unrestricted Net Position represents a conservative projection.

Strengths:

- No long term debt
- Strong cash position

Concern:
The District is increasingly **drawing on reserves** to balance the budget. If investment income weakens or emergency repairs are needed, reserves could erode quickly.

Key Risks & Constraints

1. **Minimal Growth in Connections**
    - FY2024 saw only a 0.32% increase in equivalent connections.
    - Future revenue growth will depend primarily on **rate adjustments**, not system expansion.
2. **Declining Unrestricted Net Position Trends**
    - The District is increasingly **drawing on reserves** to balance the budget.
3. **Rising Cost Pressures**
    - Inflation, aging infrastructure, and regulatory mandates (e.g., PFAS testing) are increasing costs.
4. **Reduced Capital Contributions**
    - Major capital reimbursements are tapering off, increasing reliance on internal funding and grants.

Financial Condition Summary

The **Loxahatchee River District is financially stable**, with a strong asset base, healthy reserves, and no debt. It is strategically investing in renewing and upgrading infrastructure to maintain service quality and minimize environmental impacts. However, **the District is entering a period of tighter financial conditions**, with limited revenue growth capacity, rising costs, and a growing dependency on investment income and reserves to maintain balance.

Key strategies to preserve fiscal health include:

- Continued implementation of asset management best practices
- Cost containment, particularly in labor and capital programs
- Pursuit of grants to offset major capital investments
- Timely rate adjustments (planned 3% annually through 2027, 2% in 2028 and 3% in 2029)

Financial SWOT Analysis

Strengths:

a. Fiscally sound
b. Significant cash reserves
c. Meaningful interest income
d. No outstanding debt
e. Asset management efforts
f. Fiscally prudent management
g. Careful, forward-looking fiscal strategy
h. Increased budgeting flexibility for capital projects to maintain intended capital spending on identified projects when a key project is delayed

Weaknesses:

a. Aging infrastructure
b. District is facing build-out of service area, limiting capital revenues
c. No revenues are captured for engineering services to support redevelopment if the number of equivalent connections is not increased.

Opportunities:

a. Potential business collaborations (e.g., cell tower lease) to increase revenue
b. Potential to acquire private wastewater systems
c. Growth of service territory

Threats:

a. Persistent inflation
b. Unfunded regulatory mandates (e.g., PFAS testing and ultimately treatment)
c. External limitations on available grant funds (federal and state)

LRD System Reliability White Paper

July 2025

The District's 2018 Strategic Planning process identified improving system reliability (2.1) as a key strategic objective nested within Operational Excellence (2.0). This is clearly documented in the 2018 LRD Strategy Map and the concept was further communicated in several strategic initiatives (listed below). This white paper is drafted with the intent of documenting system reliability improvements we have achieved and to identify the current state of affairs through an updated assessment of our strengths (S), weaknesses (W), opportunities (O), and threats (T).

Below, we have listed our 2018 system reliability strategic initiatives (number & title) and provided a discussion relative to the improvements we have implemented.

2.1a Develop comprehensive rehabilitation program for all assets

2.1a1 Refine preventative maintenance / rehabilitation / replacement program to include all assets with effort based on industry standards, failure analysis, and cost considerations.

Preventative Maintenance - Preventative Maintenance is managed through the District's Computerized Maintenance Management System (CMMS) software (Hexagon EAM previously known as InforEAM). Preventative maintenance is equipment specific based on operational experience, manufacturer's recommendation, or industry standards. The District has implemented various analytical tools to confirm the PM program is reaching all applicable equipment and the PM program is improving performance of the system as desired. The approach has been developed and implemented throughout our Collections and Transmission system and is being pushed out to all other departments.

Rehabilitation - Rehabilitation is managed through a tiered review system. Equipment condition is monitored and cataloged in Hexagon EAM through routine preventative and corrective maintenance. Based on data collection, field observation, and performance reviews of equipment, specific SYSTEMS can be identified for evaluation. These systems are forwarded to Engineering to be pulled from service and a complete inspection performed. Based on inspection results, steps required to bring the SYSTEM back to reliable service are identified and implemented. Steps can range from inhouse corrective maintenance/repair of the system to total system replacement. The renewal/replacement/rehabilitation program is condition based at implementation (annual budget) but time/age based for long term planning (rate study). The approach has been developed and implemented throughout Collections and Transmission and currently encompasses lift stations, gravity collection systems, force mains, standby generator systems, portable generators, portable pumps, and vehicles. The approach will be deployed to all other departments as we continue.

Replacement - See discussion above under Rehabilitation.

2.1a2 Conduct high-level risk analysis for all meaningful assets (composite scored based on probability of failure x consequence of failure).

Risk and Resilience Assessment - in September of 2024 the District engaged in a contract with Carollo Engineers, Inc. to complete a risk and resilience assessment using America's Water Infrastructure Act (AWIA) guidelines. The risk and resilience assessment is coming to conclusion with a scheduled Board presentation in August 2025, followed by FINAL Risk and Resilience Assessment Report as we start planning efforts for the 2026 Rate Study.

2.1a3 System Failure leading to customer/regulatory issues

Collection/Transmission actively track and report on system failures impacting customers. Tracking includes various KPIs including unauthorized discharge, in-home backups, emergency calls, lift station red lights, low pressure red lights. Data collection is standardized through the Emergency Call Work Order which populates the KPIs, two of which are included in the Executive Dashboard, unauthorized discharges and in home backups that cause damage within our customers' homes.

The collection/transmission system is undergoing a major expansion to SCADA. Current plan will have all lift stations providing critical station statuses through SCADA by the end of 2027.

2.1b Improve Master Plan for collection and transmission systems; Schedule system rehabilitation in context of master plan

2.1b1 Schedule system rehabilitation in context of master plan

As noted above, rehabilitation is managed through a tiered review system. From the context of a Master Plan, rehabilitation schedules are based on time/age with a CONDITION review annually for refined schedules at the budget level. The approach has been developed and implemented throughout Collections and Transmission and currently encompasses lift stations, gravity collection systems, force mains, standby generator systems, portable generators, portable pumps and vehicles. The approach will be deployed to all other departments as we continue.

2.1b2 Respond to redevelopment in context of master plan (contribute resources to achieve larger vision of collection and transmission system improvements)

A system wide master plan has not been developed that addresses current approved land use and impacts to existing District systems. However, sub-sections of the District's transmission system, e.g., Northwest Service Area, Tequesta - Western Peninsula, East of the Intracoastal from Jupiter Inlet through Juno Beach and central transmission system (Tequesta eastern peninsula and areas south of the Loxahatchee River, west of the intracoastal and east of I-95), have been modeled. Based on these models, major improvements to regional repump stations have been completed or are under way, which will ensure capacity exists to accommodate continued development and redevelopment.

2.1b3 Evaluate impact of each new development on existing collection/transmission facilities

A system wide master plan has not been developed that addresses current approved land use and impacts to existing District systems. Sub-sections of the District's transmission system, e.g., Northwest Service Area, Tequesta - Western Peninsula, East of the Intra-coastal from Jupiter Inlet through Juno Beach and central transmission system (Tequesta eastern peninsula and areas south of the Loxahatchee River, west of the intracoastal and east of the I-95), have been modeled and are reviewed in context of proposed development and redevelopment.

2.1c Develop emergency response plans for high-risk assets

2.1c1 Develop an emergency response plan for assets with high-risk scores

The current version of the District's Emergency Response Plan addresses emergency responses to the District's systems with an emphasis on providing emergency power in the event of significant service area wide power outage. This plan addresses critical plant processes, critical collection/transmission assets as well as non-critical assets. The District also maintains an inventory of System Shutdown and Bypass Plans with details on planned and executed shutdowns and bypasses of portions of the system.

2.1d Acquire, operate, and maintain private wastewater systems

2.1d1 Acquire, operate, and maintain private wastewater systems

District standards require new systems outside private property be conveyed to the District. Existing private systems have proven difficult to gain traction, but staff continue to work on new and alternate methodologies to investigate.

System Reliability Strengths, Weaknesses, Opportunities and Threats

1. Strengths
    a. Standards
        i. Class 1 Reliability as defined in FAC 62-610.300 referencing EPA – Design Criteria for Mechanical, Electric and Fluid System and Component Reliability for the WWTF.
        ii. New design and construction of wastewater collection and transmission system components meeting the requirements of FAC 62-604.400 and current District Standards.
        iii. New design and construction of low pressure collection and transmission system components meeting the requirements of FAC 62-604.300(5)(b) and (c) and current District Standards.
        iv. Rehabilitation of existing wastewater collection and transmission system components meeting the requirements of FAC 62-604.400 and current District Standards.
        v. Rehabilitation of existing low pressure collection and transmission system components meeting the requirements of FAC 62-604.300(5)(b) and (c) and current District Standards.
        vi. Standard operating protocols to keep operation of the system in compliance with regulatory agencies. e.g. Plant SOPs and Emergency Call / SSO standard work orders.
    b. Preventative Maintenance
        i. Preventative maintenance/replacement program based on industry and system data, failure analysis and cost considerations.
        ii. Competent/dedicated staff tasked with building the CMMS program.
        iii. Use of Power BI as a key tool to work within the CMMS database
        iv. Use of KPIs to monitor and direct PM program
        v. Interdepartmental communication tools for integration of equipment into GIS and CMMS databases.
    c. Emergency Response
        i. Emergency Response Plan
        ii. System evaluation tools for response during an emergency
        iii. ~85% of lift stations on remote telemetry (project substantial completion is imminent) with a project ready for bid to expand the remote telemetry program to the remaining ~15%.
        iv. Provisions for emergency power via portable generator or permanent standby at the WWTF and all lift stations.
        v. General Services Contracts for repair, maintenance and emergency response.
        vi. Adequate material and equipment in inventory to ensure reasonable response to emergencies and repairs.

d. Repair/Renewal/Replacement/Rehabilitation
    i. Capital Program – Projects SharePoint resulting in well-defined project reviews, problem resolution and schedule updates.
    ii. Rate Study level schedule for rehabilitation of collection and transmission system infrastructure and critical equipment.
    iii. Budget procedures to evaluate the condition of collection and transmission system infrastructure scheduled for rehabilitation in the rate study.
    iv. Defined procedures to identify, inspect and correct issues with infrastructure.
e. Private Systems
    i. Catalog of private systems in GIS and CMMS

2. Weakness
    a. Standards
        i. Consolidate SOP libraries into one methodology.
    b. Preventative Maintenance
        i. Incomplete failure analysis and troubleshooting program.
        ii. Expand current reliability methodologies to all departments (CMMS and KPIs).
        iii. Single standard form for equipment integration into Hexagon EAM
        iv. Procedure for condition assessments on in-service force mains
        v. Rate study level schedule for rehabilitation of WWTF infrastructure.
        vi. Aging and obsolete IQ Distribution System
    c. Emergency Response
        i. Low pressure remote monitoring capabilities.
        ii. Limited # of manned generator units to address low pressure emergency response.
        iii. Although standardized the reporting process during emergency response is manual and requires dedicated staff time to generate.
        iv. Evaluation and reconfiguration of system to address alternate transmission routes for critical infrastructure and reduction of cascading systems/repump stations.
        v. A Master Plan providing complete bypass plans for all critical force mains in the service area. – Weakness
    d. Repair/Renewal/Replacement/Rehabilitation
        i. Rate study level schedule for rehabilitation of WWTF infrastructure.
        ii. Budget procedures to evaluate the condition of WWTF infrastructure scheduled for rehabilitation in the rate study.
        iii. Rate study level schedule for rehabilitation of Reuse infrastructure.
        iv. Budget procedures to evaluate the condition of Reuse infrastructure scheduled for rehabilitation in the rate study.
        v. Overall Capital Project's scheduling/spending

vi. A Master Plan updated as necessary to understand and address new development, redevelopment

3. Opportunity
    a. Standards
    b. Preventative Maintenance
    c. Emergency Response
        i. FPL power status during emergency response for low pressure customers or alternate power survey capabilities.
        ii. Integration of AI or a more complex algorithms to guide portable generator deployment during a emergency response.
4. Threat
    a. Standards
        i. Complex and slow moving regulatory agencies and right-of-way agencies overseeing permitting requirements required for major infrastructure improvements to include ACOE, FEC, PBCLD, FDOT
    b. Preventative Maintenance
        i. Critical component obsolescence
    c. Emergency Response
    d. Repair/Renewal/Replacement/Rehabilitation
        i. Intergovernmental coordination related to right-of-way improvements.
    e. Private Systems
        i. Current regulatory environment appears to be focusing on cataloging and providing operational oversight to private systems connected to the regional wastewater system.

System Reliability Strengths, Weaknesses, Opportunities and Threats

1. **Strengths -See BOLD YELLOW HIGHLIGHT FOR SENIOR STAFF PRIORITY**
   a. LRD's Construction Standards and SOPs promote system reliability & regulatory compliance
   b. Use of data (CMMS, KPIs, Power BI, GIS) to actively manage system components and identify ownership (private systems)
   c. LRD's Emergency Response Plan is well documented and deployed
   d. Availability of portable and permanent generators
   e. General Services Contracts in place to expedite emergency response.
   f. **6.** Inventory of material and equipment supports emergency response and routine repairs.
   g. Rate Study provides a high-level, time-based schedule for rehab work.
   h. Budget procedures support required investment to maintain District systems.
   i. Capital Program Projects SharePoint provides well-defined project status updates.
   j. Defined and deployed procedures to inspect and correct District assets.
2. **Weaknesses - See BOLD YELLOW HIGHLIGHT FOR SENIOR STAFF PRIORITY**
   a. **8.** Non-standardized SOP libraries (methodology and formatting).
   b. **1.** Incomplete failure analysis and troubleshooting program.
   c. **5.** Reliability program (CMMS and KPIs) not fully deployed to all assets (force mains) or departments.
   d. **9.** Integration of assets into Hexagon EAM is cumbersome.
   e. **11.** Rate study level of detail is inconsistent among departments and systems.
   f. **2.** Aging systems, especially IQ Distribution System
   g. **7.** No plans to remotely monitor low pressure systems.
   h. Limited number of staff.
   i. **10.** Although standardized, the reporting process during emergency response is manual, tedious, and requires dedicated staff time to generate.
   j. **3.** Documented bypass plans do not exist for all critical infrastructure.
   k. **12.** Overall Capital Project's scheduling and spending
   l. **4.** The District needs a comprehensive Master Plan with a defined review schedule.
3. **Opportunities**
   a. FPL sharing power status data during extended power outages.
   b. Use of artificial intelligence or machine learning to optimize deployment of staff and resources during an emergency response.
4. **Threats**
   a. Regulatory and right-of-way agencies (e.g., ACOE, FEC, PBCLD, FDOT) slow capital projects through burdensome permitting requirements.
   b. Discontinuation of critical components
   c. Poor intergovernmental coordination related to right-of-way improvements.
   d. Private wastewater systems
   e. Regulatory environment appears to be focusing on cataloging and providing operational oversight to private systems connected to the regional wastewater system.

ENGINEERING STANDARDS & APPLICATION

The District's Manual of Minimum Construction Standards and Technical Specifications is a Board approved policy that details requirements for new collection-transmission system assets that are constructed by capital and developer projects. The Standards are compliant with FAC 62-604.400 and FAC 62-604.300(5)(b) and (c). Staff meet quarterly to review the Standards and any updates are periodically brought to the Board for approval. Engineering Admin and Inspections staff function to ensure compliance with the District's Manual of Minimum Construction Standards and Technical Specifications. Below is an analysis of the current state of the District's Manual of Minimum Construction Standards and Technical Specifications and its application by Engineering Staff.

SWOT: S = Strengths; W = Weaknesses; O = Opportunity; T = Threats

Manual of Minimum Construction Standards and Technical Specifications (Standards)

1. Board approved policy – Strength
2. Standardization on specific products allows for cost effective operation and maintenance. Required review every 5 years of specified products with next review in 2028– Strength
3. Standards Review Committee of internal staff from various departments meets quarterly to review Construction Standards for updates – Strength
4. New design and construction of wastewater collection and transmission system components meeting the requirements of FAC 62-604.400 and current District Standards – Strength
5. Rehabilitation of existing wastewater collection and transmission system components meeting the requirements of FAC 62-604.400 and current District Standards – Strength
6. New design and construction of low pressure collection and transmission system components meeting the requirements of FAC 62-604.300(5)(b) and (c) and current District Standards – Strength
7. Rehabilitation of existing low pressure collection and transmission system components meeting the requirements of FAC 62-604.300(5)(b) and (c) and current District Standards – Strength
8. Private systems – District Rule 31-3.005 requires new private systems to be installed per District Standards – Strength
9. Section 30.06 (c) - Maintenance responsibility of service laterals – Threat
10. Products that are standardized on become discontinued (especially electronic / control panel parts) – Threat

11. Current Board-approved Construction Standards do not speak to IQ or Plant specific items – Weakness
12. Need a more consistent proactive process to keep up with any changes to State Statutes, Florida Building Code and other relevant federal, state and local regulations – Weakness

Developer Plan Review Process

1. Transitioned to accepting electronic applications/plans – Strength
2. Integrating Project Coordinator into Engineering Admin workflow to provide redundancy – Strength
3. Integrated Director of Engineering into all plan reviews – Strength
4. Monthly reporting on plan review response time; working to automate this report through PowerBI – Strength
5. Updated external website to clarify developer review process to be consistent with District's Manual of Minimum Construction Standards and Technical Specificatiosn – Strength
6. Created general email (engineering@lrecd.org) to allow multiple staff to be able to work on new applications in the absence of other staff members. However, difficult to train longstanding developers / contractors to use this new process – Strength; Threat
7. Received inquiries regarding sewer availability west of I-95 (Jupiter Farms, Palm Beach Country Estates, etc.) and no plan is in place to provide sewer to these areas / confirm available capacity – Threat; Weakness
8. Reliance on other agencies (Town of Jupiter, Town of Juno Beach, Village of Tequesta, Palm Beach County, Martin County) to direct applicants to the District or incorporate requirement to obtain District sign-off as part of their plan reviews. Currently, not consistent with all agencies – Threat
9. Compliance issues – If compliance issues are noted during District inspection and maintenance, current practice is to have Engineering send a letter notice. Suggest integration with Customer Service for follow-up with resident / noting compliance issues on estoppels. – Weakness
10. Grease interceptors – Current change of ownership process through Engineering is consistent with all other plan reviews; however, change of tenant / ownership is difficult for the District to track. Suggest implementation of a notification process with potential fees for non-compliance – Weakness
11. Rates, fees and charges – District Rule 31-10 captures new development but does not accurately capture re-development / impact charges for residential homes with > 4

toilets. Additionally, costs associated with Engineering staff time should be evaluated and incorporated as part of these charges. - Weakness

12. Hydraulic Modeling – Impacts from larger developments are difficult to understand required system improvements without hydraulic modeling. Currently, District relies on outside consultants for hydraulic modeling – Weakness
13. EAM Work Order Reference Guide standardizes Inspection work orders – Strength
14. Consistent workflow to ensure new projects are put into GIS and EAM accurately – Strength
15. Engineering has record drawings for a majority of the collection-transmission-distribution system– Strength
16. All LRD staff are able to redline the GIS map with any updates based on field conditions – Strength
17. Older collection systems in GIS need to be QA/QC'd through record drawing review. Summer interns have been working on this project. Goal would be to update GIS and EAM simultaneously with this data – Weakness

Summary:

The Engineering Department handles a consistent flow of customer requests in a timely manner. As outlined above, Engineering does many things well but understands its weaknesses and is working towards improvement.

ENGINEERING SWOT ANALYSIS

Strengths (Internal):

1. Board approved policy
2. Standardization on specific products approves efficiency / reliability
3. Scheduled periodic review of Manual of Minimum Construction Standards (Standards) promotes continuous improvement
4. Standards ensure new work and rehab work is aligned with state statutes (e.g., FAC 62-604.400; FAC 62-604.300(5)(b) and (c))
5. Private systems – District Rule 31-3.005 requires new private systems to be installed per District Standards
6. Acceptance of electronic submittals improves efficiency
7. Project Coordinator provides needed capacity and redundancy
8. Director of Engineering is involved in all plan reviews
9. Monthly dashboard reporting provides quantitative assessment of performance vs goals
10. LRD's website provides concise consistent guidance in compliance with District Standards for development
11. General email address (engineering@lrecd.org) avoids bottleneck when a single staff member is absent
12. Documentation within EAM (e.g., Work Order Reference Guide) standardizes work protocol among staff
13. Consistent workflow to ensure new projects are put into GIS and EAM accurately
14. Availability of record drawings for the majority of the District's systems
15. All LRD staff are able to redline the GIS map with any updates based on field conditions

Weaknesses (Internal):

1. Standards do not address IQ or Plant specific items
2. Need a more consistent proactive process to keep up with any changes to State Statutes, Florida Building Code and other relevant federal, state and local regulations
3. Received inquiries regarding sewer availability west of I-95 (Jupiter Farms, Palm Beach Country Estates, etc.) and no plan is in place to provide sewer to these areas / confirm available capacity
4. Limited integration between Engineering and Customer Service to address and communicate compliance issues to customers (e.g., estoppel process)
5. Change of ownership process for food service establishments is difficult for the District to track / be informed of without assistance from other agencies or compliance inspections
6. District Rule 31-10 does not specify fees to offset staff time to review and inspect redevelopment if there are limited or no new equivalent connections (e.g., residential home going from 4 toilets to 8 toilets).
7. The District does not have in-house staff with hydraulic modeling capabilities, which is important at times when evaluating impacts from redevelopment. Currently, the District relies on outside consultants for hydraulic modeling.
8. Older collection systems in GIS need to be QA/QC'd through record drawing review. Summer interns have been working on this project. Goal is to update GIS and EAM simultaneously as data is available.

Opportunities (External):

1. Improve data sharing (including GIS) and integration of District sign-off as part of plan review processes of other agencies (Town of Jupiter, Town of Juno Beach, Village of Tequesta, Palm Beach County, Martin County).

Threats (External):

1. Maintenance of private service laterals by private citizens or companies can degrade our system or be perceived as our lack of proactive effort
2. Discontinued products that had been standardized by the District (e.g., electronics, control panel parts)
3. It is difficult to train developers, contractors, and vendors to follow new or improved procedures, e.g., use of general email address (engineering@lrecd.org) for submittals.
4. Reliance on other agencies (Town of Jupiter, Town of Juno Beach, Village of Tequesta, Palm Beach County, Martin County) to direct applicants to the District or incorporate requirement to obtain District sign-off as part of their plan reviews.

State of Cybersecurity and Protection of Valuable Data

1. Introduction

Cyber attacks are a persistent threat to organizations such as the District. However, the characteristics of these attacks continue to evolve with recent trends towards lower payouts, data exfiltration vs ransomware, and exploitation of data governance loopholes. Here we summarize some of these recent trends in most prevalent cybersecurity topics.

2. Cybersecurity Trends

2.1. Why has the average payout for ransomware declined in the past year?

The data shows an interesting paradox: while ransomware attacks are increasing, the actual payouts are declining significantly. A new report from Chainalysis revealed a 35% year-over-year decline in ransom payments, which fell from $1.25 billion in 2023 to $813,550,000 in 2024 globally, however, ransomware incidents increased 24 percent in the same period.

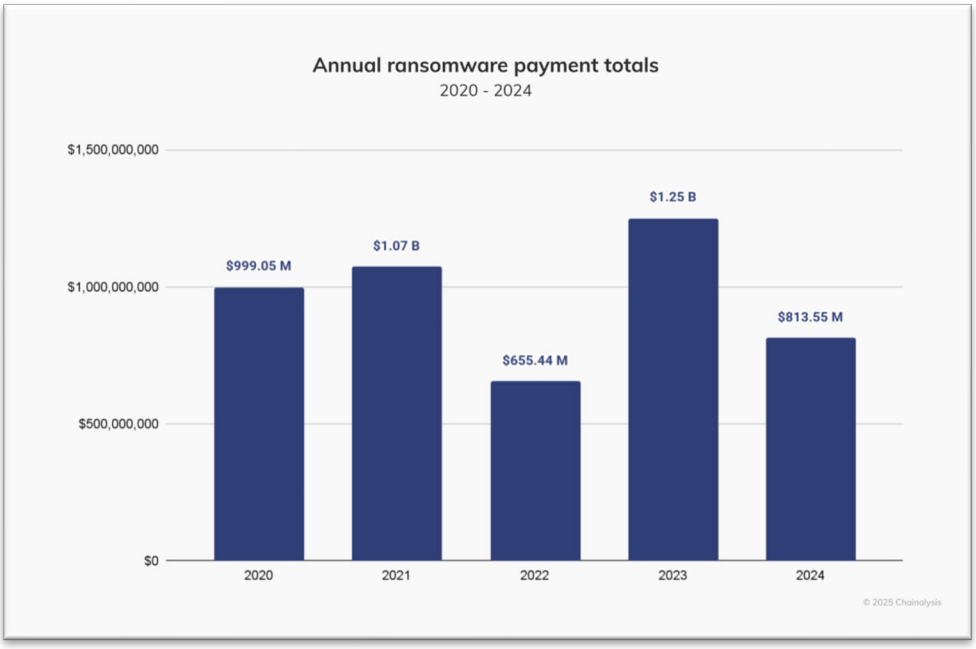


Figure 1 - Annual Ransomware Payouts (Chainalysis)

According to the Office of the Director National Intelligence (DNI), over 50% of ransomware attacks have a US based target. It would be reasonable to estimate that the US likely accounted for a significant portion of that global payouts total due to frequency and value of targets.

2.1.1. Several factors likely explain payout per attack disconnect:

Improved cyber defenses and incident response: Organizations have gotten better at preventing, detecting, and responding to ransomware attacks. Many companies now have robust backup systems, incident response plans, and security measures that reduce their dependence on paying ransoms to restore operations.

Policy and regulatory pressure: There's increasing government and regulatory pressure against paying ransoms. Some jurisdictions are implementing laws that restrict or heavily regulate ransom payments, and insurance companies are becoming more selective about coverage.

Market saturation and victim sophistication: As ransomware has become more common, potential victims have become more prepared and less likely to pay. The initial "easy targets" have hardened their defenses or learned from others' experiences.

Law enforcement action: Increased law enforcement efforts against ransomware groups have disrupted operations and made some criminals more cautious about demanding large payments that might attract attention.

Economic factors: The broader economic environment may be making organizations more resistant to large payouts, while also potentially reducing the perceived value of encrypted data.

The fact that data breaches continue rising while ransomware payouts fall suggests that cybercriminals are diversifying their monetization strategies - perhaps focusing more on data theft for sale on dark markets, identity theft, or other forms of fraud rather than traditional ransom demands.

2.2. Who is likely to be the victim of ransomware?

Breaches involving ransomware disproportionately affect small to medium organizations (88%) versus larger organizations (39%), according to Verizon Business 2025 Data Breah Investigation Report.

According to the Office of the DNI, commercial continues to be the most target type of industry by a wide margin. See the breakdown of Ransomware attacks in 2024 at right.

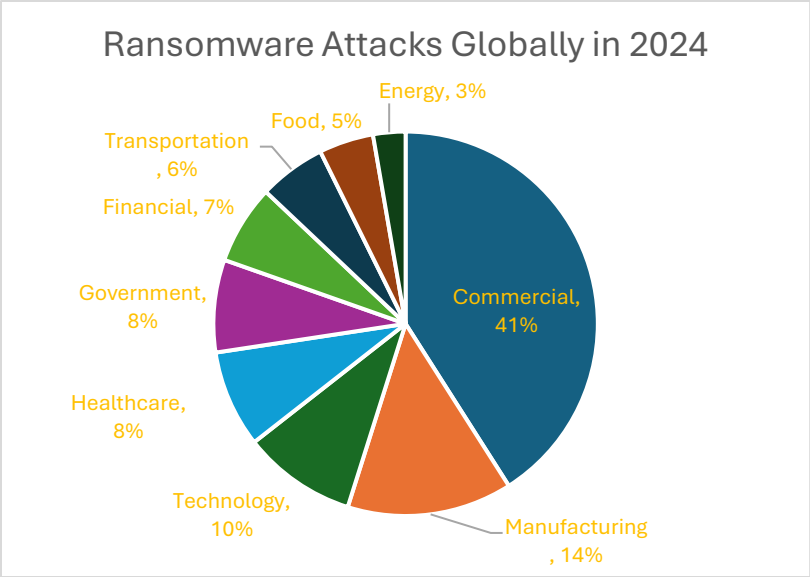


Figure 2 - Ransomware Attacks Globally 2024 (Office of the DNI)

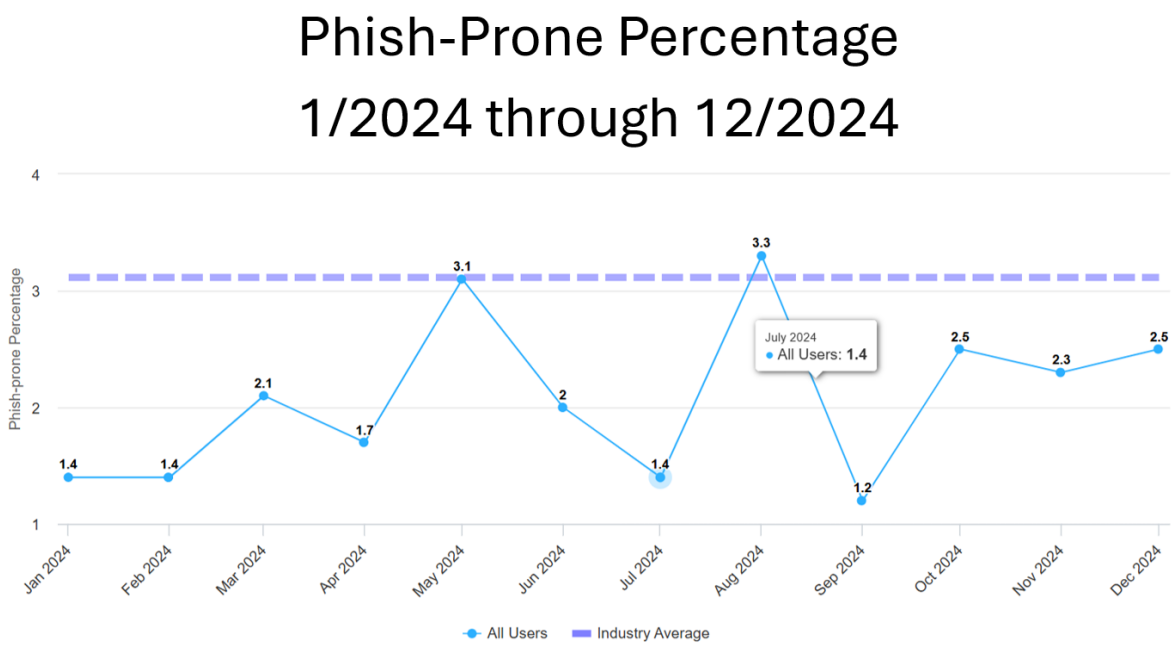
2.2.1. Several factors likely explain who is a likely target of ransomware:

Limited cybersecurity resources: Small organizations typically operate with constrained budgets and can't afford dedicated IT security teams or comprehensive security infrastructure. They often rely on basic antivirus software rather than enterprise-grade security solutions with advanced threat detection and response capabilities.

Outdated systems and poor patch management: Smaller organizations frequently run older software and operating systems that may no longer receive security updates. They also tend to have inconsistent patch management practices, leaving known vulnerabilities unaddressed for extended periods.

Less sophisticated backup strategies: While larger organizations typically maintain robust, tested backup systems with offline copies, small organizations often have inadequate backup procedures. Their backups may be connected to the network (making them vulnerable to encryption), infrequently tested, or stored in ways that don't enable quick recovery.

Higher employee vulnerability: Small organizations usually provide less comprehensive cybersecurity training to employees. Staff may be more likely to fall for phishing emails, download malicious attachments, or engage in risky online behavior that serves as an entry point for ransomware. LRD regularly engages with employees with regular training on various cybersecurity topics including phishing and social engineering. Additionally, employees are tested with simulated phishing emails to test whether the knowledge gained in training helped them identify phishing emails. See the below graph of LRD employees average phish-prone percentage over time. *Note: Phish-prone percentage is the calculated likelihood a employee would click on a real phishing email*



Weaker network segmentation: Large organizations typically implement network segmentation to contain threats, while small organizations often have flat network architectures where ransomware can spread more easily once it gains initial access.

Cost-benefit calculations by attackers: Cybercriminals often view small organizations as easier targets that require less sophisticated attack methods. Even if individual ransom payments are smaller, the higher success rate can make these attacks more profitable overall.

Limited incident response capabilities: When ransomware strikes, small organizations often lack the expertise and resources to respond effectively, making them more likely to pay ransoms rather than attempt recovery through other means.

This vulnerability gap has made small and medium-sized businesses increasingly attractive targets for ransomware operators seeking the path of least resistance. Breaches involving the human element remain about 60% of breaches while software vulnerabilities accounted for only 30%

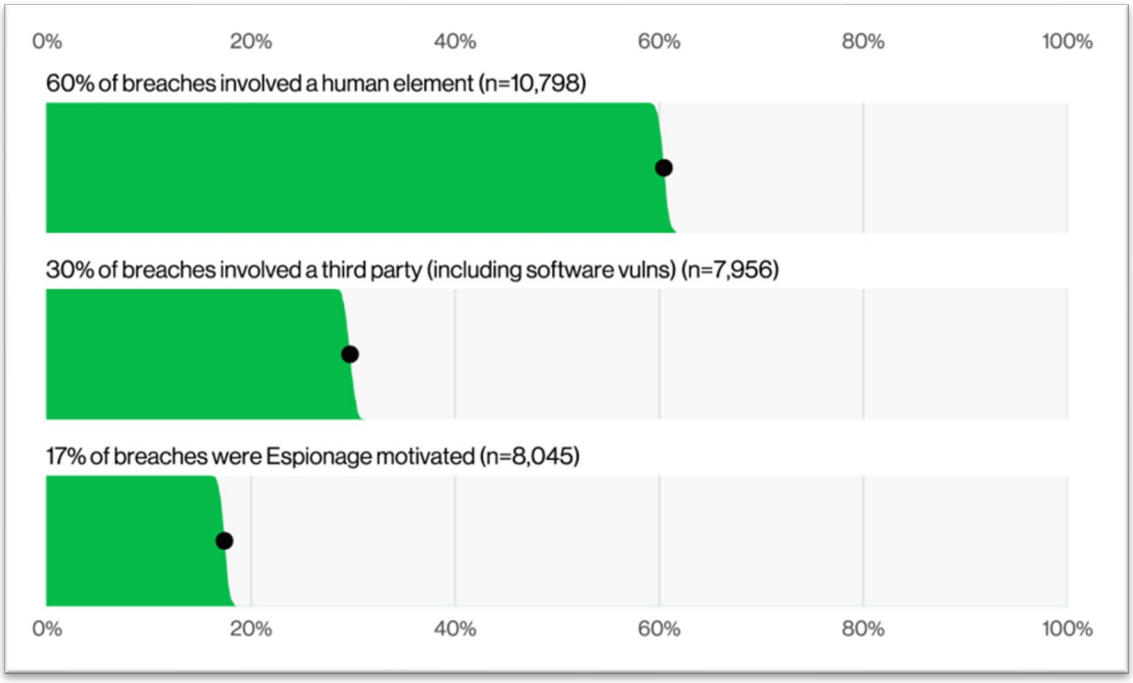


Figure 3 - Breakdown of breaches by Type (Verizon Business)

2.3. How about the unintended consequences of using AI/Machine Learning (ML) systems?

AI and machine learning can create several unintended consequences for data governance, often by introducing new complexities that traditional governance frameworks weren't designed to handle. These “loopholes” could allow easy data exfiltration and/or compliance issues where proper data governance should have been applied. Exploitation of poor data governance can lead to similar consequences of ransomware or other cyber attacks.

2.3.1. Several factors likely explain why AI/ML can be harmful for data:

Automated Data Proliferation ML systems often automatically generate, copy, and transform data at scale without human oversight. This can lead to data sprawl where organizations lose track of what data exists, where it's stored, and how it's being used. Traditional data catalogs and lineage tracking become insufficient when dealing with automated feature engineering, model outputs, and derived datasets.

Erosion of Data Quality Controls ML models can inadvertently mask data quality issues by learning to work around poor data, making problems less visible to human operators. Models might compensate for missing values, outliers, or inconsistencies in ways that hide underlying data integrity issues. This creates a false sense of security regarding data quality.

Compliance Blind Spots AI systems can inadvertently violate privacy regulations by using personal data in ways that weren't explicitly consented to. For example, a model trained on customer purchase data might inadvertently infer sensitive attributes like health conditions or financial status, creating new categories of personal data that weren't originally governed.

Loss of Interpretability Complex ML models can make it difficult to understand how decisions are made, which undermines audit trails and accountability requirements. This "black box" problem makes it challenging to demonstrate compliance with regulations that require explainable decision-making.

Unauthorized Data Access ML systems often require broad access to data for training and inference, which can break down traditional access controls. Data scientists and automated systems may gain access to sensitive information they don't actually need, violating an important principle of least privilege.

Model Drift and Governance Lag As models evolve and retrain automatically, the data they use and the decisions they make can shift over time. Governance policies may become outdated or irrelevant without regular review and updates, creating gaps between policy and practice.

The key challenge is that AI systems operate at speeds and scales that can outpace traditional governance processes, requiring new approaches to maintain control and compliance.

3. Conclusions

Cybersecurity is a top focus of many organizations due to the likeliness of being affected by an incident. Everyone within the organization has an important role to play to ensure that information technology systems and data are used correctly and business operations continue. The District should continue to make continuous incremental improvements where possible in areas that improve our security posture. Those areas include security awareness training, lifecycle replacement of all technology, and regular updates to security practices.

4. References

Crypto Ransomware 2025: 35.82% YoY Decrease in Ransomware Payments

Worldwide Ransomware, 2024: Increasing Rate of Attacks Tempered by Law Enforcement Disruptions

2025 Data Breach Investigations Report Verizon Business

5. Cybersecurity SWOT Analysis

Strengths: (internal)

a. Strong cybersecurity defense systems and protocols are in place as reflected by multiple independent assessments by Palm Beach County ISS and the Risk and Resiliency consultants.
b. Board and management support to make investments in best-in-class defense and recovery systems.
c. Effective staff training and resulting behavior better than industry standards.
d. Use of the latest technology to facilitate process workflow improvements for staff.

Weaknesses: (internal)

a. Opportunities to improve disaster recovery and business continuity planning
b. Staff mistake/error remains the greatest challenge, particularly for new employees.
c. We lack a comprehensive list of all technology assets with associated upgrade and/or replacement schedule.

Opportunities: (external)

a. Automation/ML for continuous response: more real-time threat responses from managed systems such as firewalls and threat prevention systems.
b. Continued partnerships with top-tier consultants and vendors such Palo Alto Networks, HPE, and Microsoft.

Threats: (external)

a. Constant, rapidly evolving cybersecurity threats.
b. Reliance and trust on external system/cloud providers to protect our most sensitive data (ex. customer banking information).
c. AI-powered attacks: automated and unmanned attack generation that doesn't rest until an objective is reached.
d. Price increases: both hardware and software are very susceptible to price increases due to economic factors. Integration of emerging technologies or Internet of Things: devices that have not been traditionally managed or connected with network and technology.

LRECD WWTF – Regulatory Outlook

1.0 Introduction

Understanding the regulatory landscape surrounding the District's wastewater treatment facility (WWTF) is critical for ensuring continued compliance, operational efficiency, and environmental protection. Additionally, meeting more stringent regulatory standards may result in costly facility upgrades or operational adjustments. Wastewater treatment facilities must operate within a complex and evolving framework of federal, State, and local regulations that influence nearly every aspect of system design, process performance, and end-use practices. In particular, several key regulatory areas are increasingly shaping the expectations and responsibilities of facility operators. These include effluent quality and treatment standards aimed at protecting surface and groundwater resources, requirements for public access reuse that govern how treated effluent is distributed and used, regulations surrounding the treatment and land application of biosolids, and growing concerns about per- and polyfluoroalkyl substances (PFAS), which present emerging compliance and liability risks. Evaluating current facility conditions in the context of these regulatory domains is essential for strategic planning purposes. As environmental regulations continue to tighten and public scrutiny increases, proactive assessment and planning will be vital to ensuring permit compliance, protecting public health, and supporting sustainable wastewater management practices.

2.0 WWTF Background

Loxahatchee River Environmental Control District (District) owns, operates, and maintains a regional wastewater treatment facility (WWTF) located on a 160-acre site in Jupiter, Florida. The District serves the municipalities of Jupiter, Tequesta, Juno Beach, along with the unincorporated areas of northern Palm Beach County and southern Martin County. Domestic wastewater from residential and non-residential customers located within the District's service boundaries is conveyed to the WWTF by the District's wastewater collection system.

The District's WWTF is permitted under FDEP Permit No. FL0034649MA and has a rated capacity of 11.0 million gallons per day (MGD) on an annual average daily flow (AADF) basis. At the present time, it is anticipated that the District's service area is nearing build-out conditions. As such, expansion of the District's WWTF in the future is not anticipated in the near future. The existing WWTF processes include preliminary screening, influent flow equalization, aerobic activated sludge treatment, secondary clarification, tertiary filtration, and high-level disinfection using a concentrated chlorine solution. The District's existing

treatment processes are currently not designed or capable of meeting advanced wastewater treatment (AWT) standards. The potential need to meet AWT standards will be discussed in subsequent sections.

Following disinfection, IQ Water is discharged to IQ storage pond/lakes located at the WWTF site, where it is blended with up to 3.0 MGD of nano-concentrate received from the Town of Jupiter as a byproduct of its membrane softening treatment process. The total combined storage capacity of the stabilization ponds and lakes is approximately 137.5 MG.

IQ water is pumped offsite using one of two IQ water pumping stations. IQ-511 is the primary reclaimed water distribution pump station which conveys IQ water to twelve (12) offsite reclaimed water application sites. IQ-512 conveys reclaimed water to the western service area which includes one (1) offsite reclaimed water application site. IQ water is generally pumped from the WWTF and discharged into offsite IQ storage lakes. IQ water is then applied, as needed, by dedicated irrigation pump stations located at each of the offsite storage lakes. The offsite storage lakes and associated irrigation pump stations are owned, operated, and maintained by the respective reclaimed water application site owners. The District owns, operates, and maintains one offsite pumping station (IQ-518) which distributes IQ water to specific application sites within the Abacoa Community including Roger Dean Stadium. The District does not own, operate or maintain the offsite lakes within the Abacoa community. A summary of the reclaimed water application sites is presented in **Table 1**.

Table No. 1 – Reclaimed Water Major User List

Site Number	User Name	User Type	Capacity (MGD)	Acreage
PAA-01	Abacoa	Mixed Use	4.00	807
PAA-02	Admirals Cove	Golf Courses	1.40	350
PAA-03	Bears Club	Golf Courses	0.50	141
PAA-04	Golf Club of Jupiter	Golf Courses	0.34	85
PAA-05	Jonathan's Landing	Golf Courses	0.48	120
PAA-06	Jupiter Country Club	Golf Courses and Residential Areas	0.90	260
PAA-07	Jupiter Hills	Golf Courses and Residential Areas	1.2	253
PAA-09	Loxahatchee Club	Golf Courses and Residential Areas	0.65	130
PA-11	Trump International	Golf Courses	0.50	100
PAA-12	Riverbend	Golf Courses	0.40	100
PAA-13	Tequesta Country Club	Golf Courses	0.50	125
PAA-14	Turtle Creek	Golf Courses	0.55	138
		Total:	**11.42**	**2,712**

A comparison of the locations of each of the District's reclaimed water users with FDEP's interactive GIS interface for "Impaired Waters, Total Maximum Daily Load and Basin Management Action Plans" indicates that seven (7) of the twelve (12) application sites are located within areas which are subject to a Pollutant Reduction Plan (PRP). This PRP, entitled "Loxahatchee River Pollutant Reduction Plan" was voluntarily and proactively developed by various Stakeholder entities, including the District, with the focus on restoring water quality through the Loxahatchee River watershed. The PRP was also developed in an effort to avoid the unnecessary development of a Total Maximum Daily Load (TMDL) for the parameters of concern and/or the incorporation of the application areas into a Basin Management Action Plan (BMAP), which would likely result in more stringent treatment standards. The parameters of concern include dissolved oxygen saturation, chlorophyl-a and algal mats, all of which are directly related to total nitrogen and total phosphorous loading.

The District's current operating permit also allows for the intermittent discharge of reclaimed water into two distinct Management and Storage of Surface Water (MSSW) systems located within the Abacoa Community and Jupiter Country Club during wet weather events. The Abacoa Community MSSW system discharges at outfall D-002 to EPB2 canal (class III freshwaters) which intermittently overflows to the Intracoastal Waterway (ICWW) via the Lake Worth Creek. This receiving waterbody (WBID# 3226W1) is on FDEP's verified list of impaired water bodies due to elevated concentrations of copper. This outfall is not located within the limits of the previously discussed PRP. The Jupiter Country Club MSSW system discharges at outfalls D-003 and D-004 to South Florida Water Management C-18 Canal, which is part of the Loxahatchee River watershed. These outfalls are located within the limits of the previously discussed PRP.

The District's WWTF is also equipped with a deep injection well (DIW) system which is permitted by FDEP UIC Permit No. 324728-002-UO/IX, as a secondary effluent disposal method. The DIW system is used during wet weather events when the onsite reclaimed storage is at capacity or in the event of a process upset. The injection zone of the DIW is approximately 2,839 to 3,500-ft below grade. This injection zone, which is defined as the "boulder zone" is directly beneath the lower Floridan Aquifer confining layer which extends approximately 650-ft below the lower limits of the Floridan Aquifer system.

Biosolids at the District's WWTF are conveyed to an aerated biosolids storage tank and then subsequently dewatered using two (2) belt filter press units to 14 to 16% solids. Due to the limited tank volume and relatively short detention time within the tank, there is no meaningful amount of digestion which occurs within the tank. The dewatered biosolids are then hauled offsite, using a contracted hauler, to the Solid Waste Authority (SWA) Biosolids Processing Facility (BPF). The dewatered biosolids are dried at the BPF using indirect

thermal drying units, which dry the biosolids to a minimum 90% solids. This drying process produces a pelletized product which meets all requirements stipulated by FDEP to be classified as Class AA, including pathogen and vector reduction requirements. The pelletized biosolids product is then land applied as a fertilizer or a soil amendment.

3.0 Current Regulatory Requirements

In general, there are a total of three (3) main areas of regulatory focus at the District's WWTF. These areas include:

- Secondary Effluent Water Quality Standards – Deep Injection Well
- Reclaimed Water Quality Standards - Public Access Reuse
- Biosolids Treatment and Disposal

The following sections provide an overview of the current regulations applicable to the District's wastewater treatment facility.

3.1 Secondary Effluent Water Quality Standards

The District's WWTF is currently permitted to meet secondary effluent water quality standards in accordance with Chapter 62-600, F.A.C. for all effluent disposed of to its Class I (i.e. municipal/domestic) DIW as presented in **Table 2.**

Table No. 2 – Secondary Effluent Water Quality Standards

			Reclaimed Water Condition		Monitoring Requirements		
Parameter	Units	Max. /Min	Limit	Statistical Basis	Frequency of Analysis	Sample Type	Monitoring Site Number
Flow	MGD	Max Max	18.65 Report	Max. Hourly Rate Monthly Average	Continuous	Recording Flow Meter with Totalizer	FLW-03
BOD, Carbonaceous 5 day, 20C	mg/L	Max Max Max Max	20.0 30.0 45.0 60.0	Annual Average Monthly Average Weekly Average Single Sample	5 Days/Week	24-hr FPC	EFF-03
Solids, Total Suspended	mg/L	Max Max Max Max	20.0 30.0 45.0 60.0	Annual Average Monthly Average Weekly Average Single Sample	5 Days/Week	24-hr FPC	EFF-03
pH	s.u.	Min Max	6.0 8.5	Single Sample Single Sample	Continuous	Meter	EFF-03

Note: Excerpt from District's FDEP Operating Permit No. FL0034649MA

The District is currently not required to perform any level of disinfection of secondary effluent that is disposed of to the DIW system. Based on the current regulatory requirements and

treatment standards, the District is currently capable of consistently and reliably meeting all requirements for the continued use of its deep injection well system.

3.2 Reclaimed Water Quality Standards

The District's WWTF is currently permitted to meet reclaimed water quality standards in accordance with Chapter 62-610, F.A.C. for all reclaimed water distributed for public access reuse. Public access refers to areas which are intended to be accessed by the general public including golf courses, cemeteries, parks, landscape areas, hotel, highway medians and the like. Public access reuse is also permitted to be applied at residential properties. A summary of the reclaimed water standards is presented in **Table 3**.

Table No. 3 – Reclaimed Water Quality Standards

			Reclaimed Water Limitations		Monitoring Requirements		
Parameter	Units	Max. /Min	Limit	Statistical Basis	Frequency of Analysis	Sample Type	Monitoring Site Number
Flow (Reclaimed Water)	MGD	Max Max	Report Report	Annual Average Monthly Average	Continuous	Calculated	CAL-02
BOD, Carbonaceous 5 day, 20C	mg/L	Max Max Max Max	20.0 30.0 45.0 60.0	Annual Average Monthly Average Weekly Average Single Sample	5 Days/Week	24-hr FPC	EFA-02
Solids, Total Suspended	mg/L	Max	5.0	Single Sample	Daily; 24 hours	Grab	EFB-02
Coliform, Fecal	#/100mL	Max	25	Single Sample	Daily; 24 hours	Grab	EFA-02
Coliform, Fecal, % less than detection	percent	Min	75	Monthly Total	Daily; 24 hours	Calculated	CAL-03
pH	s.u.	Min Max	6.0 8.5	Single Sample Single Sample	Continuous	Meter	EFA-02
Chlorine, Total Residual (For Disinfection)	mg/L	Min	1.0	Single Sample	Continuous	Meter	EFA-02

Note: Excerpt from District's FDEP Operating Permit No. FL0034649MA

In accordance with Chapter 62-610.450, reclaimed quality water used for public access reuse purposes is required to receive high-level disinfection. Per Chapter 62-600.440(6), high-level disinfection requires a total chlorine residual of 1.0 mg/l to be maintained at all times, with a minimum acceptable CT of 25 at the peak hour flow condition. The CT is determined by multiplying the minimum residual maintained by the hydraulic retention time. The District's WWTF is currently equipped with the required infrastructure and equipment, to consistently and reliably meet all reclaimed water quality standards based on current regulatory requirements and treatment standards.

3.3 Biosolids Treatment and Disposal Regulations

Biosolids management in Florida is regulated by FDEP under Chapter 62-640, F.A.C. In recent years, there has been a drastic shift in the policies related to the management and disposal of biosolids within the State of Florida. This shift has been largely driven by mandates to reduce nutrient runoff from land applied biosolids, which can cause algal blooms and significantly degrade the water quality of adjacent water bodies. Previous legislative changes, specifically Florida SB 712 (2020) entitled "Clean Waterways Act", resulted in a significant increase in regulatory oversight and program requirements. The bill required all biosolids land application sites to obtain individual permits and to submit a Nutrient Management Plan (NMP), amongst other regulatory burdens. As a result of these changes, the number of available land application sites for Class A and Class B biosolids has significantly decreased in recent years. This decrease has resulted in higher disposal costs due to limited permitted sites and longer hauling costs to access these sites. Fortunately, the District currently treats all biosolids generated at their WWTF to Class AA standards. Class AA standards are the highest quality level achievable in Florida. This allows for broader land application uses, including public contact sites and commercial sale.

Class AA biosolids meet the following standards:

- Pathogen Reduction – meets standard via heat drying to 90% solids
- Vector Attraction Reduction – meets standard via heat drying to 90% solids
- Metals – Must meet both the ceiling concentrations and monthly average limits. These metals include: arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc
- No Use Restrictions – Application sites are not required to be individually permitted by FDEP or an approved Nutrient Management Plan (NMP). Product can be sold commercially.

Based on the above, the District is well positioned for the future, barring further restrictions on the land application of biosolids due to potential regulations associated with PFAS compounds, which will be discussed in subsequent sections.

4.0 Potential Regulatory Requirements and Impacts

Florida's current regulatory focus for the disposal of treated effluent and biosolids is nearly exclusively centered around two primary areas of concern: nutrient reduction and emerging contaminants, particularly per- and polyfluoroalkyl (PFAS) compounds. A summary of potential and/or future regulatory requirements which would significantly impact the District's treated effluent and biosolids treatment process and limitations is presented herein.

4.1 Nutrient Reduction Regulatory Requirements

4.1.1 Effluent Disposal

Florida's regulatory framework for wastewater effluent disposal is increasingly focused on nutrient management, with a clear and accelerating push for advanced wastewater treatment (AWT). The Districts WWTF currently disposes of treated effluent via public access reuse and a deep injection well, both of which require compliance with either reclaimed or secondary treatment standards as a minimum. However, the regulatory landscape is shifting, creating a strong potential for more stringent nutrient limits.

- The most significant regulatory challenge which the District could face is the requirement for advanced wastewater treatment (AWT). While the District service area is not currently part of a Basin Management Action Plan (BMAP) or Reasonable Assurance Plan (RAP) area, it is within the limits of an existing PRP which is intended to reduce and mitigate impacts related to nutrient loading. Depending on the success, or lack thereof, of the mitigation measures outlined in the PRP it is conceivable that FDEP could mandate that a BMAP be created and implemented for the District's service area. This is significant because per Chapter 403.086, F.S., any wastewater treatment facility providing reclaimed waters to areas located within a BMAP, which FDEP determines to be a contributing to the nutrient impairment within the BMAP, are required to meet AWT standards for total nitrogen and total phosphorous. Any such facility would be required to meet these more stringent standards within 10 years of the BMAP being established.

- Of particular interest, Chapter 403.086, F.S. was updated in 2024 to mandate that any sewage disposal facility discharging to the Indian River Lagoon BMAP is now required to meet AWT standards within 10 years. This statute revision became effective on July 1, 2025. Based on a review of the geographical limits of the BMAP the District does not appear to be affected, but it certainly demonstrates FDEP's continued push toward nutrient reduction limits within South Florida. This statutory change illustrates

the potential for FDEP to mandate similar AWT requirements within the District's service area.

- Florida Senate Bill 978, which was presented during the 2025 legislative session, aimed to create a statewide priority ranking for wastewater facilities to meet AWT standards. While the bill did not pass, its introduction and progression through committees demonstrate a strong legislative interest in addressing nutrient pollution. This bill would have mandated the upgrade of all sewage disposal facilities with a permitted capacity greater than 1.0 MGD to AWT standards. The bill's failure does not eliminate the likelihood that AWT standards will be mandated at some point in the future; rather, it indicates a higher likelihood that similar legislation will be introduced in future sessions. This signals a clear intent that the legislature intends to push for AWT across the State.

4.1.2 Biosolids

While there is currently no active legislative efforts to further restrict the land application of biosolids to Class AA biosolids, the potential remains that further restrictions could be on the horizon. Future regulations could conceivably require all land-applied biosolids, including Class AA, to be accompanied by a comprehensive Nutrient Management Plan which would specify specific application rates of nitrogen and phosphorus. This could lead to a significant reduction in the amount of biosolids that can be applied per acre, effectively increasing the land area needed for disposal and potentially raising operational costs. The continued legislative interest in water quality improvement and the FDEP's efforts to minimize nutrient migration to waterbodies suggest that a re-evaluation of nutrient management for all biosolids classes in the future is probable.

4.2 PFAS Regulatory Requirements

Per- and Poly-fluoroalkyl Substances (PFAS) represent a significant and rapidly evolving regulatory concern. These "forever chemicals" are not effectively removed by conventional wastewater treatment and present a risk for both effluent and biosolids disposal, as these contaminants include known carcinogens.

4.2.1 Effluent PFAS

- FDEP Groundwater Cleanup Levels are a clear indication of Florida's intent to regulate PFAS is the FDEP's establishment of provisional groundwater cleanup target levels (GCTLs) for PFOA and PFOS. These GCTLs, developed in accordance with the methodology in Chapter 62-777, F.A.C., serve as enforceable guidance for remediation efforts. The existence of these specific, enforceable cleanup levels is a

strong indicator that the FDEP is laying the groundwork for a formal regulatory framework for PFAS across all environmental media.

- A major driver for future effluent regulations is the U.S. EPA's finalization of the National Primary Drinking Water Regulation for PFAS on April 10, 2024. This landmark rule sets legally enforceable Maximum Contaminant Levels (MCLs) for six PFAS compounds in public drinking water, including a 4.0 parts per trillion limit for PFOA and PFOS. While this rule applies to drinking water systems, it creates a powerful regulatory impetus to control PFAS sources, including wastewater discharges. It is highly likely that enforceable effluent limits will be established, particularly for facilities discharging upstream of drinking water sources or to groundwater, which would necessitate significant investments in advanced treatment technologies such as granular activated carbon (GAC) or ion exchange. It should be noted, however, that on May 14, 2025, the EPA announced its intent to rescind and reconsider parts of this regulation, which could introduce a degree of uncertainty regarding the final scope and timing of these rules.

- Florida Legislative Intent: CS/SB 1692, which was presented during the 2024 legislative session, sought to address the issue of contaminants of emerging concern, specifically PFAS and 1,4-dioxane, from discharging into the State's wastewater facilities and waterways. The bill required FDEP to provide guidance to WWTFs with industrial pretreatment programs and mandated that facilities inventory industrial users who are probable sources of PFAS. It also provided for the enforcement of new pretreatment standards with interim discharge limits. Although not enacted, this bill reflects a strong legislative and regulatory direction that will likely be revisited in future sessions.

4.2.2 Biosolids PFAS

- The land application of biosolids, including Class AA product, is also facing substantial regulatory threats from PFAS. The current Florida regulations under Chapter 62-640, F.A.C., primarily focus on nutrient management and pathogen reduction, with no specific limits for PFAS. However, the EPA's focus on PFAS contamination, as evidenced by both the new drinking water regulations and the FDEP's groundwater cleanup levels, is expected to lead to the creation of formal federal regulations on PFAS in biosolids under the Clean Water Act.

- The most significant threat to the District’s biosolids management program comes from the federal level. The EPA's Draft Sewage Sludge Risk Assessment for PFOA and

PFOS, issued in January 2025, concluded there may be human health risks from land-applied biosolids. This risk assessment is a critical precursor to the EPA proposing formal federal regulations under the Clean Water Act to set enforceable PFAS limits for biosolids. The establishment of these limits could potentially directly impact the District's biosolids management program. As PFAS tends to accumulate in biosolids, it is highly probable strict regulatory limits would be set. Fortunately, the analytical results of the District's quarterly PFAS sampling events indicate that the concentrations of PFAS in biosolids are low and limited to a handful of compounds.

5.0 SWOT Analysis for the District's WWTF

A SWOT analysis is a strategic planning tool used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or business. It's a structured method for assessing an organization's current position and developing a strategic plan for the future.

The following SWOT analysis outlines the District's strengths, weaknesses, opportunities, and threats related to the current and future regulatory requirements affecting the District's WWTF.

5.1 Strengths (Internal)

- Existing Infrastructure: The District currently employs a conventional activated sludge treatment process with secondary clarification and deep bed filters. This established infrastructure is a solid foundation which generally meets the current regulatory requirements for disposal of treated effluent to both the public access reuse sites and the DIW system.

- Deep Bed Filters: The presence of deep bed filters is a significant strength. They allow the facility to meet the stringent TSS < 5 mg/L requirement for public access reuse and, as noted, have the potential to be upgraded for denitrification, a critical component of future AWT standards.

- Dual Effluent Disposal Methods: The WWTF has a primary (public access reuse) and a secondary (deep injection well) disposal method. This operational redundancy provides flexibility and resilience. If one method becomes unavailable due to maintenance or regulatory changes, the District can divert flow to the other, ensuring uninterrupted treatment and disposal.

- Class AA Biosolids Management Program: The production of Class AA biosolids for use as a fertilizer or soil amendment is a major strength. This program generates a

valuable product, avoids the regulatory hurdles associated with Class A and B biosolids, and provides a sustainable and cost-effective disposal method.

- Current Non-BMAP Status: The facility is currently not located within the limits of an existing Basin Management Action Plan (BMAP) or Reasonable Assurance Plan (RAP) area. As such, the facility is not yet required to meet advanced wastewater treatment (AWT) standards for nutrients.

5.2 Weaknesses (Internal)

- Current Treatment Process Vulnerabilities: The District's current treatment process configuration is a fully aerobic process with a limited solids retention time (SRT) which is susceptible to the formation and propagation of filamentous organisms and associated sludge bulking issues. These issues can make the treatment process vulnerable to upset during periods of high organic loading, which could impact the District's ability to meet current regulatory treatment standards.

- PFAS Source Control: The District has a well-defined industrial pretreatment program, but the program does not currently have defined processes and procedures to identify and mitigate the potential introduction of PFAS compounds from industrial sources into the plant which could result in pass-through or interference of the existing WWTP treatment process.

- Aging Infrastructure: As with many long-standing facilities, there is a risk of aging infrastructure. The District will need to ensure that the existing plant and its components are well-maintained to continue meeting current operational demands while planning for future upgrades.

5.3 Opportunities (External)

- Implement Strategic WWTP Process Improvements: To improve the resiliency of the existing wastewater treatment process, the District should evaluate and implement targeted treatment process upgrades for the control of filamentous organisms and sludge bulking within the secondary clarification process. These improvements will improve system resiliency, enhance system reliability and ensure consistent regulatory compliance.

- Critical Program Updates for PFAS Source Control: To mitigate potential impacts from the introduction of PFAS compounds at the District's WWTP and the resulting downstream effects, the District needs to develop and integrate specific processes

and procedures to proactively mitigate the potential for these compounds to be introduced into the District's collection system at their source. These processes and procedures should become an integral part of Chapter 31-13, entitled "Regulation of Sewer Use" and/or the District's industrial pretreatment (IPT) program.

- Regimented PFAS Sampling Program: Implementing a regimented PFAS sampling program will allow the District to proactively prepare for evolving regulations by establishing baseline data, identifying potential sources, and assessing risks in treated effluent, biosolids, and reclaimed water. This approach supports regulatory compliance, informs treatment and investment decisions, enhances transparency with stakeholders, and reduces legal and financial liabilities. By monitoring PFAS consistently, the utility positions itself as a responsible environmental steward while gaining valuable insight to guide future operational and capital planning.

  Proactive Planning for WWTP R&R: Improving the level of detail in the District's annual rate study will enhance the District's ability to proactively plan for the rehabilitation and repair of critical infrastructure at the WWTP. A more detailed analysis provides a clearer understanding of system needs, prioritizes investments based on risk and asset condition, and ensures that rates are aligned with long-term capital and operational requirements. This approach supports financial sustainability, minimizes the likelihood of unexpected failures, and helps build transparency and trust with stakeholders by clearly linking rates to the ongoing maintenance and reliability of essential infrastructure.

5.4 Threats (External)

- Mandatory AWT Standards: The possibility exists for FDEP to designate all or a portion of the District's service area as part of an impaired watershed, triggering the development of a Basin Management Action Plan (BMAP). If established, the BMAP would mandate compliance with more stringent nutrient reduction targets requiring costly upgrades to the WWTP processes to meet advanced wastewater treatment (AWT) standards. This could place a significant financial and operational burden on the District. If established, the District would have ten (10) years from the date of the BMAP being established to make the necessary upgrades.

- Mandatory PFAS Limits: PFAS regulations are expected to have significant impacts on domestic wastewater utilities in Florida, requiring increased monitoring, reporting, and potential upgrades to treatment processes to meet stricter discharge limits. Utilities may face new constraints on biosolids management if land application is

restricted due to elevated PFAS levels, leading to the need for alternative disposal methods. These changes will likely result in higher operational and capital costs, increased regulatory and legal risk, and added complexity in permitting, compliance, and pretreatment programs. While these regulations aim to protect public health and the environment, they also present financial and logistical challenges.

- Aging WWTP Infrastructure: Aging infrastructure at a domestic wastewater treatment plant can lead to reduced treatment efficiency, increased risk of mechanical failures, and higher maintenance and operating costs. As equipment and structures deteriorate, the plant may struggle to meet regulatory requirements, increasing the risk of permit violations, environmental harm, and public health concerns. Additionally, aging systems often lack the capacity or flexibility to handle growth, extreme weather, or emerging contaminants, placing further strain on operations and finances. Delaying infrastructure investment can escalate long-term costs and increase the likelihood of disruptive system failures.

An abbreviated summary of the previous SWOT analysis is presented in **Table 4** below.

Table 4 – LRECD WWTF Regulatory Outlook - SWOT Analysis Summary

Category	**Strengths (Internal)**	**Weaknesses (Internal)**
Internal	- Established conventional activated sludge process with deep bed filters	- Existing treatment process is vulnerable to potential upset which could impact District's ability to meet current regulatory treatment standards
	- Dual effluent disposal methods (public access reuse and deep injection well)	- No established process or procedure to address PFAS source control
	-Currently not in a BMAP / RAP area requiring treatment to AWT standards	- Aging WWTP infrastructure and equipment
	- Biosolids treatment methodology meets Class AA standards.	
External	**Opportunities (External)**	**Threats (External)**
	-Evaluate and implement targeted treatment process upgrades for filamentous control and sludge bulking to enhance system reliability and regulatory compliance	- Potential establishment of BMAP requiring mandatory AWT standards
	-Enhance PFAS source control through targeted industrial pretreatment program improvements aligned with regulatory best practices.	- Potential restrictions or prohibition of reclaimed water and/or biosolids land application from future PFAS regulations
	- Improve rate study level of detail to proactively plan for system R&R	- Aging infrastructure threatens reliable compliance with domestic wastewater treatment regulations
	- Maintain a rigorous sampling program to proactively position the District for potential future nutrient and PFAS effluent regulations	

Customer Service Department Status Update

Introduction

Over the past two years, the Customer Service Department has come through significant changes brought about, in large part, from issues that were summarized in the 2018 Strategic Planning Exercise. The most notable change is the switch to a new Customer Information and Billing System (CIS), which also brought with it a new payment services provider. The transition was more laborious than imagined, but we have come through the storm, and the District is now well positioned with a US-owned company that is actively developing and improving their functional software. Here we summarize our current position strengths and weaknesses, and the projected trends for improving service to our customers.

Current Position

1. **Strengths (Internal)**
    a. Customer Information & Billing System (CIS) - Our new CIS (Edmunds) is provided by a US-owned/based company that is actively developing and improving. The transition was very challenging and delayed by one year, but the new system is functioning well and has brought significant improvements in efficiency and features.
    b. Payments –
        i. Prior to our switch to the new payments provider, the single most requested improvement from our customers was to accept American Express for payments. While this payment option was not part of our original contract with the new provider, it was added to our payments system for no additional cost.
        ii. Front desk card payment technology – our new payment device utilizes the latest technology such as a card chip reader, Apple Pay, Google Pay and tap to pay.
    c. Estoppel Process – With our transition to Edmunds we were able to develop a new online estoppel (or account status) request system that greatly improves staff efficiency by capturing key property information and the payment from the requestor, then it creates a pre-populated form for our staff to review, finalize and return.
    d. Email Notifications – With Edmunds we can efficiently send broadcast emails to all, or a subset, of our customers.
    e. Commercial Billing Options – In the past, a commonly requested option from our commercial customers was to compute the quarterly sewer bill based on the 3-month total water usage, rather than the current, default calculation based on the

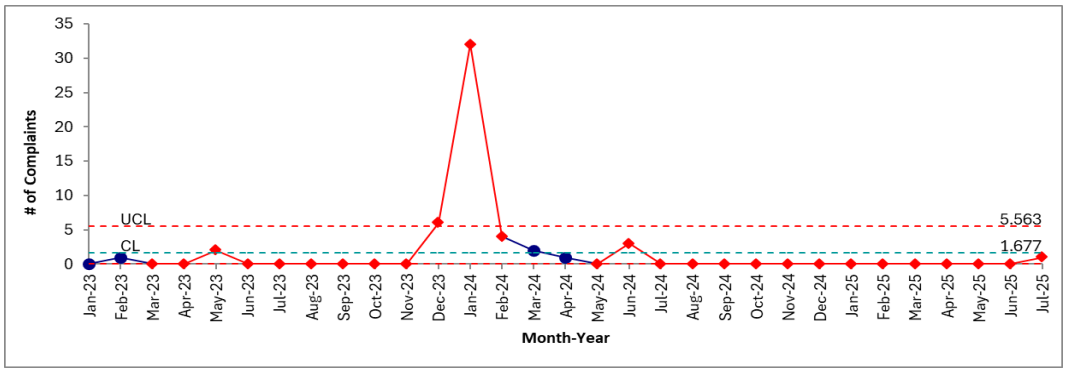
12-month average water usage. Our new CIS now offers the option to bill by either calculation method, and the Board approved a policy to manage the transitions.

f. Online Bill Pay and Check Processing – To improve the efficiency of processing payment from our customers using their bank's online bill pay service and paper checks, we now utilize a service that consolidates the online payments and a check scanner. This system facilitates reconciling and loading of the payment data to the customer's account, and simplifies bank deposits. This is a major efficiency improvement.

g. New Printing & Mailing Provider – After our previous bill printing and mailing provider abruptly went out of business this year, we are fully implemented with a new provider that is providing exceptional service.

h. Staff Cohesion – The Customer Service Team cohesion is excellent.

i. Survey Results – Disappointingly, following the transition to our new payments system, and the frustrations for some of our autopay customers, our customer satisfaction scores suffered. However, we have worked through the transition and survey results over the past 12 months have improved to pre-transition levels (i.e. one complaint over the past year).



Statistical Process Control (SPC) chart of customer complaints between January 2023 and July 2025. The high frequency of complaints in Dec and Jan 2024 coincides with frustrations for our customers trying to set up AutoPay in the new payments system. Major improvements to the payments system were released in Mar 2025.

j. Documentation – The procedures documentation developed through our transition to the CIS are excellent and consist of over 100 procedure documents.

2. Weaknesses (internal)

a. Payments System Limitations – Our transition to a new payment service provider brought several unanticipated, but significant, limitations including:

i. The inability to set up autopay, or modify credit/debit card information, on behalf of the customer;

ii. When taking a payment over the phone, our staff needs to retype billing address information which results in longer call times;

iii. We do not have the ability to save card or bank information with the customers approval to speed the next payment call;

iv. Limited/vague notifications to customers or staff about failed transactions.

v. Inability for customers to setup monthly recurring payment to satisfy a payment plan.

We do not have a contract mechanism to force the provider to resolve these issues in a timely manner because the RFP and agreement either 1) does not explicitly note that the feature was provided, or 2) was noted as not currently provided.

b. Online Bill Pay account correction issue – We have an ongoing issue, resulting from the account number change as part of our switch to Edmunds, that requires our staff to manually correct some of the account numbers on Online Bill Pay payments and hinders productivity. There is a feature to log the corrections and fix future issues, but the provider has not been able to fix it. Now that other, higher priority issues are resolved, we are hopeful that the provider will fix this.
c. Limited paperless contact information – We presently have email addresses for 65% of our customers. While we have mobile contacts for some customers, we do not have an enrollment system for the customer to grant permission for Text/SMS Messaging.

3. **Opportunities (external)**
    a. AI and Automation - With the District embracing the use of AI and Automation, there may be opportunities to improve efficiency and improve routine customer service processes.
    b. Proactive Communications – We may be able to capitalize on analytics within our new CIS, or by running our own analytics, to improve proactive notifications to our commercial customers about billing anomalies.
4. **Threats (external)**
    a. Transaction Costs – Credit/Debit Card and eCheck transaction costs are significant (~$120-130k per year). We are one of the few government entities that does not charge a transaction fee for Credit/Debit card transactions.
    b. Edmunds Contract Pricing – Our contract with Edmunds expires in February 2027 and will need to be renegotiated. We know that our current software pricing for the Customer Information System is based on revenue from their Payment Portal transaction fees that the District currently absorbs. There is uncertainty about the future pricing models whether we stay with Edmunds Payment Portal or switch to a different payment services provider. These will likely be challenging negotiations.

Projected Trends in Utility Customer Service

Over the next 5 to 10 years, sanitary sewer utilities are expected to undergo significant transformation in customer service, driven by technology, environmental pressures, and evolving customer expectations. Below are the key trends to watch and noted if *Currently Offered*:

1. Proactive Communication and Real-Time Updates

Utilities are increasingly adopting data-driven platforms to provide real-time updates on service disruptions, maintenance schedules, and emergency responses. This includes:

- Outage notifications with estimated restoration times
- Alerts for sewer overflows or backups
- Transparent communication about rate changes and infrastructure investments [1]
  Currently offered – projected rate changes are published in our Rules and typically noted on our bills when they take effect.

2. Integration of AI and Automation

The use of conversational generative AI (GenAI) is becoming central to customer service strategies. Applications include:

- AI-powered chatbots for 24/7 support
- Predictive analytics to anticipate service issues before they occur
- Automated workflows for billing, service requests, and complaints[2]

3. Customer-Centric Digital Platforms

Utilities are investing in user-friendly portals and mobile apps that allow customers to:

- Monitor usage and detect anomalies (e.g., leaks or blockages)
- Pay bills and manage accounts. *Currently offered*
- Submit service requests and track progress

4. Emphasis on Environmental Transparency

With growing public concern about sustainability, utilities are expected to:

- Communicate clearly about green infrastructure projects
- Report on carbon reduction and water reuse initiatives
- Engage customers in conservation efforts [1]

5. Personalized and Inclusive Service

Expect a shift toward personalized customer experiences, including:

- Multilingual support and accessibility features
- Tailored communication based on customer preferences
- Equity-focused programs for underserved communities

6. Enhanced Knowledge Management

Utilities are optimizing internal knowledge systems to:

- Improve first-contact resolution rates.
- Train staff more effectively. *Currently we have excellent documentation for training.*
- Support AI tools with accurate, up-to-date information [2]

7. Community Engagement and Trust Building

Utilities will focus more on building trust through:

- Community outreach and education programs. *Currently offered.*

- Transparent decision-making processes. *Currently offered*.
- Public dashboards showing performance metrics. *Currently offered*.

References

[1] Utilities Outlook 2025 | J.D. Power
[2] Top 5 Customer Service Trends and Priorities that Matter Most in 2025

Projected Trends in Payment Solutions

Over the next five years, sanitary sewer utilities are expected to adopt a range of innovative payment solutions to meet evolving customer expectations and improve operational efficiency. Here are the most significant and pertinent trends and noted if *Currently Offered*:

1. Real-Time Payments (RTP)

Real-time payment systems are gaining traction, allowing customers to pay bills instantly and receive immediate confirmation. This:

- Reduces late payments and service disruptions. *Currently offered*.
- Improves cash flow for utilities
- Enhances customer satisfaction with instant feedback[1]

2. Mobile and Digital Wallet Integration

With the ubiquity of smartphones, utilities are increasingly supporting:

- Apple Pay, Google Pay, and PayPal. *Apple and Google Pay currently offered*.
- In-app bill management and push notifications
- QR code-based payments for paperless billing [2] *Currently offered*.

3. AI-Powered Payment Agents

Conversational AI is being used to:

- Guide customers through payment processes
- Offer personalized payment plans or rate suggestions
- Send proactive reminders based on usage or due dates [1]

4. Flexible and Personalized Billing Options

To support diverse financial situations, utilities are offering:

- Installment plans and budget billing. *Currently offered*.
- Prepaid billing models for low-income or transient customers
- Dynamic due dates based on customer preferences or income cycles[1]

5. Recurring ACH and Auto-Pay Enhancements

Recurring ACH (Automated Clearing House) payments are being optimized with:

- Easier enrollment through mobile apps or web page. *Currently offered*.
- Enhanced fraud protection and compliance with Nacha standards. *Currently offered*.
- Real-time updates on payment status[2]. *Currently offered*.

6. Blockchain and Secure Ledger Technologies

Though still emerging, blockchain is being explored for:

- Transparent and tamper-proof billing records
- Smart contracts for automated service agreements
- Enhanced trust in billing accuracy and dispute resolution [2]

7. Embedded Payments and Utility Portals

Utilities are embedding payment capabilities directly into:

- Customer service chat interfaces
- Usage dashboards and leak alerts
- Smart home integrations (e.g., Alexa, Google Home)

References

[1] 2025 Payment Trends: AI, Real-Time Payments, and Cybersecurity in Utilities
[2] 5 Payment Trends That Will Shape the Future of Utilities

Summary

The customer service staff have come through a very challenging transition to the new Customer Information & Payments system, and the District is positioned better because of this work. The Team embraces the mindset of continuous improvement and will continue to work on the next, best opportunity to better serve our customers given the current and anticipated trends in services and technology.

SWOT Summary

1. **Strengths (Internal)**
    a. Customer Information & Billing System (CIS)
    b. Payment System Improvements
    c. Estoppel Process Improvements
    d. Email Notifications
    e. Commercial Billing Options
    f. Online Bill Pay and Check Processing Improvements
    g. New Printing & Mailing Provider
    h. Staff Cohesion
    i. Survey Results Recovery
    j. Documentation

2. **Weaknesses (internal)**
    a. Payments System Limitations
        i. Evaluate feasibility and options for changing payments system provider
    b. Online Bill Pay account correction issue
        i. Continue to press provider for solution
    c. Limited paperless contact information for customers; we have emails for 65%
        i. Increase the number of customer email addresses

3. **Opportunities (external)**
    a. AI and Automation
        i. Expand the use of Automation, and possibly AI, for improving customer service and process
    b. Proactive Communications
        i. Expand the use of Proactive Communications to improve customer service

4. **Threats (external)**
    a. Transaction Costs
    b. Edmunds Contract Pricing

The Importance of Artificial Intelligence in Wastewater

July 2025

Executive Summary

Artificial Intelligence (AI) is rapidly transforming how the world operates, and water and wastewater utilities are no exception. Utilities across the nation are leveraging AI to improve reliability, reduce costs, enhance environmental compliance, and bolster resilience. AI is not a distant vision but a present-day tool that, when strategically implemented, can offer quantifiable operational and financial benefits and can free staff from certain mundane administrative tasks.

This report outlines the importance of AI in the water sector, highlights key factors for successful adoption, identifies short- and long-term opportunities, and discusses how an effective AI strategy can influence operational costs and capital planning.

The Importance of AI in Wastewater Utilities

AI refers to the use of algorithms and models, especially machine learning (ML), that can learn from data and make decisions or predictions. In wastewater operations, AI's most appreciated value lies in its ability to process large volumes of data (e.g., images, sensors, assets, operational decisions, and environmental parameters) in real-time and derive actionable insights, such as:

- Anomaly detection for leak detection or system infiltration
- Forecasting anomalous influent loading
- Predictive maintenance of pumps and other rotating equipment
- Real-time optimization of treatment processes
- Automated reporting for compliance or internal dashboards

Effective use of these tools will allow utilities to move from reactive to proactive operations, improving efficiency, reducing risks, and supporting better resource allocation.

Additionally, Agentic AI—autonomous, task-driven AI systems capable of performing multi-step jobs—promises to fundamentally change how routine tasks are accomplished. Agentic workflows can improve efficiency, reduce errors, and free up human staff for higher-value work. LRD is actively working to implement a few AI projects along these lines, i.e., to use AI agents to automate mundane, routine administrative tasks such as meter reading and manual data entry.

Key Factors to Consider When Implementing AI

a. Data Quality and Integration: AI systems rely on high-quality, structured, and accessible data. Utilities must assess:

- Data integrity (e.g., SCADA, Regulatory compliance database – Hach WIMS, Asset management system – EAM, IQ Water flow measurement system – Maxicom, Lab information system – RiverKeeperSQL, Customer information and billing system – Edmunds)
- Availability of historical maintenance and asset data
- Integration between IT (e.g., CMMS, GIS, billing systems) and OT (e.g., PLCs, SCADA)

b. Cybersecurity and Privacy: AI implementations may require increased network connectivity and cloud-based services, which heightens the need for robust cybersecurity measures.

c. Workforce Skills and Change Management: AI augments human decision-making, but requires staff buy-in and training. Including operations staff in solution design helps ease the adoption curve, but there are meaningful limitations in technology skills of current staff.

d. Regulatory and Ethical Considerations: Utilities must ensure that AI-driven decisions are explainable and compliant with regulatory constraints and do not violate the public trust we have worked so hard to earn.

e. Return on Investment (ROI) and Scalability: Projects should start with defined KPIs and use cases with clear financial or operational benefits. Successful pilots that show clear wins (saved time or money) will be more likely to be emulated across the organization, especially if the project is a clear benefit to front-line workers (e.g., reducing mundane or tedious work).

Short-Term Opportunities (0–2 Years)

Several AI applications are achievable with modest investment and immediate return potential:

a. Chatbots: AI-powered chatbots use natural conversational language to handle common questions about billing, service outages, account management, and even internal questions by employees, which allow humans to address more complicated issues. While we have all been frustrated by our personal experiences with chatbots, these systems are improving rapidly.

b. Automated Data Capture and Reporting: Natural language processing (NLP) and optical character recognition (OCR) technologies to automate data extraction from cellphone photos and assimilate into databases and reports. Reducing manual data entry decreases errors and improves efficiency.

c. Automated Quality Assurance / Quality Control of Asset Management Workorders: AI agents can be used to identify and correct work order errors (e.g., work order missing labor for relevant staff, relevant checklist not completed) before being assigned to a supervisor.

d. Intelligent Alarm Management: AI can learn operator responses to common alarms and suppress nuisance alarms or recommend the most probable root cause.

e. Predictive Maintenance: Machine learning models can forecast failures based on vibration, amperage, or runtime data, allowing teams to address issues before costly breakdowns occur.

f. AI-Assisted Asset Management: AI can help prioritize rehabilitation or replacement based on historical maintenance trends, asset age, and condition scores.

g. Partial Digital Twins: A digital twin is a computer model (e.g., BioWin) of a system (wastewater treatment plant) or process (secondary clarification) that can be used to simulate specific scenarios to improve understanding and decision-making. Integration of AI into digital twins can overcome *a priori* requirements to mechanistically model individual process units (e.g., aeration basins or chemical dosing systems) and allow machine learning (complex, non-linear) models to identify relationships directly from process data.

Long-Term Opportunities (3–10 Years)

Looking forward, AI can help utilities reinvent their operating models:

a. Full-System Digital Twins: Comprehensive simulation models, fed only by real-time data, will be able to be developed and used to test operational scenarios, optimize energy use, and assess anticipated changes before they occur.

b. Adaptive Process Control: AI can enable fully autonomous or semi-autonomous control of treatment processes based on influent variability, environmental conditions, and energy cost.

c. Integrated Collection System Management: AI models can help identify collection systems with elevated inflows and infiltration and optimize response efforts following emergencies, e.g., extended power outages associated with a hurricane.

d. Emergency Planning: AI-driven models can be used to optimize deployment of resources following a significant emergency such as widespread power outage following a hurricane.

Financial Impact: Cost Reductions and Efficiency Gains

An effective AI strategy can yield both operational and capital expense benefits:

Impact Area	Potential Benefit
Labor Efficiency	Automate routine tasks (data entry, inspections)
Maintenance Costs	Reduce unplanned failures and emergency repairs
Energy Optimization	Dynamic control of blowers, pumps, or UV systems
Regulatory Compliance	Minimize permit violations and associated penalties
Asset Lifespan Extension	Improve asset care through condition-based maintenance
Capital Planning	Targeted investments using data-driven decisions

Studies suggest AI can reduce O&M costs by 10–20% over time, depending on implementation scale.

Recommendations for Action

1. **Conduct a Readiness Assessment:** Evaluate current data infrastructure, operational pain points, and staff readiness.
2. **Identify High-Impact Use Cases:** Focus on problems with immediate ROI and measurable performance gains.
3. **Build Strategic Partnerships:** Engage technology providers, consultants, or academic institutions to supplement internal expertise.
4. **Develop a Phased Implementation Roadmap:** Start small with proof-of-concept projects and scale based on success.
5. **Invest in Workforce Upskilling:** Train operators and analysts to work alongside AI tools and understand outputs.
6. **Monitor Performance and Adapt:** Use KPIs and dashboards to track progress, adjust strategies, and communicate success.

Conclusion

Artificial intelligence offers water and wastewater utilities a powerful set of tools to meet evolving regulatory, environmental, and financial challenges. From optimizing plant operations to transforming asset management and customer engagement, the opportunities are significant. The key lies in starting strategically, building strong data foundations, and fostering a culture of innovation. With the right approach, AI can become a core enabler of resilient, cost-effective, and sustainable wastewater treatment services.

Artificial Intelligence SWOT Analysis

Strengths: (internal)

a. LRD has very large datasets that can be leveraged by AI
b. Comprehensive, up-to-date documentation of workflows (e.g., standard operating procedures) facilitate automation of these processes with AI.
c. Robust existing cybersecurity measures

Weaknesses: (internal)

a. Some standard operating procedures may be outdated.
b. Budget impacts of AI implementation
c. Imposing and managing ever-increasing technological requirements on our staff
d. Limited staff with very advanced computer skills and no staff fully capable of implementing agentic workflows

Opportunities: (external)

a. Rapidly advancing technology (computational power, large language models, AI agents, etc)
b. Leveraging cost-effective consultants to achieve outcomes not possible with existing, in-house staff

Threats: (external)

a. Implementation of artificial intelligence may lead to additional avenues for cybersecurity threats
b. AI is known to provide statistically plausible but erroneous output (aka hallucinations)
c. Black box driven solutions provided by AI can create unjustified overconfidence if we do not maintain technical expertise and the ability to scrutinize AI outputs.