BALLARD MARINE CONSTRUCTION

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Town of Palm Beach, FL
Lake Worth Inlet Sand Transfer Plant Integrity Assessment

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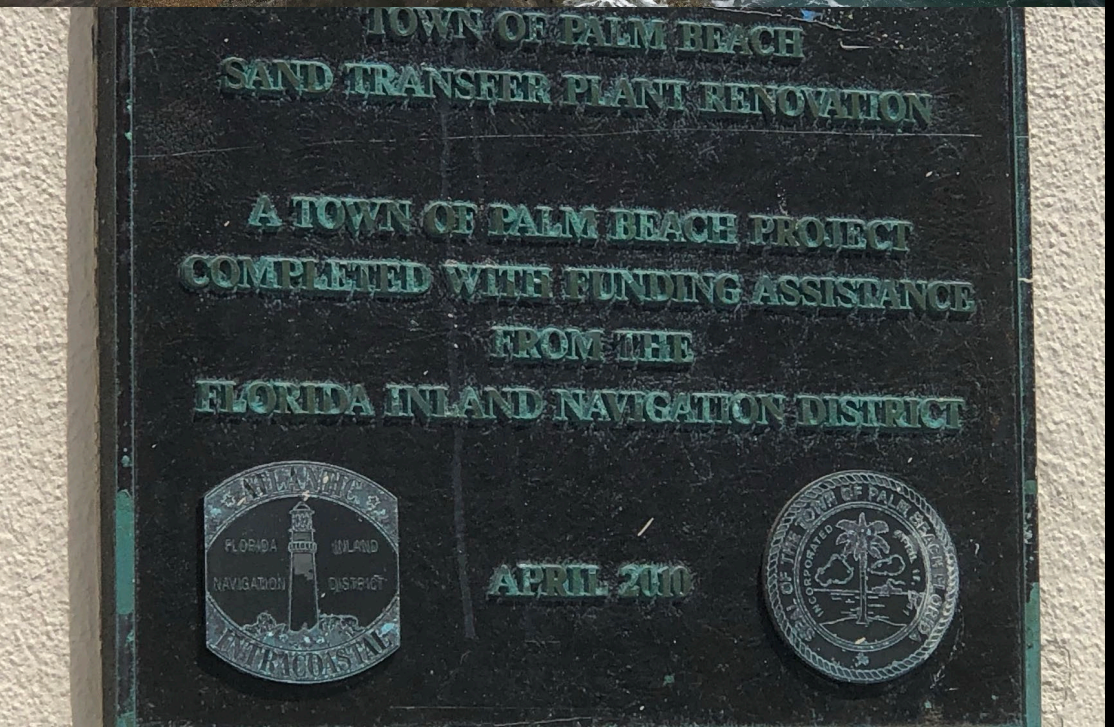

Agenda

- Introduction
- Lake Worth Inlet – Historic Perspective
- Inlet Management Strategies
- Project Scope & Approach
- Conclusions

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Introduction

"It's a pump station that sits in the ocean. It doesn't get anymore aggressive in terms of environment between the outside conditions and the material we are pumping."

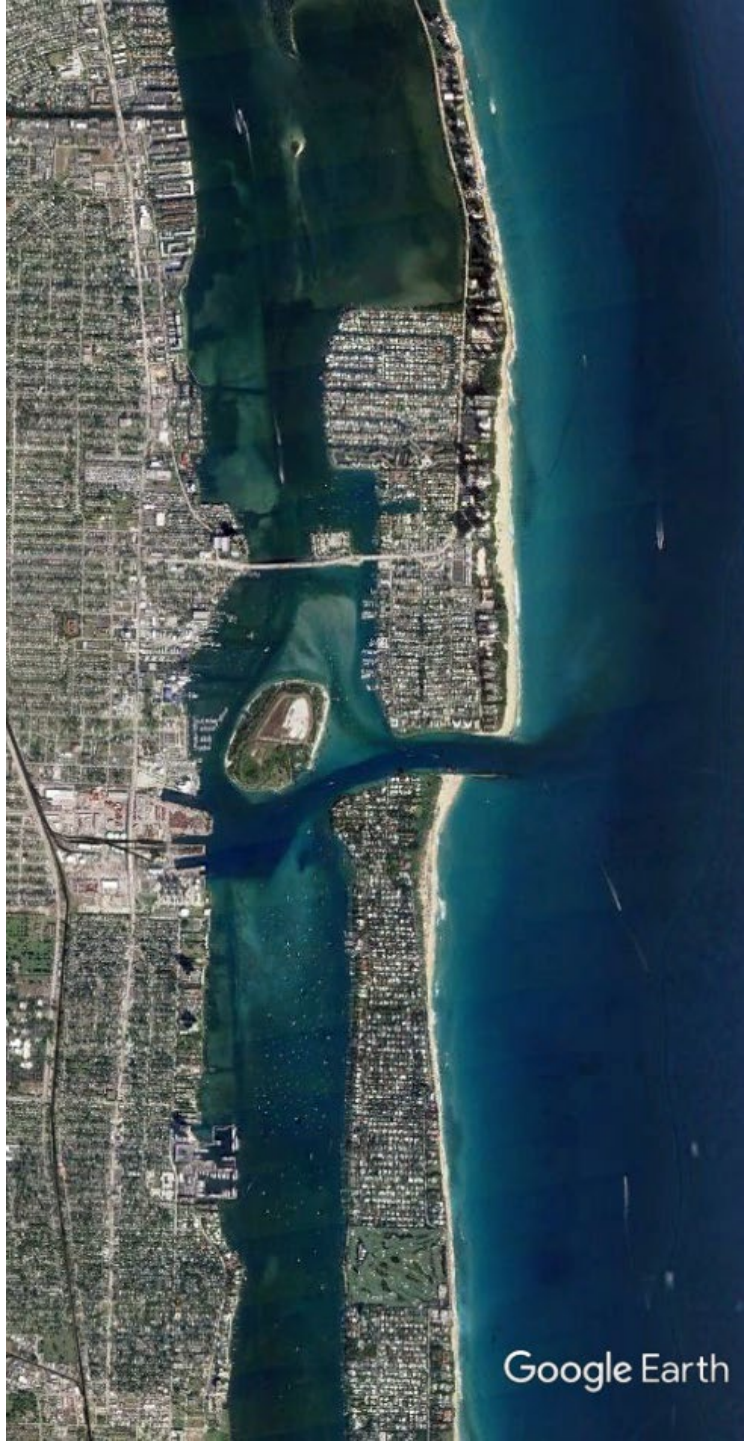
P. Brazil, PE in *A 1950's-era sand transfer plant still feeds Palm Beach, but constant repairs are costly*. The Palm Beach Post. March 14, 2022

- One of two fixed sand transfer plants in Palm Beach County, the other at South Lake Worth Inlet (Boynton Inlet).
- The sand transfer plant is designed and operated to move sand from north of the Inlet to the Palm Beach Island shoreline.
- The Town of Palm Beach owns the Plant and has financial responsibility for all repairs and upgrades.
- Palm Beach County operates the Plant under contract with the Town.

Source: BMA, Inc. *Town of Palm Beach Sand Transfer Plant Conditions Assessment Report*. June 19, 2020

Lake Worth Inlet – Historic Perspective

- Lang's Inlet first established in the 1860's ~1 mile north of current location.
- 1877 – Lake Worth Inlet is hand dug by local settlers.
- 1918 – Lake Worth Inlet stabilization.
- 1935 – Federal Government assumes responsibility.
- 1937 – South Lake Worth Inlet (Boynton Inlet) Sand Transfer Plant Installation demonstrates that fixed plant operations are effective.
- 1954 – Engineer's recommendation that a fixed plant be established at Lake Worth Inlet.
- 1958 – Sand Transfer Plant commences operations.
- 1995 – Lake Worth Inlet Management Plan.
- 1996 – Lake Worth Inlet Management Plan Adoption.
- 2008 – Lake Worth Inlet Management Plan Update.
- 2013 – Beach Management Agreement Adoption.
- 2021 – Sand Transfer Plan Integrity Assessment.



References:

- Zurmuhlen, F. H. *The Sand Transfer Plant at Lake Worth Inlet*. Tippetts Abbett McCarthy Stratton Engineers, New York. 1957.
- https://discover.pbcgov.org/erm/Pages/Lake-Worth-Lagoon.aspx
- https://en.wikipedia.org/wiki/Lake_Worth_Inlet

Inlet Management Strategies

FDEP's Annual Inlet Bypass Objective for Lake Worth Inlet is 202,000 cy/year (2008 IMP Update)

- Reactivate and enhance the performance of the existing sand transfer plant.
- Bypassing of all beach compatible material dredged during channel maintenance activities to downdrift beaches and evaluate expansion of the settling basin.
- Between 1996 and 2021, management activities at the Lake Worth Inlet have bypassed an annualized volume of 236,629 cy which is over 125% of the objective.

Reference:

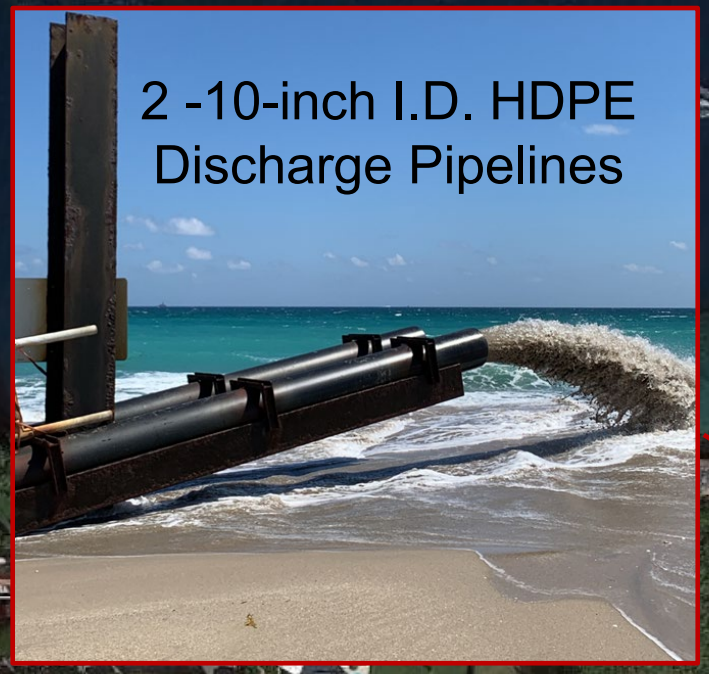
- FDEP. *Lake Worth Inlet Management Study Implementation Plan, Certificate of Adoption*. 1996.
- FDEP, Office of Resilience & Coastal Protection. *Annual Inlet Report.* August 2022.

Sand Transfer Plant Components

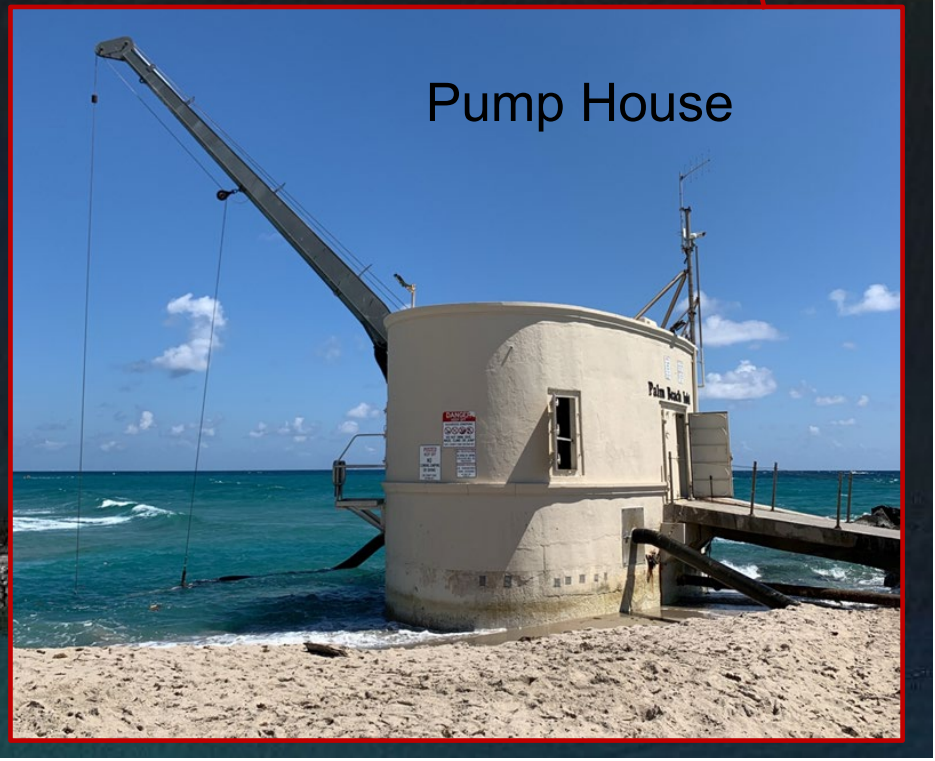
Pipeline Transition "Vault"

Primer Well

Discharge Pipeline Alignment



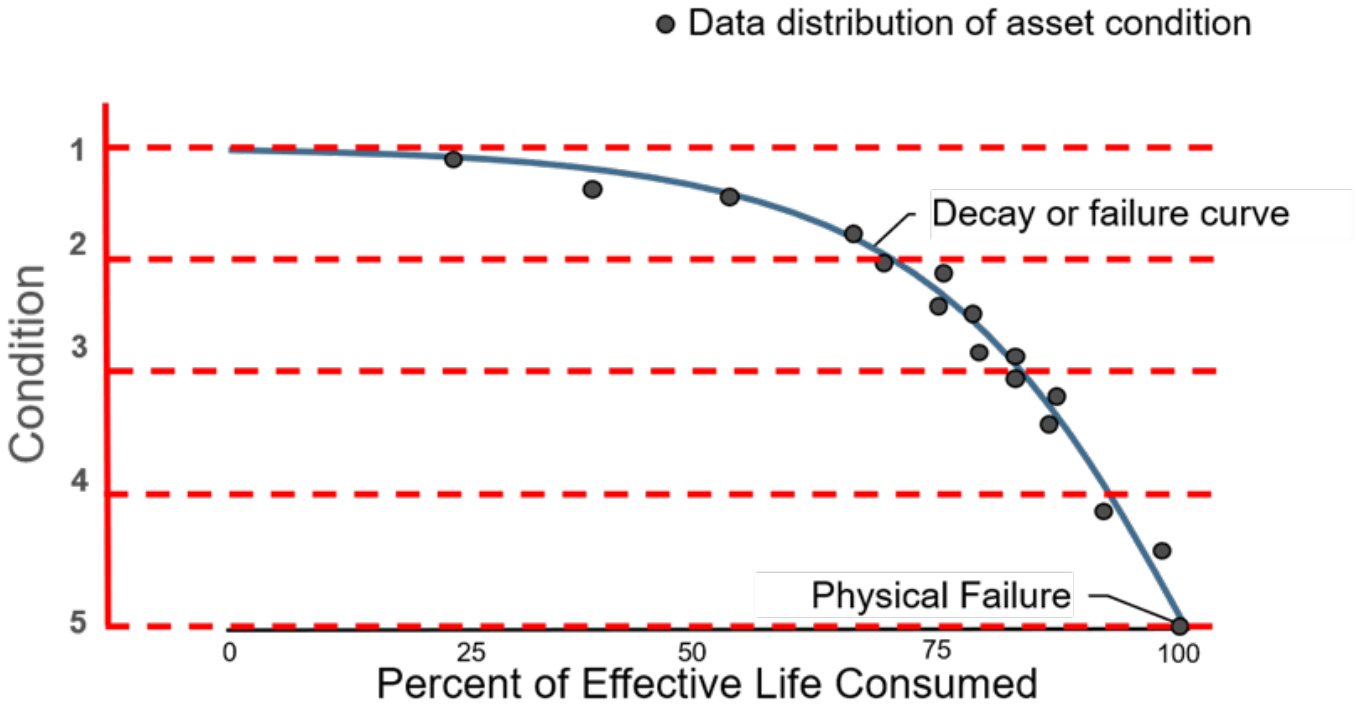
2 -10-inch I.D. HDPE Discharge Pipelines



Pump House

Integrity Assessment

The Town of Palm Beach tasked GHD to perform a Level 2 Condition Assessment of the Sand Transfer Plant. The Level 2 assessment comprised of a planned, physical walk-through visual inspection of the asset's portfolio to assign condition rankings to a representative sample of the components of the asset.



- Assets deteriorate through a combination of factors including materials, operating environment, and degree of internal and external stresses.
- The industry standard is to use one of three levels of condition assessment:
  - **Level 1** – Low Accuracy: A desktop analysis based on staff knowledge, work order history, and asset age. No actual visual inspection of the asset.
  - **Level 2** – Moderate Accuracy: A field inspection or visual assessment (e.g., CCTV) of the asset in operation and scored according to a defined and standardized scoring protocol (e.g., National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program).
  - **Level 3** – High Accuracy: The application of inspection technologies such as infrared scanning, vibration monitoring, or other technologies.

Condition and Risk Assessment

During the Level 2 assessment of the STP, each asset was identified and inspected then assigned a condition rating score from 1 to 5 based on its physical condition. Definitions and descriptions of condition ratings are provided below.

Condition Score	Definition	Condition Rating Descriptions*
1	Very Good	Sound physical condition to meet current standards. Asset likely to perform acceptably with routine maintenance for 10 years or more. No work required.
2	Good	Asset shows minor wear. Deterioration has minimal impact on asset performance. Minimal short-term failure risk, potential for reduced performance in medium term (5-10 years).
3	Moderate / Fair	Functionally sound but showing some wear with minor failures and some diminished efficiency. Minor component or isolated sections of the asset require replacement or repair, but asset still functions safely at acceptable level of performance. Work required but still serviceable.
4	Poor	Plant and components function but require a high level of maintenance to remain operational. Likely to cause a noticeable deterioration in performance in short-term. No immediate risk to health or safety but work required to ensure asset remains safe. Substantial work required in short-term, asset barely serviceable.
5	Very Poor	Failed or failure imminent. Asset effective life exceeded, and significant maintenance costs incurred. Major work or replacement.

* Definitions are adapted from the International Infrastructure Management Manual 5th Edition, IPWEA (2015)

Evaluated Assets

20 categories of general plant components were visually assessed and included:

- General Building (walkways, doors, platforms, guardrails, lighting, etc.)
- Structural concrete
- Structural steel
- Boom, pulleys, cables, and motor
- Water pump and drive, flexible water pipe, rigid water pipe, and jet head
- Sand pump and drive, flexible sand pipe, rigid sand pipe, and head
- Electrical switchgear, conduit, and wire
- Slurry discharge pipe above ground level (inclusive of both north and south sides of the inlet)
- Subsurface crawler documentation of accessible segments of the discharge pipelines

Asset Evaluation

4.4 Pipes and Fittings – Outside STP

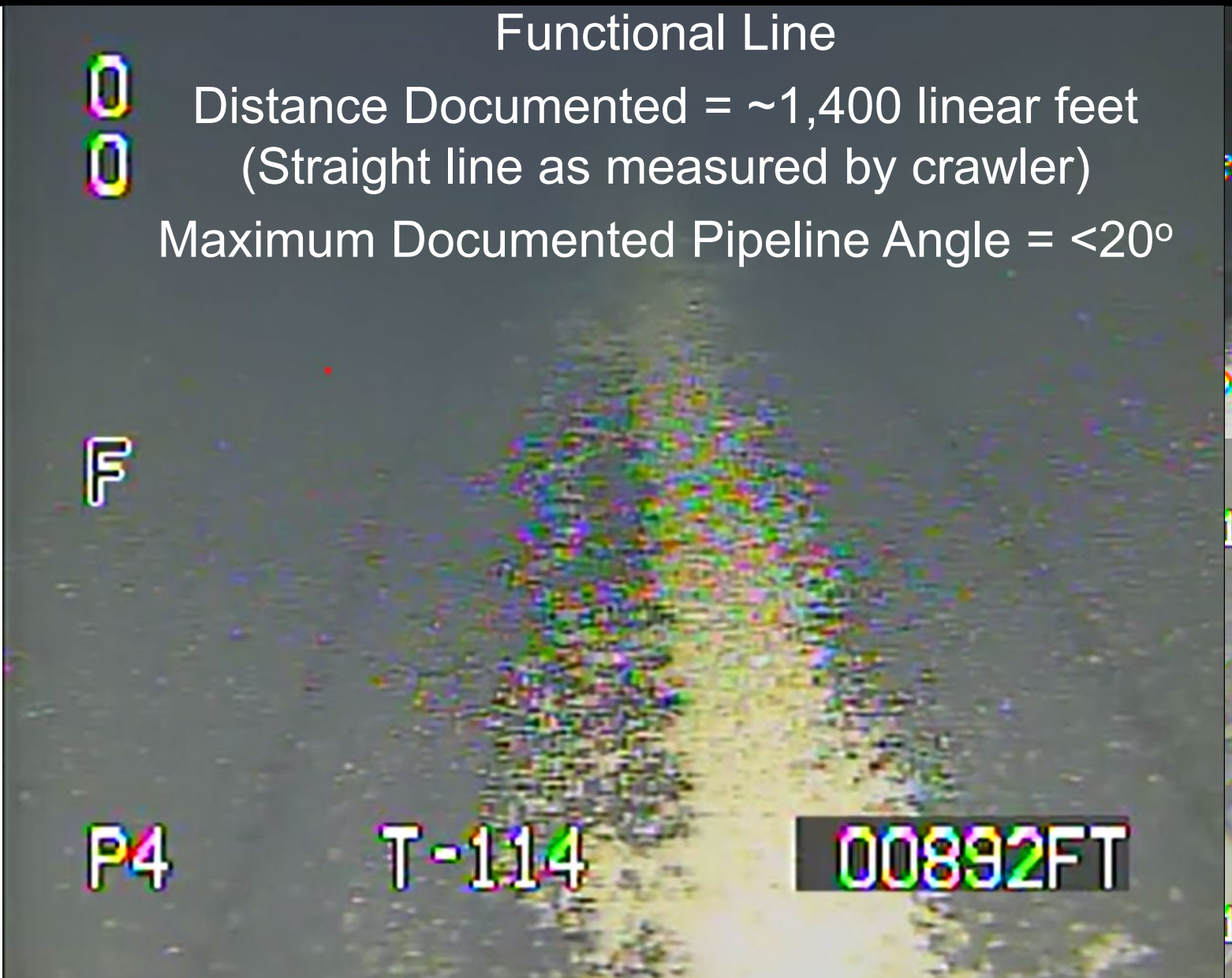
Item	Aspect	Distress Mode	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5	Comments/ References
1.	**Fluid**	Loss / Impact / Efficiency	No visible evidence of leakage. Efficiency of distribution >90%.	Some minor signs of leakage having no impact on neighboring properties / environment. Efficiency of distribution >80%.	Leakage moderate but no impact on neighboring property. Minor effect on environment. Efficiency of distribution >70%.	Significant water loss affecting neighboring property, potential for claim for damages and / or causing environmental damage. Efficiency of distribution >50%.	Water loss affecting neighboring property, claim for damages and / or causing significant environmental damage. Efficiency of distribution <50%.	Reference: a, b, c
2.	**External Coating / Surface / Bolts**	Cracking / Flaking / Corrosion	Coating as new, no defects.	Coating showing signs of aging, no visible defects.	Coating loss / deterioration exposing steel. Steel surface corroding / rusting.	Coating loss / deterioration exposing steel. Steel corroding / rusting with surface delamination / flaking.	Steel heavily corroded / rusting with large areas of surface delamination / flaking.	Reference: a, b
3.	**Environment / Soils**	Corrosion	Hardware as new. Soils non-corrosive.	Evidence of coating aging. Environment / Soils non-corrosive.	Coating visibly delaminating / exposing pipe steel at one or two points in section. Environment / Soils mildly corrosive.	Coating visibly delaminating / exposing pipe steel at several places in section. Pipe steel corroding. Environment / Soils promoting corrosion.	Coating visibly delaminating / exposing pipe steel over majority of section. Pipe steel heavily corroded. Environment / Soils highly corrosive.	A rating of 3 was given because of the age of the pipe/fittings (≈90 days) already shows corrosion. Further, intake pipe is displaying more advanced corrosion Reference b, c, d, e, f, g

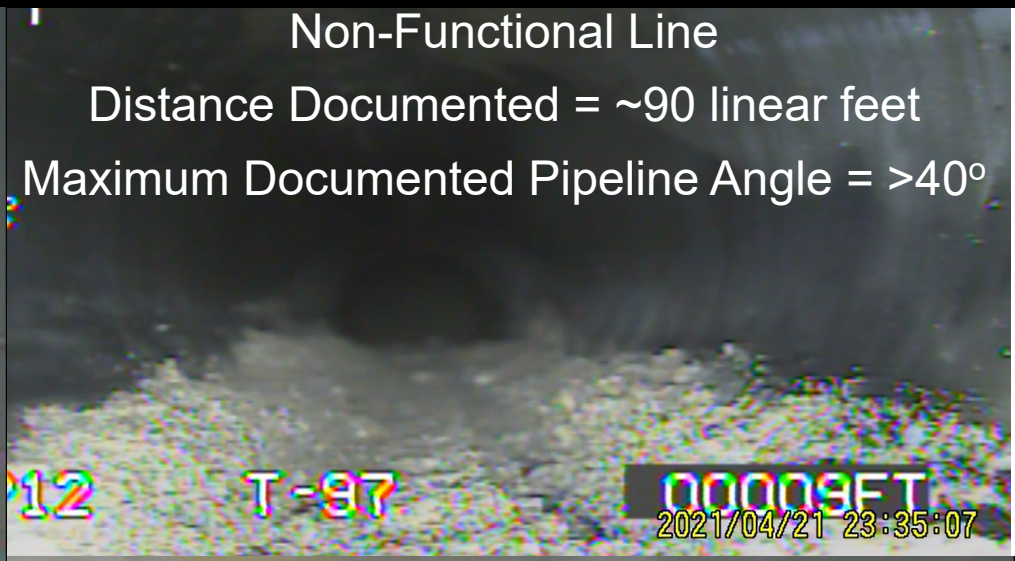
General components or aspects included in this asset category include:

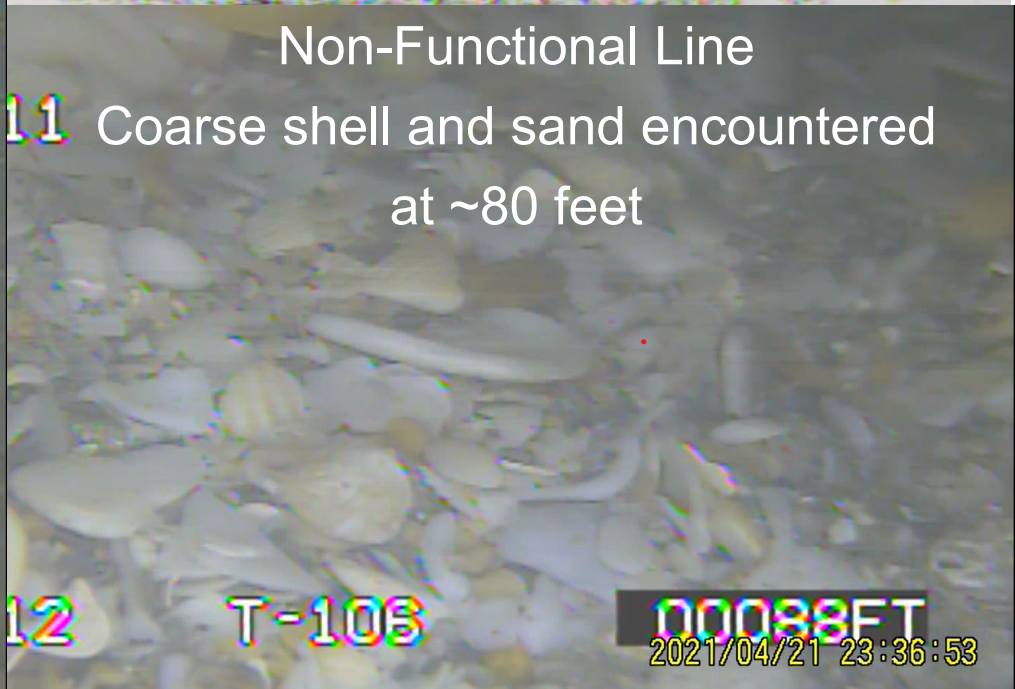
- Pipe segments protruding through STP and exposed on the exterior
- Associated hardware

Pipeline Assessment – Discharge End

Pipeline Assessment – Discharge End

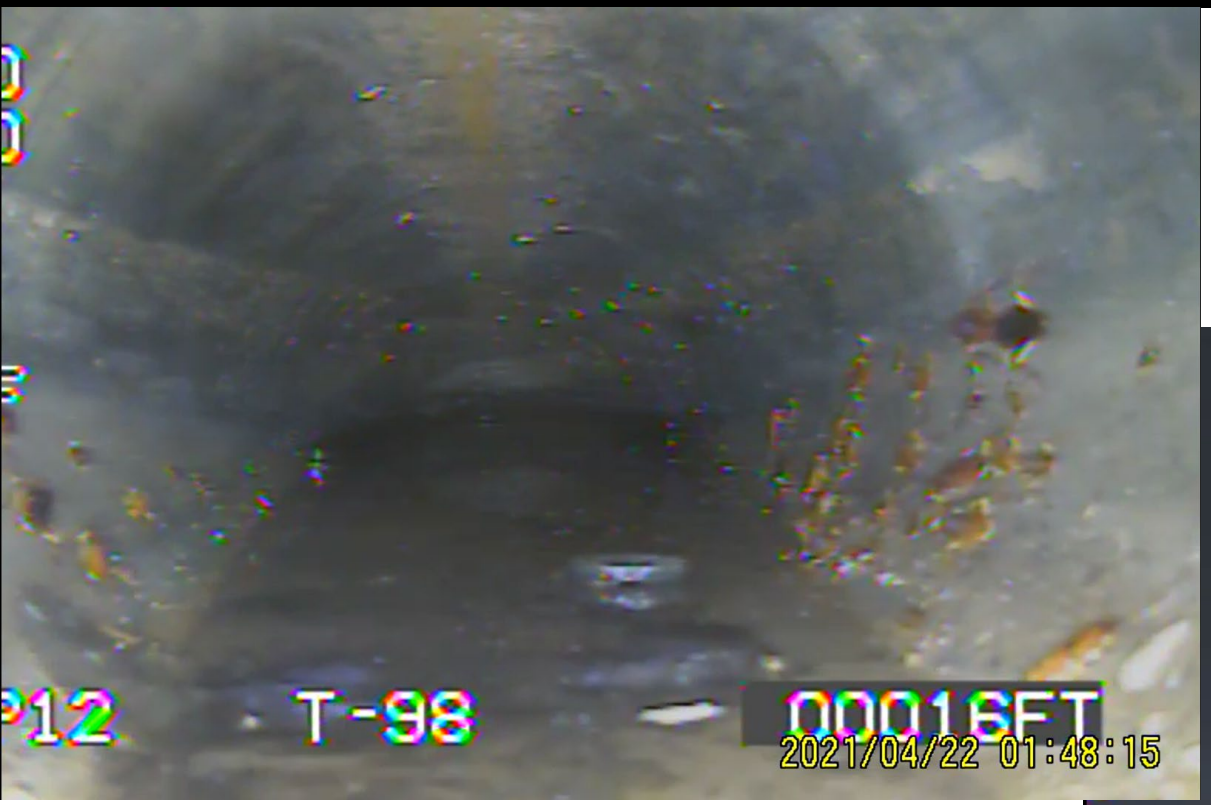






Pipeline Assessment – Vault

Pipeline Assessment – Vault



Non-Functional Line

Distance Documented = ~370 linear feet

(Straight line as measured by crawler)

- ~35 LF a steep downward angle and banking left turn was difficult to transit without crawler rollover.
- ~ 260 LF, deposits of sand and shell occur with a wave pattern.
- Forward progression stopped at ~370 LF. Pipe cross-sectional area of sediment coverage is approximately 40-50%.

Conclusions

- Overall, the Lake Worth Inlet Sand Transfer Plant is functioning as designed and with condition ratings ranging from 1 (Very Good) to Four (Poor) assigned to the 20 asset categories we evaluated.
- The Plant and it's associated assets were rated at 3.05 - *Functionally sound but showing some wear with minor failures and some diminished efficiency. Minor component or isolated sections of the asset require replacement or repair, but asset still functions safely at acceptable level of performance.*
- The only asset that was assigned a rating of 4 was the Crane Structure due to the advanced stage of corrosion observed on the steel that supports the boom and other components that are critical to its continued operation.
- The excess slope (>40-degree decline) in the non-functional discharge line as it transitions back up to the beach south of the Inlet may be the functionality issue with this asset. Remedial measures may be available to bring this line back into service without complete replacement, but additional investigations are necessary to further define the challenges.
- The Lake Worth Inlet Sand Transfer Plant is a critical component of the Town's overall Coastal Management strategy. Continued operation of the facility is recommended.

Acknowledgements

GHD

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D. B. Ecological Services

SEAL OF THE TOWN OF PALM BEACH FLORIDA

PALM BEACH COUNTY FLORIDA

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Thank you

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