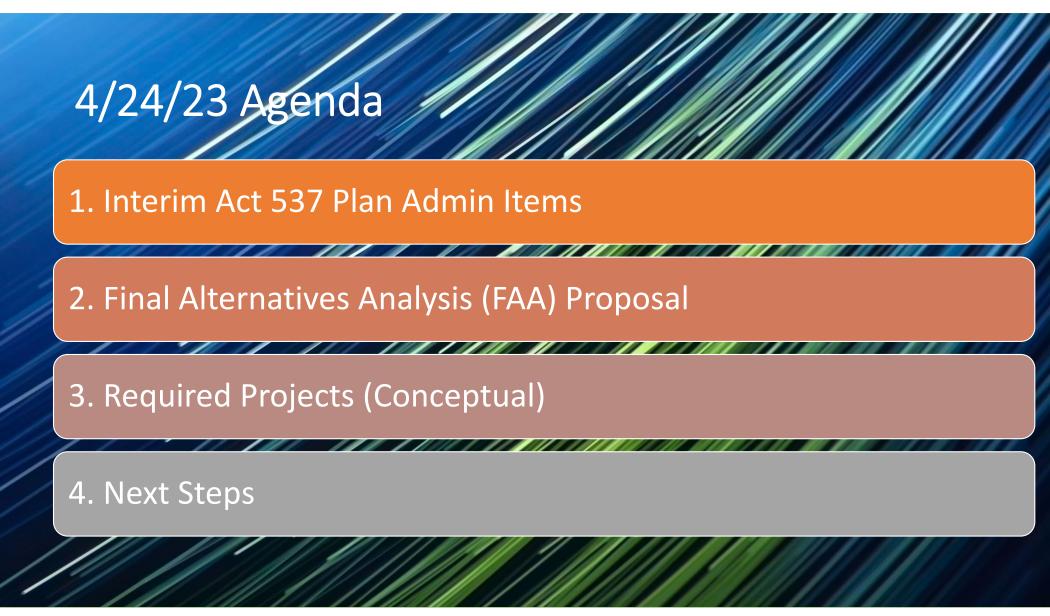
Kline's Island Sewer System (KISS) Act 537 Plan Final Alternatives Analysis (FAA) Authorization Request

Lehigh County Authority Wastewater...

Lehigh County Authority Board of Directors 4/24/2023



1. Interim Act 537 Admin Items

DEP Act 537 Expectations

This Act 537 Plan: Implementation Schedule = 2026-2035

Future planning needed for projects from 2036-2050

Act 537 Plan Objectives

(Further discussion required to prioritize goals and develop decision criteria)

- 1. Eliminate all overflows through 2035
- 2. Sequence the work to build only when needed
- 3. Build non-modular infrastructure to 2050 flow conditions
- 4. Select the most life-cycle-cost advantageous solution
- 5. Recognize long-term rehab needs for pipes, pumps, and force mains
- 6. Minimize the number of independent Signatory projects constructed inside the City
- 7. Recover wet-season dry-day capacity to protect KIWWTP max hydraulic permit limits
- 8. Recover base capacity to "free up" allocation
- Implement projects sequentially to recognize existing issues, future issues as flow increases, and funding realities

Links to Notable Prior Presentations

- 2/10/2020 KISS System Planning Overview
- 5/11/2020 Interim Act 537 Plan Review
- 2/22/2021 Flow Modeling Authorization Request
- 9/13/2021 Act 537 Planning Update
- 11/8/2021 Diagram of Act 537 Roles & Responsibilities
- 3/14/2022 Act 537 Planning Update
- 5/9/2022 Rainfall Derived 1&I Study & Summary of Results
- 8/8/2022 KISS Hydraulic Model Calibration Review
- 9/12/2022 Problem Definition & Alternatives Screening
- 10/10/2022 Preliminary Screening of Alternatives Authorization Request
- 11/14/2022 KIWWTP Wet-Weather Options & BioActiflo Pilot
- 2/27/2023 KISS Overview & Allentown System I&I Program Review
- 3/27/23 Pretreatment Plant Master Plan
- 3/27/23 Preliminary Screening of Alternatives

All presentations can be found by date on the LCA website = https://www.lehighcountyauthority.org/meetings-minutes/

Major Act 537 Components

Kline's Island WWTP (KIWWTP) Projects

- Raising Peak Wet Weather Capabilities
- Implementation of Master Plan (no FAA impact)

Source Reduction Plans (SRPs)

- Base case is "Signatory 1 SRP" (i.e. Signatory supplied plans)
- Additional 1:1 meetings needed with Signatories

Conveyance Projects

- Little Lehigh Interceptor and Western Lehigh Interceptor final solutions to be identified during FAA
- Future discussions with DEP required for individual Signatory interceptors (no FAA impact)

"Common" Items/Projects

Items identified in Appendix A of proposal

Pretreatment Plant (PTP) Projects

Implementation of PTP Master Plan (no FAA impact)

Interim Act 537 Commitments

- Connection Management (ongoing)
- Address "Trexlertown Bottleneck" (Upper Western Lehigh Pump Station project)
- Sewage billing meter upgrades and data capture (ongoing)
- Signatory inflow & infiltration source reduction work (ongoing)
- Flow Characterization Study and KISS hydraulic model calibration (complete)
- Evaluation of alternatives for the 2026-2050 planning period (this authorization)
- Preparation of long-term Act 537 Plan (in progress)

ARRO

KLINE'S ISLAND SEWER SYSTEM INTERIM ACT 537 PLAN

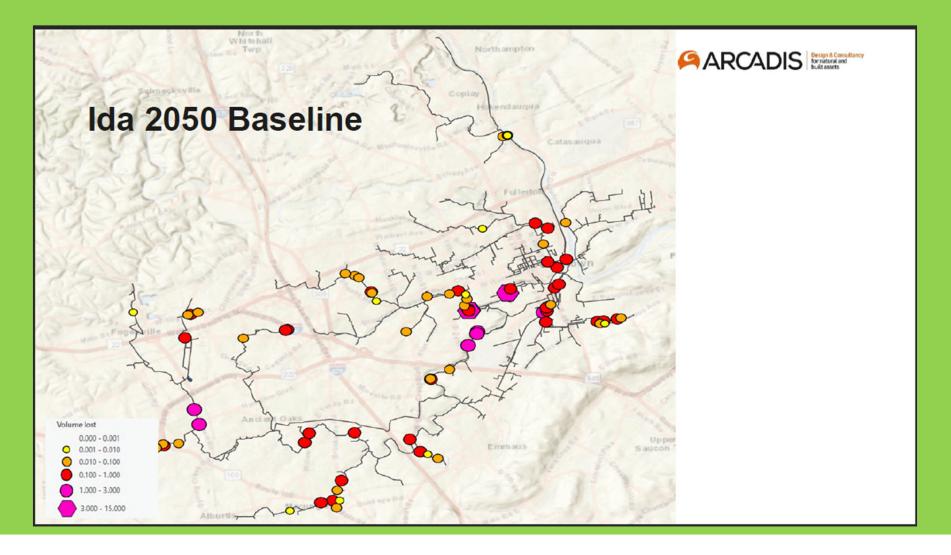
As would be expected, the precipitation and resulting saturated ground conditions dramatically increased rain derived inflow and infiltration (RDII) and base flow infiltration into the sewers, and flows to the Kline's Island Wastewater Treatment Plant (KIWWTP) Increased from the normal 2017 flows of approximately 32 million gallons per day (MGD) to over 40 MGD during periods in 2019. The annual average daily flow for 2019 was 37.64 MGD. During this period, the KIWWTP met all treatment-related permit requirements. However, the KIWWTP permit lists the plant's Hydraulic Design Capacity as 40 MGD, and the flows to the plant exceeded this level for three consecutive months in 2019, triggering Chapter 94 requirements.

This Interim Plan provides detail of the region's corrective action plan related to this hydraulic overload condition, and consists of:

- A Connection Management Plan developed under the direction of Pennsylvania Department of Environmental Protection (DEP) and to be implemented during the development and adoption of a Long-term Act 537 Plan.
- A capacity expansion of a two-mile portion of the Western Lehigh Interceptor to eliminate dry-weather overflows.
- 3. A Sewer Billing Meter upgrade effort to get all significant billing meters performing accurately across the dry- and wet-weather range of flows, allow data capture into a flow monitoring database, and development of baseline flow patterns for ongoing confirmation of meter accuracy between calibration cycles.
- Source reduction efforts by all Signatories based on previous individual inflow and infiltration (18.1) investigations.
- A Flow Characterization Study (FCS) based on flow metering and rainfall monitoring conducted in all municipalities' sewer systems to define base flows and RDII impacts and provide data to calibrate an expanded KISS model and support evaluation of alternatives.
- Identification, development, evaluation, and costing of alternatives to provide conveyance and treatment capacity across the 2026-2050 planning period.
- 7. Preparation of a Long-term Act 537 Plan.

ARRO NO. 10784.17 FINAL – JULY 24, 2020 (REVISED MAY 12, 2021) (REVISED JUNE 18, 2021)

2050 Overflow "Blossom" Diagram (5-year design storm)



2. Final Alternatives Analysis (FAA) Proposal

FAA: Prep work from 2021 – Present

Flow Characterization Study

• March – October 2021

QA/QC of flow data concludes

• December 2021

KISS Model Preparation/Calibration

• Q1 2021 – June 2022

Capacity Problem Definition

• July 2022 – October 2022

Preliminary Screening of Alternatives (PSOA)

• October 2022 – April 2023

Current 537 Proposal: Final Alternatives Analysis (FAA)

Introduction: Objectives: Scope of Work: • Final Alternatives Analysis (FAA) • Determine size, extent, and cost of • Using the model to solve system capacity infrastructure improvements limitations Solutions fall under: KIWWTP components (Master Plan + peak wet • Using Hurricane Ida (NOAA rainfall data) • Calculating capital costs of conveyance weather), Source Reduction Plans, as the selected surrogate event solutions Conveyance components, Commons • Apply various I&I treatments under 2050 • Size conveyance pump stations components wastewater usage demands • Determine service life and calculate net present costs **Schedule: Budget estimate:** • Late April 2023 - late October 2023 (if • PSA = \$208,000 proposal authorized) • CPA = \$258,000

- Combination of figures, tables, memos, spreadsheets
- Various cost estimates
- Assumes a variety of monthly meetings

Scope of Work

Task 1 (Alternatives Description)

- Create definitions for the specific FAA model runs
- Incorporate common components (Appendix A of the proposal)
- Site walks and buried infrastructure requests included

Task 2 (Alternatives Modeling)

- Using the 2021 KISS Model to provide:
 - Operating logic
 - Pressures, pumping rates, average and peak flows
 - 2035 vs 2050
- Assumptions:
 - Six model runs; Signatory 1 SRP; 5year design storm

Task 3 (Alternatives Costing)

- Arcadis to estimate conveyance projects only; remaining estimates by others
- Estimate project commission dates
- Summarize all costs onto a single dashboard
- Coordination with Raftelis for financial analysis

Task 4 (Meetings, Presentations, Workshops, & PM)

- Prepare and lead various meetings, presentations, and workshops
- Regular monthly meetings assumed
- Miscellaneous project management items

3. Required Projects *(Conceptual)*

Preliminary Screening of Alternatives Results: Required Projects

KIWWTP

• MUST DO:

- Master Plan related work to upgrade aging systems
- 87 to 100 MGD peak flow upgrade
- 100 to 120 MGD peak flow upgrade
- POTENTIAL PROJECTS:
 - New Main KIWWTP
 Pump Station

Regional Conveyance

- MUST DO:
- Little Lehigh Interceptor (LLI) upgrade (several gravity and/or pumping options)
- POTENTIAL PROJECTS:
 - New Pump Station
 - Parallel sections of Allentown-Emmaus Interceptor

Regional Conveyance

- MUST DO:
 - Western Lehigh Interceptor (WLI) upgrade (several gravity and/or pumping options, including PTP force main option)
- POTENTIAL PROJECTS:
 - Breinigsville Trunkline parallel
 - Alburtis-Macungie Trunkline parallel

I&I Source Reduction Plans (SRPs)

- MUST DO:
 - Inflow removal via manhole inspections & sealing projects → to remove peak flows
 - Infiltration removal (various methods) → to remove wet-weather
- POTENTIAL PROJECTS:
 - Infiltration removal to recover dry-day capacity
 → to remove extraneous baseline flow

KIWWTP Master Plan and Peak Wet Weather Projects

KIWWTP Master Plan



LEHIGH COUNTY AUTHORITY KLINE'S ISLAND WASTEWATER TREATMENT PLANT

MASTER PLAN



CAPITAL IMPROVEMENT PLAN PREPARED BY: KLEINFELDER, INC. IN ASSOCIATION WITH D'HUY ENGINEERING, INC.

FEBRUARY 2019

Preliminary KIWWTP Wet-Weather Improvements (see 3/27/23 Presentation for details)

Phase 1 – Increase KIWWTP peak weather capacity from 87 to 100 MGD Phase 2 – Increase KIWWTP peak weather capacity from 100 to 120 MGD Phase 3 – Increase KIWWTP peak weather capacity > 120 MGD

Source Reduction Plans (SRPs)

Impacts of I&I Source Reduction Plan Work

Model predicted peak flows (2050, 5-year storm) to KIWWTP range \rightarrow ~110-175 MGD

"Signatory 1 SRP" (Signatory supplied) indicates a KIWWTP peak flow of ~140 MGD; multiple other SRP versions have been modeled

Sizing of regional conveyance system upgrades (i.e. Little Lehigh & Western Lehigh interceptors and pump stations)

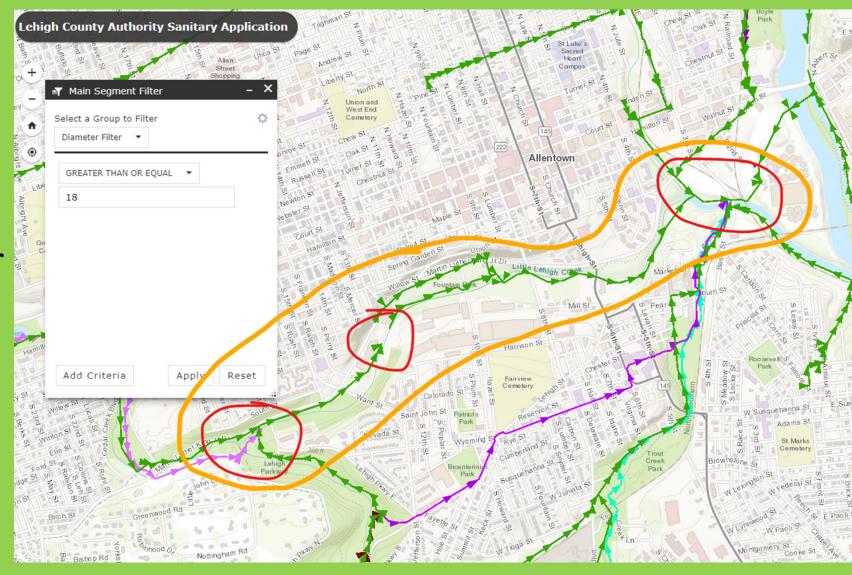
Ability to stay under KIWWTP hydraulic capacity limit during prolonged periods of wet weather (such as 2018-2019)

Ability to recapture dry-day capacity to support economic development

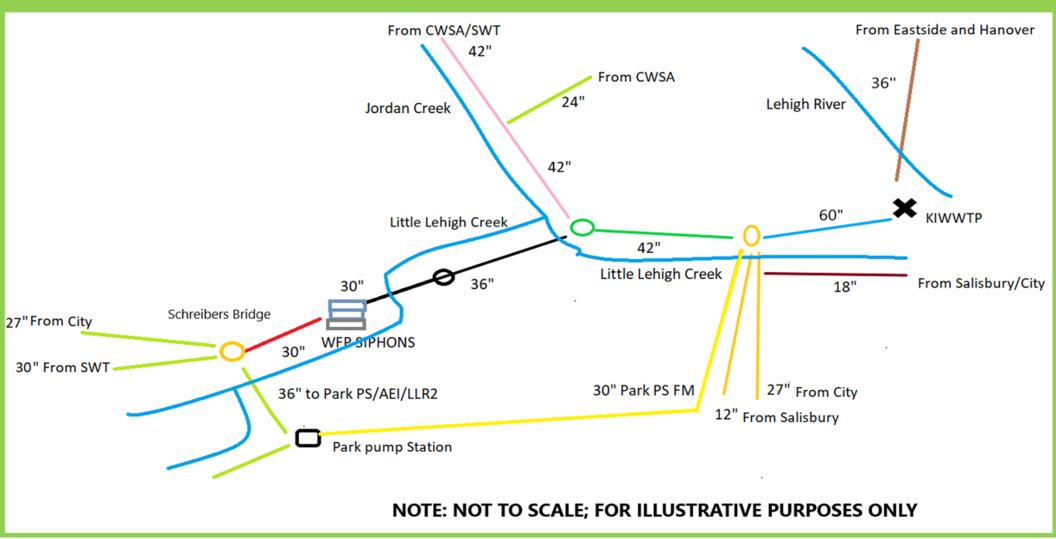
Identification of additional problem areas within signatory conveyance systems

Little Lehigh Interceptor

Little Lehigh Interceptor (MLK Jr. Drive)



Piping Schematic – Upstream of Kline's Island WWTP

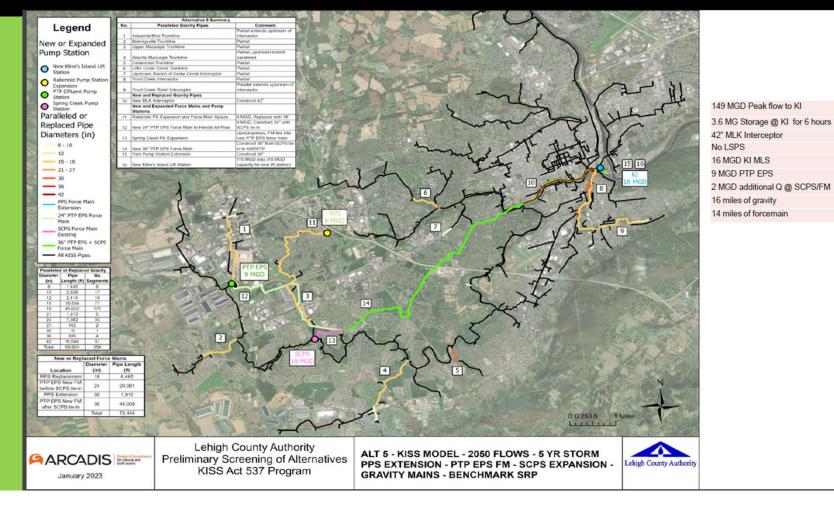


Western Lehigh Interceptor

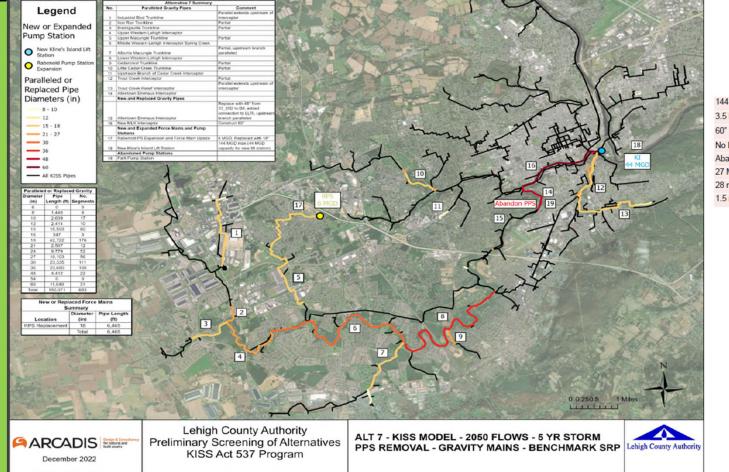
Western Lehigh Interceptor



Preliminary Alternative #5 (will move on to Final Alternatives Analysis)



Preliminary Alternative #7 (will move on to Final Alternatives Analysis)



144 MGD Peak flow to KI 3.5 MG Storage @ KI for 6 hours 60° MLK Interceptor No LSPS Abandon PPS 27 MGD KI MLS 28 miles of gravity 1.5 miles of forcemain

Additional Project Concepts

Potential Additional Projects / Problem Areas

Conveyance Pump Conveyance **KIWWTP Stations** Interceptors > 120 MGD peak flow Spring Creek Pump Station • Trout Creek Interceptor infrastructure • Park Pump Station Trout Creek Relief Interceptor Potential need for additional Rabenold Pump Station Lehigh Interceptor main influent pumping Little Cedar Creek Interceptor Hamilton Boulevard Trunkline Cedar Crest Trunkline Industrial Boulevard Trunkline

NOTE: Not all areas above will be problematic (i.e. only certain portions of the interceptors for example)



Major <u>Technical</u> Items to Address in Final Alternatives Analysis

Determine projects that fall within the 2026-2035 Act 537 window

Little Lehigh Interceptor Area \rightarrow Location and method of construction for new infrastructure

Western Lehigh Interceptor \rightarrow Location and method of construction for new infrastructure

Selecting the appropriate KIWWTP peak wet weather improvements

DEP guidance needed on "flow triggered" Signatory interceptor resolutions

Major <u>Non-Technical</u> Items to Address in Final Alternatives Analysis

Affordability

Cost Sharing

Timing

Resources / Implementation

Upcoming Major Act 537 Activities (tentative)

Preliminary Screening of Alternatives

• October 2022 – April 2023 (concluding shortly)

Final Alternatives Analysis

• April 2023 – October 2023

Selection of Solution

• November 2023 – March 2024

Finalize Writing of Act 537 Plan

• March 2024 – September 2024

Act 537 Municipal Approval Process

• September 2024 – March 2025 (Act 537 Plan submission)

Three Month Look Aheac

Final Alternatives Analysis Authorization Request (April 24, 2023)

Individual meetings with Signatories (May 2023)

Program Manager Re-authorization Request (May 8, 2023)

KISS/DEP Meeting (May 16, 2023)

May/June/July KISS Monthly Meetings

May/June/July preliminary stakeholder outreach

