

# **City of Rehoboth Beach, DE**

## **First Street Drainage Project**

**and**

## **2017 Pavement Management Study**



**Presented by:**

**Alan Kercher, P.E.**

**The Kercher Group, Inc.**

# **Drainage System in the “First Street Area”**

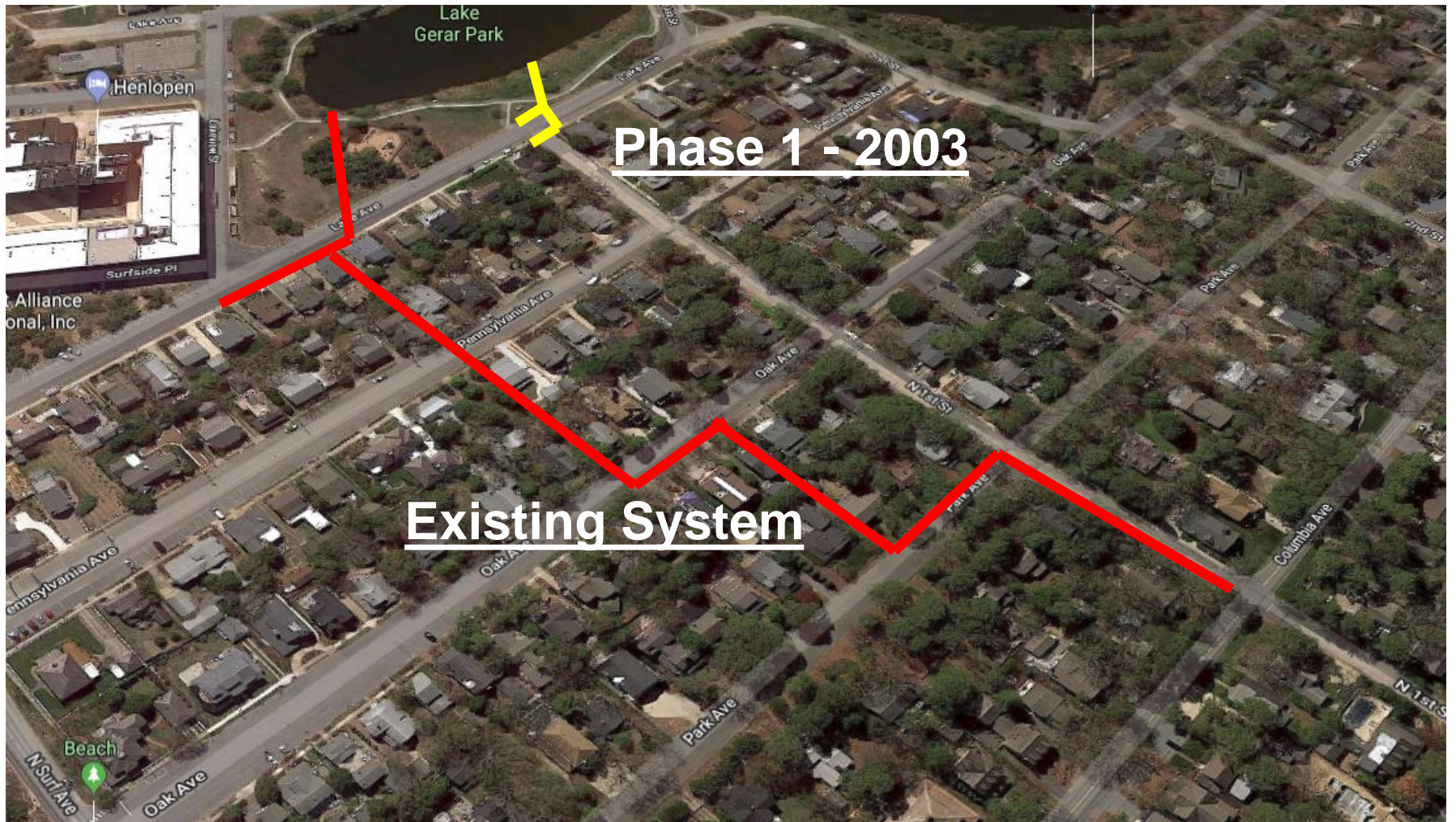
**Phase 1 - Installed in 2003**

**Phase 2 - Initial “Possibility” Investigation – 2003**

**Updated Cost Estimate – 2009**

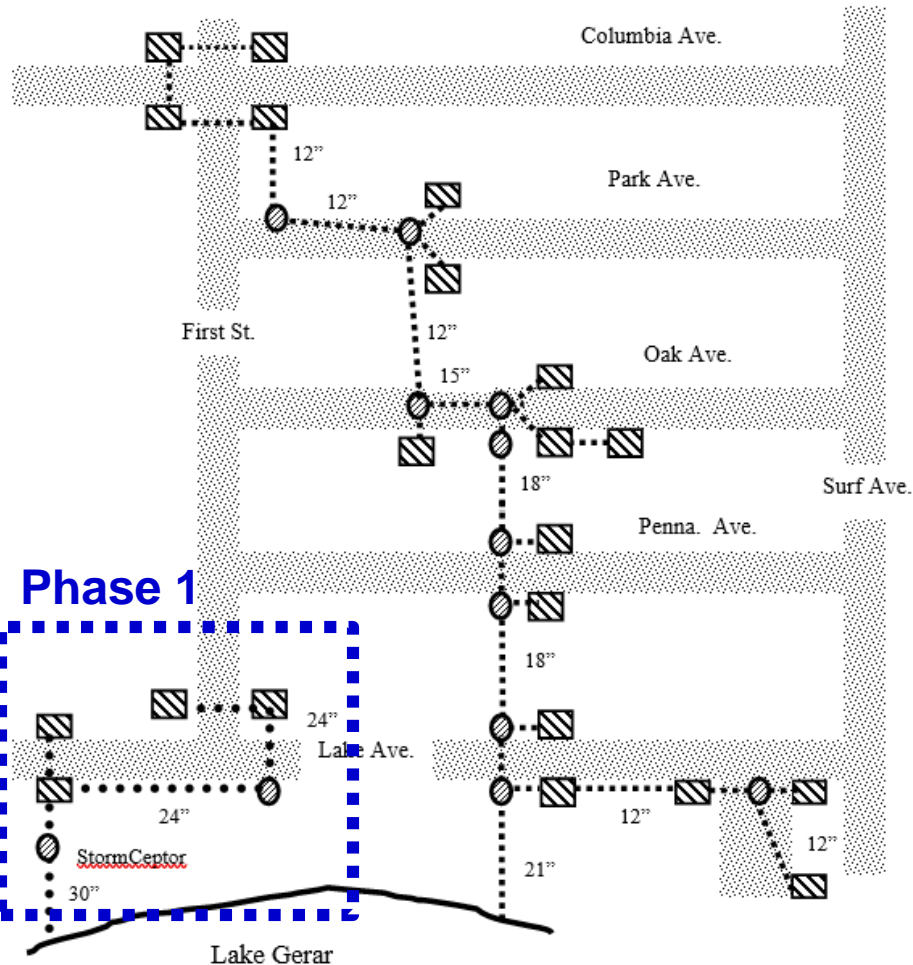
**Updated Cost Estimate – 2017**

# Existing Drainage System Schematic



Not To Scale

# Existing Drainage System Schematic



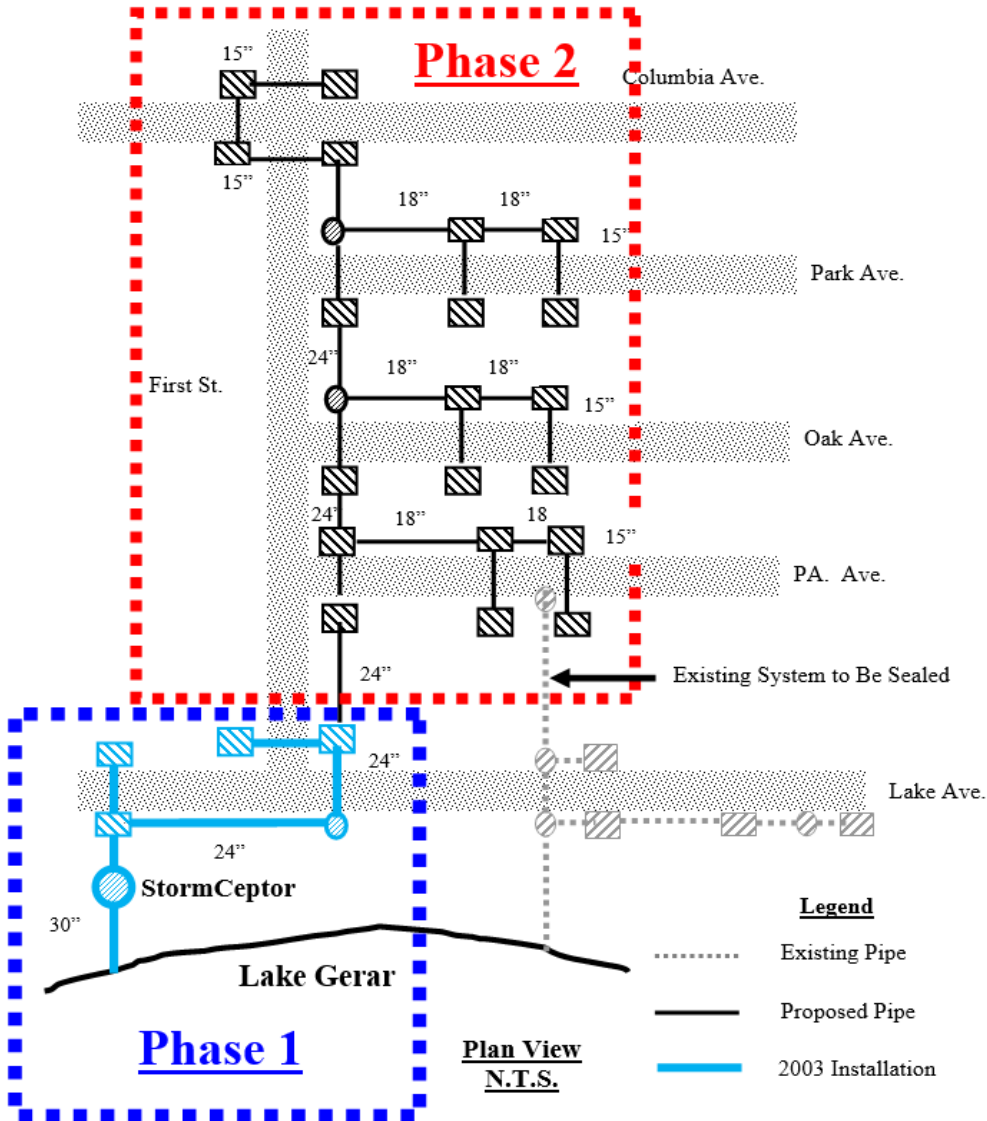
Plan View  
N.T.S.

Legend

- ..... Existing Pipe
- ..... 2003 Installation

- **Hydraulically Inadequate**
  - Undersized Pipes
  - Inefficient: Many changes in direction and junction boxes which induce energy losses
    - Reduces Capacity
    - Reduces Velocity
      - Results in Sedimentation Build-up
- **Existing Condition of Pipes**
  - No Investigation to Determine the Integrity of the Existing Pipe System
  - From Park Ave. to Lake Ave., the pipes run between houses

# Phase 1 – Installed in 2003



- **Remove and Replace Existing Pipe From First St. to Lake Ave.**

- Designed to Handle Runoff from Phase 1 & Phase 2
- StormCeptor was installed for Water Quality

- **Design**

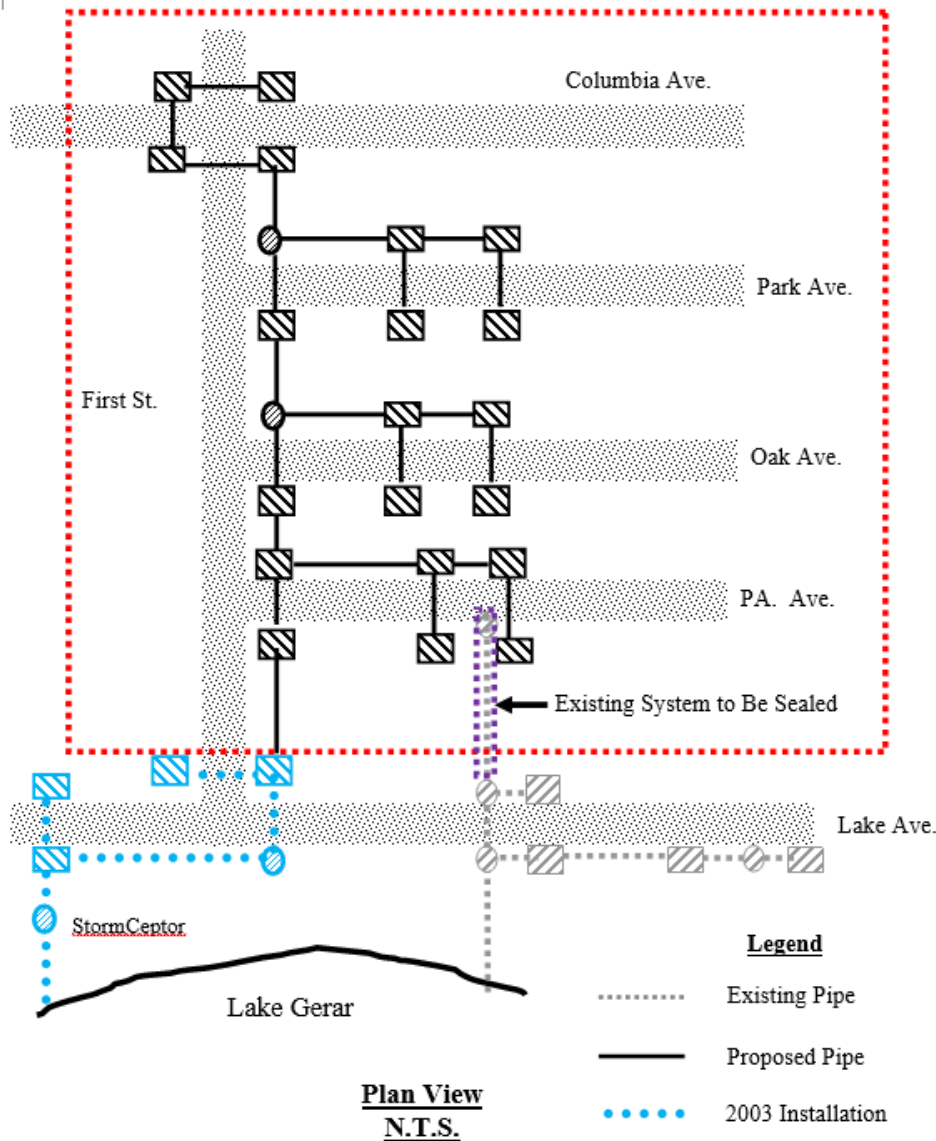
- Phase 1 - Designed to provide Hydraulic Capacity to handle Runoff from both Phase 1 and Phase 2
- Phase 2 - "Possibility" study to determine if the elevations would work for a piping system on First Street.

# Phase 2

**Columbia Ave. to Lake Ave.**

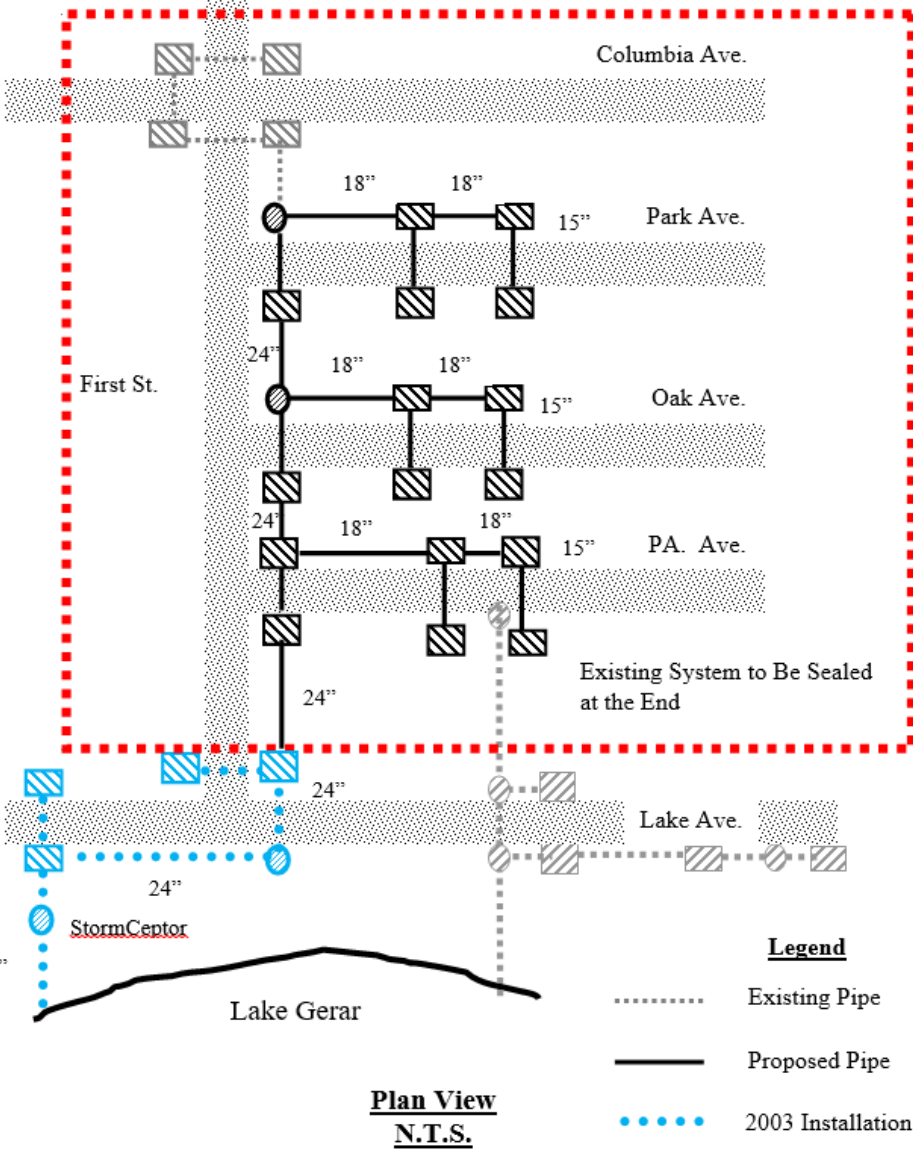
Three Options

# Option No. 1



- **Install New Pipe From Columbia Ave. to First St.**
  - Tie into 2003 Drainage Project
  - Complete Removal of Existing Pipes From Columbia Ave. to Park Ave.
  - Partial Removal of Pipes from Park Ave to PA. Ave.
  - Seal Ends of Existing Pipes that are not removed.
- **Cost Estimate: Approx. \$470K**
- **Notes:**
  - No Investigation to Determine the Integrity of the Existing Pipes
  - Seal Ends of Unused Pipes or Should Pipes be Fully Sealed???

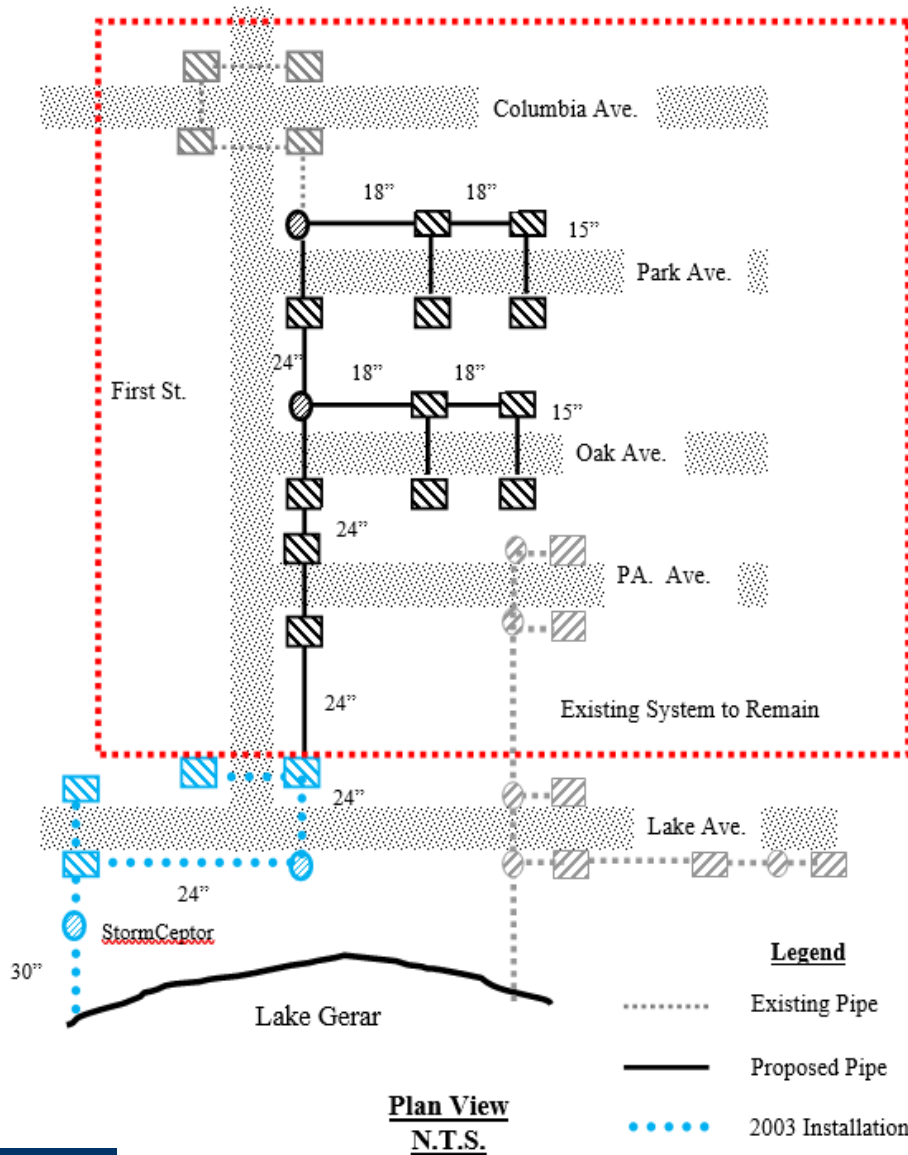
# Option No. 2



- **Install New Pipe From Park Ave. to Lake Ave.**
  - Tie into 2003 Drainage Project
  - Partial Removal of Pipes from Park Ave to Lake Ave.
  - Seal Ends of Existing Pipes that are not removed.
- **Cost Estimate: Approx. \$390K**
- **Notes:**
  - No Investigation to Determine the Integrity of the Existing Pipes
  - Seal Ends of Unused Pipes or Should Pipes be Fully Sealed???



# Option No. 3



- **Install New Pipe on Park Ave. & Oak Ave.**
  - Tie into 2003 Drainage Project
  - Partial Removal of Pipes from Park Ave to Oak Ave.
  - Seal Ends of Existing Pipes that are not removed.
- **Cost Estimate: Approx. \$320K**
- **Notes:**
  - No Investigation to Determine the Integrity of the Existing Pipes
  - Seal Ends of Unused Pipes or Should Pipes be Fully Sealed???

# 2017 Pavement Management Study

# Why Manage Your Pavements?

# But We Don't Maintain Roads Properly



**There needs to be  
a Better Method!**

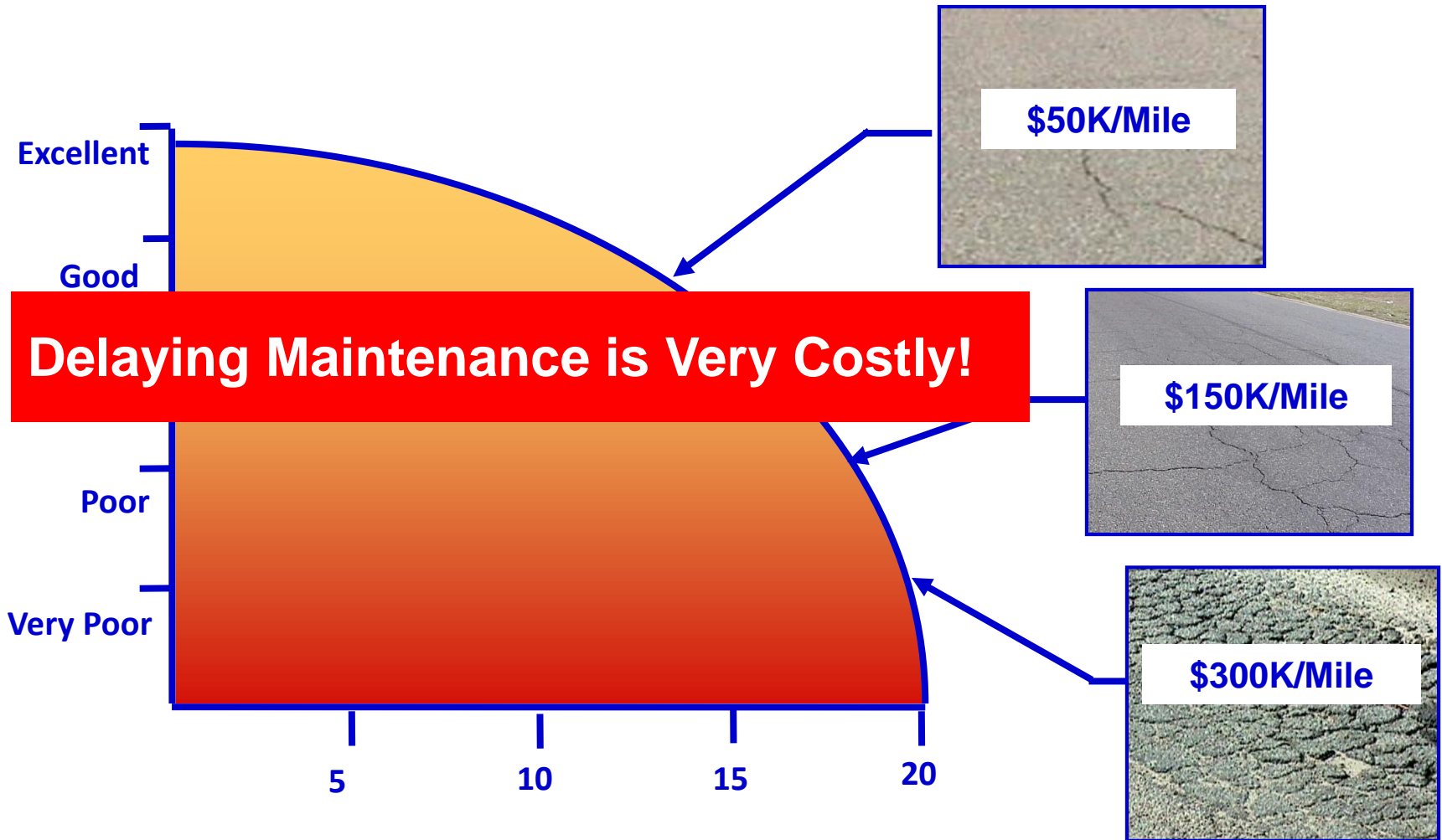


**Pavement Management**

# Why Timing Is Critical?



# Pavement Deterioration Accelerates with Time



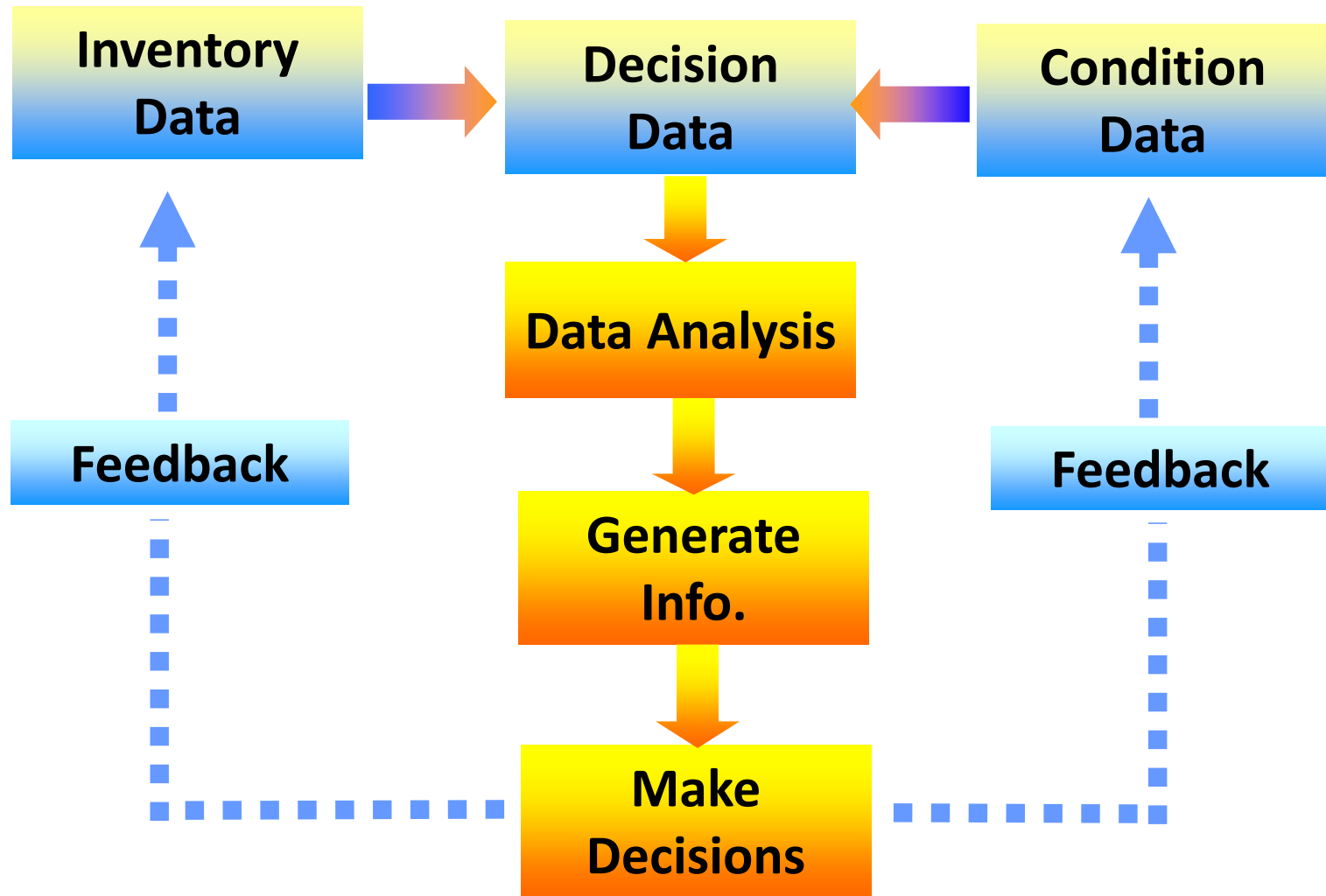
# What is Pavement Management?



# Pavement Management

- Planning tool for Budgeting:
  - Rational, Schematic Approach to managing Pavements
  - Collects and monitors data on current pavement conditions
  - Determines Repair Strategies and Costs
  - Prioritizes (Optimizes) Selected Repairs
  - Produces a Work Plan for the Selected Budget

# PMS Flow Chart



# Network-Level Management

- Overall road system
- Approximate Costs
  - Average values: actual costs depend on many factors including project size
- “General” Work Plan
  - Based on Windshield Survey
  - Requires Project-Level Analysis to finalize
    - Detailed Scope of Work
    - More Accurate Budget

# Analytics Matter

- AgileAsset's *Pavement Analyst*<sup>™</sup> was used for Analysis and Reporting
  - Utilizes Decision Trees to Select Cost-effective Repairs
  - Utilizes Performance Models to Predict the Future
  - Utilizes Multi-Constraint Integer Optimization
    - Selects the Unique Set of Projects to Optimally meet the defined Constraints
    - For these analyses, the only constraint was the annual budget
      - Selects the Optimal Set of Projects to provide the Highest Possible Benefit for the Allowable Budget

# Developing a Budget

- Ran Four 10-Year Budget Scenarios
  - \$200,000/Yr.
  - \$300,000/Yr.
  - \$375,000/Yr.
  - \$450,000/Yr.

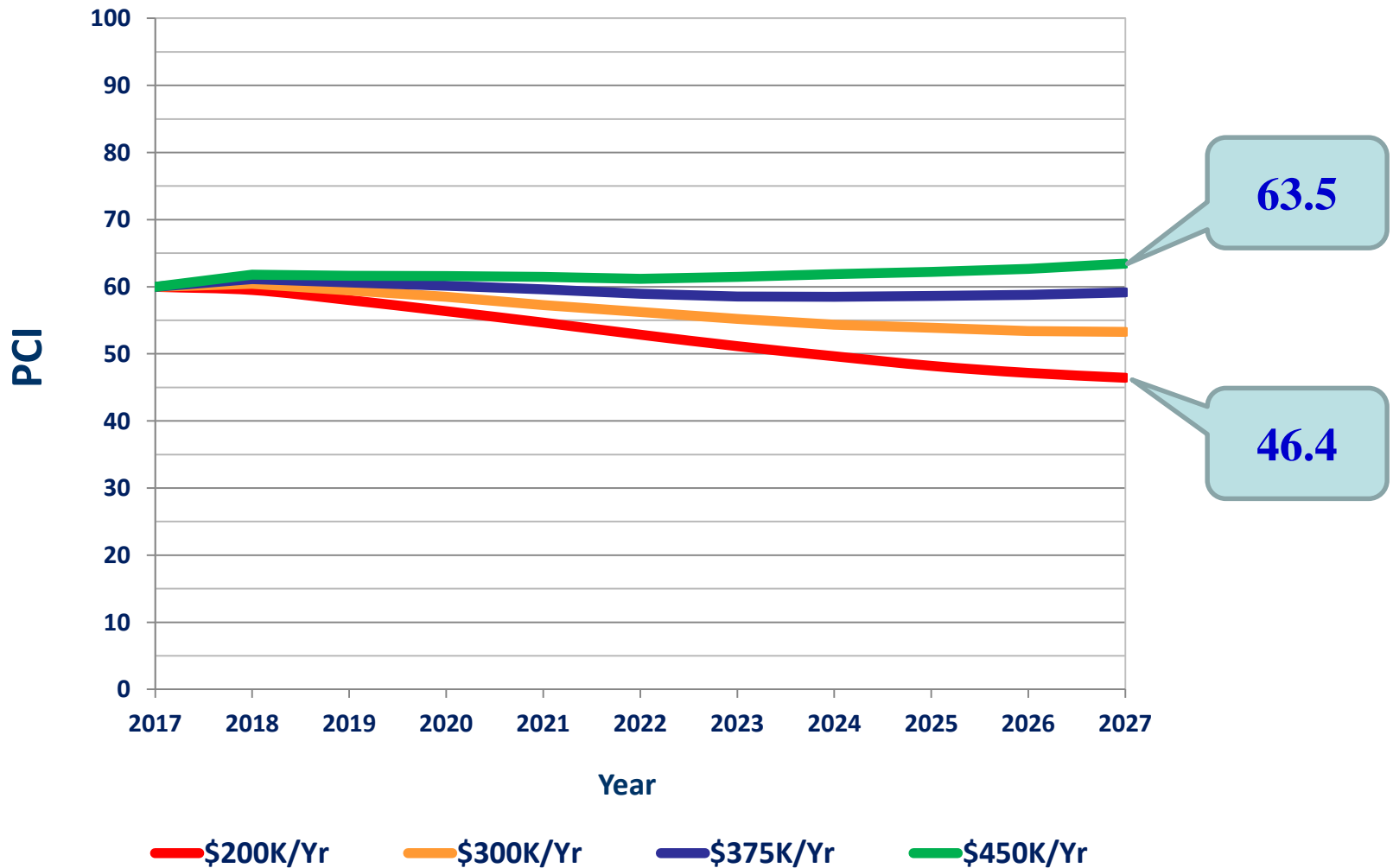
# Current State of the Network

| <b>Element</b>                         | <b><i>Total</i></b> |
|--|---------------------|
| <b>Length (CL Miles)</b>               | <b>18.8</b>         |
| <b>PCI</b>                             | <b>59.99</b>        |
| <b>Net Worth (\$)</b>                  | <b>\$20,605,816</b> |
| <b>Backlog Cost (Unfunded Repairs)</b> | <b>\$6,595,564</b>  |

“**Backlog Cost**” is the current total amount of money required to fund all pavement repairs needed within the City’s roadway network

# Future Pavement Condition

Network Pavement Condition  
10 Year Optimized Analysis



63.5

46.4

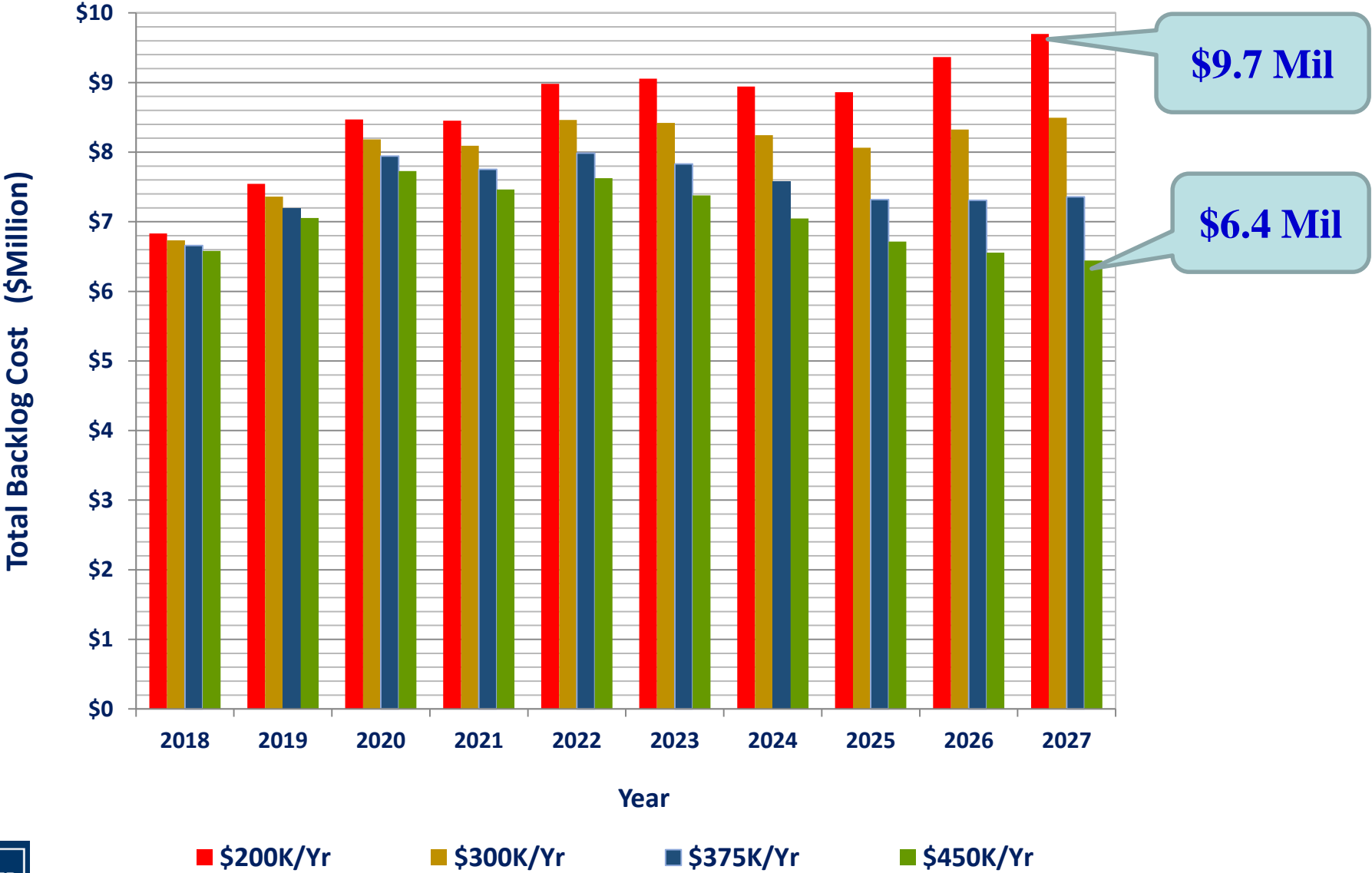
\$200K/Yr

\$300K/Yr

\$375K/Yr

\$450K/Yr

# Future Backlog Cost





# Net Savings/ROI

| Scenario Name            | PCI   | Backlog Cost |
|--------------------------|-------|--------------|
| <b>Current Condition</b> | 59.99 | \$6,595,564  |

**Baseline: \$200K per Year**

| Scenario Name    | 2027 PCI | 2027 Backlog Cost | Reduction in Backlog | Additional Investment | Net Savings | ROI         |
|------------------|----------|-------------------|----------------------|-----------------------|-------------|-------------|
| <b>\$200K/YR</b> | 46.4     | \$9,698,763       | \$0                  | \$0                   | \$0         | --          |
| <b>\$300K/YR</b> | 53.3     | \$8,496,049       | \$1,202,714          | \$1,000,000           | \$202,714   | <b>1.20</b> |
| <b>\$375K/YR</b> | 59.2     | \$7,358,315       | \$2,340,448          | \$1,750,000           | \$590,448   | <b>1.34</b> |
| <b>\$450K/YR</b> | 63.5     | \$6,442,340       | \$3,256,423          | \$2,500,000           | \$756,423   | <b>1.30</b> |



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