Mini Abstract: The Great Neck, NY BASINiQ™ Study

The Great Neck, NY BASINiQ™ study represents the largest inflow and infiltration (I&I) assessment of its kind in the United States, deploying 425 sensors across the entire wastewater collection system. BASINiQ™ integrates dense radar-based level monitoring, digital manhole twins, and precision weather data to rapidly pinpoint I&I sources. Study findings found clear locations of inflow leading to actionable insights for capital planning. This landmark project demonstrates that large-scale, data-driven I&I assessment can be achieved in weeks rather than years, transforming how municipalities prioritize rehabilitation, reduce treatment costs, and modernize infrastructure management.

Full Abstract: Transforming Inflow and Infiltration (I&I) Detection at Scale – The Great Neck, NY BASINiQ™ Study

Introduction

Inflow and Infiltration (I&I) represent one of the most persistent and costly challenges in wastewater management, accounting for 35–50% of treated wastewater nationwide. Traditional detection methods such as smoke testing, CCTV inspections, and limited flow metering are slow, expensive, and often ineffective at pinpointing sources of I&I, particularly at system scale. These limitations have forced utilities to operate reactively, allocating significant capital resources with little confidence of achieving measurable reductions.

To address these constraints, BASINiQ™, developed by RH Borden Smart Solutions, introduces a data-driven, scalable, and cost-effective methodology. By combining high-resolution digital twins of manholes, dense radar-based sensor networks, and precision weather tracking, BASINiQ™ delivers actionable insights in as little as 60–90 days—compressing workflows that previously required years.

The Great Neck, New York BASINiQ™ study represents the largest target basin deployment in the United States to date, with 425 sensors installed throughout the entire system. This landmark project is poised to redefine industry expectations for scale, speed, and precision in I&I assessment.

Methodology

The Great Neck study followed BASINiQ's established two-phase approach:

1. System Decomposition and Basin Mapping
   The collection system was divided into natural basins, each with a common outfall, creating a framework for prioritization.

2. Target Basin Assessment at Scale
   Unlike typical deployments of 30–100 sensors, the Great Neck project implemented 425 sensors across the entire system, achieving a density of one sensor every 2–3 manholes. This sensor network allows for fine-grained detection of I&I signatures, including inflow spikes, infiltration tails, blockages, and diurnal baselines.

3. Manhole Digital Twins
   The BASINiQ methodology paired each monitored location with a 360-degree video and LIDAR scan, capturing dimensional data critical for accurately converting level

measurements into flow. This ensures reliable calculations when comparing hydrographs across the network.

4. Integration with Precision Weather Data
   The system was synchronized with the Baron Weather Network, providing rainfall measurements every half mile at four-minute intervals. This granularity enables correlation between precipitation and localized flow anomalies.

Findings

Great Neck confirmed several key outcomes:

- High sensor transmission reliability with redundancy across the dense network ensured continuity throughout the study.
- Clear evidence of inflow was identified through immediate post-rainfall spikes in hydrographs, distinguishing it from slower infiltration patterns.
- AI-driven pattern recognition enables automation of anomaly detection. Additional manual review revealed inflow-prone areas and problematic laterals.

Importantly, this system-wide deployment enables a level of redundancy and resolution never before achieved providing compensatory coverage, preserving study integrity.

Significance

The Great Neck BASINiQ™ study represents a turning point in wastewater management for several reasons:

1. Scale – At 425 deployed sensors, this is the largest target basin study in the country to date, providing an unprecedented volume of data for I&I assessment.
2. Speed – Actionable results are generated in weeks rather than years, allowing Great Neck to incorporate findings into its next capital planning cycle.
3. Cost Efficiency – Even at this scale, BASINiQ™ remains more cost-effective than traditional methods, which could never achieve this density of monitoring.
4. Holistic Asset Insight – Beyond flow analysis, the 425 manhole digital twins provide a complete structural inventory with automated wall degradation assessments, creating additional value for asset management.

5. Future-Proofing – Data collected during the study is preserved for additional analysis allowing future re-analysis as tools advance.

Broader Implications

The Great Neck project is not just a study of local I&I—it is a proof of concept for the future of nationwide wastewater infrastructure management. By scaling dense sensor deployments across entire systems, utilities can:

- Pinpoint specific sources of inflow and infiltration with high certainty.
- Prioritize rehabilitation funding for the greatest return on investment.
- Monitor post-repair performance to confirm reductions and prevent regression.
- Leverage AI and big data approaches for predictive maintenance and smart utility management.

As municipalities face aging infrastructure, limited budgets, and heightened regulatory scrutiny, the BASINiQ™ methodology offers a transformative path forward. The Great Neck study demonstrates not only feasibility at scale but also the power of integrating digital twins, weather intelligence, and real-time monitoring into one cohesive platform.

Conclusion

The Great Neck BASINiQ™ study is a landmark in wastewater engineering: 425 sensors deployed across an entire collection system, creating the largest and most comprehensive I&I assessment of its kind in the United States. Preliminary findings reveal actionable insights into inflow behavior, supported by high-resolution digital twins and precise weather correlation.

This study validates BASINiQ™ as a game-changing approach that compresses I&I detection timelines, reduces costs, improves accuracy, and empowers data-driven decision-making. Its success in Great Neck sets a new benchmark for the industry, showing how next-generation methodologies can scale nationally to address one of the most pressing challenges in wastewater management.