SCOPE OF SERVICES

CITY OF LORAIN
SEWER SYSTEM EVALUATION STUDY

January 19, 2026

The Scope of Services set forth herein defines the work to be performed by HDR in completing the Project. Both the City of Lorain ("City") and HDR have attempted to clearly define the work to be performed and address the needs of the Project.

The City Utilities Department has made significant progress in fulfilling its Clean Water Act obligations. The City has completed sewer and manhole rehabilitation projects, SSO closures, pump station upgrades, and a system optimization study. As part of its ongoing commitment, the City is now seeking services to complete a Sanitary Sewer System Evaluation Study (SSES), as required by its Administrative Order on Consent (AOC). This study will support the development of a prioritized capital improvement plan to address the City's remaining Clean Water Act issues.

SERVICES TO BE PERFORMED

Task 1. System Assessment Strategy
Task 2. System Inspection and Condition Assessment
Task 3. Hydraulic Modeling & System Evaluation
Task 4. Capital Solutions & Maintenance Recommendations

The Scope of Services for the Project shall consist of the tasks outlined above.

PROJECT OBJECTIVES

The City's SSES outcomes need to achieve compliance with the City's Administrative Order on Consent (AOC) and enhance long-term system performance. Aligning both SSES and Asset Management System (AMS)

implementation outcomes will enable the City to strategically develop and prioritize City-wide, proactive capital improvements and maintenance plans for your sewer system and both wastewater treatment plants.

Using a planning-based approach, the SSES will assess the condition and performance of selected infrastructure, investigate potential inflow and infiltration (I/I) sources, and identify sewer capacity limitations in known problem areas of the sewer system. The study will collect and review existing information, perform inspection activities within the sewer system, and conduct hydraulic analysis and modeling. The study will develop and compare alternatives and associated costs and benefits and recommended potential study areas or planning-level projects to address identified issues.

PROJECT MANAGEMENT

Project management is a critical activity to be integrated with all project tasks. HDR shall use procedures related to cost estimating, scheduling, project documentation, risk management, QA/QC, and others as necessary to enhance budget, scope and time management for the Project.

HDR will develop a project management plan (PMP) and quality management plan (QMP) for the work. HDR will also develop a safety plan for all field work and require that any subconsultants develop safety plans for their work that comply with HDR requirements at a minimum.

To ensure that this project is successfully completed in a timely manner and to the satisfaction of the City, the following project management items are included in the Scope of Services:

- Monthly Project Progress Summary
- Monthly Invoicing: HDR shall comply with the City's most current invoice policies and invoice format.
- Project Meetings, to be held monthly (as needed), and may be in person or via Teams Meeting.

HDR's Project Manager shall meet with select City personnel monthly to review the progress of this project and to discuss any outstanding issues and potential problems. These meetings should include identification of work performed last period, work to be completed next period, critical action item status, and responsible parties to complete actions. Budget or schedule issues shall be identified and corrective actions noted.

HDR shall prepare and deliver an agenda, updated schedule, and revised action items in advance of the meeting and shall prepare and deliver meeting minutes for review within three (3) working days after the meeting.

It is also expected that HDR's Project Manager and the City's PM will hold telephone discussions as frequently as needed.

HDR shall also make personnel available for meetings with other agencies and utilities to answer questions pertaining to elements of the project. The City will take the lead in organizing, planning and conducting any meetings with other agencies and utilities.

TASK 1: SYSTEM ASSESSMENT STRATEGY

The Task 1 activities will plan the project and review and assess available information from the City. Task 1 activities will also document responsibilities and operating parameters for flow monitoring and field investigations.

HDR will develop an SSES Project Prioritization Approach TM, which will document criteria, data used, and a priority list of catchments. HDR will submit the draft TM to City for review and finalize upon receipt of comments.

Task 1.1 Data Gap Analysis & Data Collection and Management Plan

HDR will prepare a data request for City review. HDR anticipates requesting the following information, at a minimum:

- Existing drawings as provided on Arc GIS Online (AGOL) or by the City.
- City's Arc GIS Online (AGOL) Information.
    - Exportable geodatabase of sanitary and storm sewers and pump stations for use in model import.
- City's AGOL field inspection and survey forms, if applicable.
- Readily available historical flow information, including:
    - SSO Locations
    - Basement Backup Reports
    - Surface Flooding Reports
    - Pump Station Service Records

  - Pump Station Pump Data
  - Past Studies and Records of Rehabilitation, Relief, I/I Projects Completed
  - Records of Flow Monitoring Completed in the Collection System
  - Records of System Storage Tunnel Overflows
  - Records of WWTP Bypassing
  - Records of System CCTV inspections
- Existing model and associated flow/rainfall data.
- Future Growth Projections.

HDR will develop an existing information summary with accompanying table/database to summarize information gathered and gaps identified during the review.

HDR has assumed the City will be the maintainer of the City's AGOL system, and the City's Enterprise system. HDR is responsible for managing, compiling, and loading Project datasets. The HDR team will coordinate with the City at the outset of the project to establish protocol for use of the AGOL database.

Development of new field inspection data collection and reporting tools is not included in this scope.

1.1.1 Asset Management Coordination

The SSES project team will participate in an asset management coordination meeting with members of the City's Asset Management project team. The current asset management project's scope will be reviewed, and the project teams will identify tasks where close integration will be needed to ensure data is collected efficiently and in accordance with the asset management project's structure. It is expected that members of Stantec's asset management team will participate in routine SSES project status calls and meetings to ensure the two projects stay aligned and to minimize duplication of effort.

1.1.2 Data Collection and Management Plan

All field data will be reviewed by HDR on a weekly basis as it is received from the field for quality control and completeness. Project-specific data management tools will be modified as necessary. All data will be collected and managed in accordance with HDR standards and presented in digital

format and in hard copy as appropriate. Pipe and manhole defect coding will conform to NASSCO's PACP/ MACP criteria and formats.

HDR will manage and communicate GIS discrepancies using the City's GIS platform and provide a summary on a weekly basis. The City's staff will maintain responsibility for the City's AGOL system and data maintenance for data collected, posted and housed in the AGOL project group.

HDR will provide a Data Collection and Management Plan TM that will outline the data management tools and procedures used during the project to ensure that the library of information gathered on the project is structured and delivered in a useful format. The DCMP describes the data systems that were used to manage information during the project and how data flows between them. The DCMP will be a "living document," incorporating changes as the project progresses. HDR will describe how data will be collected under each major fieldwork activity to serve as a guide for the project team at the project outset about how work will proceed.

Task 1.2 System Inspection and Monitoring Strategy

The inspection and monitoring strategy will be driven initially by calibration meter flow characterization to identify locations of high I/I. Calibration meter locations will be based on the following factors:

- Known SSO and basement backup areas
- Areas where lining has occurred to provide estimates of post-rehab I/I
- Areas of known high level I/I based on past monitoring efforts

Once high I/I is verified, micro-monitoring will be performed to screen areas for further investigation. The goal of the micro-monitoring will be to remove areas exhibiting minimal direct inflow response from further field investigation efforts. Based on micro-monitoring data, additional field investigations to identify the sources of direct inflow may include:

- CCTV
- Smoke and/or Dye Testing

A System Inspection and Monitoring Strategy Workshop (Workshop #1) will be held to get the City's input on the preliminary prioritization approach, the resulting priorities, and provide direction on any necessary adjustments.

Task 1.3 Hydraulic Evaluation Criteria

SSOs need to be controlled to the 10-year, 2-hour design storm. A common level of service goal utilized in the industry is to maintain the water surface elevation at least 8 feet below the rim elevation/ground to provide a buffer below a typical basement elevation. Desired depth to be clarified with the City during the development of the strategy.

Evaluation will include whether the collection system piping can sufficiently transport resulting flows to the WWTPs and whether the increased flows to the WWTPs will result in any bypassing of the plant or any process at the plant.

The SSO control storm (10-yr, 2-hour) will be simulated to assess SSO activations as part of Task 3 efforts.

Acceptable levels of surcharge will be agreed upon with the City, and the SSO control storm as well as up to one additional design storm, will be simulated as part of Task 3 efforts to locate pipes that do not meet the acceptable level of surcharge.

For pump stations, the SSO control storm as well as up to one additional design storm, will be simulated as part of Task 3 efforts to identify locations where the pump station cannot keep up with the influent flow resulting in unacceptable levels of surcharge in the influent sewer. Modeling in Task 3 will also simulate the post-construction conditions for pump stations that have improvements under construction at the time of the model build as part of the evaluation.

Evaluation criteria will be presented for the City's feedback/acceptance at a monthly progress meeting. Revision to evaluation criteria will be finalized prior to performing capacity assessments under Task 3.

Task 1.4 Future Conditions Considerations

Based on feedback from the City, up to 3 future growth scenarios will be developed. It is assumed that a near-term (5-year), mid-range (15-20 year) and full build out scenarios will be developed. Future growth scenarios will account for population growth in accordance with other master planning work done by the City including the Water plant and will be based largely on zoning and ERU estimates by land use. Future growth scenarios will take into consideration connection of properties currently on septic as well as future population growth. Flow projections from future residential and/or commercial zone population will

be based on zoning, minimum lot sizing, and typical flow values published by Ohio EPA for these developments. Data from NOACA FPA planning with input from the City will be utilized for flow projections.

“Mega site” industrial user projections may be included. Development of flow projections from a future industrial mega site is not included in this scope, it is assumed the City will provide an estimated flow.

Development of future condition growth scenarios and documentation of assumed flow projections will be documented in a technical memorandum and submitted to the City for their review and comment. Future condition growth scenarios will be finalized prior to modeling future flow conditions under Task 3 efforts.

Task 1.5 Black River and PQM WWTPs Evaluation Approach

The collection system findings and recommendations from this Study will impact the wastewater treatment plants. For example, increased capture of SSO’s will increase flows to the plant, while reductions in infiltration/inflow will reduce plant flows. At this point, it is not clear how the SSES will have a net impact on flows to each treatment plant. Changes in flows can also create changes in influent characteristics.

HDR will hold a WWTP Evaluation Strategy Workshop (Workshop #2) with the City and leadership from both WWTPs to discuss the approach which will be used to evaluate potential impacts to the Black River and PQM WWTPs. At this Workshop, HDR and City WWTP staff will review:

- Concerns that plant staff have regarding certain processes and/or equipment,
- Operational issues, strategies and practices,
- Overarching performance influences and facility limitations,
- Known hydraulic bottlenecks and/or impacts to process performance,
- Challenges that are encountered during transitions to/from wet weather,
- History behind why certain practices have evolved to what they are today, and
- Recommended improvements identified by plant staff to upgrade the facilities
- Any planned improvements

After that Workshop, under Tasks 2 and 3 (respectively), HDR will assess the existing facilities condition and potential impact of future influent flows resulting from implementation of the SSES program.

Task 1 Deliverables

- Data Request – Gap Analysis
- Quarterly Data Collection and Management Plan TM
- SSES Prioritization Approach TM
- Meeting Agenda and Minutes for Workshops #1 and #2
- Future Conditions TM

TASK 2: SYSTEM INSPECTION AND CONDITION ASSESSMENT

Task 2 will include inspection and assessment of the sewer system to identify significant sewer system defects causing water quality and/or quantity problems, including basement flooding, and sanitary sewer overflows (SSOs). Task 2 will integrate with Tasks 1 and 3 to both use and update existing information and provide guidance for flow monitoring locations and confirmation of flow monitoring results.

Baseline inspection and assessment tasks are listed in **Table 2**. An allowance for each type of assessment is included in the base fee for the SSES. Actual quantities will depend on Task 1 prioritization and work orders developed based on City input, ongoing investigation results, and allocated budget for field assessment efforts. Depending on the results of the flow monitoring and ongoing investigations, some activities may be substituted for others.

Table 2 – Task 2 Activities

Activity:	Comments:
Sewer Inspections per NASSCO PACP	To provide detailed condition data on sewer pipe segments. Perform sonar, lidar, and light cleaning as needed
Manhole Inspections per NASSCO MACP	To provide detailed connectivity and condition data on select manholes
Manhole Surveys	To verify pipe diameters, pipe invert elevations, and rim elevations for hydraulic model extensions and verification.
3D Laser Scanning	To provide detailed information with 3D point clouds that can be used to determine the internal characteristics of structure.

360 Pole Cameras	To provide for quick video and/or photos of the interior structure of manholes and for the two pipe segments, in each direction.
Smoke Testing (Mainline or Private)	To identify possible I/I from sewer lines, catch basins, downspouts, or other locations.
Dye Testing (Mainline or Private)	To identify connectivity by introducing dye to at public sewers or structures, or on private properties, such as downspouts and yard drains.
Survey at select locations at Black River and PQM WWTPs	To verify as-built elevations and dimensions for hydraulic capacity elevations.

Task 2.1 Field Investigations

The dollar figures in the descriptions below are for budgeting purposes for subconsultant services and the fees may be shifted from one type of inspection to the other as needed.

Pipe and Manhole Inspections (Condition Inspections)

Following the Task 1 planning activities and initial work order development, HDR team will conduct CCTV inspections on sections of sewer mains identified in the work orders. Additional CCTV will be conducted following the calibration of the collection system model in Task 3. The CCTV inspection will be conducted according to NASSCO's PACP[1] criteria. HDR will provide digital recordings of the inspection along with inspection reports. All information will be provided in a PACP compliant database. Additionally, all CCTV will be collected in a manner to be compatible with Cityworks. HDR staff will accompany the Subconsultant during this activity on an as-needed basis. **The budget includes $200,000 for CCTV.**

Panorama/scanning technology will be used for select manhole inspections on this project. If access or structural limitations exist, a man entry will be used to complete the inspection if needed. Known SSO manholes that aren't well documented will be inspected with scanning technology, if feasible, to assess status and condition. **The budget includes $75,000 for panoramic inspections.**

[1] National Association of Sewer Service Companies; Pipeline Assessment Certification Program

In conjunction with new data collection, existing CCTV data obtained from the City since 2024 will be uploaded to the Sewer AI Pioneer cloud platform and processed through the AutoCode model to generate NASSCO-compliant coding outputs. **The budget includes 200 hours for this work.** Prior to completing this work the files and data will be reviewed with the City to determine whether there is value to completing this work.

The resulting PACP-coded data and reports for both the existing and new inspections will be used to develop recommendations for sewer rehabilitation and renewal, as needed.

Manhole Survey (survey rim and depth to invert)

The HDR team will survey the location and elevation of selected manholes in the SSES project area for modeling and alternatives development. Manhole surveys will also be used to verify connectivity, configuration, evidence of surcharge, and/or manhole and trench type. The locations will be gathered by GPS survey based on the Ohio State Plane Coordinate System (North Zone) and the North American Datum of 1983 (2011) (NAD 83 2011). Elevations will be based on the North American Vertical Datum of 1988 (NAVD88). **The budget includes $75,000 for MH surveys.**

HDR staff are not anticipated to be necessary to accompany survey crews for these activities.

Smoke Testing

Upon identification of areas with high I/I, the HDR team will conduct targeted smoke testing to identify potential defects and sources of I/I into the sanitary sewer system. Testing will be conducted using a blower and commercially available smoke. HDR will coordinate with authorities and distribute public notification door hangers in advance of the smoke testing work.

Digital photographs will be taken of each defect and I/I source revealed. Defects identified by smoke testing may include catch basins, broken or missing cleanout caps, downspouts and other private property I/I connections, major line breaks, storm sewer cross-connections, and defective plumbing. Smoke testing results may trigger additional investigations, such as CCTV inspections and dyed water testing. Results of smoke testing will also be documented in a GIS layer within the City's GIS map. **The budget includes $150,000 for smoke testing.**

HDR staff will typically accompany smoke testing crews for this activity.

Dyed Water Testing/Flooding

Where Task 1 prioritization, flow monitoring, or smoke testing indicates the potential for direct sources of inflow or rapid infiltration into the sanitary sewer, HDR team may conduct dyed water testing to confirm the suspected inflow sources. In these locations, dye tests will be performed, documented and photographed in conjunction with mainline CCTV PACP inspections. The CCTV camera will be positioned in the pipe at the suspected inflow source to document the sections of pipe and/or service connections where dye water is observed entering the system. **The budget includes $75,000 for dye testing.**

HDR staff will typically accompany inspection crews for this activity.

Private Property Dyed Water Testing / Single Family Residential, (optional, if authorized)

Private I/I sources can be a significant overall I/I contributor, and the I/I rate can be higher for older properties, particularly for homes constructed before WWII. The HDR team will conduct testing on private property by injecting dyed water directly into potential I/I sources such as downspouts and area drains. HDR will not enter onto private property without permission from property owners.

Private property notification (door hangers) will be developed and distributed prior to any dye testing work on private property. Additional notification will be provided by City, if necessary.

HDR field inspectors will typically accompany inspection crews for this activity.

Model Confirmations and Alternative Analysis

Information requests during model development and calibration or alternative analysis may require field survey or inspection. The HDR team will use visual inspection, including CCTV equipment, as appropriate to confirm connectivity. Budget for this work is included in the figures included in the specific type of work, as described above.

Confirmation of elevations at the two wastewater treatment plants may also be necessary when building the hydraulic models; the budget includes **$25,000** for this type of survey work.

HDR field inspectors will typically accompany inspection crews for this activity.

Task 2.2 Sanitary Sewer Renewal Recommendations

The objective of this task is to utilize the risk model being developed for the City (under a separate contract) to make recommendations for gravity sewer renewal and rehabilitation using a condition-based approach.

Specific tasks include:

1) Engagement with City staff includes a workshop to determine and identify the typical renewal activities with local unit costs to better tailor the decision logic.
2) Configure renewal and cost estimation portions of the model including linear cost estimations per renewal activity.
3) Develop draft recommended renewal decision logic diagram for gravity sewer.
4) Conduct meetings and workshops throughout this process with City staff to collaborate and obtain operational input.
5) Develop a technical memorandum summarizing data inputs, the risk modeling process, and resulting outputs.

Workshop #3 will be held with the City to review the findings of the collection system assessment.

Task 2.3 Black River and PQM WWTPs Condition Assessments

HDR will assess the existing treatment facilities from both a high-level condition (Task 2) assessment standpoint and (under Task 3) a hydraulic standpoint. Each is described below:

High-Level Condition Assessment

HDR will perform a high-level condition assessment of each WWTP. The high-level condition assessment is not intended to document every piece of equipment, and/or system. Instead, it will focus on critical equipment which has not been replaced in (at least) five years and/or is of concern to plant staff. HDR will utilize the asset inventories that were recently developed for the Black River WWTP, PQM WWTP, and pump stations as a basis for this evaluation. HDR staff will walk each facility with plant Operations & Maintenance staff and perform a

high-level assessment of the condition of aged facilities and equipment and to document known issues. The output will supplement the City's existing asset inventories with notes on observed condition and operational challenges and estimated remaining life.

The condition assessment will be provided in a format that is compatible with the asset inventory database and as a GIS layer that can be overlain on the City's collection system map.

After completion of Task 2 condition assessments and Task 3 hydraulic evaluations of the WWTPs, HDR will schedule Workshops #4 and #5 with plant staff, as described further in Task 3.

As a Supplemental Service, and if desired by the City, HDR can provide a more comprehensive condition assessment at each WWTP, tied to your asset management system.

Task 2 Deliverables

- SOPs and forms for inspection field crews
- Weekly field status reports
- Inspection data deliverables
  - Pipe and Manhole inspection data
  - Field I/I investigations data
  - NASSCO PACP/LACP/MACP Data and Reports
- Configured risk and renewal model for gravity sewer system
- System Investigation Results and Summary TM
- Black River and PQM High-Level Condition Assessment TM
- Workshop #3 Agenda and Minutes

TASK 3: SYSTEM EVALUATION

Task 3 system evaluation, following the strategy developed in Task 1, will be used to inform and system assessments to be completed in Task 2. The sewer system flow and rainfall monitoring and modeling will also be used to analyze existing system performance. The analysis will identify system performance problems (SSO activations, projected risk of basement backups, manhole flooding) and likely causes to be considered for potential improvements in the

Task 4 alternatives analysis.

The proposed monitoring and modeling will focus on identifying and characterizing problems and providing sufficient information to allow for the determination of solution alternatives as described in Task 4.

Task 3.1 Flow and Rainfall Monitoring

Calibration Monitoring:

Flow Monitoring Plan

HDR will develop a Flow Monitoring Plan (FMP) for City review based on Task 1 information developed. The FMP will describe flow and rainfall monitoring activities and proposed locations.

We estimate that 55 calibration meters will be needed, 45 in the Black River WWTP tributary area and 10 in the PQM tributary area. Meters will be installed by May 1, 2026, and will record flow, depth and velocity data for up to 4 months.

Calibration meters that show no significant response for areas in which no known problems exist may be redeployed in areas exhibiting higher wet weather flow responses and/or known performance problems.

Rainfall Monitoring and Radar Rainfall

It is assumed at up to 5 rain gauges will be installed throughout the SSE study area. The actual number and placement of the gauges will be finalized during the flow monitoring plan development. If recorded rainfall events show significant spatial variation across the study area, radar rainfall data may be procured for up to 5 events.

A Flow and Rainfall Monitoring TM summarizing the implemented flow monitoring program will be developed for City's review.

Micro-monitoring

Based on characterization of I/I at each calibration meter, micromonitors (I/I isolation meters) will be installed in metersheds having the highest evidence of direct inflows. These short-term meters will be used to break down areas of roughly 100 acres or less for further I/I investigations in target sewer areas that

are contributing high peak flows.

It is assumed that:

- micromonitors will be deployed in one third of the calibration monitoring metersheds (assume 18 calibration metersheds), and
- that up to 4 micrometers will be installed in each of the 18 calibration sewershed showing the highest I/I. Micrometers will be installed for long enough to capture a minimum of two wet weather events.

For budgeting purposes, it assumed:

- Each set of 4 micromonitors will be installed for 4 weeks, and
- that 72 meter-months will be included.

Not all meters will be installed at the same time and sets of micrometers will likely be rotated throughout the collection system. Areas showing significant response would then be targeted for further investigations. Areas showing little response would be screened from further consideration. The same 5 rain gauges installed during the calibration monitoring are planned to support the micro-monitoring effort. The actual number and placement of the gauges will be finalized during micro-monitor plan development.

Task 3.2 Hydraulic Modeling

HDR will use the Black River WWTP collection system model as updated under the Pearl/Tacoma Pump Station upgrades project as a starting point for the Black River WWTP Collection system model update. The model used PCSWMM software and it is planned to keep the model in PCSWMM.

HDR will use the hydrologic and hydraulic model of the collection system tributary to the Jaeger pump station developed under the Jaeger Pump Station upgrades projects as the starting point for the PQM WWTP collection system model development.

Both models will be expanded to include all pipes 8” in diameter or larger. The resolution of subcatchment delineation will be increased to the level required to support evaluation of existing conditions, and potential future improvements.

At a minimum, newly added manholes and pipes will be named according to the City’s GIS database to establish a one-to-one relationship between the model(s) and the GIS. Because the existing Black River collection system nodes and

conduits do not align with the City's GIS, an evaluation will be performed to assess the feasibility of renaming the modeled elements to match the CITY's GIS.

The City's GIS database will be used as the primary source of data for populating the model. Pipe sizes, materials, invert elevations and rim elevations will be imported, where available. Where physical attribute data is not available in the GIS or system connectivity is not clear, record drawing will be requested and reviewed. If no record drawings exist, a field investigation plan will be developed to collect critical attribute information. It is assumed that up to 200 manholes will be surveyed in support of model development.

The existing portions of the Black River collection system model will be reviewed to assess accuracy and appropriateness for use. For example, multiple SSOs have been eliminated since the original Black River collection system model was developed. These changes are not reflected and will need to be updated.

In the Black River WWTP collection system model, the representation of the Black River Storage Tunnel, diversion and overflow structures and dewatering pump station will be reviewed and updated. Calibration meters will be placed strategically to allow for the behavior of the siphon to be evaluated during dry weather and wet weather events of varying duration and intensities.

The models will be extended into the respective WWTPs far enough that hydraulic impacts upstream can be properly represented. This is expected to include the plants' headworks.

Model Calibration

The model will be calibrated to dry and wet weather flow in accordance with industry best practices. Calibration events will have a minimum depth of 0.25" inches or rainfall and a minimum hourly intensity of 0.25 in/hr. A minimum of 5 calibration events will be used for calibration. If insufficient rainfall is recorded during the calibration monitoring period, extending the monitoring period will be recommended in coordination with the City.

Model update and calibration will be documented in a technical memorandum.

Task 3.3 System Hydraulic Capacity Evaluations

HDR will use the updated/calibrated model to evaluate existing conditions. This includes the following tasks:

- Simulate the SSO and level of service design storms identified in Task 1 (at a minimum this will be 10-yr, 2-hour design storm for which SSOs must be controlled).
- At SSO locations predicted to overflow, the volume of overflow will be quantified as well as the peak flow rate.
- Areas where predicted surcharge exceed level of service goals will be identified along with the cause of the surcharge (pipe lacks hydraulic capacity or surcharge is caused by a downstream restriction such as pump station limitation or siphon). Thematic maps will be developed showing pipes that do not meet level of service of SSO control targets.

Future Conditions Assessment:

The same capacity assessment will be performed for the 3 future planning horizons identified in Task 1.

I/I Characterization

HDR will use model results in combination with City input, flow meter data, and existing information to identify areas with excessive I/I which cause excessive surcharge, basement flooding and/or SSOs in the downstream systems.

Thematic maps will be developed that characterize the relative severity of I/I in each calibration and/or micromonitor metershed. I/I characterization will differentiate between areas exhibiting evidence of direct inflows versus more infiltration-based I/I.

System Characterization TM

The results of the capacity assessments, SSO activations and I/I characterization will be summarized in a System Characterization TM. Both existing conditions and future conditions (where appropriate) will be documented.

The results of smoke/dye testing or CCTV defects will be included in the summary TM related to I/I characterization. This TM will also include areas where no storm sewers are present as these may be opportunities to reduce I/I into the sanitary if storm sewers were built

Task 3.4 Black River & PQM Hydraulic Evaluations

WWTP Hydraulic Model Development.

HDR will develop a desktop liquid stream hydraulic model for each of the two wastewater treatment plants, using Visual Hydraulics software. The model will be developed using existing plant drawings, supplemented by field observations and anecdotal information obtained from plant staff. The model will be used to understand flow conditions through each WWTP, as well as identify hydraulic bottlenecks and low velocity zones. The model can also be used to evaluate hydraulic conditions with trains and/or equipment out of service, to confirm level of service and redundancy requirements.

It is assumed that existing record drawings are available to represent the current state of the plant.

If desired, as a Supplemental Service HDR can survey critical control points and water surface elevations to calibrate this model with actual field data. Budget for this service was included in Task 2 above.

Model outputs will be reviewed with plant staff to facilitate their feedback in comparing model outputs with actual operating experience. HDR will schedule Workshops with plant staff following WWTP evaluations from Task 2 and Task 3 to discuss model findings and obtain feedback from City staff.

As a Supplemental Service, specific pump stations (in-plant or collection system) can be modeled to identify predicted pump performance, as well as low or high velocity zones, for example. HDR uses AFT Fathom to evaluate pumped systems, through development of system curves and inputting pump curves. For problematic areas, improvements would be recommended, such as different pump selections or other piping/hydraulic modifications.

Workshops #4 and #5 will be scheduled at the two WWTP to review the WWTP evaluations including:

- Results of the condition assessments at both WWTPs (performed under Task 2)
- Hydraulic model findings from each WWTP (Task 3)

As a Supplemental Service and if the hydraulic model of the WWTPs identifies it as a potential capacity issue, HDR can support the City in stress testing the final

clarifiers under predicted short-term or sustained peak conditions, using field testing or Computational Fluid Dynamic (CFD) modeling.

Task 3 Deliverables

- Calibrated Model Files
- Flow Monitoring TM
- Model Build and Calibration TM
- Capacity and I/I Characterization TM
- Black River and PQM WWTPs Hydraulic Evaluations TM
- Agenda and Minutes from Workshops #4 and #5

TASK 4: CAPITAL SOLUTIONS & MAINTENANCE RECOMMENDATIONS

HDR will develop and analyze alternatives to solve the identified problems and achieve the desired water quality and public health benefits. Feasible alternatives will be compared, and cost-effective solutions will be identified for the City.

Specifically, HDR will coordinate with the City to determine which SSO control solutions will be included in a Capacity Assurance Plan (CAP) update for the submittal to the EPA. The CAP update will include a capital improvement plan to achieve 10-year, 2-hour SSO control at Consent-decree mandated SSOs.

In addition to the CAP update, HDR will develop a Capital Improvement Plan (CIP) that includes prioritized projects to address capacity problems causing a risk of basement backups or surface flooding. The CIP will also include a prioritized plan to cost-effectively reduce I/I across the City.

Task 4.1 Alternatives & Project Development

HDR will use information developed in previous tasks to identify significant sewer system problems within the City's service area.

HDR will review and update cost and benefit calculation methods, and the feasible improvements prioritization process from the other SSES projects completed by HDR in similar areas. Costing methods will utilize the procedures and cost basis set forth for the other SSES projects.

HDR will develop, analyze and compare alternatives to solve the identified problems based on above analysis, and identify the highest ranked alternatives

for implementation.

HDR will evaluate these areas for potential system improvements including I/I reduction in the public ROW and on private property, and conveyance and/or storage alternatives to control peak flows and provide acceptable system performance. Alternatives will include relatively low-cost corrective measures such as rerouting catch basins and downspouts away from sanitary sewers. For areas where additional flow reduction or capacity is required, or where these sources are not the primary cause of basement flooding, HDR will evaluate other corrective measures such as sewer rehabilitation/separation, lateral repair, footing drain disconnection, relief sewers and storage facilities.

HDR will document hydraulic capacity, and I/I problem identification and potential corrective actions in a technical memorandum for use in development and analysis of improvement alternatives.

HDR will prioritize the recommended improvements based on above and review with City prior to final documentation.

Alternatives will be grouped into the following categories:

- Baseline Improvements
- I/I Source Reduction
- Stormwater Offloading
- Conveyance Alternatives
- Storage Alternatives
- Black River & PQM WWTPs Alternatives

A project prioritization workshop (Workshop #6) will be held to review the alternatives.

Task 4.2 Maintenance Recommendations

HDR will use the information and recommendations developed above to identify PFLs and maintenance and policy recommendations to optimize long-term system performance and serviceability.

HDR will utilize FreeFlowH2O, a web-based O&M scheduler that uses predictive maintenance to optimize collection system maintenance schedules to provide a recommended maintenance plan for the collection system. HDR will also hold a Workshop (Workshop #7) for City staff on use of the program.

Task 4.3 Policy Recommendations

HDR will identify examples of potential private property ordinances that the City could implement to address private property I/I issues, if identified as a significant contributor to SSOs and wet weather issues at the WWTPs. In addition, HDR will identify examples of billing options intended to encourage outside communities to address I/I issues in their collection systems rather than transport to the City for treatment.

Task 4.4 Final Recommendations, Phasing and Reporting

HDR will identify projects that can be completed in the short term to provide immediate impact on the reduction of I/I in the collection system or otherwise aid in the reduction of SSO occurrences without needing to be included in a long-term CIP.

HDR will summarize the recommended improvements in a report that includes proposed work, projected hydraulic performance, preliminary layouts and/or routing, planning level cost opinions and implementation schedules, and priorities of proposed work.

HDR will compile the report and relevant background information in a final Capital Improvement Program (CIP) Report that provides an overall summary of the project approach, results and recommendations.

Workshop #8 will be scheduled to review final recommendations.

Task 4 Deliverables

- SSES Report, draft and final, for submittal to USEPA
- SSES CIP, draft and final, Recommendations
- Agenda and Minutes for Workshops #6 - #8.