

Guadalupe-Blanco River Authority (GBRA)



Asset Management Plan

June 2022



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Document Revision Table

Revision	Release date	Revision Prepared by	Revision Approval

Executive Summary

This Asset Management Plan (AMP) specifies how GBRA will sustain its Asset Management (AM) program and achieve the defined goals of the program:

- Improve and standardize utility management practices.
- Provide a consistent and transparent prioritization process.
- Enable better short and long-term renewal planning.
- Empower staff with new information, tools, and training.
- Improve analysis, reporting, and internal and external communication capabilities.
- Differentiate GBRA from other competing utility operators.
- Be sustained by GBRA.

GBRA's AM program is a coordinated effort by staff from across the organization that strives to achieve these goals. This AMP is a living document, revised annually, that defines key program elements, roles and responsibilities, data requirements, software tools, and business processes. The annual updates will capture (in Section 7) planned improvements and enhancements that GBRA will develop and deploy to be more efficient and effective in the future.

Table ES-1 lists the major AM program elements and tasks and their timing throughout the year. The rows highlighted in grey reference specific sections within this AMP where the activities are explained in detail. Several sustainment activities are performed throughout the year, but the annual project development, project prioritization, and budget planning processes start every August when the AM Steering Committee is convened to review the status of previously identified initiatives and to identify and prioritize plans for the following 12 months.

Table ES-1 Annual Schedule of Major Program Elements

AM Program Tasks	Month											
	August	September	October	November	December	January	February	March	April	May	June	July
Section 1.4.1 - AM Steering Committee												
AM Steering Committee Meeting	✓											
Section 2 - Asset Inventory												
Create New Assets	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Update Attribute Data	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Deactivate Assets	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Section 3 - Condition Assessments												
Update Condition through Regular O&M Practices	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Annual Bulk Import of Unassessed Assets				✓								
Section 4 - Preventive Maintenance												
Manage Maintenance Strategies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Maintenance Strategy Review											✓	✓
Section 5 - Risk Assessments												
Assess Risk of New Assets	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Review of Risk Scores			✓									
Section 6.1 - Renewal Planning												
Required Data Review				✓								
Replacement Cost Review				✓								
Generate Renewal Planning Outputs					✓							
Generate Renewal Planning Output Review						✓						
Refine and Update Renewal Planning Data						✓	✓					
Generate Finalized Renewal Plan Outputs							✓					
Section 6.2 - Proposing and Prioritizing Projects												
Propose Projects							✓					
Prioritize Projects							✓					

Section 1

Introduction

1.1 Purpose

This Asset Management Plan (AMP) specifies how GBRA intends to accomplish the goals it set for its Asset Management (AM) program. Those goals developed by GBRA's Asset Management Steering Committee (listed below in Section 1.2) are high-level objectives that guided the development and implementation of GBRA's AM Program. This AMP documents the major program elements and the related roles and responsibilities that will support GBRA in achieving those objectives.

The Asset Management Steering Committee should review and update this AMP annually to ensure that it reflects program updates and enhancements that are planned and/or implemented over time. Most sections of this document are not likely to require significant updates from year to year but Section 7.2, Program Improvements, should be thoroughly reconsidered by the Steering Committee annually to review progress made in the previous year and to define improvement goals for the coming year.

1.2 Asset Management Program Goals

The Asset Management program directly supports GBRA's mission, vision, values, and organizational goals. The program applies to all assets owned or operated by GBRA, and will:

- Improve and standardize utility management practices.
- Provide a consistent and transparent prioritization process.
- Enable better short and long-term renewal planning.
- Empower staff with new information, tools, and training.
- Improve analysis, reporting, and internal and external communication capabilities.
- Differentiate GBRA from other competing utility operators.
- Be sustained by GBRA.

1.3 Asset Management Program Elements

The major AM program elements, that are designed to achieve the AM program goals, are listed below. Each is defined in a separate section of the AMP and the numbers below indicate the section numbers in the AMP.

1. Asset Inventory
2. Condition Assessments

3. Preventive Maintenance
4. Risk Assessments
5. Capital Project Development
6. Program Review and Improvements

1.4 Roles and Responsibilities

This section specifies the responsibilities of the various GBRA groups and staff that support the Asset Management program. Table 1-1, Roles and Responsibilities, summarizes the program activities each different person or group within GBRA participates in. The subsections that follow Table 1-1 further describe each person or group’s specific responsibilities.

Table 1-1 Roles and Responsibilities

Responsibility	Role									
	AM Steering Committee	Asset Manager	Engineering	Division Managers	Supervisors/Lead Operators	GIS Administrator	Information Technology	GBRA Senior Management	Customer Service	Finance
Create and Manage Service Requests									✓	
Maintaining the Asset Inventory		✓			✓	✓				
Perform/Update Condition Assessments		✓			✓	✓				
Work Order Management		✓			✓					
Manage Preventive Maintenance Program		✓			✓					
Perform/Support Risk Assessments		✓		✓	✓	✓				
Identify Risk Mitigation Strategies		✓	✓	✓	✓					
Analyze Asset Renewal Plans		✓	✓	✓	✓					✓
Capital Project Development		✓	✓	✓	✓					✓
Capital Project Approval								✓		
AM Program Review and Improvement	✓	✓	✓	✓		✓				
Update Asset Management Plan	✓	✓								
AM Program Performance Monitoring	✓	✓		✓						
Reporting/Technology Management		✓				✓	✓			

1.4.1 AM Steering Committee

The AM Steering Committee should include representation from across the GBRA organization. It is a decision-making body that should include, at a minimum, representatives from each Operating Division, Engineering, IT, GIS, Finance, and Customer Service. Its purpose is to:

- Identify and prioritize AM Program planned changes/improvements.

- Standardize approaches and procedures as needed or desired across the organization.
- Review and approve changes to the AMP.
- Evaluate the performance of the AM Program in consideration of the defined objectives.
- Support the Asset Manager in implementing program changes/improvements.

The AM Steering Committee should meet in August each year to kick off the annual project development and prioritization process and to define changes or improvements that should be made to the AM Program. Additional detail is provided within Section 7.1, Program Review. If needed, the AM Steering Committee may meet at other times throughout the year to make decisions and/or coordinate AM program improvement or sustainment activities.

1.4.2 Asset Manager

The Asset Manager coordinates and monitors all AM related activities and improvement initiatives across the organization. This includes, but is not limited to, the following:

- Convenes and facilitates steering committee meetings as needed to:
 - Review/revise/improve/standardize/streamline key program elements. This may include making changes related to required asset and work order data, business processes, and software configurations.
 - Discuss/coordinate prioritized program improvement activities.
- Works with internal stakeholders to assess and modify key business processes and presents modifications to the Asset Management Steering Committee for approval and adoption.
- Maintains the AMP and oversees/coordinates the implementation of prioritized program improvements.
- Serves as the go-to person and GBRA's functional expert for the NEXGEN software. This includes end-user training and support, bug identification and coordinating issue resolution with NEXGEN, reporting/analysis, bulk loading data, and software configuration changes.
- Collaborates with Engineering to incorporate new systems and assets into NEXGEN as GBRA's operations continue to expand.
 - Attends project meetings for new facilities or facility improvements whenever assets are to be added or removed from the system.
 - Works with bid proposals to ensure that itemized lists of new assets are required and included on all new facility projects. These lists should include individual asset costs, specs, installation date, and O&M maintenance requirements.
- Leads performance monitoring to track progress toward defined objectives.

- Supports renewal planning and project development/prioritization efforts.

1.4.3 Engineering

The Engineering Division has the following support roles:

- Provides support to operations in identifying appropriate ways to mitigate risks. Helps determine cost estimates of the different alternatives.
- Analyzes asset renewal plans to consider if major investments will be needed.
- Supports the Operating Divisions in adjusting/refining asset degradation, renewal strategies, and costs in NEXGEN.
- Reviews risk scores and supports the Operating Divisions in prioritizing capital investments.
- Assists with incorporating new systems and assets into NEXGEN as projects are completed.

1.4.4 Division Managers

- Monitor performance of program elements with support from the Asset Manager.
- Drive consistent implementation and sustainment of the program.
- Review condition and risk data and ensure appropriate mitigation strategies are in place.
- Work with their staff to develop and propose Capital Improvement Plan (CIP) projects.
- Ensure coordination with Engineering on major replacements/CIP projects.

1.4.5 Supervisors/Lead Operators

This role includes Supervisors and Lead Operators that work within one of the five Operating Divisions as well as those who work across the Operating Divisions such as Electrical, SCADA, Fleet, etc.

- Define and maintain preventive maintenance strategies (i.e., tasks and schedules) in NEXGEN.
- Manage and schedule all work orders in NEXGEN.
- Ensure required program data (e.g., asset data, condition assessments, risk data, work order data) is sustained.
- Support risk assessments as needed.
- Review risk results and recommend/implement mitigation strategies.

1.4.6 GIS Administrator

- Create and maintain all GIS data for linear assets.

- Maintain the GIS integration with NEXGEN.
- Update condition assessment scores in GIS for linear assets.
- Support linear asset risk assessments and maintain scores in GIS.
- Support annual reviews of condition and risk data and the development of inspection and capital projects.

1.4.7 Information Technology

- Manage the iPads and the NEXGEN application.
- Manage network performance.
- Assist with ad hoc report creation.

1.4.8 GBRA Senior Management

- Reviews and approves capital projects.

1.4.9 Customer Service

- Fields and manages service requests.
- Oversees the 311 Portal and works with NEXGEN and/or the Asset Manager to make configuration changes.
- Leverages available tools and data to convey information to stakeholders as needed and appropriate.

1.4.10 Finance

- Assists the Operating Divisions with setting and monitoring budgets.
- Supports the Operating Divisions by determining the funds that are available for projects.
- Reviews renewal planning results to gain an understanding of the short- and long-term funding needs. Develops plans for meeting each Division's funding needs.

Section 2

Asset Inventory

2.1 Asset Definition / What Should be Inventoried

The AM Steering Committee developed the guidance that follows to characterize what vertical assets should be inventoried within its NEXGEN maintenance management system.

The vertical asset inventory should include every asset that meets one or more of the following criteria:

- Requires recurring or preventive maintenance.
- Performs a critical function within the system.
- Would typically be repaired rather than replaced if it fails.

GBRA will leverage its Geographic Information System (GIS) to manage linear assets (e.g., pipes, distribution valves, manholes) and those assets will be automatically loaded and synchronized with NEXGEN. The linear assets that should be inventoried generally will also meet the definition above for vertical assets, but there may be many small valves, cleanouts, or other point features that are critical to include in the GIS so that their location and connectivity are known. For that reason, GBRA is endeavoring to build and maintain its GIS with the details of its distribution, transmission, collection, and other linear systems, consistent with standard utility industry practices.

2.2 NEXGEN Inventory Structure Overview

GBRA has implemented the NEXGEN software to track and manage the assets it owns and/or maintains over their lifecycles. NEXGEN organizes GBRA's vertical and linear assets by leveraging two defined hierarchies: Location and Class. GBRA is utilizing the Location hierarchy in NEXGEN to organize assets by Operating Division and budget center. After the budget center, locations become more detailed in many cases to both group specific assets and indicate where they are (e.g., specific WWTP, WTP, Pump Station, etc.).

The Class hierarchy in NEXGEN categorizes assets by type and by expected life span. The Class hierarchy starts with the 6 standard parent classes within NEXGEN that cannot be modified. The Area and Linear parent classes are for linear assets that are created and managed in GIS and synchronized with NEXGEN. A brief description of the 6 parent classes is below.

Equipment - Most vertical assets will fit into one of the Equipment subclasses. It includes mechanical, instrumentation, and electrical assets.

Vehicle - Includes boats, trailers, and heavy equipment.

Structure - Includes buildings and associated assets as well as tanks, septic systems, and other structure assets.

Misc – This parent class houses the miscellaneous computer, communication, security, and safety assets.

Area - Currently not utilized, but it is intended to capture assets that can be represented with a spatial area such as parks, drainage basins, reservoirs, etc.

Linear - All GIS point and line features including sewer pipes, water pipes, manholes, valves, etc.

2.3 Required Data

Table 2-1, Required Attributes, lists and describes the attributes that are needed for all vertical assets. Attributes flagged with an asterisk are NEXGEN required attributes that must be populated before an asset can be created. The other attributes listed in Table 2-1, while not required by NEXGEN, need to be specified to support AM program goals.

There are additional attributes, not included in Table 2-1, that have been configured within NEXGEN that will support regular operations and maintenance activities. These attributes include Manufacturer, Model, Serial Number, etc. Additional Asset Class-specific attributes are also available that users should populate (e.g., HP and CFM for blowers, GPM and HP for pumps). The classification-specific attributes must be populated if they meaningfully impact asset replacement costs or preventive maintenance strategies.

Table 2-1 Required Attributes

NEXGEN Attributes	Description
Asset Number*	A smart ID unique to each asset that utilizes information from the asset's location and classification. For guidance on creating the smart IDs, reference the Asset Number Tool located here: G:\AssetManagement\01-AssetInventory.
Asset Name*	Name of the asset. Include enough detail to uniquely classify the asset. Maintain a consistent format using similar assets as a guide.
Active	A checkbox to indicate whether the asset is operational. For all new assets, ensure this box is checked.
QR Code	Stores the value of the QR Code associated with the asset. This allows users in the field to scan the barcode and open the asset record within NEXGEN without having to search.
Asset Description	Allows for additional descriptive information to be captured that helps identify the asset and wasn't included within the asset name.
Division	The GBRA group that has ownership of/operational responsibility for the asset.
System	The budget center that has ownership of/operational responsibility for the asset.
Class*	The type of asset. Allows similar assets to be grouped. Specify the appropriate asset classification by navigating the class hierarchy. Ensure the classification that is selected is at the lowest level of the class hierarchy. The classification selected should have a "-##" at the end of it representing the classification's estimated useful life.
Location*	Where the asset is physically located. Specify the lowest level Location/Sub Location that applies.
Install Date	The date the asset was installed. If the exact date is unknown, an approximate year is sufficient.
Replace Cost	Replacement cost estimate for budgeting purposes. Including installation costs. Reasonable estimates are sufficient. Generally, there is no need to contact vendors or manufacturers.

NEXGEN Attributes	Description
Condition Score	Refer to Section 3 for information regarding condition assessments and condition scores.
Performance	Refer to Section 5 for information regarding risk assessments and associated attributes.
CoF Regulatory Compliance	Refer to Section 5 for information regarding risk assessments and associated attributes.
CoF Disruption Severity	Refer to Section 5 for information regarding risk assessments and associated attributes.
CoF Public Impact and Safety	Refer to Section 5 for information regarding risk assessments and associated attributes.
CoF Fiscal Impact	Refer to Section 5 for information regarding risk assessments and associated attributes.
Redundancy Type	Refer to Section 5 for information regarding risk assessments and associated attributes.
Redundancy Spare Available	Refer to Section 5 for information regarding risk assessments and associated attributes.

2.4 Maintaining the Asset Inventory

For GBRA’s AM program to be successful, a complete and up-to-date asset inventory must be maintained in GIS and NEXGEN. This should be accomplished by maintaining the asset inventory throughout the year as assets are installed, replaced, and as new information becomes available. The maintenance of the vertical asset inventory is the responsibility of all NEXGEN users but will be primarily completed by Supervisors, Lead Operators, and Operators with support as needed from GBRA’s Asset Manager. Maintaining the linear asset inventory is the responsibility of GBRA’s GIS Administrator but significant input and support will be required from Operations staff and Engineering.

The maintenance of the asset data amounts to executing three simple processes in NEXGEN (vertical assets) or GIS (linear assets): creating new assets, updating attribute data if inaccuracies or missing data are found, and deactivating assets that are no longer operational or that have been replaced. Vertical assets that are replaced must be deactivated in NEXGEN and a new asset record must be created so that the condition, maintenance, and repair history is reset (see the *Retiring a Vertical Asset* business process). GBRA’s Asset Manager can provide training to any NEXGEN user that is unfamiliar with creating, editing, retiring, or replacing assets in NEXGEN.

For new vertical or linear assets stemming from completed projects, GBRA can capture most of the information by leveraging the design and as-built documentation supplied by contractors during design or construction. If there are many (i.e., more than 50) new vertical assets, a bulk data load into NEXGEN can be performed using an Excel template that contains the required asset data. GBRA’s Asset Manager can facilitate the bulk data load if support is needed. If only a relatively small number of vertical assets need to be created, Operations staff should create them directly within NEXGEN. When adding new assets, Section 2.3 of this AMP should be referenced to ensure all required AM Program data is captured. For newly created assets, preventive maintenance strategies should be considered and implemented as needed.

Most asset attributes are static and will not need to be updated over the life of the asset unless required or other important data is missing or is found to be inaccurate. Asset condition can of course change throughout the year and must be updated as described in Section 3 of this AMP.

Section 3

Condition Assessments

Condition is the most dynamic piece of asset data that is needed to support GBRA's AM programs. Routinely performing condition assessments and assigning condition scores to all assets directly supports GBRA's preventive maintenance program, risk-based prioritization efforts, and the development of its short and long-term renewal plans.

- Preventive Maintenance – condition can be utilized to determine if mitigating measures should be taken which can impact preventive maintenance strategies. Critical assets towards the end of their lifespan, those in poor condition, can have more frequent maintenance assigned to help extend their life and reduce the chance of an unanticipated breakdown.
- Risk Assessments – condition is utilized within the Likelihood of Failure calculation (along with Performance) as it indicates the degree to which the asset has degraded since it was installed.
- Renewal Planning – condition assessments are the basis for the degradation modeling that NEXGEN performs based on the assets' estimated useful lives. The degradation models are used by NEXGEN to schedule future asset renewal needs (and their estimated costs).

3.1 Condition Scoring

Condition scores for linear and vertical assets should be evaluated utilizing a 1 to 10 scale where 1 indicates the asset is brand new and 10 indicates the asset has failed and is no longer functional. The Operations staff that are most familiar with each asset should assess its condition based on what they know about the asset's operational and repair history and what they can currently observe or measure. Condition scores should be assigned for each vertical asset in NEXGEN based on the scoring guidance included in Table 3-1, Condition Assessment Score Definitions.

To ensure a consistent and transparent process, the following should be followed while performing condition assessments.

- The condition of an asset focuses on the degree to which it is functional and reliable, and if maintenance or replacement is required. Because of this, an asset's age should not generally be considered when assessing condition.
- An asset's inability to meet current demand or quality requirements, should not be considered while assessing the condition. The "performance" score, or the degree to which the asset is/isn't able to satisfy current pressure, flow, or other requirements can be modified in NEXGEN or will be evaluated separately during the risk assessment.

- If an asset's condition is a 6 or higher (i.e., its function or reliability is significantly affected), comments must be entered into the assessment within NEXGEN describing why it was scored that way and what repairs may be required.

Table 3-1 Condition Assessment Score Definitions

Score	Condition
1	Fully functional and reliable. No noticeable defects. Like new.
2	Fully functional and reliable. No noticeable defects. Some wear and tear may be visible.
3	Fully functional and reliable. Only minor deterioration or defects are evident. Minor maintenance may be needed.
4	Functional and reliable. Deterioration or defects are evident. Maintenance or minor repairs may be needed.
5	Function and reliability are not significantly affected. Deterioration or defects are evident. Repairs may be required.
6	Function or reliability is significantly affected. Deterioration or defects in at least some portion of the asset. Repairs or replacement are required.
7	Function or reliability is significantly affected. Serious deterioration or defects in at least some portion of the asset. Significant repairs or replacement are required.
8	Major impact to function or reliability. Extensive deterioration or defects in the asset. Major repairs or replacement are required.
9	Barely functional or demonstrated track record of major reliability problems. Extensive deterioration or defects in the asset. Major repairs or replacement are required.
10	Not functional. Major repairs or replacement are required.

3.2 Condition Assessment Requirement

GBRA's Operating Divisions should strive to record the condition of both vertical and linear assets in NEXGEN or GIS, as applicable, throughout the year anytime one of the following occurs:

- Intrusive inspection or maintenance is performed (e.g., CCTV inspection of gravity main, vertical asset is disassembled and a more complete assessment of its components or internals is possible).
- A repair or rehabilitation is completed.
- GBRA staff becomes aware of new defects or degradation.

By entering condition scores in NEXGEN and GIS throughout the year, the data will be captured while it is fresh and GBRA will more successfully maintain an up-to-date understanding of asset conditions.

While there are advantages to recording assessment results throughout the year, the minimum requirement is for the Operating Divisions to update the condition of all their assets annually in

November. For vertical assets, this can be accomplished by manually entering assessment results in NEXGEN or by bulk loading condition scores from an Excel template.

For linear assets, annual score updates should also be completed in November. The process will start with the GIS Administrator reaching out to the Operating Divisions and requesting that they review their linear condition scores. The Operating Divisions will provide condition score changes to the GIS Administrator for incorporation into the GIS.

Given the relatively long useful lives of linear assets and the fact that NEXGEN automatically models condition degradation over time, condition updates only need to be made for linear assets where GBRA staff know or suspect that the scores are inaccurate. After incorporating the condition updates into the GIS, the GIS Administrator will create an import file and work with the Asset Manager and NEXGEN support staff to update the condition scores in the NEXGEN database. In the future, an Enterprise License Agreement with Esri may allow Operations staff to edit condition scores directly in the GIS at any time throughout the year.

Section 4

Preventive Maintenance

Due to the vastly different systems, configurations, asset types, manufacturers, and equipment models that GBRA operates and maintains, this AMP does not attempt to specify preventive maintenance tasks or frequency requirements. Those decisions have been, and will continue to be, made by each Operating Division for the assets they are responsible for.

4.1 Maintenance Strategy Documentation

As GBRA's maintenance management system, NEXGEN is the authoritative source for defining detailed maintenance strategies. NEXGEN will create and assign detailed preventive maintenance work orders for the relevant assets based on the maintenance intervals specified in the database. While NEXGEN is designed to store the detailed tasks and maintenance intervals and issue work orders for specific assets, it can be difficult to step back and comprehend the overall maintenance strategy for one or more facilities (e.g., WWTP, WTP, pump station) or to understand why a particular maintenance approach is the appropriate strategy.

To document maintenance strategy decisions, each Operating group has an Excel spreadsheet based on their NEXGEN vertical and linear asset inventory that groups assets that perform a similar function and that are maintained the same way. The spreadsheet was used to craft the maintenance strategy that is defined in detail in NEXGEN. The spreadsheets should be maintained over time to:

1. Document the maintenance decisions that were made and that are implemented in NEXGEN.
2. Document why the maintenance strategy is appropriate, or why maintenance should not be performed on the assets (e.g., low asset criticality, assets are run to fail, no return on investment)
3. Convey maintenance overall strategy and thought process to staff.
4. Greatly simplify periodic maintenance strategy reviews.

Over time, Operations groups may elect to standardize certain maintenance strategies (or issue GBRA-wide maintenance contracts) for common asset types (e.g., generators, high service pumps, etc.). Common maintenance approaches across Operating Divisions that get developed over time should be described in Section 4.3 of this AMP.

4.2 Annual Maintenance Strategy Review

Maintenance strategies should of course be modified in NEXGEN throughout the year as task, frequency, and scheduling requirements change so that the work orders are issued at the right time with the right tasks for the right assets. Operating Divisions should review new assets created throughout the year and establish preventive maintenance schedules as necessary. In

addition, each Operating Division should review their maintenance strategy Excel spreadsheet annually during June and July to review and (re)consider:

- The defined maintenance tasks and frequencies for the most critical assets (i.e., high consequence of failure).
- Changes in condition scores and deteriorated, repaired, or rehabilitated assets that now warrant more, or less, maintenance.
- Any planned projects or asset replacements that may render preventive maintenance less important.
- If the defined maintenance is being completed. If it is not being completed, is it because the maintenance is not needed, or is there a limitation (e.g., staff availability or expertise) that should be addressed?

4.3 Maintenance Strategy Standardization

As described at the beginning of Section 4, it would be inappropriate to generically define maintenance strategies for GBRA’s diverse assets and apply them across the organization. But some assets may warrant consistent maintenance approaches. At this time (March 2022) GBRA has not yet defined standard preventive maintenance strategies that should be rolled out but has identified several asset types that standard strategies should be completed for. Those asset types and an example of the high-level maintenance strategy are listed in Table 4-1, Standard Preventive Maintenance Strategies. Once the strategies are developed by Operations, the detailed tasks and schedules should be defined in NEXGEN and applied to all the associated asset records across the GBRA’s Operating Divisions. The NEXGEN identifier associated with each standard maintenance strategy should be entered into Table 4-1.

Table 4-1 Standard Preventive Maintenance Strategies (To Be Further Developed by GBRA)

Assets that should be maintained using the same strategy	High-Level Maintenance Strategy	NEXGEN PM Identifier
All Backup Generators	Weekly - test run performed by GBRA Quarterly - maintenance by a contractor	
All High Service Pumps	Monthly - inspection Yearly - oil change	
All High Service Motors	Quarterly - greasing of the bearings, inspection of the packing, and oil change	
All Blowers	Quarterly - inspection and grease if needed Yearly - change the lubricant	

Section 5

Risk Assessments

5.1 Overview and Framework

The AM Steering Committee developed a standard risk framework and scoring protocols to allow risk to be evaluated consistently across the organization and asset types. This section of the AMP summarizes the risk scoring framework and the Likelihood of Failure (LoF), Consequence of Failure (CoF), and Redundancy components that combine to produce asset level risk scores. Risk assessments have been performed, and should be maintained, on each of GBRA’s vertical and linear assets in support of GBRA’s asset management program objectives.

NEXGEN was selected after the AM Steering Committee developed the risk framework. NEXGEN was designed to support a very simple risk assessment methodology, but NEXGEN made several modifications to its software to more closely replicate GBRA’s more accurate method of determining risks. Despite the modifications, there are still terminology differences in NEXGEN that are important to understand. These differences are detailed in Table 5-1, Risk Framework Equivalent Terminology.

Table 5-1 Risk Framework Equivalent Terminology

GBRA Terminology	NEXGEN Terminology
Likelihood of Failure (LoF)	Asset Probability Index (API)
Condition	Asset Condition Index (ACI)
Consequence of Failure (CoF)	Asset Impact Index (AII)
Risk	Asset Risk Index (ARI)

5.1.1 Likelihood of Failure

Likelihood of Failure, known as Asset Probability Index (API) in NEXGEN, is a numeric score on a 1 to 10 scale that represents how likely the asset is to experience operational failure or be unable to meet its current performance requirements. LoF is determined by considering both the asset condition, known as Asset Condition Index (ACI) in NEXGEN, and Performance as shown in Table 5-2 Likelihood of Failure Score Criteria. Condition and performance are essentially two different, but equivalent, failure modes. For example, an asset can be new and in good condition but that should not override or minimize a significant performance/capacity problem. For that reason, the LoF assigned to each asset is the maximum of its Condition and Performance scores.

Table 5-2 Likelihood of Failure Score Criteria

Score	Condition	Performance
1	Fully functional and reliable. No noticeable defects. Like new.	Asset operates within design limits while meeting demand and quality requirements.
2	Fully functional and reliable. No noticeable defects. Some wear and tear may be visible.	

Score	Condition	Performance
3	Fully functional and reliable. Only minor deterioration or defects are evident. Minor maintenance may be needed.	
4	Functional and reliable. Deterioration or defects are evident. Maintenance or minor repairs may be needed.	
5	Function and reliability are not significantly affected. Deterioration or defects are evident. Repairs may be required.	Asset operates outside design limits in order to meet demand and quality requirements.
6	Function or reliability is significantly affected. Deterioration or defects in at least some portion of the asset. Repairs or replacement are required.	
7	Function or reliability is significantly affected. Serious deterioration or defects in at least some portion of the asset. Significant repairs or replacement are required.	
8	Major impact to function or reliability. Extensive deterioration or defects in the asset. Major repairs or replacement are required.	
9	Barely functional or demonstrated track record of major reliability problems. Extensive deterioration or defects in the asset. Major repairs or replacement are required.	
10	Not functional. Major repairs or replacement are required.	Asset is unable to meet demand or quality requirements under any circumstances

5.1.2 Consequence of Failure

Consequence of Failure, known as Asset Impact Index (AII) in NEXGEN, is focused on the potential impacts of asset failure on the system, customers/employees, and the environment.

Table 5-3, Consequence of Failure Score Criteria, summarizes the scoring framework for CoF. The four following factors are used to determine the CoF for an asset:

- Regulatory Compliance - the failure's impact on compliance with Federal (EPA), State, County, and municipal laws and regulations.
- Disruption Severity - the relative impact of the failure on service provided. Includes degradation in the quality of service. While sewer customers may not recognize the service disruption, failures of assets that prevent the conveyance or treatment of sewage should be considered to disrupt and/or degrade service.
- Public Impact and Employee/Public Safety - The failure's impact on the public and on employee and public safety. Includes impacts to GBRA's public reputation.
- Fiscal Impact - Represents the direct financial impact from temporary and emergency repairs or other actions required as a result of the asset failure. Financial impact excludes damage to private property.

CoF is calculated using a weighted average based on the weightings in the second row of Table 5-3, Consequence of Failure Score Criteria. This weighted average is on a 1 to 5 scale where 1 is minor or no impact of failure and 5 is a significant impact of failure. NEXGEN converts the scores on the 1-5 scale to the comparable score on a 1-10 scale utilizing a custom formula.

When evaluating the CoF criteria, it must be assumed no redundancy exists. Redundancy is accounted for in a separate step within the risk framework (refer to Section 5.1.3 Redundancy). This is because redundancies come and go over time as assets fail, new demands reduce originally designed redundancies, spare assets get utilized, etc. For that reason, the CoF for assets is evaluated assuming no redundancy exists but then any redundancies that might be present are accounted for in the final risk ratings.

Table 5-3 Consequence of Failure Score Criteria

Score	Regulatory Compliance	Disruption Severity	Public Impact and Employee/Public Safety	Fiscal Impact
	35%	35%	25%	5%
1	In compliance	No impact on quality or service provided	<u>Safety</u> : No injuries and no potential hazard. <u>Public Impact</u> : None	Cost of repair can be included in typical operating budget.
2	Compliance issue possible but not likely	Minor impact on quality or service. Includes situations where wholesale customers have alternative means to temporarily provide service with no reduction to demand.	<u>Public Impact</u> : Minor	
3	Not in compliance, no enforcement action likely	Moderate impact on quality or service. Includes situations where wholesale customers have alternative means to temporarily provide service but will be required to moderately reduce demand to avoid service interruptions.	<u>Safety</u> : Creates hazard that is difficult to mitigate, injuries possible <u>Public Impact</u> : Significant	
4	Violation, no enforcement action likely	Significant impact on quality or service. Includes situations where wholesale customers have alternative means to temporarily provide service but will be required to significantly reduce demand to avoid service interruptions.	<u>Public Impact</u> : Significant, negative media exposure likely	
5	Violation requiring enforcement action or correction likely.	Widespread or persistent impact on quality or service. Includes situations where wholesale customers have no alternative means to maintain operations and end user will experience total loss of service.	<u>Safety</u> : Significant potential for lost time injuries <u>Public Impact</u> : Very significant, extensive negative media exposure likely	Cost of repair is well outside of typical operating budget.

5.1.3 Redundancy

Asset redundancies have the effect of reducing the consequences when a failure occurs. Redundancies are evaluated based on if they are automatic (i.e., no operator intervention is required) or manual and if spare assets are available that could be installed. The specified redundancies in Table 5-4, Redundancy Types and CoF Factor Reductions, reduce the individual CoF factor scores as noted when deriving the overall risk score.

For an asset to receive Auto or Manual redundancy credit, a redundant asset must be installed and have sufficient capacity to meet the demand requirements for the failed asset. If the redundant asset will be placed into service automatically without an operator intervening, the redundancy should be considered automatic. If the redundant asset requires an operator to intervene (e.g., close/open valves, manually start the asset) the redundancy should be considered manual. Spare asset redundancy should not be counted if the spare is currently installed at another location.

Table 5-4 Redundancy Types and CoF Factor Reductions

Type(s) of Redundancy		Regulatory Compliance	Disruption Severity	Safety / Public Impact	Fiscal Impact
Auto/Manual	Spare Available				
Auto	Yes	75%	100%	50%	0%
Auto	No	75%	100%	40%	0%
Manual	Yes	25%	50%	35%	0%
Manual	No	25%	50%	25%	0%
None	Yes	10%	10%	10%	0%
None	No	0%	0%	0%	0%

To illustrate how redundancy is evaluated and the effect that it has on the CoF score, consider the following example:

A wastewater pump station has two pumps (Pump 1 and Pump 2) and either can satisfy the station's pumping requirements on their own. If both pumps fail an overflow will occur. If one pump fails, the other pump will turn on automatically and there will be a reduction in redundancy but no overflow.

To evaluate the CoF for Pump 1, first assume that no redundancy exists. The redundancy criteria (Auto/Manual, Spare Available) will be added later to account for the fact that there is a second pump that can satisfy the station's pumping requirements (i.e., it effectively mitigates the effects of Pump 1 failing). The CoF criteria scores for the failure of Pump 1, assuming no pumping redundancy exists, are as follows (note that the scores in this example should not be utilized for other wastewater pump stations without confirming their applicability):

- Regulatory Compliance – 5 – an overflow will be experienced resulting in a violation requiring enforcement action or correction.
- Disruption Severity – 5 – customers will not experience a disruption of service, but the quality of service provided is significantly diminished due to the overflow.
- Public Impact and Employee/Public Safety – 4 – significant and negative media exposure likely due to the overflow.
- Fiscal Impact – 1 – the pump is low cost, and the cost of repair/replacement can be included in the Division's typical operating budget.

Since a fully redundant pump is installed that will start automatically when Pump 1 fails, the redundancy is “Auto”. If there is no uninstalled spare pump in inventory that could replace Pump 1, the Spare Available criteria should be “No”. The row in Table 5-4 that corresponds to this situation (Automatic redundancy, No spare) specifies how much each CoF criteria should be reduced. Table 5-5 shows the amount each CoF criteria should be reduced and the overall CoF score with and without redundancy for Pump 1.

Table 5-5 Redundancy Reduction Example Scenario

CoF Criteria	Score	Redundancy Reduction (From Table 5-4)	Redundancy Adjusted Score
Regulatory Compliance	5	75%	1.25
Disruption Severity	5	100%	1
Public Impact and Employee/Public Safety	4	40%	2.4
Fiscal Impact	1	0%	1
CoF	4.55	-	1.44

In this hypothetical example, having a fully redundant second pump at the pump station (that will come on automatically if a failure occurs) has the effect of reducing the CoF from 3.15 to 2.11.

5.1.4 Risk Calculation

A custom risk calculation formula has been built into NEXGEN to support GBRA’s preferred calculation method. GBRA determined a more accurate way to calculate risk than NEXGEN’s standard calculation method. Risk is calculated from Likelihood of Failure (LoF), Consequence of Failure (CoF), and redundancy evaluations discussed in the previous sections. The risk score for assets is calculated as a weighted average of the LoF and CoF with LoF having a weight of 65% and CoF having a weight of 35%. LoF is weighted higher than the CoF because when they are weighted equally, situations arise where critical assets in good condition (i.e., they are important to monitor but renewal is not a priority) are flagged as higher risk than assets that are in poor condition and that are moderately critical (i.e., renewal is a priority). Weighting LoF higher than CoF ensures that risk scores are useful to GBRA in making asset renewal decisions. The raw CoF scores are useful for identifying assets that warrant frequent or thorough inspections or maintenance.

- Likelihood of Failure – the max of condition and performance on a 1 to 10 scale
- Consequence of Failure – weighted average of the four CoF factors on a 1-5 scale that is converted to a 1-10 scale by NEXGEN utilizing a custom formula.
- Redundancy – reduces the CoF factor scores.
- Risk – weighted average of LoF and CoF with LoF being weighted at 65% and CoF being weighted at 35%.

NEXGEN’s modules require risk/ARI to be between 1 and 100 instead of between 1 and 10. Because of this, NEXGEN multiplies the calculated risk score by 10 before displaying it as the asset’s ARI. This conversion results in GBRA having risk scores between 10 and 100. The risk scores are divided into five risk levels, defined below, and displayed in Figure 5-1 Levels of Risk.

Low Risk	=	Risk < 35
Moderate Low Risk	=	35 ≤ Risk < 50
Moderate Risk	=	50 ≤ Risk < 65
Moderate High Risk	=	65 ≤ Risk < 80
High Risk	=	Risk ≥ 80

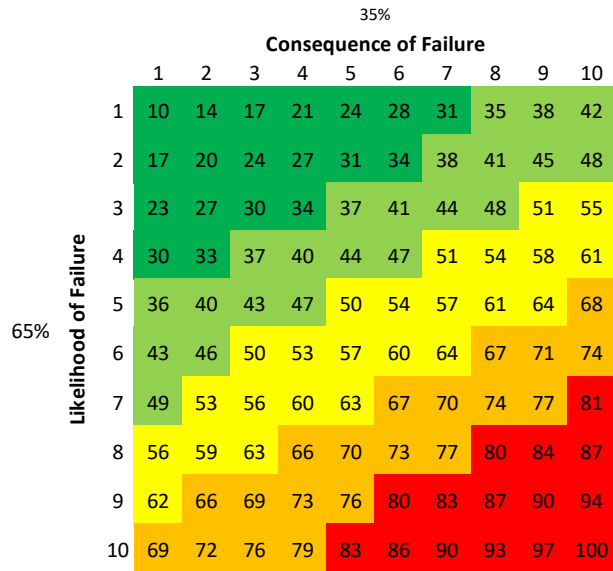


Figure 5-1 Levels of Risk

5.2 Risk Assessment Process

One of the most common elements of any asset management program is an evaluation of asset failure risks. Risk scores provide a mechanism for prioritizing asset maintenance and renewal activities so that those investments specifically target the highest risks to the organization. GBRA will utilize the risk scores that result from these evaluations to help prioritize inspections, maintenance, and capital investments.

Risk assessments should be performed throughout the year if large numbers of new assets are added or if significant projects are completed that might affect the existing consequence of failure scores. GBRA’s Asset Manager should assist the divisions when performing new risk assessments to ensure scores are assigned consistently.

As described in Section 6, the renewal planning and project development process begins in November each year. Since the risk assessment results directly support the prioritization aspect of project development, the Asset Manager will run a report in October to determine if there are missing scores that need to be populated. Risk assessment scores should be reviewed by each Operating Division in October to ensure the scores are accurate and they should work with the Asset Manager to complete assessments for any assets that are missing scores.

As long as the asset inventory and condition scores are updated throughout the year as described in previous sections of the AMP and major reconfigurations of the system haven’t been implemented, the existing Performance, CoF, and redundancy scores in NEXGEN and GIS likely do

not need to be updated each year. The Performance and Redundancy values should however at least be reviewed by each Operating Division as these may change from year to year. Redundancies can come and go over time as assets fail, new demands reduce originally designed redundancies, or spare assets get utilized. Existing LoF, CoF, and redundancy criteria should therefore be reviewed annually in (or before) November to identify these potential changes.

The steps below detail the mechanics of completing the annual risk review that has been discussed above. Due to the differences in how the risk attributes are stored and managed for vertical and linear assets, the processes have been detailed separately.

Vertical Asset Risk Review Process

1. Asset Manager utilizes the Asset Data Collection List Report to export the risk assessment attributes to Excel for each operational group. To make the file more manageable, remove superfluous columns that are not required as part of the risk review. Reviewing risk at the asset level in NEXGEN is cumbersome. The Excel spreadsheets will allow for a more streamlined review process.
2. Asset Manager distributes the Excel spreadsheets to the operational groups for review.
3. Supervisors and Lead Operators review the risk assessment attributes (Performance, CoF factors, and redundancy factors) to evaluate if changes need to be made. It is recommended that this step be completed by skimming the ARI values for each asset and making sure the calculated score aligns with the actual understanding of the asset's risk. If it does not, the individual factors should be reevaluated and updated directly in Maximo. When reviewing, also consider if new redundancies were introduced, spare assets were utilized, or if changes to the system have resulted in performance issues with particular assets.

Note: if numerous updates are required to the risk attribute scores or many scores need to be populated for the first time then make the changes and additions directly in the Excel spreadsheet. The spreadsheet will then be utilized to bulk upload the scores to NEXGEN.

4. Supervisors provide the updated spreadsheets back to the Asset Manager or let the Asset Manager know the review has been completed and all updates were made directly in NEXGEN.
5. Asset Manager works with NEXGEN to bulk upload data changes and additions if necessary.

Linear Asset Risk Review Process

Since GIS is the repository for all linear asset risk assessment attributes and not NEXGEN, the process differs from the one utilized for vertical assets.

1. The Operating Divisions review condition, performance, CoF attributes, redundancy attributes, and risk scores in GIS. It is recommended that this step be completed by skimming the risk values for each asset and making sure the calculated risk scores are

reasonable. If the relative scores do not seem accurate, the individual factors should be reevaluated and updated directly in GIS.

2. Operating Divisions inform the GIS Administrator that the risk review has been completed.
3. GIS Administrator creates load files and provides them to NEXGEN to be imported.
4. NEXGEN imports the load files and automatically recalculates API, AII, and ARI.
5. GIS Administrator requests a data extract out of NEXGEN containing the recalculated API, AII, and ARI and then updates the GIS with the new values.

5.3 Linear Risk Assessment Assumptions

GBRA evaluates the risk of vertical assets individually by stepping through each record. For linear assets, it would be time consuming and of little/no benefit to facilitate a segment-by-segment evaluation of each LoF, CoF, and redundancy factor. For linear assets, risk scores are instead assigned using available attribute information (e.g., size, depth, material) and spatial characteristics (e.g., near a body of water, under a road) of the assets with the aid of GIS.

The scoring strategy for linear assets documented in the following subsections was developed during a pilot risk assessment of pipe assets in the Stein Falls wastewater collection system and Calhoun County Rural Water System. The scores were reviewed by GBRA then manually extrapolated to all the other pipes in the GIS. Each Operating Division reviewed the scores and, in some instances, made minor changes to reflect the consequences of failure more accurately. When risk assessments are performed on new linear systems or new pipe assets the same scoring strategy should be applied, and the risk results should be reviewed to ensure the scores are accurate.

5.3.1 Wastewater Gravity and Force Main Consequence of Failure Assumptions

Regulatory Compliance (Gravity and Force Main)

All wastewater pipes that break and cause an overflow will put GBRA in violation. Therefore, all pipes are assigned a score of 4 or 5 based on the criteria below.

- 4 – All pipes that are not located near a body of water.
- 5 – All pipes that are located near a body of water were given a score of 5 due to the higher probability that the violation would result in an enforcement action.

Disruption Severity (Gravity and Force Main)

In scenarios where wastewater gravity and force main pipe breaks can be temporarily bypassed, assign a 2. If the broken pipe is unable to be bypassed, assign a higher score based on the severity of the disruption and its impact on quality or service.

Public Impact and Employee/Public Safety (Gravity Main)

- 2 – Gravity pipes that are 8” or less in diameter and not located near bodies of water or major attractions are assigned a score of 2 due to the low chance that they would create any safety issues or negative media exposure.
- 3 – Gravity pipes that are greater than 8” in diameter and are not located near any bodies of water or major attractions are assigned a score of 3 due to more flow and a higher potential for a significant public impact.
- 4 – Gravity pipes that are located near bodies of water or carry large amounts of flow are assigned a score of 4 due to the potential of some negative media exposure.
- 5 – Gravity pipes that are located near bodies of water and carry large amounts of flow are assigned a score of 5 due to the potential for extensive negative media exposure.

Public Impact and Employee/Public Safety (Force Main)

- 3 – Force mains that are 8” in diameter and are not located near bodies of water or major attractions are assigned a score of 3 due to lower flow. Force mains are scored higher than similar gravity mains due to their increased pressure and flow.
- 4 – Force mains that are 10” in diameter or are located near bodies of water or major attractions are assigned a score of 4 due to increased flow and negative exposure potential.

Financial Impact (Gravity and Force Main)

- 1 – All pipes that do not have accessibility issues are assigned a score of 1 because most repairs would be included in the typical operating budget.
- 5 – All pipes that have accessibility issues due to the depth of burial are assigned a score of 5 because repairs would not be able to be covered under the typical operating budget.

Redundancy

During the pilot risk assessment of wastewater linear assets, it was determined that there are no redundancies present in the wastewater collection systems, so no credit was given. Some of the Operating Divisions may keep spare pipe on hand, but it was debated if spare pipe availability should reduce the CoF score. Having spare pipe available increases the speed at which a permanent solution can be implemented and reduces the amount of time a failed pipe would need to be bypassed, but overall provides little to no reduction in the CoF. Because of this, no redundancy was provided for having spare pipe.

5.3.2 Water Pipe Scoring Consequence of Failure Assumptions

- Regulatory Compliance – All pipes are assigned a score of 1 since the failure of distribution and transmission water pipes will not result in a compliance issue.
- Disruption Severity – All pipes are assigned a score of 5 because any failure of a water pipe will result in a loss of service to customers.
- Public Impact and Employee/Public Safety – Scores range from a 2 to 5 based on the location of the pipe and how many customers would be impacted by a failure.

- Fiscal Impact – All pipes are assigned a score of 1 since the cost to repair can be included in a typical operating budget.
- Redundancy – Any pipe that is part of a looped system is assigned manual redundancy. In situations where parallel pipes are present and a failure of one pipe does not impact the quality of service provided, automatic redundancy will be assigned to the pipe.
- Spare Parts – No credit is given for having spare pipe since spares of all pipe sizes are maintained. Since spares of all pipe sizes are on hand, assigning redundancy does not help distinguish between the CoF of the pipes. It is arguable however that credit should be given to all pipes to be consistent with how redundancy was assigned for vertical assets.

5.3.3 Water Pipe Scoring Performance Assumptions

- Performance – Pipes that are sized appropriately and can meet current demand and pressure requirements are assigned a score of 1. Pipes that are unable to meet current or planned demand requirements are assigned a score of 5. Areas that experience issues with low-pressure are assigned a 3.

Section 6

Capital Project Development

This section of GBRA's AMP builds upon the capabilities and processes specified in previous sections to describe how current and future asset renewal needs (i.e., rehabilitation and replacement) should be forecasted and how those renewal needs support GBRA's annual project development, project prioritization, and budget planning processes.

6.1 Renewal Planning

One of the main drivers for GBRA's decision to develop and implement an asset management program was to have better information on the renewal needs of its existing infrastructure. Through asset renewal planning using the NEXGEN software, GBRA will have better information on its short and long-term asset investment needs and will have data to support developing and justifying budgets. This section of the AMP describes the mechanics and roles and responsibilities related to producing short and long-term asset renewal plans and how they support GBRA's annual capital planning process.

Renewal planning involves modeling asset degradation over time, predicting when assets will fail, and scheduling appropriate renewal events (rehabilitations or replacements). GBRA's NEXGEN software will automatically schedule renewal events based on the available data for each asset. The intent is certainly not for the software to make asset-level renewal decisions and remove GBRA Operations or Engineering staff from the decision-making process. Rather, the purpose of the NEXGEN asset renewal outputs is to:

1. Provide a more comprehensive look at the assets than has traditionally been available to support GBRA Operations groups as they develop their short-term plans.
2. Forecast long-term aggregate needs for planning purposes.
3. Help justify short and long-term needs and required funding levels.

NEXGEN produces asset renewal plans by modeling the degradation of each asset from their most recent condition assessment. The rate of degradation in NEXGEN is based on each asset's estimated useful life (stored at the Asset Class level in NEXGEN) and is constant over the life of the asset. When NEXGEN determines the condition of an asset has fully degraded (i.e., the asset has failed, condition = 10) a replacement event and associated cost will be scheduled for the asset. As long as GBRA continues to populate required data for its assets (i.e., install date, replacement cost, asset class) and record condition assessment results in NEXGEN, the software will automatically model degradation and maintain a current schedule of needed renewal events and present-day cost estimates of those events.

As GBRA addresses condition issues and updates NEXGEN accordingly, the risk profile of the system will change. The risk scores for previously high-risk assets for which a renewal action has been implemented will be reduced as the condition of that asset is improved or redundancy has

been increased. Conversely, assets that have not been repaired or replaced will continue to degrade over time, and the risk will increase in NEXGEN.

6.1.1 Renewal Planning Process

Since the renewal planning outputs provide valuable information for developing budgets, the renewal planning schedule defined in this section is designed to support GBRA’s budget meetings. To ensure the renewal planning outputs are created in time to support budget development, the renewal planning process should start each November. The November start assumes that the “Ongoing Activities” described below are performed throughout the year.

Ongoing Activities

GBRA should maintain the asset inventory of vertical assets in NEXGEN and linear assets in GIS throughout the year. This will involve removing assets that have been replaced or abandoned and adding new assets with the required data specified. Since condition scores are dynamic, GBRA has elected to require that all asset scores be updated annually whether the score has changed or not. While this requires effort, it ensures GBRA maintains an awareness of the condition of the infrastructure it owns or operates and ensures NEXGEN is not basing its forecasts on out-of-date information. It is recommended that condition assessments be performed throughout the year as part of preventive maintenance work (especially for critical assets) or as a change in an asset’s condition is noted at any point. Assessments performed throughout the year do not need to be repeated at the beginning of the renewal planning process.

November

The start of the annual renewal planning process involves three efforts. First, the AM Planning Scorecard report in NEXGEN should be reviewed to verify the required AM Planning data is populated for each system. If there is missing data, it should be populated in NEXGEN. The second is to ensure all assets have had a condition assessment performed within the calendar year. Scores for assets that did not have a condition assessment performed throughout the year should be entered by the relevant Operations group into an Excel template provided by GBRA’s Asset Manager. The completed Excel templates will be sent to NEXGEN for bulk upload by the Asset Manager.

The last effort in November is to review replacement costs (and update them where necessary) for at least the assets with an Asset Condition Index (ACI) of 8 or greater. In general, assets with an ACI of 8 or greater are likely to be included in the 5-year asset renewal forecast (unless the asset has a long estimated useful life). Completing a review of the replacement costs for these assets improves the accuracy and usefulness of the results.

December

In December, GBRA’s Asset Manager will generate the renewal planning outputs by running the Renewal Plan Summary report in NEXGEN. The report will be used to produce both the 5-year and the 20-year renewal forecasts. The reports will be distributed to the relevant Operations groups for review.

It is anticipated that in the first couple of years GBRA completes the renewal planning process, there will be assets forecasted to be replaced that may not require immediate action. There are a couple of reasons this may happen. First, the useful life assigned to the asset class of an asset

could be unrealistic. The Asset Manager can modify the useful life of the asset class if it is determined to be too long or too short. Second, the latest condition score for some assets may be inaccurate. Since NEXGEN degrades each asset's condition from its latest assessment date, an inaccurate starting condition score will skew the renewal planning results. Lastly, for simplicity, NEXGEN assumes linear condition degradation. Since assets do not necessarily degrade linearly, there may be assets in the renewal forecast that do not need replacement and vice versa.

If, upon review, there are any concerns about how NEXGEN is modeling degradation or scheduling renewal events, Operations staff should work with the Asset Manager and Engineering to update how the assets are modeled in NEXGEN to increase the accuracy of the renewal forecasts.

January

The Asset Manager, Engineering, and Division Managers review the renewal planning outputs and meet as needed to discuss the results.

The 5-year renewal forecast will list each group's short-term investment needs and will be utilized to support the development and justification of budgets for the upcoming fiscal year. This forecast will be reviewed to ensure its accuracy and alignment with GBRA's understanding of current renewal needs.

The 20-year renewal forecast should be reviewed and discussed to confirm where large investments may need to be made in the future. Years with high funding requirements should be evaluated and discussed to ensure they are accurate. A high funding requirement can indicate a large CIP need or many lower-cost assets requiring replacement. If the latter, mitigation measures can be evaluated such as scheduling replacements earlier to smooth budget increases.

Based on the review the Asset Manager, Supervisors, and Lead Operators will begin to refine and update the renewal planning data in NEXGEN as needed.

February

During February, the Asset Manager, Supervisors, and Lead Operators will finalize the data changes arising out of the output review in January.

Upon completion of the revisions, the Asset Manager should rerun the renewal plan reports. The Asset Manager, Engineering, Division Managers, and Finance should then meet to consider existing project plans and budgets and to develop and prioritize projects using the renewal plan reports. The group should develop the plan for generating any supporting documentation that will be needed/useful for budget justification during the budget setting meetings.

This review should include the assets that currently present the highest risks to GBRA. Many of these assets will be included in the near-term NEXGEN asset renewal schedule because they are in poor condition. Other assets that are not yet in poor condition may also present a significant risk to GBRA because they have a very high consequence of failure. For high-risk assets (at least those with a risk ≥ 65) that are not to be rehabilitated or replaced, Division Managers should consider the feasibility of:

- conducting more frequent or more detailed inspections to try to more accurately evaluate the likelihood of failure.
- conducting more frequent or more thorough maintenance to try to prevent further deterioration in the asset.
- developing response plans and training staff so that they are equipped to respond to the failure more safely and/or more quickly.
- maintaining a supply of critical spare parts (or spare assets) to ensure staff have the materials they are likely to need if a failure does occur.
- adding monitoring/alarms in SCADA to alert staff of, or ideally before, asset failure.

6.1.2 Renewal Planning Roles and Responsibilities

The roles and responsibilities within Section 1.4 highlight the part each person/group plays in sustaining the AM Program. This section describes the roles and detailed responsibilities specifically related to developing the renewal plans and using them to develop and prioritize projects.

Asset Manager

Renewal Planning

- Provide support throughout the year in maintaining the asset inventory and facilitating risk assessments for new assets.
- Maintain the asset modeling characteristics (e.g., useful life, renewal strategy, etc.) in NEXGEN with input from other Operations staff and Engineering.
- Develop condition assessment templates that will be provided to the Supervisors/Lead Operators on an annual basis to facilitate condition score updates.
- Coordinate with NEXGEN on the upload of the condition assessment templates.
- Lead the generation of the short and long-term renewal plans using the asset data and defined modeling characteristics within NEXGEN.
- Facilitate the renewal plan reviews each January.
- Refine and update the renewal planning data in NEXGEN based on the decisions made during the January reviews.
- Evaluate renewal planning results and produce documentation/reports as needed to support budget meetings.

Project Development and Prioritization

- Review risk scores and renewal plan results and support the Operating Divisions in developing and proposing projects.

- Work with the Division Managers, Engineering, GIS, and others as needed to develop project plans and estimates.

Division Managers

Renewal Planning

- Define how assets should be modeled (e.g., useful life, replacement cost, renewal strategy) in NEXGEN and/or GIS.
- Review the 5 and 20-year renewal plans developed each January.

Project Development and Prioritization

- Review risk scores and renewal plan results and decide which projects should be pursued.
- Work with their staff, the Asset Manager, Engineering, GIS, and others as needed to develop project plans, estimates, and project justifications.
- Communicate recommended projects and estimated costs related to contract operations.

Supervisors/Lead Operators

Renewal Planning

- Maintain vertical asset inventory information throughout the year in NEXGEN.
- Provide input on renewal planning characteristics (e.g., useful life, replacement cost, renewal strategy) in NEXGEN and/or GIS.
- Update condition assessments annually for all assets.
- Refine and update the renewal planning data based on the decisions made during the annual review.

Engineering

Renewal Planning

- Assist with defining renewal planning characteristics (e.g., useful life, replacement cost, renewal strategy) as needed.
- Participate in the renewal plan reviews each January.

Project Development and Prioritization

- Assist Operating Divisions in defining appropriate solutions to risks that have been identified.
- Work with Division Managers, the Asset Manager, GIS, or others as needed to support the development of project plans and estimates.

- Provide input on the merit of proposed projects and how they should be scheduled based on other planned or in-progress work across GBRA.

GIS Administrator

Renewal Planning

- Maintain linear assets and condition information in GIS throughout the year.
- Provide extracts of GIS data needed for renewal planning in NEXGEN that isn't automatically synchronized with NEXGEN.
- Maintain/load Renewal Plan results into GIS to support visualization and map development.

Project Development and Prioritization

- Enable the scope of proposed and in-progress projects to be viewed in the GIS.
- Support additional analysis in the GIS as needed to support project prioritization/scheduling (e.g., overlaying paving schedules).

NEXGEN

- Support the bulk loading of the condition assessment templates.
- Provide support, training, and troubleshooting with the configuration and generation of the asset renewal plan outputs.

6.1.3 Renewal Planning in NEXGEN

This section describes the relevant modules and reports in NEXGEN that support GBRA's renewal planning efforts. NEXGEN develops AM Plans by modeling linear degradation of each asset's condition starting from the date of its most recent condition assessment. The rate of degradation is determined by each asset's defined useful life (in years). Once an asset is forecasted to fail (i.e., it reaches a condition score of 10), NEXGEN schedules a replacement action with an associated cost. Users can review these replacement actions and costs within the Funding Module of NEXGEN and by running the Renewal Plan Summary report.

AM Planning Wizard and Required Data

NEXGEN requires four pieces of information for an asset to be included within an AM Plan:

1. Install Date – the date the asset was installed.
2. Replace Cost – the cost to replace the asset in present day dollars.
3. Impact Index – also known as consequence of failure; a 1 (low impact) to 10 (high impact) score assigned to assets to indicate their relative importance to GBRA. The score is evaluated by considering impacts to regulatory compliance, disruption severity, public impact and employee/public safety, fiscal impact, and redundancy.

4. Useful Life – the total anticipated life of the asset in years. NEXGEN assigns useful lives at the asset classification.

While NEXGEN only has four required attributes, condition and risk scores are also needed to support GBRA’s renewal planning objectives.

The AM Planning Wizard within NEXGEN helps with the initial setup and maintenance of the AM Planning data. This module has tools that allow bulk editing of required data and the ability to create import templates and consume the import template for bulk loading.

The AM Planning Wizard provides a Scorecard, as shown in Figure 6-1 NEXGEN’s Asset Management Planning Scorecard, that tracks the percent complete for each of the required attributes. This scorecard should be reviewed by the Asset Manager annually to ensure all required data is populated. Missing data can either be collected or estimated working with staff from the relevant Operating Divisions.

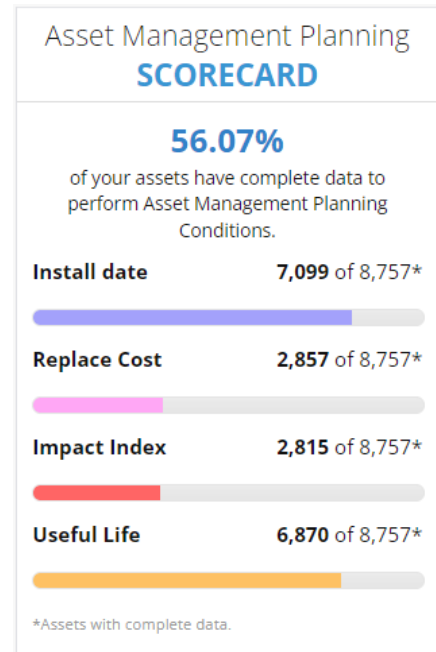


Figure 6-1
NEXGEN’s Asset Management Planning Scorecard

Asset Plan Module

The purpose of the Asset Plan module is to enter the assumptions NEXGEN utilizes to create the asset plans. While NEXGEN creates asset plans for each asset with the required data, the assumptions are set at the classification level. The assumptions that can be configured include:

- Useful Life – the number of years the asset is anticipated to remain operational.
- Inflation Value – the estimated percent asset costs are projected to increase from year to year.
- Tasks – tasks the asset can experience throughout its useful life (rehabilitation, replacement, maintenance expenses). Currently, only replacement tasks are built into the asset plans, but as the Asset Management Program matures, GBRA can elect to model asset rehabilitation and maintenance expenses.
- Task Frequency – the frequency, in years, each task is anticipated to occur. For asset replacements, this equals the assigned useful life.
- Task Cost – the cost of each task specified as a percent of the asset replacement cost.

To date, the asset plans have been developed for all asset classes. Moving forward, GBRA will utilize the Asset Plan module to refine data assumptions or to further leverage NEXGEN’s capabilities to model rehabilitation or maintenance activities.

NEXGEN Renewal Planning Outputs

NEXGEN's native renewal planning outputs are limited. NEXGEN does not come with standard renewal planning reports within its Performance Reports module. The output within the Funding Module was determined to be insufficient for GBRA's needs for a couple of reasons. The first is that NEXGEN does not aggregate the renewal needs for the number of years within the projection period, but instead displays one year at a time. If a user desires to aggregate the data, they would need to export individual years and aggregate the data manually outside of NEXGEN. The second reason is the data within NEXGEN's renewal planning output within the Funding Module does not include several attributes that are useful to understand and prioritize the renewal needs. For example, the Funding Module output does not include assets' Asset Risk Index (ARI) which can be a useful attribute to help prioritize which renewal events should be completed first.

Due to the limited native capabilities within NEXGEN to provide useful renewal planning outputs, a custom report has been developed. This report is called "Renewal Plan Summary" and can be found within the Funding section of the standard Performance Reports. This report allows users to create outputs that contain the projected renewal events throughout the projection period as specified by the user. The projection period can be 5, 10, 15, 20, or 25 years.

The Renewal Plan Summary custom report can be run as needed. To support the annual renewal planning process, the Asset Manager will run the report twice each December. The first will be to develop the near-term, 5-year, renewal needs forecast, and the second time will be to develop the long-term, 20-year forecast.

6.2 Proposing and Prioritizing Projects

6.2.1 Developing and Proposing Projects

The final renewal plan outputs from NEXGEN should be consulted in February when the Operating Divisions develop their projects. Reviewing the renewal plan outputs is intended to ensure that the proposed projects address both GBRA's immediate renewal needs and that they aim to address GBRA's highest risks.

The renewal plan forecasts asset replacements, however, the appropriate action may simply be to repair the asset or to have a spare on hand in case the asset fails. For more significant issues, projects should be developed for consideration. The 5-year renewal planning output will be utilized as the basis for developing projects

For all systems, and especially for contract operations, it may be beneficial to estimate the capital investment required to reduce asset risks to an appropriate level (i.e., risk < 65). That can be accomplished by reviewing the 5-year renewal planning output from NEXGEN and totaling the cost of mitigating all risks over a certain value. For it to be accurate, the estimated cost to replace the asset (as output by NEXGEN) should be reviewed and updated outside of NEXGEN so that the total cost to mitigate the highest risks reflects the actions that GBRA would actually take (e.g., asset in poor condition should be repaired rather than replaced).

6.2.2 Prioritizing Projects

When near-term project needs exceed the budget available, GBRA should consider the risk scores of the assets within the projects as the primary means of selecting which project(s) should

receive funding. Because the risk assessment framework, through the CoF criteria and weightings, reflects GBRA's values, basing the prioritization primarily on the asset risk scores ensures that GBRA's infrastructure investments go toward its most critical needs.

Section 7

Program Review and Improvements

7.1 Program Review

As stated in Section 1, most sections of this AMP are not likely to require significant updates from year to year but Section 7.2, Program Improvements, should be thoroughly reconsidered by the Steering Committee at least annually to review progress made in the previous year and to define improvement goals for the coming year. GBRA's Asset Manager should schedule and facilitate the meeting with the Steering Committee to develop changes and improvements to the program (and to this AMP) that should be prioritized in the coming year.

7.2 Program Improvements

This Section of the AMP should be used to capture changes and improvements to GBRA's AM Program that the Steering Committee would like to implement that affect all the Operating Divisions. GBRA will likely want to make modifications to various elements of the program over time to, for example, streamline business processes, standardize contracted maintenance, change roles and responsibilities, or deploy software enhancements. This Section of the AMP should capture the Steering Committee's approved initiatives that should be worked on over the coming year. The Asset Manager has responsibility for coordinating and tracking the development and implementation of each item and reporting progress to the Steering Committee. Each initiative should have a specified lead who will coordinate the development and implementation effort with the relevant stakeholders (e.g., Operating Divisions, IT, NEXGEN, GIS Administrator). The Asset Manager may lead many of the initiatives (especially those that involve NEXGEN and standardizing procedures across the Operating Divisions), but other leads are encouraged.

The following sections summarize draft recommendations for Steering Committee consideration. Steering Committee members may also propose additional improvements.

7.2.1 NEXGEN Improvements

Configure and Utilize NEXGEN's Inspection Module, Modify Existing Reports to Leverage the Data

Determine for each Operating Division if there are inspections currently being completed on paper that should be completed in NEXGEN. Completing inspections in NEXGEN will ensure the data is stored for historical reference and reporting. Any data that is frequently captured as part of operator rounds can be exported to Excel and it may be straightforward to link existing reports to the data exports so that 1) the existing reports can continue to be used, and 2) the reports begin to leverage data captured electronically in NEXGEN on the iPads in the field.

Configure and Utilize NEXGEN's Backflow Module

GBRA purchased NEXGEN's Backflow module but has so far not implemented it. There is a plan in place currently to implement the module for the groups within GBRA that manage backflow preventers and it should be pursued.

Configure and Utilize NEXGEN's Warehouse Module

Hydro maintains an existing inventory of spare parts and safety equipment and has traditionally managed it in MP2. Hydro should move forward with plans to implement the NEXGEN warehouse module including barcode scanning, loading its spare part inventory, and utilizing it to manage issuing and receiving parts going forward.

Utilize NEXGEN to Manage Fleet Assets

Currently, NEXGEN is not used to manage GBRA's fleet assets. GBRA's fleet assets should be loaded into NEXGEN and should be consistently managed there over their lifecycles, eliminating the need for the current Excel tracking sheet.

7.2.2 Asset Inventory Improvements

Add SCADA and Control Assets to NEXGEN

The SCADA Manager manages GBRA's SCADA assets and maintains a list of assets and spare parts outside of NEXGEN. During the initial data collection effort, Operations staff in some cases inventoried and assessed the controls assets but the inventory and condition scores likely are not accurate. The feasibility of migrating the information from the current SCADA inventory spreadsheets to NEXGEN should be investigated. If feasible, the existing NEXGEN assets should be reviewed and updated or deleted and replaced. Spare parts that the SCADA team manages should be added either in the Warehouse module or just linked to the asset records.

7.2.3 Preventive Maintenance Improvements

Continue Preventive Maintenance Program Refinement

In late 2021, meetings were held with Operations to review and refine the preventive maintenance strategies for their assets. The result was a high-level maintenance strategy that each group elected to move forward within NEXGEN. Some groups likely have fully implemented the changes in NEXGEN. The Asset Manager should work with Operations to ensure that the defined preventive maintenance strategies are successfully established in NEXGEN. This may include:

- Modifying frequencies of existing PMs.
- Modifying tasks for existing PMs.
- Creating PMs that were not created initially.
- Deleting PMs that were determined to be unnecessary.

7.2.4 Condition Assessment Improvements

Improve Linear Asset Condition Assessment Process

Define the process for getting sewer condition data into GIS and for performing condition assessments. NEXGEN provides out-of-the-box functionality for bulk uploading pipe assessment scores derived from CCTV footage to the Condition Assessment module. This functionality will work for GBRA's wastewater gravity main pipe assets and GBRA should review and utilize this functionality should pipe assessment scores start getting generated from the review of CCTV footage.

The above will work for wastewater gravity mains, but GBRA should also settle on a process for periodically updating condition scores for other types of pipes in GIS and getting the scores loaded into NEXGEN.

7.2.5 Staffing Improvements

Asset Management Workload

GBRA has had significant support from consultants and NEXGEN as it has implemented this AM program. NEXGEN will continue to provide very basic software support, but the day-to-day management and sustainment of the program now is GBRA's responsibility. Much of the responsibility for overseeing and coordinating the program falls to GBRA's Asset Manager, Sean Murphy. So that he can focus on program coordination and planned improvements, Sean will need to heavily rely on staff within each of the Operating Divisions to perform their responsibilities related to maintaining the asset inventory, performing condition assessments, maintaining the preventive maintenance strategies, managing work orders, and completing renewal planning related activities. If, due to staffing limitations or other reasons, Sean ends up needing to spend considerable time supporting these activities, it may significantly detract from his ability to coordinate and lead improvements to the program.

As GBRA is still learning to use and expanding its use of NEXGEN, it is difficult to characterize the type of additional support Sean will require. The answer will, in part, depend on the degree to which each Operating group is able to adequately perform their responsibilities related to maintaining the asset inventory, performing condition assessments, maintaining the preventive maintenance strategies, managing work orders, and completing renewal planning related activities. If Sean ends up spending considerable time performing or supplementing these functions, he will very likely require additional support. The nature of the support that will be needed (i.e., short-term/long-term, reports to Sean or assigned to the Operating group(s) requiring help) should be considered as the program matures in 2022.

GIS Workload

Currently, about 75% of GBRA's linear assets are represented in GIS. With the backlog and current workload, the GIS Administrator estimates that it will take months before there is enough time to finish the creation of the remaining 25%. The main concern in the short term is that preventative maintenance that is being completed is not being tracked in GIS. Staff is in the field jetting lines and performing other preventative maintenance but until these assets are created in GIS, and created in NEXGEN as part of the integration, this maintenance will not be captured. A GIS Technician has been hired but there is still a concern that this will be not enough support to get the GIS to where it needs to be and to sustain it over time. Short-term contract/consultant assistance for specific data development tasks may be needed. The GIS related workload and staffing plan should be monitored going forward, especially as GBRA assumes ownership of or operational responsibility for new systems.

7.2.6 Customer Service Improvements

Review Service Request to Work Order Process

Review the process by which Service Requests become Work Orders. Work out the kinks to ensure that notifications of new SRs are distributed appropriately and responded to quickly. The

current response times to customer service requests should be reviewed and monitored over time.

Create a Standard Process for Requesting New Utility Service

A process for requesting a new utility service should be developed and documented to ensure it is consistently performed.

