

FINAL

CLEARWATER WRF MASTER PLAN: CONDITION ASSESSMENT GUIDE

Technical Memorandum

BLACK & VEATCH PROJECT NO. 408831
CITY PROJECT NO. 17-0007-UT

PREPARED FOR

City of Clearwater, Florida

20 OCTOBER 2023

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Disclaimer – This document was finalized after approval of the Condition Assessment Guide and the Condition Assessment took place.

1.0 Introduction

As part of the Water Reclamation Facility Master Plan for the City of Clearwater, Black & Veatch (BV) has been tasked to perform condition assessment inspections at the Northeast Water Reclamation Facility (NEWRF). The condition of the assets will help determine the renewal and replacement projects required over the 30-year master plan planning horizon.

The inspections will be performed in situ at the NEWRF and will cover all major processes and subprocesses. During the inspections, if an asset is found to require specialized follow-up testing such as, but not limited to, corrosion testing, pH testing, vibration testing, and penetration measurements – these assets will be identified for follow-up and execution. The results of the condition assessment will be compiled into a GIS-supported file format (file geodatabase) as well as Microsoft Excel.

2.0 Field Data Collection

Condition assessment data will be collected in the field using a series of electronic data collection forms for each asset type (Structural, Civil, Electrical, Instrumentation, Mechanical). The forms will be developed utilizing Survey123 Connect, and the mobile app Survey123 will be installed and leveraged by field users on iPads. The forms will be pre-loaded with the preliminary asset registry developed in the Data Inventory Collection Plan Technical Memorandum (TM).

The survey team will be provided copies of the design drawings used to build the preliminary asset registry. This will allow additional context and information for inspectors to ensure that they visit and check off all assets and components to be inspected.

2.1 Inspection Logistics

Condition assessment will be limited to the NEWRF facility located at 3200 FL-580, Safety Harbor, FL 34695.

It is recommended that the survey team start and inspect the Headworks process first. They should inventory and document all assets associated with the system they are inspecting (e.g., Mechanical). Once all inspectors have inventoried and assessed all assets in their process, they may proceed together to the next process for inspection.

The recommended order of inspection at the NEWRF facility is as follows (with Electrical and Buildings/Structures being inspected with the other processes):

1. Headworks
2. Flow Equalization
3. Primary Treatment
4. Secondary Treatment (Biological)
5. Secondary Treatment (Clarification)
6. Tertiary Filtration
7. Disinfection
8. Effluent
9. Reclaimed
10. Digestion
11. Dewatering/Solids Handling
12. In-Plant Pump Stations

2.1.1 Contact Information for Assessment Team

The contact information for the BV Project Team and Public Utilities’ staff is provided in **Table 1**. Please contact Amanda Schwerman in case of an emergency.

Table 1 Contact Information

PROJECT TEAM DIRECTORY: FIELD INSPECTIONS				
BLACK & VEATCH FIELD INSPECTORS				
Name	Title/Specialty	Office Phone	Cell Phone	Email
Elias Pourladian	Civil & Structural	(913) 458-6377	(816) 261-5925	pourladiane@bv.com
David Martins	Electrical & Instrumentation	(913) 458-1950	(850) 300-3353	martinsd@bv.com
Michael Nellis	Mechanical	(813) 207-7942	(813) 732-2484	nellism@bv.com
BLACK & VEATCH OFFICE				
Name	Title/Specialty	Phone	Cell Phone	Email
Amanda Schwerman	Project Manager and Emergency Contact	(813) 207-7943	(727) 612-6863	SchwermanA@bv.com
Rebecca Oliva	Project Manager, Administration	(813) 282-4189	(813) 281-0032	OlivaR@bv.com
Zach Smierciak	Staff Engineer	(813) 207-7933	(330) 931-7712	smierciakzs@bv.com
Laura Moreno*	Task Lead	(469) 513-3222	(817) 715-3917	MorenoL@bv.com
Nick Alexandrou	Technical Lead	(813) 207-7956	(941) 276-0202	AlexandrouNA@bv.com
CLEARWATER PUBLIC UTILITIES				
Name	Title/Specialty	Office Phone	Cell Phone	Email
Rich Gardner	Public Utilities Director	(727) 339-2212	(727) 224-7043	Richard.Gardner@MyClearwater.com
Michael Flanigan	Public Utilities Assistant Director	(727) 339-2114	(727) 224-7690	Michael.Flanigan@MyClearwater.com
Kaylynn Price	Project Manager	(727) 562-4773		Kaylynn.Price@MyClearwater.com
Catherine Borden*	Lead Operator	(727)-462-6667	(727)-224-7691	Catherine.Borden@myclearwater.com
Christina Goodrich	WET Manager	(727) 339-2123	(727) 224-7477	Christina.Goodrich@myclearwater.com

Travis Teuber	WET Assistant Manager	(727)-421-1059	(727)-224-7680	Travis.Teuber@myclearwater.com
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*As of the date of finalizing this document, employee is no longer with that organization.

2.1.2 Assessment Schedule

The assessment schedule is provided in **Table 2**. It is anticipated that the assessments will be conducted over a consecutive two-day timeframe. Inspection starts at 7:00 AM and ends at 3:45 PM.

Table 2 Data Collection Schedule

Survey Schedule		
Item	Time of Day	Duration
Day 1 - Onsite Kick-Off Meeting and Safety Review	7:00 – 7:30	30-min
Day 1 - Condition Inspections	7:30 – 2:00	5.5-hours
Day 1 - Performance Review with Operations	2:00 – 3:00	1-hour
Day 1 - End of Day Wrap Up	3:00 – 3:45	45-min
Day 2 - Onsite Safety Review	7:00 – 7:30	30-min
Day 2 - Condition Inspections	7:30 – 2:00	5.5-hours
Day 2 - Performance Review with Operations	2:00 – 3:00	1-hour
Day 2 - End of Day Wrap Up	3:00 – 3:45	45-min

2.2 Safety Plan

The health and safety of everyone involved in the condition assessment inspections is BV’s highest priority, and it is BV’s policy to maintain a comfortable and safe work environment. Safety shall not be compromised during Project work, and safety will be given precedence over convenience and productivity. All BV’s work will be conducted in compliance with the requirements of the Occupational Safety and Health Administration (OSHA).

2.2.1 Personal Protective Equipment

The survey team will use the following PPE:

- Hard hat
- Safety vest
- Steel-toed boots
- Hearing protection where required
- Eye protection where required
- Fall protection where required

2.2.2 Safety Protocols

The survey team will observe the following safety protocols:

- Do not operate any equipment
- Be aware of trip hazards and fall hazards
- Be careful around rotating equipment as equipment that will start without notice
- Do not enter any confined spaces
- Do not open any electrical control panels

2.2.3 Hazardous Areas

Potential job hazards are identified as: Parts of the site are under construction and heavy equipment moving around, therefore, precautions should be taken in these areas. Active construction projects at the time of the inspections are the influent structure, removal of primary clarifiers, construction of equalization tank, and reconstruction of the sludge holding tanks.

A Pre-Planning Checklist (PPC) must be completed before the inspection activities described in this Inspection Plan can be executed. The PPC can be found in **Document A**. This is an internal BV procedure that is required to be completed before all site work; it is primarily used to perform a job hazard analysis (JHA) and create an emergency action plan (EAP). The JHA is an important planning tool that works by finding hazards and eliminating, or minimizing, them before they have a chance to become an incident. All relevant hazards associated with this inspection are included in the PPC, as well as mitigation measures. The EAP provides steps to be taken in the event of an emergency on-site.

In general, deviations or differences between the safety considerations outlined in this assessment plan and the PPC will be resolved by deferring to the most conservative approach.

3.0 Condition Assessment Guidance

3.1 Assets to be Surveyed

There is a total of 745 assets identified to be surveyed and a list of the assets is summarized in **Table 3**. Data will be verified for each asset for the following attributes:

- Asset ID
- Facility: All will be NEWRF
- Process
- Subprocess
- Description: To be used to describe the physical appearance or physical location, for instance, if there are five blowers in a row, this field could be used to describe if the blower is the 1st, 2nd, 3rd, 4th, or 5th blower to help provide even further clarity about which blower is being inspected)
- Asset Class: **Table 3**
- Asset Function/Discipline: Buildings, Civil, Structural, Mechanical, Electrical, Instrumentation

As an example, below is the general asset identification information for the first of three primary sludge pumping units in the secondary treatment process.

- Asset ID: PMPU-00001
- Facility: NEWRF
- Process: Secondary Treatment (Clarification)
- Subprocess: Primary Sludge Pumps
- Description: From East, first pump in row
- Asset Class: Pumping Unit
- Asset Function/Discipline: Mechanical

NOTE: There will be an option in the Survey123 forms to add a new asset not already identified as part of the Preliminary Asset Registry.

3.2 Photographs

There will be several photos taken of each asset. Captions and image titles can and should be, updated when added to the inspection forms to give context and background where needed.

1. A photo should be taken that has the entire asset in the image frame.
2. Photographs should be taken of any manufacturing tags/labels that indicate make, model, manufacturer date, serial number, install date, gpm, hp, etc.
3. Any visual defects should have a photo(s) taken of them as supporting evidence to justify their lowered condition rating score.

Table 3 Summary of Asset Classes to be Surveyed

Asset Class	Total #	ID Abbreviation	Asset Function/Discipline	Assessment Required
AERATOR	4	AER	Mechanical	Y
BASINS	18	BSN	Civil & Structural	Y
BELT FILTER PRESS	2	BLT	Mechanical	Y
BLOWERS	3	BLW	Mechanical	Y
BOILERS	1	BOIL	Mechanical	Y
CENTRIFUGE	1	CEN	Mechanical	Y
CLARIFIER	8	CLAR	Structural	Y
CLASSIFIERS	2	CLS	Civil & Structural	Y
CIVIL-STRUCTURAL	27	CIV	Civil & Structural	Y
ELEC-EQUIPMENT	33	ELEC	Electrical	Y
FAN	2	FAN	Mechanical	Y

Asset Class	Total #	ID Abbreviation	Asset Function/Discipline	Assessment Required
FILTERS	13	FLT	Structural & Mechanical	Y
FUEL STORAGE	6	FUL	Civil & Structural	Y
GATES	43	GTE	Mechanical	Y
GENERATORS	7	GEN	Electrical & Mechanical	Y
GRINDERS	2	GRN	Mechanical	Y
HEAT EXCHANGER	1	HEAT	Mechanical	Y
MCC	6	MCC	Electrical	Y
MIXERS	37	MIX	Mechanical	Y
MOTORS	96	MTR	Electrical	Y
PLC	2	PLC	Instrumentation	Y
PROCESS PIPING	9	PIP	Civil, Structural & Mechanical	Y
PUMPS	83	PMP	Mechanical	Y
SAMPLERS	2	SAM	Electrical	Y
SCREENS	2	SCR	Mechanical	Y
TANKS	18	TNK	Civil & Structural	Y
VALVES	1	VLV	Mechanical	Y

Note: The TANK Asset type will be used for both chemical and process tanks. The process, subprocess, design type, and additional attributes will be what define them as a chemical vs. process tank. Both types can exist in the same table in GIS.

3.3 Physical Condition Assessment

Condition assessment will be based on visual observations only during the inspection. If assets require additional, more specialized testing such as vibration analysis, thermography, and oil analysis – those assets will be flagged and recommended for follow-up testing. Physical condition scoring criteria have been developed for each asset function/discipline and are provided in the sub-sections below.

3.3.1 Civil and Structural Assets

This covers all assets whose main function is structural. It includes concrete structures with rebar, foundations, and equipment bases, particularly water retaining structures such as basins, pump station wet/dry wells, reservoirs, and tanks. Civil includes piping, and site works like roads, drainage, and fencing.

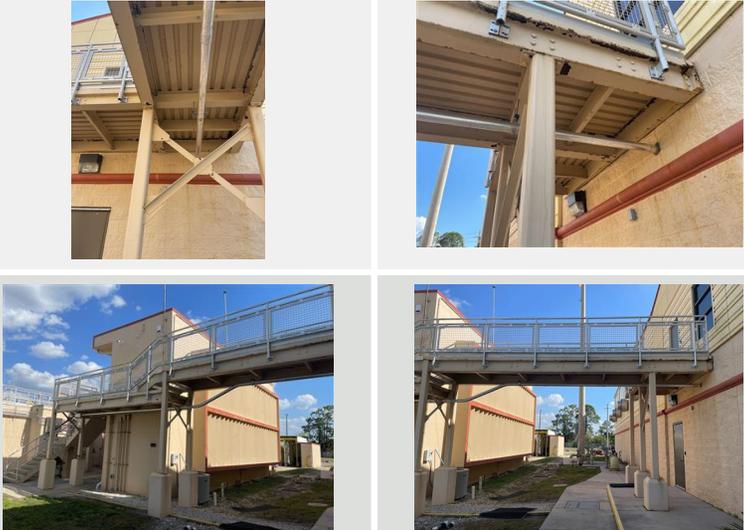
Table 4 Concrete Civil Assets Condition Scoring Criteria

Condition Score	Physical Description	Example	
1 – Very Good	Good original surface, hard material, and sound. Protective coatings in place.		
2 – Good	Mechanical abrasion or impact dents up to 1 inch. General cracks up to 1/16 in. and hairline corrosion cracks. Occasional corrosion stains or small pop-out corrosion spalls. Protective coatings worn or delaminate in small patches only greater than 98% coverage.		
3 – Fair	Structural cracks up to 1/16 in. Corrosion cracks from 1/32 in. up to 1/4 in. wide. Chemical deterioration: Random cracks up to 1/16 in.; “Soft” concrete and rounding or erosion of corners up to 3 in. deep. Protective coatings significantly degraded 90-98% of coverage.		

Condition Score	Physical Description	Example	
4 – Poor	Structural cracks 1/16 in. to 1/4 in. and partial breakages (structural spalls). Corrosion cracks wider than 1/4 in. and open spalls (excluding pop-outs). Multiple cracking and disintegration of the surface layer due to chemical deterioration. Protective coatings significantly degraded 75-90% of coverage.		
5 – Very Poor	Structural cracks wider than 1/4 in. or complete breakage. Loss of bearing and displacement at connections. Complete loss of concrete cover due to corrosion of reinforcing steel with over 30 percent of diameter loss for any main reinforcing bar. Protective coatings failure, coverage less than 75%.		
			

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

Table 5 Metal Civil Assets Condition Scoring Criteria

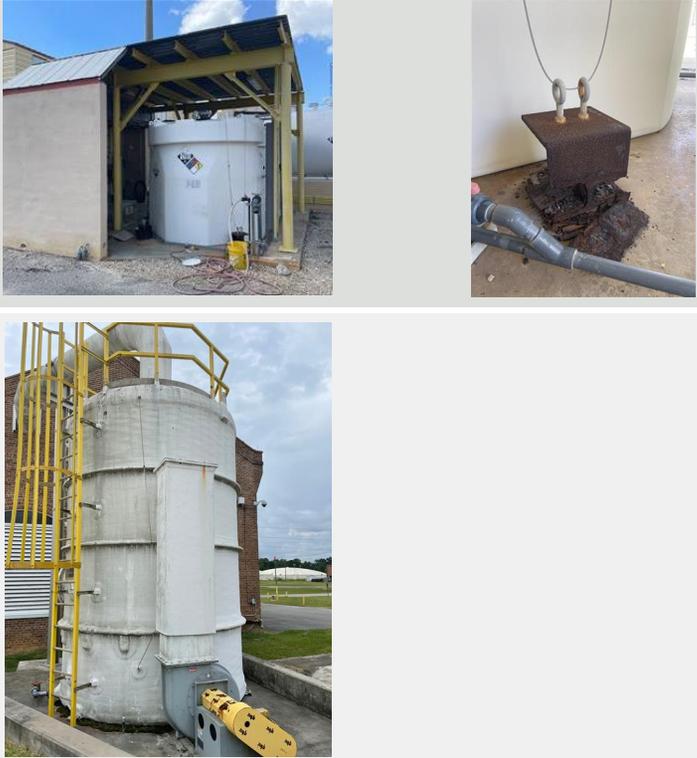
Condition Score	Physical Description	Example
1 – Very Good	No visible defects or erosion.	
2 – Good	Few visible defects. Localized surface erosion with slight loss of thickness. No physical deformation.	
3 – Fair	Moderate defects. Moderate surface erosion or corrosion. Some physical deformation or impact damage. Minor movement.	

Condition Score	Physical Description	Example
4 – Poor	Significant defects. Loss of thickness, erosion, or corrosion threatening structural integrity. Severe physical deformation or impact damage. Extensive movement. Potential safety hazard.	
5 – Very Poor	Derelict, or structural failure beyond repair. Safety hazard.	

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

Table 6 Chemical Storage Tanks Condition Scoring Criteria

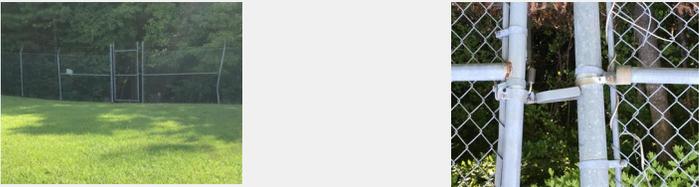
Condition Score	Physical Description	Example	
1 – Very good	No visible defects or erosion.		
2 – Good	Few visible defects. Some discoloration. Minor hairline cracking		
3 – Fair	Moderate defects or web cracking. Some physical deformation or impact damage.		

Condition Score	Physical Description	Example
4 – Poor	<p>Significant defects or cracking threaten integrity. Severe physical deformation or impact damage. Evidence of minor leakage. Potential safety hazard.</p>	
5 – Very Poor	<p>Derelict, or structural failure beyond repair. Safety hazard.</p>	

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

Table 7 Civil Site Assets Condition Scoring Criteria (Road, Fence, and Drainage)

Condition Score	Physical Description	Example
1 – Very Good	New condition.	
2 – Good	Minor cosmetic surface damage or erosion.	
3 – Fair	Minor erosion, cracking to surface. Minor corrosion or deterioration of fencing material. Debris near storm drains, surface erosion.	

Condition Score	Physical Description	Example
4 – Poor	<p>Major erosion, 1-3 Potholes, rutting of roads. Holes in fencing, major corrosion, damaged or missing fence posts. Minor standing water, major erosion to drainage pipes.</p>	
5 – Very Poor	<p>Road not structurally safe, more than 3 potholes, large potholes. Fence is not structurally safe, missing, or broken sections. Damaged drainage pipes need replacement.</p>	

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

3.3.2 Mechanical Assets

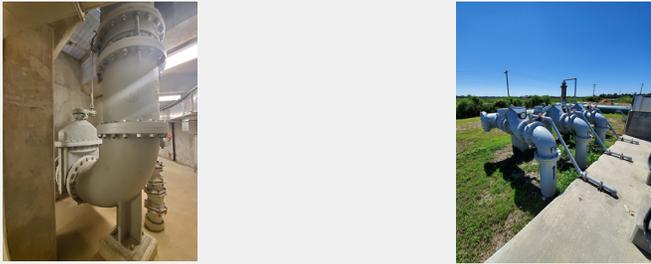
Table 8 Mechanical Assets Condition Scoring Criteria

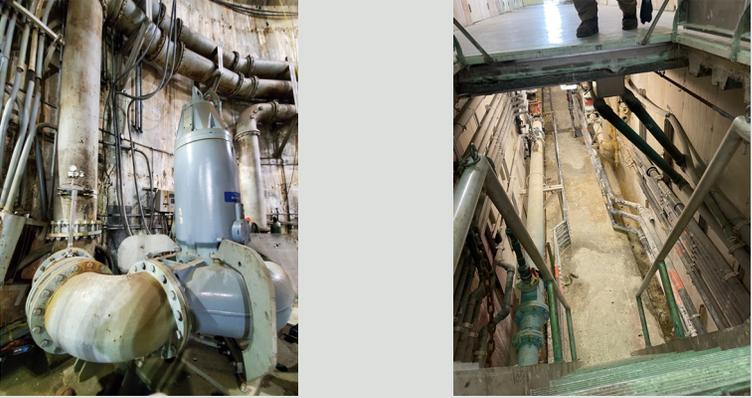
Condition Score	Physical Description	Example	
1 – Very good	New condition, minimal signs of wear.		
2 – Good	Some wear or surface corrosion, or not designed to current standards. Minor oil or gland leakage is evident.		
3 – Fair	Functionally sound plant and components, moderate wear, or surface corrosion. Moderate oil or gland leakage evident, evidence of historic leakage. Evidence of internal wear (sound, smell, temperature, etc.) Roughness when starting/stopping.		

Condition Score	Physical Description	Example	
4 – Poor	Aging asset, significant wear, or surface corrosion. Significant oil or gland leakage evident, evidence of historic leakage. Evidence of moderate internal wear (sound, smell, temperature, etc.) Intermittent failure when starting/stopping. Potential safety hazard.	 	 
5 – Very Poor	Failing service, beyond repair. Safety hazard.		

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

Table 9 Process Pipework Condition Scoring Criteria

Condition Score	Physical Description	Example
1 – Very Good	New condition.	
2 – Good	Minor cosmetic surface abrasion or coating damage (Superficial Corrosion), minor piping alignment deviation.	
3 – Fair	Average surface or structural wear based on asset age (Minor Pitting of metal), moderate piping alignment deviation, and signs of minor leakage.	

Condition Score	Physical Description	Example
4 – Poor	Surfaces show excessive wear – rehab in 2 yrs. or less (Moderate Pitting), major piping alignment shift, signs of moderate leakage.	 <p>The first photograph shows a large industrial valve with a yellowish, worn surface and some rust. The second photograph shows a long, narrow industrial corridor with pipes and structural elements that appear misaligned and worn.</p>
5 – Very Poor	Condition is beyond acceptable level – immediate replacement (Significant Pitting/Through Holes), signs of significant leakage.	 <p>The photograph shows a large industrial valve that is severely corroded. The metal is heavily pitted and discolored, with significant rust and structural damage, indicating a condition that requires immediate replacement.</p>

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

3.3.3 Electrical Assets

Table 10 Electrical Assets Condition Scoring Criteria

Condition Score	Physical Description	Example
1 – Very Good	New condition, minimal signs of wear.	
2 – Good	Superficial surface wear, no interior corrosion. Major components with >10 years of remaining service. Minor components with >3 years of service.	
3 – Fair	Deteriorating surface wear, some interior corrosion. Major components with 5-10 years of remaining service. Minor components with <3 years of remaining service, with intermittent failures. Low-risk safety hazard.	

Condition Score	Physical Description	Example
4 – Poor	Significant surface wear, interior corrosion. Evidence of some arcing. Major components with <5 years of remaining service, recurrent failures. Minor components with <1 year of remaining service, frequent failures. High-risk safety hazard.	
5 – Very Poor	Failing service, beyond repair. Evidence of arcing. Very high-risk safety hazard.	

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

3.3.4 Instrumentation Assets

Table 11 Instrumentation Assets Condition Scoring Criteria

Condition Score	Physical Description	Example	
1 – Very good	New condition.		
2 – Good	Minimal cosmetic surface defects. Normal calibration schedule, minimal adjustment required.		
3 – Fair	Average physical wear and tear based on asset age. Normal calibration schedule, normal frequency of adjustment required.		

Condition Score	Physical Description	Example
4 – Poor	Above average wear based on asset age, replace in 2 years. Frequent calibration schedule, high frequency of maintenance or calibration required.	
5 – Very Poor	Significant cosmetic wear or evidence of impact. Unreliable performance after maintenance or calibration. Immediate replacement.	

Note that the physical description terms listed are intended as a guide, and evaluators must exercise judgment based on how many terms offered may present themselves at any one site.

3.4 Performance Assessment

The performance assessment is based on the Operations and Maintenance staff’s knowledge and experience, and maintenance records. Scores should be captured for each asset based on discussions with staff at the end of each inspection day.

3.4.1 Reliability

The assessment provides a measure of asset reliability based on maintenance records and Operations and Maintenance staff’s experience with the equipment. **Table 12** shows the reliability performance grading criteria.

Table 12 Reliability Performance Scoring Criteria

Performance Score	Description
1 – Very good	Very reliable. No reported failures. Equipment is generally available more than 99% of the time.
2 – Good	Good reliability. Infrequent breakdown.
3 – Fair	Average reliability. Occasional breakdowns.
4 – Poor	Poor reliability. Frequent breakdowns (monthly) with repeated repairs.
5 – Very Poor	Very poor reliability. Continuous recurrent breakdown (weekly). Equipment out of service for more than 50% of the time.

3.4.2 Operability

Operability assessment is intended to provide an indication of the level of operator intervention that the asset requires under varying service conditions. **Table 13** demonstrates the operability performance grading criteria.

Table 13 Operability Performance Scoring Criteria

Performance Score	Description
1 – Very Good	Normal operator involvement during average and peak flow conditions.
2 – Good	Normal operator involvement during average flow conditions. Greater than normal operator involvement during peak flow conditions.
3 – Fair	Greater than normal operator involvement during average flow conditions. Greater than normal operator involvement during peak flow conditions.
4 – Poor	Greater than normal operator involvement during normal flow conditions. Excessive operator involvement during peak conditions.
5 – Very Poor	Excessive operator involvement during normal conditions. Excessive operator involvement during peak conditions.

3.4.3 Capacity

Capacity should be scored at the process level and the same score should be assigned to each asset that forms part of the process. Capacity performance criteria assess the capability of the process to provide the required capacity at average and peak flow (**Table 14**).

Table 14 Capacity Performance Scoring Criteria

Performance Score	Description
1 – Very Good	Adequate capacity for average and peak flow conditions, some margin for increased capacity.
2 – Good	Adequate capacity for average and peak flow conditions. No margin for increased capacity for peak flow conditions.
3 – Fair	Maximum capacity for average and peak flow conditions, no margin for increase.
4 – Poor	Maximum capacity for average flow conditions, no margin for increase. Overloaded for peak flow conditions, may impact other processes.
5 – Very Poor	Overloaded for average and peak flow conditions, may impact other processes.

3.4.4 Parts Availability & Obsolescence

Parts availability & Obsolescence assesses the availability of spare parts to repair an asset if it fails, and if the asset is nearing obsolescence (**Table 15**).

Table 15 Parts Availability & Obsolescence Performance Scoring Criteria

Performance Grade	Description
1 – Very good	Parts are quickly and readily available. They are typically in stock.
2 – Good	Parts are generally available with a short lead time. They are typically in stock.
3 – Fair	Parts are generally available with a long lead time. They are not typically in stock.
4 – Poor	Parts are generally difficult to obtain. Technology is nearing obsolescence and is not used in new installations.
5 – Very Poor	Parts are generally no longer available. Technology is obsolete.

3.5 Quality Control Plan

3.5.1 Field Quality Control

At the end of each day, the forms should be reviewed to ensure the information has been entered correctly. This should include:

- Verifying that all assets have been surveyed within the location or process surveyed that day.
- Verifying that all required fields have been completed.
- Verifying that any comments recorded are understandable and relevant.
- Reviewing physical condition scores for outliers. If outliers are found, the reviewer should compare the photos and comments of the asset taken during the assessment.
- Meet with plant staff at the end of the day to discuss asset performance and review and update any condition or performance scores.

3.5.2 Office Quality Control Plan

In addition to the daily field quality reviews, a final office review will occur to review the completeness of the asset information collected. Quality checks include:

- Reviewing all inspections for attribute completeness, most importantly for condition scores. These will be flagged and returned to inspectors for correction.
- Reviewing and confirming all inspections have photograph attachments. These will be flagged and returned to inspectors for correction.
- Reviewing the attribution for any 'outliers' that vary from the common scoring and attributes applied to similar assets. These will be flagged and returned to inspectors for clarification.

The field and office quality controls outlined above are specific to the field data collection. Additional quality management activities as part of the overall project quality management plan will be performed for the condition assessment task.