

# **Gananoque Municipal Marina Dock Condition Assessment Report**



**Prepared for:**

**The Corporation of the Town of  
Gananoque**

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**APPENDICES:**

**Appendix A: Cost Summary**

**Appendix B: Photo Summary**

**Appendix C: Quotes**

**Appendix D: Field Notes & Sketches**

## 1 GENERAL

The Town of Gananoque has retained The Greer Galloway Group Inc. to complete a comprehensive inspection and condition assessment for the Gananoque Municipal Marina. The condition assessment consisted of a physical review by Engineers as well as a commercial dive team to determine the condition of marina facilities including but not limited to:

- Floating docks (deck boards, pontoons, chains and connections)
- Anchor Piles and Cribbing
- Gangways and Gangway connections
- Dock appurtenances (cleats, safety cabinets, etc.)
- Marina servicing (electrical, plumbing, etc.)

At the time of completing this study the Marina was shut down for the season with the majority of slips were empty. There was no ongoing work on the docks or servicing infrastructure.

The results of the field inspections have been used to create this dock condition assessment report. Included in the report is a 15-year dock replacement strategy including the remaining useful life of key marina elements, estimates for replacement costs of key marina elements and a Reserve Fund Analysis. The Reserve Fund Analysis presents the annual investment required to properly account for anticipated maintenance and capital replacement expenses for existing marina infrastructure.

The condition, life expectancy, etc. of marina elements have been tabulated and included in the attached appendices. In determining the remaining life of the various elements, professional judgement, specific site conditions, product quality and local factors have been considered.

The study considers the following:

- 15-year replacement strategy;
- HST rate on all replacement costs of 13.0%;
- Initial reserve fund balance of \$ (199,039.00) carried over from 2018;
- Initial annual reserve fund contribution of \$171,327.00 for 2019;
- Annual reserve fund contribution of \$185,691.00 for 2020;
- Regular increases to the annual reserve fund contribution based on inflation (2.0%);
- Replacement costs based on quotes provided for present cost to replace;
- Prices for future replacements based on quotes provided in 2019 dollars and an average assumed annual inflation rate of 2.0%;
- New docks (built after 2010) have a 30-year life expectancy;
- Existing docks have a 30-35 year-life expectancy;

The Town may wish to consider the transfer of any year-end surplus contained in the operating fund for the Marina to the reserve fund - no allowance has been made for this activity in this report due to the variable nature of the additional contribution.

Limitations on the scope of work included within this analysis and report:



- Field investigations were limited to a non-invasive, visual evaluation of dock and servicing elements – to the extent that the weather conditions allowed.
- The testing of the various systems has not been conducted as part of this study.
- Physical measurements of the elements within this report are solely based on those taken on site. In water measurements were completed by sub-contractor Dundee Marine and are based on visual inspection/rough measurements taken by diver.
- Marina buildings were not included within the scope of this investigation.

## 2 DEFINITIONS

The following terms have been used throughout this document to record the condition of each of the property elements:

|                          |   |
|--------------------------|---|
| <b><i>Excellent:</i></b> | Acceptable in present condition, element presents as new.   |
| <b><i>Good:</i></b>      | Acceptable in its present condition. Presence of minor, non-critical wear. Repair or replacement not necessary.   |
| <b><i>Fair:</i></b>      | Acceptable in its present condition, generally speaking; however, portions of this element require some repair or replacement: it is expected that this element will continue to deteriorate in the following few years, to a poor condition. |
| <b><i>Poor:</i></b>      | The current condition of the specific element reviewed, would not meet the required standard and consequently will require full repair or replacement.  |

## 3 COSTING

A detailed summary of the following is provided in ***APPENDIX A – Costing Summary***. The costing summary includes:

- A reasonable replacement cost, in current dollars, for all anticipated infrastructure replacements through a fifteen (15) year horizon. This includes replacement costs for specific dock series, site service upgrades and replacements, and any other additional capital items.
- A reasonable remaining life expectancy for all dock series.
- Development of yearly budgets for capital works expenditures through a fifteen (15) year horizon.

The recommendations contained within this report are based upon field observations and upon life expectancy predictions of the marina features, elements and finishes. The estimated life expectancy has been determined based upon the wear and tear to date, quality of the original product and the normal life expectancy of a similar product under similar circumstances. The life expectancy of an element

referenced in this report is not a guarantee of performance but an estimate of the duration of continued serviceability of the element that can reasonably be expected.

All cost estimates prepared herein are for budgeting purposes only. The estimated costs typically include the removal and disposal of the existing element, replacement of the element to match the quality of the original element, reinstatement of the facility to original condition as necessary and, where applicable, additional engineering costs.

## 4 MAINTENANCE

Many of the docks have components that are in fair condition or worse including deck boards, rim boards, cleats and chains. Other dock series are in generally good condition with discrete elements that are in fair to poor condition. For series in good condition, these discrete elements will need replacement before the whole dock does. For the purpose of this report, it has been assumed that the replacement of discrete elements will fall under regular maintenance and will be funded through the Marina's operations budget. As such, Greer Galloway has not incorporated the cost of such work into the reserve fund calculations. The values were based on the observations made during the site investigations which are further detailed in section 5.2 – Observations.

Maintenance for site service infrastructure and new (10 years old or less) docks should be carried out in accordance with manufacturer recommendations in order to achieve the estimated (*normal*) life of the marina components. This maintenance should include regular inspections, repairs, cleaning and in some instances replacement of some equipment components.

## 5 SITE REVIEW

### 5.1 Physical Description

#### 5.1.1 General

The Gananoque Municipal Marina is a popular marina operated by the Town of Gananoque which includes 400 slips for seasonal and transient boaters. The age of the marina infrastructure varies greatly, with some sections that are 30 years older or more, and others that have been replaced as recently as summer of 2019. A map of the marina has been provided in Appendix D. This is the most up-to-date map available at the time of completing this report. The only significant deviation from current site conditions is the absence of the boat launch along the North shore which now divides the RB series of docks. Hand sketches of the boat launch area can also be found in Appendix D

The marina slips are categorized into numbered docks (100s, 200s, etc.), lettered docks (A's, B's, RB, etc.), the loading dock and the customs check-in dock. A raised, fixed dock section projects West from the shore connecting to a primary floating dock from which the numbered docks branch off. The loading dock, customs dock and A series and B series docks are all attached to the fixed dock. The pump-out station is located on the fixed dock. The fixed dock is supported on timber piles while the rest of the docks in the marina float on pontoons and are attached with chains to anchor blocks on the riverbed.

There is a boardwalk with vertical skirting boards along the East shore adjacent to the marina buildings. At the time of inspection this area has been cordoned off with caution tape due to ground instability.

At the North side of the marina is a boat launch, which splits the RB dock series. The boat launch was installed in 2018.

### 5.1.2 Structural

The fixed dock is comprised of a wood framed structure supported on solid wood piles driven into the river bed. The wood framing is comprised of timber and dimensional lumber. The remainder of the structures throughout the marina are floating docks connected to either the fixed dock or the primary floating dock that extends West from the fixed dock's end.

Each floating dock series varies in construction, but in general they are comprised of wood framed decks built on top of steel pontoons. The floating docks are held in place by anchor chains connected to concrete anchor blocks that have been settled on/in the riverbed. Detailed description of each dock series, and their current condition can be found in section **5.2 Observations**.

### 5.1.3 Mechanical

#### 5.1.3.1 Domestic Water Service

The domestic water service for the marina is sourced from the municipal drinking water system. The water service enters the dock office building through the floor in the service room and contains the main shut-off valves and metering device. The water service then exits the building through the service room floor and distributed to the dock slips. There is an exterior shut-off valve housed under the dock adjacent to slip 002 and accessible through a concrete access cover that controls the water flow to the slips.

The undergrounding piping from the dock office to the exterior shut-off appears to be PVC. At this valve, the pipe transitions to polyethylene pipe, which is used for the remainder of the distribution piping. The following sections of dock have the described domestic water infrastructure:

- |   |  |
|---|--|
| • Fixed Dock: Hose bib with reels and pedestal. | • 500 (all slips)                                      |
| • Check-in Dock: Hose bib.                      | • 600 (slips 1-10): Pedestals                          |
| • 100 (all slips): Hose bibs.                   | • 700 (all slips): Pedestals (even) and hose bibs(odd) |
| • 300 (all slips): Hose bibs.                   | • 800 (all slips): Hose bibs with standpipes.          |
| • 400 (slips 1-10): Hose bibs.                  | • 900 (all slips): Pedestals                           |

#### 5.1.3.2 Sanitary Pump Out System

The sanitary system for the docks consists of a single pump out station located on the fixed dock. The pump out station uses a vacuum pump to suck the sewage out of the vessels and then pumps the sewage to a holding tank located just north east of the dock office building. The holding tank separates the sludge and effluent and has a duplex pump system to pump the effluent to municipal sanitary manhole.

### 5.1.4 Electrical

The marina docks are electrically serviced by a pole-mounted 225KVA, 600V, three-phase utility transformer. This transformer feeds the service entrance equipment located adjacent the utility pole. The

service entrance consists of weatherproof cabinets containing metering, surge protectors, and main distribution panels. These panels provide several 600V feeds to the docks. See Figure 1 showing this equipment. Several stepdown transformers are distributed around the docks to provide 120V main feeds, which are further distributed to finger docks using breaker panels. In general, these breaker panels are located on the primary dock adjacent the start of the numbered dock, however where numbered docks are long, additional panels are located along the numbered dock. A notable exception to this scheme is that the stepdown transformers for the 900 Series docks are located on the actual 900 Series dock.

The finger docks are serviced by pedestals combining electric power and water hookups.

Cabling between the main service, stepdown transformers, distribution panels, and pedestals consists of wet-location rated armoured cable running under the primary and numbered docks.

Photos of electrical items in specific dock sections are referenced in the appropriate report sections.

It should be noted that there is a padmount transformer adjacent the utility pole, but this is used to provide a 120/240V service for the dock office building. The 120/240V service does not provide power to the docks.

### 5.1.5 Data Gathering

The conditions indicated within the reserve fund study are indicative of the noted on-site inspections conducted by Greer Galloway on October 10<sup>th</sup> and 15<sup>th</sup> 2019. Detailed descriptions of the marina elements are described in the observations section of this report. Additional information, including a comprehensive photo summary of all elements assessed, field sketches, field notes and drawings can be found in the appendices of this document. Additionally, video footage from the in-water investigation conducted by Greer Galloway and Dundee Marine has been provided to the Town on a USB Flash Drive submitted with the hard copy of this document.

## 5.2 Observations

As previously mentioned, site visits were conducted on October 10<sup>th</sup> and 15<sup>th</sup>, 2019 to observe the marina first-hand. Greer Galloway staff, including structural, electrical and mechanical specialists were in attendance as well as a dive team from Dundee Marine who conducted a thorough in-water investigation of the marina infrastructure over the course of two days. These site visits were non-invasive and primarily visual inspections. The only exception to this being actions taken by the diver to clear marine growth, zebra mussels or rust blooms from in-water elements to provide a better view for the video camera. The findings of the investigations are described in this section.

### 5.2.1 Fixed/Pump-Out Dock

#### 5.2.1.1 Deck, Skirting and Appurtenances

The fixed/pump-out dock is the only to feature a brick deck surface. Overall, the deck is in fair condition. The bricks are in good condition, with slight unevenness in the deck surface and moss, grass and weed growth present between roughly 30% of bricks, particularly along the North side of the deck. See Figure 2. It is recommended that the growth be removed and mortar between bricks be cleaned and re-sealed to prevent further damage and water infiltration. The deck also features a concrete perimeter

curb which is in fair condition with some poor areas included discoloured areas, crooked elements, and impact damage in some areas.

The fixed dock has skirting boards installed along the North and South faces below the deck level. The skirting on the fixed dock was found to be largely in poor condition. It appears that 5-10% of boards have been recently replaced and are in good condition. The remaining boards range from fair to poor condition. All old boards shown sign of water staining from the highwater events of recent years. 20-25% of the skirting boards show signs of rotting from the centre outward and have weed growth protruding from the top. An additional 5-10% of skirting boards are cracked or damaged. There are also several missing boards. See **Figure 3**. Greer Galloway recommends that all damaged and missing skirting boards be replaced as soon as possible and rotting boards be replaced in the next 1-2 years before degrading further. Remaining boards should be monitored for deficiencies or signs of rot.

The dock appurtenances including cleats and benches are in good condition with minor corrosion present. It is recommended that corroded areas be cleaned and sanded, removing rust and other debris, before applying new layers of protective primer and paint.

#### *5.2.1.2 Framing & Piles*

The dock framing was visible from below and can be clearly seen throughout the Dive footage for the inspection on Thursday October 10, 2019. See **Figure 4**. Deck is supported by timber joists running parallel to the dock. The joists are supported on perpendicular timber beams that in turn bear on timber piles. There is no visible deflection observed in the deck and as per the dive footage and comments from the diver, all timber beams and piles appear to be in good condition. See **Figure 5**. During the investigation the diver found existing cribbing located below the fixed dock. This cribbing was found to be in poor condition with many rotten pieces, and several cribs showing loss of rock fill. However, it was determined that the cribs are no longer part of the fixed dock support system and as such are not in need of repair or replacement.

#### *5.2.1.3 Site Services*

##### Mechanical

The fixed dock houses the shut-off valve for the domestic water supply, two separate hose bibs / hose reels mounted on wooden assemblies, a pedestal that contains both electrical service and domestic water, a hose bib with metal support and two portable hose reels, and the pump out station.

The shut-off valve is in good condition. The hose bibs and associated y-fittings are generally in poor condition with leaking fitting or valves. The hose reels and hoses are in fair condition. The pedestal is in poor condition with a leaking hose bib. See **Figures 6-8**.

The pump out system is a WMW ED125 system and is in good condition. It appears to have a new motorized valve assembly that has been replaced as part of on-going maintenance. See **Figures 9 & 10**.

##### Electrical

Electrical power is fed from the utility transformer to the fixed dock via an underground connection. At the fixed dock, and onwards, the conductors consist of armoured cable run under the dock. The pump-out station is fed from the nearby 75KVA stepdown transformer installed adjacent the 100 Series

docks. The stepdown transformer is enclosed in a large green metal enclosure and is integrated with distribution panels which serve nearby docks (in particular, the Series 100 docks).

The stepdown transformer enclosure appears to be from the original dock installation and is in fair condition. The attached side-enclosure containing the distribution panel is in poor condition due to corrosion. Consideration should be given to replacing this transformer/distribution panel. **Figures 11-13** show this equipment.

This dock section is served by pole-mounted lighting. The poles are metal. This lighting is in good condition, but with some early signs of corrosion on the light poles.

## 5.2.2 Loading Dock

### 5.2.2.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the loading dock was replaced in 2015. The dock consists of a main branch advancing southward from the fixed dock, with 4 “finger-docks” protruding from each side. The wood deck and rim boards of the main branch as well as finger docks are in good condition with minimal cracks, knots, damage or signs of wear. The cleats and gangway were observed to be in excellent condition.

### 5.2.2.2 Framing, pontoons & Chains

The in-water inspection found the dock framing and connections to be in good condition. Loading dock is supported on a single, central pontoon with a combination of steel and wood framing. Pontoon was found to be in good condition with minimal rust blooms and less than 1mm of pitting present. All chains were found to be in good condition with less than 5% wear on the links. Anchor blocks were difficult to assess as they were buried approximately 30 cm into sediment, but diver confirmed that anchor “eye” was in good condition.

### 5.2.2.3 Site Services

#### Mechanical

There are no mechanical services on this section.

#### Electrical

There are no electrical services on this section.

## 5.2.3 Customs/Check-In Dock

### 5.2.3.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the customs/check-in dock is approximately 29-32 years old, having been installed around 1990 (+/- 3 years). The customs dock consists of a single branch advancing southward from the fixed dock with 4 finger docks protruding to the East. The deck and rim boards were observed to be in fair condition. Boards show signs of drying, checking and cracking throughout with isolated poor areas. Marina staff should review the deck boards and replace those with significant signs of damage or rot as part of regular maintenance. See **Figures 14 & 15**.

The cleats and gangway are in good condition with minor corrosion present. It is recommended that corroded areas be cleaned and sanded, removing rust and other debris, before applying new layers of protective primer and paint. The gangway plate at the North end of the Customs Dock is in fair condition



with more significant corrosion. The plate should be cleaned of rust and debris and assessed for degree of section loss. If after cleaning the corrosion is observed to be severe, plate should be replaced.

#### *5.2.3.2 Framing, Pontoons & Chains*

The in-water inspection found the dock framing and connections to be in fair condition, as were the connection plates. Pontoons in the main branch were found to be in poor condition, with significant rust blooms along the freeze-thaw line, deep pitting in several locations as well as a 5mm diameter hole found in the West pontoon approximately in line with the first (northmost) finger dock, and evidence of previous hole repair on the East pontoon. **See Figures 16 & 17.**

The main dock chains were in fair condition with 30-40% wear of the links. The chain on third finger dock was found to be broken and should be replaced while remainder of finger chains are in fair condition.

The poor condition of the pontoons and presence of at least one observed hole suggests this dock has reached the end of its service life and that replacement of this dock should be a high priority.

#### *5.2.3.3 Site Services*

##### Mechanical

There is a single hose bib with metal standpipe on this dock adjacent to the power pedestal. The hose bib and standpipe are in poor condition. The hose bib is leaking, and the standpipe has significant rusting. **See Figure 18.**

##### Electrical

There is a single power pedestal on this dock near Dock-023, powered by the distribution panel located in the adjacent 75KVA transformer (green metal enclosure). This pedestal is constructed of injection-molded heavy-resin enclosure and is in good condition. This is the same type as the small pedestal used on Series 700. Refer to the Series 700 section for details.

### **5.2.4 A & B Series Docks**

#### *5.2.4.1 Deck, Rim Boards, Appurtenances and Gangways*

According to records provided by the marina coordinator, the A & B series docks were installed in 2010. The A and B docks are single branches that protrude from the North side of the fixed dock across from the pump-out station. For both A and B series docks, the deck boards, skirting and cleats were observed to be in good condition. **See Figures 19 & 20.**

#### *5.2.4.2 Framing, Pontoons & Chains*

The in-water inspection found the dock framing and connections to be in good condition. Pontoons were observed to be in good condition, with minimal rust blooms and less than 1mm of pitting. Chains were also observed to be in good condition. The chains are covered heavily in marine growth but have minimal wear at the links.

#### *5.2.4.3 Site Services*

##### Mechanical

There are no mechanical services on this section.

##### Electrical

There are no electrical services on this section.

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### 5.2.5 Primary Floating Dock

#### 5.2.5.1 Deck, Rim Boards, Appurtenances and Gangways

The primary floating dock runs westward 207m from the end of the fixed dock to the start of the 900 series docks. Greer Galloway was unable to confirm the age of these sections. The deck and rim boards are in generally fair condition with signs of wear and aging. Marina staff should review the deck boards and replace any that are found to be in poor condition as part of regular maintenance.

See **Figures 21-23** for condition of decking along the primary floating dock.

The gangway between the fixed dock and primary floating dock is in excellent condition. See **Figure 24**.

#### 5.2.5.2 Framing, Pontoons & Chains

The in-water inspection found the dock framing and connections to be in good condition with no signs of wood rot or damage, nor significant corrosion on the metal plates and framing. The condition of the pontoons is generally fair, but it does vary somewhat along the length of the dock.

Between the 100 and 300 series docks the pontoons were observed to have up to 3mm of pitting, as well as several anchor chains in poor condition, and a broken chain along the south side, 5m beyond the “no-docking” sign.

Between the 300 and 500 series docks the pontoons were in better condition. Pitting was observed to be less than 1mm and the chains were in generally fair condition, with up to 30% wear on the links. However, there were two broken chains found at the intersection with the 500 series docks.

Between the 500 and 700 series docks the pontoons were observed to be in fair condition with approximately 1-2mm of pitting in the freeze-thaw zone. Chains between the 500 and 700 series were observed to be in fair condition, with significant coverage in marine growth and 20-30% wear in the links. The chains in this section are fairly slack in this area and it is suggested that tightening the chains could provide better anchorage/stability to this section.

Between the 700 and 900 series docks the pontoons were observed to be in good condition with less than 1mm of pitting in the freeze-thaw zone.

#### 5.2.5.3 Site Services

##### Mechanical

There are no mechanical services on this section.

##### Electrical

The primary dock primarily serves to provide a path for electrical feeds to the downstream distribution panels. Some of these panels are located on the primary dock itself, while some panels are located along the numbered docks.

A notable exception is that the primary dock is used to house a significant power distribution centre at the interface to the 700 Series docks which consists of several stepdown transformers and 600V feeds to the 900 Series docks. Distribution panels for 700 & 800 Series docks happen to also be located in this area but will be described in the respective 700 & 800 Series report sections.

In addition, the primary dock contains deck-mounted lighting along its entire length.

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The following description is broken down by section:

Between 100 Series and 300 Series Docks: Nothing to note. Deck mounted lighting is in good condition.

Between 300 Series and 500 Series Docks: Nothing to note. Deck mounted lighting is in good condition.

Between 500 Series and 700 Series Docks: Nothing to note. Deck mounted lighting is in good condition.

### **Primary/700 Series Dock intersection:**

As noted earlier, this area houses significant electrical distribution:

600V panel feeding 900 Series docks: This panel, labelled “900 Block Distribution Panel” provides three 600V feeds to the 900 Series dock. It has been recently installed and is in excellent condition.

600V panel feeding 700-area stepdown transformers: These panels were installed in 2010 and are in excellent condition.

Stepdown transformers: An array of four stepdown transformers are located in this area. Three transformers are 100kVA, and the fourth is 75KVA. These feeds the nearby numbered dock distribution panels. No date code was found, but they are in excellent condition and were likely installed at the same time as the 2010-dated panel which provides input power.

**Figure 25** shows this power distribution equipment.

Between 700 Series and 900 Series Docks: Deck mounted lighting is absent in this section. Lots of branch circuit conductors hanging down to bottom of the river at intersection of primary dock/800 series. It is recommended that an electrician be hired to fasten the cables to the underside of the dock and out of the water as part of regular maintenance. This advice is applicable to any other location where loose/hanging wires are observed.

## **5.2.6 100 Series Docks**

### *5.2.6.1 Deck, Rim Boards, Appurtenances and Gangways*

The 100 series docks are comprised of a single branch that protrude from the South side of the primary floating dock with 2 finger docks on each side. The fingers are 0.9m wide and 8.3m long. See **Figure 26**. The deck and rim boards of the 100 series docks were found to be in fair condition. Many of the boards show sign of drying in aging, in the form of splitting and cracking. 0-5% of the existing boards have been replaced recently and those boards are typically in excellent condition, see **Figure 27**. It is likely that another 10-15% will need to be replaced in the next 2 years due to degradation. Damage from marina use may increase this number. Marina staff should review deck boards and replace deficient ones as part of regular maintenance.

Cleats are in good condition with minor visible corrosion. Cleats should be cleaned, and a protective coating of anti-corrosion paint should be applied to any cleats that have become corroded over winter. The 100 series docks do not feature any gangways.

### *5.2.6.2 Framing, Pontoons & Chains*

The in-water inspection found the dock framing and connections to be in fair condition. The pontoons of the 100 series were found to be in poor condition with deep-pitting throughout the main branch pontoons, mostly concentrated to the freeze-thaw zone near the water line.

The anchor chains of the 100 series are in fair condition, typically showing 20-30% corrosion of the links.

### 5.2.6.3 Site Services

#### Mechanical

This section of docks has hose bibs located at slips 102/104 and 106/108. The hose bib assemblies are generally in fair condition. The assembly support is inadequate. **See Figure 28.** There is evidence that piping and hose bibs were replaced at 106/108 as part of on-going maintenance.

#### Electrical

The utility pedestals are in fair condition. These pedestals are constructed of a metal enclosure. Corrosion of the enclosure is setting in. The age of these units (approx. 30 years) would warrant replacement of the pedestal and associated branch circuit wiring. Picture “100 Series Pedestal” shows this pedestal.

The distribution panel feeding this dock also appears to be of the same vintage as the pedestals and is in fair condition. It is located in the same green enclosure as the 75KVA transformer located on at the end of the fixed-dock. The panel enclosure is showing signs of corrosion. It is recommended that this panel be replaced due to age. Refer to the electrical section of the Fixed Dock section (5.2.1) for photos of this panel and corrosion.

### 5.2.7 200 Series Docks

#### 5.2.7.1 Deck, Rim Boards, Appurtenances and Gangways

The 200 series docks are comprised of a main branch protruding North from the primary floating dock with 5 finger docks on each side. The main branch is 1.7m wide and 30m long. The finger docks are 0.8m wide and vary from 4.5-4.6m long. **See Figure 29.** The deck boards and rim boards are in largely fair condition with isolated poor areas. Boards are typically dry, cracking and splitting with damaged ends and there are some damaged/rotten areas, **see Figure 30.** Approximately 0-5% of the boards were observed to be loose. It is recommended that all loose boards be re-fastened, and any poor boards be replaced as part of routine maintenance. The cleats on the 200 series docks were observed to be in good condition.

#### 5.2.7.2 Framing, pontoons & Chains

The in-water inspection found the dock framing and connections to be in fair condition with no obvious damage or rot of the timber framing or steel connection plates. The pontoons were observed to be in poor condition with deep pitting of 3-4mm typical on the finger docks in the freeze-thaw zone. The main branch pontoons were also observed to have significant pitting in the freeze thaw zone, upwards of 4mm. Marina staff informed us that the pontoon for the finger at slip 204/206 required repairs for holes in the pontoon. This repair work was observed during the in-water inspection and can be seen in **Figure 31.**

The most significant damage was observed to be above the water line and further investigation confirmed that the other finger pontoons were in similarly poor condition. **Figure 32** shows similar damage above the water line on the pontoon for slips 208/210, immediately north of 204/206.

This damage combined with deep pitting observed below the water line confirms that the 200 series docks have reached the end of their service life and that replacement of this series is a high priority.

### 5.2.7.3 Site Services

#### Mechanical

There are no mechanical services on this section.

#### Electrical

There are no electrical services on this section. Several broken electrical cables were observed below the main branch of the 200 series docks. These should be further investigated and capped/removed as a safety precaution.

## 5.2.8 300 Series Docks

### 5.2.8.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the 300 series docks were installed in approximately 1988 and are comprised of a main branch with 9 finger docks on each side. The deck boards and skirting on the 300 series docks are in fair condition. See **Figure 33**. The boards are showing signs of drying and cracking and certain boards will need replacement before others. 0-5% of boards will likely need replacement in the next year.

Cleats are in good condition with minor visible corrosion. Cleats should be cleaned, and a protective coating of anti-corrosion paint should be applied to any cleats that have become corroded over winter. The 300 series docks do not feature any gangways.

### 5.2.8.2 Framing, pontoons & Chains

The in-water inspection found the dock framing and connections to be in fair condition. The pontoons supporting the main branch of the 300 series docks are in poor condition, with significant pitting and corrosion along the length of the pontoons, concentrated mostly near the waterline within the freeze-thaw zone. The corrosion was so bad in certain areas that the diver was unwilling to remove rust blooms for fear of further damaging/compromising the pontoons.

The anchor chains of this series are also in poor condition. During the in-water inspection it was observed that all main branch chains south of slip 327 had 80% wear or greater on the chain links, and one chain at the end is broken.

The remaining main branch chains north of slip 327 were in better (fair) condition with wear on the links ranging from 30%-50%. Finger chains were found to similarly have 30-50% wear on the links.

It is recommended that the pontoons be monitored for signs of failure and replacement chains be installed at the South End to replace broken or worn chains prior to replacement.

### 5.2.8.3 Site Services

#### Mechanical

This section of docks has hose bibs located at all the even slips. The hose bib assemblies are generally in fair condition. The assembly support is inadequate in most cases. There are portions of a white PVC braided tubing having replaced the original polyethylene pipe at a couple of locations, pointing to some failure of existing piping. PVC braiding tubing is not approved for potable water applications and should be replaced with PE piping to match existing. See **Figure 34**.

#### Electrical

The utility pedestals are in fair condition. These pedestals are constructed of a metal enclosure. Corrosion of the enclosure is setting in. The age of these units (approx. 30 years) would warrant replacement of the pedestal and associated branch circuit wiring.

The distribution panels feeding this dock also appears to be of the same vintage as the pedestals and are in fair condition. There are two panels. One is located on the primary dock. The other is located near dock-322. It is recommended that these panels be replaced due to age. Refer to **Figures 35-37**.

It was noted that the light atop pedestal 330/328 has been slightly damaged due to an impact.

## 5.2.9 400 Series Docks

### 5.2.9.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the 400 series docks were installed in approximately 1988 and are comprised of a main branch with 6 finger docks on each side. The main branch is 1.8m wide and 56.3m long. The finger docks are 0.8m wide and 8.4m long. See **Figure 38**. The deck boards and rim boards are in fair condition with signs of drying, splitting, cracking and surface damage. **Figure 39** shows the split, cracked end of an existing deck board. Approximately 0-5% of boards are in poor condition and should be replaced within the next 1-2 years. Marina staff should review deck boards and replace deficient ones as part of regular maintenance.

The cleats were observed to be in good condition with no visible damage or corrosion.

### 5.2.9.2 Framing, pontoons & Chains

The 400 series docks are unique amongst the dock series in the Marina as the main branch is not supported by pontoons. The main branch of the 400 series docks is supported by open web steel joists (OWSJ) complete with steel angle lateral bracing. The OWSJ are supported by pontoons at each finger dock which are continuous through the main branch. **Figure 40** shows the OWSJ supporting the main branch between the last two fingers.

The OWSJ are 16" deep and spaced at 60" apart. The top and bottom chord are comprised of steel angles. Lateral cross bracing is comprised of 2"x2" square steel tubing in x-shaped patterns along the length of the joists between pontoons.

The OWSJ are in fair condition with light surface corrosion on the bottom chord and lateral cross bracing. In-water inspection found several of the bolts below the waterline that connect the framing to the pontoons were severely corroded. The

Pontoons on finger docks are in fair condition with surface rust and 2-3mm pitting observed in the freeze thaw zone.

The chains for this series are in poor condition. There are 5 broken finger chains at slips 403, 404, 415, 425 and 426, as well as 4 broken main branch chains between slips 404/403, 406/407, 413/414 and 419/420. The remaining chains have 50% wear or more on the links as well as significant wear on eyes at anchor blocks.

### 5.2.9.3 Site Services

#### Mechanical

This section of docks only provides water supply to the first 10 slips via hose bibs that are located at the even slips. The hose bib assemblies are generally in fair condition. The assembly support is inadequate in most cases.

#### Electrical

Only the first 10 docks are serviced in this section.

The utility pedestals are in fair condition. These pedestals are constructed of a metal enclosure. Corrosion of the enclosure is setting in. The age of these units (approx. 30 years) would warrant replacement of the pedestal and associated branch circuit wiring.

The distribution panel feeding this dock also appears to be of the same vintage as the pedestals and is in fair condition. It is recommended that this panel be replaced due to age.

### 5.2.10 500 Series Docks

#### *5.2.10.1 Deck, Rim Boards, Appurtenances and Gangways*

According to records provided by the marina coordinator, the 500 series docks were installed in the fall of 2016. The main branch is 2m wide and 149.5m long with 15 finger docks on each side. The fingers are 0.9m wide and 10.1m long, with the last 6 fingers being 11m long, see **Figure 41**. Throughout the 500 series docks, the deck and rim boards are in good condition. The boards show minimal signs of drying, checking, cracking or damage. No areas were observed to be in fair or poor condition and there seems to be no immediate need for replacement of decking or rim boards. The cleats of the 500 series docks were all found to be in excellent condition with no significant visible corrosion. There are no gangways installed in the 500 series docks, however there were loose boards observed at the intersection of the primary floating dock with the 500/600 series docks, see **Figure 42**. These boards should be fastened down as part of regular marina maintenance.

#### *5.2.10.2 Framing, Pontoons & Chains*

The in-water inspection found the dock framing and connections to be in good condition. 500 series main-dock and branch pontoons were also in good condition, with minimal surface corrosion, pitting and rust blooms observed. The majority of anchor chains for the 500 series docks were found to be in good condition with approximately 30% wear typical at the links. The only exception to this is a pair of broken chains at the intersection of the 500 series docks with the primary floating dock. These chains are connected to the primary floating dock and appear to be left-over from the removal of the previous 500 series. No action is required. See **Figure 42A**.

#### *5.2.10.3 Site Services*

##### Mechanical

This section of docks provides water supply to all slips via utility pedestals. The pedestals are generally in good condition. Refer to the Electrical observations below for the make and model of the pedestals. See **Figure 43**.

##### Electrical

The utility pedestals are in good condition. They are Eaton “Lighthouse” model# LH3050. These pedestals are constructed of an injection-molded heavy-resin enclosure. **Figure 44** shows this pedestal style.

There are three distribution panels (PP 500 A, PP 500 B, and PP 500 C) feeding this dock and the adjacent 600 Series dock. PP 500 A and PP 500 B are located on the primary dock. PP 500 C is located at dock-538.

PP 500 A and PP 500 C are in excellent condition with a date code of 2016.

PP 500 B appears to have been from the original 1988 installation and is in fair condition. The panel enclosure is showing signs of corrosion. It is recommended that this panel be replaced due to age. **Figures 45 & 46** show PP 500 B.

An electrical cable was observed hanging down between dock 509 and 511. See **Figure 46A**.

## 5.2.11 600 Series Docks

### 5.2.11.1 Deck, Rim Boards, and Appurtenances

According to records provided by the marina coordinator, the 600 series docks were installed in July 2018. The main branch is 1.8m wide and 56.4m long with 6 finger docks on each side. The finger docks are 0.9m wide and 8.4m long. Given the age of the 600 series docks it is unsurprising that both the deck boards and rim boards were observed to be in excellent condition. Decking featured minimal cracking or splitting due to age, and no damage was observed during the inspection. The cleats were also found to be in excellent condition with no corrosion observed. See **Figures 47 & 48** in Appendix B for condition of 600 series deck and appurtenances.

### 5.2.11.2 Framing, pontoons & Chains

The in-water inspection found the dock framing and connections to be in excellent condition. Pontoons for main branch and finger docks were observed to be in good condition with minimal pitting, minimal rust blooms and limited marine growth. Chains were observed to be overall good condition with approximately 5% wear in the links throughout. Anchor blocks were also observed to be in good condition with limited wear to the eyes observed.

### 5.2.11.3 Site Services

#### Mechanical

This section of docks only provides water supply to 10 slips via utility pedestals. The pedestals are generally in good condition. Refer to the Electrical observations below for the make and model of the pedestals.

#### Electrical

Only the first 10 docks are serviced in this section.

The utility pedestals are in good condition. They are Eaton “Lighthouse” model# LH3050. These pedestals are constructed of an injection-molded heavy-resin enclosure.

Refer to the 500 Series dock section for a description of the electrical distribution panels. The 600 Series dock is fed from the 500 Series distribution.



## 5.2.12 700 Series Docks

### 5.2.12.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the 700 series docks were installed in 1995. The main branch is 2m wide and 159.3m long with 15 finger docks on each side. The finger docks are 0.9m wide and 12.3m long. The deck and rim boards in the 700 series docks are in fair condition, with most boards show signs of aging in the form of splitting and cracking, see **Figure 49**.

The 700 series deck and rim boards both have poor areas including severe cracking in 10-20% of boards, 5-10% of boards are either loose or have some form of external damage. There are also signs of both wood rot and weed/moss growth in a further 0-5% of boards. The rotten boards are typically located around the base of the service pedestals, where some boards have completely rotted through, as per **Figure 50** showing the rotten boards between slips 737 and 739.

The gangway at the 700 series dock is in fair condition with the landing plate on the primary floating dock showing minor surface corrosion over 20-30% and loss of anti-slip strips per **Figure 51**.

Gangway plate should be sanded, cleaned and coated with corrosion resistant paint and non-slip strips should be re-applied as part of regular maintenance.

### 5.2.12.2 Framing, pontoons & Chains

The in-water inspection found the dock framing and connections to be in fair condition. pontoons for both the main branch and finger docks were found to be in fair condition. pontoons were observed to have an average of 1-2mm pitting on the surface, with no signs of damage. pontoons were also observed to have significant coverage with marine growth below the spring line. Anchor chain were found to be in fair-poor condition. Chains from slips 701-714 were observed to be in poor condition with 50% wear or greater in the links. The remaining chains were observed to be in fair condition with 20-30% wear in the links typical in both main branch and finger chains. All chains were observed to have significant marine growth from the lakebed up to the underside of the docks.

### 5.2.12.3 Site Services

#### Mechanical

This section of docks only provides water supply to the all slips via hose bibs supported by metal assemblies. The hose bib assemblies are generally in poor condition, many are leaking and/or missing valve handles. See **Figure 52**.

#### Electrical

There are two types of utility pedestals in this dock. The south side are Eaton “Lighthouse” model# LH3050. These pedestals are constructed of an injection-molded heavy-resin enclosure and are in good condition. The north side pedestals are of similar construction but are older and are in fair-to-good condition. The primary issue with the north side pedestals being wear and tear with age as evidenced below. **Figure 53** shows the two pedestals on this dock.

Damage to particular pedestals is noted as follows:

- dock-702/704 is missing the light-top
- dock-714/716 has been marked out of service

- dock-741/743, dock-749/751, dock-713/715, dock-753/755, and have faulty spring-loaded receptacles covers. Refer to **Figure 54**
- dock-705/707 is missing a receptacle cover

It is recommended that the spring-loaded covers be repaired to protect the receptacles from weather elements when not in use.

The distribution panels feeding this dock have date codes of 2010 and are in good condition.

### 5.2.13 800 Series Docks

#### 5.2.13.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the 800 series docks were installed in 1988. The main branch is 2.1m wide and 58.4m long with 6 finger docks on each side. The finger docks are 0.9m long and 9.0 m long, see **Figure 55**. The deck boards and rim boards of the 800 series docks were found to be in fair condition, with several recently replaced boards. Isolated poor areas were also observed where boards are cracked, splitting or otherwise damaged as seen in **Figure 56**. Poor areas should be replaced as needed based on severity of damage and risk to public safety.

Cleats were found to be in fair condition with minor surface corrosion. Cleats should be sanded, cleaned and coated with new layer of corrosion resistant paint as part of regular maintenance.

The gangways for the 800 series docks consist of diamond checkered plates between docks and steel landing plates with non-slip strips. The diamond checkered plates are in fair condition with light corrosion over 10-20%. Landing plates are in fair condition with surface corrosion over 40-50% and loss of anti-slip strips, see **Figure 57**. Gangway plates should be sanded, cleaned and coated with corrosion resistant paint and non-slip strips should be re-applied as part of regular maintenance. Additionally, there is a wooden railing installed at the intersection of the 800 series with the primary floating dock that is loose, see **Figure 58**. This railing should be secured as part of regular marina maintenance.

#### 5.2.13.2 Framing, Pontoons & Chains

The in-water inspection found the dock framing and connections to be in fair condition. Pontoons were observed to be in fair condition with an average of 1mm-1.5mm pitting in the freeze/thaw zone. The anchor chains throughout the 800 series were observed to be in poor condition. The finger chains at slips 803/805, 804/806, 815/817 and 814/816 were all found to be broken. The remaining finger chains and main branch chains were observed to have between 50% and 75% wear in the links. It is advised that new chains and anchor blocks be installed at the location of broken chains prior to replacing the entire dock series to ensure adequate anchorage and reduce loads on remaining chains.

#### 5.2.13.3 Site Services

##### Mechanical

This section of docks only provides water supply to all slips via hose bibs supported on metal standpipes. The hose bib assemblies are generally in good condition showing some early signs of rusting. See **Figure 59**.

##### Electrical



The utility pedestals are the same type as found on the north-side of the 700 Series dock and are in a similar fair-to-good condition. Specific damage is noted as follows:

- dock-801/803, has a faulty spring-loaded receptacles cover.

It is recommended that the spring-loaded covers be repaired to protect the receptacles from weather elements when not in use.

The distribution panels feeding this dock have date codes of 2010 and are in good condition.

### 5.2.13 900 Series Docks

#### 5.2.14.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the 900 series docks were installed in 2014. The main branch of the 900 series docks is 3.0m wide and 291.7m long projecting south from the end of the primary floating dock. There is a turn to the east 217.6m south of the primary floating dock, see **Figure 60**. The 900 series dock also acts as the breakwater for the marina and as such all 20 fingers project inward, either to the East or North. The deck and rim boards were found to be in good condition with no significant damage, splitting or cracking. There was a fair amount of animal/bird droppings near the end of the 900 series that should be cleaned/removed as part of regular maintenance, see **Figure 61**. Cleats were observed to be in good condition with minor surface corrosion, see **Figure 62**. Cleats should be cleaned, sanded and have a layer of corrosion resistant paint applied as part of regular maintenance. There are no gangways in the 900 series docks.

#### 5.2.14.2 Framing, Pontoons & Chains

The in-water inspection found the dock framing and connections to be in good condition. The pontoons were observed to have nearly 100% coverage in zebra mussels and marine growth below the spring line but have less than 1mm of surface pitting and are in good condition. In-water inspection also observed the condition of the damper structures suspended from the pontoons. The dampers are in similar condition to the pontoons, with heavy marine growth and zebra mussel presence, but minimal pitting or other damage.

Anchor chains from slip 916 to 940 at the end of the 900 series docks were observed to be in fair condition with heavy marine growth and approximately 30% wear on the chains at the links. Anchor blocks were found to be buried below typically 150mm of sediment with the eyes in good condition.

The anchor chains from slip 916 North to the intersection with the primary floating dock are in worse shape, but would still be considered fair with 50% wear at the links typical.

#### 5.2.14.3 Site Services

##### Mechanical

This section of docks provides water supply to all slips via utility pedestals. The pedestals are generally in good condition. Refer to the Electrical observations below for the make and model of the pedestals.

##### Electrical

The utility pedestals are in good condition. They are Eaton “Lighthouse” model# LH3050. These pedestals are constructed of an injection-molded heavy-resin enclosure.

Due to the distances involved, electrical distribution to the 900 Series is accomplished with three 600V feeds serving stepdown-transformer/distribution-panel stations (PP1, PP2, & PP3) along the 900 Series dock. As indicated prior in the 'Primary Dock' section, these three 600V feeds originate at the distribution centre located near Series 700. Each PPx station is powered by its own 100KVA stepdown transformer. PP1 is located near dock-904/906, PP2 is located near dock-920/921, and PP3 is located near dock-934/935. The distribution panels and stepdown transformers are in good condition. **Figure 63** shows one of the three stations (ie, PP1).

This section of dock contains pole mounted lighting which outlines the dock perimeter. The pole are metal. The lighting and light poles are in good condition.

## 5.2.15 C & D Series Docks

### 5.2.15.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the C & D series docks were also installed in 2014. C and D docks are both single branches projecting North from the primary floating dock between the 800 and 900 series docks, see **Figures 64 & 65**. The deck and rim boards were observed to be in good condition with no significant damage, splitting or cracking. Cleats were observed to be in good condition. There are no gangways to the C and D series docks.

### 5.2.15.2 Framing, Pontoons & Chains

The in-water inspection found the dock framing and connections to be in good condition. Pontoons were found to be in good condition with 80% coverage in marine growth to the spring line, and minimal pitting of less than 1mm in the freeze thaw zone. The chains were observed to be in fair condition with 30-40% wear on the links.

### 5.2.15.3 Site Services

#### Mechanical

For these docks water supply is provide through a single pedestal at each dock. The pedestals are in good condition. Refer to the Electrical observations below for the make and model of the pedestals.

#### Electrical

These two docks have one pedestal each. It is unique compared to all other docks, with Eaton model # HL13-GFI. These pedestals are in good condition.

These pedestals are power from the PP1 distribution station on the 900 Series dock. Refer to the 900 Series document section for a description of this power source.

## 5.2.16 Sea-Doo Docks

### 5.2.16.1 General Condition

The sea-doo docks are located between the 800 series docks and C series docks, on the North side of the primary floating dock. The sea-doo docks are a comprised of modular floating plastic cells plastic and steel hardware, see **Figure 66**. A steel gangway connects the sea-doo dock to the primary floating dock, see **Figure 67**. The Sea-doo dock is anchored by two chains attached to the Northeast and Northwest corners respectively. All components were found to be in good condition. The in-water inspection observed no obvious signs of sinking or water infiltration. The underside of the dock is covered in marine growth but there is no observed damage. Chains were found to be in good condition

as well with only 10-15% wear in the links. Anchor block was also observed to be in good condition with no significant wear or damage to the block or eye observed.

### 5.2.17 RB Series Docks (@ New Boat Launch)

#### 5.2.17.1 Deck, Rim Boards, Appurtenances and Gangways

According to records provided by the marina coordinator, the RB docks were installed in 2010. In 2018 the series was split and to accommodate the installation of the new boat launch at the North shore of the marina. New docks were added at either side of the boat launch and attached to original RB series docks. The new deck boards, rim boards, cleats and gangways are all in excellent condition, as is these **Figure 68**. The pavement and sidewalks surrounding the boat launch are also in excellent condition.

In the older parts of the RB series docks the deck boards and rim boards are in good condition. Cleats and the cleats in the older section of the RB series are still in good condition as well. The gangway between the shore and East section of RB dock is in good condition with no significant corrosion or apparent damage, see **Figure 69**.

#### 5.2.17.2 Framing, Pontoons & Chains

The in-water inspection found the dock framing and connections to be in good condition. Pontoons in the RB series docks were observed to be in good condition with less than 1mm of pitting. The anchor chains were also observed to be in good condition with minimal wear and marine growth.

#### 5.2.17.3 Site Services

##### Mechanical

There are no mechanical services on this section.

##### Electrical

There are no electrical services on this section.

### 5.2.18 East Shoreline & Boardwalk

#### 5.2.18.1 Shoreline & Cribbing

At the time of the inspection the boardwalk area West of the marina building was taped off due to the presence of several sinkholes along the edge of the boardwalk, see **Figures 70-74**. Visual inspection of several sinkholes found that more earth appears to have fallen away beyond the extents of the hole itself and prodding of the ground adjacent to the sink holes resulted in further collapse/subduction.

The dive team inspected the cribbing that supports the boardwalk at the shore. The cribs were filled with a mix of various sizes of stone and the timbers of the cribbing were found to be in good condition. There were several locations where the diver located spill-outs of cribbing fill material. Each spill-out area was in-line with one of the sinkholes, suggesting that the spilled material may be sediment that “washed-out” from the shore-line, creating the sinkhole above.

Greer Galloway believes that there is likely more damage to the shoreline than is visually obvious and that the shoreline along the boardwalk is significantly compromised. The instability is believed to be caused by the high-water events in 2017 and 2019 and is highly concerning. Greer Galloway recommends that a geotechnical engineer be retained to assess the damage and provide suggestions for remedial action to stabilize the area as soon as possible. This is discussed further in section 6 – **Summary of Results**.

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#### 5.2.18.2 Deck, Skirting & Cleats

The deck boards along the boardwalk are in fair condition, with some recently replaced boards and others that are likely in need of replacement. Many of the skirting boards are cracked and show signs of warping. Many of the boards are loose at the bottom due to failed hardware or rotten boards at site of the connection to the cribbing. Divers identified several skirt boards as being broken at the bottom in addition to reporting the loose boards. It is recommended that the broken boards be replaced, and loose boards be re-fastened or replaced accordingly in order to protect the cribbing. This should be done as part of regular marina maintenance.

#### 5.2.18.3 Site Services

##### Mechanical

There are no mechanical services on this section.

##### Electrical

There are no electrical services on this section.

#### 5.2.19 Sanitary Lift Station

North east of the dock office building is a sanitary holding tank and pumping chamber that lifts the sewage to a municipal manhole for gravity drainage through the municipal system. It is believed that there may be ground or lake water infiltration into the sanitary holding tank and lift station. If this were the case it would be considered in poor condition. See **Figure 75**. Greer Galloway recommends that this system be further investigated to verify that there is infiltration. If it is found that there is infiltration, a suitably qualified contractor should be engaged to pump out and inspect the tank to identify remediation options. There are a couple of low-cost options that could be considered for identifying infiltration. An energy monitor could be installed at the control panel for the duplex pumps to monitor energy usage during the off-season/when the facilities are not in use. Alternatively, Marina staff could shut down the duplex pumps and visibly observe the rise in effluent level while the facilities are not in use.

The duplex pump system that lifts the sewage to the municipal system is of unknown condition. It was in use on the date of observation which did not allow for further investigation. The age of the duplex pump system is also unknown. See **Figure 76**. Based on an average service life of 5-10 years, we feel it is best to replace the system within the first 5 years of the 15 year forecast, due to the above noted uncertainties.

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## 6 SUMMARY OF RESULTS

Greer Galloway was retained by the Town of Gananoque to complete a comprehensive inspection and condition assessment for the Gananoque Municipal Marina. The condition assessment consisted of a physical review by Engineers as well as a commercial dive team to determine the condition of marina facilities including but not limited to:

- Floating docks (deck boards, pontoons, chains and connections)
- Anchor Piles and Cribbing
- Gangways and Gangway connections
- Dock appurtenances (cleats, safety cabinets, etc.)
- Marina servicing (electrical, plumbing, etc.)
- Shoreline and Boardwalk

At the time of completing this study the Marina was shut down for the season with the majority of slips were empty. There was no ongoing work on the docks or servicing infrastructure.

The in-water inspection revealed that the condition of the marina infrastructure varies widely depending on the age and composition of each element. All components built within the last decade were found to be in generally good condition and should be able to meet their anticipated 30-year service life. As such, capital replacement considerations for newer docks have not been included in this report as they fall beyond the report's 15-year forecast. **Table A2** in **Appendix A** summarizes the age, condition and remaining life expectancy for each dock series. As per **Table A2**, the loading dock, 500 series, 600 series, 900 series and A,B,C,D and RB series docks were all installed within the last 10 years and is not anticipated that they will need replacement in the next 15 years.

The remaining docks range in age from 32-26 years old, based on information provided by the Marina Recreation Coordinator. All of these older docks are in fair to poor condition and will need to be replaced during the 15-year forecast of this report. The timing and order of replacements is detailed in section **6.1 – Dock Replacement Strategy**.

### 6.1 Dock Replacement Strategy

The customs dock, 100 series, 200 series, 300 series, 400 series and 700 series will all need to be replaced within the next 15 years. All of these docks are over 25 years old, with the majority of them being over 30 years old. Based on an average life of 30-35 years all of these docks are approaching their maximum life span, however based on the existing conditions described in **section 5.2 – Observations**, it appears that several series are already at or beyond the end of their service life due to the combination of damaged and/or corroded pontoons and loss of/wear to the anchor chains.

The docks that are in the most critical need of replacement are those with significant corrosion or damage to the pontoons. This is due to the difficulty involved with rehabilitating damaged pontoons and the risks associated with pontoon failure. As such, those series with significant pontoon deficiencies have been prioritized in the replacement strategy (i.e. the customs dock, 200 series). Dock series with pontoons in fair condition but poor anchorage have been given lower priority as additional anchor chains and blocks can still be installed as a temporary measure until the whole dock series can be replaced (i.e. the 400 series docks).

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The replacement strategy also considered the costs associated with replacing each segment and the effects on the reserve fund. **Table 1** below provides a summary of the capital replacements and investments required over the next 15 years, and the anticipated replacement cost. As per the assumptions laid out in **Section 1 – General**, all replacement costs are based on quotes received during the preparation of this report, adjusted for future based on an assumed average annual inflation of 2% and are inclusive of HST. The original quotes for capital investments and replacements can be found attached in **Appendix C - Quotes**.

| <b>Table 1 - Replacement Strategy</b> |                                |                        |  |               |
|---------------------------------------|--------------------------------|------------------------|--|---------------|
| <b>Year</b>                           | <b>Dock Series Replacement</b> |                        | <b>Additional Capital Investment</b>               |               |
|                                       | <b>Series</b>                  | <b>Cost (with HST)</b> | <b>Item</b>  | <b>Cost</b>   |
| 2020                                  | 200 Series Docks               | \$ 198,315.00          | Geotechnical Investigation & Retaining Wall Design | \$ 5,650.00   |
| 2021                                  | Customs Dock                   | \$ 109,727.52          | Transformer Replacement at Pumpout                 | \$ 11,300.00  |
| 2022                                  | 100 Series Docks               | \$ 103,927.64          | Retaining Wall Installation                        | \$ 135,600.00 |
| 2023                                  |                                |                        |  |               |
| 2024                                  | 300 Series                     | \$ 408,409.23          |  |               |
| 2025                                  |                                |                        | Pumpout Replacement                                | \$ 28,320.78  |
|                                       |                                |                        | Duplex Pump Replacement                            | \$ 7,485.67   |
| 2026                                  | 400 Series                     | \$ 276,909.82          |  |               |
| 2027                                  | 800 Series                     | \$ 301,918.24          |  |               |
| 2028                                  |                                |                        |  |               |
| 2029                                  |                                |                        |  |               |
| 2030                                  |                                |                        |  |               |
| 2031                                  | 700 Series                     | \$ 817,015.04          |  |               |
| 2032                                  |                                |                        |  |               |
| 2033                                  |                                |                        |  |               |
| 2034                                  |                                |                        |  |               |
| 2035                                  |                                |                        |  |               |

## 6.2 Services Replacement Strategy

### Mechanical

The water distribution piping is polyethylene (PE) and should have an expected life of greater than 50 years. In considering the 15-year replacement strategy, the PE piping should out live the dock infrastructure. It is recommended that PE piping only be replaced on schedule with the dock replacement strategy schedule outlined in Table 1.

The water is delivered to the slips by utility pedestals or hose bibs. The utility pedestals replacement, which are generally in good condition, should follow the dock replacement strategy. The hose bibs have an expected life of between 10-15 years if winterized and maintained adequately. Hose bibs should be replaced on an on-going basis as part of regular maintenance. The support of the hose bibs should also be addressed. Current support through hose clamps allows for stresses to be applied to the fittings due to dragging and pulling of attached hoses. This reduces the life of the fittings and adds to required maintenance.



The sanitary pump out system is a WMW ED125 system and is in good condition. The unit is from 2012 and is expected to have a life of between 12-15 years if subjected to regular maintenance. This would schedule its replacement between 2024 and 2027.

The sanitary holding tank and lift station possibly has infiltration and should be further investigated. The duplex pump system has a seasonal duty and should have an expected life off approximately 10 years. The age of the existing duplex pump system is unknown. It should be anticipated that it will need to be replaced within the next five years.

The water distribution system appears to have no means of protecting the municipal drinking water supply. Distribution piping and hoses connected to hose bibs at the slips could be potential sources of contamination due to back siphonage. A DCVA type backflow preventer should be installed in the service room of the dock office on the water supply.

### Electrical

The electrical services on the numbered docks would be replaced as part of dock replacement. This section describes common electrical components located on the primary dock.

Transformers: The 75KVA stepdown transformer on the primary dock, near Series 100 docks has a corroded enclosure. This transformer appears to be from the original installation. A breaker panel is integrated into this unit in an extension to the enclosure and it is also suffering from corrosion. It is recommended that this unit be replaced within the next 2-3 years.

Distribution Panels: Several distribution panels are located on the primary-dock. In general, they feed the numbered-dock fingers closest to the primary dock, and in some cases feed multiple numbered-docks. Replacement of a numbered-dock would require replacement of distribution panels located on the numbered dock. Thus, numbered-dock distribution panels will get properly replaced as part of numbered-dock replacement. However, since certain distribution panels are located on the primary-dock, a numbered-dock could conceivably be replaced and partially powered by the existing primary-dock distribution panels. It is recommended that primary-dock distribution panels listed as poor-to-fair condition be replaced as part of replacing the docks serviced by these panels. Refer to the detailed description (Section 5) for affected distribution panels. In the absence of a dock-replacement, the affected panels should be replaced within the next 2-3 years.

## 6.3 Shoreline Rehabilitation

As described in **Section 5.2.18 - East Shoreline and Boardwalk** the area immediately West of the Marina buildings has suffered significant shoreline damage with several sinkholes of varying size formed at the edge of the board walk. In-water inspection found signs of washout at the base of the cribbing below the sinkhole locations. It is believed that the shoreline damage is related to the high-water events of 2017 and 2019.

Greer Galloway believes that there is likely more damage to the shoreline than is visually obvious and that the stability of the shoreline along the boardwalk may be significantly compromised. We recommend that a qualified geotechnical engineering firm be retained to complete a geotechnical investigation of the shoreline and to provide a plan for remediation. We have accounted for the cost of

this investigation and design as part of the reserve fund budget for 2020. Based on experience with similar projects, and based on an approximate affected area length of 60m, Greer Galloway has budgeted \$5,000.00 + HST for the cost of the investigation and design.

We believe that a retaining wall system should be installed in place of the existing cribbing and a new boardwalk be installed on top. This would help prevent future erosion. For budgeting purposes Greer Galloway has assumed a replacement cost of \$2,000.00 + HST per meter of retaining wall. This price is based on similar project experience. Based on an approximate wall length of 60m, this results in an anticipated capital cost of \$120,000.00 + HST. This price has been included in the reserve fund budget for 2022, however action may be required sooner pending the results of the geotechnical investigation, or if another high-water event occurs leading to further damage.

Pending the results of the geotechnical investigation, it is recommended that temporary measures be undertaken to infill damaged shoreline and prevent further erosion. This can be undertaken as part of marina maintenance until the retaining wall can be installed.

## 7 CONCLUSION

Greer Galloway is pleased to present this report to the Corporation of the Town of Gananoque. After completing a thorough site investigation, corresponding with Marina staff and service providers and soliciting quotes for replacement costs of critical infrastructure Greer Galloway has been able to detail the current condition of all primary structural, mechanical and electrical elements of the Gananoque Municipal Marina, as well as generate yearly budgets for the Marina reserve fund over the requested 15-year forecast.

We trust that the contents of this report and appendices attached herein are sufficient to your needs at this time.

Respectfully submitted,



**Jaime Maitland, P.Eng**

**The Greer Galloway Group Inc.  
Engineers & Planners**