BURNSIDE

Sault Ste. Marie Golf Club
Irrigation System Preliminary Evaluation

Prepared by

R.J. Burnside & Associates Limited
16775 Yonge Street Suite 200 Newmarket ON L3Y 8J4 Canada

November 2005

File No: PGN 09630

Table of Contents

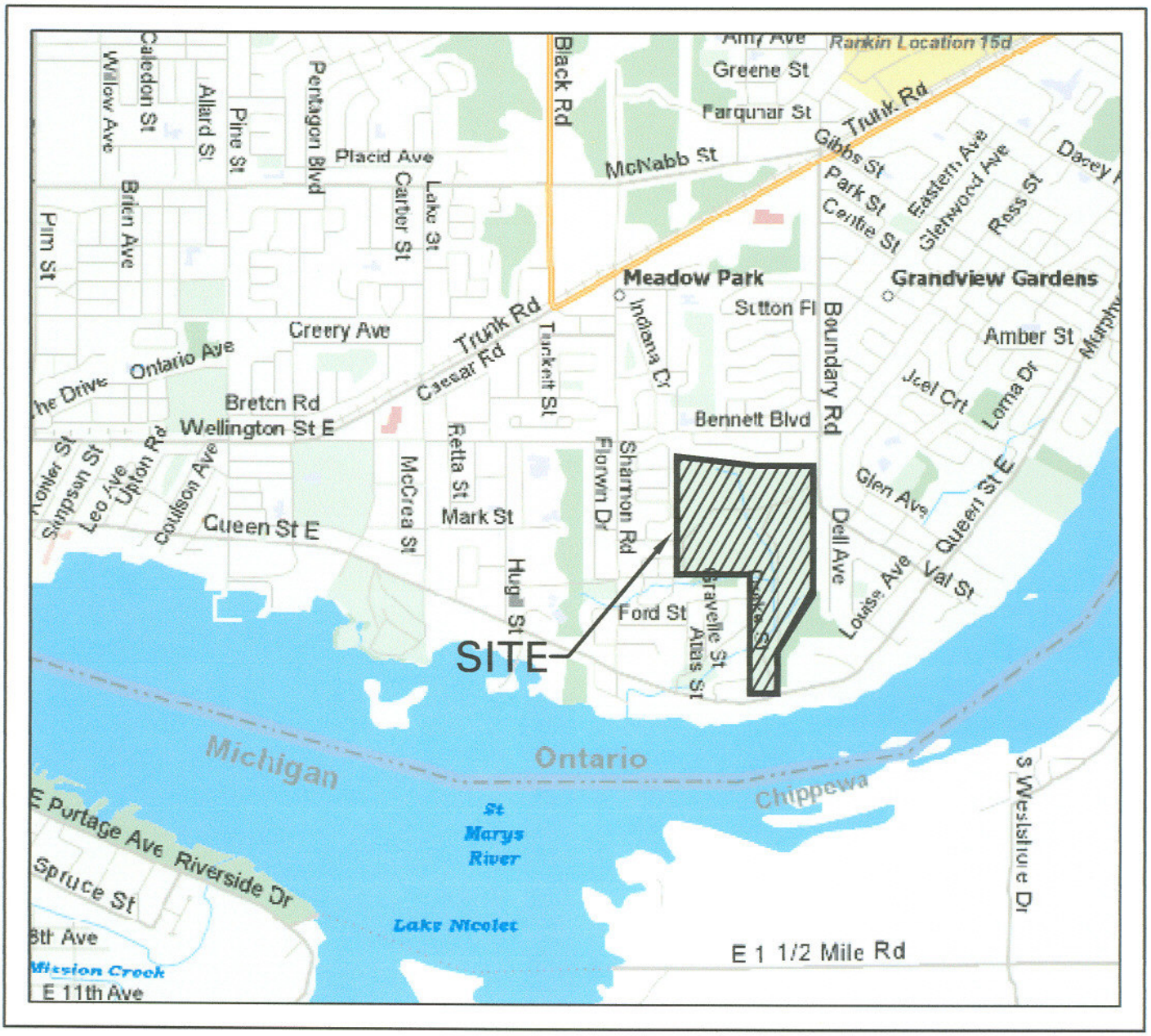
Figures

Appendices

1.0 Introduction

R. J. Burnside & Associates Limited (Burnside) was retained to evaluate the existing irrigation system that is currently in place at the Sault Ste. Marie Golf Club (Golf Club) and to comment on the efficiency of the existing system. The evaluation process included an analysis of the current irrigation piping design and sprinkler head layout, a visit of the site, and talks with the Golf Course Superintendent and his staff to determine current irrigation practices. We have included as part of this report some information relating to a new irrigation system, including preliminary sprinkler head counts and cost estimate. The pictures that accompany this report were taken on September 1, 2005 and are included in Appendix A.

Sault Ste. Marie Golf Club is a private 18-hole golf course located on Queen Street East, on the shores of the St. Mary's River, in Sault Ste. Marie, Ontario. The site location is shown on Figure 1.



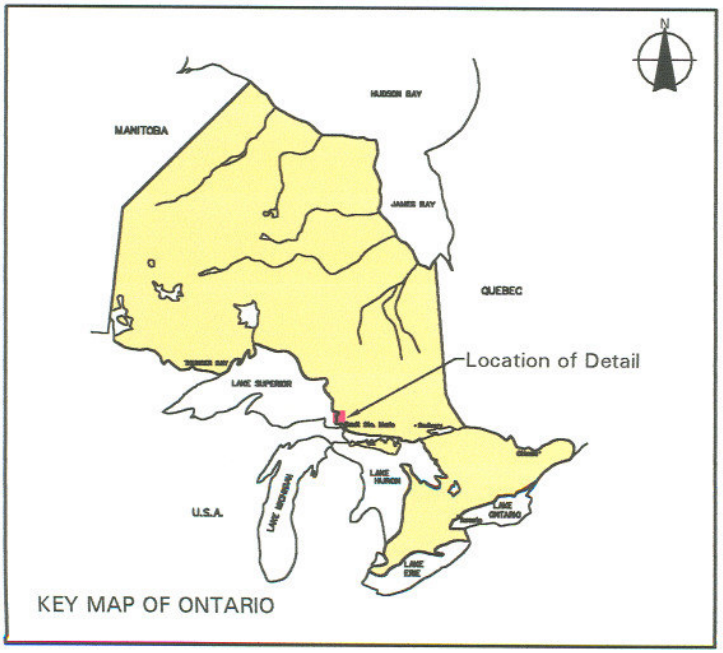


FIGURE 1 - SITE LOCATION MAP

SAULT STE. MARIE GOLF CLUB

SAULT STE. MARIE

Project Number: PGN 09630

Prepared by: R.STACEY

Verified by: T.J. RULE

BURNSIDE

PGN 09630 Fig1.dwg

2.0 Current Irrigation System

The current irrigation system at the Sault Ste. Marie Golf Club was installed in 1976, with some upgrades being implemented over the years, including Hole Nos. 6 and 11 in 2004. The central control system is a Toro OSMAC 4.0, operating Toro 634 and 730 sprinkler heads around the greens and tees, while the fairways are irrigated using impact sprinklers that are manually operated. The system is mostly single row, with some perimeter heads on individual holes. Over the years, the Golf Club has added several sprinkler heads to the system to cover poorly irrigated areas.

At the time of the initial installation, the irrigation system would have been considered "state of the art". While continuing maintenance and repairs have been performed over the years, since the initial installation, the original system remains primarily intact with no major upgrades having occurred. At nearly 30 years of age, many of the components are reaching the end of their useful lifespan. Sprinkler head motors are beginning to wear out, resulting in the sprinklers not turning at a consistent speed. Nozzles are worn and do not produce proper distribution patterns, swing joints are rusting through (see Photos 1 and 2), and satellite components are becoming worn and broken. The fairway sprinklers are mainly quick coupler valves, increasing the manual labour to operate the system, as well as increasing the inconsistency of the watering schedules. In general, the piping system is intact, however several breaks are occurring and the time and cost required to repair the system breaks is increasing on an annual basis.

The system that is currently installed is mostly hydraulically activated meaning that water pressure traveling through small tubes from the satellite (see Photo 3) to the sprinkler head is used to hold the sprinkler heads closed. When a station is activated in a hydraulically activated system, the water pressure is released, and the sprinkler head comes on. This is known as a "normally open" system, as the sprinkler heads will come on and stay on if no water pressure is applied through the tubing. If the hydraulic system has any problems with the tubing (nicks or kinks in the line), the heads may not operate properly, or the timing can be affected, as the tubes take longer to come up to the proper pressure. In some cases, a sprinkler head can take several minutes to shut off after the station has timed out. This leads to inconsistent watering as some heads are left on longer than others (see Photo 4). Also, if the head stays on for several minutes too long, excess water is applied, and can lead to problems with the pump station operation if too many heads remain stuck on. Components for hydraulically activated systems are quickly becoming obsolete and thus problems with the existing system are becoming more and more difficult to repair.

Most systems installed today are electrically activated – electricity must be applied to the sprinkler head for the heads to activate. This is the case with the newly installed irrigation on Hole Nos. 6 and 11. This is a "normally closed" system with much quicker response times and therefore much more accuracy in timing the stations. It is therefore recommended that any new irrigation system incorporate electrically activated sprinkler heads to improve efficiency and reduce water usage.

The system has limited isolation capabilities for maintenance and repair, with several holes isolated in one "loop", and controlled by the same shut-off valve. This means that large areas of the irrigation system must be shut down in order to perform repairs. If the Golf Club is to upgrade to a new irrigation system, the new system design should incorporate much greater isolation capability, with each green, tee and fairway having separate isolation capabilities.

2.1 Existing Coverage

2.1.1 Tees, Greens and Green Surrounds

In general, the tees and greens are relatively well covered with 4 to 7 sprinkler heads on each tee and green (see Photos 4 and 5). All the heads, at any given tee or green, are controlled by the same station, operating on a "block" system. This means that there is no isolation capability around the tees or greens, and therefore all heads operate simultaneously. Since the system is mainly operated hydraulically, and the heads do not always turn on at the same time, the distribution of water on and around the greens is not consistent. On the undulating greens at the Golf Club, it is often desirable to water one area of the green more than other areas for effective coverage and water conservation. This is very difficult to achieve with multiple heads on one station, and in most cases, supplemental water must be added manually. It is recommended that the new system incorporate single head control on the greens sites to alleviate this problem.

The system utilizes the greens heads to cover the surrounding areas as well. Many of the greens have significant mounding surrounding the green site, and these areas, while covered by the greens heads, do not receive enough water. Due to the significant slopes found in many of the surrounds, these areas require more water than do the green sites. As there is currently no way to water these areas separately, the Superintendent must water the green correctly and let these areas dry out, or over-water the green site in order to keep the mounds green. It is strongly recommended that any new irrigation layout include supplemental irrigation for these perimeter areas surrounding the greens sites so that the Superintendent can water these areas separately from the greens.

2.1.2 Fairways

In most cases, the fairways have been irrigated with a single row of irrigation in the center of the fairway, with double row irrigation in some of the landing areas. The Greens Staff has added supplemental irrigation in several areas where mounding has been added. The single row design means that much more water is applied to the center of the fairway than is applied to the outer edges of the fairway and the roughs. The Superintendent must over-water the center of the fairway to keep the edges green. In addition, some areas of the fairway are receiving coverage from two sprinkler heads, while other areas are only receiving single head coverage, or half the water. This leads to

"scalloping", or triangles of dry turf on the outer edges of fairways that are not receiving enough water.

All sprinkler heads put much more water down close to the head than at the end of their throw. In general, sprinklers are usually placed such that the radius of throw equals the spacing of the sprinklers. This configuration allows for an even amount of water to be distributed throughout the irrigated area. At the Sault Ste. Marie Golf Club many of the sprinkler heads are not spaced head to head. In many cases, sprinkler heads that throw 75 feet are spaced 90 feet apart. This reduces the efficiency of the coverage dramatically, leading to dry-spots or over-watering to compensate. The new design should include multiple row coverage on fairways at head to head spacing, to maximize the distribution uniformity, and ensure all fairway areas are equally irrigated.

2.1.3 Rough Areas

The coverage of rough areas at Sault Ste. Marie Golf Club is very poor and in many areas non-existent (see Photo 6). Most rough areas on the course, including many areas that are definitely in-play, do not receive any irrigation at all, and thus go dormant during drought periods. A new irrigation system would allow for irrigation coverage in most rough areas, with supplemental irrigation in areas with significant mounding or other in-play features. Areas that are not in-play but are aesthetically important, such as around the halfway house, should also be irrigated if a new system is incorporated.

2.2 Pump Station

A Pumptronics variable frequency drive pump station provides water to the existing irrigation system at a rate of 700 U.S. GPM at 130 PSI pressure (see Photo 7). The pump station is currently situated adjacent to St. Mary's River, with the intake pipe extending several meters into the river, and equipped with a screen to keep fish and debris out of the irrigation system. The pump station is currently working properly, with no major problems.

3.0 New Irrigation System

3.1 Design Paramters

The layout of the existing irrigation system is shown on an as-built drawing prepared by Kenneth Siddall Inc. dated May 5, 1976. The irrigation system has undergone some minor changes since the creation of this plan, and those changes have been sketched onto the as-built drawing. The existing system has approximately 105 tee heads, 98 green heads, and 205 fairway heads (including quick couplers in the fairways) for a total of 408 sprinkler heads. There are also approximately 57 quick couplers around the tees, greens, and perimeter areas.

Using the Kenneth Siddall drawing as a base map, a new preliminary sprinkler head layout was sketched which incorporates sprinkler heads with a 65-foot radius of throw on greens, tees and approaches and an 80-foot radius of throw on fairways and in most rough areas. The sprinklers were designed with head to head spacing to achieve the best possible distribution efficiency. Multiple row coverage was used to achieve proper coverage to all playable areas. Additional sprinklers were added in several areas of the rough to provide supplemental coverage for mound areas or other features. Part circle (perimeter) rotors were added facing away from the green sites to allow supplemental irrigation of the green side mounds.

Due to the inaccurate base mapping available, this design is only a very rough approximation of what a new system would resemble. Should we receive more detailed base mapping, a more detailed design could be completed. For the purpose of this report, the preliminary head layout that we have assembled will at least provide the Golf Club with an idea of the approximate number of sprinkler heads required for adequate irrigation coverage, and provide a basis for developing a preliminary cost estimate for a new system.

3.2 Preliminary Design Data

The following Table details the sprinkler head quantities that exist in the current system, as well as the approximate number of heads included in the new preliminary design:

Sprinkler Head Type Design	Current System	New Design
65 Foot Radius (Greens, Tees, Approaches)	203	308
80 Foot Radius (Fairways and Rough)	205	469
Total	**408**	**777**

It should be noted that, while the new design incorporates almost double the number of sprinkler heads, this does not equate to double the amount of water used. The new design

uses water much more efficiently, so lower watering times will be required. In addition, many of the sprinklers are supplemental and will require much lower watering times than those covering the main areas.

In addition to an increased number of sprinkler heads, the new design would include additional satellites to provide the Superintendent more flexibility in controlling the system. A new system would also include more valves to isolate more specific areas so that repairs to the system are more easily implemented.

3.3 Preliminary Pump Station Data

Based on the preliminary sprinkler head counts and a 7.5 hour water window, it was determined that at minimum a 900 U.S. gallon/minute pump station would be required to irrigate the property during peak load times. This assumes that approximately 1.4 inches/week is applied to the tees and greens, while 1.0 inches/week is applied to the fairways and rough areas, which represent typical numbers for private golf courses in Northern Ontario. The current pump station produces 700 USGPM, which would equate to a 9.8 hour water window, and therefore would not provide sufficient flow to water the golf course fully in one night's cycle assuming the preliminary head layout. It was not within the scope of this preliminary report to do an audit of the existing pump station, however, should the Golf Club decide to move forward with the design of a new irrigation system, it is recommended that an audit be performed with the pump station manufacturer to determine if the station can be modified to meet the new conditions, or if a new pump station is needed.

The intake line from the pond should also be investigated to determine if sufficient water can be provided to the current pump location through the existing pipe and intake screen.

3.4 Preliminary Budgeting

A preliminary budget for the new irrigation system is difficult to predict accurately as Contractor availability, the U.S. dollar conversion and oil prices can all affect the price at the time of tender. For example, as of November 1, 2005, the cost of PVC pipe and electrical wiring increased approximately 20% and 35% respectively. Also, every golf irrigation system is different, and uses different quantities of product, so an exact dollar amount is difficult to determine without going through the detailed design and tender process. As an estimate, new installations of this size and scope can be budgeted between $1200 and $1300 per sprinkler head installed. This figure includes all piping, irrigation components and control system components. With 777 sprinkler heads on the preliminary drawing, the Golf Club would likely need to budget between $900,000 and $1,000,000 for a new irrigation system. Once again, this number is a rough estimate as the preliminary design is very approximate. A more detailed cost estimate could be established with a more detailed irrigation design.

This preliminary cost estimate does not include any pump station costs. As the pump station needs have yet to be determined, it is very difficult to predict these costs. Obviously, if a new wet well, pump house building and pump station are required, the costs will be much greater than if modifications can be made to the existing station.