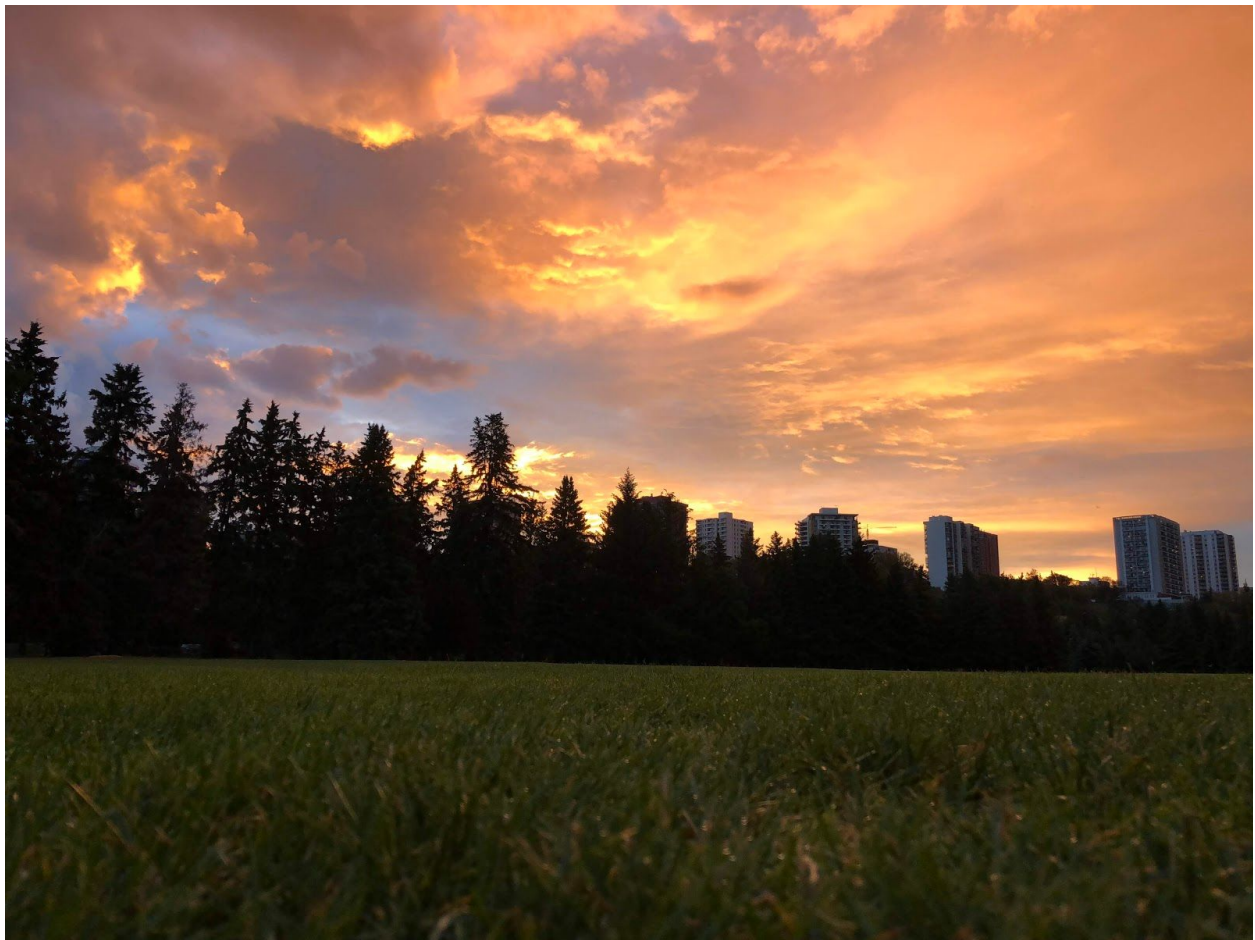


Directed Field Study #1 - Establishing an Irrigation Database

- Scott Dillon -

BASc Golf Course Management



The Goal:

Establish an up to date irrigation database with GPS mapping of all current irrigation components, and compile an assessment of the expected lifespan of the current system. Furthermore, create a maintenance reminder and an accurate prediction system for existing sprinkler heads.

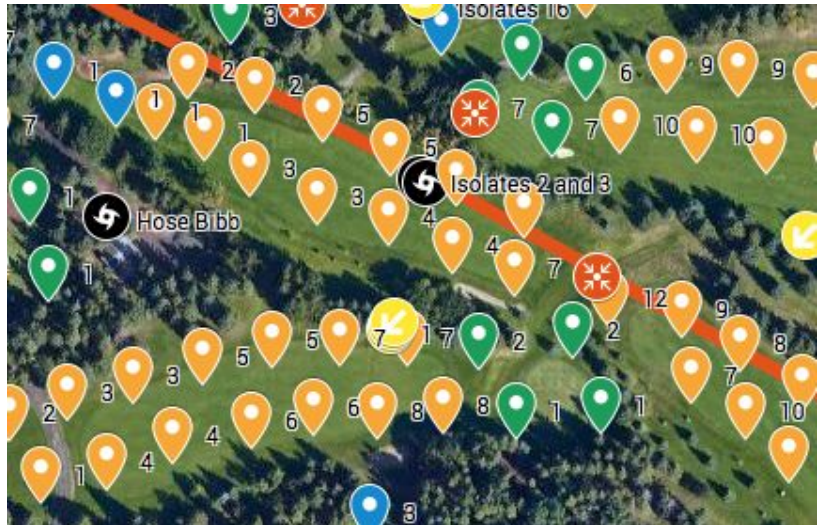
- Design and complete a database of existing sprinkler heads utilizing Google Sheets
- Retrieve old pipe diagrams and irrigation maps for pipe routing, overlay these diagrams on Google Maps for a satellite view of each aspect
- Mark each sprinkler head using GPS receiver and overlay with Google MyMaps.
- Use the generated data and Google Sheets to design a tool to predict when maintenance might be expected for each irrigation component.
- Script spreadsheet to send applicable notifications via email to the irrigation technician or applicable staff members.
- Create a series of consistently formatted station lists with notes on which station controls what sprinkler heads on what area of the golf course.
 - Validations:
 - Employer validation letter
 - Complete information sheets for stations along with hole mapping
 - Complete database for all sprinkler heads

The Objective:

Throughout my career in the golf industry, and particularly from within the property lines of Victoria Golf Course, I have developed a love for irrigation work. Ever since taking over the position at Victoria, there has always been an area lacking in completeness within the position; irrigation mapping. In previous years there has been an irrigation technician that has “grown with the course” and can “remember anything”. In some cases and when luck is on your side, statements such as these might be true. But as the current irrigation technician, when it comes to the case of keeping both golfers and staff members dry when attempting to douse hot spots on a fairway, tee box, or green, a lucky guess is less than optimal. However, using tactics I

discovered at Olds College, I know there is definitely a better and more efficient way of tackling these areas and taking the guesswork out of irrigation.

While in school I knew creating irrigation maps for the golf course was something I wanted to pursue while completing my Directed Field Study (DFS). While these maps might not be used by everyone, a full scale irrigation mapping system of the property had to be created. Establishing both digital and hard copies, these maps will prove to provide both accuracy, efficiency, as well become a contributing factor to the environmental sustainability of the property. It's no secret, ask anyone that works on the



property, the irrigation system at Victoria is old, thirty plus years old. Spanning 27 unique controllers in a surprising 16 different locations across the property, there lies a combination of old analogue pin clocks and new digital residential style controllers that work to run over 540 sprinkler heads. In previous years, knowledge of these 27 different controllers was passed down from each irrigation technician to its successor. The time has come to change that. As global warming affects the global climate, the need for an efficiently operated irrigation system is desperately needed.

The objective of this Directed Field Study was to create an accurate set of irrigation station maps that are able to be updated as changes are made. Additionally to establish a functioning database of current system components to be considered in future golf course projects and renovations.

The Project LINK:

[Career Portfolio DFS 1 - Establishing an Irrigation Database](#)

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Project Updates

Under this heading you will find details pertinent to the completion of this goal. This section will effectively work as a type of blog used in the completion of the first directed field study goal:

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Update 1 - Opening Remarks and GIS Cloud Software

As this project gets underway, there are a couple parameters that must be set at the commencement of this field study. Doing so will ensure continuity amongst all aspects in the sense that the data will be collected in the desired format. This step begins with determining which software will be used to track the multiple GPS locations as well as the desired attributes of each feature.

For the purposes of this test, accuracy for each feature is important, however without tens of thousands of dollars to spend on this project to really zero in on a GPS location, my phone's GPS accuracy of 3.2 meters will have to do. Using my phone as a GPS responder will allow for a mapping application called GIS Cloud to be used.

LINK: [GIS Cloud Software](#)

Now that the input method has been selected, it is time to establish the criteria of which will be collected. For the purposes of this assignment, I have created four features that will be noted, along with their respective features. Each of these features is described below, as well as a link to their respective Google Doc.

LINK: [Sprinkler Heads](#)

LINK: [Irrigation Isolation Valves](#)

LINK: [Irrigation Controllers](#)

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After these attributes are created, they are then transferred into the GIS Cloud Software, and are uploaded into the app on my phone, and the data collection process can begin. I plan to be plotting GPS locations for the next two to three weeks as the project continues.

Update 2 - Data Collection

As data collection continued, I realized I forgot to include an important part of the irrigation system. This being the quick coupler valve locations! An attribute document has been created for these forgotten items, and project wide data collection is ongoing and still on pace to finish around the middle of June.

LINK: [Quick Couplers](#)

Update 3 - Data Collection Continues

Data collection continues for this project, approximately 45% of the golf course's irrigation features have been logged into the GIS Cloud app. This is a large portion of this Directed Field Study, and with the busyness of the golf course season, this may still take some time.

Update 4 - Data Collection Completed

Data collection is complete, and the project has moved on to the next step. This entails creating a Google My Map of all components as well as compiling all collected data into a easy to use database. Once this stage is complete, the project will move into its final stage; creating detailed station maps for all sprinkler head zones on the property.

Update 5 - Google MyMaps Integration

With the completion of the field data collection through the use of the GIS Cloud software, the next step is to integrate this information with google. Originally I had thought irrigation maps should be printed and either used in a binder or in the satellite boxes. However, with the

industry moving to a more technology based direction, the integration within the Google environment will prove valuable for multiple years to come, as digitally based databases are an easy way to remain up to date with improvements and changes throughout the season, and from year to year.

When integrating with Google MyMaps, it is fairly simple, all that needs to occur is downloading the CSV file from the GIS Cloud program and uploading it into the Google MyMaps platform. From there, changes can be made to increase accuracy of the positioning points where required. Additionally, piping diagrams can be drawn in along with other desirable features.

However, when using this program I have discovered a major drawback. Originally I was going to plot the sprinkler heads on a hole by hole basis, but within the MyMaps program, you are only able to have a certain number of layers overlaid on the map. So unfortunately I will be lumping all of the sprinkler heads into their own layer, along with additional layers created for the pipe, isolation valves, quick couplers, and controllers.

LINK: [Google MyMaps](#)

Update 6 - Sprinkler Head Database on Google Sheets

Creating a database for your irrigation system is almost as important as mapping out the various components. A database with effective information and formatting can help give perspective to the state of the irrigation system. By adding charts to the database you can see the approximate age of the sprinkler heads within the system and predict when major maintenance work or replacement will be required.

For this section of the directed field study, I decided to keep it clean and simple to use. Pulling the GPS data from Google Sheets, I am able to manipulate the data on Google Sheets to be able to do a couple of different things. The first being a sprinkler head count detailing the numbers of each sprinkler head make and model. Knowing these numbers will help to plan for future budgets when attempting to overhaul a system while not changing the pipes. Using my golf course as an example, we are making the switch to Toro 855 Infinity series sprinkler heads

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as they are more effective for our properties needs. By using potable water debris flowing through the system is not an issue. By talking to various suppliers and other golf courses in the area, many golf courses decide to go with RainBird sprinkler heads to handle debris issues. By creating an effective database I was able to determine we have replaced approximately half of the systems sprinkler heads.

Another useful factor the database can be used for is a guideline for station maps. Being able to sort by hole number and receive an output of the sprinkler heads within that location will be helpful, especially when training more people on the irrigation system. However I have found that this data pull can be somewhat unreliable on the Google platform. I imagine as their products develop further, these abilities will improve.

By developing this database, planning for the future will be easier as well as help to save costs on future training when an additional or replacement irrigation technician is needed. Keeping this database up to date will be quite easy and explained in section nine below. A portion of this database can be seen in the picture below. To receive a more detailed view this database please use the link below.

LINK: [Victoria Golf Course Sprinkler Head Database](#)

Update 7 - Integrate with DFS 3, Golf Course Mapping

Integrating with DFS #3, which is the Digital Mapping of Victoria Golf Course, detailed irrigation maps will be able to be constructed. Ideally one map for each controller will be completed with outlines of each station's function, how many sprinkler heads each station operates, and where the isolation valves are located for each hole. These will be the first maps of their kind created for Victoria Golf Course since the golf course was established over 100 years ago.

To update the database, the irrigation technician can go into the Google MyMaps program and make any changes as they happen on the fly. This can be done from both a computer as well as a mobile device, making changes easy to keep track of as sprinkler heads are replaced.

Update 8 - Creation of Sprinkler Head Zone Maps for All Holes

Creating sprinkler head zone maps is a major portion of this DFS, therefore I spent a lot of time thinking about what each of these maps should contain. Obviously showing the sprinkler heads as well as their locations was the most important part, however I did add in the controller locations as well. By adding both of these aspects to these maps, they should be as easy as possible to understand and use.

Included below is a list of features included in each map:

- Tee, fairway, and green outlines
- Sprinkler head locations with station labels color coded in pairs.
- Controller location and unique symbology

Each map has since been printed and posted inside each controller box for use in the field.

The PDF files for each controller are located below:

[Controllers 1-9](#)

[Controllers 10-19](#)

[Controllers 20-27](#)

Update 9 - Creation of Isolation Maps for All Holes

Similar to the sprinkler head zone maps, I went ahead and created additional maps displaying where each isolation valve is for each hole on the property. These maps will aid in times when the irrigation technician or superintendent are away from the golf course and there is a break somewhere on the golf course. It would have been nice to include piping diagrams to these isolation valve maps, however because no accurate map exists, this was not possible.

Included below is a list of features included in each map:

- Tee, fairway, and green outlines

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- Isolation valve locations highlighted with unique symbology
- Broken down into hole by hole locations for ease of use

The isolation valve maps have been printed and are posted in an irrigation binder for use in the case of an emergency.

The PDF files for each hole's isolation valves are located below:

[Isolation Valves Holes 1-9](#)

[Isolation Valves Holes 10-18](#)

[Isolation Valves \(Other Areas\)](#)

Gained Knowledge:

While most of the knowledge I gained from this field study wasn't necessarily scholastic, there was a tremendous impact on my physical knowledge of the golf course. Going into this field study, I thought there was just over 430 sprinkler heads. As it turns out, there are nearly 100 more than I had thought, even after three years of being the irrigation technician at Victoria.

Another influential learning experience taken from this directed field study was discovering the overall direction the industry (within a municipality) is moving. We live in a digital age, and when I first brought the idea of establishing an irrigation database to them, the superintendent as well as the assistant both said they would absolutely be blown away if an online database could be created that had the ability to update in real time as new changes or renovations occurred. This was interesting to me because both managers at the property are beginning to make the shift towards the new “digitally focused” industry standard.

Changes in Professionalism:

In a moment of self reflection I have begun to change my overall mentality towards the irrigation technician position at Victoria or any other golf course I may find myself working at in the future. I used to think that holding knowledge of irrigation stations was a good way to make sure I kept my job, a form of “job security” so to speak. However, restricting this knowledge from others has become pointless. I strongly believe that what makes a great superintendent is his

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ability to trust others to do the right thing when it is appropriate to do so. All trusted and long serving staff members have the same common goal; to make the golf course the best place it can be with the resources available to them. Holding back use of the irrigation system from the rest of the employees is detrimental to the success of that common goal.

Initially, when creating this field study idea in school, the project was originally meant to only help me be a better irrigation technician. However while completing the assignment, it has morphed into something more than just creating station maps and an irrigation database. It has evolved into an incredibly useful tool that will undoubtedly contribute to the future success of the golf course with or without me as the irrigation technician. When I think about what I want my legacy at the property to be, I don't want to be remembered for the sprinkler heads I replaced. I want to be remembered by the tools I helped create, effectively allowing future staff to stay true to creating the best possible playing conditions the golf course is capable of producing.