

To: Okanagan Basin Water Board
From: Don Degen, Utility Services Manager
RE: 2011 Grant Progress Report
Date: March 9, 2012

Organization Background: The City of Kelowna Water Utility is one of five water suppliers operating within municipal boundaries. The City serves over 50,000 residential customers and over 1,700 industrial, commercial and institutional properties in north, central and south Kelowna. The raw water source is Okanagan Lake.

Project Description: As part of its Water Sustainability Action Plan, established in 2007, Kelowna City Council directed staff to reduce overall water consumption by 15% by the year 2012, over and above the 20% reduction already achieved since 1998. Reducing outdoor irrigation is an integral part of the Water Sustainability Action Plan.

Over the past several years the Water Utility has undertaken a number of projects designed to help reduce water consumption in Municipal Parks and Green Spaces. We are grateful to the Okanagan Basin Water Board for their assistance in funding many of these projects (Compost tea, drought tolerant grass, landscape and irrigation standards, and irrigation system assessments).

This year's project is a culmination of these prior projects into a single document – a Best Practices Manual for Irrigation in Municipal Parks and Green Spaces. Several small but related projects will be completed in 2011 before we can write the manual. This includes completing the Landscape and Irrigation Standards documents and process, along with completion of metering, data collection, and irrigation assessments of city parks.

Present Achievements:

- 1) Landscape and Irrigation Standards documents and process complete. New bylaw endorsed by Kelowna City Council in April 2011.
- 2) Meter installations complete at all parks with service lines of 1.5 inches or larger.
- 3) Data collection and analysis using Omni Systems has begun.
- 4) Irrigation Assessments complete
- 5) Begin installation of flow sensors in all parks
- 6) Final draft of "Water Conservation Manual for Municipal Parks and Green Spaces" complete
- 7) Electronic copy provided to Okanagan Basin Water Board







Timeline of Remainder of Project: Complete

Obstacles Encountered: None

Feedback on Application Process: None

Attached Information: None

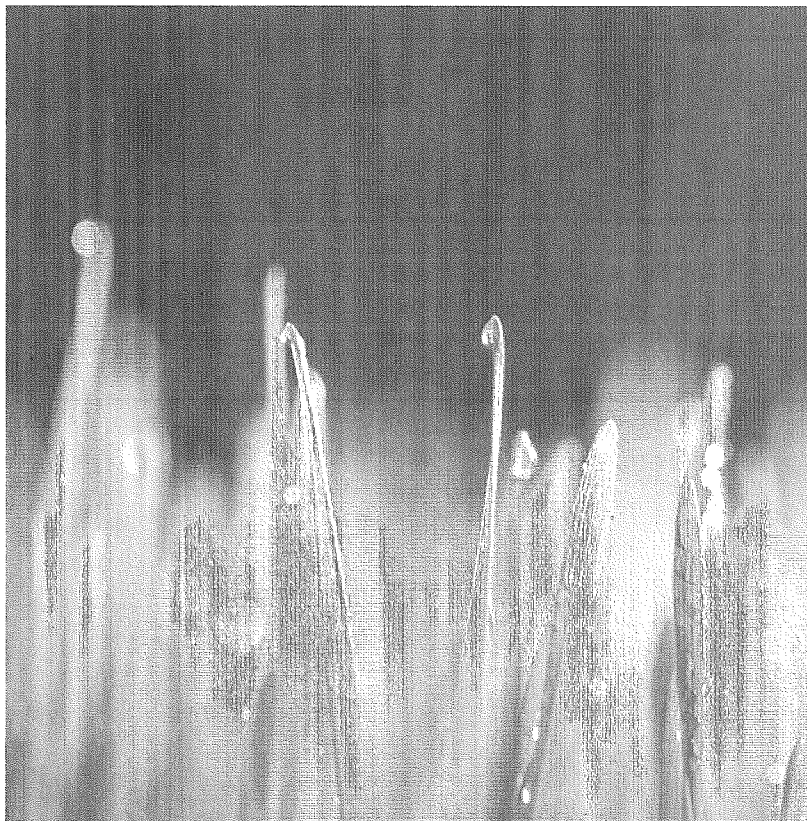
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SECTION ONE

City of Kelowna

Irrigation Efficiency Program



City of Kelowna Irrigation Efficiency Program Overview

The City of Kelowna is fortunate to have the climate and location to support extensive green spaces. With tourism as a major economic driver, and a commitment to being an active community, the value of these green spaces cannot be overstated and irrigation plays an integral role in their success.

Large scale irrigation initiatives such as the installation of irrigation central control systems and the initiation of irrigation specifications began over a decade ago. While there have been some good tools available to increase irrigation water use efficiency, bringing those tools into force has presented challenges over the years. To begin on a path of consolidating efforts and documenting inroads and successes, the city partnered with Waterkind Consulting Services Ltd. to develop an Irrigation Efficiency Program.

The Irrigation Efficiency Program (IEP) began in 2010 with the initial and “simple” objective of fully utilizing the capabilities of the central control systems. Those central control capabilities being:

- i) Flow Monitoring: monitoring and managing irrigation water flows for potential reductions and to ensure sites have components in place for auto shut off in emergency situations;
- ii) Real time communication infrastructure: reduce travel, investigative and programming time;
- iii) Evapotranspiration (ET) or weather based irrigation: irrigate to maximum efficiency utilizing existing and additional weather stations.

The process began with the investigation of existing irrigation sites to clarify information as to the flow monitoring and other capabilities at each site. During this investigative phase involving considerable site time, it was also determined that many new projects were being undertaken without clear communication or inspection protocols. This was resulting in subpar irrigation systems including incorrect flow sensing installations. As a result of this discovery, the IEP was expanded during the first year to include new design and new installation inspections, as well as site personnel training. Over the course of the following year, several other elements were added making the City of Kelowna IEP a robust and well rounded program.

City of Kelowna Irrigation Efficiency Program now includes:

1. Irrigation Specifications (see Appendix)
2. Training of parks irrigation personnel
3. Creation of an irrigation site database
4. GPS Mapping of active irrigation sites
5. Design reviews
6. New installation inspections leading to correction of deficiencies prior to system transfer
7. Asset listing for the irrigation network
8. GPS as-built for Waterfront Park
9. Certified Landscape Irrigation Audits
10. Initiation of the Point of Connection (POC) / Pedestal Upgrade Program

It is important to note that the Irrigation Efficiency Program includes components that are logically phased in as well as elements that are ongoing and are completed in conjunction with other phases.

The following sections provide more detail and insight into the IEP components to date.

SECTION TWO

Irrigation Training Programs

City of Kelowna in-house

General training programs

Product related training



The Value of Irrigation Training Programs

The definition of irrigation efficiency is the combination of irrigation system performance in conjunction with the quality of system management. If the personnel maintaining sites do not have adequate training and experience, it is unlikely that the site will be at its optimal efficiency. The City of Kelowna recognized this and has invested in various training formats including customized in-house sessions offered in 2010 and 2011.

Studies conducted by the Alliance for Water Efficiency determined that water wasted by misaligned heads alone is 5% of the volume of each irrigation event. For the City of Kelowna this means that if trained personnel were to use their knowledge and motivation to correct this issue alone, as much as 13M gallons of water could be saved each season.



Customized Training Programs

As with many organizations, green space management involves individuals with varying backgrounds and mandates. Determining the appropriate form and content for this variety can be very challenging. Several round table discussions were held with key parks department personnel as well as members of the Waterkind team and through these meetings, training session outlines and specifics were established. The collaborative efforts resulted in not only a stronger program, but more buy-in from participants.

The Irrigation Fundamentals and Irrigation Water Conservation sessions were attended by all selected parks maintenance personnel, while the Large Irrigation Systems session included only participants whose roles were specifically irrigation system maintenance.

Format:

Research has shown that the average adult can listen and retain information for approximately twenty minutes at a time. Therefore training in shorter sessions over a period of one to several weeks can be more effective than covering everything in one or two full day sessions. The City of Kelowna sessions have averaged three and a half hours in duration including two short breaks and have a focus on being highly interactive. Observations and feedback from participants indicates that this format is successful for not only maintaining the interest of participants, but also from the follow up aspect that occurs when participants reconvene after a week or two. Every session began with a review from the previous session(s) and ended with discussion around what was covered. Question and answer opportunities were incorporated as well as the opportunity to ask questions and gain clarification one on one. Many adult learners are intimidated by the presence of a group of their peers and may not volunteer questions even when they do not understand. As much as possible, more experienced irrigation personnel were “paired up” with those less experienced giving them a resource to ask questions quietly if they so chose. This is not always effective however and speaking with participants individually to see how they are progressing is the best path to training success.

Content:

The training sessions began with irrigation fundamentals and graduated to more advanced topics. All sessions incorporated Sustainable Irrigation Practices – tips on how to get the most of the water used for irrigation.

Irrigation Fundamentals

Topics to include

- Understanding a system layout; what you see and what you don't
- Small system product components (up to 25mm or 1")
 - Spray heads and nozzles
 - Rotary sprinklers and nozzles
 - Swing joints
- Manual valves
- Check valves and other low cost, high value product features

Irrigation Water Conservation; improving irrigation system performance and using less water.

Topics to include

- Water wasted through common system deficiencies
- Understanding and implementing precipitation rates
- Understanding distribution uniformity
- System hydraulics; safe flows / velocities and pressures
- Micro irrigation; understanding the products and appropriate applications
- Filters; understanding and maintaining

Large Irrigation Systems (sports fields)

Topics to include

- Large system product components (38mm / 1.5" to 50mm / 2")
- Commercial rotors; installation and maintenance
- Golf style rotors; installation and maintenance
- Electric and hydraulic valves; installation, maintenance, pressure regulation
- Water hammer; causes and prevention
- Thrust blocks
- Syringe cycles
- System winterization and startup

General Irrigation Training Programs; Irrigation Industry Association of British Columbia (IIABC)

Established in 1979, the IIABC has continuously worked with its members to establish industry best practice guidelines as well as training courses and material for British Columbia. The following is a general outline of the certification training programs offered through the IIABC, as described on their website.

Certified Irrigation Technician (CIT)

This certification is for irrigation installers and irrigation maintenance workers. One year field experience or more is *recommended* prior to writing the CIT - Level 1 exam. Level one must be completed before advancing to CIT- Level 2 Landscape or CIT-Level 2 Agriculture. Completion of the course and passing the exam are both required to be certified.

- CIT - Level 1 Certification requires taking a 1 day IIABC course and passing the exam.
- CIT - Level 2 Landscape Certification requires taking the 2 day IIABC course and passing the exam.
- CIT - Level 2 Agriculture Certification requires taking the 2 day IIABC course and passing the exam.

Certified Irrigation Scheduler (CIS)

- CIS Certification requires taking a 2 day IIABC course and passing the exam.

The IIABC offers a Certified Irrigation Scheduler Certification to learn to use the best tools, technology and knowledge to produce a watering schedule in the simplest, most efficient, and cost effective manner to the benefit of the customer and/ or end user.

Learn skills to evaluate a system's problems, determine how uniformity affects irrigation scheduling, perform a proper catch can test, calculate Precipitation Rate. Students learn to create a simplified irrigation schedule and correctly use the IIABC's online scheduling calculator to create a schedule.

Certified Irrigation Designer (CID)

The Certified Irrigation Designer (CID) Program is available to IIABC members and requires that a person passes the CID exam of the specialty he or she applies for. A minimum one (1) year of irrigation design experience is required to be eligible to write a CID exam.

The objective of the program is to establish design standards and criteria throughout the industry and to promote individuals who have achieved a level of competence. A certified designer must pass a rigorous IIABC written examination.

Once certified, the irrigation designer is expected to subscribe to a code of ethics which includes promoting water, soil and energy conservation practices through the development of cost effective and efficient irrigation system designs. A CID will endeavor to design plans for clients that are cost effective, efficient and designed according to the standards and guidelines put forth by the IIABC.

Through this program the IIABC accredits that a successful applicant has achieved a high level of knowledge and expertise regarding irrigation system design and operation. Certified designers, following the code of ethics and design standards, are responsible for their own workmanship to ensure program integrity is maintained.

Certified Irrigation Contractor (CIC)

Certified Irrigation Contractor (CIC) status is available to IIABC member companies upon obtaining the credentials established by the IIABC. Certification is determined in two designations: Turf-Residential and Turf-Commercial.

To contact the IIABC or for more information, visit their website at www.irrigationbc.com

General Irrigation Training Programs; Irrigation Association (IA)

The Irrigation Association is based out of the United States but is affiliated with organizations across North America, as well as in Europe, Australia and China.

The IA website states that the association serves its members and the irrigation industry by:

- Educating the public on sound practices and water management.
- Serving as a centralized clearing house for research and innovation.
- Improving industry proficiency through continuing education.
- Recognizing and promoting experience and excellence with professional certification.
- Lending expertise to water-use public policy at the local, state, regional and national level.

Together with experts and stakeholders from industry, academia and the public sector, IA works to:

- Define best practices for effective water management.
- Establish benchmarks and guidelines for irrigation products and applications.
- Promote efficient irrigation technology and practices.
- Advocate sound policies to ensure the availability, quality and conservation of water supplies.

The Irrigation Association currently offers a number of certification programs for professionals specializing in agriculture, turf/landscape and golf irrigation.

- Certified irrigation contractors install, maintain and repair irrigation systems.
- Certified irrigation designers establish specifications and design drawings for irrigation projects. IA certifies irrigation designers in six specialties. Landscape/turf specialties include commercial, golf course and residential irrigation; agriculture specialties include sprinkler, surface and drip-micro irrigation.
- Certified landscape irrigation auditors gather irrigation water-use data and test landscape irrigation systems.
- Certified golf irrigation auditors gather irrigation water-use data and test golf irrigation systems.
- Certified landscape water managers evaluate, operate, manage and improve landscape irrigation systems to achieve the highest level of water conservation possible.
- Certified agricultural irrigation specialists manage and operate on-farm irrigation systems.
- Certified agriculture water managers evaluate, operate, manage and improve agriculture irrigation systems to achieve the highest level of water conservation possible.

To contact the IA or for more information, visit their website at www.irrigation.org.

Product related training opportunities

In addition to in-house customized training sessions and courses offered through irrigation associations, most major irrigation manufacturers and some irrigation distributors offer product or brand specific training opportunities. These information sessions can provide more in depth training for specific products being utilized by an organization. They are often provided at little or no charge to the participants which is helpful when faced with limited training budgets. However they should not be seen as a substitute for other less biased educational courses.

Examples of manufacturer sponsored training opportunities include:

Hunter Industries online training

<http://training.hunterindustries.com/>

Rain Bird Academy

<http://www.rainbirdservicescorporation.com/training/index.htm>

Toro Service Training Centre

<http://www.toro.com/en-us/customer-support/Pages/educational-technical-references/service-training-guides/factory-service-schools.aspx>

Netafim University

<http://www.netafimusa.com/education>

Viking Pump online training

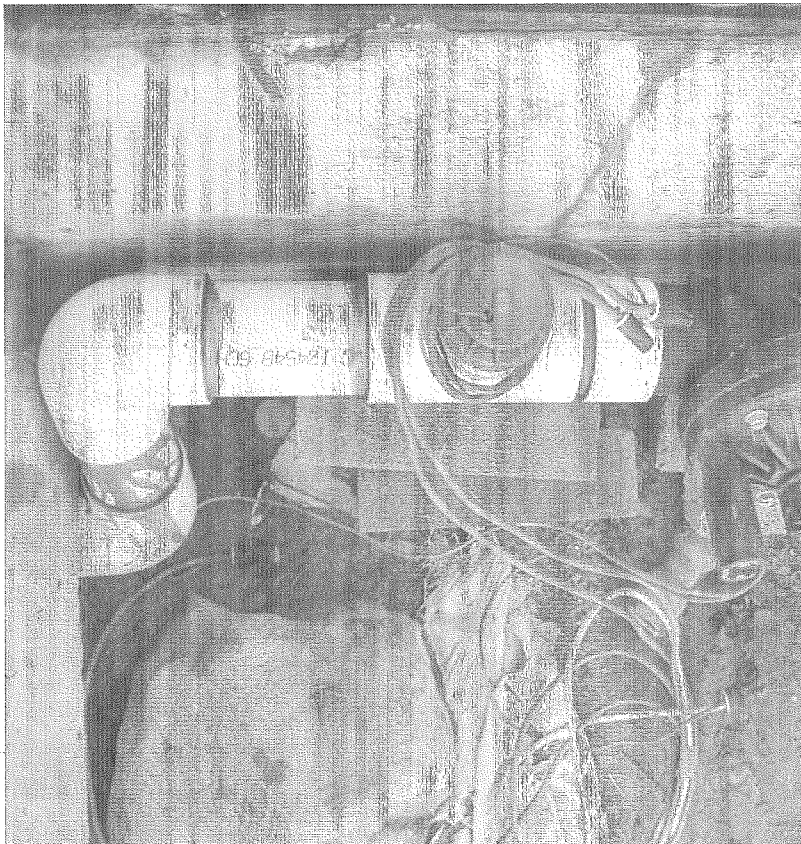
<http://www.pumpschool.com/>

SECTION THREE

City of Kelowna

Irrigation Site Database

And Mapping



Irrigation Site Database and Mapping

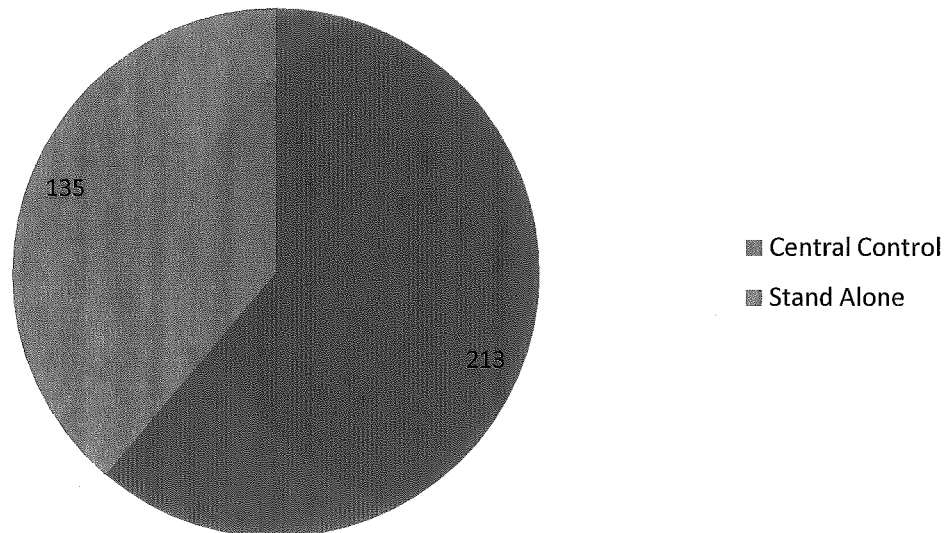
A comprehensive database of irrigation sites operated by the City of Kelowna was created through the implementation of standardized assessment forms. These forms were completed during site visits conducted in six phases of the database creation. Phases 1 through 5 were part of the Central Control Field Assessment (CCFA) program and as such, provide insight into central control irrigation network sites. Phase 6 was the assessment of irrigation sites listed as Stand Alone.

The field assessment data included in the database facilitates decision making to streamline operations and improve irrigation system maintenance and improvements. The database is the main resource when making decisions necessary for:

- Prioritization of projects related to irrigation efficiency and reduced water use
- Point of connection renovations
- Addressing safety concerns; electrical, cross connection, mechanical, master valves
- Expansion of the central control system
- Upgrading and standardizing stand alone controllers
- Decommissioning of appropriate sites

The following provides some visual examples of the type of data easily extracted from the database once completed.

Figure 1: # of Sites by Control System, March 2011



Data Application Examples: This type of data is useful for understanding the level of site control currently available as well as for determining appropriate budgets for upgrading sites to central control.

Table 1: Sites Details by Control System Style, March 2011

	CENTRAL CONTROL		STAND ALONE		TOTALS	
	#	%	#	%	#	%
# of Controllers	213	-	126	-	339	-
# of POCs	198	-	132	-	330	-
# of Zones	2769	-	419	-	3,188	-
# of POCs w/ Flow Sensors	62	74%	n/a	-	62	31%††
# of POCs Recording Flow†	13	16%	n/a	-	13	7%††
# of POCs w/ Master Valve ‡	111	56%	3	2%	114	35%
# of POCs w/ Water Meter*	120	61%	28	21%	148	45%

†: Sites recording flow as per City personnel

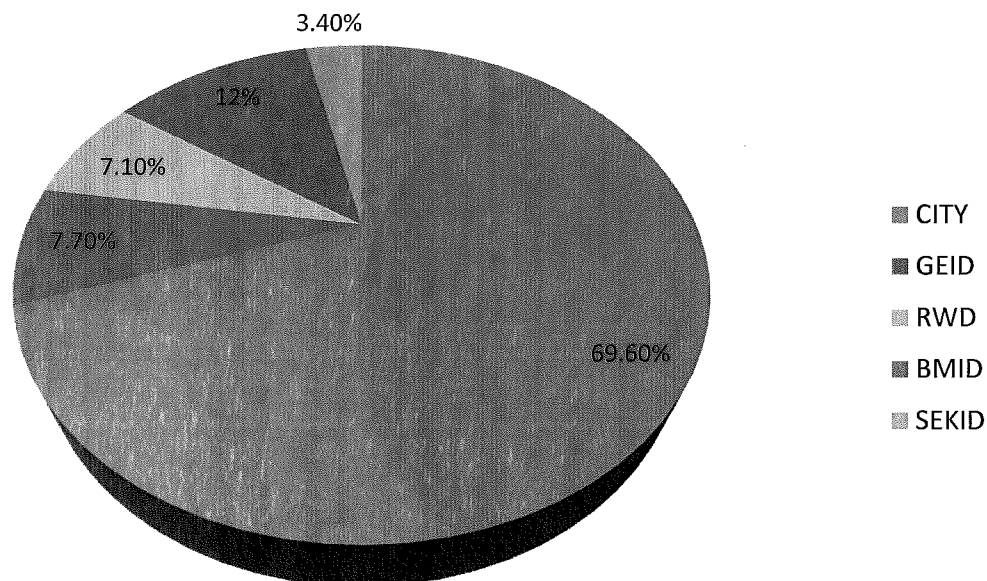
††: Does not include Stand Alone POCs for calculating percentages. Current Stand Alone controllers do not have flow sensing capability.

‡: Master Valves documented not tested.

*: Includes water meters that were visually confirmed.

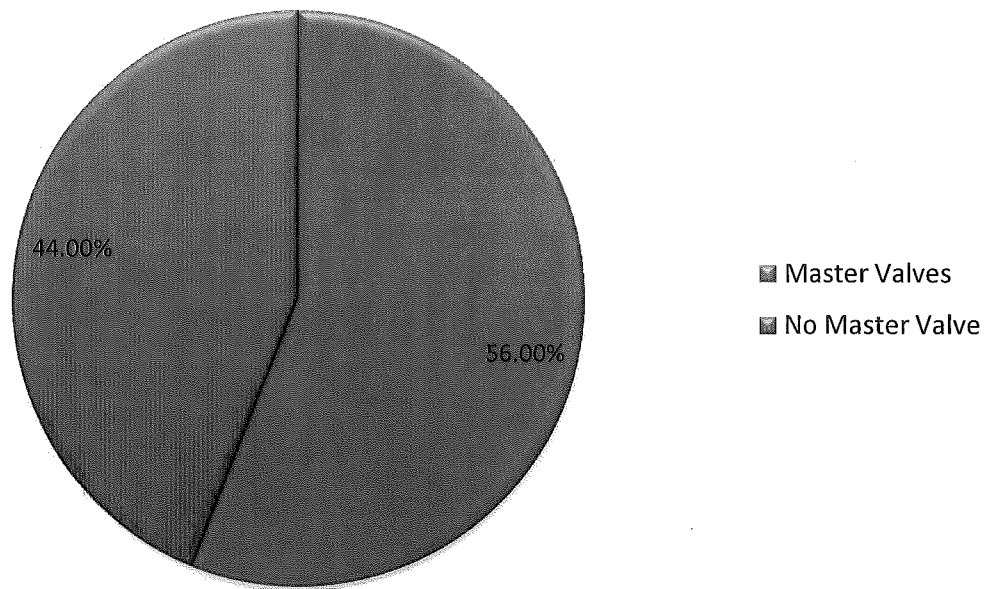
Data Application Examples: This type of data is useful for determining the irrigation system network asset value as well as for determining budgets for Point of Connection renovations.

Figure 2: % of Active Irrigation Systems by Water Purveyor, March 2011



Data Application Examples: This type of data is useful for multi purveyor discussions around irrigation water use and improvements.

Figure 2-5: Central Control Sites; those with master valves and those without master valves, March 2011



Data Application Examples: This type of data is useful to understand the current situation with respect to irrigation system water use monitoring and fail safe equipment.

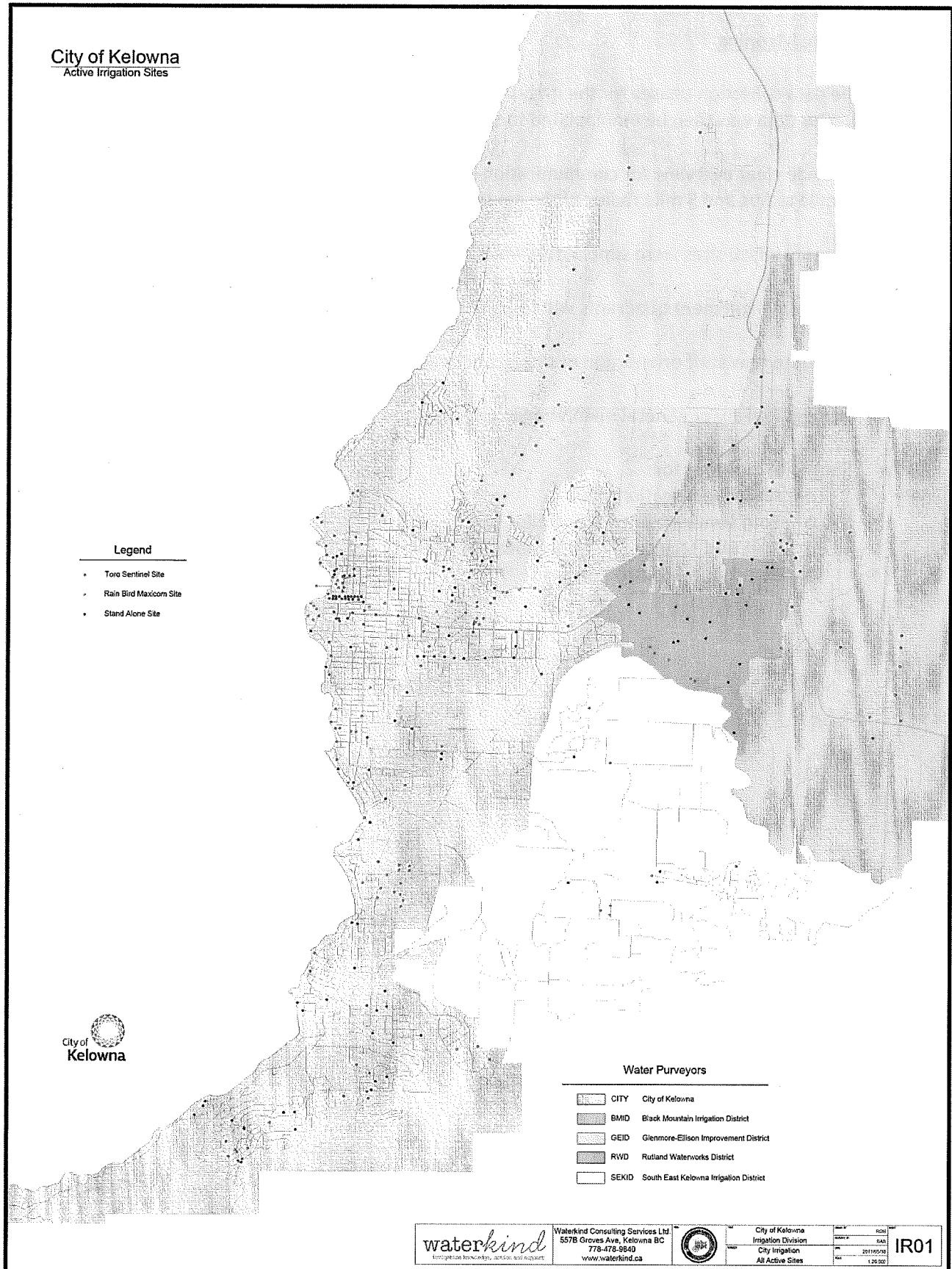
Irrigation Site Mapping

Irrigation Site Mapping

During the data collection phases for the irrigation site database, active irrigation sites were also GPS mapped. This data was then be manipulated to serve various purposes including:

- Provide clear overview for communication infrastructure analysis; easy to identify those sites within 3 mile radius and 5 mile radius of the central computer(s)
- Identify which sites were supplied by which water purveyor
- Create management quadrants with accurate site locations for irrigation specific personnel
- Facilitate new staff orientation of site locations
- Highlight safety or general maintenance priorities
- Show site locations for:
 - All active irrigation sites
 - Toro Sentinel central controller sites
 - Rain Bird Maxicom central controller sites
 - Stand alone controller sites

Sample Site Map

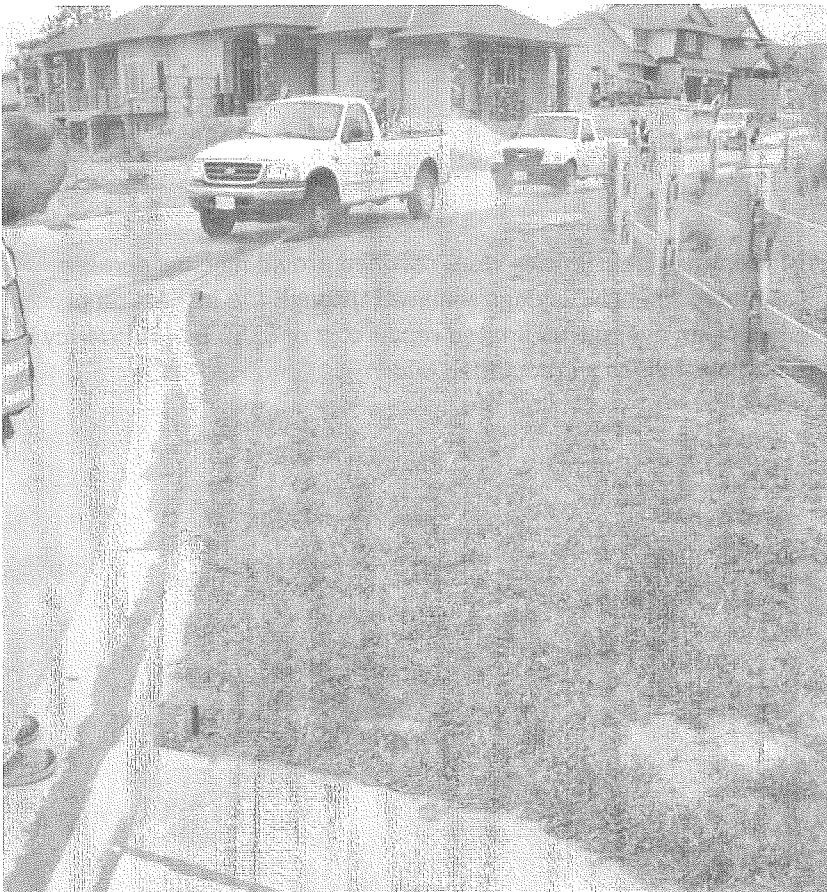


SECTION FOUR

Irrigation System Design Review

and

Irrigation System Installation Inspections



Irrigation System Design Review

The first opportunity to catch irrigation system deficiencies is at the design review stage of the process. Where irrigation specifications exist, new irrigation designs must be reviewed to determine if the design has been created in accordance with those specifications. Where an irrigation design and/or design details vary from or contradict irrigation specifications, the irrigation design information has traditionally taken precedence. Therefore if deficiencies are not caught at this stage of the process and the design is approved, it can prove very difficult to determine accountability for a subpar irrigation system once it is installed.

Information from the new installation inspection process has shown that as much as 20% of new irrigation system deficiencies that are found in the field could be isolated and rectified at the design stage if there is an effective process in place. The City of Kelowna has estimated that through stronger design review protocols, over \$80,000 could be saved in over a two year period as a result of a reduction in repairs to irrigation systems due to *approved deficiencies*. As well as the savings in repair investments, there would also be reduced irrigation water waste and a significant decrease in the chances of a large system failure.

New Irrigation System Installation Inspections


Standardized field inspection sheets were created to apply the irrigation specifications to the irrigation installations. A sample of an inspection report is included in this section. The most common deficiencies identified during the inspections included:

- Incorrect flow sensor installation
- Incorrect supports in vaults
- Substitutions without approval
- Stretched spacing; all product types
- Non-specified wire connectors
- Areas missing irrigation
- Valve boxes not to grade / not lockable
- Incorrect pipe bury depths
- Non specified products

Follow up inspections showed over 70% of identified deficiencies were rectified providing considerable financial and water savings for the city. Estimated financial savings achieved through the inspection process is \$200,000. This amount was determined using an average estimated repair cost of \$750 per deficiency if the city had to make the repairs after site responsibilities were handed over.

Sample Irrigation Design Review Checklist

Sample Design Review Checklist

Point of Connection	Meets Specs?	Comments	Control System and Details	Meets Specs?	Comments
PSI verified	Yes No		Controller	Yes No	
Flow verified	Yes No		Location	Yes No	
Size	Yes No		Power Source	Yes No	
Type of Pipe	Yes No		Grounding	Yes No	
PSI loss	Yes No		Sensors	Yes No	
POC Components					
Backflow	Yes No		PRV	Yes No	
Blow out	Yes No		Vault	Yes No	
Master Valve	Yes No		Piping	Yes No	
Flow Sensor	Yes No		Supports	Yes No	
Mainline	Yes No		Laterals	Yes No	
Type	Yes No		Type	Yes No	
Correct sizing	Yes No		Correct sizing	Yes No	
Sizing indicated	Yes No		Sizing indicated	Yes No	
Depth of cover	Yes No		Depth of cover	Yes No	
Thrust blocks?	Yes No		Thrust blocks?	Yes No	
Sleeving	Yes No			Yes No	
For pipe	Yes No		Valves – Manual	Yes No	
For wire	Yes No		Correct sizing	Yes No	
	Yes No			Yes No	
Sprinklers	Yes No		Valves – Electric	Yes No	
Rotors	Yes No		Correct sizing	Yes No	
Spray heads	Yes No			Yes No	
Inline micro	Yes No		Valves – Other	Yes No	
Individual micro	Yes No		Correct sizing	Yes No	
Hydraulic Analysis					
Mainline	Yes No		Valves psi loss	Yes No	
Laterals	Yes No		Elevation losses	Yes No	
Designer Info	Yes No		Detail sheets	Yes No	
Legend	Yes No		Heads and SJ's	Yes No	
North arrow	Yes No		Valves/boxes	Yes No	
Scale	Yes No		City Details	Yes No	
Schedule	Yes No		Water Meter	Yes No	
Date and Name	Yes No		Other	Yes No	
CID stamp	Yes No				
Design Status	Yes No				
Other					

Reviewed by: _____

SAMPLE

Site

Station

Assessments

Station 1

Recommendations and observations

1. Match product, nozzles and precipitation rate (PR):
Spacing is 39'-41' all along McCulloch Road (except for the 2 sprinklers near the pedestal – see point 3). One product and nozzle could be utilized for the entire zone.
2. Lower pressure for the zone:
Pressure exceeds manufacturers' pressure ratings
Radius of throw from 40' to 49' across spectrum of product at the highest pressure
Precipitation rates vary from .12" / hour (S700 low angle 1.5gpm nozzle) to .6"/hour (1-25 with 7gpm nozzle)
Uneven application of water occurs and likely results in overwatering where higher precipitation rates exist to compensate for the lower precipitation rates. Excessive misting present.
3. Adjust arcs and/or turn off/remove sprinkler:
Two heads near power pole and controller are within 5' of one another, both running 180 degrees and dumping water as they both spray the large pole 2-3' in front of them. Controller at risk if the pedestal is open while zone is operating. Two other heads currently spray the road considerably and should be adjusted.
4. Level heads
Whether fixing existing product or installing new product, ensure that the heads are level for optimum performance. There are two in particular east of the controller with extreme angles. One of those sprinklers loses 20' of throw distance and shoots 25' flat to the east and 25' to the west because of the height of the spray (rather than the 45' achieved by similar sprinklers).

Product within the zone

1 ea Hunter I-25 with orange 7gpm nozzle

- whistles from high pressure (100+ psi), waters the road (near intersection stop sign)
- rated for 40 – 70psi

1 ea Toro S800

11 ea Toro S700 with mix of black 3gpm nozzle, green 6gpm nozzle, blue 4.5gpm nozzle, low angle orange 1.5gpm nozzle

- S700 at eastern corner is plugged and not turning
- rated for 25 – 60psi

1 ea Rain Bird 5000+ blue 3gpm nozzle

1 ea Rain Bird 5000+ stainless steel blue 3gpm nozzle

2 ea Rain Bird 5000 blue 3gpm nozzle

- rated for 25 – 65psi

Pressure readings + / - 5psi

100+ to 82 psi, west to east

Approximate GPM required for this zone based on existing nozzle information:

66gpm

Station 2

Recommendations and observations

1. Lower pressure for the zone:
Pressure exceeds manufacturers' pressure ratings.
Uneven spray patterns result. Inconsistent delivery with few heavy droplets and too much misting.
2. Check diffuser / nozzle screw:
Appears to be utilized for many of the heads.

Product within the zone

18 ea Rain Bird 3500

- rated for 25 – 55psi

Pressure readings + / - 5psi

65psi to 76psi, north to south

Approximate GPM required for this zone based on existing nozzle information:

18gpm

Station 3

Recommendations and observations

1. Pressure is within manufacturers' ratings for all 3 models.
2. Match product and/or nozzles:
Distance of throw is similar across the product but precipitation rates should be better matched by changing products and /or nozzles.

Product within the zone

3ea Rain Bird 7005 with blue 18gpm nozzle

1 ea Rain Bird 7005 with beige 12gpm nozzle

- rated for 50 – 90psi
- at 70psi throw is 59' (beige) to 67' (blue) and .73"/hour to .83"/hour

3 ea Rain Bird Falcon with blue 18gpm nozzle (2 regular risers, one stainless steel)

- rated for 30 – 90psi
- at 70psi throw is 65' and .83"/hour

2 ea Rain Bird 8005 with green 14gpm nozzle (stainless steel risers)

- rated for 50 – 100 psi
- at 70psi throw is 63' and .74"/hour

Pressure readings + / - 5psi

78 to 62 psi, south to north

Approximate GPM required for this zone based on existing nozzle information:

134gpm

Station 4

Recommendations and observations

1. Lower pressure for the zone:
Pressure is at the maximum of manufacturers' pressure ratings.
Uneven spray patterns result. Inconsistent delivery with few heavy droplets and too much misting.
2. Level tilted sprinklers:
Throw significantly varies throughout the rotation due to the angle of the sprinkler.

Product within the zone

- 1 ea Rain Bird 7005 with blue 18gpm nozzle
- 1 ea Rain Bird 7005 with beige 12gpm nozzle
- rated for 50 – 90psi

Pressure readings + / - 5psi

92psi (blue), 88 psi (beige), south to north

Approximate GPM required for this zone based on existing nozzle information:

36gpm

Station 5

Recommendations and observations

1. Pressure is within manufacturers ratings for all 3 products.
2. Match product and/or nozzles:
Distance of throw varies from 55' to 75' and precipitation rates range from .75"/hour to .94"/hour for the product in this zone (per manufacturer's information).
3. Activate sprinkler currently turned off:
Once the products are more closely matched, where the I-35 is currently located and turned off inside the ball field, it could be re-activated as a full circle.
The sprinkler to the south and outside of the ball field would then be changed to a part circle. This would provide coverage of the same area but with less spray interference from the fence and trees and less damage to the trees. Note that zone 7 has a similar layout with the head outside the field doing part circle only.

Product within the zone

2 ea Rain Bird 7005 blue 18gpm nozzle

1 ea Rain Bird 7005 grey 10gpm nozzle

2 ea Rain Bird 7005 beige 12gpm nozzle

- at 80psi throw is 55' (beige) to 69' (blue) and .75"/hour to .85"/hour

1 ea Rain Bird 8005 yellow 22gpm nozzle

1 ea Rain Bird 8005 green 14gpm nozzle

- at 80 psi, throw is 75' and .93"/hour (yellow)
- at 80 psi, throw is 63' and .80"/hour (green)

1ea Hunter I-35 grey 15gpm nozzle – turned off

- at 80 psi, 58' and .94"/hour

Pressure readings + / - 5psi

86psi average

Approximate GPM required for this zone based on existing nozzle information:

121gpm

Station 6

Recommendations and observations

1. Control Pressure:
Pressure readings were at the maximum recommended pressure for this product and have a plus or minus 5psi accuracy level so the pressure could be just above recommended pressure. Ensure the product is not operating above recommended pressure.
2. Overall spacing and performance of the 4 sprinklers in this zone appeared to be adequate by visual inspection.

Product within the zone

- 2 ea Rain Bird 7005 with light green 14gpm nozzle – one regular and one stainless steel riser
- 1 ea Rain Bird 7005 with dark green 6gpm nozzle
- 1 ea Rain Bird 7005 with blue 18gpm nozzle
 - rated for 50 -90 psi

Pressure readings + / - 5psi

90psi average

Approximate GPM required for this zone based on existing nozzle information: 52gpm

Station 7

Recommendations and observations

1. Control Pressure:
Currently above manufacturer's maximum.
2. Match product and nozzles (and PR)
All are full circle sprinklers with similar spacing, making matching of product and nozzles easier.

Product within the zone

- 2 ea Rain Bird 7005 with blue 18gpm nozzle
- 1 ea Rain Bird 7005 with light green 14gpm nozzle
 - rated for 50-90psi

Pressure readings + / - 5psi

96 to 92psi, south to north or average

Approximate GPM required for this zone based on existing nozzle information: 50gpm

Station 8

Recommendations and observations

1. Match product and nozzles (and PR)

All are part circle sprinklers with similar spacing, making matching of product and nozzles easier.

Product within the zone

- 1 ea Rain Bird Falcon with blue 6gpm nozzle
- 1 ea Rain Bird Falcon with brown 16gpm nozzle
- 1 ea Rain Bird Falcon with green 8gpm nozzle
- rated for 30-90psi

- 1 ea Rain Bird 7005 with beige 12gpm nozzle
- rated for 50-90psi

- 1 ea Hunter I-35 with cream 9gpm nozzle
- rated for 40-100psi

Pressure readings + / - 5psi

64-58 psi, west to east

Approximate GPM required for this zone based on existing nozzle information: 51gpm

Station 9

Recommendations and observations

1. Match product and nozzles
Determine exact spacing and what product is most appropriate to create best possible matched precipitation rate for this zone.

Product within the zone

- 2 ea Rain Bird 7005 s/s riser with blue 18gpm nozzle
- 1 ea Rain Bird 7005 with beige 12gpm nozzle
- rated for 50-90psi

Pressure readings + / - 5psi

60-90 psi, south to north or average

Approximate GPM required for this zone based on existing nozzle information: 48gpm

Station 10

Recommendations and observations

1. Control pressure
Pressure readings are at the maximum of the manufacturer's recommendations.
2. Matching product and nozzles
There are 2 sprinklers in the field and 2 outside the playing field. The two inside the field area are both 7005 with blue nozzles.
The two outside the fence are different but have the same throw distances and precipitation rates not far off (.99" to .82"/hour).
3. Check the head nearest zone 13
Middle outfield there are two sprinklers 19' apart; one from zone 13 and the other from zone 10. At present, this is one of the sprinklers set for part circle and makes it more difficult to match product with some part and some full circle. It may be possible to select one of these two close heads to be shut off and allow the other to be full circle and match the rest of the zone. Alternatively, ensuring that if one of the heads remains as a part circle, the product and nozzle selected attempt to create a reasonable matched precipitation rate for the zone.

Product within the zone

1 ea Rain Bird 8005 s/s riser with green 14gpm nozzle

- rated for 50-100psi

1 ea Rain Bird Falcon s/s riser with blue 18gpm nozzle

- rated for 30-90psi

2 ea Rain Bird 7005 with blue 18gpm nozzle, 1 s/s riser, 1 regular

- rated for 50-90psi

Pressure readings + / - 5psi

92 psi average

Approximate GPM required for this zone based on existing nozzle information:

50gpm

Station 11

Recommendations and observations

1. Repair broken sprinkler
7005 closest to southern fence line inside the field has broken cap and spews water
2. Investigate one sprinkler
The head farthest north outside of field may be unnecessary.

Product within the zone

- 1 ea Rain Bird 7005 with brown 16gpm nozzle
- 1 ea Rain Bird 7005 with blue 18gpm nozzle
- 1 ea Rain Bird 7005 with beige 12gpm nozzle
 - rated to 50-90psi
- 1 ea Rain Bird Falcon s/s riser with blue 18gpm nozzle
 - rated to 30-90psi

Pressure readings + / - 5psi

Average 70psi

Approximate GPM required for this zone based on nozzle information: 64 gpm

Station 12

Recommendations and observations

1. Change sprinkler style
When this zone is run it immediately shows runoff down the bank. Whether the intention is to seed the area or just irrigate the trees, sprinklers with a lower precipitation rate and less powerful spray would serve the purpose much better. Pressure drop would likely be less significant as well as improving overall zone performance and uniformity.
2. Match product and nozzles
If the product is not going to be changed overall, choosing one head style and nozzle size to match the precipitation would assist in creating a more efficient schedule.

Product within the zone

- 3 ea Rain Bird 8005 with beige 14gpm nozzle
 - rated for 50-100psi
- 2 ea Rain Bird 7005 with dark blue 18gpm nozzle
- 1 ea Rain Bird 7005 with brown 16gpm nozzle
 - rated for 50-90psi

Pressure readings + / - 5psi

82 to 54psi, south to north

Approximate GPM required for this zone based on nozzle information: 94gpm

Station 13

Recommendations and observations

1. Change heads to be all full circle
Zone contains quarter, half, three quarter and full circle sprinklers.
2. Match product and nozzles as closely as possible
It appears that all sprinklers could be full circle, making it easier to match them.
3. Investigate low pressure
Pressure readings averaged 60psi which was the lowest average for all zones. The draw is not the highest in gpm and other zones also at the higher elevation are not this low.
4. Check the head nearest zone 10
Middle outfield there are two sprinklers 19' apart; one from zone 13 and the other from zone 10. At present, this is one of the sprinklers set for part circle and makes it more difficult to match product with some part and some full circle. It may be possible to select one of these two close heads to be shut off and allow the other to be full circle and match the rest of the zone. Alternatively, ensuring that if one of the heads remains as a part circle, the product and nozzle selected attempt to create a reasonable matched precipitation rate for the zone.

Product within the zone

1 ea Rain Bird 8005 with blue 18gpm nozzle

- rated for 50-100psi

1 ea Rain Bird Falcon with grey 10gpm nozzle

1 ea Rain Bird Falcon with beige 12gpm nozzle

- rated for 30-90psi

2 ea Rain Bird 7005 with blue 18gpm nozzle, 1 s/s riser

1 ea Rain Bird 7005 with brown 16gpm nozzle

- rated for 50-90psi

Pressure readings + / - 5psi

Average 60 psi

Approximate GPM required for this zone based on nozzle information:

74gpm

Station 14

Recommendations and observations

1. Spacing Uniformity
This zone has uniform spacing between all heads in the zone which is not the norm for this site.
2. Match product and nozzles (and PR)
All are part circle sprinklers with similar spacing, making matching of product and nozzles easier.
Currently ranges from 4gpm to 18gpm within the zone and large variations in distance of throw.

Product within the zone

- 1 ea Rain Bird Falcon s/s riser with black 4gpm nozzle
- 1 ea Rain Bird Falcon s/s riser with light green 14gpm nozzle
- 1 ea Rain Bird Falcon s/s riser with dark green 8gpm nozzle
 - rated for 30-90psi

- 1 ea Rain Bird 7005 with light blue 6gpm nozzle
- 1 ea Rain Bird 7005 with dark blue 18gpm nozzle
 - rated for 50-90psi

Pressure readings + / - 5psi

Average 90 psi.

Approximate GPM required for this zone based on nozzle information: 50gpm

Station 15

Recommendations and observations

1. Match product and nozzles as closely as possible for upper and lower backstop
Presently the nozzles range from 6gpm to 18gpm. The area being irrigated is behind the backstops and not truly "formal" turf. Head to head coverage may not be necessary; matching of the products and nozzles may be the better choice to allow for more efficient scheduling of the zone. Selecting lower gpm (precipitation rate) heads for the upper backstop may alleviate some runoff and ponding as both the top backstop and lower backstop are in the same zone.

Product within the zone

- 1 ea Rain Bird Falcon with green 8gpm nozzle
- 1 ea Rain Bird Falcon with light blue 6gpm nozzle
- 1 ea Rain Bird Falcon with dark blue 18gpm nozzle
 - rated for 30-90psi

- 1 ea Rain Bird 7005 with 12gpm beige nozzle
- 1 ea Rain Bird 7005 with dark green 8gpm nozzle
- 1 ea Rain Bird 7005 with light blue 6gpm nozzle
 - rated for 50-90psi

Pressure readings + / - 5psi

92-82psi west to east

NOTE: 10psi drop from lower field to upper

Approximate GPM required for this zone based on nozzle information: 58gpm

Station 16

Recommendations and observations

1. Control pressure
7005 whistles from the high pressure.

Product within the zone

1 ea Rain Bird Falcon with beige 12gpm nozzle

- rated for 30-90psi

1 ea Rain Bird 7005 with 12gpm beige nozzle

- rated for 50-90psi

Pressure readings + / - 5psi

98 psi average

Approximate GPM required for this zone based on nozzle information: 24gpm

SAMPLE

*Audited
Zones
Worksheets*

Audited Zones Worksheets – Southwest corner

Zone information for heads affecting catch can audit

Zone	Spacing	Throw	Pressure	Rotation Speed	Product
1	40'	42'-45'	82-100psi	Wide variation	S700, S800, 5004, 5004+, I-25
3	60'	58'	68psi	2min 40sec (7005)	7005, 8005, Falcon
5	60', 75', 97'	78' (8005) 65' (7005)	86psi	2 min	7005, 8005, I-35

Other Spacing Comments

Zone 5 has unusual and widely varied spacing within the zone.

Distance between heads on zone 5 and zone 1 is 79' plus. Zone 1 sprinklers are shooting up over a hill with throws of 45' or less so the coverage is poor.

Point of Connection Size

The site has one 3" point of connection.

Controller Information

Sentinel satellite, 24 station, unit code 140. This is part of a central control system. The controller is capable of complex programming options so the controller is not one of the constraints with respect to scheduling.

Existing Scheduling Comments

Varies and adjusted frequently down as per site irrigation staff.

Microclimate

Very affected by the tree shade and slope from the road or parking lot up to audited area.

A factor (Kmc) of .75 was selected

Soil Observations

The soil appears to have a mix of clay, sand and silt; Silty Clay Loam. It is mostly dark in colour with obvious sand particles. The soil was moist at the time of observation due to the frequent rainfall events and the zones being operated just prior; however it was not as wet as might be expected with the precipitation experienced. Beyond 1.5" in depth, dry areas could be seen.

Squeeze tests produced medium strength worms.

Note: Significant thatch was present which may impede the infiltration of water. Much of the rainfall and irrigation may not be getting past the first 1"-1.5" of the profile.

Rooting Depth

Roots were observed between 3.5" and 4" in all test areas.

Audited Zones Worksheets – Upper field

Zone information for heads affecting catch can audit

Zone	Spacing	Throw	Pressure	Rotation Speed	Product
Zone 14	49'	47'-62' (varying nozzles)	90 psi	3min 30sec (Falcon) 2min 20sec (7005)	Falcon, 7005
Zone 13	47'9"-49'8"	63-67'	60psi	3 min 20 sec	Falcon, 7005, 8005
Zone 10	75'1"	64'1"-67'3"	92psi	4min 10 sec avg	Falcon, 7005, 8005
Zone 11	73'-74'	57'-69'	70psi	3min	Falcon, 7005

Other Spacing Comments

Note the differences in throw distance versus spacing of the sprinklers in the zone. Matching the product will begin to match the throw distances more closely to what is required and result in the appropriate amount of water being used and healthier plant material.

Spacing between zones also presents challenges as in the two heads from zones 13 and 10 that are only 19' apart. See the Site Station Assessment for these zones for more comments.

Point of Connection Size

The site has one 3" point of connection.

Controller Information

Sentinel satellite, 24 station, unit code 140. This is part of a central control system. The controller is capable of complex programming options so the controller is not one of the constraints with respect to scheduling.

Existing Scheduling

Varies and adjusted frequently down as per site irrigation staff.

Microclimate

Very affected by the tree shade and slope from the road or parking lot up to audited area.
A factor (K_{mc}) of .75 was selected.

Soil Observations

The soil appears to have a mix of clay, sand and silt; Silty Clay Loam. It is mostly dark in colour with obvious sand particles. The soil was moist at the time of observation due the frequent rainfall events and the zones being operated just prior; however it was not as wet as might be expected with the precipitation experienced. Beyond 1.5" in depth, dry areas could be seen.

Squeeze tests produced medium strength worms.

Significant thatch was present. Much of the rainfall and irrigation may not be getting past the first 1"-1.5" of the profile.

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Roots were observed between 3.5" and 4" in all test areas.

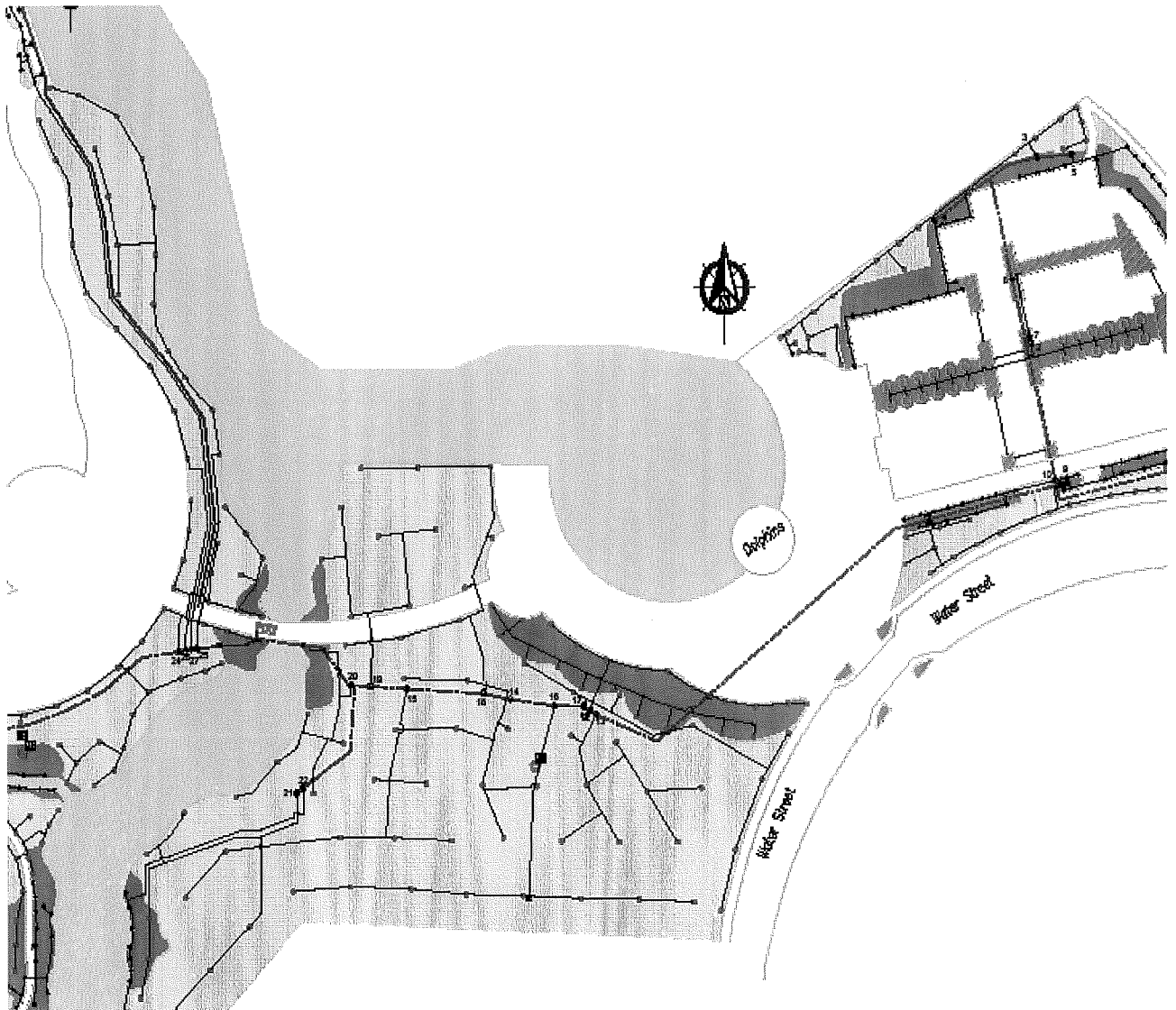
END OF AUDIT REPORT

Irrigation As-Builts

Irrigation As-Builts

For those maintaining large amounts of green space, accurate as-builts are an invaluable tool. As part of the City of Kelowna IEP commitment to building an accurate as-built library, Waterfront Park at almost 25 acres was GPS mapped in detail by Waterkind Consulting in cooperation with site staff. This was a large undertaking considering the size and age of the site but immediately become a valuable tool for maintenance and upgrades. The site had begun to experience increased mainline breaks and through the as-built process it became possible to determine where scheduling changes could lessen system stress based on the flow demands of the various zones. Moving forward the as-built will be continually updated and will be utilized as a system scheduling tool to decrease site water use and increase irrigation system longevity.

Section of the Waterfront Park As-Built



Appendix

Irrigation Efficiency Program Checklist

Waterkind Irrigation Efficiency Program Checklist

When it comes to managing large amounts of green space, the most effective long term strategy for generating water savings, energy savings, labour savings and overall return on investments is an Irrigation Efficiency Program (IEP). The following checklist identifies areas to focus on when creating an IEP.

Check each component that already exists within the organization.

- ☐ Written irrigation specifications
- ☐ Irrigation specification details
- ☐ Irrigation design review forms and protocols
- ☐ Irrigation installation inspection forms and protocols
- ☐ Irrigation training program
- ☐ Global site plan (all irrigation sites mapped)
- ☐ Database of irrigation site information; created through Site Assessments of POC, controller and field product
- ☐ Irrigation site audit program
- ☐ As-builts for irrigation systems
- ☐ Renovation plan complete with budgetary allowance
- ☐ Communication protocol between involved departments

Irrigation System Installation Inspection Report (sample)

PROJECT	ABC Park	
DATE		FILE #
CONTRACTOR		SPEC VERSION
OWNER	City of Kelowna	TIME:
INSPECTION TYPE	Substantial Completion	
ATTENDEES	Waterkind Consulting Services Ltd.; Brad Burnell	

Tests and Submittals

ITEMS	COMMENTS
	Completed
Anticipated Water Window	<input type="checkbox"/> _____
Voltage Drop	<input type="checkbox"/> _____
Water Service Connection Permit	<input type="checkbox"/> _____
Electrical Permit	<input type="checkbox"/> _____
Plumbing Permit	<input type="checkbox"/> _____
Communication Test	<input type="checkbox"/> _____
Pressure Test	<input type="checkbox"/> _____
Coverage Test	<input type="checkbox"/> _____
Earth Ground Resistance Test	<input type="checkbox"/> _____
Site Inspection	<input type="checkbox"/> _____
As-Built Review	<input type="checkbox"/> _____

Opening Comments

Inspection was delayed 20 minutes due to late arrival of the contract administrator.

Plant material near park entrance had not yet been installed.

Deficiencies

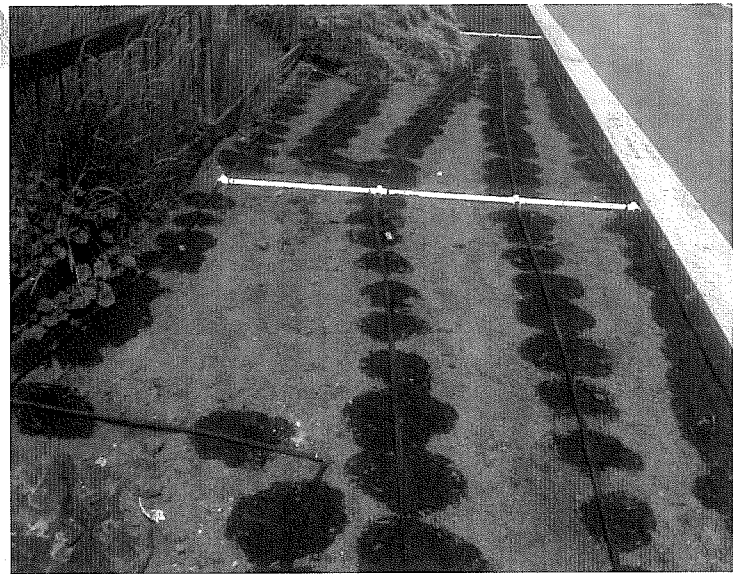
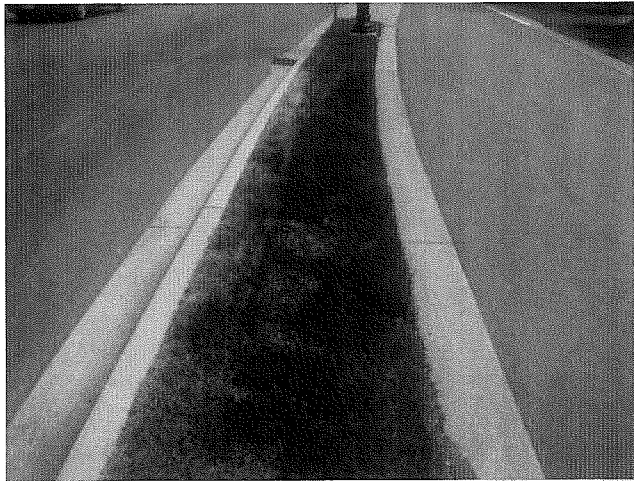
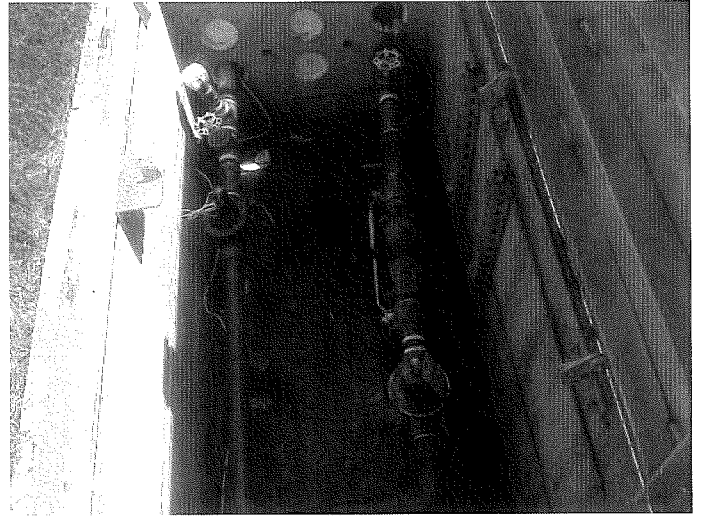
1. Section 2.18.1 Wire Splice Box
Electrical junction box at the entrance to Rotary Beach is green in colour; should be grey
2. Section 3.22.5 Valve Boxes
Valve boxes not set to grade.
3. Section 3.22.4 Valve boxes
Valve Boxes not locked.
4. Section 2.17.5 Control Wire
Incorrect wire connectors are installed.
5. Section 3.22.2 Valve Boxes
Insufficient space provided for maintenance of filter unit.
6. Section 3.22.2 Valve Boxes
Insufficient space within and around valve box components.
7. Section 1.0.2 General and 1.4.5 Quality Assurance
Cracked valve box lid.
8. Section 1.0.3 General
Exposed drip-in installation revealed lateral spacing variance of 12" to 40".
9. Section 3.13.1 Flow Sensor
No flow sensor installed.
10. Section 3.17.1 Irrigation Vault
Incorrect supports within vault; supported with wooden blocks.
11. Section 3.17.2 Irrigation Vault
Piping within vault is not brass; components are connected with S80 PVC. Verify pre-approval.
12. Section 1.5 Substitutions
2" Apollo DCVA installed; drawing calls for Watts 007, 40 mm (1.5").

Noted Concerns

1. API Air Relief valves on all sub-surface installations. Design calls for Toro T-YD-500-34 air relief valves.
2. Flood Bubbler assemblies appear to be installed within sewer pipe and buried in drain rock.
3. No controller installed at time of inspection.
4. Solid bottom concrete vault will require drainage inspection to pit or verification from Contract Administrator as to correct installation.
5. Master valve specified on design is a 1.5" P220. Master valve installed is 2" Rain Bird PEB.

Closing Comments

Pictures



END OF SAMPLE INSPECTION REPORT

SECTION FIVE

City of Kelowna

Certified Landscape Irrigation
Audits

Irrigation as-builts



Certified Landscape Irrigation Audits

The Irrigation Association provides a certification process for individuals within the irrigation industry as well as specific procedures and reporting protocols for conducting and documenting a Certified Landscape Irrigation Audit. The goal of the audit process is to provide the end user with information as to the current irrigation system performance of a site as well as recommendations for improving that performance. There are many steps to the audit process; all of which provide key insight. The catch can procedure for instance, allows for distribution uniformity (DU) calculations which can then be used for site specific scheduling so long as the DU is found to be at an acceptable level. Improvements made to the irrigation system will increase the distribution uniformity and these improvements in conjunction with enhanced site management techniques (i.e.: site specific scheduling) will then increase overall system efficiency. Site manager see a reduction in water use as well as improvements in the condition of plant material.

City of Kelowna Certified Landscape Irrigation Audits

Certified Landscape Irrigation Audits have been conducted for the City of Kelowna. For three sites totaling approximately 33 acres the anticipated water savings once improvements have been made will be over **7 million gallons per season (27,046m³)**. At an estimated delivery cost of .65/m³ the dollar savings for these sites will be **\$17,580** per year as well as over 47,000 kWh in energy savings.











The following pages include a sample irrigation audit outlining the type of information and detail available.

IRRIGATION AUDITING AND ASSESSMENT REPORT

As part of the Irrigation Efficiency Program for the City of Kelowna, certified landscape irrigation audits will provide the foundation for making informed decisions to improve the irrigation system performance of existing green spaces. Irrigation audits can also determine the performance of new irrigation systems and assist in determining the success or otherwise of those involved in that process from concept to design to installation.

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Catch Can Device Layout	Appendix	
Reference Information including PR and DU worksheets	Appendix	
Pictures	Appendix	

SAMPLE

Overview

Methodology

Terminology

Irrigation Audit Overview

The purpose of an irrigation audit is to improve the efficiency of an irrigation system. Recommendations are made based on visual inspections, catch can collections, soil observations, water pressure tests and discussions with site staff. Inferences and guidelines provided are based on industry best practices and manufacturers' specifications.

Deliverables from an irrigation audit include increased uniformity, decreased water window, water savings, healthier plant material and corresponding cost reductions from all of these improvements.

The following table created by the Alliance for Water Efficiency (AWE) illustrates on a small scale the results of not correcting common irrigation system problems. It is important to consider that generally speaking, poorly performing systems will have all of the problems listed below which would equate to wasting 34% of the total volume of each irrigation event!

Problem	Estimate of event volume affected	Volume of total event (gal)	Events/week	Events/Year	Waste/year (gal)
Misting (high pressure)	10%	4,500	3.5	91	40,950
Misaligned heads	5%	4,500	3.5	91	20,475
Overspray	15%	4,500	3.5	91	61,425
Mismatched heads	4%	4,500	3.5	91	16,380

Application of the recommendations in this report will vary in keeping with client needs, budgets and external constraints. The information provided is intended to serve as a guideline for improving efficiency. The data contained within allows for selecting a course of action and prioritizing for changes and repairs based on the optimum results possible.

Methodology

All Waterkind irrigation audits are conducted by Certified Landscape Irrigation Auditors.

Each audit begins with a site assessment of product performance and major issues that will affect the outcome of the catch can test. The assessment generally includes all zones in the specified area or site but can be limited to the zones being fully audited at the client's request. This pre-audit assessment is made available to the client prior to the full audit process being conducted.

The full audit and assessment process including catch can data will encompass a minimum of 3 zones to a maximum of 10% of the total zones on site. For the zones being audited, the information gathered is as follows:

1. Point of connection(s) components and size
2. Controller parameters
3. Current scheduling practices
4. Site perimeter documentation
5. Soil, thatch and root depth observations
6. Sprinkler operation
7. Valve defects; not activating or shutting down
8. Catch can test

Terminology

For the purposes of this report and in keeping with industry best practices and language, the following terminology will apply:

1. Station and zone are used interchangeably and refer to a group of sprinklers that operate at the same time.
2. Sprinklers may be referred to as heads.
3. Any valves referred to are assumed to be electric (solenoid) valves unless otherwise stipulated.
4. Sunken heads are defined as those whose performance is impeded as a result of having sunk below the industry best practice of ½" below grade.
5. Tilted heads are defined as those whose performance is impeded as a result of the tilt.
6. Thatch is described by the Irrigation Association as a buildup of rhizomes, stolons and shallow roots found above the soil profile. When excessive it impedes the absorption of water and nutrients and can also result in runoff.
7. Distribution Uniformity refers to how evenly the water is being distributed over the irrigated area. For this report DULQ (Lower quarter distribution uniformity) is used. This compares the overall average of the catch can test with the lowest 25% of the data and acts as a strong indicator of the uniformity of the overall system. There are industry standards for DU; see the table below.
8. PR = Precipitation Rate. The rate at which the system delivers water, expressed in inches per hour.
9. Catch can devices utilized are Cal Poly self-leveling vessels used for improved accuracy.

Estimated DU by sprinkler type and system quality.

SPRINKLER TYPE	EXCELLENT (achievable)	GOOD (expected)	POOR (if lower than this, consider not scheduling)
Rotary Sprinklers	80%	70%	55%
Spray Sprinklers	75%	65%	50%

Irrigation Association Landscape Irrigation Auditor Manual

SAMPLE

*Highlights
and
Recommendations*

Highlights and Recommendations

Distribution Uniformity (DU)

Upper field (northeast corner) 57%

Southwest corner

63%

Precipitation Rate (PR)

Upper Field (northeast corner) .60"/hour

Southwest corner

.36"/hour

Using the DU and PR

The above information can be utilized and interpreted in myriad ways.

For our purposes, this information tells us that within this site, there are areas with different performance profiles.

For the southwest corner, the PR is low and more evenly distributed.

For the northeast corner, the PR is higher but less evenly distributed.

Repair sprinklers

Zone 1, furthest east has Toro S700 with plugged nozzle and drive that does not turn.

Zone 11, middle outfield has Rain Bird 7005 with broken cap that shoots water straight up.

Match Product and Nozzles

The dominant products on site are the Rain Bird 7005 and Falcon.

Four out of 16 zones (25%) have only one model of sprinkler.

The rest are a mix of product (and nozzles).

All of the zones have myriad nozzles in place and no precipitation matching.

Examples:

Zone 3 is likely the closest to matching of all zones as the products chosen are similar in throw distances at the same pressure and have the potential to have closely matched precipitation rates. Nozzles in existing products (7005, 8005 and Falcon) could be changed to more closely match distances and precipitation rates or one product could be chosen and used for the entire zone.

Zone 1 is likely the worst case scenario with eight different product-nozzle combinations within 17 sprinklers. While the distance of throw did not vary greatly, the precipitation rates vary from .12" to .60" per hour.

Arc alignment

Zones 1 and 3 should be addressed to correct arc alignments. They spray roadways or parking lot.

Level sprinklers

Eleven of 16 zones have obviously tilted sprinklers where the angle is affecting the performance of the head.

Example:

Zone 1 has two sprinklers with extreme tilts; one of them loses 20' of throw in both directions as a result.

Change product

Zone 12 has product that appears to be overkill for the required application. It is in place to irrigate a tree line and originally was going to assist with grass seeding along the hillside. The 7005's and 8005's in place have high precipitation rates and powerful sprays. An alternative product with lower PR and gentler spray pattern could deliver the desired effect (ie: finger spray style product ideal for hillside applications).

Pressure

Where the operating pressure of the zone is the highest or exceeds the highest pressure ratings for the product as per the manufacturer's specifications, it is noted as having high pressure. High pressure was observed on 10 of the 16 zones.

The results are less heavy droplets and more misting which means more lost to the wind and less likely to reach its possible throw distance. High pressure also generally also results in higher product failure rates such as drives not turning and risers not retracting at the end of the run time (vandalism opportunity and increased debris accessing the riser). Nozzle wear will also occur faster leading to increased inconsistency in the amount of water each sprinkler is delivering. Sprinklers in several locations were observed to be "whistling" as a result of high pressure.

Example:

Zone 2 is 1/2" rotors, Rain Bird 3500, rated for 25-55psi. Pressure readings ranged from 65 to 76psi. All rotors are misting and not reaching their possible distance of throw. Significant water blows onto the road and the water does not reach the plant material.

SAMPLE

Water Use

Water Window

*Scheduling
Considerations*

Site Water Use

Irrigated site area is 7.15 acres.

To deliver 1" of water to 1 acre requires 27,154 gallons

The site ET is calculated at 1.1" per week

Weekly Water Calculations (peak season)

To deliver 1.1" of water to this area would require 213,566 gallons per week with a 100% distribution uniformity (DU).

Current system DU average is 60%.

At 60% DU, to deliver 1.1" of water to this area would require 355,944 gallons/week.

After improvements –

At 70% DU, to deliver 1.1" of water to this area would require 305,095 gallons/week.

A savings of 50,849 gallons per week!
650,867 gallons could be saved in one season...

Site Water Window

One of the goals of irrigation managers is to irrigate in the least amount of time possible. To do this requires an available flow rate capable of running the required stations, a high precipitation rate, decent distribution uniformity (in the IA range for acceptable) and a strong infiltration rate (dictated by soil and plant material conditions).

At present

At present with 60% DU and an average PR of .48"/hour, to deliver the site water requirement of 1.1" per week would require 4 hours per week per station.

There are 16 stations in total, all rotors. $16 \times 4 \text{ hours} = 64 \text{ hours per week or } 9 \text{ hours per day of irrigation.}$

Note: Station 1 will have a precipitation rate considerably lower (it operates all $\frac{3}{4}$ " rotors with lower precipitation rates) so it would require additional time. This may be offset but the reduced run time for station 12 once more appropriate product is selected.

After changes/improvements are made

At 70% efficiency, and with a precipitation rate of .70"/hour overall, the water window changes to 2.25 hours per station per week. $16 \times 2.25 = 36 \text{ hours per week or } 5 \text{ hours per day of irrigation.}$

Note: Station 1 will have a precipitation rate considerably lower (it operates all $\frac{3}{4}$ " rotors with lower precipitation rates) so it would require additional time. This may be offset but the reduced run time for station 12 once more appropriate product is selected.

Scheduling Considerations

Soil

Clay content in any soil texture results in lower infiltration rates but increased holding capacity. The soil on site is estimated to be silty clay loam. With this soil type and rooting depths of up to 4", irrigation would not need to be daily but should not exceed the infiltration rate.

Infiltration rate

To determine the infiltration rate, the vegetative cover, thatch level, compaction and soil texture should be considered. For this site, the reference infiltration rate is .25"/hour with no plant material. Turfgrass acts as a wick to assist water to enter the soil, increasing the infiltration rate. Thatch can also increase the infiltration rate so long as it is not allowed to dry out and become hydrophobic.

Estimated infiltration rate for this site: .35"/hour

For scheduling purposes, this would mean that if a zone had a precipitation rate of .70"/hour, it could not operate in excess of 30 minutes before runoff/ponding would occur.

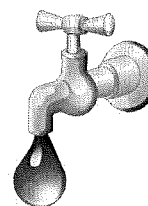
The site ET is estimated to be 1.1" per week. The zone with .70"/hour PR would need to run 3 times for 30 minutes each time and once for 8 minutes to provide precisely 1.1".

Why is scheduling with site information important?

Incorrect scheduling can result in large water losses, unhealthy plant material, higher maintenance and increased costs.

The following are some of the situations that occur when scheduling is done without investigating the site and irrigation system parameters.

- Irrigating every day when not necessary; results in excessive evaporation and turf water uptake
- Running cycles for too long resulting in runoff
- Running zones for too long resulting in leaching
- Running too many stations at once, resulting in varying pressures and pattern distortion



If improvements are made...

The recommendations are provided to assist in improving overall system uniformity, adjust precipitation rates as necessary and lay the groundwork for effective scheduling.

The higher the Distribution Uniformity gets the more effective the irrigation system can become. The stronger the Precipitation Rates become the shorter the run times and total water window will be.

Too much or too little water on the landscape leads to damage, loss of aesthetic appeal and increased time and money to maintain the site.

If the site were renovated with industry best practices for installation and product selection being utilized, the result could be a uniformity of 70% or better overall.

This improvement in DU could result in saving over 650,000 gallons per season!

Matching product, matching nozzles and controlling for pressure would bring the zones closer to matched precipitation rates. These changes would also increase precipitation rates for most if not all zones, moving the PR from a .48"/hour site average to .70"/hour

This improvement in PR could reduce the water window by almost 50%!

Irrigation Training Session Sample Review Quiz

Irrigation Training Session, Sample Session Review Quiz

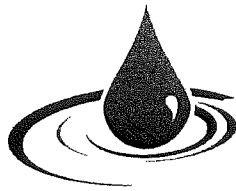
Name: _____

Date: _____

These sessions are intended to be interactive and provide useful information and tools. The questions below are intended as a review and to provide some insight into areas requiring more time and/or information.

1. List two products or procedures (ways of doing things) that you believe would fall into the Sustainable Irrigation Practices (SIPs) concept.
2. Define Evapotranspiration
3. What is the formula for calculating the precipitation rate of a full circle sprinkler with square spacing? (hint, the back of the catalogs also have this)
4. What is the maximum safe velocity that water should travel through pipe at?
5. What is one reason for staying within the safe velocity? (hint, what does it help avoid?)
6. How many gallons per minute can travel through 1" PVC, class 200, at a safe speed (velocity)?
7. If you have 5 gpm, how many gph do you have?
8. List at least one key component that ensures micro irrigation systems perform well?
9. What is more important to know for any irrigation system, static or dynamic pressure?
10. As the mesh rating of a filter gets larger, so does the micron rating – true or false?
11. How often should an irrigation water filter be cleaned?
12. Which of the 3 battery operated controllers does not offer programs?
TBOS SVC DDCWP

City of Kelowna 2011 Irrigation Specifications



Okanagan Basin
WATER BOARD

1450 K.L.O. Road
Kelowna, V1W 3Z4
250-469-6270
www.obwb.ca
grants@obwb.ca

Water Conservation and Quality Improvement Grant Program Contribution Agreement

2011

Between
the Okanagan Basin Water Board ("OBWB")
and

City of Kelowna

Agency name (hereafter known as the "Agency")

1435 Water Street,
Kelowna, B.C.
V1Y 1J4

Agency Address

Acknowledging the receipt of a
Water Conservation and Quality Improvement Grant

in the amount of \$ 20,000.00

for the project titled

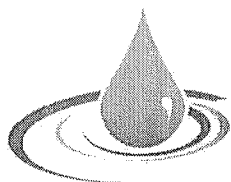
Water Conservation Manual for Green Spaces

(hereafter known as the "Project")

A. Financial Obligations

1. The Agency will:

- a. before receiving payment, provide written confirmation to the OBWB that all unconfirmed funding listed in their 2011 WCQI grant application has been received;
- b. apply all funds awarded by the OBWB to the operating costs of the project as outlined in the Project Expenses section of the application form;
- c. keep accounting records and books in accordance with generally accepted accounting principles and maintain necessary controls and approvals in revenue and expense items;
- d. make the project accounting records available to the OBWB at the OBWB's request.



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Water Conservation and Quality Improvement Grant Program Contribution Agreement

A. Financial Obligations

2. The OBWB will:

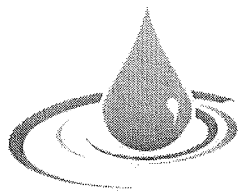
- a. release, once all criteria in the grant agreement have been met, the funds awarded to the agency according to the payment scheme selected below:

- ☐ 25% at Project outset, 25% after submission of mid-point report, and 50% after Project completion and receipt of final report, or;
- ☒ 50% after submission of mid-point report, and 50% after Project completion and receipt of final report, or;
- ☐ 100% after Project completion and receipt of final report.

B. Project Administration and Completion

1. The Agency will:

- a. complete the Project and submit the final report and invoice no later than **March 23, 2012**;
- b. acquire all permits and permissions required for the completion of the project;
- c. assume all liability for work related to the Project;
- d. immediately notify the OBWB of significant changes to the Project scope, methodology, completion date, or funding;
- e. give public recognition to the OBWB for its support in any advertising or print materials related to the Project, whenever appropriate;
- f. provide the OBWB with copies of all published materials created as a result of the Project, and the right to make use of same at its sole discretion;
- g. facilitate observation of the Project by OBWB staff at mutually convenient times;
- h. complete all reporting requirements as documented in section C;
- i. reimburse the OBWB for the amount of any funds not used in the completion of the project.



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Water Conservation and Quality Improvement Grant Program Contribution Agreement

1. The Agency will:

- a. complete and submit the mid-point report for the Project, using the template supplied, no later than **September 26, 2011;**
- b. complete and submit the final report using the template supplied, including submission of any Project deliverables, no later than **March 23, 2012;**

I, Signature: Financial Officer or Statutory Authority

I am the financial officer, or have statutory authority within the Agency. I have read the terms of this grant agreement, and I understand and agree to them.

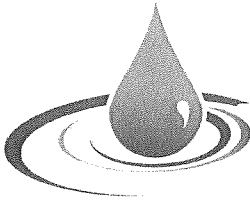
Keith Grayston

Print Name
of Financial Officer

Signature
of Financial Officer

May 9, 2011

Date



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1450 K.L.O. Road
Kelowna, B.C.
250-469-6270
www.obwb.ca
grants@obwb.ca

Water Conservation and Quality Improvement Grant Program 2011 Application Form

Please carefully complete and review this form before submitting. If you are unclear on any of the sections, please consult the guide to the application, or contact the Office and Grants Administrator at 250-469-6270 or grants@obwb.ca.

A. PROJECT SUMMARY

Name of Organization
Project Title
Regional District ☐ RDNO ☒ RDCO ☐ RDOS
Supporting Local Gov't
Project Budget \$ Grant Requested \$ (31%)

B. PROJECT CONTACT

Name
Title
Phone Fax
Email

C. PROJECT GOALS

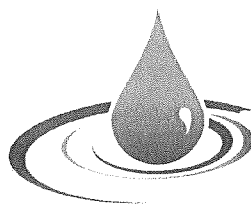
What is the aim of the project?

To consolidate and finalize into one document the work done to achieve watering conservation in municipal parks and green spaces over the past several years. Since 2005, the City of Kelowna Water Utility has undertaken research into Compost Tea (an alternative to chemical fertilizers) and drought tolerant grass. The Utility has also installed meters and completed in-depth assessments of most municipal parks and has developed landscape and irrigation standards for watering efficiency. The aim of the 2011 project is to finish the assessments and compile into one document all the information from the past seven years.

D. PROJECT DELIVERABLES/MEASURABLE OUTCOMES

What are the expected deliverables of the project? How will the project's success be measured?

The final deliverable will be an extensive manual, tentatively titled "Water Conservation Methods for Municipal Parks and Green Spaces." The project's success will be measured by reductions in water use in Kelowna's existing municipal parks, and adherence to water conservatio



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Water Conservation and Quality Improvement Grant Program 2011 Application Form

E. PROJECT METHODOLOGY

Briefly describe how your organization will achieve its goal.

The Water Utility has undertaken a number of projects over the past several years, many with financial assistance from the Okanagan Basin Water Board. Each of these projects were developed to reduce water used for landscape irrigation, in keeping with the City of Kelowna's Water Sustainability Action Plan, which calls for a 20% reduction in water use by 2012, over and above the reductions already achieved since 1998.

This year's project is a culmination of these other projects into a final set of standards, policies and documents for residential and municipal (parks and green spaces) water conservation. The 2011 grant requested from the OBWB will focus specifically on water conservation in parks and green spaces.

The City of Kelowna will achieve its goal by completing the Landscape and Irrigation Standards documents and process, along with completion of metering, data collection, and irrigation assessments of city parks.

F. PROJECT TIMELINE

Project Start Date (dd/mm/yy) 01/01/11

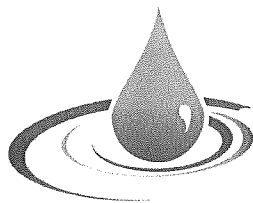
Completion Date (dd/mm/yy) 31/10/11

Activity (describe components of project below)

Category (select)

Date (mm/yy)

Finalize Landscape & Irrigation Standards for Parks	Planning/Policy Développement	02/11
Workshops for Developers, Irrigation Companies, Landscapers	Education/Outreach	03/11
Complete Water Meter installations in parks	Water Monitoring/Metering	06/11
Commence meter reading and analysis	Water Monitoring/Metering	06/11
Complete Parks Irrigation System Audits	Education/Outreach	08/11
Pilot processes with Irrigation/landscape industry	Education/Outreach	08/11
Compile and print report	Please Select	10/11
	Please Select	
	Please Select	
	Please Select	



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Water Conservation and Quality Improvement Grant Program 2011 Application Form

G. PROJECT PARTNERS

How does this project illustrate collaboration with other agencies? With other jurisdictions?

This project is done in collaboration with the Irrigation Association of British Columbia and the BC Landscape and Nursery Association.

H. PROJECT VALLEY-WIDE BENEFIT

Recognizing that the Okanagan is one valley with one water, how does this project benefit the valley as a whole?

The Okanagan Valley has four major cities (Vernon, Kelowna, West Kelowna, & Penticton), many medium sized towns, and several smaller centres. Most of these areas are experiencing growth and all of them have neighborhood parks and sportsfields. A 2007 study suggested that public parks departments are the biggest single customer for most urban water suppliers. The manual produced at the end of this project could be used by any community to increase watering efficiency in existing parks, and to build parks that use less water in the future.

I. PROJECT INNOVATION

What is innovative about this project?

To our knowledge, the manual produced at the end of the project will be the only one of its kind. It will be a complete guide for water conservation in municipal parks, including information on water efficient design and maintenance, landscape and irrigation system standards, metering, rates, data collection and analysis, and parks irrigation system assessments. It will include suggestions on irrigation system maintenance and a suggested product procurement policy that will encourage watering efficiency.

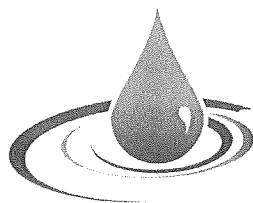
J. GRANT TRACK RECORD

If your organization has received OBWB grants for previous projects, please comment on the success of the projects and the significance of the grants to your organization.

The City of Kelowna Water Utility is grateful to have received grants from the OBWB in the past. These include:

- 1) Compost Tea and drought tolerant grass research/incentive programs
- 2) Landscape and Irrigation Standards for Water Efficiency
- 3) Residential Odd/Even Watering Restrictions Study
- 4) Municipal Parks Irrigation System Audits

Each of these projects have been successful on their own, and they are also parts of the much bigger, over-arching project to be completed this year.



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Water Conservation and Quality Improvement Grant Program 2011 Application Form

K. PROJECT FUNDING

Total Project Funding \$

Source	Type	Confirmed
City of Kelowna Water Utility	Direct Funds	Confirmed
<input type="text"/>	Please Select	Please Select
<input type="text"/>	Please Select	Please Select
<input type="text"/>	Please Select	Please Select

L. PROJECT EXPENSES

Total Project Budget \$

Project Management	<input type="text" value="15,000"/>
Equipment	<input type="text" value="20,000"/>
Supplies/Consumables	<input type="text" value="10,000"/>
Printing/Media	<input type="text" value="10,000"/>
Consultant/Contractor	<input type="text" value="15,000"/>
Travel	<input type="text" value="5,000"/>
Wages	<input type="text" value="5,000"/>
Other	<input type="text"/>
<input type="text"/>	<input type="text"/>

SUBMITTING THIS APPLICATION

Please ensure you have reviewed the terms of reference and the guide to the application. Once your application is complete, please submit a copy, along with the **required supporting resolution** from local government and any other supporting documents, to:

The Okanagan Basin Water Board
re: 2011 WCQI
1450 K.L.O. Road
Kelowna, B.C.
V1W 3Z4

Applications must be recieved by **4:00 p.m., February, 21, 2011**. Late or incomplete applications will not be accepted.

Okanagan Basin Water Board
Attn: Genevieve Dunbar
1450 KLO Road
Kelowna BC V1W 3Z4

RE: Request for Funding: Best Practises Manual for Irrigation in Municipal Parks and Green Spaces.

Dear Genevieve

This letter is to request funding in the amount of \$25,000 from the Okanagan Basin Water Board to help complete a 2011 project by the City of Kelowna Water Utility.

As part of its Water Sustainability Action Plan, established in 2007, Kelowna City Council directed staff to reduce overall water consumption by 15% by the year 2012, over and above the 20% reduction already achieved since 1998. Reducing outdoor irrigation is an integral part of the Water Sustainability Action Plan.

Over the past several years the Water Utility has undertaken a number of projects designed to help reduce water consumption in Municipal Parks and Green Spaces. We are grateful to the Okanagan Basin Water Board for their assistance in funding many of these projects (Compost tea, drought tolerant grass, landscape and irrigation standards, and irrigation system assessments).

This year's project is a culmination of these prior projects into a single document – a Best Practises Manual for Irrigation in Municipal Parks and Green Spaces. Several small but related projects will be completed in 2011 before we can write the manual. This includes completing the Landscape and Irrigation Standards documents and process, along with completion of metering, data collection, and irrigation assessments of city parks.

We are looking to the Okanagan Basin Water Board for a grant that will help us complete the final deliverable: the best practises manual. Once complete, this manual can be a guide for other municipalities in the Okanagan Basin.

2011 is a pivotal year for the City of Kelowna Water Utility. As mentioned, this year will see the culmination of many projects initiated since 2001. A grant from the OBWB will help us to complete the work we have done over the past five years.

Don Degen
Utility Services Manager
City of Kelowna

February 14, 2011 P.M. Regular Meeting

PLEASE NOTE:

THIS COUNCIL MEETING RECAP REPORT IS FOR "INFORMATION ONLY" AND ANY COUNCIL MEETING DIRECTIVES (RESOLUTIONS AND/OR DIRECTIONS) THAT REQUIRE FOLLOW UP WILL BE INITIATED VIA A SERVICE REQUEST.

PLEASE REVIEW FOR YOUR INFORMATION.

5. NON-DEVELOPMENT APPLICATION REPORTS

As the staff member presenting Agenda Item No. 5.1 was not present, Mayor Shepherd advised that Agenda Item No. 5.2 would be moved forward and dealt with immediately.

- 5.2 Manager, Development Engineering, dated February 9, 2011, re: McCulloch Road Reconstruction
To award the contract for the upgrade of McCulloch Road to TT Contractors Ltd. in the amount of \$1,178,718.30, including HST.

The following resolution was adopted:

THAT Council approves the award of the construction contract for the upgrade of McCulloch Road to TT Contractors Ltd in the amount of \$1,178,718.30 which includes HST and a 10% contingency as part of the Canyon Creek Partnering Agreement.

- 5.1 Utility Technologist, dated February 9, 2011, re: Okanagan Basin Water Board Conservation and Quality Improvement Grants
To endorse various grant applications to the Okanagan Basin Water Board Water Conservation and Quality Improvement Grant Initiative.

The following resolution was adopted:

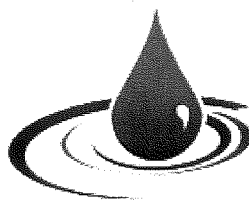
THAT Council endorse the following grant applications to the Okanagan Basin Water Board (OBWB) Water Conservation and Quality Improvement Grant Initiative.

- Mill Creek Riparian Management Plan;
- Sensitive Habitat Inventory & Mapping (SHIM);
- Goose Management Committee Outreach and Education Program;
- Best Practices Manual for Irrigation in Municipal Parks and Green Spaces.

6. BYLAWS (OTHER THAN ZONING & DEVELOPMENT)

- 6.2 Bylaw No. 10473 - Amendment No. 1 to City of Kelowna Mill Creek Flood Plain Bylaw No. 10248
To consider various housekeeping amendments to Bylaw No. 10248 - City of Kelowna Mill Creek Flood Plain Bylaw.

Bylaw was adopted.



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grants@obwb.ca

Water Conservation and Quality Improvement Grant Program Mid-point Report

This mid-point report is due no later than **4 p.m. on Friday, October 7, 2011.**

A. PROJECT SUMMARY

Name of Organization : City of Kelowna Water Utility

Project Title Parks Irrigation Manual

Project Budget \$ 80,000

Grant Recieved \$ 20,000

B. PROJECT CONTACT

Name Don Degen

Title Utility Services Manager, Civic Operations

Phone 250 469-8726

Fax 250 862-3337

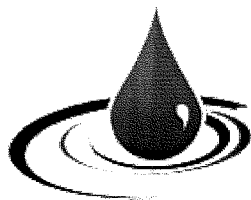
Email ddegen@kelowna.ca

C. ACHIEVEMENTS TO DATE

Please describe the activities completed at this point in the project. To complete this section, refer to the work plan given in section F of your original Water Conservation and Quality Improvement Grant (WCQI) application.

- 1) Landscape and Irrigation Standards documents and process complete. New bylaw endorsed by Kelowna City Council in April 2011.
- 2) Workshops for Developers, Irrigation Companies, Landscapers completed
- 3) Meter installations complete at all parks with service lines of 1.5 inches or larger.
- 4) Data collection and analysis using Omni Systems has begun.
- 5) Irrigation Assessments complete
- 6) Begin installation of flow sensors in all parks
- 7) Rough draft of "Water Conservation Manual for Municipal Parks and Green Spaces" compete

All that remains is a review of the rough draft. The final draft will be completed in November, 2011.



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Water Conservation and Quality Improvement Grant Program Midpoint Report

D. PROJECT PROGRESS

The project is ahead of schedule ☐ on schedule ☒ behind schedule. ☐

If the project is behind schedule, please comment on why and describe the new anticipated timeline.

E. OBSTACLES ENCOUNTERED

Briefly describe any obstacles or challenges encountered, as well as steps taken to overcome them.

None

F. PROJECT DELIVERABLES

Please attach any materials created as a part of your project activities. Examples include, but are not limited to: brochures, media resources (e.g. press releases, backgrounders), newsletters, photographs, maps. Electronic submissions are appreciated.

None