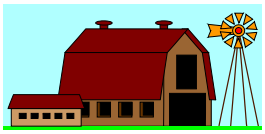

Peninsula Agricultural Commission

CAPITAL REGIONAL DISTRICT
Water Services

BRITISH COLUMBIA
Ministry of Agriculture and Lands

Agricultural Water Use and Conservation Study

Final Report

Submitted by:

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December 12th, 2005

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EXECUTIVE SUMMARY

Background

The premise behind the CRD Agriculture Water Use and Conservation Study is to get an understanding of how water is being used for agriculture across the Capital Regional District (CRD). The study was commissioned by the CRD, in partnership with the Peninsula Agricultural Commission (PAC), BC Ministry of Agriculture and Lands (MAL), and with funding provided by the Canada-British Columbia Water Supply Expansion Program.

Key Objective

A key objective has been to gather, analyze and present information on farm water use and conservation practices across the CRD. This information is needed to support informed decision making on water rates for the agricultural sector, and help to develop a CRD water conservation program. The primary end user and custodian of this information is the CRD Water Services Department, who are accountable for delivering defensible information and recommendations regarding water rates to the CRD Regional Water Supply Commission.

Project Team

The study was carried out by a project team from both the private sector and government. The project team provided the range of expertise necessary to successfully complete the project, including professional agrologists, engineers, and technical experts in data, database analysis, and Geographic Information Systems (GIS).

Project Approach

Three streams of data gathering were initiated to provide the required 'core' dataset for analysis, including a Land Use Inventory (LUI), Water Use Survey, and baseline data acquisition. The Land Use Inventory was led by the Ministry of Agriculture and Lands' Regional Agrologist, and involved over forty days of driving around the CRD gathering agricultural land use data, including irrigation practices.

The Water Use Survey involved the development of a questionnaire and mailing out over 1,100 surveys to properties classified as "farms" by BC Assessment. The mail-out was followed-up with phone calls and visits to some of the large farms and high consumers of CRD water.

Fundamental to these data gathering exercises and the final analysis, was the need for baseline data. The baseline data acquired included, CRD retail water data, soils data, property boundary data, BC Assessment data, and historic climate data.

Data from the three data collection streams were rationalised, integrated and cleaned to provide a reliable core dataset that could be used for analysis, now and into the future. The varying levels of detail and accuracy in the core dataset resulted in much of the analysis being done at a more generalised level, providing excellent results on water use and conservation trends for agriculture across the CRD.

Determining how efficiently farmers are using water was identified as a critical project requirement. Measuring the level of water efficiency required filtering the data down to a sub-set of the data that enabled measuring benchmark water use against known actual use. Particular emphasis was placed on measuring water use efficiency for each crop type using the irrigation model outlined in the B.C. Sprinkler Irrigation Manual.

More details on the approach are in the body of the report.

Results and Findings

Considering that the project was carried out in the busiest part of the year for farmers, the overall response and interest from the agricultural community to the agricultural water use survey was very positive, with 33% percent of the questionnaires being returned. This level of return is 25% higher than what is considered as an acceptable minimum for mail out surveys. The return of 33% represents approximately 37% of the agricultural land area, and 50% of the CRD water users. Most farms types were well represented, with the exception of turf, horse, beef, and "unknown" farm types.

Based on the survey results, the farmers identified CRD water as being a critical water source for agriculture. Over 35% of the farms rely entirely on CRD water, while 18% use CRD water in combination with other sources, including wells, creeks, and dugouts. Wells are a critical secondary water source, with 34% of the respondents indicating that they use wells to supply at least some of their water needs, including 19% who rely exclusively on wells.

The results from the Land Use Inventory were incorporated with the water use survey results, providing a greater understanding of the farm use, types and extent of crops grown, irrigation and conservation methods being used, as well as validating the data from the respective data gathering exercises. Unfortunately, further data collection was not possible within the project timeframe and/or scope, but the resultant 'incorporated' database provides an excellent basis from which the CRD can work to do more detailed analysis and follow-up work to improve water use practices by farmers.

The efficiency analysis showed that farmers, on the average, were in fact using 1.4 times less water than the benchmark levels. This is consistent with the fact that 93% of the farmers surveyed self-assessed their level of water use efficiency to be good to excellent. Even so, 40% of the farmers were still interested in receiving more information and help at improving their water use efficiency.

Based on the results for those CRD water users and the commentary from the survey questionnaires, it is apparent that farmers are reluctant to use CRD water because of cost. Farmers have to use other cheaper water sources in order to maintain a viable business and stay competitive.

Focus Group

In response to the results of this study, there was an identified need to get feedback from the agricultural community on these results and how they may be applied to support agriculture, now and into the future. A focus group workshop also enabled the project team to examine the factors that influence farmers' decisions about water sources and uses in the study area. The focus group provided insights into the study results and provided input into the importance of water for agriculture, the costs of varying water sources to agriculture, and the need for increased management of water for agriculture, particularly ground water.

The outcomes from the focus group workshop are intended to provide a guide to developing water conservation planning and programs for agriculture across the Capital Regional District.

This study would not have been possible without the support of many members of the farm community. The project team acknowledges the time taken by many to complete and return surveys, and of those who took time during the busiest part of the year to attend meetings and workshops.

APPROACH
Methodology for Farm Efficiency Assessment

OVERVIEW

The approach taken for the study was one that would provide the CRD Water Services Department with the best possible information to make informed decisions on agricultural water rates in the region.

The project was divided into ten primary tasks (see below), with most of the emphasis being placed on the Water Use Survey (Questionnaire) and the Land Use Inventory, Task 2 and Task 3 respectively. The biggest challenge was to try to achieve the preferred return rate of 75% for the Water Use Survey (Survey Questionnaire). Considering that they survey went out during the very busiest time of the year for farmers, a multi-pronged approach was undertaken to achieving the highest level of return possible.

The project was conducted in three primary phases:

1. Data Gathering: This included conducting a water use survey through a questionnaire to farmers, a land use inventory, and collecting base and resource data to support irrigation efficiency and spatial analysis.
2. Data Integration & QA: Data from the various sources were quality controlled, rationalized and integrated to enable a higher level of confidence in the analysis results.
3. Data Analysis: Spatial and tabular datasets were used interchangeably to determine how efficiently water is being used in agriculture in the study area.

DATA GATHERING

CRD Farm Water Use Survey (Survey Questionnaire)

- The intial focus was on modifying the questionnaire to ensure that it would provide the CRD with the answers they wanted, and to make it as easy as possible for recepients to complete. This included reviewing the questionnaire with a stakeholder group and with the Peninsula Agricultural Commission to ensure that the questionnaire was reader

friendly, easy to complete, brief, and accepted by the farming community as being a worthwhile exercise.

- Once finalised, the structure of the questionnaire was used to develop a new data model that would support the data entry, management, analysis, and extraction of the survey data. An interface to this data model was also developed to expedite data entry and to provide greater rigour to the data entry process. Considerable effort was put into developing the data model and the data entry interface to ensure that they could support future surveys.

- The mailout and follow-up was managed and supported by the entire project team. The CRD's Finance & Corporate Services Department group handled the mail-out and receiving of responses. The mail-out list was based on BC Assessment's "farm status" database, which was in-turn rationalised against the retail water users list provided by the CRD Water Services and other municipalities in the CRD. The final list of properties on the mail-out list was 1,142, up from the 800 properties anticipated in the Terms of Reference for the project.

- The mail-out survey was followed up with a combination of phone and on-farm visits and interviews. The project team also contacted key farm groups and particpiated in a few agricultural activities on the peninsula to create awareness of the importance of the survey and to get their endorsement. The project team also leveraged the work of the Land Use Inventory (LUI) team to ensure that data collected by both groups are complimentary and compatible, and to assist in making contact with farmers.

Land Use Inventory

- A Land Use Inventory (LUI) was undertaken for all farm properties in the Greater Victoria Area. The methodology used follows the standard used by the Ministry of Agriculture & Lands (formerly Agriculture, Food & Fisheries) to determine the farm use(s) and extent, structures and improvements, and farm management and irrigation practices for each farm property. This approach is documented in the "AgFocus – a Guide to Agricultural Land Use Inventory", authored and published by the Ministry of Agriculture & Lands.

- The LUI fieldwork was carried out by expert staff and professional agrologists from the Ministry of Agriculture & Lands, and supported by a contracted trained assistant. The data was captured and recorded directly into the LUI Database in the field. The data entered was also based on aerial photo interpretation.

- The LUI was carried out primarily in May and June, 2005, which limited the level of interpretation, including cropping, use, and irrigation practices, because it was early in the growing season when irrigation had not yet started for most crops.

- Field data recorded was checked by the field surveyors and provided to the Resource Management Branch of the Ministry of Agriculture & Food. Once reviewed by the Resource Management Branch, this data was passed onto the contracting team to be used to ensure data correlation and integration with the Farm Water Use Survey results, in preparation for analysis.

Base Parcel Data

- The private parcel boundary data used for the study was the Integrated Cadastral Fabric, which was obtained from the Province of British Columbia. This parcel data was used to determine the area of farm properties. The 'key' to linking this parcel boundary data to other attribute data is the Jurisdictional Roll Number (JUROL), including the BC Assessment data.
- BC Assessment's data was used to determine which properties were classified as farms. This was the key to identifying which farms would be surveyed as part of the LUI, and which farms were eligible for the "farm rate" for retail water.
- ALR data was acquired and also used to define the farms to be part of the LUI.

Soils Data

- The Province of B.C.'s 1:50 000 soils digital data was obtained from MapPlace, hosted and managed by the Ministry of Energy & Mines. This soils data was used as it was the most accessible and complete for the study area. The analysis and interpretation of this data was done using

the Soils of Southern Vancouver Island, MOE Technical Report 17, authored by John Jungen, and published in 1985.

- The following process was undertaken to determine the dominant soil type for each farm property, and to get the data into a format and structure to allow it to be used for spatial analysis and populating the WURLD irrigation model.

	Activity	Outcome
1	Acquire digital soils polygonal and attribute data for the CRD from MapPlace	Complete soils dataset for CRD
2	Identify dominant soil type for each polygon	Generalized soil map for CRD
3	Analyze and derive dominant soil characteristics including texture, depth and drainage for each polygon, based on the soil type identified in the Soils of Southern Vancouver Island report	Dominant soils texture and depth table for each Soil Type
4	Verify derived "Soils Texture/Depth Table" with Soils of Southern Vancouver Island author and resident soils expert, John Jungen	"ENDORSED" - dominant Soils texture/depth table for each Soil Type
5	Determine dominant soil texture and depth for each farm property through overlay analysis using ArcGIS tools	A dominant soils texture/depth map and table for each farm property

Retail Water Use Data

- The 2004 retail water use data for those properties designated as "farm" was acquired from the various municipalities in the CRD, and incorporated in a single dataset by CRD Water Services Department.

DATA INTEGRATION

- The final analysis dataset was derived through the cleaning and rationalization of the data from the water use survey sent to farmers and the land use inventory data.

- To determine CRD water uses, by volume, involved the identification of those surveys that used CRD water (200 surveys). These surveys were then sorted to identify those entries whose total volume estimates did not exceed a total of 100% (as several respondents answered question four incorrectly). A total of 135 surveys met these criteria. These surveys were then merged with the retail data of which 89 of the surveys had retail data.

- The retail water consumption volumes for the various agricultural uses, namely irrigation, crop washing, livestock and domestic (including other uses) were done for each farm using the farm survey and CRD's retail water use data. The volume of consumption for each use was determined by multiplying the estimated use proportions identified by the farmer, by the CRD retail volume.

- A total of 68 surveys were used for the water use efficiency analysis. These 68 surveys were derived from the 89 surveys by selecting only those farms that used CRD water only.

- Data for the 68 surveys required for the analysis was integrated for each parcel. The data included:
    - Retail water volume data
    - Parcel area data from the integrated cadastral data (ICF)
    - Dominant parcel soil information including texture and depth
    - The total number of livestock and poultry per parcel from the survey data
    - Crop types by area from the Land Use Inventory
    - Crop types by area identified in the survey
    - Presence of a residence from the LUI and from the survey

- Parcel area (size) was generated from the integrated cadastral data for the 89 surveys. Three of the surveys were not part of the ICF data set thus reducing the total of surveys to 86 for the analysis.

- Numbers of livestock and poultry were determined from the surveys. The livestock total is a sum of beef, replacement stock, swine and horses; there were no dairy animals identified in any of the 86 surveys. The poultry total includes turkeys, meat chickens and layers.

- Crop area for the LUI parcel information was generated by dividing the % crop area estimate by 100, then multiplying this value by the total parcel area.

- The crop survey area data was also summarized for each crop from question 9 of the survey for each parcel.

- The crop data from both the LUI and survey for each parcel were then compared and assessed to develop a final crop area for the efficiency analysis. In general, there was agreement between the LUI and survey data. The survey crop area data was used to supplement the LUI crop area data were there was no information in LUI data set, or the LUI cover data was identified as "unknown" crop or "cultivated" land.

- The presence of a residence on a parcel was determined by merging the land cover codes indicating a residence from the LUI with the survey data indicating a residence from question 20 of the survey.

WATER USE EFFICIENCY ANALYSIS

Irrigation Requirements for Crops

- Determining the level of water use efficiency required measuring the "Benchmark Water Use" against the actual water used from the CRD's "Retail Water Data".
- Based on the granularity (level of accuracy) of the data collected from both the LUI and the Survey, the project team decided to adopt the methodology for calculating the "Benchmark Water Use" from the Ministry of Agriculture & Lands' B.C. Sprinkler Irrigation Manual, as referenced in the Guide to Irrigation System Design with Reclaimed Water fact sheet, February 2001, Agdex 753. This methodology was recommended by the Ministry's District Agrologist, Rob Kline.
- Based on the Guide, the following approach was used to determine the Average Irrigation Requirement (IR) or Benchmark for each farm:

Table 1: Average Irrigation Requirement (IR)

IR (Irrigation Requirement)
AWSC (Available Water Storage Capacity)
MSWD (Maximum Soil Water Deficit)
AWSC for Soil Textures:

- Where there was no soil texture (8 records) the average soil water storage capacity was used, 150mm/m
- The soil water storage capacity for sand was used for very gravely loamy sand textured soils

Calculations:
AWSC = crop rooting depth x dominant soil texture (mm/m)
MSWD = AWSC x crop availability coefficient (mm)
IR: Using the MSWD, the IR could be determined from the average seasonal irrigation requirement look-up table for specific locations across BC. See ***Appendix III.

- Since the study area ranged between Metchosin and North Saanich, the IR value used for the MSWD was the average between the published Victoria and Saanichton values.

***Appendix III: Provides the report, including look-up tables used to derive the AWSC, MSWD, and the IR - Guide to Irrigation System Design with Reclaimed Water factsheet, February 2001, Agdex 753*

- Organic soil water storage capacity used, was from the Ministry of Agriculture & Lands, Developing a Sprinkler Irrigation Schedule Using Site Parameters, April 2005
- Using the IR, the total amount of water applied to each crop was determined for each farm by multiplying the area of the crop cover (from LUI) by the IR. Results are in cubic metres.

Example: A Farm has 2 acres in Tree Fruits on a gravely sandy loam soil

Rooting Depth: 1.20m
Soil Water Storage Capacity: 125mm/m
Crop – Availability Coefficient: 40% (0.4)

AWSC	= Rooting depth x Soil Water Storage Capacity
	= 1.2m x 125
	= 150 mm
MSWD	= AWSC x Av. Coefficient
	= 150mm x 0.40
	= 60 mm
IR	= 252 mm
Total IR	= Area x IR
	= (2 x 4046.9) x .252
	= 2,040 cubic metres

Water Requirements for Livestock

- Water use requirements for livestock are based on the values taken from various sources and averaged. The sources from which these values were taken include, "The Health of our Water", published by Agriculture and Agri-Food Canada (University of Saskatchewan); the Stockman's Guide to Range Livestock Watering from Surface Water Sources; and, the US Department of Energy - Office of Civilian Radioactive Waste Management, Ontario Pork, and Ziggity Systems Inc.
- Based on this information from these publications, the average water use per animal per year for general animal groupings, including cattle, horses, poultry, and other are assumed to be:

Animal Type	Per Animal/yr (m3)
Cattle (Beef & Dairy)	25 m^3
Horses	16 m^3
Poultry	0.08 m^3
Other Livestock, includes: - pigs (1.9 - 7.3m^3/yr), and/or - sheep (2.6 - 3.3 m^3/yr)	4.3 m^3

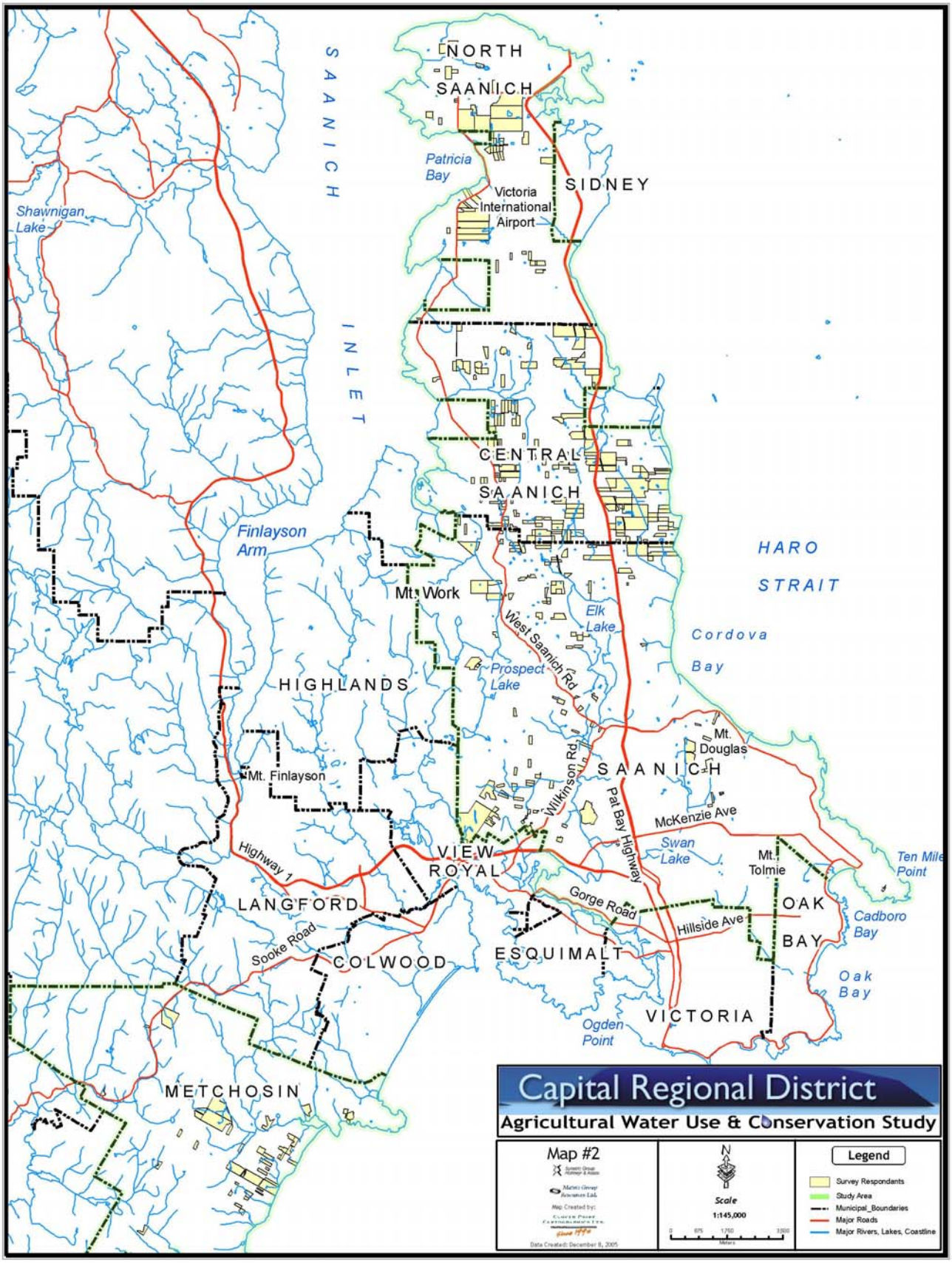
Water Requirements for Domestic Use

- The benchmark for the total domestic water use per single family residence per year is 413 m^3 for Central Saanich. (Source: CRD Water Services)

FOCUS GROUP

- The purpose of the focus group was to review the findings of the study and to provide the project team an understanding of how these findings could be used to improve water conservation and use in agriculture.
- The CRD, Ministry of Agriculture & Lands, and the Peninsula Agricultural Committee representatives on the project team spearheaded the focus group session, providing a forum for the agricultural community to communicate how various factors influence their decisions on water use, including:
    - Economics of food production, e.g. labour, water, etc.
    - Land use policy and regulations
    - Climate change, local soils, and groundwater
    - Cost & quality of water from different sources
    - Additional factors
- These factors were matched to the study results in an attempt to get a better understanding of how they may influence water use and conservation practices on farms within the CRD.
- Based on the above, the group identified and discussed the present and future challenges facing farmers in preserving the availability and quality of water to ensure the viability of agriculture in the CRD. Specifically:
    - "What can the farmers do?"
    - "What can the residents do?"
    - "What can governments do?"
- The presentation materials, transcripts and outcomes from the focus group workshop are in Appendices IV and V.


NORTH SAANICH
SAANICH INLET
Patricia Bay
SIDNEY
Victoria International Airport
Shawnigan Lake
CENTRAL SAANICH
Finlayson Arm
HARO STRAIT
Mt. Work
Elk Lake
West Saanich Rd
Cordova Bay
Prospect Lake
HIGHLANDS
Mt. Douglas
SAANICH
Mt. Finlayson
Wilkinson Rd
Pat Bay Highway
McKenzie Ave
Swan Lake
Mt. Tolmie
Ten Mile Point
Highway 1
VIEW ROYAL
Gorge Road
OAK BAY
Cadboro Bay
LANGFORD
Hillside Ave
Sooke Road
COLWOOD
ESQUIMALT
Oak Bay
VICTORIA
Ogden Point
METCHOSIN
Capital Regional District
Agricultural Water Use & Conservation Study
Map #1
Scale
1:145,000
Legend
Farms without CRD water
Farms with CRD water
Study Area
Municipal_Boundaries
Major Roads
Major Rivers, Lakes, Coastline


NORTH SAANICH
SAANICH INLET
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Ten Mile Point
LANGFORD
Gorge Road
Hillside Ave
OAK BAY
Cadboro Bay
Sooke Road
COLWOOD
ESQUIMALT
Oak Bay
VICTORIA
Ogden Point
METCHOSIN
Capital Regional District
Agricultural Water Use & Conservation Study
Map #2
Scale
1:145,000
Legend
Survey Respondants
Study Area
Municipal_Boundaries
Major Roads
Major Rivers, Lakes, Coastline

RESULTS
CRD Farm Water Use

SUMMARY OF SURVEY RESULTS

1. CRD water has been identified as a critical water source for the agriculture community. For 35% of the farms, CRD water is the only source reported, while 18% of the farms use CRD water in combination with other sources, including wells, creeks, and dugouts.
2. Wells are an important secondary source of water among survey respondents. Wells account for 19% of the surveys as the only source of water and when combined with other sources (including CRD water) account 34% of the surveys.
3. CRD water was the most commonly identified source for irrigation equalling that of wells and creeks together.
4. Well and CRD water were equal as a source for livestock use and crop washing, and both are important domestic water sources.
5. An analysis of agriculture use of CRD water by volume suggests that most of the water is used for irrigation (92%); the remainder is domestic use (4%), and livestock (2%) and crop washing (1%). (Analysis of 89 surveys)
6. Crop production sector is the largest consumer of CRD water (by volume) accounting for 80% of the total volume and 87% of irrigation volumes.
7. Generally low volumes of CRD water were used by the livestock sector for livestock and crop washing. This plus the importance of well water as a source for livestock use tentatively suggests that the livestock sector may be less dependent on CRD water. However, this requires further research due low number of small beef and horse farm surveys, and lack of information on well water use and volumes.
8. Within the crop production sector the top three users of CRD water (by volume) for irrigation are nursery/ornamentals, field vegetable and vine/berry. Within the livestock sector, poultry farms were the largest user.
9. Only 14% of the surveys responded that water shortages in 2004 limited their crop production or quality of crops (*see point 15).*
10. Sprinkler and trickle irrigation (regardless of crop type) are the most popular methods of crop production irrigation accounting 43% and 30% of the surveys respectively.

11. There was a high response to the questions of how efficiently farmers felt they were using water (85% answered the question), and the types of conservation practices being used (90% responded).
    a) 93% assessed their overall water use efficiency rating as excellent or good; 6% considered themselves as moderate; and, only 1% felt their water efficiency was poor. There does not appear to be any differentiation between the farm sectors (crop production, livestock) --- all rate their own water efficiency as "good" to "excellent".
    b) The top four conservation practices use are night or morning irrigation, matching irrigation methods with crops, mulch and compost. Low use conservation practices include use of ET index, automatic rain shutoff devices, soil moisture measurement and water use monitoring. Conservation practices appear to be similar between the two primary farm sectors, crop and livestock production. These results should prove useful in developing a strategy for a water conservation program.
    c) 40% of respondents indicated that they would like to get more information on how to improve water efficiency and/or to conserve water resources on their property.
12. About 50% of the surveys indicated some form of change in land use, production or number of residents on their farm properties within the next five years.
    a) 38% of the respondents predicted an increase in use and residents; 7% anticipated a decrease; and, 55% indicated no change.
    b) The largest changes are in crop production and area, livestock numbers, and greenhouse area.
13. The net increase in water use is anticipated to be around 7% by 2009, which is approximately 1.4% per year.

SURVEY RESULTS

Survey Response

The overall response of the agricultural community to the survey was very positive considering the timing of the survey (summer season) and the survey method (mail-in questionnaire). The response results of the survey were:

- 33% from a total of 1127 surveys were returned. These represent 37% of the agricultural land base and 50% of the CRD water user consumption.

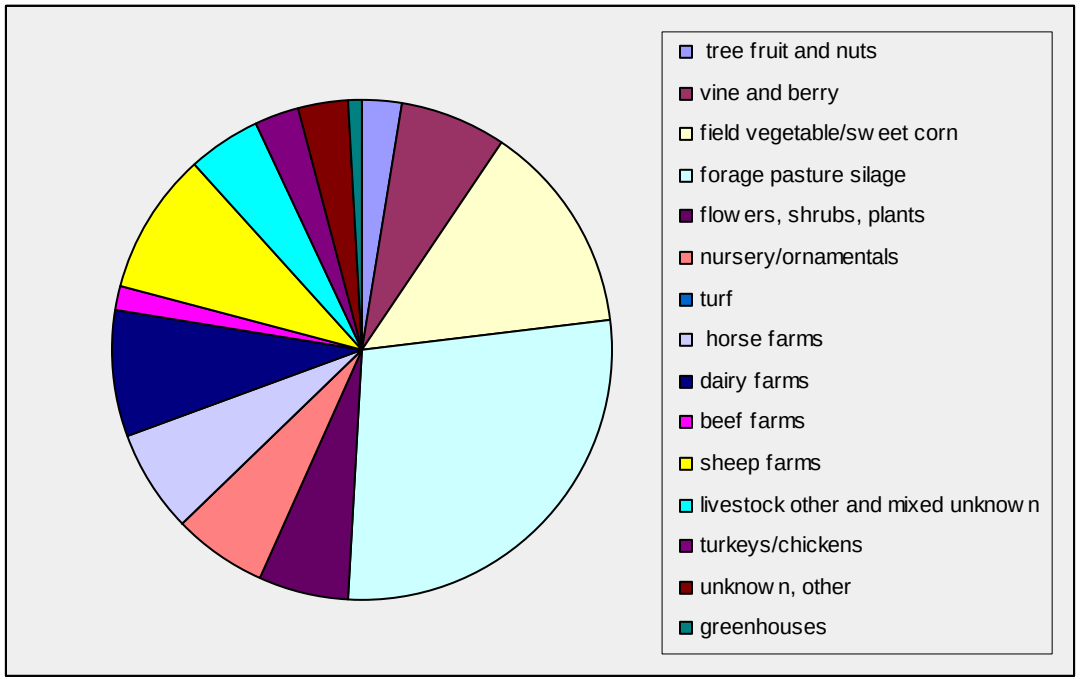
Farm Type	# Surveys Completed	Total # Surveys Issued	% Completed Surveys	Area of Surveys Completed (acres)	Total Area (acres)	% Area Surveys Completed	Consumption Volume of Surveys Completed (m^3)	Total Volume Consumed (m^3)	% Area Surveys Completed (acres)
tree fruit and nuts	20	38	**53%**	110.4	243.0	**45%**	5,720	24,850	**23%**
vine and berry	28	55	**51%**	320.6	608.3	**53%**	63,456	96,259	**66%**
field vegetable sweet corn	57	118	**48%**	628.9	1114.1	**56%**	99,723	197,360	**51%**
forage pasture silage	87	240	**36%**	1288.1	3171.0	**41%**	33,953	65,702	**52%**
flowers, shrubs, plants	18	29	**62%**	267.5	498.0	**54%**	7,083	12,678	**56%**
nursery ornamentals	23	56	**41%**	277.7	749.3	**37%**	94,023	148,746	**63%**
turf	1	6	**17%**	4.6	26.0	**18%**	25,073	26,909	**93%**
horse farms	33	136	**24%**	311.3	1132.9	**27%**	19,076	78,618	**24%**
dairy farms	5	12	**42%**	370.1	442.0	**84%**	4,296	5,993	**72%**
beef farms	6	36	**17%**	67.5	501.3	**13%**	2,050	21,184	**10%**
sheep farms	13	30	**43%**	430.9	558.6	**77%**	4,340	12,317	**35%**
livestock other and mixed unknown	26	260	**43%**	216.9	481.1	**45%**	3180	14175	**22%**
chicken turkeys	18	52	**35%**	122.9	428.4	**29%**	61,058	73,256	**83%**
unknown, other	26	248	**10%**	161.3	2271.4	**7%**	5,325	128,460	**4%**
greenhouses	6	11	**55%**	34.8	93.1	**37%**	48,834	52,783	**93%**
Summary	367	**1,127**	**33%**	4613.6	12318.6	**37%**	477,190	959,290	**50%**

Table SR1: Survey Response: Frequency of Return, Area and CRD Water Consumption by Farm Type

(Total survey number was determined merging the BCAA mailing list with the Land Use Inventory (LUI) properties. This identified 1090 properties. Additional 37 survey properties were added to the base as these were not included in the 1090 properties. This resulted in a total of 1127 agricultural surveys)

Table SR1 provides information on survey response by general farm type. Farm type for each property was determined from the LUI primary agriculture activity field which indicates primary farm type. Some farm properties did not have a primary agriculture activity identified during the LUI survey due to the nature of the survey (visual off-property assessment with no formal interviews). They were either classified as unknown or by farm type based on crop and livestock information from a survey (if available).

Graph SR1a: Summary of Farm Area by Farm Type (Respondents)



In addition there are misclassified farm types due to errors or lack of detail in LUI assessment of primary agriculture activity (due also to the nature of LUI survey). For example, the nursery/ornamental farm type was described as nursery or nursery with greenhouses. Thus, this farm type will also contain greenhouses. Other farms were only identified as greenhouses – these have been treated as a separate farm type. Nevertheless, the LUI does however provide a reasonable framework to assess the survey response by different farm types.

Some observations of Table SR1 and Graph SR1.a are:

- Generally there is reasonable representation of most farm types.

- Most farms types (11 out of 15) are well represented in the survey from a frequency, area and CRD consumption perspective. All of these have a survey frequency response of 35% or more.
- Farm types with lesser representation include turf, horse, beef, and unknown, although the one survey for turf farms accounts for 93% of CRD turf farm consumption.
- Finally, although tree fruit/nut farms are well represented from a frequency and area perspective, the surveys only account for 23% of their CRD water consumption.

Section One: Water Sources and Uses

Water Sources: Overview

The most common source of agriculture water among survey respondents is CRD water or CRD water combined with well and/or creek water (54%) based on 367 surveys (Table SR2 and Graphs SR1.b and SR2). Wells, creeks, dugouts and/or other sources account for 31% of agriculture water sources. The remaining 14% of the surveys had no water source information. This may indicate that their water sources are natural (rain water) or the survey question was not completed as question 4 did not request this information (no data).

Graph SR1b: Proportion of Water Use by Farm Type (Respondents)

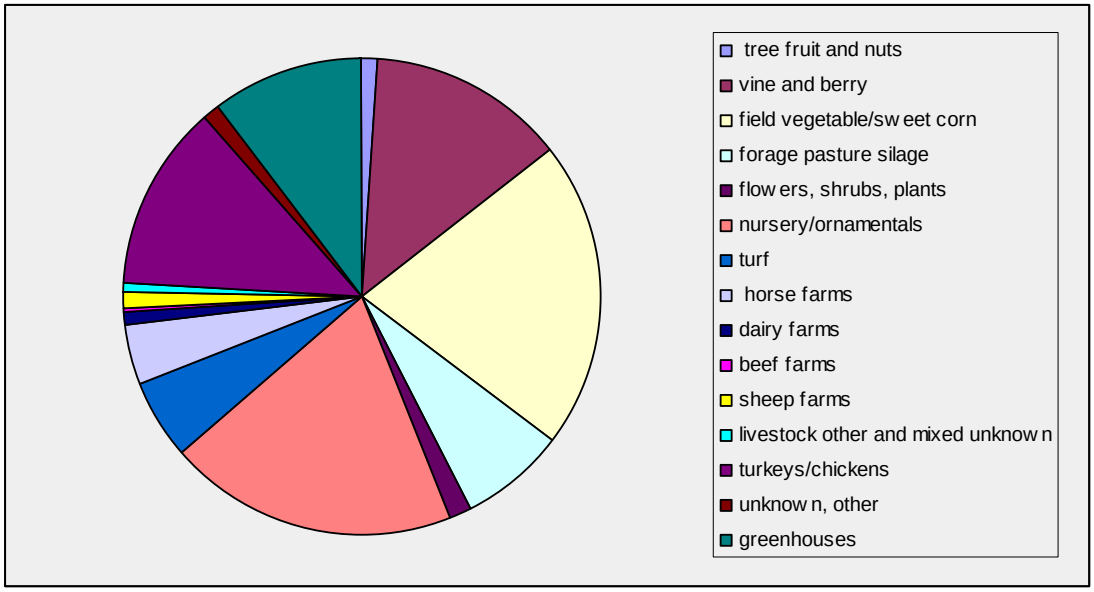
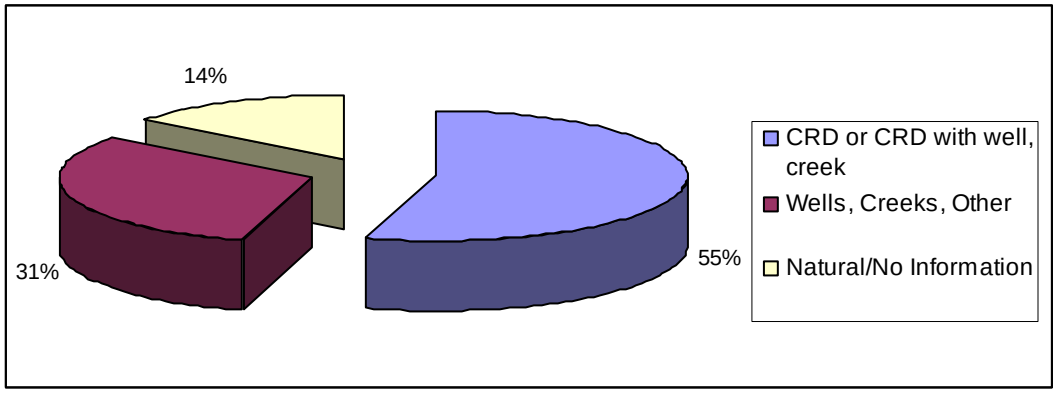


Table SR2: Water Sources

CRD or CRD with well, creek	54%	200
Wells, Creeks, Other	31%	114
Natural/No Information	14%	53
Total # of Surveys		367

Graph SR1c: Major Sources of Water



Water Sources by Frequency of Survey Responses

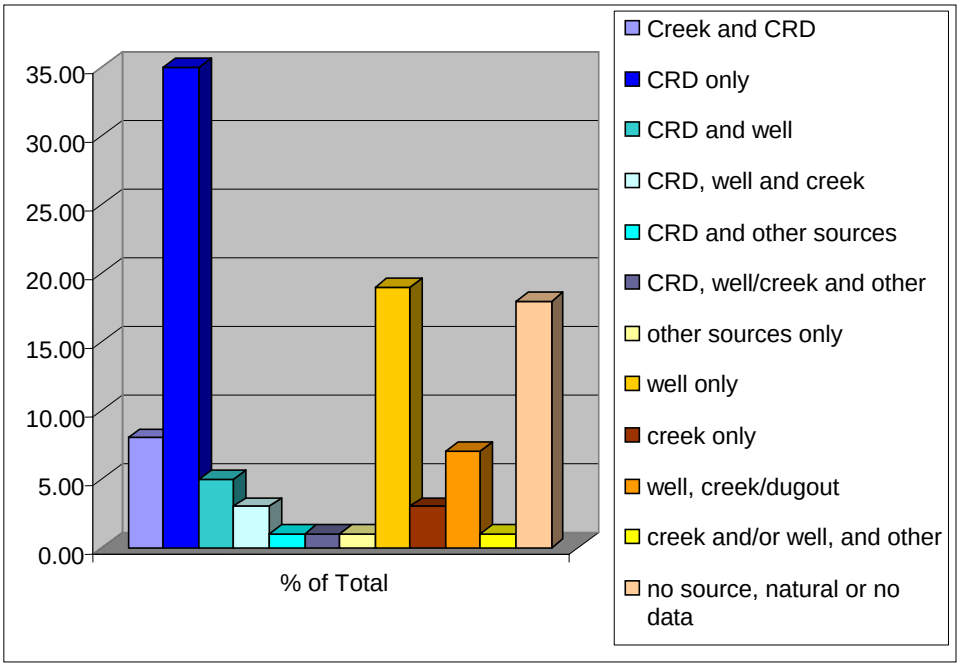
The overall agriculture water sources can be further subdivided into 12 groups on the basis of different combination of sources. These are outlined below in Table SR3 and Graph SR2. Based on these combinations the top three water sources are:

- CRD-only water source (35%)
- Well-only water source (19%)
- Natural water source/no data (18%).

Table SR3: Various Combinations of Water Sources

Water Source	# of surveys	%of total
Creek and CRD	30	8%
CRD only	135	35%
CRD and well	18	5%
CRD, well and creek	10	3%
CRD and other sources	5	1%
CRD, well/creek and other sources	2	1%
other sources only	2	1%
well only	71	19%
creek only	10	3%
creek and well	27	7%
creek and/or well, and other sources	4	1%
natural or no data	53	18%
Total	367	100%

Graph SR2: Various Combinations of Water Sources



Water Uses: Overview

The agricultural use of water from different sources results were based on 314 surveys (53 surveys had no data). The results are outlined below in Tables SR4 and SR5, and Graph SR3.

Water use by category, regardless of source is:

- 42% of respondents reported irrigation water use
- 31% of respondents reported domestic and other water uses
- 20% of respondents reported livestock water use
- 7% of respondents reported crop washing water use

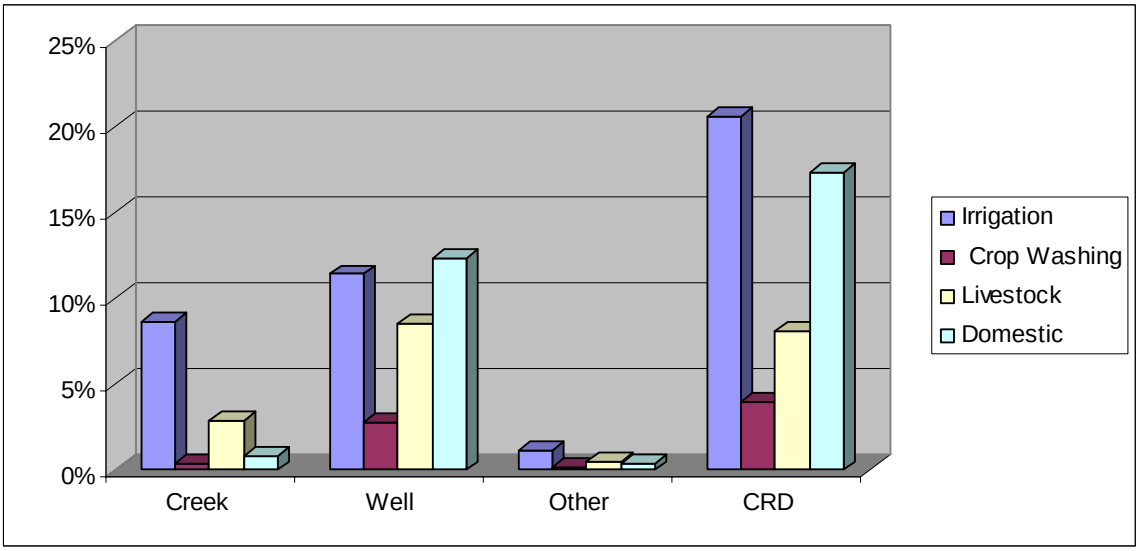
Table SR4: Number of Responses for Each Water Source and Use
(Based on 314 Surveys)

	Creek	Well	Other	CRD	Total Responses	%
Irrigation	66	87	9	157	319	42%
Crop Washing	3	21	1	30	55	7%
Livestock	22	65	4	62	153	20%
Domestic	6	94	3	132	235	31%
Total	97	267	17	381	762	

Table SR5: Per Cent Responses of Water Use by Water Source
(Based on 314 surveys)

	Creek	Well	Other	CRD
Irrigation	9%	11%	1%	21%
Crop Washing	0%	3%	0%	4%
Livestock	3%	9%	1%	8%
Domestic	1%	12%	0%	17%
Total	13%	35%	2%	59%

Graph SR3: Per Cent Surveys for Each Water Source and Use
(Based on 314 surveys)



The above information indicates the following:

- CRD water was the most frequently identified source for irrigation and crop washing. CRD water was the most commonly identified source for irrigation equalling wells and creeks together.
- Well and CRD water were equal as a source for livestock use.
- Well and CRD are important domestic water sources.

Water Uses: Specific

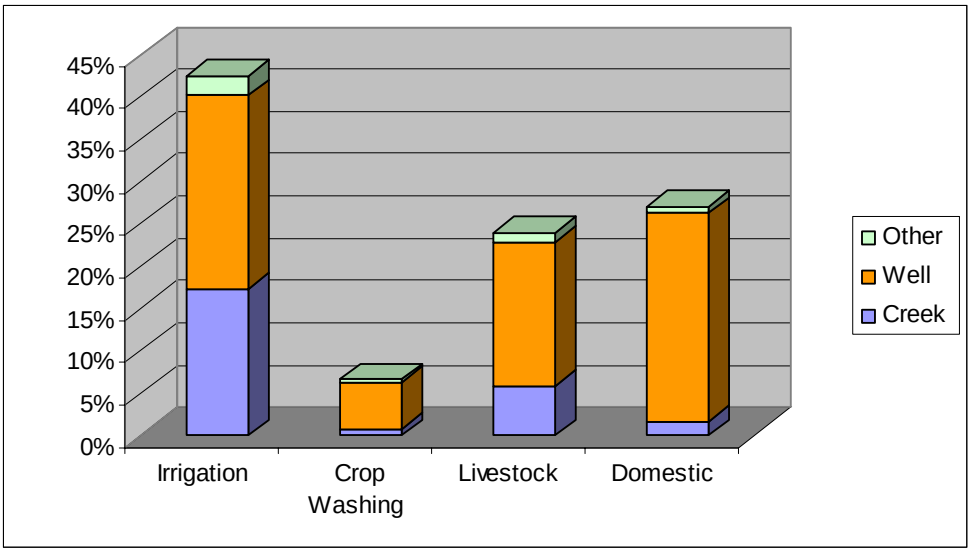
Uses of Water from Non-CRD Sources by Frequency of Survey Responses

Water use excluding CRD sources is outlined on Table SR6 and Graph SR4 and was based on 181 surveys. This data demonstrates the important role of well water for all four agriculture uses, and creek water as a tertiary source for irrigation and livestock. Graph SR5 details survey frequency for farm sectors (groupings of farm types). Two sectors are identified and are *crop production* (tree fruit, vine/berry, vegetable, nursery, turf, greenhouse farm types) and *livestock* (beef, diary, sheep, swine, livestock unknown, and unknown). This information illustrates the importance of wells to livestock and crop irrigation, and the importance of wells as a domestic water source (Graph SR6 and SR3).

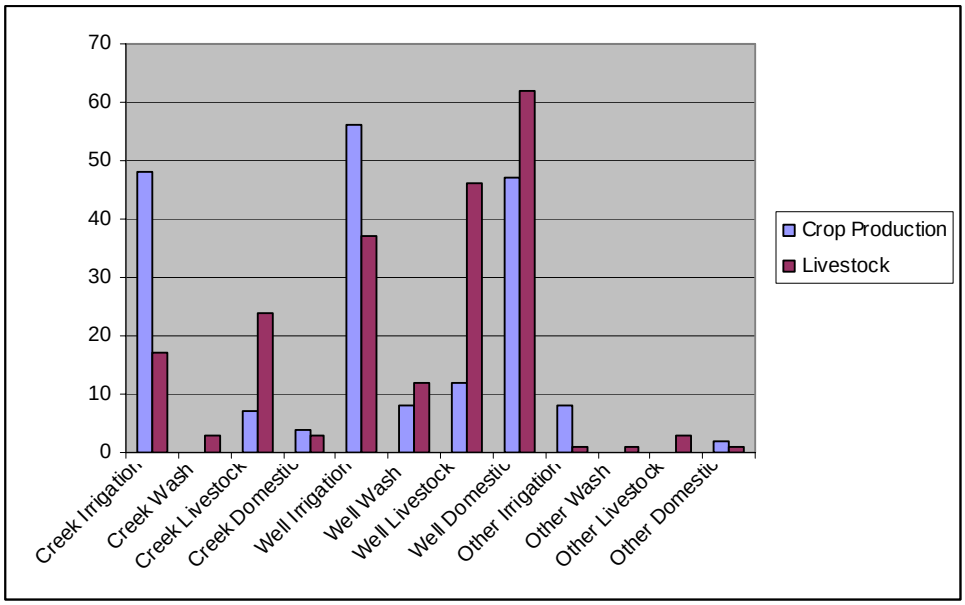
Table SR6: Water Use Responses for Each Non-CRD Source
(Total Number of Surveys = 181)

	Creek	Well	Other
Irrigation	66	87	9
Crop Washing	3	21	1
Livestock	22	65	4
Domestic	6	94	3

Graph SR4: Per Cent Responses of Agriculture Water Use excluding CRD



Graph SR5: Frequency of Responses by Source and Use (Excluding CRD)



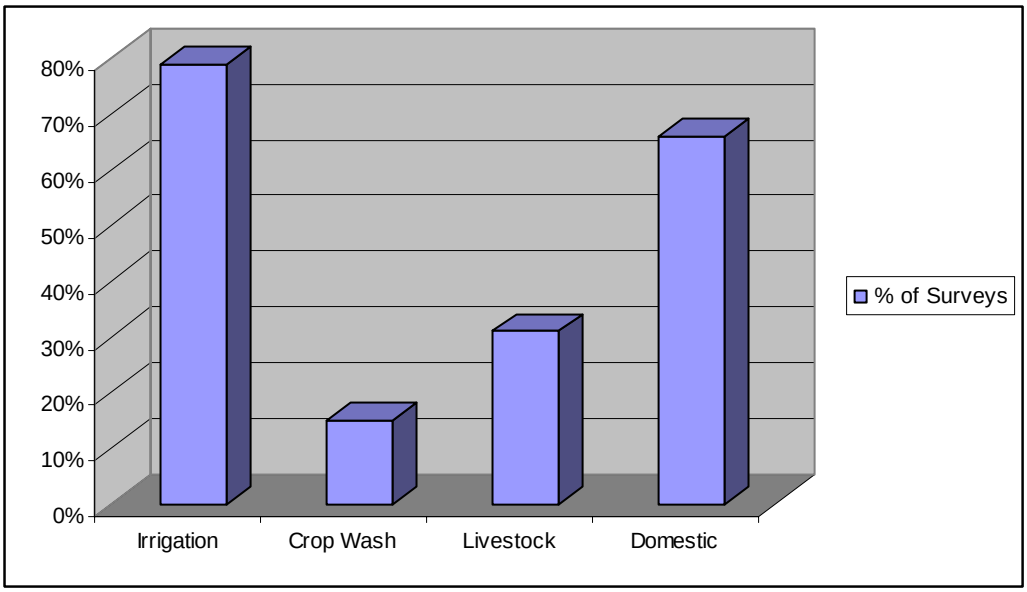
CRD Water Uses by Frequency of Survey Responses

A total of 200 surveys (55% of the total number of surveys) identified some type of CRD water use. The results are in Table SR 7 and Graph SR6. These surveys indicate that CRD water is important source for irrigation (79% of the surveys), domestic (66% of the surveys) and livestock (31% of the surveys).

Table SR7: Per Cent of Surveys for Each Agriculture Water Use

	% of Surveys	# of Responses
Irrigation	79%	158
Crop Wash	15%	30
Livestock	31%	62
Domestic	66%	132

Graph SR6: Uses of CRD Water by Percentage of Survey Responses



CRD Water Uses by Volume

Information on CRD consumption water use was based on 89 surveys. These surveys were determined in the following manner. The first step was to identify those surveys that used CRD water, of which there were 200 surveys. These surveys were then assessed for proper completion of question 4 in the survey, i.e., the total volume of all entries did not exceed a 100%. Unfortunately, many respondents answered this question incorrectly, resulting in only 135 surveys meeting this criterion. The surveys were then merges with the CRD retail data resulting in match of 89 surveys.
The 89 surveys were then sorted into two groups; one group consisting of those surveys that only used CRD water and the other consisting of surveys that used CRD with other sources. For the former, water consumption was determined by multiplying the % volume estimate by each agriculture use (provided in the survey) times the CRD retail consumption rate. For the latter, water consumption use was determined by summing the total municipal %volume and dividing the % volume for each agriculture municipal water use by this sum. This value was then multiplied by the CRD consumption rate to determine the consumption estimate for each agricultural use.

Based on the above method, irrigation accounted for 92% of the retail water consumption for the 89 surveys. Table SR8 summarizes the results for the overall consumption for the agricultural uses of irrigation, crop washing, livestock and domestic.

Table SR8: CRD Retail Water Consumption by Agriculture Use

	Irrigation (m3)	Crop Washing (m3)	Livestock (m3)	Domestic (m3)	
Consumption Total	399605	5614	9590	19027	433836
%	92%	1%	2%	4%	100%

Table SR9 and Graph SR7 summarise CRD water consumption by the two farm sectors. These groups are *crop production* (tree fruit, vine/berry, vegetable, nursery, pasture, turf, greenhouse farm types) and *livestock* (beef, diary, sheep, swine, livestock unknown, and unknown). Unknown farms accounts for less than 1% of total CRD consumption.

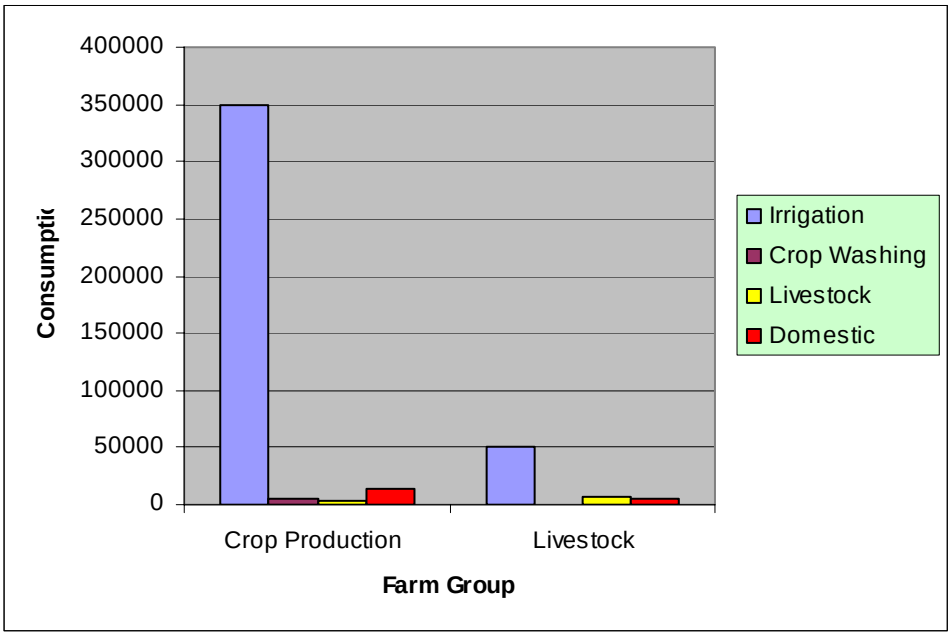
The results indicate:

- Crop production sector is the largest consumer of CRD water (volume); irrigation for crop production purposes is 87% of irrigation volumes and 80% of total volumes.
- Generally there are very low volumes of CRD water used for livestock and crop washing.
- Domestic water consumption is also greatest for the crop production sector.

Table SR9: CRD Retail Water Consumption by Farm Sectors

Farm Sector Consumption (m3)	Irrigation	Crop Washing	Livestock	Domestic	
Crop Production	349455	5503	3200	13967	
Livestock	50150	111	6390	5060	
Total Consumption (m3)	399605	5614	9590	19027	433836

Graph SR7: Water Consumption Use by Farm Sectors
(Consumption in m3)



CRD water consumption by specific farm type is reported in Table SR10 and Graph SR7a. The survey responses indicate the following:

Within the Crop Production Sector

- Nursery/ornamentals farm types (which may have greenhouses) are the largest consumer of retail water for irrigation purposes (about 31% of irrigation water consumption).
- The second largest retail consumer for irrigation is field vegetable farms (23% consumption of irrigation water).
- The greenhouse irrigation value is relatively low (9% of irrigation water consumption) and is may be due to method of LUI coding primary activity. However, combining nursery/ornamentals (some with greenhouses) and greenhouses accounts for 40% of the consumption of irrigation water.
- The turf farm retail consumption is based on 1 major turf farm which accounts for 6% of the consumption of irrigation water and 93% of water consumption of this farm type (see Table SR1)

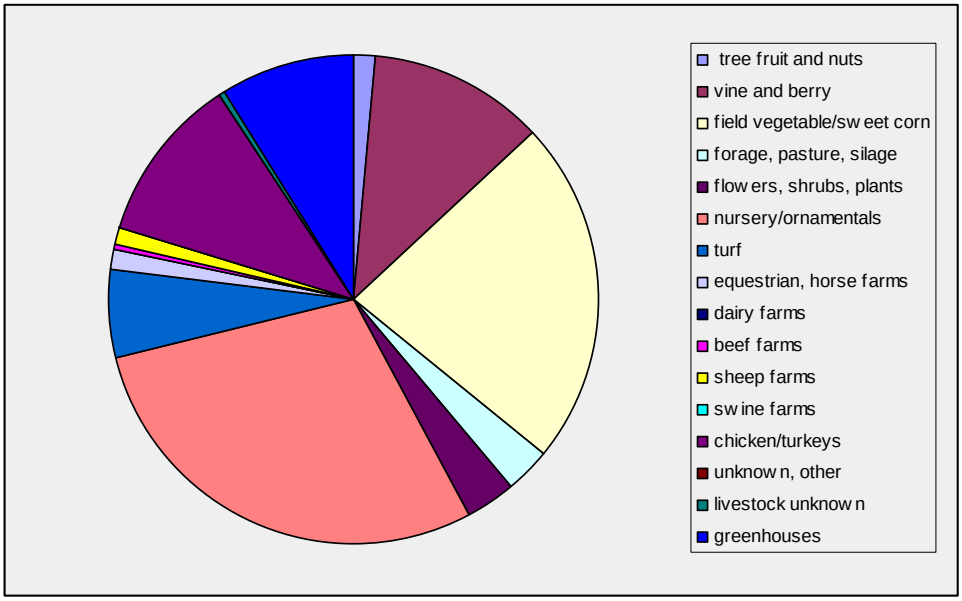
Within the Livestock Sector

- The chicken/turkey farms come out as one of the largest overall consumers of retail water, 11.2%, and the largest consumer in the livestock sector. However, this result may be misleading due to the very limited number of surveys returned from this sector.
- Low beef farm consumption values may be a result of the small sample size of beef farms in the overall survey or reflect a greater dependence on well and creek sources, or a combination of both.

Table SR10: Retail Water Consumption by Farm Type and Use

Farm Type	Irrigation (m3)	Crop Washing (m3)	Livestock (m3)	Domestic (m3)	Total (m3)	% of Total use
tree fruit and nuts	4730	0	2	916	5648	1.3%
vine and berry	47220	335	0	3794	51349	11.8%
field vegetable/sweet corn	91387	4335	1172	1226	98120	22.6%
forage, pasture, silage	7707	0	1862	4268	13837	3.2%
flowers, shrubs, plants	12412	154	164	1863	14593	3.4%
nursery/ornamentals	124008	0	0	990	124998	28.8%
turf	25073	0	0	0	25073	5.8%
equestrian, horse farms	3585	0	1555	1224	6364	1.5%
dairy farms	0	0	0	0	0	0.0%
beef farms	0	0	1186	0	1186	0.3%
sheep farms	1078	0	868	2395	4341	1.0%
swine farms	0	0	85	138	223	0.1%
chicken/turkeys	45348	73	2510	510	48441	11.2%
unknown, other	7	38	0	131	176	0.0%
livestock unknown	132	0	186	662	980	0.2%
greenhouses	36918	679	0	910	38507	8.9%
Total	**399605**	**5614**	**9590**	**19027**	**433836**	**100.0%**

Graph SR7a Total Water Consumption by Farm Type



Section Two: Crop Production

Two hundred and seventy-six surveys identified some level of crop production representing 75% of the total number of surveys.

Overview Data

An overview of crop, irrigated and greenhouse area are presented in Table SR11. This data indicates that 68% of the crop production area was irrigated. The total area of greenhouses is 1,511,996 square feet.

Table SR11: Crop, Irrigation and Greenhouse Area

Crop Area (acres)	Irrigated Area (acres)	Greenhouse Area (sq ft)
3354	2275	1511996

Water shortage Concerns

Only 14% responded that water shortages in 2004 limited their crop production or quality crops in 2004. The reasons for this were not identified.

Crop irrigation timing

The average start month and end month of irrigation for field crops is as follows:

- Irrigation beginning in May
- Irrigation ending in September

Table SR12: Average Start/End Dates for Field Crop Irrigation

Average Irrigation Start Month	Average Irrigation End Month
5	9

The average start/end data is based on those surveys that indicated crop area in production and irrigation start and end dates. However, it did not include those surveys that indicated crop area, irrigation start and end dates and greenhouse area as it is unknown which activity (greenhouse versus field crop) the irrigation start and end dates applied. These averages in Table SR12 are based on a total of 152 surveys.

No determination could be made on greenhouse irrigation timing as only 12 surveys reported greenhouse operations – a small sample. The irrigation range for the start month was January to August, with an end range from August to December. Six greenhouses reported year–round irrigation.

Specific Crop Type, Greenhouse and Irrigation Methods

Specific details on the types of crop production, area irrigated and irrigation methods are provided below.

Total field area and area irrigated

The total field area reported in the surveys was 3354 acres, of which 2275 acres were irrigated in 2004 (68% of the total crop area). This is based on 276 surveys (75% of all surveys) for which there were specific crop production information. Information on the total field area and area irrigated for a number of farm types is presented in Table SR13 and Graph SR8.

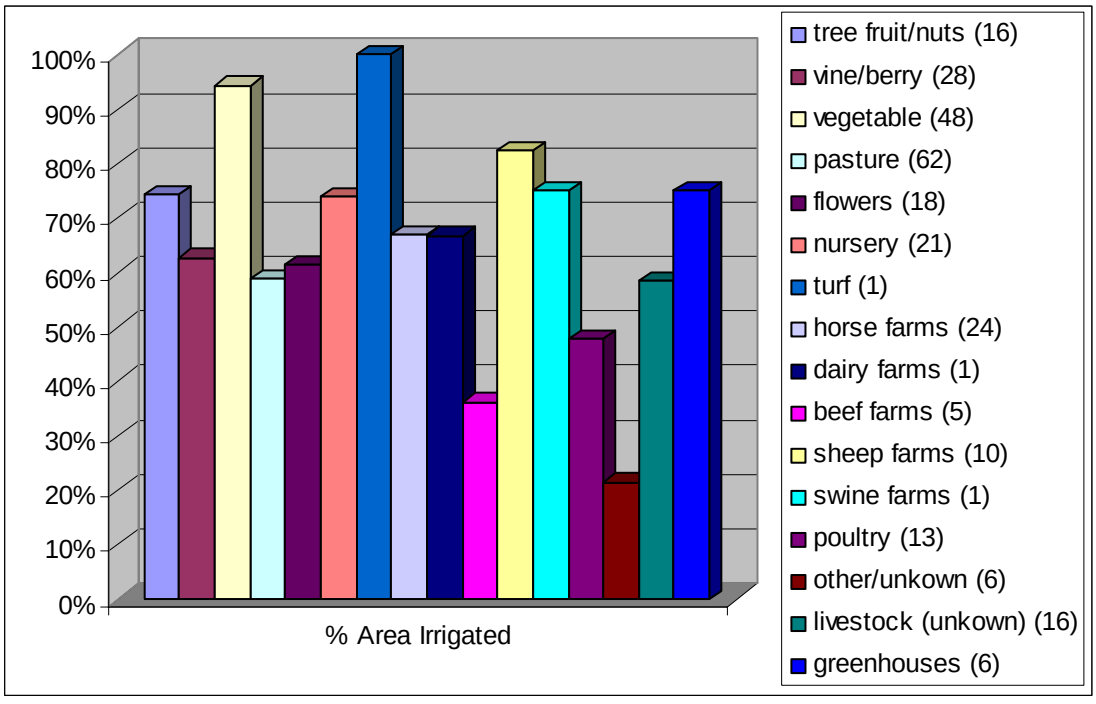
SR13: Crop and Irrigated Area by Farm Type

(Number in farm type represents total # surveys for that farm type)

Farm Type	Crop Area (acres)	Irrigated Area (acres)	% Area Irrigated
tree fruit/nuts (16)	66	49	74%
vine/berry (28)	182	114	63%
vegetable (48)	614	579	94%
pasture (62)	1299	764	59%
flowers (18)	306	188	61%
nursery (21)	134	99	74%
turf (1)	20	20	100%
horse farms (24)	142	95	67%
dairy farms (1)	300	200	67%
beef farms (5)	47	17	36%
sheep farms (10)	85	70	82%
swine farms (1)	8	6	75%
poultry (13)	92	44	48%
other/unknown (6)	14	3	21%
livestock (unknown) (16)	41	24	59%
greenhouses (6)	4	3	75%
Total (276)	3354	2275	68%

Graph SR8: Per Cent Area Irrigated by Farm Type

(Number in farm type represents total # surveys for that farm type)



Total greenhouse area for specific crop types

Table SR 14 provides information on the greenhouse area for different crops. The top three crop uses of greenhouses are:

- Flowers and shrubs (40%)
- Other (32%) of which 400,000 sq ft of greenhouse area is for reforestation (1 survey); the remaining other greenhouse uses include herbs, mushrooms, and orchids.
- Nursery, ornamentals, and shrubs (27%)
- The remainder are all less than 1%

Note: The difference between the greenhouse area total identified in question 6 (1,511,996 sq ft) and the total area in green house in question 9 (1,310,580 sq ft) is due to some respondents not completing question 9. Question 9 requested further details on specific crop production for greenhouse production.

Table SR14: Greenhouse Area and Per Cent by Crop Type

Crop Type	% Total Greenhouse Area	Total Area Greenhouse (sq ft)	# of surveys with greenhouse data
tree fruit, nuts	< 1%	3815	2
berry/vine)	< 1%	7815	5
vegetables	< 1%	4050	12
sweet corn	-		
pasture	-		
silage	-		
forage	-		
flowers, shrubs	40%	523590	14
nursery/ornamentals	27%	351510	10
turf	-		
other	32%	419800	5
		1310580	48

Irrigation Methods and Crop Production

There were a total of 563 responses to the survey question 9 that requested specific irrigation methods for specific crop types (Table SR15). The per cent irrigation method of each crop type is presented in Table SR16.

Sprinkler and trickle irrigation, regardless of crop type, are the most popular methods of crop irrigation accounting 43% and 30% respectively (Graph SR9).

Table SR15: Frequency of Irrigation Use by Crop Type
(Number in brackets in crop type = # surveys for that crop type)

Irrigation Method/ Crop Type	Sprinkler	Gun	Trickle	Wand	Other	Total Number of Responses
tree fruit, nuts (76)	25	2	33	12	2	74
berry/vine (79)	23	2	44	8	2	79
vegetables (109)	62	15	42	20	4	143
sweet corn (23)	12	9	3	1	1	26
pasture (55)	26	5	0	1	0	32
silage (40)	11	5	0	0	0	16
forage (31)	12	11	1	0	1	25
flowers, shrubs (39)	32	5	25	25	4	91
nursery/ornamentals (17)	21	1	12	12	1	47
turf (17)	13	0	1	0	0	14
other (13)	5	1	6	3	1	16
Total Responses	242	56	167	82	16	

Graph SR9: Per Cent Irrigation Use Response Regardless of Crop Type

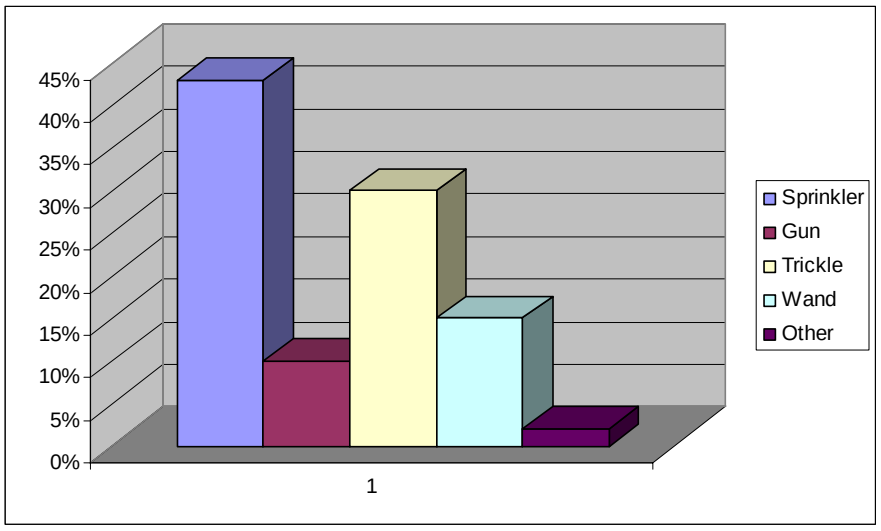


Table SR16: Per Cent Irrigation Method for Each Crop Type
(Number in brackets in crop type = # surveys for that crop type)

Irrigation Method/ Crop Type	Sprinkler	Gun	Trickle	Wand	Other
tree fruit, nuts (76)	4%	0%	6%	2%	0%
berry/vine (79)	4%	0%	8%	1%	0%
vegetables (109)	11%	3%	7%	4%	1%
sweet corn (23)	2%	2%	1%	0%	0%
pasture (55)	5%	1%	0%	0%	0%
silage (40)	2%	1%	0%	0%	0%
forage (31)	2%	2%	0%	0%	0%
flowers, shrubs (39)	6%	1%	4%	4%	1%
nursery/ornamentals (17)	4%	0%	2%	2%	0%
turf (17)	2%	0%	0%	0%	0%
other (13)	1%	0%	1%	1%	0%
Total	43%	10%	30%	15%	2%

Section Three: Crop Washing

Estimates on Crop Washing Water Volumes and Facility Use

Table SR17 summarizes the data on water volume estimates for crop washing based on 25 surveys (or about 50% of the surveys that indicated crop washing in question 4). Table SR18 provides some summary information on crop washing facility use.

Approximate water volumes in Table SR17 were calculated in the following manner:

- Summing surveys that provided total water volume estimate, or
- Multiplying facility washing time by gal/minute provided in the surveys.

Table SR17: Water Volume Estimates for Crop Washing

Total Wash (hours)	# of Surveys	Average Wash (hr/year)
2949	25	118

Crop washing facilities were used by survey respondents for a total of 2,949 hours in 2004, with an average of 118 hours per facility. These results were based on 25 surveys.

Stable SR18: Crop Washing Facility Use

Units	Total Volume Estimated directly by respondents	Total Volume calculated from time and flow rate estimates (washing time x m^3/min)	Total Estimated Crop Washing Water Use
m^3	541	111	652

Section Four: Livestock

Estimates of Water Volumes Used

Table SR19 summarizes the estimated volume of water used for livestock (including building/equipment washing) from 99 surveys. A total of 209,966 m^3 was reported to be used for watering livestock, and 93,430 m^3 was reported to be used for livestock building and equipment washing.

Table SR19: Livestock Water Volume Estimates

	Livestock Watering (m^3)		Total Reported Livestock Water Use by survey respondents (m^3)
Total (m3)	209,966	93,430	303,396
Average (m3)	2,121	1,584	3,064
Range (m3)	0.03 – 163,660	0.02 – 90,922	
# of Surveys	99	59	99

The upper value of the livestock range (163,660 m^3) was from a horse operation whereas the upper value for the building/equipment wash range (90,922 m^3) was for a diary farm. Without these surveys, the livestock upper range value would be 18,184 m^3 and the upper value for the building/equipment washing would be 750 m^3.

Assuming that the building/equipment water volumes are part of the overall livestock volume water estimate, the average per cent per farm of overall water volume for this activity is 14% based on 59 surveys. The average is based on the sum of the average for each farm divided the number of farms. However, there is some ambiguity in questions 13 and 14 as question 14 does not specifically ask how much *of the total livestock water* is used for building/equipment washing.

Livestock and Poultry Estimates

Tables SR20 and SR21 represent the total numbers of livestock and poultry reported by survey respondents. These results are based on 154 surveys that responded positively to livestock on the property.

The livestock summary indicates that sheep/goats and dairy animals are the most common, accounting for 39% and 23% respectively of all animals (Table SR20).

Table SR20: Frequency of Livestock

(# of surveys refers to the number of surveys of the 154 total reporting a specific livestock).

Livestock Type	Number of Livestock	Per Cent of All Livestock (number/# of surveys)	# of Surveys Reporting
Dairy	867	23%	6
Beef	316	8%	26
Replacement Stock	538	14%	6
Swine	93	2%	10
Horses	359	10%	39
Sheep/Goats	1458	39%	47
Other	98	3%	6
Total	3729	100%	

Layers are the dominant type of poultry, accounting for 80% of all the birds from the survey. However, this high per cent of layers is the result of one large producer in the survey that has a flock size of 15,200 birds or 80% of the layer total. Without this producer, the average layer flock size would be about 58 birds with a range of 2 - 375 birds. Other flock birds include ducks and ostrich.

Table SR21: Poultry Frequency

(# of surveys refers to the number of surveys of the 154 total reporting a specific poultry type)

Poultry Type	Total Number of Birds	# of Surveys	Per Cent of All Birds	Average total birds/# survey)	Range (# Birds)
Turkeys Processed	464	9	2%	52	6 - 150
Meat Chickens Processed	2981	16	13%	186	3 - 1590
Layers - Flock Size	18913	65	80%	291	2 -15200
Layers - Processed	587	10	2%	59	2 - 200
Other Flock Size	515	9	2%	57	3 - 300
Other Processed	320	5	1%	64	50 - 100
Total	23780		100%		

Types of Livestock and Poultry Watering Systems

A total of 141 surveys provided data on livestock watering systems (Table SR22). The most common watering system types used are water buckets (32%) and troughs that are hosed filled (23%). Some types of other water systems include ponds and tubs.

Table SR22: Frequency of Livestock Watering Systems

Watering System	# of Responses	Per Cent of Responses
Troughs - float regulated	36	15%
Troughs - hose filled	55	23%
Water Buckets	77	32%
Pressure Water bowls	44	18%
Pressure Nipples	10	4%
Other (describe)	17	7%
Total Responses	239	100%

Section Five: Accessory On-Farm Operations

The total volume of water used is 2,974 m^3 based on 17 surveys or about 5% of the overall survey total. The small number of surveys and information related to on-farm activities limits the usefulness of this data. The types of on-farm operations reported in these surveys are summarized in Table SR23. The high number of customers in direct farm marketing facility is due to one large facility (survey) which identified 20,000 customers. Some other activities noted in the surveys were art shows, corn maze, washing equipment for Agriculture Canada and manufacturing wine cases.

Table SR23: Summary of On-Farm Operations

Operation	# of Responses	Type of Activity in 2004	Quantity	# of Responses for Quantity
Bed and breakfast or guesthouse	1	Guest nights	300 nights	1
Restaurant or food service (picnic)	3	Customers served	no data	0
Winery/cider tasting room/tours	2	Customers served	20 customers	1
Direct farm marketing facility	19	Customers served	20,555 customers	5
On-farm food processing	8	Describe product(s) & process	no data	no data

Section Six: Domestic Use and Municipal Water Supply

A total of 287surveys indicated domestic water use or about 78% of all the surveys. Of these, 200 respondents (70% of domestic users) reported watering their lawns or landscape plants (Table SR 24).

Table SR24: Domestic Water Use

	Domestic Use	Lawn Use
# of survey responses	287	200
% of Surveys	78%	54%
Total # Surveys	367	367

Section Seven: Water Efficiency and Conservation Practices

Water Efficiency Self-Assessment

A total of 312 (85%) out of the 367 survey respondents rated their efficiency of water use in 2004. Overall self-assessment of water efficiency was high with 93% of respondents rating their water use efficiency as excellent or good; only 1% felt their water efficiency was poor (Table SR25).

Table SR25: Water Use Efficiency Rating

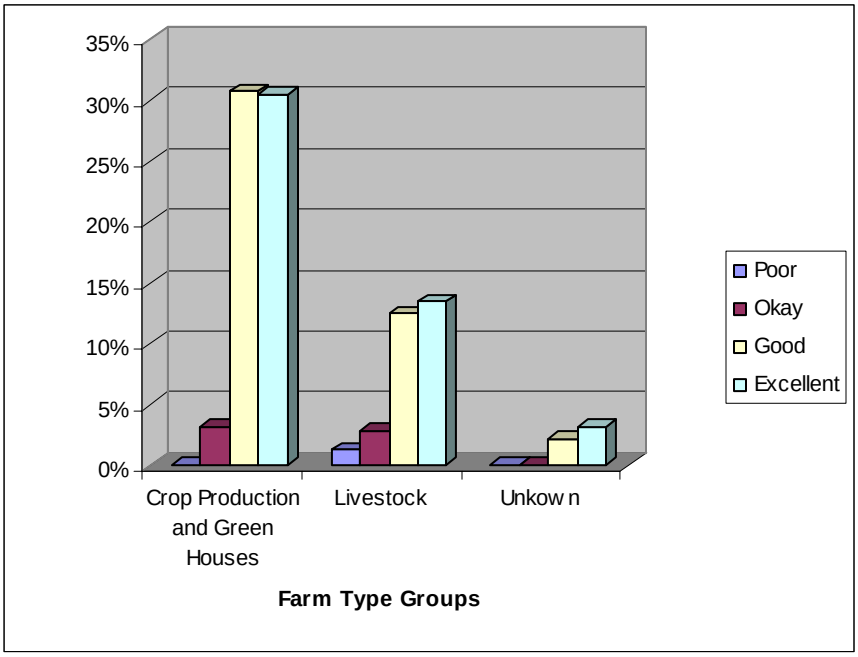
Water Use Efficiency Self-Assessment	# of Surveys	% of Total
4 - excellent	147	47%
3 - good	142	46%
2 - okay	19	6%
1 -poor	4	1%
Total	312	100%

Table SR26 and Graph SR10 present the water use efficiency self-assessments for 2 farm sectors - *crop production* (tree fruit, vine/berry, vegetable, pasture, nursery, turf, greenhouse farm types) and *livestock* (beef, diary, sheep, swine, livestock unknown), and for *unknown farm types*. There does not appear to be any differentiation between the groups as all have high efficiency ratings.

Table SR26: Water Use Efficiency Ratings by Farm Sectors

Grouped Farm Types	Poor	% Poor	Okay	% Okay	Good	%Good	Excellent	% Excellent	# of Surveys
Crop Production and Green Houses	0	0%	10	3%	96	31%	95	30%	201
Livestock	4	1%	9	3%	39	13%	42	13%	94
Unknown	0	0%	0	0%	7	2%	10	3%	17
Total									312

Graph SR10: Water Use Efficiency Self-Assessment by Farm Sectors



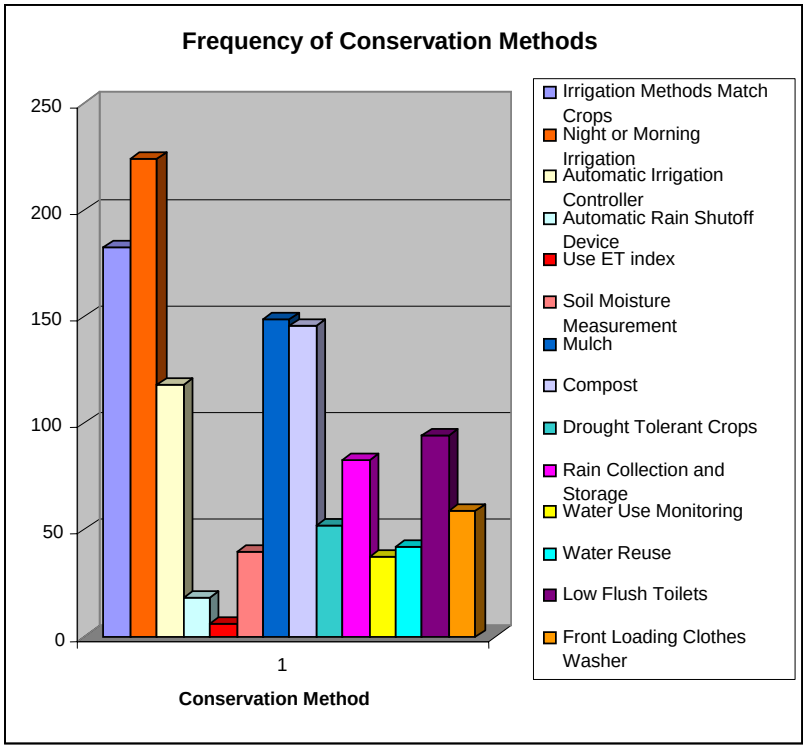
Conservation Practices

When questioned on conservation practices employed in 2004, there were a total of 1251 practices reported in 323 surveys (i.e. average 3.8 practices reported per property) (Table SR27 and Graph SR11). There were an additional 11 surveys that provided conservation practice information but no efficiency rating. The top four conservation practices reported are night or morning irrigation (18%), matching irrigation methods with crops (15%), applying mulch (12%), and applying compost (12%). Low use conservation practices include use of E/T index (<1%), automatic rain shutoff device (1%), soil moisture measurement and water use monitoring (both 3%). These results could prove useful in developing a strategy for a water conservation program.

Table SR27: Frequency of Responses for Conservation Practices in 2004

Efficiency Rating	Irrigation Methods Match Crops	Night or Morning Irrigation	Automatic Irrigation Controller	Automatic Rain Shutoff Device	Use ET index	Soil Moisture Measurement	Mulch	Compost	Drought Tolerant Crops	Rain Collection and Storage	Water Use Monitoring	Water Reuse	Low Flush Toilets	Front Loading Clothes Washer	Total Responses
# Responses	183	224	118	18	6	40	149	146	52	83	37	42	94	59	1251
% of Total	15%	18%	9%	1%	0%	3%	12%	12%	4%	7%	3%	3%	8%	5%	

Graph SR11: Frequency of Responses for Conservation Practices in 2004



There does not appear to be a relationship between the efficiency ratings and the number and range of conservation practices undertaken in each rating group (Table SR28). The average number of conservation practices is similar between efficiency rating classes and most have a wide range of practices. This suggests that efficiency is not related to the number of practices (i.e. more practices reported do not indicate better efficiency).

Table SR28: Average Number of Practices/Survey for Efficiency Ratings

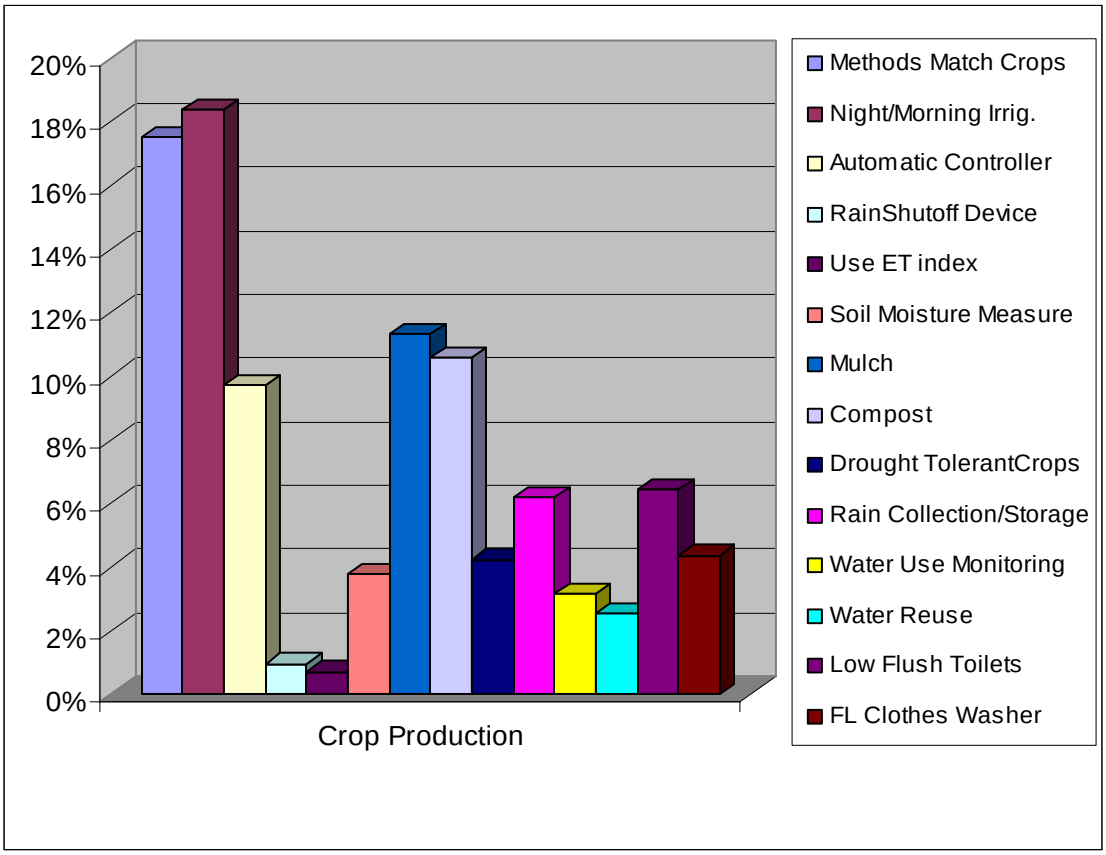
Efficiency Rating	Average # of Practices/ Survey	Range (# of practices)	# of Surveys
1	4.7	1-7	4
2	2.9	0-11	19
3	4	0-10	142
4	3.8	0-12	147

Table SR29 breaks down the responses of conservation methods by farm sector - *crop production* (tree fruit, vine/berry, vegetable, nursery, turf, pasture and greenhouse farm types) and *livestock* (beef, diary, sheep, swine, livestock unknown), and *unknown*. Graph SR12 and SR13 present break down of the conservation method used for crop production and livestock. The results indicate the use of conservation practices is similar between the two farm groups.

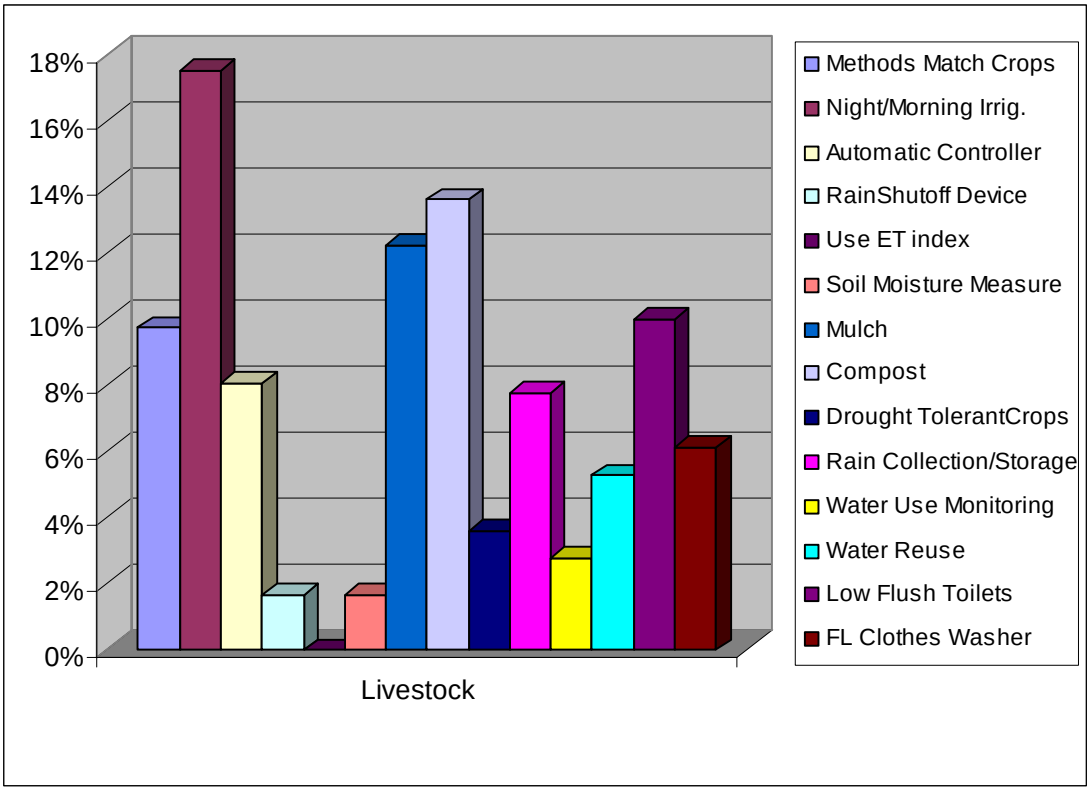
Table SR29: Frequency of Conservation Practices by Farm Group

Farm Sector	Irrigation Methods Match Crops	Night or Morning Irrigation	Automatic Irrigation Controller	Automatic Rain Shutoff Device	Use ET index	Soil Moisture Measurement	Mulch	Compost	Drought Tolerant Crops	Rain Collection and Storage	Water Use Monitoring	Water Reuse	Low Flush Toilets	Front Loading Clothes Washer	# of Responses
Crop Production	144	151	80	8	6	31	93	87	35	51	26	21	53	36	822
Livestock	35	63	29	6	0	6	44	49	13	28	10	19	36	22	360
Unknown	4	10	9	4	0	3	12	10	4	4	1	2	5	1	69

Graph SR12: Per Cent Use of Conservation Practice for Crop Production



Graph SR13: Per Cent Use of Conservation Practice for Livestock Group



Water reduction through increased efficiency

A total of 100 respondents (27%) indicated that they could probably reduce water consumption through increased efficiency, without reducing productivity or incurring new costs. The average % reduction was about 15%; the range of water reduction was from 1 to 100%.

Interest in more information on water efficiency and conservation

A total of 144 respondents (40%) indicated that they would like more information on how to improve water efficiency or to conserve water resources on their property.

Section Eight: Future Changes & Water Use

Future Changes to Property Use

A total of 184 surveys (50%) responded to the question on change in land use, production or residents on their farm properties either by answering 26 and/or completing portions of question 27. A total of 38% of the responses indicated an increase of some form, while a 7% decrease and 55% no change.

Anticipated Changes

Table SR30 presents a summary of the anticipated changes in the agriculture community. The survey suggests significant increases in crop production and area, livestock population and greenhouse area. Some of the "other" changes include selling, putting in a well, offering camping and tours, and opening a Bed and Breakfast.

Table SR30: Anticipated Changes in the Agriculture Community

Category	Frequency of Responses				Percent of Surveys Returned			
	No Change	Decrease	Increase	Total	No Change	Decrease	Increase	Total
Crop Production	67	13	80	160	42%	8%	50%	100%
Field Crop Area	64	10	56	130	49%	8%	43%	100%
Greenhouse Area	49	2	32	83	59%	2%	39%	100%
Crop Washing	46	3	15	64	72%	5%	23%	100%
Livestock Population	53	5	41	99	54%	5%	41%	100%
Accessory Operations	44	3	20	67	66%	4%	30%	100%
Number of Residents	72	11	22	105	69%	10%	21%	100%
Other	1	2	8	11	9%	18%	73%	100%
TOTAL	**396**	**49**	**274**	**719**	**55%**	**7%**	**38%**	**100%**

Future Water Use

The anticipated impacts of these changes on future total water use on the property relative to 2004 water use is outlined in Table SR31. These results were based on 114 surveys. The average per cent increase in water use anticipated is 33%; the future average per cent decrease is 20%; the range is variable for both.

Table SR31: Average Per Cent Increase/Decrease in Water

	Future Increase	Future Decrease
Average	33%	20%
Range	2 -500%	2 -75%
# of Surveys	94	20

MEASURING WATER USE EFFECIENCY*

Using a subset of farm data where 100% of the water used is from the CRD, and where respondents filled out the survey correctly, it was determined that the average water use efficiency* is 1.4 times better than the irrigation benchmark levels for the area (i.e. actual water use is about 70% of what is theoretically needed for optimum crop production). The table and graph (Table WE1 and Graph WE1) below show the difference between the actual use by crop type, the benchmarks for each crop type, and the level of efficiency*. Benchmark irrigation intensities and volumes were calculated for each individual crop area included in the table below using the method described in the "Approach" section of this report. The large discrepancies between benchmark and actual values may be a result of a few factors including, crops are not being irrigated, fields may have been fallow, or the extent and type of the crop may not be accurate.

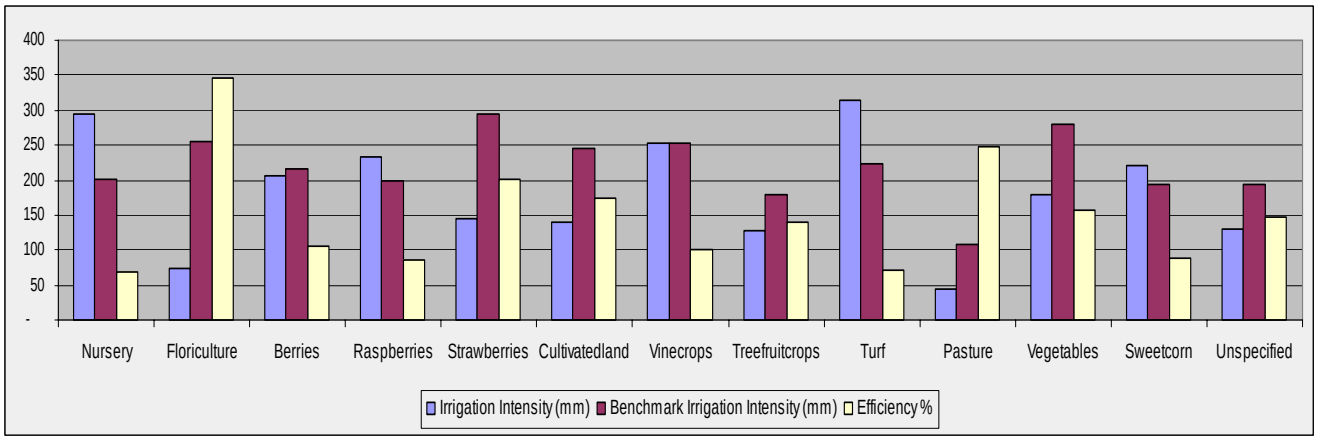
Table WE1: Irrigation Rates – Actual vs. Benchmark, and Efficiency*

CROP	BM_Irr m^3	Astir m^3	# Crops	Farm Area Irrigated (acres)	Irrigated area (m^2)	Irrigation Intensity (mm)	Benchmark Irrigation Intensity (mm)	# surveys = 141
Nursery	21,604.03	31,773.52	7.00	26.60	107,666	295	201	68%
Floriculture	14,771.42	4,258.12	9.00	14.27	57,736	74	256	347%
Berries	40,917.80	39,003.86	14.00	46.55	188,389	207	217	105%
Raspberries	4,329.99	5,063.69	4.00	5.36	21,675	234	200	86%
Strawberries	4,680.32	2,319.16	2.00	3.93	15,920	146	294	202%
Cultivated land	13,063.61	7,450.03	7.00	13.19	53,383	140	245	175%
Vine crops	379.83	379.83	2.00	0.37	1,507	252	252	100%
Tree fruit crops	8,587.92	6,106.90	10.00	11.79	47,729	128	180	141%
Turf	17,912.55	25,072.73	1.00	19.77	80,000	313	224	71%
Pasture	76,185.42	30,644.28	38.00	172.26	697,116	44	109	249%
Vegetables	171,004.42	108,986.56	24.00	151.11	611,537	178	280	157%
Sweet corn	4,540.62	5,146.87	4.00	5.75	23,270	221	195	88%
Unspecified	26,971.30	18,291.09	14.00	34.50	139,618	131	193	147%
TOTAL	**404,949.23**	**284,496.66**	**136.00**	**505.45**	**2,045,547**	**139**	**198**	**142%**

* The term "efficiency" is used in this section in the context of irrigation application efficiency, meaning the ratio of the amount of water theoretically needed based on the model to the amount of water actually applied. For example, if a crop is calculated to need 100 m^3 of irrigation and 125 m^3 is actually applied, then the efficiency is calculated as 100/125 x 100% = 80%. In this context, efficiencies greater than 100% are not possible. Due to the methodology used in this analysis, the "efficiency" as reported takes into account not only the application efficiency but also the ratio of water actually applied during the year to the amount of water theoretically required by the plants to maximize growth through the entire growing season. Thus a reported efficiency greater than 100% indicates that at least some of the crop area reported as "irrigated" was probably not irrigated through the entire season. Sources of error in applying the model may also overstate efficiency in some cases.

The efficiency results are relatively consistent with those from the farmer's self-assessment in the CRD water use survey (see Section Seven, "Water Efficiency and Conservation Practices"). Overall, the results show that farmers are using water efficiently.

Graph WE1: Irrigation Efficiency Rating by Crop Type



SUGGESTIONS FOR FURTHER WORK
Agricultural Water Management in Greater Victoria

The project team during the farm survey and the focus group session identified a number of areas for potential future work related to agriculture water and its use, which are offered as suggestions in this section. It is acknowledged that some of the suggested work falls beyond the specific mandates of the project partners, and would require the participation of other agencies.

1. There is a need for a comprehensive groundwater baseline study to gain a better understanding of this resource, its use (including agricultural), dynamics of the system, overall volumes, recharge and water balance, future water requirements, effects of urbanization, relationship to waste management, efficiency of use, etc. These baseline results could potentially be used to help shape conservation and protection initiatives, address quality and quantity concerns, support an education program, develop effective regulations, etc. These results could also be used to support integrated watershed basin planning – an integrated process for building a water management plans with all water users including the agriculture community. (Refer to Appendix V for specific comments from the focus group with respect to ground water comments and concerns).

2. The farm survey and the focus group both supported the development of a water conservation program to promote improved water use and efficiency through conservation measures. The program design and content should be developed and implemented jointly by the CRD, agricultural community and other levels of government. Features of the program could include on-site environmental farm plans, information on different conservation methods, result from recent research, etc.

3. The focus group strongly supported the need for further education and public awareness with respect to the agricultural use of water (and the agriculture water rate) and the effects of land use and activities on surface and ground water. Education materials and seminars with community decision-makers, interested parties, and schools could be developed to increase public awareness. Some content areas for consideration include:

a. results of the farm survey and future conservation efforts;
b. potential contamination of surface and groundwater from different commercial and urban activities (including agriculture), and effects of this contamination has on water quality and impact on drinking water and farm water sources, freshwater and marine ecosystems, and related industries;

4. The farm survey indicated that most of the CRD water was used for irrigation for field vegetable and vine/berry whereas low volumes of CRD water were used by the livestock sector. This pattern was confirmed by the focus group that identified health standards required the use of municipal water for vegetable, vine and berry crops (BC Vegetable Marketing Board, VIHA – food preparation). In contrast, they pointed out that there was no economic benefit to put in irrigation systems and use CRD water for crops such as hay production. The relationship between health requirements for agricultural water and the availability and quality of water from various sources indicates a need for inter-agency discussion and cooperation.

5. One of the benefits of the study was the development of the integrated spatially referenced dataset that can be used for further analysis and trend monitoring.

   CRD has good spatial data, but there were problems in integrating the datasets assembled for the study as they came from disparate sources. Some of the data was not consistent, particularly its linkage to the property ownership data. For example, the retail water data acquired from the various retailers (municipalities) was not structured consistently, requiring a substantial amount of effort to integrate the data for analysis. There would be considerable benefit, cost savings and improved data accuracy, if the CRD and municipalities were to jointly develop and establish some fundamental data management standards to ensure ease of integration and exchange of information. One data area requiring consistent management is the primary key, which is the JUROL.

Some of the information such as the soil data used in the study lacked specific detail. There is the need for more accurate/detailed data for soils or as the focus group noted there needs to be 'better on farm soils mapping'. Comprehensive soils data is an important base data set to support better water management modeling, research and planning. Thus, the integrity of the data collected for the study to a certain extent was constraint to the study.

Finally, an on-going challenge is the on-going maintenance of this integrated information so as to retain currency and value for future studies.

6. The water efficiency model used in the agriculture water study was a generalized model that was limited by the lack of local information (e.g. crop coefficients or information that was too general (e.g. soils - see above). For example, crop coefficients used for determining irrigation efficiency are based on those used for Southeast Kelowna Irrigation District water conservation studies.

   Although the study results provided a general assessment of water efficiency, the modeling can be improved through a better understanding of local conditions and improved local data. As noted by the study team and the focus group, future water efficiency studies could use the recently updated Ministry of Agriculture and Lands WURLD model. Better benchmarks would be derived from this model provided it was calibrated for local conditions and empirical research was available such as on-farm monitoring of crop coefficients for different crop and soil types, and different irrigation techniques. Irrigation types were not considered in the study model.

7. The study team and focus group identified the need to build and promote cooperation and partnerships with mutual goals between local, provincial and federal governments and the agriculture community. Partnership provides the advantage of leveraging funding and resources to address areas of common interest and develop win-win scenarios (e.g conducting baseline studies, on-farm research) For example, the clay spoil from dugout construction has been used for landfill capping at Hartland Road dump providing a benefit to both farmers and the CRD.

The agriculture water study is an example of three levels of government and the agriculture community working together with a common goal.

The challenge is for someone or group to take the lead and responsibility to seek out various partnership and joint-funding opportunities. This may be accomplished through an informal working group of key players who look for these opportunities and communicate on a regular basis, or perhaps it may be a role best served by the provincial ministry due to its relationship with the other levels of government and the agriculture community.

8. Water management planning should be inclusive. This was recognized by the study team in that the agriculture water study results were largely focused on CRD water use. The focus group also identified watershed based planning as a strategy to address both municipal and local sources of water. Integrated water basin planning is a process to address the water issues and concerns of the different communities (including the agriculture community) within a watershed. The planning process provides a framework to identify issues, community perspectives, stakeholder present and future water demand, future challenges and a process to build a community-based solution. Many of the concerns expressed by the focus group related to water quality and quantity, intensification of farms, land use changes, and urbanization (refer to Appendix V for details) could be addressed through this type of planning. Voluntary measures both on farms and off, such as water audits, groundwater and local surface water diversion metering, and water quality monitoring, would improve knowledge of the extent of usage of these resources.

APPENDIX I
"CRD Water Use Survey"

SURVEY QUESTIONNAIRE
CRD Agricultural Water Use and Conservation Study

Completing the Survey

RESPONSES MUST RELATE TO THE CALENDAR YEAR 2004 ONLY.

- A survey must be completed for each agricultural property (parcel) that you owned in 2004.
- If you leased or rented all or part of a parcel for farming operations, please include the lessee's information on this survey; alternatively please pass this on to the lessee to be completed.
- Please return the survey in the enclosed postage-paid envelope, within two weeks.
- Report all quantities in the units shown in the questionnaire. The following formulas are provide to help you convert from other common units:

hectares	x **2.47**	→ acres
square metres (m^2)	x **10.8**	→ square feet (sq.ft.)
litres per minute	x **0.26**	→ gpm (US)
litres per second	x **16**	→ gpm (US)
kilograms (kg)	x **0.001**	→ tonnes
pounds (lb)	x **0.000454**	→ tonnes

If you have any questions about how to complete this survey, please contact Colwyn Sunderland, CRD Water Services at 250-474-9689 or send an email message to csunderland@crd.bc.ca

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SURVEY QUESTIONNAIRE

Section 1 – General Property Information

1. Please identify the farm property (parcel) that was farmed in 2004

Street Address	**Municipality**	**BC Assessment Roll No.** **** See BCA # on cover letter***

2. Do you own or rent this property? (please check one) rent ☐ own ☐

3. What is the area of the property (parcel) farmed in 2004 _____ acres

4. Please identify the source(s) and uses of water for the property in 2004 **(by percent %) To answer, first identify what are your sources of water (e.g. 70% municipal, 30% creek). Then determine what the per cent use of these water sources for the listed activities, see example below.**

Source	Irrigation	Crop Washing	Livestock	Domestic or Other
Creek, dugout or lake	%	%	%	%
Well	%	%	%	%
Municipal water supply	%	%	%	%
Other (describe)	%	%	%	%

Example

Source	Irrigation	Crop Washing	Livestock	Domestic or Other
Creek, dugout or lake	30%	%	%	%
Well	%	%	%	%
Municipal water supply	30%	%	30%	10%
Other (describe)	%	%	%	%

The total of all the boxes should equal 100%. The example above indicates 70% of the water is supplied from the municipality (of which 30% is used for irrigation, 30% for livestock; 10% domestic); the remaining 30% is from creek, dugout and used for irrigation.

Section 2 – Crop Production

5. Were crops grown on the property in 2004? Yes ☐ No ☐
If no, please go to Section 3

6. How many acres of the property were in crop production, and how many acres were irrigated?

Total Crop Area (acres)	**Field Area Irrigated (acres)**	**Greenhouse or Nursery Area Irrigated (sq. ft.)***
acres	**acres**	**sq. ft.**

7. a) Approximately when did crop irrigation begin in 2004? _____ week of _____ (month)

b) When was crop irrigation stopped? _____ week of _____ (month)

8. Was crop production or quality limited by a water shortage in 2004? Yes ☐ No ☐

9. For each of the following crops, please estimate the area by crop type, how much is irrigated and the type of irrigation.

* "Area of field irrigated" = a percentage of the field area that is irrigated (watered).

Crop Type	Field Area (acres)	Greenhouse or Nursery Area (sq.ft.)	*Area of Field Irrigated (percent)	Water Applied (inches/yr)	Irrigation Types (please tick as applicable)				
					Sprinkler	Gun	Trickle, drip, or mist	Hand Applicator Wand	Other (describe)
Tree Fruits & Nuts			%	"	☐	☐	☐	☐	
Vine & Berry Crops			%	"	☐	☐	☐	☐	
Vegetables			%	"	☐	☐	☐	☐	
Sweet Corn			%	"	☐	☐	☐	☐	
Forage			%	"	☐	☐	☐	☐	
Pasture			%	"	☐	☐	☐	☐	
Silage (corn, hay)			%	"	☐	☐	☐	☐	
Flowers, Shurbs, Plants & Bulbs			%	"	☐	☐	☐	☐	
Nursery & Orna-mental Trees			%	"	☐	☐	☐	☐	
Turf			%	"	☐	☐	☐	☐	
Other, describe			%	"	☐	☐	☐	☐	

Section 3 – Crop Washing

10. Were crops washed on the property in 2004? Yes ☐ No ☐
If no, please go to Section 4

11. If yes, use **one of the following** to estimate the amount of water used:

a) Total Water Volume (gallons) _____gal
OR
Gallons per Minute _____gal/min
OR
Inch diameter pipe to washing facility _____ inches, plus length of time _____ hours

b) How much was the crop washing facility used in 2004, on average?

_____ hours/day x _____ days/week x _____ weeks = _____ hours total

Section 4 – Livestock

12. Were livestock farmed on the property in 2004? Yes ☐ No ☐
**** If no, please go to Section 5***

13. Please estimate the total water volume for your livestock in 2004: _____ gallons

14. Estimate how much water was used to wash down barns, holding areas, equipment, livestock trailers etc:

_____ gpm) x _____ minutes per cleaning) x _____ number of cleanings in 2004) = _____ gallons

15. For each type of livestock on the property, please provide an estimate of the following numbers for 2004:

Livestock Type	Number of animals in 2004
Cattle	
Dairy	
Beef	
Replacement Stock	
Swine	
Horses	
Other (describe)	

Livestock Type	Average flock size in 2004	Number of birds processed in 2004
Poultry		
Turkeys		
Chickens - Meat		
Chickens - Layers		
Other (describe)		

16. What type watering system was used for livestock (***please check <u>all</u> applicable***):

Troughs - float regulated ☐ Pressure Water bowls ☐
Troughs - hose filled ☐ Pressure Nipples ☐
Water Buckets ☐ Other (describe) _____

Section 5 – Accessory On-Farm Operations

17. Were there any accessory operations in 2004? Yes ☐ No ☐
e.g. agri-tourism, food processing, winery or cidery
**** If no, please go to Section 6***

18. Please estimate the total water volume used in accessory operations in 2004: _____ gallons

19. Indicate the type and size of operation in 2004 for the following:

Operation	Yes	Activity in 2004	Quantity	Units
Bed and breakfast or guesthouse	☐	Guest nights		
Restaurant or food service (picnic	☐	Customers served		
Winery/cidery tasting room/tours	☐	Customers served		
Direct farm marketing facility	☐	Customers served		
On-farm food processing	☐	Describe product(s) & process		tonnes
Other (please describe:				

Section 6 – Domestic Use and Municipal Water Supply

20. Was there a residence on the property in 2004? Yes ☐ No ☐

21. Were the lawn or landscape areas on the property irrigated in 2004? Yes ☐ No ☐

Section 7 – Water Efficiency and Conservation Practices

22. On a scale or 1-4, how would you rate the water use efficiency on the property in 2004? (***circle one***)

Poor (1) (2) (3) (4) Excellent

23. Identify water efficiency/conservation practices that were employed in 2004, ***check all appropriate***:

Irrigation methods matched to crop types	☐	Drought tolerant crops	☐
Night or early morning irrigation	☐	Rainwater collection and storage	☐
Automatic irrigation controller	☐	Water use measurement/monitoring	☐
Automatic rain shutoff device	☐	Water reuse or recycling	☐
Irrigation by evapo-transpiration (ET) index	☐	Low flush toilets	☐
Soil moisture measurement	☐	Front-loading clothes washer	☐
Mulch to retain moisture	☐	Other: describe _____	
Compost to retain moisture	☐		

24. By how much water use could be reduced on the property by improving efficiency, without reducing productivity or increasing costs? _____ %

25. Would you like more information on how to improve water efficiency or to conserve water resources on this property? Yes ☐ No ☐

Section 8 – Future Changes

26. In relation to 2004, do you anticipate any changes in production, land use or number of residents on the property in the next five years? Yes ☐ No ☐
**** If no, please go to Section 9***

27. Please indicate the changes that you anticipate will occur on the property by the year 2009 in the table below by checking the appropriate boxes

Item	**Increase**	**Decrease**	**No Change**
Crop Production	☐	☐	☐
Field Crop Area	☐	☐	☐
Greenhouse Area	☐	☐	☐
Crop Washing	☐	☐	☐
Livestock Population	☐	☐	☐
Accessory Operations	☐	☐	☐
Number of Residents	☐	☐	☐
Other (describe): _____	☐	☐	☐

28. How do you anticipate these changes will impact future total water use on the property relative to 2004 water use? Increase 2004 water use ☐ **OR** decrease 2004 water use ☐

By what % do you think the total water use either increases or decreases _____ %

Section 9 – Comments

29. Do you have any comments about agricultural water use, conservation or needs in the CRD?

Thank you for taking time to answer these important questions.

APPENDIX II

"Survey Comments"

Survey #	Juris-diction	Survey Comments
1	302	
2	302	NONE
3	302	The whol 10 acres are under-production and irrigated using trickle irrigation with fertigation included in system set-up
4	302	CRD water is too expensive to make agriculture viable on the Saanich Peninsula.
5	302	
6	309	Agricultural water is far too expensive. Compare it to other areas. I would use more if cheaper.
7	309	
8	309	Sec8.27- Our well is capable of producing about 26 gallons per minute. It is drilled in rock water is not measured.
9	309	Notes: Sec
10	309	Canada went metric over 20 years ago. Use metric measurements.
11	309	
12	309	
13	309	
14	309	
15	309	Our farm has considerable flood plain (6 acres of 25 acres for farmland). Hay is main crop: 1st cut requires no watering, 2nd crop is that part in flood plain so requires little water.
16	309	We are fortunate to have an abundance of water from an artesian well on our propoerty- we have developed a "total acreage" system of pipes + water-outlet bits in order to water all areas of our property. The only municipal water used is domestic and animal watering. Occasional winter freezes obviate use is well water all year round. To ensure good health of animals + guaranteed supply of "one-type water" all year round we water animals with municipal water.
17	309	
18	309	We have 2 wells, one for the crop irrigation and the 2nd well for the household and garden. Field crops(berries) with trickle irrigation, garden with soaker hoses. There is a limited supply in the wells and we have to be very careful with water use. Will be installing low volume flush toilets in future.
19	309	I believe water is too expensive. I am considering going to well.
20	309	Prioir to getting rebate for farm used water, we paid full amount and as such arranged our water practices to fit our budget. We still continue the same principle and are cogaigent of need to conserve water. Wind is our biggest enemey - taking off water in periods of high winds, by evapouration. Have started wind breaks to reduce this aspect. Most areas water once week (1/4" setting) a few hot spots may get additional in extreme heat.
21	309	Sec8.28-Grape vines established require less water.
22	309	
23	309	In process of installing micro irigation system.
24	309	NONE
25	309	
26	309	No we are very happy the way CRD is. We are located very near a CRD park they are very helpful and pleasant. Edwina MacDonald
27	308	

28	308	Note on fornt page: We are in a 'farm pool' and grow appro 3 acres of hay. We do not water the field, one cut only. We use less water than the average household(1/2" main). Please feel free to check with Saanich Water Dept. ; Sec9- You should educate the government , the city and municipalites also the CRD about the use of water. Automative sprniklters waste a lot of water, lots of water ends up on the road! Let the grass die down in the summer and save more money by not having to mow it. Have you got water saving toilets in your building? People look for an example from any governing budy.
29	308	Please Note we are no longer ALR lands nor a farm status.PS.
30	308	
31	308	
32	308	Well water this property est: 50 gallons/min at wellhead. Pump can only pump 10 gal/min.
33	308	Agricultural water rates should be at cost at least, if not subsisized, to create a more even playing field with U.S. imports.
34	308	Poultry increase in population to 30 birds. Bee hives decrease to 20 hives. Greenhouse & forage crops to remain the same.
35	308	This is a marginal at best for a hobby farm, the soil condition is poor to non existant as far a productive soil. If I have any chance of keeping some pasture land I must water one field at the bery least to keep my livestock with some grass to field on. As idicated the farm operation is on an agricultural water meter the residences are in a separate water meter and does not impact the net change in %. Should this suvey impact greatly on my operation , Iwould be compelled to look at another avenue for the use of this land.
36	332	Ours is a small scale operation which includes close to 20 different types of crops. As a result it is difficult to employ efficient watering methods at all times- but in the overall picture we will have little impact. Our results in terms of water consumption must be quite small.
37	332	-as a fortunate farm that has to date a reliable source of quality water (tested) for certified organic, we have learned to irrigate conserving as much water as possible- if we were due to any reason, forced to use CRD source wter the cost to small farm operators is very expensive. For the sake of promoting locally grown foo/reduing produce transportation costs to major outlets, the CRD waer costs to all farms should be significantly reduced, based on crop or livestock prduction and efficiency of irrig. Practices. The # of farms and food produced in our area, continues to erode (over past 5-6 decades) one factor causing this is the cost of water to farms that require CRD source. I woul suggest you analyse the real value to our community to use it's farm land to grow and produce here rather thatn import- food from elswhere… Pat and Diane Zanichelli If the CRD were to overhaul its water provision charges to farmers (dramatically) reducing costs, with provincial and federal inputs to CRD for this added value to increasing + sourcing local food production this would be a great service to all the community.
38	332	Sec2.7a-When the rain stopped early summer I think. Sec2.7b-Late fall I think
39	332	
40	332	
41	332	-unable to give estimate of total last year water usage as documentation is still with accountant. It was roughly 1.5 million gallons. E grow blueberries, which have a large water requirement, our plants are only at 25% production and will require more water as plants get larger and increase yield. We are also planning over next 3 years to add another 1.5 acres planted.
42	332	Hae big Farm operations wit ponds wells held accountable for excessive use, eg 500 cattle on 200 acres is too much.
43	332	See note note 9721 West Saanich- info included in other prop. Some of the items of this survey apply to both properties 9721/9743 W. Saanich.

44	332	
45	332	We are fortunate to have a good well and so far plenty of water.
46	332	
47	332	Arbutus Grove does have 2 deep water wells which are not in use any more during the last 4 years. Main reason is: high salt levels during the rapid growth months Aug Sept affecting the crop negatively.
48	332	
49	332	
50	332	
51	344	Normally we have turkeys, pigs and chikens but an illense has caused us to take a break for a year. We will probably resume our farming in 2006.
52	344	
53	344	
54	302	The best way to measure water use from a well is to have all wells especially the large producers and users is to have them metered. Water usage approx 1,500,000 gal.
55	302	Sold Property as of Dec. 2005
56	302	My property is 5.78 Ac approx 1.3 not farmed- used for residential and unfarmable area. Farming is done by next door neighbour who produces forage and uses his own well for irigation. I cannot answer the questions relative to his water use, ETC. My own well is used for a sprinkler system as required and for usual hosehold use. I live alone, am elderly and cannot forecast what may or may not happen in the next 5 years with my propoerty or water use- I wish I could!
57	302	
58	302	
59	302	
60	302	
61	302	
62	302	Our problem is with excess surface water flooding onto our property from the rest of the municipality. We may wish to irrigate in future in order to ensure a third cut of hay due to dry summer conditions.
63	302	Please note: property presently used for hay poduction. We may go back to raising pure bred registered livestock at some future date. This would result in an increase of water use.
64	302	
65	302	We are fortunate to have the quality of water we have and we must use it wisely.
66	302	
67	302	We have a "composting" sanitary system and no appliances that use water. While we are very carefull with water use, we notice that some people in the area use large volumes watering lawns and flower gardens.
68	309	We have an efficient well for our property. No changes planned.
69	309	
70	309	Ag consumes less than 2% of use, therefore a small price break is NOT a burden on the rest of the CRD especially when there are so many benefits. Ay arangement MUST be of at least 5 years to allow to plan longer term.
71	308	Happy with water quality of municiple supply.
72	308	
73	308	
74	302	
75	302	
76	302	In our situation we are happy with what we have.
77	302	We need M. water at a reduced cost to be cost efficient.

78	302	
79	302	
80	302	
81	302	Centrtal Saanich would only give us a .5 inch feed in line from strret. This gives us low pressure and reduced volume available. It's a problem for us.
82	308	Approx 25 acres in Hay crop- no irrigation. 10 acres used for Beef cow grazing.
83	309	
84	309	Water is priced too cheaply. Raise the price and it will not be wasted as it is now.
85	309	
86	302	There is no water used to grow the hay crop on the property.
87	302	We consider the water "our liquid" -gold.
88	332	
89	344	Due to limited ground water in immediate area, we are preluded from crops that require high volumes of water. The size of our farm is also limited by available water.
90	344	
91	344	No.
92	344	None- I agree with your water conservation. My fields are used for grazing sheep only.
93	309	When in a drought cycle as we have experienced in the last number of years most farm operators had insuficient water volume. If the intent is to keep small lot farms operational , and assuming there is an increase in demand relative to population increases. There is consequently a need for more water as well as allowing some cushion for dry weather cycles!
94	344	
95	309	
96	302	I converted to a trickle irrigation system after attending a session organized by CRD. Thankyou. I may be able to improve my water conservation with rain barrels.
97	344	
98	309	
99	344	We produce forages + grain on about 200 acres in Metchosin. Production could be trippled with affordable water.
100	332	
101	332	
102	332	
103	332	
104	332	
105	332	CRD water is too expensive for small farm irrigation I must use over 100,000 Gal/billing period to get a reduced rate and the rate reduction is only on the water consumption over the 100,000 Gal. Mark. So I apy premium rates on 1st 100,000gal. Our domestic usage is very conservative for our household (3) yet I have large water bills through June-October mainly from irrigating fields for forage (pasture) to feed my sheep/cattle after initial pasture burns off due to dry conditions. I can't possibly afford to irrigate to get a second crop of hay.
106	302	In 2005 the nursery will increase volume by 30% and water useage will increase as trees grow in size.
107	302	
108	302	CRD needs to maintain available municipal water to farms. Rates should reflect farm use rate and not residential rates.
109	308	
110	309	

111	309	Low Flow toilets should be mandatory in new constructions. I don't feel it is essential that golf courses stay green. They should pay a premium for h2O for irrigation. Let lawns go brown in the summer. Who deserves a green lawn during water shortages, or in plenty for that matter.
112	309	Time to supply rain barrels on the same principles as blue box program to home owners. Time to change bi-laws to make developers replace building footprint with green roofs or other green areas. Time to change bi-laws to allow grey water use & use of composting toilets.
113	309	
114	302	WE NEED A WATER MAIN FOR DOMESTIC USE. I DO NOT LIKE PUMPIG DRINKING WATER FROM A TEN FOOT DEEP WELL.
115	302	Over watered plants, do not exactly thrive. People need to pay more attention to see what they are doing. My trees are hand watered once a week in hot weather only. We do not water hay or lawn. Vegies are waterd by hand as need. We preserve water.
116	332	
117	332	
118	308	I do not have enough water especially in summer months July, August-September. I wish to have Municipal water supply too.
119	308	I fully agree with agricultural water use in the raising of food & livestock and maintaining the ALR in our municipality.
120	344	We use the water all year long 365 days a year.
121	344	
122	344	Farm meter only for farm use well for residence.
123	309	Not at this time.
124	302	Keep up the good (conservation) P.R.- newspaper articles, etc.
125	308	
126	309	Why does the dich water flowing down the south & east side of Old West Saanich (near 4900) have soap bubbles in it at times?
127	309	
128	344	
129	309	No at this time.
130	308	
131	302	
132	302	We would like to be hooked up to Municipal Water to increase crop production and density.
133	309	Do not have access to CRD water, should be made available for residential use. My well could be for irrigation.
134	308	
135	308	
136	302	
137	332	
138	302	
139	302	
140	302	
141	308	
142	302	
143	302	NO, but I have a lot of commetn about other water uses in the CRD; eg, as population sees the increasing number of Large subdivisions in area (later needing water supply) and NO attempt to limit these, how can expect anyone to take "water conservation" seriouly??!! D K Edwards
144	302	

145	344	Attached Comment: My hay fields are leased on a year agreement, by a sheep farmer- first for feed and then for grazing. I do not irrigate the fields, and the 50 or so sheep that graze for possibly 3 months, use very little drinking water. I don't anticipate any changes in the near future. Audrey Coburn.
146	302	
147	302	
148	344	It is critical that we increase the local production of food crops. The shortage of water in other food prducing areasa (California and Mexico for example) combined with increased transportation costs will make food imports much more expensive here in the near future. Given the above, it is imperative that the RD ensure an adequate supply of reasonably priced water for agricultural purposes. Population growth in the CRD should not impact the availability of agricultural water!!!
149	309	We use our well for domestic use & watering flowers etc around house. Agri water is great pressure for fields and pasture.
150	302	
151	302	I use captured pond water, but hydro is expensive for just pasture, which would be cheaper, pumping reservoir or using piped in water?
152	302	
153	302	
154	332	
155	309	In the 20 years I have been resident on the farm in Saanich we have expanded our demand for water/conserved the water resources available in order to meet our requirements. There are three water factors that limit or impinge our productive capacity and all of those are water related. 1) leaking Powd/less annual accumulation of water in storage due to unseassonably dry conditions. 2) water table dropping and water levels, water storage capacity in well, columns have dropped over a meter. Local + neighbouring changes in forest cover and increased water demand are two significant impacts on water table (owd or heat valves locally) ALDA programs for water development have been curtailed. ALDA= Agricultural Land Development Programs.
156	332	
157	302	My property, .7A, was part of a 27A farm before 1990. It is NO LONGER farmed so I fail to see why I need to complete this questionaire. However, I did the best I could.
158	332	
159	344	
160	302	
161	309	
162	309	Ours is a small operation and we do not anticipate any significant impact on our farming operation as a result of our need for water.
163	332	Agriculture Activities need a reliable, clean water supply at competitive rates.
164	302	Crops will be chaning to Carrots- 10 acres and hay- 35 acres. Field drainage and sub-irrigation have been completed.
165	344	
166	332	I cannot think of any questions off hand, however information on water efficiency improvement woul be appreciated and put into use as able. Thank you.
167	302	
168	309	$50- farm credit for water a bit of a joke? Water use in irrigation and farm and animal use is related to weather patterns no rain- irrigation; rain- no irigation. Restrictions are related to amounts available.
169	302	I am thinking about getting a 2inc Main Line for the farmright now my main source for water is my ponds.
170	309	

171	308	
172	308	
173	309	
174	302	Extension of municipal water west of the 1400 Block on Mount Newton X-Rd Saanichton would encourage more agricultural activity.
175	302	
176	344	
177	309	We are a very small compact operation and don't anticipate much change in water use unless the summers become hotter in which case we may revert to more sprinkler/drip irigation methods.
178	332	We anticipate doubling to trippling the planted area. So will have a doubling of the water use. We may require another 25-35% as the vines mature. We are anicipating a gradual increase in platings in the future to cover most of 30 acres. So there will be an increse over years with a move to an on farm winery and some secondary processing of nuts and olives.
179	302	
180	344	No
181	302	Our acre of grapes will need less water as the plants become established- but some water will be needed in making wine. We don't know how to estimate that. We appreciate having a farm rate for water use. Thank you. Drip irrigation- or soaker hoses (in the landscape area) are now so easy to install that very few farmers [continue] to use overhead sprayers. We never water the lawn or rough grassed areas on our property. All flower/? Beds have soaker hoses or drip lines. The CRD does a good job in educating the public. Thanks again, T Brooks.
182	308	Thankyou for providing us with low cost, clean water we are very lucky people in this country. On our farm we have converted 1/2 the mountain side to drip line this year and will increase drip in years to come.
183	309	
184	308	No Yet!
185	302	Only 2.5 acres of 3 acres area used for horses and we only use a small amount of water.
186	302	None of the water used on the farm is municipal. Major costs were incurred to upgrade the pump and water line with no tax relief.
187	302	I have a crek behind my property and because a meter has to be installed the water cannot be used until the meter is installed. I had to cancel my water rights because in order to use the water- a water meter has to be installed. I have argued the necessity of the use of the water to no avail. Other neighbouring farmers have also given up their rightsa due to the same circumstances. This governmnet does not want us to conserve water and this is their reason for it. The water does not cost anyone and my use will not affect the fish habitat.
188	302	
189	302	We may hook up to municipasl water for house but retain ag. Use of well.
190	302	Maintaining reasonable water rates and ensuring adequate quantities of water for farm use is essential in supporting agriculture in the Victoria region. Land costs are rising due to competing uses (eg. Use of farm land for primarily residential purpose). As well, farming is not a dessirable occupation because of the long hours and high risk for failure. Adding further burdens such as increased water rates will do little to help farmers who are actually using farm land for crop production.
191	309	
192	302	Will you have Municipal water clinics or field demo's?
193	344	
194	309	
195	302	Tons of waste curretly going on.

196	309	
197	309	
198	309	
199	308	
200	308	
201	308	
202	302	
203	302	
204	308	We do not currently use a public water supply- all water comes from a well on the property. Some responses are very rough estimates.
205	344	Thankyou for doing this survey, the planning and management of water is extremely important.
206	344	Thankyou for doing this survey water conservation so very important.
207	302	
208	332	
209	332	
210	332	
211	332	
212	332	
213	332	
214	332	
215	302	We have lived here 40 years. We would get 1 pass over the fields if irrigated. As the area built up our wells went down. We can not even have a kitchen garden and have to take laundry out. Everyone on this island should have access to water--especiallyon the lower island as it is all the way to Sidney. Many people in this area have the same problem and it should NOT be so. This survey is a @Joke@ to us. Frances Kennedy.
216	302	Our area has no municipal water supply. We are at the merc of our well. The large pond of Vantreight Farms has lowered the aquifer, and reduced production of surrounding wells.
217	332	
218	344	I appreciate having an agricultural rate for water and being able to use the same meter as my domestic supply.
219	308	
220	302	
221	309	
222	302	All irigation on this property is taken from stored water from dugout.
223	302	
224	302	
225	302	
226	344	Much greater production could occur with economically priced water.
227	302	Only necessary to irrigate crop sufficiently to grow. The weather rainfall also irrigates. Also a crop that is suitable to environment is most efficient for use.
228	302	
229	302	
230	302	Preferential rates for agricultural use are absolutely imperative.
231	309	We are conscious of water use because we are on a well. We plan to install low-flush toilets but think we need to "tweak" he septic system, ie clean out pipes to septic tank first. Plan to kep livestock away from seasonal creek. (waterfowl). Plan to install more drip irrigation as/when able to do so: ie blackberries + rhubarb in one area as yet not drip fed.

232	302	Encourage more people to save rain water; store water around rural properties; practice better vegetation control in order to prevent fires. Have storage tanks available for fire suppression & in the event of a natural disaster,ie earthquake.
233	302	More fire control measures promoted- in storage tanks c/w portable pumps. Dry vegetation management.
234	302	Re-using water + rai water collection could have profound effects on conservation but both require expensive (large) water storage tanks--- How about a rebate program for this purpose? These tanks are ideal for greenhouse/domestic use for landscaping/lawn etc.
235	332	Some difficulty answering questions, as well water use not measured. Estimated use by water requirements for horses, turkeys + chickens. Does domestic use not count? There are 3 houses on the propoerty with 9 residents.
236	344	Rainwater is a big resource. Subsidized barrels/containers would be a big help.
237	302	(Attached Letter) July 13/05 Dear Sirs, RE: BCA ROLL No. 302 221 061 000 This is to inform you that we are not on municipal water, but rely on drilled wells (2) and 2 ponds which are filled by water from a creek called Thomson Brook (to which we have water rights). One well supplies our home/ chicken house/ farm help rental unit and the other fills a 37,000 gallon cistern up on the top of our property on the slope of Mt Newton. There is no municipal Water at this end (west) of Mt Newton X Rd ad so we are all dependent on our own resources. Yours truly Andree J. Williams. Andree J. Williams 1124 Mt Newton X Rd, Saanichton BC, V8M 1S1
238	302	
239	302	
240	344	(Attched comments) I didn't complete the survey because we took possesion of the property in Sept. of 2004, and don't have accurate answers to the questions. G Clare.
241	302	No
242	344	
243	302	
244	302	Note- I have two water meter- one is exclusively farm use, the other is mostly domestic, so I only used the farm one in filling out this survey.
245	332	Concerns about water loss/run-off due to trees being cut down in Dean Park area.
246	309	
247	302	
248	302	This property is leased and farmed by Slugget Farms (Larry) as noted in phone conversation with Colwyn Sunderland, 05/07/06. Owned by Fred Kockott of 5300 Santa Clara Ave.
249	302	
250	302	
251	302	Installed low-volume drip irigation in need areas.
252	309	Please send the water conservation inforation to 3878 Hobbs St, Victoria, V8N 4C7. Thank you.
253	309	
254	302	
255	302	
256	332	We bought this propoerty in Oct. of 2004. Until spring 2003 it was a flower nursery. Between Mar or Apr 2003 ad Oct 2004 the nly water use was by the resident (one person). Now there are five people living here and we intend to develop the rest of this acre to include a large veg. Garden/orchard/cut flower garden. We intend to install drip irrigation on timers as much as possible. Water use may increase from 2003, but be a lot lower than 2003 or earlier, and more than 2004.
257	332	
258	309	Sorry that I could not e more helpful. We have pasture land that is not irrigated.

259	302	
260	309	Currently we are able to reach our farm quota ($2,500 gross income per year) to maintain our farm status. IF, however, he BC assessment authority increases he amount of income required to keep farm status, many farms like ours will have to plow up their pastures and plant expensive crops. Then we will all be needing a lot more water to irrigate our fields. We all, of course, prefer the status quo ($2,500/yr) as we would not like to see our beautiful pastures plowed up and replaced with intesive crop farming!
261	344	When I see the increase in housing + commerce in Colwood and Langford- I think there will come a time when I will have to dig my own well. Since there will not be enough water left for agriculture- start chagning domestic use- at higher rate and put negative incentives to the kind of development (bulldoze and flatten) hat is allowed in your CRD communities- Also- give positive incentives for maintaining green belt areas- I have atleast 3 acres of that.
262	309	
263	302	
264	309	
265	332	No
266	308	We are a small urban farm producing eggs, vegetables & horticultural plants. We use drip and micro irrigation throughout the farm. We received 2 survey forms, but the information for both propoerties has been combined on this one form.
267	308	
268	309	
269	309	Estimates approx. don't use much water because dry land bulbs [?] ; but some minor fruit production --> probably increasing because local demand/ request. Plan to increase small berry prod. Please check water use numbers to see if it makes sense.
270	309	The municipal water supply is used in our home. The dugout is used to water the vegetable, flower + shrubs around the house.
271	344	Re Section 4. It is impossible to estimate the total volume of water used as the number of cattle and sheep varies: 3 different sources of water are used, well, pond and municipal. The amount of water consumed by animals varies with the weather.
272	344	
273	308	
274	308	
275	344	
276	344	
277	344	
278	308	
279	308	
280	302	
281	302	
282	344	
283	344	
284	302	
285	332	Simply a comment on our own situation: We have a hobby farm: -1/3 acre U-Pick blueberry sitting on a very high water table (no watering needed), - 1/3 acre of (largely) flowers, which are spot-watered on an as-neded basis (presumed low-usage)
286	308	
287	332	
288	308	
289	344	

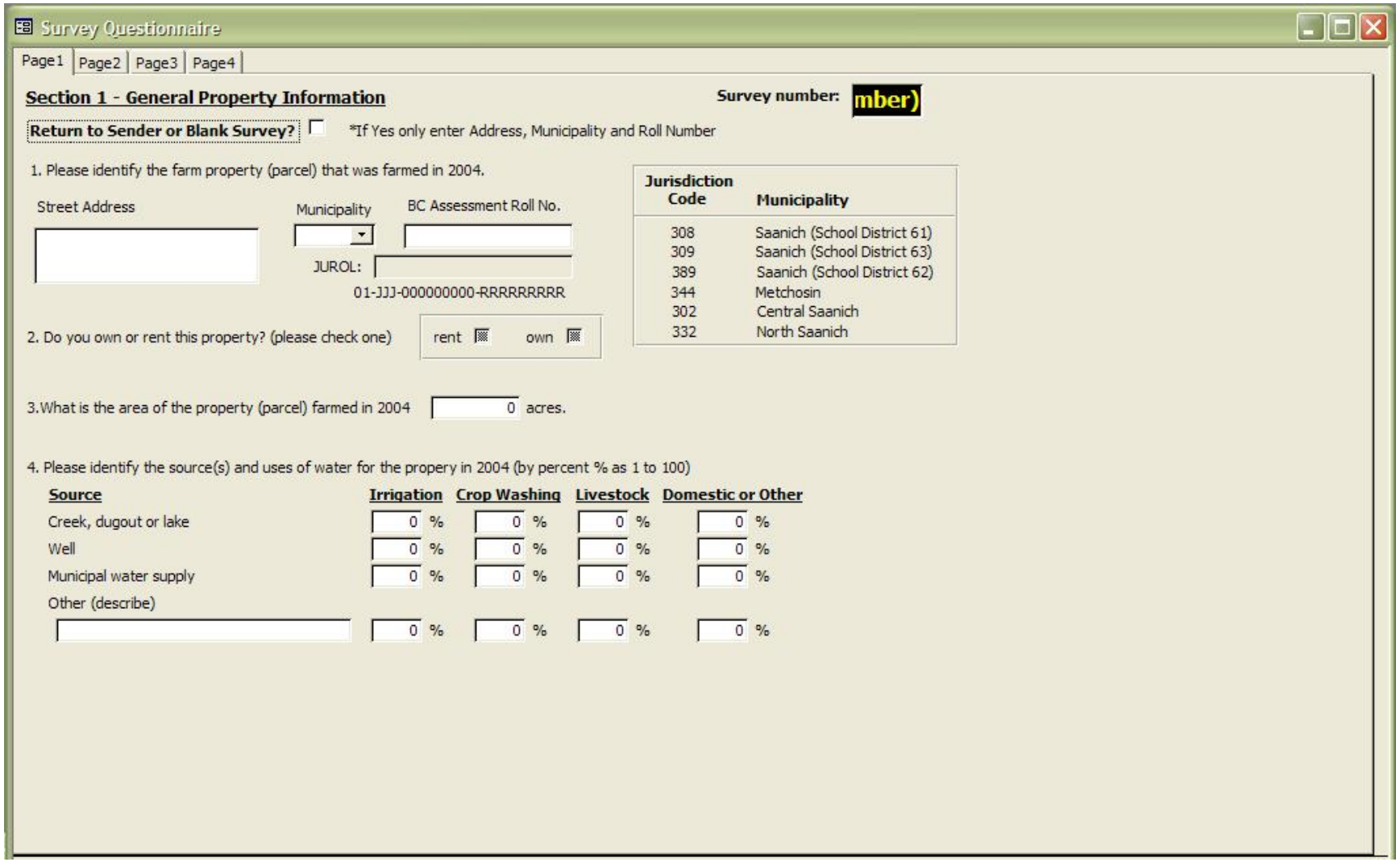
290	302	We are on well and barely have enough water for the house. Outdoor plants are watered with water out of ditch.
291	302	
292	302	
293	309	
294	309	
295	332	If agriculture is to be encouraged and promoted water for agriculture crops is essential. It is critical that water is available.
296	302	Sorry we are busy moving. No time to deal with this.
297	302	
298	344	Metchosin has very low water pressure. Start a program promoting rainwater barrels.
299	344	Even though the agricultural water rate (introduced by the CRD Water Dept. a few years ago) reamains much, much higher than that enjoyed by farming operations in other parts of the province, it is still a godsend for local farmers, please ensure that it continues.
300	302	Less use of guns for watering. More regulating use of household water use ie. Watering lawns in summer by municipal water.
301	309	relating to question 28. - not by much, we will have another pond dug to supply the increase demand of water
302	309	
303	344	
304	344	We don't use enough water here to receive farm water rates. Could use a break on number of gallons used before this rate is applied. Would like very much to be able to afford a rate that would allow pasture watering.
305	309	
306	308	
307	308	
308	302	Our small farm uses municipal water for the house, a shallow well for all lawn watering, irrigation and livestock. We also have a pond available but not currently used our water needs are modest relative to large producers. Not withstanding we believe it's very important and critical to the agricultural community to have a reasonably priced and available source of water to remain productive and economic. We are in full support of your efforts to help the agricultural community remain a significant part of our community.
309	309	The Colquitz River runs through our property, it would be nice to have water rights and use this water for irrigation. As it is, it just goes out to sea.
310	302	All new construction should have storage tanks for rain water and run-off. Use in summer for lawns and gardens.
311	309	I think a move towards more Organic production is an important part of water conservation. As well, utilising irrigation technologies to aid in propoer watering practises. I would like to see the municipalities reduce their water use, especially for areas like lawns and boulevards. It's difficult to be limited by CRD water restrictions when the Municipalities are often watering roads and sidewalks, due to carrellesly managed sprinkler systems.
312	344	
313	308	
314	308	At current, wells on property do not meet demand. Production is limited to water supply. Quality of water is good and very important with any new water supply. A CRD source of water would greatly benefit this greenhouse operation.
315	309	Please direct your future survey to Mr and Mrs David Gibbs, new owners. Same address, thankyou.
316	309	

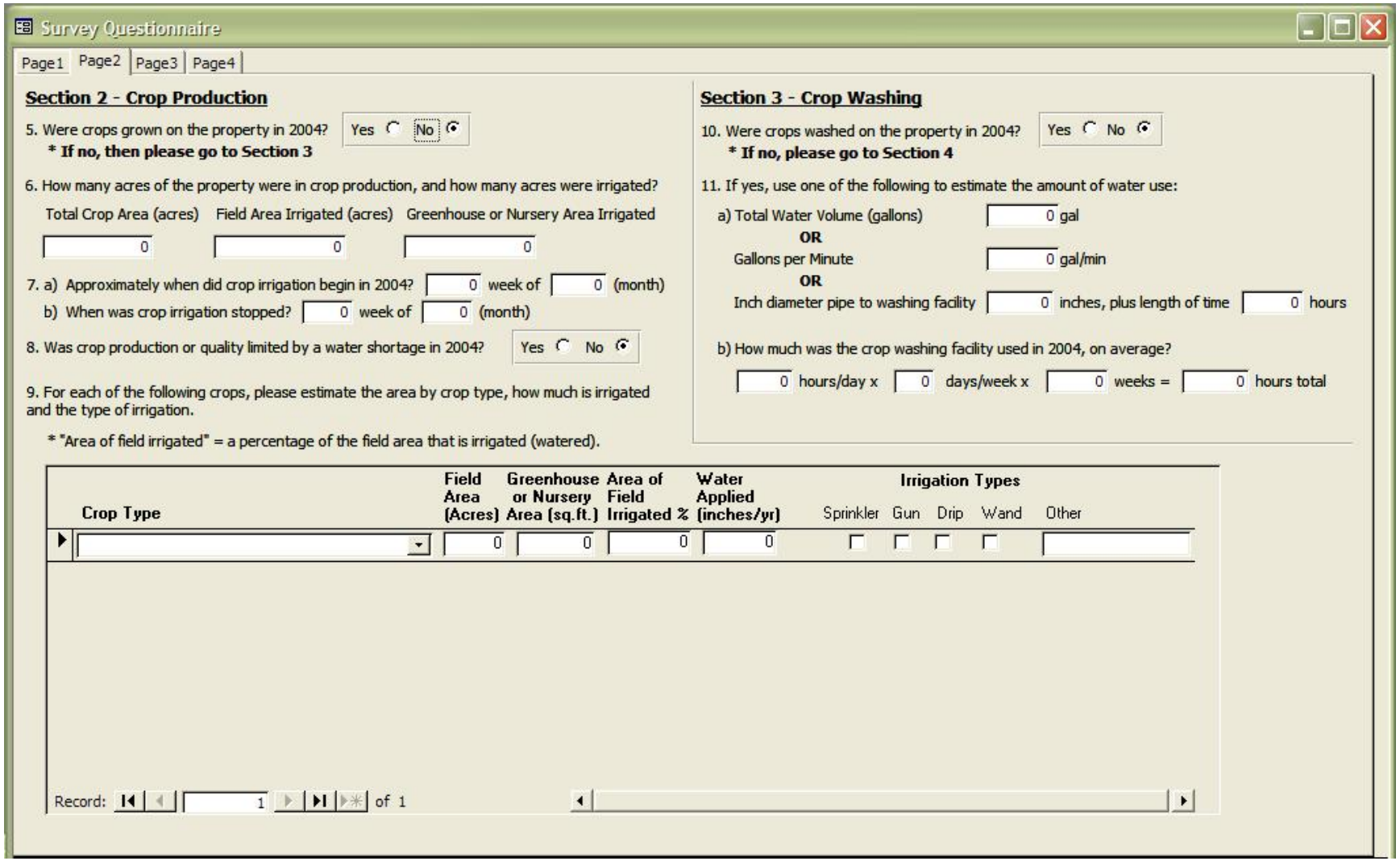
317	308	
318	344	CRD water is essential for some small farming operations and helps diversify our food source.
319	302	
320	302	
321	302	
322	302	More water pressure required here.
323	332	
324	302	Pressure Ok.
325	309	
326	344	Application for agricultural water rate.
327	309	We lease land from 6201 Rodolph to rotate our sheep onto. There is no source of water other than Municipal water. Sorry to delay sending in the report- we were away.
328	309	We rely on our pond water mostly for irrigation and livestock. The Municipal water is also used for filling some troughs but mostly for home use. Sorry to delay sending in the report- we were away.
329	344	See that we have enough water by tapping into available supplies and don't put so much emphasis on conservation when we have lots of water. Or it just goes out to sea.
330	302	Water for use with livestock on this property came for property BCA ROLL# 302 310166020. Animals share the 2.16 acres used for farming described in survey for the above roll number.
331	302	See survey for property Roll#302310166010
332	302	-training program for farming, I have sen very poor applications in area. - more night watering all over. - Note: big guns do not run well on Municipal water at ~80psi, they need about 150psi at the pump.
333	302	
334	302	Note crops grow better with sprinklers and with moist to moist conditions until maturity size. Low water= wrinkled carrots.
335	302	*Problem incured due to poor root growth from drip system.
336	302	
337	302	- considering plant needs and productivity, sprinklers have given the best return.
338	302	-drip irrigation reduces raspberries root growth, cucumbers and pumpkin need overhead = low production.
339	302	
340	302	
341	332	
342	332	
343	332	
344	332	
345	302	To grow more crops, I.e forage, fruits, or vegetables we must have more access to cheaper water.
346	332	I find it dissapointing that North Saanich does not have the infrastructure to supply me with my water needs.
347	332	
348	309	Berry and vegetable use minimum depending on the crop and year. 2004 was the water use ever.
349	309	Washer facilities washes 270 acres of cropped land. Crop is transported in from approx 16 diferent properties.
350	302	Cost of Municipal water for agricultural use is too expensive. The cost of water is the biggest deterring factor for expanding agriculture production.

351	302	Municipal Water for Agriculturel use should be cheaper. It is far too expensive. It is the main deterrent for expanding production.
352	302	
353	302	
354	302	Drain into pond on farm- undertilled the entire nursery area, covered with ground cloth and water drained into collection pond, which is used for irrigation.
355	309	Entire production area undertillled, drained, and water goes into collection pond for irrigation.
356	302	
357	302	
358	302	
359	302	
360	302	
361	302	All 4 properties sub-tilled to pond, conservation of water and soil.
362	302	
363	302	
364	302	
365	302	To insure 2-inch agricultural meters are available on request by Bonafide farmers and to ensure agricultural rates stay in place and be cost competitive.
366	302	Property sub-irrigation from ponded water and when crops permit.
367	302	
368	302	
369	302	
370	302	
371	302	
372	302	
374	302	In recycling water for crop use, water is treated with heat pasturisation
375	302	
376	302	Need to have the same water price and district of Saanich
377	302	
378	308	
379	302	
380	302	
382	332	The crd should be extremely careful about raising the rates charged to agricultural producers. Water is already expensive enough to ensure we don't waste any. Increasing the water rate could push some marginal producers out of business and lead to job losses. In our case we employ 12 to 13 people, half of which are permanent full time jobs. If you wish to maintain the rual natureof our municipality and provid jobs for the people who live here, then you will proceed very cautiously when considering an increase. If anything, the rate should be decreased for small producers.
383	302	In an ideal world - ifI had not bought an existing nursery - it woild have been easier to an efficient irrigation system- drip feed each and collect all excess water. To do this now is not cost efficient - it would be simple to sell up and move on.

APPENDIX III

"Survey Data Entry Interface"


Survey Questionnaire
Page1
Page2
Page3
Page4
Section 1 - General Property Information
Survey number:
mber)
Return to Sender or Blank Survey?
*If Yes only enter Address, Municipality and Roll Number
1. Please identify the farm property (parcel) that was farmed in 2004.
Street Address
Municipality
BC Assessment Roll No.
JUROL:
01-JJJ-000000000-RRRRRRRRR
Jurisdiction Code
Municipality
308 Saanich (School District 61)
309 Saanich (School District 63)
389 Saanich (School District 62)
344 Metchosin
302 Central Saanich
332 North Saanich
2. Do you own or rent this property? (please check one)
rent
own
3.What is the area of the property (parcel) farmed in 2004
0
acres.
4. Please identify the source(s) and uses of water for the propery in 2004 (by percent % as 1 to 100)
Source
Irrigation
Crop Washing
Livestock
Domestic or Other
Creek, dugout or lake
Well
Municipal water supply
Other (describe)


Survey Questionnaire
Page1
Page2
Page3
Page4
Section 2 - Crop Production
5. Were crops grown on the property in 2004? Yes No
* If no, then please go to Section 3
6. How many acres of the property were in crop production, and how many acres were irrigated?
Total Crop Area (acres)
Field Area Irrigated (acres)
Greenhouse or Nursery Area Irrigated
0
0
0
7. a) Approximately when did crop irrigation begin in 2004? 0 week of 0 (month)
b) When was crop irrigation stopped? 0 week of 0 (month)
8. Was crop production or quality limited by a water shortage in 2004? Yes No
9. For each of the following crops, please estimate the area by crop type, how much is irrigated and the type of irrigation.
* "Area of field irrigated" = a percentage of the field area that is irrigated (watered).
Section 3 - Crop Washing
10. Were crops washed on the property in 2004? Yes No
* If no, please go to Section 4
11. If yes, use one of the following to estimate the amount of water use:
a) Total Water Volume (gallons) 0 gal
OR
Gallons per Minute 0 gal/min
OR
Inch diameter pipe to washing facility 0 inches, plus length of time 0 hours
b) How much was the crop washing facility used in 2004, on average?
0 hours/day x 0 days/week x 0 weeks = 0 hours total
Crop Type
Field Area (Acres)
Greenhouse or Nursery Area (sq.ft.)
Area of Field Irrigated %
Water Applied (inches/yr)
Irrigation Types
Sprinkler
Gun
Drip
Wand
Other
0
0
0
0
Record: 1 of 1

Survey Questionnaire

Page1 | Page2 | Page3 | Page4

Section 4 - Livestock

12. Were livestock farmed on the property in 2004? Yes ○ No ◉

13. Please estimate the total water volume used for your livestock in 2004: 0 gallons

14. Estimate how much water was used to wash down barns, holding areas, equipment, livestock trailers, etc.

0 gpm x 0 minutes per cleaning x 0 number of cleanings in 2004 =

0 gallons

15. For each type of livestock on the property, please provide an estimate of the following numbers for 2004:

Livestock Type	# of animals
Cattle	0
Dairy	0
Beef	0
Replacement Stock	0
Swine	0
Horses	0
Other (describe)	0

Livestock Type	Ave flock size	# of birds proccessed
Poultry	0	0
Turkeys	0	0
Chickens - Meat	0	0
Chickens - Layers	0	0
Other: (describe)	0	0

16. What type of water system was used for livestock (please check all applicable):

- ☐ Troughs - float regulated
- ☐ Troughs - hose filled
- ☐ Water Buckets
- ☐ Pressure Water Bowls
- ☐ Pressure Nipples
- Other (describe)

Section 5 - Accessory On-Farm Operations

17. Were there any accessory operation in 2004? Yes ○ No ◉

*** If no, please go to Section 6**

18. Please estimate the total water volume used in accessory operation in 2004: 0 gallons

19. Indicate the type and size of operation in 2004 for the following:

Operation	Yes	Activity in 2004	Quantity / units
Bed and breakfast or guesthouse	☐	Guest nights	0
Restaurant or food service	☐	Customers served	0
Winery/cidery tasting room/tours	☐	Customers served	0
Direct farm marketing facility	☐	Customers served	0
On-farm food processing	☐	Describe product(s) and process	tonnes
Other (describe):			0

Section 6 - Domestic Use and Municiple Water Supply

20. Was there a residence on the property in 2004? Yes ○ No ◉

21. Were the lawn or landscape aresa on the property irrigated in 2004? Yes ○ No ◉

Survey Questionnaire

Page1 | Page2 | Page3 | Page4

Section 7 - Water Efficiency and Conservation Practices

22. On a scale of 1-4, how would you rate the water use efficiency on the property in 2004?

Poor (1) ○ (2) ○ (3) ○ (4) ○ Excellent

23. Identify water efficiency/conservation practices that were employed 2004. check all appropriate:

Irrigation methods matched to crop types	☐	Drought tolerant crops	☐
Night or early morning irrigation	☐	Rainwater collection and storage	☐
Automatic irrigation controller	☐	Water use measurement/monitoring	☐
Automatic rain shutoff device	☐	Water reuse or recycling	☐
Irrigation by evapo-transpiration (ET) index	☐	Low flush toilets	☐
Soil moisture measurement	☐	Front-loading clothes washer	☐
Mulch to retain moisture	☐	Other: describe	
Compost to retain moisture	☐		

24. By how much water use could be reduced on the property by improving efficiency, without reducing productivity or increasing costs?

0 %

25. Would you like more information on how to improve water efficiency or to conserver water resources on this property?

Yes ○ No ◉

Section 8 - Future Changes

26. In relation to 2004, do you anticipate any changes in production, land use, or number of residents on the property in the next five years?

*** If no, please go to Section 9**

Yes ○ No ◉

27. Please indicate the chages that you anticipate will occur on the property by the year 2009 in the table below by checking the appropriate boxes

Activity	Increase	Decrease	No Change
Crop Production	☐	☐	☐
Field Crop Area	☐	☐	☐
Greenhouse Area	☐	☐	☐
Crop Washing	☐	☐	☐
Livestock Population	☐	☐	☐
Accessory Operations	☐	☐	☐
Number of Residents	☐	☐	☐
Other (describe):	☐	☐	☐

28. How do you anticipate these chages will impact future water use on the property relative to 2004 water use?

Increase 2004 water use ☐ **OR** Decrease 2004 water use ☑

By what % do you think the toatal water use either increases or decreases 0 %

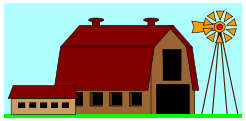
Section 9 - Comments

29. Do you have any comments about agricultural water use, conservation or needs in the CRD?

Errata and Data entry Resolusions:

APPENDIX IV

"Focus Group – Agenda & Presentation Slides"



Peninsula Agricultural Commission

CAPITAL REGIONAL DISTRICT
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BRITISH COLUMBIA
Ministry of Agriculture and Lands

Agricultural Water Use and Conservation Study

KEY FINDINGS

Focus Group Workshop

November 21, 2005

Synetric Group
Hofmeyr & Assoc.

Matrix Group Resources Ltd.

Clover Point Cartographics Ltd.

Agricultural Water Use and Conservation

Focus Group Workshop - Introduction

➢ Purpose of this Workshop

- Examine the factors that influence how local farmers obtain and use water
- Verify the key findings of the study with your own experience
- Provide content for the final report

➢ Today's Agenda

10:00-11:00	Key findings of the Agriculture Study (Presentation)
11:00-12:00	Small group discussion: Factors that influence farm water use
12:00-12:30	Lunch break (lunch will be provided)
12:30-1:30	Whole group discussion: Matching factors to findings
1:30-2:00	Whole group discussion: How can we improve farm water management?

Key Objectives

- Collect water use/conservation information
- Support review agriculture sector water rates
- Development of CRD conservation program

Approach

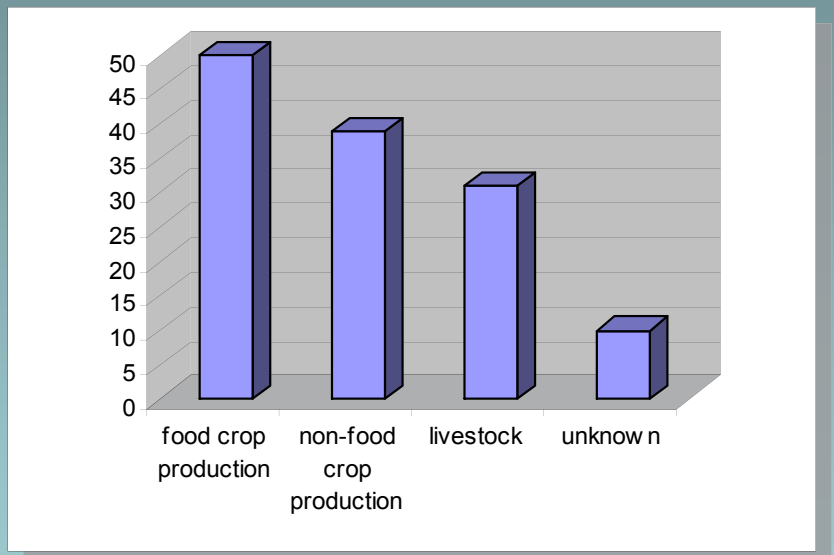
- Water use survey of farm properties
  - 1100+ surveys, mail out with phone & on-site follow-ups
- Land use inventory
  - mapping of current land use, Provincial standard
- Assembly of other relevant information
  - retail water use, soils, property and climate data

Farm Survey Response

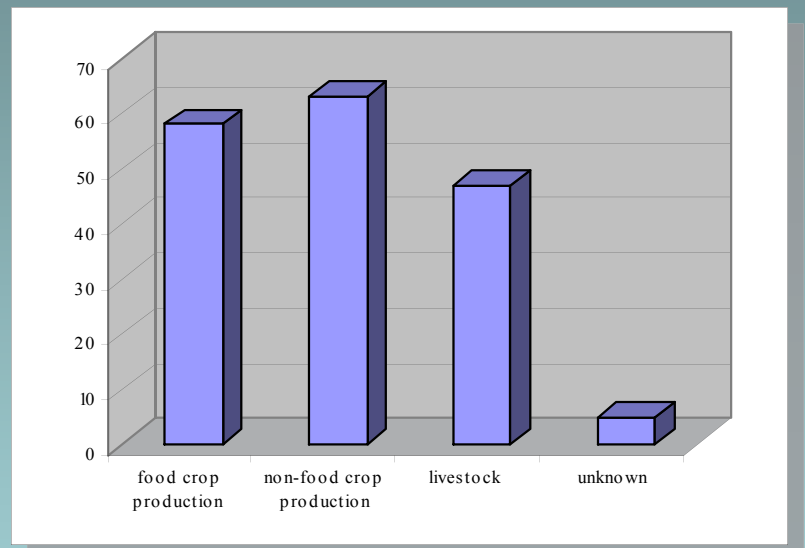
- Positive response
  - timing -- summer, type - mail out survey
- Response Return: 367 surveys out of 1127
  - 33% frequency
  - 37% area basis
  - 50% CRD water consumption

Farm Survey Response

% by Frequency



% CRD Water Consumption



Farm Types (15) –beef, horse, unknown and turf least representation

Farm Survey Response

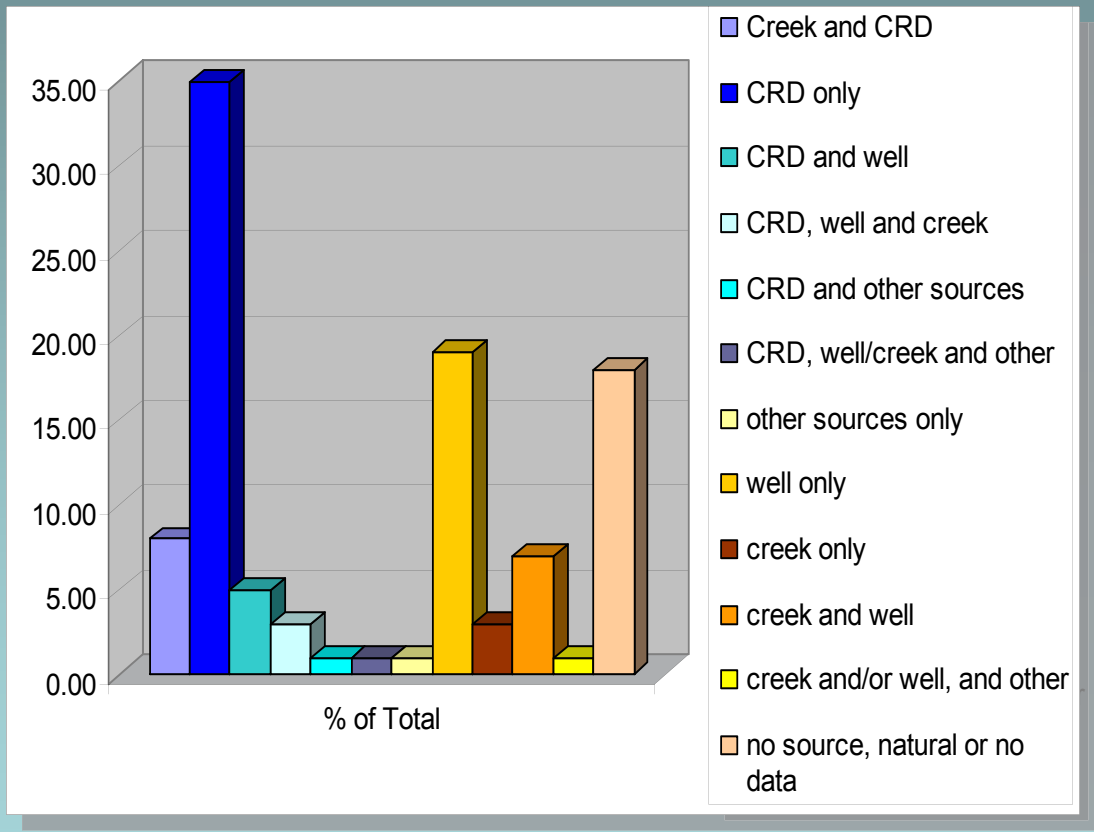
MAP #2

"SURVEY RESPONDENTS"

Key Survey Results:

Water Sources by Frequency of Survey Responses

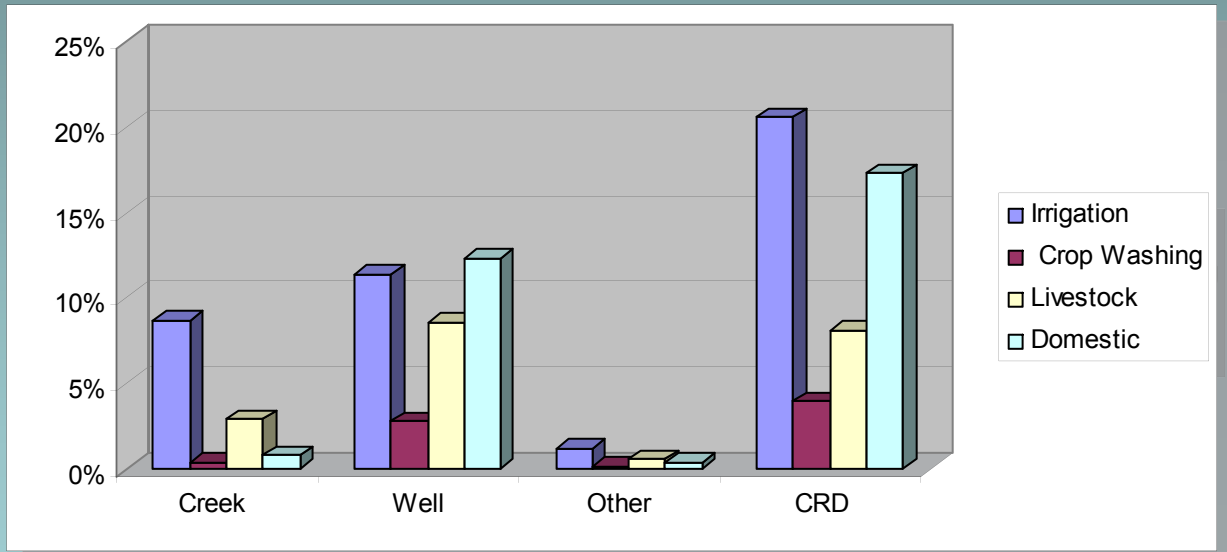
- CRD critical water source
  - 35% as only source
  - 54% with other sources
- Wells key secondary source
  - 19% as only source
  - 34% with other sources



Key Survey Results:

Water Uses by Frequency of Survey Responses

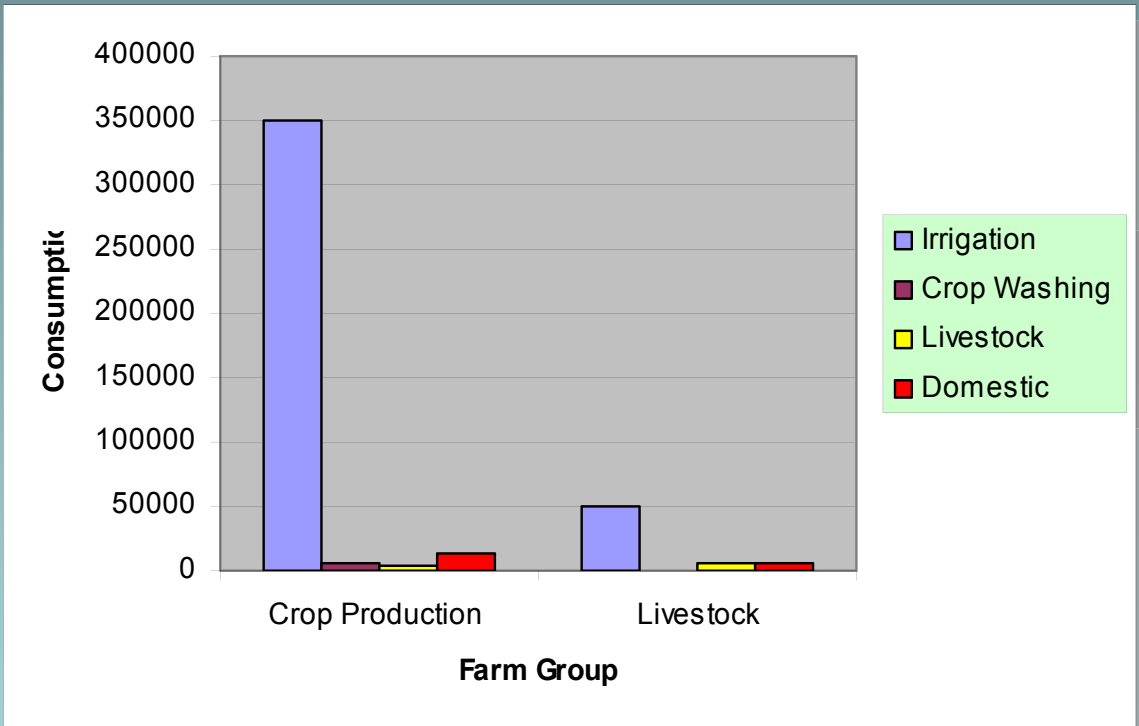
- CRD water most frequent source for irrigation water
- Well and CRD water important domestic source
- Well and CRD water sources are important for livestock use



Key Survey Results:

CRD Water Use By Volume

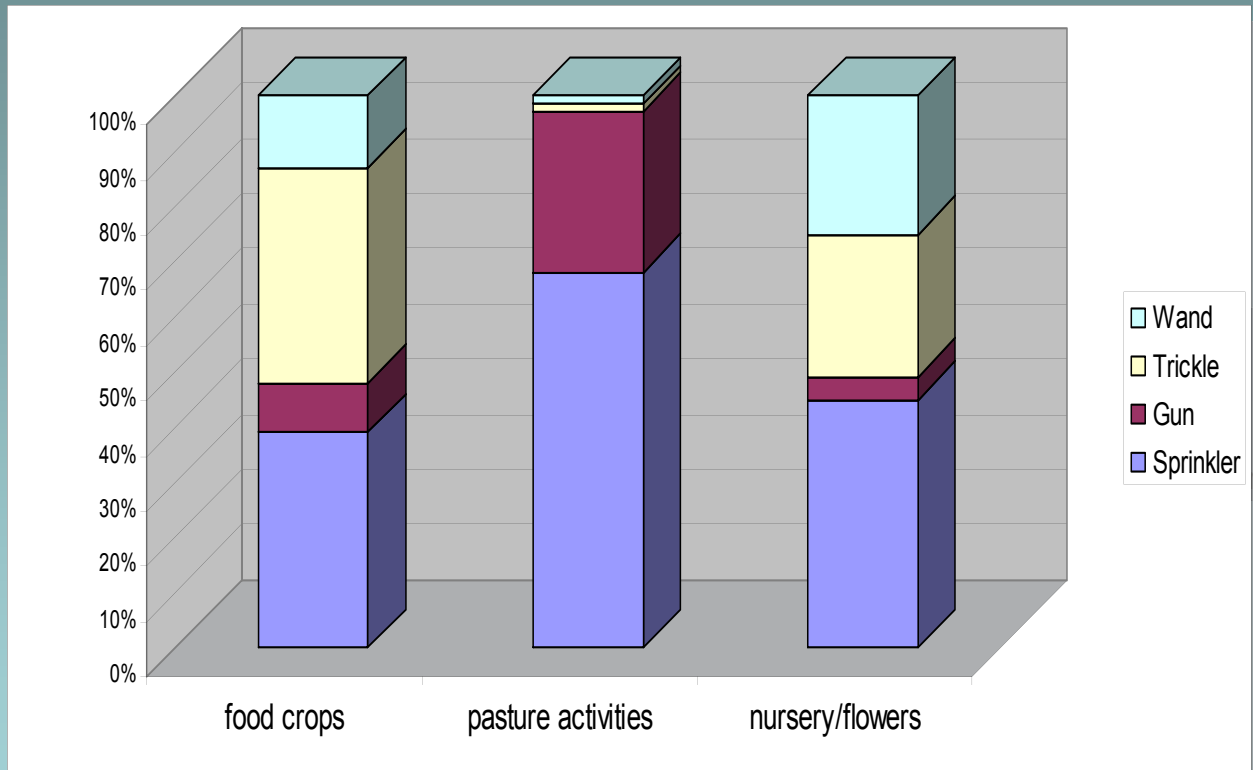
- Crop production sector
  - largest consumer
  - irrigation dominant use
  - vegetable, vine, berry, nursery and ornamentals
- Top livestock water user: poultry



Key Survey Results:

Irrigation Methods by Frequency of Survey Responses

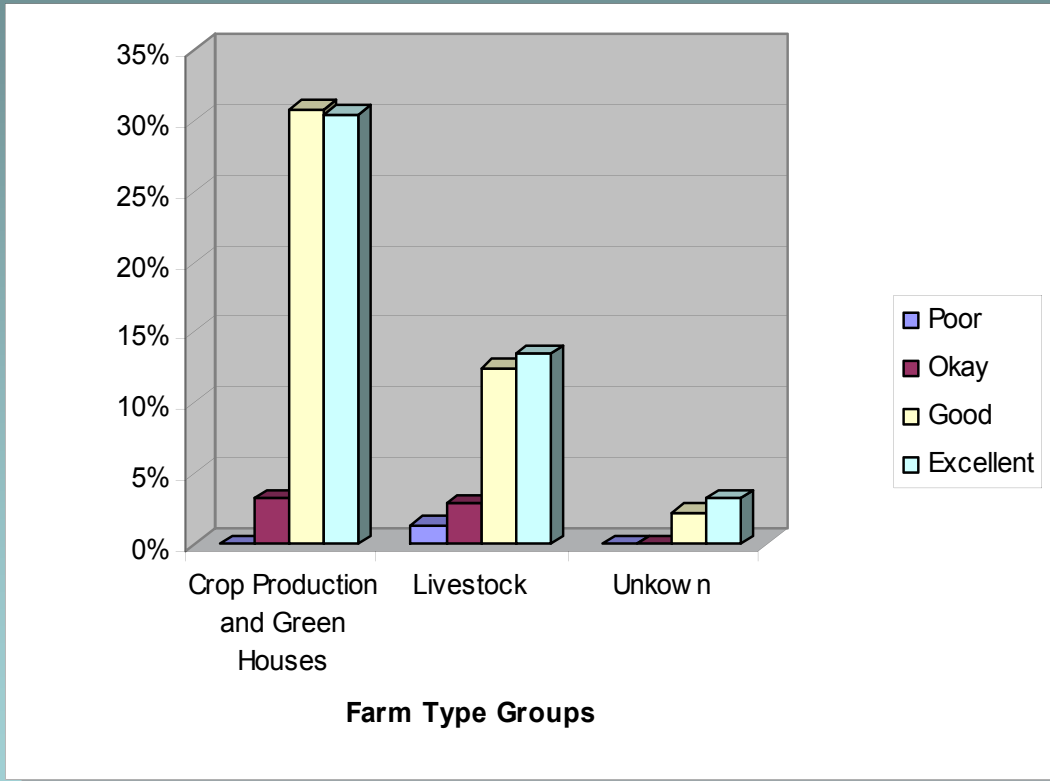
- Food crops: trickle and sprinkler
- Pasture, silage and forage crops – gun and sprinkler
- Nursery/flowers: sprinkler with trickle and wand
- 14% of surveys indicated water shortages impacted production



Key Survey Results:

Water Efficiency Self-Assessment

- Farmers were asked to rate their own water efficiency
- Overall 93% reported "excellent" or "good"
- Similar result by sectors

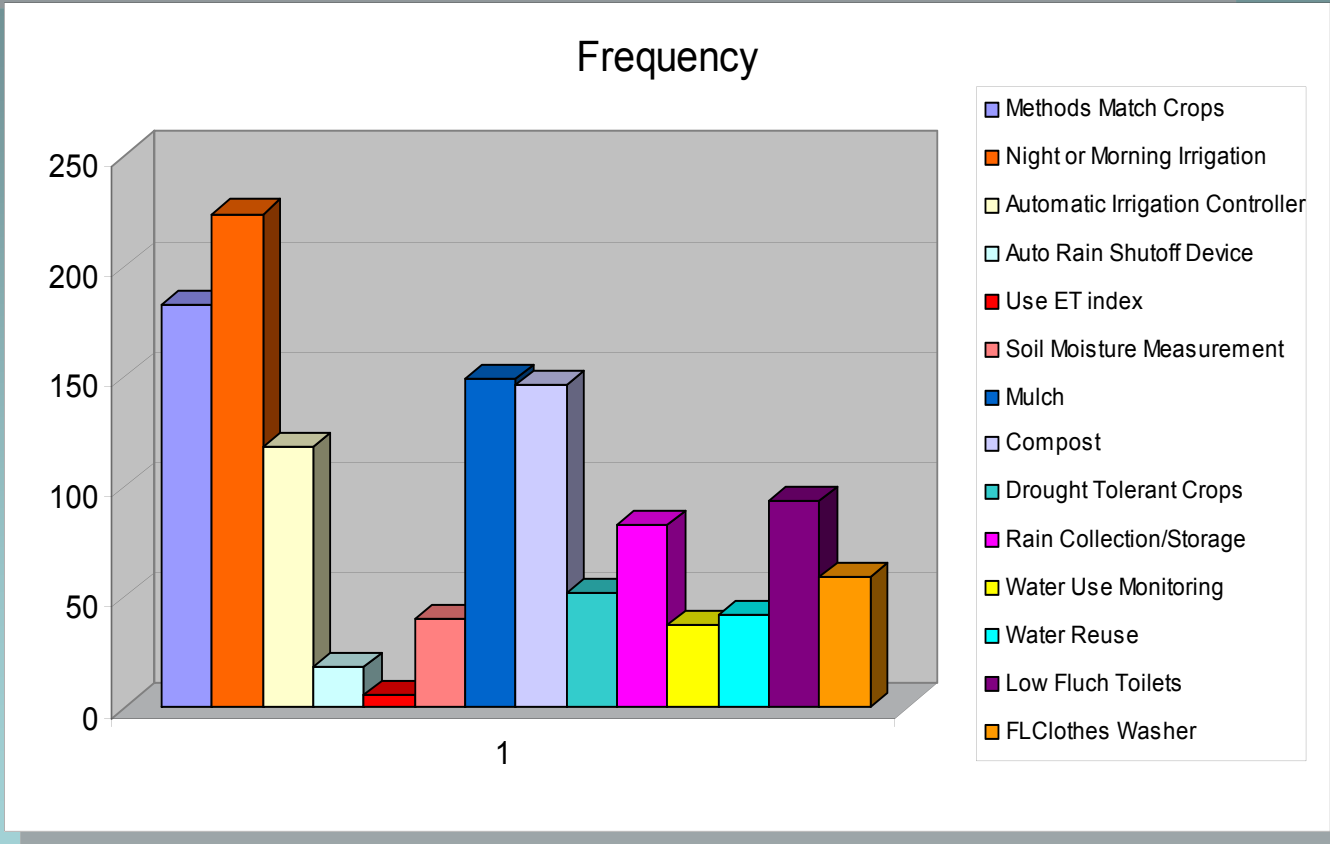


Key Survey Results:

Conservation Practices Reported

- Same pattern for livestock and crop production sectors except irrigation method matching crops used more frequently in crop production sector.

40% want to improve conservation and efficiency



Key Survey Results:

Anticipated Future Changes

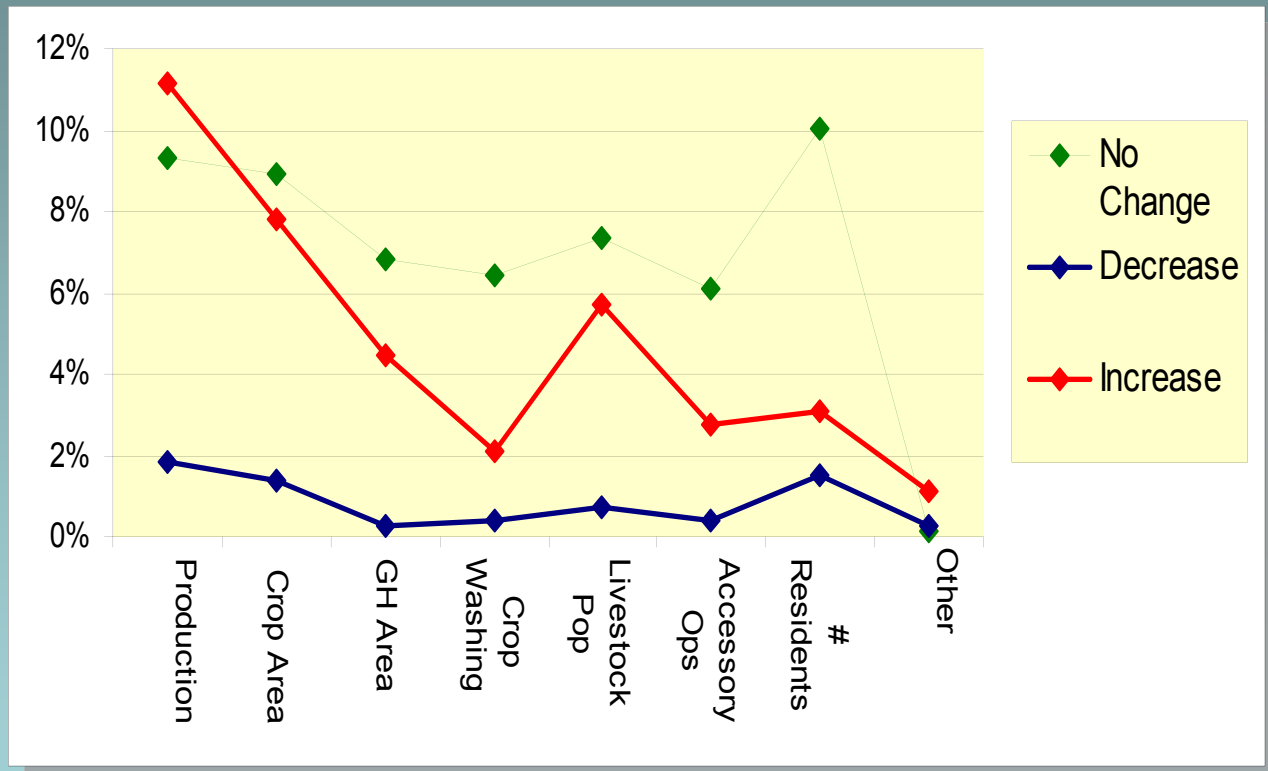
Areas of increase are:

crop production field

crop area

livestock population

greenhouse area



Water Efficiency Analysis

Approach

- Data Gathering – three primary; survey, LUI, base (incl. retail water)
- Core Dataset filtered – 100% water from CRD
- Benchmark vs. Actual water use
- Benchmark Water Use Model – BC Sprinkler Irrigation Manual
  - parcel – dominant soil texture, crop type (coefficient/root depth)
- 'Irrigation Requirement' for each parcel calculated, based upon:
  - AWSC = rooting depth x dominant soil texture
  - MWSD = AWSC x crop coefficient
  - Total IR = avg. IR x dom. crop area

Water Efficiency Analysis

Results

"Average efficiency was 1.4 times better than irrigation bench mark"

- Efficiency by crop type determined
- Rationalization of large discrepancies – actual vs. benchmark
  - crops not irrigated or fields fallow
  - crop extent and type

  e.g. pasture – 249% efficient

  raspberries – 86% efficient

ON AVERAGE, FARMERS USING ONLY MUNICIPAL WATER APPEAR TO BE USING LESS WATER THAN IS REQUIRED TO MAXIMIZE CROP YIELDS

Integrated Information (Study Database)

- All the information is spatially referenced
- Can be used for further analysis
- Future change analysis
- Includes:
  - agriculture land use/farm information by property
  - private parcel boundaries
  - BC assessment data
  - ALR and soils
  - well locations

Summary - Observations

- CRD critical water source for agriculture
- Wells are also an important source
- Irrigation is the primary use of CRD water – crop sector
- Less water is used than required to maximize crop yields
- Water efficiency is good, and is important to farmers
- Strong interest in future conservation and efficiency improvement
- Future growth in crop and livestock production, greenhouses

Focus Group Discussion

11:00 – 12:00

Small group discussion: Factors that influence farm water use

- A flip chart is provided for each of the following factors:
  - The economics of food and labour
  - Land use policy and regulations
  - Climate change, local soils and groundwater
  - Cost and quality of water from various sources
  - Others factors
- Divide into small groups (2-4 people each)
- **Brainstorm and record on the flip chart how the factor assigned to your group influences decisions about water use on Greater Victoria farms. Also record any factors that we missed!**

12:00 – 12:30

Lunch Break!

Focus Group Discussion

12:30 – 1:30

Whole group discussion: Matching factors to findings

- A flip chart is provided for each of the following factors:
  - The economics of food and labour
  - Land use policy and regulations
  - Climate change, local soils and groundwater
  - Cost and quality of water from various sources
  - Others factors
- **Which study findings are associated with each factor?**
- **How does each factor explain the study findings?**
- **What other facts about farm water use did the study miss? Which factors contribute to these other facts?**

Focus Group Discussion

1:30 – 2:00

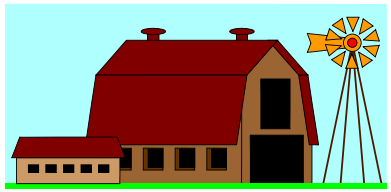
Whole group discussion:

Looking ahead, how can we improve farm water management?

- Based on our work today, we now have a clearer picture of how various factors combine to influence how water is used on farms in Greater Victoria
- **What actions can we take to resolve some of the present and possible future challenges facing water supply availability and quality for farming in Greater Victoria?**
  - What can farmers do?
  - What can governments do?
  - What can residents and businesses of the CRD do?
- **Our objective is to brainstorm viable "win-win" solutions to water management challenges that will benefit farmers, the community as a whole, and the environment .**

THANK YOU

for taking time from your busy schedule to participate in today's workshop!



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APPENDIX V

"Focus Group – Workshop Notes"

Focus Group Workshop Transcript
Understanding Farm Water Use in Greater Victoria
November 21, 2005

Session 1: Factors that Influence Farm Water Use

Participants were asked to form four small groups of 3-4, plus a facilitator/recorder from the project team. Each group was asked to discuss one broad category of factors, and all groups were asked to identify additional or "other" factors that are not included in any of the four categories assigned to the groups.

1. The Economics of Food and Labour

- US competition – subsidy is greater than for local farmers
- Labour costs – relatively higher
- Public decision making
  - disposable income
  - education
    - value to society
      - local benefits
      - food security and sustainability – feed your own community
- Lifestyle (emotional factors)
  - alternative source of income will be needed to keep farming viable
  - passion – family business
- Water management education
  - smarter use of water
  - cost prohibitive currently
- Land values – money
  - As land values increase, crop diversity decreases
    - i.e. urban development – people want to live here
  - long term analysis will be needed to help ALL plan
  - who?.....CRD
- Population growth
  - pressure for food
  - demographic shift
- Labour
  - lack of experienced labour
  - shortage
  - seasonal
  - maximize efficiency!
- Policy (see policy group)
  - effects all decision making
  - land use – need OCP
- Water costs
  - less than 10% of overall cost of a farm business
  - not very much but it's greater than the profit
- Government restrictions
  - Federal (crop restrictions?) – e.g. spuds?
  - review and remove?
  - it is POLITICAL
- Public opinion

- resistance to change
- present and future conflicts

2. Land Use Policy and Regulations

- Municipal water (CRD)
  - health standards require use of municipal water for some farm purposes
    - BC vegetable marketing board
    - VIHA – food preparation
  - municipal infrastructure policy – e.g. Senanus Road
  - Regional growth strategy (CRD)
  - ALC
- Locally sourced water (ground and surface)
  - health standards prevent its use for some farm purposes
  - ground water licensing
  - waste water management – impacts groundwater quality
  - water re-use policies (lack of policy may deter water reuse)
  - surface water licensing
  - municipal OCP and land use bylaws
    - conflicts with fisheries
  - over allocation
  - municipal rainwater management
    - storm water management
    - storage
    - critical recharge management
    - rainwater harvesting
- Watershed based planning and environmental farm plans are strategies that can address issues with both municipal water and locally sourced water

3. Climatic Change, Local Soils and Groundwater

- Climatic change
  - this area is drier over time and there is a decrease in precipitation
  - increased water demand
    - more need for farmers, housing and industry
  - weather patterns will likely change, influencing irrigation
  - in the ‘old’ days there was more snow; ponds froze over
- Groundwater
  - development creates hard surfacing and therefore there is less recharge
  - total capacity for aquifers is likely NOT great
  - more farmers are using cover crops, therefore less run-off
  - reduction of forested areas implies
    - less absorption
    - faster run-off
  - crops with low water requirements (should) might be a consideration
  - where are all of the ground water recharge sites and areas? - are they diminishing?
  - groundwater survey a few years ago – for what purpose?
  - more work or information needed on water balance in aquifers
  - groundwater mapping and rating of sensitivity - what is the status?
  - what is the annual withdrawal and recharge
  - aquifer volumes

- nature of future regulations
    - drilling
    - monitoring
    - permitting
    - charges
    - who is to do this?
- CRD waste water management – how does it connect to aquifer protection?
- inter agency cooperation
- how to finance groundwater regulations
    - funds from surface water licenses - $350,000,000 per year
- groundwater – licensing and royalties
- relationships between surface water and groundwater (diagram depicting migration of gasoline in groundwater from surrounding developed hill areas to a central low-lying agricultural area)
- increase in housing (diagram depicting development in hilly areas resulting in contamination of groundwater that daylights in Hagan Creek)
- effects of sewer
    - no more septic and recharge
    - Ardmore situation

▪ Local soils

- Clays (less than 75m)
    - need good management
    - less surface run-off
    - "mole drains not too expensive" add buffering
    - deep ripping and drainage increases AWSC but likely more winter site drainage
    - deeper rooting means more access to soil moisture
- need better 'on farm' soils mapping to understand I/R as to variability
- soil/compost 3-5 inch cover saves 20-30% watering
- need strong CRD – farmer relationship
    - municipal working relationship should encourage 'good' organic matter management
- CRD waste and sewage – where to go and how to do it?
    - contaminates
    - public upset

4. Cost and Quality of Water from Various Sources

▪ Quality issues

- CRD water in certain areas
    - pressure is too low
    - half throw distances (i.e. sprinkler throws are half what they should be?)
- dry season volume (July/August) – draw down/pressure or a combination of both
- CRD water for [illegible] crops 'meet standards' – advantages [illegible] selling (point about health requirement to use CRD water for some food crops, due to higher health risks with groundwater or other sources?)
- groundwater temperature – too cold – requires surface storage to raise temperature (capital cost intensive)
- CRD chlorine "issue" – may affect production rate of ornamentals?
- groundwater quality varies
    - deep well sodium content = capital cost of subsurface drainage system
- quality concerns of surface water
    - urban and commercial impact - contamination

- degraded quality can cause an increase in costs or loss of a water source
- potential impact of surface run-off – funneled to sewers, etc.

- earthquake, etc. – 'contingency (supply) planning'
  - possible loss of CRD water source
  - greater reliance on well water
- contamination from surface emergencies 'oil spills, etc.'

- Cost issues
  - size of the farm (capital costs)
    - small farm = relatively cost effective (low costs)
    - large farm = storage, ponds, etc. (high costs)
  - CRD water cost relatively expensive compared to other sources (e.g. groundwater, etc.)
  - monitoring
    - surface and groundwater – annual costs
    - CRD 'done'
  - water rate increase would impact (?)
  - energy cost of ground and surface water irrigation – hydro
  - water costs
    - small part of overall economics
    - interlinked – crop and irrigation method changing demand
    - not independent

5. Other Factors

- Provincial Marketing Regulations
  - restricts market access
  - quotas
- New crops
- Wells – number and volume
  - aquifer – input vs. output
  - will have impact on (?)
- Agriculture water use in future –will it increase in the future or level off?
- Demographic changes
  - urban growth
  - change in farm types
- Intensification of farms
  - value of land increase
  - lifestyle changes
  - policy of subdivision of farmland remaining in agriculture
  - succession of farms
  - concept for solution to these issues – "Agriculture water reserve policy"? (CRD or province?)
- Geese and water quality
  - more geese implies more CRD water use (polluted dugouts)
- Education and conservation for all water use
  - television segments (2 minute fillers)
  - city folk vs. country folk - understanding the interface
- Terminology influences public perception – Use of the word "subsidy" vs. "agriculture water rate"
- Consistency
- Foreign competition

Matching Factors to Findings

Why is farm water "underused" based on survey results? (i.e. why is less water used on average than would be required to maximize crop yields where crops are reported to be irrigated by survey respondents?)

Factor: Economics

1. Farm infrastructure costs
    - two cuts only as cost is too high to build irrigation systems for more cuttings
2. Labour constraints
    - costs
    - seasonal shortages
3. Fuel costs
    - costs will rise (certainty) therefore local productivity will make more economic sense (contrary to predictions of productivity decreasing)
4. Food security
    - risk management – food charter
        - bio-terrorism
        - earthquake
5. Model error
    - Possible problems with model parameters – overestimates irrigation requirement?
    - calibration of model?
6. Sub irrigation
7. Productivity "Optimization"
    - optimize not MAXIMIZE (i.e. grape producers turn water off for better crop not more crop)
    - reference: Kelowna model
    - local models lacking local data (i.e. ET rates calibrated in Kelowna)
    - WURLD model
        - needs local customization
        - empirical research needed
8. Usage Risk Management
    - projected use is a guessing game

Factor: Policy Effects

1. Lack of supply
    - Profit potential does not justify high water line cost
2. Allocation to agriculture (i.e. "agriculture water reserve" principle)
    - needs much analysis – rational approach
3. Water revenue distribution
    - $300 million in provincial dollars to support needs
    - tap into it?
4. Infrastructure
    - Development of infrastructure requires urban density as a driving force
    - no increased infrastructure for agriculture alone - needs residential
5. Groundwater
    - better understanding is key
        - must be managed – quality and quantity
    - politics – ever present
        - quality is in jeopardy
        - contamination can kill groundwater aquifers

        - i.e. simple signage to warn of presence or absence of groundwater
    - how are we doing? – good compared to others
    - stakeholders (other demands on groundwater)
        - need to involve all players (i.e. golf courses)
        - groundwater as a source of energy
        - alternate uses (energy) or users (golf) need consideration
6. Land use
    - size of retail facility allowed on a farm (municipal bylaw)

Factor: Climate Change and Soils

1. Topographic and land values
    - Some local conditions (e.g. rock) are a disincentive for dugouts - too much money to build and no return
2. Groundwater recharge
    - where are we?
    - are recharge rates sufficient
    - how do we assess
    - what to do
        - change to crops that use less water
    - i.e. Dean Park – development has adverse effect on water table

Factor: Cost and Quality of Water

1. Ancillary hidden costs
    - Grit or silt in some groundwater wrecks pumps
    - pump replacement can be expensive ($5,000 every 5 years)
    - too costly in this case, therefore CRD water used
2. Long term security
    - 'grandfather' principle: protect what you have for what you'll need
    - i.e. make sure you are using the water sources you have available to you so the government doesn't allocate them to some other use
3. New technology
    - varying energy sources – may change the economics

Factor: Other Factors

1. Who gets the "investment" (water at the farm rate)?
    - qualification based on use – food crop, other
    - can we set better criteria to assess who and why?
    - guidelines to assess water rates
        - pro-rated based on use
        - split rates between agriculture and residential
    - careful balance is required due to increasing pressure to develop farmland
    - connect forage to cattle – don't take away the farm water rate from livestock/dairy farms
    - 'presence' of water allows for better choices on land use
        - i.e. if a property has an adequately sized well or municipal water connection, it has more value for agriculture than a property with an inadequate water source

Looking Ahead: How can we Improve Farm Water Management?

- Government – cooperation
    - look for the win-win opportunities
        - e.g. Hartland – clay spoil from dugout construction has been used for landfill caps
    - Decommissioned municipal reservoirs – look for opportunities to convert to private use for agriculture before selling off the land for urban development
    - Increase transfer of biosolids/organics from urban areas to farms
        - septage?
        - e.g. Saanich leaf collection and yard waste depot
- Education (it's good, but there is always room for improvement)
    - inform
    - teach
    - share information
- Conservation!

APPENDIX VI

"Metadata – Farm Survey Relational Database"

Date: November 30, 2005
Project: CRD Water - Agriculture Water Use and Conservation Study
Client: Colwyn Sunderland
Consultant Team: Hally Hofmeyr, Synetric Consulting
Don Howes, Matrix Resource Droup
Jeff Warwick, Clover Point Cartographics Ltd.

Application: CRD_AG_DB.mdb (Access 2000)
Creator: Scott Ritchie, Clover Point Cartographicws Ltd.

Notes:
1. **[<TABLE_NAME>]** – name of the table in the Access database followed by a description of the table and its use where applicable.
2. "JUROL" field was used in joins wherever possible as it was the unique key to the CRD's spatial base (ICF).

MAIN DATA TABLES:

[SURVEY] – the main table for the Farm Survey. It is a flat table with primary key (SURVEYNUM), an automatically assigned number which was written on the actual returned survey for ease tracking. The table is self documented in the FORMS design view which refers to the section number, subnumber, and text found on the distrubuted survey.

[CROPS] – joined in a 1:Many relationship with the **[SURVEY]** table on JUROL

SUPPORTING DATA TABLES:

[ACTIVITIES_SURVEY_2005] – table extracted from the Ministry of Agriculture Land Use Inventory (LUI) – ammended July 8, 2005 version (See Rob Kline / Stacy Meech for LUI specific inquiries)

[DONCODE] – based on **[ACTIVITIES_SURVEY_2005]**, a generalised numerical field named **[DONS CODE]** was applied across the various land use indicators to simplify them for subsequent analysis.
Note: See [**LUT_DONCODE]** table for the integer to text representaion values.

[LUT_DONCODE] – explaination of the numerical representation of **[DONCODE].[DONS CODE]**

[LUT_BIGFARMS]- subsetted list of proposed largest farms supplied by CRD

[LUT_TOP20] – list of the approximate top 20 farms by water useage, supplied by CRD

[MAILOUTLIST] – inital mail our list for farm survey / people the survey was mailed to, supplied by CRD

[METERS] – water meter volume data supplied by CRD Water in XLS format. This data used BCROLL number as its unique key which is a portion of the actual JUROL number. Data accuracy and credibility is suspect and not considered to be 100% accurate.

[METERS_JUROL] – a subset of the **[METERS]** table with JUROL attached
Note: Not all BCROLL numbers have a corosponding JUROL

[MUNICIPLE] – list the municiple names and corresponding codes used as part of the JUROL.

FORMS:

MAIN – four page Graphic User Interface design and data entry view for the Farm Survey. It uses the **[SURVEY]** table for the record source. It has a subform called **FRM_CROPS** that uses the **[CROPS]** tables to store the matrix of irrigation use for the farmers various crops. The form's focus was to mimic the survey mail out and to keep its simple as possible to aid in the speed and accuracy of data input.

FRM_CROPS – subform called by **MAIN** form to store the matrix of irrigation use for the farmers various crops.