2011 Budget & 2012 – 2016 Financial Plan Presentation

Prepared for : English River Water Service Board

November 9, 2011

arrowsmithwaterservice.ca

Mission:

An environmentally sensitive use of water to improve fish habitat and domestic water supply.

PHASING

STAGE I – Complete

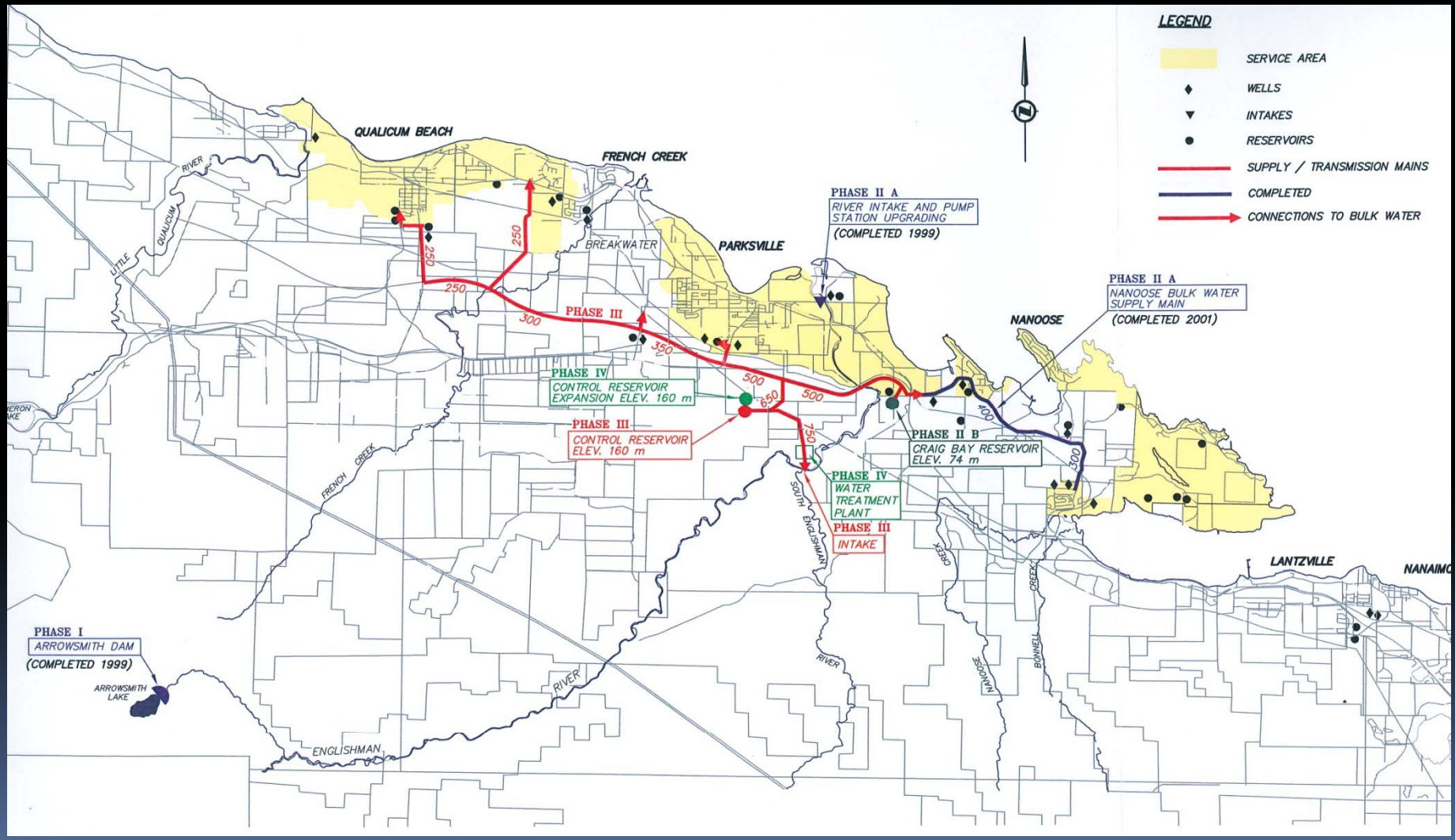
What was Done ?

- Constructed Arrowsmith Dam - 1999
- Interconnected Nanoose systems with Parksville system, Interim Water Use Agreement with RDN - Nanoose
- Expanded intake facilities
- Interim control reservoir (Top Bridge Res. No. 5)

We created Water Storage for the Future and secured a Conditional Water Licence to extract 48 ML / day

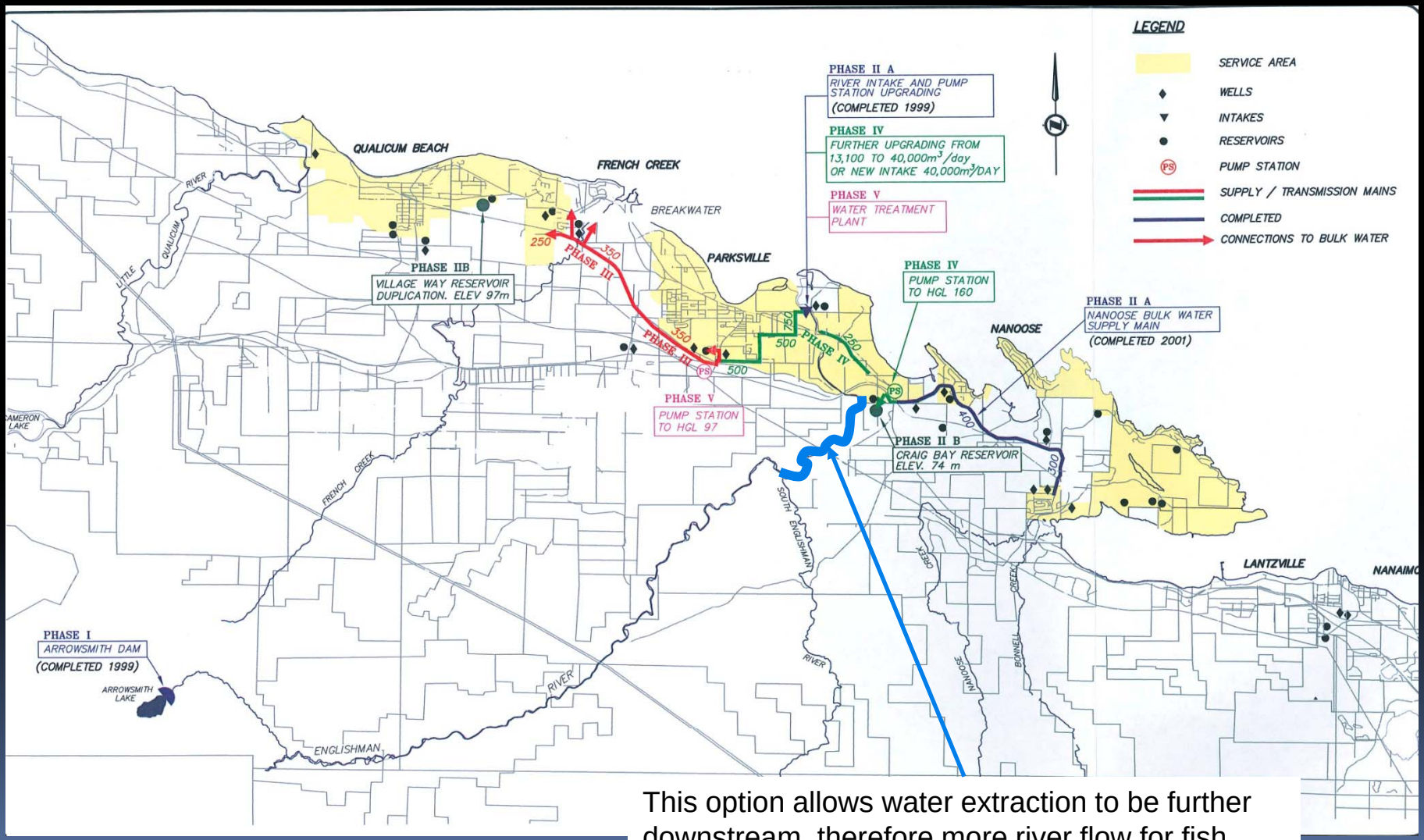
Arrowsmith Water Service (AWS)……Additional HISTORY

Original 1996 Bulk Water Supply Option



Arrowsmith Water Service (AWS)……Additional HISTORY

2005 - Downstream Intake Bulk Water Supply Option



This option allows water extraction to be further downstream, therefore more river flow for fish.

Current Planning Study Objectives

- Review prior work and determine water supply needs for the AWS communities
- Determine the site and development concept for a new intake and water treatment plant on the Englishman River based on the Downstream Option
- Determine how the surface water (also termed bulk water) and groundwater resources can best be managed over the next 40 years

The Study Activities

- Potential Population Growth Trends
- Water Demands
- Groundwater Management
- Water Intake and Treatment Plant Locations
- Water Supply Infrastructure
- Water Supply Strategic Plan

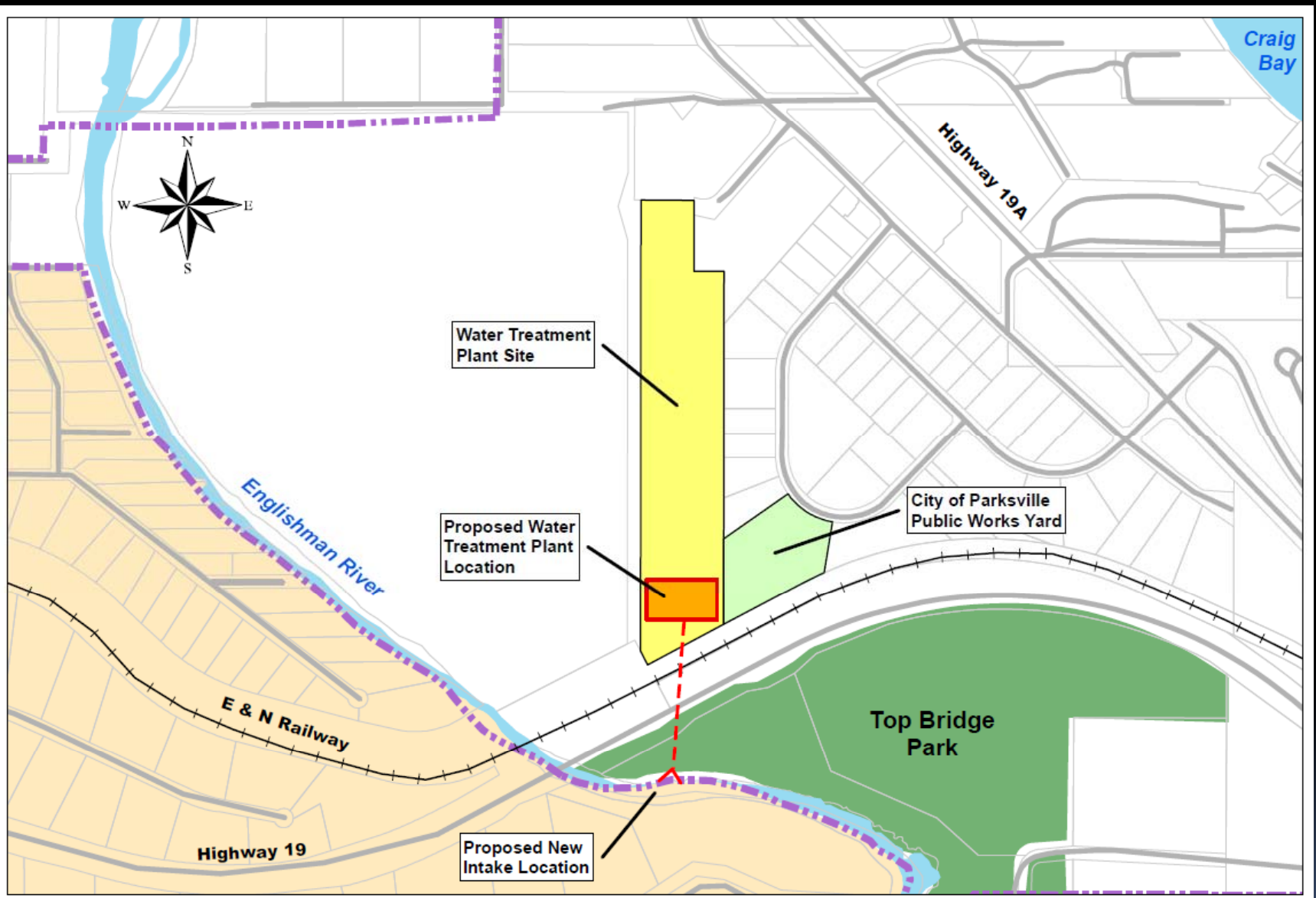
Fourteen discussion papers. Draft Summary Report was issued December 2010. Final report issued April 26, 2011

These Studies can be viewed on the Arrowsmith Water Service Web Page.

Planning Study Conclusions:

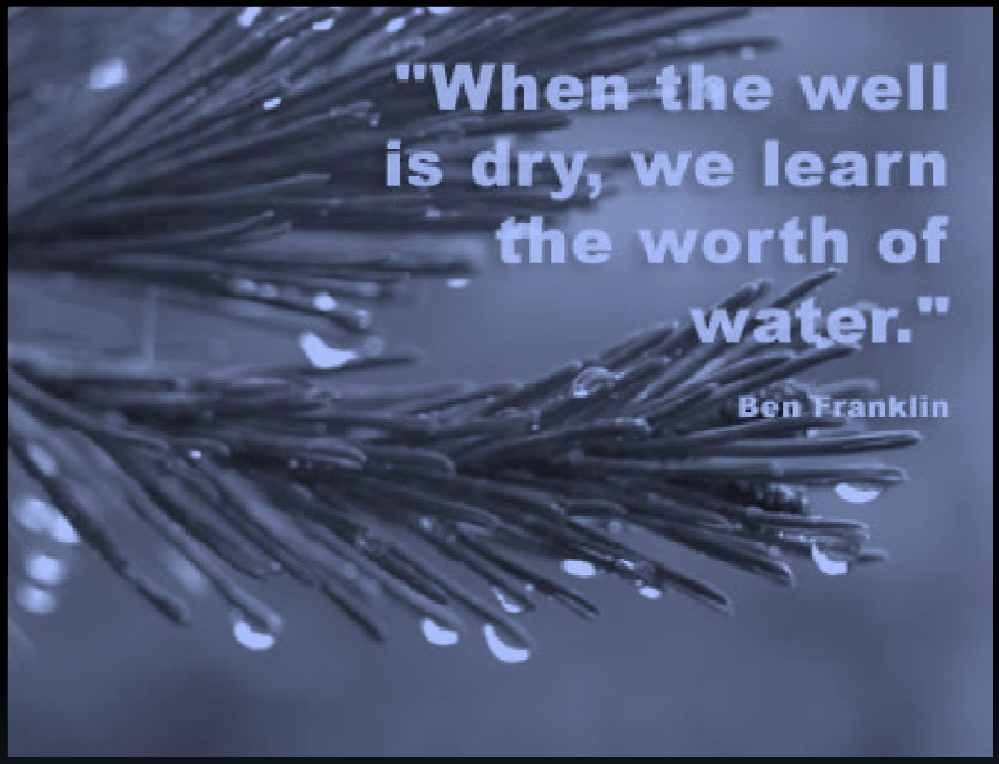
Based on a broad review of sites along the lower Englishman River:

- The best location for the water treatment plant is in the industrial area adjacent to the Parksville Works Yard.
- The best location for the water intake location is upstream of Hwy 19



Proposed Water Treatment Plant

Why are we planning for future water supply ?



Proactive Sustainable Approach, knowing that.....

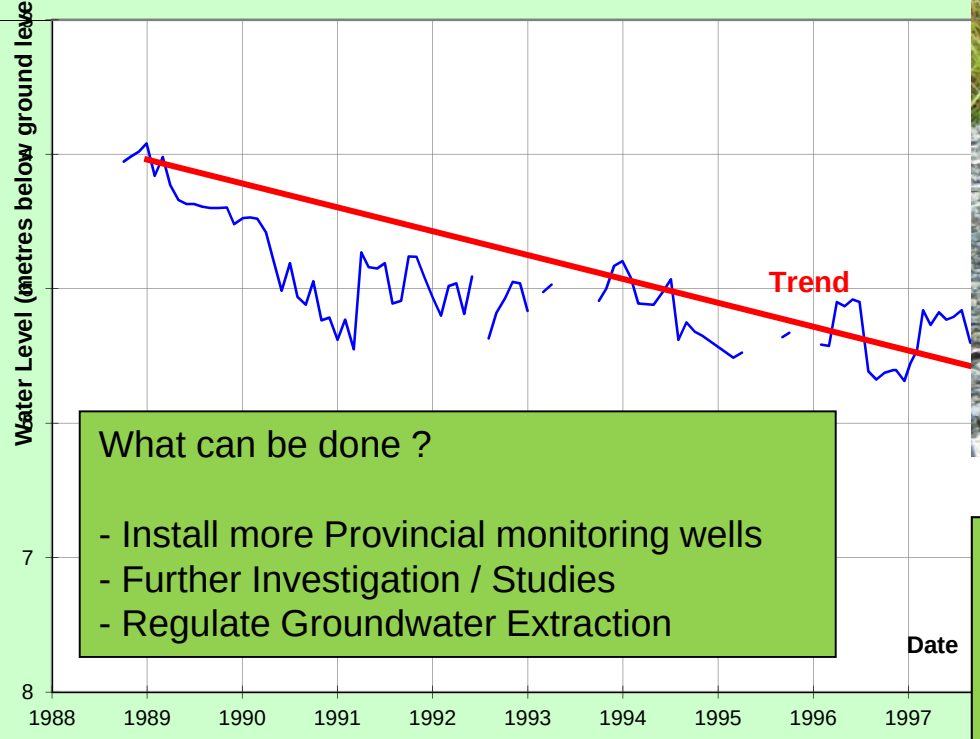
Drinking water is the public's biggest natural resource and ensures our best security for the future.

Why do we need a New Intake ?

- Declining Aquifer Levels (Parksville)

Hydrograph of Observation Well No. 304 Springwood Well, Parksville

Note: This information is from only one observation well located in the Parksville aquifer. The AWS service area region consists of 13 individual aquifers.



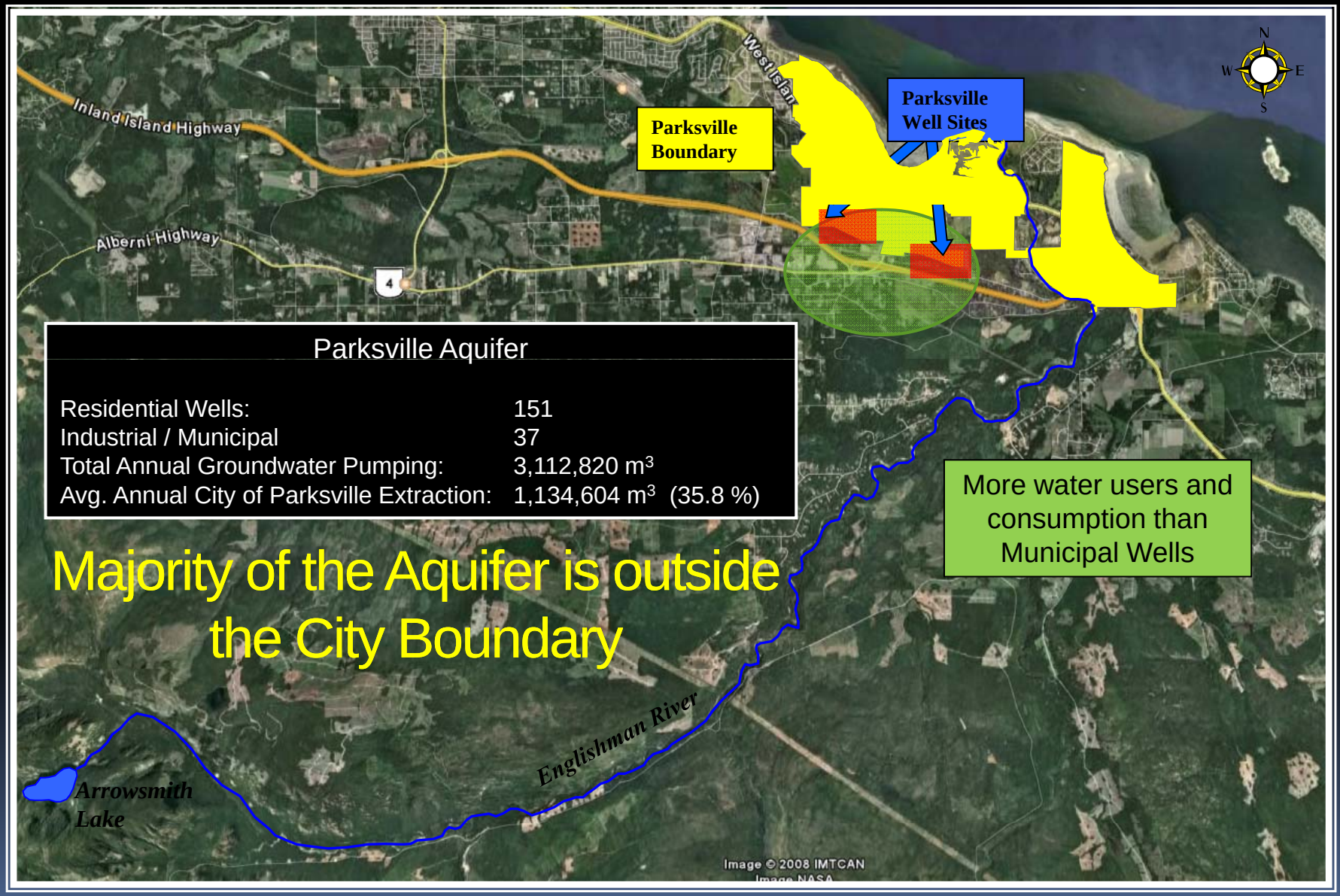
What can be done ?

- Install more Provincial monitoring wells
- Further Investigation / Studies
- Regulate Groundwater Extraction

What has changed?

- Provincial Highway (Hwy 19)
- Development
- Private Water System (more wells)
- Climate

Why do we need Water Treatment and a New Intake ?

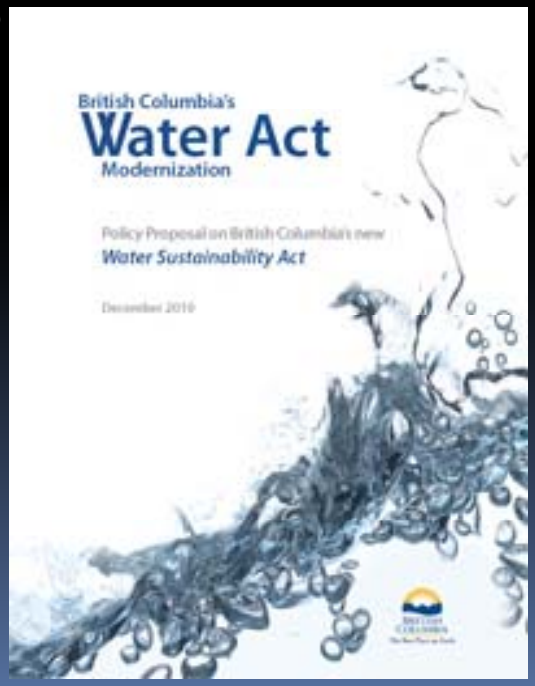


Why do we need a New Intake ?

- No Formal Control over Aquifer Area

- The Current Water Act does not regulate groundwater extraction
- The Province Considers our area at High Risk for Quality
- The Majority of the Aquifer re-charge area is Outside City Boundaries
- Farm Practices Protection (Right to Farm Act) ?
- Water Act is Being Modernized (….2012) to :

  - Protect In-Stream Flows (Water License)
  - Regulate Groundwater Use
  - Require more Efficient Use of Water

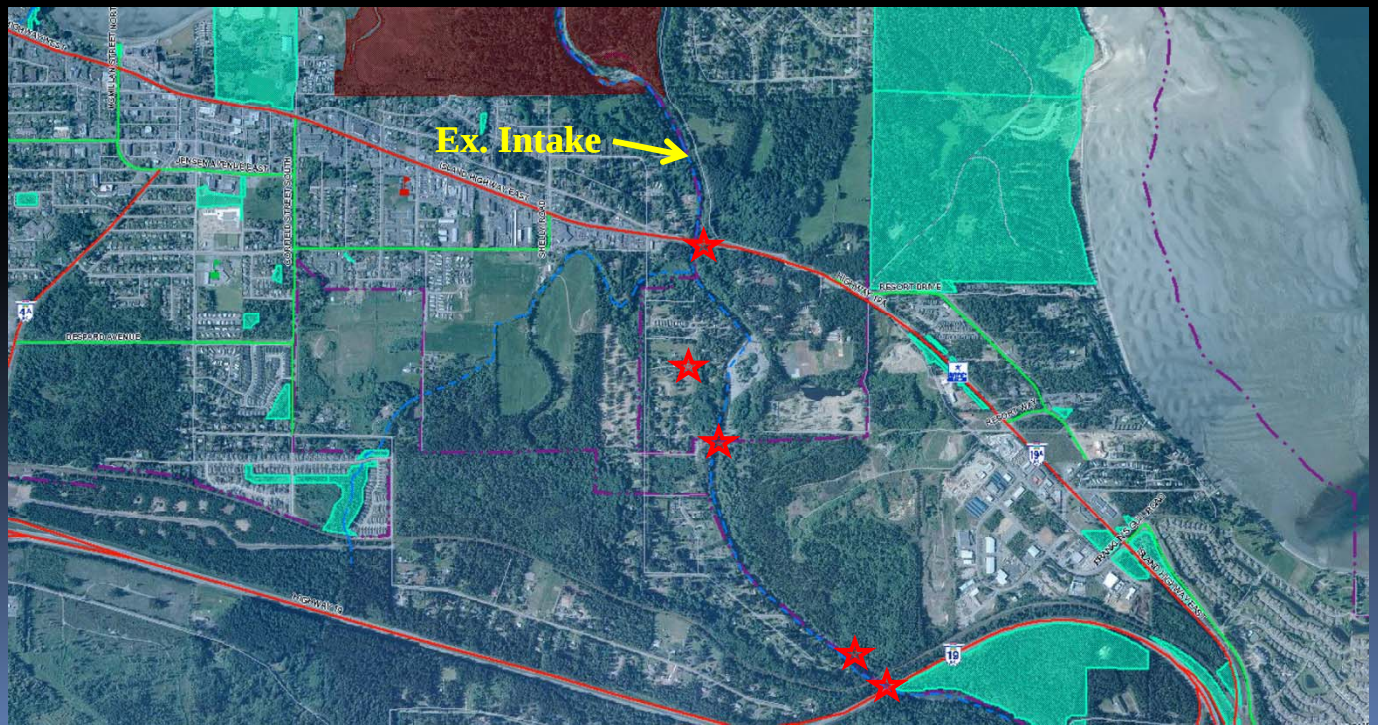


Why do we need a New Intake ?

Existing / Interim Intake Location

Location (risk of contamination):

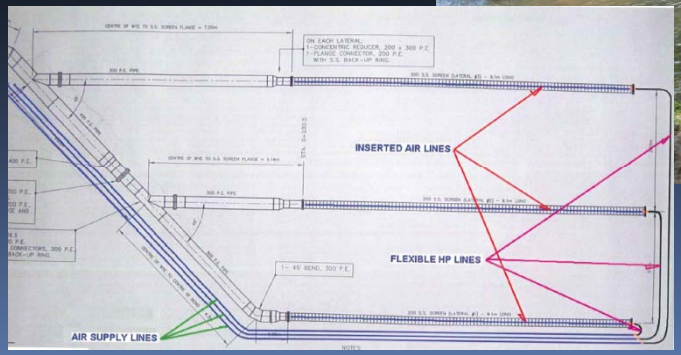
- Below two Highways……fuel spill
- Below one Railway / Septic Fields / Oil Tanks
- Below Flood Plain Area
- Below Sanitary Sewer Crossing



Why do we need a New Intake ?

Deficiencies in current Parksville water intake (Three Horizontal Well Screens)

- Becoming increasing difficult to operate due to the age of the existing infrastructure and the current location being adjacent to a single family residential neighbourhood.
- Only two of the three infiltration gallery legs are operational
- The intake gallery is under the Englishman River gravel bed and current maintenance procedures implicate fish habitat
- In flood plain and therefore becomes inaccessible during flood events
- Type of intake does not lend itself for future expansion



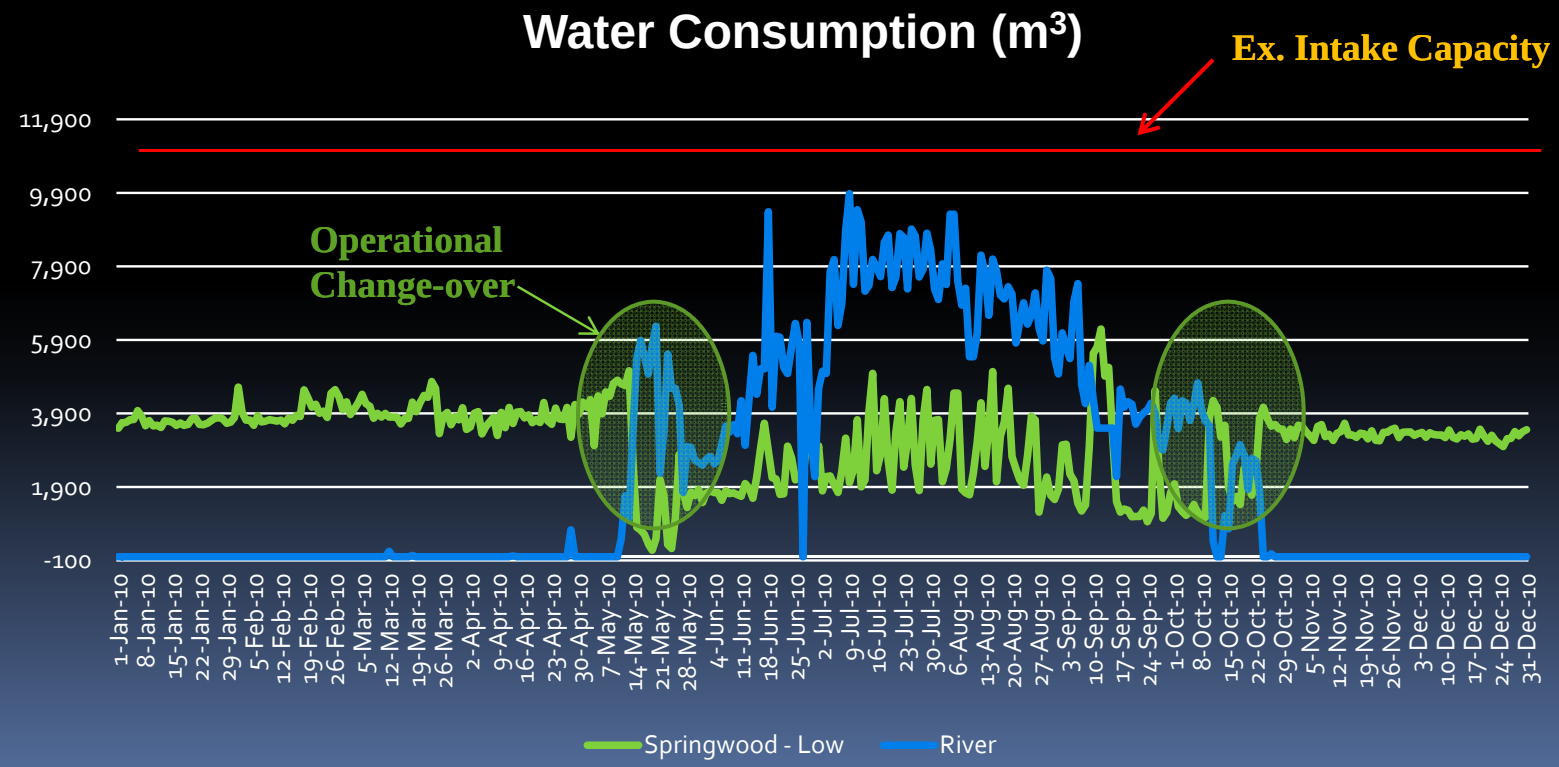
Why do we need Water Treatment and a New Intake ?

- Climate Change
  - Indication of more extreme events (wetter) and drier summers – both drought and flood events
  - Sea Level Rise – will it make the existing intake tidal ?
  - Salt Water intrusion into foreshore aquifers ?

Why do we need Water Treatment ?

- New VIHA Water System Operating Conditions

Our Operating Permit previously allowed us to extract water from the Englishman River below 5 NTU. This requirement has now changed to below 1 NTU. This has reduced the time that we can draw water from the Englishman River and therefore need to take from the wells.



Condition 6.

To be constructed by December 31, 2016

In accordance with VIHA 4321 treatment policy for the Englishman River water source, provide finished water quality using technology that will achieve the following performance standard; a 4-log removal/inactivation of viruses, a 3-log removal/inactivation of Giardia cysts and Cryptospordium oocysts, provide two treatment processes and produce finished water with less that 1 NTU turbidity.

In consultation with, and in reference to the City of Parksville letter dated February 4, 2009 (Your file 5600-10-AWS), the City of Parksville is required to meet the following implementation plan:

May, 2009: Obtain the services of a professional engineering firm to develop a conceptual plan and preliminary design for a water intake and treatment facility.
November, 2010: Conceptual plan and preliminary design is completed.
December, 2013: Detailed design of the new intake and treatment facility is completed.
January, 2015: Construction for the water intake and treatment facility commences with completion scheduled for December 31, 2016.

Date: April 24, 2009

B. Wreall

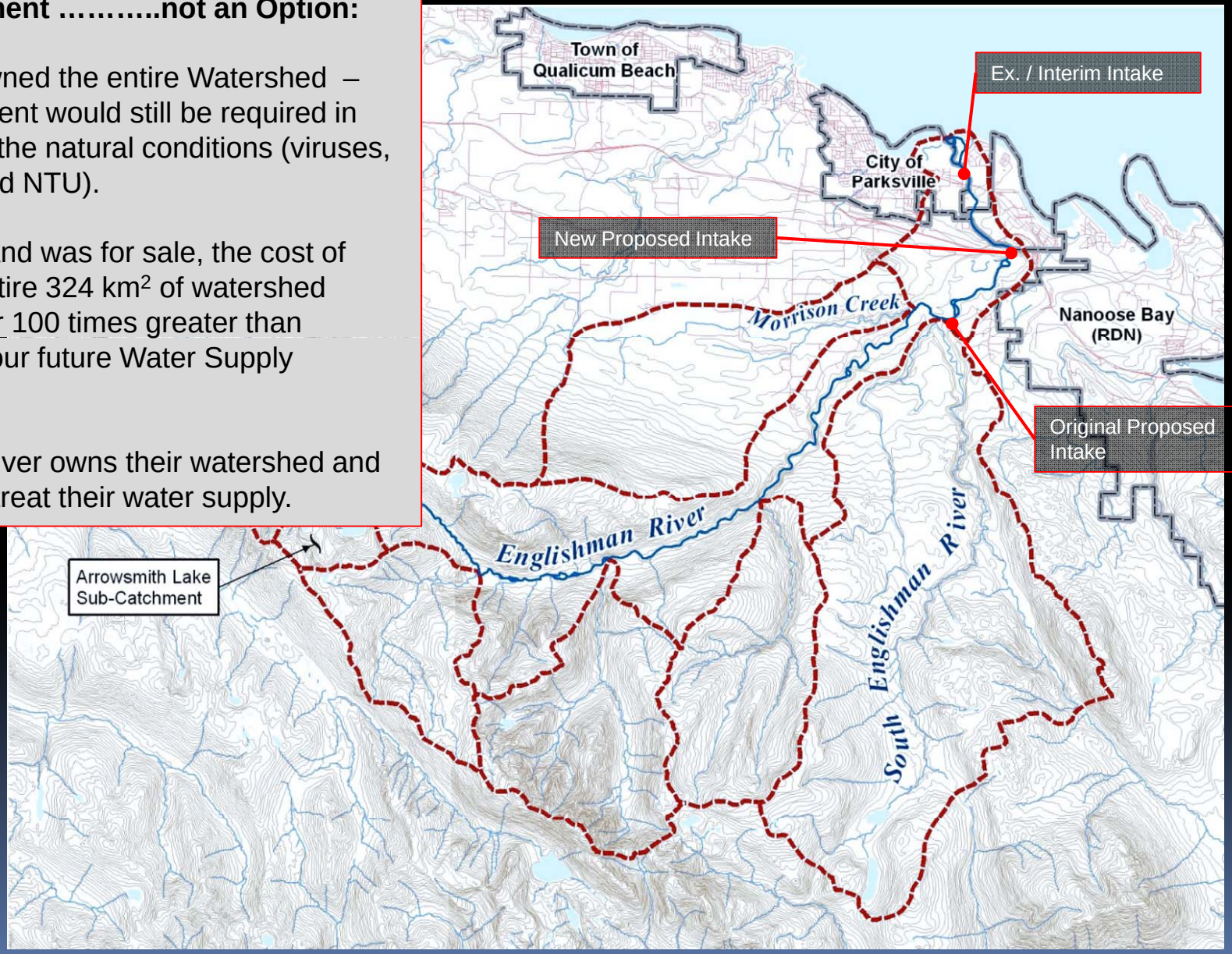
Why do we need Water Treatment ?

Water Treatment ……..not an Option:

Even if we owned the entire Watershed – Water Treatment would still be required in order to treat the natural conditions (viruses, pathogens and NTU).

Given if the land was for sale, the cost of buying the entire 324 km^2 of watershed would be over 100 times greater than constructing our future Water Supply upgrades.

Metro Vancouver owns their watershed and still needs to treat their water supply.



Why do we need Water Treatment and a New Intake ?

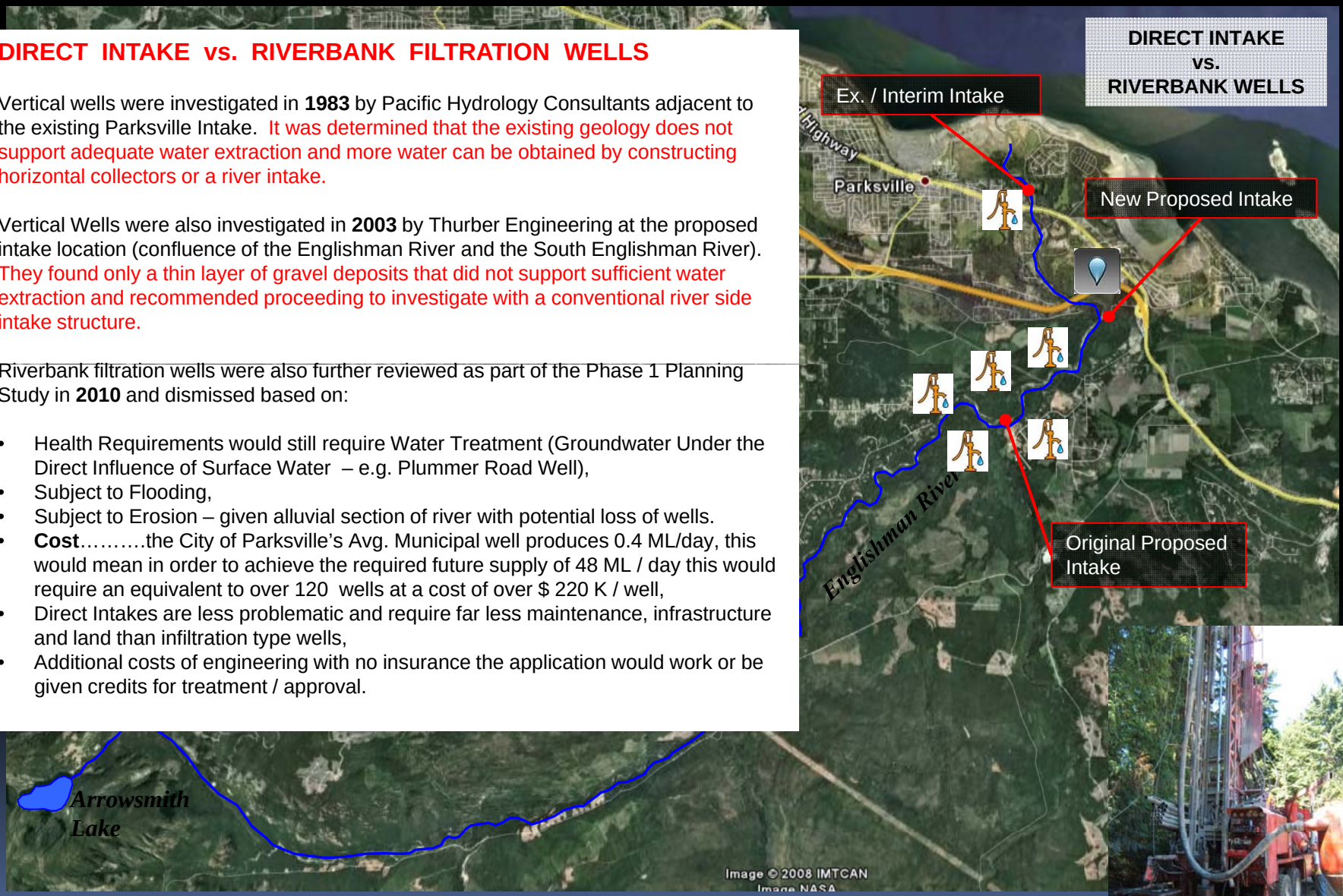
DIRECT INTAKE vs. RIVERBANK FILTRATION WELLS

Vertical wells were investigated in **1983** by Pacific Hydrology Consultants adjacent to the existing Parksville Intake. It was determined that the existing geology does not support adequate water extraction and more water can be obtained by constructing horizontal collectors or a river intake.

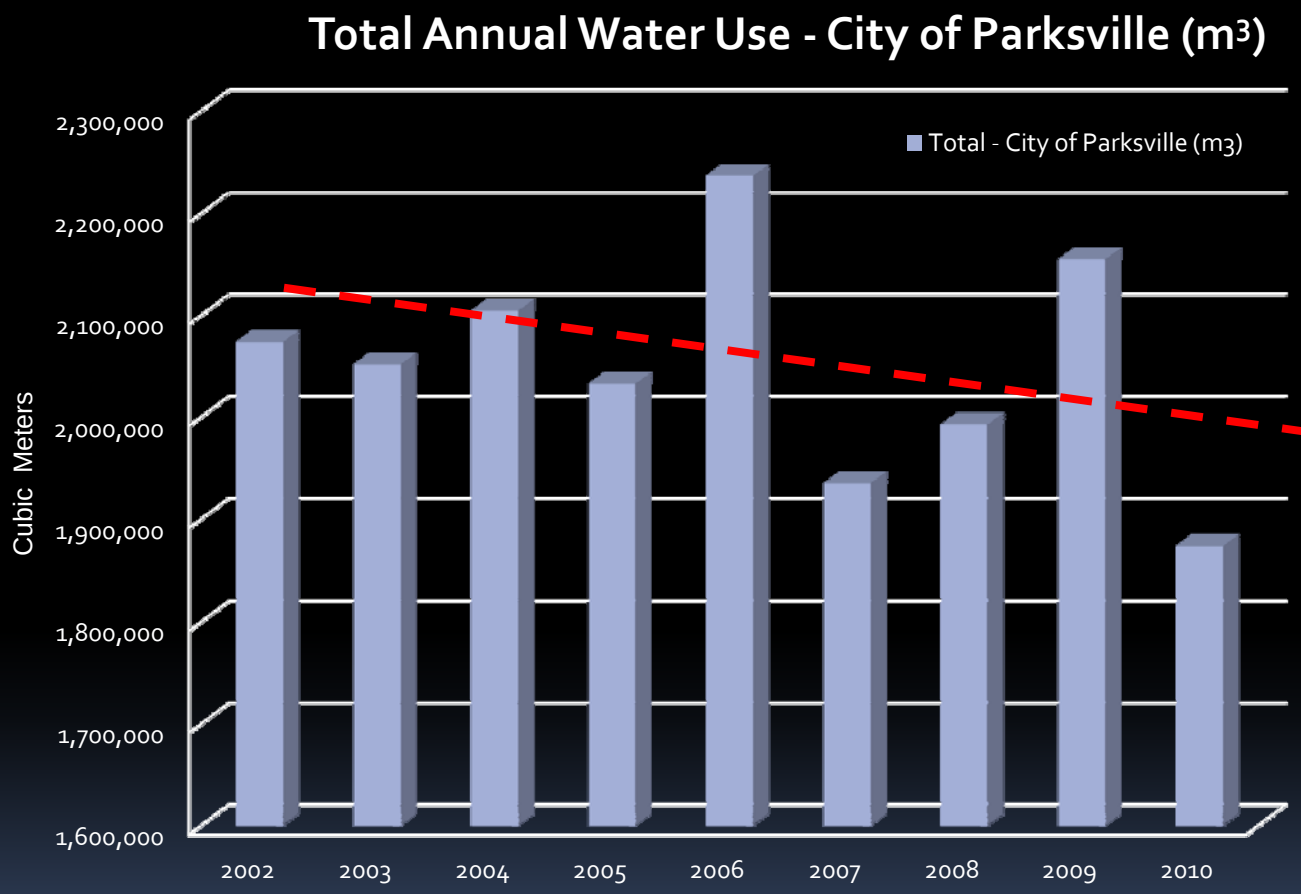
Vertical Wells were also investigated in **2003** by Thurber Engineering at the proposed intake location (confluence of the Englishman River and the South Englishman River). They found only a thin layer of gravel deposits that did not support sufficient water extraction and recommended proceeding to investigate with a conventional river side intake structure.

Riverbank filtration wells were also further reviewed as part of the Phase 1 Planning Study in **2010** and dismissed based on:

- Health Requirements would still require Water Treatment (Groundwater Under the Direct Influence of Surface Water – e.g. Plummer Road Well),
- Subject to Flooding,
- Subject to Erosion – given alluvial section of river with potential loss of wells.
- **Cost**…….the City of Parksville's Avg. Municipal well produces 0.4 ML/day, this would mean in order to achieve the required future supply of 48 ML / day this would require an equivalent to over 120 wells at a cost of over $ 220 K / well,
- Direct Intakes are less problematic and require far less maintenance, infrastructure and land than infiltration type wells,
- Additional costs of engineering with no insurance the application would work or be given credits for treatment / approval.



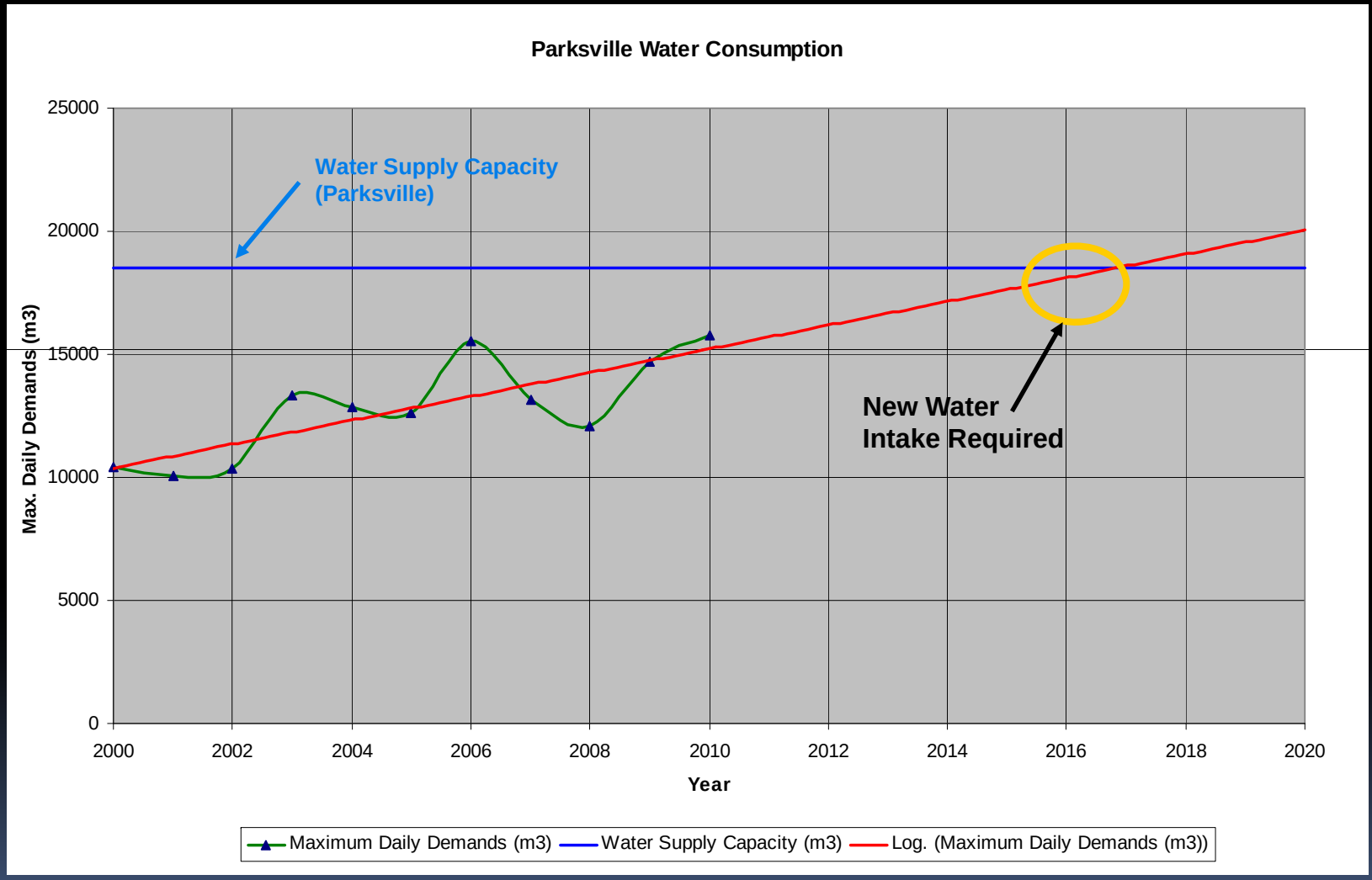
Good News……



Water Conservation Works !!!

Total Annual Water Use – Declining Trend

Why do we need Water Treatment and a New Intake ?



Max. Day Demand - **Increasing**

Do we need water treatment ?

How much **Risk** do <u>you</u> want to take ?

- *As a Water Purveyor, we do not have the luxury of personal opinion regarding risk, we have the legal responsibility of supplying clean, safe potable water to the region from the source to property.*

- Health safety……priority for Local Government
- Elderly demographic in the region
- Children more susceptible

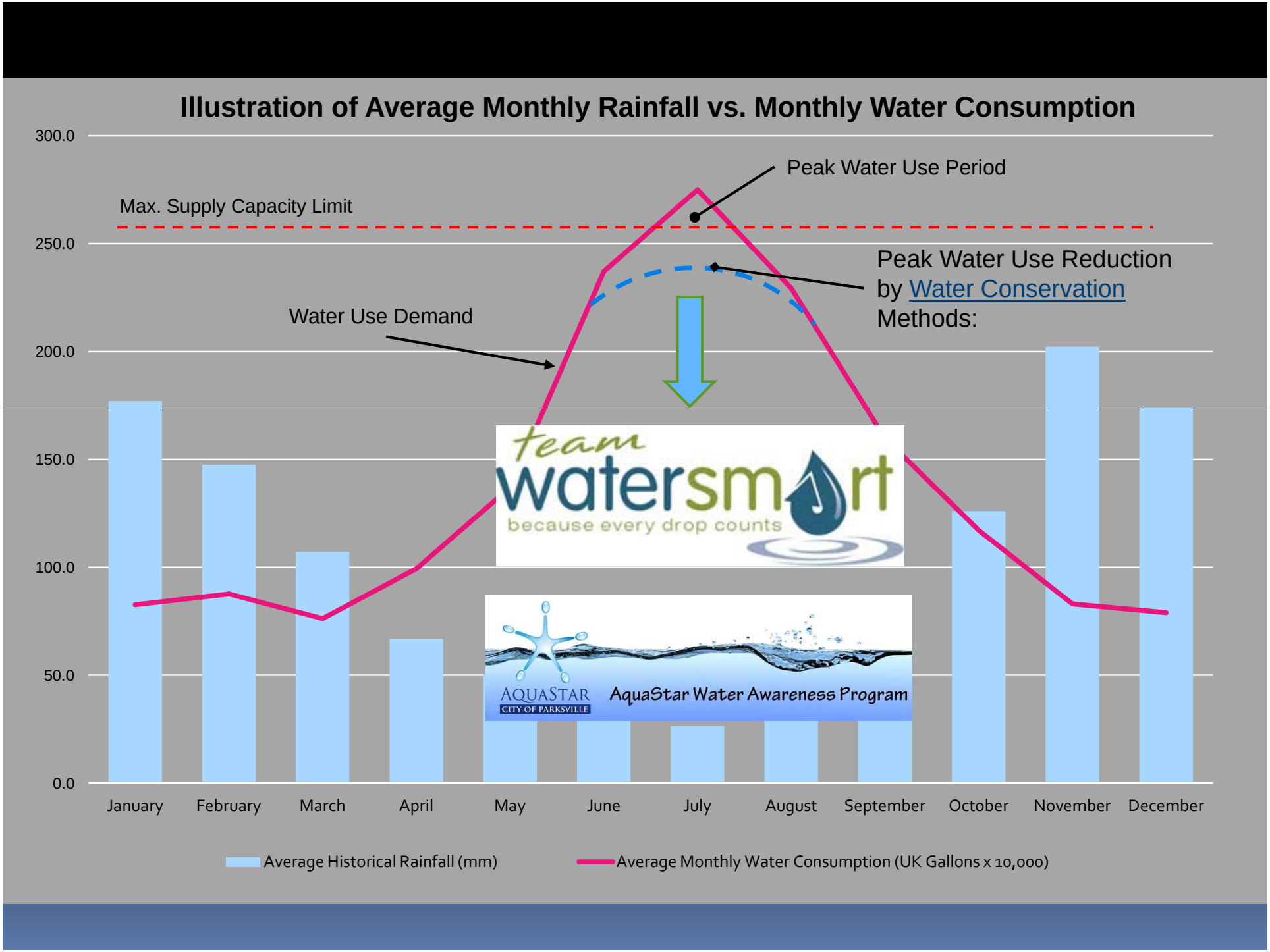
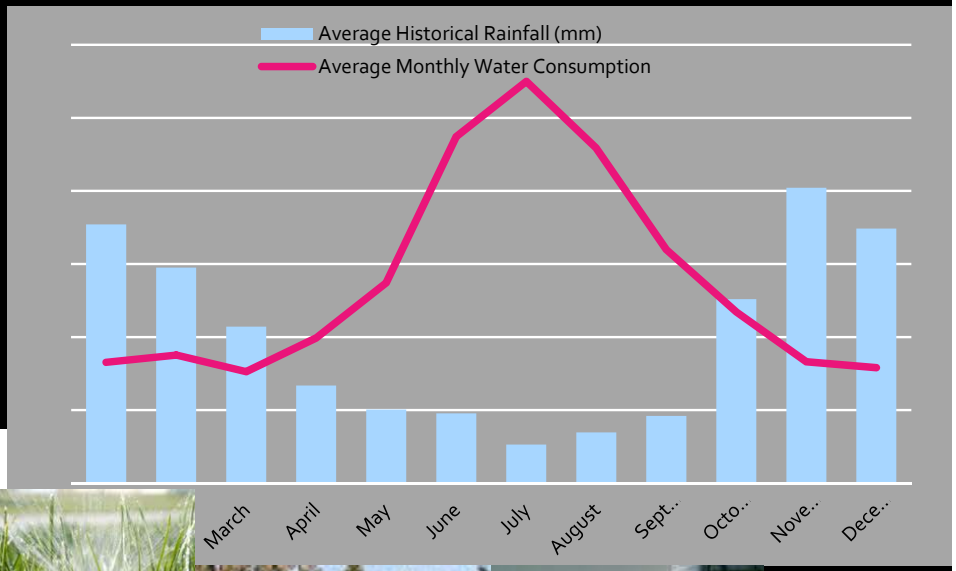


Illustration of Average Monthly Rainfall vs. Monthly Water Consumption
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Peak Water Use Period
Max. Supply Capacity Limit
Peak Water Use Reduction by Water Conservation Methods:
Water Use Demand
team watersmart
because every drop counts
AQUASTAR
CITY OF PARKSVILLE
AquaStar Water Awareness Program
January
February
March
April
May
June
July
August
September
October
November
December
Average Historical Rainfall (mm)
Average Monthly Water Consumption (UK Gallons x 10,000)

team watersmart
because every drop counts

AQUASTAR CITY OF PARKSVILLE AquaStar Water Awareness Program



Water Conservation: methods to help reduce consumption

… **Education**
… **Water Conservation Levels (Watering Restrictions)**
… **Water Rates (metering)**
… **Indoor Use (low flush toilets)**
… **Outdoor Use:**
- Xeriscape Gardens, Rain Gardens
- Watering Times
- Efficient Irrigation Systems
- Source Control (disconnecting rain roof leaders, rain barrels, cisterns etc.)

… **Grey Water Recycling (need to implement over time):**

Pros.

Saves water !

Cons. – Expensive !

Both capital cost and operation and maintenance costs are high for grey water treatment and reuse systems. These systems must produce a high quality, disinfected effluent and operate reliably. Because home-owners and business owners do not normally have the skills required to operate a high-tech treatment system, the systems are typically built with added redundancy and sophisticated controls and alarms to ensure their successful operation and to ensure that problems are addressed quickly. These systems cost between $ 7,000 to $ 10,000 / household.

Average $ 8,500 x 8,000 properties within region = **$ 68,000,000**
(plus Water Treatment would still be required).

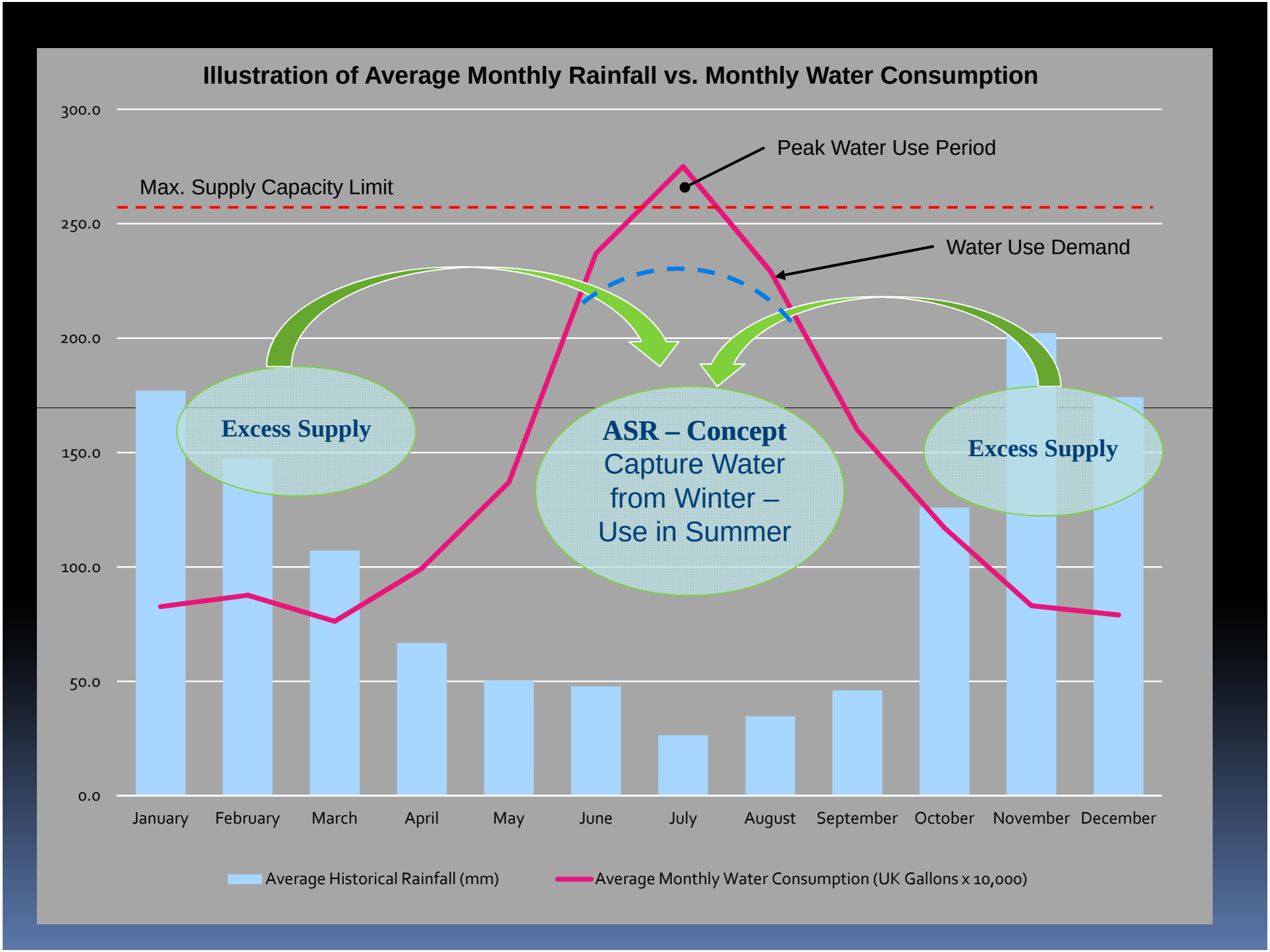


Illustration of Average Monthly Rainfall vs. Monthly Water Consumption
300.0
250.0
200.0
150.0
100.0
50.0
0.0
Peak Water Use Period
Max. Supply Capacity Limit
Water Use Demand
Excess Supply
ASR – Concept
Capture Water from Winter – Use in Summer
Excess Supply
January
February
March
April
May
June
July
August
September
October
November
December
Average Historical Rainfall (mm)
Average Monthly Water Consumption (UK Gallons x 10,000)

Advantages of ASR.....

- Water Quality Improvements to native groundwater
- Cooler Water in the Summer
- Water Plant Size Reduction
- Less Storage Cost (smaller footprint and investment)

Health Authority requires above ground potable water to be secure and covred

Above Ground Conventional Storage:

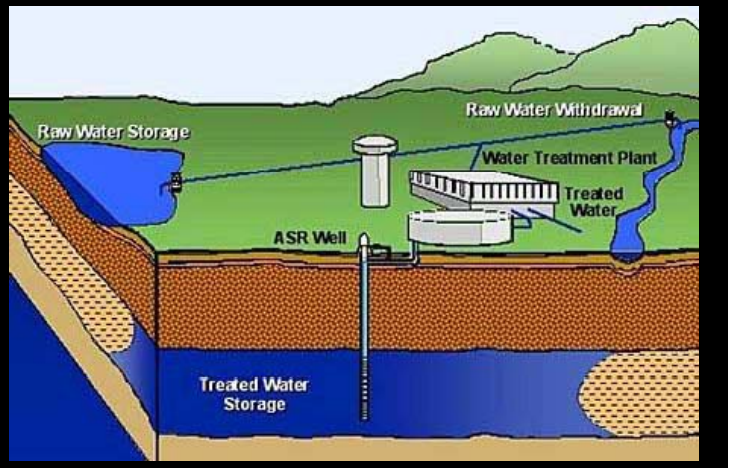
Parksville: Current Storage = 8.5 ML

Current Cost of Replacement = $ 5.2 Million

Storage Requirement for Peak Demand of 1,000 ML
= $ 611 Million for above ground conventional storage

ASR Storage cost for 1,000 ML = $ 5 Million

Advantages of ASR.....



Aquifer Storage Recovery (ASR)

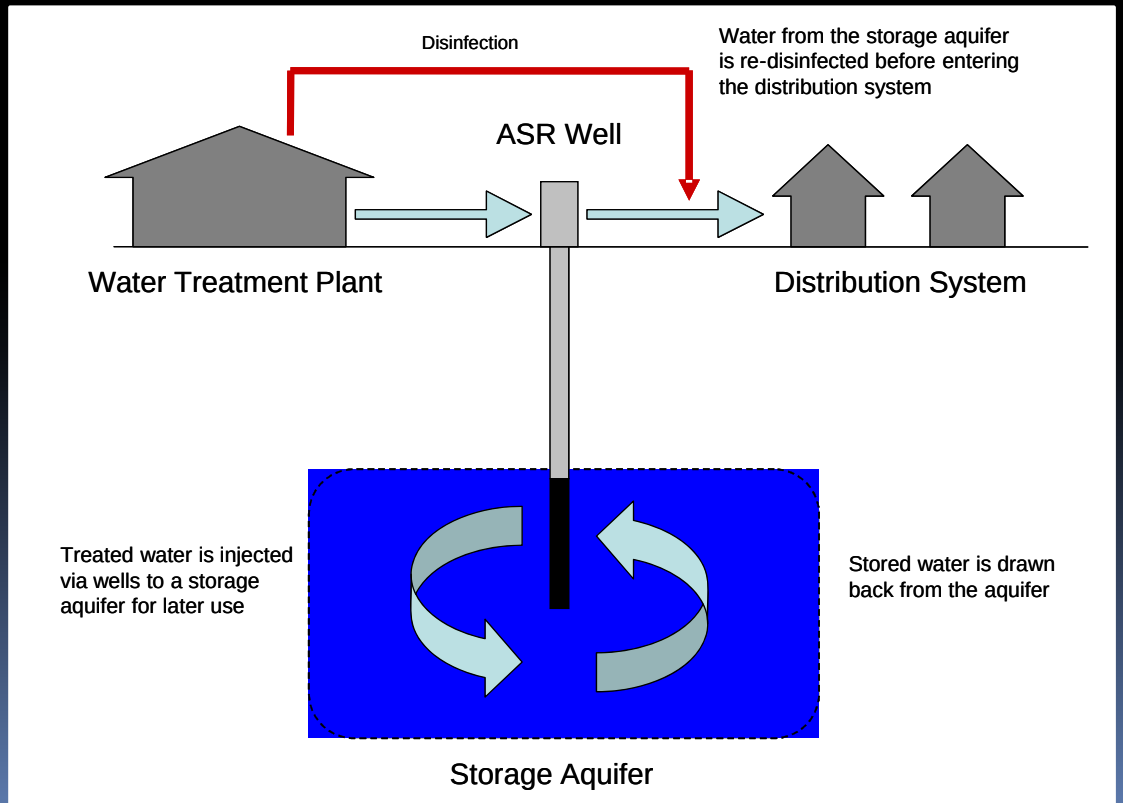
- Less Surface Water Use during Peak Summer Demands (Environmental – more water available for fish)
- Existing Aquifer Benefits (groundwater improvements through displacement of native groundwater, may also prevent influx of seawater)
- Defer or Reduce Infrastructure Expansion

ASR Challenges:

- Uncertainties, require thorough engineering review and well drilling, piloting and investigation (up front engineering costs)
- Currently no groundwater regulation – Water Act.
- Health Authority regulations / approvals – first in BC

Planning Study Conclusions:

Aquifer Storage and Recovery (ASR) could play a major role as a “third water source”.



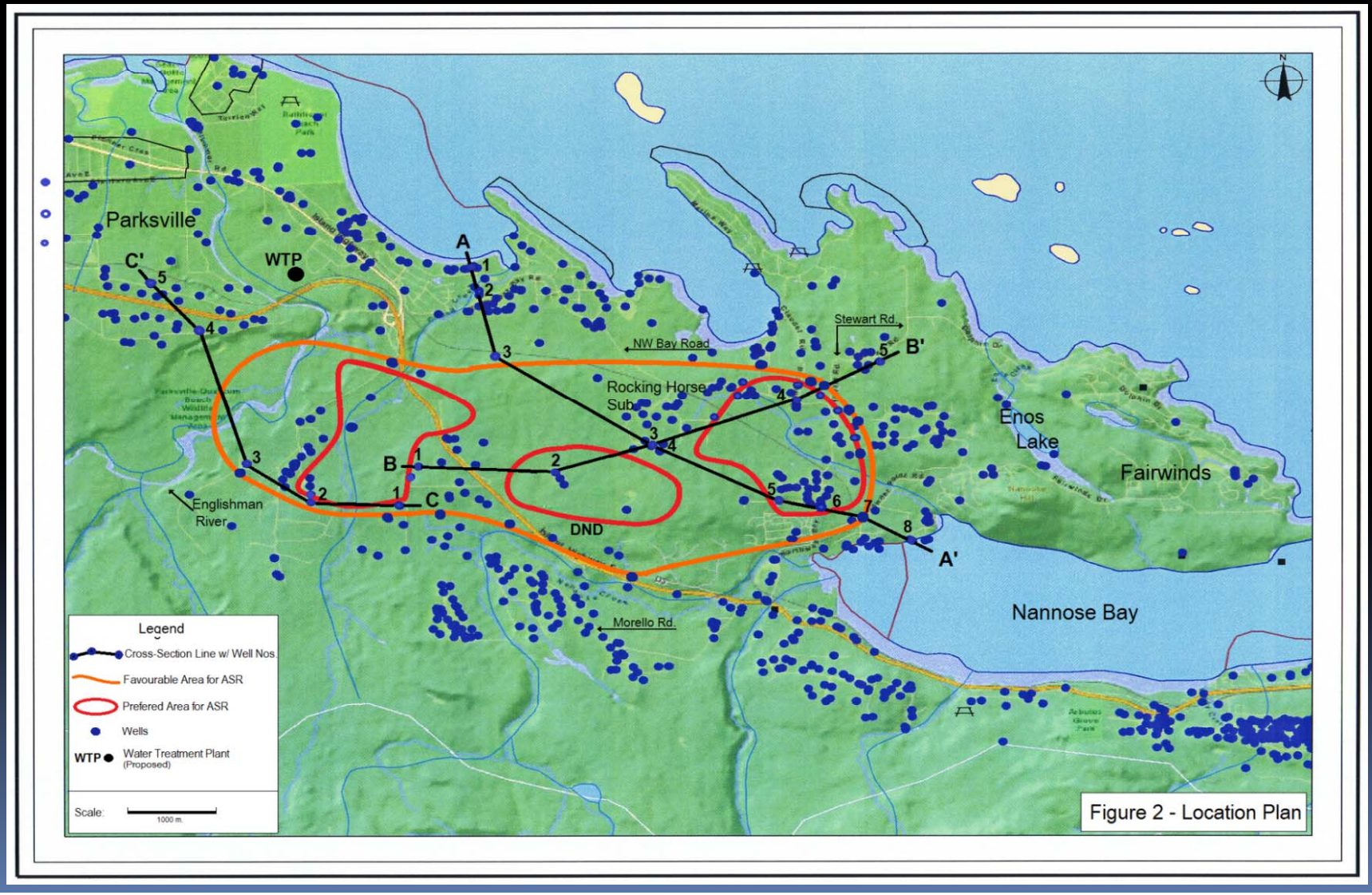
Aquifer Storage Recovery (ASR)

- All 13 Aquifers within the region were analyzed and rated.
- Aquifer No. 219 Nanoose Creek was the top rated aquifer in the region.

Aquifer Number	Aquifer Location / Name	Confinement	Water Quality	Depth	Hydraulic Gradient	Depth to Water	Transmissivity	Storage	Multi-Layer	WTP * Large Pipes Distance	End of System Location	Development	Total Scores
664	Little Qualicum River	0	10	0	5	0	10	0	0	0	10	5	40
663	Upper Whiskey Creek	0	5	0	5	0	5	0	0	0	5	10	30
217	Qualicum	5	5	5	10	5	10	5	0	0	10	10	65
212	Parksville	10	10	5	5	5	0	0	0	5	0	5	45
216	Parksville	5	5	5	5	5	5	5	0	10	0	5	50
220	Errington	10	5	10	5	0	0	0	0	5	0	0	35
209	Errington	10	10	0	5	0	0	0	0	0	0	10	35
219	**Nanoose Creek**	**10**	**10**	**10**	**5**	**10**	**5**	**10**	**10**	**10**	**10**	**10**	**100**
221	Parksville	5	10	0	10	0	5	0	0	5	0	10	45
214	Madrona Point	5	5	5	10	0	0	0	0	10	5	10	50
218	Nanoose Hill	5	10	10	5	0	0	0	0	0	10	10	50
210	Nanoose Bay	5	10	10	5	0	0	0	0	0	10	0	40
213	Lantzville	5	0	10	0	5	0	5	0	0	10	10	45

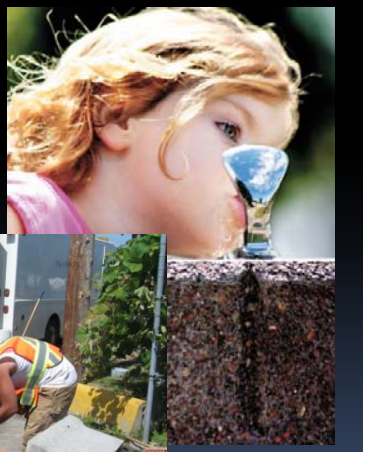
* *WTP - Water Treatment Plant*

- Aquifer Storage Recovery (ASR)
  - Further investigation is required to determine if the concept of ASR is feasible and that a confined aquifer is available



What are we doing now to mitigate our current risks?

- Planning for future water treatment
- Planning to move the surface water intake
- Made water supply and distribution system capital enhancements to the existing system to improve water quality
- Cross Connection Control Program
- Source to Tap Investigation (VIHA)
- Raw Water and weekly potable water sampling and monitoring
- Well Head Protection (Springwood / Railway wells)
- Bi-directional flushing program
- Annual Water Report and Audits



Estimated Costs

- Conceptual level capital cost of first stage is estimated at $38 million (2010 dollars). This includes a new intake, Water Treatment Facility, ASR and required Water Distribution upgrades by Year 2016.

- Upgrades are anticipated, based on current growth demands would be year 2035 – 2050, this would included treatment plant expansion and further water supply / distribution mains. Conceptual level total capital cost is estimated at $15 million (2010 dollars)

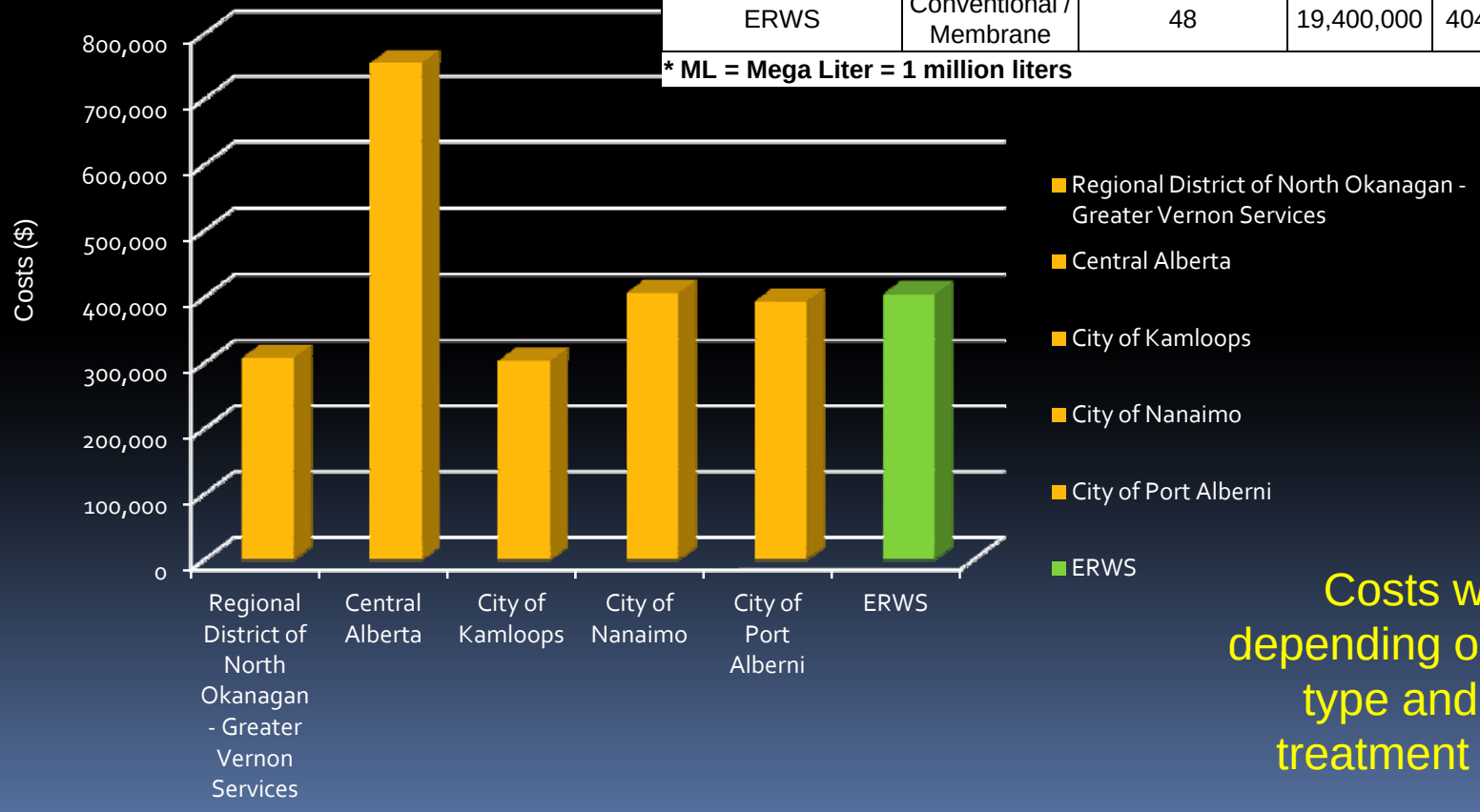
- Program should be attractive for senior government funding given the regional cooperation and ASR elements

Costs

Treatment Costs Only (Ultimate Build Out)

Municipality	Water Treatment	Treatment Plant Capacity (ML/D - Mega Liter / Day)	Water Treatment Cost $	$/ML	Comments
Regional District of North Okanagan - Greater Vernon Services	DAF	160	49,200,000	307,500	First Stage Constructed
Central Alberta	Membrane	20	15,100,000	755,000	Built in 2009
City of Kamloops	Membrane	160	48,500,000	303,125	Built in 2004
City of Nanaimo	Membrane	160	65,000,000	406,250	Future – Conceptual Cost
City of Port Alberni	Filtration	30	11,800,000	393,333	Future – Conceptual Costs
ERWS	Conventional / Membrane	48	19,400,000	404,167	Future – Conceptual Costs

*** ML = Mega Liter = 1 million liters**



Costs will vary depending on treatment type and level of treatment required.

2011 AWS Activities

Required Activities

- Continue conceptual level planning
- Discussions with regulators
- Explore senior government funding
- Develop a financial rate structure model
- Secure required properties and easements
- Carry out raw water characterization and bench scale treatment process testing
- Water Treatment pilot testing
- Carry out first phase of ASR feasibility analysis
- Communications Planning
- Implementation Plan

2012 to 2016 AWS Activities

2012 and 2013

- Engage a design consultant
- Complete process selection
- Finalize approvals / Public Consultation
- Secure senior government funding
- Preliminary Design / Value Engineering

2014 to 2016….. and beyond

- Detailed design of intake, WTP and water transmission mains
- Complete ASR feasibility analysis
- Funding approval
- Tender construction contracts
- Construction
- Commissioning
- Operation and maintenance of new facilities
- ASR Implementation
- Additional Capacities constructed in later stages

Why do we need Water Treatment and a New Intake ?

Bottom Line

- Further mitigate any potential risks to the potable water supply
- Develop a sustainable water supply for the future

2011 Budget & 2012 – 2016 Financial Plan