Resident's Presentation to Technical Oversight Panel
Core Area Liquid Waste Management Plan
Capital Regional District
2015-11-23

Considerations for Distributed Tertiary Treatment With Optimized Resource Recover

Oscar Regier
Victoria BC

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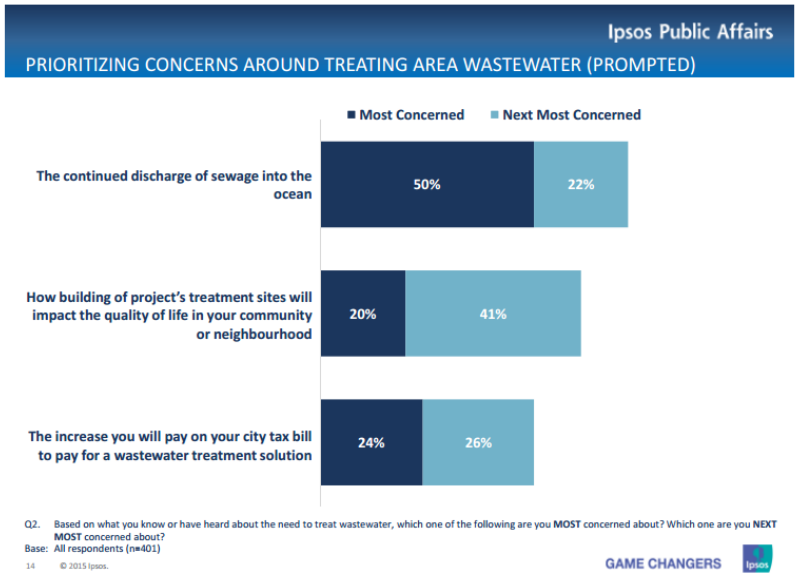

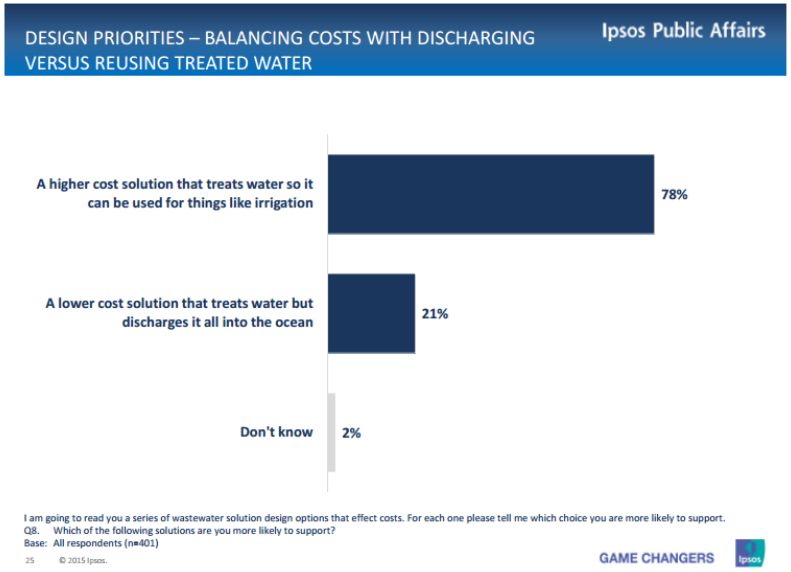

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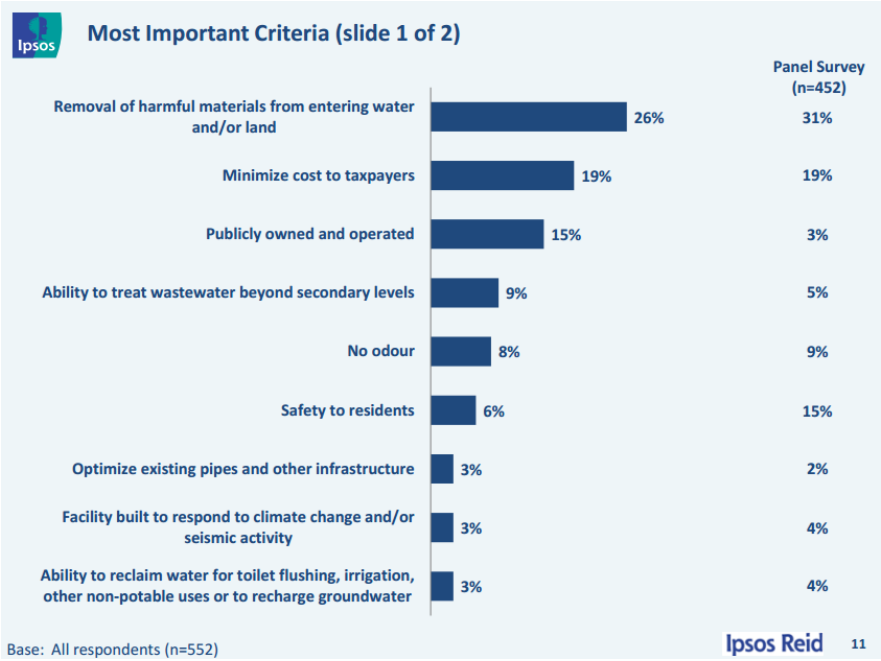

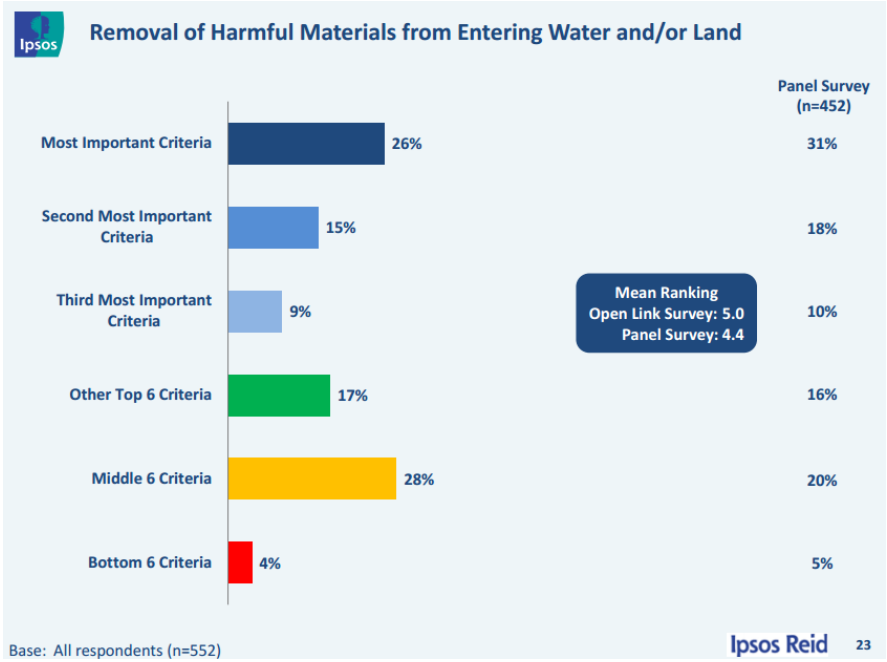

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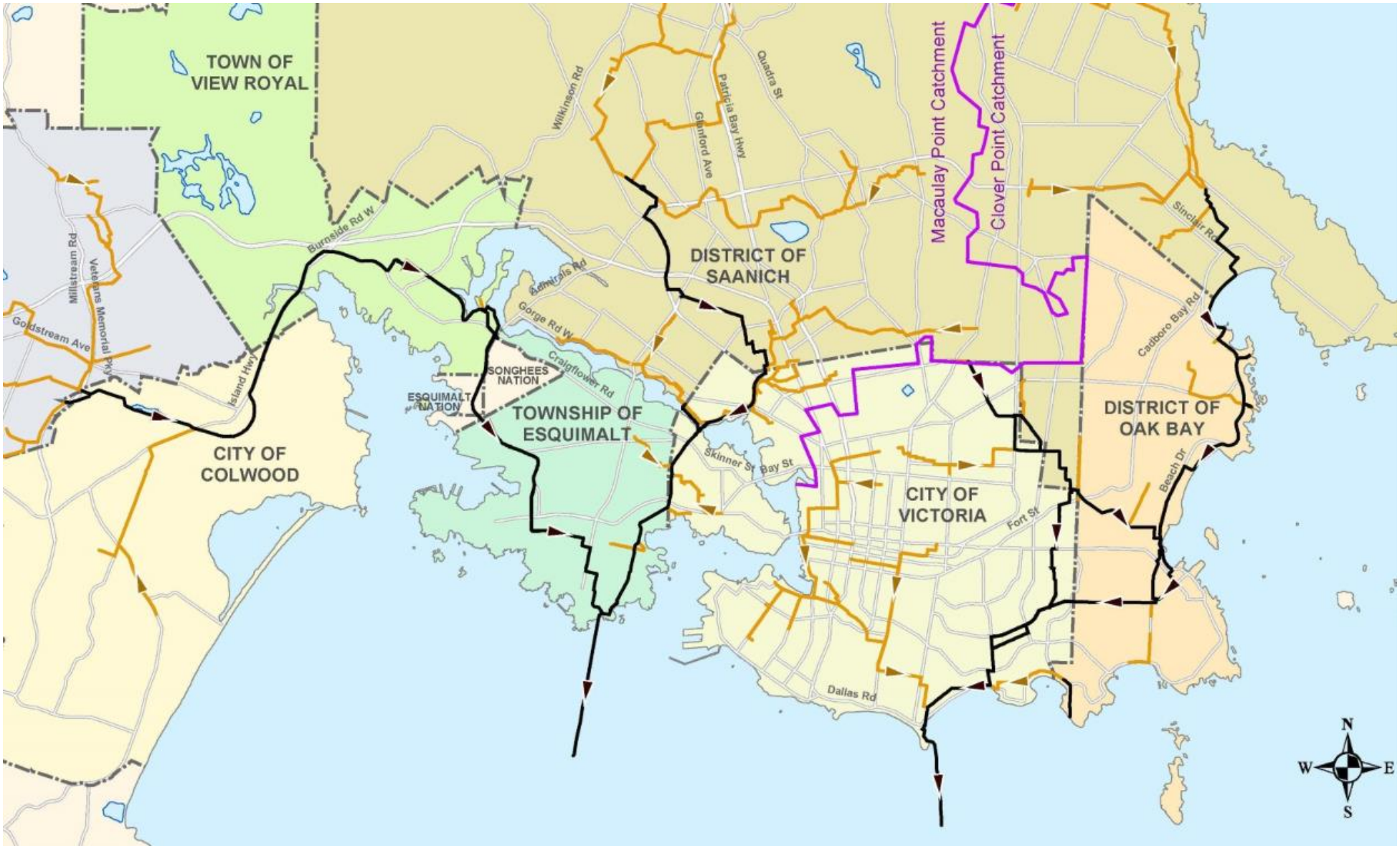
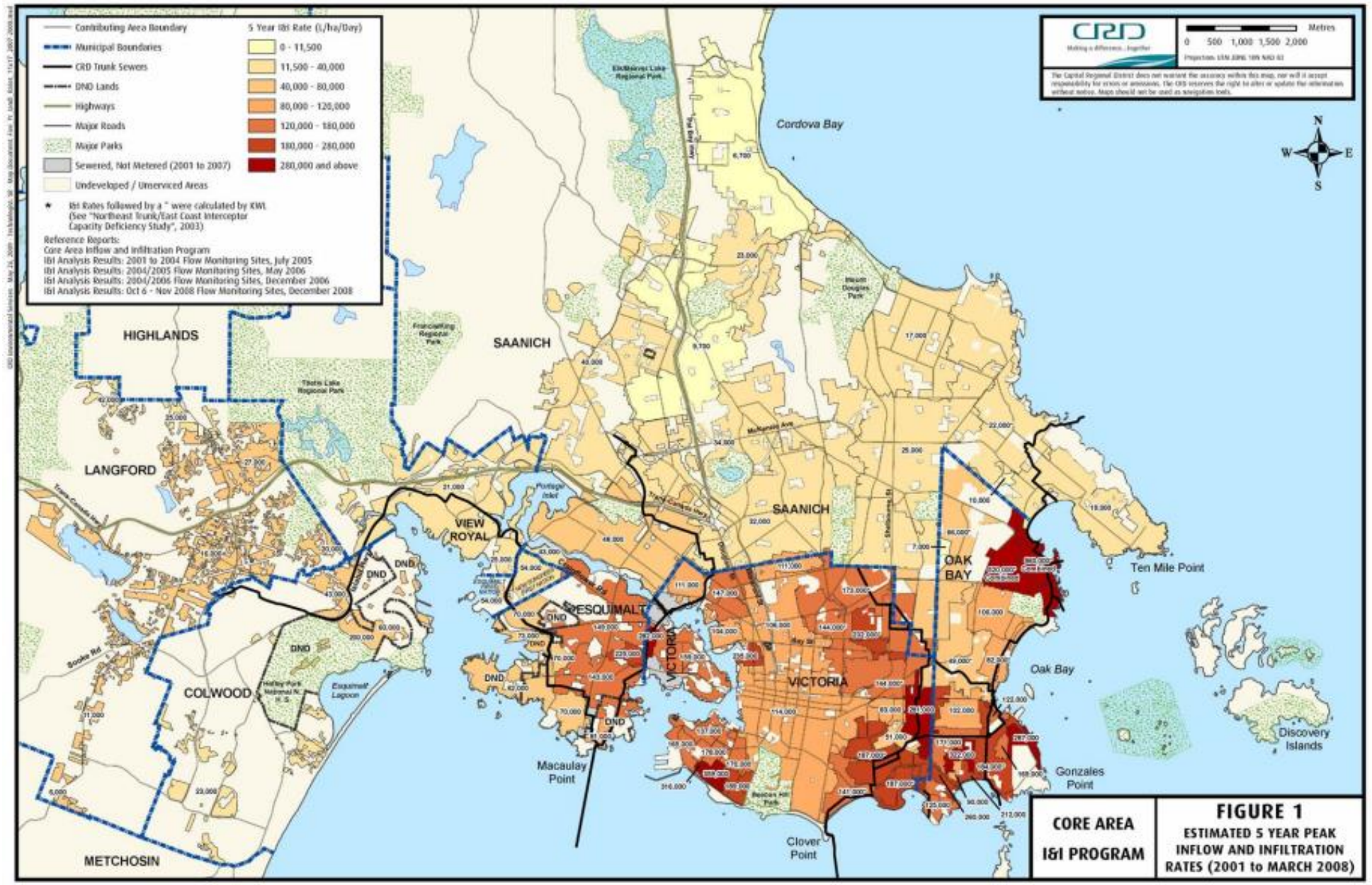

TOWN OF VIEW ROYAL
DISTRICT OF SAANICH
Macaulay Point Catchment
Clover Point Catchment
TOWNSHIP OF ESQUIMALT
SONGHEES NATION
ESQUIMALT NATION
CITY OF COLWOOD
CITY OF VICTORIA
DISTRICT OF OAK BAY
Wilkinson Rd
Quadra St
Patricia Bay Hwy
Glanford Ave
Burnside Rd W
Millstream Rd
Veterans Memorial Pkwy
Goldstream Ave
Island Hwy
Admirals Rd
Gorge Rd W
Craigflower Rd
Skinner St
Bay St
Fort St
Dallas Rd
Cadboro Bay Rd
Beach Dr
Sinclair Rd
N
W
E
S



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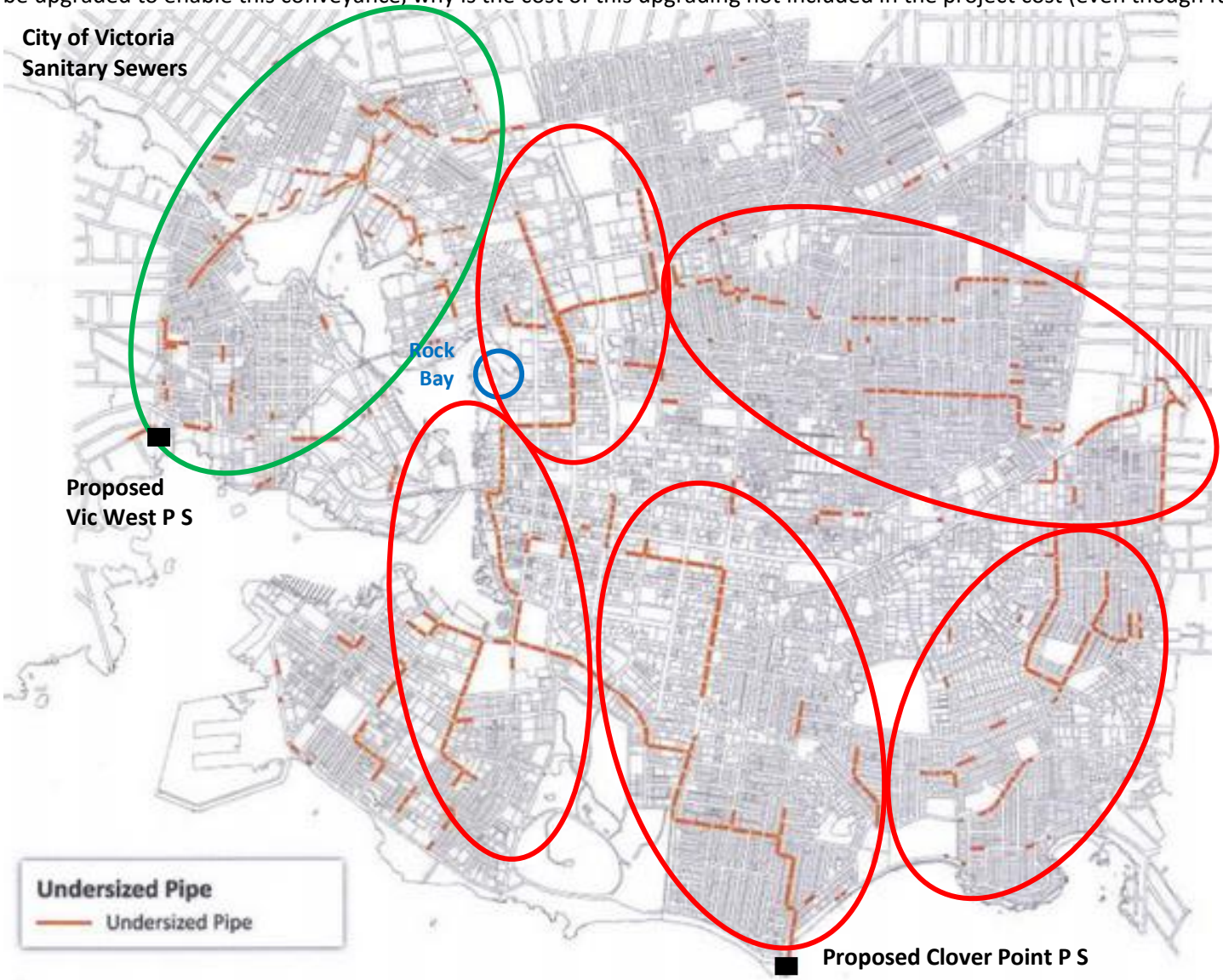
A 2010 City of Victoria report to identify sewer system capacity challenges identified six major trunk systems that are currently undersized, one lift station at capacity, and four additional trunk main systems that would be undersized for 2026 and 2056 flows (map below). "These challenges can result in back-ups and overflows leading to potential property damage and health risks." A 15 year capital plan valued at $29.5 million has been developed to address these challenges in the Clover Point sewer system.

The proposed regional and sub-regional plans for Rock Bay are dependent on conveying all flows to the Rock Bay site. If existing City of Victoria trunk mains must be upgraded to enable this conveyance, why is the cost of this upgrading not included in the project cost (even though funding may come from the City)?



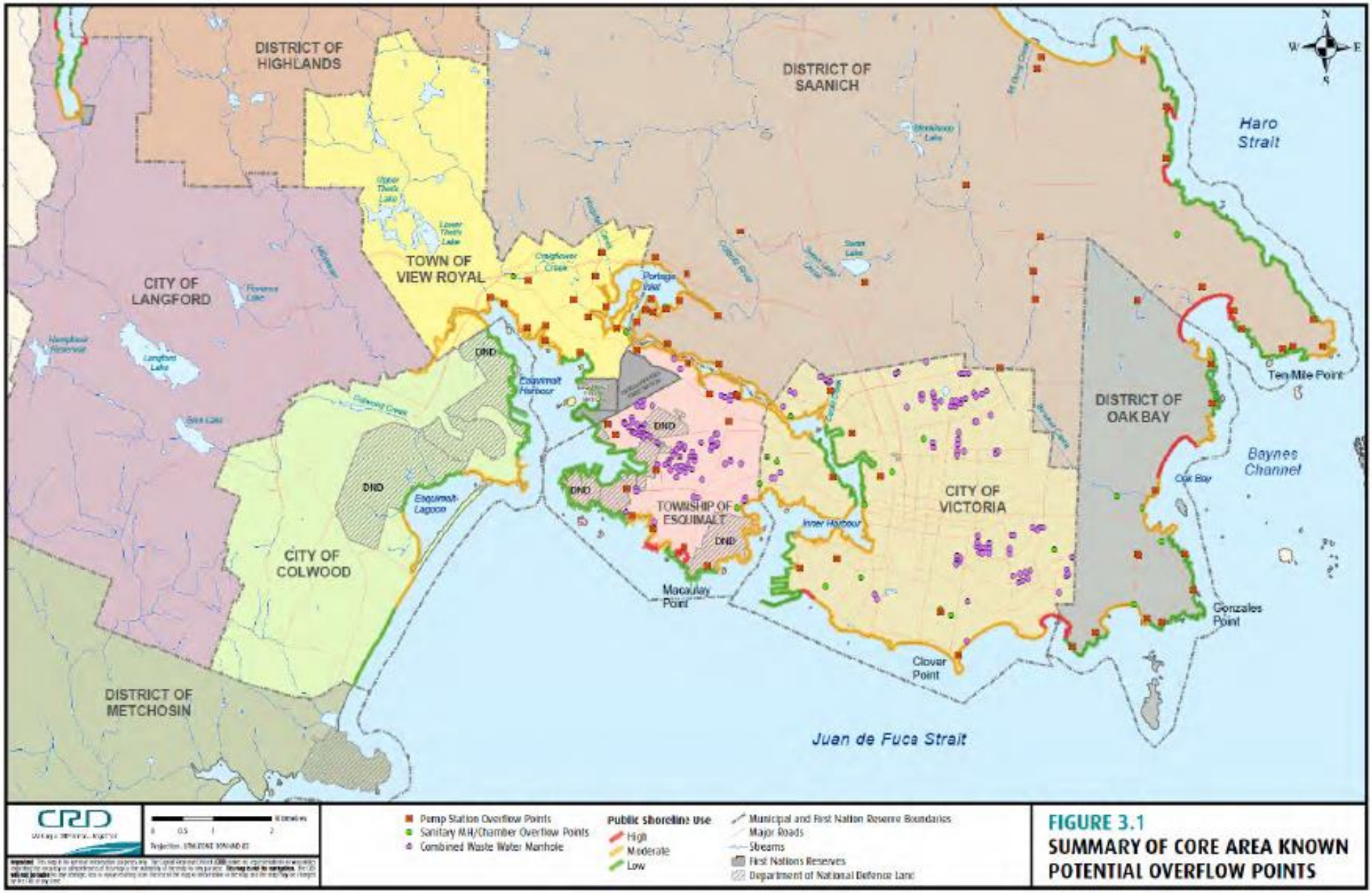
Undersized Trunk Mains Leading to Proposed Clover Point Pump Station in Rock Bay Concept

Estimated Undersized Pipe Replacement or Twinning Cost (in 2010 dollars) for Clover Point Sewer System: **$29.5 million**

Undersized Trunk Mains Leading to Proposed Vic West Pump Station in Rock Bay Concept

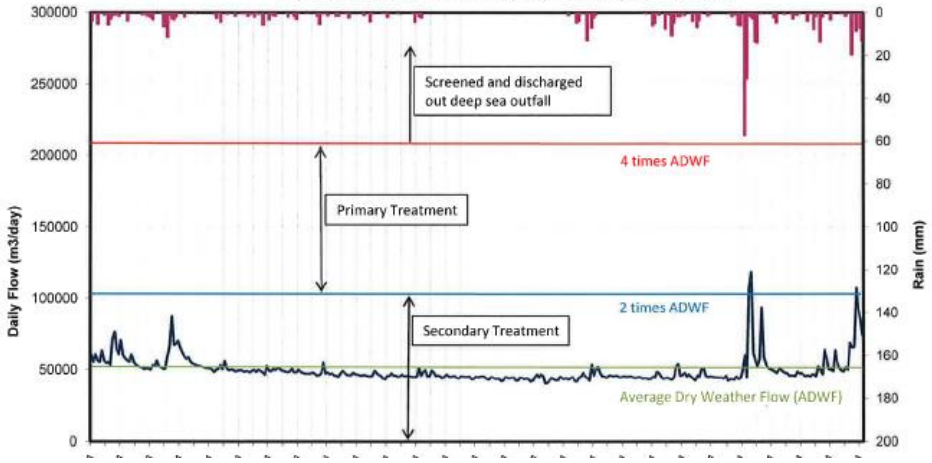
Estimated Undersized Pipe Replacement or Twinning Cost for Macaulay Point Sewer System: $ Not Indicated

https://docs.google.com/viewer?a=v&pid=sites&srcid=ZGVmYXVsdGRvbWFpbnxzZXdhZ2VwbGFudHN2aWN0b3JpYXxneDoyMTM3NTY3YTAzNjRkMjk5



https://www.crd.bc.ca/docs/default-source/environmental-engineering/ii-management-plan---final.pdf?sfvrsn=2

Figure 2.1: Clover Point Pump Station Daily Flows - 2008



Inflow and Infiltration – Cost vs. Benefit Discussion Paper
March 2009

Low Impact Development

Rain Water Harvesting

Water-Use Reduction

Resource Recovery

I&I Reduction

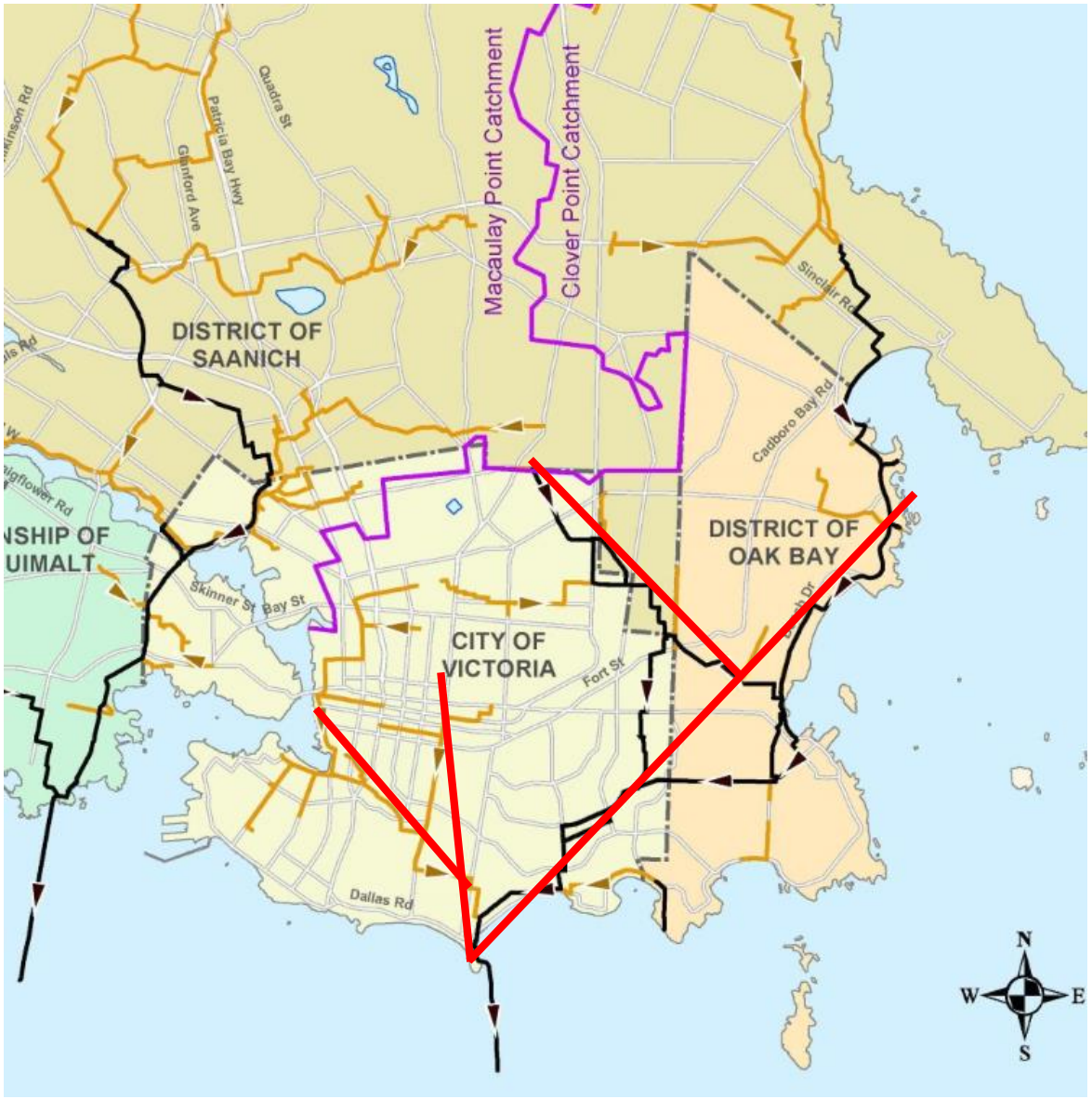
vs. Supersizing

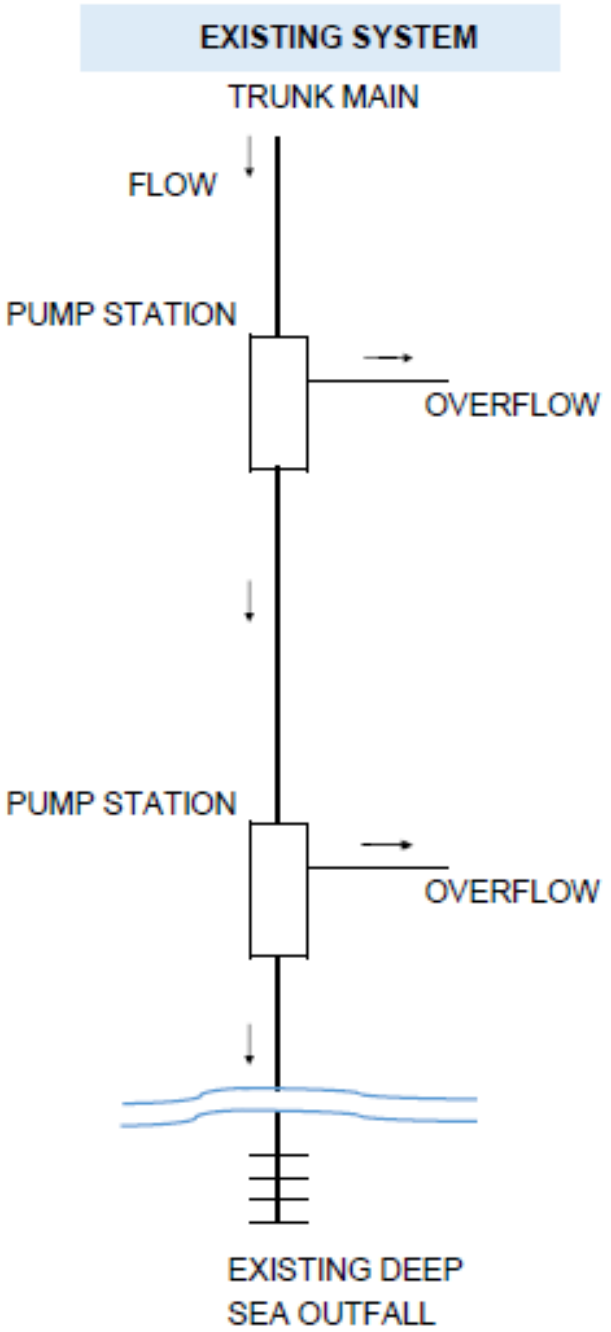
Table 3.3 Cost Estimate to Rehabilitate 2,270 ha to Reduce Flow to 4xADWF

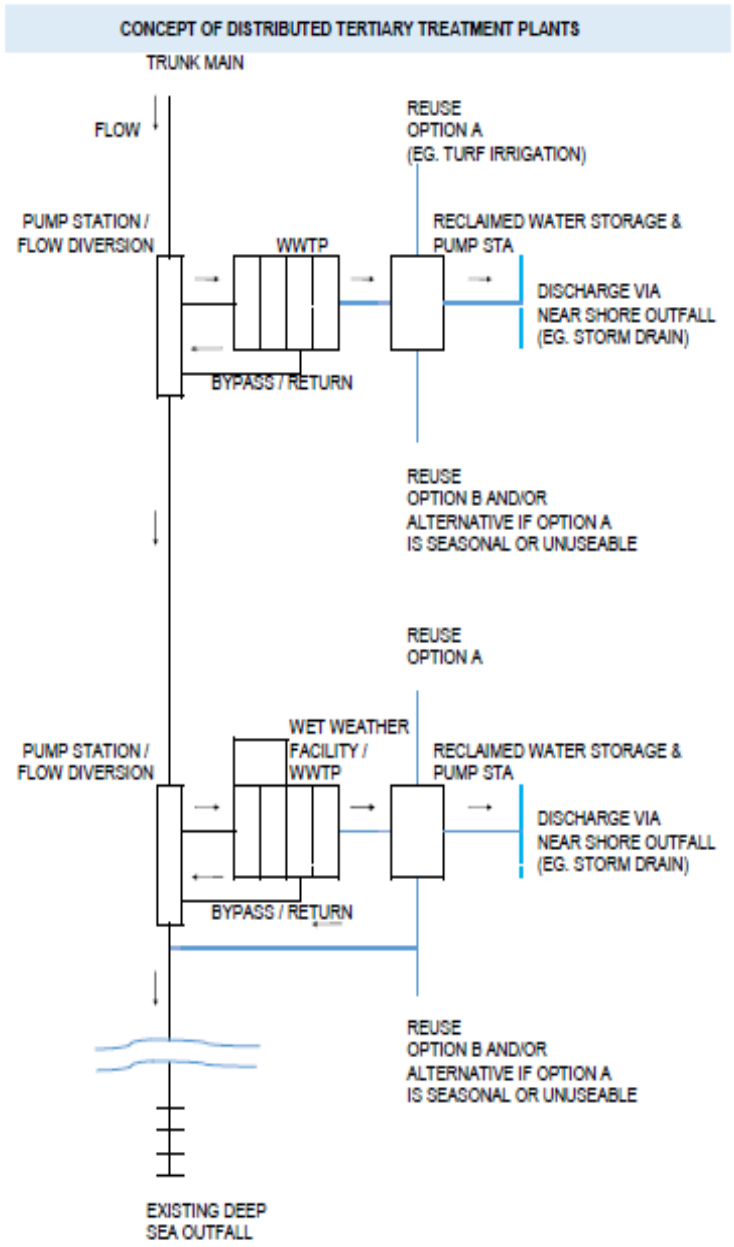
Item Description	Quantity	Percent Requiring Rehabilitation	Unit Rate	Total Cost (million)
Manholes	4,750 no.	60%	$2,500	$7.13
Vents	890 no.	60%	$2,000	$1.07
Public Sewers	365 km	60%	$500	$109.50
Private Sewer Laterals	20,900 no.	60%	$4,500	$56.43
Private Storm Laterals	20,900 no.	30%	$5,000	$31.35
			TOTAL	**$205.48**

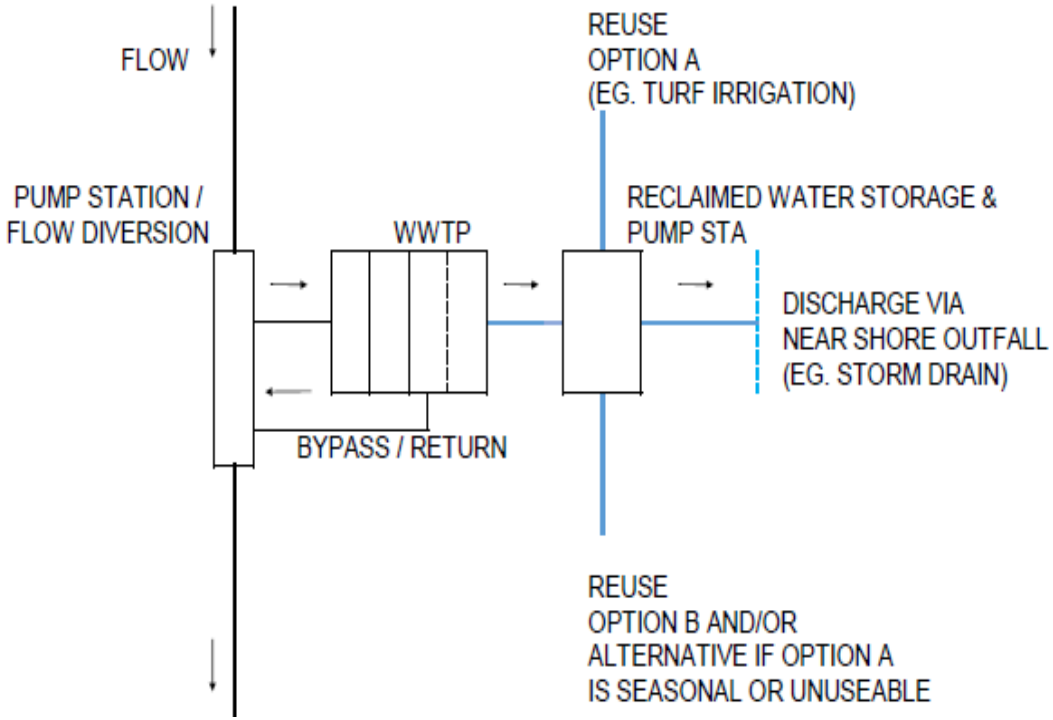
Table 3.4 Cost Estimate to Rehabilitate 5,010 ha to Reduce Flow to 2xADWF

Item Description	Quantity	Percent Requiring Rehabilitation	Unit Rate	Total Cost (million)
Manholes	8,330 no.	70%	$2,500	$14.58
Vents	910 no.	70%	$2,000	$1.27
Public Sewers	685 km	70%	$500	$239.75
Private Sewer Laterals	35,600 no.	70%	$4,500	$112.14
Private Storm Laterals	35,600 no.	30%	$5,000	$53.40
			TOTAL	**$421.14**


Macaulay Point Catchment
Clover Point Catchment
DISTRICT OF SAANICH
DISTRICT OF OAK BAY
CITY OF VICTORIA
Quadra St
Patricia Bay Hwy
Glanford Ave
Sinclair Rd
Cadboro Bay Rd
Skinner St
Bay St
Fort St
Dallas Rd
N
W
E
S


EXISTING SYSTEM
TRUNK MAIN
FLOW
PUMP STATION
OVERFLOW
PUMP STATION
OVERFLOW
EXISTING DEEP
SEA OUTFALL

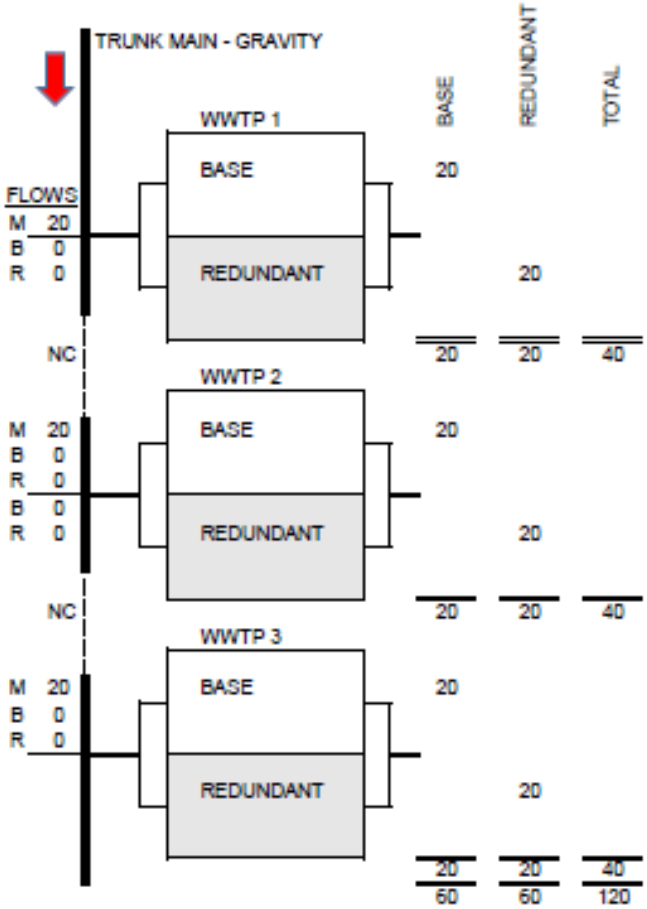

CONCEPT OF DISTRIBUTED TERTIARY TREATMENT PLANTS
TRUNK MAIN
FLOW
REUSE
OPTION A
(EG. TURF IRRIGATION)
PUMP STATION /
FLOW DIVERSION
WWTP
RECLAIMED WATER STORAGE &
PUMP STA
DISCHARGE VIA
NEAR SHORE OUTFALL
(EG. STORM DRAIN)
BYPASS / RETURN
REUSE
OPTION B AND/OR
ALTERNATIVE IF OPTION A
IS SEASONAL OR UNUSEABLE
REUSE
OPTION A
WET WEATHER
FACILITY /
WWTP
PUMP STATION /
FLOW DIVERSION
RECLAIMED WATER STORAGE &
PUMP STA
DISCHARGE VIA
NEAR SHORE OUTFALL
(EG. STORM DRAIN)
BYPASS / RETURN
REUSE
OPTION B AND/OR
ALTERNATIVE IF OPTION A
IS SEASONAL OR UNUSEABLE
EXISTING DEEP
SEA OUTFALL


FLOW
REUSE
OPTION A
(EG. TURF IRRIGATION)
PUMP STATION /
FLOW DIVERSION
WWTP
RECLAIMED WATER STORAGE &
PUMP STA
DISCHARGE VIA
NEAR SHORE OUTFALL
(EG. STORM DRAIN)
BYPASS / RETURN
REUSE
OPTION B AND/OR
ALTERNATIVE IF OPTION A
IS SEASONAL OR UNUSEABLE

ASPECTS OF DISTRIBUTED WASTEWATER TREATMENT PLANTS, CONVEYANCE, REDUNDANCY & INTER-RELATED OPERATIONS

CONSTRICTED TRUNK MAIN WITH 3 WWT PLANTS & 1 PROCESS TRAIN EACH

CASE 1:
EACH SITE IS INDEPENDENT:



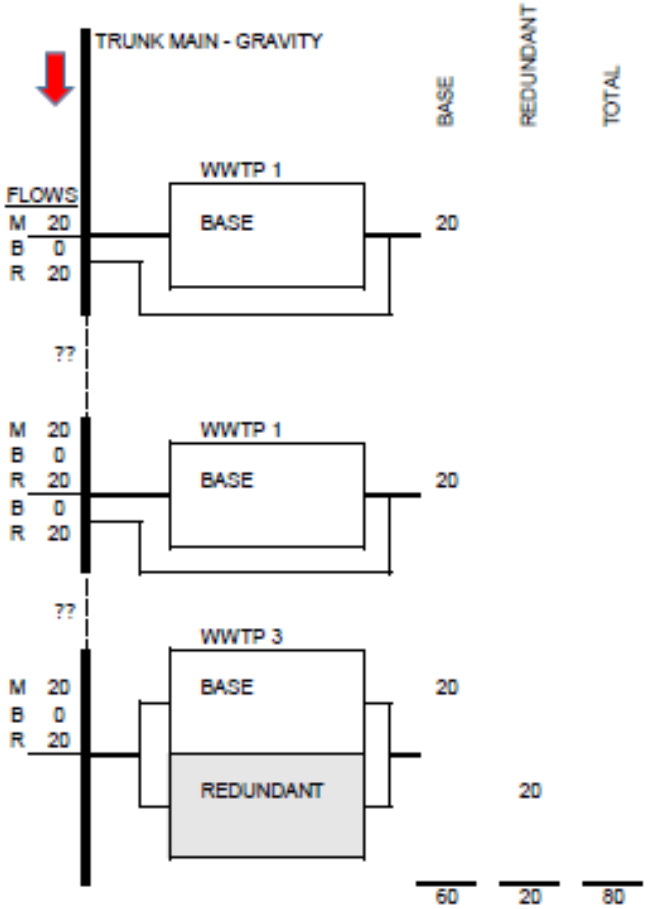
AVAILABLE CAPACITY WITH 1 BASE TRAIN DOWN 0

AVAILABLE ÷ BASE CAPACITY 0%

THEREFORE ADDITIONAL REDUNDANCY CAPACITY IS REQUIRED TO MEET REGS *

* BC MW REGS REQUIRE THE REMAINING SECONDARY AND TERTIARY TREATMENT PLANT COMPONENTS TO BE ABLE TO TREAT 75% OF THE DESIGN MAXIMUM FLOW WITH THE LARGEST UNIT OUT OF SERVICE (MWR TABLE 1)

CASE 2:
LOWEST SITE IS INTER-RELATED:



AVAILABLE CAPACITY WITH LOWEST BASE TRAIN DOWN 40

AVAILABLE ÷ BASE CAPACITY 67%

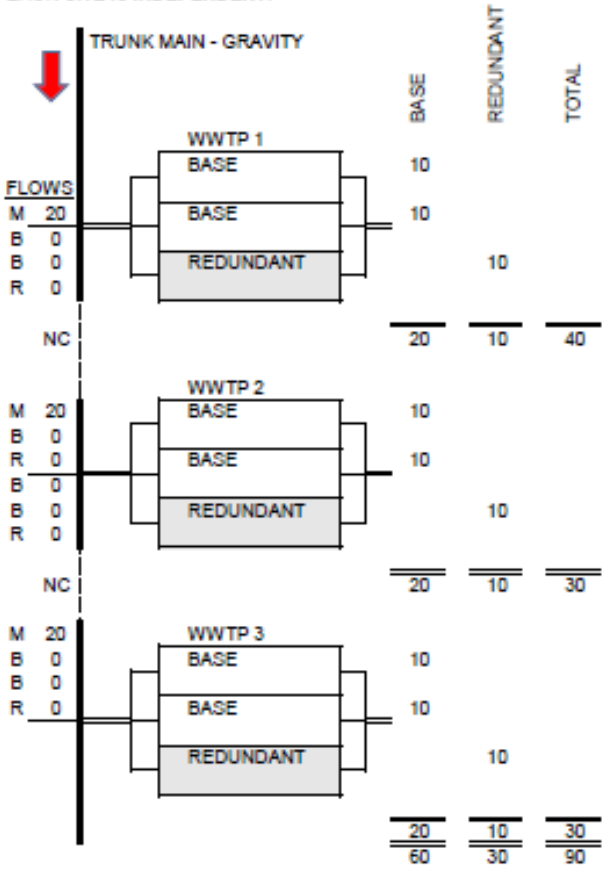
THEREFORE ADDITIONAL REDUNDANCY CAPACITY IS REQUIRED TO MEET REGS

33% LESS TOTAL CAPACITY IS REQUIRED RESULTING IN SIGNIFICANT SITE AREA AND PLANT COST SAVINGS COMPARED TO CASE 1

ASPECTS OF DISTRIBUTED WASTEWATER TREATMENT PLANTS, CONVEYANCE, REDUNDANCY & INTER-RELATED OPERATIONS

CONSTRICTED TRUNK MAIN WITH 3 WWT PLANTS & 2 PROCESS TRAINS EACH

CASE 3:
EACH SITE IS INDEPENDENT:

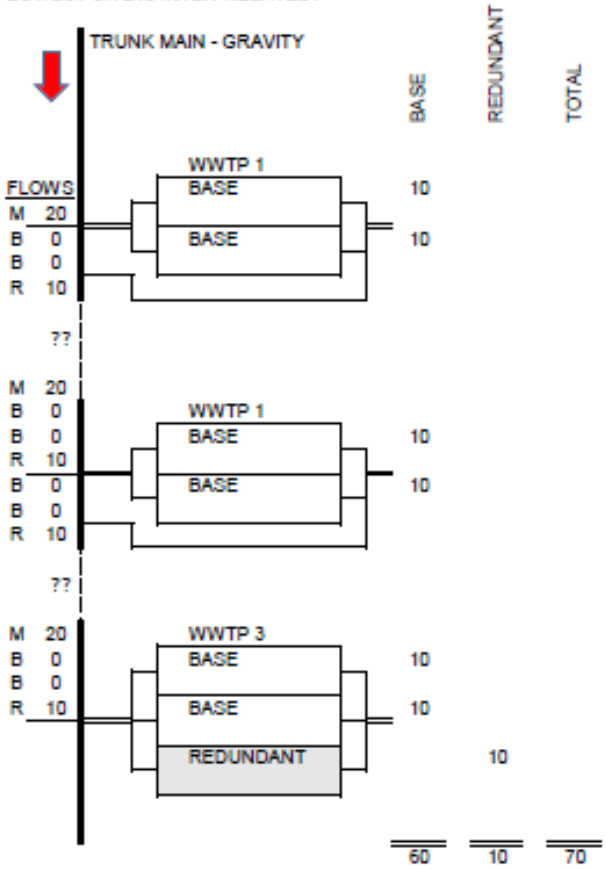


AVAILABLE CAPACITY WITH 1 BASE TRAIN DOWN: 0

AVAILABLE ÷ BASE CAPACITY: 0%

THEREFORE ADDITIONAL REDUNDANCY CAPACITY IS REQUIRED TO MEET REGS

CASE 4:
LOWEST SITE IS INTER-RELATED:



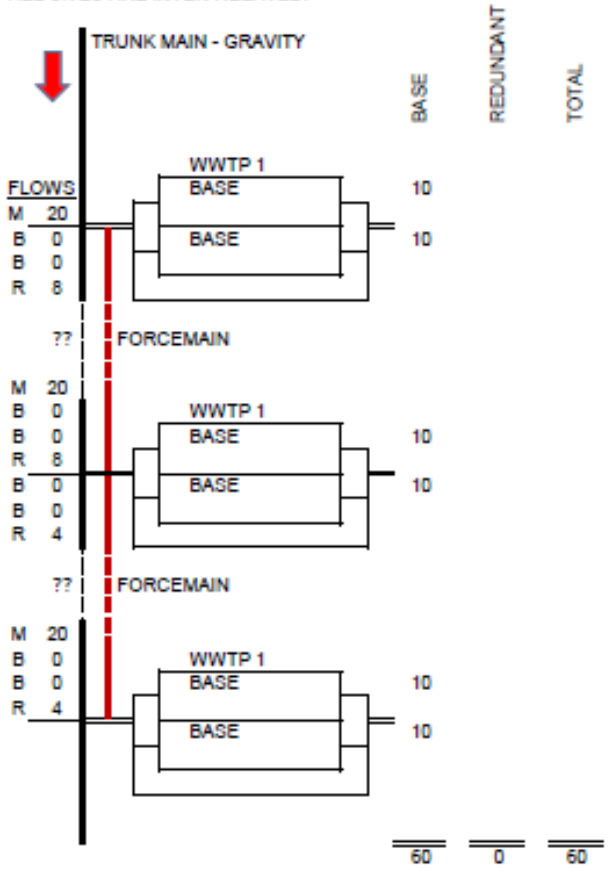
AVAILABLE CAPACITY WITH LOWEST BASE TRAIN DOWN: 40

AVAILABLE ÷ BASE CAPACITY: 67%

THEREFORE ADDITIONAL REDUNDANCY CAPACITY IS REQUIRED TO MEET REGS

22% LESS TOTAL CAPACITY IS REQUIRED RESULTING IN SIGNIFICANT SITE AREA AND PLANT COST SAVINGS COMPARED TO CASE 3, **OR 42%** LESS COMPARED TO CASE 1

CASE 5:
ALL SITES ARE INTER-RELATED:



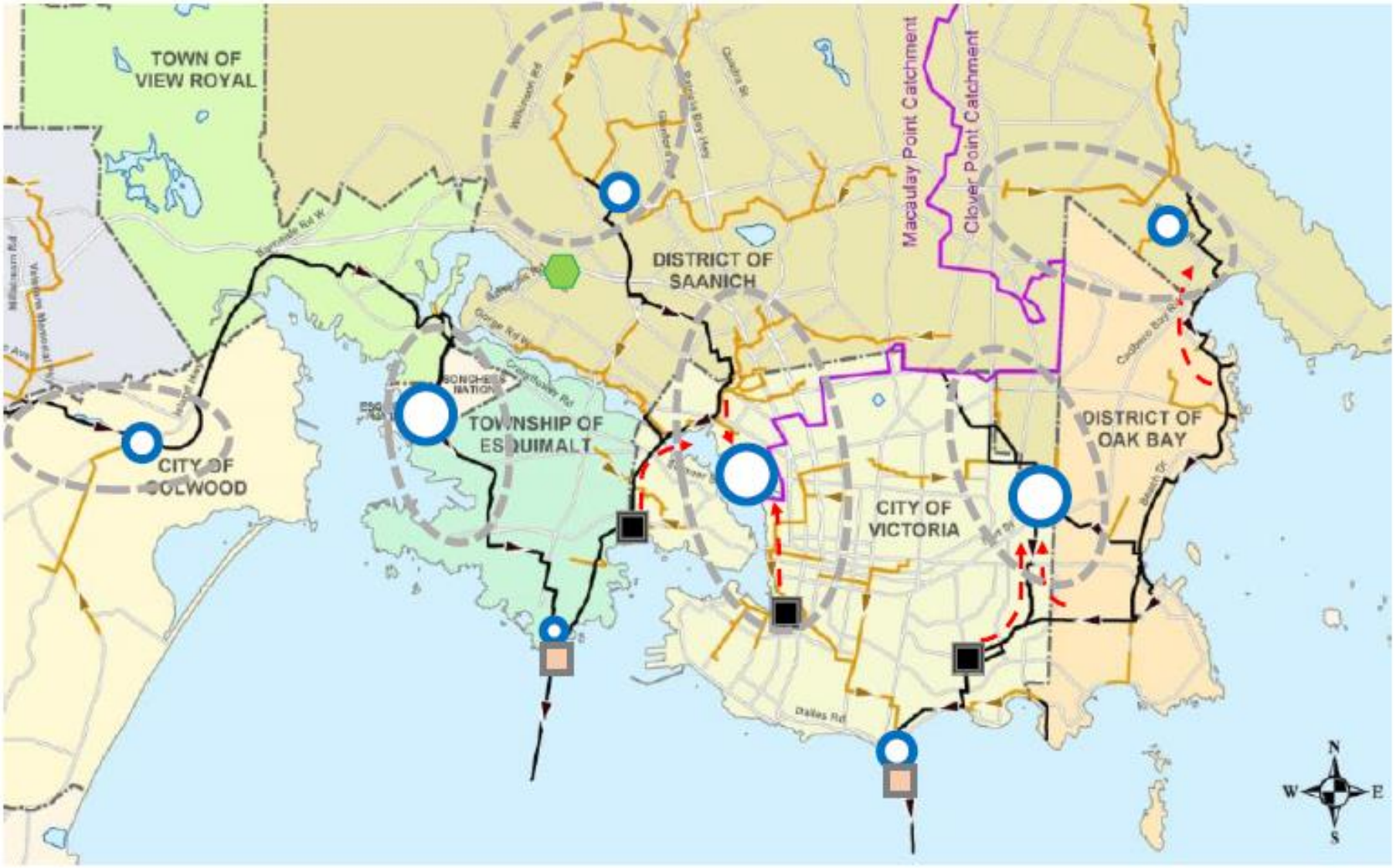
AVAILABLE CAPACITY WITH ANY 1 BASE TRAIN DOWN: 50

AVAILABLE ÷ BASE CAPACITY: 83%

THEREFORE ADDITIONAL REDUNDANCY CAPACITY IS REQUIRED TO MEET REGS

33% LESS TOTAL CAPACITY IS REQUIRED RESULTING IN SIGNIFICANT SITE AREA AND PLANT COST SAVINGS COMPARED TO CASE 3, **OR 50% LESS** COMPARED TO CASE 1

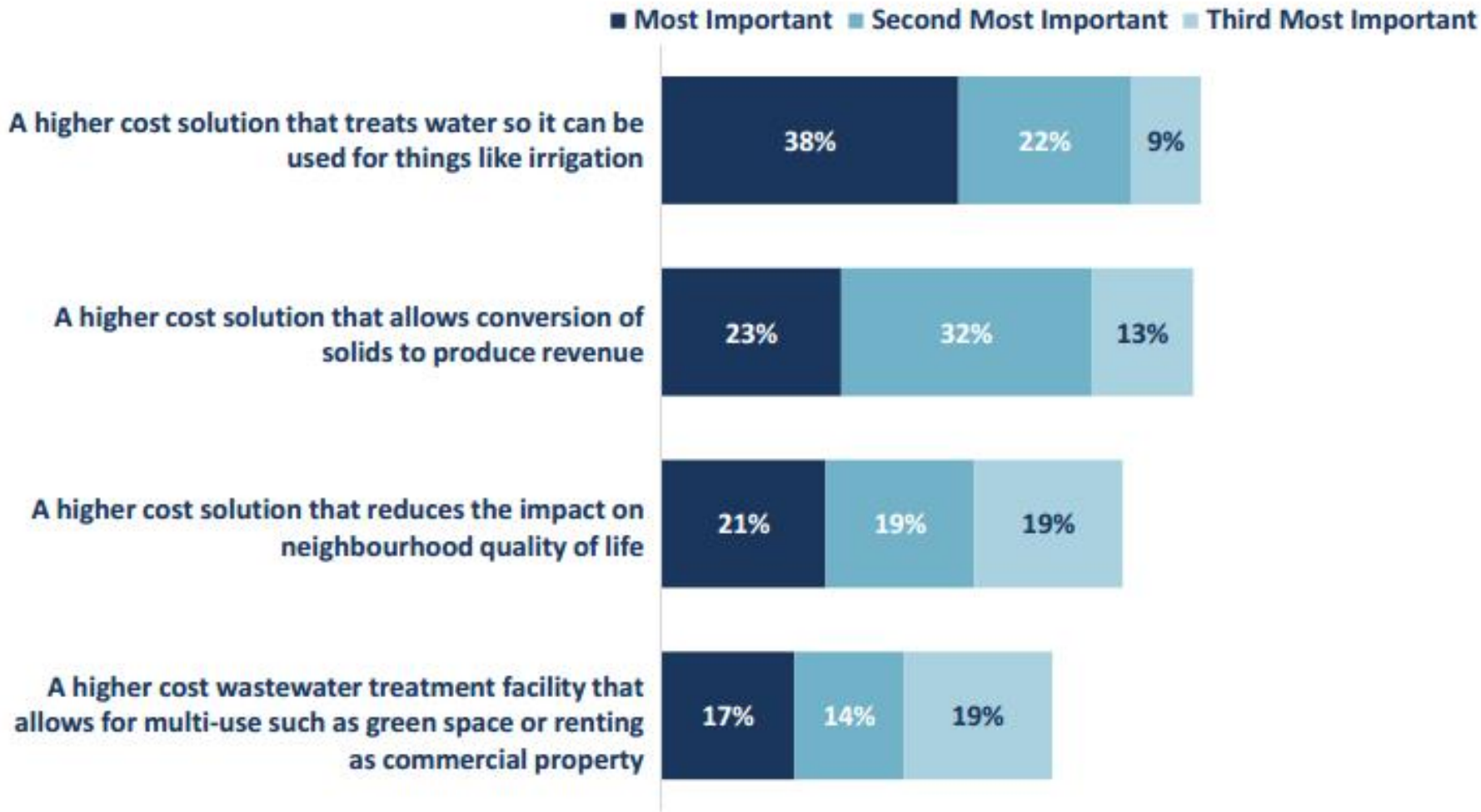
DOES AN OPPORTUNITY LIKE THIS EXIST IN THE CRD CORE AREA?



Tertiary WWTP Approx. 20 % of Total Flow	Tertiary WWTP Approx. 10 % of Total Flow	Tertiary WWTP Approx. 5 % of Total Flow	Wet Weather Facility Major Pump Station
Organic Waste Collection & Processing Centre	Gasifier & Energy Production Centre	Recovered Resource Use Area	Redirected Flow –Optimized Use of Existing Pump Stations & Pipes

PRIORITIZING DESIGN PRIORITIES (AMONG THOSE WHO PREFER TWO OR MORE HIGHER COST SOLUTIONS)

Ipsos Public Affairs



Q12. You supported more than one option that increases project costs. If only one of your choices was affordable, which one is **MOST** important to you? Which one is **SECOND MOST** important to you? Which one is **THIRD MOST** important to you?

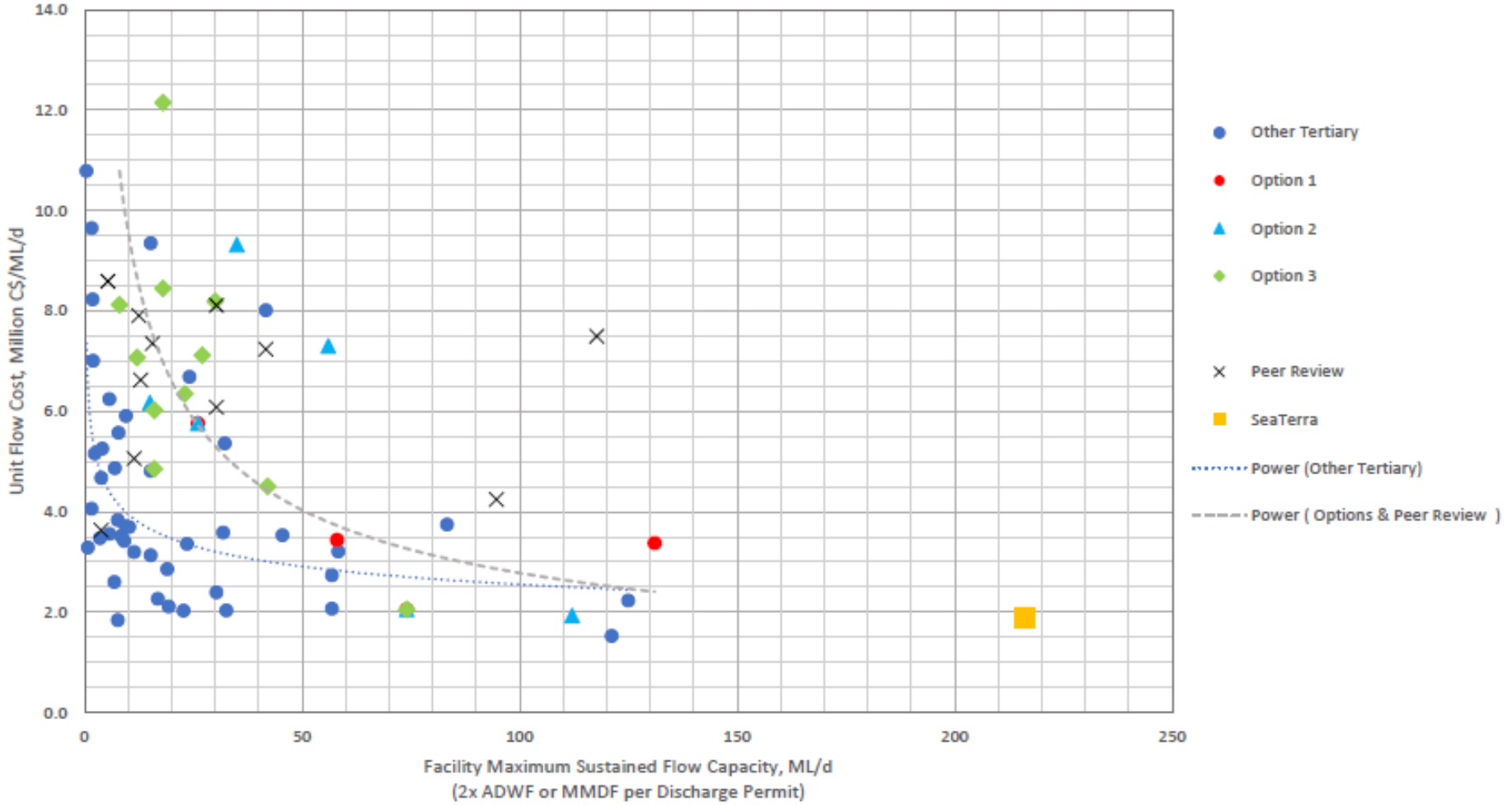
Base: Those who prefer two or more higher cost solutions (n=357)

GAME CHANGERS

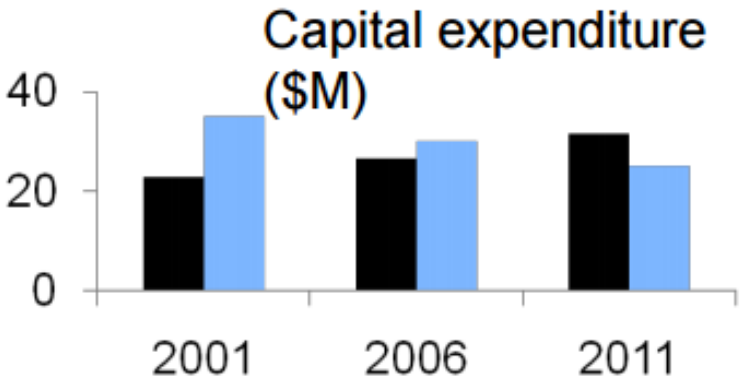
https://www.crd.bc.ca/docs/default-source/Wastewater-Planning-2014/Westside/westside-solutions-ipsos-reid-report.pdf?sfvrsn=0

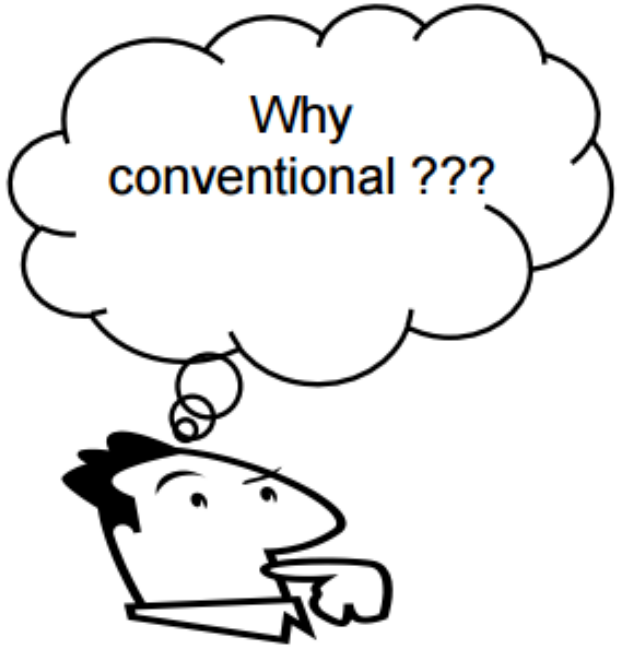
In 2009 the CRD rejected the option of distributed treatment facilities for the core area on the basis of excessive costs for such a system as estimated by their consultants. Were their estimates realistic? Compare the estimated unit costs for each of the distributed plants in the consultant's three options and the unit costs used for comparison by the CRD's peer review committee with the unit costs of a cross-section of existing treatment facilities located in various regions in Canada and the USA shown in the chart below.

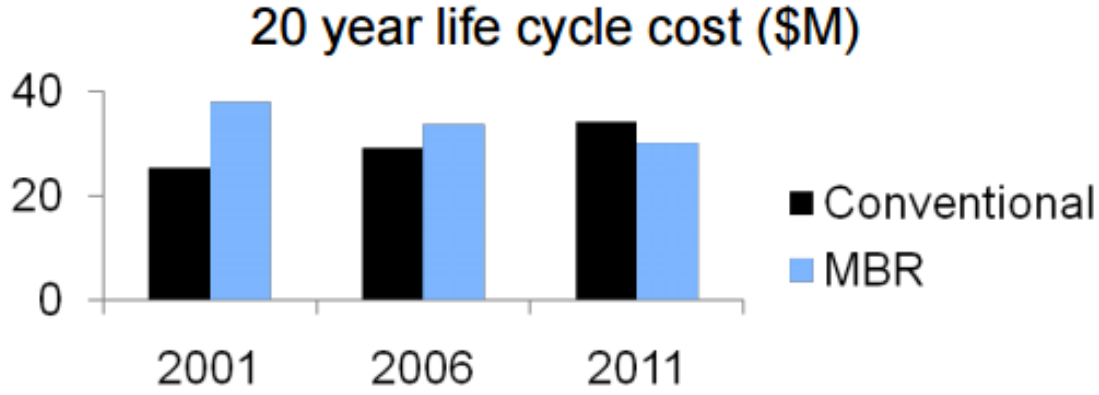
Figure 2C - Comparison of Unit Costs for Other Tertiary Water Reclamation Facilities versus Secondary Sewage Treatment Plants for the Capital Regional District: a) CRD 032-DP Options 1-2-3, b) CRD Peer Review Report & c) SeaTerra McLoughlin Point WWTP Pla



Summary







* Based on 5 MGD treatment capacity as compared to Conventional Secondary Treatment.

http://www.e-ht.com/Docs/SCMA2014-IsitTimeforMBR.pdf

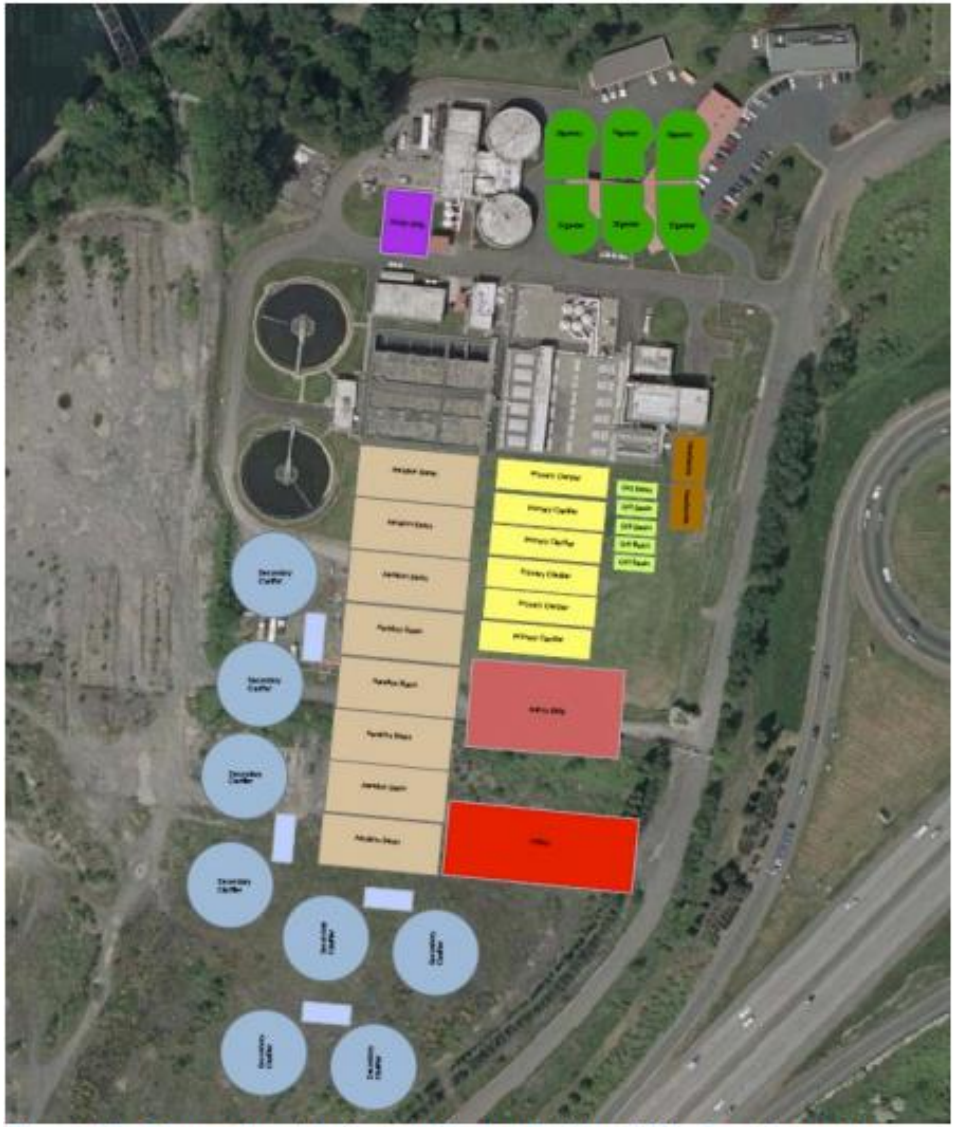


Figure 16: Conventional Activated Sludge Build-out Site Requirements

Figure 17: MBR Build-Out Site Requirements

"Both processes were reviewed and MBR treatment was selected. It was determined that the total power cost when compared to conventional treatment will be close to the same due to the additional system ventilation and odor control required in the conventional treatment. Intermediate pumping requirements are the same for both processes. Most importantly, the MBR process will provide the highest level of water quality and maximize the available open space. Construction costs of the MBR process is estimated to be lower than conventional treatment because of the fewer number of tanks, ability to phase construction with low impact on the neighbors…"

http://www.tri-cityservicedistrict.org/sites/default/files/fileattachments/tri-city_site_master_plan_final.pdf

SANTA PAULA CA – WRF, ADWF Capacity 13 MLD existing, 16 MLD design

VICTORIA BC – Dockside Green WWTP,
Capacity 0.19 MLD existing,
0.38 MLD with additional
membrane filters

GOODYEAR AZ – Palm Valley WRF, AAF Capacity 19 MLD existing; expandable to 31 MLD

PEORIA AZ – Butler WRF, ADWF Capacity 37.8 MLD existing, 50 MLD design

APPLE VALLEY CA – Architectural Renderings of Proposed Plants

CONSIDERATION OF DISTRIBUTED, ADVANCED TERTIARY WASTEWATER TREATMENT WITH OPTIMIZED RESOURCE RECOVERY

Page 1 • Introduction	Page 2 • Maps of options that have been presented in the current studies
Page 3 • Results of recent public polls	Page 4 • Map of existing Core Area trunk mains and outfalls
Page 5 • Map of existing I & I rates in the Core Area	Page 6 • Map of undersized trunk mains in the City of Victoria
Page 7 • Map of raw sewage overflow point in the Core Area	Page 8 • Flow chart, potential solutions to I & I problems and related cost estimates
Page 9 • Map of trunk mains in eastern section of Core Area and schematic of East Cost Intercepter	Page 10 • Schematic of distributed treatment plants concept applied to East Coast intercepter
Page 11 • Schematic of redundant treatment process trains – example 1	Page 12 Schematic of redundant treatment process trains – example 2
Page13 • Map of possible option for distributed treatment plants optimizing use of existing conveyance infrastructure	Page 14 • Result of recent public poll regarding higher cost solutions
Page 15 • Unit costs of some 40 recently completed tertiary treatment plants	Page 16 • Cost trends for MBR versus Conventional Activated Sludge treatment plants
Page 17 • Figures comparing site area requirements for a conventional activated sludge plant and a membrane bioreactor plant	Page 18 • Photos of several existing tertiary treatment plants constructed within developed urban areas • Architectural renderings of proposed treatment plants

Note: Page 14 source: SCMA Annual Conference & Expo “Membranes: Basics, Barriers, and Breakthroughs” San Antonio, TX – Aug. 20 - 22, 2014 © SCMA Joshua Berryhill, PE Enprotec / Hibbs & Todd, Inc. (eHT) It is Time for MBR – A Comparison of MBR Vs. Traditional Wastewater Treatment Technologies http://www.e-ht.com/Docs/SCMA2014-IsitTimeforMBR.pdf