Making a difference...together

CEDARS OF TUAM WATER SERVICE COMMISSION
Notice of Meeting on **Thursday, November 5, 2020 at 1:00 PM**
Lions Hall, 103 Bonnet Ave, Salt Spring Island, BC

Gary Holman Peter Wypkema

(r) regrets

AGENDA

1. Territorial Acknowledgement / Call Meeting to Order

2. Limited Space Meeting Resolution

That this resolution applies to the Cedars of Tuam Water Service Commission for the meeting being held on November 5, 2020, and that the attendance of the public at the place of the meeting will be limited in accordance with the applicable requirements or recommendations under the Public Health Act, despite the best efforts of the Commission because:

a. The available meeting facilities cannot accommodate more than (30) people in person, including members of the Commission and staff, and
b. There are no other facilities presently available that will allow physical attendance of the Commission and the public in sufficient numbers; and

That the Commission is ensuring openness, transparency, accessibility and accountability in respect of the open meeting by the following means:

a. By making the meeting agenda, as well as the other relevant documents, available on the CRD website, and directing interested persons to the website by means of the notices provided in respect of the meeting,
b. By making the minutes of the meeting available on the CRD website following the meeting.

3. Approval of Agenda

4. Approval of Minutes November 22, 2019 3-4

5. Director, Chair and Commissioner Reports

6. New Business

6.1 2021 Capital and Operating Budget 5-22

That the Cedars of Tuam Water Service Commission:

1. Approve the 2021 operating and capital budget as presented, and that the 2020 actual surplus or deficit be balanced on the 2020 transfer to the Capital Reserve Fund; and,

2. Recommend that the Electoral Area Services Committee recommend that the CRD Board approve the 2021 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service as presented.

To ensure quorum, advise Tracey Shaver 250 537 4448 if you cannot attend.

7. Outstanding Business

7.1 Water Rate Structure analysis 23-26

That the Cedars of Tuam Water Service Commission retain the current water rate structure proposed in the 2021 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service

7.2 Cedars of Tuam Water Service Concept Design for Connecting to New Well 27-205

That the Cedars of Tuam Water Service Commission approves proceeding with Option 2 - interim design outlined in the Cedars of Tuam Conceptual Design Technical Memo dated September 12, 2019 and a detailed design to connect a new well in 2022.

7.3 Cedars of Tuam Asset Management Plans 206-251

To be received for information

8. Adjournment

Making a difference...together

Minutes of the Cedars of Tuam Water Service Commission
Held November 22, 2019 in the Creekside Meeting Room, Suite 108- 121 McPhillips Ave, Salt Spring Island, BC

DRAFT

Present: **CRD Director**: Gary Holman
Commission Members: Peter Wypkema
Staff: Karla Campbell, Senior Manager; Allen Xu, Manager Engineering; Tracey Shaver, Recording Secretary.
Present: Julian Edwards

1. **Approval of Agenda**

MOVED by Director Holman, **SECONDED** by Commissioner Wypkema,
That the Cedars of Tuam Water Service Commission approve the November 22, 2019 agenda.

CARRIED

2. **Adoption of Minutes of February 5, 2018**

MOVED by Commissioner Wypkema, **SECONDED** by Director Holman,
That the Cedars of Tuam Water Service Commission approve the February 5, 2018 agenda.

CARRIED

3. **Presentation:** Mr. Julian Edwards-191 Roland Road

Mr. Edwards presented his case that his property at 191 Roland Road has been identified unfairly and charged a second fixed user fee.

- CRD recently changed bylaw from per connection to single family equivalent
- Small water service with only his property identified as having a secondary cottage
- Single family equivalent not defined; trailer, cabin, duplex
- Islands Trust not enforcing zoning for structures on other properties
- Considered disconnecting and using well

4. **Director and Chair Reports** - none

5. **New Business**

5.1 2020 Operating and Capital Budget

- $685,000 in Capital Projects over the next 5 years
- New well location secured

MOVED by Commissioner Wypkema, **SECONDED** by Director Holman,
That the Cedars of Tuam Water Service Commission approve the 2020 operating and capital budget as presented, and that the 2019 actual surplus or deficit be balanced on the 2019 transfer to the Capital Reserve Fund.

CARRIED

MOVED by Commissioner Wypkema, **SECONDED** by Director Holman,
That the Cedars of Tuam Water Service Commission recommend that the Electoral Area Services Committee recommend that the CRD Board approve the 2020 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service as presented.

CARRIED

6. Outstanding Business

6.1 Petition to amend Bylaw 4236 (currently 4311)

- Small utility with 17 SFE properties paying for annual budget of +/- $35,000
- Funding sources available: Parcel tax; user fee; and consumption charges
- This service has no Parcel Tax.
- Consider increasing consumption charges to balance a reduction in the user fee

MOVED by Commissioner Wypkema, **SECONDED** by Director Holman,
That the Cedars of Tuam Water Service Commission request staff prepare a summary table which moves towards funding the service with consumption fees; subject to a revenue neutral basis.

CARRIED

7. Adjournment

MOVED by Commissioner Wypkema, **SECONDED** by Director Holman,
That the Cedars of Tuam Water Service Commission adjourn the meeting at 11:08 am.

CHAIR

SENIOR MANAGER

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REPORT TO CEDARS OF TUAM WATER SERVICE COMMISSION
MEETING OF THURSDAY, NOVEMBER 5, 2020

SUBJECT **2021 OPERATING AND CAPITAL BUDGET**

ISSUE

To present the 2021 operating and capital budget. In accordance with Bylaw No 3055, "Cedars of Tuam Water Service Commission Bylaw No. 1, 2003" the Commission's approval of the annual budget is required.

BACKGROUND

The Capital Regional District (CRD) is required by legislation under the *Local Government Act* (LGA) to prepare an annual Operating and Capital budget and a five year Financial Plan. CRD staff have therefore, prepared the financial plan shown in Attachment to this report for the Cedars of Tuam Water Service.

The Operating Budget includes the regular annual costs to operate the service. The Capital Expenditure Plan shows the anticipated expenditures for capital additions. These may include purchases of new assets or infrastructure, upgrades or improvements to existing assets or asset review and study work that could potentially lead to future capital improvements.

In preparing the Operating Budget, CRD staff took into account:

1. Actual expenditures incurred between 2018 and 2020
2. Anticipated changes in level of service (if any)
3. Maximum allowable tax requisition
4. Annual Cost per taxpayer and per SFE

Factors taken into consideration in the preparation of the Capital Expenditure Plan included:

1. Available funds on hand
2. Projects already in progress
3. Condition of existing assets and infrastructure
4. Regulatory, environmental, and health and safety factors.

Adjustments for surpluses or deficits from 2020 may be made in January 2021. The CRD Board will give final approval to the budget and financial plan in March 2021.

The Financial Plan for the years 2022 – 2025 may be changed in future years.

BUDGET OVERVIEW

Operating Budget

It is projected that the 2020 operating expenses will be approximately $2,327 over budget. Factors contributing to the operating overage include well pump corrective maintenance and a replacement of an electronic level transducer.

It is projected that the 2020 operating revenue will be approximately $699 over budget primarily as a result of higher projected water sale revenue.

As a result, there is an operating deficit of approximately $1,628.

In order to balance the 2020 budget, CRD staff recommend that the 2020 transfer to the capital reserve fund be reduced by the deficit amount.

The 2021 net operating cost has been increased by $1,558 (5.7%) over 2020. The increase is primarily due to core inflation and an increase in the Allocations funding for Salt Spring Island Engineering and Administration support.

The 2021 operating budget also includes a $1,500 expenditure to conduct a hydrant/standpipe system flush funded by the Operating Reserve Fund.

Municipal Finance Authority (MFA) Debt

Currently, there is no existing outstanding debt for this service. New debt of $70,000 planned in 2020 for project *New Well Detailed Design* was deferred to 2022 and to be funded by grant. The savings from this planned debt servicing cost will reduce the operating deficit by $1,058 resulting in an overall service deficit of $570 to be balanced on capital reserve fund transfer.

Operating Reserve Fund

The Operating Reserve Fund is used to undertake maintenance activities that typically do not occur on an annual basis. Typical maintenance activities include hydrant/standpipe maintenance and reservoir cleaning and inspection and ground water well servicing. The operating reserve also funds the procurement of equipment and supplies that are not purchased on an annual basis. Additionally, the operating reserve could be used for emergency unplanned repairs.

It is proposed that transfers to the operating reserve increase by 1.8% from $2,750 to $2,800 to ensure maintenance activities are fully funded. There is $11,500 of planned maintenance to be funded by the Operating Reserve over the next five years.

The operating reserve balance at the end of 2020 is projected to be approximately $1,397.

Capital Reserve Fund

The Capital Reserve Fund (CRF) is to be used to pay for capital expenditures that are not funded by other sources such as grants, operating budget or debt.

It is proposed, as a result of a projected 2020 overall service budget deficit, that the 2020 capital reserve transfer be decreased from $3,000 to $2,430. It is also proposed that the annual capital transfer be increased from $3,000 to $5,000 in 2021 to fund capital requirements in the five year plan.

The balance of the Capital Reserve Fund at the end of 2020 is projected to be $15,785.

Capital Expenditure Plan

The 5-year plan includes $753,000 of expenditures to be funded by a combination of the service's Capital Reserve Fund, grant, and new debt.

New projects added to the 2021 five year capital plan include the following:

1. Replace chlorinator and chlorine analyzer, install well level transducer and replace raw water flow meter, $36,000, in 2021;
2. Investigate current issues and install a suitable sand separator, $10,000 in 2022.

The service's asset management plan (AMP) supports long term planning on assets which drive capital replacement strategy, prioritization and schedule, as well as inform operations on the ongoing maintenance of assets, and assist with the asset upgrades and replacements. The AMP, which was completed in Q1 2020 by a third party consultant engineer, will assist with defining the level of service required for the service. Using this information, and the asset age and condition information, the AMP helps classify the capital upgrades, operational requirements and appropriate budgets, and project funding mechanisms to include in the 5-year capital plans for the service.

Contingent on electoral assent, two borrowings of in 2022 and 2023 are projected to cover the capital expenditures related to *design and construction of a back-up Power Generation equipment*, and *a new Well and Distribution System*.

Table 1 below provides the future debt servicing cost simulation for analytical purpose with the indicative interest rate provided by MFA at the time of simulation.

Table 1 – Future New Debt Simulation

Future Borrowing(s) Estimation	*Term*	*Borrowing Year*	*Retirement Year*	*Refinance Year*	*Estimated Interest Rate*	*Principal*	*Principal Payment*	*Interest Payment*	*Total Annual Debt Cost*
	25	2022	2047	2032	2.60%	$15,000	$468	$390	$858
	25	2023	2048	2033	2.60%	$605,000	$18,888	$15,730	$34,618
Total						**$620,000**	**$19,356**	**$16,120**	**$35,476**

At the commencement of each loan, 1% of the gross amount borrowed is withheld and retained by MFA as Debt Reserve Fund (DRF). In order to provide the full amount to fund the capital project, this 1% DRF amount is budgeted in the operating budget in the year of borrowing. However, there is no principle payment required in the year of borrowing.

Capital Projects Fund

As specific capital projects are approved, the funding revenues for them are transferred into this Capital Project Fund from multiple funding sources if applicable, including Capital Reserve Fund (CRF), grant funding, external contributions and Debt. Any funds remaining upon completion of a project will be transferred back to its original funding source(s).

Projects CE.091 (SAMP Study) and CE.670 (Well Hook-up) are anticipated to be completed by end of 2020.

User Charge

The service is primarily funded by fixed user charges and variable water consumption charge. Properties connected to the water system pay the annual user charge. The tiered water consumption rates remain unchanged from 2020. The water consumption revenue is projected to be $700 higher than 2020 in alignment with historical actual water sales of previous years.

Table 2 below summarizes the 2021 over 2020 changes for user charge.

Table 2 – User Charge Summary

Budget Year	*User Charge*	*SFE Numbers*	*User Charge per SFE*
2020	$33,163	17	$1,950.76
2021	$35,013	17	$2,059.59
Change ($)	$1,850	0	$108.83
Change (%)	5.58%	0.00%	5.58%

RECOMMENDATION

That the Cedars of Tuam Water Service Commission:

1. Approve the 2021 operating and capital budget as presented, and that the 2020 actual surplus or deficit be balanced on the 2020 transfer to the Capital Reserve Fund; and,

2. Recommend that the Electoral Area Services Committee recommend that the CRD Board approve the 2021 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service as presented.

Submitted by	Karla Campbell, Senior Manager, Salt Spring Island Electoral Area
Submitted by	Matthew McCrank, MSc., P.Eng., Senior Manager, Infrastructure Operations
Submitted by	Rianna Lachance, BCom, CPA, CA, Senior Manager Financial Services
Concurrence	Ted Robbins, B.Sc., C.Tech., General Manager, Integrated Water Services
Concurrence	Robert Lapham, MCIP, RPP, Chief Administrative Officer

MMc/DR/JR/KC:ts

Attachment: 2021 Budget Cedars of Tuam Service Budget

CAPITAL REGIONAL DISTRICT

2021 Budget

Cedars of Tuam Water (SSI)

Commission Review

Compiled and Presented by CRD Finance

Nov-20

Service: **2.622 Cedars of Tuam Water (SSI)** **Committee: Electoral Area**

DEFINITION:

To provide and operate water supply and distribution facilities for the Salt Spring Island Cedars of Tuam Water System Service Area.
Bylaw No. 3021 (October 9, 2002).

PARTICIPATION:

Local Service Area #45, T(764).

MAXIMUM LEVY:

Greater of $25,425 or $6.75 / $1,000 of actual assessed value of land and improvements. To a maximum of $72,162.

MAXIMUM CAPITAL DEBT:

AUTHORIZED:	LA Bylaw No. 3024 (October 10, 2002)		24,000
BORROWED:	SI Bylaw No. 3050 (March 12, 2003)	5.5%	(24,000) (Rate reduced to 2.1% June 2013)
REMAINING:			$0

COMMITTEE:

Cedars of Tuam Water Service Committee established by bylaw No 3055 (March 12, 2003).

FUNDING:

User Charge

- Annual Fixed Fee per per single family dwelling unit or equivalent plus consumption charge
- The consumption charge for water will be the total volume of water metered to the water service connections, measured in cubic meters at the following rate:
  - First 38 cubic metres or portion - $0.90 / cubic metre
  - Greater than 38 cubic metres - $7.70 / cubic metre

Water Connection Charge

- Actual cost for the connection.

RESERVE FUND:

Fund 1057, established by Bylaw #3136 (June 14, 2004); amended by Bylaw 3948 (April 16, 2014).

2.622 - Cedars of Tuam Water (SSI)	2020 BOARD BUDGET	2020 ESTIMATED ACTUAL	BUDGET REQUEST 2021 CORE BUDGET	BUDGET REQUEST 2021 ONGOING	BUDGET REQUEST 2021 ONE-TIME	BUDGET REQUEST 2021 TOTAL	FUTURE PROJECTIONS 2022	FUTURE PROJECTIONS 2023	FUTURE PROJECTIONS 2024	FUTURE PROJECTIONS 2025
OPERATING COSTS										
Repairs & Maintenance	13,060	12,500	560	-	1,500	2,060	560	560	560	10,560
Allocations	2,582	2,582	3,314	-	-	3,314	3,154	3,212	3,273	3,334
Water Testing	2,030	1,800	2,060	-	-	2,060	2,100	2,140	2,180	2,220
Electricity	630	670	640	-	-	640	650	660	670	680
Supplies	710	490	720	-	-	720	730	740	750	760
Labour Charges	19,613	23,000	20,369	-	-	20,369	20,802	21,219	21,644	22,078
Other Operating Expenses	1,380	1,290	1,400	-	-	1,400	1,410	1,420	1,430	1,440
TOTAL OPERATING COSTS	**40,005**	**42,332**	**29,063**	**-**	**1,500**	**30,563**	**29,406**	**29,951**	**30,507**	**41,072**
*Percentage Increase over prior year						-23.6%	-3.8%	1.9%	1.9%	34.6%
Transfer from Operating Reserve Fund	(12,500)	(12,500)	-	-	(1,500)	(1,500)	-	-	-	(10,000)
NET OPERATING COSTS	**27,505**	**29,832**	**29,063**	**-**	**-**	**29,063**	**29,406**	**29,951**	**30,507**	**31,072**
						5.7%				
DEBT / RESERVES										
Transfer to Capital Reserve Fund	3,000	2,430	5,000	-	-	5,000	6,000	5,000	3,000	3,000
Transfer to Operating Reserve Fund	2,750	2,750	2,800	-	-	2,800	2,860	2,920	2,980	3,040
MFA Debt Reserve Fund	700	-	-	-	-	-	150	6,050	-	-
MFA Debt Principal	-	-	-	-	-	-	-	468	19,357	19,357
MFA Debt Interest	358	-	-	-	-	-	98	4,323	16,120	16,120
TOTAL DEBT / RESERVES	**6,808**	**5,180**	**7,800**	**-**	**-**	**7,800**	**9,108**	**18,761**	**41,457**	**41,517**
TOTAL COSTS	**34,313**	**35,012**	**36,863**	**-**	**-**	**36,863**	**38,514**	**48,712**	**71,964**	**72,589**
FUNDING SOURCES (REVENUE)										
Sales - Water	(1,100)	(1,800)	(1,800)	-	-	(1,800)	(1,800)	(1,800)	(1,800)	(1,800)
User Charges	(33,163)	(33,162)	(35,013)	-	-	(35,013)	(36,664)	(46,862)	(70,114)	(70,739)
Other Revenue	(50)	(50)	(50)	-	-	(50)	(50)	(50)	(50)	(50)
TOTAL REVENUE	**(34,313)**	**(35,012)**	**(36,863)**	**-**	**-**	**(36,863)**	**(38,514)**	**(48,712)**	**(71,964)**	**(72,589)**
REQUISITION - PARCEL TAX	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
*Percentage increase over prior year										
Sales						63.6%	0.0%	0.0%	0.0%	0.0%
User Charge						5.6%	4.7%	27.8%	49.6%	0.9%
Requisition						0.0%	0.0%	0.0%	0.0%	0.0%
Combined						**7.4%**	**4.5%**	**26.5%**	**47.7%**	**0.9%**

Cedars of Tuam Water (SSI)
Reserve Summary Schedule
2021 - 2025 Financial Plan

Reserve/Fund Summary						
	Estimated	Budget				
	2020	2021	2022	2023	2024	2025
Capital Reserve Fund	15,785	14,785	2,785	7,785	10,785	13,785
Operating Reserve Fund	1,397	2,697	5,557	8,477	11,457	4,497
Total	**17,182**	**17,482**	**8,342**	**16,262**	**22,242**	**18,282**

Reserve Schedule

Reserve Fund: 2.622 Cedars of Tuam Water (SSI) - Capital Reserve Fund - Bylaw 3948

Monies in the reserve fund will be used to provide for capital works, including the planning, study, design, onstruction of water facilities, conveyance, treatment, storage, distribution of water, land purchases, machinery or equipment necessary for the extension or renewal of existing capital works and related debt servicing payments.

Reserve Cash Flow

Fund: 1057 Fund Centre: 101843	Estimated	Budget				
	2020	2021	2022	2023	2024	2025
Beginning Balance	13,155	15,785	14,785	2,785	7,785	10,785
Transfer from Ops Budget	2,430	5,000	6,000	5,000	3,000	3,000
Transfer from Cap Fund	-	-	-	-	-	-
Transfer to Cap Fund	-	(6,000)	(18,000)	-	-	-
Interest Income*	200	-	-	-	-	-
Ending Balance $	**15,785**	**14,785**	**2,785**	**7,785**	**10,785**	**13,785**

Assumptions/Background:

Transfer as much as operating budget will allow.

* Interest should be included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

Reserve Schedule

Reserve Fund: 2.622 Cedars of Tuam Water (SSI) - Operating Reserve Fund

Reserve fund used for: unforeseen operational repairs and maintenance; infrequent maintenance activities such as reservoir cleaning and inspection, hydrant teardowns and ground water well maintenance. Optimum minimum balance of $2,500 (approximately 10%) of the annual operating budget.

Reserve Cash Flow

Fund:	**1500**	**Estimated**	**Budget**				
Fund Centre:	**105532**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Beginning Balance		10,977	1,397	2,697	5,557	8,477	11,457
Transfer from Op Budget		2,750	2,800	2,860	2,920	2,980	3,040
Expenditures		(12,500)	(1,500)	-	-	-	(10,000)
Planned Maintenance Activity		Reservoir cleaning and inspection/ Well inspection	Hydrant/Standpipe Maintenance/ System Flush				Reservoir cleaning and inspection
Interest Income*		170	-	-	-	-	-
Ending Balance $		**1,397**	**2,697**	**5,557**	**8,477**	**11,457**	**4,497**

Assumptions/Background:

* Interest should be included in determining the estimated ending balance for the current year. Interest in planning years nets against inflation which is not included.

CAPITAL REGIONAL DISTRICT

FIVE YEAR CAPITAL EXPENDITURE PLAN SUMMARY - 2021 to 2025

Service No.	2.622 Cedars of Tuam Water (SSI)	Carry Forward from 2020	2021	2022	2023	2024	2025	TOTAL
EXPENDITURE								
Buildings		$0	$0	$0	$0	$0	$0	$0
Equipment		$0	$36,000	$35,000	$600,000	$0	$0	$671,000
Land		$0	$0	$0	$0	$0	$0	$0
Engineered Structures		$0	$0	$77,000	$5,000	$0	$0	$82,000
Vehicles		$0	$0	$0	$0	$0	$0	$0
		$0	**$36,000**	**$112,000**	**$605,000**	**$0**	**$0**	**$753,000**
SOURCE OF FUNDS								
Capital Funds on Hand		$0	$0	$0	$0	$0	$0	$0
Debenture Debt (New Debt Only)		$0	$0	$15,000	$605,000	$0	$0	$620,000
Equipment Replacement Fund		$0	$0	$0	$0	$0	$0	$0
Grants (Federal, Provincial)		$0	$30,000	$79,000	$0	$0	$0	$109,000
Donations / Third Party Funding		$0	$0	$0	$0	$0	$0	$0
Reserve Fund		$0	$6,000	$18,000	$0	$0	$0	$24,000
		$0	**$36,000**	**$112,000**	**$605,000**	**$0**	**$0**	**$753,000**

CAPITAL REGIONAL DISTRICT CAPITAL PLAN

CAPITAL BUDGET FORM
2021 & Forecast 2022 to 2025

Service #: 2.622
Service Name: Cedars of Tuam Water (SSI)

Proj. No.
The first two digits represent first year the project was in the capital plan.

Capital Exp. Type
Study - Expenditure for feasibility and business case report.
New - Expenditure for new asset only
Renewal - Expenditure upgrades an existing asset and extends the service ability or enhances technology in delivering that service
Replacement - Expenditure replaces an existing asset

Funding Source Codes
Debt = Debenture Debt (new debt only)
ERF = Equipment Replacement Fund
Grant = Grants (Federal, Provincial)
Cap = Capital Funds on Hand
Other = Donations / Third Party Funding

Funding Source Codes (con't)
Res = Reserve Fund
STLoan = Short Term Loans
WU - Water Utility

Asset Class
L - Land
S - Engineering Structure
B - Buildings
V - Vehicles

Capital Project Title
Input Title of Project. For example "Asset Name - Roof Replacement", "Main Water Pipe Replacement".

Capital Project Description
Briefly describe project scope and service benefits.
For example: *"Full Roof Replacement of a 40 year old roof above the swimming pool area; The new roofing system is built current energy standards, designed to minimize maintenance and have an expected service life of 35 years".*

Total Project Budget
This column represents the total project budget not only within the 5-year window.

FIVE YEAR FINANCIAL PLAN

Proj. No.	Capital Exp.Type	Capital Project Title	Capital Project Description	Total Proj Budget	Asset Class	Funding Source	C/F from 2020	2021	2022	2023	2024	2025	5 - Year Total
18-01	Decommission	Abandon unused wells	Decommission wells	$5,000	S	Debt	$0	$0	$0	$5,000	$0	$0	$5,000
21-05	New	Cholorinator, level transducer and flow meter replacement	replace chlorinator and chlorine analyzer, install well level transducer and replace raw water flow meter	$30,000	E	Grant	$0	$30,000	$0	$0	$0	$0	$30,000
21-05	New	Cholorinator, level transducer and flow meter replacement	replace chlorinator and chlorine analyzer, install well level transducer and replace raw water flow meter	$6,000	E	Res	$0	$6,000	$0	$0	$0	$0	$6,000
21-01	Renewal	Public Engagement for Future Projects	Inform and engage public within service area on upcoming works that will require borrowing to fund.	$5,000	E	Res	$0	$0	$5,000	$0	$0	$0	$5,000
21-02	Renewal	Referendum or Alternative Approval Process - Funding for Future Projects	Undertake a referendum or AAP to borrow funds to carry out the new well design and construction	$5,000	E	Res	$0	$0	$5,000	$0	$0	$0	$5,000
21-03	Study	New well detailed designs	Detailed designs, IHA application, construction documents	$70,000	S	Grant	$0	$0	$70,000	$0	$0	$0	$70,000
21-03	Study	New well detailed designs	Detailed designs, IHA application, construction documents	$7,000	S	Res	$0	$0	$7,000	$0	$0	$0	$7,000
21-04	New	Construct new well and dist system	Construction of new infrastructure for future needs	$600,000	E	Debt	$0	$0	$0	$600,000	$0	$0	$600,000
22-01	Study	Power generation equipment	Back up power detailed designs	$5,000	E	Debt	$0	$0	$5,000	$0	$0	$0	$5,000
22-02	New	Power generation equipment	Back up power construction	$10,000	E	Debt	$0	$0	$10,000	$0	$0	$0	$10,000
22-03	New	Vortex sand seperator replacement	Investigate current issues and install a suitable sand seperator - gas tax funded	$9,000	E	Grant	$0	$0	$9,000	$0	$0	$0	$9,000
22-03	New	Vortex sand seperator replacement	Investigate current issues and install a suitable sand seperator	$1,000	E	Res	$0	$0	$1,000	$0	$0	$0	$1,000
			GRAND TOTAL	**$753,000**			**$0**	**$36,000**	**$112,000**	**$605,000**	**$0**	**$0**	**$753,000**

Service: **2.622** **Cedars of Tuam Water (SSI)**

Proj. No.	18-01	**Capital Project Title**	Abandon unused wells	**Capital Project Description**	Decommission wells
Asset Class	S	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*Abandon unused wells*				

Proj. No.	21-01	**Capital Project Title**	Public Engagement for Future Projects	**Capital Project Description**	Inform and engage public within service area on upcoming works that will require borrowing to fund.
Asset Class	E	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*Public engage for project requiring borrowing.*				

Proj. No.	21-02	**Capital Project Title**	Referendum or Alternative Approval Process - Funding for Future Projects	**Capital Project Description**	Undertake a referendum or AAP to borrow funds to carry out the new well design and construction
Asset Class	E	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*referendum is required for borrowing voting.*				

Proj. No.	21-03	**Capital Project Title**	New well detailed designs	**Capital Project Description**	Detailed designs, IHA application, construction documents
Asset Class	S	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*Detailed design for new well.*				

Proj. No.	21-04	**Capital Project Title**	Construct new well and dist system	**Capital Project Description**	Construction of new infrastructure for future needs
Asset Class	E	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*Construction for new well system.*				

Proj. No.	21-05	**Capital Project Title**	Cholorinator, level transducer and flow meter replacement	**Capital Project Description**	replace chlorinator and chlorine analyzer, install well level transducer and replace raw water flow meter
Asset Class	E	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*replace chlorinator and chlorine analyzer, install well level transducer and replace raw water flow meter*				

Proj. No.	22-01	**Capital Project Title**	Power generation equipment	**Capital Project Description**	Back up power detailed designs
Asset Class	E	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*Design of back up power.*				

Proj. No.	22-02	**Capital Project Title**	Power generation equipment	**Capital Project Description**	Back up power construction
Asset Class	E	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*Construct and install power generation equipment for emergency back up power.*				

Proj. No.	22-03	**Capital Project Title**	Vortex sand seperator replacement	**Capital Project Description**	Investigate current issues and install a suitable sand seperator - gas tax funded
Asset Class	E	**Board Priority Area**	0	**Corporate Priority Area**	0
Project Rationale	*0*				

2.622 - Cedars of Tuam Water (SSI)

Capital Projects Fund

Updated @ Oct 06, 2020

Year	Project#	Status	Capital Project Description	Total Project Budget	Expenditure Actuals	Remaining Funds	Funding Source		Total Funding in Place
							CRF*	CWF**	
2011	CE.091.4603	Closed	SAMP Study	11,300	10,634	666	1,300	10,000	11,300
2018	CE.670	Closed	Well Hookup	10,500	8,496	2,004	10,500	-	10,500
2019	CE.699.4502	Open	Safe Work Procedures	3,000	558	2,442	3,000	-	3,000
			Totals	**24,800**	**19,689**	**5,111**	**14,800**	**10,000**	**24,800**

* CRF (Capital Reserve Fund)

** CWF (Community Works Fund)

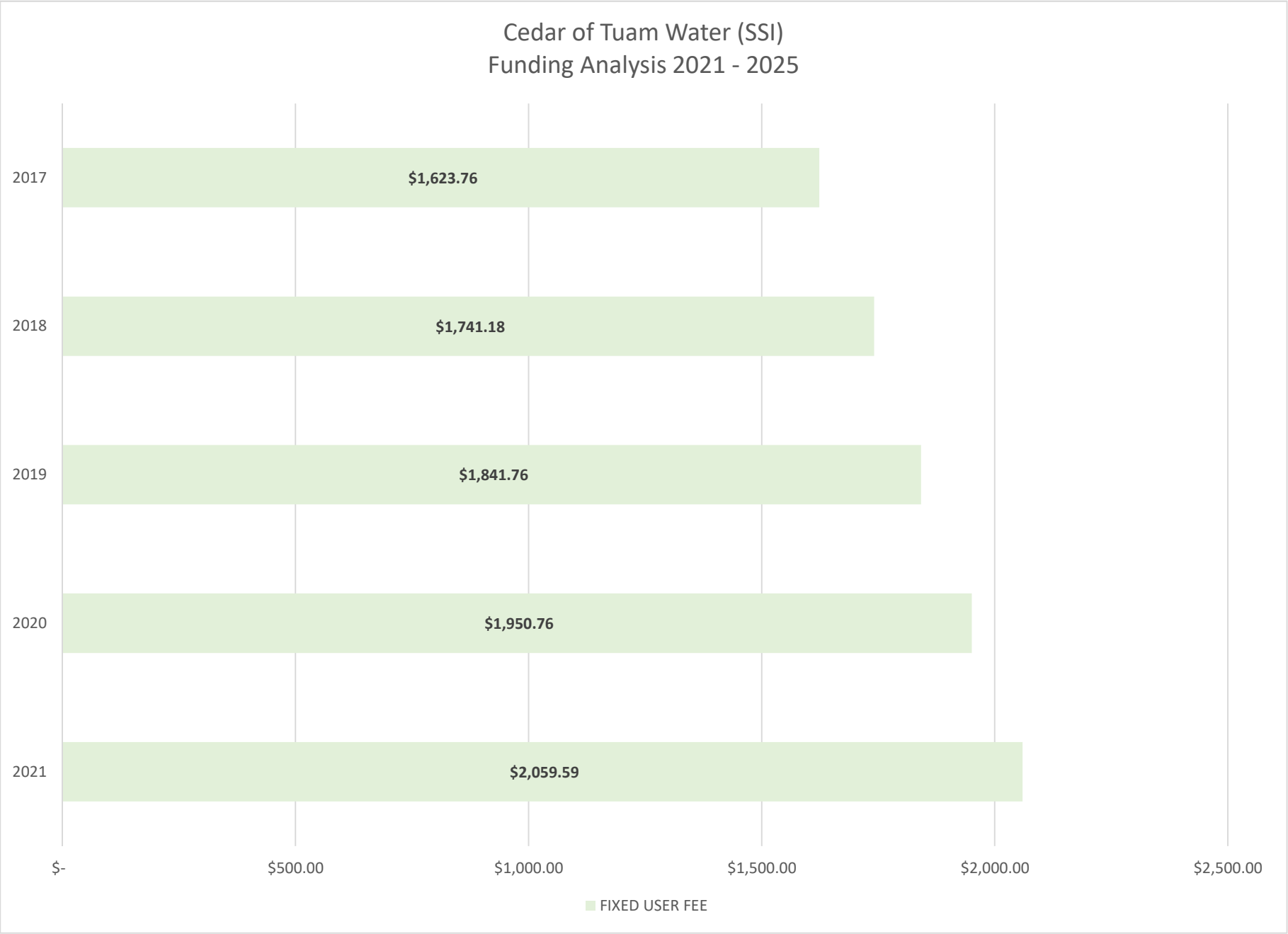
Service: 2.622 Cedars of Tuam Water (SSI) **Committee:** Electoral Area Services

Year	SFE's	User Charge	Bylaw	Actual Assessments $(000's)
2011	16	$1,603.87	3777	8,855.30
2012	16	$1,603.87	3822	8,731.60
2013	16	$1,373.62	3891	8,248.70
2014	16	$1,373.62	3925	8,198.50
2015	16	$1,470.63	3993	8,199.00
2016	16	$1,544.38	4073	7,716.70
2017	16	$1,623.76	4171	8,070.00
2018	17	$1,741.18	4236	9,419.00
2019	17	$1,841.76	4311	10,129.00
2020	17	$1,950.76	4339	10,690.70
2021	17	$2,059.59		

Change from 2020 to 2021

$108.82
5.58%

**** A variable consumption charge is paid in addition to the fixed user charge.***


Cedar of Tuam Water (SSI)
Funding Analysis 2021 - 2025
2017
$1,623.76
2018
$1,741.18
2019
$1,841.76
2020
$1,950.76
2021
$2,059.59
$-
$500.00
$1,000.00
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$2,500.00
FIXED USER FEE

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REPORT TO CEDARS OF TUAM WATER SERVICE COMMISSION
MEETING OF THURSDAY, NOVEMBER 5, 2020

SUBJECT **WATER RATE STRUCTURE ANALYSIS**

ISSUE

To review the water rate structure for Cedar of Tuam.

BACKGROUND

At the November 22, 2019 Cedars of Tuam Commission meeting, staff were requested to prepare a summary table outlining alternative service funding based on higher consumption fees and lower fixed fees; subject to revenue neutrality. The following table represents the current rate structure and a proposed rate structure which reduces the fixed charge per single family equivalent (SFE) and increases the consumption tiered rates.

Table 1:

	Current Rate Structure		Proposed Rate Structure	
Fixed Charge per SFE	$ 2059.59		$ 748.00	
Number of SFE's	17		17	
	M^3	**$**	**M^3**	**$**
Consumption charge Tier 1 <=	38	$ 0.90	12	$ 15.85
Consumption charge Tier 2 <=	<38	$ 7.70	25	$ 20.00
Consumption charge Tier 3 >			<25	$ 25.00

	Current	Proposed
Fixed charge	$ 35,013	$ 12,716
Consump.chg	$ 1,191	$ 24,156
∑ $	$ 36,204	$ 36,872

1. Water Revenue – Fixed User Charge and Tiered Rate Structure

To meet the annual revenue requirement, the current water rate structure is set to receive approximately 3% from water consumption and 97% from a fixed user charge. The 2021 operating budget projects $36,863 in operating costs, a 7.4% increase over 2020. Using the actual metered water consumption from 2019 under the proposed rate structure, water sales revenues will need to increase approximately $22,965 (1,927.7%) to allow a decrease to the fixed user charge and to cover the 2021 operating expenses and transfers to reserves.

The impact on the average annual water user account is as follows (user charge plus consumption):

Table 2:

	Current	Proposed	% increase (decrease)
1	$ 2,189.51	$ 2,572.00	17%
2	$ 2,201.07	$ 2,873.03	31%
3	$ 2,199.47	$ 2,859.88	30%
4	$ 4,303.18	$ 3,685.76	(14)%
5	$ 2,216.25	$ 3,289.39	48%
6	$ 2,155.53	$ 1,791.91	(17)%
7	$ 2,174.91	$ 2,244.85	3%
8	$ 2,156.94	$ 1,823.27	(15)%
9	$ 2,110.02	$ 931.72	(56)%
10	$ 2,211.26	$ 3,150.63	42%
11	$ 2,188.26	$ 2,539.39	16%
12	$ 2,157.24	$ 1,867.50	(13)%
13	$ 2,127.59	$ 1,241.20	(42)%
14	$ 2,132.68	$ 1,367.72	(36)%
15	$ 2,125.45	$ 1,204.36	(43)%
16	$ 2,234.96	$ 3,429.47	53%
Total	$36,884.32	$ 36,872.08	(0)%

Eight water accounts will receive an increase in water rates and eight properties will receive a decrease under the proposed rate structure.

The following table shows the average metered water per quarter and the number of properties that fall below or above the average:

Table 3:

Average Consumption	m^3	Properties Above	Properties Below
Q1	18	8	8
Q2	21	8	8
Q3	25	9	7
Q4	18	8	8
Annual	82	9	7

2. *Water Revenue – Uniform Rate Structure*

If a uniformed water rate was applied the system could divide the revenue it will need by the volume of water it will sell during the year. Therefore, the uniform rate per cubic meter that meets the 2021 projected water revenue requires is:

2021 Uniform rate = $36,863 ÷ 17 SFE = $2,168

3. Fixed and Variable Rates

The Cedars of Tuam Water Service relies on a combination of fixed and variable rates which is typical of many water systems. A fixed rate is an amount the system charges each customer every month, regardless of how much water the customer uses. Fixed rates guarantee stable, predictable revenue, regardless of water consumption. Fixed rates can be used to cover the system's fixed costs.

A variable rate is based on customer usage, which is determined by routine meter readings. The more water a customer uses, the more the customer pays (in addition to the fixed rate). Variable rates encourage water conservation. If revenue becomes too unpredictable due to good adherence to a conservation program, the utility would want to rely more on fixed rates. Variable pricing rates send a price signal to encourage conservation; and fixed rates help preserve some predictability in revenue from year to year.

ALTERNATIVES

Alternative 1

That the Cedars of Tuam Water Service Commission retain the current water rate structure proposed in the 2021 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service.

Alternative 2

That the Cedars of Tuam Water Service Commission recommend that the Electoral Area Services Committee recommend that the CRD Board approve amending the Cedars of Tuam rate structure in the 2021 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service to a fixed charge of $748; and a tiered water consumption charge as follows: Tier 1 at 12 m^3 or less at $15.85 per m^3; Tier 2 at 25 m^3 or less at $20.00 per m^3; and Tier 3 at greater than 25 m^3 at $25.00 per m^3.

Alternative 3

That the Cedars of Tuam Water Service Commission recommend that the Electoral Area Services Committee recommend that the CRD Board approve amending the Cedars of Tuam rate structure in the 2021 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service to a Uniform Rate Structure.

Alternative 4

That the Cedars of Tuam Water Service Commission water rate structure review be referred back to staff for further analysis and information.

CONCLUSION

The current rate structure is a fair distribution of costs for the 17 SFE connected to the water system which 97% is based on fixed user charge and keeps the rates generally stable. Shifting the revenue from a fixed rate to more reliance on water consumption will create revenue instability as the tiered rates will be high and many consumers will conserve in opposition to the increase. The aim of a fixed rate revenue rate structure on a very small water service is a general practice

and will keep sufficient funding so the system can survive significant decreases in water use and reduction of revenue. There current rate structure is fair balance between the cost to operate the system and encourage water conservation. There is one property that has two legal improvements under the current zoning connected to the water system and it is treated the same as any SFE in other CRD water services on Salt Spring Island. It is not a good practice to change a rate structure to accommodate one property.

RECOMMENDATION

That the Cedars of Tuam Water Service Commission retain the current water rate structure proposed in the 2021 Operating and Capital Budget and the five year Financial Plan for the Cedars of Tuam Water Service.

Submitted by:	Karla Campbell, Senior Manager, BPA, Salt Spring Island Electoral Area
Submitted by	Rianna Lachance, BCom, CPA, CA, Senior Manager, Financial Services
Concurrence	Robert Lapham, MCIP, RPP, Chief Administrative Officer

KC/kc

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REPORT TO CEDARS of TUAM WATER SERVICE COMMISSION
MEETING OF THURSDAY, NOVEMBER 5, 2020

SUBJECT **Cedars of Tuam Water Service Concept Design for Connecting to New Well**

ISSUE

To present the conceptual design options to connect a new well for the Cedars of Tuam Water Service and seek the Commission's approval to proceed with a detailed design.

BACKGROUND

The Cedars of Tuam Water Utility on Salt Spring Island is comprised of 16 parcels of land and 17 single family equivalents (SFE), all of which are connected to the system. Currently, the Cedars of Tuam Local Water Service receives water from one groundwater well. This well, treatment facility and storage reservoir are located within a statutory right-of-way (SRW) on a private property. Due to access restrictions, operation and maintenance at this location has proven to be difficult.

A new well on nearby land (school board property previously inhabited by an old school house) has been installed, tested, and registered with the Ministry of Environment's well data base. This new well has a good potential source of water according to the well completion report date in 2010 (yield of 1.8 L/s).

The CRD retained an engineering consultant in 2019 who completed a concept design that investigated the current system, evaluated various options and provided a summary of the design criteria, conceptual design details, and Class C cost estimates of connecting a new well to the existing Cedars of Tuam Local Water Service.

2019 Asset Management Plan

An asset management plan (AMP) was completed in 2019. The AMP identified current issues requiring improvements (2010 and 2019) and the 2019 conceptual design technical memo are summarized as follows:

- Water source is slightly undersized to meet the current maximum day water demands near the end of the drier periods of the year. The present sustainable maximum production rate is about 10 m^3 per day, however, the well has trouble maintaining this volume in the drier times of the year. The current actual Maximum Day Demand (MDD) is approximately 14 m^3 per day.
- The existing well has sand migration issues and is highly vulnerable to seasonal variations in groundwater conditions.
- The existing distribution system currently meets the domestic needs of the community. However, the mains are asbestos cement (AC) and reported to have been constructed in the early 1970s and are near to or have passed expected service life.
- The water system is not designed to provide fire protection.
- The reservoir has adequate storage for domestic requirement but is inadequate for fire protection.
- The electrical system does not comply with the current BC Electrical Code.
- There is no automatic control to ensure water is adequately disinfected nor that water storage capacity maintained.
- The system lacks pumping redundancy and a backup power source.

The following two options to upgrade the current system were evaluated during the 2019 conceptual design:

Option 1 – Ultimate Design

The ultimate design option would require:

a) Removing the existing treatment facility and reservoir from the private property SRW.
b) Constructing a new treatment facility and reservoir on the school board land; and,
c) Connecting both wells to the new treatment and storage facilities to be conveyed to the existing local water system.

Option 2 – Interim Design

The interim design option involves connecting the new well to the existing treatment facility with some retrofits to the existing piping system.

The design would be conducted so that the piping systems are suitable to be used for the ultimate option, should further upgrades take place in the future.

During the conceptual design in 2019, legal property ownership, site archaeological conditions and permitting and regulatory requirements for both options were reviewed and summarized in the 2019 design memo, which is attached in Appendix 1 and summarized as follows:

- A preliminary field archeological site reconnaissance is recommended to be conducted during the detailed design phase. A *Heritage Conservation Act* Permit is not expected to be required;
- For 184 Roland Road (existing well site), a SRW is in place between the land owners and the CRD for existing facilities. However modifications/new agreement is required if new facilities are to be installed on the land. This will be addressed once a detailed design is developed;
- For 736 Isabella Point Road (new well site); a SRW has been registered for the new treatment facility, reservoir, new well and associated piping;
- A permit will be required to conduct construction within the Ministry of Transportation and Infrastructure's right of way.

ALTERNATIVES

Alternative 1

That the Cedars of Tuam Water Service Commission approves proceeding with Option 2 - interim design outlined in the Cedars of Tuam Conceptual Design Technical Memo dated September 12, 2019 and a detailed design to connect a new well in 2022.

Alternative 2

That the Cedars of Tuam Water Service Commission approves proceeding with Option 1 ultimate design and a detailed design to connect a new well and construct a new treatment and storage facility in 2022.

Alternative 3

That the Cedars of Tuam Water Service Commission recommends the request be referred back to staff.

IMPLICATIONS

Financial Implications

Option 1 and Option 2 construction costs are presented in Table 1 as estimated in the 2019 design memo.

Table 1 Cost Estimate for Cedars of Tuam Ultimate Design and Interim Design Options

Item	Option 2 Interim Design	Option 1 Ultimate Design
General	$108,000	$193,000
Earthworks	$20,000	$53,000
Treatment Facility	$64,000	$382,000
Reservoir (modification work or new)	$40,000	$425,000
Well 1 (existing) Work	n/a	$136,000
Well 2 (new) Work	$64,000	$73,000
Engineering	$62,000	$190,000
Contingencies	$74,000	$316,000
Total Cost	$432,000	$1,768,000

1) The cost estimate is based on conceptual design and considered as Class C ±20%-40%.
2) General cost item includes mobilization, demobilization, quality control testing and decommission of current facilities (if applicable).
3) The above cost estimate does not include CRD costs on administration, project management and quality assurance, topographic survey, well production tests, archaeological study, costs associated with SRW, regulatory permits.

There is approximately $15,785 in the Capital Reserve Fund at the end of 2020 for the service which is not sufficient to support the detailed design and construction of either interim design or the ultimate design options. The project will need to be funded by debt (approval through a referendum or alternative approval process). CRD staff will explore grant funding opportunities from senior level of governments to reduce the service's borrowing amount as funding opportunities become available.

A detailed design project to develop detailed design, obtain regulatory permits and develop tender/construction documents are included for the year of 2022 in the 2021 -2025 capital project planning with a budget of $77,000. The funding is proposed to be $70,000 from Community Works Fund (CWF) and $7,000 from the Capital Reserve Fund of the Cedar of Tuam service to fund costs ineligible under CWF.

Service Delivery Implications

Currently water production from the existing well is subject to seasonal groundwater variations and is considered to be not meeting the Maximum Day Demand. The well also experiences

sand intrusion problems from time to time. Connecting the new well (Option 2, interim design) will provide much needed additional water source to the service and reduces dependency on the problematic existing well.

Currently the water treatment plant generally produces water that meeting drinking water quality guidelines however its building structural components will need to be replaced in 5 years and the electrical system does not meet current BC electrical codes (2019 Asset Management Plan). The current treatment system lacks spare pumping capacity and backup power and requires replacement/upgrading of the chlorinator (chlorine analyzer) and the sand separator. The treatment facility and storage reservoir are located within a statutory right-of-way (SRW) on a private property. Due to access restrictions, operation and maintenance at this location has proven to be difficult. Option 1, ultimate design, will provide a new water treatment plant and storage that are located on the new well site and will replace existing aging infrastructure.

CONCLUSION

The 2019 Conceptual design has evaluated an interim design option limited to connection of the new well and an ultimate design option to connect the new well, construct a new treatment facility and construct a new reservoir. The interim design option will increase the water supply which is currently considered not meeting demand and will cost significantly less than the ultimate design option. The interim option could be designed to ensure that the piping systems are suitable to be used for the ultimate option. Given the needs and financial conditions of the service, the interim design option is preferred due to its significantly lower costs and ability to increase water supply to meet the water demand.

RECOMMENDATION

That the Cedars of Tuam Water Service Commission approves proceeding with Option 2 - interim design outlined in the Cedars of Tuam Conceptual Design Technical Memo dated September 12, 2019 and a detailed design to connect a new well in 2022.

Submitted by	Allen Xu, MSc., P.Eng, Manager of Engineering, Salt Spring Island Electoral Area
Submitted by	Karla Campbell, BBA, Senior Manager, Salt Spring Island Electoral Area
Concurrence	Matthew McCrank, MSc., P.Eng, Senior Manager, Infrastructure Operations

AX/ :

Attachments:
Appendix 1, Cedar of Tuam Conceptual Design Memo

To	From
Karla Campbell, BPA Senior Manager, Salt Spring Island Electoral Area	Chris Lucas, P.Eng. Project Engineer
Company Capital Regional District	**MCSL Branch** 2243 - Victoria
Re **Cedars of Tuam Concept Design for Connecting to New Well** Conceptual Design Technical Memorandum	**Date** September 12, 2019 **[FINAL – REVISION 1]** **File Number** 2243-18029-00

This technical memorandum provides a summary of the design criteria, conceptual design, and regulatory guidelines applicable to the conceptual design of connecting a new well to the existing Cedars of Tuam Local Water Service. This includes a new water treatment facility, above-ground reservoir tank, pumping system, and associated piping.

1. INTRODUCTION

Currently, the Cedars of Tuam Local Water Service on Salt Spring Island receives water from one groundwater well. This well and associated existing reservoir and treatment facility is located within a statutory right-of-way (SRW) on private property. Due to access restrictions, operation and maintenance at this location has proven to be difficult. In addition, during periods of high demand, the well does not have the appropriate capacity.

A new well on nearby land (school board property previously inhabited by an old schoolhouse) has been installed, tested, and registered with the Ministry of Environment's well data base. According to a Well Completion Report by Thurber Engineering Ltd. in 2010, this new well has proven to be a good potential source of water. The purpose of this conceptual design memo will be to provide a conceptual design to upgrade the existing system incorporating the new well (Option 1) and provide an interim design (Option 2) as requested by the CRD to only incorporate the new well into the existing system. The options are further described as follows:

Option 1
Ultimate Design

- Remove the existing treatment facility and reservoir from the private property SRW;
- Construct a new treatment facility and reservoir on the school board land; and,
- Connect existing water infrastructure from private property SRW to the new site.

Land acquisition has been completed for the new treatment facility, reservoir, and well.

Option 2
Interim Design

- Connect the new well to the existing treatment facility with retrofits to the existing piping system.

Along with other deficiencies discussed further throughout this Memo, the existing treatment facility is not up to current electrical code and significant upgrades would be required.

The existing piping within the SRW will be retained for the distribution water main and reconnection (downstream of the existing water treatment facility).

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Victoria BC
V8X 4A3

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www.McElhanney.com

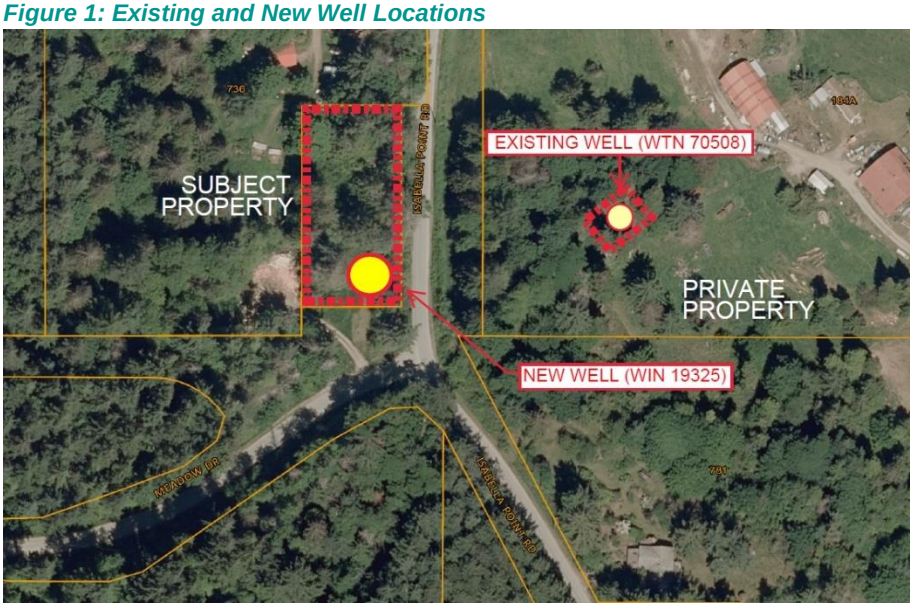
The Capital Regional District Salt Spring Electoral Area (CRD) has retained McElhanney Consulting Services Ltd. (McElhanney) to provide this conceptual design memorandum to provide:

- A site review;
- An archaeological review;
- Summary of the legal property ownership & documents;
- Summarize permitting and regulatory requirements;
- Conceptual civil, mechanical, structural and electrical schematic design of a new treatment facility, reservoir, and associated piping for both options; and,
- Class 'C' construction cost estimate for both options.

1.1. Background

The existing well, treatment facility, and reservoir are situated on a statutory right-of-way (SRW) on private property at 184 Roland Rd. Access restrictions have led to operation and maintenance issues since commissioning of the local water service. The CRD is considering relocating the treatment facility and associated infrastructure to a 10 m wide SRW on the former Isabella Point school property at 736 Isabella Point Rd, the *subject property*. The 2 sites and locations of the new and existing wells are shown in *Figure 1*. They are both adjacent to the Isabella Point Rd and Meadow Dr intersection.

Figure 1: Existing and New Well Locations



Previously, a feasibility study for the condition and operation of the Local Water Service was completed – the ***Cedars of Tuam Water District Feasibility Study – Preliminary*** report (2000), see ***Appendix A***. The following summary notes were obtained from the study and are utilized for this conceptual design:

- The Local Water Service services 16 properties along Roland Road, on the south side of Fulford Harbour, with a total of 15 homes constructed.
- The small community is designated as 'rural residential' from Islands Trust (federation serving islands in the Salish Sea) and is within a cool Mediterranean climate;
- The groundwater source is well WTN 70508 that utilizes a 0.5 hp pump yielding 0.4 L/s (6.5 US gpm) for short durations since 1989;
- A well pump station with basic treatment system (UV treatment) and sand filtration is housed in a wooden building adjacent to well WTN 70508;
- A 10,000 US gal bolted-steel reservoir, manufactured by TriCo Industries Ltd., installed in 1978, is located adjacent to well WTN 70508;

- The distribution system consists of a 100 mm dia. asbestos cement watermain approximately 750 m in length with 3 standpipes and water meters for each property:
    - Water service pressures range from 24.6 to 56.2 m of head (35 to 80 psi); and,
    - Standpipe pressures range from 35.2 to 49.2 m of head (50 to 70 psi) with flow rates ranging from 7.58 to 9.09 L/s (100 to 120 US gpm).

The ***Cedars of Tuam Water District Feasibility Study*** identified deficiencies in the local water. These deficiencies are listed as follows:

- Groundwater supply has quality issues relating to weather influence during certain periods of the year, generally in October and November where the groundwater is at its lowest and being recharged with winter precipitation. Refer to the study for more details;
- Integrity of Well WTN 70508 casing may be compromised by sand migration from the casing into the well reducing pump rates;
- Electrical system does not comply with the current BC Electrical Code;
- Treatment facility building has rodent issues;
- No automatic control to ensure water is adequately disinfected nor that water storage capacity is maintained;
- Some components are beyond their service life, mostly in the distribution system, and,
- The system lacks pumping redundancy.

In addition to the deficiencies listed above, further issues with the existing system are detailed with prioritized recommended capital projects recommended to help address the issues in the Cedars of Tuam Water System Asset Management Plan (Draft) by McElhanney Ltd. dated March 2019.

This memorandum intends to help mitigate these issues through an Ultimate Conceptual Design (Option 1) replacing the existing system and, at the request of the CRD, provide an alternate interim conceptual design (Option 2) which would connect the new well to the existing system as a short term solution to help address solely the water system supply issues.

1.2. Hydrogeological Data Information

In 2010, Thurber Engineering Ltd. (Thurber) was retained by CRD to investigate the supply of groundwater for the Cedars of Tuam Local Water Services and provided the ***Cedars of Tuam Water Service Area, Salt Spring Island, BC, Community Well Water Supply, Well Completion Report***, March 2010 (see ***Appendix B***), summarizing the groundwater investigation.

The following information is a summary of the hydrological report and forms the basis of the conceptual design.

Well WIN 19325 Production

Well WIN 19325 is located at the southeast corner of 736 Isabella Point Rd and is within an allotted 35.2 m L x 10.0 m W SRW (see *Figure 2*). The topography of the site has steep-to-moderate slopes and is on a gently sloping bench located on bedrock-controlled terrain. The well is approximately 500 m west from Fulford Harbour, approximately 87 m above sea level and within an artesian aquifer. The site was originally the Isabella Point School property, in which the school building and all facility appurtenances have been removed from the site since 1951.

Figure 2: Well WIN 19325

A single test / production well, Well WIN 19325, was drilled and test pumped early in 2010. Characteristics of the well are as follows:

- Step Test was done at the following flow rates for 100 mins and was capable of delivering the maximum test pump capacity of 1.8 L/s (28 US gpm).
    - 0.32 L/s (5 US gpm)
    - 0.48 L/s (15 US gpm)
    - 1.8 L/s (28 US gpm)
- Drawdown test was done with pumping at 1.8 L/s (28 US gpm) for 72 hours and monitoring water level in nearby wells. It was concluded that Well WIN 19325 was not being hydraulically stressed at this pumping rate.
- The potential yield estimate of Well WIN 19325 during the time of the tests were:
    - Assumed 100% of available drawdown, potential (optimal) yield is 4.1 L/s (65 US gpm);
    - Assumed 70% of available drawdown, potential yield is 2.9 L/s (46 US gpm); and,
    - Assumed 50% of available drawdown, potential yield is 2.1 L/s (33 US gpm).

Thurber concluded that Well WIN 19325 has a yield of 1.8 L/s (28 US gpm) and has the potential to yield quantities in excess of test pumping rates.

Well WIN 19325 Water Quality

Water sampling and testing was done during the single test / production well investigation by Thurber. The test results for the water sampled are:

- Below the Maximum Acceptable Concentration (MAC) for all health-related parameters, including key parameters such as Arsenic, Total Coliform, and E. Coli.
- Below the Aesthetic Objective (AO) for all non-health related parameters, except for manganese. Manganese was identified at 0.06 mg/L (0.06 ppm) where the AO should be less than 0.05 mg/L (0.05 ppm).

  Further investigations should be done prior to having the well in operation. The manganese should be treated, as manganese can be problematic to staining of laundry and plumbing fixtures.

- Iron Related Bacteria (IRB) was reported at 9,000 CFU/mL and can be problematic when incrustation of a well screen becomes clogged that results in reducing water production in the well.

  Recommend to hyper-chlorinate the well to remove or reduce the IRB prior to placing the well online.

- Well WIN 19325 is not in a Ground Water Under the Direct Influence (GWUDI[1]).

Well WTN 70508 (Ex. Well Currently in Operation)

Well WTN 70508 is currently in operation supplying groundwater to the Local Water Service via small treatment facility and reservoir (see *Figure 3*). The well is situated on private property at 184 Roland Rd.

There is very limited data and information pertaining to this well. Original well data from Willis Cunfliffe Tait in 1969 notes that the well depth is 19.8 m (65 ft) from top of well and there is no well yield data available. Subsequent to this, the well was refurbished in 1989 – the well was drilled a total of 27 m depth with 7 m of coarse drain rock placed at the bottom of the well. See ***Appendix B*** for Well Details.

Further investigations should be done prior to detailed design to confirm available capacity and water quality.

A second well was drilled approximately 1.4 m (5') away from Well WTN 70508 to a depth of 27 m but was not used due to an inadequate well yield. Water was encountered 16.1 m below grade – since there is limited data for Well WTN 70508, we are assuming that the water will be the same depth as the second well for the conceptual design.

Figure 3: Well WTN 70508

[1] Under the direct influence of surface water, "GWUDI" means the groundwater source is located close enough to nearby surface water, such as a river or lake, to receive direct surface water recharge. Since a portion of the groundwater source's recharge is from surface water, the groundwater source is considered at risk of contamination from pathogens such as Giardia lamblia and viruses, which are not normally found in true groundwaters.

1.3. Design Criteria

Design Guidelines

The design guidelines, manuals, and reports used to derive the conceptual design are:

- Capital Regional District, "*Pump Station Design Guidelines (Draft)*", Mar 2010.
- Capital Regional District, "*Engineering Specifications and Standard Drawings*", July 2009.
- Fire Underwriters Survey, "*Water Supply for Public Fire Protection*", 1999.
- Interior Health, "4-3-2-1-0 Drinking Water Objective", Jan 2006.
- Master Municipal Construction Documents Association, "*Master Municipal Construction Documents – Design Guidelines 2014*", 2014.
- Ministry of Forest, Lands, Natural Resource Operations & Rural Development, Water Management Branch, "*Design Guidelines for Rural Residential Community Water Systems*", 2012.
- Ministry of Health, Health Protection Branch, "*Drinking Water Treatment Objectives (Microbiological) for Ground Water Supplies in British Columbia, Version 1*", Nov 2015.
- Ministry of Health, Health Protection Branch, "*Guidelines for the Approval of Water Supply Systems*", Apr 2006.
- Ministry of Health, Health Protection Branch, "*Small Water System Guidebook*", Feb 2017.
- Mott, Robert L., "*Applied Fluid Mechanics, 5th Edition*", 2000.
- Sanks, Robert L., et al, "*Pumping Station Design, 2nd Edition*", 1998.
- Viessman, Jr., Warren and Mark J. Hammer, "*Water Supply and Pollution Control, 6th Edition*", 1998.

Regulations and Permits

The following acts and regulations are to be met to proceed with detailed design and construction of the new water system:

- Ministry of Environment, "*Environmental Management Act*", 2018.
- Ministry of Environment, "*Forest and Range Practices Act*" (FRPA), 2018.
- Ministry of Environment, "*Water Act*", 2016.
- Ministry of Environment, "*Water Protection Act*", 2018.
- Ministry of Environment, "*Water Sustainability Act*", 2014.
- Ministry of Environment, "*Water Utility Act*", 2018.
- Ministry of Health, "*Drinking Water Projection Act*", 2018.
- Ministry of Health, "*Drinking Water Projection Regulation*", 2005.
- Ministry of Health, "*Local Services Act*", 2018.
- Ministry of Health, "*Public Health Act*", 2018.

Permits and applications required for the design, construction, commissioning, and operations of the new water system are:

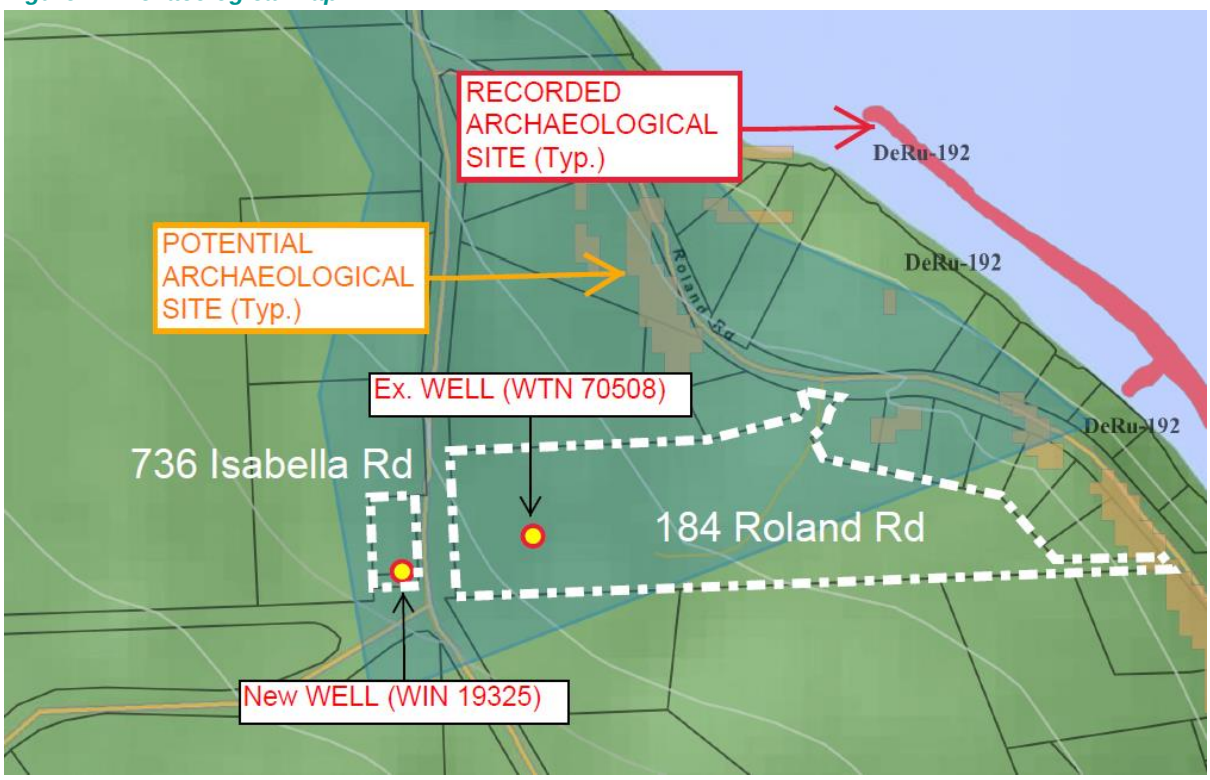
- Island Health, "*Application for Drinking Water System*".
- Island Health, "*Application for Waterworks Construction Permit*".
- Island Health, "*Application for Water Supply System Construction Permit*".
- Island Health, "*Construction Permit Waiver Form*".
- Island Health, "*Drinking Water System Annual Report*".
- Ministry of Transportation and Infrastructure, "*Provincial Public Permit Highway Application*".

1.4. Archaeological Due-Diligence

There are no recorded archaeological sites overlapping the 2 well sites at 184 Roland Rd and 736 Isabella Point Rd, as shown in the outlined area below. However, it does overlap lands modeled as high archaeological potential according to the Hul'qumi'num Treaty Group Archaeological Overview Assessment (HTG AOA) (the GIS-based model of archaeological potential for this area).

See *Figure 4* below for map illustrating recorded archaeological sites in **red** and high potential archaeological areas in **orange**.

Figure 4: Archaeological Map



For development projects in this area, a Preliminary Field Reconnaissance (PFR) is recommended for further investigation to move forward with detailed design and construction. Specifically, this is an onsite visit by an archaeologist (usually accompanied by staff from local First Nations) to judge the archaeological potential in the precise project areas. This visit does not require a Heritage Conservation Act (HCA) permit.

2. PROPERTY ACQUISITION

*Refer to **Appendix C** for legal plans and documentation. Title searches are also included.*

184 Roland Road (Private Residence)

The property at 184 Roland Rd is registered to JOHN MARTIN DOUGLAS MCDONALD and LOUISE AMANDA MCDONALD. The property has a registered SRW in favour of the CRD for the existing treatment facility, reservoir, well (Well WTN 70508), and associated piping.

SRW Documentation

Document F21218 (Dec 29, 1976): An agreement between [Grantor] JOHN MARTIN DOUGLAS MCDONALD and LOUISE AMANDA MCDONALD and the [Grantee] CEDARS OF TUAM WATERWORKS DISTRICT was made on Dec 29, 1976 and registered on Feb 23, 1977.

Plan VIP3148RW (Jan 13, 1977): SRW legal plan showing the easement through private residential property.

Legal Description: PLAN OF RIGHT OF WAY THROUGH THE REMAINDER OF LOT 3 PLAN 6306, SECTION 41 SOUTH SALT SPRING ISLAND COWICHAN DISTRICT.

New Documentation for Future Works: The existing SRW (Plan VIP3148RW) on Lot 3, Plan 6303, does not allow for new equipment; however, to move forward, the requirements are to have either:

- a second SRW document to allow installation and maintenance of new facilities etc.; or,
- a replacement document to cover installation and maintenance of existing and proposed facilities.

736 Isabella Point Road (School Board)

The property at 736 Isabella Point Rd is registered to THE BOARD OF EDUCATION OF SCHOOL DISTRICT NO. 64 (GULF ISLANDS). The property has a registered 10 m wide SRW in favour of the CRD for the new treatment facility, reservoir, new well (Well WIN 19325), and associated piping.

SRW Documentation

Document CA5882744 (Mar 21, 2017): An agreement between [Transferor] THE BOARD OF EDUCATION OF SCHOOL DISTRICT NO. 64 (GULF ISLANDS) and the [Transferee] CAPITAL REGIONAL DISTRICT was made on Mar 21, 2017.

Plan EPP57261: SRW legal plan showing the easement through the school board property.

PID: 004-343-131

Legal Description: EXPLANATORY PLAN OF STATUTORY RIGHT OF WAY OVER PART OF LOT A, SECTION 42, SOUTH SALT SPRING ISLAND, COWICHAN DISTRICT, PLAN 14152

Isabella Point Road (Road ROW)

Isabelle Point Road and its ROW is under Ministry of Transportation and Infrastructure jurisdiction. Any construction within the ROW will necessitate a *Provincial Public Permit Highway Application*.

3. CONCEPTUAL DESIGN

Our conceptual design is based on CRD requirements, discussions with CRD staff, regulatory requirements, and well characteristics. This section describes the design parameters and components for the 2 conceptual designs of the water system. In some cases, more than one option is presented for each component. Our conceptual design drawings are shown in ***Appendix D***.

The components for each option are shown below.

Option 1 (Ultimate Design)

- New Treatment Facility;
- New Reservoir;
- New Well (WIN 19325);
- Ex. Well (WTN 70508); and,
- Linear Infrastructure.

Option 2 (Interim Design)

- New Well (WIN 19325); and,
- Linear Infrastructure.

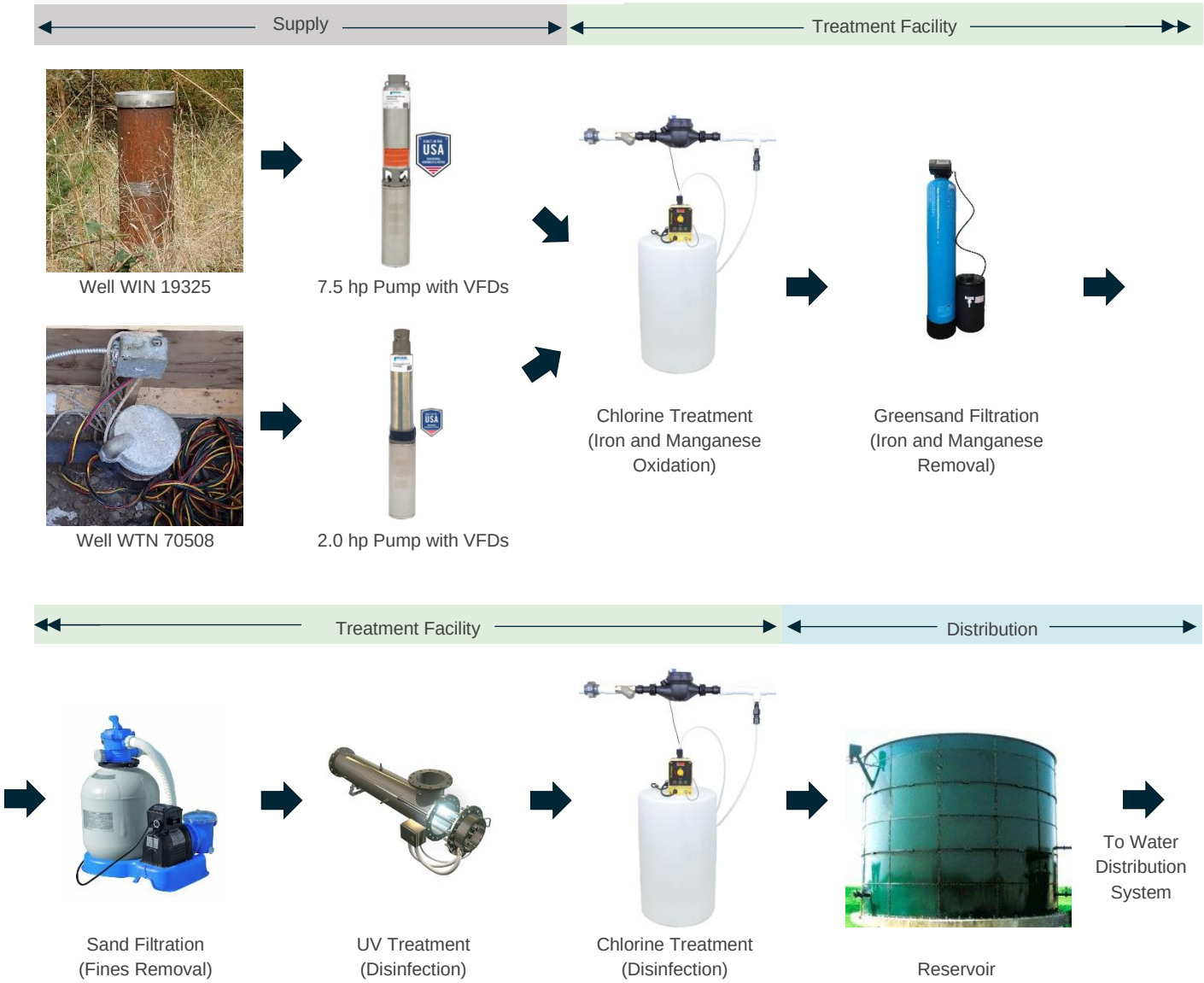
Option 2 is a cost-effective interim design option that connects the new well to the existing treatment facility. Underground piping from the new well to the existing building would be designed to also be suitable for the ultimate design, when it would connect the existing well to the new treatment building.

3.1. New Treatment Facility for Option 1

Treatment Process

The treatment process will include filtration and disinfection. This will comprise of the following items shown in the schematic diagram below (see *Figure 5*).

Figure 5: Treatment Process Schematic Diagram



Conceptual Design

Assumptions:

- Filtration process – chlorine treatment for oxidation, greensand filtration, and sand filtration;
- Disinfection processes – UV disinfection and chlorine disinfection;
- Min 1.5 m offset from reservoir to property line;

- 5.0 m head loss within the treatment facility;
- Factor of Safety of 3.0 m of head loss; and,
- Pipe roughness coefficient 150.

Treatment Facility Components

Components identified, as part of the conceptual design, for the treatment facility are broken down into civil, mechanical, electrical, and structural components as follows:

Civil Components:

- Gravel Driveway;
- Parking Lot (option of 3 vs 2 parking stalls); and,
- Chain-link Perimeter Fencing (option of perimeter fence or fence around the well).

Mechanical Components:

- Chlorine Injection Units x 2 (one for oxidation and one for disinfection);
- Greensand Filtration Unit (removal of iron and manganese);
- Sand Filtration Unit (removal of solids);
- UV Treatment Unit (disinfection);
- Magnetic Flow Meter;
- Water Sampling Port; and,
- Piping and associated valves.

Electrical Components:

- BC Hydro Connection;
- Motor Control Center (enclosure) and Controls;
- Communications (radio and antenna);
- Primary Power;
- Backup Power;
- Distribution Power;
- Pump Motor Controllers;
- Level Sensors;
- Data Logger;
- HVAC System;
- Lighting; and,
- Backup Generator.

Structural Components:

- Mortared-brick building, approximately 3.5 m x 3.5 m; with concrete foundation and,
- New reservoir (detailed in Section 3.2).

Safety, Health and Environmental Components:

- Integrated Eye Wash Station and Shower;
- Fire Extinguisher; and,
- First Aid Kit.

For Option 2, there will need to be modifications to manifold piping to tie in both supply wells and will necessitate additional mechanical costs.

3.2. New Reservoir for Option 1

*Refer to **Appendix D** for conceptual design drawings.*

Conceptual Design

Assumptions:

- 170 m³ (45,000 IG) Steel-bolted reservoir; and,
- Active storage of 126 m³ (33,286 US gal), based on A+B+C storage requirements:
    - A (Domestic) – using 230 L/capita/day at 2.5 capita per unit = 5,750 L
    - B (Fire Protection) – using minimum FUS fire water supply. = 120,000 L
    - C (Emergency) – not required (use greater volume of B or C) = 0 L

TOTAL STORAGE REQUIRED = 125,750 L (126 m³)

Reservoir Components

Components identified as part of the conceptual design for the reservoir are listed as follows:

- Steel-bolted epoxy-coated steel reservoir
    - Knuckle-shaped Roof – Knuckle-shaped roofs are less costly than dome-shaped roofs. Knuckle roof is typically on a 30 deg angle with no walking permitted on top of the roof, so there's a single elevated walkway (galvanized railing on both sides) from the galvanized observation platform (top of the aluminum ladder) to the center of the roof for access to the vent. The top of the observation platform also provides close access to the manway.
    - Colour – CRD's standard for above-ground water infrastructure colour is PC145 Railing Green.
    - Piping and associated valves.

3.3. New Well WIN 19325 for Option 1 & 2

*Refer to **Appendix D** for conceptual design drawings.*

For Option 1 & 2, the development of Well WIN 19325 will be the same. As for the linear infrastructure for both options, this is where the 2 options differ. The differentiating factors are connections to (1) the new treatment facility and (2) connection to the existing treatment facility.

Option 1 – This option (ultimate design) will connect both wells (new WIN 19325 and ex. WTN 70508) to the new treatment facility with the final piping design, as shown on the conceptual ultimate design drawing. Details of the final piping design are discussed under the *Linear Infrastructure* Section 3.5.

Option 2 – This option (interim design) will connect Well WIN 19325 to the existing facility with interim and provisional (for ultimate/future) piping, as shown on the conceptual interim design drawing. Details of the interim and provisional piping design are discussed under the *Linear Infrastructure* Section 3.5.

Well WIN 19325 should have a minimum 15 m environmental protection zone where no chemicals, petroleum products, fertilizers, pesticides, herbicides, paints, or other deleterious substances are to be stored.

Conceptual Design

Assumptions:

- Using 100% of available [hypothetical] drawdown, the potential (optimal) yield is 4.1 L/s (65 US gpm).
- Pump to be placed 1.0 m above bottom of strain pipe.
- Using contours from CRD's Natural Areas Atlas map.

Well Components

Components identified, as part of the conceptual design, for the Well WIN 19325 asset are, but not limited to:

- Submersible Pump with associated Variable Frequency Drives (VFDs).
- Pitless adapter with well identification on top of the well.
- Piping and associated valves.

3.4. Existing Well WTN 70508 for Option 1 & 2 (Ex. Well Currently in Operation)

*Refer to **Appendix D** for* conceptual *design drawings*.

Option 1 – This option (ultimate design) will connect both wells (new WIN 19325 and ex. WTN 70508) to the new treatment facility with the final piping design, as shown on the conceptual ultimate design drawing. Details of the final piping design are discussed under the *Linear Infrastructure* Section 3.5.

Option 2 – This option (interim design) will leave Well WTN 70508 in operations to the existing facility with interim and provisional (for ultimate/future) piping, as shown on the conceptual interim design drawing. Details of the interim and provisional piping design are discussed under the *Linear Infrastructure* section 3.5.

Conceptual Design

Assumptions:

- Using the test pumping rate of 2.0 L/s (31.7 US gpm).
- Using the water depth of 16.1 m, which is based on the second well drilled (adjacent to Well WTN 70508, not used). No water level was provided for Well WTN 70508.
- Pump to be placed 1.0 m above drain rock.
- Using contours from CRD's Natural Areas Atlas map.

Well Components

Components identified, as part of the Conceptual Design, for the Well WTN 70508 asset are, but not limited to:

- Submersible Pump with associated Variable Frequency Drives (VFDs).
- Pitless adapter with well identification on top of the well.
- Piping and associated valves.

3.5. Linear Infrastructure – Interim & Future Works

The existing 100 mm dia. asbestos cement distribution watermain servicing the local service area is undersized for fire requirements and has deficiencies that are discussed in the ***Cedars of Tuam Water District Feasibility Study***.

As part of the study, Fire Underwriter Survey (FUS) typically requires minimum of 400 US gpm for firefighting. Increasing the diameter size of distribution main from 100 mm to 150 – 200 mm with the installation of a 48,000 US gal reservoir should provide minimum FUS requirements and fire flows to the water system.

Currently, firefighting is done via the volunteer fire department's bladder truck.

As part of the design, it will necessitate an interim and final connection from the new reservoir and is illustrated in our conceptual drawings (see ***Appendix D***).

The 2 design options for the linear infrastructure piping are:

Option 1 – this option (ultimate design) will include:

- Final piping design includes piping coming from both wells that will be connected to a new treatment facility and reservoir. From reservoir, a distribution main will be connected to the existing local water system.

Option 2 – this option (interim design) will include:

- The interim piping design includes connecting Well WIN 19325 to the existing treatment facility. This will necessitate a line from the new well to the ex. treatment facility – this line will be intended to be used in the future for a connection from Well WTN 70508 to the new treatment facility (ultimate design).
- Modifications to the existing piping into the ex. treatment facility will have to be modified with additional manifolds to tie in the additional piping from Well WIN 19325.
- The provisional piping includes connection of the future (ultimate design) reservoir to the existing local water system. This will only include piping within the Isabella Point Rd ROW and extend at least 3 m into the SRW to reduce construction costs. This is intended to minimize the number of road crossings by installing the 50 mm pipe and future 150 mm pipe section at the same time.

4. CONSTRUCTION COSTS

The construction cost estimate is considered a Class 'C' cost estimate with definition of the class as an estimate (+/- 40%) prepared with limited site information and based on probable conditions affecting the project.

We have included additional costs for the suggested options noted in ***Section 3 Conceptual Design***.

Table 1: Construction Class 'D' Cost Estimate (2 design options are described under each asset component)*

ASSET	OPTION 1* ULTIMATE DESIGN COMPONENTS	CLASS 'D' COST ESTIMATE	OPTION 2* INTERIM DESIGN COMPONENTS	CLASS 'D' COST ESTIMATE
GENERAL	Mobilization & Demobilization, QC Testing, Well Re-testing (both wells)	$143,000	Mobilization & Demobilization, QC Testing, Well Re-testing (both	$108,000
	Final Watermain Connection: Decommission Ex. Treatment Facility and Reservoir, PVC Piping	$50,000	N/A	
EARTHWORKS	Earthworks: Clearing and Grubbing, Tree Removal, Landscaping	$55,000	Earthworks: Clearing and Grubbing, Tree Removal, Landscaping	$20,000
TREATMENT FACILITY	Civil: Gravel Driveway, Parking, Chain link fencing, PVC Watermain Piping, Gate valve and Check Valve	$128,000	Civil: Gravel Driveway, Parking, Chain link fencing, Piping Modifications at Ex. Facility, PRV	$52,000
	Mechanical: Chlorine Units, Filtration Units, UV Unit, Flow Meter, Treatment Process Piping and Valves	$44,000	N/A	
	Electrical: Hydro Connection, MCC Enclosure, Controls Equipment, Communication Equipment, Primary and Backup Power Equipment, Backup Generator, Distribution, Pump Motors, Level Sensors, HVAC, lighting	$142,000	Electrical: MCC Enclosure, RTU, Pump Motor connection	$12,000
	Structural: Building, Foundation, furnishings	$63,000	N/A	
	Health & Safety: Eye Wash Station, Fire Extinguisher, First Aid Kit	$5,000	N/A	
RESERVOIR	170 cu.m (45,000 IG) Steel-bolted Reservoir, Concrete Foundation, Reservoir Piping, PVC Distribution Piping, Gate Valve, Electrical Connection	$425,000	PVC Distribution Piping	$40,000
WELL #1 (Ex)	VFD, Pitless Adapter, Casing, PVC piping, Gate & Check Valves, Electrical Connection	$136,000	N/A	
WELL #3 (Prop)	Well WIN 19325: Pump and Motor w/ VFD, Pitless Adapter, Casing, PVC piping, Gate & Check Valves, Electrical Connection	$73,000	Well WIN 19325: Pump and Motor w/ VFD, Pitless Adapter, Casing, Gate & Check Valves, Electrical Connection	$64,000
CONTINGENCIES	Engineering (15%)	$190,000	Engineering (15%)	$62,000
	Contingencies (25%)	$316,000	Contingencies (25%)	$74,000
	TOTAL COST	**$1,770,000**		**$432,000**

5. RECOMMENDATIONS

5.1. Next Steps

In order to advance to the detailed design stage, as a minimum, the following steps are suggested:

- Topographic survey to allow for detailed design.
- Further Well Production Tests investigation – confirmation of well yield for both Well WIN 19325 and WTN 70508, as these were completed approximately 10 years ago. This will include water quality testing;
- For archaeological due diligence, a Preliminary Field Reconnaissance (PFR) is recommended to move forward with detailed design and construction, and does not require a Heritage Conservation Act (HCA) permit;
- New SRW documentation will be required for the ex. SRW on the property of 184 Roland Rd for the installation of new infrastructure, and will include either:
    - a second SRW document to allow installation and maintenance of new facilities etc.; or,
    - a replacement document to cover installation and maintenance of existing and proposed facilities.
- Confirm pump design combining both pump system curves to determine backflow pressures.
- Confirm electrical supply for detailed design.
- Production of detailed design & drawings and construction documents.
- Develop an annual Operating Plan and Performance Report for the community well, as noted in the ***Well Completion Report***, including a method for recording total and instantaneous flow volumes and water levels to provide estimated annual water consumption in addition to well water levels and pump performance. A data logger / flow meter should be installed as a method to monitor water production (as shown under *Treatment Facility Components*).
- Maintenance and performance monitoring (water quality sampling, periodic well test pumping, etc.) should be conducted on a routine basis as per regulations.

6. CLOSE OUT

We thank you for the opportunity to work with the CRD Salt Spring Island Electoral Area for the *Cedars of Tuam Conceptual Design for Connecting to New Well* and sincerely look forward to working with you in the near future

This report has been prepared by **McELHANNEY CONSULTING SERVICES LTD.**

Prepared by:

Chris Lucas, P.Eng.
Project Engineer

Reviewed by:

John Sturdy, P.Eng.
Branch Manager

Appendix A

Feasibility Study – Preliminary

CEDARS OF TUAM WATER DISTRICT

FEASIBILITY STUDY - PRELIMINARY

1.0 INTRODUCTION

1.1 Authorization

The Capital Regional District (CRD) was approached by the Cedars of Tuam Water Improvement District to conduct a study into the condition and operation of their water utility. The improvement district committee also wished to determine the annual cost for CRD to acquire, upgrade and operate the system as a new water local service under the CRD.

The improvement district requested that CRD apply to the Ministry of Municipal Affairs for an infrastructure planning study grant to assist in funding the project. The Ministry agreed to provide a grant in accordance with their funding criteria which included provision 100% of the funds for the first $5,000 and 50% for the next $5,000. The study cost was estimated at $6,000. The Ministry agreed to fund the study to $5,500 with the remainder of the funds ($500) funded by the Cedars of Tuam Water District.

1.2 Scope

This report is a preliminary technical review of the infrastructure and operation of the Cedars of Tuam water system. Work was carried out to assess the system condition, capacity, and performance and to assess those areas of the water system that do not meet the typical standards of the Region. The cost for water system infrastructure improvements and the costs for operating and maintaining the utility to CRD standards, was estimated as a total cost and on a unit cost to residents of the improvement district area. A final report will be completed, incorporating any additional information requested by the Cedars of Tuam, and subsequent to video work now underway.

Subsequent to the final report, residents of the Cedars of Tuam may elect to be poled to determine whether they favor a proposal to create a new water local service under the CRD and to have the Region carry out upgrade works proposed in the study. The residents of Cedars of Tuam may wish to receive the report for information only, to be used as a guide to budgeting for improvements to their water system.

1.3 Study Area

The Cedars of Tuam is a small community consisting of 16 lots situated along Roland Road on the southwest side of Fulford Harbour on Salt Spring Island. Legal information for the properties is presented in Appendix "A".

The Islands Trust has established the zoning for the area as "rural residential". Existing homes are currently constructed on 15 of the 16 properties. The majority are reported to be year round residents.

The climate is cool Mediterranean, experiencing a mean annual precipitation of approximately 760mm (30"). The subdivision is located on a side slope of a hill overlooking Fulford Harbour with elevations varying between sea level and approximately 75m (250').

2.0 EXISTING WATER SYSTEM

2.1 General

The existing Cedars of Tuam water system consists of a groundwater source, well pump station, basic disinfection system, bolted steel storage reservoir and small diameter distribution mains between the well site and the customer.

2.2 Source

The utility presently obtains its water from a groundwater source. A well has been drilled through sand/gravel overburden to a depth of 27 m (90'). This well replaced a previous shallow well that originally supplied the utility. The well site is located on a right of way on a gentle slope above the service area. There is no direct vehicle access to the site. A private well is located on the same property, some 50 m (150') down slope from the service area well.

In 1989, Piteau Associates, a geotechnical consulting firm, conducted well maintenance/improvements for the utility. The old well had become prone to contamination, and had experienced reduced yield over the previous two years. The 150 mm (6") well was drilled in 1969 by Tri K Drilling to a depth of 27 m with the bottom 7 m backfilled with coarse drain rock. Specific details about well construction and yield potential were not available.

Under Piteau Associates, a new well was drilled approximately 1.4 m (5') away from the old well to 27 m below grade. Water was encountered at 16.1 m below grade (+/- 0.8 Igpm), bedrock (shale) was encountered from 16.5 m to 27 m and a 150 mm (6") casing was installed from the surface into the bedrock. The new well was estimated by the driller at approximately 1.5 Igpm yield. Confirmation of the yield through actual testing was not achieved.

The production from the new well was significantly less than had been anticipated so an attempt to refurbish the 1969 well, to restore its yield, was also made. A 113 mm (4 ½") PVC casing was inserted inside the existing 150 mm steel casing as far as was possible (21.3 m). This PVC casing was slotted between depths of 8.4 m (26') and 17.7 m (60') to capture water flow that had been encountered by the driller when drilling the new well. The space between the two casings was filled with sand to act as a filter and provide stability to the new casing. Preliminary pumping of the refurbished well, in August 1989, at 2.7 Igpm for 20 minutes exceeded the recharge potential which means that at least at certain times of the year the production capacity is less than 2.7 Igpm

No subsequent sustainability testes have been carried out on the refurbished well, which remains in use as the source of water for the utility. Present pumping rates of 6.5 Igpm for short duration have been ongoing since 1989 and appear sustainable for present usage throughout the majority of the year.

The groundwater source provides high quality water that, with minimal disinfection, presently meets Canadian Drinking Water Quality Guidelines.

The existing well pump is a .5 hp Mastercraft (Canadian Tire) jet pump located in the wooden pump house.

2.3 Pump House

The pump house is located at the well head in a fenced right of way. The pump station is connected by a communications cable to the adjacent reservoir to regulate the required pumping to ensure a supply of water for the utility is available from storage at all times.

The water is abstracted via a jet pump, passed through a sand/silt trap, metered, chlorinated, and transmitted directly to the adjacent reservoir storage tank. Water flows by gravity from the reservoir to meet system demand.

The well abstraction flow rate and chlorine residual must be manually adjusted at the pump station.

The pump house is a wooden structure. Evidence of rodent activity was noted, and the storage of chlorine in the building, which is against WCB regulations, has resulted in significant corrosion of the electrical components.

There is neither standby power nor replacement pump at the facility. The distribution system would be reliant upon available reservoir storage in case of a power outage or a mechanical failure. Any replacement equipment, portable standby power, or chemicals must be carried over ground to the site. While the operator of the system has been transporting chemicals in this manner for years, the process would not likely meet WCB regulations.

2.4 Distribution System

The supply/distribution system consists of approximately 750m of 100mm (4") Asbestos Cement (AC) mains, a 10,000 Imperial gallon (Ig) steel reservoir, two standpipes and metered service connections to all of the 16 services lots.

The utility has a single service area, pressured by the 10,000 Ig storage tank, which has a high water level (HWL) of approximately 75 m (250'). Recorded pressure readings of 50-70 psi were taken at the two standpipes at each end of the system on Ronald Road. Individual household pressure should range between 35-80 psi dependent upon relative location and elevation.

There are no drawings providing information as to location of mains or offset from property lines.

2.5 Reservoir Storage

The 10,000 Ig steel storage tank was manufactured by TriCo Industries Ltd. and installed in 1978, replacing a previous wood stave tank. The tank appears in good condition, but will need recoating in future.

The reservoir is immediately adjacent to the pump house and is connected by communications cable to the jet pump operation to ensure adequate water levels exist in the tank. The cistern style float set up is presently non-functioning and reservoir top up is manually undertaken by the system operator. Low water marks on the tank exterior indicate the present well production has at various times in the past been insufficient to maintain the system storage at anything above a minimum level.

2.6 Fire Protection

The existing system has two standpipes installed off the 100mm AC mains. Maximum flow rates through these would be in the order of 100-120 Igpm, assuming a full storage tank and little alternative usage. The required flow rate established for a rural residential community by the Fire Underwriters Survey (FUS) is 400 Igpm for 2 hours. The water system, like many small water utilities, does not meet the requirements of the FUS. In order to achieve the Fire Underwriters minimum standard of 400 Igpm, replacement of the small diameter mains with larger 150-200mm (6" – 8") would be required as would a much larger storage reservoir with 48,000 Ig for dedicated storage capacity.

The Salt Spring Island Fire Department has indicated they typically respond to residential fire situations using their pumper and tanker trucks which are deployed with a bladder (portable holding tank) and drafting out of the numerous ponds/lakes on the island. The department assumes that adequate water volume and pressure is not available from the water system and will respond to a fire in the Cedars of Tuam area in this manner.

3.0 SYSTEM DEFICIENCIES

3.1 General

The CRD, in operation of a public water supply, strives to provide water to its customers in adequate quantity and with quality exceeding the Canadian Drinking Water Quality Guidelines. Operationally, the water system must address safety concerns for employees, and be cost effective to operate. The evaluation of the water infrastructure in the Cedars of Tuam system was made with these objectives in mind.

The major concerns the CRD has identified with the community water system relate to the security of the supply, and the age and condition of some of the components of the system. The concerns are summarized following:

- the groundwater supply is compromised during certain time periods, generally in October/November;
- the integrity of the well casing may be being compromised by sand migration from the casing into the well requiring reduced pumping rates;
- the pump station electrical system is not to code, and has a rodent problem;
- there is no automatic control to ensure that the water is adequately disinfected nor that water storage capacity is maintained;
- the age and operating condition of some components, mostly distribution system related, and the lack of redundancy in pumping;

3.2 Design Criteria

The theoretical design criteria used to establish the requirements for the Cedars of Tuam are as follows:

a)	Maximum day flow rate	=	500 Imperial gallons per lot per day (Igplotpd)
b)	Peak hour flow rate	=	3 times maximum day
c)	Annual average flow rate	=	maximum day/1.5 = 333 Igplotpd
d)	Fire protection	=	400 Imperial gallons per minute (Igpm)
e)	System operating pressure at property	=	40-100 psi
f)	Reservoir storage	=	Balancing + Fire Protection
g)	Population Development	=	Assumed growth within the utility, however, since 15 of the 16 lots are presently occupied, little or no additional development will occur without a change in zoning.

Note: The utility is individually metered, historical data indicates that actual consumption rates are presently significantly less at 80-150 Igplotpd compared to theoretical values 333-500 Igplotpd.

3.3 Water Quality and Quantity

The water quality as tested meets Canadian Drinking Water Quality guidelines. Disinfection of the groundwater source is provided to reduce bacterial growth in the mains using 12% sodium hypochlorite solution (chlorine).

The 27 m deep refurbished well is the present course of water for the utility. The August 1989 work carried out by Piteau Associates indicated the yield and potential to be less than 2.7 Igpm and it recommended sustainability testing be undertaken to evaluate the actual yield capacity of the well.

The well is presently being operated at 6.5 Igpm for 2 – 10 hours per day. As documented in the operators/maintenance diary, maintained at the pump house, the well experiences high levels of sand intrusion such that the jet pump intake level must be periodically raised to maintain operation.

The problem has been resolved to date through periodic purging of the well, at which time considerable volumes of sand have been removed. This sand intrusion would appear to be a migration of the filter sand, which was installed to stabilize and support the internal slotted PVC casing. The migration of sand in this manner should be prevented by reducing the velocity of water flow in the well, which is likely too high at the present pumping rate. The results of a video inspection conducted on the well will be reported in the final report.

To minimize further erosion of the sand fill through the slotted casing, which will preserve the structural integrity of the casing, the present pumping rate should be reduced. A reduced flow rate of 2 – 3 Igpm, would likely be sufficient to prevent sand migration and would meet system demand under existing maximum day conditions, however, reduction of flow to this rate would be far short of that required under current CRD design criteria which suggest that a flow rate of 6.5 Igpm should be provided.

The other apparent problem with the well is availability of water during the months of October and November when, prior to the winter rains and subsequent groundwater recharge, the groundwater table is at its lowest. Although this problem of low well production has been likely worsened by the sand intrusion problem, and the periodic raising of the pump intake, it is suggested that the present well will not likely supply the maximum daily needs of the utility especially during years of low groundwater. The only options to provide for this scenario include the drilling and development of a new well remote to the present site, or the imposition of water use restrictions with possible supplemental water provision from another island source (trucked water) to sustain the utility during these periods.

To preserve the present groundwater source, the refurbishment of the present well and the reduction in abstraction rate over a larger time frame to provide the same volume of water for the utility is recommended rather than continuing with the present practice of purging of the well. Given the limited development potential of the subdivision, the development of a new well at a remote location to supplement the water supply for the district to meet current design criteria can not be supported at this time, however, provision of funds for purchase of water from another utility should be included in the annual operating budget.

3.4 Pump House

The existing wooden pump house has a number of safety and operational concerns which need to be addressed. The storage of chlorine should be relocated outside of the main pump station to be isolated from electrical and pumping equipment, and to meet present safety requirements. The electrical service equipment is old, would not meet the electrical code, and needs to be replaced. The facility needs to be rewired to meet electrical codes and upgraded or replaced to prevent rodent intrusion. Access to the pump house, for restocking chemical disinfectant needs to be improved to be acceptable by safety authorities.

The plumbing and valving appears operational, however the controls to regulate reservoir filling and control of disinfection equipment require replacement. The CRD remotely monitors its facilities in most locations. If a component fails, or disinfectant runs low, or power is interrupted, a signal is forwarded to a remote computer with the fault reviewed and an operator dispatched as necessary to attempt to correct the problem before customers run out of water or receive non disinfected water. A telephone service to the pump station is necessary for the monitoring equipment.

3.5 Distribution System

The 100Ømm AC distribution mains are adequate for their present rural residential use. A leak assessment program, conducted in March, indicated the system is very sound, with a recorded difference between the volume pumped to the reservoir compared to that used by the community as being 145 Igpd or 1/10 Igpm.

Access to the pipeline is limited in several areas due to heavy vegetation growth. Experience has shown that roots of larger diameter trees can damage the AC pipe, resulting in failure and repair, hence it is recommended that rights of way over the pipe routes should be cleared. Clearing also permits access to the mains for regular exercise and maintenance of the system valving, standpipes, curbstops, and meters and permits more rapid identification of leaks from the system.

Given the length of time the Cedars system has been installed it is likely that a significant buildup of organic material has occurred on the interior pipe walls. Such growth can result in higher than normal use of disinfectant, and may result in bacterial growth during the warm summer months. The district has undertaken "pigging" of such mains to physically remove the growth. A pig is a polyethylene ball, which is forced down the pipe under pressure to scour the pipe walls. The exercise to clean out the 100mm AC mains is suggested, followed by periodic flushing of mains in summer time when water temperature is higher and water may stagnate somewhat in low use mains.

3.6 Fire Protection

Fire protection is not available through the system. The utility would have to install 150 mm or 200 mm mains to meet the minimum Fire Underwriters Association requirement of 400 Igpm, plus install an additional 48,000 Ig storage. This option is not recommended for consideration at this time.

3.7 Reservoir Storage

The 10,000 Ig steel tank is in good condition, however, the controls regulating its filling rate require replacement. The size of reservoir storage desirable for this utility depends upon the level of service to be provided. Three factors are usually considered in sizing reservoir storage. They are:

a) Peak Hour Balancing

This is the additional volume of water available from storage that is in excess of the well capacity. The volume is calculated based upon 25% of maximum day system requirements, where maximum day flow is 500 Igplotpd.
ie for the Cedars system, 16 x 500 x 0.25 = 2,000 Ig

b) Fire Protection

This is the volume required to be available from storage to fight a fire,
for Cedars, 120 min x 400 Igpm = 48,000 Ig

c) Emergency Storage

This is the volume of water available from storage when the system is unable to utilize its normal operation, due to power outage or mechanical failure. The volume is estimated at one day supply at maximum day rates, ie 16 lots x 500 Igplot = 8,000 Ig.

To meet all the requirements for storage, volume equals the sum of the above (a + b + c). As it is not likely that the mains will be replaced, it is not recommended that storage be sized for fire protection hence the recommended storage volume (a + c) are already available with the existing 10,000 Ig tank.

Care should be taken so as not to provide too large a reservoir, as this could lead to water quality concerns if the water is retained too long in storage.

3.8 System Operation

The system is operated, on a part time basis, by an island resident. A review of the records over recent years indicates a suitable level of service for operations has generally been maintained. It is evident that the system operation during the low water production periods (coinciding with high sand infiltration periods) requires far more operator time than would be expected from a part time position. The apparent result is inadequate available volume necessitating on one or more occasions the trucking of water from another island utility.

Maintenance of the utility has been carried out with minimal expenditure. The result is that much of the equipment and wiring in the pump station, which should have been replaced from the safety or reliability perspective, remains in use. There are no records to suggest that the lines have been regularly flushed necessitating mechanical pigging, nor valves exercised regularly such that if a leak develops, isolation of the damaged section may be difficult as valves wont seat.

The ongoing day to day operations of the utility, negotiation with operators, ordering of chemicals and materials, periodic meter readings, billing, and notification of water restrictions, as well as administration tasks such as planning for the utility, annual budgets, requirements of government agencies and general decision making have become increasingly complex and taxing on the elected trustees.

4.0 SYSTEM IMPROVEMENTS AND COSTS

4.1 General

For the CRD to take over the infrastructure of the Cedars of Tuam Improvement District to form a new CRD local water service, commitment of the residents of the improvement district to fund certain system improvements would be sought. The improvements, deemed necessary to ensure safe operation of a water system that will be able to supply the customer with a certain volume of potable water throughout the year, include the following:

- purge and redevelop the existing well, provide new well pump with lower capacity which will operate at a more sustainable flow of 2 – 3 Igpm;
- provide a second redundant jet pump, controls and piping as backup or standby;
- refurbish or replace pump house c/w external chlorine storage room, new wiring and electrical service equipment;
- update control system, combined with remote polling system to CRD SCADA computer;
- clear r/w over pipelines, mechanically clean lines, service standpipes, valving;
- internal tank inspection and clean out as necessary;

The works are defined and costed below.

4.2 Well Upgrade

The existing well operation permits sand intrusion resulting in periodic loss of supply. The problem is believed to be due to abstracting water at a rate in excess of the sustainable yield of the well. This causes the fines (sand) to migrate through the slotted PVC casing and fill in the well so that the pump intake has to be raised above the sustainable groundwater table level.

The purging (redevelopment) of the existing well together revisions to the system pumping capacity is anticipated to reduce the migration of sand, preserve the casing structure and result in improved water availability. At the time of the purging, it is recommended that a camera inspection of the well be undertaken to review its actual condition.

The cost to video inspect the well, purge it and replace the modify the existing pump system would be $5,000.

If it becomes necessary to drill a secondary well, install a 150 mm casing and appropriate screen at an alternate location, the cost is estimated at $8,000 - $15,000 dependent upon the drilling depth and the infrastructure necessary to pump the water to the reservoir.

4.3 Pump Station and Controls

The existing pump station structure needs to be rebuilt, made rodent proof, and extended to provide a separate chlorine storage facility. The building needs to be rewired and brought up to code, and the pump/reservoir control system needs to be replaced. A new jet pump in parallel to the existing pump will be installed. The estimated cost to do this upgrade is $20,000.

4.4 Clear R/W, Clean Mains

The pipe alignment on Ronald Road is overgrown in places and root damage to the 100mm AC main, resulting in system leakage and future repair costs, is of considerable concern. The allowance to clear and grub the R/W to minimize root damage to the pipeline and to facilitate access for regular maintenance and meter reading has been estimated at $5,000.

The cost to rebuild the two standpipes and the system valves and to repair any meters needing maintenance and to mechanically clean the interior surfaces mains to safeguard water quality is estimated to cost $5,000.

4.5 Summary of Improvement Costs

Video inspect and purge well, provide new pump	$5,000*
Pump house and controls	$20,000
Clear R/W	$5,000
Clean mains, System maintenance	$5,000
Subtotal	$35,000
Engineering + Contingency, Financing	$10,000
TOTAL	**$45,000**

* Cost may vary subsequent to well video inspection.

4.6 Additional Capital Considerations

To provide for fire protection, the system upgrade would also include replacement of all pipelines with 150mm mains and provision of an additional 48,000 Ig storage. The cost to provide this infrastructure is estimated at $250,000. This work is not recommended at this time.

4.7 Operational Costs

As a local service of the CRD, a committee of local area residents would work with staff to review an annual budget for operation and maintenance of the water system. An estimate of the budget for the utility has been developed with a format in use in other CRD water utilities on the Gulf Islands.

The operational and maintenance costs estimated for the first year of operation of the Cedars of Tuam Water system by the CRD amount to $15,750 per annum. The annual operating budget as would be proposed for CRD operation of the utility is inclusive of the following items:

- insurance,
- repair and maintenance allocations for buildings, machinery and equipment;
- purchased maintenance for emergency and equipment repairs;
- allowances for equipment rentals such as a backhoe;
- allowances for internal CRD charges for WCB safety requirements and engineering assistance;
- allocation for staff time for system operation; annual maintenance of electrical, control and mechanical equipment and mains flushing;

- power;
- mechanical, electrical and chemical supplies;
- CRD administration and financial charges for billing; and
- miscellaneous charges for postal, freight, advertising and water license.

Annual Operational and Maintenance Costs

Following is a breakdown of the proposed annual operating budget that would be put to the local service committee for approval:

Insurance	$180
Repairs, purchased maintenance, rentals	$925
Water testing	$500
Allocations, staff time	$6,125
Hydro	$400
Operational supplies	$250
Administration, financial services	$1000
Emergency water purchase	$700
Postal, freight, advertising, licence	$400
Total	**~~$10,480~~** 17,840

Funded as a user charge, and based on 16 users, the annual cost would be $655. - (1115) 2003/04

Funds unexpended or over expended at year-end are rolled over either as a surplus or as a deficit to the following year's budget.

5.0 FINANCIAL ANALYSIS

5.1 General

The financial analysis is provided for the benefit of residents of the Cedars of Tuam water improvement district to assist them in making a decision whether or not to carry out the proposed works in concert with the formation of a new water local service under the Capital Regional District. The analysis assumes that the capital improvements required would be financed through the CRD over a fifteen-year borrowing period. The borrowing would be through the Municipal Finance Authority. The rate shown is thought to represent what would be available through the MFA in the year 2000.

5.2 Estimated Capital Debt and Annual Repayment

The estimated capital debt to be financed is $45,000. Based upon the following criteria the annual repayment charge is calculated below:

Interest rate	7.75%
Debt repayment term	15 years
Annual repayment on $45,000	$5,573 *
Annual capital repayment (parcel tax)	$350

* Financing assistance and grants for waterworks projects may be available on a priority basis from Ministry of Municipal Affairs. Any such grant would reduce this amount by either 25% or 50%.

5.3 Estimated Operating, Maintenance and Administrative Costs

The estimated annual operating and maintenance costs are	$10,480
Total annual capital maintenance and operating costs are	$5,573+ $10,480 = $16,053

5.4 Cost Recovery

The capital debt repayment and annual operating and maintenance costs can be recovered from the ratepayers in a variety of methods. A parcel tax is uniform tax to each parcel of land in the service area, whether or not connected to the water system. A user charge is a fixed charge allocated to only those users who are physically connected to the water system. A variable user charge can be implemented based on actual metered use. Costs can also be recovered through a frontage tax or based on the property assessment, although a frontage tax is more difficult to apply in rural areas where property frontages may vary widely from resident to resident.

5.5 Annual Charges

For purposes of this report, the fees to be recovered are assumed to be recovered using a combined parcel tax, for recovery of the capital improvements and a user fee, for recovery of the annual operating and maintenance costs.

The estimated annual cost per parcel for capital improvements, based on 16 parcels in the system, is $350.

The estimated annual cost per user, for operating and maintenance costs, based on 16 users on the system is $655.

There may be an option for parcels to prepay the capital improvements rather than pay for the project over time. The cost for each parcel to prepay the capital cost is estimated at $2,815.

6.0 CONCLUSIONS

6.1 Conclusions

The following conclusions are made:

a) the existing groundwater source appears to provide water of suitable quality but limited quantity for the utility;

b) the existing well is being pumped at a rate that is believed to be outside its sustainable yield, resulting in the migration of sand through the slotted PVC casing into the well;

c) the existing pump house requires significant upgrading, wiring and controls require replacement to meet code, and access and storage for chemicals acceptable to WCB is necessary;

d) the existing right of way over the mains needs to be grubbed and cleared to prevent future leakage and repair problems due to root invasion;

e) the existing water main system and appurtenances need mechanical cleaning and basic maintenance;

f) the reservoir storage tank and 100mm AC mains provide sufficient storage capacity and transmission capability for the utility;

g) water supply for fire protection is not adequate, replacement of both water mains and storage reservoir would be necessary to ensure adequate supply and storage;

h) the existing area has 16 lots, 15 of which are serviced and metered;

i) the projected annual cost to each parcel, for principle and interest on an MFA loan for capital improvements is $350;

j) the projected annual cost to each user, for the CRD to operate, maintain and administer the water system is $655.

6.2 Project Implementation Process

The following recommendations are made with respect to presentation of the feasibility report and to implement a process leading to formation of a new water local service area and reconstruction of the Cedars of Tuam water system.

Feasibility Report:

1. distribution of the preliminary report to Cedars of Tuam trustees for public review at 13 May 2000 AGM;
2. complete video inspection of well casing, and adjust costs as necessary;
3. presentation of the final report by CRD staff at a public meeting on Salt Spring Island;
4. obtain consensus as to preferred method of taxation to fund the works;
5. obtain consensus whether or not a formal poll of the resident electors of the improvement district should be undertaken to fund the works and form a new local service area.

Implementation:

1. provide additional costing and funding information to Cedars of Tuam residents as necessary;
2. make application to the Ministry of Municipal Affairs for a provincial infrastructure grant, approval subject to the formation of a Cedars of Tuam water local service area;
3. establish a time table to poll the residents and to complete implementation of the process;
4. draft bylaws for approval of the CRD Board and the Ministry of Municipal Affairs. Examples of typical bylaws are provided in Appendix B.

APPENDIX A

LEGAL INFORMATION

ADDRESS	LOT	PLAN	FOLIO	OWNER
191/193 Roland Road	1	16708	153.010	Donald Fletcher
207 Roland Road	2	16708	153.012	Doug/Janette Grey
211 Roland Road	3	16708	153.014	Charles/Pat Goff
221 Roland Road	4	16708	153.016	Kathleen Williams
227 Roland Road	5	16708	153.018	James/Marg Sargent
231 Roland Road	6	16708	153.020	John/Pamela McCaw
241 Roland Road	7	16708	143.022	Judith Jared
256 Roland Road	1	22715	153.024	Deborah T. Gainer
226 Roland Road	2	22715	153.026	Arthur/Mary Crickmore
216 Roland Road	3	22715	153.028	Ronald Bain
Roland Road	4	22715	153.030	Bates/Harnden
206 Roland Road	5	22715	153.032	Mary Gillies
202 Roland Road	6	22715	153.034	Daniel/Jean King
186 Roland Road	7	22715	153.036	Sylvia Bristoll
178 Roland Road	8	22715	153.038	Moyra Watson-White
170 Roland Road	9	22715	153.040	James/Ethel King

APPENDIX B

TYPICAL CRD LOCAL SERVICES BYLAWS

CAPITAL REGIONAL DISTRICT

BYLAW NO.

****

A BYLAW TO ESTABLISH A LOCAL SERVICE AREA WITHIN THE ELECTORAL AREA OF SALT SPRING ISLAND FOR THE PURPOSE OF OPERATING A WATER SUPPLY SYSTEM

****

WHEREAS:

A. the Regional Board of the Capital Regional District may, by Bylaw, establish and operate a local service under the provisions of Section 798 of the *Municipal Act*;

B. the Regional Board has been requested, by petition under the provisions of Section 812 of the *Municipal Act*, to establish, operate and maintain a water supply system for the benefit of the residents of the _____ Water Local Service Area;

C. the sufficiency of the petition has been certified under Section 632 of the *Municipal Act*;

D. the Director for the Salt Spring Island Electoral Area has consented in writing to the adoption of this bylaw pursuant to section 811(2) of the *Municipal Act*;

E. the approval of the Inspector of Municipalities is required under Section 807(1)(a) of the *Municipal Act*;

NOW, THEREFORE, the Board of the Capital Regional District in open meeting assembled enacts as follows:

1. The local service being established, and to be operated, is the supply, treatment, conveyance, storage and distribution of water;

2. The local service area is contained within the boundary shown outlined on the plan attached to this Bylaw as Schedule "A";

3. Only the Electoral Area of Salt Spring Island includes a participating area for this local service;

4. The annual costs for the local service, net of grants and other revenue, shall be recovered:

   (a) by the imposition of a frontage or parcel tax to be imposed in the manner provided under Section 825(2) of the *Municipal Act*;

   (b) by the imposition of fees and other charges which may be fixed by separate bylaw for the purpose of recovering these costs; and

   (c) any deficiency arising from a shortage of revenue generated by (a) and/or (b) by the requisition of funds under Section 823(1) of the *Municipal Act* to be collected by a property value tax to be levied and collected under Section 825(1) of the *Municipal Act*.

5 The maximum amount that may be requisitioned for the local service will be the greater of:

(a) or

(b) an amount equal to the amount that could be raised by a property value tax rate of _____per ONE THOUSAND ($1,000.00) DOLLARS which, when applied to the net taxable value of land and improvements within the Local Service Area, will yield the maximum amount that may be requisitioned under Sections 816(1) (a) and (b) for the local service.

6. This Bylaw may be cited as the _____ Water Local Service Establishment Bylaw No. 1, _____.

READ A FIRST TIME THIS day of

READ A SECOND TIME THIS day of

READ A THIRD TIME THIS day of

APPROVED BY THE INSPECTOR
OF MUNICIPALITIES THIS day of

ADOPTED THIS day of

_____ _____

CHAIR SECRETARY

FILED WITH THE INSPECTOR OF MUNICIPALITIES THIS day of

CAPITAL REGIONAL DISTRICT

BYLAW NO.

****

A BYLAW FOR THE ESTABLISHMENT OF THE _____ LOCAL SERVICE COMMITTEE

****

WHEREAS the Chair of the Capital Regional District has the authority to establish a Committee, as a standing Committee of the Board, being Section 795 of the *Municipal Act*, to which the Regional Board may delegate any or all of the administrative powers of the Regional Board by bylaw adopted by at least two thirds of the votes cast.

NOW, THEREFORE, the Board of the Capital Regional District in open meeting assembled enacts as follows:

1. Establishment of Committee

   (a) A standing Committee to be known as the _____ Water Local Service Committee" (the "Committee") established by the Regional Board through the Chair of the Regional Board shall consist of the Director representing the Electoral Area of Salt Spring Island plus _____ other persons to be appointed by the Chair on resolution by the Regional Board.

   (b) A member appointed by the Regional Board through the Chair of the Regional Board under paragraph (a) must be an owner of real property within the _____ Water Local Service Area.

   (c) Each member of the Committee shall have one vote on matters relating to the management and operation of the water system as provided for in Bylaw No. _____, _____ Water Local Service Establishment Bylaw No. 1, _____.

2. Term of Office

   Subject to subsection 4(a), the term of office for a member of the Committee, other than the Director representing the Electoral Area of Salt Spring Island, shall be for a two year period except that of the initial appointees, _____ shall hold office from the date of appointment until the _____ and _____ shall hold office from the date of appointment until the_____.

3. Nominations

   (a) The Committee shall hold an Annual General Meeting on or before the last day of _____ in each year to which the owners of real property in the Local Service Area shall be invited to attend by written notice distributed at least 30 days prior to the date of the Annual General Meeting.

   (b) The Committee must accept nominations for the members of the Committee to be appointed effective the following _____ from the owners of real property of the Local Service Area present at the Annual General Meeting, and if more nominations are received than there are positions to fill, the Committee must poll the owners of real property present at the meeting.

   (c) The names of the persons nominated or the results of the poll under subsection (b) must be forwarded immediately after the Annual General Meeting to the Secretary of the Regional District and in any event, before the date when the agenda for the first meeting of the Regional Board in November of that year is distributed to the Regional Directors.

4. Appointment

(a) The Regional Board through the Chair of the Regional Board shall immediately upon enactment of this bylaw appoint persons to act as members of the Committee. The interim appointments are not required to be nominated at an Annual General Meeting.

(b) Before the _____ every year the Regional Board through the Chair of the Regional Board shall appoint or re-appoint members to the Committee to fill the term of office of the member whose terms expires as of the _____ in each year. The term of office for all appointments after the initial appointment will be for a two year period commencing the _____ following each such appointment or until their successors are appointed.

(c) In the event of death, resignation, or disqualification of a member of the Committee, the Regional Board shall appoint a successor for the remainder of the term.

5. Committee Procedure

(a) The Committee must, at its first meeting in each year, elect a Chair from among its members.

(b) A quorum of the Committee is a majority of all members.

(c) Rules of Procedure which govern the Regional Board apply to the Committee where applicable.

6. Delegation

(a) The Regional Board hereby delegates to the Committee all of the administrative powers of the Regional Board with respect to the provision of the Local Service established by Bylaw No. ____, _____ Water Local Service Establishment Bylaw No. 1, _____.

(b) Without limiting the generality of paragraph (a), the Committee must establish policies governing the provision and operation of the service including the recommendation of levels of user charges, frontage taxes or parcel taxes to be established by bylaw of the Regional Board.

(c) The operational functions of the Local Service shall be performed by the staff of the Regional District.

7. Board Powers

Notwithstanding the provisions of section 6 of this bylaw, the Regional Board retains the right of approval of operational rules, procedures, and policies and the levels of taxes, fees and other charges to be established by bylaw of the Regional Board.

8. Budget

(a) Upon its establishment, and in November of each year, the Committee must approve an annual budget for the services provided in the Local Service Area which shall include estimates for the administrative, development, maintenance, operational and other expenses, including debt charges, and shall submit such expenditure estimates, together with estimates for expected revenue, in a form approved by the Treasurer of the Regional Board for the approval of the Regional Board and for inclusion in the Regional Board's provisional and annual budgets.

(b) The Committee must not make any expenditures, other than those provided for in the approved budgets of the Committee as included in the approved budget of the Regional Board.

9. Regional District Assets

Any facilities or equipment acquired by the Committee in their administrative capacity will be acquired in the name of the Regional District, shall be the property of the Regional District and must not be disposed of without the approval of the Board of the Regional District.

10. This Bylaw may be cited as the _____ Water Local Service Committee Bylaw No. 1, _____.

READ A FIRST TIME THIS	day of
READ A SECOND TIME THIS	day of
READ A THIRD TIME THIS	day of
ADOPTED THIS	day of

_____ _____

CHAIR SECRETARY

CAPITAL REGIONAL DISTRICT

BYLAW NO.

****

A BYLAW TO IMPOSE FEES AND OTHER CHARGES
AND TO IMPOSE A PARCEL TAX WITHIN THE _____ WATER LOCAL SERVICE AREA

****

WHEREAS:

A. Under Bylaw No. _____, _____ Water Local Service Establishment Bylaw No. 1, _____, the Capital Regional District established a local service to supply, treat, convey, store and distribute water in the area shown outlined on Schedule "A" of Bylaw No. _____;

B. The bylaw authorizes the recovery of the annual costs net of grants or other revenue to be recovered by the imposition of a parcel tax and by the imposition of fees and other charges to be fixed by separate bylaw;

C. Under Section 816 of the *Municipal Act* the Board, having established the local service, the Regional District may recover the annual operating and debt servicing costs for that service by the requisition of money as a property value tax or by a frontage or parcel tax or by the imposition of fees and other charges fixed by a separate bylaw.

NOW, THEREFORE, the Board of the Capital Regional District in open meeting assembled enacts as follows:

1. Interpretation

In this Bylaw, unless the context otherwise requires:

(a) "Consumer" means a person to whom water is supplied by the Regional District;

(b) "Local Service Area" means the Local Service Area established under Bylaw No. _____, _____ Water Local Service Establishment Bylaw No. 1, _____;

(c) "Service Connection" means a pipe and all necessary valves, connections and other appurtenances necessary to connect a water main to a curb stop on the property line.

2. Service Connection Fee

An Applicant for a Service Connection in respect of real property within the Local Service Area shall at the time of making application for the Service Connection pay the Service Connection Fee set out in Schedule "A" hereto.

3. Turn on and Turn off Fee

A Consumer in the Local Service Area requesting the turning off or turning on of the water supply at the Curb Stop under Section 22 or 24 of Bylaw No. 1792, "Water Regulation Bylaw No. 1, 1990" shall pay the applicable turn on or turn off fee set out in Section 1 of Schedule "B" hereto.

4. Abandonment Fee

The Owner of Property in the Local Service Area wishing to discontinue the water supply under Section 23 of Bylaw No. 1792, "Water Regulation Bylaw No. 1, 1990" shall pay the applicable abandonment fee set out in Section 2 of Schedule "B" hereto.

5. User Fee

The user fees set out in Schedule "C" hereto are hereby imposed on every Consumer in the Local Service Area and shall be paid in accordance with Schedule "C" hereto.

6. Parcel Tax

The Parcel Tax set out in Schedule "D" hereto is hereby imposed on the owner of each parcel of land in the Local Service Area.

7. This Bylaw may be cited for all purposes as the _____ Water Local Service Area Fee and Charge Bylaw No. 1, _____.

READ A FIRST TIME THIS day of

READ A SECOND TIME THIS day of

READ A THIRD TIME THIS day of

ADOPTED THIS day of

_____ _____

CHAIR SECRETARY

SCHEDULE "A"

WATER CONNECTIONS AND CHARGES

STICKS ALLISON WATER DISTRIBUTION SYSTEM

The British Columbia Plumbing Code shall apply to all connections made to the Capital Regional District Water System, together with the conditions as set forth hereinafter:

1. Any connections not conforming to the requirements set out in the British Columbia Plumbing Code shall not be connected to the Capital Regional District Water System.

2. The connection charge for a service connection shall be the actual cost for the connection, calculated as follows:

   (i) Engineering Costs:
   Including survey, design, permit acquisition, layout, inspection, and as-constructed drawings $_____

   (ii) Construction Costs:
   Including labour, materials, and equipment $_____

   (iii) Administration Costs:
   At 15% of the sum of (i) + (ii) $_____

   ACTUAL COST = Sum of (i) + (ii) = (iii) $_____

   The minimum connection charge shall be $400.

3. The fees payable herein shall be paid to the Capital Regional District on application for connection to the utility.

SCHEDULE "B"

MISCELLANEOUS FEES

The fees payable herein shall be paid to the Regional District on application for the service:

1. Turn on and Turn off Fee:

   Pursuant to Section 3, the fee for turning on or turning off the water supply at the Curb Stop is:

   (a) During normal working hours (07:30 - 16:00) - no fee
   Monday through Friday non-inclusive of Statutory Holidays

   (b) During non-working hours:

Turn off	$25.00
Turn on	$25.00

2. Abandonment Fee:

   Pursuant to Section 4, the fee for abandonment of a water supply is the actual cost to the Regional District.

SCHEDULE "C"

USER FEES

1. Billing and Payment:

   (a) User fees invoiced by the Capital Regional District are due and payable on presentation. A ten per cent (10%) penalty will be charged if payment is not made within thirty (30) days of the billing date.

   (b) Amounts outstanding after penalty dates will be considered arrears.

   (c) All payments received will be applied firstly against arrears, and then to current balances.

2. Fees Payable:

   (a) User charge per unit: $

The type of use described in Column A is equivalent to the number of units specified in Column B.

COLUMN A	COLUMN B NO. OF UNITS
Residential Housing - each single family dwelling	1
Apartments - each apartment	1
Motel/Hotel - each unit or room	1
Cabins - each single family dwelling	1
Mobile Home Park - each fixed or overnight space	1
Others - For each 300 imperial gallons of daily water consumption over the year. Estimated flows will be based upon minimum daily flows as established by regulations issued pursuant to BC *Health Act*.	1

b) Excess consumption fee:
for metered water use by all consumers
in excess of 3,000 imperial gallons per month $ per 100 imperial gallons

SCHEDULE "D"

RATES PAYABLE

1. Parcel Tax:

   The Capital Regional District hereby levies a parcel tax on each parcel of land located within the _____ Local Service Area whether or not the parcel of land is connected to a water main.

Appendix B

Community Well Water Supply Well Completion Report

THURBER ENGINEERING LTD.
GEOTECHNICAL ▪ ENVIRONMENTAL ▪ MATERIALS

CEDARS OF TUAM WATER SERVICE AREA
SALT SPRING ISLAND, BC
COMMUNITY WELL WATER SUPPLY
WELL COMPLETION REPORT

Report

to

CAPITAL REGIONAL DISTRICT

Thurber Engineering Ltd.
Victoria, B.C.

Kevin B. Sterne, P.Eng.
Review Principal

PROFESSIONAL
PROVINCE OF
B. I. INGIMUNDSON
BRITISH COLUMBIA
GEOSCIENTIST

March 12, 2010

Bruce I. Ingimundson, P.Geo.
Senior Hydrogeologist

File: 17-210-113

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APPENDIX A

- Figure A-1: Site Plan
- Figure A-2: Well 19325 – Location Plan
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APPENDIX B

- Step and 72 Hour Test Pumping Data

APPENDIX C

- Cantest Ltd. Water Quality Results

APPENDIX D

- MOE Data Base Detailed Well Records

APPENDIX E

- Iron Bacteria Removal Rehabilitation Procedure “A”

1. INTRODUCTION

1.1 Background

Thurber Engineering Ltd. (Thurber) was retained by the Capital Regional District (CRD) to investigate a supply of groundwater for the existing Cedars of Tuam Water Service Area along Roland Road in the Fulford Area of south Salt Spring Island, BC. Thurber initially investigated the groundwater supply situation for the area in 2003, issuing our report entitled "*Cedars of Tuam – Salt Spring Island Water Works District, Groundwater Supply Study, Well Location Report, June 10, 2003*". Further investigations for an optimum site for a new well were undertaken in 2008.

We understand the expected water supply pumping rate of Well 19325 will be less than 4 L/s (6 USgpm). Well 19325, the existing production well (WTN 70508), and water distribution system are operated by the CRD.

The scope of work for this project included the well location, well design, drilling and test pumping management, evaluation of groundwater quality and yield, VIHA Source Approval investigations and development of a protection plan for the new well (WIN #19325) located as shown on Figure 1 in Appendix A.

Initially, we searched the Ministry of Environment (MOE) groundwater *"WELLS"* data base for wells within approximately 500 m of the proposed site for Well 19325. The location of these wells is shown on Figure 1 in Appendix A. The search revealed a total of 16 existing wells, consisting of 13 drilled wells and 3 dug wells. The existing drilled wells ranged in depth from 20 m to 90 m (65' to 300') and the range in dug wells was 1.8 m to 4.3 m (6' to14'). The driller's estimated yields for water bearing wells ranged from 0.03 to 0.8 L/s (0.5 to 12 USgpm). The MOE Detailed Well Records for 16 reported wells (plus Well 70508) in the area are shown in Appendix D.

During the course of the project, a single test/production Well 19325 was drilled and test pumped within the site of the old Isabella Point School. The school was operational from 1904 to 1951. All buildings had been removed from the site several years ago.

This report presents a summary and interpretation of the hydrogeological investigations conducted, which include: well location and construction, test pumping, well and water quality assessment.

Use of this report is subject to the *Statement of General Conditions* which is included at the end of the text of this report. The reader's attention is specifically drawn to these conditions as it is considered essential that they be followed for the proper use and interpretation of this report.

1.2 Site Description

The target location of Well 19325 was selected from Geological Survey of Canada mapping (Victoria Geology Map 1553A, Muller, 1980), air photo geological (lineament) mapping by Thurber and an examination of information on existing wells within the study area from wells shown in the MOE *WELLS* Data Base. Well 19325 was located in the south-east corner of the school site at the intersection of Isabella Point Road and Meadow Drive, as shown on Figure 2 in Appendix A.

We note that the location of MOE Data Base well (WTN) 4151 as shown on Figure 1, Appendix A (taken from the CRD Natural Areas Atlas), is incorrect. We refer the reader to Figure 2, Appendix A for the correct location.

The topography of the area is steep to moderately sloping, with the well site area being on a gently sloping bench located on bedrock controlled terrain. The site is approximately 500 m from Fulford Harbour and approximately 90 m above sea level.

The well was drilled into a significant fracture zone (possible fault) near the contact between Haslam Formation sedimentary rocks (shale and siltstone) and the Myra Formation tuff, breccia and other volcanic rocks (Muller, 1980). Drill cuttings indicate the well was completed in the volcanic formation material.

2. WELL DRILLING

Red Williams Drilling Ltd. (RWD) conducted the drilling of Well 19325 at the site located by Thurber. A 150 mm (6") steel surface casing was set to a depth of 8.2 m (27') followed by a 150 mm diameter open hole into bedrock to a depth of 67.1 m (220'). The primary fracture was encountered between 64.0 to 65.5 m (210' to 215') from the surface. A MOE well identification plate (#19325) was attached to the well casing. A log of the well is shown on Figure 3 in Appendix A.

3. TEST PUMPING PROGRAM

CRD determined that the minimum requirements for the water supply system would be a well capable of sustaining a yield in excess of 0.15 L/s (2.4 USgpm). RWD conducted test pumping of Well 19325 under the direction of Thurber.

A step test was carried out on January 26, 2010 at 0.32, 0.48 and 1.8 L/s, (5, 15 & 28 USgpm) for 100 minutes each. The results of the step test indicated the well was capable of delivering the maximum capacity of the test pump (1.8 L/s (28 USgpm)).

Well 19325 was then test pumped continuously for 72 hours at 1.8 L/s (28 USgpm). Drawdown readings on the test well were taken manually at specified intervals and also by using a Solinst Data Logger installed in the well. Manual and data logger water level observation readings were taken on the closest well WTN 4151. Well 4151 is a 5.5 m (18') deep, dug well owned by the Michener family at 736 Isabella Point Road. This domestic supply well (to three residences) is 64 m from Well 19325.

Although this well is a dug well and is artesian, there is no evidence to identify it as a natural spring. Well 4151 was registered as the "Prendergast Spring" (#C052980) by James and Maxine Prendergast on May 1, 1979. The next closest well (WELLS data base) is approximately 130 m south of Well 19325 along Isabella Point Road (See Figure 1, WTN 22569). To our knowledge there were no other domestic wells available for monitoring at the time of the test pumping of Well 19325.

Following the completion of the 72 hour test, the rising water levels (recovery) were monitored in the pumping well for a period of 24 hours. Similarly the water level in the nearby observation well continued to be monitored for 24 hours.

The static (non-pumping) water level in Well 19325 (at the time of the start of test pumping) was 5.8 m from the top of the casing (which was 0.825 m above ground level). The water level in the well drew down a total of 10.690 m or 20% of the total available drawdown to the primary water bearing fracture at 64.0 m below ground level. The well water level recovered only 27% of the drawdown within 24 hours. We suspect the slow rise in recovering water level was due to the minimal drawdown, which infers that Well 19325 was not being hydraulically stressed at the low pumping rate of 1.8 L/s (28 USgpm). Test pumping information tables and figures are shown in Appendix B.

4. ESTIMATED LONG TERM WELL YIELD

Using the test pumping drawdown data extrapolated to 100 days of continuous pumping under test pumping conditions, the estimated potential yield of Well 19325 is as follows:

[The following yield estimates are based upon hydraulic conditions at the time of winter test pumping at 1.8 L/s (28 USgpm), between January 27 – 30, 2010.]

- Assuming <u>100% of the available drawdown</u>, the estimated potential (optimal) yield is 4.1 L/s (65 USgpm);
- Assuming <u>70% of the available drawdown</u>, (as required by the MOE, during summer pumping), the estimated potential yield is 2.9 L/s (46 USgpm);
- Assuming <u>50% of the available drawdown</u>, (conservative winter pumping conditions), the estimated potential yield is 2.1 L/s (33 USgpm).

We have rated the yield of Well 19325 at **1.8 L/s (28 USgpm)**, based on the test pumping rate. This well has the potential to yield quantities in excess of the test pumping rate.

5. WELL WATER QUALITY ASSESSMENT

Water samples were taken from Well 19325 on January 29, 2010, during 72-hour test pumping. The samples were analyzed by Cantest Ltd. for potable parameters required by the Vancouver Island Health Authority (VIHA) Guidelines for the Approval of Water Supply Systems and compared to the Guidelines for Canadian Drinking Water Quality (Guidelines).

The water sampled from Well 19325 was below the **Maximum Acceptable Concentration** (MAC) for all **HEALTH** related parameters tested, including key parameters such as Arsenic, Total Coliform and E.Coli.

The water sampled was below the **Aesthetic Objective (AO)** for all non-health related parameters tested, except manganese. The test result for manganese was reported to be 0.06 mg/L. The AO is 0.05 mg/L, at this level it is not considered a threat to health. Manganese can be problematic by staining laundry and plumbing fixtures. As the level detected is only 0.01 mg/l above the AO from a single sample, it would be prudent to sample the water again once the well is on line. If the test result is again out of compliance, further sampling should be considered. If staining of laundry and plumbing fixtures becomes a problem with users, water treatment should be considered.

Iron Related Bacteria (IRB) was reported at 9000 CFU/mL. IRB can be problematic when incrustation of a well screen becomes clogged, in-time reducing the transmitting capacity of the screen and thus the well yield. This is unlikely to happen in large fractures in a bedrock well, such as the subject well. Hyper-chlorination of the well to remove or reduce the IRB should be considered just prior to placing the well on line. A copy of this process (Procedure A) is provided in Appendix E.

Water quality test result data is given in Appendix C.

6. VIHA SOURCE APPROVAL

Part of the approval process for a new or expanded community groundwater supply is approval of the source by VIHA. We contacted Chris Laughlin, EHO for

Salt Spring Island who referred us to John Spencer, P.Eng. Public Health Engineer (PHE). His response of November 30, 2010 required us to provide the proximity of the well location with regard to separation distances to existing buildings, roadways, property lines, ditches, agricultural activities and septic fields. The following table provides the information requested:

Measured Distance (in meters)

From Well 19325 to:	**Distance (m)**
East property line	2
South property line	5
Isabella Point Road (nearest ditch line)	15
Isabella Point Road (nearest edge of pavement)	16
Meadow Drive (nearest ditch line)	22
Meadow Drive (nearest edge of pavement)	24
Nearest other well (WTH 4151)	64
Nearest building (shed)	66
Nearest habitable dwelling	>100
Nearest septic field	>100

We understand that the school was closed and buildings removed in 1951. An enlarged portion of a 1921 legal plan (see Figure 4) in Appendix A shows what is assumed to be the old one-room school house location and two small outbuildings, which we assume to be (Boys/Girls) pit privies. The sites of the school house, and pit privies are not identifiable today.

We expect the pit privies were backfilled around the time of the school closure, almost 60 years ago. Considering the site is well drained, the source of the artesian groundwater is a bedrock fracture (64 m below ground level), the overburden material is compact stony silt (till) to a depth of 6.5 m, and the well has been constructed with the required GWPR well seal (to 5.5m depth), we are of the opinion that there is an extremely low risk of septic contamination of the groundwater from Well 19325.

7. GWUDI DETERMINATION

For all new community supply wells, an investigation known as Ground Water Under the Direct Influence *{of surface water}*, (GWUDI) is required to determine if surface water is being drawn into the well which could cause pathogens to enter the drinking water supply.

A review of the terrain indicates that the nearest ephemeral stream (winter storm fed) is greater than 500 m north of the well site and the nearest body of open water is Fulford Harbour (salt water), 500 m north east of the well site (as shown in Figure 1 in Appendix A).

Well 19325 well extracts groundwater from major fracture 64 m below ground level at an elevation of 26 m (above sea level). As noted earlier the groundwater flow path is from the upland Mt Tuam area north east towards Fulford Harbour.

Under the hydrogeological conditions summarized above and detailed elsewhere in this report, it is our considered opinion that Well 19325 is not in a GWUDI situation.

8. WELL PROTECTION

8.1 Aquifer Description

The drilling results and test pumping suggest the deep bedrock aquifer is confined (artesian) with depths to the potentiometric surface varying from 5.6 to 5.8 m below ground level at elev. 90 m. The productive bedrock fracture zone is estimated to be up to 1.5 m thick, 65.5 m below ground level at elev.24.5 m. The overburden material is compact stony silt (till) to a depth of 6.5 m over the underlying bedrock, and the well has been constructed with the required GWPR well seal to 5.5 m depth from surface.

A domestic well on Meadow View Drive (approximately 700 m south west of Well 19325) is reported to have been completed to a similar depth from the surface. The primary fracture of this well is at elevation 70 m. The primary fracture in Well 19325 is at elevation 20 m. The hydraulic gradient slopes from the Meadow Drive

area down to Well 19325 and continues dipping towards the north-east. It is expected that the source of aquifer recharge is seasonal precipitation entering the bedrock fractures at high elevations on south Salt Spring Island. The groundwater generally flows from these higher elevations eastward towards Fulford Harbour, roughly following the surface contours.

8.2 Capture Zone Mapping

Other than the static water level in Well 19325, there were no other non-pumping water levels available to determine the local flow. In the absence of a known uniform regional flow, the use of an analytical determination of the capture zone is inappropriate. Suffice to say, it is highly probable that Well 19325 is intercepting water from the fracture zone regime described earlier, primarily from up-gradient flow. In that case, the inferred capture zone for Well 19325 would be upgradient to the south-west, and considering the minimal drawdown (20%) at the test pumping rate, the lineal cone of influence is not expected to extend a great distance south-west of the well, and virtually nil to the north-east.

8.3 Aquifer Vulnerability

The MOE Aquifer Vulnerability Mapping (Aquifer #723) rates this bedrock aquifer as being at MODERATE risk from surface contamination.

Open File 5333 (Allen, D.M., Simon Frazer University) mapping entitled *Susceptibility of Ground Water to Contamination – Southern Gulf Islands* list the area as having a LOW to MODERATE susceptibility. The reason for this is the depth of the water bearing zones from the surface, which adds a level of protection. As noted, the target aquifer's water bearing fracture is 64 m below ground level at the site of Well 19325.

8.4 Aquifer and Well Protection

It is recommended that Well 19325 be completed with a Pitless Unit to house the pump and connect to the underground water line to the reservoir. This system provides limited area disturbance and visual impact, considerably less that a pump

house structure. The controls for the pump would be at another location far from the historic school site.

The surface casing completion must be made vandal and varment proof. We further suggest that the well head be protected from vehicle impact with the installation of three (brightly painted), 100 mm diameter, and Schedule 40 steel pipe bollards in a triangular formation.

Well 19325 should have a minimum 15 m environmental protection zone were no chemicals, petroleum products, fertilizers, pesticides, herbicides, paints, or other deleterious substances are to be stored.

The well area is not in a floodplain and is elevated 1 to 2 m above nearby ditches and roads. The completion of the well head should be done in such a manner as to control any surface drainage away from the Well 19325. The well casing or Pitless Unit must be completed at least 300 mm above current ground level and this stickup must be maintained.

Currently, the school site is not fenced and therefore open to adjacent, privately owned land. Should the neighbours desire to graze farm animals (sheep, cattle, horses, lamas etc.) on their property, the 0.4 ha (1 acre) school property should be fenced. Alternately, the recommended 15 m distance from the well (environmental zone) in the direction of the neighbours property, should be enclosed with suitable fencing to prevent farm animals from accessing the well site.

8.5 Annual Operating Plan and Performance Report

It is suggested that an Operating Plan and Performance Report be created each year for the Cedars of Tuam community well(s). In addition, a method for recording total and instantaneous flow volumes and water levels should be implemented to provide estimates of annual water consumption in addition to well water levels and pump performance. Maintenance and performance monitoring (water quality sampling, periodic well test pumping, etc.) should be conducted on a regular basis. The Operating Plan should be reviewed and modified annually and an Annual Performance Report for the utility operations should be prepared summarizing the results of the implemented Operating Plan.

8.6 Emergency Response Plan

Unless one is already in place, it is recommended that an Emergency Response Plan for the well water supply be developed and implemented should the water resource be threatened and provide immediate mitigation actions if required. The Emergency Response Plan should address the actions required in case of:

- Contamination of one or more wells, aquifer, or reservoir;
- Contaminant spill in vicinity of wells;
- Unplanned shutdown of one or more wells or pumps, or a break in the piping network, and;
- Chorine or other water treatment chemical leak.

9. CONCLUSIONS

The drilling, test pumping, water quality analysis, and hydrogeological assessment provide the flowing conclusions:

- The estimated long-term yield for Well 19325 is in excess of the test pumping rate of 1.8 L/s (28 USgpm) and significantly greater than the current groundwater requirements of the community;
- The well water quality is within the MAC and AO of the *Guidelines* for Well 19325, except for a slightly elevated level of manganese, which is discussed in Section 5;
- The well water testing indicates an elevated level of Iron Related Bacteria. This is not a health related issue and is discussed in Section 5;
- Pumping Well 19325 at the required yield is not expected to have any adverse impact on the quantity or quality of wells within the general area.

10. RECOMMENDATIONS

The following recommendations for Well 19325 are suggested to maintain the existing groundwater resource:

- Pump Well 19325 at a rate not exceeding the test pumping rate of 1.8 L/s (28 USgpm);
- Assess the level of manganese in the well water with further sampling and analysis once the well is operational. If a problem arises, treat the well water as required;
- Address the IRB issue with hyper-chlorination (see Procedure A in Appendix E;
- Implement and maintain well and aquifer protection measures;
- Prepare an annual Operating Plan and Performance Report;
- Prepare an Emergency Response Plan;
- Install a permanent data logger for water level recording and a recording flow meter in Well 19325. The collected data should be reviewed and assessed annually;
- Follow other well head protection measures as outlined in this report.

11. CLOSURE

The information provided and conclusions drawn in this report are valid for the conditions at the time of drilling, test pumping, and water sampling and analysis. Use of the subject well outside the recommended conditions given herein, and future wells drilled in the general area, may change the conditions from those assessed for this report. Thurber cannot guarantee the well yield or water quality of Well 19325.

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THURBER ENGINEERING LTD.

STATEMENT OF GENERAL CONDITIONS

1. STANDARD OF CARE

This study and Report have been prepared in accordance with generally accepted engineering or environmental consulting practices in this area. No other warranty, expressed or implied, is made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report which is of a summary nature and is not intended to stand alone without reference to the instructions given to us by the Client, communications between us and the Client, and to any other reports, writings, proposals or documents prepared by us for the Client relative to the specific site described herein, all of which constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. WE CANNOT BE RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to us by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this Report expressly addresses proposed development, design objectives and purposes, and then only to the extent there has been no material alteration to or variation from any of the said descriptions provided to us unless we are specifically requested by the Client to review and revise the Report in light of such alteration or variation or to consider such representations, information and instructions.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT OUR WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS WE MAY EXPRESSLY APPROVE. The contents of the Report remain our copyright property. The Client may not give, lend or, sell the Report, or otherwise make the Report, or any portion thereof, available to any person without our prior written permission. Any use which a third party makes of the Report, are the sole responsibility of such third parties. Unless expressly permitted by us, no person other than the Client is entitled to rely on this Report. We accept no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without our express written permission.

5. INTERPRETATION OF THE REPORT

a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel, may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and this report is delivered on the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. Where special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.

b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

(see over . . . .)

INTERPRETATION OF THE REPORT *(continued . . . .)*

c) Design Services: The Report may form part of the design and construction documents for information purposes even though it may have been issued prior to the final design being completed. We should be retained to review the final design, project plans and documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the report recommendations and the final design detailed in the contract documents should be reported to us immediately so that we can address potential conflicts.

d) Construction Services: During construction we must be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RISK LIMITATION

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause an accidental release of those substances. In consideration of the provision of the services by us, which are for the Client's benefit, the Client agrees to hold harmless and to indemnify and defend us and our directors, officers, servants, agents, employees, workmen and contractors (hereinafter referred to as the "Company") from and against any and all claims, losses, damages, demands, disputes, liability and legal investigative costs of defence, whether for personal injury including death, or any other loss whatsoever, regardless of any action or omission on the part of the Company, that result from an accidental release of pollutants or hazardous substances occurring as a result of carrying out this Project. This indemnification shall extend to all Claims brought or threatened against the Company under any federal or provincial statute as a result of conducting work on this Project. In addition to the above indemnification, the Client further agrees not to bring any claims against the Company in connection with any of the aforementioned causes.

7. SERVICES OF SUBCONSULTANTS AND CONTRACTORS

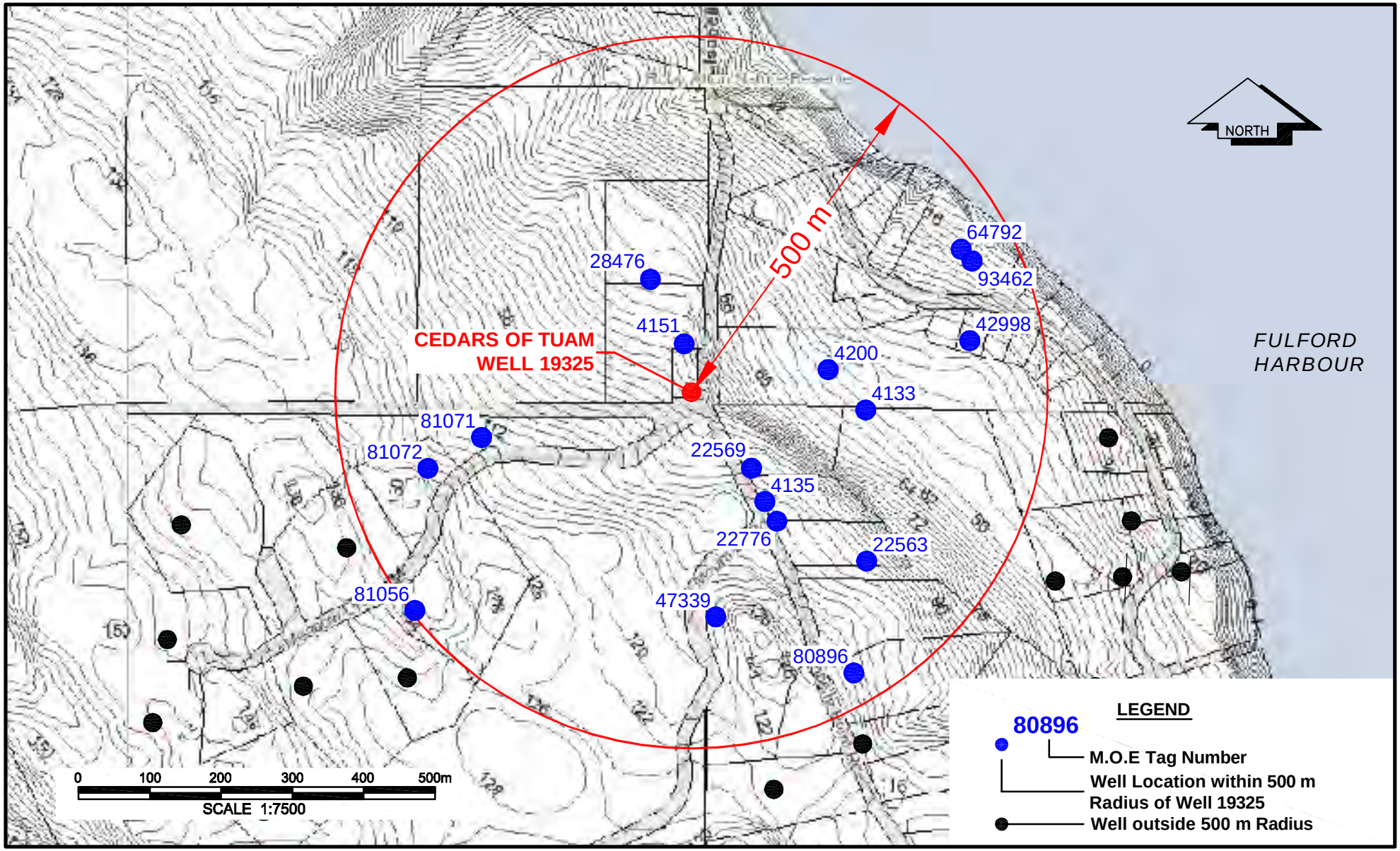
The conduct of engineering and environmental studies frequently requires hiring the services of individuals and companies with special expertise and/or services which we do not provide. We may arrange the hiring of these services as a convenience to our Clients. As these services are for the Client’s benefit, the Client agrees to hold the Company harmless and to indemnify and defend us from and against all claims arising through such hirings to the extent that the Client would incur had he hired those services directly. This includes responsibility for payment for services rendered and pursuit of damages for errors, omissions or negligence by those parties in carrying out their work. In particular, these conditions apply to the use of drilling, excavation and laboratory testing services.

8. CONTROL OF WORK AND JOBSITE SAFETY

We are responsible only for the activities of our employees on the jobsite. The presence of our personnel on the site shall not be construed in any way to relieve the Client or any contractors on site from their responsibilities for site safety. The Client acknowledges that he, his representatives, contractors or others retain control of the site and that we never occupy a position of control of the site. The Client undertakes to inform us of all hazardous conditions, or other relevant conditions of which the Client is aware. The Client also recognizes that our activities may uncover previously unknown hazardous conditions or materials and that such a discovery may result in the necessity to undertake emergency procedures to protect our employees as well as the public at large and the environment in general. These procedures may well involve additional costs outside of any budgets previously agreed to. The Client agrees to pay us for any expenses incurred as the result of such discoveries and to compensate us through payment of additional fees and expenses for time spent by us to deal with the consequences of such discoveries. The Client also acknowledges that in some cases the discovery of hazardous conditions and materials will require that certain regulatory bodies be informed and the Client agrees that notification to such bodies by us will not be a cause of action or dispute.

9. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on our interpretation of conditions revealed through limited investigation conducted within a defined scope of services. We cannot accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



NOTES:

1. Well locations are approximate only.
2. Digital base plan from C.R.D. Natural Areas Atlas.

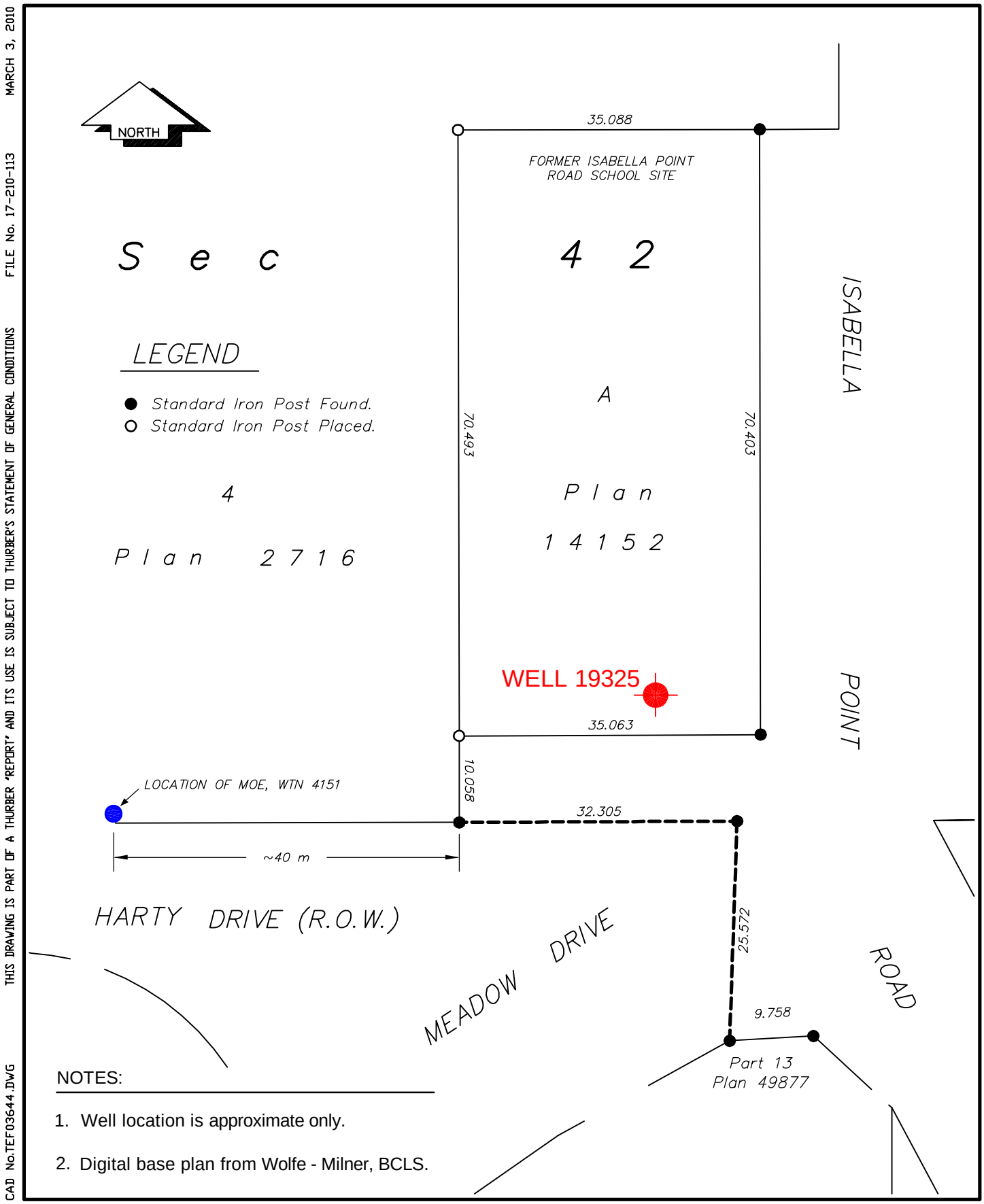
CAPITAL REGIONAL DISTRICT - CEDARS OF TUAM WATER UTILITY WELL PROGRAM

WELL 19325 - SITE PLAN

SCALE: 1:7500 (Approx.)

FIGURE 1

THURBER



NOTES:

1. Well location is approximate only.
2. Digital base plan from Wolfe - Milner, BCLS.

THIS DRAWING IS PART OF A THURBER "REPORT" AND ITS USE IS SUBJECT TO THURBER'S STATEMENT OF GENERAL CONDITIONS

CAD No.TEF03644.DWG FILE No. 17-210-113 MARCH 3, 2010

CAPITAL REGIONAL DISTRICT - CEDARS OF TUAM WATER UTILITY WELL PROGRAM

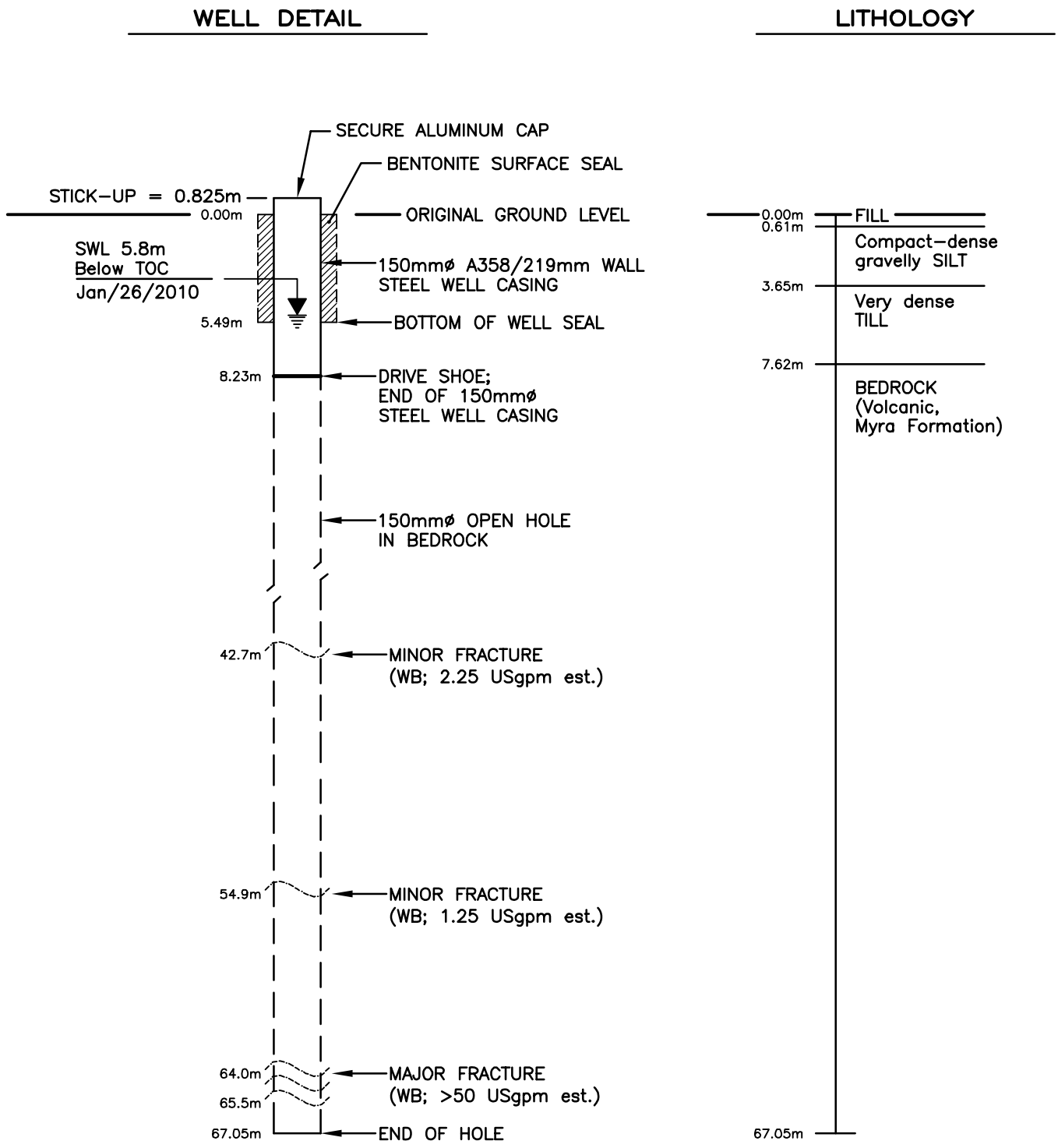
WELL 19325 - LOCATION PLAN

SCALE: 1:600

FIGURE 2

THURBER

CAD No.TEF03644.DWG THIS DRAWING IS PART OF A THURBER "REPORT" AND ITS USE IS SUBJECT TO THURBER'S STATEMENT OF GENERAL CONDITIONS FILE No. 17-210-113 MARCH 3, 2010



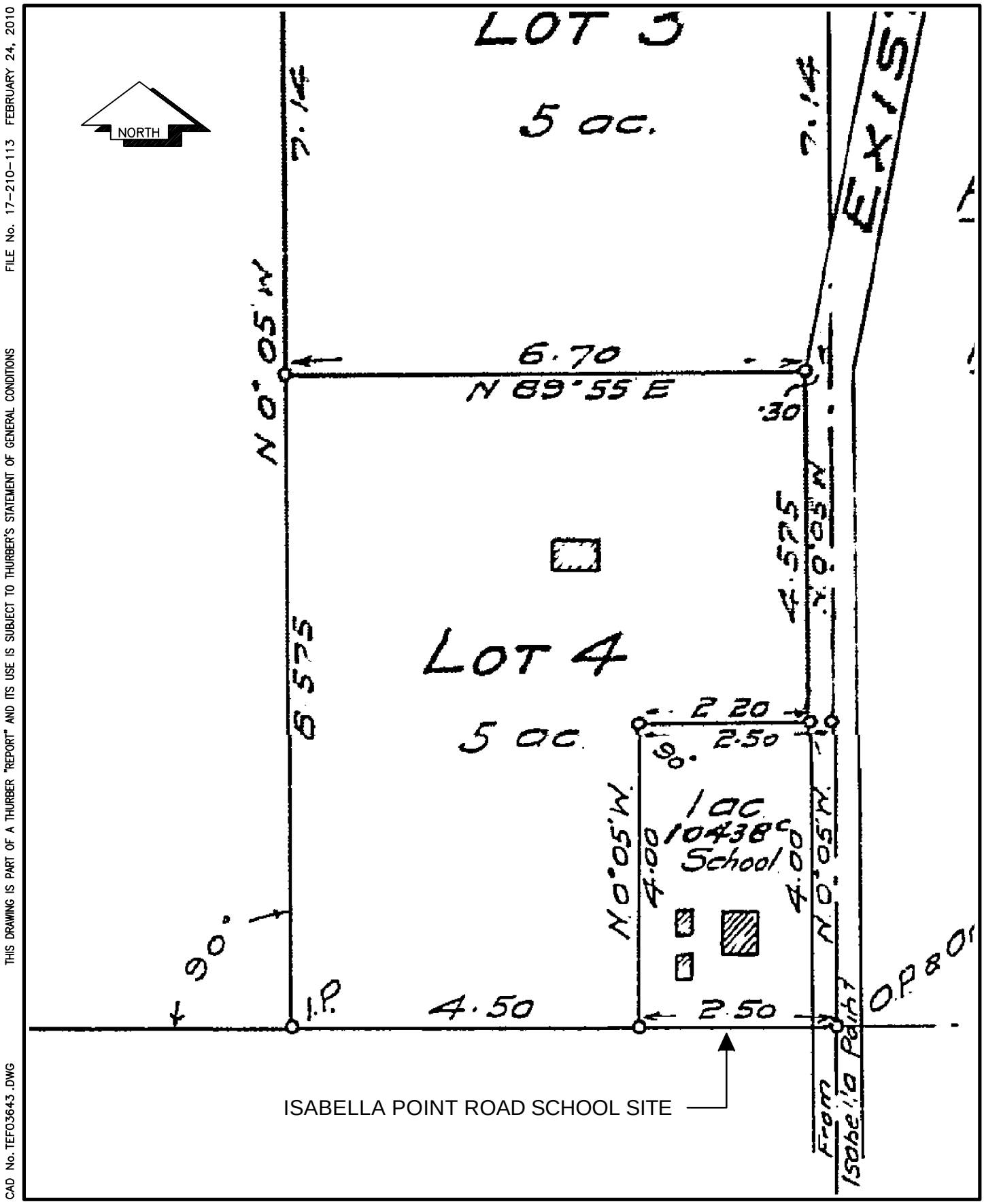
CAPITAL REGIONAL DISTRICT - CEDARS OF TUAM WATER UTILITY WELL PROGRAM

WELL 19325 - LOG & CONSTRUCTION DETAIL

Not to Scale

FIGURE 3

THURBER



CAD No. TEF03643.DWG
THIS DRAWING IS PART OF A THURBER "REPORT" AND ITS USE IS SUBJECT TO THURBER'S STATEMENT OF GENERAL CONDITIONS
FILE No. 17-210-113 FEBRUARY 24, 2010

CAPITAL REGIONAL DISTRICT - CEDARS OF TUAM WATER UTILITY WELL PROGRAM

PORTION OF 1921 LEGAL PLAN

Not to Scale

FIGURE 4

THURBER

THURBER ENGINEERING LTD.

WIN 19325 - STEP TEST

DRAWDOWN DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 26, 2010

START TIME: 12:45 SWL = 5.601 metres

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
0	5.601		0.000	
0.5	5.926		0.325	
1	5.880		0.279	
1.5	5.876		0.275	
2	5.879		0.278	
2.5	5.881		0.280	
3	5.887		0.286	
3.5	5.890		0.289	
4	5.894		0.293	
4.5	5.904		0.303	
5	5.904		0.303	
6	5.915		0.314	
7	5.924		0.323	
8	5.929		0.328	
9	5.934		0.333	
10	5.941	5	0.340	
12	5.954		0.353	
14	5.961		0.360	
16	5.970		0.369	
18	5.976		0.375	
20	5.982		0.381	
25	5.994		0.393	
30	6.005	5	0.404	
35	6.015		0.414	
40	6.022		0.421	
45	6.028		0.427	
50	6.036		0.435	
55	6.041		0.440	
60	6.046		0.445	
70	6.054		0.453	
80	6.061		0.460	
90	6.068		0.467	
100	6.074		0.473	
100.5	6.074		0.473	
101	6.314		0.713	Increase rate
101.5	6.395		0.794	
102	6.404		0.803	
102.5	6.424		0.823	
103	6.443		0.842	
103.5	6.456		0.855	
104	6.471	15	0.870	
104.5	6.486		0.885	

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 Step Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
105	6.498		0.897	
106	6.521		0.920	
107	6.546		0.945	
108	6.562		0.961	
109	6.580		0.979	
110	6.589		0.988	
112	6.629		1.028	
114	6.653		1.052	
116	6.674		1.073	
118	6.703		1.102	
120	6.720	14	1.119	TDS: 123 ppm
125	6.760		1.159	
130	6.798		1.197	
135	6.821		1.220	
140	6.851		1.250	
145	6.875		1.274	
150	6.895		1.294	
155	6.912		1.311	
160	6.930		1.329	
170	6.945		1.344	
180	6.972		1.371	
190	6.999		1.398	
200	7.025		1.424	Increase rate
200.5	7.490		1.889	
201	7.608		2.007	
202	7.768		2.167	
202.5	7.831		2.230	
203	7.882		2.281	
203.5	7.923		2.322	
204	7.951		2.350	
204.5	7.989		2.388	
205	8.016	31	2.415	
206	8.059		2.458	
207	8.105		2.504	
208	8.147		2.546	
209	8.186		2.585	
210	8.237		2.636	
212	8.302		2.701	
214	8.346		2.745	
216	8.397		2.796	
218	8.445		2.844	
220	8.487	28	2.886	
225	8.586		2.985	
230	8.669		3.068	
235	8.740		3.139	
240	8.815		3.214	
245	8.865		3.264	
250	8.918		3.317	
255	8.969		3.368	
260	9.015		3.414	
270	9.100		3.499	

THURBER ENGINEERING LTD.

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
280	9.178		3.577	
290	9.253		3.652	
300	9.319		3.718	<-- Stop Test. Start Recovery

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 Step Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

WIN 19325 - STEP TEST

DRAWDOWN DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 26, 2010

START TIME: 12:45 SWL = 5.601 metres

ELAPSED TIME (min.)	WATER LEVEL* (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
0	49.430		0.000	* measured with levelogger
15	49.090	5	0.340	
45	49.010		0.420	
75	48.990		0.440	
105	48.530		0.900	
135	48.220	15	1.210	
165	48.090		1.340	
195	48.040		1.390	
225	46.420	28	3.010	
255	46.050		3.380	
285	45.800		3.630	

THURBER ENGINEERING LTD.

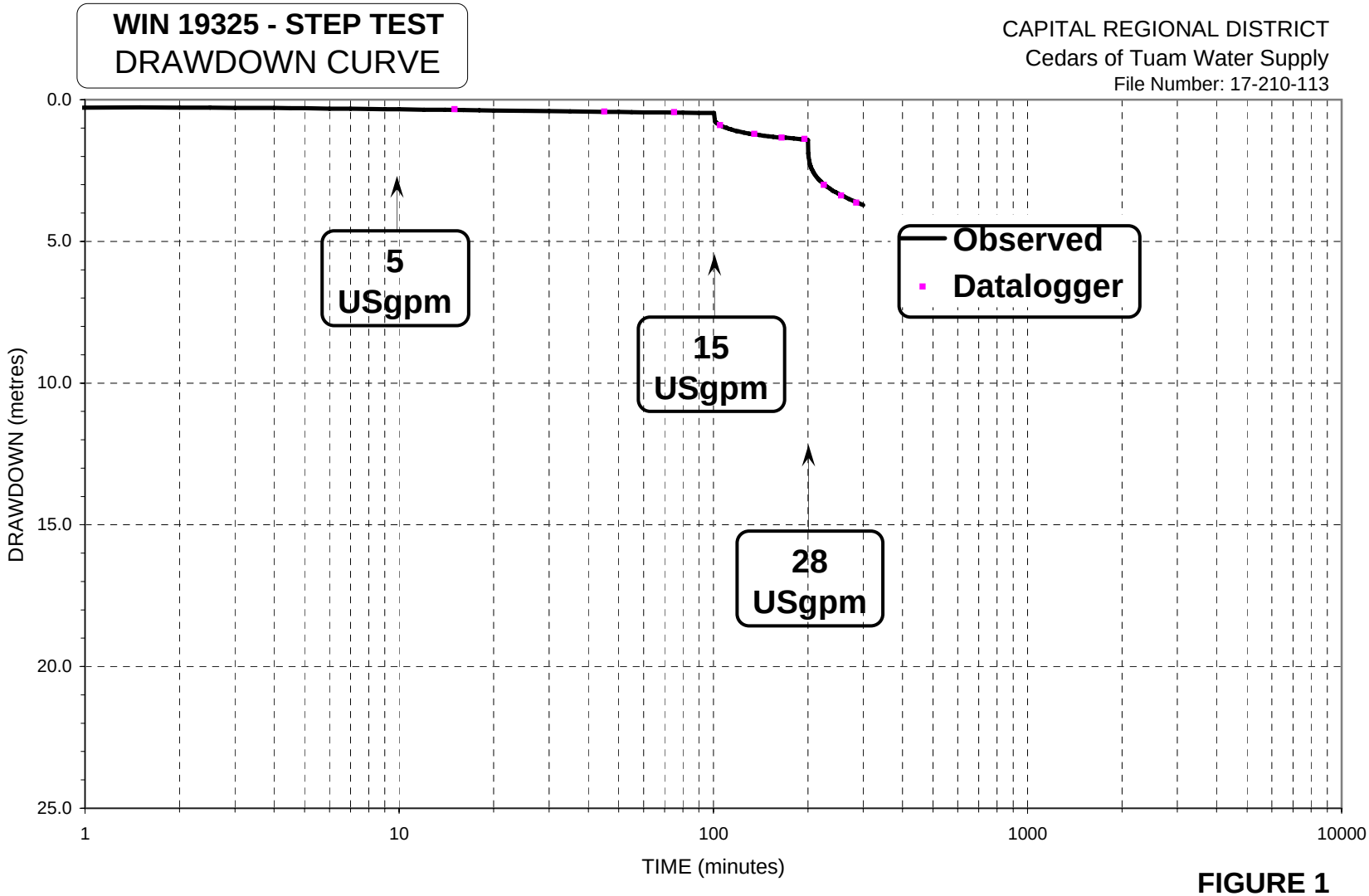


FIGURE 1

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 Step Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

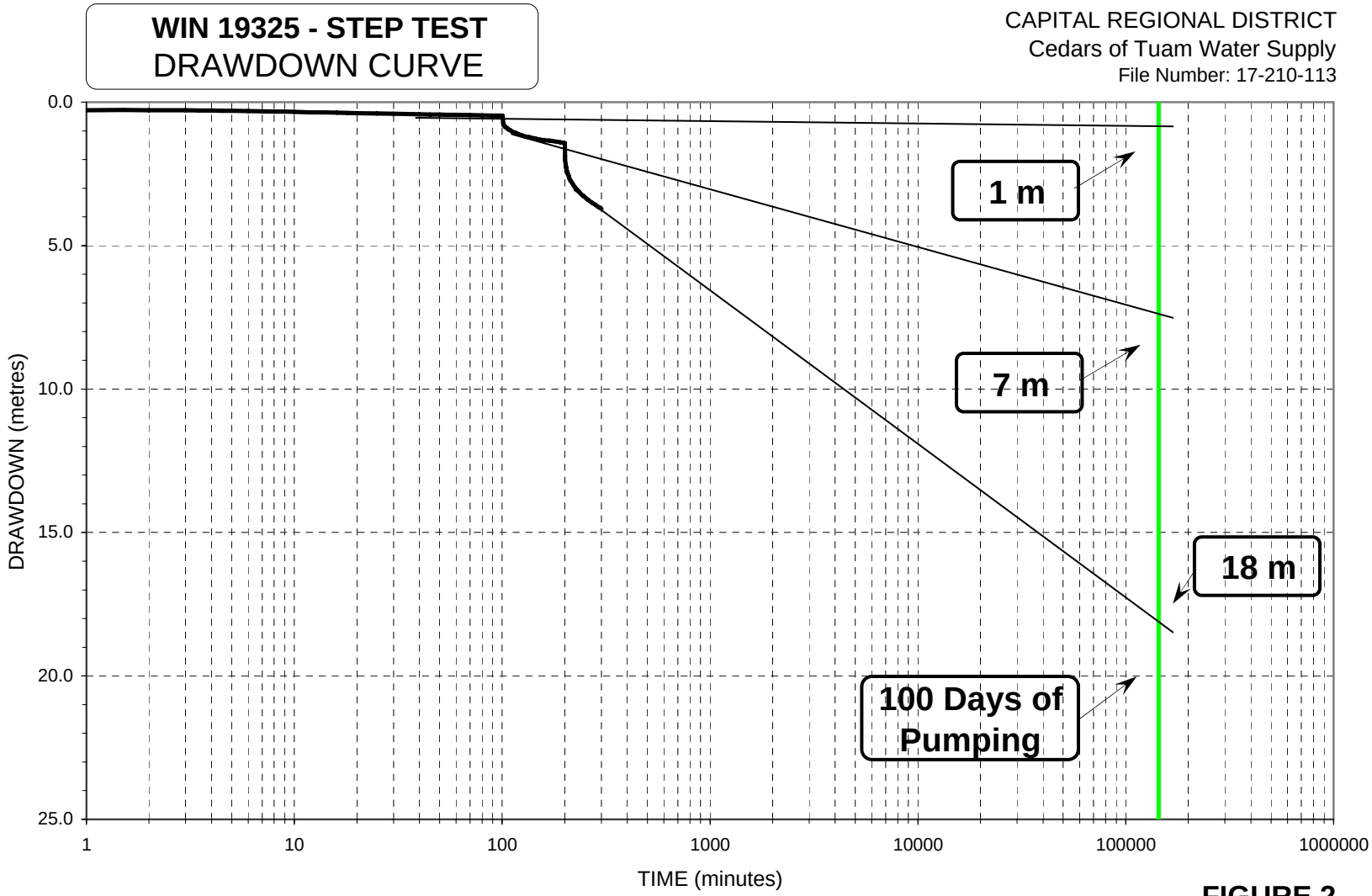


FIGURE 2

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 Step Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

WIN 19325 - STEP TEST

RECOVERY DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 26, 2010
START TIME: 17:45

SWL = 5.601 metres

ELAPSED TIME (Minutes) t @ t ' = 300			WATER DEPTH	RATE	RESIDUAL DRAWDOWN	NOTES
t	t '	t / t '	s (metres)	(USGpm)	s ' (metres)	
300	0		9.319		3.718	Last reading pumping
301	0.5	601	8.396		2.795	
301	1	301	8.220		2.619	
302	1.5	201	8.131		2.530	
302	2	151	8.049		2.448	
303	2.5	121	7.976		2.375	
303	3	101	7.919		2.318	
304	3.5	87	7.865		2.264	
304	4	76	7.819		2.218	
305	4.5	68	7.778		2.177	
305	5	61	7.735		2.134	
306	6	51	7.665		2.064	
307	7	44	7.602		2.001	
308	8	39	7.544		1.943	
309	9	34	7.491		1.890	
310	10	31	7.443		1.842	
312	12	26	7.332		1.731	
314	14	22	7.282		1.681	
316	16	20	7.218		1.617	
318	18	18	7.155		1.554	
320	20	16	7.107		1.506	
325	25	13	6.997		1.396	
330	30	11	6.912		1.311	
335	35	10	6.984		1.383	
340	40	9	6.779		1.178	
345	45	8	6.734		1.133	
350	50	7	6.682		1.081	
355	55	6	6.652		1.051	
360	60	6	6.614		1.013	
370	70	5	6.587		0.986	
380	80	5	6.532		0.931	
1245	945	1	5.811		0.210	<-- 94% Recovery

THURBER ENGINEERING LTD.

WIN 19325 - STEP TEST

RECOVERY DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 26, 2010
START TIME: 17:45

SWL = 5.601 metres

ELAPSED TIME (Minutes) t @ t ' = 300			WATER LEVEL*	RATE	RESIDUAL DRAWDOWN	NOTES
t	t '	t / t '	s (metres)	(USGpm)	s ' (metres)	
285	-15		45.800		3.630	Last reading pumping
315	15	21	47.780		1.650	* measured with levelogger
345	45	8	48.290		1.140	
375	75	5	48.480		0.950	
405	105	4	48.590		0.840	
435	135	3	48.680		0.750	
465	165	3	48.730		0.700	
495	195	3	48.790		0.640	
525	225	2	48.820		0.610	
555	255	2	48.850		0.580	
585	285	2	48.870		0.560	
615	315	2	48.890		0.540	
645	345	2	48.930		0.500	
675	375	2	48.930		0.500	
705	405	2	48.960		0.470	
735	435	2	49.010		0.420	
765	465	2	49.010		0.420	
795	495	2	49.030		0.400	
825	525	2	49.050		0.380	
855	555	2	49.080		0.350	
885	585	2	49.090		0.340	
915	615	1	49.120		0.310	
945	645	1	49.130		0.300	
975	675	1	49.140		0.290	
1005	705	1	49.170		0.260	
1035	735	1	49.150		0.280	
1065	765	1	49.160		0.270	
1095	795	1	49.150		0.280	
1125	825	1	49.160		0.270	
1155	855	1	49.170		0.260	
1185	885	1	49.170		0.260	
1215	915	1	49.180		0.250	
1245	945	1	49.190		0.240	

THURBER ENGINEERING LTD.

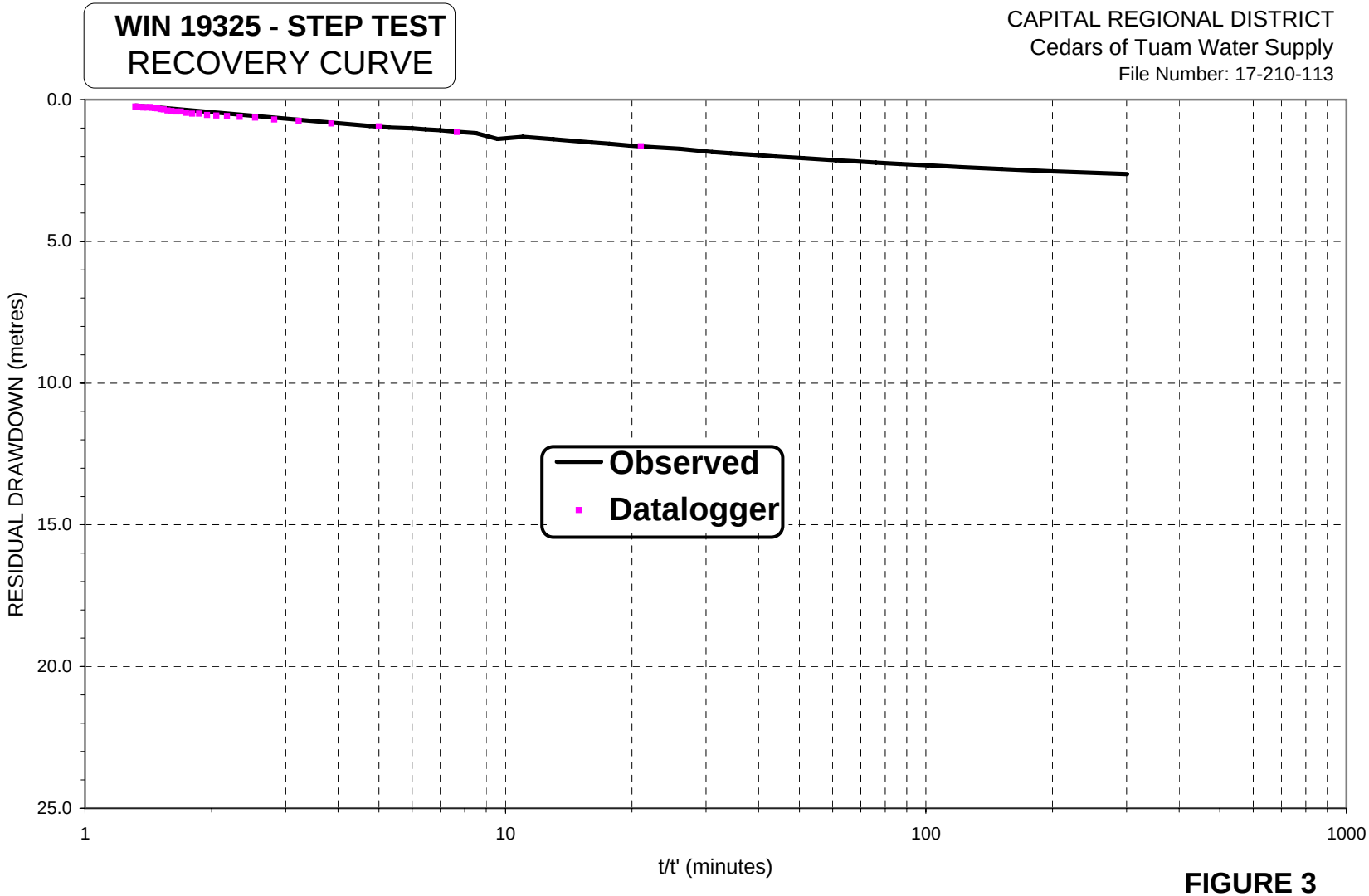


FIGURE 3

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 Step Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

WIN 19325 - 72 HR. TEST

DRAWDOWN DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 27, 2010

START TIME: 9:30 SWL = 5.811 metres

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
0	5.811		0.000	
0.5	6.618		0.807	
1	6.814		1.003	
1.5	6.946		1.135	
2	7.039		1.228	
2.5	7.114		1.303	
3	7.179		1.368	
3.5	7.237		1.426	
4	7.288		1.477	
4.5	7.335		1.524	
5	7.379		1.568	
6	7.454		1.643	
7	7.523		1.712	
8	7.592		1.781	
9	7.647		1.836	
10	7.702		1.891	
12	7.803		1.992	
14	7.892		2.081	
16	7.973		2.162	
18	8.040		2.229	
20	8.108	28	2.297	
25	8.245		2.434	
30	8.366		2.555	
35	8.463		2.652	
40	8.547		2.736	
45	8.628		2.817	
50	8.698		2.887	
55	8.764		2.953	
60	8.820		3.009	
70	8.922	28	3.111	
80	9.022		3.211	
90	9.106		3.295	
100	9.175		3.364	
110	9.245		3.434	
120	9.312		3.501	
150	9.487		3.676	
180	9.638		3.827	
210	9.778		3.967	
240	9.899	28	4.088	TDS: 126 ppm
270	10.014		4.203	
300	10.124		4.313	
330	10.224		4.413	

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
360	10.323		4.512	
420	10.516		4.705	
480	10.694		4.883	TDS: 127 ppm
540	10.882		5.071	
600	11.044	28	5.233	
660	11.224		5.413	
720	11.388		5.577	
780	11.519		5.708	
840	11.643		5.832	
900	11.753		5.942	
960	11.856		6.045	
1020	11.946		6.135	
1080	12.036		6.225	
1200	12.223	28	6.412	
1260	12.326		6.515	
1320	12.441		6.630	
1380	12.565		6.754	
1440	12.680		6.869	
1500	12.793		6.982	
1560	12.900		7.089	
1620	12.998		7.187	
1680	13.085		7.274	
1740	13.182		7.371	
1800	13.272		7.461	
1860	13.371		7.560	
1920	13.467		7.656	
1980	13.579		7.768	
2040	13.681		7.870	
2100	13.793		7.982	
2160	13.918		8.107	
2220	14.021		8.210	
2280	14.103		8.292	
2340	14.182		8.371	
2400	14.250		8.439	
2460	14.303	28	8.492	
2520	14.360		8.549	
2580	14.416		8.605	
2640	14.493		8.682	
2700	14.569		8.758	
2760	14.632		8.821	
2820	14.739		8.928	TDS: 128 ppm
2880	14.827		9.016	
2940	14.918		9.107	
3000	15.002		9.191	
3060	15.077		9.266	
3120	15.154		9.343	
3180	15.220		9.409	
3240	15.286		9.475	
3300	15.353		9.542	
3360	15.427		9.616	
3420	15.492		9.681	

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
3480	15.584		9.773	
3540	15.681		9.870	
3600	15.792		9.981	
3660	15.864		10.053	
3720	15.957		10.146	
3780	16.029	28	10.218	
3840	16.082		10.271	
3900	16.128		10.317	
3960	16.164		10.353	
4020	16.199		10.388	
4080	16.229		10.418	
4140	16.276		10.465	TDS: 138 ppm
4200	16.336		10.525	
4260	16.413		10.602	
4320	16.487		10.676	<-- Stop Test. Start Recovery

THURBER ENGINEERING LTD.

WIN 19325 - 72 HR. TEST

DRAWDOWN DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 27, 2010

START TIME: 9:30 SWL = 5.811 metres

ELAPSED TIME (min.)	WATER LEVEL* (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
0	49.190		0.000	* measured with levelogger
30	46.630	28	2.560	
60	46.160		3.030	
90	45.910		3.280	
120	45.680		3.510	
150	45.490		3.700	
180	45.350		3.840	
210	45.210		3.980	
240	45.100	28	4.090	
270	44.960		4.230	
300	44.860		4.330	
330	44.800		4.390	
360	44.660		4.530	
390	44.580		4.610	
420	44.480		4.710	
450	44.410		4.780	
480	44.320		4.870	
510	44.210		4.980	
540	44.110		5.080	
570	44.020		5.170	
600	43.940	28	5.250	
630	43.870		5.320	
660	43.790		5.400	
690	43.700		5.490	
720	43.620		5.570	
750	43.540		5.650	
780	43.480		5.710	
810	43.420		5.770	
840	43.350		5.840	
870	43.300		5.890	
900	43.250		5.940	
930	43.190		6.000	
960	43.150		6.040	
990	43.090		6.100	
1020	43.060		6.130	
1050	43.020		6.170	
1080	42.980		6.210	
1110	42.940		6.250	
1140	42.870		6.320	
1170	42.800		6.390	
1200	42.790	28	6.400	
1230	42.720		6.470	
1260	42.680		6.510	

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

ELAPSED TIME (min.)	WATER LEVEL* (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
1290	42.610		6.580	
1320	42.550		6.640	
1350	42.490		6.700	
1380	42.440		6.750	
1410	42.360		6.830	
1440	42.310		6.880	
1470	42.250		6.940	
1500	42.200		6.990	
1530	42.130		7.060	
1560	42.080		7.110	
1590	42.040		7.150	
1620	41.980		7.210	
1650	41.940		7.250	
1680	41.900		7.290	
1710	41.850		7.340	
1740	41.820		7.370	
1770	41.770		7.420	
1800	41.730		7.460	
1830	41.680		7.510	
1860	41.630		7.560	
1890	41.560		7.630	
1920	41.500		7.690	
1950	41.500		7.690	
1980	41.400		7.790	
2010	41.340		7.850	
2040	41.310		7.880	
2070	41.260		7.930	
2100	41.180		8.010	
2130	41.140		8.050	
2160	41.060		8.130	
2190	41.030		8.160	
2220	40.980		8.210	
2250	40.950		8.240	
2280	40.880		8.310	
2310	40.830		8.360	
2340	40.820		8.370	
2370	40.760		8.430	
2400	40.750		8.440	
2430	40.720		8.470	
2460	40.670	28	8.520	
2490	40.650		8.540	
2520	40.630		8.560	
2550	40.610		8.580	
2580	40.570		8.620	
2610	40.520		8.670	
2640	40.480		8.710	
2670	40.440		8.750	
2700	40.400		8.790	
2730	40.390		8.800	
2760	40.350		8.840	
2790	40.280		8.910	
2820	40.260		8.930	
2850	40.190		9.000	

THURBER ENGINEERING LTD.

ELAPSED TIME (min.)	WATER LEVEL* (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = 0.725m AGL
2880	40.180		9.010	
2910	40.130		9.060	
2940	40.050		9.140	
2970	40.040		9.150	
3000	40.010		9.180	
3030	39.950		9.240	
3060	39.940		9.250	
3090	39.890		9.300	
3120	39.830		9.360	
3150	39.810		9.380	
3180	39.770		9.420	
3210	39.740		9.450	
3240	39.700		9.490	
3270	39.670		9.520	
3300	39.630		9.560	
3330	39.590		9.600	
3360	39.550		9.640	
3390	39.540		9.650	
3420	39.490		9.700	
3450	39.450		9.740	
3480	39.420		9.770	
3510	39.350		9.840	
3540	39.310		9.880	
3570	39.260		9.930	
3600	39.190		10.000	
3630	39.180		10.010	
3660	39.140		10.050	
3690	39.090		10.100	
3720	39.050		10.140	
3750	39.020		10.170	
3780	38.980	28	10.210	
3810	38.930		10.260	
3840	38.900		10.290	
3870	38.890		10.300	
3900	38.870		10.320	
3930	38.870		10.320	
3960	38.820		10.370	
3990	38.810		10.380	
4020	38.810		10.380	
4050	38.780		10.410	
4080	38.770		10.420	
4110	38.740		10.450	
4140	38.740		10.450	
4170	38.680		10.510	
4200	38.660		10.530	
4230	38.620		10.570	
4260	38.590		10.600	
4290	38.570		10.620	
4320	38.500		10.690	<-- Stop Test. Start Recovery

THURBER ENGINEERING LTD.

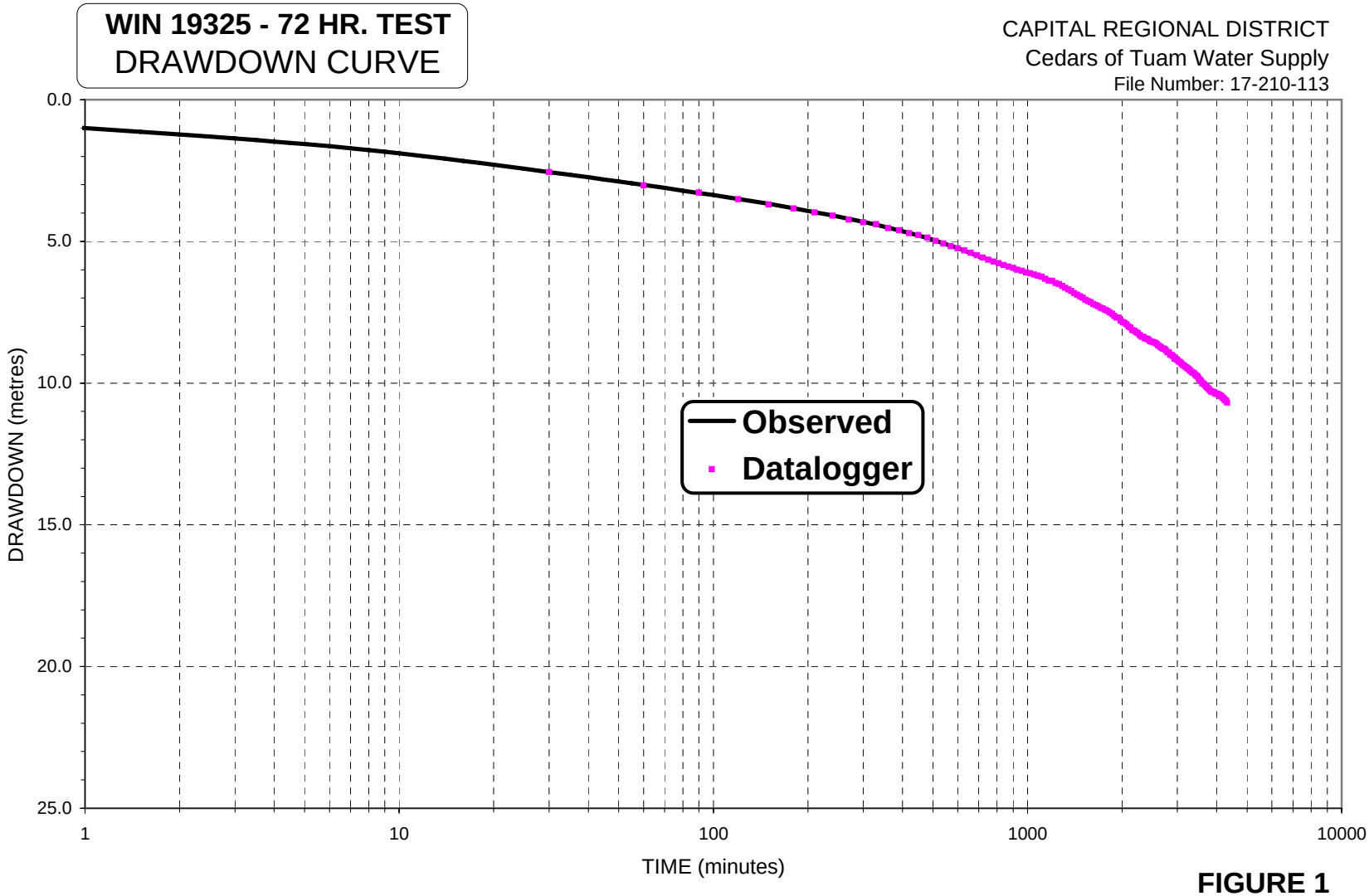


FIGURE 1

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

CAPITAL REGIONAL DISTRICT
Cedars of Tuam Water Supply
File Number: 17-210-113

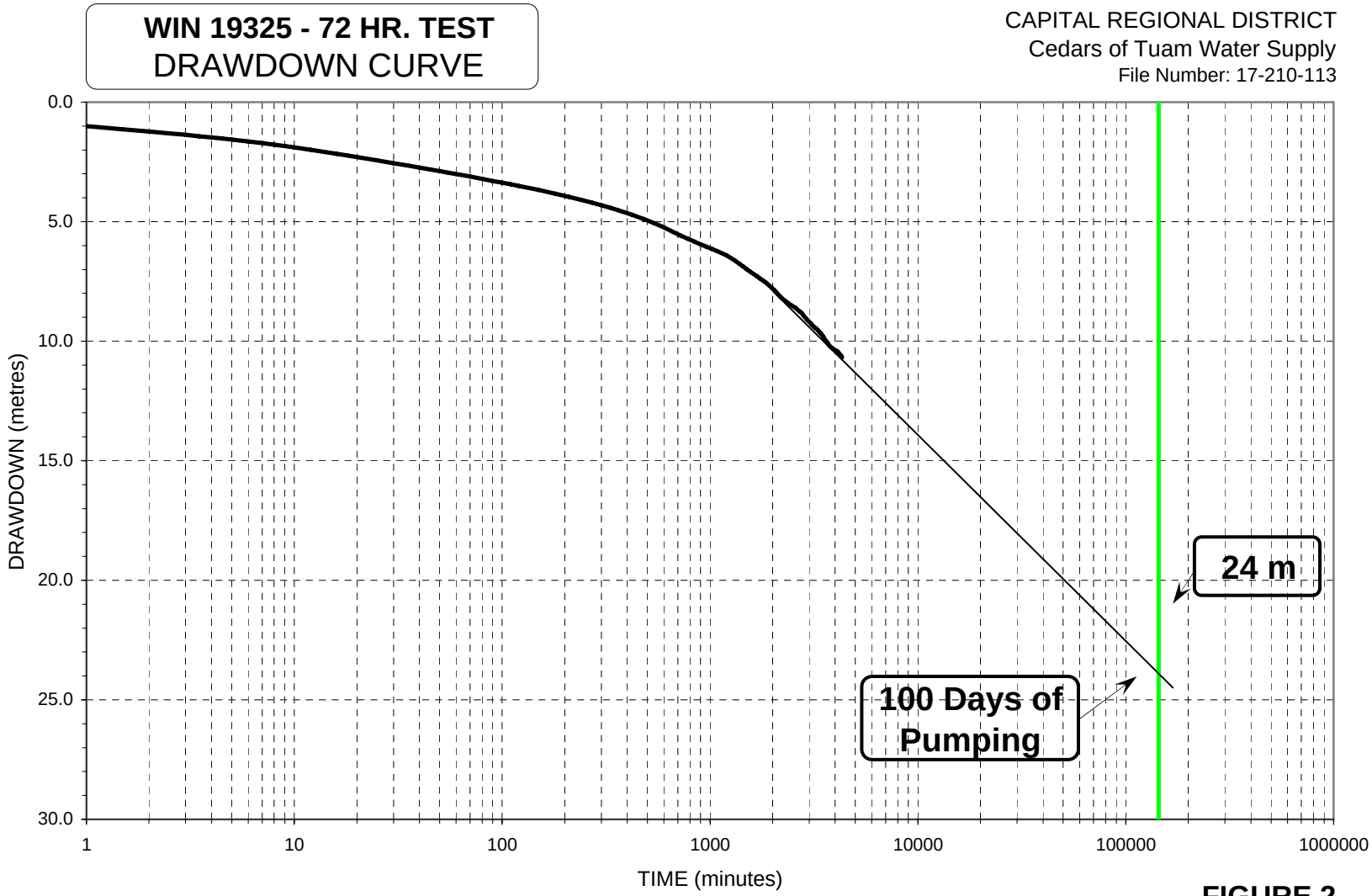


FIGURE 2

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

WIN 19325 - 72 HR. TEST

RECOVERY DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 30, 2010

START TIME: 9:30

SWL = 5.811 metres

ELAPSED TIME (Minutes) t @ t ' = 4320			WATER DEPTH	RATE	RESIDUAL DRAWDOWN	NOTES
t	t '	t / t '	s (metres)	(USGpm)	s ' (metres)	
4320	0		16.487		10.676	Last reading pumping
4321	0.5	8641	15.665		9.854	
4321	1	4321	15.455		9.644	
4322	1.5	2881	15.330		9.519	
4322	2	2161	15.230		9.419	
4323	2.5	1729	15.159		9.348	
4323	3	1441	15.093		9.282	
4324	3.5	1235	15.036		9.225	
4324	4	1081	14.984		9.173	
4325	4.5	961	14.937		9.126	
4325	5	865	14.894		9.083	
4326	6	721	14.817		9.006	
4327	7	618	14.749		8.938	
4328	8	541	14.684		8.873	
4329	9	481	14.630		8.819	
4330	10	433	14.578		8.767	
4332	12	361	14.483		8.672	
4334	14	310	14.404		8.593	
4336	16	271	14.333		8.522	
4338	18	241	14.270		8.459	
4340	20	217	14.214		8.403	
4345	25	174	14.099		8.288	
4350	30	145	14.006		8.195	
4355	35	124	13.931		8.120	
4360	40	109	13.865		8.054	
4365	45	97	13.809		7.998	
4370	50	87	13.756		7.945	
4375	55	80	13.708		7.897	
4380	60	73	13.668		7.857	
4390	70	63	13.590		7.779	
4400	80	55	13.521		7.710	
4410	90	49	13.461		7.650	
4420	100	44	13.407		7.596	
4430	110	40	13.357		7.546	
4440	120	37	13.309		7.498	
4470	150	30	13.184		7.373	
4500	180	25	13.075		7.264	
4530	210	22	12.974		7.163	
4560	240	19	12.883		7.072	
4590	270	17	12.798		6.987	
4620	300	15	12.709		6.898	
4650	330	14	12.630		6.819	

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

ELAPSED TIME (Minutes) t @ t ' = 4320			WATER DEPTH	RATE	RESIDUAL DRAWDOWN	NOTES
t	t '	t / t '	s (metres)	(USGpm)	s ' (metres)	
4680	360	13	12.565		6.754	
4740	420	11	12.427		6.616	
4800	480	10	12.303		6.492	
4860	540	9	12.197		6.386	
4920	600	8	12.110		6.299	
4980	660	8	12.043		6.232	
5040	720	7	11.985		6.174	
5100	780	7	11.932		6.121	
5160	840	6	11.872		6.061	
5220	900	6	11.808		5.997	
5280	960	6	11.734		5.923	
5340	1020	5	11.651		5.840	
5400	1080	5	11.558		5.747	
5460	1140	5	11.463		5.652	
5520	1200	5	11.373		5.562	
5580	1260	4	11.286		5.475	
5640	1320	4	11.215		5.404	
5700	1380	4	11.150		5.339	
5760	1440	4	11.101		5.290	<-- 50% Recovery

THURBER ENGINEERING LTD.

WIN 19325 - 72 HR. TEST

RECOVERY DATA

FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 30, 2010

START TIME: 9:30

SWL = 5.811 metres

ELAPSED TIME (Minutes) t @ t ' = 4320			WATER LEVEL*	RATE	RESIDUAL DRAWDOWN	NOTES
t	t '	t / t '	s (metres)	(USGpm)	s ' (metres)	
4320	0		38.500		10.690	Last reading pumping
4350	30	145	40.980		8.210	* measured with levelogger
4380	60	73	41.310		7.880	
4410	90	49	41.530		7.660	
4440	120	37	41.670		7.520	
4470	150	30	41.820		7.370	
4500	180	25	41.900		7.290	
4530	210	22	41.990		7.200	
4560	240	19	42.100		7.090	
4590	270	17	42.180		7.010	
4620	300	15	42.260		6.930	
4650	330	14	42.330		6.860	
4680	360	13	42.420		6.770	
4710	390	12	42.470		6.720	
4740	420	11	42.550		6.640	
4770	450	11	42.610		6.580	
4800	480	10	42.670		6.520	
4830	510	9	42.730		6.460	
4860	540	9	42.790		6.400	
4890	570	9	42.820		6.370	
4920	600	8	42.870		6.320	
4950	630	8	42.910		6.280	
4980	660	8	42.940		6.250	
5010	690	7	42.980		6.210	
5040	720	7	43.010		6.180	
5070	750	7	43.020		6.170	
5100	780	7	43.050		6.140	
5130	810	6	43.090		6.100	
5160	840	6	43.090		6.100	
5190	870	6	43.150		6.040	
5220	900	6	43.170		6.020	
5250	930	6	43.210		5.980	
5280	960	6	43.250		5.940	
5310	990	5	43.300		5.890	
5340	1020	5	43.330		5.860	
5370	1050	5	43.370		5.820	
5400	1080	5	43.430		5.760	
5430	1110	5	43.490		5.700	
5460	1140	5	43.530		5.660	
5490	1170	5	43.570		5.620	
5520	1200	5	43.610		5.580	
5550	1230	5	43.650		5.540	
5580	1260	4	43.710		5.480	

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

ELAPSED TIME (Minutes) t @ t ' = 4320			WATER LEVEL*	RATE	RESIDUAL DRAWDOWN	NOTES
t	t '	t / t '	s (metres)	(USGpm)	s ' (metres)	
5610	1290	4	43.740		5.450	
5640	1320	4	43.770		5.420	
5670	1350	4	43.790		5.400	
5700	1380	4	43.810		5.380	
5730	1410	4	43.850		5.340	

THURBER ENGINEERING LTD.

CAPITAL REGIONAL DISTRICT
Cedars of Tuam Water Supply
File Number: 17-210-113

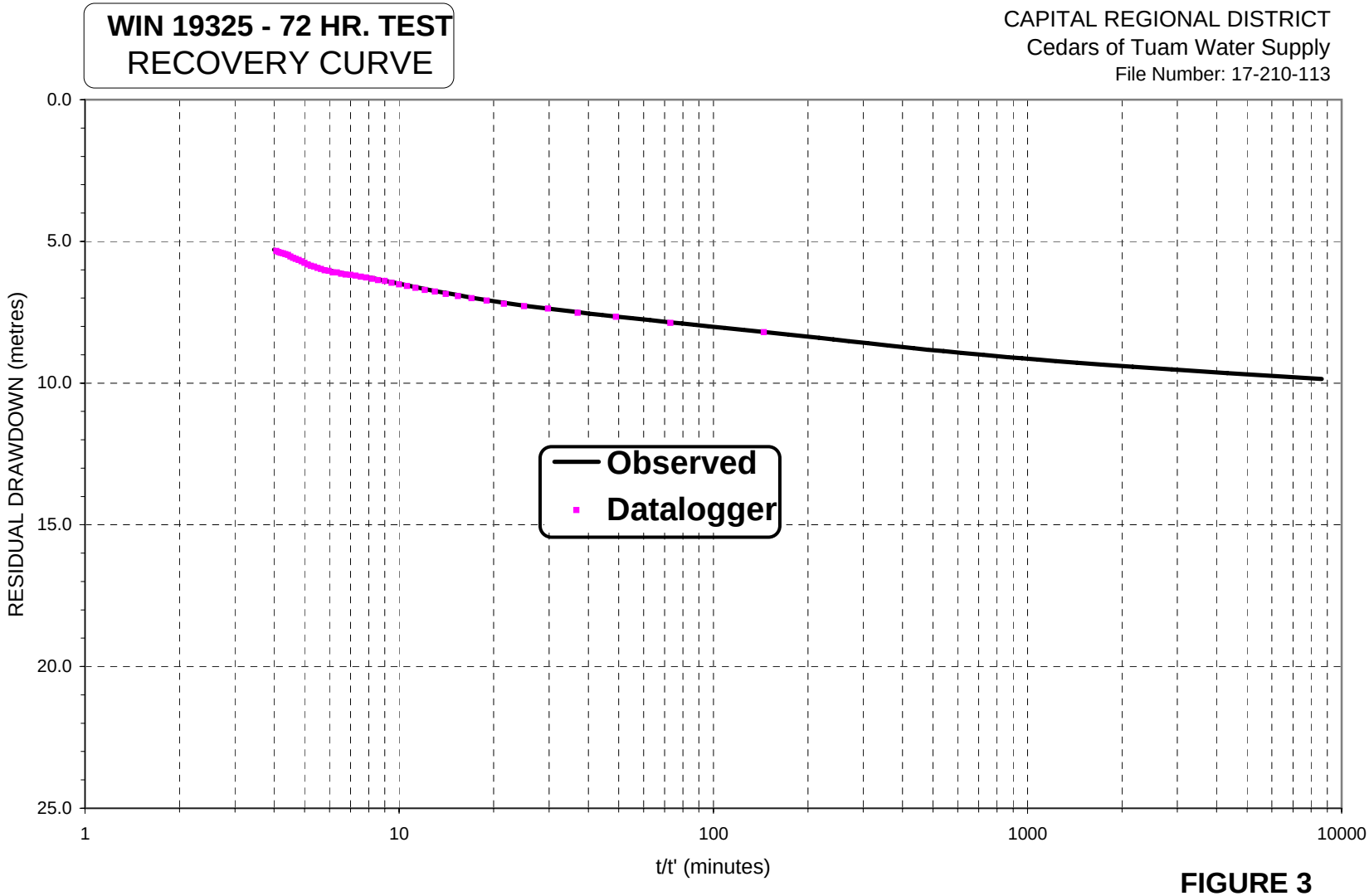


FIGURE 3

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

THURBER ENGINEERING LTD.

OBS WELL - while pumping WIN 19325 DRAWDOWN DATA

(Dug Well @ 736 Isabella Point Rd.) FILE No.: 17-210-113

CRD - Cedars of Tuam Water Supply

START DATE: January 27, 2010

START TIME: 9:30 SWL = 1.57 metres

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = Xm AGL
0	1.570		0.000	
62	1.600		0.030	
96	1.600		0.030	
146	1.600		0.030	
205	1.590		0.020	
272	1.590		0.020	
332	1.590		0.020	
422	1.620		0.050	
482	1.630		0.060	
543	1.620		0.050	
602	1.620		0.050	
725	1.599		0.029	
960	1.598		0.028	
1020	1.600		0.030	
1200	1.598		0.028	
1320	1.540		-0.030	
1382	1.570		0.000	
1442	1.580		0.010	
1502	1.575		0.005	
1562	1.565		-0.005	
1675	1.630		0.060	
1742	1.620		0.050	
1802	1.680		0.110	
1862	1.675		0.105	
1922	1.670		0.100	
1982	1.660		0.090	
2042	1.650		0.080	
2230	1.629		0.059	
2340	1.612		0.042	
2530	1.572		0.002	
2645	1.561		-0.009	
2705	1.556		-0.014	
2822	1.550		-0.020	
2882	1.550		-0.020	
2942	1.555		-0.015	
3002	1.565		-0.005	
3055	1.585		0.015	
3115	1.610		0.040	
3183	1.675		0.105	
3242	1.660		0.090	

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: January 26, 2010

THURBER ENGINEERING LTD.

ELAPSED TIME (min.)	WATER DEPTH (metres)	RATE (USGpm)	DRAWDOWN (metres)	NOTES TOC = Xm AGL
3302	1.670		0.100	
3423	1.655		0.085	
3482	1.660		0.090	
3720	1.642		0.072	
3845	1.626		0.056	
3965	1.602		0.032	
4085	1.589		0.019	
4260	1.570		0.000	

THURBER ENGINEERING LTD.

OBS. WELL - WHILE PUMPING WIN 19325
DRAWDOWN CURVE

CAPITAL REGIONAL DISTRICT
Cedars of Tuam Water Supply
File Number: 17-210-113

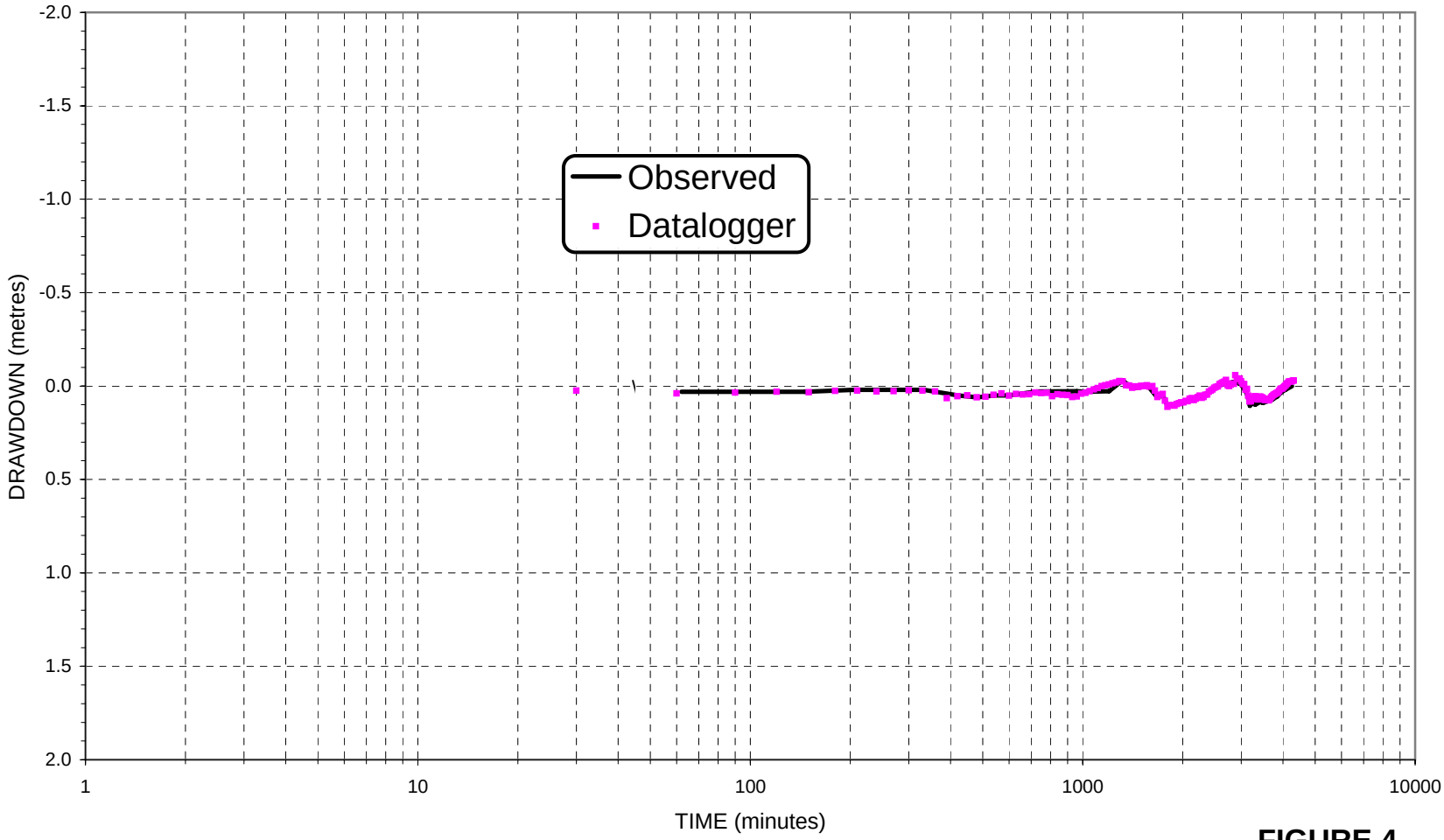


FIGURE 4

Client: CRD
File No.: 17-210-113
E file: cwp_17-210-113_tbl_CRD Cedars of Tuam WIN 19325 72 Hour Test.xls

Date: February 2, 2010

Analysis Report

CANTEST

REPORT ON: Analysis of Water Sample

REPORTED TO: Thurber Engineering Ltd
100-4396 West Saanich Rd
Victoria, BC
V8Z 3E9

Att'n: Chad Petersmeyer

CHAIN OF CUSTODY: VI7250
PROJECT NAME: CRD- Cedars of Tuam
PROJECT NUMBER: 17-210-113

NUMBER OF SAMPLES: 1

REPORT DATE: February 9, 2010

DATE SUBMITTED: January 29, 2010

GROUP NUMBER: 110129065

SAMPLE TYPE: Ground Water

NOTE: Results contained in this report refer only to the testing of samples as submitted. Other information is available on request.

Aesthetic Objective Summary:

Aesthetic Objectives as set by "Guidelines for Canadian Drinking Water Quality Summary Table" -May 2008. Aesthetic objectives apply to certain substances or characteristics of drinking water that can affect its acceptance by consumers or interfere with practices for supplying good quality water. For certain parameters, both aesthetic objectives and health-related guidelines have been derived. Where only aesthetic objectives are specified, these values are below those considered to constitute a health hazard

CLIENT SAMPLE ID	STATUS
WIN 19325	Unacceptable

Max. Acceptable Concentration Summary:

Maximum Acceptable Concentrations (MAC) for both chemical and microbiological parameters are put forth in the "Guidelines for Canadian Drinking Water Quality Summary Table" - May 2008. For the parameters tested, results are generally categorized by health concerns. Some parameters have no limit value denoted because: a) currently available data indicates no health risk, b) the compound is not permitted in Canada, or c) it refers to a family of compounds.

CLIENT SAMPLE ID	HEALTH	HARDNESS
WIN 19325	Acceptable	Moderate

TEST METHODS:

(Continued)

Anna Becalska, PhD
Coordinator, Trace Metals

4606 Canada Way, Burnaby, BC V5G 1K5
Tel: 604 734 7276 Fax: 604 731 2386

Anions in Water by Ion Chromatography - was determined based on Method 4110 in Standard Methods (21st Edition) and EPA Method 300.0 (Revision 2.1).

Ammonia in Water - was performed using Flow Injection Analysis where the aqueous sample is injected into a carrier stream, which merges a sodium hydroxide stream. Gaseous ammonia is formed, which diffuses through a gas permeable membrane into an indicator stream. This indicator stream is comprised of a mixture of acid-base indicators, which will react with the ammonia gas; resulting in a colour shift which is measured photometrically @ 590 nm.

Sulfide in Water - was performed based on Method 4500-S2 D in Standard Methods (21st Edition) and Method X031 in the BC Laboratory Manual (2005).

Total Kjeldahl Nitrogen in Water - was determined based on Method 4500-N in Standard Methods (21st Edition) and Method X325 in the BC Laboratory Manual (2005).

Total Organic Carbon in Water - was determined based on Method 5310 A and B in Standard Methods (21st Edition) and Method X314 in the BC Laboratory Manual (2005).

Conventional Parameters - analyses were performed using procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual for the Analysis of Water, Wastewater, Sediment and Biological Materials", (2005 edition) Province of British Columbia and "Standard Methods for the Examination of Water and Wastewater" (21st Edition), published by the American Public Health Association.

Conventional Parameters - Victoria Laboratory (1104 - 4464 Markham Street, Victoria, BC V8Z 7X8): - Analyses performed at Cantest's Victoria facility follow procedures based on those described in the most current editions of "British Columbia Environmental Laboratory Manual" (2005) and/or "Standard Methods for the Examination of Water and Wastewater" (21st Edition).

Langelier Saturation Index - analysis was performed based on Standard Methods for the Examination of Water and Wastewater (21st Edition).

Mercury in Water - analysis was performed using procedures based on U. S. EPA Method 245.7, oxidative digestion using bromination, and analysis using Cold Vapour Atomic Fluorescence Spectroscopy.

Metals in Water - analysis was performed using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP), Inductively Coupled Plasma-Mass Spectroscopy (ICP/MS). NOTE: If Sulphur is included in this report, only non-acid volatile sulphur is reported.

Iron Bacteria - Victoria Laboratory (1104 - 4464 Markham Street, Victoria, BC V8Z 7X8) - analysis was performed using procedures based on Lab-BART test for Iron-Related Bacteria, which can detect Iron-oxidizing and Iron-reducing bacteria. This is a presence/absence test that is observed for eight days. Comments regarding the assessment of risk potential are quoted from DBI Bart User Manual, 2004.

(Continued)

Microbiological Parameters - analyses were performed using procedures based on those described in "B. C. Environmental Laboratory Manual For the Analysis of Water, Wastewater, Sediment and Biological Materials" (2005 Edition), "Standard Methods for the Examination of Water and Wastewater", 21st Edition (2005) and Colilert Quanti-tray Standard Operating Procedure. Results are reported as Most Probable Number(MPN) per unit volume. <1 MPN is equivalent to "Absent". Analysis was performed at CANTEST Ltd - Victoria Laboratory (1104 - 4464 Markham Street, Victoria, BC V8Z-7X8).

Microbiological Parameters - analyses were performed using procedures based on those described in "B. C. Environmental Laboratory Manual For the Analysis of Water, Wastewater, Sediment and Biological Materials" (2005 Edition) and "Standard Methods for the Examination of Water and Wastewater", 21st Edition. Analysis was performed at CANTEST Ltd. Victoria Laboratory (1104 - 4464 Markham Street, Victoria, BC, V8Z 7X8).

Sulphur Reducing Bacteria - Victoria Laboratory (1104 - 4464 Markham Street, Victoria, BC V8Z 7X8) - analysis was performed using procedures based on the Lab-BART test for Sulfate-reducing bacteria. This is a presence/absence test that is observed for eight days. Comments regarding the assessment ofrisk potential are quoted from DBI-BART User Manual, 2004.

TEST RESULTS:

(See following pages)

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Potability (Aesthetic Criteria) in Water

CLIENT SAMPLE IDENTIFICATION:		WIN 19325	Aesthetic Objective	UNITS
DATE SAMPLED:		Jan 29/10		
CANTEST ID:		1001290186		
Conventional Parameters				
Dissolved Chloride	Cl	7.29	250	mg/L
Dissolved Sulphate	SO4	6.11	500	mg/L
Sulphide	S	< 0.05	0.05	mg/L
Conventional Parameters-Victoria Laboratory-				
pH, Laboratory		7.6	6.5 - 8.5	pH units
True Color		< 5	15	CU
Turbidity		0.50	-	NTU
Total Dissolved Solids		175	500	mg/L
Alkalinity Total 4.5		123	-	mg/L
Bicarbonate Alkalinity	HCO3	150	-	mg/L
Carbonate Alkalinity	CO3	< 2	-	mg/L
Hydroxide Alkalinity	OH	< 2	-	mg/L
Total Metals Analysis				
Copper	Cu	0.0009	1.0	mg/L
Iron	Fe	< 0.05	0.3	mg/L
Manganese	Mn	**0.06 X**	0.05	mg/L
Sodium	Na	14.9	200	mg/L
Zinc	Zn	< 0.005	5	mg/L

mg/L = milligrams per liter
NTU = nephelometric turbidity units
< = Less than reporting limit
X = Result is outside the Aesthetic Objective

CU = color units

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Potability (Health Criteria at Point of Use) in Water

CLIENT SAMPLE IDENTIFICATION:		WIN 19325		
DATE SAMPLED:		Jan 29/10	Max. Acceptable Concentration	UNITS
CANTEST ID:		1001290186		
Conventional Parameters				
Hardness (Total)	CaCO3	107	-	mg/L
Dissolved Fluoride	F	0.28	1.5	mg/L
Dissolved Sulphate	SO4	6.11	-	mg/L
Ammonia Nitrogen	N	0.04	-	mg/L
Conventional Parameters-Victoria Laboratory-				
Conductivity		277	-	µS/cm
Nitrate by UV	NO3	< 0.04	10.0	mg/L
Nitrite	N	< 0.002	1.0	mg/L
Total Metals Analysis				
Aluminum	Al	0.012	-	mg/L
Antimony	Sb	< 0.0005	0.006	mg/L
Arsenic	As	< 0.001	0.010	mg/L
Barium	Ba	0.019	1.0	mg/L
Boron	B	2.03	5	mg/L
Cadmium	Cd	< 0.00005	0.005	mg/L
Calcium	Ca	33.1	-	mg/L
Chromium	Cr	< 0.001	0.05	mg/L
Lead	Pb	< 0.00025	0.01	mg/L
Magnesium	Mg	5.84	-	mg/L
Mercury	Hg	< 0.02	1	µg/L
Potassium	K	0.9	-	mg/L
Selenium	Se	< 0.001	0.01	mg/L
Silver	Ag	< 0.0002	-	mg/L
Uranium	U	< 0.00025	0.02	mg/L
Microbiological Analysis-Victoria Laboratory-				
Total Coliform		< 1	not detected	MPN/100mL
E. coli		< 1	not detected	MPN/100mL

mg/L = milligrams per liter
µg/L = micrograms per liter
< = Less than reporting limit

µS/cm = microsiemens per centimeter
MPN/100mL = Most Probable Number / 100 mL

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Conventional Parameters in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Total Organic Carbon C	Total Kjeldahl Nitrogen N	Total Organic Nitrogen N
WIN 19325	Jan 29/10	1001290186	<	<	<
REPORTING LIMIT			1	0.2	0.2
UNITS			mg/L	mg/L	mg/L

mg/L = milligrams per liter
< = Less than reporting limit

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Metals Analysis in Water

CLIENT SAMPLE IDENTIFICATION:		**WIN 19325**	
SAMPLE PREPARATION:		TOTAL	
DATE SAMPLED:		Jan 29/10	REPORTING LIMIT
CANTEST ID:		1001290186	
Beryllium	Be	<	0.0005
Bismuth	Bi	<	0.0005
Cesium	Cs	<	0.0005
Cobalt	Co	<	0.0005
Lanthanum	La	<	0.0005
Lithium	Li	0.004	0.0005
Molybdenum	Mo	0.001	0.0005
Nickel	Ni	<	0.001
Phosphorus	P	<	0.075
Rhenium	Re	<	0.0005
Rubidium	Rb	0.0008	0.0005
Silicon	Si	10.8	0.25
Strontium	Sr	0.283	0.0005
Sulphur	S	<	5
Tellurium	Te	<	0.001
Thallium	Tl	<	0.0001
Thorium	Th	<	0.00025
Tin	Sn	<	0.0005
Titanium	Ti	<	0.001
Tungsten	W	<	0.0005
Vanadium	V	0.0009	0.0005
Zirconium	Zr	<	0.0005

Results expressed as milligrams per liter (mg/L)
< = Less than reporting limit

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Microbiological Analysis-Victoria Laboratory- in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Iron-related Bacteria	Heterotrophic Plate Count	Sulphate-reducing Bacteria
WIN 19325	Jan 29/10	1001290186	9000	3	<
REPORTING LIMIT			25	1	200
UNITS			CFU/mL	Col./1 mL	CFU/mL

CFU/mL = Colony Forming Units per mL
< = Less than reporting limit

Col./1 mL = Colonies per 1 mL

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Langelier Saturation Index in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CANTEST ID	Saturation Index at 4.4C	Saturation Index at 60C
WIN 19325	Jan 29/10	1001290186	-0.71	0.33
REPORTING LIMIT			-	-
UNITS			SI 4.4C	SI 60C

SI 4.4C = Saturation Index at 4.4C

SI 60C = Saturation Index at 60C

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Batch Quality Control for Conventional Parameters in Water

Parameter		QC Type	QC Result	Units	Lower Limit	Upper Limit
Dissolved Fluoride	F	Dionex Certified Standard	98.5	% Recovery	90	110
Dissolved Chloride	Cl	Dionex Certified Standard	102.0	% Recovery	90	110
		Duplicate	0.0	R.P.D.	0	12
		Duplicate	0.6	R.P.D.	0	12
		Duplicate	0.9	R.P.D.	0	12
		Duplicate	2.1	R.P.D.	0	12
		Duplicate	4.2	R.P.D.	0	12
		Duplicate	4.4	R.P.D.	0	12
Dissolved Sulphate	SO4	Dionex Certified Standard	92.7	% Recovery	90	110
		Duplicate	0.5	R.P.D.	0	10
		Duplicate	0.6	R.P.D.	0	10
		Duplicate	0.7	R.P.D.	0	10
		Duplicate	0.8	R.P.D.	0	10
Total Organic Carbon	C	Blank	< 1	mg/L	0	1
		Certified Standard	98.2	% Recovery	93	109
		Duplicate	NC	R.P.D.	0	12
Ammonia Nitrogen	N	Blank	< 0.01	mg/L	0	0.01
		Spike	99.0	% Recovery	70	132
		Spike	107.0	% Recovery	70	132
		Duplicate	0.0	R.P.D.	0	20
		Duplicate	PASS	R.P.D.	0	20
Total Kjeldahl Nitrogen	N	Blank	< 0.2	mg/L	0	0.2
		Spike	107.0	% Recovery	66	124
		Spike	108.0	% Recovery	66	124
		Duplicate	0.0	R.P.D.	0	20
		Duplicate	NC	R.P.D.	0	20

mg/L = milligrams per liter
< = Less than reporting limit
R.P.D. = Relative Percent Difference
PASS = Duplicate sample results were in the range of one to five times the detection limit. R.P.D. calculation is not applicable in this range. Acceptance criteria is a maximum difference between the duplicates equivalent to the value of the detection limit.
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Thurber Engineering Ltd.

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Batch Quality Control for Total Metals Analysis in Water (QC# 132125)

Parameter		Duplicate (R.P.D.) 1001290129	Duplicate Limits	Duplicate (R.P.D.) 1001290186	Duplicate Limits	ICPMS (Elan) Spike (% Recovery) 1001290019	ICPMS (Elan) Spike Limits
Aluminum	Al	NC	20	PASS	20	110	70 - 130
Antimony	Sb	NC	20	NC	20	-	-
Arsenic	As	NC	20	NC	20	94	80 - 118
Barium	Ba	NC	20	0	20	86	70 - 130
Beryllium	Be	NC	20	NC	20	107	79 - 123
Boron	B	-	-	-	-	100	70 - 130
Cadmium	Cd	NC	20	NC	20	91	74 - 124
Calcium	Ca	NC	20	1.2	20	-	-
Chromium	Cr	NC	20	NC	20	92	70 - 130
Cobalt	Co	NC	20	NC	20	90	76 - 126
Copper	Cu	NC	20	PASS	20	97	77 - 125
Iron	Fe	NC	20	NC	20	96	70 - 130
Lead	Pb	NC	20	NC	20	94	77 - 124
Lithium	Li	NC	20	2.5	20	-	-
Magnesium	Mg	NC	20	1	20	-	-
Manganese	Mn	NC	20	0	20	76	69 - 131
Molybdenum	Mo	NC	20	PASS	20	96	68 - 118
Nickel	Ni	NC	20	NC	20	98	77 - 123
Sulphur	S	NC	20	NC	20	-	-
Selenium	Se	NC	20	NC	20	81	70 - 130
Silver	Ag	NC	20	NC	20	90	70 - 130
Sodium	Na	3.4	20	0	20	-	-
Strontium	Sr	NC	20	1.4	20	87	70 - 130
Thallium	Tl	NC	20	NC	20	-	-
Thorium	Th	NC	20	NC	20	-	-
Tin	Sn	NC	20	NC	20	-	-
Uranium	U	-	-	-	-	92	65 - 133
Vanadium	V	-	-	-	-	90	75 - 123
Zinc	Zn	NC	20	NC	20	93	70 - 130
Zirconium	Zr	NC	20	NC	20	-	-

mg/L = milligrams per liter
R.P.D. = Relative Percent Difference
PASS = Duplicate sample results were in the range of one to five times the detection limit. R.P.D. calculation is not applicable in this range. Acceptance criteria is a maximum difference between the duplicates equivalent to the value of the detection limit.
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Batch Quality Control for Total Metals Analysis in Water (QC# 132125)

Parameter		ICPMS Elan Lab Fortified Blk (% Recovery)	ICPMS Elan Lab Fortified Blk Limits	Total Blank (mg/L)	Total Blank Limits
Aluminum	Al	95	78 - 122	< 0.001	0.015
Antimony	Sb	90	75 - 117	< 0.0001	0.001
Arsenic	As	85	72 - 114	< 0.0002	0.001
Barium	Ba	95	81 - 119	< 0.0002	0.001
Beryllium	Be	95	73 - 115	< 0.0001	0.001
Cadmium	Cd	90	78 - 116	< 0.00001	0.001
Chromium	Cr	90	83 - 119	< 0.0002	0.001
Cobalt	Co	95	85 - 119	< 0.0001	0.001
Copper	Cu	100	85 - 120	< 0.0001	0.001
Iron	Fe	100	50 - 150	-	-
Lead	Pb	94	80 - 116	< 0.00005	0.001
Lithium	Li	-	-	< 0.0001	0.001
Manganese	Mn	90	82 - 120	< 0.0001	0.001
Molybdenum	Mo	95	82 - 114	< 0.0001	0.001
Nickel	Ni	100	78 - 118	< 0.0002	0.001
Potassium	K	-	-	< 0.01	0.05
Selenium	Se	80	58 - 120	< 0.0002	0.001
Silver	Ag	92	85 - 117	< 0.00004	0.001
Strontium	Sr	95	83 - 115	-	-
Thallium	Tl	90	86 - 118	< 0.00002	0.001
Thorium	Th	-	-	< 0.00005	0.0005
Tin	Sn	-	-	< 0.0001	0.005
Uranium	U	-	-	< 0.00005	0.0005
Vanadium	V	-	-	< 0.0001	0.001
Zinc	Zn	85	64 - 126	< 0.001	0.01
Zirconium	Zr	-	-	< 0.0001	0.01

mg/L = milligrams per liter

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Batch Quality Control for Total Metals Analysis in Water (QC# 132182)

Parameter	Duplicate (R.P.D.) 1001280119	Duplicate Limits	Spike (% Recovery) 1001280119	Spike Limits
Mercury Hg	NC	20	95	70 - 128

ug/L = micrograms per liter
R.P.D. = Relative Percent Difference
NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Instrument Quality Control for the PSA Mercury Analyzer-AF (QC# 255424)

QC Type: Calibration Verification

Parameter	% Recovery	Limits
Mercury Hg	96	90 - 110

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Instrument Quality Control for the Perkin Elmer Elan in TM (QC# 255439)

QC Type: Cert. Std. HPS-TMA ICPMS

Parameter		% Recovery	Limits
Aluminum	Al	92	79 - 121
Antimony	Sb	100	70 - 116
Arsenic	As	100	88 - 108
Barium	Ba	102	79 - 121
Boron	B	98	72 - 144
Cadmium	Cd	101	89 - 111
Chromium	Cr	92	83 - 119
Cobalt	Co	94	83 - 119
Copper	Cu	104	86 - 116
Iron	Fe	80	75 - 137
Lead	Pb	103	88 - 114
Manganese	Mn	92	86 - 124
Molybdenum	Mo	94	86 - 108
Nickel	Ni	102	82 - 119
Selenium	Se	100	86 - 114
Silver	Ag	88	84 - 120
Strontium	Sr	96	87 - 117
Thallium	Tl	99	80 - 120
Vanadium	V	92	84 - 120
Zinc	Zn	100	90 - 114

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Batch Quality Control Frequency Summary

Total Metals Preparation (Batch# 132125)

QC Type	No. Samples
ICPMS (Elan) Spike	1
ICP Spike Vista ICAP	1
ICPMS Elan Lab Fortified Blk	1
Total Blank	2
Duplicate	3

Mercury Water Bromination Prep (Batch# 132182)

QC Type	No. Samples
Duplicate	3
Spike	3

Water Lab Ion Chromatography (Batch# 132199)

QC Type	No. Samples
Blank	2
Duplicate	6

TKN Preparation (Batch# 132337)

QC Type	No. Samples
Blank	1
Duplicate	2
Spike	2

Ammonia Water/Lq Auto Analyzer (Batch# 132346)

QC Type	No. Samples
Blank	1
Duplicate	2
Spike	2

(Continued on next page)

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Batch Quality Control Frequency Summary

Iron & Sulphur Bacteria (VIC) (Batch# 132087)

QC Type	No. Samples
Batch Size	1

HPC by MF (Victoria Lab) (Batch# 132101)

QC Type	No. Samples
Batch Size	3

Colilert Quanti-Tray (VIC) (Batch# 132102)

QC Type	No. Samples
Batch Size	24

Total Metals Preparation (Batch# 132125)

QC Type	No. Samples
Batch Size	32

Mercury Water Bromination Prep (Batch# 132182)

QC Type	No. Samples
Batch Size	35

Water Lab Ion Chromatography (Batch# 132199)

QC Type	No. Samples
Batch Size	59

(Continued on next page)

REPORTED TO: Thurber Engineering Ltd

REPORT DATE: February 9, 2010

GROUP NUMBER: 110129065

CANTEST

Batch Quality Control Frequency Summary

TKN Preparation (Batch# 132337)

QC Type	No. Samples
Batch Size	25

Ammonia Water/Lq Auto Analyzer (Batch# 132346)

QC Type	No. Samples
Batch Size	21

4133 - Detailed Well Record

Well Tag Number: 4133

Owner: C BASTEDO

Address:

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 6306 Lot: 3
Township: Section: 41 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 18

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Unknown Constru
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 65 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1950-01-01 00:00:00.0

Driller: Tri-K Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 0 (Driller's Estimate)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
 WELL WAS ORIGINALLY 90' FILED WITH P.U.C. UNDER G. C. BASTEDO

LITHOLOGY INFORMATION:
From 0 to 0 Ft. IN GRAVEL

4135 - Detailed Well Record

Well Tag Number: 4135

Owner: F J GRANT

Address: ISABELLA PT RD

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: Lot:
Township: Section: Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 17

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Unknown Constru
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 12 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1950-01-01 00:00:00.0

Driller: Unknown
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 0 (Driller's Estimate)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level: 4 feet

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
"WELL WITHIN 5' OF STEAM, STREAM LOWEST IN 17 YEARS ON THE PROPERTY". MRS. GRANT

LITHOLOGY INFORMATION:

4151 - Detailed Well Record

Well Tag Number: 4151

Owner: S LAFORTUNE

Address: ISABELLA PT RD

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: 42 Plan: Lot:
Township: Section: Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 2

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Private Domestic
Observation Well Number:
Observation Well Status:
Construction Method: Dug
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 14 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1950-01-01 00:00:00.0

Driller: Unknown
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 0 (Driller's Estimate)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
TILL AT SURFACE IN AREA.

LITHOLOGY INFORMATION:

4200 - Detailed Well Record

Well Tag Number: 4200

Owner: H L ROLLAND

Address:

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: Lot:
Township: Section: 41 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 5

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Private Domestic
Observation Well Number:
Observation Well Status:
Construction Method: Dug
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 6 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag: N
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1950-01-01 00:00:00.0

Driller: Unknown
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: (Driller's Estimate)
Development Method:
Pump Test Info Flag: N
Artesian Flow: .01 U.S. Gallons per Minute
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM): N

Water Utility: N
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
SPRING OVER FLOWS MOST OF THE YEAR, GRAVITY FED TO THE HOUSE.

LITHOLOGY INFORMATION:
From 0 to 0 Ft. SHALE
From 0 to 6 Ft. SANDY BOTTOM

22563 - Detailed Well Record

Well Tag Number: 22563

Owner: ISABELLA RIDGE HOLDI

Address:

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 22460 Lot: 3
Township: Section: 41 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 7

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 145 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 3 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1969-07-07 00:00:00.0

Driller: Ken's Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 0 (Driller's Estimate)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
HAS LOCKED CAP. NOT IN USE.

LITHOLOGY INFORMATION:

From	0 to	2.5 Ft.	CALY & SHALE
From	2.5 to	25 Ft.	SANDSTONE & SOME SHALE WITH A TRACE OF
From	0 to	0 Ft.	WATER.
From	25 to	125 Ft.	SHALE WITH WATER INCREASE TO 1 GPM
From	125 to	134 Ft.	SHAEL WITH A GOOD STREAM OF WATER
From	134 to	145 Ft.	RESERVOIR.

22569 - Detailed Well Record

Well Tag Number: 22569

Owner: ISABELLA RIDGE HOLDI

Address:

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 22460 Lot: 1
Township: Section: Range:
Indian Reserve: Meridian: Block: 41
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 11

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 68 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 6 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1969-07-10 00:00:00.0

Driller: Ken's Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 2.5 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
HAS LOCKED CAP NOT IN USE

LITHOLOGY INFORMATION:

From	0 to	6 Ft.	CLAY & GRAVEL
From	6 to	28 Ft.	SHALE WITH A LITTLE WATER
From	28 to	58 Ft.	SHALE WITH WATER INCREASE 2.5 GPM
From	58 to	68 Ft.	RESERVOIR

22776 - Detailed Well Record

Well Tag Number: 22776

Owner: ISABELLA RIDGE HOLDI

Address: ISABELLA PT RD

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 22460 Lot: 2
Township: Section: Range:
Indian Reserve: Meridian: Block: 41
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 30

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 120 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 4 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1969-09-07 00:00:00.0

Driller: Ken's Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 8 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:

LITHOLOGY INFORMATION:

28476 - Detailed Well Record

Well Tag Number: 28476

Owner: J KILGOUR

Address: ISABELLA PT RD

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 2716 Lot: 3
Township: Section: 42 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 14

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Unknown Constru
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 295 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 103 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1973-07-25 00:00:00.0

Driller: Ken's Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: .5 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level: 205 feet

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
ORIGINAL WELL DRILLED BY DEN'S 14/07/69

LITHOLOGY INFORMATION:

From	0	to	60 Ft.	HOLE DRILLED 4 YEARS AGO
From	60	to	103 Ft.	BROWN SAND & GRAVEL
From	103	to	295 Ft.	BLACK SHALE: FRACTURE @ 180' .25 GPM
From	0	to	0 Ft.	FRACTURE @ 270' 1 GPM
From	0	to	0 Ft.	
From	0	to	6 Ft.	CLAY
From	6	to	18 Ft.	BLUE CLAY & GRAVEL
From	18	to	30 Ft.	CLAY
From	30	to	36 Ft.	GRAVEL
From	36	to	45 Ft.	PURE FINE SAND
From	45	to	60 Ft.	MORE GRAVEL

42998 - Detailed Well Record

Well Tag Number: 42998

Owner: DAN KING

Address: ROLAND RD

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 22715 Lot: 6
Township: Section: 41 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 23

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 300 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 101 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1979-08-01 00:00:00.0

Driller: Tri-K Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: .5 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level: 100 feet

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
SULPHUR SMELLL HANGS AROUND. IT STILL GETS CLOUDY - FROM TIME TO TIME

LITHOLOGY INFORMATION:
From 0 to 100 Ft. SAND & ROCKS
From 100 to 101 Ft. SOME GRAVEL
From 101 to 0 Ft. SHALE WATER .25 GPM
From 101 to 225 Ft. SHALE
From 225 to 226 Ft. FRACTURE WATER .75 GPM

47339 - Detailed Well Record

Well Tag Number: 47339

Owner: R THORN

Address: MOUNTAIN RD

Area:

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 27972 Lot: 1
Township: Section: 41 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 27

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Unknown Well Use
Observation Well Number:
Observation Well Status:
Construction Method: Unknown Constru
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 125 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 0 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1981-03-04 00:00:00.0

Driller: Tri-K Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 10 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:

LITHOLOGY INFORMATION:

From	0 to	65 Ft.	HARD VOLCANIC ROCK
From	65 to	68 Ft.	SEAM OF IRON
From	68 to	100 Ft.	SOFTER CONGLOMERATE TYPE ROCK
From	0 to	0 Ft.	
From	0 to	0 Ft.	WATER AT: 70' - TRACE
From	0 to	0 Ft.	95' - 3 GPM
From	0 to	0 Ft.	105' - 7 GPM

64792 - Detailed Well Record

Well Tag Number: 64792

Owner: FLETCHER MR

Address: ROLAND ROAD

Area: SALT SPRING ISLAND

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 16708 Lot: 1
Township: Section: 41 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALT SPRING ISLAND
BCGS Number (NAD 27): 092B073243 Well: 58

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use:
Observation Well Number:
Observation Well Status:
Construction Method:
Diameter: 0.0 inches
Casing drive shoe:
Well Depth: 200 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag: N
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1990-12-11 00:00:00.0

Driller: Tri-K Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 1 (Driller's Estimate) U.S. Gallons per Minute
Development Method:
Pump Test Info Flag: N
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
 CASING

LITHOLOGY INFORMATION:

From	0 to	200 Ft.	DEPTH OF WELL 90' CASING
From	0 to	40 Ft.	SAND GRAVEL
From	0 to	0 Ft.	LINER IS RECOMMENDED
From	90 to	200 Ft.	SHALE
From	0 to	0 Ft.	1 GPM AT 180'
From	40 to	90 Ft.	TILL SAND

70508 - Detailed Well Record

Well Tag Number: 70508

Owner: CEDARS OF TUAM

Address: 193 ROLAND RD

Area: SALTSPRING

WELL LOCATION:
Land District
District Lot: Plan: Lot:
Township: Section: Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 51

Class of Well: Water supply
Subclass of Well: Domestic
Orientation of Well: Vertical
Status of Well: New
Well Use: Water Supply System
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: 6.0 inches
Casing drive shoe:
Well Depth: 90 feet
Elevation: feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag: N
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1989-08-30 00:00:00.0

Driller: Fred's Drilling
Well Identification Plate Number: 18282
Plate Attached By: PUBLIC HEALTH OFFICER
Where Plate Attached: TOP OF THE WELL CASING

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 1.9 (Driller's Estimate) Gallons per Minute (U.S./Imperial)
Development Method:
Pump Test Info Flag: Y
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name: CEDARS OF TUAM WATER SYSTEM
Water Supply System Well Name: WELL 1

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
STEEL CASING,0.0 TO 56.0,0.0 TO 18.0,.250 THICK,.322 THICK,17 LBS,28 LBS PUMP TEST RATE 2 USGM,95 FT AFTER 1 HRS

LITHOLOGY INFORMATION:

From	0 to	2 Ft.	TOP SOIL - SILTY SAND & COBBLES
From	2 to	3 Ft.	PACKED SAND & GRAVEL FIRST 3 EXCAVATED B
From	0 to	0 Ft.	BACK HOE
From	3 to	12 Ft.	PACKED SILTY SAND & GRAVEL WITH SOME COB
From	12 to	27 Ft.	GRAVELLY TILL WITH COBBLES BROWN WASH
From	63 to	0 Ft.	SHALE ROCK WITH LAYERS OF SANDSTONE
From	32 to	46 Ft.	BROWN SILTY SAND & GRAVEL - A LITTLE WAT
From	46 to	53 Ft.	PACKED SILTY SAND - GREY
From	53 to	54 Ft.	SAND & COARSE GRAVEL - LITTLE WATER
From	54 to	63 Ft.	BROKEN SHALE - BEDROCK
From	27 to	32 Ft.	TILL/BOULDERS - BLUE GRAY WASH

80896 - Detailed Well Record

Well Tag Number: 80896

Owner: HENERY PICKSTONE

Address: 847 ISABELLA POINT ROAD

Area: SALT SPRING ISLAND

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 33794 Lot: B
Township: Section: 41 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALT SPRING ISLAND
BCGS Number (NAD 27): 092B073243 Well: 49

Class of Well: Water supply
Subclass of Well: Domestic
Orientation of Well:
Status of Well: New
Well Use: Private Domestic
Observation Well Number:
Observation Well Status:
Construction Method:
Diameter: 8 inches
Casing drive shoe:
Well Depth: 180 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag: N
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1994-11-16 00:00:00.0

Driller: Well-Tec Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 4 (Driller's Estimate) U.S. Gallons per Minute
Development Method:
Pump Test Info Flag: N
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft):
Thickness (in):

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size
0	0		0
0	0		0

Casing from	to feet	Diameter	Material	Drive Shoe
null	null	0	null	null

GENERAL REMARKS:
 SOUTH SALT SPRING ISLAND 4 GPM @ 138'

LITHOLOGY INFORMATION:

From	0 to	10 Ft.	SAND/GRAVEL
From	10 to	90 Ft.	BLACK/GREEN BEDROCK
From	90 to	115 Ft.	WHITE/GRAY
From	115 to	165 Ft.	BLACK/GRAY
From	165 to	175 Ft.	SILTSTONE COAL STREAK
From	175 to	180 Ft.	GRAY/BLACK

81056 - Detailed Well Record

Well Tag Number: 81056

Owner: DOROTHY DRUBEK

Address: 215 MEADOW DRIVE

Area: ISABELLA POINT

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 49877 Lot: 12
Township: Section: 42 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 38

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Private Domestic
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: UNK inches
Casing drive shoe:
Well Depth: 125 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 0 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1989-08-02 00:00:00.0

Driller: Tri-K Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 12 (Driller's Estimate) U.S. Gallons per Minute
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft): 0 feet
Thickness (in):
Liner from To: feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size
0	0		0
0	0		0
0	0		0
0	0		0

Casing from	to feet	Diameter	Material	Drive Shoe
0	0	0	null	null

GENERAL REMARKS:
12' CASING

LITHOLOGY INFORMATION:
From 0 to 22 Ft. CONGLOMERATED BEDROCK
From 22 to 24 Ft. CONGLOMERATED BEDROCK FRAC AREA 22-24' WATER 2 GPM
From 24 to 101 Ft. CONGLOMERATED BEDROCK
From 101 to 104 Ft. CONGLOMERATED BEDROCK BROKEN FORMATION 101-104' WATER 8 GPM
From 104 to 125 Ft. CONGLOMERATED BEDROCK WATER INCREASED TO 12 GPM

81071 - Detailed Well Record

Well Tag Number: 81071

Owner: STANERIC HOLDINGS

Address: 142 MEADOW DRIVE

Area: ISABELLA POINT

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 49877 Lot: 1
Township: Section: 42 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 33

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Private Domestic
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: UNK inches
Casing drive shoe:
Well Depth: 150 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 0 feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1989-08-29 00:00:00.0

Driller: Tri-K Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 7 (Driller's Estimate) U.S. Gallons per Minute
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft): 0 feet
Thickness (in):
Liner from To: feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size
0	0		0
0	0		0
0	0		0
0	0		0

Casing from	to feet	Diameter	Material	Drive Shoe
0	0	0	null	null

GENERAL REMARKS:
LOCATION ON LOT UNKNOWN

LITHOLOGY INFORMATION:

From	0 to	10 Ft.	SOFT GRANITE
From	10 to	38 Ft.	HARD GRAY GRANITE
From	38 to	55 Ft.	GREEN GRANITE TRACES OF FELDSPAR
From	55 to	73 Ft.	GREEN GRANITE TRACES OF FELDSPAR FRAC @ 73' 2 GPM
From	73 to	95 Ft.	GREEN GRANITE
From	95 to	120 Ft.	GREEN GRANITE FRACTURED 5 GPM
From	120 to	150 Ft.	SOFT GREY GRANITE

81072 - Detailed Well Record

Well Tag Number: 81072

Owner: JOAN O'CONNOR

Address: 186 MEADOW DRIVE

Area: ISABELLA POINT

WELL LOCATION:
COWICHAN Land District
District Lot: Plan: 49877 Lot: 2
Township: Section: 42 Range:
Indian Reserve: Meridian: Block:
Quarter:
Island: SALTSPRING
BCGS Number (NAD 27): 092B073243 Well: 34

Class of Well:
Subclass of Well:
Orientation of Well:
Status of Well: New
Well Use: Private Domestic
Observation Well Number:
Observation Well Status:
Construction Method: Drilled
Diameter: UNK inches
Casing drive shoe:
Well Depth: 225 feet
Elevation: 0 feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: 10 feet
Lithology Info Flag: N
File Info Flag: N
Sieve Info Flag: N
Screen Info Flag: N

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 1989-08-29 00:00:00.0

Driller: Tri-K Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 2.5 (Driller's Estimate) U.S. Gallons per Minute
Development Method:
Pump Test Info Flag: N
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID: E268817
Water Chemistry Info Flag:
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag: N
Material:
Method:
Depth (ft): 0 feet
Thickness (in):
Liner from To: feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size
0	0		0
0	0		0
0	0		0
0	0		0

Casing from	to feet	Diameter	Material	Drive Shoe
0	0	0	null	null

GENERAL REMARKS:
16' CASING

LITHOLOGY INFORMATION:

From	0 to	10 Ft.	OVERBURDEN
From	10 to	16 Ft.	COAL SOFT
From	16 to	123 Ft.	SOFT COAL - .5 GPM
From	123 to	168 Ft.	GRAY GRANITE SEAMS GREEN GRANITE & FELDSPAR
From	168 to	172 Ft.	SOFT COAL .5 GPM
From	172 to	201 Ft.	GREY GRANITE TRACES OF FELDSPAR
From	201 to	205 Ft.	SOFT COAL - 1.5 GPM
From	205 to	225 Ft.	HARD GRAY GRANITE SEAMS OF FELDSPAR

93462 - Detailed Well Record

Well Tag Number: 93462

Owner: GATES

Address: 193 ROLAND ROAD

Area: SALT SPRING ISLAND

WELL LOCATION:
Land District
District Lot: Plan: Lot:
Township: Section: Range:
Indian Reserve: Meridian: Block:
Quarter:
Island:
BCGS Number (NAD 27): Well:

Class of Well: Water supply
Subclass of Well: Domestic
Orientation of Well: Vertical
Status of Well: New
Well Use: Private Domestic
Observation Well Number:
Observation Well Status:
Construction Method:
Diameter: inches
Casing drive shoe:
Well Depth: 300 feet
Elevation: feet (ASL)
Final Casing Stick Up: inches
Well Cap Type:
Bedrock Depth: feet
Lithology Info Flag:
File Info Flag:
Sieve Info Flag:
Screen Info Flag:

Site Info Details:
Other Info Flag:
Other Info Details:

Construction Date: 2005-07-20 00:00:00.0

Driller: Albert Kaye & Sons Drilling
Well Identification Plate Number:
Plate Attached By:
Where Plate Attached:

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield: 3.75 (Driller's Estimate) U.S. Gallons per Minute
Development Method:
Pump Test Info Flag:
Artesian Flow:
Artesian Pressure (ft):
Static Level:

WATER QUALITY:
Character:
Colour:
Odour:
Well Disinfected: N
EMS ID:
Water Chemistry Info Flag: N
Field Chemistry Info Flag:
Site Info (SEAM):

Water Utility:
Water Supply System Name:
Water Supply System Well Name:

SURFACE SEAL:
Flag:
Material:
Method:
Depth (ft):
Thickness (in):
Liner from To: feet

WELL CLOSURE INFORMATION:
Reason For Closure:
Method of Closure:
Closure Sealant Material:
Closure Backfill Material:
Details of Closure:

Screen from	to feet	Type	Slot Size

Casing from	to feet	Diameter	Material	Drive Shoe

GENERAL REMARKS:
ROTARY. MEASUREMENTS FROM GROUND LEVEL. FRACTURES: 86', 143', 170', 247', 271'. CASING: 79'. WATER AT TIME OF DRILLING: 1/2 GPM @ 85', 1 GPM @ 142', 2 1/4 GPM @ 246'.

LITHOLOGY INFORMATION:
From 0 to 76 Ft. overburden
From 76 to 300 Ft. shale

IRON BACTERIA REMOVAL REHABILITATION PROCEDURE "A"

1. Retain a *B.C. Qualified Well Driller, listed under the GWPR*[1] with extensive well rehabilitation experience to undertake the following procedure;
2. Confirm through measurement the depth of the well;
3. Mechanically scour the entire well using a suitable brushing technique to loosen and remove (air lift) iron bacteria growth until the water is relatively clear;
4. Install a suitable tremmie pipe to the bottom of each well;
5. At the surface prepare one or more well volumes of fresh water treated with a disinfectant solution (250 mg/l chlorine concentration of Sodium Hypochlorite (or equivalent) in accordance with the CGWA *Fact Sheet #4., Sect.4.0.*)[2] Specific requirements to be determined later;
6. Introduce the disinfectant solution through the tremmie pipe displacing the untreated well water out of the surface of the casing. Once the disinfectant has been placed into the well and the well water displaced (as shown by a significant concentration of disinfected water returning to the surface), using the drilling tools, enhance mixing and distribution of the treated water by mechanical means (surging, jetting etc.).
7. Allow the disinfectant solution to sit in each well for not less than 24 hrs;
8. Install a steam cleaned pump and riser pipe in the targeted well accordingly. The pump intake should be set as close as possible to the primary fracture(s) identified from the well log;
9. Flush the wells by pumping at the consultant's designated test rate until field testing indicates the water is continuous at <1 mg/l chlorine. During this process, the chlorinated water must be handled in an appropriate manner, to not endanger fish or other sensitive habitat. Permits or permission may be required from various government authorities;
10. Once the residual chlorine is removed (<1 mg/L) let the well sit for not less than 24 hours, then (flush) pump the well for 2 hours to take a sample of the water and test[3] the quality for the following parameters; pH, turbidity, iron bacteria, heterotrophic plate count, iron and manganese (total and dissolved metals), total coliform and E.coli;
11. Leave the pump in the well for two weeks. During this period purge/pump for 24 hours at the end of the first and second weeks to re-sample the water and analyze as noted above in 10;
12. Have the water quality results reviewed by the water purveyor, their consultants and other stakeholders;
13. Meet to discuss findings and proceed as results indicate.

[1] BC Ministry of Environment *Ground Water Protection Regulation*;
[2] Canadian Ground Water Association; *Guidelines for Sanitizing a Water Well*;
[3] Recommended laboratory is CanTest Ltd, Victoria, B.C., using the *BART* method for IRB determination.

bii/17-210-113_mem_IRON BACTERIA REMOVAL REHABILITATION PROCEDURE A.doc

TOWNSHIP (TENS / UNITS)	MERIDIAN	RANGE (TENS / UNITS)	SECTION (TENS / UNITS)	QUARTER (NE SE SW NW)	LAND DISTRICT (TENS / UNITS)

GROUND — WATER DIVISION, WATER INVESTIGATIONS BRANCH, DEPT. OF LANDS, FORESTS, and WATER RESOURCES, VICTORIA, B.C.

X8 Y3

LOCATION LOT 3 PL. 6306 SEC 41 COWICHAN DIST 15 #12
(COMPLETE LEGAL DESCRIPTION)

OWNER'S NAME C. BASTEDO ADDRESS FULFORD HBR.

DRILLER'S NAME TRI-K ADDRESS _____ DATE OF COMPLETION _____

DEPTH 165' ELEVATION OF COLLAR _____ CASING DIAM. _____ LENGTH _____ TYPE _____

METHOD OF DIGGING _____ SCREEN ☐ SIZE _____ LENGTH _____ TYPE _____

LOCATION OF SCREEN _____ DEVELOPED ☐ DESCRIBE _____

PERFORATED CASING ☐ LENGTH _____ LOCATION OF PERFORATIONS _____

GRAVEL PACK ☐ LENGTH _____ DIAM. _____ SIZE GRAVEL, ETC. _____

PUMP ☐ TYPE _____ POWER _____

CAPACITY _____ OTHER DATA _____

COSTS WELL _____ PUMP _____ PUMP HOUSE, ETC. _____

MAINTENANCE _____

DISTANCE TO WATER FROM TOP OF CASING _____ ☐ ESTIMATED ☐ MEASURED ELEVATION _____ FLUCTUATION _____

HIGH WATER _____ MONTH _____ LOW WATER _____ MONTH _____ OBSERVATION DATA ☐ FILE No. _____

WATER USE _____

MAX. RATE WITHDRAWAL ☐ ESTIMATED ☐ MEASURED _____

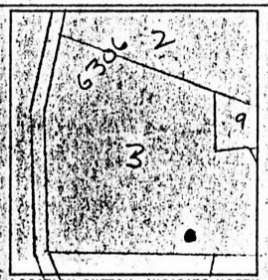
TEMPERATURE _____ PUMPS SAND ☐ _____

CLOGS SCREEN ☐ TYPE DEPOSIT _____ AQUIFER DATA _____

LICENSE No. _____ DATE LICENSE _____ AMOUNT _____

DATE APPLICATION _____ USE _____

"The attached information has been supplied gratuitously to the Province of British Columbia and has not been independently confirmed. Those persons relying on it do so at their own risk, and all persons to whom it is supplied should be cautioned against its use in making financial and other commitments. Comments on the well rec[illegible] may be obtained on request by contacting th[illegible] concerned."



LOCATION SKETCH—INDICATE NORTH

Sht3

SALTSPRING ISLAND

WILLIS CUNCLIFFE, TAIT WERE CONSULTING ENG BUT WE HAVE NO INFO ON WELL YIELD ETC.

P.UC NO. U-474

VISIrecord® 12708

MUNICIPALITY (TENS / UNITS)	WATER QUALITY	CAPACITY GPD.	SUPPLY AQUIFER (TENS / UNITS)	OTHER AQUIFER PRESENT (TENS / UNITS)	OTHER AQUIFER PRESENT (TENS / UNITS)
	☐ ANALYSIS ☐ SOFT ☐ HARD ☐ HIGH IRON ☐ HIGH SULPHUR ☐ SALTY ☐ ALKALINE ☐ SALINE ☐ POLLUTED ☐ INADEQUATE QUALITY	☐ DRY HOLE ☐ INADEQUATE QUANTITY ☐ PUMPING TEST ☐ 0 – 10^3 ☐ 10^3 – 10^4 ☐ 10^4 – 10^5 ☐ 10^5 – 10^6 ☐ 10^6			

METHOD	DEPTH	TYPE WELL	CHARACTER OF SUPPLY AQUIFER	WATER USE	RELIABILITY OF DATA
☐ DUG ☐ DRIVEN ☐ DRILLED ☐ JETTED ☐ BORED	☐ 0 – 25 ☐ 25 – 50 ☐ 50 – 100 ☐ 100 – 200 ☐ 200 – 400 ☐ > 400	☐ OBSERVATION ☐ ABANDONED ☐ DEVELOPED ☐ SCREEN ☐ PERF. CASING ☐ GRAVEL ENV. ☐ PUMP	☐ SAND ☐ GRAVEL ☐ TILL	☐ DOMESTIC ☐ GARDEN ☐ STOCK ☐ COOLING ☐ IRRIGATION ☐ INDUSTRIAL ☐ WATERWORKS	☐ GOOD ☐ FAIR ☐ POOR ☐ ROCK ☐ SPRING
		☐ FLOWING ☐ NON-FLOW ARTESIAN ☐ WATER TABLE ☐ PART CONFINED			

Sulphates Not detected Not detected

125 East 4th Ave., Vancouver 10, B. C. Phone 876-4111 — Telex 04-50353

WILLIS, CHIPLEY, TAIT, & COMPANY LTD.

Chemical Analysis

Vancouver Laboratory

APR 24 1969

FILE NO. C.3-W.2-69-5436

VICTORIA, B. C. DATE April 22 1969

FROM			
		WELL WAS ORIGINALLY	
		90'	
		in Gravel	

LAB.

COLIFORM ORGANISMS

TOTAL BACTERIA

COLOUR ODOUR

TASTE

PUMPING TEST SUMMARY

TEST BY

DATE FILE No.

SPECIFIC CAPACITY PERMIABILITY

STORAGE COEFF TRANSMISSIBILITY

REMARKS

"The attached information has been supplied gratuitously to the Province of British Columbia and has not been independently confirmed. Those persons relying on it do so at their own risk, and all persons to whom it is [illegible] should be cautioned against its use in [illegible] and other commitments. Co[illegible] may be obtained on [illegible] OTHER DATA [illegible] concerns.

SIZE ANALYSIS, ETC.

FILED WITH P.U.C.
UNDER G.C. BASTEDO

CARD BY BWD DATE FEB 4 1972

SOURCES INFORMATION FIELD SURVEY

YSIS	
	PPM
Carbonate Hard	
Magnesium Hard	
Fe	
SO_2	
Ca	
Mg	
Na	
K	
HCO_3	
CO_3	
Cl	
SO_4	
NO_3	
B	
E	
Total Dis-solids	
Total Alkalinity	
Suspended Solids	
Ph	

VISIrecord®

12717

125 East 4th Ave., Vancouver 10, B. C. Phone 876-4111 — Telex 04-50353

WILLIS, GUNLIFFE, TAIT,
& COMPANY LTD.

APR 24 1969
VICTORIA, B. C.
RECEIVED

REPORT OF	Chemical Analysis	FILE NO	C.3-W.2-69-5436
AT	Vancouver Laboratory	DATE	April 22, 1969
PROJECT	Water Samples	REPORT NO.	
REPORTED TO	Willis Gunliffe Tait & Co. Ltd. 1006 Government Street Victoria, B.C.	ORDER NO.	

We have analyzed two water samples submitted to us on April 17, 1969 and report as hereunder:

THE QUALITY OF WELL WATER MAY VARY OVER A PERIOD OF TIME AND THIS ANALYSIS IS RELEVANT ONLY TO THE TIME AND DATE OF SAMPLING. RESULTS OF THE ANALYSIS ARE DEPENDANT ON THE METHOD OF SAMPLING AND THESE RESULTS MAY NOT BE REPRESENTATIVE OF THE QUALITY OF THE GROUNDWATER PUMPED FROM THE WELL. THIS ANALYSIS MAY BE INCOMPLETE FOR SOME PURPOSES.

SAMPLE IDENTIFICATION

Sample No. 1 - A.C. Bastedo Well
Sample No. 2 - Braithwait Farm

TEST RESULTS

	Sample No. 1	Sample No. 2
pH	7.0	7.5
Colour (Pt-Co Scale)	Not detected	Not detected
Colour with Charcoal	Not detected	Not detected
Turbidity (SiO_2 Scale)	0.55 ppm	7.6 ppm
Suspended Matter	2.0 ppm	4.9 ppm
Alkalinity: Carbonate	Not detected	Not detected
Bicarbonate	76.0 ppm	35.0 ppm
Total Hardness (Soap Method)	46.3 ppm	32.5 ppm
Chlorides	6.0 ppm	5.0 ppm
Sulphates	Not detected	Not detected
Total Dissolved Solids	104.0 ppm	53.0 ppm
Volatile Solids	38.0 ppm	18.0 ppm
Fixed Solids	66.0 ppm	35.0 ppm
Calcium	15.5 ppm	9.0 ppm
Magnesium	6.9 ppm	2.4 ppm
Sodium	4.0 ppm	4.0 ppm
Potassium	Not detected	Not detected
Manganese	Not detected	Not detected

...2.

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TEST RESULTS - Cont'd

	Sample No. 1	Sample No. 2
Total Iron	0.08 ppm	0.24 ppm
Dissolved Iron	0.08 ppm	0.16 ppm
Total Aluminum	0.5 ppm	0.6 ppm
Dissolved Aluminum	0.5 ppm	0.5 ppm
Dissolved Silicon	1.36 ppm	1.36 ppm

REMARKS

The waters as represented by the submitted samples were found to meet the chemical requirements as recommended by the American Public Health Association for a drinking water.

WARNOCK HERSEY

W. Wong,
CHIEF CHEMIST

/jp

THE QUALITY OF WELL WATER MAY VARY OVER A PERIOD OF TIME AND THIS ANALYSIS IS RELEVANT ONLY TO THE TIME AND DATE OF SAMPLING. RESULTS OF THE ANALYSIS ARE DEPENDANT ON THE METHOD OF SAMPLING AND IN SOME CASES MAY NOT BE REPRESENTATIVE OF THE QUALITY OF THE GROUNDWATER PUMPED FROM THE WELL. THIS ANALYSIS MAY BE INCOMPLETE FOR SOME PURPOSES.

PITEAU ASSOCIATES
GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS

KAPILANO 100, SUITE 408
WEST VANCOUVER, B.C.
CANADA V7T 1A2
TELEPHONE (604) 926-8551
FAX 926-7286
TELEX 04-352896

DENNIS C. MARTI
R. ALLAN DAKIN
ALAN F. STEWART
FREDERIC B. CLA
TADEUSZ L. DAB

Our file: 89-141

May 10, 1989

Cedars of Tuam Waterworks District
186 Roland Road
Fulford Harbour, B.C.
V0S 1C0

Attention: Ms. Sylvia Bristoll

Dear Sirs:

Re: Cedars of Tuam Water Works District - Water Supply Improvements

As instructed at a meeting held in our offices on April 20, 1989, we have proceeded with assessment of the problem experienced by the Tuam Water Works system's source.

BACKGROUND

Based on information provided by you, we understand that the source is a water well that has a 90 feet deep bore and that it has produced a satisfactory yield ever since it was constructed in 1969. However, during the summers of 1987 and 1988, the yield appears to have declined and the water has been prone to bacterial contamination.

ASSESSMENT OF THE PROBLEM

Based on data provided by you and data on regional geology and water well logs obtained from government sources, we conclude that the existing well taps into a water bearing sand and gravel unit (an aquifer). You have also indicated that the well is located not far from a barn and that the well bore casing appears to be very rusty. As many of the well bores constructed in the 1960's were not constructed with good quality steel, we conclude that the well bore casing has corroded, and that bacteria associated with the nearby animals has entered the well via a crack in the casing. As bacteria cannot survive very long and cannot migrate very far in the ground, it is highly unlikely that the bacteria can have entered the well bore after flowing through the aquifer.

... 2

Cedars of Tuam Waterworks District
Attention: Ms. Sylvia Bristoll

 May 10, 1989

SUGGESTED SOLUTION

The well bore should be replaced with a new thicker and better grade of casing. This is a relatively simple operation that will not affect other parts of the well, such as the pump, well head and electrical controls. We recommend that the existing bore be abandoned and sealed, and that a new bore be constructed alongside and as close as possible to the existing bore. Practically speaking, this would involve sinking a new bore at a distance of up to five feet from the existing bore. The remainder of the well will essentially remain unchanged.

When the new bore is in place and the pump replaced, we recommend that the system be chlorinated and that a short (up to 24 hour) aquifer pump test be run, to ensure that it is operating satisfactorily. A water sample would then be taken and submitted to a laboratory for inorganic chemical and bacterialogical analyses. We feel very confident that results of this test will confirm that the water is potable and that the refurbishing of the existing well was completely successful.

We trust this is sufficient information for your current needs. Should you require further clarification, please do not hesitate to contact us.

Yours very truly,

PITEAU ASSOCIATES ENGINEERING LTD.

R. Allan Dakin, P.Eng.

RAD/jb

Att.

cc: Mr. Don White

PITEAU ASSOCIATES
GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS
215 - 260 WEST ESPLANADE
NORTH VANCOUVER, B.C.
CANADA V7M 3G7
TELEPHONE (604) 985-8551
FAX (604) 985-7288

Our file: 89-141

April 16, 1991 (Final Draft)
(First Draft: September 18, 1989)

DENNIS C MARTIN
R ALLAN DAKIN
ALAN F STEWART
FREDERIC D CLARIDGE
TADEUSZ L DABROWSKI

Cedars of Tuam Water Works District
Roland Road, R.R. #1
Fulford Harbour, B.C.
V0S 1C0

Attention: Mr. Jim Armstrong

Dear Sirs:

Re: Cedars of Tuam Water Works District - Water Supply Improvements

As authorized by the Cedars of Tuam Water Works District (the District) in their July 15, 1989 letter, Piteau Associates Engineering Ltd. (PAEL) have expedited maintenance of the well supplying the District. Work carried out as part of this maintenance has included reviewing relevant information regarding the hydrogeology at the site, drilling a replacement well shaft, and refurbishing the old well shaft.

BACKGROUND

The Cedars of Tuam Water Works District has obtained water from a well bore located approximately 150m southwest of Roland Road (Fig. 1) that had functioned satisfactorily for many years. Over a two year period to mid 1988, the well yield had apparently declined and the source was prone to contamination. As many of the well bores constructed in the 1960's were not constructed with good quality steel, it was concluded that the well bore casing had corroded, and that bacteria associated with nearby animals and surface runoff had entered the well. Based on these considerations, replacement of the well shaft was recommended by Hardy BBT Ltd. following a visit to the site and a review of data.

The log of the old well shaft was obtained from the Groundwater Division of the Ministry of Environment. Based on the very limited information provided in this log and a summary of chemical analyses of groundwater, the shaft had apparently been drilled in 1969 by Tri-K Drilling to a depth of 90 feet. Based on conversations with the drilling firm, we believe that the lower portion of the well bore had been backfilled with coarse drain rock to a depth of 19.8m (65 feet). Details concerning well construction and initial yield were not available.

Cedars of Tuam Water Works District
Attention: Mr. Jim Armstrong

DRILLING OF A NEW SHAFT

The new well shaft was drilled about 5 feet across from the old shaft between August 3 and 21, 1989 by Fred's Drilling of Langley, B.C. A cable tool type drilling rig was used to drill to a depth of 5.5m (18 feet) with 200mm diameter steel surface casing. The hole was extended with a 150mm diameter casing, 0.6m into bedrock, which was encountered at a depth of 16.5m. The hole was drilled open hole in bedrock to a final depth of 27.4m (980 feet). As indicated in the attached diagram of the new shaft (Fig. 2), the material encountered during drilling consisted of dense silty sand and gravel with a layer of glacial till, overlying shale bedrock with sandstone layers. The driller reported that a layer of sand and gravel between 16.1 and 16.5m (43 and 54 feet) produced about 0.06 L/s (1 US gallon per minute). After this zone had been isolated by the 150mm drilling casing which had been extended 0.6m into the bedrock, and the hole had been drilled to a final depth of 27.4m, the driller reported that groundwater was bailed from the uncased shale bedrock between depths of 17 and 27.4m, at approximately 0.13 L/s (2 USgpm).

(54') ? 90' 90'

The static water level in the new shaft was measured to be 10.2m below the top of the 150mm diameter well casing on August 23, 1989. The top of the well casing is approximately level with the final ground level at the well site, and is about level with the top of the old shaft.

Although it was recommended by PAEL that the new shaft should be pump tested to confirm its yield, and that a sample of the groundwater should be obtained for inorganic chemical analysis, this work has not been carried out by the District. It is our understanding that this work may be carried out by the District at a later time.

A copy of the driller's log for the new well shaft is included with this letter.

REFURBISHING OF OLD SHAFT

Fred's Drilling

As the bailed yield from the new shaft was less than expected, an effort was made to refurbish the old shaft on August 22 and 23, 1989. The existing well pump was removed, and the driller attempted to bail the drain rock fill from the shaft in order to extend it down to its original depth of 27.4m. However, due to instability of the shaft walls, it was not possible to deepen the hole beyond 21.3m.

70'

Cedars of Tuam Water Works District
Attention: Mr. Jim Armstrong

69.7m 4"±

In order to stabilize the walls of the old shaft, and to provide for a satisfactory sanitary well seal, a 113mm diameter PVC casing was installed in the shaft; this casing was slotted between depths 8.4 and 17.7m. The annulus between the shaft wall and the plastic casing was filled with sand up to a depth of about 6.7m below ground. The well pump was reinstalled into the older well, along with a 19mm diameter plastic pipe to allow measurement of the water level in the shaft without catching on the pump or sides of the casing. A diagram of the refurbished shaft is included with this letter (Fig. 3).

After the well pump had been reinstalled inside the plastic liner, a short pumping test was conducted; this consisted of pumping the shaft at rates between 0.06 and 0.19 L/s (1 and 3.4 USgpm) for a duration of 20 minutes. The water level in the shaft had almost been drawn down to the depth of the pump intake at the time the test was terminated; had the test continued, the water level would have reached the intake within a few minutes. We therefore concluded that the sustainable yield of the old shaft was much less than 0.19 L/s. Additional testing, similar to that recommended for the new shaft, would be required to confirm the actual yield.

Mr. D.J. Tiplady, P.Eng. of PAEL visited the site on August 23, 1989 to assist with refurbishment of the old shaft.

COMMENTS

As an aquifer pumping test was not conducted with the new shaft, we cannot confirm its yield. However, based on the information provided by the driller, it is not expected to exceed 0.09 L/s. In order to confirm a yield, we recommend that an aquifer pumping test be conducted. A groundwater sample should be obtained during this test for inorganic chemical analyses to confirm the basic potability of the groundwater.

If the yield from either shaft is not sufficient to meet the District's requirements, consideration could be given to pumping both shafts at the same time. However, without accurate pumping test data from the new shaft, we are unable to estimate the total combined yield of the two shafts.

Cedars of Tuam Water Works District
Attention: Mr. Jim Armstrong

In order to prevent surface water from flowing along the outside of the surface conductor casing on either shaft, it is recommended that earth from around the outer casings of both shafts be removed between 0 and 2m, and the excavation backfilled with concrete or bentonite. If a new pumphouse is to be constructed, this should be done prior to its construction. In addition, the annulus between the inner and outer casings of both shafts should be filled with cement grout to prevent surface water from entering the well through this space (see Figs. 2 and 3).

We further recommend that a shallow ditch be excavated uphill from the well site to divert surface water away from both shafts (see Fig. 1).

Both shafts should be chlorinated soon after the permanent pump(s) are installed. The following is a recommended procedure:

- Add sufficient chlorine compound (liquid or solid) to raise concentration in the well to 50 ppm (mg/L).
- Mix in the well by turning the pump on and off.
- Repeat mixing several times at hourly intervals.
- Pump to waste until taste and/or odour of chlorine disappears.
- Take water samples for bacteria analyses.
- Repeat the above process if any form of bacteria are identified in the water.

Until the aquifer settles down, there is likely to be some minor movement of material in the discharge water. It is suggested that the new shaft be discharged to waste for a few minutes to an hour or so, until the water clears up, before connecting it to a water distribution system.

Cedars of Tuam Water Works District
Attention: Mr. Jim Armstrong

April 16, 1991

We trust this letter provides sufficient information for your present needs. Should you require further clarification, please do not hesitate to contact us.

Yours truly,

PITEAU ASSOCIATES ENGINEERING LTD.

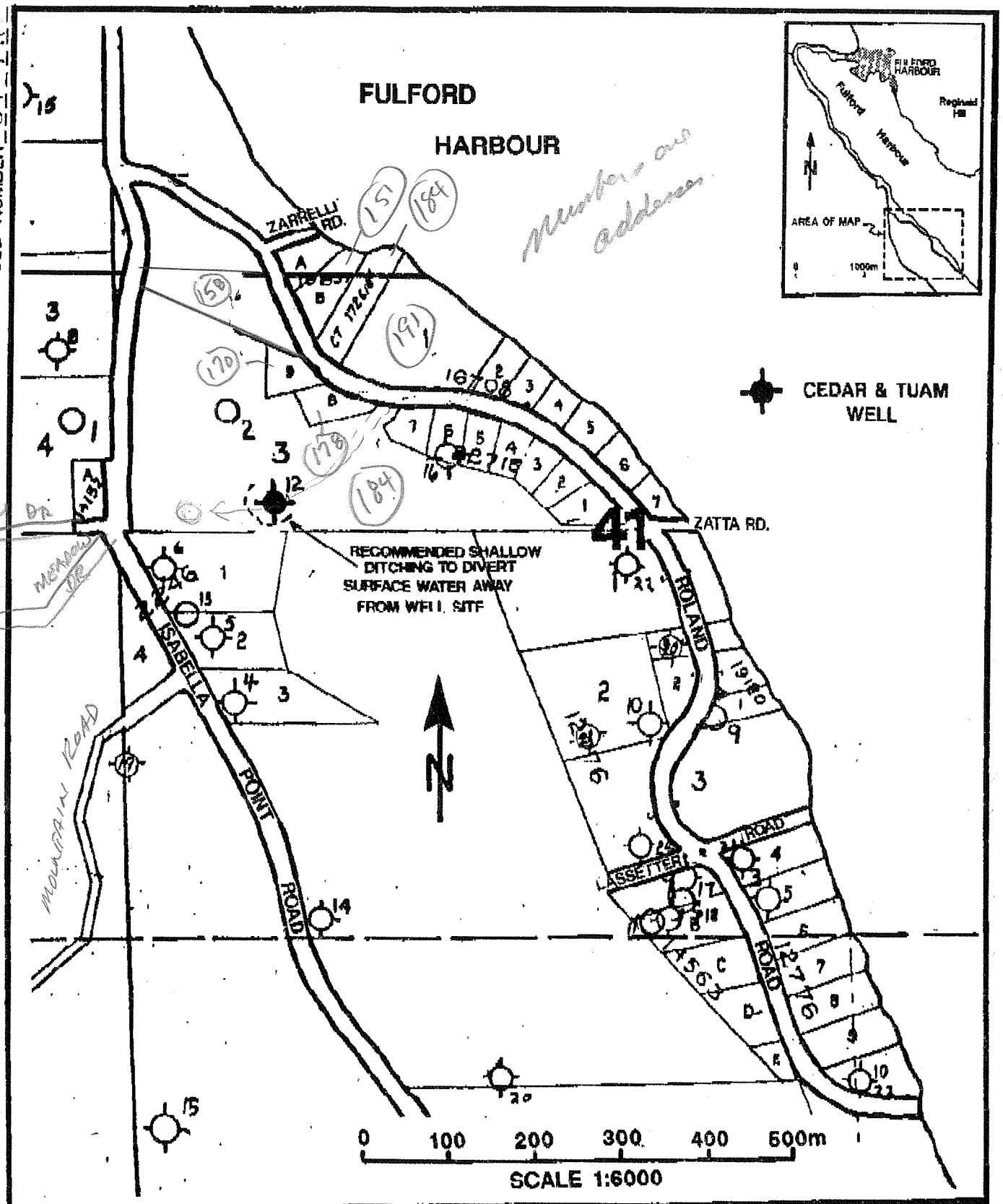
R. Allan Dakin, P.Eng.

David J. Tiplady, P.Eng.

RAD/DJT/ef

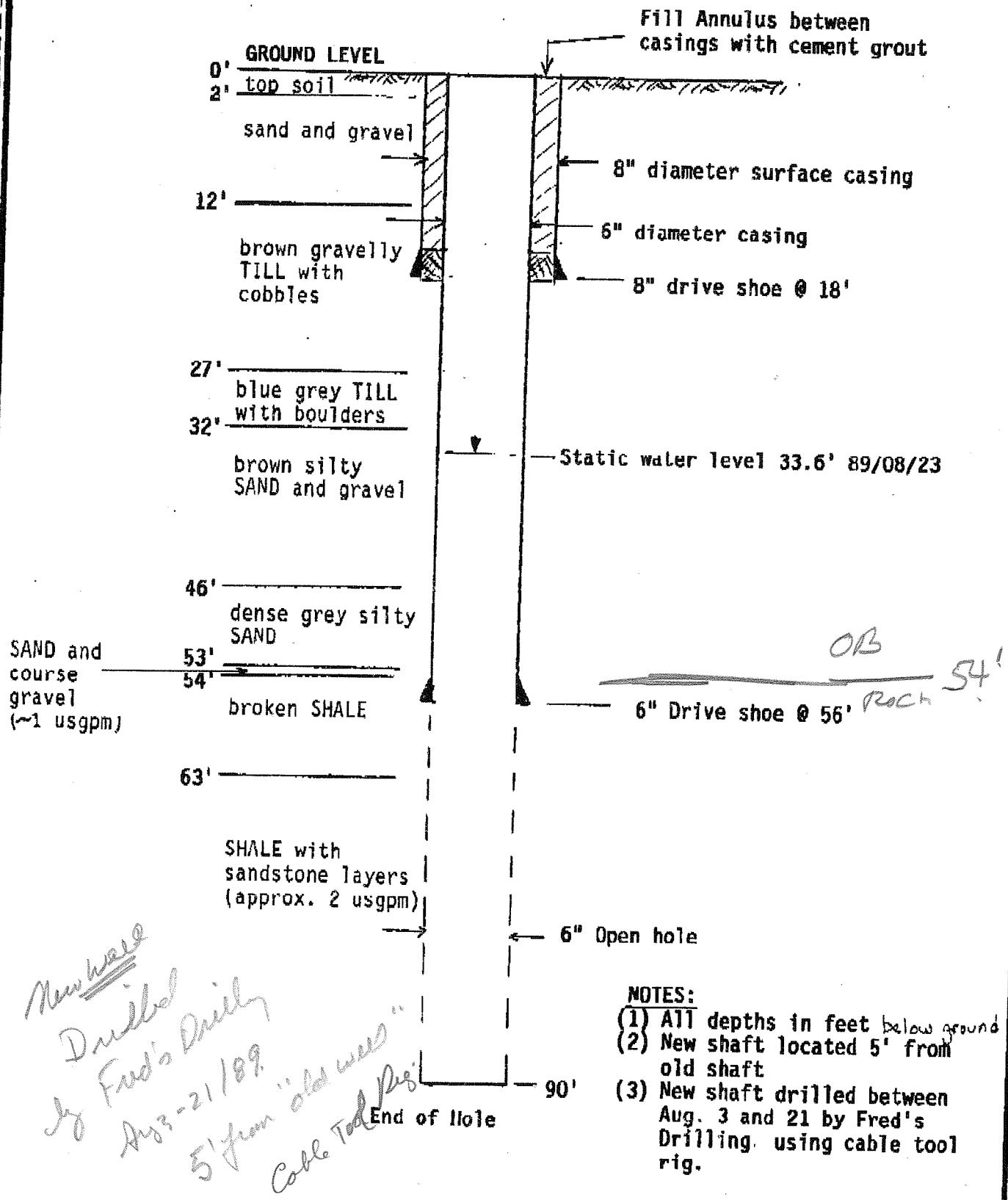
Att.

JOB NUMBER 89-141



CEDARS OF TUAM WATER WORKS DISTICT SALTSPING ISLAND, B.C.	PITEAU ASSOCIATES GEOTECHNICAL CONSULTANTS VANCOUVER CALGARY	
REFURBISHMENT OF PRODUCTION WELL ROLAND ROAD, FULFORD HARBOUR	**SITE LOCATION MAP**	BY: AD / BL DATE: 89/09 APPROVED: **FIG.1**

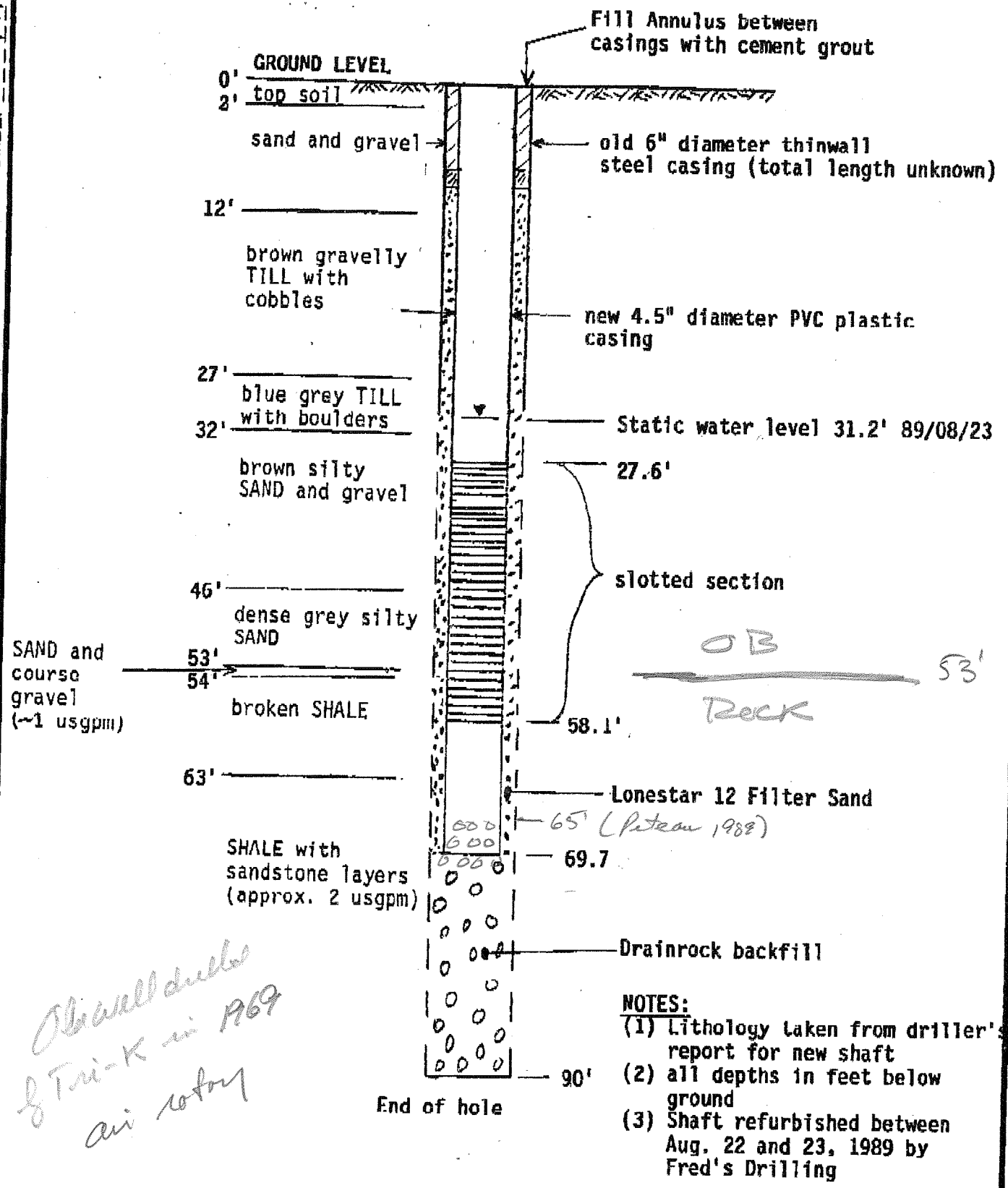
JOB NUMBER 89-141



NOTES:
(1) All depths in feet below ground
(2) New shaft located 5' from old shaft
(3) New shaft drilled between Aug. 3 and 21 by Fred's Drilling using cable tool rig.

CEDARS OF TUAM WATER WORKS DISTICT SALTSPING ISLAND, B.C.	PITEAU ASSOCIATES GEOTECHNICAL CONSULTANTS VANCOUVER CALGARY		
REFURBISHMENT OF PRODUCTION WELL ROLAND ROAD, FULFORD HARBOUR	NEW WELL SHAFT	BY: D.T. APPROVED:	DATE: 09/89 Fig. 2

JOB NUMBER 89-14



Observed during Tri-K in 1969 air rotary

NOTES:

(1) Lithology taken from driller's report for new shaft

(2) all depths in feet below ground

(3) Shaft refurbished between Aug. 22 and 23, 1989 by Fred's Drilling

CEDARS OF TUAM WATER WORKS DISTICT SALTSPING ISLAND, B.C.	PITEAU ASSOCIATES GEOTECHNICAL CONSULTANTS VANCOUVER CALGARY		
REFURBISHMENT OF PRODUCTION WELL ROLAND ROAD, FULFORD HARBOUR	OLD WELL SHAFT	BY: D.T.	DATE: 09/89
		APPROVED:	Fig. 3

Province of British Columbia Ministry of Environment Water Investigations Branch

WATER WELL RECORD

Date L.8,9 10,8 13,01

Legal Description & Address: Roland Rd., Saltspring Island, B.C.

Descriptive Location:

Owners Name & Address: Cedars of Tuam Water District / Saltspring Island

N T S MAP ____ ELEV ____ WELL No ____

UTM Z ____ E ____ N ____ Date 19__

1. TYPE OF WORK: 1 ☑ New Well 2 ☐ Reconditioned 3 ☐ Deepened 4 ☐ Abandoned

2. WORK METHOD: 1 ☑ Cable tool 2 ☐ Bored 3 ☐ Jetted 4 ☐ Rotary a ☐ mud b ☐ air c ☐ reverse 5 ☐ Other

3. WATER WELL USE: 1 ☑ Domestic 2 ☐ Municipal 3 ☐ Irrigation 4 ☐ Commercial & Industrial 5 ☐ Other

4. DRILLING ADDITIVES: water

5. MEASUREMENTS from 1 ☑ ground level 2 ☐ top of casing

FROM ft	TO ft	6. WELL LOG DESCRIPTION	SWL ft
0	2'	top soil - silty sand & cobbles	
2'	3'	packed sand and gravel (First 3' excavated by back hoe)	
3	12	packed silty sand and gravel with some cobbles	
12	27	gravelly till with cobbles (brown wash)	
27	32	till / boulders - blue/gray wash	
32	46	brown silty sand and gravel - a little water	
46	53	packed silty sand - gray	
53	54	sand + coarse gravel - little water	
54	63	broken shale - bed rock	
63	-	shale rock with layers of sand stone	

7. CONSULTANT: Piteau & Associates

Address: Vancouver.

8. WELL LOCATION SKETCH

9. CASING: Materials 1 ☑ Steel 2 ☐ Galvanized 3 ☐ Wood 4 ☐ Plastic 5 ☐ Concrete 6 ☐ Other

							units
Hole Diameter							
Diameter	6	8					ins
from	0	0					ft
to	56	13					ft
Thickness	.250	.322					ins
Weight	17	28					lb/ft

Pitless unit ____ ft 1 ☐ above 2 ☐ below ground level

1 ☐ Welded 2 ☐ Cemented 3 ☐ Threaded 4 ☐ New 5 ☐ Used

Perforations:

Shoe (s): 6-inch gopher

Open hole, from 56 to ____ ft Diameter 6 ins

Grout: hole plug® - between 8" & 6" casings

10. SCREEN: 1 ☐ Nominal 2 ☐ Pipe Size

Type 1 ☐ Continuous Slot 2 ☐ Perforated 3 ☐ Louvre 4 ☐ Other

Material 1 ☐ Stainless Steel 2 ☐ Plastic 3 ☐ Other

Set from ____ to ____ ft below ground level

	SCREEN & BLANKS						units
Length							ft
Diam. I D							ins
Slot Size							ins
from							ft
to							ft

Fittings, top ____ bottom ____

Gravel Pack

11. DEVELOPED BY: 1 ☐ Surging 2 ☐ Jetting 3 ☐ Air 4 ☑ Bailing 5 ☐ Pumping 6 ☐ Other

12. TEST 1 ☐ Pump 2 ☑ Bail Date 1989 08 21

Rate 2 USgpm Temp ____ °C SWL before test 58 ft

95 ft after test of 1 hrs ____ mins

TIME in mins & DRAWDOWN in ft				TIME in mins & RECOVERY in ft			
mins	WL	mins	WL	mins	WL	mins	WL

13. RECOMMENDED PUMP TYPE: Submersible RECOMMENDED PUMP SETTING: 90 ft RECOMMENDED PUMPING RATE: 1½ - 2 USgpm

14. WATER TYPE: 1 ☑ fresh 2 ☐ salty 3 ☑ clear 4 ☐ cloudy

colour ____ smell ____ gas 1 ☐ yes 2 ☐ no

15. WATER ANALYSIS: 1 ☐ Hardness ____ mg/l 2 ☐ Iron ____ mg/l 3 ☐ Chloride ____ mg/l 4 ☐ pH ____

Field Date ____

SITE I D No ____ Lab Date ____

16. FINAL WELL COMPLETION DATA

Well Depth 90' ft Water Flowing ____ USgpm

Static Water Level ____ ft Pressure Head ____ ft

Back filled: Information on engineers report.

Well Head Completion

17. DRILLER (PLEASE PRINT) SURNAME: COOLIDGE FIRST NAME: FRED

Signature: Fred Coolidge

18. CONTRACTOR, Address: Fred's Drilling 4489-200 St. Langley, B.C.

Member, BCWWDA ☑ yes ☐ no ;

1989 well

Appendix C

Legal Documents and Plans

TITLE SEARCH PRINT 2018-10-11, 09:54:53

File Reference: 2243-18029-00 Requestor: Glen Quarmby

CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN

Title Issued Under SECTION 172 LAND TITLE ACT

Land Title District VICTORIA
Land Title Office VICTORIA

Title Number F85445
From Title Number D39066

Application Received 1977-10-18

Application Entered 1977-10-27

Registered Owner in Fee Simple
Registered Owner/Mailing Address: JOHN MARTIN DOUGLAS MCDONALD, FERRY EMPLOYEE
LOUISE AMANDA MCDONALD, HIS WIFE
R.R.#1
FULFORD HARBOUR, BC
AS JOINT TENANTS

Taxation Authority Capital Assessment Area

Description of Land
Parcel Identifier: 005-841-232
Legal Description:
LOT 3, SECTION 41, SOUTH SALT SPRING ISLAND, COWICHAN DISTRICT, PLAN 6306, EXCEPT THOSE PARTS IN PLANS 16708, 22715 AND 30993, AND EXCEPT THAT PART THEREOF LYING TO THE NORTH OF ROLAND ROAD AS SAID ROAD IS SHOWN ON SAID PLAN 6306 AND TO THE WEST OF THE WESTERLY BOUNDARY OF LOT 1, PLAN 16708

Legal Notations
BYLAW CONTRAVENTION NOTICE, MUNICIPAL ACT, SECTION 750.1
SEE EL27073

Charges, Liens and Interests
Nature: RIGHT OF WAY
Registration Number: F21218
Registration Date and Time: 1977-02-23 10:11
Registered Owner: CAPITAL REGIONAL DISTRICT
Transfer Number: EV8710
Remarks: PART OUTLINED IN RED ON PLAN 3148
MODIFIED BY EG107995

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	EG107995
Registration Date and Time:	1993-08-19 14:47
Registered Owner:	CAPITAL REGIONAL DISTRICT
Transfer Number:	EV8710A
Remarks:	MODIFICATION OF F21218 PART IN PLAN VIP57116

Nature:	PRIORITY AGREEMENT
Registration Number:	EG107996
Registration Date and Time:	1993-08-19 14:47
Remarks:	GRANTING EG107995 PRIORITY OVER EF131281

Nature:	MORTGAGE
Registration Number:	EG118726
Registration Date and Time:	1993-09-09 14:05
Registered Owner:	BANK OF MONTREAL
Remarks:	MODIFIED BY EN44452

Nature:	MORTGAGE
Registration Number:	EN44452
Registration Date and Time:	1999-05-25 13:51
Remarks:	MODIFICATION OF EG118726

Duplicate Indefeasible Title NONE OUTSTANDING

Transfers NONE

Pending Applications NONE

F21218 D39066

THIS AGREEMENT made the 29th day of December

A. D. 1976,

BETWEEN:

LORRAINE AMANDA BASTEDO, Widow, and
LOUISE AMANDA BASTEDO, Secretary, of
R. R. #1, Roland Road, Fulford Harbour,
in the Province of British Columbia,
as Joint Tenants,
(hereinafter called the "Grantor")

OF THE FIRST PART,

AND:

CEDARS OF TUAM WATERWORKS DISTRICT
a duly incorporated Improvement
District pursuant to the provisions
of the "Water Act",
(hereinafter called the "Grantee")

OF THE SECOND PART.

WHEREAS the Grantor is the registered owner of the lands and premises situate, lying and being in the Gulf Islands Assessment District, in the Province of British Columbia, more particularly known and described as Lot Three (3), Section Forty-one (41), South Salt Spring Island, Cowichan District, Plan 6306, except those parts thereof included within the boundaries of Plans 16708 and 22715 and except that part thereof lying to the North of Roland Road as said road is shown on said Plan 6306 and to the West of the Westerly boundary of Lot One (1), Plan 16708.

1977-02-23 811697 LSD 3 5.00

AND WHEREAS the Grantee has requested the Grantor to grant an Easement over those portions of the Grantor's land as outlined in red on the Plan of Right-of-Way filed at the Victoria Land Registry Office under No. 3148 RW (hereinafter referred to as the "Easement Area") for the purposes hereinafter stated.

AND WHEREAS the Grantor has agreed to grant the Easement upon the terms and subject to the conditions hereinafter set forth.

Form "G" Land Registry Act (Sec. 50)
MEMORANDUM OF REGISTRATION
Registered the 23 day of 2 1977
on application received at the time
written or stamped on the application
H. T. KENNEDY, Registrar of the
Victoria Land Registration District

WITNESSETH that in consideration of the sum of TEN ($10.00) DOLLARS of lawful money of Canada now paid by the Grantee to the Grantor (the receipt of which is hereby acknowledged by the Grantor) and the covenants and agreements hereinafter contained to be observed and performed by the Parties hereto, the Parties hereto agree as follows:

1. The Grantor hereby grants unto the Grantee the full, free and uninterrupted Right-of-Way and Easement for the Grantee its successors in title, invitees, licensees, agents and contractors, from time to time and at all times hereafter over the Easement Area for the following purposes:

(a) To operate and maintain the well, water pump, water line and all related equipment situate thereon;

(b) To maintain power poles and power lines to the well site;

(c) Ingress and egress, with or without vehicles, animals, materials, supplies and equipment.

2. The Grantor hereby covenants with the Grantee that they will not make, place, erect or maintain on the Easement Area any building, structure, or obstruction which will interfere with the rights granted to the Grantee by these presents.

3. The covenants herein contained shall be perpetual and the Easement herein granted shall be perpetual.

4. This Agreement shall enure to the benefit of and be binding upon the parties hereto, their heirs, successors, assigns, licensees and invitees.

IN WITNESS WHEREOF the Parties hereto have hereunto set

3

their hands and seals and the Grantee has affixed its Common Seal in the presence of its duly authorized officers in that behalf the day and year first above written.

SIGNED, SEALED and DELIVERED)
by the Grantors in the)
presence of:)

CHARLES LOUIS ALBAS
Barrister & Solicitor
9830 4th ST.
SIDNEY, B.C.

LORRAINE AMANDA BASTEDO

LOUISE AMANDA BASTEDO

The COMMON SEAL of CEDARS OF)
TUAM WATERWORKS DISTRICT)
was hereunto affixed in the)
presence of:)

TRUSTEE

Status: Registered
Doc #: F21218
RCVD: 1977-02-23 RQST: 2018-10-11 09.59.31
Page 4 of 6

DATED 1976

BETWEEN:

LORRAINE AMANDA BASTEDO and
LOUISE AMANDA BASTEDO

AND:

CEDARS OF TUAM WATERWORKS DISTRICT

A G R E E M E N T

F21218

LISSON, McCONNAN, BION & O'CONNOR
Barristers and Solicitors
837 Burdett Avenue
Victoria, B. C.

SUBSTITUTE FOR FORM "C"

Date Feb. 23 1977 Easement

Declared Value $

Please Merge

Telephone
385-1383

Lisson, McConnan, Bion & O'Connor
837 Burdett Avenue, Victoria, B. C.

5

Form No. 33. Acknowledgment for Maker.

LAND REGISTRY ACT

FORM O.
(*Section 57 (b).*)

Acknowledgment for Maker of a Deed

I HEREBY CERTIFY that on the 29th day of December, 19 76 at Sidney, in the Province of British Columbia

Lorraine Amanda Bastedo and Louise Amanda Bastedo ~~(whose identity has been proved by the evidence on oath of~~

who is) personally known to me, appeared before me and acknowledged to me that they are the person s mentioned in the annexed instrument as the maker s thereof, and whose name s are subscribed thereto as part ies, that they knows the contents thereof, and that they executed the same voluntarily, and ~~is~~ are of the full age of twenty-one years.

IN TESTIMONY whereof I have hereto set my hand and Seal of Office at Sidney, this 29th day of December, in the year of our Lord one thousand nine hundred and seventy-six

~~A Notary Public in and for the Province of British Columbia.~~
A Commissioner for taking affidavits within British Columbia.

Note—Where the person making the acknowledgment is personally known to the officer taking the same, strike out the words in brackets.

PARKS

FORM NO. 206 ACKNOWLEDGMENT OF OFFICER OF A CORPORATION.

6 21218

Acknowledgment of Officer of a Corporation

I HEREBY CERTIFY that, on the 13th day of January, 19 77, at Ganges, in the Province of British Columbia, James Sargent ~~(whose identity has been proved by the evidence on oath of~~, who is) personally known to me, appeared before me and acknowledged to me that he is ~~the~~ a Trustee of CEDARS OF TUAM WATERWORKS DISTRICT, and that he is the person who subscribed his name to the annexed instrument as A Trustee of the said Cedars of Tuam Waterworks District and affixed the seal of the Cedars of Tuam Waterworks District to the said Instrument, that he was first duly authorized to subscribe his name as aforesaid, and affix the said seal to the said Instrument, and that such corporation is legally entitled to hold and dispose of land in the Province of British Columbia.

IN TESTIMONY whereof I have hereunto set my Hand and Seal of Office, at Ganges in the Province of British Columbia, this 22nd day of ~~January~~ February one thousand nine hundred and seventy-seven.

~~A Notary Public in and for the Province of British Columbia.~~
A Commissioner for taking Affidavits for British Columbia.

NOTE—WHERE THE PERSON MAKING THE ACKNOWLEDGMENT IS PERSONALLY KNOWN TO THE OFFICER TAKING THE SAME, STRIKE OUT THE WORDS IN BRACKETS.

PLAN OF RIGHT OF WAY THROUGH THE REM DR OF LOT 3 PLAN 6306, SECTION 41 SOUTH SALT SPRING ISLAND COWICHAN DISTRICT.

Scale: 1 inch = 100 feet

PLAN 3148 RW

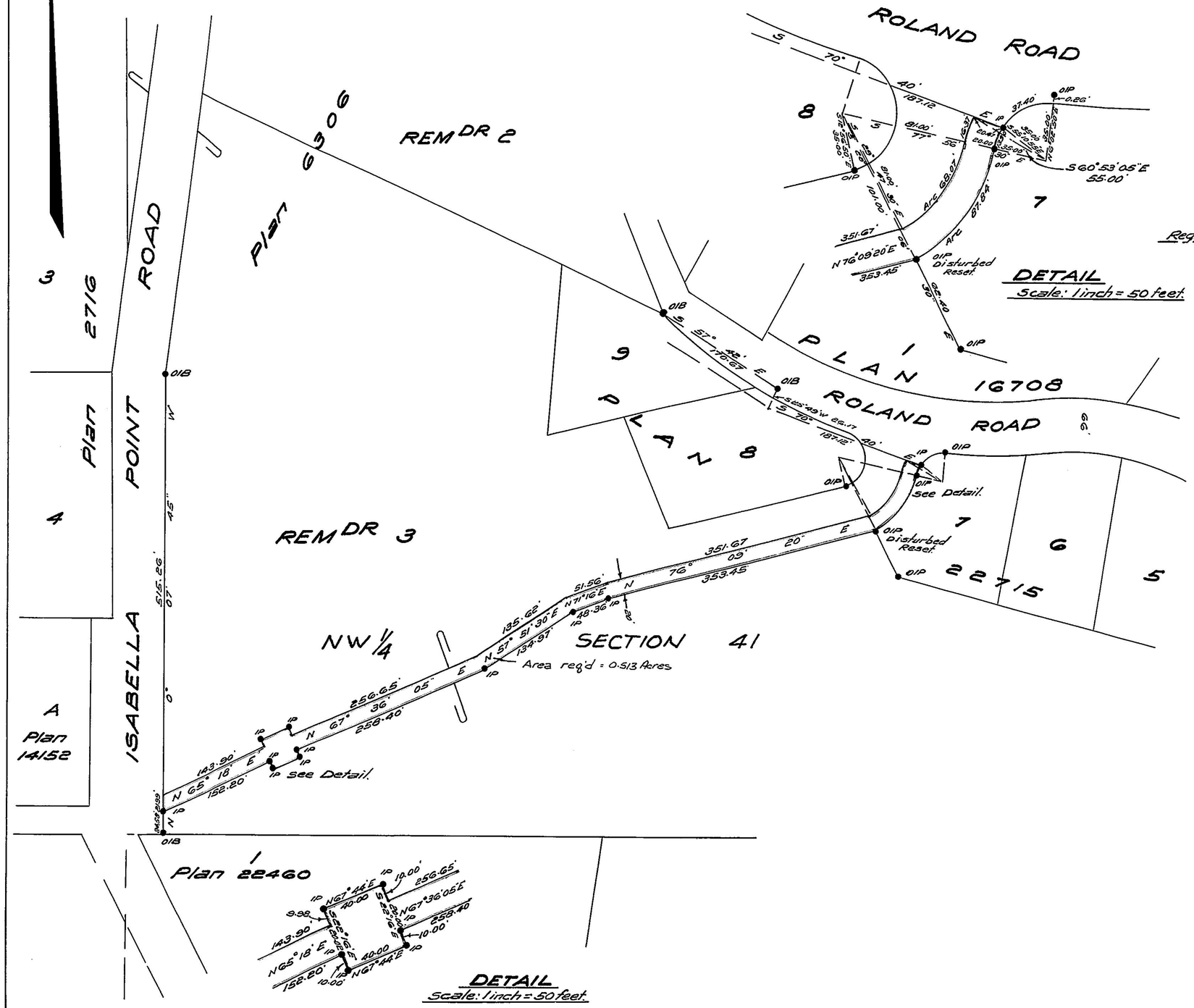
Deposited in the Land Registry Office at Victoria, B.C.

this 13th day of January 1977

Asst. Deputy Registrar.

Bearings Astronomic derived from Plan 22715

1/4" Sq Iron Bar found shown thus • 01B
1/2" Sq Galv Iron Post " " " • 01P
1/2" " " " set " " • 1P



Registered Owners: Lorraine Amanda Bastedo; Louise Amanda Bastedo

Witness as to both signatures: Allan R. Hardie, Name; P.O. Box 3 Ganges, Address; B.C. Land Surveyor, Occupation

I Allan R. Hardie of Ganges Harbour, British Columbia, Land Surveyor make oath and say that I was present and did personally superintend the survey represented by this plan and that the survey and plan are correct. The said survey was completed on the 20th day of December, 1976.

Sworn before me this 10th day of January 1977

A Notary Public in and for the Province of British Columbia.

A.R. Hardie & Associates, B.C. Land Surveyors, Ganges Harbour, B.C. J 1628. M/S 1845.

This Plan lies within the Capital Regional District.

TITLE SEARCH PRINT 2018-10-11, 10:00:31

File Reference: Requestor: Glen Quarmby

CURRENT INFORMATION ONLY - NO CANCELLED INFORMATION SHOWN

Land Title District	VICTORIA
Land Title Office	VICTORIA
Title Number	CA5903054
From Title Number	301449I
Application Received	2017-03-30
Application Entered	2017-03-31

Registered Owner in Fee Simple

Registered Owner/Mailing Address: THE BOARD OF EDUCATION OF SCHOOL DISTRICT NO. 64 (GULF ISLANDS)
112 RAINBOW ROAD
SALT SPRING ISLAND, BC
V8K 2K3

Taxation Authority Capital Assessment Area

Description of Land

Parcel Identifier: 004-343-131

Legal Description:

LOT A SECTION 42 SOUTH SALT SPRING ISLAND COWICHAN DISTRICT PLAN 14152

Legal Notations

SUBJECT TO EXCEPTIONS AND RESERVATIONS CONTAINED IN CROWN GRANT FILED DD 301449I

Charges, Liens and Interests

Nature:	STATUTORY RIGHT OF WAY
Registration Number:	CA5882744
Registration Date and Time:	2017-03-21 14:15
Registered Owner:	CAPITAL REGIONAL DISTRICT

Duplicate Indefeasible Title NONE OUTSTANDING

Transfers NONE

Pending Applications NONE

FORM_C_V21 (Charge)

VICTORIA LAND TITLE OFFICE

Mar-21-2017 14:15:05.004

CA5882744

LAND TITLE ACT
FORM C (Section 233) CHARGE
GENERAL INSTRUMENT - PART 1 Province of British Columbia

Your electronic signature is a representation that you are a subscriber as defined by the Land Title Act, RSBC 1996 c.250, and that you have applied your electronic signature in accordance with Section 168.3, and a true copy, or a copy of that true copy, is in your possession.

Madelaine Ann Campbell RT9TAG
Digitally signed by Madelaine Ann Campbell RT9TAG
Date: 2017.03.21 11:54:15 -07'00'

1. APPLICATION: (Name, address, phone number of applicant, applicant's solicitor or agent)

STEWART McDANNOLD STUART
BARRISTERS & SOLICITORS
2nd FLOOR - 837 BURDETT AVENUE
VICTORIA BC V8W 1B3

Tel.: 250 380-7744 Fax.: 250 380-3008
File No.: 111 1727 CS/slw
SRW Well

Document Fees: $71.58

Deduct LTSA Fees? Yes ☑

2. PARCEL IDENTIFIER AND LEGAL DESCRIPTION OF LAND:

[PID]	[LEGAL DESCRIPTION]
004-343-131	**LOT A, SECTION 42, SOUTH SALT SPRING ISLAND, COWICHAN DISTRICT, PLAN 14152**

STC? YES ☐

3. NATURE OF INTEREST | CHARGE NO. | ADDITIONAL INFORMATION

Statutory Right of Way | | Entire document

4. TERMS: Part 2 of this instrument consists of (select one only)
(a) ☐ Filed Standard Charge Terms D.F. No. (b) ☑ Express Charge Terms Annexed as Part 2
A selection of (a) includes any additional or modified terms referred to in Item 7 or in a schedule annexed to this instrument.

5. TRANSFEROR(S):

THE BOARD OF EDUCATION OF SCHOOL DISTRICT NO. 64 (GULF ISLANDS)

6. TRANSFEREE(S): (including postal address(es) and postal code(s))

CAPITAL REGIONAL DISTRICT

625 FISGARD STREET
VICTORIA BRITISH COLUMBIA
V8W 1R7 CANADA

7. ADDITIONAL OR MODIFIED TERMS:
N/A

8. EXECUTION(S): This instrument creates, assigns, modifies, enlarges, discharges or governs the priority of the interest(s) described in Item 3 and the Transferor(s) and every other signatory agree to be bound by this instrument, and acknowledge(s) receipt of a true copy of the filed standard charge terms, if any.

Officer Signature(s)

ANNA J PUGH
Barrister & Solicitor
1-105 Rainbow Road
Salt Spring Island, BC V8K 2V5
250-537-5505
(as to both signatures)

Execution Date		
Y	M	D
17	03	01

Transferor(s) Signature(s)

THE BOARD OF EDUCATION OF SCHOOL DISTRICT NO. 64 (GULF ISLANDS), by its authorized signatory(ies):

ROBERT PINGLE

RODNEY SCOTVOLD

OFFICER CERTIFICATION:
Your signature constitutes a representation that you are a solicitor, notary public or other person authorized by the *Evidence Act*, R.S.B.C. 1996, c.124, to take affidavits for use in British Columbia and certifies the matters set out in Part 5 of the *Land Title Act* as they pertain to the execution of this instrument.

LAND TITLE ACT
FORM D

EXECUTIONS CONTINUED

Officer Signature(s)	Execution Date Y	M	D	Transferor / Borrower / Party Signature(s)
BRENT REEMS Commissioner for Taking Affidavits in British Columbia Capital Regional District 625 Fisgard St. Victoria BC V8W 1R7	17	03	17	CAPITAL REGIONAL DISTRICT, by its authorized signatory: ROBERT LAPHAM

OFFICER CERTIFICATION:
Your signature constitutes a representation that you are a solicitor, notary public or other person authorized by the *Evidence Act*, R.S.B.C. 1996, c.124, to take affidavits for use in British Columbia and certifies the matters set out in Part 5 of the *Land Title Act* as they pertain to the execution of this instrument.

TERMS OF INSTRUMENT - PART 2

W H E R E A S:

A. The Grantor is the registered owner of the land set out in item 2, Part 1 of this Instrument (the "**Grantor's Lands**");

B. The Grantee is the Capital Regional District;

C. This Right of Way is necessary for the operation and maintenance of the Works by the Grantee; and

D. To facilitate the installation of a system of waterworks including a well or wells, feed and discharge pipelines, reservoir, treatment facility, access road, and all pipes, valves, fittings, electrical and data/telecommunication equipment, and appurtenances in connection therewith (the "**Works**"), the Grantor has agreed to permit the construction by the Grantee of the Works on a portion of the Grantor's Lands and to grant for that purpose the Right of Way in section 1.1.

NOW THEREFORE, in consideration of the sum of One ($1.00) Dollar of lawful money of Canada, now paid by the Grantee to the Grantor (the receipt and sufficiency of which is hereby acknowledged by the Grantor), and in consideration of the covenants and conditions agreed to be observed and performed by the parties and for other valuable consideration:

1.0 THE GRANTOR:

1.1 Grants, conveys, confirms and transfers, in perpetuity, to the Grantee the full, free and uninterrupted right, license, liberty, privilege, permission and right of way to lay down, install, construct, entrench, operate, maintain, inspect, alter, remove, replace, bury, cleanse, string, and otherwise establish one or more systems of Works upon, over, under and across that portion of the Grantor's Lands shown on Statutory Right of Way Plan EPP 57261, a reduced copy of which is attached hereto as Schedule 'A' (the "**Right of Way**").

1.2 Covenants and agrees to and with the Grantee that the Grantee shall:

(a) for itself and its servants, agents, workers, contractors and all other licensees of the Grantee;
(b) together with machinery, vehicles, equipment, and materials;
(c) upon, over, under and across the Right of Way;
(d) as may be considered necessary, useful, or convenient by the Grantee for the purposes in section 1.1; and
(e) in connection with the operations of the Grantee in relation to the Works;

be entitled at all times to enter, use, pass and repass, labour, construct, erect, install, dig, carry away soil or other surface or subsurface materials, and remove any growth, seedlings, trees, brush, buildings or obstructions now or hereafter in existence.

1.3 Grants, conveys, confirms and transfers to the Grantee for itself, and its servants, agents, workers, contractors and all other licensees of the Grantor together with machinery, vehicles, equipment and materials, the full, free and uninterrupted right, license, liberty, privilege, permission and right of way to enter upon, pass and repass over, clear, labour, and use the Grantor's Lands for the purpose of ingress and egress to and from the Right

of Way.

1.4 Grants unto the Grantee the licence, permission, easement and right of way to lay down, install, erect, construct, operate, maintain, repair, inspect, alter, remove, replace, cleanse, string and otherwise establish one or more temporary systems of works upon the Grantor's Lands, in the event of a breakdown or malfunction of the Works.

1.5 Transfers, assigns and conveys to the Grantee all right, title and interest in and to any Works that the Grantee, or the Grantor have prior to this Agreement established or constructed or maintained or operated within the Right of Way or in relation to any similar Works previously constructed by any party whatsoever within the Right of Way.

2.0 THE GRANTOR COVENANTS:

2.1 Except as specifically permitted by this Agreement, not, and not to permit any other person, to erect, place, install or maintain any building, structure or addition to a building or structure including, without limiting the generality of the foregoing, any mobile home, patio, fish pond, waterfall, retaining wall, derelict vehicle, shed, pipe, wire or other conduit on, over or under any portion of the Right of Way.

2.2 Not to do anything that in any way interferes with or damages or prevents access to or is likely to cause harm to the Works installed in or upon the Right of Way, including, without limiting the generality of the foregoing, erecting fences without reasonable access for the Grantee's maintenance personnel and equipment. Reasonable access shall include the provision of conveniently located access gates or openings.

2.3 As an exception to section 2.1, the Grantor may, upon receiving prior written consent of the Grantee, which consent shall not be unreasonably withheld, construct and maintain a driveway across the Right of Way at the location shown as "Driveway Access" attached hereto as Schedule "B". Upon construction of said driveway in accordance with the above, the Grantee hereby provides its licence and consent to the use of the driveway by the Grantor, its servants, agents, employees, licensees and invitees for the purpose of accessing the Land.

2.4 Not to do or knowingly permit to be done any act or thing which will interfere with or injure the Works and in particular will not carry out any blasting on or adjacent to the Right of Way without the consent in writing of the Grantee, which consent shall not be unreasonably withheld.

2.5 Not to substantially add to or diminish the soil cover over any of the Works installed in the Right of Way and in particular, without limiting the generality of the foregoing, will not construct open drains or ditches along or across any of the Works installed in the Right of Way without the consent of the Grantee, which consent shall not be unreasonably withheld.

2.6 From time to time and at all times at the reasonable request and at the cost of the Grantee to do and execute or cause to be made, done or executed any further and other lawful documents, conveyances, transfers, assurances or things in law required to ensure the Grantee of its rights under this Agreement.

3.0 THE GRANTEE COVENANTS:

3.1 Not to bury any debris or rubbish of any kind in excavations or backfill, and to remove shoring and like temporary structures as backfilling proceeds.

3.2 To thoroughly clean all lands to which it has had access under this Agreement of all rubbish and construction debris created or placed thereon by the Grantee and to leave such lands in a neat and clean condition.

3.3 As soon as weather and soil conditions permit, and as often as it may exercise this right of entry to any of the Grantor's Lands, to replace the surface soil as near as reasonably possible to the same condition as it was prior to the entry, in order to restore the natural drainage to the Grantor's Lands. This shall not require the Grantee to restore any improvements or structures in the Right of Way, or trees, brush, grass or other surface growth, or prevent the Grantee from clearing and removing improvements, structures, or grass, seedlings, trees, brush or other surface growth from the Right of Way.

3.4 As far as reasonably possible, to carry out all work in a proper and workmanlike manner so as to do as little injury to the Grantor's Lands as possible.

3.5 The Grantee shall not extract water at an average rate greater than 0.9 litres per second without first obtaining the consent, in writing, of the Grantor, which consent shall not be unreasonably withheld.

3.6 That the Grantee will indemnify and save harmless the Grantor from and against all liability, actions, proceedings, costs, claims and demands whatsoever that may be lawfully brought against the Grantor by reason of anything done by the Grantee, its servants, agents, workers, contractors and all other licensees and invitees of the Grantee in the exercise or purported exercise of the rights and liberties hereby granted provided however that this indemnity shall not apply if and to the extent that such liability, actions, proceedings, costs, claims or demands are caused by negligence or wilful default on the part of the Grantor, its officers, directors, employees, agents or those for whom it is at law responsible. For certainty, this indemnity shall not apply if and to the extent that the liability, actions, proceedings, costs, claims or damages are caused by a breach of the Grantor of one or more of parts of this Agreement.

4.0 THE PARTIES COVENANT AND AGREE WITH EACH OTHER AS FOLLOWS:

4.1 The Works, together with all wells, pipes, valves, conduits, wires, casings, fittings, lines, meters, appliances, facilities, attachments or devices used in connection therewith shall constitute the Works. The general layout and location of the Works will be substantially in accordance with Schedule "B".

4.2 The Grantor may request that the Grantee amend the Salt Spring Island Cedars of Tuam Water System Service Establishment Bylaw No. 1, 2002 ("**Bylaw 3021**") and the water service area boundary described therein so that the Grantor is included in the service area created by Bylaw 3021, and the Grantee shall consider the Grantor's request to approve the amendment to Bylaw 3021 described in this section 4.2.

4.3 If the Grantee, acting in it's sole discretion, decides to approve the amendment described in section 4.2, the Grantor may apply for a nineteen (19) millimeter water service connection from the Works to the Grantor's Lands, and all applicable costs and fees,

including those payable under the Salt Spring Island Liquid Waste, Sewer, and Water Fees and Charges Bylaw No. 1, 2012, shall be paid by the Grantor to the Grantee. Upon receipt of the application and fees described in this section 4.3, the Grantee shall consider the Grantor's application, and approval of such application shall not be unreasonably withheld.

4.4 In spite of any rule of law or equity to the contrary, the Works brought on to, set, constructed, laid, erected in, upon or under the Right of Way by the Grantee shall at all times remain the property of the Grantee, even if the Works are annexed or affixed to the freehold, and the Works shall at any time and from time to time be removable in whole or in part by the Grantee.

4.5 In the event that the Grantee abandons the Works or any part of them, the Grantee may, if it so elects, leave the whole or any part of the Works in place and if so abandoned the Works, or part thereof, shall become the property of the Grantor.

4.6 No part of the title in fee simple to the Grantor's Lands shall pass to or be vested in the Grantee under or by virtue of this Agreement and the Grantor may fully use and enjoy all of the Grantor's Lands subject only to the rights and restrictions in this Agreement.

4.7 The Grantor acknowledges that (a) these Covenants are enforceable against the Grantor and its successors in title, but (b) the Grantor is not personally liable for breach of these Covenants after the Grantor has ceased to be the owner of the Grantor's Lands.

4.8 If at the date hereof the Grantor is not the sole registered owner of the Grantor's Lands, this Agreement shall nevertheless bind the Grantor to the full extent of his interest therein, and if he shall acquire a greater of the entire interest in fee simple, this Agreement shall likewise extend to such after-acquired interests.

4.9 Where the expression "Grantor" includes more than one person, all covenants made by the Grantor shall be construed as being several as well as joint with respect to all persons constituting the Grantor.

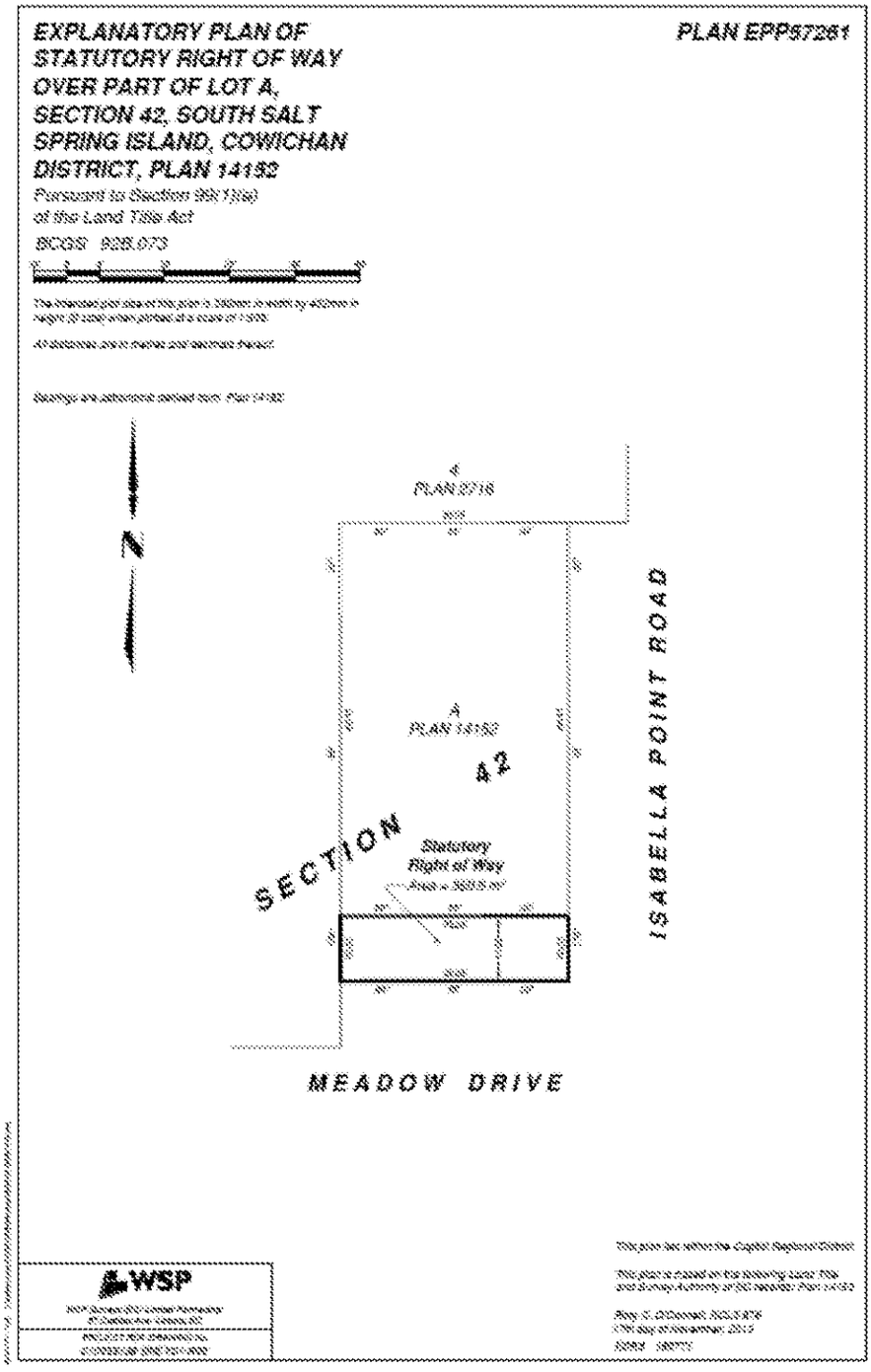
4.10 If any part of this Agreement is found to be illegal or unenforceable because it creates a positive obligation for the Transferor or for any other reason, that part will be considered separate and severable and the remaining parts will not be affected thereby and will be enforceable to the fullest extent permitted by law.

4.11 The Grantor acknowledges that nothing in this Agreement fetters, prejudices or impairs the Grantee, in the exercise of its statutory powers, duties and functions, including but not limited to its powers under the *Local Government Act*.

4.12 This Agreement shall enure to the benefit of and be binding upon the parties hereto and their respective heirs, administrators, executors, successors and assigns as the case may be and wherever the singular or masculine is used, it shall be construed as if the plural or the feminine or neuter, as the case may be, had been used, where the parties or the context hereto so require and the rest of the sentence shall be construed as if the grammatical and terminological changes thereby rendered necessary had been made.

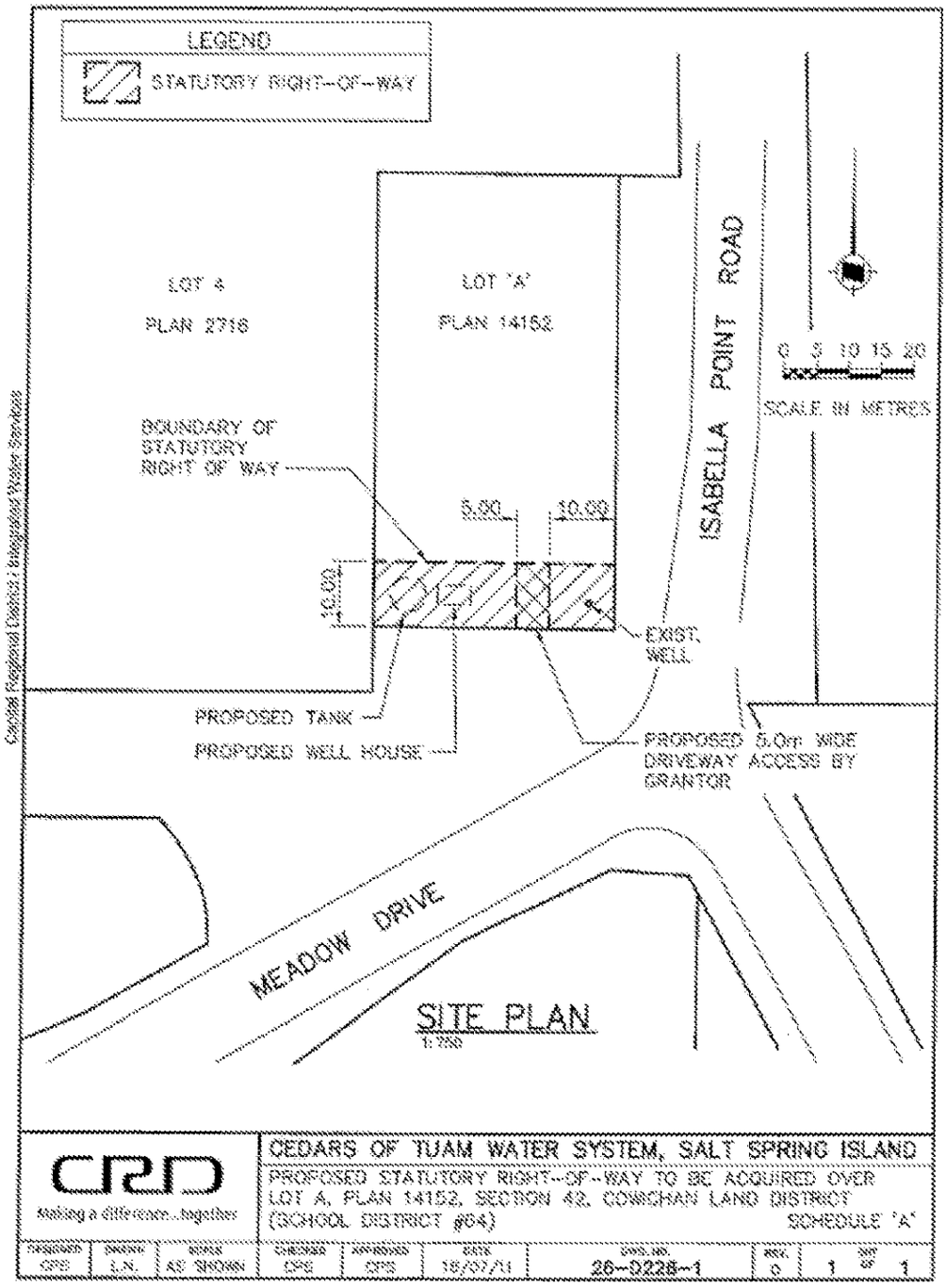
The Grantor and Grantee acknowledge that this Agreement has been duly executed and delivered by the parties executing Forms C and D (pages 1 and 2) attached hereto.

SCHEDULE 'A' – STATUTORY RIGHT OF WAY PLAN



111-1727 / SPW Wall / Feb 25'16 / MC-slw

SCHEDULE 'B' – THE WORKS



111 1727 / SPW Well / Feb 25'16 / MC-slw

EXPLANATORY PLAN OF STATUTORY RIGHT OF WAY OVER PART OF LOT A, SECTION 42, SOUTH SALT SPRING ISLAND, COWICHAN DISTRICT, PLAN 14152

PLAN EPP57261

Pursuant to Section 99(1)(e)
of the Land Title Act

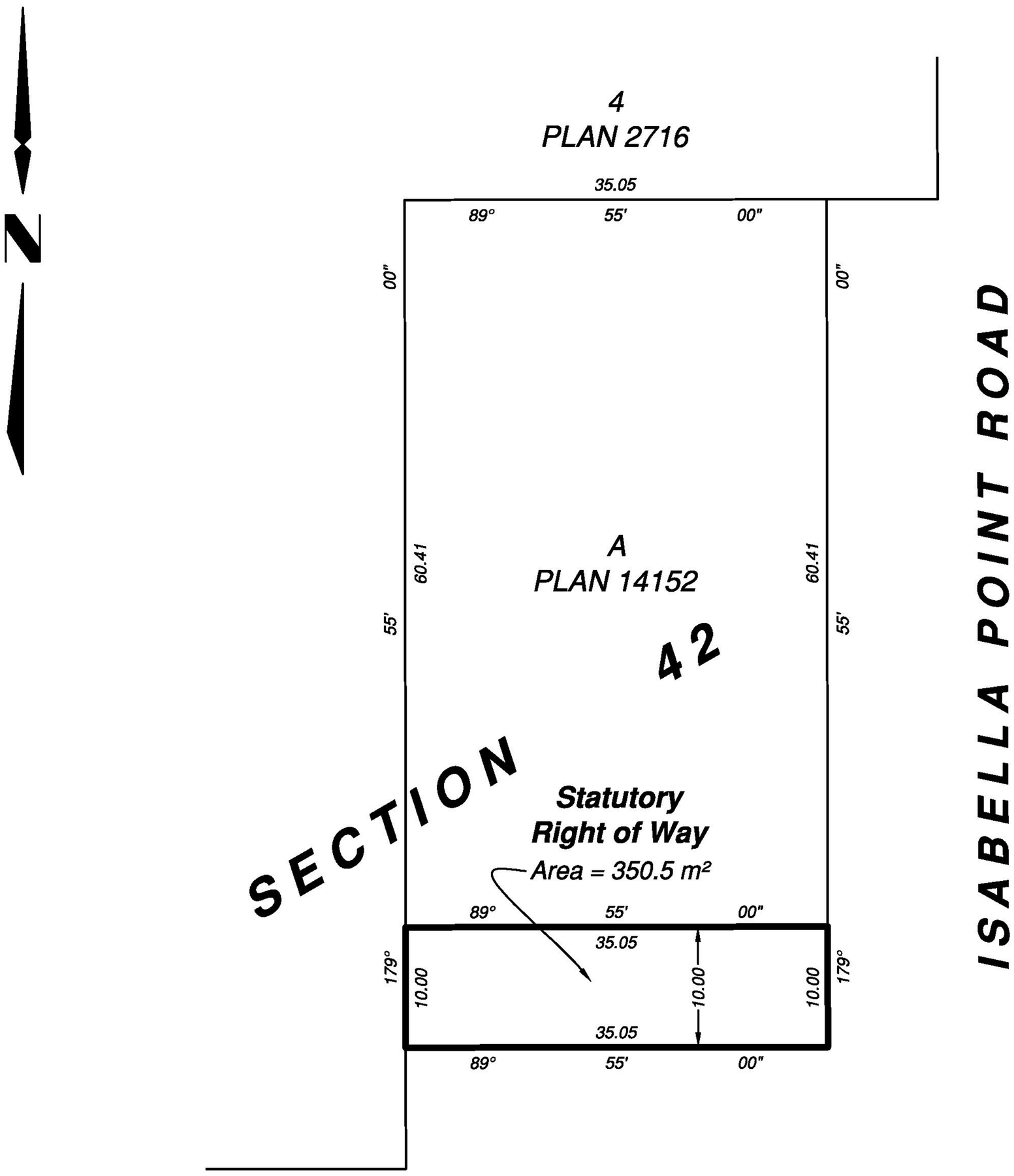
BCGS 92B.073

10 5 0 10 20 30 40

The intended plot size of this plan is 280mm in width by 432mm in height (B size) when plotted at a scale of 1:500.

All distances are in metres and decimals thereof.

Bearings are astronomic derived from Plan 14152.



WSP

WSP Surveys (BC) Limited Partnership
57 Cadillac Ave, Victoria, BC

PROJECT REF./DRAWING No.
010055138-BNEX01-R00

This plan lies within the Capital Regional District

This plan is based on the following Land Title and Survey Authority of BC records: Plan 14152

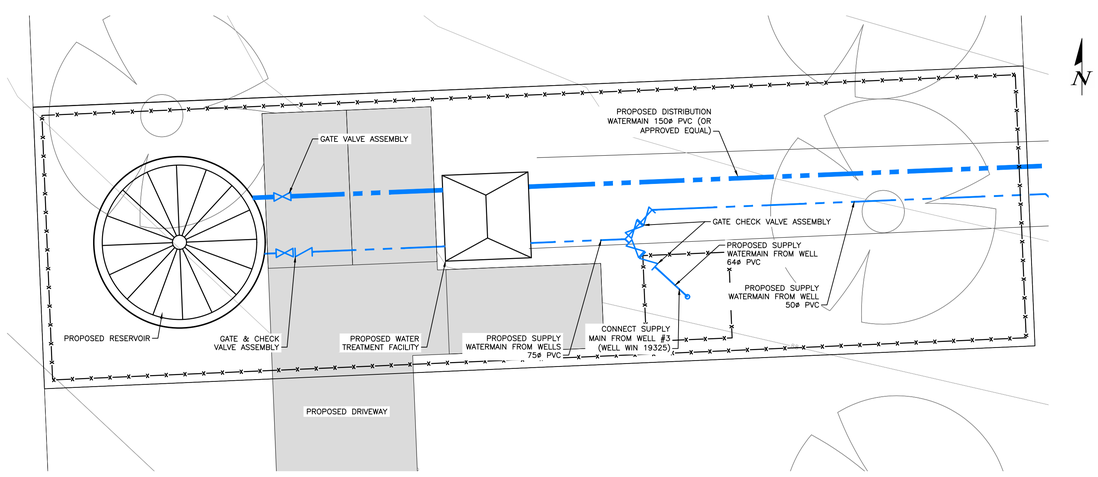
Rory C. O'Connell, BCLS 876
17th day of November, 2015
ECR# 180771

2015/11/17 - 11:58 S:\southern bc ms\010055138\CAD\Working\010055138-BNEX01-R00.dwg

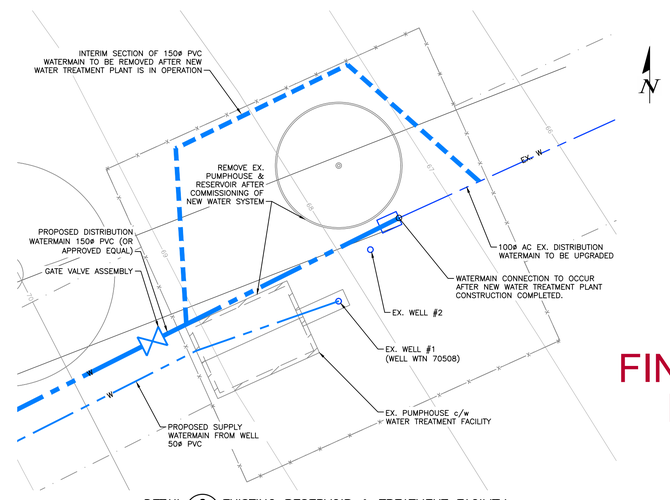
Appendix D

Conceptual Design Drawings

SITE PLAN
1:500



DETAIL 1 PROPOSED RESERVOIR & TREATMENT FACILITY
1:100 CONCEPTUAL LAYOUT



DETAIL 2 EXISTING RESERVOIR & TREATMENT FACILITY
1:100 CONCEPTUAL LAYOUT

FEB 15, 2019

FINAL REPORT DRAWING

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NO.	DATE	BY	ISSUED	NO.	DATE	BY	REVISIONS

McElhanney
McElhanney Consulting Services Ltd.
500 - 3960 QUADRA STREET
VICTORIA, BC V8X 4A3
PH (250) 370-9221
FAX (855) 407-3895

SEAL

PROJECT:
CEDARS OF TUAM – LOCAL WATER SERVICE
CONCEPT DESIGN FOR CONNECTING TO NEW WELL

TITLE:
CONCEPTUAL SITE PLAN
ULTIMATE DESIGN

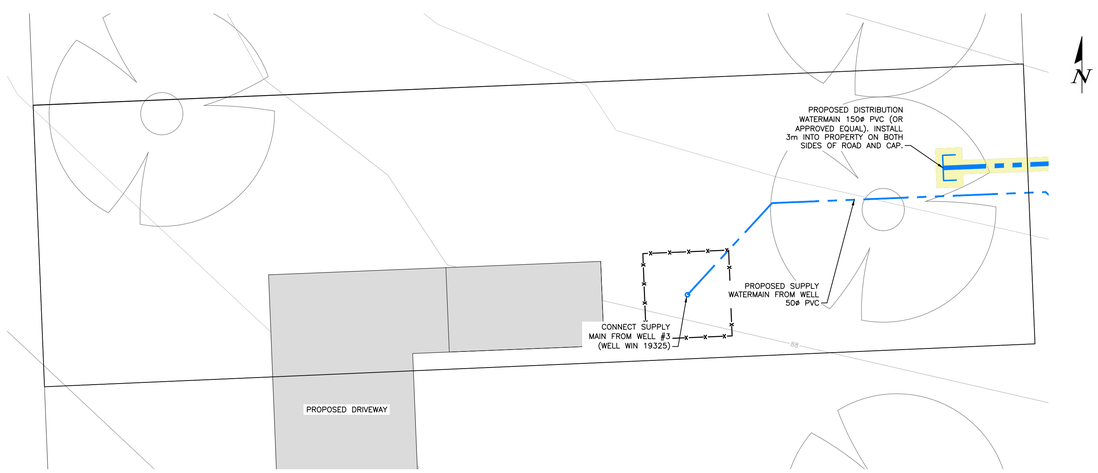
SCALE
HORIZ: AS SHOWN VERT: N/A

PROJECT NO. 2243-18029
ISSUED/REVISION 0/–

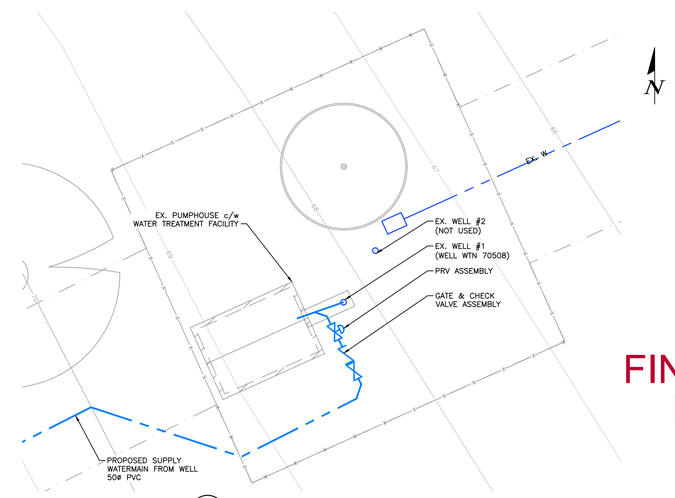
APPROVING AUTHORITY FILE NO.
SSI 2018-005

DRAWING NO.
18-029-C01

SITE PLAN
1:500



DETAIL 1 PROPOSED WELL#3
1:100 — CONCEPTUAL LAYOUT



DETAIL 2 EXISTING RESERVOIR & TREATMENT FACILITY
1:100 — CONCEPTUAL LAYOUT

FEB 15, 2019

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NO.	DATE	BY	ISSUED	NO.	DATE	BY	REVISIONS

McElhanney
McElhanney Consulting Services Ltd.
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PH (250) 370-9221
FAX (855) 407-3895

SEAL

PROJECT:
CEDARS OF TUAM – LOCAL WATER SERVICE
CONCEPT DESIGN FOR CONNECTING TO NEW WELL

TITLE:
CONCEPTUAL SITE PLAN
INTERIM DESIGN

SCALE
HORIZ: AS SHOWN VERT: N/A

PROJECT NO. 2243-18029
ISSUED/REVISION 0/–

APPROVING AUTHORITY FILE NO.
SSI 2018-005

DRAWING NO.
18-029-C02

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Memo

TO: Cedars of Tuam Lane Water Local Area Service

FROM: Karla Campbell, Senior Manager, Salt Spring Island Electoral Area

DATE: November 5, 2020

SUBJECT: Cedars of Tuam Asset Management Plans

BACKGROUND:

In 2019 the CRD engaged McElhanney Consulting Services to develop an Asset Management Plan (AMP) for each of the CRD water services on Salt Spring Island. The purpose of the AMP is to ensure that we are being sustainable in our delivery of our service and with that, the CRD has changed the name of the plan to Sustainable Service Delivery Plan (SSDP). An SSDP is essentially a plan to understand the demands of our community, the level of service that is being provided to serve that demand, risk, workforce and management of the asset's current and future lifecycle needs. It guides prioritization of future capital improvements and/or replacement through informed decision making and provides the basis to create a financial strategy for maintaining required and desired level of services. An SSDP ensures that sufficient resources are in place when needed to address the full lifecycle costs of owning tangible capital assets (assets) that are needed for delivering services. An asset is a physical component that has value, enables services to be provided, and has an economic life greater than 12 months.

The SSDP helps put some rigour and structure around the information used to make strategic decisions; and to ensure that the level of service being provided is sustainable and the assets will continue to work well, with no surprises, and provide our citizens with services by providing the following information:

- What are the demands and what is the level of service (current and desired) that is being provided?
- What performance level that each asset need to provide to provide the agreed upon level of service to the community?
- What we own, where it is, and what condition is it in?
- What is the asset's remaining useful life or service life?
- Which assets are the most critical, and what is the level of risk to their function and sustainability?
- What do we need to do to sustain the services provided by each asset? When do we need to do it by? What will it cost?

SSDP is a process used in decision making. It helps the CRD sustain the services that is delivered to the community and essential care for the infrastructure in way that considers service needs of the community; manages risks and opportunities; and uses resources wisely. In effect it is way to ensure safe and sustainable services delivered in a predictable, and cost-effective manner.

KEY FINDINGS:

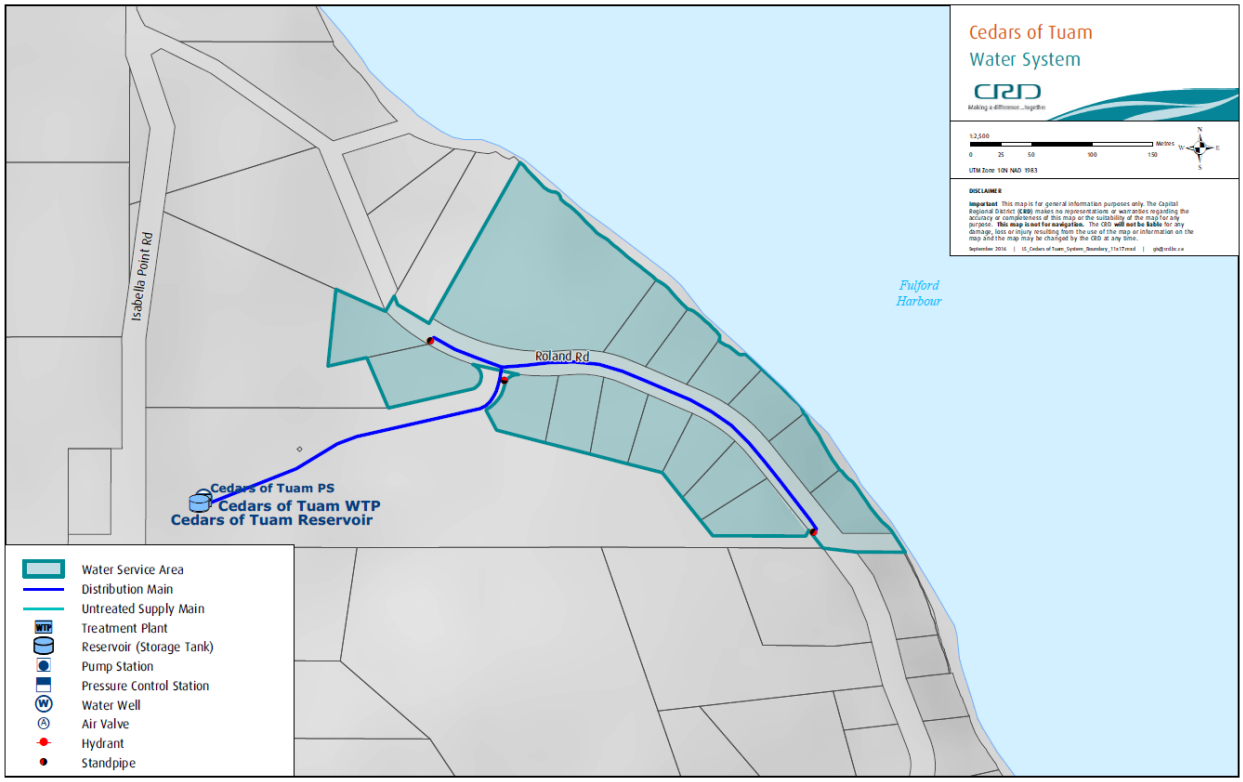
- Total estimated capital infrastructure replacement is $128,800
- Roughly 66% ($84,800) of the Cedars of Tuam assets are overdue for renewal; a further 34% ($44,000) in 1 – 5 years.
- Financial planning work is required to address the asset investment while still maintaining sustainable services.
- Recommend resources be attached to improved data and records management to ensure accuracy, and create adequate system maps, working drawings, and system documentation.

Attachment(s): Cedars of Tuam Water System Asset Management Plan

KC/AX:kc

CRD Salt Spring Island Electoral Area

Cedars of Tuam Water System Asset Management Plan



Prepared By:

McElhanney Consulting Services Ltd.

www.mcelhanney.com

Date:

April 2020

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Victoria BC
Canada V8X 4A3

Tel 250 370 9221
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REVISION No.	REVISION DESCRIPTION	DATE

ACKNOWLEDGEMENT

McElhanney would like to acknowledge and express their appreciation to the CRD and North Salt Spring Waterworks District (NSSWD) staff during this assignment. A team effort was required to develop this Asset Management Plan; and it could not have been completed without the invaluable assistance provided by the following key individuals.

- Luke Sturdy, CRD Operations and Maintenance Operator
- Grant Tamboline, Waterworks Supervisor, North Salt Spring Waterworks District

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EXECUTIVE SUMMARY

McElhanney Consulting Services Ltd. (McElhanney) has been retained by the Capital Regional District (CRD) – *Salt Spring Island Electoral Area* to provide an updated asset management plan for the Cedars of Tuam Water System. The asset management plan is intended to help the CRD optimize allocation of resources, support long term financial plans to fund infrastructure renewal / replacement as required, and further understand associated risks to help ensure that the Cedars of Tuam Water System meets acceptable levels of service and regulatory requirements.

The asset management plan was developed through review of available system background information, site inspection of each asset, a system capacity assessment for current and future demands; and incorporation of CRD staff comments and concerns.

Based on the data gathered assembling the asset management plan, prioritized capital project recommendations to benefit the Cedars of Tuam water system have been provided along with recommended time lines for implementation and cost estimates for planning purposes.

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Appendix A – Cedars of Tuam Water System Boundary Map

Appendix B – Cedars of Tuam System Background Information List

Appendix C – Cedars of Tuam Condition Assessment Table

Appendix D – Cedars of Tuam Photo Observation Sheets

Appendix E – Cedars of Tuam System Recommended Capital Projects Table

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1. BACKGROUND

1.1. INTRODUCTION

McElhanney Consulting Services Ltd. (McElhanney) has been retained by the Capital Regional District (CRD) – *Salt Spring Island Electoral Area* to provide an updated Asset Management Plan (AMP) for the Cedars of Tuam Water System. The goals of the Cedars of Tuam Water System AMP are to help the CRD optimize allocation of resources, support the CRD's long term financial plan to fund infrastructure renewal / replacement as required, and further understand associated risks to help ensure that the Cedars of Tuam Water System meets acceptable levels of service and regulatory requirements.

McElhanney developed the AMP by reviewing available background information, conducting a site inspection of each asset generating a condition assessment; assessed system capacity for current and anticipated future population; and established prioritized recommendations with related cost estimates based on the study findings.

1.2. SYSTEM SUMMARY

The Cedars of Tuam Water System is located in a rural residential development on the southwest side of Fulford Harbour on Salt Spring Island. Cedars of Tuam is at an elevation of approximately 75 m above sea level with the topography of the water service area ranging between sea level and 75 m. The area is comprised of 16 parcels of land of which all are presently connected to the system. See the *Cedars of Tuam Water System Boundary System Map* in ***Appendix A***.

The Cedars of Tuam Water System is primarily comprised of the following assets:

CEDARS OF TUAM WATER TREATMENT PLANT, WELL #1, PUMP STATION, AND RESERVOIR

The Cedars of Tuam water system pumps and extracts groundwater from Well #1 into the water treatment with a treatment process consisting of chlorination and vortex sand separator. The disinfected water is then pumped to the 45 m^3 (10,000 IG) steel-bolted reservoir and then to the distribution system. The water service area has a single pressure zone provided by the reservoir.

The Cedars of Tuam water system, noted above, is located on private property within a statutory right-of-way (SRW) area. CRD requires permission from the landowner to access the site to perform operations and maintenance work. Currently, there is a conceptual design plan (concept plan completed in 2019) to relocate the water system to a dedicated SRW on a nearby property, school board property previously inhabited by an old school house.

CEDARS OF TUAM DISTRIBUTION SYSTEM

Approximately 750 m of water distribution pipe, being asbestos cement pipe, was installed in 1970. The distribution also includes standpipes, gate valves; and water service connections complete with water meters.

1.3. LEVEL OF SERVICE

The level-of-service that a water system should provide can be broken down into a few key areas as follows:

- Regulatory Compliance;
- Capacity of the System (existing and future); and,
- Customer Expectations / Risk tolerance.

The regulatory compliance level-of-service is mandatory and must be achieved to meet minimum public health and safety standards for safe drinking water and safe operation of the system. Regulatory compliance regulations, guidelines and standards for the Cedars of Tuam Water System are listed in ***Section 1.5*** for reference.

The capacity of the system relates to the supply, production and delivery of the drinking water to the service area. There are a number of factors that can influence the level-of-service including, how much water people consume, age of the system (reduced efficiency), growth of the service area, climate change, etc. Capacity for the Cedars of Tuam Water System is discussed in ***Section 2.2***.

Customer expectation and risk tolerance is related to how well customers expect the system to perform over the long-term. This can include improved water quality requirements, water storage volumes (for domestic use and fire protection), system conveyance and pressures, system reliability and fire protection (flow, capacity, hydrants, etc.). Risk tolerance also relates to how much preventative maintenance should be performed on the system, when assets should be upgraded or replaced, system redundancy, and seismic resiliency.

The CRD has defined customer expectation and risk tolerance for the Cedars of Tuam Water System as follows:

- Water quality meets regulatory compliance and safe water drinking guidelines;
- Fire flows/capacities are not supported; however, some hydrants are present;
- Storage capacity is adequate for existing usage, however, does not meet requirements for peak demand, or fire flows;
- Flushing of watermains occurs once per year for maintenance of the system, including exercising valves;
- Pipe sizing is adequate for existing usage, but does not meet minimum requires as per Fire Underwriters Society;
- There is no system wide leak detection program;
- There is no back up power at critical infrastructure;
- There is no minimum requirement for pressure or flow for individual services; and,
- Maintenance program is a combination of preventative and reactive (discussed in more detail below), with the goal leaning more towards cost savings, rather than system resiliency.

1.4. 2011 CEDARS OF TUAM WATER SYSTEM ASSET MANAGEMENT PLAN

The Cedars of Tuam Water System was first developed in 1970 under the name 'Cedars of Tuam Water Utility'. The CRD undertook a feasibility study in 2000 towards ownership of the system and then took control of the service in 2002.

In 2011, the CRD developed a Cedars of Tuam Water System AMP to re-evaluate the system and recommend improvements. The following table summarizes the 2011 Cedars of Tuam Water System AMP recommendations, confirms if the recommendations are currently still valid and if they have been addressed.

TABLE 1 2011 CEDARS OF TUAM WATER SYSTEM AMP EVALUATION AND IMPROVEMENTS SUMMARY

Item #	Category	Asset Name	2011 AMP Evaluation / Recommendation	Still Valid ?	Addressed as of 2018 ?
1	Water Source	WTP CEDARS OF TUAM	"The water source is slightly undersized to meet the current maximum day water demands near the end of the drier periods of the year. The present sustainable maximum production rate is about 10 m³ per day, however, the well has trouble maintaining this volume in the drier times of the year. The current actual MDD is approximately 14 m³ per day."	YES	NO*
2	Water Source	WTP CEDARS OF TUAM	"The new well that was developed in 2010 with a higher yield near 1.8 litres per second (23 imperial gallons per minute) should be considered for future use or if affordable, be commissioned and connected to the existing treatment system and reservoir."	YES	NO*
2	General	WTP CEDARS OF TUAM	"The existing system is over 30 years old, with much of the infrastructure showing its age. The 2010 Annual Water Quality Report for the Cedars of Tuam water system indicates that the system continues to produce safe drinking water. However, the water quality does approach the aesthetic limits for iron and manganese."	YES	YES
3	Disinfection and Treatment	WTP CEDARS OF TUAM	"The existing well receives grit removal and chlorine disinfection. The disinfection and treatment systems were installed in 2010 and 2008, respectively. These systems are in good condition and no upgrades are required for the current sources."	YES	NO
4	Storage	RES CEDARS OF TUAM	"The existing storage capacity of 45 m³ with the existing steel tank is more than	NO	YES

Item #	Category	Asset Name	2011 AMP Evaluation / Recommendation	Still Valid ?	Addressed as of 2018 ?
			sufficient to provide equalization and emergency storage for the Cedars of Tuam water service area."		Storage capacity is considered to be adequate provided fire flows are not required
5	Distribution System	DISTRIBUTION CEDARS OF TUAM	"The existing distribution system currently meets the domestic needs of the community and does not have significant leakage. The water system is not designed to provide fire protection. The mains are asbestos cement (AC) and reported to have been constructed in the early 1970s, making them almost 40 years old."	YES	NO distribution capacity is considered to be adequate provided fire flows are not required
6	Distribution System	DISTRIBUTION CEDARS OF TUAM	"Replacement of the distribution system may be necessary over the next 15 to 20 years if leakage and main breaks begin to increase. Destructive testing of a sample may provide insight into the condition of the pipe and how long it may last. The system pressures are relatively high (70 psi) and may impact the asbestos cement as it ages."	YES	NO See recommendations
7	Distribution System	DISTRIBUTION CEDARS OF TUAM	"The system has two dead-end mains that should be flushed during the summer months to ensure chlorine residual and water quality are maintained."	YES	NO
8	Distribution System	DISTRIBUTION CEDARS OF TUAM	"The other distribution components will be replaced as part of a main replacement program. Many of these components are as old as the mains. The valves need to be located and exercised regularly. The valves that do not work should be identified and only replaced if they are critical to the operation of the distribution system."	YES	NO See recommendations
9	Distribution System	DISTRIBUTION CEDARS OF TUAM	"The watermains would need to be upgraded to a minimum 150 mm in order to provide fire protection."	YES	NO See comments on watermain pipe sizing in the Capacity Analysis

** A conceptual design plan to utilize the well that was developed in 2010 has been completed.*

Further discussion on the "Still Valid" 2011 AMP system evaluation and recommendations that have not been addressed as of 2018 are covered in ***Section 3***.

1.5. REGULATORY COMPLIANCE

The operation and maintenance of a water utility should be compliant with Provincial and Federal legislation, regulations, guidelines and standards as listed below, but not limited to:

- Guidelines for Canadian Drinking Water Quality, Health Canada
- Drinking Water Protection Act and Regulations, British Columbia
- British Columbia Water Sustainability Act and Groundwater Protection Regulation
- Island Health Authority
- Worksafe BC

1.6. MAINTENANCE PROGRAM

The Fernwood Water System currently relies on a combination of preventative maintenance for larger serviceable items and reactive maintenance for smaller non-serviceable items, but not limited to:

- Currently using Preventative Maintenance Practices, with maintenance activities (PM's) scheduled in the Strategic Asset Plan (SAP);
- Smaller replaceable assets rely on reactive maintenance (fix it when it breaks), which is common industry practice;
- A shift to more predictive maintenance practices for critical assets may provide a more reliable system; however, this practice would increase costs, and may not be deemed necessary for a system of this size;
- Currently, some spare parts are not stored on Salt Spring Island and are kept in a pool of spare parts to be shared with other services within the CRD in an effort to reduce costs. Maintaining an inventory of critical spare parts on-hand may provide a more reliable system; however, maintaining such inventory would increase costs; and,
- The lifecycle plan for major assets (i.e. water treatment plant, reservoir, pump stations, etc.) will be to maintain and operate until it becomes cost-prohibited to do so. This lifecycle point will be anticipated through maintenance reviews and updated AMPs, at which time options for replacement/upgrade will be evaluated.

2. SYSTEM FINDINGS

2.1. ASSET ASSESSMENTS

McElhanney undertook an investigation which included review of available CRD system information and conducted site condition assessments for each asset with CRD staff.

2.1.1. SYSTEM BACKGROUND INFORMATION REVIEW

McElhanney reviewed Cedars of Tuam Water System information made available by the CRD which primarily consisted of the documents listed in ***Appendix B***. Relevant information was used to further understand the system and confirm asset components.

2.1.2. CONDITION ASSESSMENTS

Site assessments were completed to determine asset physical condition, establish criticality, and estimated remaining service life. The two (2) system assets have been defined as follows:

- CEDARS OF TUAM WTP – The water treatment plant, pump station, reservoir, and groundwater well are located in the southwest corner of 184 Isabella Point Road.
- CEDARS OF TUAM DISTRIBUTION - Approximately 750 m of water distribution pipe and appurtenances located throughout the water system area.

The site assessments occurred over a two-day period on September 13th & 14th 2018. CRD staff attended the reviews to provide site access and offer relevant background information. CRD Operations staff input on the assessments is covered in ***Section 2.1.3***.

Assets were assessed primarily focusing on mechanical, civil, health & safety, electrical, and structural aspects. Assessments were based on the following criteria:

2.1.3. ASSET PHYSICAL CONDITION GRADING SYSTEM

Asset physical conditions were graded based on the level of maintenance now required and on expected renewal / rehabilitation requirements:

1. **Very Good** – Asset is physically sound, performing its function as originally intended. Generally new or recently rehabilitated. Only planned maintenance required.
2. **Good** – Asset is physically sound, performing its function as originally intended. Required maintenance costs as within acceptable standards but increasing. Asset has been used for some time but is within mid stage of expected life.
3. **Fair** – Asset is showing signs of deterioration, performing at a lower level that originally intended. Some components are becoming physically deficient. Required maintenance costs exceed acceptable standards and increasing. Asset within the later stages of expected life.
4. **Poor** – Asset is showing significant signs of deterioration, performance is much lower than originally intended. Majority of asset is physically deficient. Required maintenance costs significantly exceed acceptable standards. Asset is approaching end of expected life.
5. **Very Poor** – Asset is physically unsound and/or not performing as originally intended. Asset has higher probability of failure or failure is imminent. Maintenance costs are unacceptable. Replacement / major refurbishment required.

2.1.4. ASSET CRITICALITY GRADING SYSTEM

Asset criticality grades were established focusing on system interruption risk and health and safety issues. The grades are based on the following criteria:

1. **Non-Critical Asset** – Failure would not result in an immediate problem.
2. **Asset Standby Equipment Available** –Asset failure would result in replacement/repairs which could be completed relatively quickly.
3. **No Asset Equipment Redundancy** – Asset failure could result in moderately prolonged service interruption. Asset standby equipment not readily available.
4. **No Equipment Redundancy & Failure of equipment not monitored by alarm** - Asset failure could cause prolonged system interruption. Significant time and cost to get system back online.
5. **No Equipment Redundancy & Failure of equipment not monitored by alarm and/or immediate Health & Safety Concerns** - Asset Failure could cause prolonged system interruption. Significant time and cost to get system back online. Asset essential to health and safety requirements.

2.1.5. ASSET DATA CONFIDENCE GRADING SYSTEM

Assets were graded based on available data and records including but not limited to; documented procedures, investigations, analyses, reports, and drawings. Data confidence grades are based on the following criteria:

A. **Highly Reliable** - Data based on sound records, procedures, investigations and analysis, documented properly and agreed as the best method of assessment. Dataset is complete. Accuracy estimated +/- 2%.

B. **Reliable** - Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, i.e. some data is old, missing, and / or extrapolated. Dataset is complete. Accuracy estimated +/- 10%.

C. **Uncertain** - Data is based on sound records, procedures, investigations and analysis which is incomplete, unsupported, and/or extrapolated. Dataset is substantially complete but up to 50% is extrapolated. Accuracy estimated +/- 25%.

D. **Very Uncertain** - Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete, and most of the data is estimated or extrapolated. Accuracy estimated +/- 40%.

E. **Unknown** - Very little or no data available.

2.1.6. ASSET DATA CONFIDENCE GRADING SYSTEM

A capacity analysis was conducted for existing and future system requirements based on anticipated growth projections. The asset capacity analysis findings are discussed further in ***Section 2.2***. Assets were graded based on capacity to meet current and long-term demands. Capacity Grades are based on the following criteria:

A. **Excellent** - The asset has the capacity to meet long-term demand up to 10 years.

B. **Good** - The asset has the capacity to meet medium-term demand up to 5 years.

C. **Moderate** - The asset has the capacity to meet short-term growth demands.

D. **Borderline** - The asset has the capacity to meet short-term growth demands but experiences some shortfalls.

F. **Fail** - The asset capacity is not meeting its current demand and experiencing frequent shortfalls.

2.1.7. ASSET SYSTEM CAPACITY GRADING SYSTEM

Estimated remaining service life of each asset and/or essential components were taken into consideration for the condition assessment with known installation dates.

Asset assessment data have been compiled into the *Asset Condition Assessment Table* found in ***Appendix C***. The tables summarize the assessment findings and are grouped into mechanical, civil, health and safety, electrical, and structural components. The table provides additional information such as asset equipment description, general comments, location, gradings, service life, recommendations related to asset capital projects for improvements / upgrades, along with estimated costs. Capital project recommendations and cost estimates are discussed further in ***Section 3***. *Photo Observation Sheets* found in ***Appendix D*** provide additional photographic details of select assets.

2.1.8. CRD AND NSSWD INPUT

CRD and NSSWD operator comments and concerns were collected and incorporated into the AMP recommendations. Comments and concerns received for the Cedars of Tuam Water System are listed below:

- “Standpipe on south east corner of distribution system is buried under a tree. Remove tree or re-route the main.”
- “Watermain is not accessible along Roland Rd, should be relocated.”
- “Some water meter boxes are under water and constantly flooding.”
- “Chlorine pump and chlorine injector are for a residential pool and not for a water disinfection system; poor injection and poor sampling. They are on a re-circulation line and should be on the raw water line.”
- “Need a chlorine analyzer to replace the [residential] pool chlorinator.”
- “Need to fix sand separator.”
- “There is no eyewash out there. Need a bigger re-circ pump to drive an eye-wash station.”
- “Building is rotten and damp.”
- “Building may not have proper electrical permitting.”

2.2. SYSTEM CAPACITY ANALYSIS

Existing and Future Demand

The Cedars of Tuam water service area is comprised of 16 properties all of which are connected to the system. The system is fully metered with water meters read quarterly.

Between 2014 and 2017, water consumption has varied between 1,051 m^3/year and 1,231 m^3/year. Water production has varied significantly over the same years, with some years showing the water produced as less then the volume of water consumed. This clearly indicates that the meter used to track water production was not functioning correctly and cannot be relied upon. The malfunctioning meter is likely due to sand being extracted from the well and passing through the meter.

The measured Maximum Day Demand (MDD) in 2011 was 14 m^3/day or 875 L/day per service connection. This is significantly lower than the CRD design criteria for MDD of 2,680 L/day per service connection.

While population on Salt Spring is anticipated to grow by approximately 2.5% per year, it is also predicted that water consumption per person will continue to decrease. Currently, 100% of the properties in the water service area are serviced. Unless the boundaries of the water district are expanded or significant subdivision occurs within the water service boundaries, we would anticipate that future demand will remain at current levels or perhaps decrease slightly.

Water Supply

The Cedars of Tuam water system extracts groundwater via one well located near Isabella Point Road. The peak volume of water withdrawn from the well in a year between 2013 and 2017 was 1,759 m^3.

The well capacity is reported to be less than 18 m^3/day (4,000 igpd).

Water Treatment Plant & Pump Station

The water treatment system has been designed to treat the raw water at the flow rate provided by the well. The water treatment system has adequate capacity for the existing flow. If an additional well is added to the system or higher flow pumps installed in the existing wells, then the ability of the system to treat the higher flows would need to be reviewed.

Currently, a conceptual design plan has been completed to construct a new water treatment plant with 2 wells at a greater capacity for the water service area.

Water Storage

The system has a 46 m^3 (10,000 IG) bolted-steel tank located on 184 Isabella Point Road. The storage tank was installed in 1978 and is located at an approximate elevation of 75 m. The water service area has a single pressure zone provided by the reservoir.

Water reservoir capacity is comprised of three components: balancing storage, fire storage and emergency storage. Balancing storage should be a minimum of 25% of maximum day demand. Fire storage is dependent on the properties being protected, but for rural residential should be a minimum of 60 L/s for 1.5 hours or a total of 324 m^3. Emergency storage is 25% of the balancing + fire storage.

Balancing storage requirements for the reservoir is 3.5 m^3 and fire storage 324 m^3. Emergency storage is 82 m^3. Making the total storage required 409.5 m^3. The reservoir has adequate storage for domestic requirement but in inadequate for fire protection.

Water Distribution

The water distribution system consists of 750 m of distribution main. The watermain is 100 mm asbestos cement pipe. There are a few deficiencies in the watermain, such as water meters submerged in groundwater and obstruction for maintenance for watermain appurtenances. The system is very linear with only one branch off the primary watermain.

The 100 mm watermains do not meet typical MMCD design guidelines and are under sized for fire flow as the friction head loss at fire flow would be excessive. At domestic flow rates, the friction head loss is lower, and the existing mains seem to provide adequate flow and pressure. Should the system be upgraded to provide fire flows in the future, watermain sizing should be designed accordingly.

Summary

As it is anticipated that future demand will remain at current levels or perhaps decrease slightly, future system capacity analyses were not evaluated. The following table provides a brief summary of the system capacity findings based on fire flow requirements not being required.

TABLE 2 CEDARS OF TUAM WATER SYSTEM CAPACITY ANALYSIS SUMMARY TABLE

Asset Name	System Components	System Capacity	System Capacity Grades (Defined in Section 2.1.6)
WTP CEDARS OF TUAM	Water Treatment Plant and Pump Station	14.7 m^3/day	D
WELL CEDARS OF TUAM #1	Groundwater Well	14.7 m^3/day	D
RES CEDARS OF TUAM	Water Storage	45 m^3	D
DISTRIBUTION CEDARS OF TUAM	Water Distribution	Measured MDD in 2011 was 14 m^3/day or 875 L/day per service connection	C

Evaluation Design Criteria

The system capacity analysis referenced the following list of design criteria and guidelines:

- Design Guidelines for Rural Residential Community Water System, BC
- CRD Juan de Fuca Water Distribution Engineering Specifications
- Master Municipal Construction Document Design (MMCD) Guidelines
- Fire Underwriters Survey (FUS) – Water Supply for Public Fire Protection
- American Water Works Association (AWWA) Standards
- Recommended Standards for Water Works, Health Research Inc.

3. RECOMMENDATIONS

Prioritized capital project recommendations with recommended timelines and estimated costs have been developed for the Cedars of Tuam Water System to support the CRD's asset management goals. The recommendations along with supporting data have been detailed in the *Cedars of Tuam Water System Recommended Capital Projects Table* in ***Appendix E***. Itemized recommendations are referenced to the *Condition Assessment Table* in ***Appendix D*** for further information and have been sorted by timeline prioritization. Prioritization, cost estimates, and evaluation source are further described below.

3.1. GOVERNING PRINCIPLES

The capital project recommendations are prioritized based on the Cedars of Tuam Water System AMP governing principles which have been developed to align with the CRD's water system level of service and asset management strategic goals. The governing principles, along with recommended timeline for project completion have been defined as follows:

1. **Mandated Projects (IMMEDIATE: to be completed immediately to within one (1) year)**

   These are projects that are mandated by senior level of government. Projects required to adhere to regulatory compliance is an example of this.

2. **Health and Safety Issues (IMMEDIATE: to be completed immediately to within one (1) year)**

   These are projects, that if not completed, could impact health, safety and property.

3. **Community Priority (SHORT TERM: to be completed within one to five years)**

   These are projects that have been identified as a higher priority to benefit the community.

4. **Operating Efficiencies / Costs (SHORT TERM: to be completed within one to five years)**

   These are projects that are intended to help reduce higher than usual operations and maintenance costs, and / or improve system functionality

5. **Economic Support (LONG TERM: to be completed after six (6) plus years)**

   These are projects that are not immediately necessary but may be provided through community funding and grants.

6. **Sustainability (LONG TERM: to be completed after six (6) plus years)**

   These are projects related to asset life cycle planning. All systems deteriorate over time; as such they will require maintenance and replacement.

3.2. COST ESTIMATES

Estimated costs have been provided as an order of magnitude approximation for planning purposes. There are several limitations with preliminary budgetary estimates due to many variables and unknowns for work without detailed cost estimations, and assembling quotes, especially where the work may take place many years from now. CRD costs such as procurement, staff time, contingencies and additional operations and maintenance should be considered along with a detailed evaluation of any design, permitting, and construction costs. Timing and extent of asset upgrades and/or replacements is highly dependent on how well existing equipment is maintained in the interim and the owner following regularly scheduled AMP reassessments which are recommended to be completed every 5 years. For the Purposes of this exercise, cost estimates are generally intended to only include, engineering / design / planning, equipment procurement, and construction with a relatively small contingency (approx. 10%).

3.3. EVALUATION SOURCE

The evaluation source for each asset capital project recommendation are listed in the *Cedars of Tuam Water System Recommended Capital Projects Table*. Each of the evaluation sources listed below have been detailed throughout this report:

- Asset condition assessment;
- Review of current and future asset capacity requirements;
- Review of previous system AMP recommendations and current status; and,
- Incorporation of system comments and concerns from CRD staff.

4. FINANCIAL PLANNING

It was identified at the outset of this AMP that there were insufficient funds available to complete Financial Planning for implementation of the AMP recommendations. As such, Financial Planning will be completed by the Manager of Engineering, Salt Spring Island Electoral Area, in cooperation with CRD's Operations and Financial departments.

5. IMPROVEMENT PLAN

To help ensure future asset management plans and re-assessments on the CRD Salt Spring Island Electoral Area's water systems are executed effectively and efficiently, the following suggestions are provided for consideration:

- Provide additional details in future asset management plan request-for-proposals on service delivery expectations, report formatting, additional system background information, and avoid setting limitations on man-hours;
- Provide CRD staff NAMS training if the CRD wish to utilize this asset management system moving forward;
- Provide more time and opportunity for Operations staff to communicate issues, concerns, histories, and system details during asset management plan updates;
- Allocate additional time and resources to CRD staff to assemble, update, and keep track of all documentation relating the water system which could assist in future asset management planning exercises;
- Provide resources for more detailed Condition Assessments of critical equipment including, but not limited to, take-down, asset inspections, and non-destructive testing;
- Provide resources to provide more thorough review maintenance records;
- Provide resources to complete financial planning for recommended works; and,
- Provide resources to update / create adequate system maps, working drawings, and record documentation.

6. CLOSURE

We thank you for the opportunity to work on advancing the CRD Salt Spring Island Electoral Area's asset management planning and strategy for the Cedars of Tuam Water System and sincerely look forward to working with you in the near future.

This report has been prepared by **McELHANNEY CONSULTING SERVICES LTD.**

Prepared by:

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Vice President

APPENDIX A

CEDARS OF TUAM WATER SYSTEM BOUNDARY MAP

Cedars of Tuam
Water System

CRD
Making a difference...together

1:2,500

0 25 50 100 150 Metres

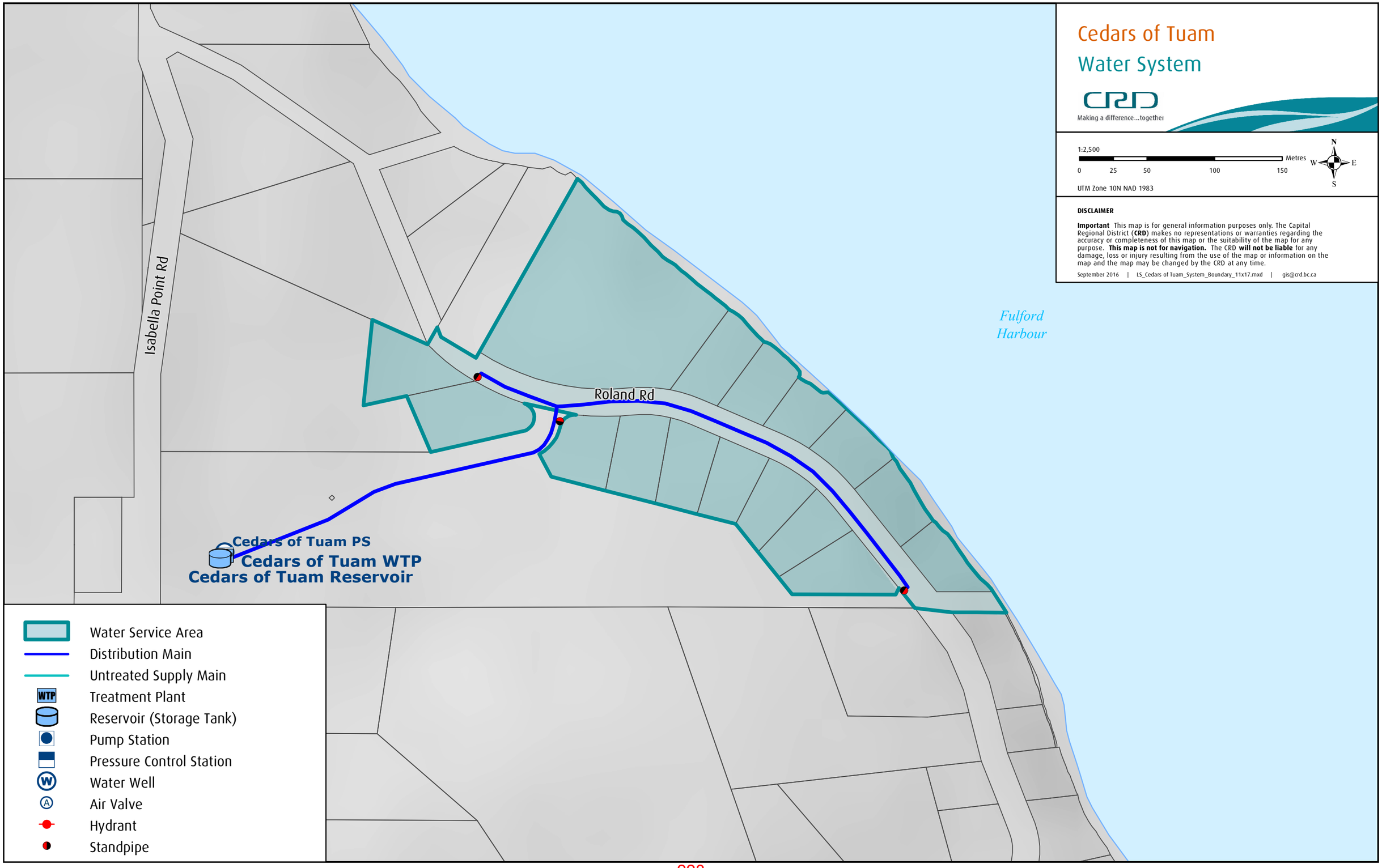
N W E S

UTM Zone 10N NAD 1983

DISCLAIMER

Important This map is for general information purposes only. The Capital Regional District (**CRD**) makes no representations or warranties regarding the accuracy or completeness of this map or the suitability of the map for any purpose. **This map is not for navigation.** The CRD **will not be liable** for any damage, loss or injury resulting from the use of the map or information on the map and the map may be changed by the CRD at any time.

September 2016 | LS_Cedars of Tuam_System_Boundary_11x17.mxd | gis@crd.bc.ca



APPENDIX B

CEDARS OF TUAM WATER SYSTEM BACKGROUND INFORMATION LIST

CEDARS OF TUAM WATER SYSTEM DOCUMENTS

1 CEDARS OF TUAM SYSTEM BOUNDARY AND LAYOUT
2 SAMP - UPDATED DEC 2011
3 CEDARS OF TUAM WATER SERVICE - 2017 ANNUAL REPORT - JUNE 7, 2018
4 CEDARS OF TUAM WATER SYSTEM
5 CEDARS OF TUAM PUMPHOUSE
6 CEDARS OF TUAM WELL

APPENDIX C

CEDARS OF TUAM WATER SYSTEM ASSET CONDITION ASSESSMENT TABLE

Item No.	Water System	Asset Name	Component	Object types	Equipment Identifier			Equipment Location		Asset Ratings				Asset Service Life			Capital Project Recommendations and Cost Estimate	
					Equipment Description	Quantity	Comments	Location	System Description	Physical Condition	Criticality	Data Confidence	Capacity Adaptation	Date Installed	Service Life	Anticipated Replacement / Refurbishment Date	Recommended Upgrade / Replacement / Investigation Capital Projects	Estimated cost (in 2019 dollars)
WTP CEDARS OF TUAM - 159 Roland Road																		
1	Cedars of Tuam	WTP CEDARS OF TUAM	Mechanical	WTP	Water Treatment Plant (WTP) - the WTP treats water supply from a ground water well. The treatmen process consists of chlorination and vortex sand separator. The well capacity is estimated up to 14 m^3/day (0.16 l/sec) over dry summer period. The system cannot provide fire water flow. Old well is not connected to the system. The WTP will be abandoned and decommissioned following development of a new GW well located on the other side of Isabella Point Rd. The existing GW well will be tied into the new system.	1	Regular maintenance taking place, as needed. There is no emergency power supply at the WTP. There are no spare parts on inventory; purchase is based on need. Chlorine dosing pump currently used for chlorine disinfection is typically used for swimming pools, not for water supply systems. Chlorine is currently injected into a recirculation line (not into a raw water supply line). A chlorine analyzer should replace the pool chlorinator. The chlorine recirculation pump does not have sufficient pressure to feed an eye wash station. Bigger pump is required. Vortex (sand) separator is not been able to remove the high volume of sand that is present in the source water. In 2017 operations added a larger home-made 6" sand separator to reduce the amount of sand entering the system. Much of the sand is very fine and does not settle rapidly and is not captured by neither the vortex unit nor the 6" separator. No washroom facilities at the WTP. The WTP building is damp and showing signs of aging.	Pump Building	The WTP consists of the following components: Storage and chemical dosing system with a single chlorine injection pump; chlorine monitoring equipment with a single chlorine recirculation pump Vortex sand separator	3	3	A	D	2008	20	2028	Replace pool chlorinator with chlorine analyzer Larger pump is required to feed eyewash station Investigte and install new Vortex (sand) separator unit to appropriately separate sand	$4,000 $4,000 $5,000
2	Cedars of Tuam	WTP CEDARS OF TUAM	Mechanical	RES	RES, Cedars of Tuam Reservoir	1	No leaks were identified.	Pump Building	45 m^3 (10,000 Igal) steel water tank	2	3	A	D	2008	20	2028		
3	Cedars of Tuam	WTP CEDARS OF TUAM	Health & Safety	SHO	SHO, Eyewash Station, Self-contained, Dynamic, 32 oz	1	No comments. Will be obsolete after construction of new WTP.	Pump Building - Chlorine room	Eyewash Station	1	1	A	N/A		30			
4	Cedars of Tuam	WTP CEDARS OF TUAM	Health & Safety	SHO	SHO, Eyewash Station, Drench hose, Guardian, G5026	1	Not enough pressure in system for water. Purchased self-contained eyewash bottle for use. Will be obsolete after construction of new WTP.	Pump Building - Chlorine room	Eyewash Station	4	1	A	N/A		50		Install a recirculation pump to create sufficient pressure for eyewash station.	$2,000
5	Cedars of Tuam	WTP CEDARS OF TUAM	Health & Safety	EXT	EXT, Fire Extinguisher	1	Fire extinguisher purchased in 2018. Fire extinguisher to be inspected on scheduled basis. Will be obsolete after construction of new WTP.	Pump Building - Chlorine room	Fire Extinguisher	1	1	A	N/A	2018	50	2068		
6	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	FLT	FLT, Level Transducer	1	N/A	Reservoir	Level Sensing	2	5	A	D	2007	15	2022		
7	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	FLT	FLT, Float Switch	2	N/A	Reservoir	Backup Level Sensing	2	5	A	D	2007	15	2022		
8	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	HVAC	HVAC, Baseboard Heater	1	Baseboard heater not suitable for wet\damp location and freeze protection, replace with approved heat trace.	Well Pump Gallery	Freeze Protection	5	1	A	N/A	2007	15	2022	Replace baseboard heater with approved heat trace	$1,600
9	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	PMP	PMP, Pump, Well Pump	1	Well Pump, BX cable not suitable for wet\damp location, replace with approved wiring method	Well Pump Gallery	Wiring Methods	5	5	A	D	<1975			Replace Well Pump cables with approved wiring method	$2,000
10	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	ELC	ELC, Main Elec Service, 60 Amp Main Fused Service Switch 120\240 single phase	1	Fused Switch & Square D Loadcenter. Fused Switch & Square D Loadcenter are corroded, wooden Electrical Service mast is rotting away, recommend replacement.	Pump Building	Electrical service and BC Hydro meter	5	5	A	D	<1975	30	2005	Replace Fuse Switch, Square D Loadcenter, and wooden electrical service mast	$10,000
11	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	SCA	SCA, SCADA, Scada Control Cabinet	1	Local Control, Resivior Level and Scada Communication	Pump Building	Local Pump Control and Communications	2	5	A	D	2015	30	2045		
12	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	STA	STA, Starter, Telemecanique Starter, Coyote Well Pump Protector	1	No standby duty starter motor protector and pump	Pump Building	Pump starter	5	2	A	D	2008	15	2023		
13	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	HVAC	HVAC, Baseboard Electric Heater Building	1	Requires replacement, Heater is heavly correded	Pump Building	Electric Heat	5	1	A	N/A	<1975	15	1990	Replace baseboard heater	$1,000
14	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	LIT	LIT, Light, Beghelli 2 Lamp T8 fluorescent	1	N/A	Pump Building	Lighting	5	1	A	N/A	2015	10	2025		
15	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	LIT	LIT, Light, Keyless socket and light bulb	1	Unprotected lightbulb and keyless socket. Replace Chlorine room lighting with vapour proof LED fixture	Pump Building - Chlorine room	Lighting	5	1	A	D	<1975	10	1985	Replace lighting with vapour prood LED.	$1,000
16	Cedars of Tuam	WTP CEDARS OF TUAM	Electrical	ELC	ELC, CL2 receptacle	2	Replace with Corrosion Resistant CR rated device	Pump Building	Receptacles	3	3	A	D	<1975	15	1990	Replace with Corrosion Resistant CR rated device.	$200
17	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SIT	SIT, Overall site	1	Ongoing maintenance is being performed by CRD personnel. It is recommended that this building be replaced. There is debris around the facility that traps moisture against the finishes. Large rocks in front of the building pose a tripping hazard. Trees trimming is required to protect finishes from further damage.	Pump Building	Site is sloping and located in the corner of a farmer's field.	3	1	A	N/A	1900	50	1950	Debis recommended to be removed around facilty, as well, tree trimming is required.	$2,000
18	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	DWY	DWY, Onsite driveway	1	Access is free of debris and accessible.	Pump Building	Access is by way of a series of gates along a dirt road through the field.	3	1	A	N/A	1900	50	1950		
19	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	PKG	PKG, Parking lot	1	N/A	Pump Building	Parking is located on Roland Road.	1	1	A	N/A	1900	50	1950		
20	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SER	SER, Service, Water system.	1	N/A	Pump Building	Onsite services are related to the water system.	1	1	A	N/A	1900	50	1950		
21	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	FEN	FEN, Fence, Perimeter Fence	1	No issues were noted with the fence as vandalism is not an issue in the area.	Pump Building	Onsite protective fencing is a farmer's page wire fence around the facility.	1	1	A	N/A	1900	25	1925		
22	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Foundation, Concrete	4.0 m^2	Backfilling is required at the front of the building to prevent further erosion at the concrete foundation.	Pump Building	Foundation is a reinforced concrete foundation and slab on grade system.	2	1	A	D	1900	50	1950	Backfill required at front of building.	$3,000

Item No.	Water System	Asset Name	Component	Object types	Equipment Identifier			Equipment Location		Asset Ratings				Asset Service Life			Capital Project Recommendations and Cost Estimate	
					Equipment Description	Quantity	Comments	Location	System Description	Physical Condition	Criticality	Data Confidence	Capacity Adaptation	Date Installed	Service Life	Anticipated Replacement / Refurbishment Date	Recommended Upgrade / Replacement / Investigation Capital Projects	Estimated cost (in 2019 dollars)
23	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Wood Frame	4.0 m^2	PST Roland is a part of the WTP Cedars at Tuam and Well Cedars of Tuam #1 building. The WTP and PST building is a single storey wood frame structure on a concrete slab on grade foundation system. Many structural components are rotting and require replacement. It is recommended the building be demolished and replaced with a new facility. Electrical mast is rotting and requires replacement.	Pump Building	Structure is a wood framed wall and roof system.	5	1	A	D	1900	50	1950	Structural components of building require replacing. Structure should be demolished and replaced with a new facility. Electritcal mast requires replacing.	$13,000
24	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Stucture, Cladding	4.0 m^2	Exterior walls are covered in horizontal cedar siding. Finishes are in poor condition and require replacement.	Pump Building	The building is clad in horizontal cedar siding.	5	1	A	D	1900	25	1925	Facilty finishing requires replacing.	$10,000
25	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Openings, Exterior	4.0 m^2	No issues were noted with door.	Pump Building	Door to pump room is wood.	3	1	A	D	1900	25	1925		
26	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Roof, Asphalt Shingle	4.0 m^2	The roof system is sloped with asphalt shingle roofing and no gutters. Roofing is damaged and has exceeded life expectancy. There are no gutters and rainwater is splashing against finishes.	Pump Building	Roof is an asphalt shingle roofing system with no gutters.	5	1	A	D	1900	25	1925	Roofing is damaged and requires replacing with appropriate gutters.	$5,000
27	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Partitions, Interior	4.0 m^2	No issues were noted with interior partitions.	Pump Building	Interior partitions are wood framed.	2	1	A	D	1900	25	1925		
28	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Finishes, Interior	4.0 m^2	Interior finishes are rotting and show mould from excess water spraying on surfaces.	Pump Building	Walls and ceiling are covered in unfinished plywood sheathing. Floor is an exposed concrete slab.	5	1	A	D	1900	15	1915	Interior finishing rotting are requires replacement.	$4,000
29	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	ELC	ELC, Heater	1	Heating is provided by electric baseboard heaters. There is no emergency generator to operate emergency systems in case of a power outage. See electrical for comments.	Pump Building	The building is heated with electric baseboard heaters.	1	1	A	N/A	1900	25	1925	Replace baseboard heaters	$500
30	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SAF	EXT, Fire Extinguisher	1	Fire extinguisher is serviced on a regular basis.	Pump Building	There is a fire extinguisher installed.	1	1	A	N/A	1900	25	1925		
31	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	LAD	LAD, Ladder, Access, Extension Ladder	1	Ex. ladder is not secure to reservoir. WTP Cedars of Tuam is anticipated to be decommissioned and relocated. Items noted above will be obsolete after construction of new WTP.	Reservoir	Ladder for Reservoir Access	4	1	A	N/A		75		Ladder to be secured properly until decommissing of WTP	$500
32	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SIT	SIT, Overall site	1	Ongoing maintenance is being performed by CRD personnel. Large rocks and debris around the tank pose a tripping hazard.	Reservoir	Site is sloping and located in the corner of a farmer's field.	2	1	A	N/A	1900	50	1950		
33	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	DWY	DWY, Onsite driveway	1	Access is free of debris and accessible.	Reservoir	Access is by way of a series of gates along a dirt road through the field.	1	1	A	N/A	1900	50	1950		
34	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	PKG	PKG, Parking Lot	1	N/A	Reservoir	Parking is located on Roland Road.	1	1	A	N/A	1900	50	1950		
35	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SER	SER, Service, Water System	1	N/A	Reservoir	All services are related to the water system.	1	1	A	N/A	1900	50	1950		
36	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	FEN	FEN, Fence, Perimeter Fence	1	No issues were noted with the fence as vandalism is not an issue in the area.	Reservoir	There is a farmer's page wire fence around the facility.	2	1	A	N/A	1900	25	1925		
37	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Foundation, Concrete	1	No foundation issues were noted.	Reservoir	Foundation is a reinforced concrete foundation system.	1	1	A	D	1900	50	1950		
38	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Steel Tank	1	Res Cedars of Tuam reservoir is a packaged metal tank on a concrete foundation system. There are several areas where the structural steel is exposed and rusting.	Reservoir	Tank is a packaged steel tank.	1	1	A	D	1900	50	1950		
39	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Cladding, Sheet Metel	1	All exterior finishes require cleaning and refinishing.	Reservoir	Tank is clad in prefinished sheet metal.	4	1	A	D	1900	25	1925		
40	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Openings, Exterior	1	No issues noted with exterior openings.	Reservoir	Tank lid is secured from vandalism.	1	1	A	D	1900	25	1925	Tank drain is not secured to prevent insects or rodents - repair drain	$500
41	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Roof, Steel	1	Roof requires moss and debris removal. Upgrading of all finishes are required.	Reservoir	Roof is part of the packaged steel tank.	4	1	A	D	1900	25	1925	Removal of moss buildup is required to prevent damage to roofing materials and supporting structure. Replace all finishings.	$5,000
42	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	RAI	RAI, Railing, Exterior	0	A safety railing is required to prevent falls. The top of the tank is considered working at heights due to the overall height above ground. However, Operations do not believe a 'safety railing' is required as they do not walk on this reservoir. The access hatch is reached from the portable extension ladder.	Reservoir	There are no exterior railings.	5	1	A	N/A	1900	25	1925		
43	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SAF	SAF, Safety, Top of Tank	0	Safety measures for access to the top of tank are required.	Reservoir	There are no safety measures at tank.	5	1	A	N/A	1900	25	1925	Safety measures are required for access to the top of the tank	Refer to Item (31)
44	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SIT	SIT, Overall Site	1	Ongoing maintenance is being performed by CRD personnel. Large rocks in front of the building pose a tripping hazard.	Reservoir	Site is sloping and located in the corner of a farmer's field.	3	1	A	N/A	1900	50	1950		
45	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	DWY	DWY, Onsite Driveway	1	Access is free of debris and accessible.	Pump Building - Well Enclouse	Access is by way of a series of gates along a dirt road through the field.	3	1	A	N/A	1900	50	1950		
46	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	PKG	PKG, Parking Lot	1	N/A	Pump Building - Well Enclouse	Parking is located on Roland Road.	1	1	A	N/A	1900	50	1950		
47	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SER	SER, Service, Water System	1	N/A	Pump Building - Well Enclouse	All services are related to the water system.	1	1	A	N/A	1900	50	1950		
48	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	FEN	FEN, Perimeter Fence	1	No issues were noted with the fence as vandalism is not an issue in the area.	Pump Building - Well Enclouse	There is a farmer's page wire fence around the facility.	1	1	A	N/A	1900	25	1925		
49	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Foundation, Ground	1.5 m^2	The enclosure is in poor condition and should be replaced with a new enclosore that includes a concrete foundation.	Pump Building - Well Enclouse	There is no foundation.	5	1	A	D	1900	50	1950	Concrete foundation should be included with constuction of a new facility. CRD is considering upgrades / replacement of the treatment system. Costing is not included in the AMP for the upgraded system.	N/A
50	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Well enclousure, Wood Frame	1.5 m^2	Well Cedars of Tuam #1 is a part of the WTP Cedars at Tuam and PST Roland building. The well enclosure is a 0.6 m high wood frame structure constructed with no foundation. Structure is constructed on ground. Components are not pressure treated. The enclosure is in poor condition and should be replaced.	Pump Building - Well Enclouse	Structure is a wood framed wall and lid system.	5	1	A	D	1900	50	1950	Structure should be demoloshed and reconstucted. CRD is considering upgrades / replacement of the treatment system. Costing is not included in the AMP for the upgraded system.	N/A

Item No.	Water System	Asset Name	Component	Object types	Equipment Identifier			Equipment Location		Asset Ratings				Asset Service Life			Capital Project Recommendations and Cost Estimate	
					Equipment Description	Quantity	Comments	Location	System Description	Physical Condition	Criticality	Data Confidence	Capacity Adaptation	Date Installed	Service Life	Anticipated Replacement / Refurbishment Date	Recommended Upgrade / Replacement / Investigation Capital Projects	Estimated cost (in 2019 dollars)
51	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Cladding	1.5 m^2	Exterior walls are covered in unfinished plywood sheathing. Siding is incomplete and does not provide adequate protection from the elements. The enclosure is in poor condition and should be replaced.	Pump Building - Well Enclouse	The enclosure is clad in unfinished plywood sheathing and exposed building paper.	5	1	A	D	1900	25	1925	Siding is incomplete and does not provide adequate protection from the elements. The enclosure is in poor condition and should be replaced.	$700
52	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Opening, Exterior	1.5 m^2	Plywood lid is unfinished.	Pump Building - Well Enclouse	Access to the enclosure is by way of a plywood lid.	5	1	A	D	1900	25	1925	Plywood lid is unfinished - paint unfinished plywood	$1,000
53	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Roof	1.5 m^2	The hinged top is sloped plywood with no finishes.	Pump Building - Well Enclouse	There is no roof as the lid noted above covers the enclosure.	5	1	A	D	1900	25	1925		
54	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	ELC	ELC, Heater	1	Heating is provided by an electric baseboard heater. There is no emergency generator to operate emergency systems in case of a power outage. See electrical for comments.	Pump Building - Well Enclouse	The building is heated with electric baseboard heaters.	5	1	A	N/A	1900	25	1925		
55	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SIT	SIT, Overall Site	1	Ongoing maintenance is being performed by CRD personnel. There is debris around the facility that traps moisture against the finishes. Large rocks in front of the building pose a tripping hazard. Trees trimming is required to protect finishes from further damage.	Pump Building - Chlorine room	Site is sloping and located in the corner of a farmer's field.	3	1	A	N/A	1900	50	1950	Debis recommended to be removed around facilty, as well, tree trimming is required.	$1,000
56	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	DWY	DWY, Onsite Driveway	1	Access is free of debris and accessible.	Pump Building - Chlorine room	Access is by way of a series of gates along a dirt road through the field.	3	1	A	N/A	1900	50	1950		
57	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	PKG	PKG, Parking Lot	1	N/A	Pump Building - Chlorine room	Parking is located on Roland Road.	1	1	A	N/A	1900	50	1950		
58	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SER	SER, Service, Water System	1	N/A	Pump Building - Chlorine room	All services are related to the water system.	1	1	A	N/A	1900	50	1950		
59	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	FEN	FEN, Fence, Perimeter Fence	1	No issues were noted with the fence as vandalism is not an issue in the area.	Pump Building - Chlorine room	There is a farmer's page wire fence around the facility.	1	1	A	N/A	1900	25	1925		
60	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Foundation, Concrete	3.0 m^2	Backfilling is required at the front of the building to prevent further erosion at the concrete foundation.	Pump Building - Chlorine room	Foundation is a reinforced concrete foundation and slab on grade system.	2	1	A	D	1900	50	1950	Backfill required at front of building.	$1,000
61	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Wood Frame	3.0 m^2	WTP Cedars at Tuam is a part of the PST Roland and Well Cedars of Tuam #1 building. The WTP and PST building is a single storey wood frame structure on a concrete slab on grade foundation system. Many structural components are rotting and require replacement. It is recommended the building be demolished and replaced with a new facility.	Pump Building - Chlorine room	Structure is a wood framed wall and roof system.	5	1	A	D	1900	50	1950	Structural components of building require replacing. Structure should be demolished and replaced with a new facility. Electritcal mast requires replacing.	$7,000
62	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Cladding	3.0 m^2	Exterior walls are covered in horizontal cedar siding. Finishes are in poor condition and require replacement.	Pump Building - Chlorine room	The building is clad in horizontal cedar siding.	5	1	A	D	1900	25	1925	Facilty finishing requires replacing.	$2,000
63	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Opening, Exterior	3.0 m^2	No issues were noted with door.	Pump Building - Chlorine room	Door to treatment room is wood.	3	1	A	D	1900	25	1925		
64	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Roof, Asphalt Shingle	3.0 m^2	The roof system is sloped with asphalt shingle roofing and no gutters. Roofing is damaged and has exceeded life expectancy. There are no gutters and rainwater is splashing against finishes.	Pump Building - Chlorine room	Roof is an asphalt shingle roofing system with no gutters.	5	1	A	D	1900	25	1925	Roofing is damaged and requires replacing with appropriate gutters.	$2,400
65	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Partition, Interior	3.0 m^2	No issues were noted with interior partitions.	Pump Building - Chlorine room	Interior partitions are wood framed.	2	1	A	D	1900	25	1925		
66	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	STR	STR, Structure, Finishes, Interior	3.0 m^2	All interior finishes require painting.	Pump Building - Chlorine room	Walls and ceiling are covered in unfinished plywood sheathing. Floor is an exposed concrete slab.	5	1	A	D	1900	15	1915		
67	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	HVAC	HVAC, Ventillation System	0	An exhaust system is required to remove dangerous gases before maintenance personnel enter the space.	Pump Building - Chlorine room	Structure mechanical	1	1	A	D	1900	25	1925	Install an exhaust system for removal of dangerous gases.	$3,000
68	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	ELC	ELC, Heater	1	Heating is provided by electric baseboard heaters. There is no emergency generator to operate emergency systems in case of a power outage. See electrical for comments.	Pump Building - Chlorine room	Structure electrical	1	1	A	N/A	1900	25	1925		
69	Cedars of Tuam	WTP CEDARS OF TUAM	Structural	SAF	SHO/EXT, Eye wash station/Fire Extingusiher	1	Emergency wash station and fire extinguisher are serviced on a regular basis. There is no hot water tank to temper the water for the eyewash station.	Pump Building - Chlorine room	There is a packaged, hand-held emergency eye wash station. There is a fire extinguisher installed.	1	1	A	N/A	1900	25	1925		

Asset Physical Condition Rating:

- **1. Very Good:** Asset is physically sound, performing its function as originally intended. Generally a new or recently rehabilitated. Only planned maintenance required
- **2. Good:** Asset is physically sound, performing its funtion as originally intended. Required maintenance costs as within acceptable standards but increasing. Asset has been used for some time but is within mid stage of expected life.
- **3. Fair:** Asset is showing signs of deterioration, performing at a lower level that originally intended. Some components are becoming physically deficient. Required maintenance costs exceed acceptable standards and increasing. Asset within the later stages of expected life.
- **4. Poor:** Asset is showing significant signs of deterioration, performance much lower than originally intended. Majority of asset is physically deficient. Required maintenance costs significantly exceed acceptable standards. Asset is approaching end of expected life
- **5. Very Poor:** Asset is physically unsound and/or not performing as originally intended. Asset has higher probability of failure or failure is imminent. Maintenance coasts are unacceptable. Replacement / major refurbishment required

Asset Criticality Rating:

- **1. Non-critical: Asset** failure would not result in immediate problem.
- **2. Asset Standby Equipment Available:** Asset failure would result in replacement/repairs which could be completed relatively quickly.
- **3. No equipment redundancy:** Asset failure could result in moderately prolonged service interruption. Asset standby equipment not readily available.
- **4. No Equipment Redundancy & Failure of equipment not monitored by alarm:** Asset Failure could cause prolonged system interruption. Significant time and cost to get system back online
- **5. No Equipment Redundancy & Failure of equipment not monitored by alarm and/or immediate Health & Safety Concerns:** Asset Failure could cause prolonged system interruption. Significant time and cost to get system back online. Asset essential to health and safety requirements.

Data Confidence Grading System

- **A - Highly Reliable:** Data based on sound records, procedures, investigations and analysis, documented properly and agreed as the best method of assessment. Dataset is complete. Accuracy estimated +- 2%
- **B - Reliable:** Data based on sound records, procedures , investigations and analysis, documented properly but has minor shortcomings, i.e. some data is old, missing, extrapolated. Dataset is complete. Accuracy estimated +- 10%
- **C - Uncertain:** Data is based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated. Dataset is substantially complete but up to 50% is extrapolated. Accuracy estimated +- 25%
- **D - Very Uncertain:** Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete and most data is estimated or extrapolated. Accuracy estimated +- 40%
- **E - Unknown:** None or very little data held

Capacity Adaptation Ranking System

- **A - Excellent:** The asset has the capacity to meet long-term demand up to 10 years
- **B - Good:** The asset has the capacity to meet medium-term demand up to 5 years
- **C - Moderate:** The asset has the capacity to meet short-term growth demands.
- **D - Borderline:** The asset has the capacity to meet short-term growth demands but experiences some shortfalls.
- **E - Fail:** The asset capacity is not meeting its current demand and experiencing frequent shortfalls.

Item No.	Water System	Asset Name	Component	Object types	Equipment Identifier			Equipment Location		Asset Ratings				Asset Service Life			Capital Project Recommendations and Cost Estimate	
					Equipment Description	Quantity	Comments	Location	System Description	Physical Condition	Criticality	Data Confidence	Capacity Adaptation	Date Installed	Service Life	Anticipated Replacement / Refurbishment Date	Recommended Upgrade / Replacement / Investigation Capital Projects	Estimated cost (in 2019 dollars)
DISTRIBUTION CEDARS OF TUAM																		
70	Cedars of Tuam	DISTRIBUTION CEDARS OF TUAM	Civil	WM	WM, Watermain, 100 mm, AC	750 m (α)	Watermain flushing is scheduled annually. One valve requires repair / replacement. Two valves are required for branch valves. Services along Roland Rd are not accessible, as watermain is located behind hydro poles up an embankment	Local Water Service	Watermain piping	4	5	A	C	1970	50	2020	Repair or replace watermain valve. Install an additional valve for branch valves. Sections of watermain under trees, consider re-aligning.	$14,000
71	Cedars of Tuam	DISTRIBUTION CEDARS OF TUAM	Civil	STP	STP, Standpipe	3 ea. (α)	All standpipes should be painted and have caps on outlets.	Local Water Service	Standpipe	4	1	A	C	1970	50	2020	Standpipes require painting and caps on the outlets.	$2,500

Asset Physical Condition Rating:

- **1. Very Good:** Asset is physically sound, performing its function as originally intended. Generally a new or recently rehabilitated. Only planned maintenance required
- **2. Good:** Asset is physically sound, performing its funtion as originally intended. Required maintenance costs as within acceptable standards but increasing. Asset has been used for some time but is within mid stage of expected life.
- **3. Fair:** Asset is showing signs of deterioration, performing at a lower level that originally intended. Some components are becoming physically deficient. Required maintenance costs exceed acceptable standards and increasing. Asset within the later stages of expected life.
- **4. Poor:** Asset is showing significant signs of deterioration, performance much lower than originally intended. Majority of asset is physically deficient. Required maintenance costs significantly exceed acceptable standards. Asset is approaching end of expected life
- **5. Very Poor:** Asset is physically unsound and/or not performing as originally intended. Asset has higher probability of failure or failure is imminent. Maintenance coasts are unacceptable. Replacement / major refurbishment required

Asset Criticality Rating:

- **1. Non-critical: Asset** failure would not result in immediate problem.
- **2. Asset Standby Equipment Available:** Asset failure would result in replacement/repairs which could be completed relatively quickly.
- **3. No equipment redundancy:** Asset failure could result in moderately prolonged service interruption. Asset standby equipment not readily available.
- **4. No Equipment Redundancy & Failure of equipment not monitored by alarm:** Asset Failure could cause prolonged system interruption. Significant time and cost to get system back online
- **5. No Equipment Redundancy & Failure of equipment not monitored by alarm and/or immediate Health & Safety Concerns:** Asset Failure could cause prolonged system interruption. Significant time and cost to get system back online. Asset essential to health and safety requirements.

Data Confidence Grading System

- **A - Highly Reliable:** Data based on sound records, procedures, investigations and analysis, documented properly and agreed as the best method of assessment. Dataset is complete. Accuracy estimated +- 2%
- **B - Reliable:** Data based on sound records, procedures , investigations and analysis, documented properly but has minor shortcomings, i.e. some data is old, missing, extrapolated. Dataset is complete. Accuracy estimated +- 10%
- **C - Uncertain:** Data is based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated. Dataset is substantially complete but up to 50% is extrapolated. Accuracy estimated +- 25%
- **D - Very Uncertain:** Data is based on unconfirmed verbal reports and/or cursory inspections and analysis. Dataset may not be fully complete and most data is estimated or extrapolated. Accuracy estimated +- 40%
- **E - Unknown:** None or very little data held

Capacity Adaptation Ranking System

- **A - Excellent:** The asset has the capacity to meet long-term demand up to 10 years
- **B - Good:** The asset has the capacity to meet medium-term demand up to 5 years
- **C - Moderate:** The asset has the capacity to meet short-term growth demands.
- **D - Borderline:** The asset has the capacity to meet short-term growth demands but experiences some shortfalls.
- **E - Fail:** The asset capacity is not meeting its current demand and experiencing frequent shortfalls.

APPENDIX D

CEDARS OF TUAM ASSET PHOTO OBSERVATION SHEETS

Local Water Service
CEDARS OF TUAM LOCAL WATER SERVICE

Asset	Component	Location
WTP Cedars of Tuam	**Mechanical**	**159 Roland Road**

Description:

Cedars of Tuam WTP

Observation:

View of the water treatment plant (left-hand side) with 10,000 Imp. gallon (45 m^3) water reservoir in the foreground.

Description:

Cedars of Tuam WTP

Observation:

Interior of the water treatment plant. The building is damp and showing signs of aging. Vortex (sand) separator needs repair.

Description:

Cedars of Tuam WTP

Observation:

Interior of the WTP with chlorine dosing pump (blue), chlorine recycle loop/pump (red) and analyzer (light blue) (in the middle). The chlorine recirculation pump does not have sufficient pressure to feed an eye wash station in the adjacent room. Bigger pump is required.

Asset	Component	Location
WTP Cedars of Tuam	**Mechanical**	**159 Roland Road**

	Description: Cedars of Tuam WTP Observation: Interior of the water treatment plant. The building is damp and showing signs of aging.
	Description: Cedars of Tuam WTP Observation: Chlorine room and emergency eye wash. The chlorine recirculation pump (located in the adjacent room) does not have sufficient pressure to feed an eye wash station. Bigger pump is required.

Asset	Component	Location
WTP Cedars of Tuam	**Civil / Health & Safety**	**159 Roland Road**

	Description: Drench Hose Eyewash Station Observation: Drench hose eyewash station does not provide enough pressure. CRD Personnel Observation: Eyewash station has insufficient pressure. Suggested adding recirculation pump. Included self-contained eyewash bottle to WTP.
	Description: Self-contained Eyewash Bottle Observation: No issues noted CRD Personnel Observation: No issues noted
	Description: Fire Extinguisher Observation: Fire extinguisher was purchased this year (2018) and will require maintenance inspection. CRD Personnel Observation: No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Electrical**	**159 Roland Road**

	Description: Main electrical service mast support Observation: Safety concerns, wood electrical service mast is severely rotten and needs replacement CRD Personnel Observation: No issues noted
	Description: Electrical Main Fused Switch and Panel Observation: Safety concerns, both pieces of equipment are severely corroded and past their serviceable life, need replacement CRD Personnel Observation: No issues noted
	Description: Well Pump Starter and Pump Protection Observation: No issues noted CRD Personnel Observation: No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Electrical**	**159 Roland Road**

	Description: Electric Heater Observation: Safety concerns, heater is severely corroded and needs replacement CRD Personnel Observation: No issues noted
	Description: Scada Process Control Panel and Radio Communications Observation: No issues noted CRD Personnel Observation: No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Structural**	**159 Roland Road**

Description:

Front view of building with WTP room (left) with PST room (center) and well enclosure (right). Reservoir is in the background.

Observation:

Debris removal is required around building and reservoir.

CRD Personnel Observation:

No issues noted

Description:

Front of building above WTP door.

Observation:

Roof requires replacement. Structural elements are rotting. Gutters are required.

CRD Personnel Observation:

No issues noted

Description:

Rear of building outside WTP.

Observation:

Debris removal is required to prevent further deterioration of the finishes and structure.

CRD Personnel Observation:

No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Structural**	**159 Roland Road**

Description:

Inside of WTP with eyewash and chlorine treatment.

Observation:

Eyewash station is serviced on a regular basis. There is no hot water to temper the water.

CRD Personnel Observation:

No issues noted

Description:

Front view of building with WTP room (left) with PST room (center) and well enclosure (right). Reservoir is in the background.

Observation:

Debris removal is required around building and reservoir.

CRD Personnel Observation:

No issues noted

Description:

Rear of PST and WFP Building

Observation:

Tree removal and roof replacement is required. All finishes have exceeded life expectancy and require upgrading.

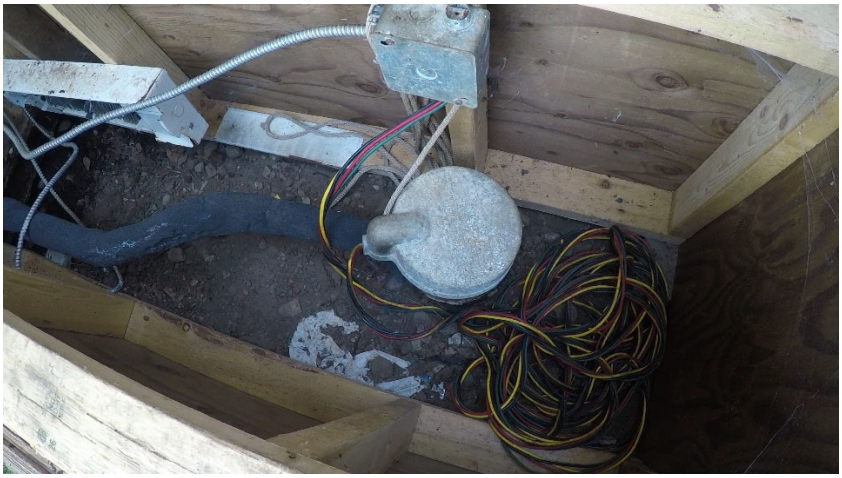
CRD Personnel Observation:

No issues noted

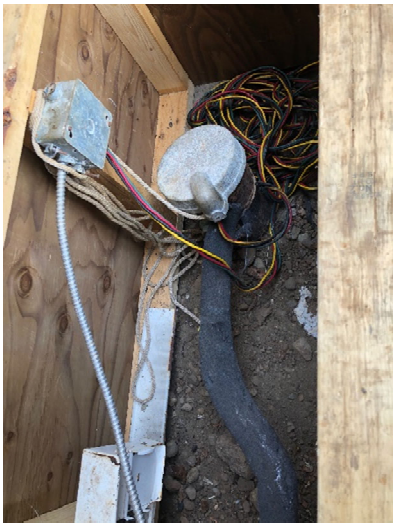
Asset	Component	Location
WTP Cedars of Tuam	**Structural**	**159 Roland Road**

	Description: Access to Pump Station Building Observation: Excess water has caused rotting of the door sill. CRD Personnel Observation: No issues noted
	Description: Inside of Pump Station Building Observation: Mould is present on the wall behind water system components. Electrical components are rusted due to continued exposure to moisture. CRD Personnel Observation: No issues noted
	Description: Inside of Pump Station Building Observation: Electric baseboard heater is damaged and rusted. CRD Personnel Observation: No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Mechanical**	**159 Roland Road**

	Description: Cedars of Tuam WTP Observation: Production GW well and well head located inside a wooden enclosure.
	Description: Cedars of Tuam WTP Observation: Production GW well (left-hand side) and a capped well head (blue) of a GW well (foreground) disconnected from the system.

Asset	Component	Location
WTP Cedars of Tuam	**Electrical**	**159 Roland Road**

	Description: Well Pump connection Observation: Safety concerns, wiring method, BX cable not suitable for damp locations, change pump feeder with cable suitable for location. Well pump cable should be shortened. CRD Personnel Observation: No issues noted
	Description: Electric Heater Well Pump Gallery Observation: Safety concerns, electric heater not suitable for damp locations. Replace with GFCI receptacle and heat trace. CRD Personnel Observation: No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Structural**	**159 Roland Road**

Description:

Front view of building with WTP room (left) with PST room (center) and well enclosure (right). Reservoir is in the background.

Observation:

Debris removal is required around building and reservoir.

CRD Personnel Observation:

No issues noted

Description:

Inside of Well enclosure.

Observation:

There are no foundations or interior finishes to protect structure from moisture. There is no floor. Electric baseboard heater is damaged and requires replacement.

CRD Personnel Observation:

No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Structural**	**159 Roland Road**

Description:

Reservoir tank

Observation:

The temporary ladder and lack of fall protection make access to the tank lid unsafe.

CRD Personnel Observation:

No issues noted

Description:

Top of Reservoir.

Observation:

Moss and debris removal and upgrading of all finishes is required.

CRD Personnel Observation:

No issues noted

Description:

Reservoir lid.

Observation:

Paint is chipping and steel is rusting.

CRD Personnel Observation:

No issues noted

Asset	Component	Location
WTP Cedars of Tuam	**Structural**	**159 Roland Road**

Description:

Reservoir drain.

Observation:

Tank drain is not secured to prevent insects or rodents.

CRD Personnel Observation:

No issues noted

Asset	Component	Location
Distribution Cedar of Tuam	**Civil**	**Cedars of Tuam Area**

Description:

Standpipe in front of 170 Roland Road

Observation:

All standpipe should be painted and have a cap on the outlet.

CRD Personnel Observation:

No issues noted

APPENDIX E

CEDARS OF TUAM WATER SYSTEM RECOMMENDED CAPITAL PROJECTS TABLE

CRD Salt Spring Island Electoral Area
CEDARS OF TUAM WATER SYSTEM RECOMMENDED CAPITAL PROJECTS

Item No.	Condition Assessment Table Item No.	Asset Name	Evaluation Source	Description of Recommended Capital Project	Relevant Governing Principles	Timeline	Estimated Costs (in 2019 dollars)
1	1	WTP Cedars of Tuam	Condition Assessment CRD Staff Comment	Replace pool chlorinator with chlorine analyzer	1, 2, 4, 6	Immediate to < 1 year	$4,000
2	1	WTP Cedars of Tuam	Condition Assessment CRD Staff Comment	Larger pump is required to feed eyewash station	2, 6	Immediate to < 1 year	$4,000
3	1	WTP Cedars of Tuam	Condition Assessment CRD Staff Comment	Investigte and install new Vortex (sand) separator unit to appropriately separate sand	1, 2, 4, 6	Immediate to < 1 year	$5,000
4	4	WTP Cedars of Tuam	Condition Assessment CRD Staff Comment	Install a recirculation pump to create sufficient pressure for eyewash station.	2	Immediate to < 1 year	$2,000
5	8	WTP Cedars of Tuam	Condition Assessment	Replace baseboard heater with approved heat trace	4	Immediate to < 1 year	$1,600
6	9	WTP Cedars of Tuam	Condition Assessment	Replace Well Pump cables with approved wiring method	4	Immediate to < 1 year	$2,000
7	10	WTP Cedars of Tuam	Condition Assessment	Replace Fuse Switch, Square D Loadcenter, and wooden electrical service mast	4	Immediate to < 1 year	$10,000
8	13	WTP Cedars of Tuam	Condition Assessment	Replace baseboard heater	4	Immediate to < 1 year	$1,000
9	15	WTP Cedars of Tuam	Condition Assessment	Replace lighting with vapour prood LED.	4	Immediate to < 1 year	$1,000
10	16	WTP Cedars of Tuam	Condition Assessment	Replace with Corrosion Resistant CR rated device.	4	Immediate to < 1 year	$200
11	17	WTP Cedars of Tuam	Condition Assessment	Debis recommended to be removed around facilty, as well, tree trimming is required.	2, 4, 6	Immediate to < 1 year	$2,000
12	31	WTP Cedars of Tuam	Condition Assessment	Ladder to be secured properly until decommissing of WTP	2	Immediate to < 1 year	$500
13	40	WTP Cedars of Tuam	Condition Assessment	Tank drain is not secured to prevent insects or rodents - repair drain	2, 6	Immediate to < 1 year	$500
14	41	WTP Cedars of Tuam	Condition Assessment	Removal of moss buildup is required to prevent damage to roofing materials and supporting structure. Replace all finishings.	2, 4, 6	Immediate to < 1 year	$5,000
15	43	WTP Cedars of Tuam	Condition Assessment	Safety measures are required for access to the top of the tank	2	Immediate to < 1 year	Refer to Item No. 12
16	55	WTP Cedars of Tuam	Condition Assessment	Debis recommended to be removed around facilty, as well, tree trimming is required.	2, 4, 6	Immediate to < 1 year	$1,000
17	67	WTP Cedars of Tuam	Condition Assessment	Install an exhaust system for removal of dangerous gases.	2	Immediate to < 1 year	$3,000
18	70	Distribution Cedars of Tuam	Condition Assessment CRD Staff Comment 2011 AMP	Repair or replace watermain valve. Install an additional valve for branch valves. Sections of watermain under trees, consider re-aligning.	2, 3, 6	Immediate to < 1 year	$20,000
19	71	Distribution Cedars of Tuam	Condition Assessment CRD Staff Comment	Standpipes require painting and caps on the outlets.	2, 3, 6	Immediate to < 1 year	$2,500
20	22	WTP Cedars of Tuam	Condition Assessment	Backfill required at front of building.	2, 6	1 - 5 years	$3,000
21	23	WTP Cedars of Tuam	Condition Assessment	Structural components of building require replacing. Structure should be demolished and replaced with a new facility. Electritcal mast requires replacing.	2, 6	1 - 5 years	$13,000
22	24	WTP Cedars of Tuam	Condition Assessment	Facilty finishing requires replacing.	2, 6	1 - 5 years	$10,000
23	26	WTP Cedars of Tuam	Condition Assessment	Roofing is damaged and requires replacing with appropriate gutters.	2, 6	1 - 5 years	$5,000
24	28	WTP Cedars of Tuam	Condition Assessment	Interior finishing rotting are requires replacement.	2, 6	1 - 5 years	$4,000
25	29	WTP Cedars of Tuam	Condition Assessment	Replace baseboard heaters (as stated above)	2, 6	1 - 5 years	$500
26	49	WTP Cedars of Tuam	Condition Assessment	Concrete foundation should be included with constuction of a new facility. CRD is considering upgrades / replacement of the treatment system. Costing is not included in the AMP for the upgraded system.	2, 6	1 – 5 years	N/A
27	50	WTP Cedars of Tuam	Condition Assessment	Structure should be demoloshed and reconstucted. CRD is considering upgrades / replacement of the treatment system. Costing is not included in the AMP for the upgraded system.	2, 6	1 – 5 years	N/A
28	51	WTP Cedars of Tuam	Condition Assessment	Siding is incomplete and does not provide adequate protection from the elements. The enclosure is in poor condition and should be replaced.	2, 6	1 – 5 years	$700
29	52	WTP Cedars of Tuam	Condition Assessment	Plywood lid is unfinished - paint unfinished plywood	2, 6	1 – 5 years	$1,000
30	60	WTP Cedars of Tuam	Condition Assessment	Backfill required at front of building.	2, 6	1 - 5 years	$1,000
31	61	WTP Cedars of Tuam	Condition Assessment CRD Staff Comment	Structural components of building require replacing. Structure should be demolished and replaced with a new facility. Electritcal mast requires replacing.	2, 6	1 – 5 years	$7,000
32	62	WTP Cedars of Tuam	Condition Assessment	Facilty finishing requires replacing.	2, 6	1 – 5 years	$2,000
33	64	WTP Cedars of Tuam	Condition Assessment	Roofing is damaged and requires replacing with appropriate gutters.	2, 6	1 – 5 years	$2,400