Rosedale Sanitary Sewer Feasibility

Review Report

Submitted by:

WEDLER ENGINEERING LLP

201 – 9300 Nowell Street
Chilliwack BC V2P 4V7
Phone: 604-792-0651

Wedler File No: C13-5032/A | December 6, 2013

STATEMENT OF LIMITATIONS

This document has been prepared by Wedler Engineering LLP exclusively for the City of Chilliwack, for their sole use and benefit. No other party is entitled to rely on any or all of this report and content and no warranty, expressed or implied, is made.

Table of Contents

Introduction

The City of Chilliwack retained Wedler Engineering to review sanitary servicing options for the Rosedale area in July 2013. This review is based on a high level sanitary sewage servicing investigation completed by Kerr Wood Leidal (KWL) for the communities of Yarrow, Greendale and Rosedale in 2008. The City has requested further review on the two options, R1 and R2 presented in the KWL study and any feasible alternative options for expansion or extension of the system for potential additional cost sharing benefits.

Scope of Works

Wedler has reviewed the original report and costs and provide the following information:

- Analysis of alternative alignment options
- Potential of additional servicing options/cost sharing benefits to Popkum (FVRD)
- Analysis of the servicing integration of option R1 into the current Eastern Hillsides Servicing Plan
- Other potential cost sharing benefits

Background

The 2008 KWL report provides core and optional servicing areas for the Rosedale community along with benefitting land parcels. Substantial work was completed in conjunction with the City to establish service areas, land use, equivalent population, water consumption (for wastewater loading) and design flows. Number of lots and equivalent design populations were provided for the Rosedale area, broken down by the “core” area and the “optional” areas for development. The design peak wet weather flow was calculated to be 37 liters per second based on both the core and optional areas with an equivalent population of 1824 over 367 lots. We have utilized this data in this analysis for the trunk forcemain and major pump station.

Rosedale Community Sewer System

In review of overall costs, Welder reviewed the proposed servicing strategy within the community. While the concepts are high level at this time, there are some basic constraints which govern the potential servicing. Service areas on the North side of the slough require individual pump stations to cross to the south or a stand-alone gravity system with a local pump station. *Figure 1* shows the catchment boundary proposed for the community.

We have developed two options for servicing the Rosedale Community further detailed in this report.

Major Pump Station and Trunk Forcemain

The two routes previously identified (R1 and R2) have been reviewed in context with the current Eastern Hillsides Servicing Report. We have also considered other options and cost sharing potential for the major routing for the sanitary sewer from Rosedale to the City of Chilliwack's trunk sewer. All options involve approximately 9km or more of sewer line to gain this connection.

Popkum West (Fraser Valley Regional District - FVRD) Sewer System

The FVRD had commissioned a sewage servicing feasibility study in 2004, completed by Urban Systems. The study area included a larger area (Popkum and Bridal Falls) which included 344 existing lots and 705 new lots.

One of the options reviewed within this study was connecting to the City of Chilliwack's sewage system. While the City did not support accepting sewage from the FVRD at that time, a potential option was reviewed to connect to the City's Eastern Hillside Sanitary Sewer System. The capital and operating costs were incomplete but were expected to be higher than the other options considered in the study and not considered viable.

Route Considerations for Trunk Sewer Options

There are planned infrastructure upgrades for the Eastern Hillsides based on the Eastern Hillsides Comprehensive Area Plan and May 2012 Eastern Hillside Servicing Report by Urban System Ltd. This program has changed from when the original KWL report was completed in 2008. The major impact in routing the sewer forcemain to this area is there is no capacity available in the existing forcemain from SPS 32 to Luckakuck Way as the Eastern Hillside Plan will use it all. This will add a considerable additional forcemain requirement as any additional flow beyond the Eastern Hillside development will require a separate forcemain to this existing forcemain. This will change the cost advantage that Route 1 had over Route 2 in the KWL report. Integration with the planned Eastern Hillside sewer upgrades and possible contributions towards a comprehensive system have been reviewed.

Original Route 2 was also reviewed along with the option of adding additional users west of Rosedale along Yale Road. The City of Chilliwack permits direct service connections to sanitary trunk forcemains at line pressures up to 40 psi. At 37 l/s flow, this condition can be met along the Yale Road route and there are approximately 89 connections available. However, once the additional flow of approximately 10 l/s is added to the 250mm diameter forcemain, the system pressure will be near 50 psi with the additional head loss. Increasing the forcemain size will reduce head loss but velocities fall below the minimum of 0.9 m/s. We have kept this option in as is but it would need further analysis to finalize the actual number of lots which could connect in conjunction with City of Chilliwack standards.

Figure 2 shows the original R1 route, R2 Route, known upgrades with the current Eastern Hillside servicing, and an alternative Route 3 servicing concept.

The alternative Route 3 considers directing the Rosedale trunk sewer to the proposed Nixon East local pump station and upgrade this pump station accordingly for possible cost sharing with future known development. This would also require an extended forcemain on Hack Brown and upgrade to SPS 32. The forcemain alignment along McElwee Road would be more economical to construct and the freeway crossing will be much easier at this location as well. There are planned upgrades to SPS 32 so this station could be incorporated for Rosedale flows as well since an additional forcemain would be required from here to Luckakuck Way to permit Rosedale flows. The Eastern Hillside 250mm diameter gravity sewer upgrade on Hack Brown Road can also be reduced. Following is a summary of the three servicing options in conjunction with Eastern Hillsides Servicing Report.

Route R1 Annis Road and Prairie Central Road

- 250mm diameter trunk forcemain from Rosedale South PS
- Bridge crossing on Old Yale east of Annis Rd
- Railway directional drill crossing on Annis Road
- Hwy 1 direction drill crossing on Annis Road (long crossing at interchange)
- Tie in to SPS 32 with additional upgrades for 37 l/s flow (Rosedale) and 21 l/s (Popkum West)
- 250mm diameter forcemain from SPS 32 to Luckakuck Way
- Alternatively bypass SPS 32 with 250mm diameter forcemain direct to Luckakuck Way
- Forcemain size increase to 300mm diameter from Popkum west sewage flow
- 20 possible additional users along trunk forcemain from Rosedale to SPS 32

Route R2 Yale Road

- 250mm diameter trunk forcemain from Rosedale South pump station
- Bridge crossing on Yale Road, East of Annis Road
- 250mm diameter forcemain on Yale Road to Prest Road and Prest Road to First Avenue
- Upgrade existing gravity sewer on First Avenue to Broadway to 450mm diameter
- Upgrade existing gravity sewer to Williams Street and south to Third Avenue to 600mm diameter
- 89 possible additional users along the trunk forcemain from Annis Road to Armstrong Road
- Forcemain size increase to 300mm diameter from Popkum west sewage flow

Note, with Rosedale flows only, the pump station would need to be increased to 43 l/s capacity in order to achieve a minimum velocity of 0.90 m/s or additional maintenance may be required with the velocity of 0.77 m/s at 37 l/s for both routes R1 and R2.

Alternate Route 3 McElwee Road

- 200mm diameter trunk forcemain from Rosedale North PS
- Railway directional drill crossing on McGrath Road
- Hwy 1 direction drill crossing between Chilliwack Central and McElwee Road (short)

- Construct and upgrade future Nixon East local pump station, increased flow to 43 l/s to include cell 1 to 3 from the Eastern Hillside
- Forcemain to SPS 32 with additional upgrade for 43 l/s to SPS 32
- 300mm diameter forcemain from SPS 32 to Luckakuck Way
- Popkum West not considered in this route

Figures 3, 4 and 5 show the routes for the above options.

Popkum Area – Fraser Valley Regional District

We met with Fraser Valley Regional District (FVRD) senior management to review the possibility of Popkum contributing to an extended Rosedale sewer system. The Popkum West area is a priority for the FVRD to consider for sanitary sewerage but by in large, the FVRD will look to development to drive the need for local collection systems and treatment facilities, built to the FVRD's standards for their ownership and operation. There is a significant development underway in the Popkum West area of approximately 200 homes but there is a treatment plant in place for this project already. In considering this, there is likely little appetite from the development community to contribute a City municipal system and the FVRD does not have any planned capital works or budget identified or available for municipal sewer upgrades in the area.

While it appears the opportunity to incorporate Popkum West area into a City sewer system would be challenging, we have provided a potential sewer expansion area as shown on *Figure 6* along with corresponding budget costs.

This area was determined in consultation with the City of Chilliwack. In addition to the local Popkum West costs, there would be additional trunk forcemain and major pump station upgrade costs for the additional sewage flow. Based on the existing 296 lots identified within the boundary area, the factored peak flow for this Popkum West is 21 l/s.

While there are lands to the east south of Hwy 1 in the FVRD (Popkum South) which have development potential, there is minimal planned development in the Popkum South area under the current Official Community Plan (OCP) for area D. We do understand there is a planned update to the OCP for area D in about 3 years.

Original Cost Estimates

As the Eastern Hillside servicing scenario has changed from the original KWL, we revised the original R1 route to reflect the current Eastern Hillside Servicing Concept so it can be compared relative to the R2 option in the original report. The costs for R1 increases to $16,138,000 (from $11,534,000 – see *Appendix A*) using the KWL criteria in order to directly compare with the R2 costs of $16,534,000.

New Costs Analysis

Rosedale Community

In order to refine the cost estimates, a closer look at the servicing concept for the local Rosedale community was required. *Figures 7 and 8* provide two concept options in reference to the original criteria in the 2008 report. The criteria for the local servicing used in the original reports were:

- 2 main pump stations to service the gravity and low pressure service areas
- Approximately 1000m maximum gravity run length to generally keep gravity sewer excavation less than 4m
- Low pressure sewage systems to provide service for areas beyond the core service area as defined above

A more detailed review was done for the criteria of the low pressure systems and where they would be applicable based on our review gravity service concept. Certain areas on the north side of the slough previously identified as gravity service likely require pumped services to cross the slough. We also tweaked the boundary for a few obvious additions and removals due to servicing extension costs and proposed coverage.

The maximum length of run was reviewed for a gravity 200Ø sewer at 0.33%

Minimum cover	=	1.20m
700m @ 0.33%	=	2.31m
Allow 12 Manholes at 0.02m drop	=	0.24m
		3.75m

As deep excavations are more difficult in existing roadways, we consider 700m to be a maximum distance. Local topographic variances could still push excavations to over 4.0m. We considered 2 options; option 1 minimized to gravity and expanded the low pressure service system and option 2 maximized the gravity system.

In our review we have not differentiated between ‘core’ areas and optional ‘low pressure’ areas as the boundaries are dynamic with servicing strategies.

Option 1

Option 1 minimized the gravity system. As the areas north of the slough require pressure system, the low pressure system was expanded according, specifically on the west side. This option facilitates the gravity service installation by limiting the run length to about 550m which reduces the depth to approximately 3.0 – 3.5m. There are additional more costly pumped services connections with this option.

Option 2

Option 2 provides additional gravity service catchment with run length of 700m and installation depths of approximately 3.5 – 4.0m. There would be additional installation cost for the deeper sewers. Also an additional local pump station and gravity catchment on the north side of the slough is provided. This option reduces the number of pumped connections.

Bulk Conveyance Options

The two original routes, R1 and R2 and an alternative Route 3 for the bulk conveyance options were reviewed and updated to reflect current typical construction costs and the current Eastern Hillside Servicing Report.

We have consulted with the City of Chilliwack in terms of budget costs for larger local and major pump stations to municipal standards. Installation costs along Yale Road are higher due to higher traffic volumes and greater impact to existing asphalt. *Appendix B* contains the individual budget cost estimates for all of these options.

Please note that these are still high level budget construction cost, subject to survey, detailed design, utility coordination (including major infrastructure crossings), geotechnical, environmental, ground water table and applicable municipal and government approvals.

Popkum West Area

The primary focus was to optimize the gravity service within this service area. Again, 700m maximum run length was used to keep excavation depths to an approximate maximum of 4m.

The result will be three local pump stations and no low pressure systems. The local pump stations would pump to the major pump station in Rosedale.

The additional sewage flow does cause increase in forcemain size and cost, as well as the SPS 32 upgrade contribution as itemized in the individual budget cost estimates found in *Appendix B*.

Summary

The following cost summary compares the 3 bulk conveyance and the 2 local servicing options provided. There is a small cost difference if SPS 32 is bypassed, but there would be a benefit to the Eastern Hillside at large as the sanitary capacity would increase considerably with SPS 32 being tied in with the new forcemain from Rosedale.

The cost summary makes it apparent that integrating the Rosedale sewage system into the Eastern Hillsides system (alternative Route 3) is more costly. Even in consideration of the Nixon east pump

station cost sharing from Eastern Hillside development and a reduction in the Hack Brown gravity twin requirements; this option has a higher budget as outlined in *Appendix C*.

Costs

Due to the small incremental costs to expand the preferred gravity service extents with option 2, the following summary is provided with option 2 for comparative purposes.

Rosedale Only – Option 2 - Municipal Cost Only

Route R1 with SPS 32 Bypassed – Annis Road

Bulk Pump Station & Forcemain	$	9,476,000.00
Local Community Servicing	$	8,750,000.00
Land Acquisition	$	60,000.00
Total		**$18,286,000.00**

Route R1 with SPS 32 Bypassed & Connections – Annis Road

Bulk Pump Station & Forcemain	$	9,592,000.00
Local Community Servicing	$	8,750,000.00
Land Acquisition	$	60,000.00
Total		**$18,402,000.00**

Route R1 with SPS 32 Upgrade – Annis Road

Bulk Pump Station & Forcemain	$	9,987,000.00
Local Community Servicing	$	8,750,000.00
Land Acquisition	$	60,000.00
Total		**$18,797,000.00**

Route R2 no Connections – Yale Road

Bulk Pump Station & Forcemain	$	10,600,000.00
Local Community Servicing	$	8,750,000.00
Land Acquisition	$	60,000.00
Total		**$19,410,000.00**

Route R2 with Connections – Yale Road

Bulk Pump Station & Forcemain	$	11,088,000.00
Local Community Servicing	$	8,750,000.00
Land Acquisition	$	60,000.00
Total		**$19,898,000.00**

Alternative Route 3 - McElwee Road

Bulk Pump Station & Forcemain	$	12,315,000.00
Local Community Servicing	$	8,750,000.00
Land Acquisition	$	60,000.00
Total		**$21,125,000.00**

With Cost Benefit from Eastern Hillside (450,000) **$20,675,000.00**

Rosedale Combined with Popkum West Included – Option 2

Route R1 with SPS 32 Bypassed – Annis Road

Bulk Pump Station & Forcemain	$	9,926,000.00
Local Community Servicing	$	15,320,000.00
Land Acquisition	$	60,000.00
Total		**$25,306,000.00**

Route R1 with SPS 32 Bypassed & Connections – Annis Road

Bulk Pump Station & Forcemain	$	10,042,000.00
Local Community Servicing	$	15,320,000.00
Land Acquisition	$	60,000.00
Total		**$25,422,000.00**

Route R1 with SPS 32 Upgrade – Annis Road

Bulk Pump Station & Forcemain	$	10,168,000.00
Local Community Servicing	$	15,320,000.00
Land Acquisition	$	60,000.00
Total		**$25,548,000.00**

Route R2 no Connections – Yale Road

Bulk Pump Station & Forcemain	$	10,600,000.00
Local Community Servicing	$	15,320,000.00
Land Acquisition	$	60,000.00
Total		**$25,980,000.00**

Route R2 with Connections – Yale Road

Bulk Pump Station & Forcemain	$	11,403,000.00
Local Community Servicing	$	15,320,000.00
Land Acquisition	$	60,000.00
Total		**$26,783,000.00**

Alternative Route 3 - McElwee Road

Not analyzed due to highest cost option.

Discussion

In general, our budget cost estimates for the bulk conveyance system were comparable with the original 2008 report. However, our analysis of the community servicing for Rosedale resulted in higher budget cost estimates.

The main considerations to this difference is trench line road repairs, asphalt surface restoration and the cost for service connections, specifically pumped service connections to City of Chilliwack standards (see standard drawing DS-11 in *Appendix D*).

We also included a budget for each individual pump station for the pumped service connections and the individual connection from the house to the municipal service at the road frontage. We have identified these in a separate line item as implementation of these is not yet determined.

Given the small incremental cost for the benefit of increased gravity servicing, the following is a brief summarization of the budget cost estimates using Option 2 only for the Rosedale Community Servicing:

Route R1 with SPS 32 Bypassed

- Lowest capital cost
- Independent of other systems, for less unknown costs
- Municipal cost of $49,830.00 per connection based on 367 lots – Rosedale only
- Municipal cost of $38,170.00 per connection based on 663 lots – includes Popkum West
- Does not included private onsite connection cost estimated at $3,000.00 for private gravity sewer service, $9,000.00 for pump station and forcemain service

Route R1 with SPS 32 Bypassed & Connections

- Slight increased capital cost
- Independent of other systems, for less unknown costs
- Municipal cost of $47,550.00 per connection based on 387 lots – Rosedale and forcemain route connections
- Municipal cost of $37,230.00 per connection based on 683 lots – includes Popkum West
- Does not included private onsite connection cost estimated at $3,000.00 for private gravity sewer service, $9,000.00 for pump station and forcemain service

Route R1 with SPS 32 Upgrade

- Increased capital cost
- Final SPS 32 upgrade costs are not clear at this point
- Possible benefit to the available sanitary capacity for the Easter Hillside but no current financial benefits
- Municipal cost of $51,220.00 per connection based on 367 lots – Rosedale only

- Municipal cost of $38,540.00 per connection based on 663 lots – includes Popkum West
- Does not included private onsite connection cost estimated at $3,000.00 for private gravity sewer service, $9,000.00 for pump station and forcemain service

Route 2 No Connections

- Increased capital costs
- Less unknown cost
- Higher traffic volume along route
- Municipal cost of $52,890.00 per connection based on 367 lots – Rosedale only
- Municipal cost of $39,190.00 per connection based on 663 lots – includes Popkum West
- Does not included private onsite connection cost estimated at $3,000.00 for private gravity sewer service, $9,000.00 for pump station and forcemain service

Route 2 with Connections

- Increased capital cost
- Higher traffic volume along route
- Further design analysis required to finalize additional users
- Municipal cost of $43,646.00 per connection based on 456 lots – subject to further design, review and confirmation of participation – Rosedale only
- Municipal cost of $35,620.00 per connection based on 752 lots – subject to further design, review and confirmation of participation – includes Popkum West
- Does not included private onsite connection cost estimated at $3,000.00 for private gravity sewer service, $9,000.00 for pump station and forcemain service

Alternative Route 3

- Highest costs
- Must be coordinated with Easter Hillside development
- Final SPS 32 upgrade costs are not clear at this point
- Possible benefit to the available sanitary capacity for the Easter Hillside but not current financial benefits
- Municipal cost of $56,340.00 per connection based on 367 lots and cost benefit from the Eastern Hillside – Rosedale only
- Does not included private onsite connection cost estimated at $3,000.00 for private gravity sewer service, $9,000.00 for pump station and forcemain service

Conclusion

The budget cost estimates show a substantial cost per lot to extend sanitary service to the Rosedale community. This cost per lot is also dependent on full participation from all owners within the service boundary. Additionally full participation would be required for the shared Route R2, providing potential service connections outside of the Rosedale community, going west along Yale Road.

With the Popkum West proposed sewer servicing (Figure 8) is included with the Rosedale servicing scenario's the cost per connection does reduce. Please note the cost per connection is based only on existing lots and does not account for any potential new developments.

Appendix A: Updated Original Route R1 Budget Cost

Option R1 - Convey via Prairie Central Rd (Modified to Reflect the May 2012, Eastern Hillsides Servicing Report)

Item	Description	Unit	Estimated Quantity	Unit Rate		Total Price $$	Comment	
1	General							
1.01	Bonding / Insurance	2%			$	111,420.00		
1.02	Mobilization / Demobilization	6%			$	334,280.00		
1.03	Land acquisition	ha	0.2	300,000	$	60,000.00		
	Total - General (excl GST)				**$**	**506,000.00**		
2	Local Servicing							
2.1	Gravity sewers - core areas							
2.1.1	200 mm dia. PVC SDR 35	lin.m	5,729	260	$	1,492,098.00		
2.1.2	250 mm dia. PVC SDR 35	lin.m	232	293	$	67,972.00		
2.1.3	Service connections, 100 mm dia. c/w inspection chamber	each	291	1,500	$	436,500.00		
2.2	Low pressure forcemain - optional Areas							
2.2.1	100 mm dia HDPE DR21	lin.m	3986	201	$	799,611.00		
2.2.2	Simplex packaged pump station	each	76	5,000	$	380,000.00		
	SUBTOTAL for TASK				$	3,176,381.00		
	Engineering & Construction Management	20%			$	535,276.00		
	Contingencies	40%			$	1,270,552.00		
	Market Factor	15%			$	478,457.00		
	Sub Total - Local Servicing (excl GST)				**$**	**5,559,000.00**		
3	Bulk Conveyance							
3.1	North Rosedale Pump Station							520000
3.1.1.	Wet well chamber 2.13 m dia. pre-cast FRP c/w ladder, hatch, other appurtenances	LS	1	46,000	$	46,000.00		
3.1.2	Flygt pumps 2 @ 11.2 kW	each	2	20,000	$	40,000.00		
3.1.3	15 kW Standby genset c/w fuel storage	allow			$	25,000.00		
3.1.4	Control building c/w valves, piping & electrical control equipment	allow			$	275,000.00		
3.1.5	Odour control unit	allow			$	5,000.00		
3.1.6	Reinforced concrete	cu. M	15	1,800	$	27,000.00		
3.1.7	Site preparation, excavation, installation, backfilling	days	10	7,736	$	77,362.00		
3.1.8	Shoring	aq.m	50	300	$	15,000.00		
3.1.9	Dewatering	days	10	1,000	$	10,000.00		
3.2	South Rosedale Pump Station							483,000
3.2.1	Wet well chamber 1.83 m dia. pre-cast FRP c/w ladder, hatch other appurtenances	LS	1	37,000	$	37,000.00		
3.2.2	Flygt Pumps 2 @ 7.5 kW	each	2	10,000	$	20,000.00		
3.2.3	10 kW standby genset c/w fuel storage	allow			$	35,000.00		
3.2.4	Control building c/w valves, piping & electrical control equipment	allow			$	270,000.00		
3.2.5	Odour control unit	allow			$	5,000.00		
3.2.6	Reinforced concrete	cu. M	15	1,800	$	27,000.00		
3.2.7	Site preparation, excavation, installation, backfillling	days	10	7,736	$	77,362.00		
3.2.8	Shoring	sq. m	40	300	$	12,000.00		
3.2.9	Dewatering	days	10	1,000	$	10,000.00		
3.3	Forcemains							
3.3.1	200 mm ID HDPE DR17	lin.m	1150	238	$	273,650.00		
3.3.2	250 mm ID HDPE DR 17	lin.m	12400	272	$	3,372,800.00		
3.3.3	Pipe-jacked encased crossings of Highway 1 & CP Rail	allow			$	100,000.00		
3.3.4	Tie-in to LS #32	allow			$	10,000.00		
3.3.5	Pigging chambers	each	12	75,000	$	900,000.00		
	SUB TOTAL FOR TASK				$	5,670,174.00		
	Engineering & Construction Management	20%			$	1,134,034.80		
	Contingencies	40%			$	2,268,069.60		
	Market Factor	15%			$	850,526.10		
	Total - Bulk Conveyance (excl GST)				**$**	**9,922,804.50**		
4	Incremental upgrades to proposed Prairie Central conveynace system							
4.1	Eastern Hillsides conveyance system upgrade				$	150,000.00	Cost provided by City	
	SUB TOTAL FOR TASK				**$**	**150,000.00**		
	Engineering & Construction Management	incl.						
	Contingencies	incl.						
	Market Factor	incl.						
	Total - Existing System Upgrades (excl GST)				**$**	**150,000.00**		
	TOTAL AMOUNT (excl GST)				**$**	**16,138,000.00**		

Appendix B: Individual Budget Cost Estimates

Route R1 With SPS 32 Bypassed - Annis Road

Description	Unit	Price per unit	Total Cost
Major pump station, Rosedale South	allow	LS	$ 650,000.00
Annis Road 250Ø forcemain to SPS 32	2600m	350/lm	$ 910,000.00
Prairie Central 250Ø forcemain, SPS32 to Banford	5300m	350/lm	$ 1,855,000.00
Prairie Central 250Ø f/m, Banford to Luckakuk	4500m	350/lm	$ 1,575,000.00
Bridge crossing - Annis Road watercourse	allow	LS	$ 50,000.00
Highway 1 directional drilling	allow	LS	$ 200,000.00
Railway 11 (Annis Road) directional drilling	allow	LS	$ 100,000.00
Pigging chamber	12	35,000	$ 420,000.00
Allow 50% trenchline asphalt surface restoration	6200m	125/lm	$ 775,000.00
Sub Total			**$ 6,535,000.00**
Engineering & Construction Management		15%	$ 980,250.00
Contingency		30%	$ 1,960,500.00
Total			**$ 9,475,750.00**
Popkum West			
Additional cost for Popkum West sewage 250Ø increase to 300Ø forcemain ($25/m)	12,400	25	$ 310,000.00
Engineering & Construction Management		15%	$ 46,500.00
Contingency		30%	$ 93,000.00
Total			**$ 449,500.00**
Municipal Total			**$ 9,925,250.00**

Route R1 With SPS 32 Bypassed and Connections - Annis Road

Description	Unit	Price per unit	Total Cost
Major pump station, Rosedale South	allow	LS	$ 650,000.00
Annis Road 250Ø forcemain to SPS 32	2600m	350/lm	$ 910,000.00
Prairie Central 250Ø forcemain, SPS32 to Banford	5300m	350/lm	$ 1,855,000.00
Prairie Central 250Ø f/m, Banford to Luckakuk	4500m	350/lm	$ 1,575,000.00
Bridge crossing - Annis Road watercourse	allow	LS	$ 50,000.00
Highway 1 directional drilling	allow	LS	$ 200,000.00
Railway 11 (Annis Road) directional drilling	allow	LS	$ 100,000.00
Pumped Service Connections **	20	4000	$ 80,000.00
Pigging chamber	12	35,000	$ 420,000.00
Allow 50% trenchline asphalt surface restoration	6200m	125/lm	$ 775,000.00
Sub Total			**$ 6,615,000.00**
Engineering & Construction Management		15%	$ 992,250.00
Contingency		30%	$ 1,984,500.00
Total			**$ 9,591,750.00**
Popkum West			
Additional cost for Popkum West sewage 250Ø increase to 300Ø forcemain ($25/m)	12,400	25	$ 310,000.00
Engineering & Construction Management		15%	$ 46,500.00
Contingency		30%	$ 93,000.00
Total			**$ 449,500.00**
Municipal Total			**$ 10,041,250.00**
Private Works			
Individual onsite pump stations	20	6000	$ 120,000.00
Individual connection to municipal service	20	3000	$ 60,000.00
Private Total			**$ 180,000.00**

** Annis and Yale Road from Rosedale system toHighway 1

Route R1 With SPS 32 Upgrade - Annis Road

Description	Unit	Price per unit	Total Cost
Major pump station, Rosedale South	allow	LS	$ 650,000.00
Annis Road 200Ø forcemain	2600m	325/lm	$ 845,000.00
Tie in to SPS 32	allow	LS	$ 25,000.00
SPS 32 upgrade contribution **	allow	LS	$ 150,000.00
Prairie Central 300Ø forcemain SPS 32 to Banford Road pump station	5300m	375/lm	$ 1,987,500.00
Prairie Central 300Ø forcemain Banford Road pump station to Luckakuk	4500m	375/lm	$ 1,684,500.00
Bridge Crossing	allow	LS	$ 50,000.00
Highway 1 directional drilling (Annis Road)	allow	LS	$ 200,000.00
Railway 11 directional drilling (Annis Road)	allow	LS	$ 100,000.00
Pigging chamber	12	35,000	$ 420,000.00
Allow 50% trenchline asphalt surface restoration	6200m	125/lm	$ 775,000.00
Sub Total			**$ 6,887,000.00**
Engineering & Construction Management		15%	$ 1,033,050.00
Contingencies		30%	$ 2,066,100.00
Total			**$ 9,986,150.00**
Popkum West			
Additional cost for Popkum West sewage 200Ø increase to 250Ø forcemain ($25/m)	2600	25	$ 65,000.00
SPS 32 upgrade contribution	allow	LS	$ 80,000.00
Engineering & Construction Management		15%	$ 12,000.00
Contingencies		30%	$ 24,000.00
Total			**$ 181,000.00**
Municipal Total			**$ 10,167,150.00**
** Upgrade contribution budgets subject to pump station design review.			

Route R2 No Connections - Yale Road

Description	Unit	Price per unit	Total Cost
Major pump station, Rosedale South	allow	LS	$ 650,000.00
Old Yale 250Ø forcemain	8700m	375/lm	$ 3,262,500.00
Gravity sewer upgrade 450Ø	1300m	700/lm	$ 910,000.00
Gravity sewer upgrade 600 Ø	960m	800/lm	$ 768,000.00
Bridge crossing - Annis Road watercourse	allow	LS	$ 50,000.00
Pigging chamber	8	35,000	$ 280,000.00
Trenchline asphalt surface restoration	11000m	125/lm	$ 1,375,000.00
Sub Total			**$ 7,295,500.00**
Engineering & Construction Management		15%	$ 1,094,325.00
Contingency		30%	$ 2,188,650.00
			$ 10,578,475.00
Municipal Total			**$ 10,600,000.00**

Route R2 With Connections - Yale Road

Description	Unit	Price per unit	Total Cost
Major pump station, Rosedale South	allow	LS	$ 650,000.00
Old Yale 250Ø forcemain	8700m	375/lm	$ 3,262,500.00
Gravity sewer upgrade 450Ø	1300m	700/lm	$ 910,000.00
Gravity sewer upgrade 600 Ø	960m	800/lm	$ 768,000.00
Bridge crossing - Annis Road watercourse	allow	LS	$ 50,000.00
Pumped service connections	89	4000	$ 356,000.00
Pigging chamber	8	35,000	$ 280,000.00
Trenchline asphalt surface restoration	11000m	125/lm	$ 1,370,000.00
Sub Total			**$ 7,646,500.00**
Engineering & Construction Management		15%	$ 1,146,975.00
Contingency		30%	$ 2,293,950.00
Total			**$ 11,087,425.00**
Popkum West			
Additional cost for Popkum West sewage 250Ø increase to 300Ø forcemain ($25/m)	8700	25	$ 217,500.00
Engineering & Construction Management		15%	$ 32,625.00
Contingency		30%	$ 65,250.00
Total			**$ 315,375.00**
Municipal Total			**$ 11,402,800.00**
Private Works			
Individual onsite pump stations	89	6000	$ 534,000.00
Individual connection to municipal service	89	3000	$ 267,000.00
Private Total			**$ 801,000.00**

Alternative Route 3 - McElwee Road

Description	Unit	Price per unit	Total Cost
Major pump station, Rosedale North	allow	LS	$ 650,000.00
McElwee Road 200Ø forcemain	3300m	250/lm	$ 825,000.00
Railway crossing McGrath Road	allow	LS	$ 75,000.00
Highway 1 directional drilling McElwee Road	allow	LS	$ 125,000.00
Major pump station, Nixon Road East	allow	LS	$ 650,000.00
Nixon East to SPS 32 250Ø forcemain	2550m	275/lm	$ 701,250.00
SPS 32 tie In	allow	LS	$ 25,000.00
SPS 32 upgrade and Banford Rd PS contribution *	allow	LS	$ 300,000.00
Pigging chambers	14	35,000	$ 490,000.00
Prairie Central 300Ø forcemain SPS 32 to Banford Road pump station	5300m	375/lm	$ 1,987,500.00
Prairie Central 300Ø forcemain Banford Road	4500m	375/lm	$ 1,687,500.00
Allow 50% trenchline asphalt restoration	7800m	125/lm	$ 975,000.00
Sub Total			**$ 8,491,250.00**
Engineering & Construction Management		15%	$ 1,273,687.50
Contingency		30%	$ 2,547,375.00
			$ 12,312,312.50
Municipal Total			**$ 12,315,000.00**
* Upgrade contribution budgets subject to pump station design review.			

Popkum West Local Servicing - Figure 6

Description	Unit	Price per unit	Total Cost
3 Local pump stations	3	500,000	$ 1,500,000.00
200Ø forcemain common trench 200Ø Gravity	1230m	525/lm	$ 645,750.00
200Ø Gravity	1760m	325/lm	$ 572,000.00
200Ø Forcemain	1350	300/lm	$ 405,000.00
Railway Crossing	1	75,000.00	$ 75,000.00
Pumped service connections	33	4,000.00	$ 132,000.00
Gravity service connections	263	2,500.00	$ 657,500.00
Asphalt paved surface restoration	4340m	125/lm	$ 542,500.00
Sub Total			**$ 4,529,750.00**
Engineering & Constuction Management		15%	$ 679,462.50
Contingencies		30%	$ 1,358,925.00
Total			**$ 6,568,137.50**
Municipal Total			**$ 6,570,000.00**
Private Works			
Individual onsite pump station	33	6,000	$ 198,000.00
Individual connection to municipal service	296	3,000	$ 888,000.00
Total Private			**$ 1,086,000.00**

Rosedale Community Local Servicing - Figure 7
Option 1

Description	Unit	Price per unit	Total Cost
Core area gravity 200Ø	1900m	325/lm	$ 617,500.00
Core and optional area 100Ø low pressure	4500m	200/lm	$ 900,000.00
200Ø forcemain common trench 200Ø gravity	600m	525/lm	$ 315,000.00
200Ø forcemain common trench 100Ø forcemain	600m	450/lm	$ 270,000.00
150Ø forcemain common trench 200Ø gravity	900m	475/lm	$ 405,000.00
Local pump station	allow	LS	$ 500,000.00
Paved surface restoration	8000m	125/lm	$ 1,000,000.00
Gravity service connections	197	2500 ea	$ 492,500.00
Pumped service connections	170	4000 ea	$ 680,000.00
Bridge crossings	2	50,000	$ 100,000.00
Railway crossings	2	75,000	$ 150,000.00
Sub Total			**$ 5,430,000.00**
Engineering & Constuction Management		15%	$ 814,500.00
Contingencies		30%	$ 1,629,000.00
Total			**$ 7,873,500.00**
Municipal Total			**$ 7,885,000.00**
Private Works			
Individual onsite pump stations	170	6,000	$ 1,020,000.00
Individual connection to municipal service	367	3,000	$ 1,101,000.00
Private Total			**$ 2,121,000.00**

Rosedale Community Local Servicing - Figure 8
Option 2

Description	Unit	Price per unit	Total Cost
2 Local pump stations	2	500,000	$ 1,000,000.00
200Ø forcemain common trench 200Ø Gravity	600m	525/lm	$ 315,000.00
150Ø forcemain common trench 200Ø Gravity	1500m	475/lm	$ 712,500.00
200Ø Gravity	3500m	325/lm	$ 1,137,500.00
100Ø Forcemain	2800	200/lm	$ 560,000.00
Bridge Crossing	2	50,000.00	$ 100,000.00
Railway Crossing	2	75,000.00	$ 150,000.00
Pumped service connections	92	4,000.00	$ 368,000.00
Gravity service connections	275	2,500.00	$ 687,500.00
Asphalt paved surface restoration	8000m	125/lm	$ 1,000,000.00
Sub Total			**$ 6,030,500.00**
Engineering & Constuction Management		15%	$ 904,575.00
Contingencies		30%	$ 1,809,150.00
Total			**$ 8,744,225.00**
Municipal Total			**$ 8,750,000.00**
Private Works			
Individual onsite pump station	92	6,000	$ 552,000.00
Individual connection to municipal service	367	3,000	$ 1,101,000.00
Private Total			**$ 1,653,000.00**

Appendix C: Alternative Route 3 Cost Savings

Alternative Route 3 Cost Sharing and Savings Analysis

Nixon East Pump Station

Major Pump Station	$	650,000.00
Engineering & Construction Management	15%	97,500.00
Contingency	30%	195,000.00
	Total	**$942,500.00**

Total Flow 43 l/s

Eastern Hillside flow 6 l/s

Eastern Hillside Contribution $\frac{6}{43}$ * 942,500 = $131,500

Hack Brown Road Gravity Sewer Twinning

Identified Upgrade

900m - 250Ø Sanitary

Required Upgrade with Alternative Route 2

350m - 200Ø Sanitary

Difference saved – 550m

Cost Savings:

550m - 250Ø Sanitary @ 400/lm	$	220,000.00
Engineering & Construction Management	15%	33,000.00
Contingency	30%	66,000.00
	Total	**$319,000.00**

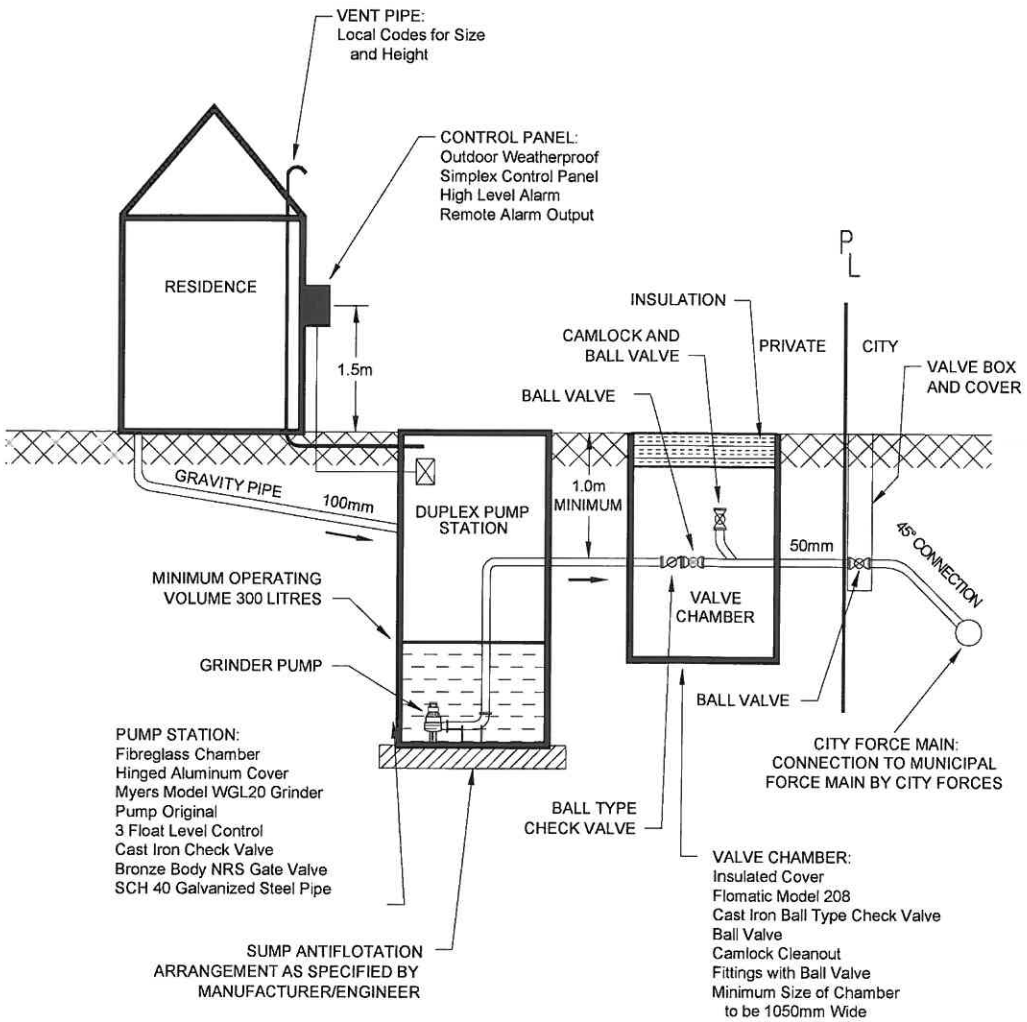
Summary

Nixon East Pump Station Sharing	$	131,500.00
Gravity Sewer Reduction	$	319,000.00
	Total	**$450,500.00**

Total Alternative Route 3 Cost	$	21,620,000.00
Less Potential Contribution	-	450,500.00
	Total	**$21,169,500.00**

Appendix D: Standard Drawing DS-11

SCHEMATIC DESIGN ONLY



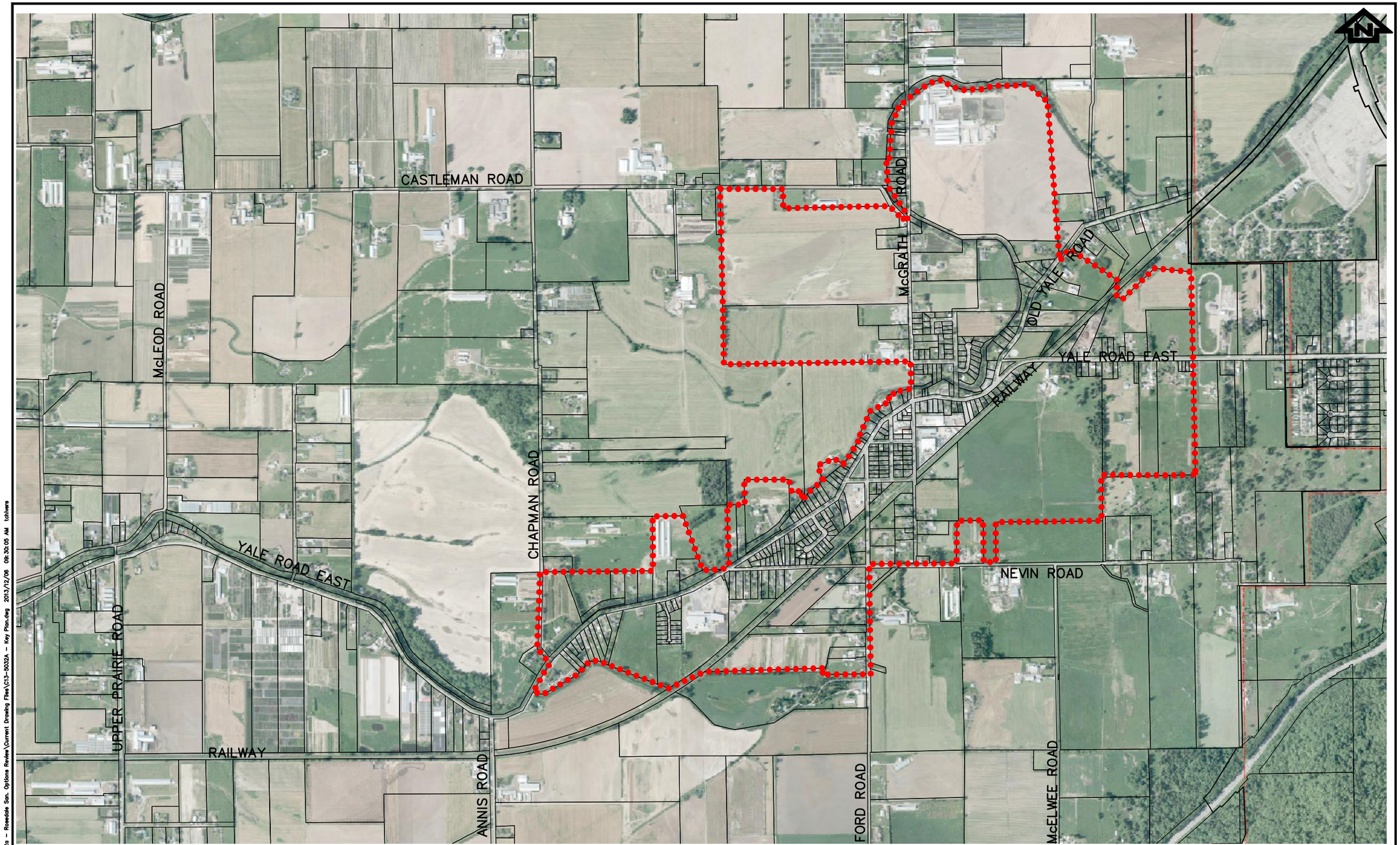
NOT TO SCALE

TYPICAL SANITARY FORCE MAIN SERVICE CONNECTION

CITY OF CHILLIWACK

REVISED:		APPROVED:
APPROVED:		DWG. NO.
DATE:	06/00	DS-11
DRAWN:	SEH	

Appendix E: Figures 1 - 8



WEDLER ENGINEERING

www.wedler.com

THE WEDLER GROUP
- Chilliwack 1.604.792.0651
- Courtenay 1.250.334.3263
- Surrey 1.604.588.1919

FIGURE 1
ROSEDALE STUDY AREA

G:\Drawing\50005099\C13-5032a - Rosedale Sec. Options Review\Current Drawing Files\C13-5032A - Key Plan.dwg 2013/12/06 08:30:05 AM tshiwra

PROP. ROSEDALE NORTH PUMP STATION

PROP. ROSEDALE SOUTH PUMP STATION

PROP. EH – NIXON EAST LOCAL PUMP STATION SERVING CELLS 1, 2 AND 3

PROP. EH – HACK BROWN SANITARY SEWER TWIN

EX. SPS32 PUMP STATION.

PROP. 300ø TWINNED SANITARY FORCEMAIN

PROP. EH – BANDFORD RD. PUMP STATION.

PROP. EH GRAVITY SIPHON SERVING CELL 13

EX. NIXON ROAD GRAVITY SEWER SERVICING CELLS 4 AND 5

PROP. EH – FALLS GRAVITY SEWER SERVING CELL 6A

EX. MARBLE HILL GRAVITY SIPHON SERVICING CELLS 10, 11 AND 12

BANFORD ROAD
GIBSON ROAD
UPPER PRAIRIE ROAD
ANNIS RD.
FORD RD.
McELMEE ROAD
NIXON RD.
ALLAN RD.
PRESTI ROAD
CHILLIWACK CENTRAL ROAD
HIGHWAY 1
PRAIRIE CENTRAL ROAD
PATTERSON RD.
McGUIRE ROAD
BAILEY ROAD

SANITARY SEWER SERVICING LEGEND

- FORCEMAIN
- GRAVITY SEWER
- TWINNED GRVITY SEWER
- GRAVITY SIPHON
- PROPOSED ROUTE R1 SANITARY FORCEMAIN FOR ROSEDALE SERVICING CONCEPT
- PROPOSED ROUTE R2 SANITARY FORCEMAIN FOR ROSEDALE SERVICING CONCEPT
- PROPOSED ROUTE R2 SANITARY GRAVITY SEWER FOR ROSEDALE SERVICING CONCEPT
- PROPOSED ALTERNATIVE ROUTE 3 FORCEMAIN FOR ROSEDALE SERVICING CONCEPT
- SANITARY CATCHMENT AREA –EASTERN HILLSIDES (EH)
- SANITARY CATCHMENT AREA –PROPOSED ROSEDALE CONCEPT AREA

FIGURE 2
OVERALL CITY SANITARY ROUTES

WEDLER ENGINEERING
www.wedler.com
THE WEDLER GROUP
Chilliwack 1.604.792.0651
Courtenay 1.250.334.3263
Surrey 1.604.588.1919

G:\Drawing\50005099\C13-5032a - Rosedale San. Options Review\Current Drawing Files\C13-5032A - Key Plan.dwg 2013/12/06 08:51:00 AM tchivers

PROP. ROSEDALE NORTH PUMP STATION

PROP. ROSEDALE SOUTH PUMP STATION

CHAPMAN ROAD

McGRATH ROAD

YALE ROAD EAST

YALE ROAD

NEVIN ROAD

McELWEE ROAD

FORD ROAD

ANNIS ROAD

CHILLIWACK CENTRAL ROAD

HIGHWAY 1

NIXON RD.

ALLAN RD.

PROP. EH – NIXON EAST LOCAL PUMP STATION SERVING CELLS 1, 2 AND 3

PROP. EH – HACK BROWN SANITARY SEWER TWIN

EX. SPS32 PUMP STATION.

EX. NIXON ROAD GRAVITY SEWER SERVICING CELLS 4 AND 5

PROP. EH – FALLS GRAVITY SEWER SERVING CELL 6A

PROP. EH – GRAVITY SIPHON SERVING CELL 13

EX. MARBLE HILL GRAVITY SIPHON SERVICING CELLS 10, 11 AND 12

SANITARY SEWER SERVICING LEGEND

- FORCEMAIN
- GRAVITY SEWER
- TWINNED GRAVITY SEWER
- GRAVITY SIPHON
- PROPOSED ROUTE R1 SANITARY FORCEMAIN FOR ROSEDALE SERVICING CONCEPT
- PROPOSED ALTERNATIVE ROUTE 2 FORCEMAIN FOR ROSEDALE SERVICING CONCEPT

FIGURE 3

WEDLER ENGINEERING
www.wedler.com
THE WEDLER GROUP
Chilliwack 1.604.792.0651
Courtenay 1.250.334.3263
Surrey 1.604.588.1919

G:\Drawing\50005099\C13-5032a – Rosedale San. Options Review\Current Drawing Files\C13-5032A – Key Plan.dwg 2013/12/04 08:35:24 AM tchivers

CHILLIWACK CENTRAL ROAD

HIGHWAY 1

BANFORD ROAD

GIBSON ROAD

PREST ROAD

PROP. EH – BANDFORD RD. PUMP STATION.

PRAIRIE CENTRAL ROAD

HIGHWAY 1

VEDDER ROAD

PREST ROAD

PATTERSON ROAD

McGUIRE ROAD

SANITARY SEWER SERVICING LEGEND

- FORCEMAIN
- GRAVITY SEWER
- TWINNED GRAVITY SEWER
- GRAVITY SIPHON
- PROPOSED ALTERNATIVE ROUTE 2 FORCEMAIN FOR ROSEDALE SERVICING CONCEPT

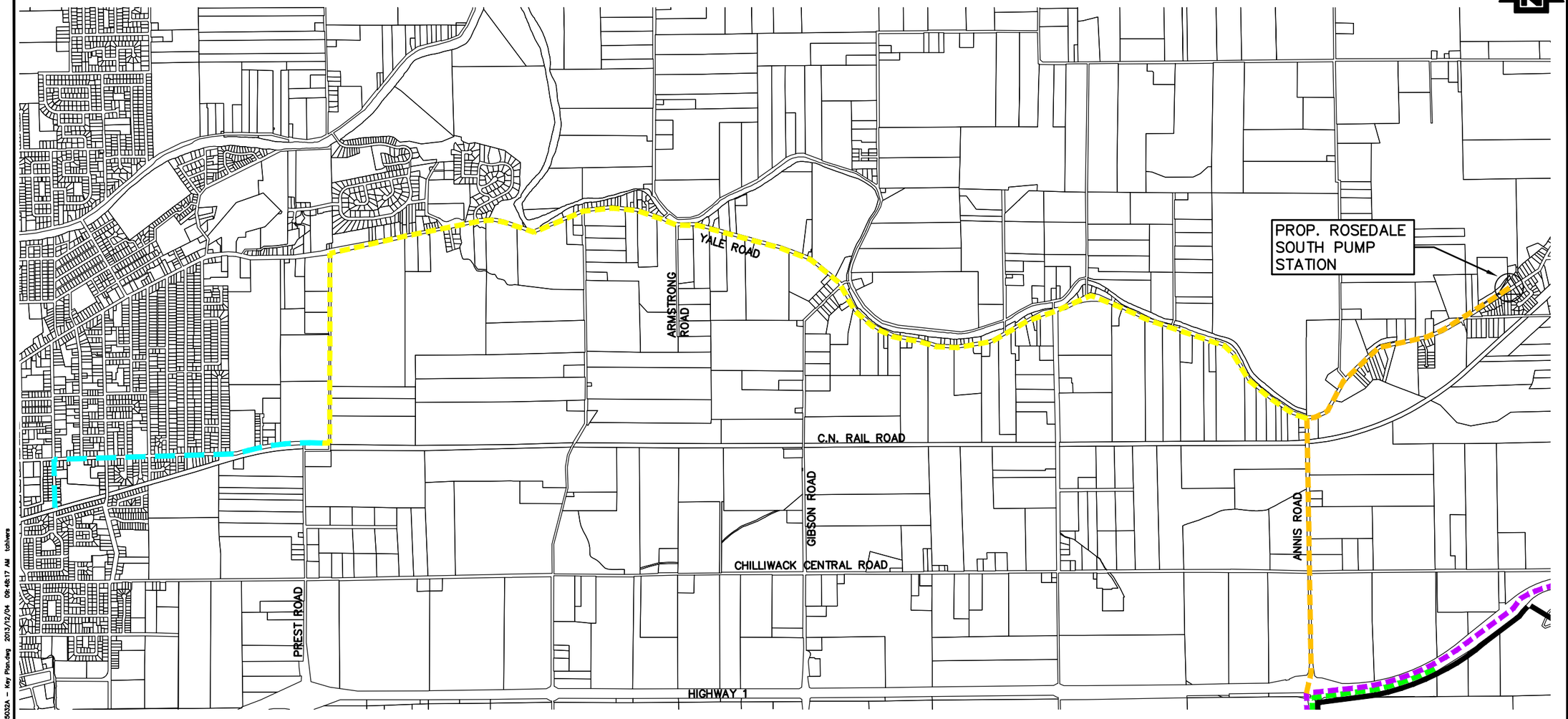
FIGURE 4

WEDLER ENGINEERING

THE WEDLER GROUP
- Chilliwack 1.604.792.0651
- Courtenay 1.250.334.3263
- Surrey 1.604.588.1919

www.wedler.com

G:\Drawing\5000509\C13-5032a - Rosedale San. Options Review\Current Drawing Files\C13-5032A - Key Plan.dwg 2013/12/04 08:37:01 AM tchivers



SANITARY SEWER SERVICING
LEGEND

- GRAVITY SEWER
- TWINNED GRAVITY SEWER
- PROPOSED ROUTE R1 SANITARY FORCEMAIN FOR ROSEDALE SERVICING CONCEPT
- PROPOSED ROUTE R2 SANITARY FORCEMAIN FOR ROSEDALE SERVICING CONCEPT
- PROPOSED ROUTE R2 SANITARY GRAVITY SEWER FOR ROSEDALE SERVICING CONCEPT
- PROPOSED ALTERNATIVE ROUTE 2 FORCEMAIN FOR ROSEDALE SERVICING CONCEPT

FIGURE 5

WEDLER ENGINEERING
www.wedler.com
THE WEDLER GROUP
Chilliwack 1.604.792.0651
Courtenay 1.250.334.3263
Surrey 1.604.588.1919

G:\Drawing\50050099\C13-5032a - Rosedale San. Options Review\Current Drawing Files\C13-5032A - Key Plan.dwg 2013/12/04 08:48:17 AM tahlers

McGRATH ROAD

McGRATH ROAD

OLD YALE ROAD

YALE ROAD EAST

PARKWOOD DRIVE

AGASSIZ-ROSEDALE HIGHWAY

YALE ROAD EAST

CARYKS RD.

SUSSEX DRIVE

PARKWOOD DRIVE

THOMSON ROAD

LLANDBERIS WAY

HIGHWAY 1

MERCER ROAD

McELWEE ROAD

McMILLIAN ROAD

N

LEGEND

- 200ø GRAVITY
- 200ø FORCEMAIN
- 100ø FORCEMAIN
- PUMP STATION
- GRAVITY/PUMP STATIONS
- LOW PRESSURE SYSTEM

FIGURE 6
POPKUM WEST SANITARY
SERVICING CONCEPT
SCALE 1:5000

THE WEDLER GROUP
WEDLER ENGINEERING
Chilliwack 1.604.792.0651
Courtenay 1.250.334.3263
Surrey 1.604.588.1919
www.wedler.com

G:\Drawing\5000599\C13-5032a - Rosedale San. Options Review\Current Drawing Files\C13-5032A - Key Plan 3.dwg 2013/12/06 09:44:20 AM tchivers

CASTLEMAN ROAD

McGRATH ROAD

OLD YALE ROAD

YALE ROAD EAST

CHAPMAN ROAD

YALE ROAD EAST

ANNIS ROAD

FORD ROAD

RAILWAY

NEVIN ROAD

McELWEE ROAD

LEGEND

- 200ø GRAVITY
- 150ø FORCEMAIN
- 100ø FORCEMAIN
- 200ø F/M IN COMMON TRENCH w/ 200ø GRAVITY OR 100ø F/M
- PUMP STATION
- GRAVITY/PUMP STATIONS
- LOW PRESSURE SYSTEM

FIGURE 7
OPTION 1 – ROSEDALE SANITARY SERVICING CONCEPT

SCALE 1:5000

THE WEDLER GROUP
Chilliwack 1.604.792.0651
Courtenay 1.250.334.3213
Surrey 1.604.588.1919
WEDLER ENGINEERING
www.wedler.com

G:\Drawing\50005099\c13-5032a – Rosedale San. Options Review\Current Drawing Files\c13-5032A – Key Plan.dwg 2013/12/06 09:49:30 AM tchivers

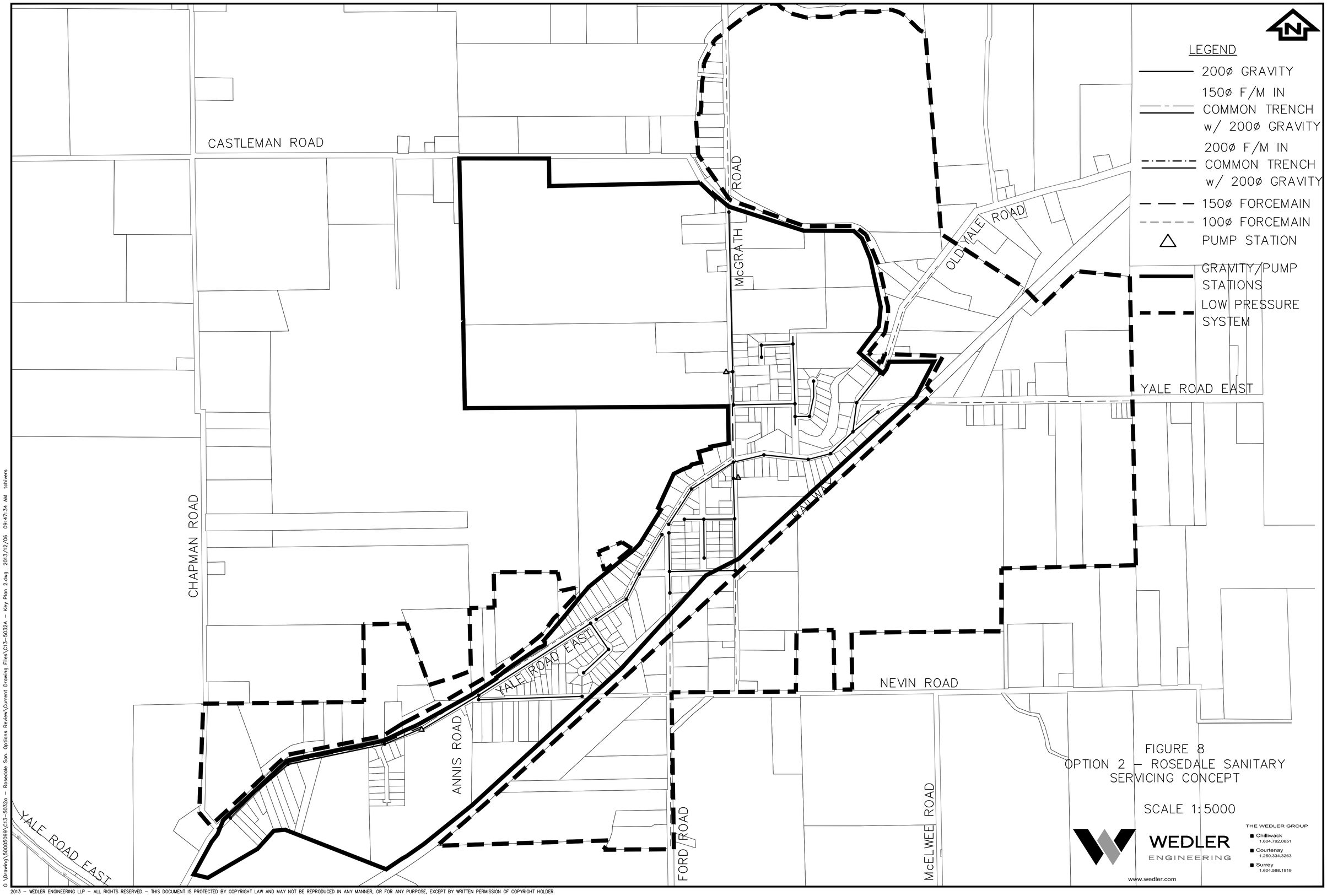


FIGURE 8
OPTION 2 – ROSEDALE SANITARY SERVICING CONCEPT

SCALE 1:5000

THE WEDLER GROUP
- Chilliwack 1.604.792.0651
- Courtenay 1.250.334.3263
- Surrey 1.604.588.1919

WEDLER ENGINEERING
www.wedler.com

G:\Drawing\50005099\C13-5032a – Rosedale San. Options Review\Current Drawing Files\C13-5032A – Key Plan 2.dwg 2013/12/06 09:47:34 AM tchivers