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Summer Village of Half Moon Bay Conceptual Sanitary Servicing Report (Issued for Review)

May 15, 2019

Prepared for:

Summer Village of Half Moon Bay

Prepared by:

Stantec Consulting Ltd.

Revision	Description	Author		Quality Check		Independent Review	
0	IFR	2019.05.13	BVH	2019.05.14	JK	2019.05.14	SW

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Executive Summary

Table of Contents

Abbreviations

km	kilometre
m	metre
mm	millimetre
m/s	metres per second
SLRWWC	Sylvan Lake Regional Wastewater Commission

1.0 INTRODUCTION

1.1 BACKGROUND

The regional initiative through the Sylvan Lake Regional Wastewater Commission (SLRWWC) will, in the future, provide regional sewer transmission from the area around Sylvan Lake to the Town of Sylvan Lake, and on to Red Deer, where the wastewater will be treated and discharged into the Red Deer River.

In 2001, the *Sylvan Lake Regional Sewer Feasibility Study* was prepared by Stantec. The document reviewed the potential of constructing a regional sewer transmission system that would provide sanitary collection services to both existing and future developments around Sylvan Lake. Since that time, the Summer Villages of Jarvis Bay, Norglenwold, and Birchcliff have successfully implemented internal servicing in their communities. The Summer Village of Sunbreaker Cove has completed detailed design of the local low-pressure force main system and is ready to construct the project when funding becomes available. Lacombe County has also implemented low-pressure force main systems in Blissful Beach, Yuill, Palm Bay, and Kuusamo Krest.

In 2005, AXYS Environmental Consulting Ltd. completed the *Sylvan Lake Water Quality Assessment and Wastewater Management Considerations* report. The following quote is from the report:

> "*During groundwater sampling conducted down gradient of septic fields for this study, wide ranging nutrient concentrations were measured among the wells, suggesting that septic field performance is highly variable.*
>
> *Based on these conditions, all new development should be required to install communal holding tank systems, rather than septic fields".*

The ultimate goal is to ensure that all sanitary wastewater from existing and future developments around Sylvan Lake does not enter the groundwater and ultimately, the lake. Residents in Half Moon Bay currently use septic tanks and septic fields. In general, septic fields don't have life expectancies of more than 20 years before they fail, but it should be noted lifespans can vary significantly and that it is impractical to estimate when they will fail. Given the age of the community, short-term implementation of a low-pressure force main system through Half Moon Bay is being examined in this report, as commissioned by The Summer Village.

1.2 REPORT OBJECTIVES

The objectives of this report are as follows:

- Identify how Half Moon Bay fits into the regional long-term plans around Sylvan Lake (based on previous reports);

Introduction
May 15, 2019

- Complete a conceptual design of a low-pressure force main system through Half Moon Bay, including logical alignments;
- Complete hydraulic modeling to determine the appropriate collection system pipe sizes and recommended pump parameters that should be installed in the private tanks; and
- Complete an opinion of probable capital cost of the proposed system.

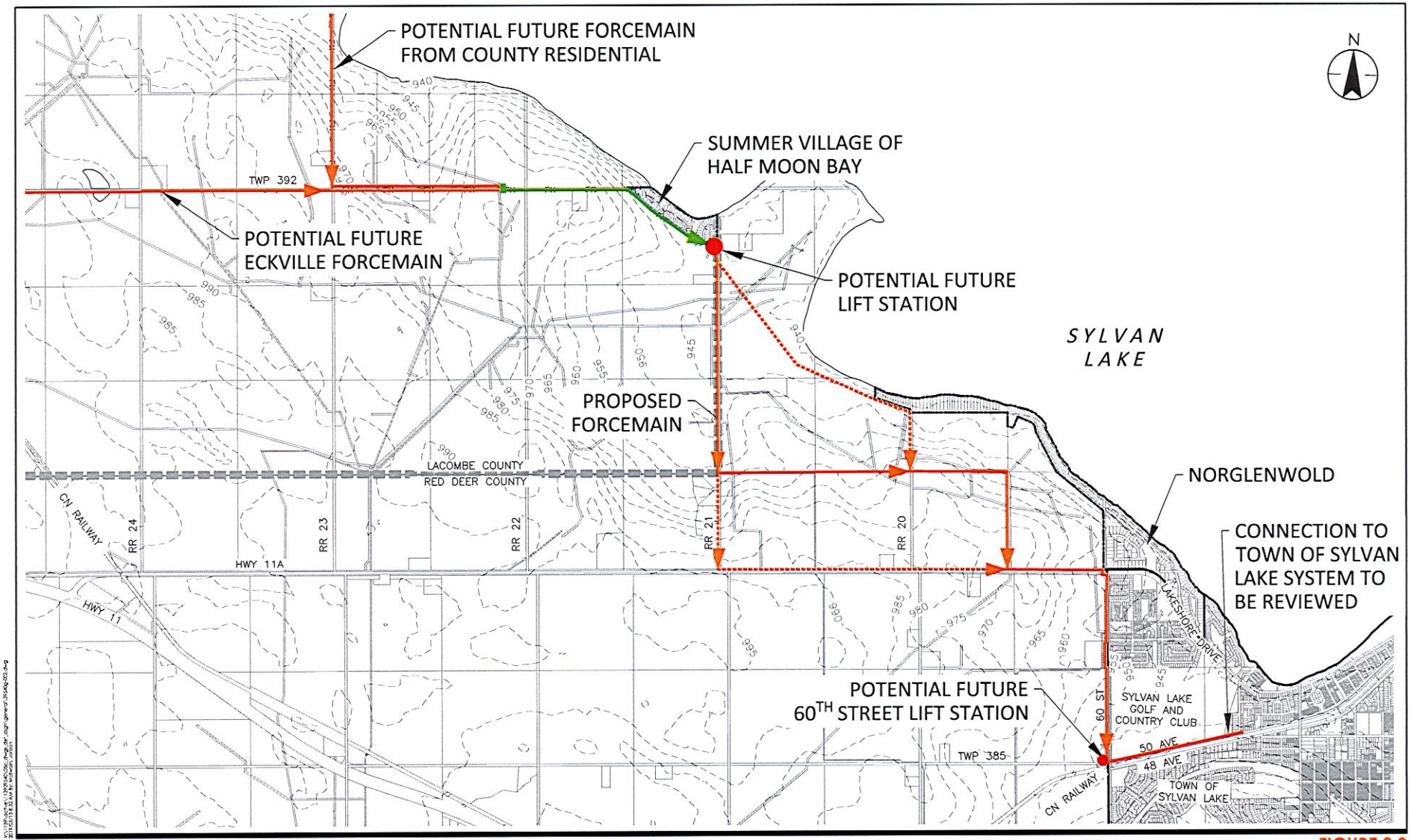
2.0 REGIONAL CONTEXT

Half Moon Bay is located on the south shore of Sylvan Lake and is approximately centered east/west along the shoreline. As illustrated in the figure from the SLRWWC Technical Memo 13, which is included in **Appendix B**, Half Moon Bay will be the most downstream community of all long-term development that has been identified for the south and west shores of Sylvan Lake. Other communities that are ultimately considered to be connected to the regional line include Kuusamo Krest, Westside Country Estates, Yuill, Eagle's Quay, Westend Landing, Westview, Lakeview Estates, and an unnamed potential future subdivision directly south of Half Moon Bay. The Town of Eckville has also recently expressed interest in connecting to the Sylvan Lake Regional Wastewater Commission line.

The Half Moon Bay area is a suitable sitefor a regional lift station, which would also serve as the community's connection point to the system. A regional lift station should be designed to accommodate all future development that will tie into the regional system, including the Town of Eckville, should it commit to tying into the system. Based on LiDAR data, the regional line west of Half Moon Bay can feed into the proposed Half Moon Bay lift station in either a gravity line or a force main configuration. Half Moon Bay will need to tie into the lift station separately from the regional line because the Half Moon Bay collection system will operate at lower design pressures. Based on the topography, the lift station should be located at the east end of Half Moon Bay Drive.

As illustrated on Figure 2.0 on the following page, the lift station would pump the wastewater to the Sylvan Lake collection system. There are a few ways in which the regional line can potentially connect into the Town's wastewater collection system. Past studies have indicated that the force main can to connect to the Town's trunks on 49 Avenue, west of 46 Street. However, the Town has recently upgraded trunks along 49 Avenue in the 60th Street area and have also identified a potential future lift station on 60th Street, just northwest of the CN Railway tracks. The Town of Sylvan Lake is planning on updating their wastewater master plan in the short-term future. It is recommended that the SLRWWC consult with the Town of Sylvan Lake on potential strategies that could create efficiencies with both jurisdictions.

The future Half Moon Bay lift station at the end of the low-pressure wastewater collection system will be sized to accommodate the largest anticipated volume through the regional system. Communications and a supervisory control and data acquisition system, with level alarm sensors, will be integrated into the lift station and relayed back to a central point for alarming.



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LEGEND

- FUTURE REGIONAL FORCEMAIN
- POTENTIAL ALTERNATIVE REGIONAL FORCEMAIN ROUTES
- POTENTIAL FUTURE GRAVITY MAIN
- LIFT STATION

1:30000 0 300 600 1500

FIGURE 2.0
OVERALL PROJECT AREA
OVERALL SYLVAN LAKE REGIONAL WASTEWATER COMMISSION STRATEGY
SYLVAN LAKE, ALBERTA

3.0 LOW PRESSURE FORCE MAIN DESIGN CONCEPT

The low-pressure force main concept is shown on Figure 3.1 on the following page. The sub-sections below describe the design criteria, how the system operates and is constructed, and how the residences will be required to tie in.

3.1 DESIGN CRITERIA

The Summer Village of Half Moon Bay has 67 residential lots. There are 20 permanent dwellings, with a permanent population of 42, and 44 seasonal dwellings. Technical Memo #13 for the SLRWWC estimated that the design population of Half Moon Bay is 235 (3.50 people per household).

In accordance with the *Alberta Private Sewage Systems Standard of Practice*, the median daily wastewater volume for the residences is 228 L/cap/day and the maximum day wastewater volume is 350 L/cap/day.

Table 3.1 below summarizes the population and flow projections:

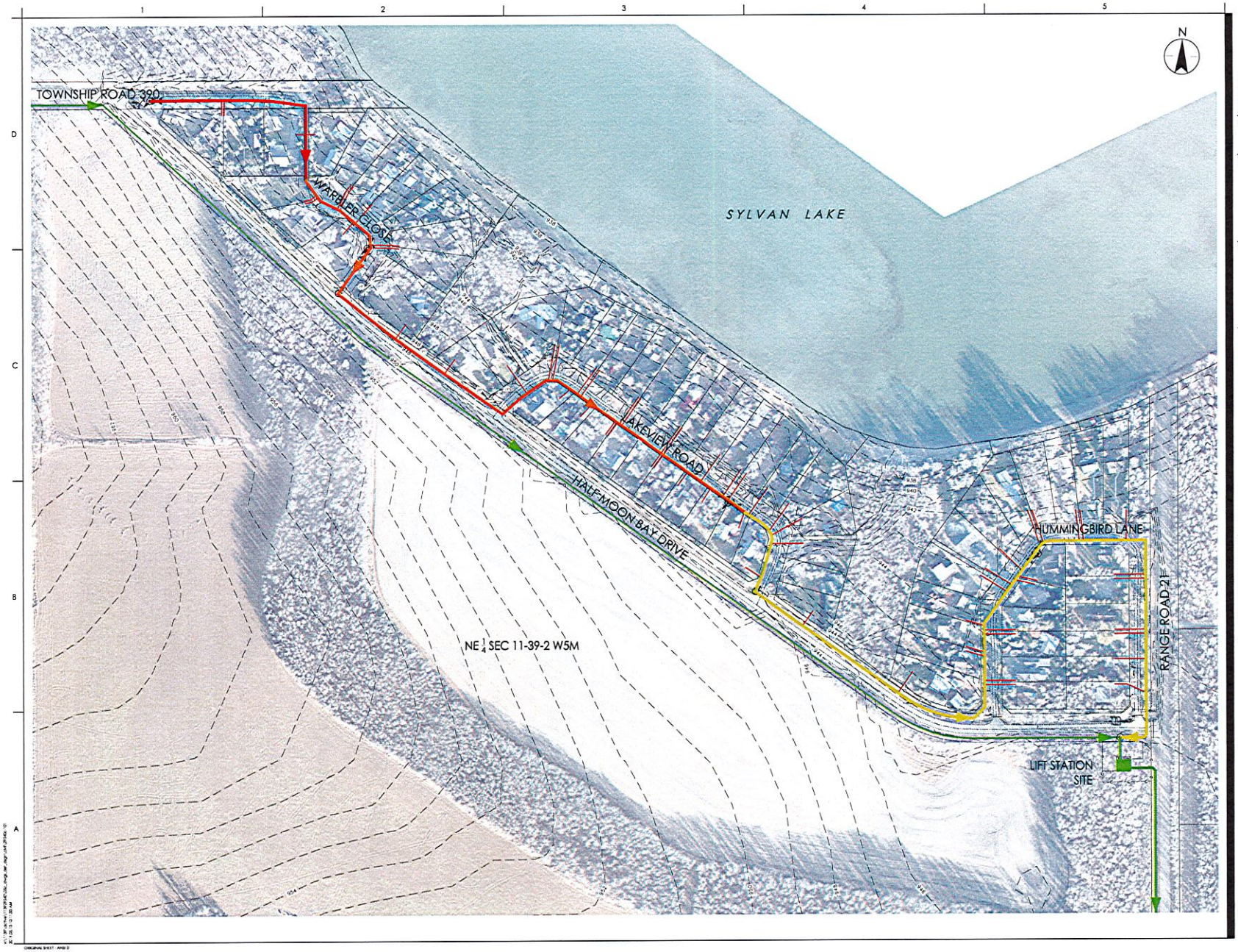
Table 3.1: Wastewater Volumes

Parameters	Total
Residential Lots	67
Population	235
Average Day Wastewater Volume *(m^3/day)*	54

Generally, where low pressure sewer systems are installed, forcemains are sized to allow a minimum velocity of 0.6 m/s-1.5 m/s under the maximum flow conditions, and approximately 1.5 m/s under higher flow conditions. Given the significant variations in flow between Winter and Summer seasons in a community like Half Moon Bay, it is prudent to size the lines so that adequate system velocities can be achieved even under winter conditions, as long as the system pressures remain achievable for most household pumping stations.

3.2 LOW-PRESSURE FORCE MAIN SYSTEM

A low-pressure sanitary collection system is a closed pipe system where sewage is pumped through the trunk forcemain through the combined operation of the residents' grinder pumps. Each residence will have a low-pressure grinder pump in a tank, or self-contained unit, that is pumped into a forcemain within the municipal right of way. Due to the transient nature of the residents, it is anticipated that only a small percentage of users are pumping from their system into the main line simultaneously. Thus, the collection network pipe sizing is based on a reasonable number of users operating simultaneously and not the total number of users connected to the system at one time. The system piping was sized with combined use of basic calculations and WaterCAD computer modelling.



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Consultant

Notes
1. SERVICE ALIGNMENTS AND TANK LOCATIONS TO BE ESTABLISHED IN A FUTURE DETAILED DESIGN STAGE.

Legend
- 50mm LOW PRESSURE SANITARY FORCEMAIN
- 65mm LOW PRESSURE SANITARY FORCEMAIN
- 75mm LOW PRESSURE SANITARY FORCEMAIN
- SANITARY SERVICE
- FUTURE REGIONAL FORCEMAIN
- AIR RELEASE VALVE (ARV)
- FLUSHOUT
- SHUTOFF VALVE

Revision	By	Appd	YYYY.MM.DD
G —	—	—	—
F —	—	—	—
E —	—	—	—
D —	—	—	—
C —	—	—	—
B —	—	—	—
A FOR REVIEW	JSM	BVH	2019.04.12

Issued	By	Appd	YYYY.MM.DD
File Name: 29540c-101	JSM Dsn.	BVH Dsgn.	BVH Chkd.	2019.05.10 YYYY.MM.DD

Permit/Seal

PRELIMINARY NOT FOR CONSTRUCTION

Not for permits, pricing or other official purposes. This document has not been completed or checked and is for general information or comment only.

Client/Project
SUMMER VILLAGE OF HALF MOON BAY

HALF MOON BAY SERVICING STUDY

Half Moon Bay, AB Canada

Title
OVERALL SITE PLAN

Project No.	Scale
113929540	1:1250 (0, 12.5, 25, 62.5)
Revision 0	Sheet 1 of 1
	Drawing No. FIG 3.1

The low-pressure system has the following characteristics:

Advantages:

- Lower capital cost associated with smaller diameter pipe sizes, as compared to a traditional gravity sewer system.
- Most of the line can be installed by directional drilling, which requires little surface disturbance and excavations (see Section 3.3 below).
- System can be sized to service existing users and implemented immediately.
- Low operating costs to the municipality.
- System can typically be constructed within existing road rights of way with little, if any, disturbance to traffic.

Disadvantages:

- Residents will be required to get pumps installed in their lots (further information in Section 3.4 below).
- All residents must have pumps that perform with similar pump curves. This can be difficult to enforce without regular inspections.

To provide for central collection of waste, a lift station is proposed.

3.3 PIPE DESIGN AND CONSTRUCTION

Due to limited space within the road right of way, it is typically most cost-effective to install the line by directional drilling. Pit-excavations are typically required only where pipes are joined or where valves are needed. The line is designed to have a depth of cover that meets or exceeds 2.70 metres to be below frost penetration and reduce the risk of freezing of the line during the winter. HDPE DR11 pipe is typically what is used for directional drilling. It has a pressure rating that is considerably higher than what will be observed during operations and has a low risk of breaking. The high tensile strength of HDPE DR11 is required not for operations, but for the part of construction in which the line is pulled through the ground.

The design also includes the installation of flushouts, air-release valves, and standard shutoff valves in select locations throughout the system.

Figure 3.2
Roadside Directional Drilling Example

Flushouts are used as part of semi-annual to annual maintenance procedures in which clean water is pumped through the system at relatively high velocities to clear buildup of sediment and prevent potential blockages. The flushouts are installed at the ends are spread within the system, spaced approximately 200-300 metres apart. In addition to flushing, the flushouts can also assist with emergency repairs of broken lines by providing a temporary release point in which a collection truck can temporarily take sewage for areas that are upstream of the system outlet and outside of the zone in which the repair is being made, thus reducing the number of lots that are impacted by a temporary repair.

The elevation of the line will vary throughout the system (i.e. there will be high and low points). It is important that air does not get locked in the system and to ensure it doesn't, air release valves can be installed in the highest points of the system to automatically release air that can build up in the system.

Shutoff valves are installed at key areas within the system, including on all private service lines. They are installed near all flushouts, air releases, and tees and crosses so that portions of the main can be isolated for maintenance or repairs.

3.4 PROPERTY SERVICING

With the system proposed, the property owners will need to pump from their own private sanitary system into the Summer Village system. Hydraulic pump requirements for the residential pumps have been calculated and are provided in **Appendix B**. The property owners will be required to contract a plumber or septic tank installer to ensure the pump is installed correctly. The pumps may be installed in existing septic tanks; however, inspections of individual systems should be completed to ensure that there is no groundwater infiltration into the tanks or exfiltration out of the tank.

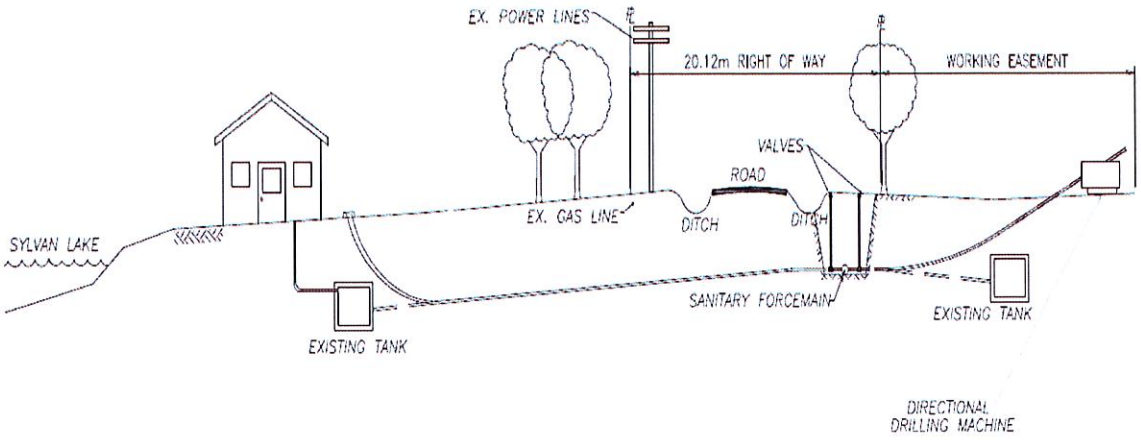

Figure 3.3 – Typical Lot Servicing Strategy

For connection to the main line, each property will be provided with a 38 mm diameter service line with a curb stop (shutoff valve) at the property line. The cost to install the service line for each lot, from property line to the septic system, will vary as residences will vary in length requirements and have their own unique issues such as special landscaping or surface features that will need to be considered during construction. In general, the shutoff valves should be installed in areas that are not prone to being struck by vehicles or other heavy equipment and protected according.

Please note that in Figure 3.1, the service locations are based on high level desktop information only and the locations of the septic systems are unkonwn. It is highly recommended that during the future detailed design stage, the residents be consulted to identify exactly where their septic systems are to optimize the connections strategy.

3.5 RESIDENTIAL UNIT PUMP SELECTION

Using the "Maximum pump in operation method", the maximum flow in each of the low pressure pipe section was calculated. The HDPE DR11 pipe sizes were then determined by using the 0.6-1.5 m/s velocity criteria. Based on the flow projections and hydraulics of the system, a nominal 50-75 mm pipe size will be sufficient for the collection system. The design criteria was based on use of Liberty single stage LSG-202 series pumps, which are two horsepower (hp) pumps. The specification booklet attached in **Appendix C.**

Liberty pumps have been cost-effective and reliable on other projects, but municipalities don't typically force residents to use a specific make and model. There are numerous other makes and models of pumps that can be used in low pressure force main systems, but they may not be compatible. If residents wish to use another brand of pump, it is important that the pump have a similar pump-curve to the Liberty LSG202 pump. If the alternative pump applies too much pressure, it could overwhelm the pumping ability of other pumps. Conversely, if it is too small, it may not have enough pressure to pump into the system. Therefore, it is recommended that proposed alternatives be reviewed by an engineer to ensure it is compatible with the system.

4.0 OPINION OF PROBABLE COST

4.1 COLLECTION SYSTEM COST

The opinion of probable cost (rounded up) for the proposed sanitary collection system for the Summer Village of Half Moon Bay is $960,000 ($735,000 construction + 30% Professional Services and Contingency) for the municipal portion of work. This excludes GST. The detailed opinion of probable cost is included in Appendix A.

4.2 PRIVATE LANDOWNER COSTS

The owner of each property will be responsible for installing a pump that can pump into the system. Property owners will also need to assess the condition of their septic/holding tank to ensure there is no groundwater infiltration into the system or exfiltration out of the system. Leaking tanks will increase operating, pumping and treatment costs, as well as, increase the wear on the pump causing it to be replaced sooner than otherwise anticipated or required. Service pipe quantities for the private portion of work have not been finalized as Stantec has not received information feedback forms from all the residents.

4.3 REGIONAL LIFT STATION AND FORCE MAIN

A lift station will be installed at the holding tank site and a forcemain will also be installed connecting the regional transmission line. The specifics of this are not included within this scope but have been investigated in multiple Tech Memos sent to the SLRWWC. In the SLRWWC Technical Memo #13, the opinion of probable cost for the lift station and 9.6km forcemain was $5.8M in 2014. However, it should be noted that the costs can vary substantially by the economic climate.

As an alternative to the lift station, interim communal holding tanks could be considered. However, based on similar projects, it is estimated that tanks capable of storing the wastewater for 67 lots would be quite costly (in the order of $500,000), particularly given that a lift station is eventually needed and proposed for in the future regardless. Further, the required truck hauling of sewage from Half Moon Bay to a suitable receiving station would also be quite costly.

5.0 CONCLUSIONS AND RECOMMENDATIONS

In 2001, the Sylvan Lake Regional Sewer Feasibility Study was prepared by Stantec Consulting Ltd. The document reviewed the potential of constructing a regional sewer transmission system that would provide sanitary collection services to both existing and future developments around Sylvan Lake. The Summer Village of Half Moon Bay is the next community in line to get tied into this regional sewer transmission system.

Stantec has completed the detailed design for the low-pressure sanitary collection system in the Summer Village of Half Moon Bay. The LPS system was sized with the "Max pump running" method.

In the future, a lift station will be located at the holding tank location to convey the flow to the regional transmission system.

The opinion of probable cost for the proposed sanitary collection system for the Summer Village of Half Moon Bay is $960,000 for the municipal portion of work. This includes contingency and professional services but excludes GST. The 2014 estimated cost to complete the lift station and forcemain is $5.8M.

An application for a new municipal sanitary collection system will need to be submitted to Alberta Environment and Parks as part of the requirements. This should be completed and approved prior to construction initiation and typically requires approximately 3 months to be reviewed and approved by Alberta Environment and Parks.

6.0 CORPORATE AUTHORIZATION

[TO BE COMPLETED UPON FINALIZATION OF REPORT]

7.0 REFERENCES

Sylvan Lake Water Quality Assessment and Wastewater Management Considerations, AXYS Environmental Consulting Ltd. (2005)

Technical Memo #13 - SLRWWC Regional System Cost Update, Stantec Consulting Ltd. (March 19, 2014)

APPENDIX A

Opinion of Probable Cost

Item No.	Item of Work	Est. Quantity	Measure Unit	Unit Rate	Total
SCHEDULE A: Half Moon Bay					
A. MOBILIZATION AND DEMOBILIZATION		1	L.S.	$ 70,000	$ 70,000
	TOTAL ITEM A				**$ 70,000**
B. MISCELLANEOUS ITEMS					
0.1	Traffic accommodation, detouring & signage	1	L.S.	$ 2,500	$ 2,500
0.2	Utility Locates including Hydrovacing	1	PC Sum	$ 10,000	$ 10,000
0.3	Tree clearing and grubbing	1	L.S.	$ 10,000	$ 10,000
	TOTAL ITEM B				**$ 22,500**
C. SANITARY SEWER MAIN					
0.1	Supply and Horizontal Directionally Drill HDPE Pressure Sewer Main c/w tracer wire and "Little Fink" end connections or approved alternative				
	a) 75 mm HDPE DR 11	635	lin. m	$ 160	$ 101,600
	b) 62.5 mm HDPE DR 11	470	lin. m	$ 155	$ 72,850
	c) 50 mm HDPE DR 11	162	lin. m	$ 150	$ 24,300
0.2	Blowoff / Air Release Assembly (1,200mm dia. Barrel)	2	each	$ 15,000	$ 30,000
0.3	Isolation Valves and Appurtenances				
	a) Supply and Install 75mm Gate Valve	4	each	$ 3,000	$ 12,000
	b) Supply and Install 62.5mm Gate Valve	4	each	$ 2,750	$ 11,000
	c) Supply and Install 50mm Gate Valve	1	each	$ 2,500	$ 2,500
0.4	Flushouts (900mm Barrel)	4	each	$ 5,000	$ 20,000
	TOTAL ITEM C				**$ 274,250**
D. SERVICE CONNECTIONS					
0.1	Sewer Service Connections to Main including supply and install 38mm service each valves and curb box	67	each lot	$ 1,800	$ 120,600
0.2	Service Excavation Pits including backfill and compaction to 95% S.P.D	67	each	$ 2,000	$ 134,000
0.3	Supply and Directionally Drill 38mm HDPE DR 11 including tracer wire and "Little Fink" within Road Right-Of-Way	670	lin.m	$ 140	$ 93,800
	TOTAL ITEM D				**$ 348,400**
E. SITE RESTORATION					
0.1	Import topsoil, fine grading, and seeding (Provisional)	1500	sqr.m	$ 10	$ 15,000
0.2	Asphalt Replacement (Provisional)	30	tonne	$ 140	$ 4,200
	TOTAL ITEM E				**$ 19,200**
SUMMARY - SCHEDULE A:					
A. MOBILIZATION AND DEMOBILIZATION					$ 70,000
B. MISCELLANEOUS ITEMS					$ 22,500
C. SANITARY SEWER MAIN					$ 274,250
D. SERVICE CONNECTIONS					$ 348,400
E. SITE RESTORATION					$ 19,200
	SUBTOTAL - CONSTRUCTION COSTS				**$ 734,350**
	30% Contingency and Professional Services				*$ 220,305*
	TOTAL				**$ 954,655**

APPENDIX B

SLRWWC Tech Memo #13 – Figure 1.0

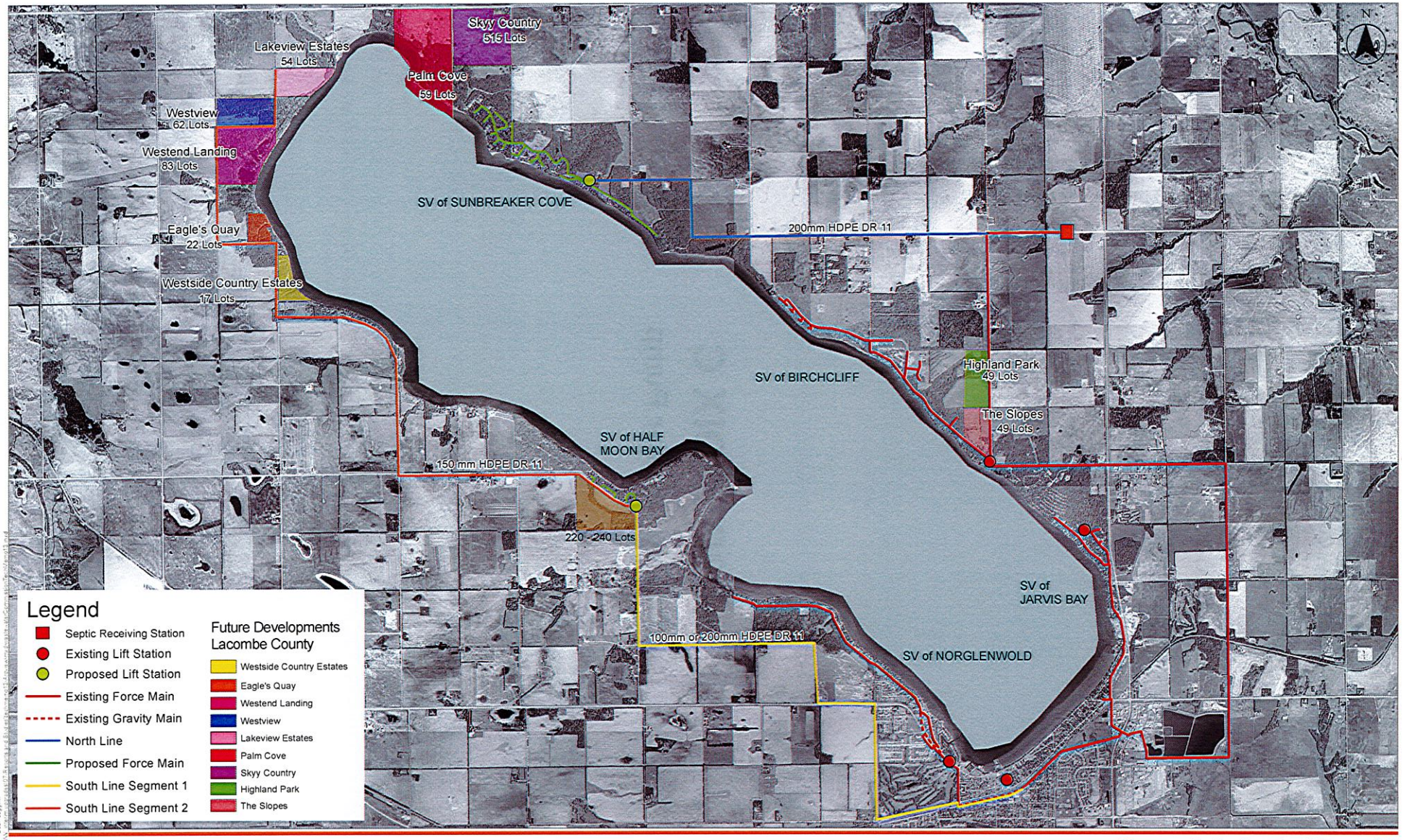

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Figure 1.0: Tech Memo 13

Sylvan Lake Regional Waste Water Commission

APPENDIX C

Liberty Grinder Pump

Liberty Pumps®

LSG200-Series

Omnivore® Grinders

3 Year Warranty

Patent: See www.libertypumps.com/patents

2 hp

1-1/4" Discharge

Features:

- New Patented V-Slice® cutter technology
- One-piece uni-body casting
- Stainless steel impeller
- Quick-connect power cord
- Internal or external capacitor models available
- 300 Series SS Rotor Shaft

POWDER COATED TOUGH™

innovate. evolve.

Omnivore® Grinders

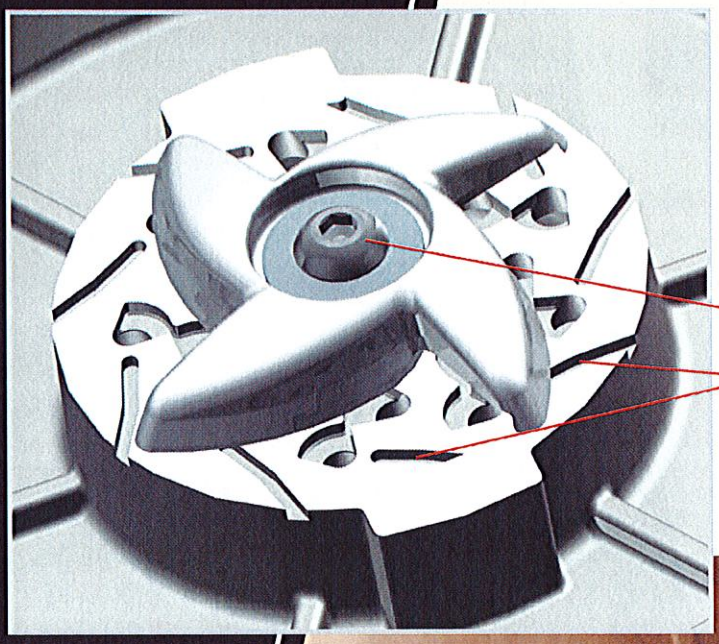
LSG200-Series Grinder Pumps

Liberty's LSG200-Series Grinder Pumps meet the demanding needs of commercial and residential sewage applications where difficult solids-handling ability is crucial. The LSG200-Series features a superior cutting system made of hardened 440 stainless steel – Rockwell C 58, for shearing solids into small particles prior to being passed to the discharge by the impeller under high pressure. Applications include individual or groups of homes, motels, schools, shopping centers, lakefront developments and systems requiring high pressure sewage pumping.

Features:

- 2 hp, heavy-duty motor – oil filled, thermally protected
- Upper and lower ball bearings
- One-piece uni-body cast iron housing
- 300 Series SS Rotor Shaft
- 316 Stainless steel impeller
- Dual seals – Upper seal is unitized durable silicon carbide. Lower seal is Viton® double-lip. (Lower seal ensures that all debris is kept away from main seal)
- Motor windings insulated to Class B (130°C)
- Advanced V-Slice® cutting system made of hardened 440 stainless steel – Rockwell C 58
- Horizontal 1-1/4" FNPT Discharge
- Back vanes on impeller and spiraled bottom plate for superior solids clearing
- All stainless steel fasteners
- Clog-free volute design
- Designed for maximum heat dissipation and cool motor operating temperatures
- Solid state starting circuit - no mechanical relay coil
- 25' power cord with Quick-connect
- Piggy back plug with wide angle float (on automatic model) eliminates need for expensive panel

Viton® is a registered trademark of DuPont Dow Elastomers LLC.



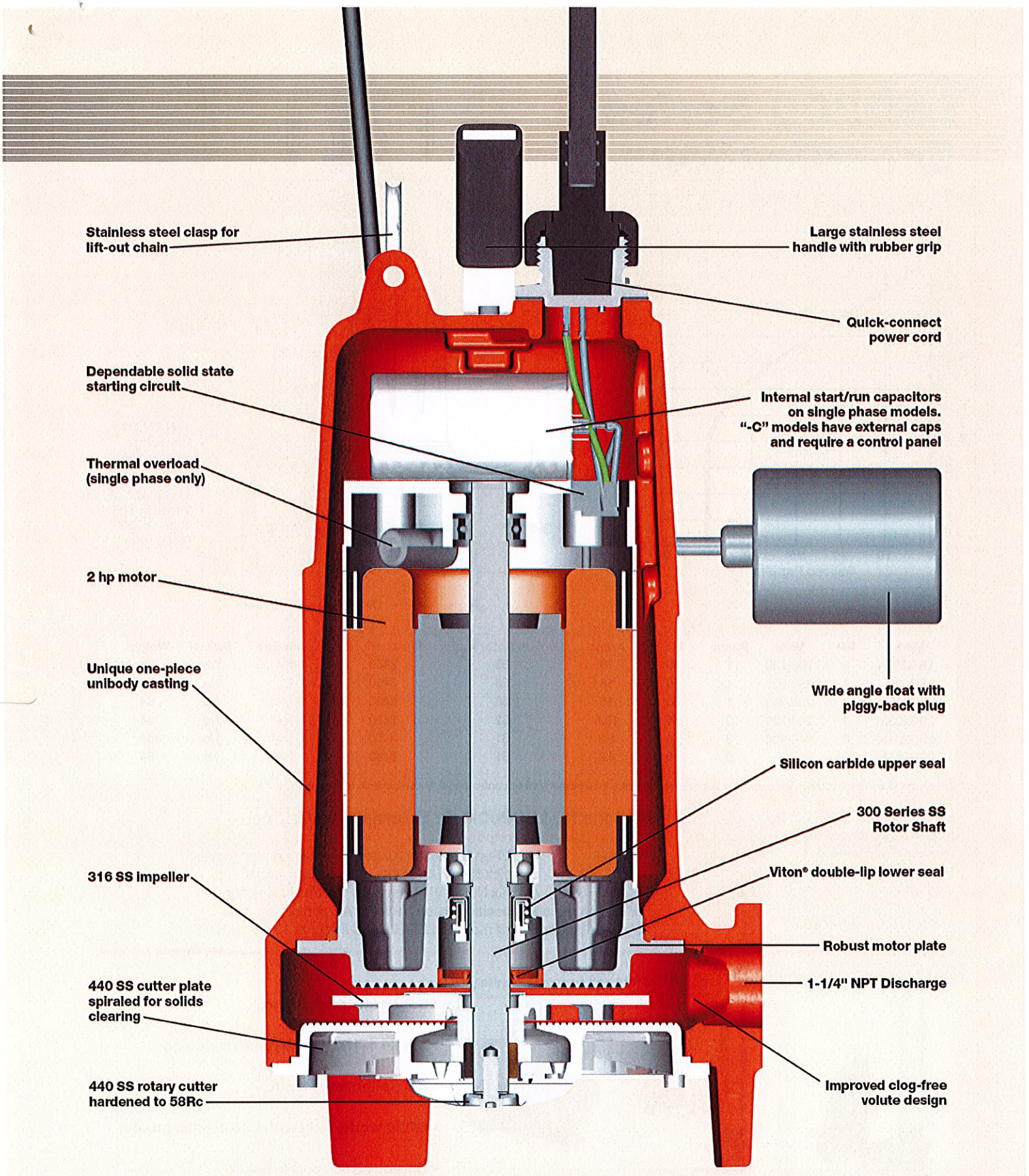
V-Slice® Technology

Superior cutting system provides improved shredding performance over radial cutters. V-pattern provides up to 108 alternated cuts per revolution. Entire cutting system made of 440 stainless steel hardened to 58Rc.

Recessed cutter bolt eliminates wadding

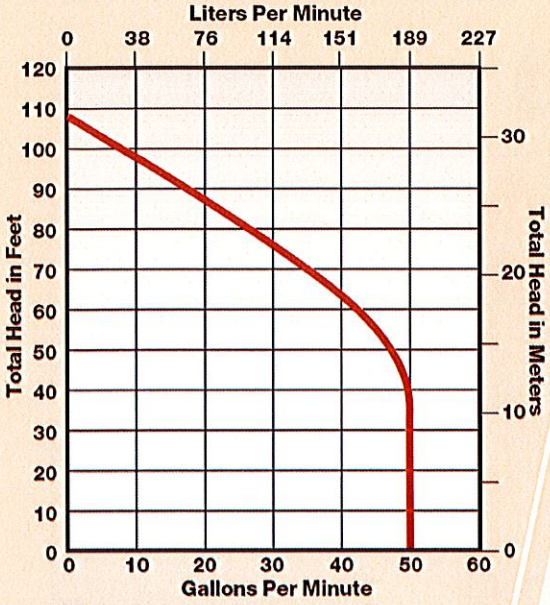
Exclusion cleanout slots and back relief clears debris from under cutter

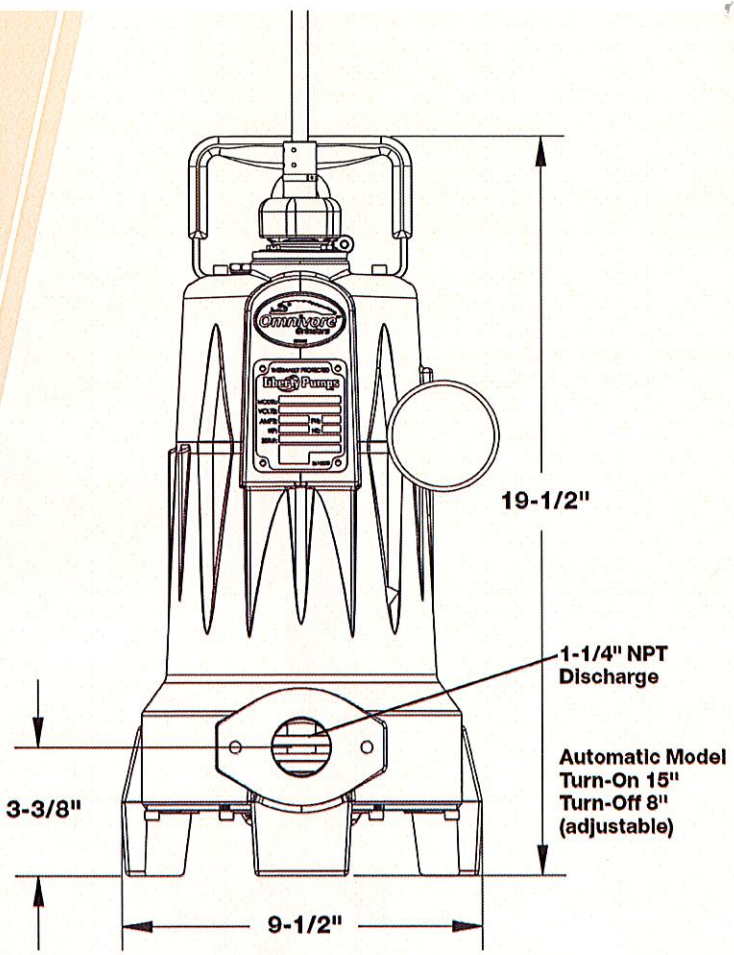
Patent: See www.libertypumps.com/patents


Stainless steel clasp for lift-out chain
Large stainless steel handle with rubber grip
Quick-connect power cord
Dependable solid state starting circuit
Internal start/run capacitors on single phase models. "-C" models have external caps and require a control panel
Thermal overload (single phase only)
2 hp motor
Unique one-piece unibody casting
Wide angle float with piggy-back plug
Silicon carbide upper seal
300 Series SS Rotor Shaft
316 SS impeller
Viton® double-lip lower seal
Robust motor plate
1-1/4" NPT Discharge
440 SS cutter plate spiraled for solids clearing
440 SS rotary cutter hardened to 58Rc
Improved clog-free volute design

vate. evolve.

LSG200-Series Specifications





Model	HP	Volts	Phase	HZ	Amps	Locked Rotor Amps	Speed (RPM)	Discharge	Switch	Weight
LSG202A	2	208-230	1	60	15	53	3450	1-1/4"	Yes	86
LSG202M	2	208-230	1	60	15	53	3450	1-1/4"	No	84
LSG202M-C	2	208-230	1	60	15	53	3450	1-1/4"	No	84
LSG203M	2	208/230	3	60	10.6	62	3450	1-1/4"	No	84
LSG204M	2	440-480	3	60	5.3	31	3450	1-1/4"	No	84
LSG205M	2	575	3	60	4.9	31	3450	1-1/4"	No	84

Single phase models are thermally protected. 3-phase models require a properly sized control panel. Maximum fluid temperature 140° F

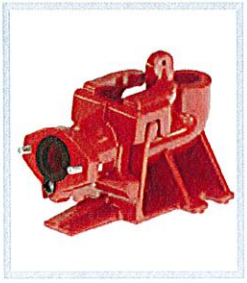
LSG202M and LSG202A feature internal capacitors and do not require a separate control panel for operation. LSG202M-C features external capacitors, requiring a panel with appropriately sized start and run capacitors.

Options for LSG202M-C: External Cap Grinder

Model	Description
K001316	Start/Run Capacitor Kit (for retrofit in existing panels)
SXHC24=3	Simplex NEMA 4X Panel with start/run capacitors
AE24HC=3	Duplex NEMA 4X Panel with start/run capacitors

For complete panel specifications, see SX or AE-series literature.
25' cord standard on all models. LSG202M-C features 35' cord standard.

GR20 Guide Rail Base (GR20 option sold separately)



- **Cast Iron construction**
- **Single 1-1/4" guide rail pipe design**
- **Auto alignment feature**
- **GR20 works only with LSG-Series pumps**
- **Upper rail support bracket**

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