MPE Engineering Ltd.

Final Rev.1 Report for:

VILLAGE OF LONGVIEW

INFRASTRUCTURE MANAGEMENT PLAN

Date: May 11, 2017
Project #: 2530-013-00

Proud of Our Past… Building the Future

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Village of Longview
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May 11, 2017
File: N:\2530\013\00\\R01-1.0

Attention: Dale Harrison
Chief Administrative Officer

Dear Mr. Harrison:

Re: Village of Longview
Infrastructure Management Plan – FINAL Rev.1

MPE Engineering Ltd. is pleased to provide you the final report for the Village of Longview Infrastructure Management Plan. The report contains our findings and recommendations for the Village's municipal infrastructure based on the work undertaken as part of this study.

We wish to thank you for the opportunity to work with the Village on this valuable project and look forward to assisting you with any future needs that you may have.

If you require further information, please contact the undersigned at (403) 219-6466.

Yours truly,

MPE ENGINEERING LTD.

Sarah Fratpietro, P.Eng.
Project Manager

SF/sf
Encl.

CORPORATE AUTHORIZATION

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Sarah Fratpietro, P.Eng.

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EXECUTIVE SUMMARY

An Infrastructure Master Plan (IMP) is a very useful tool that can be used by municipalities to deal with infrastructure that is nearing the end of its life, may not be able to meet increasing demands, or does not meet current regulatory standards. The Village of Longview (Village) retained MPE Engineering Ltd. (MPE) to undertake an IMP based on MPE's April 15, 2016 proposal. The IMP will allow Village administration and Council to be pro-active in its decision-making role for maintenance of existing infrastructure, as well as expansion of infrastructure as necessary to accommodate new developments. This update enables the Village to prioritize capital expenditures and provides a solid basis for funding applications.

This IMP provides a review and assessment of the major infrastructure elements:

- Water supply, treatment, storage and distribution,
- Wastewater collection system and treatment,
- Storm drainage,
- Road network.

As well as the major infrastructure elements, this IMP updated the population projections for the Village for the next 25 years, and provides a recommended Capital Plan for the Village.

Population Projections

The 2016 population of the Village is 322. The annual growth rate over the past 25 years is an average of 0.7%. For purposes of this Study, an annual growth rate of 1.0% is utilized. The following table summarizes the projected population for the Village over the next 25 years.

Population Projections

Year	Population
2016	322
2021	339
2026	356
2031	374
2036	393
2041	414

Water System

The water supply system consists of two groundwater wells, raw water pipeline, a water treatment plant (WTP), two buried potable water reservoirs and distribution piping throughout the Village. The raw water supply, potable water storage reservoirs and water distribution system have sufficient capacity for the projected 25-year population. However, much of the water infrastructure is asbestos cement (AC) pipe over 50 years old and is reaching the end of its life expectancy. The AC water mains should be replaced. Two hydrants are recommended to be added to provide adequate coverage for the Village. It is also recommended that the water system be computer modelled, and calibrated with results of a hydrant flow testing program. This will assist with proper engineering for future development and to identify potential problems with the existing distribution system.

Programming revisions were made to the WTP in April 2017 to limit the capacity to 150 m^3/day. This was done to prevent the AEP requirement to add a second filter to the WTP when capacity is over 150 m^3/day. The Village's Potable Water Reservoirs are sufficient size to provide the current daily flows that are over this daily flow limit. Continuous monitoring of the reservoir water level with a level transmitter is recommended along with radio communication to the WTP.

The WTP site requires grading to prevent the flooding of the building in the spring, and requires the repair of a leak under the WTP in the floor drains. The WTP roof requires replacement and some upgrades to the backwash valves are recommended.

Wastewater System

The wastewater facilities include a gravity collection system, lift station, forcemain and wastewater stabilization pond. The wastewater collection system appears to be adequately sized for the current population and the projected 25-year population. Much of the collection piping system, however, is clay tile (CT) pipe over 50 years old, and is experiencing a high volume of infiltration and inflow (I/I). A long-term refurbishment and upgrade program should be implemented. Video inspections, manhole inspections and an assessment of the collection system were undertaken to identify specific problem areas.

The lift station, forcemain and waste stabilization ponds were built in 2011 and are adequately sized to handle the projected 25-year population projection.

Stormwater System

In general, drainage in the Village of Longview flows from northeast to southwest. Drainage is conveyed by a combination of curb and gutter on the sides of some of the streets, grass ditches and culverts in a few areas to keep larger flows off the roads, and a number of catch basins and storm pipes underneath paved roads. Based on conversations with Village Public Works and Administration, the existing system is working well and there has not been any flooding reported. However, there has been issues with spring water infiltrating the storm water main to the Highwood River from Highway 541 and freezing at the outfall structure.

Road Network

The road system consists of mostly paved roads. The roads are in varying states of condition, but are generally functional with some problem areas. The existing road network was inspected and priority for upgrades are identified. The required road work should be completed in conjunction with water and wastewater replacement projects in order to make the most efficient use of funds.

Capital Plan

A complete listing of the recommended capital projects and associated priority is included in ***Table 9.1 Capital Plan*** in ***Section 9.0*** of this report, which can be used as a quick reference by the Village. It provides a coordinated schedule of capital projects for all infrastructure types, so financial resources can be used efficiently. This list is intended to be a 'living' document, which is to be updated as new information arises and capital funding allows. This table is reproduced below for convenience.

The Capital Plan identifies and prioritizes the required infrastructure improvements along with their respective costs. The Plan shows the total infrastructure commitment by the Village amounts to just over $7.3 Million, of which a portion may be offset with provincial grants and funding and the remainder will need to be funded through taxation or utility rates.

Table 9.1: Capital Plan

Priority	Infrastructure Project	Class 'D' Cost Estimate	Estimated Timeline
1	Video inspect and spot repair storm main from Highway 541 to outlet at Highwood River	$50,000	2017
2	Site grading and repair of leaking drain pipe at WTP site	$40,000	2017
3	Potable water reservoir monitoring and communication to WTP	$170,000	2017
4	WTP backwash pressure and flow control	$100,000	2017
5	Wells monitoring and control enhancements	$70,000	2017
6	Replacement of WTP roof over laboratory	$25,000	2017
7	Phase 1 Water/Wastewater Pipeline Replacement (Twin Cities Dr., Mountain View Pl., Foothills Dr.)	$1,040,000	2018
8	Phase 2 Water/Wastewater Pipeline Replacement (Highwood Dr.)	$1,140,000	2022
9	Phase 3 Water/Wastewater Pipeline Replacement [Morrison Dr. (south of Foothills Dr.), Kee Dr.]	$1,480,000	2026
10	Phase 4 Water/Wastewater Pipeline Replacement [Morrison Dr. (north of Foothills Dr.)]	$1,620,000	2030
11	Phase 5 Water/Wastewater Pipeline Replacement (Royalties Cr., Longview Dr.)	$ 950,000	2034
12	Phase 6 Water/Wastewater Pipeline Replacement (Trailer Park and Highway 541 Crossing)	$ 620,000	2038
	TOTAL	**$7,305,000**	

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1.0 INTRODUCTION

1.1 Overview

The Village of Longview authorized MPE Engineering Ltd. (MPE) to undertake an Infrastructure Management Plan in June 2016 based on MPE's April 15, 2016 proposal. This report will be an update to the 2006 Infrastructure Study completed by MPE in 2006. An Infrastructure Management Plan (IMP) is a useful tool that can be used by municipalities to deal with infrastructure that is nearing the end of its life, may not be able to meet increasing demands or does not meet current regulatory standards.

The IMP evaluates the infrastructure currently owned and maintained by the Village, and summarizes the present states and capacities of the community's water, wastewater, stormwater and road systems. The IMP identifies and recommends specific infrastructure upgrades and rehabilitation required to meet current standards and future demands and also provides suggested prioritization, timelines, and order of magnitude cost estimates for the proposed work.

The prioritized capital works program provided by this Study will assist the Village with assessment of long-term budget requirements and provides a solid basis for funding applications.

The IMP should be formally updated every five to ten years to monitor progress, update capital budget projections, assess developing infrastructure issues and to incorporate new information.

1.2 Study Scope

The following lists the major tasks completed in this project:

- Review historical population statistics and provide updated Village population projections.
- Evaluate and confirm water and wastewater flow rates for the Village using historical demands.
- Visual inspection and condition evaluation of the Village's road network.

- Carry out two field inspections of ten wastewater manholes at strategic locations to measure wastewater depths during a dry weather day and during a wet weather event.
- Evaluate measured wastewater depths in manholes to identify and compare sections of sewer main that have a significant increase in wastewater flow during the storm event (indicating inflow & infiltration (I/I)).
- Coordinate with Thuro Inc. to carry out video inspections of the wastewater collection system and review of the inspection report and videos.
- Provide wastewater pipe condition rating for each segment of pipe based on defects identified in the videos, or any I/I locations.
- Prepare infrastructure system maps using record drawings, survey, LIDAR and field-gathered information.
- Review existing water, wastewater and storm system information and indicate what needs to be upgraded to meet future growth and *Alberta Environment and Parks Standards and Guidelines.*
- Provide order of magnitude capital cost estimates for recommended infrastructure upgrades.
- Prepare suggested capital plan to address recommended infrastructure upgrades.

1.3 Assessment Process

MPE used GIS (Geographic Information System) applications to collate data about the inventory and condition of existing infrastructure and to integrate this information with required upgrade work and cost estimates associated with that work.

The water, wastewater, stormwater and roads systems assessments are based on information gathered from:

- Record drawings.
- GIS data base (water, wastewater and roads).
- LIDAR topographic information.
- Site visits.
- Discussions with Village Staff and the Operator.
- Historic water plant and wastewater lift station flow records.

- Previous construction experience in the Village.
- Wastewater video inspection of the wastewater collection system.

Using the aforementioned information sources, MPE developed condition ratings for the road, water and wastewater infrastructure systems. The condition ratings factored in the present condition and importance of the components for each infrastructure system to determine an overall priority assessment.

2.0 BACKGROUND

The Village of Longview was established in the 1960s. Small-scale residential developments occurred around 1969 on Riverview Place around 1975 along Highwood Drive. The trailer park on the north side of Longview was developed sometime between 30 and 50 years ago. The Malmberg Subdivision started construction in 2001, with the third phase completed in 2008.

The wastewater collection system, the water distribution system and a potable water reservoir were built in the mid-1960s. The water supply was from a pump house on the Highwood River until it was replaced by the well system in 1981, along with the construction of an additional water storage reservoir. The water treatment plant was constructed in 1996 adjacent to the mechanical wastewater treatment plant (WWTP). The sanitary wastewater treatment system was a lagoon until 1981, when it was replaced by a mechanical WWTP, and in 2011 the current wastewater lagoon northwest of the Village was built and the mechanical WWTP decommissioned. The storm collection mains were constructed in 1985, both in the Village and to the North System along Highway 541.

2.1 Infrastructure History

Since the preparation of the Infrastructure Study by MPE in 2006, a number of project have proceeded to upgrade the Village's Infrastructure:

- The mechanical wastewater treatment plant was decommissioned and a lift station and wastewater lagoon was constructed in 2011.
- The water treatment plant (WTP) was upgraded to have a UV system and dechlorination tank (for backwash to waste) installed outside in 2013.
- The raw water wells were extended and a berm installed in 2015 to protect against flood events.
- Design for WTP Upgrades to extend the building and add a redundant filter train was completed in 2014. However, this project is on hold until the WTP capacity needs to be increased to more than 150 m^3/day.

2.2 Previous Projects

The IMP references the work done in the following previous projects:

- 2006 Infrastructure Study (MPE).
- 2008 Water Treatment System Study (MPE).
- 2009 Wastewater Treatment Study (MPE).
- 2010 Wastewater Stabilization Pond Study (MPE).
- 2012 Record drawings for Wastewater Stabilization Pond and Facilities (MPE).
- 2013 Record drawings for Water Treatment Plant Upgrades – UV System (MPE).
- 2014 Approval drawings for Water Treatment Plant Upgrades – Additional Filtration Train (MPE).

3.0 POPULATION PROJECTIONS

For infrastructure planning purposes such as determining water demands and wastewater flow, an understanding of current and future serviced population is required. Population projections used in this study make reference to census information obtained from Statistics Canada and Alberta Municipal Affairs. From this information and from discussions with Village administration, the following was concluded:

1. The current serviced population is approximately 322 people.
2. Historically, Longview has experienced low growth. The overall increase from 271 in 1991 to an estimated 322 in 2016 represents 0.7% annual growth rate over the past 25 years. Over the last five years the population increased from 314 to 322, which represents 0.5% annual growth rate.
3. The 2006 Infrastructure Study had assumed a very aggressive growth as summarized below. These growth rates were based on the premise that a 104-unit subdivision would be built on the east side of Longview by 2016. However, this subdivision was not built and the annual growth rate in Longview has remained steady at around 0.5% since 2006.

Time Period	***Annual Growth Rate***
2006 - 2011	*8.5%*
2011 - 2016	*6.4%*
2016 - +	*2.0%*

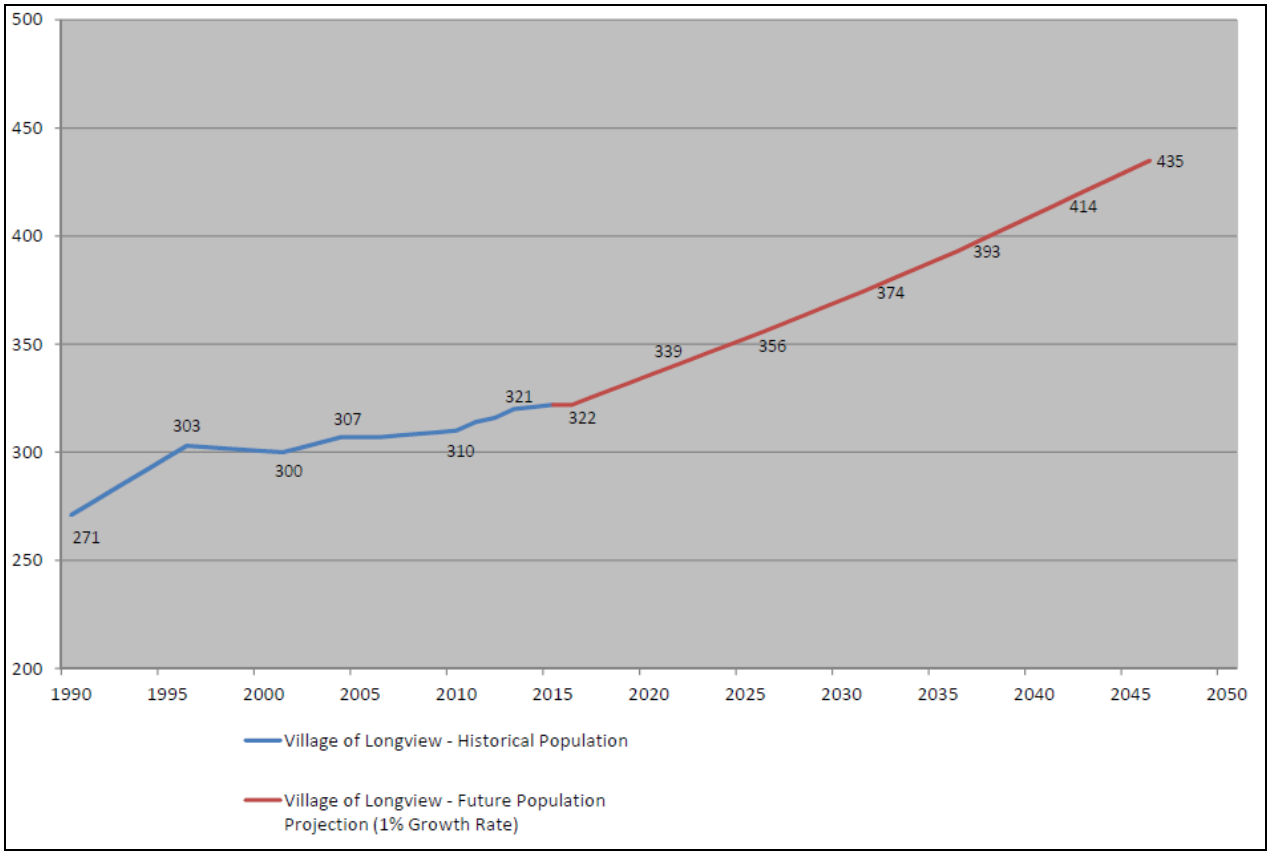
4. For purposes of this study, a growth rate of 1.0% will be utilized.

Table 3.1 and ***Graph 3.1*** provide a summary of the Village's population trends for the last 25 years and projected populations over the next 30 years.

Table 3.1: Population Summary – Village of Longview 1996 to 2046

Year	1991	1996	2001	2006	2011	2016	Projected to 2026	Projected to 2036	Projected to 2046
Population	271	303	300	307	314	322	356	393	435
Annual Growth from Previous	-	2.2%	-0.2%	0.5%	0.5%	0.5%	1.0%	1.0%	1.0%

Graph 3.1: Historical and Projected Population



4.0 WATER SYSTEM ASSESSMENT

The following water system assessment is based on information gathered from record drawings, site visits and interviews with the Village of Longview Administration and Water Treatment Plant Operator.

The water supply system consists of two groundwater wells, raw water pipeline, a water treatment plant, UV system, a 67 m^3 clear well, two transfer pumps, a 243 m^3 buried concrete reservoir, a 756 m^3 buried concrete reservoir, distribution piping throughout the Village and one truck fill located at the Fire Hall. Components vary in age from recent installation to original installation in 1965. The existing water infrastructure is shown in ***Figure 1.1*** in ***Appendix A***.

4.1 Water Demands

The Village's water consumption records between 2012 and 2015 are reviewed in order to determine historical consumptive use (CU). The 4-year CU is calculated as 339 liters per capita per day (l/c/d). ***Table 4.1*** shows the highest CU rate over this 4-year period was in 2014 at an average of 358 l/c/d. A per-capita CU of 340 L/c/d is adopted for this study.

The *2006 Infrastructure Study* found the average historical CU between 2002 and 2005 to be 560 L/c/d, and used this value for projecting water demands in the study. This decrease of 220 l/c/d in CU may be due to the capping and abandonment of the water main from the old decommissioned Pump House in October 2010. This abandoned water main was approximately 550 m long, 100mm diameter, and was a dead end line with no users on it. The line was capped after it was discovered that a valve was leaking at the old Pump House.

The historical annual average day demand (ADD) is 110 m^3/day. ***Graph 4.1*** illustrates the historical ADD graphically. Water use is higher in the summer, ranging up to a maximum day demand of 393 m^3/day. This increase in water use in the summer is likely due to watering of lawns and flower gardens.

The historical maximum day demand (MDD) is also shown on ***Table 4.1***. The MDD factor was calculated to be 3.0, and this is the value that will be used for the purpose of this study. The Peak Hour Demand (PHD) is assumed to be 2x MDD and is an industry standard design factor.

The bulk water demand from the truckfill is an average of 400 m^3/year (based on information provided by the Village). This value is not included in the daily average per capita water consumption. However, when establishing design flows, the truckfill flows are taken into account.

Table 4.1: Historical Water Consumptive Use

Year	Annual Water Demand	Average Day Demand (ADD)	Maximum Day Demand (MDD)	Bulk Water Use	Consumptive Use Without Bulk Water	Population	Average per Capita Consumptive Use
	(m^3)	(m^3/day)	(m^3/day)	(m^3)	(m^3)		(L/c/d)
2012	37,961	104	245	400	37,561	316	323
2013	39,834	109	366	400	39,434	320	338
2014	42,394	116	334	400	41,994	321	358
2015	40,068	110	393	400	39,668	322	338
Average	**40,068**	**110**	**334**	**400**	**39,664**		**339**

Graph 4.1: Historical Consumptive Use

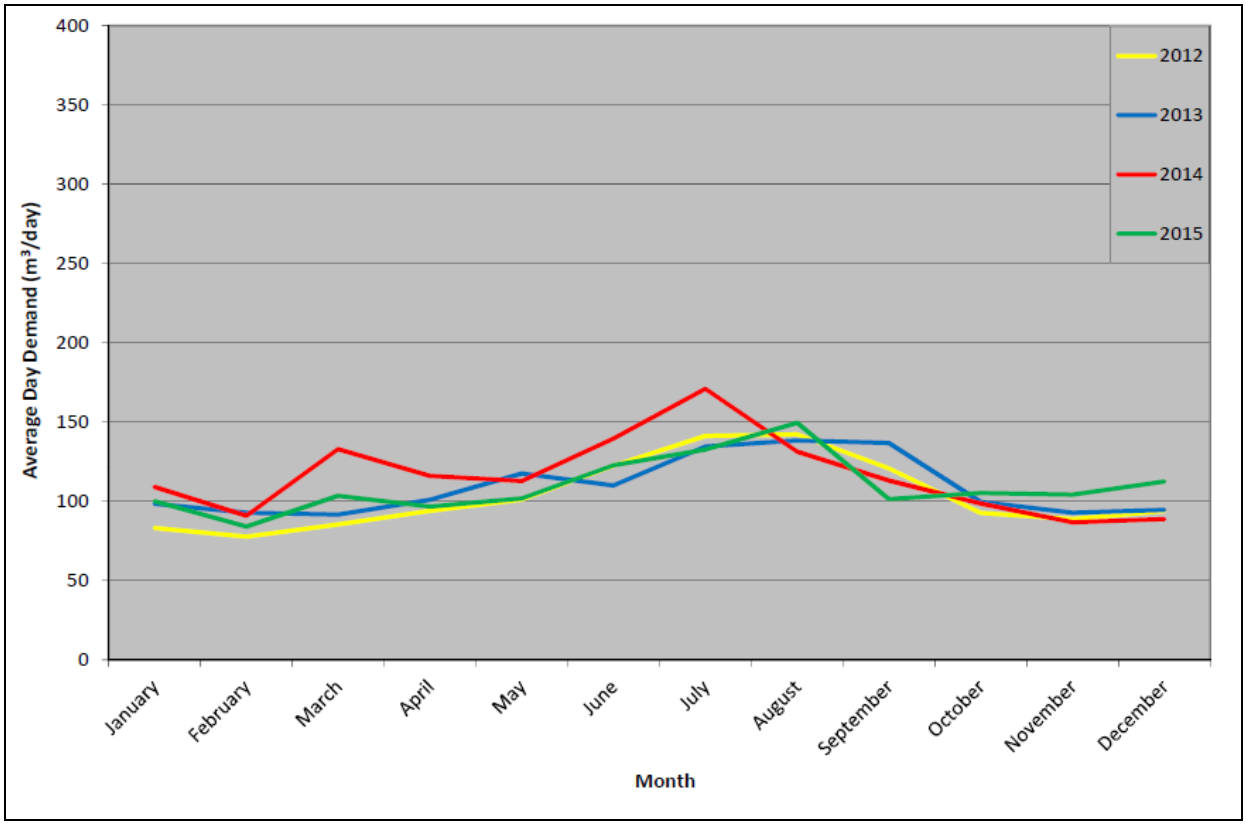


Table 4.2 shows the projected water demand for a design period of 25 years. The projected flows are based on the CU of 340 l/c/d and an average truckfill demand of 400 m^3/year.

Table 4.2: Projections of Water Demands

Year		5 year	10 year	15 year	20 year	25 year
	2016	2021	2026	2031	2036	2041
Population	322	339	356	374	393	413
Annual Water Demand (m^3)	40,360	42,470	44,580	46,813	49,171	51,653
Average Day Demand (m^3/day)	111	116	122	128	135	142
Max Day Demand (m^3/day)	332	349	366	385	404	425
Max Day Flow Rate (L/s)	3.8	4.0	4.2	4.5	4.7	4.9
Peak Hour Demand (L/s)	7.7	8.1	8.5	8.9	9.4	9.8

4.2 Raw Water Supply

The raw water supply for the Village is obtained from two groundwater production wells. In 1982 eight wells were originally drilled, and the wells now known as Well #1 and #2 had the highest production rates. These two were the only wells that were developed and now used for the Village water supply. They are located alongside the Highwood River south of the Village. There is also an observation well that is to be used for the water level readings. The locations of the wells are illustrated in ***Drawing 1.1*** in ***Appendix A***.

In 2013, the Village suffered significant flood damage along the Highwood River near the Village's water supply wells. The flood water overflowed the north river bank where the Village's water supply wells are located, eroded the area around the wells and deposited flood debris all around the wells. In 2015, the Village had the area around the wells raised with armored banks and the wells extended in order to protect the wells in future flood events.

Well #1 is the Village's primary water source. Its pump has a capacity of approximately 8.8 L/s however, it is licensed to take a maximum of 8.5 L/s. The flow rate from Well #1 pump is typically kept at approximately 8.0 L/s. There is approximately 20 m of 150mm PVC water line from Well #1 to the tee that connects Well #2. From this part it is approximately 200 m of 200mm PVC pipe to the Water Treatment Plant.

Well #2 is a source of emergency water supply only according to the AEP diversion license. It is licensed to divert up to 247 m^3 per day at a maximum rate of 7.4 L/s. The pump installed has a capacity of 4.7 L/s. A condition of the license is that Well #2 be used no more than seven days in any calendar month without approval.

The well pumps are currently controlled from the WTP over Telus lease lines. There is no feedback from the well pumps. Adding radio communications to the wells would allow monitoring the status of the pumps. The radio link would also eliminate the monthly Telus fee associated with the wells.

The maximum flow rate that each well can produce is unknown; there were no hydrogeological studies available to confirm design flow rates. The production wells are considered "ground water under the direct influence" (GWUDI) of surface water. Therefore, based on AEP design guidelines, the raw water must be filtered and disinfected before entering the distribution system.

Table 4.3 below lists the details of the AEP well license held by the Village and compares the licensed volumes to the existing pump capacity and the projected water demands from ***Table 4.2***.

Table 4.3: Raw Water Diversion Rates

Water Diversion	Population	Annual Diversion	Diversion Rate*	
	Raw	m^3	L/s	m^3/day
Current Licensed Raw Water Diversion	**-**	**100,014**	**8.5**	**734.4**
Existing Well #1 Pump Capacity	-	277,400	8.8	760
2016	322	40,360	4.2	365
2021 Projection (5-year)	339	42,470	4.4	384
2026 Projection (10-year)	356	44,580	4.7	403
2031 Projection (15-year)	374	46,813	4.9	423
2036 Projection (20-year)	393	49,171	5.1	445
2041 Projection (25-year)	413	51,653	5.4	467

**Diversion Rate is based on 110% the projected MDD.*

AEP design guidelines state that the raw water supply (diversion rate) is to be designed for at least 110% of the projected MDD. The diversion rates required at the various projected populations are shown in the table above. Based on the current CU, the current annual licensed diversion of 100,014 m^3 will be adequate up to a population of approximately 800. This corresponds to the 91-year population projection (2107) at the 1% growth rate assumed for this study.

4.3 Water Treatment and Distribution

Figure 1.1 in ***Appendix A*** shows the general location of the water treatment plant and distribution facilities. As per AEP design guidelines, the raw water is filtered and disinfected at the water treatment plant (WTP) prior to distribution. A chlorine contact time (CT) clearwell is provided at the treatment plant. From this clearwell, the two submersible transfer pumps pump treated water to the community and to the two potable water reservoirs located northeast of the Village. Backwash water supply (water used in the cleaning of the WTP filters) is provided via the Village distribution system.

4.3.1 Treatment

The WTP was constructed in 1996, and upgraded to have a UV system in 2013. Filtration of the raw water is achieved with a BCA Model DF-140 Direct Filtration Plant. The treatment process is a completely automatic, gravity flow operation incorporating: a flash mixer, two-stage variable speed mechanical flocculator and dual-media filter with an inverted sand-anthracite bed.

The raw water pumped from the groundwater well into the treatment train is continuously metered at which point it is injected with coagulant, mixed, settled in a flocculation basin and then filtered. Post-filtration, the treated water is directed from the treatment train to one of two UV units. Downstream of the UV units, sodium hypochlorite is added as the filtered water is discharged into a 67 m^3 treated water reservoir (Clearwell) beneath the floor of the plant. The Clearwell is baffled (concrete baffle) to provide optimal chlorine contact time.

From the Clearwell water is pumped, using one of two transfer pumps, to the distribution system and two remote Potable Water Reservoirs (PWRs) located uphill to the northeast of the Village. The PWRs are buried concrete reservoirs with volumes of 243 m^3 and 756 m^3 each. The high elevation of this reservoir ensures adequate pressure is maintained throughout the distribution network. The PWRs gravity feed the community. When the transfer pumps are pumping to the PWR, water also feeds the community. The PWR supply line is connected to the community distribution system.

The *AEP Standards for Municipal Waterworks* state that for plants with capacity greater than 150 m^3/day, a minimum of two filters shall be provided, each capable of independent operation and backwash. Each filter should have a hydraulic capacity not less than 150% of design filtration rate. The existing plant has a capacity of 8.8 L/s (760 m^3/day), however, programming revisions were made in April 2017 to limit the capacity to 150 m^3/day. This was done to prevent the requirement to add a second filter to the WTP. The Village's Potable Water Reservoirs are sufficient size to provide the current daily flows that are over this daily flow limit.

In the future, once the plant cannot keep up to the flow demand at the 150 m^3/day limit, it will need to be upgraded to have two filters to meet the AEP requirements. The design for a building expansion and this filter upgrade is already 95% complete (WTP Phase 2 Upgrades project). Note that the estimate for this upgrade in 2017 dollars is $1.8 million dollars.

The water treatment facility meets the maximum 5.5 log reduction of Giardia and Cryptosporidium, and 4-log reduction of viruses required to meet the AEP requirements. ***Table 4.4*** below provides a summary of the log inactivation credits for the WTP.

Table 4.4: WTP Log Removal

Treatment Process	Viruses	Giardia	Crypto
Direct Filtration	1.0	2.5	2.5
UV Disinfection	-	3.0	3.0
Chlorine Disinfection	3.0	-	-
Required Log Removal	**4.0**	**5.5**	**5.5**

The WTP filter backwash presently uses the full pressure available from the elevation of the potable water reservoir. This pressure is too high to control with the existing valve for effective backwash. It is recommended to replace the existing hydraulic flow control valve with a pressure reducing valve, flowmeter, and motor operated flow control valve. This arrangement would allow proper pressure and flow for effective filter backwash. The addition of flowmeter will allow the backwash volume to be deducted from the production total. This will be significant with the plant capacity being limited to 150 m^3/day.

The wastewater from the WTP is collected in a holding tank on the north side of the building. This holding tank was installed in 2011 when the old mechanical WWTP was decommissioned. The Village has indicated that this holding tank leaks groundwater into the tank in the spring, and results in significant additional hauling fees due to the frequent emptying of the tank. The interior of this tank was sealed in June 2015 by Mountain Waterproofing. It was indicated at the time by Mountain Waterproofing that while they were in the tank there was water continuously coming in through the wastewater pipe to the tank. Also, a video inspection in 2012 indicated that there was a leak somewhere under the WTP in the floor drains. It is recommended that the floor drains be re-videoed to confirm the location of the leak and have it repaired.

The WTP building is in a low spot and experiences flooding in the spring. It takes the Village Public Works staff half a day to sand bag and pump out the area. The WTP area requires surface grading to prevent future flooding. This will likely also reduce the issue of the leaking pipe underneath the WTP.

The Village has indicated that the flat roofed laboratory portion of the WTP has been leaking. MPE completed a roof inspection and replacement of this roof is recommended.

4.3.2 Potable Water Storage

Longview has two potable water storage reservoirs. They are:

- A 243 m^3 buried concrete reservoir that was constructed in 1965, and
- A 756 m^3 buried concrete reservoir that was constructed in 1981.

Total storage volume is 1,009 m^3. The *AEP Guidelines for Municipal Waterworks* states the minimum storage volume requirement is:

S = A + B + (the greater of C or D)

Where S = Total Storage Requirement

A = Fire storage requirement

B = Equalization storage (25% of Max Day)

C = Emergency storage (15% of Avg Day)

D = Disinfection contact time storage

Using the above equation, the existing combined storage is suitable for a population of over 1,100 people. Based on the population projection, these reservoirs will meet storage requirements for the next 125 years.

The minimum fire storage volume of 655 m^3 (91 L/s for 2.0 hrs) is adopted, based on Fire Underwriters Survey (FUS) requirements. This is the same fire storage volume used for the 2006 Infrastructure Study.

The reservoir is currently filled with two level switches which communicate to the WTP over Telus lease lines. When the reservoir water level reaches the low level switch, the WTP pumps will fill the reservoir until the water level reaches the high level switch. There is currently no continuous monitoring of the reservoir water level. Continuous monitoring of the reservoir level would require radio communications to the WTP. Communications with the WTP would require a small antenna tower at the WTP. With the WTP capacity being limited to 150m^3/day, it is recommended that continuous monitoring of the reservoir water level be implemented in order to optimize water production. The radio link would also eliminate the monthly Telus fee associated with the reservoir.

4.3.3 Water Distribution

The transfer pumps are two 7 ½ hp submersible pumps, each rated at 8.8 L/s (116 lgpm). They pump treated water from the clearwell to the potable water reservoirs. The reservoirs then gravity feed the community. When the transfer pumps pump to the reservoirs, water also feeds the community. The reservoir(s) supply line is connected to the community distribution system.

The water distribution lines vary from 100mm to 200mm in diameter. They are constructed of asbestos cement (AC) in the original construction pre 1981, and PVC in the areas constructed since 1981. No major problems have been experienced with the mains in regards to breaks or freezing. However, in October 2010, the water system was drained dry due to a leaking valve in the old decommissioned Pump House. The Village capped and abandoned this old water main at Highway 22 that was approximately 550 m long, 100 mm diameter, and was a dead end line with no users on it.

There is a location of potential concern where the two mains from the potable water reservoirs tie to a single 150mm diameter main to the Village. The concern is that this pipe diameter is too small and may restrict flow to the community. Computer modeling of the water distribution system can determine where any problem areas might be.

4.3.4 Fire Protection

The design standard for hydrant spacing from the City of Calgary is often referenced for waterworks engineering design in the southern Alberta region. The City of Calgary standard for allowable hydrant spacing is 300 meters for low density residential and 150 meters from the back of the house at the end of a cul-de-sac. For institutional, commercial, industrial and high density residential areas, the maximum allowable spacing is 150 meters and 75 meters from the end of a cul-de-sac. These spacing requirements are more stringent than the Fire Underwriters Survey (FUS); a comparison of hydrant coverage requirements is listed in ***Table 4.5***.

Table 4.5: Maximum Hydrant Spacing

Development Type	City of Calgary[1]	Fire Underwriters Survey (FUS)
Low Density/Single Family Residential	300 metres	360 metres
High Density/Commercial, Industrial, Institutional and Multi-family Residential	150 metres	180 metres

[1]*Distance between hydrants (hydrant spacing) shall be measured along the roadway or as the hose lies.*

One additional hydrant is required along the commercial area on Morrison Road, and one on the east end of Kee Drive to meet both the City of Calgary and FUS minimum hydrant spacing. See ***Figure 1.2*** for hydrant coverage details.

AEP guidelines and the FUS state that water mains designed to carry fire flows should have a minimum inside diameter of 150 mm and as shown in this report, all the Village's hydrants meet this criterion. However, there is a hydrant recommended to be installed at the east end of Kee Drive on a dead end 100 mm water main. This water main should be upgraded to 150 mm when the hydrant is installed.

5.0 WASTEWATER SYSTEM ASSESSMENT

The following wastewater system assessment is based on information gathered from record drawings, site visits and interviews with Longview Administration and the Lift Station Operator. The wastewater facilities include a gravity collection system, lift station, forcemai, and wastewater stabilization pond. The location of the wastewater facilities is shown on ***Figure 1.3*** and ***Figure 1.4*** in ***Appendix A***.

5.1 Existing Flows

Wastewater flows are measured at the Village's lift station. ***Table 5.1*** summarizes the flows from 2012 to 2015. The 4-year average wastewater generation has been calculated as 489 l/c/d. ***Graph 5.1*** illustrates graphically the historical average day wastewater generation. ***Graph 5.2*** illustrates the historical average water use versus the historical average wastewater generation. Industry standards show average wastewater rates should be approximately 90% of water demands. Based on ***Graph 5.2,*** the wastewater rates generally are higher than the water use rates. This suggests infiltration of groundwater/surface runoff into the wastewater system. During the last four years, the average per capita sanitary wastewater generation is 143% of per capita water demands.

The *2006 Infrastructure Study* found the average historical wastewater generation between 2002 and 2005 to be 645 L/c/d. This decrease of 156 l/c/d in wastewater generation is most likely due to the wastewater collection system repairs that were done in spring of 2009 resulting from the recommendations of the *2009 Village of Longview Wastewater Treatment Study.* These repairs included:

- Disconnection of a storm catch basin cross connection by Alberta Transportation on the corner of Kee Drive and Morrison Road.
- Repairs to leaky manholes.
- Disconnection of house sump pumps from wastewater collection system.

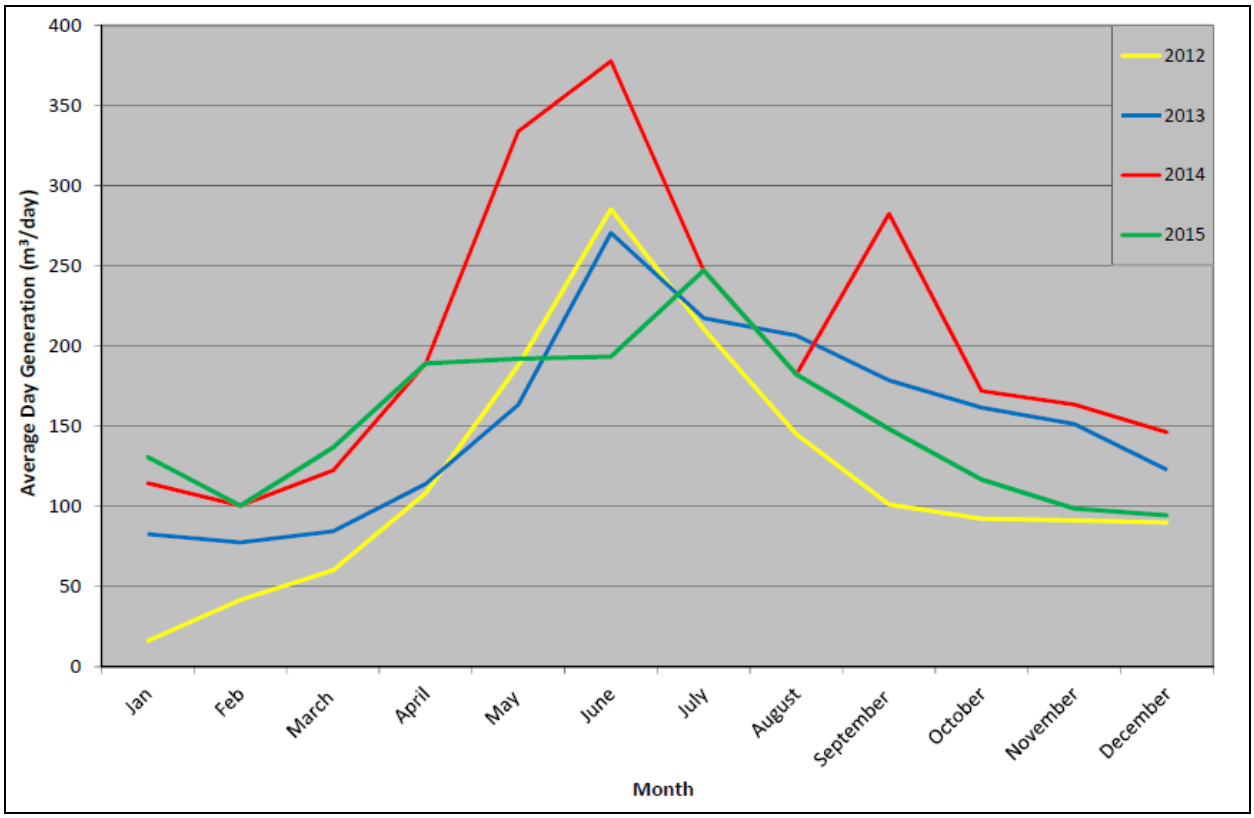
The 2009 study also indicated there was significant infiltration and inflow (I/I) entering the collection system in the wastewater main in the low lying coulee to the old mechanical WWTP.

This wastewater main was abandoned in 2011 when the lift station was installed, and would no longer be contributing to the I/I.

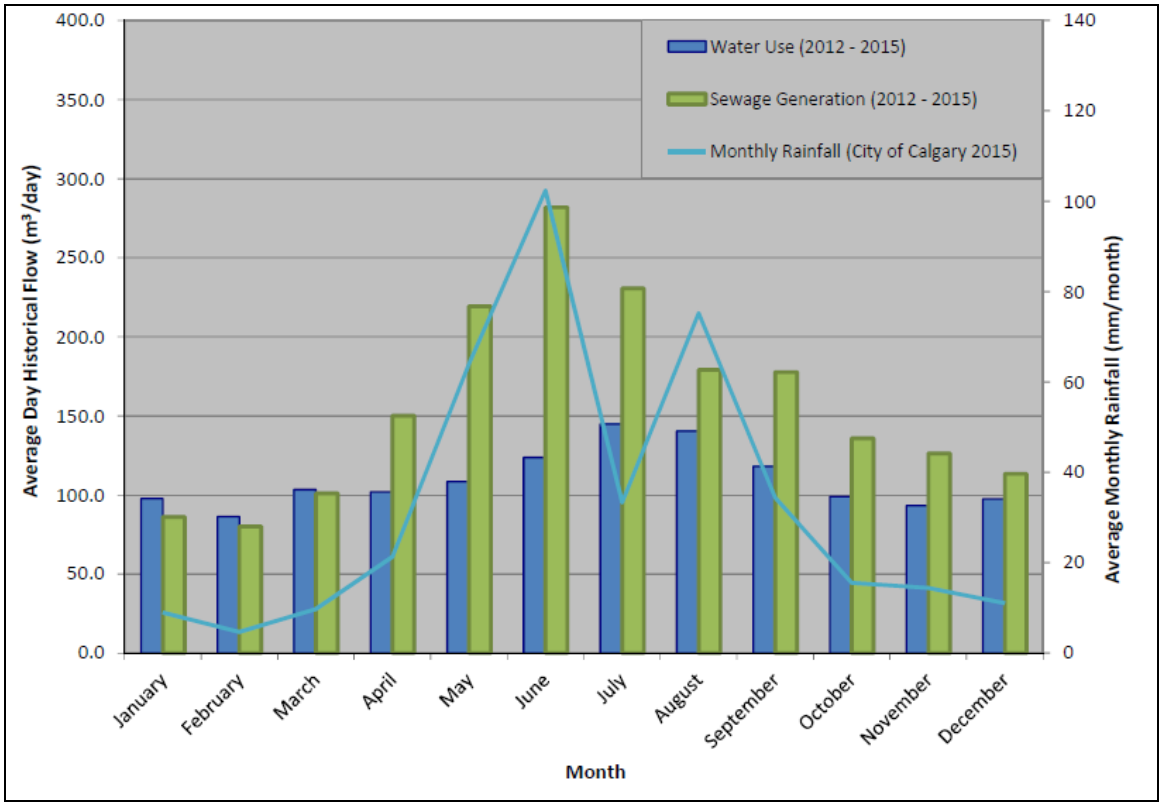
Table 5.1: Historical Wastewater Flows

Year	Annual Wastewater Generation	Average Day Flow	Population	Per Capita Avg.	Percent of Avg. Per Capita Wastewater Generation
	(m^3)	(m^3/day)		(l/c/d)	%
2012	43,527	119	316	377	117%
2013	55,629	152	320	476	141%
2014	73,909	202	321	631	176%
2015	55,635	152	322	473	140%
Average	**57,175**	**156**		**489**	**143%**

Graph 5.1: Historical Wastewater Generation



Graph 5.2: Average Water Use vs. Average Wastewater Generation



5.2 Infiltration and Inflow (I/I)

Groundwater and storm runoff water that enters a wastewater collection system is categorized infiltration and inflow (I/I). Infiltration is generally the groundwater that enters a collection system via defective pipes, pipe joints, connections or manhole walls. Inflow is generally by the surface water entering a collection system through a direct stormwater runoff connection or pumped flows from sump pumps. Inflow can result in a more immediate increase in wastewater flow rates. Possible sources of inflow are roof leaders, manhole covers, cross connections from storm drains and discharge of sump pumps from basements.

The four-year historical average daily flow includes all wet weather days (and I/I) and therefore is not an accurate representation of the actual average per capita day flow. The average wet weather and average dry weather flows from the lift station are analyzed to quantify the amount of I/I into the collection system. The wet weather months are assumed to be the five

months of May to September. The dry weather months are assumed to be the four months from November to February.

Table 5.2 summarizes the historical average day dry weather flows for each year.

Table 5.2 - Dry Weather Average per Capita per Day Wastewater Generation

Year	Average Dry Weather Day Flow (m^3)	Population	Average Per Capita Dry Weather Day Wastewater Flow (L/c/d)	Average Wet Weather Day Flow (m^3)
2012	60	316	189	186
2013	109	320	340	207
2014	131	321	409	285
2015	106	322	330	193
Average	**101**		**317**	**218**

The overall (2012-2015) average day flow for the dry months of November to February was 101 m^3/day, and the wet months of May to September was 218 m^3/day. The difference of 117 m^3/day is a reasonable estimate of the average daily wet weather I/I. This equates to a total annual volume of approximately 17,791 m^3 of I/I over the five-month wet weather season.

The alternative method to estimate average daily wet weather I/I is to review the potable water flows compared to the wastewater flows. Typically, wastewater flows are estimated at 90% of water use, or 99 m^3/day. This method is likely more accurate as it will capture more of the infiltration over the course of the year than the previous method. The average wastewater flow over the last four years is 156 m^3/day. Therefore, the average day I/I is the difference between the 90% of average water use and the average wastewater flows, or 57 m^3/day. This equates to a total annual volume of approximately 20,805 m^3 of I/I. For purposes of this study, a total I/I flow of 20,805 m^3/year to the wastewater collection system will be used.

5.3 Projected Wastewater Flows

The projected wastewater generation is determined using a per person wastewater generation of 317 L/c/day, plus an annual I/I flow of 57 m^3/day (20,805 m^3/year). This is the average flow per capita per day during the dry months when the I/I is minimal, and average I/I over the last four years. It is assumed that any future collection system that is constructed within the Village will be a "tight" system with no I/I flow. The projected peak day flow is based on the average day flow multiplied by Harmon's Peaking Factor plus the existing I/I in summer months of 117 m^3/day. ***Table 5.3*** shows the projected sanitary wastewater generation for the next 25 years.

Table 5.3: Projections of Wastewater Generation

Year		5 year	10 year	15 year	20 year	25 year
	2016	2021	2026	2031	2036	2041
Population	322	338	356	374	393	413
Average Day Wastewater Generation (m^3/day)	102	107	113	119	125	131
Average I/I Flow (m^3/day)	57	57	57	57	57	57
Average Day Wastewater Flow (m^3/day)	159	164	170	176	182	188
Annual Wastewater Flow (m^3)	58,062	59,962	61,960	64,059	66,266	64,059
Peak Day Flow (m^3/day)	532	552	573	595	618	643

5.4 Wastewater Collection System

Wastewater from Longview is collected in two main branches. One branch is from the west at Highwood Drive and the other along the east at Morrison Road. These two trunks join at the southern end of the Village at the wastewater lift station. The wastewater is pumped from the lift station to the wastewater stabilization ponds through a 2.6 km long, 250 mm diameter HDPE DR11 forcemain.

Approximately half of the collection mains in the Village are of 200 mm Vitrified Clay Tile (CT) pipe. Experience has shown after a certain age typically there have been numerous problems

such as cracking, joint separation, deterioration, roots infiltration, mineral build up and grade disturbance. The newer developments (20 yrs old and newer) are generally made up of 200mm PVC pipes and, knowing the performance and lifespan of PVC, industry expectation are these mains to be in generally good condition.

No specific wastewater system modeling was done for this study to review existing pipeline capacities. However, a cursory review of existing main sizes, slopes and layout indicated that the mains have sufficient capacity to accommodate the system demand. The Village has not indicated any issues with the capacity of the collection system.

It was noted by the Village in 2014 that the manhole behind 142 Westview Place (MH 52) had a strong odour emanating from it, especially in the spring. During the construction of this gravity main, the section of HDPE pipe prior to this manhole (from MH 51) was directionally drilled due to the close proximity to the garage. It was noted at the time of pipe inspection that there was a dip in this section of pipe. The Village was notified, and it was recommended that this section of pipe would need to be flushed on a yearly basis with a minimum flushing velocity of 1 m/s (flow rate of 30 L/s). The Village did carry out this flushing, however it did not get rid of the odour. To resolve this, the Village installed a Parson Odoreater Manhole Insert in this manhole (MH52). A Parson Insert fits right into the manhole beneath the lid, and has a canister containing activated carbon to eliminate the odours. The carbon needs to be replaced every 6-12 months.

The Village has indicated that they are concerned with excessive I/I entering the wastewater collection system, and the review of historical wastewater flows confirmed that there is significant I/I in the system. The wastewater collection system was video inspected and manhole inspections were carried out in July 2016. The inspections were completed in order to determine the wastewater pipeline conditions and to determine how and where the I/I is occurring. Results from the video inspections and manhole inspections are summarized below.

5.4.1 Video Inspections and Assessment

Thuro Inc. was awarded the contract to undertake a video inspection of the wastewater collection mains. The approximate 3.5 km of collection system was video inspected the week of July 25 to the 29, with Thuro submitting its findings to MPE on August 17, 2016.

The process for video inspecting the pipe was:

- Flushing of the main,
- Closed-circuitTtelevision (CCTV) Video Inspection and onsite assessment,
- Preparing and submitting a Video Inspection Report.

Using the inspection results, an assessment of the sections of the wastewater collection system is undertaken. The assessment of inspection results is based on criteria adapted from the City of Edmonton *"Sewer Condition Rating Manual"* (1991) which provides a reliable and effective methodology to rank, assess and prioritize individual segments of sewer pipeline systems based on their condition as determined by inspection.

The inspection videos are reviewed and a "Condition Rating" is assigned to each segment of pipe.

5.4.1.1 Condition Rating

There are two main categories that make up a condition rating to break down the defects of a pipe:

1) Structural and,
2) Service.

5.4.1.2 Structural Condition Rating

The structural condition ratings are made up of eight different sub-categories that identify various defects that can occur in the pipe sections. Each type of defect is given a severity rating of light, moderate or severe. These structural condition rating sub-categories include:

1) Displaced joints: *pipe sections are together, but a severe deflection has occurred.*
2) Open joints: *pipe sections are separate and open to the environment.*
3) Cracking: *fracture lines visible around the circumference and/or length of a pipe.*
4) Fractures: *cracks visibly open along the length and/or circumference of the pipe.*
5) Holes: *caused by an impact or a solid object pressing on the outer pipe wall.*
6) Deformations: *egging caused by trench wall failure.*
7) Collapsed Pipe*: excessive deformation, piping has collapsed in on itself.*
8) Sagging: *generally located between the pipe joints.*

These defects are all rated with a weighted score with the exception of sagging, which is rated on the length of the sagged section, and holes, which are based on the specific hole circumference.

5.4.1.3 Service Condition Rating

The service condition ratings are made up of five different sub-categories that break down the various obstructions that can occur within the segments of pipe. These are also broken down into light, moderate or severe. These service condition rating sub-categories include:

1) Debris: *Soil, rocks, sand, grease, roots, etc. attached to the pipe.*
2) Protruding services: *service connection extending too far into main.*
3) Roots: *from water seeking tree species.*
4) Encrustation: *typically dissolved salts deposited on pipe walls or grease.*
5) Infiltration: *groundwater entering the pipe through defects (joints, fractures, etc.).*

5.4.1.4 Overall Pipe Condition Rating

After the defects are evaluated for each segment of pipe, the condition rating is then broken down into three scores within each of the Structural condition and Service condition categories. These three scores are:

- Total Score which represents the sum of all the defects along the segment of pipe.
- Mean Score which represents the average of the defect scores.
- Peak Score which represents the worst conditions within the segments of pipe.

These scores are used to calculate a physical condition rating of the pipe for both the Structural and Service categories. These scores are calculated as follows:

$$\text{Total Score} = \Sigma \text{ (Defect scores)}$$

$$\text{Mean Score} = \frac{\Sigma \text{ (Defect score)}}{\text{Total Pipe Link Length}}$$

Peak Score = Maximum (worse) Rating within the specific pipe run

The highest condition rating outcome between the Structural and Service conditions is then used to create an overall condition rating for the whole segment of pipe ranking from 1-5, with 1 being the best physical condition and 5 being the worst.

5.4.1.5 Condition Rating Recommendations

Each wastewater pipe segment is assigned a condition rating. The recommendations for each condition rating are shown in ***Table 5.4***.

Table 5.4: Wastewater Rating Recommendation

Rating	Recommendation
1 - Good	Pipe is in good condition, no maintenance required.
2	Light sagging (10%), no maintenance required.
3 - Fair	Light to moderate sagging (10-20%), moderate encrustation, minor pipe defects; flush and video every one to two years.
4	Moderate sagging, infiltration encrustation, minor blockages. Recommend removal and replacement of mains.
5 - Poor	Heavy sagging, infiltration, pipe cracking, holes, grease blockages, H_2S erosion; recommend removal and replacement of mains.

The condition rating system is applied to quantify the defects. See ***Figure 2.2*** for a detailed map showing sewer pipe condition rating.

5.4.1.6 Wastewater Pipe Assessment Results

Approximately 3.5 km of sanitary sewer, consisting of a variety of pipe materials was videoed, assessed and ranked. The majority of piping within the Village is clay tile pipe which is labeled as "CT". Most sections of CT pipe are in fair to poor condition.

There are three sections of pipe rated as "Poor". The sections are shown in red on ***Figure 2.2*** and are labeled as SP 132, 139 and 156. These sections can be found under the streets of Morrison Road, Twin Cities Drive and Little New York Estates. The reason these sections are classified as "Poor" is due to the presence of multiple crack, fractures, high infiltration and pipe sagging.

Photo 5.1: Severe Cracking and Fractures near Service Connection in Twin Cities Drive (SP 139)

As stated previously, the piping between MH 51 and MH 52 was directionally drilled to avoid a nearby garage. It was noted that there was a dip in the line during construction. Unfortunately, this dip could not be corrected due to proximity to a garage, and because of the sag, the newly installed piping is assigned a “Fair” rating.

The highest areas of infiltration are seen throughout the concrete piping for Highwood Drive and Riverview Place. From the video inspection, I/I can be seen at several locations where the service pipe connects to the main line. At four locations where the service pipe connects to the main line, a rag is being used as a gasket. Two of these locations are along SP 124, one is along SP 125 and the other is along SP 127. Other sources of I/I were seen along Twin Cities Drive and Morrison Road.

Photo 5.2: Rag Wrapped around Service Pipe in Highwood Drive (SP 125)

The detailed breakdown of the condition rating for each pipe inspected can be found in ***Table 5.5.***

Table 5.5: Wastewater Pipeline Condition Summary

Street	From Manhole	To Manhole	Pipe Section Number	Material	Diameter (mm)	Length (m)	Condition Rating
Kee Drive	17	16	SP107	CT	200	90.7	2
	16	15	SP108	CT	200	121.6	1
Morrison Road	22A	22	SP131	PVC	150	26.2	1
	22	21	SP132	CT	200	91.8	5
	21	20	SP133	PVC	200	118.9	3
	20	19	SP134	CT	200	112.1	3
	19	18	SP135	CT	200	122.1	3
	14	15	SP109	CT	200	78.7	2
	18	14	SP136	CT	200	100.3	4
Westview Place	14	51	SP110	CT/PVC	200	42.4	4
Between Westview Place and Lift Station	52	51	SP101	HDPE	200	44.8	4
	52	53	SP102	PVC/HDPE	200	64.3	3
	53	54	SP103	PVC	200	11.5	1
	54	55	SP105	PVC	200	38.3	1
	55	56	SP167	PVC	200	16.9	2
	56	LS	SP171	PVC	200	2.9	1
	39	56	SP166	PVC	200	70.2	2
Riverview Place	40	39	SP104	PVC	200	69.6	2
	38	39	SP127	CON	200	73.6	4
Highwood Drive	32	33	SP115	CT/CON	200	67.3	4
	33	34	SP116	CON	200	66.20	3
	34	35	SP118	CON	200	90.00	3
	35	36	SP124	CON	200	89.2	3
	36	37	SP125	CON	200	90.9	4
	37	38	SP126	CON	200	85.0	4
Between Westview Place and Lift Station	32	45	SP158	PVC	200	84.6	2
	48	45	SP157	PVC	200	110.1	3
Little New York Estates	48	49	SP112	PVC	200	72.9	3
	48	50	SP114	PVC	200	50.7	4
	46	50	SP113	PVC	150	47.0	3
Little New York Estates	47	46	SP156	PVC	150	35.2	5
Longview	31	35	SP123	PVC	200	97.0	1

Street	From Manhole	To Manhole	Pipe Section Number	Material	Diameter (mm)	Length (m)	Condition Rating
Drive	31	27	SP137	CT	200	96.7	3
Royalties Crescent	31	30	SP122	CT	200	66.5	4
	29	30	SP121	CT	200	57.5	3
	29	28	SP120	CT	200	77.0	2
	28	27	SP119	CT	200	120.0	3
Twin Cities Drive	27	26	SP138	CT	200	83.9	3
	26	25	SP139	CT	200	63.1	5
	25	24	SP140	CT	200	121.5	3
Foothills Drive	24	23	SP143	CT	200	32.0	4
	23	18	SP144	CT/PVC	200	65.1	3
	42	24	SP142	CT/PVC	200	113.0	4
Mountain View Place	42	43	SP141	CT	200	97.5	4
Malmberg Place	58	57	SP154	PVC	200	91.2	1
	57	44	SP155	PVC	200	28.0	1
	44	34	SP117	PVC	200	68.5	2

Table 5.6 shows a summary of the overall condition ratings for all the wastewater pipelines inspected.

Table 5.6: Overall Condition Summary

Rating	Total Length (meters)	Percentage
1 - Good	417	12.0%
2	556	16.1%
3 - Fair	1,437	41.5%
4	864	24.9%
5 - Poor	190	5.5%
Total	**3,464**	**100%**

5.4.2 Manhole Inspections and Assessment

Ten manholes were inspected on various streets throughout the Village. The manholes are generally in fair to poor condition. Many of them have a build-up of debris, have no benching and have unstable ladders. The manholes should be inspected on a regular basis, flushed and

any faulty ladders repaired. Inspection forms for each of the ten manholes is included in ***Appendix C***.

This inspection included an assessment on the amount of inflow and infiltration in the sanitary system. As stated in ***Section 5.0***, wastewater volumes appear to be much higher than water demands over the last five years. This is a good indication that ground and surface water are entering into the wastewater collection system. Each of the ten manholes were inspected on two separate days and the depth of flow in the manhole was recorded. One inspection took place just after a large storm event on July 28, 2016 and the other took place during a dry day on August 9, 2016. The intention is to compare the wet weather flow with the dry weather flow. The difference in flow is the approximation of I/I within the system. ***Table 5.7*** shows the difference in depth for each of the manholes.

Table 5.7: Wastewater Flow Depth

MH Number	August 9, 2016 Dry Depth (cm)	July 28, 2016 Wet Depth (cm)
46	1	1.5
34	1.5	2.5
38	2	4
31	.5	1
27	1.5	3
24	1.5	1
18	1.5	3
14	2.5	4
39	3.5	6
36	1.5	1.5

Eight of the ten manholes had an increase in flow depth when measurements were taken after the storm event. The depth along with wastewater piping slope was used to calculate a dry and wet weather flow. The difference between these flows can be used to estimate the peak hourly I/I flow. This total peak hour I/I flow during this storm event is calculated to be roughly 6.19 L/s. Based on this manhole flow assessment and the sanitary video inspection, the highest sources of I/I appear to be from the piping along Highwood Drive, Riverview Place, Twin Cities Drive and Morrison Road.

5.4.3 Wastewater Pipeline Repair Methods

In order to address the wastewater collection system defects identified from the inspections, two practical methods have been determined for replacing or repairing the segments of pipe that are affected.

- Open-cut Trenching – the traditional method of pipe installation and replacement.
- Trenchless method in which the pipe segment is re-lined with a cured-in-place pipe insert.

For the wastewater upgrade projects estimated and included in the *Capital Plan*, the method of work that has been assumed is “Open-cut Trenching”, as this work would be done in conjunction with water or stormwater main replacement and road reconstruction.

The "Trenchless Method" would be applicable to those situations where only the wastewater main and neither of the water or stormwater mains need replacement, and the roadway surface is in sufficiently good condition to not need refurbishment. The method could be used to provide a targeted repair to a compromised wastewater main.

The advantages and disadvantages for each method are further described below.

5.4.3.1 Open-Cut Trenching

Advantages:

- Allows continuous excavation, laying, and backfilling operations.
- Cost-effective because minor breakdowns do not cause delays to all activities.
- Conditions of the pipe, e.g. collapsed pipe, do not preclude using open-cut.
- Location and installation of valves, fittings, and services is facilitated because the open trench provides easy access to the work.
- Problem areas can be identified and adjustments can be made.
- Suitable for most ground conditions if there is sufficient right-of-way.

Disadvantages:

- Cost for mobilization and demobilization of equipment.
- Closing off the road and detouring traffic due to surface disturbance.
- Re-routing existing wastewater flow to allow continuous service.
- Locates of utilities that are in the area are required including existing water, storm, gas and telecommunications.
- Slope stability of the open trench must be considered.
- Removing and proper disposal of existing pipe is required, with special attention to asbestos concrete material.
- Proper bedding material and compaction is required for new pipe placement.
- Resurfacing of the area is required, including paving, sod and concrete.
- May encounter hazards like contaminated soil which would require removal and replacement with clean backfill.
- Expensive for large diameter pipes.

5.4.3.2 Cured in Place Pipe Re-Lining Using In-situ Liner

In this construction method, a jointless in-situ form tube composed of flexible needled fabric liner material impregnated with polyester or epoxy resin is placed as a liner into the pipe segment requiring re-lining from manhole to manhole by either pulling into place or by an inversion method using air or water. The liner is cured by an application of hot water when in place. Once the liner has cured, the ends are cut and the laterals and services are then opened using robotic methods to restore the active connections.

Advantages:

- Little to no excavation is required.
- Minimal surface and public disturbance.
- Speed of construction.
- Mobilization and demobilization costs are cheaper.

Disadvantages:

- Requires bypass of existing flow.
- Cannot repair sagging or collapsed pipes.
- Minor breakdowns can cause major delays.
- Would need to open cut anyway if valves, fittings, or services needed to be replaced.

5.4.3.3 Wastewater Pipeline Repair Costs

The proposed construction schedule and costs for replacing wastewater collection mains are included in the *Capital Plan* as applicable.

The proposed wastewater pipeline system upgrades were assessed in terms of cost required to complete them. Using the open-cut method, total costs for wastewater main replacement or new construction is roughly $700 - $800 per lineal meter of 200mm dimeter pipe installed in residential roads, and $1,000 - $1,100 in Highways, including contingency and engineering. For information purposes, the cost for wastewater main re-lining of a 200 mm diameter main using cured-in-place in-situ formed concrete lining is roughly $500 per lineal meter of pipe relined.

Since the wastewater services are generally of about the same age as the wastewater mains, it would be advisable in many cases to replace them fully, so the Village may have to factor in the additional cost of complete service replacement in their project budgeting.

5.5 Wastewater Lift Station

The lift station consists of a wetwell, flow meter vault and a separate generator building. The wetwell is a 2.5 m x 3.0 m x 7.7 m deep precast concrete wetwell, which houses a 5 HP grinder, and three 23 HP submersible pumps. The three pumps are constant speed. The pumps can interchangeably act as two duty pumps and an emergency pump. Wetwell discharge is metered via a flowmeter located in the flow meter vault. An emergency bypass connection is located in the flow meter vault. Electrical and controls for the wetwell and flowmeter vault equipment are housed in a generator building on site. Backup power is provided by an 80kW natural gas powered generator located in the building.

Wastewater is pumped from the lift station, through a 250 mm diameter HDPE DR 11 forcemain for 2.6 km to the wastewater stabilization ponds. Wastewater is pumped at a flow of 23.0 L/s with one pump running, at 33.5 L/s with two pumps running, and at 39.5 L/s with three pumps running. With two pumps running, and one backup, the peak day capacity of the lift station is 2,894 m^3/day. This capacity is sufficient to well beyond the 25-year peak day flow projection.

There was an occurrence of sewage backup into basements during the extreme rainfall event in 2013. Power was lost to the lift station, and the natural gas generator kicked-in to provide emergency power to the lift station. The generator operated for a short period of time until a low oxygen sensor was triggered in the generator and the generator shut down. The lift station attempted to call out an alarm; however, the telephone lines at the lift station were also down. As a result, the Operator did not receive the alarm. The wastewater back flowed into the gravity collection system, and various properties near the lift station experienced wastewater back-ups. To prevent this from happening again, an alarm beacon was installed on the exterior of the Lift Station building to provide a visual alarm in case the Lift Station wastewater reaches a high level elevation.

5.6 Wastewater Stabilization Ponds

The wastewater stabilization ponds (lagoon) are located approximately 1.5 km northwest of the Village in SW29-18-2-5. The lagoon has one facultative cell with a volume of 13,320 m^3, for 60 days of storage of wastewater, and a storage cell with a volume of 81,030 m^3, for 365 days of storage. Wastewater enters the facultative cell via a concrete manhole inlet structure. Wastewater transfers from the facultative to storage cell via a concrete manhole transfer structure, complete with weir.

The storage cell of the lagoon is emptied once per year, over a period of time not to exceed three weeks. The effluent is drained into the Highwood River through a 300 mm HDPE DR 11 outfall pipe to the existing storm system.

The following table summarizes the capacity of the lagoon:

Table: 5.8: Lagoon Capacity

	Facultative Cell	Storage Cell
Total Volume (m^3)	13,320	81,030
Maximum Water Depth	1.5 m	3.0 m
Minimum Retention Period	60 days	12 months
Design Flow	222 m^3/day (81,030 m^3/year)	

There are no electric controls for any of the lagoon structures. Plug valves are operated manually to isolate the facultative or storage cell, or allow for effluent discharge. The plug valve at the outlet structure can be throttled to adjust effluent flow to the Highwood River. A plug valve is also located on the outlet pipe, three meters upstream of MH 57 on the south side of Highway 541, at the tie-in to the existing storm main, and can be throttled for the same purpose.

Based on the projected wastewater design flows, the lagoon has sufficient capacity to service a population of 514, which is the 46-year population projection.

Although the lagoon was not inspected for this report, no concerns have been raised regarding the lagoon condition, capacity or possible leakage of wastewater.

6.0 STORMWATER SYSTEM ASSESSMENT

In general, drainage in the Village of Longview flows from northeast to southwest. Drainage is conveyed by a combination of curb and gutter on the sides of some of the streets, grass ditches and culverts in a few areas to keep larger flows off the roads and a number of catch basins and storm pipes underneath paved roads. ***Figure 1.5*** and ***Figure 1.6*** illustrate the existing drainage paths and catchment areas in and around the Village.

There are two previous issues the Village has had with the stormwater system over the last few years, which have since been resolved. These are the sink holes on the stormwater main that conveys stormwater to the Highwood River, south of Highway 541, and the washing out of the storm outfall to the Highwood River during the 2013 floods.

The sink holes were along the existing storm line down the hill to the Highwood River outfall and were inspected by MPE in November 2014. The source of the sink holes appeared to be from the stormwater from the south ditch of Highway 541. The majority of the stormwater appeared to be not entering the inlet pipe but rather flowed under the concrete inlet structure. The flow within this storm main appeared to be much less than what was observed to be coming down the ditch. This water was likely running along the outside of this stormwater main and washing away the bedding/soil around the storm main, which caused air pockets/gaps and lead to the sink holes. The sink holes were filled-in in January 2015. The issue of the stormwater undermining the inlet structure should be discussed with Alberta Transportation, as this inlet structure is within the Secondary Highway right-of-way and drains water from the south highway ditch.

Erosion sediment deposition from the 2013 flood event impacted the Village's existing outfall structure, located in SE 20-18-2 W5M, affecting drainage to the river. The accumulated sediment was cleaned out from the outfall channel in the spring of 2014. There was also erosion at the end of the outfall channel, where the water from the outfall flows into the Highwood River. In 2015, riprap was added to the existing gabion mat from the outfall structure to the river to protect it from erosion during future high flows in the Highwood River.

6.1 Drainage Within the Village

Storm drainage consists of two systems that are used to handle the flow for a variety of storm events within the Village. The first system is the minor system, which consists of the storm sewer piping system and the catch basins in the roads. This system is designed to carry the flow from a typical one in 5-year storm event. The major system is designed to handle the water from a one in 100-year storm event and consists of the overland drainage.

The storm system within the Village consists of both minor and major storm systems. The minor storm system consists of several storm sewers that range in size from 914 mm x 1,470 mm arch culverts to 375 mm pipeline that are strategically placed throughout the Village. This "Village Storm System" is designed to carry the storm water flow to the storm outfall in the south, which discharges into a ravine and eventually makes its way to the Highwood River. The major storm system within the Village consists mainly of curb and gutters and some ditches on the sides of the roads.

There was a section of drainage swale, approximately 320 m long, on the west side of the Village that consisted of a PVC pipe halved lengthwise and inlaid in the ground. This PVC swale was removed and replaced with a grass swale in 2014 due to safety concerns.

6.2 Drainage from Outside the Boundary

Drainage from surrounding lands flows from the northeast into the Village. ***Figure 1.6*** shows the catchment areas surrounding the Village. Some of these catchment areas have been divided into sub-catchment areas to distinguish the sources. In general, the surface runoff from outside the Village drain around or through portions of the Village to a separate storm system than the "Village Storm System".

The storm water from the northeast within Catchment Area A is from a large drainage area. Sub-catchment Area A1 drains to the culverts on the north side of Highway 541. Sub-catchment Areas A2 and A3 drain to the culverts on the east side of Highway 22. The culverts all eventually drain to the ditch on the south side of Highway 541 to approximately 425 m west of Highway 22.

A buried storm sewer carries the flow from the end of the ditch to an outfall structure located at the Highwood River.

The Village has indicated that this stormwater outfall structure located at the Highwood River experiences freezing water issues in the early spring. It is suspected that spring water is infiltrating the storm pipeline at a slow rate and trickling down the pipeline causing the ice buildup at the outlet. The Village is currently monitoring the water entering the storm inlet at Highway 541 and the outfall structure to confirm if more water appears to be exiting than entering. The cost to re-line the full length of 900mm and 1200mm diameter storm pipeline to prevent infiltration was reviewed and estimated to be approximately $512,000. It is recommended that the storm pipeline be video inspected to determine the locations of infiltration, and do spot repairs where needed. This will likely be much more affordable than relining the entire pipeline.

The storm water from Catchment Area B flows to the southeast corner of the Village to a double catch basin. This drains to the ditch on the east side of Highway 22. The surface runoff flows along the Highway 22 ditch and into the Highwood River.

7.0 ROAD SYSTEM ASSESSMENT

The road network within the Village generally consists of asphalt paved roads typically with concrete curb and gutter, monolithic sidewalk/curb and gutter or separate sidewalk/curb and gutter.

A visual site survey of the roads was undertaken by MPE in August 2016. The inspection includes all roads throughout the Village. Morrison Road, Kananaskis Road (Highway 551) and Kee Drive were not included in this inspection as these roads are considered highways and fall under provincial jurisdiction. A condition rating is assigned to each section of road. The condition rating is based on the visual appearance and defects. The condition ratings give a general indication of work required to bring each road to an established standard. These ratings can be used to prioritize repairs.

7.1 Roadway Condition

As previously mentioned, a visual site survey of all the roads within the Village was undertaken. The work involved visual inspections only; no detailed testing or sampling has been completed as part of this Study. The inspection forms for each section of road that was inspected are included in ***Appendix D.***

The inspection results from the visual site survey were used to determine the "Roadway Condition" rating value for each section of the roadway. Each type of defect is given a severity rating from light to severe. These asphalt paving defects include:

1) Transverse Cracks: *cracks that are perpendicular to the pavement's centerline.*
2) Longitudinal Cracks: *cracks that are parallel with pavement centerline.*
3) Alligator Cracks: *interconnected cracks forming a series of small blocks.*
4) Shrinkage Cracks: *interconnected cracks that divide pavement into large rectangular pieces.*
5) Rutting: *channeled depressions in the wheel-tracks.*
6) Corrugations: *ripples across asphalt pavement surface.*

7) Raveling*: the separation of aggregate particles in a pavement surface.*
8) Shoving/Pushing*: the formation of ripples across the pavement.*
9) Potholes*: bowl shaped depressions in the pavement's surface.*
10) Excess Asphalt*: when asphalt overlaps and spills onto curb and gutter.*
11) Polished Aggregate*: when aggregate extends above the asphalt binder.*
12) Deficient Drainage*: ponding water seen on asphalt surface.*
13) Overall Riding Quality*: a measure of quality when driving over the pavement surface.*

Each defect is assigned a value from 1 to 10; 1 being the best physical condition and 10 being the worst. These scores are weighted depending on the severity of the defect and then tallied to provide a score out of 99. The following table outlines the recommendations for each condition rating.

Table 7.1: Road Rating Recommendation

Rating	Recommendation
96-99: Good	Roadway is in good condition, no resurfacing required.
90-95	Minimal cracking, no resurfacing required.
85-89: Fair	Light to moderate cracking, isolated rutting.
72-84	Moderate cracking, potholes throughout roadway, rutting seen in multiple locations, polished aggregate, resurfacing recommended within 10 to 15 years.
68-71: Poor	Roadway is poor, severe cracking, multiple potholes, rutting, pushing and shoving seen throughout roadway. Resurfacing recommended within the next five years.

Table 7.2 summarizes the condition rating for each road that was inspected. ***Figure 2.3*** in ***Appendix A*** illustrates the condition ratings for each road on a map.

Table 7.2: Road Condition Ratings

Street	From	To	Condition Rating
Highwood Drive	North End of Highwood Drive	Intersection of Highwood Drive and Malmberg Place	70
Highwood Drive	Intersection of Highwood Drive and Malmberg Place	Intersection of Highwood Drive and Longview Drive	83
Highwood Drive	Intersection of Highwood Drive and Longview Drive	Intersection of Highwood Drive and Riverview Place	88
Riverview Place	Intersection of Highwood Drive and Riverview Place	End of Riverview Place Cul-de-sac	95
Malmberg Place	End of Malmberg Place Cul-de-sac	Intersection of Highwood Drive and Malmberg Place	89
Longview Drive	Intersection of Highwood Drive and Longview Drive	Intersection of Longview Drive and Royalties Crescent	85
Longview Drive	Intersection of Longview Drive and Royalties Crescent	Intersection of Royalties Crescent and Morrison Road	94
Royalties Crescent	Throughout Roadway	Throughout Roadway	78
Twin Cities Drive	Throughout Roadway	Throughout Roadway	68
Mountain View Place	Throughout Roadway	Throughout Roadway	71
Foothills Drive	Throughout Roadway	Throughout Roadway	93
Westview Place	Throughout Roadway	Throughout Roadway	84
School Access Parking Lot	Throughout Roadway	Throughout Roadway	91

Table 7.3 shows the road condition summary for all roads in Longview excluding highways that fall under provincial jurisdiction.

Table 7.3: Road Condition Summary

Rating	Total Approximate Length (metres)	Percentage
96-99: Good	0	0%
90-95	813	36%
85-89: Fair	521	23%
72-84	414	18%
68-71: Poor	509	23%
Total	**2,257**	**100%**

7.1.1 Road Upgrade Standards

In this Study, it is assumed that the Village prefers to maintain its system of mostly paved roads by overlaying the existing asphalt if required and rebuilding the road structure if the road is sufficiently degraded to make this necessary or if water/wastewater replacements are required. In other words, no major change such as converting all existing paved roads to gravel surfaces or upgrading gravel roads to a paved standard is contemplated.

The following assumptions have been made to calculate the quantities and costs of road maintenance and upgrading:

- Rebuilds of residential paved road structure include:
    - 300 mm thick sub-base (pit-run) gravel.
    - 50 mm thick base (crushed) gravel.
    - 90 mm thick asphalt paving.
    - Road coring excavation sufficient to install the above structure.
- Rebuilds of Highway road structure include:
    - 350 mm thick sub-base (pit-run) gravel.
    - 150 mm thick base (crushed) gravel.
    - 120 mm thick asphalt paving with 50mm overlay.
    - Road coring excavation sufficient to install the above structure.

The above assumptions are for estimating purposes only, and have been used to determine quantities to which typical unit rates have been applied. Each section of road would require proper geotechnical soils investigation and engineering analysis to confirm the actual design.

7.2 Concrete Surface Works

As mentioned previously, the roads in the Village typically have the following concrete surface installations associated with them:

- Curb and gutter low profile.
- Separate sidewalk usually with the curb and gutter.
- Monolithic sidewalk with curb and gutter.

The majority of the curbs and sidewalks throughout the Village appear to be in good condition. At this time, the replacement of the concrete surface works are considered low priority.

8.0 RECOMMENDATIONS

The following are recommendations based on this Study:

Water System

1. *Repair of WTP Holding Tank:* A video inspection should be completed of the floor drains below the WTP floor to determine the source of leaking water into the holding tank.
2. *Grading around WTP:* The surface grading around the WTP building is required to resolve flooding issues at the WTP site.
3. *Potable water reservoir monitoring and communication*: Continuous monitoring of the reservoir water level is recommended along with radio communications to the WTP. Communications with the WTP would require a small antenna tower at the WTP.
4. *WTP backwash pressure and flow control:* It is recommended to replace the existing hydraulic flow control valve with a pressure reducing valve, flowmeter, and motor operated flow control valve. This arrangement would allow proper pressure and flow for effective filter backwash.
5. *Wells monitoring and control enhancements:* The well pumps are currently controlled from the WTP over Telus lease lines. There is no feedback from the pumps. Adding radio communications to the wells would allow monitoring the status of the pumps.
6. *Hydrant Flow Testing:* This assists in assessing water main condition as well as providing invaluable information for determining fire flow capability. An added benefit is flushing of sediments from lines. This operation can be performed by third-party or by the Village's Public Works staff (with rented equipment) if budgets allow.
7. *Water System Modeling:* Computer modeling of the water system, calibrated using the results of the hydrant flow testing, is essential to proper engineering design of future development and to identify potential problems with the existing distribution system.
8. *Addition of Hydrants:* One additional hydrant should be installed along Morrison Road, and another at the east end of Kee Drive to provide adequate coverage as identified on the hydrant map (***Figure 1.2***).
9. *Replacement of Water Mains:* For planning purposes, it is assumed that all asbestos cement pipes are medium/high priority (condition rating of 4) to be replaced, especially if the sewer main in the same road is replaced and the road paved. It is assumed that

the PVC lines are low priority for replacement. The condition ratings for the water mains are shown on ***Figure 2.1***. The 100mm diameter water main in Kee Drive is given a high priority for replacement with a 150mm water main, as 150mm is the minimum diameter water main to feed a fire hydrant.

Wastewater System

1. *Collection Mains:* All lines with a condition rating of sub-standard (4 or 5) are a high priority to be replaced, particularly before any paving program. Isolated wastewater main(s) requiring refurbishment located in areas where no water main work is required or where it is desirable to preserve the existing road surface (such as in Morrison Rd.) the Village should consider relining using cure-in-place in-situ formed lining. The wastewater collection system condition ratings are shown on ***Figure 2.2***.
2. *Wastewater Manhole Maintenance*: All manholes should be cleaned out on a regular basis, broken ladders repaired and Parson manhole inserts placed in all manholes. The Parson manhole inserts are made of high-density polyethylene and are effective in reducing or preventing surface water inflow to the collection system through the manhole lid.
3. *Flushing of Wastewater Mains:* The wastewater collection system should be flushed each year. This is especially critical in the pipe section between MH51 and MH52 behind Westview Place. The HDPE pipe in this section has a significant sag that cannot be corrected due to proximity to a garage.
4. *Lift Station and Forcemain:* No immediate upgrades required.
5. *Wastewater Stabilization Ponds (Lagoon):* No immediate upgrades required.

Stormwater System

1. *Storm Water Management Master Plan:* It is recommended the Village undertake a *Storm Water Management Plan* (SWM Plan) for the entire Village to assist in planning future storm water infrastructure. The SWM Plan would assess the effectiveness of both the minor and major systems and recommend improvements.
2. *Highway 561 Catch Basin Repairs*: The repair of the stormwater undermining the inlet structure should be discussed with Alberta Transportation, as this inlet structure is

within the Secondary Highway right-of-way and drains water from the south highway ditch. This stormmain should also be video-inspected to determine the source of infiltration.

Road System

1. *High Priority Upgrades*: The roads with condition ratings between 68–71 are in poor condition and should be upgraded within the next five years. Road condition ratings are shown on ***Figure 2.3***.
2. *Medium Priority Upgrades*: The roads with a condition rating of 72–89 are in fair to poor condition. These roads should be upgraded within the next five to fifteen years.
3. *Low Priority Upgrades*: These are the road sections that are in reasonably good condition (ratings between 90-99). The condition of these roads should be monitored but there is no expected maintenance within the next fifteen years.

9.0 CAPITAL PLAN

Table 9.1 outlines the recommended capital plan for the next 21-years for the infrastructure upgrades identified in this report. This plan is a useful tool for the Village to reference on an ongoing basis. It is also intended for use as a discussion tool when prioritizing projects and for forecasting annual and upcoming expenditures. The capital plan is intended to be a "living" document that is updated regularly as situations change and projects are completed.

The infrastructure projects for the water/wastewater pipeline replacements are based on the separate risk assessments of the road, wastewater and water systems. An overall importance rating for each road/replacement project was calculated, with higher weighting precedence given first to wastewater, then road, then water system upgrades. The suggested replacement projects and combined risk rating are also illustrated in ***Figure 2.4***.

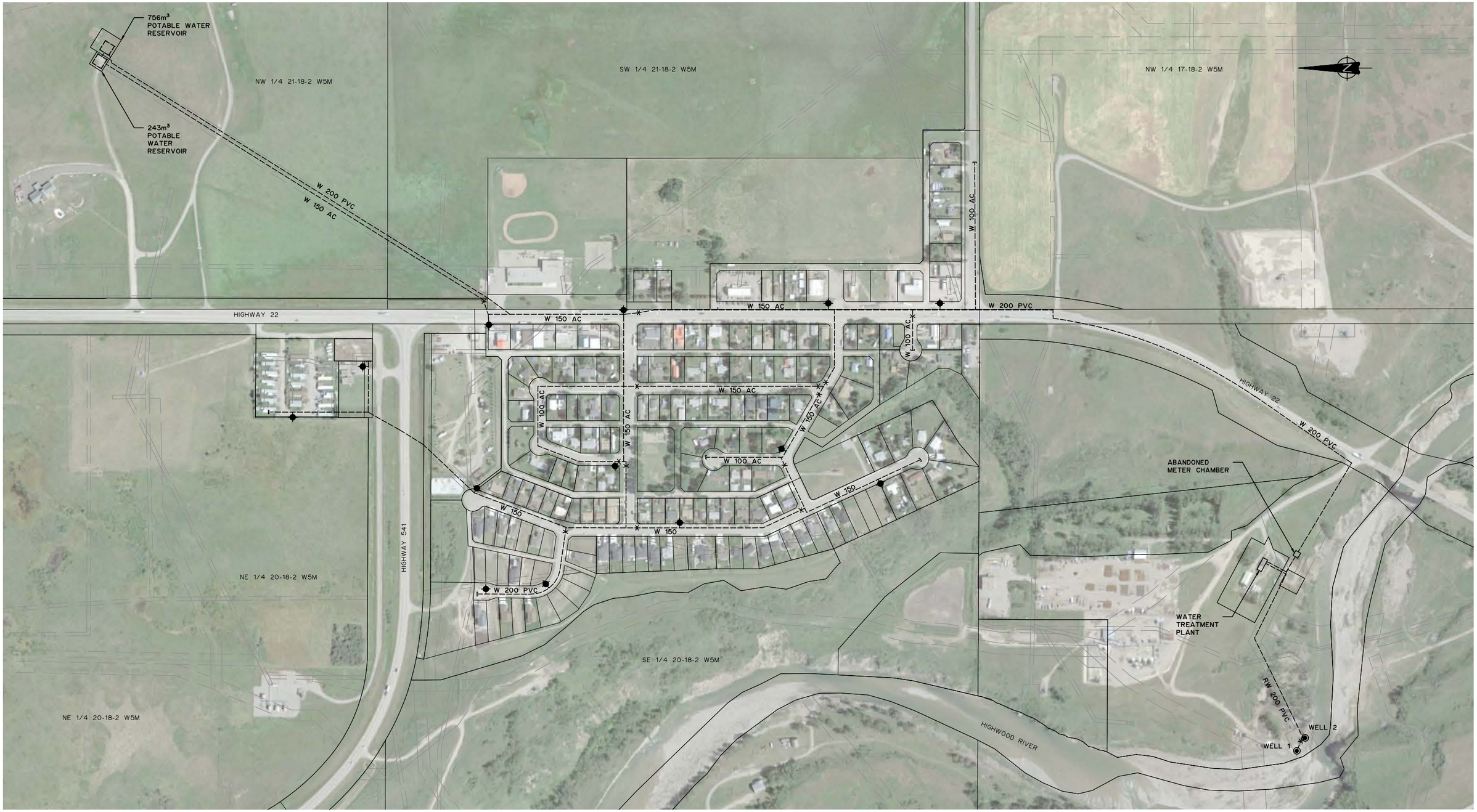
The following costs include contingencies and Engineering; they do not include G.S.T. All costs are in 2017 dollars. For construction after 2017 we recommend considering an inflation rate of 3% per year. Detailed cost estimates can be found in ***Appendix E***.

Table 9.1: Capital Plan

Priority	Infrastructure Project	Class 'D' Cost Estimate	Estimated Timeline
1	Video inspect and spot repair storm main from Highway 541 to outlet at Highwood River	$50,000	2017
2	Site grading and repair of leaking drain pipe at WTP site	$40,000	2017
3	Potable water reservoir monitoring and communication to WTP	$170,000	2017
4	WTP backwash pressure and flow control	$100,000	2017
5	Wells monitoring and control enhancements	$70,000	2017
6	Replacement of WTP roof over laboratory	$25,000	2017
7	Phase 1 Water/Wastewater Pipeline Replacement (Twin Cities Dr., Mountain View Pl., Foothills Dr.)	$1,040,000	2018
8	Phase 2 Water/Wastewater Pipeline Replacement (Highwood Dr.)	$1,140,000	2022
9	Phase 3 Water/Wastewater Pipeline Replacement [Morrison Dr. (south of Foothills Dr.), Kee Dr.]	$1,480,000	2026
10	Phase 4 Water/Wastewater Pipeline Replacement [Morrison Dr. (north of Foothills Dr.)]	$1,620,000	2030
11	Phase 5 Water/Wastewater Pipeline Replacement (Royalties Cr., Longview Dr.)	$ 950,000	2034
12	Phase 6 Water/Wastewater Pipeline Replacement (Trailer Park and Highway 541 Crossing)	$ 620,000	2038
	TOTAL	**$7,305,000**	

APPENDIX A

Figures



LEGEND

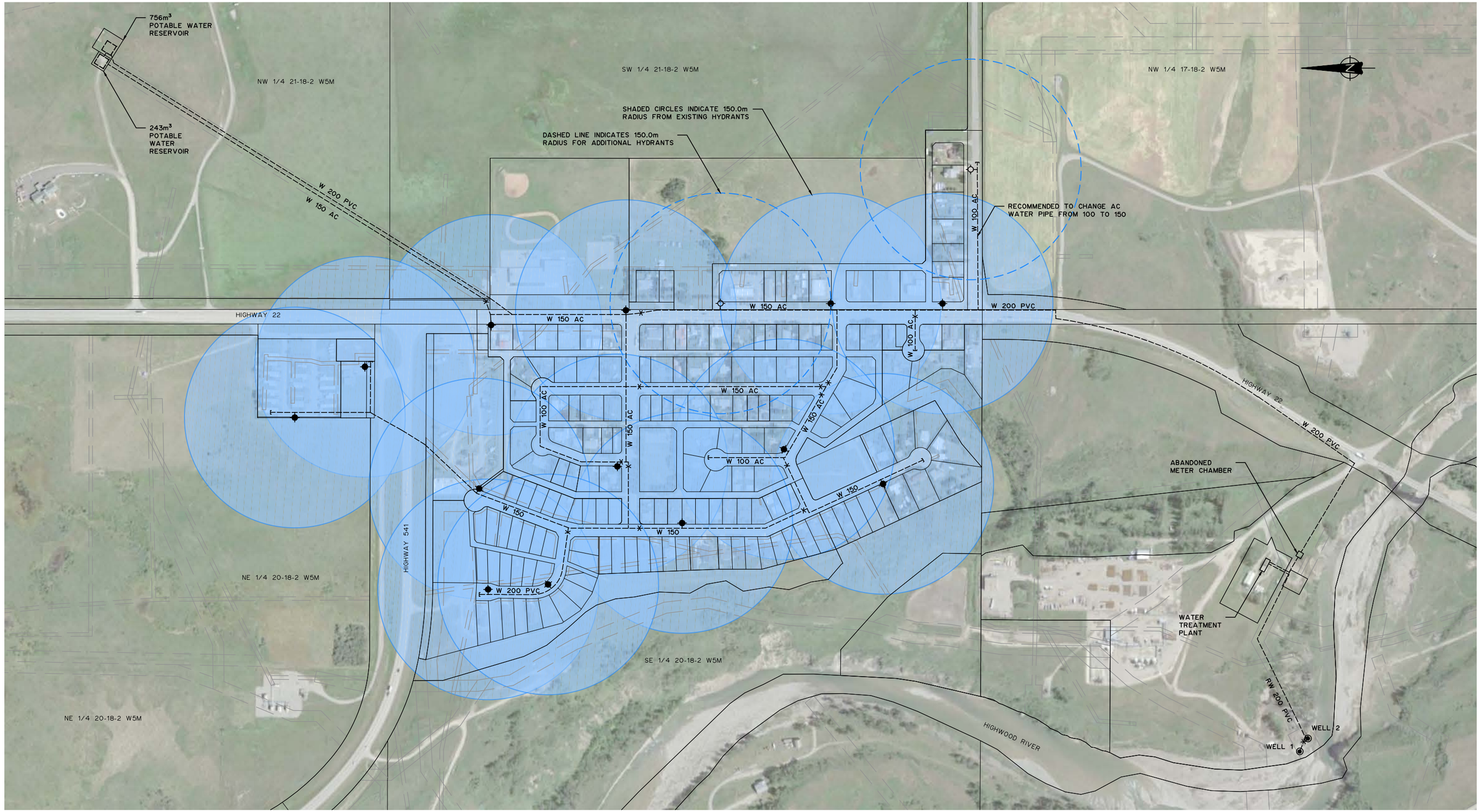
- W 150 — WATER MAIN
- X — VALVE
- HYDRANT
- RAW WATER WELL

Engineering Ltd.

VILLAGE OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
EXISTING WATER SYSTEM

SCALE: 1:5000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 1.1



LEGEND

- W 150 — WATER MAIN
- X — VALVE
- HYDRANT
- RAW WATER WELL
- PROPOSED HYDRANT

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
EXISTING HYDRANT MAP

SCALE: 1:5000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 1.2

LEGEND

S 200	SANITARY MAIN & 5A MANHOLE
■	SANITARY LIFT STATION
X	VALVE
CT	CLAY TILE PIPE
PVC	POLYVINYL CHLORIDE PIPE
PE	POLYETHYLENE PIPE
HDPE	HIGH-DENSITY POLYETHYLENE PIPE
CON	CONCRETE PIPE

NOTES:

1. ALL SANITARY MAINS 200mm UNLESS OTHERWISE NOTED.

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
EXISTING WASTEWATER SYSTEM

SCALE: 1:5000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 1.3

LEGEND

S 200	SANITARY MAIN & 5A MANHOLE
■	SANITARY LIFT STATION
X	VALVE
CT	CLAY TILE PIPE
PVC	POLYVINYL CHLORIDE PIPE
PE	POLYETHYLENE PIPE
HDPE	HIGH-DENSITY POLYETHYLENE PIPE
CON	CONCRETE PIPE

NOTES:

1. ALL SANITARY MAINS 200mm UNLESS OTHERWISE NOTED.

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
EXISTING WASTEWATER STABILIZATION PONDS

SCALE:	DATE:	JOB:	FIGURE:
1:5000	MAY 2017	2530-013-00	1.4

LEGEND

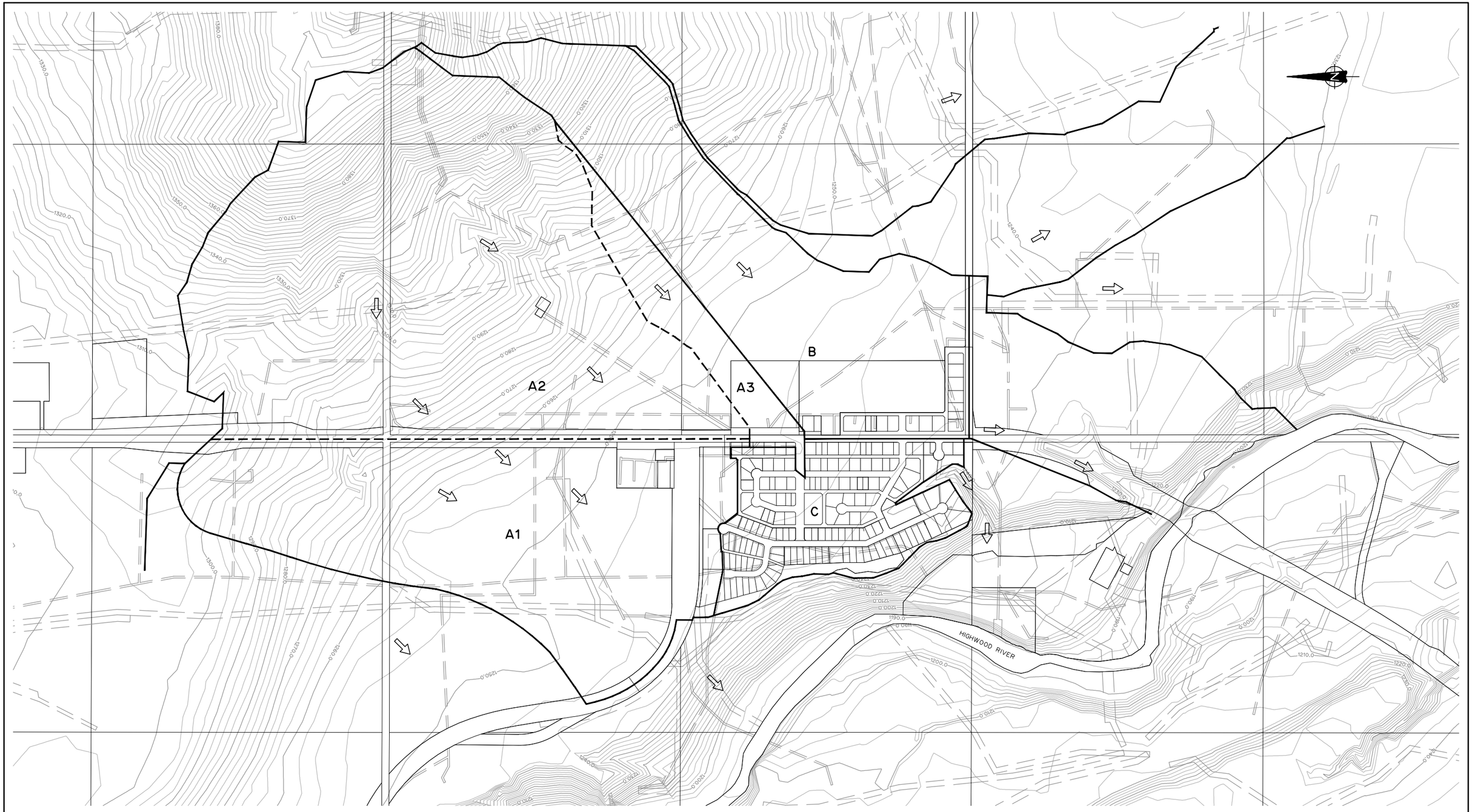
- ST 375 — STORM MAIN & 5A MANHOLE
- CATCH BASIN & LEAD
- TWIN CATCH BASIN
- CULVERT
- OVERLAND DRAINAGE DIRECTION
- DITCH

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
EXISTING STORM SYSTEM

SCALE: 1:5000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 1.5



LEGEND

- CATCHMENT AREA BOUNDARY
- SUB CATCHMENT AREA BOUNDARY
- OVERLAND DRAINAGE DIRECTION

CATCHMENT AREAS DRAINING INTO LONGVIEW:

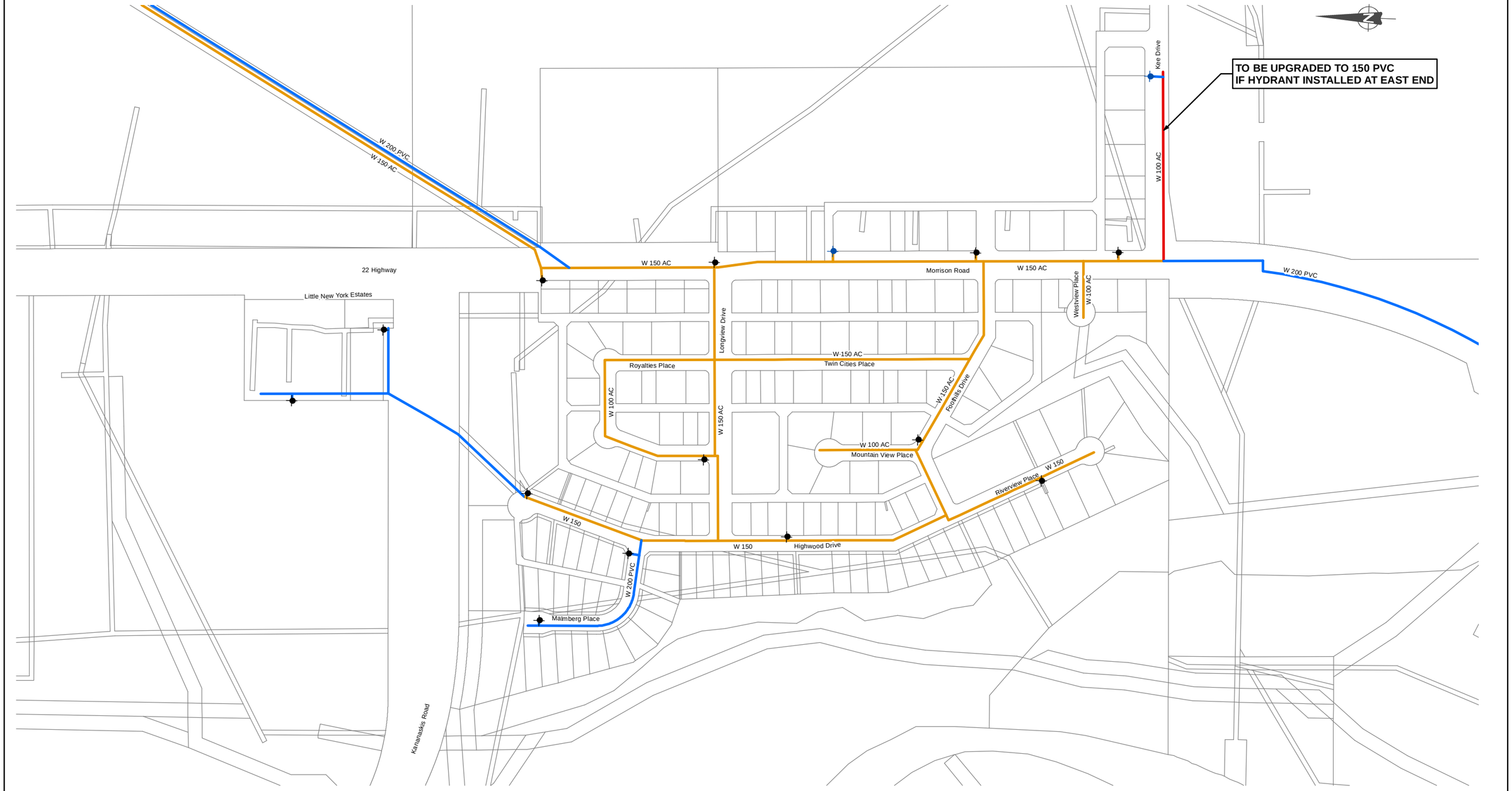
NAME	DRAINS INTO	AREA(HA)
A1	NORTH STORM DRAIN	69.0
A2	NORTH STORM DRAIN	111.50
A3	NORTH STORM DRAIN	10.70
B	SE CATCH BASIN TO HWY22 DITCH	54.10
C	VILLAGE STORM DRAIN	23.0

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
REGIONAL DRAINAGE

SCALE: 1:10 000 | DATE: MAY 2017 | JOB: 2530-013-00 | FIGURE: 1.6



Water Priority Assessment

- 5 (Poor) High Priority
- 4
- 3 (fair) Medium Priority
- 2
- 1 (Good) Low Priority
- SP116 Pipe Identification Number

- Existing Hydrant
- Hydrant Installation Recommended

NOTE:
IT IS ASSUMED THAT ALL ASBESTOS CEMENT (AC) PIPES ARE MEDIUM/HIGH (4) PRIORITY, TO BE REPLACED AND PVC PIPES ARE LOW PRIORITY.

MPE Engineering Ltd.

TOWN OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
2016 WATER SYSTEM
CONDITION RATINGS

SCALE: 1:4,000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 2.1

Wastewater Collection System Priority Assessment

- 5 (Poor) High Priority
- 4
- 3 (Fair) Medium Priority
- 2
- 1 (Good) Low Priority
- SP116 Pipe Identification Number

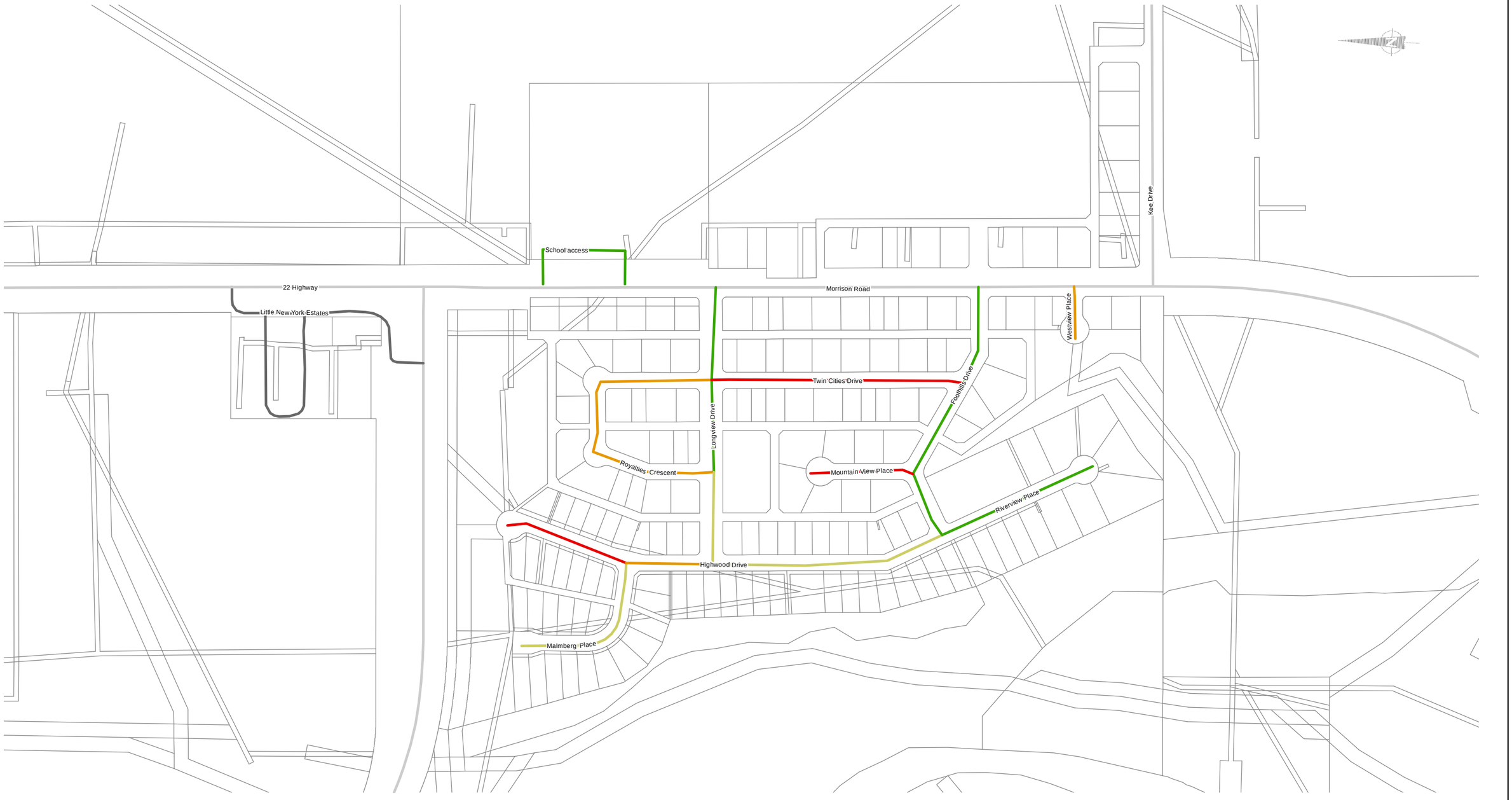
NOTE:
ONLY WASTEWATER MAINS THAT WERE VIDEO INSPECTED ARE SHOWN ON THIS DRAWING.

MPE Engineering Ltd.

TOWN OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
2016 WASTEWATER SYSTEM
CONDITION RATINGS

SCALE: 1:4,000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 2.2



Road Priority Assessment

- 68 - 71 (Poor) High Priority
- 72 - 84
- 85 - 89 (Fair) Medium Priority
- 90 - 95
- 96 - 99 (Good) Low Priority

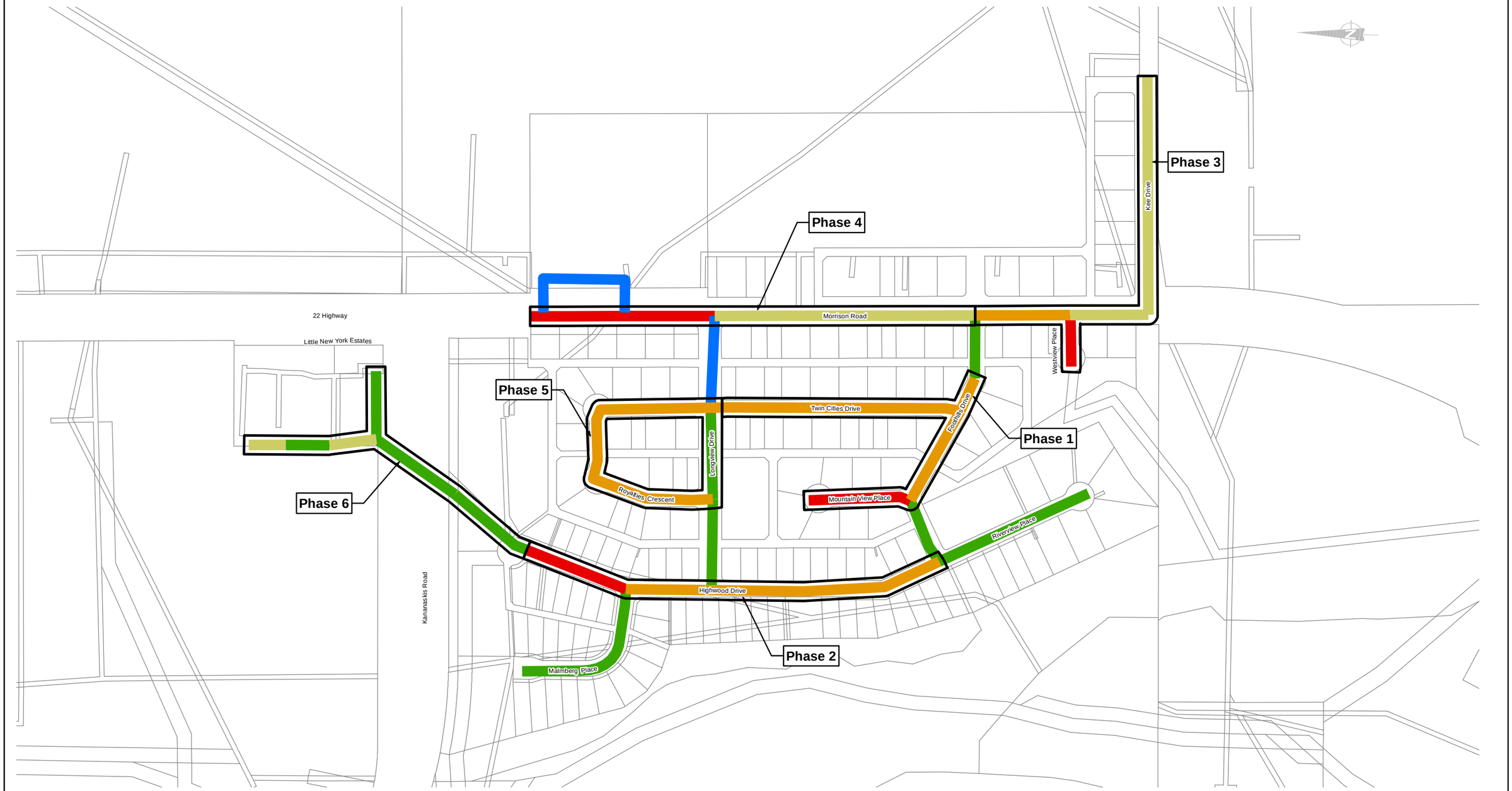
- Provincial Jurisdiction Road
- Gravel Road

MPE Engineering Ltd.

TOWN OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
2016 ROAD CONDITION RATINGS

SCALE: 1:4,000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 2.3



Combined Wastewater, Road and Water Priority Assessment

- High Priority
- Medium Priority
- Low Priority

Engineering Ltd.

TOWN OF LONGVIEW

LONGVIEW INFRASTRUCTURE MANAGEMENT PLAN
OVERALL CONDITION RATINGS AND
PROPOSED PROJECTS

SCALE: 1:4,000	DATE: MAY 2017	JOB: 2530-013-00	FIGURE: 2.4

APPENDIX B

Population Statistics

POPULATION STATISTICS FOR LONGVIEW AND AREA

Longview Population History

Year	Pop	Growth
1991	271	
1996	303	2.2%
2001	300	-0.2%
2004	307	0.8%
2006	307	0.0%
2010	310	0.2%
2011	314	1.3%
2012	316	0.6%
2013	320	1.3%
2014	321	0.3%
2015	322	0.3%
Average		*0.7%*

Source: www.albertafirst.com ~ community profiles

Historical Population Growth in the Area

Community	2015 population	2005 population	annual growth (%)
Longview	322	301	0.7%
Nanton	2259	2042	1.0%
Turner Valley	2568	1868	3.2%
Black Diamond	2814	1930	3.8%
MD Foothills	24888	19558	2.4%
High River	15364	10704	3.6%
		average	2.4%

Source: www.albertafirst.com ~ community profiles

Longview's growth has averaged 0.7% since 1991.
Maximum growth over 5 year period is 2.2%

Population Estimates at Various Rates and Periods

Starting at 322 population in 2016

Growth Rate	5 year 2021	10 year 2026	15 year 2031	20 year 2036	25 year 2046
0.50%	330	339	347	356	374
1%	339	356	374	393	435
1.5%	347	374	403	435	505
2%	356	393	435	480	587
2.5%	365	413	469	531	682
3%	374	435	505	587	792
3.5%	384	457	544	648	920
4%	393	480	587	717	1069

Population Projections Based on Village of Longview Predictions:

Year	Population	Growth Rate
2016	322	
2021	339	1.0%
2026	356	1.0%
2031	374	1.0%
2036	393	1.0%
2041	413	1.0%
2046	435	1.0%
2051	457	1.0%

APPENDIX C

Manhole Inspection Forms

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	☐	1 - S	☐	Drop	☐	
Collar Material:	Concrete	☑	Brick	☑	Other	☐	
Barrel Material:	Concrete	☑	Block	☐	Other	☐	
Bench Material:	Precast	☐	Field	☑	Other	☐	
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**	**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2	

Does surface water drain away from the MH	No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)	No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)	No / Yes	Yes	
Comments and Photo Numbers			

Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	4	

Are there between 1 and 3 collars in use	No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm	No / Yes	Yes	
Is the grouting complete and without gaps	No / Yes	No	
Free from evidence of leaking or water stains	No / Yes	Yes	
Comments and Photo Numbers			

Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	3	

Is the top step within 400 mm from lid	No / Yes	No	
Is the bottom step within 400 mm of the base	No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)	No / Yes	Yes	
Are the steps twisted	No / Yes	Yes	
Are the steps corroded or damaged	No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH	No / Yes	No	
Comments and Photo Numbers			

MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	2	

Are there cracks or damage to the MH side walls	No / Yes	No	
Do the sides of the barrel have evidence of water stains or weeping	No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints	No / Yes	Yes	
Are there unfilled open weeping holes in the sides of the storm MHs	No / Yes	No	
Comments and Photo Numbers			

MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	3	

Base and Channels are smooth without evidence of corrosion or concrete wear	No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH	No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm	No / Yes	Yes	
Are there service leads directly into the MH – i.e. cul de sacs	No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet	No / Yes	Yes	
Inverts are properly sealed and grouted	No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line	No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage	No / Yes	Yes	
Comments and Photo Numbers			

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		3.96				3.96		3.96				
Depth of Flow												

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

Village of Longview
Manhole Inspection Checklist

Project:	Longview Infrastructure Management Plan			**MH Number:**	MH14
Project Number:	2530-013	**Inspector:**	Ryan Fitzsimmons	**Date:**	Aug 9

Barrel Diameter:	1.2						**Notes:**
Manhole Type:	5A	✔	1 - S		Drop		
Collar Material:	Concrete	✔	Brick		Other		
Barrel Material:	Concrete	✔	Block		Other		
Bench Material:	Precast		Field	✔	Other		
Parson Insert Installed:	No / Yes	No					

Item	**Rate:**			**Notes**
Surface ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Does surface water drain away from the MH		No / Yes	Yes	
Is the lid matched to MH type (San, Storm, Town Logo)		No / Yes	No	
Is the frame flush to match the road grade (15 mm tolerance)		No / Yes	Yes	
Comments and Photo Numbers				
Top Slab & Collars ***(Rate 1-5 with 1 being low and 5 being high)***	2			
Are there between 1 and 3 collars in use		No / Yes	Yes	
Is the total height of collars between 50 mm – 305 mm		No / Yes	Yes	
Is the grouting complete and without gaps		No / Yes	Yes	
Free from evidence of leaking or water stains		No / Yes	No	
Comments and Photo Numbers				
Steps of Ladder ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Is the top step within 400 mm from lid		No / Yes	Yes	
Is the bottom step within 400 mm of the base		No / Yes	Yes	
Do the steps line up (within 40 mm tolerance, 20 mm dia min. Std.)		No / Yes	Yes	
Are the steps twisted		No / Yes	No	
Are the steps corroded or damaged		No / Yes	No	
Steps are below the MH lid and not on the opposite wall of MH		No / Yes	Yes	
Comments and Photo Numbers				
MH Barrels ***(Rate 1-5 with 1 being low and 5 being high)***	1			
Are there cracks or damage to the MH side walls		No / Yes	Yes	
Do the sides of the barrel have evidence of water stains or weeping		No / Yes	Yes	
Do the joints between barrels have evidence of leakage through joints		No / Yes	No	
Are there unfilled open weeping holes in the sides of the storm MHs		No / Yes	No	
Comments and Photo Numbers				
MH Base and Leads ***(Rate 1-5 with 1 being low and 5 being high)***	4			
Base and Channels are smooth without evidence of corrosion or concrete wear		No / Yes	No	
Leads into the MH stop at the springline, which is flush to inside wall of MH		No / Yes	Yes	
Sides are benched in MH floor for San, & Storm leads over 600 mm		No / Yes	No	
Are there service leads directly into the MH – i.e. cul de sacs		No / Yes	No	
Is the distance less than 760 mm from all inlet inverts to springline of outlet		No / Yes	Yes	
Inverts are properly sealed and grouted		No / Yes	No	
Channels are free from rocks and dirt which might indicate break in line		No / Yes	No	
MH base is free of sewage settlement due to slow flow or blockage		No / Yes	Yes	
Comments and Photo Numbers				

	SW	**S**	**SE**	**E**	**NE**	**N**	**NW**	**W**				
Size of Inserts		200				200		200				
Rim to Invert Elev.		4.10				4.10		4.10				
Depth of Flow	Dry	1.5cm			Wet	3.0cm						

MPE Engineering Ltd.

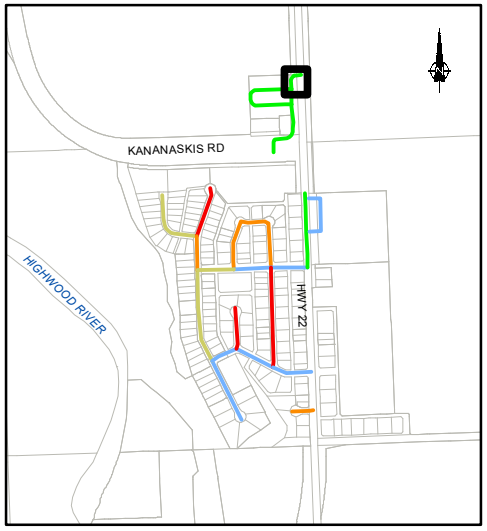
APPENDIX D

Road Inspection Forms

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	LNYE-22	Location:	Little New York Estates
Pavement:	Length: 57m	Width: 7.6m	Area: 433m^2
Pavement Type:	Gravel	Date of Inspection:	August 2016
No. of Manholes Observed:		No. of Valves Observed:	
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	
Longitudinal Cracks	0-5	
Alligator Cracks	0-10	
Shrinkage Cracks	0-5	
Rutting	0-10	
Corrugations	0-5	
Ravelling	0-5	
Shoving or Pushing	0-10	
Pot Holes	0-10	
Excess Asphalt	0-10	
Polished Aggregate	0-5	
Deficient Drainage	0-10	
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	
Sum of Defects:		0
Condition Rating = 100 - Sum of Defects:	**Condition Rating**	**100**

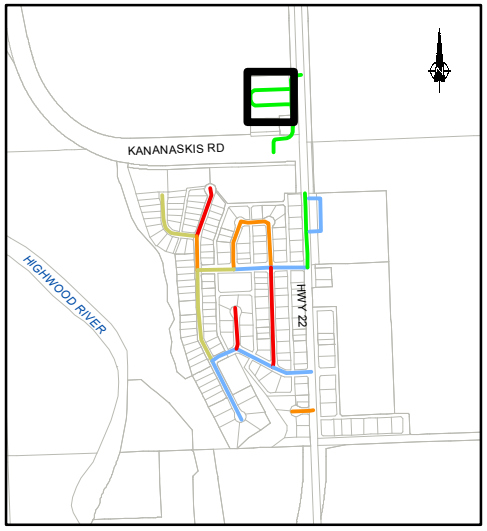
Other Notes: Gravel road

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	LNYE	Location:	Little New York Estates
Pavement:	Length: 245m	Width: 6.5m	Area: 1593m^2
Pavement Type:	Gravel	Date of Inspection:	August 2016
No. of Manholes Observed:		No. of Valves Observed:	
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	
Longitudinal Cracks	0-5	
Alligator Cracks	0-10	
Shrinkage Cracks	0-5	
Rutting	0-10	
Corrugations	0-5	
Ravelling	0-5	
Shoving or Pushing	0-10	
Pot Holes	0-10	
Excess Asphalt	0-10	
Polished Aggregate	0-5	
Deficient Drainage	0-10	
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	
Sum of Defects:		0

Condition Rating = 100 - Sum of Defects: **Condition Rating** **100**

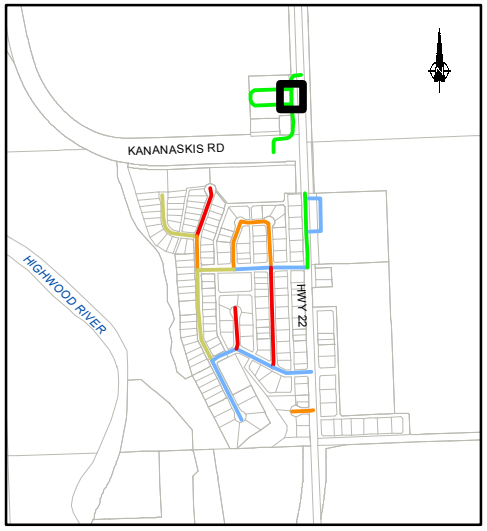
Other Notes: Gravel road with very little fines, gravel is loose and breaks away easily

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	LNYE-LNYE	Location:	Little New York Estates
Pavement:	Length: 41m	Width: 7.6m	Area: 312m^2
Pavement Type:	Gravel	Date of Inspection:	August 2016
No. of Manholes Observed:		No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	
Longitudinal Cracks	0-5	
Alligator Cracks	0-10	
Shrinkage Cracks	0-5	
Rutting	0-10	
Corrugations	0-5	
Ravelling	0-5	
Shoving or Pushing	0-10	
Pot Holes	0-10	
Excess Asphalt	0-10	
Polished Aggregate	0-5	
Deficient Drainage	0-10	
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	
Sum of Defects:		0
Condition Rating = 100 - Sum of Defects:	**Condition Rating**	**100**

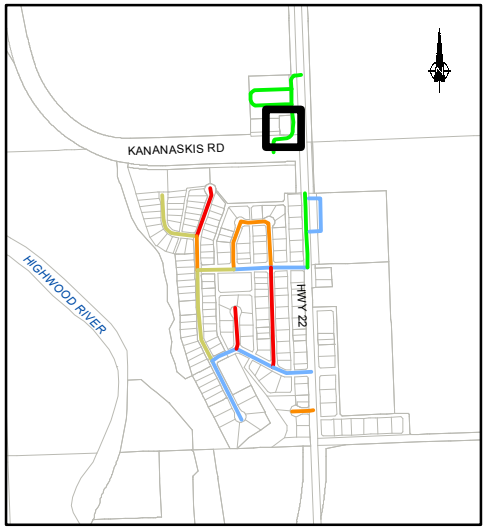
Other Notes: Gravel road

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	LNYE-KAN	Location:	Little New York Estates
Pavement:	Length: 165m	Width: 7.6m	Area: 1251m^2
Pavement Type:	Cold Mix	Date of Inspection:	August 2016
No. of Manholes Observed:		No. of Valves Observed:	
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	
Longitudinal Cracks	0-5	
Alligator Cracks	0-10	
Shrinkage Cracks	0-5	
Rutting	0-10	
Corrugations	0-5	
Ravelling	0-5	
Shoving or Pushing	0-10	
Pot Holes	0-10	
Excess Asphalt	0-10	
Polished Aggregate	0-5	
Deficient Drainage	0-10	
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	
Sum of Defects:		0

Condition Rating = 100 - Sum of Defects: **Condition Rating** **100**

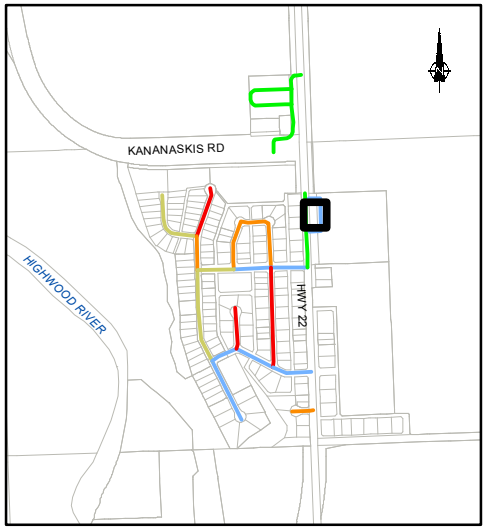
Other Notes: Half of road is gravel and other half is chip seal, road is in the poorest compared to all others in village

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	SCHOOL-ACCESS	Location:	School access
Pavement:	Length: 148m	Width: 10.3m	Area: 1527m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	0	No. of Valves Observed:	0
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	1
Alligator Cracks	0-10	2
Shrinkage Cracks	0-5	1
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	0
Polished Aggregate	0-5	0
Deficient Drainage	0-10	1
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	2
Sum of Defects:		9

Condition Rating = 100 - Sum of Defects: **Condition Rating** **91**

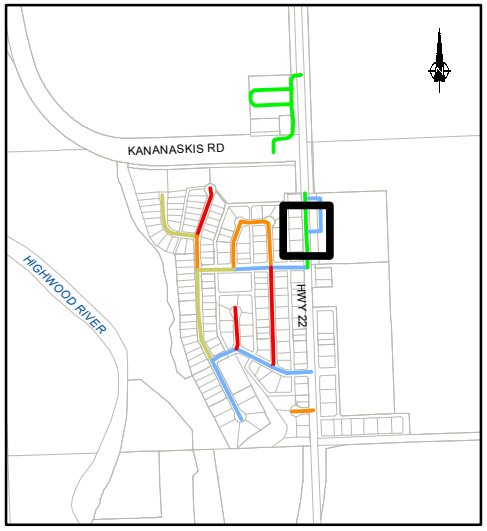
Other Notes:

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	MORRISON-22-N	Location:	Morrison Road
Pavement:	Length: 196m	Width: 10.3m	Area: 2022m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:		No. of Valves Observed:	
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	
Longitudinal Cracks	0-5	
Alligator Cracks	0-10	
Shrinkage Cracks	0-5	
Rutting	0-10	
Corrugations	0-5	
Ravelling	0-5	
Shoving or Pushing	0-10	
Pot Holes	0-10	
Excess Asphalt	0-10	
Polished Aggregate	0-5	
Deficient Drainage	0-10	
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	
Sum of Defects:		0

Condition Rating = 100 - Sum of Defects: **Condition Rating** **100**

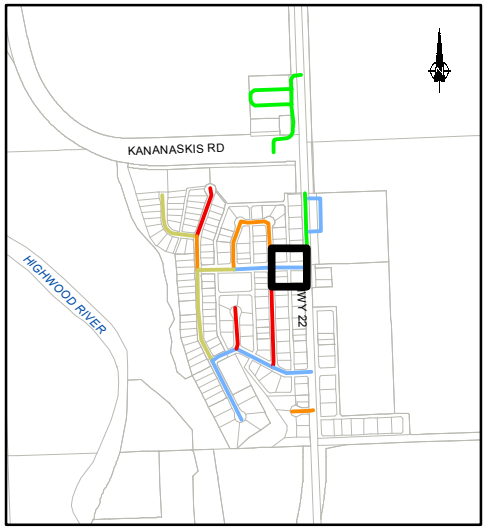
Other Notes:

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	LONGVIEW-MORRISON	Location:	Longview Drive
Pavement:	Length: 98m	Width: 15.6m	Area: 1525m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	1	No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	1
Longitudinal Cracks	0-5	1
Alligator Cracks	0-10	2
Shrinkage Cracks	0-5	1
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	0
Polished Aggregate	0-5	0
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	1
Sum of Defects:		6

Condition Rating = 100 - Sum of Defects: **Condition Rating** **94**

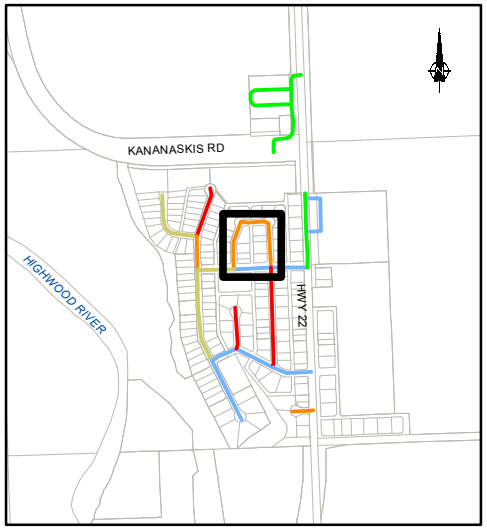
Other Notes: Attached walk on one side, moderate damage to curbs 3/10

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	ROYALITIES	Location:	Royalties Crescent
Pavement:	Length: 323m	Width: 10.3m	Area: 3332m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	3	No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	3
Longitudinal Cracks	0-5	2
Alligator Cracks	0-10	5
Shrinkage Cracks	0-5	3
Rutting	0-10	1
Corrugations	0-5	0
Ravelling	0-5	2
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	1
Polished Aggregate	0-5	1
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	4
Sum of Defects:		22

Condition Rating = 100 - Sum of Defects: **Condition Rating** **78**

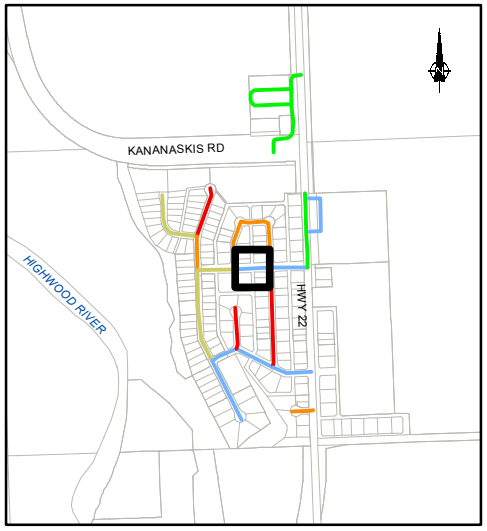
Other Notes: Attached sidewalk on 1 side of road, moderate damage to curbs/walk 5/10, (moderate to high)

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	LONVIEW-ROYALITIES	Location:	Longview Drive
Pavement:	Length: 97m	Width: 10.5m	Area: 1020m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	0	No. of Valves Observed:	0
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	1
Alligator Cracks	0-10	0
Shrinkage Cracks	0-5	2
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	0
Polished Aggregate	0-5	0
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	1
Sum of Defects:		6

Condition Rating = 100 - Sum of Defects: **Condition Rating** **94**

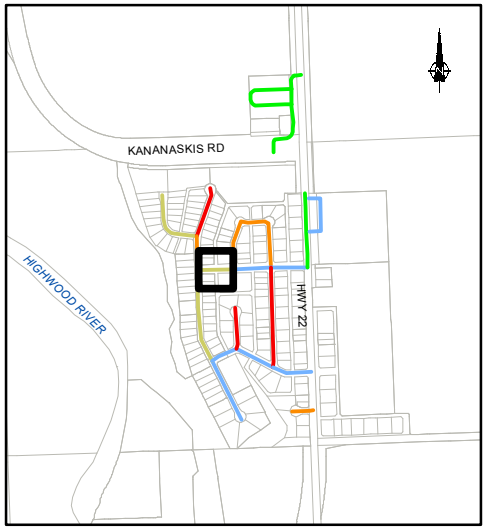
Other Notes: Walk/curb in good condition

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	LONGVIEW-HIGHWOOD	Location:	Longview Drive
Pavement:	Length: 97m	Width: 10.6m	Area: 1028m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	1	No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	4
Alligator Cracks	0-10	1
Shrinkage Cracks	0-5	1
Rutting	0-10	1
Corrugations	0-5	0
Ravelling	0-5	1
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	2
Polished Aggregate	0-5	1
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	2
Sum of Defects:		15

Condition Rating = 100 - Sum of Defects: **Condition Rating** **85**

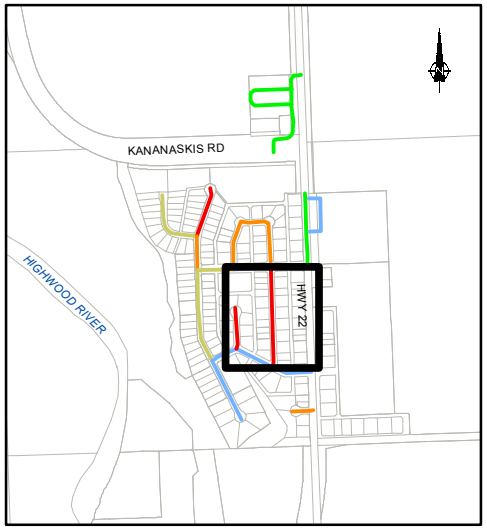
Other Notes: Curbs and walks in good condition

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	TWIN-CITIES	Location:	Twin Cities Drive
Pavement:	Length: 266m	Width: 9.55m	Area: 2542m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	1	No. of Valves Observed:	0
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	3
Longitudinal Cracks	0-5	3
Alligator Cracks	0-10	8
Shrinkage Cracks	0-5	2
Rutting	0-10	3
Corrugations	0-5	1
Ravelling	0-5	2
Shoving or Pushing	0-10	1
Pot Holes	0-10	1
Excess Asphalt	0-10	0
Polished Aggregate	0-5	2
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	6
Sum of Defects:		32

Condition Rating = 100 - Sum of Defects: **Condition Rating** **68**

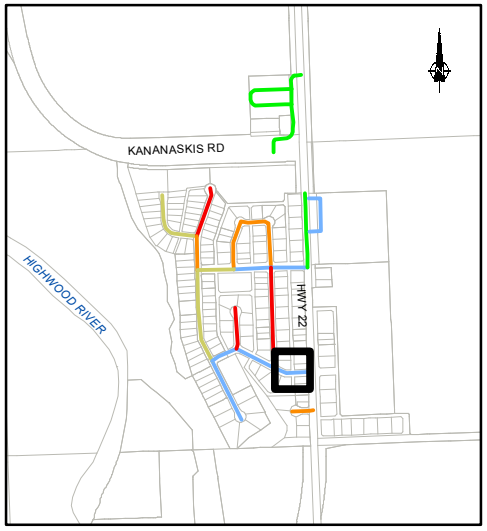
Other Notes: Attached sidewalk on 1 side of road, curbs and walk in good condition

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	FOOTHILLS-MORRISON	Location:	Foothills Drive
Pavement:	Length: 105m	Width: 10.5m	Area: 1098m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	2	No. of Valves Observed:	2
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	1
Longitudinal Cracks	0-5	1
Alligator Cracks	0-10	1
Shrinkage Cracks	0-5	2
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	1
Excess Asphalt	0-10	0
Polished Aggregate	0-5	0
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	1
Sum of Defects:		7

Condition Rating = 100 - Sum of Defects: **Condition Rating** **93**

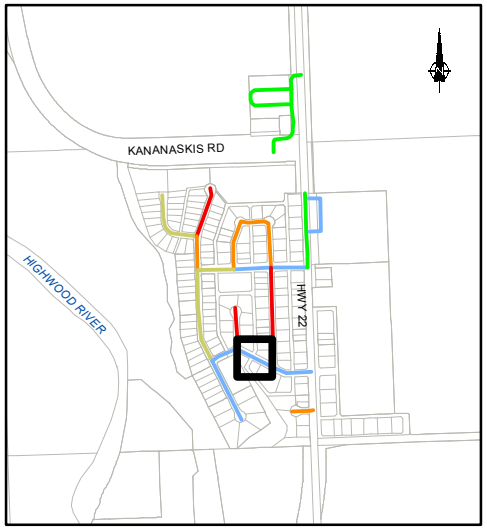
Other Notes: Attached sidewalk on one side of road, curbs and walk in good condition

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

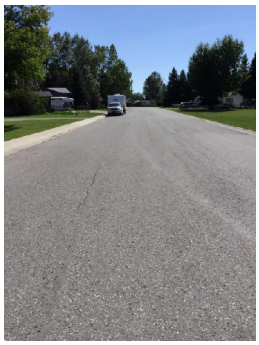
ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	FOOTHILLS-TWIN	Location:	Foothills Drive
Pavement:	Length: 109m	Width: 10.5m	Area: 1146m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	0	No. of Valves Observed:	0
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	3
Alligator Cracks	0-10	0
Shrinkage Cracks	0-5	1
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	0
Polished Aggregate	0-5	0
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	1
Sum of Defects:		7

Condition Rating = 100 - Sum of Defects: **Condition Rating** **93**



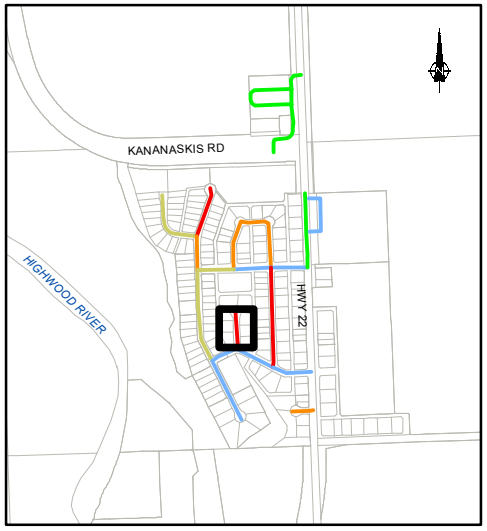
Other Notes: Attached sidewalk one side of road

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	MOUNTAIN-VIEW	Location:	Mountain View Place
Pavement:	Length: 109m	Width: 10.3m	Area: 1122m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	1	No. of Valves Observed:	0
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	1
Longitudinal Cracks	0-5	1
Alligator Cracks	0-10	2
Shrinkage Cracks	0-5	1
Rutting	0-10	4
Corrugations	0-5	1
Ravelling	0-5	3
Shoving or Pushing	0-10	3
Pot Holes	0-10	2
Excess Asphalt	0-10	4
Polished Aggregate	0-5	3
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	4
Sum of Defects:		29

Condition Rating = 100 - Sum of Defects: **Condition Rating** **71**

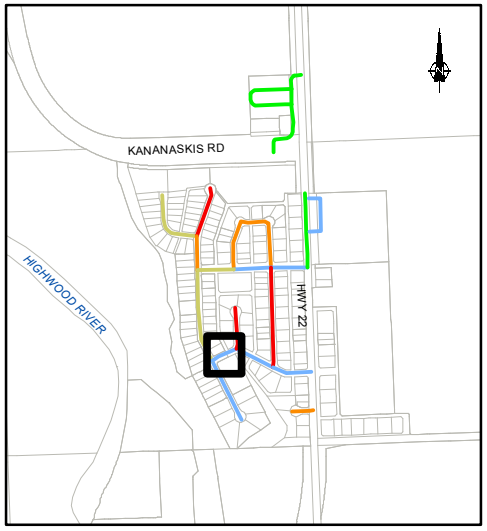
Other Notes: Moderate damage to curbs

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	FOOTHILLS-MOUNTAIN	Location:	Foothills Drive
Pavement:	Length: 72m	Width: 10.5m	Area: 760m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	1	No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	1
Alligator Cracks	0-10	2
Shrinkage Cracks	0-5	1
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	1
Excess Asphalt	0-10	0
Polished Aggregate	0-5	1
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	0
Sum of Defects:		8

Condition Rating = 100 - Sum of Defects: **Condition Rating** **92**

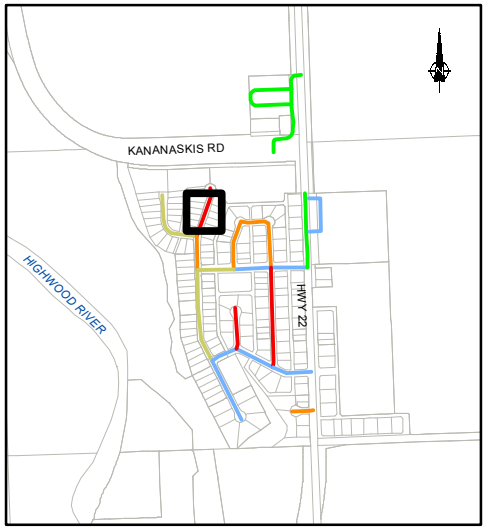
Other Notes: Attached sidewalk on 1 side of road, minor cracks in curbs and sidewalk

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	HIGHWOOD	Location:	Highwood Drive
Pavement:	Length: 133m	Width: 10.3m	Area: 1374m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	2	No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	2
Alligator Cracks	0-10	6
Shrinkage Cracks	0-5	3
Rutting	0-10	2
Corrugations	0-5	1
Ravelling	0-5	2
Shoving or Pushing	0-10	3
Pot Holes	0-10	2
Excess Asphalt	0-10	1
Polished Aggregate	0-5	2
Deficient Drainage	0-10	1
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	3
Sum of Defects:		30

Condition Rating = 100 - Sum of Defects: **Condition Rating** **70**

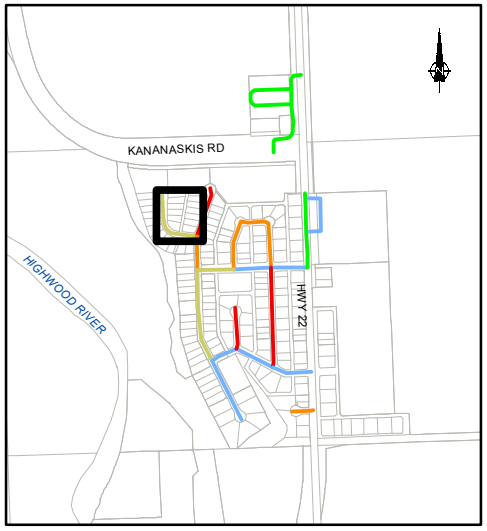
Other Notes: Sidewalk only on one side of road

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	MALMBERG	Location:	Malmberg Place
Pavement:	Length: 175m	Width: 10.3m	Area: 1807m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	2	No. of Valves Observed:	0
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	3
Longitudinal Cracks	0-5	2
Alligator Cracks	0-10	1
Shrinkage Cracks	0-5	3
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	1
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	0
Polished Aggregate	0-5	1
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	0
Sum of Defects:		11

Condition Rating = 100 - Sum of Defects: **Condition Rating** **89**

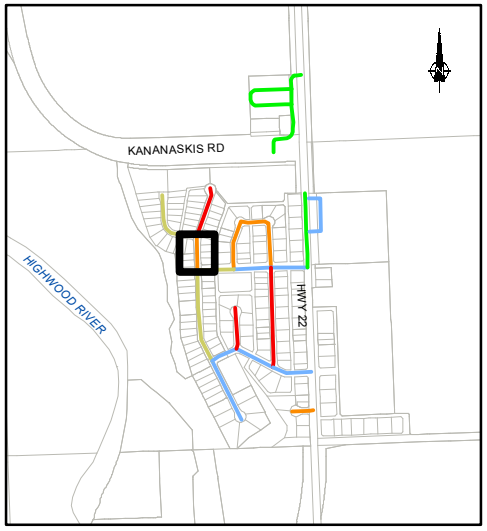
Other Notes:

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	HIGHWOOD-MALM	Location:	Highwood Drive
Pavement:	Length: 91m	Width: 10.3m	Area: 937m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	1	No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	4
Longitudinal Cracks	0-5	2
Alligator Cracks	0-10	2
Shrinkage Cracks	0-5	2
Rutting	0-10	1
Corrugations	0-5	1
Ravelling	0-5	1
Shoving or Pushing	0-10	0
Pot Holes	0-10	1
Excess Asphalt	0-10	1
Polished Aggregate	0-5	2
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	0
Sum of Defects:		17

Condition Rating = 100 - Sum of Defects: **Condition Rating** **83**

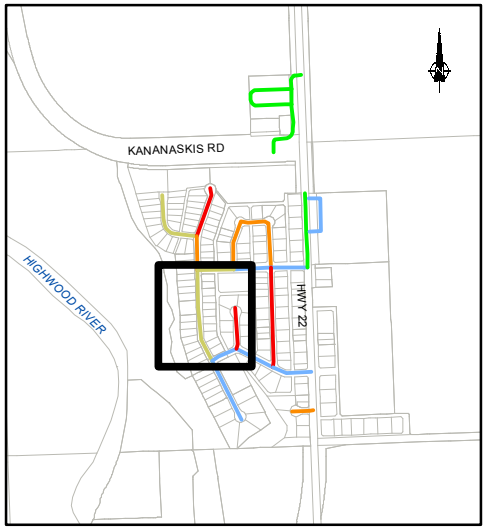
Other Notes: Minor damage to curbs and sidewalks , sidewalk on east side of road only

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	HIGHWOOD-LONGVIEW	Location:	Highwood Drive
Pavement:	Length: 248m	Width: 10.3m	Area: 2558m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	2	No. of Valves Observed:	2
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	3
Alligator Cracks	0-10	0
Shrinkage Cracks	0-5	1
Rutting	0-10	2
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	2
Excess Asphalt	0-10	0
Polished Aggregate	0-5	2
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	0
Sum of Defects:		12

Condition Rating = 100 - Sum of Defects: **Condition Rating** **88**

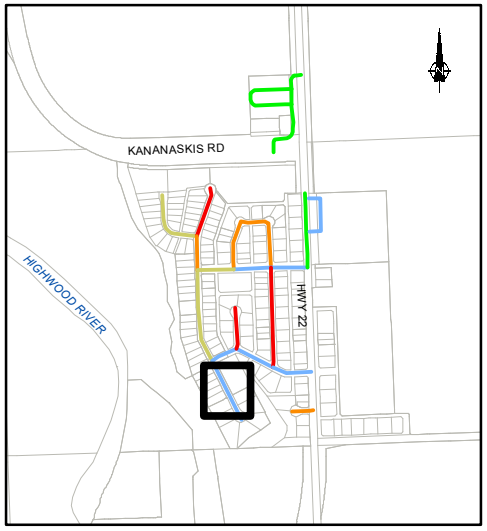
Other Notes: Attached sidewalk on one side of road , worst area is intersection of Longview and highwood drive

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	RIVERVIEW-FOOTHILLS	Location:	Riverview Place
Pavement:	Length: 174m	Width: 10.3m	Area: 1796m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	4	No. of Valves Observed:	0
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	2
Alligator Cracks	0-10	1
Shrinkage Cracks	0-5	0
Rutting	0-10	0
Corrugations	0-5	0
Ravelling	0-5	0
Shoving or Pushing	0-10	0
Pot Holes	0-10	0
Excess Asphalt	0-10	0
Polished Aggregate	0-5	0
Deficient Drainage	0-10	0
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	0
Sum of Defects:		5

Condition Rating = 100 - Sum of Defects: **Condition Rating** **95**

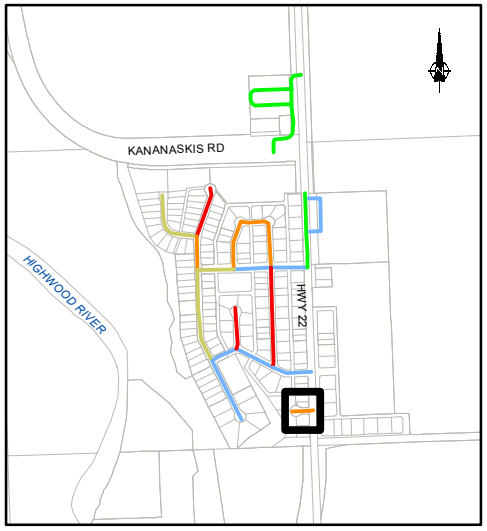
Other Notes: 3 Sani mh ,1 storm , portion south of LS gravel road has been replaced recently

MPE Engineering Ltd.

VILLAGE OF LONGVIEW

ASPHALT PAVEMENT RATING FORM

Project:	LONGVIEW IMP	File:	2530-013-00
Road ID:	WESTVIEW	Location:	Westview Place
Pavement:	Length: 55m	Width: 8.4m	Area: 462m^2
Pavement Type:	Asphalt	Date of Inspection:	August 2016
No. of Manholes Observed:	1	No. of Valves Observed:	1
Replace Sidewalk:		Replace Curb:	



Defects:		**Rating:**
Transverse Cracks	0-5	2
Longitudinal Cracks	0-5	1
Alligator Cracks	0-10	1
Shrinkage Cracks	0-5	2
Rutting	0-10	2
Corrugations	0-5	0
Ravelling	0-5	1
Shoving or Pushing	0-10	2
Pot Holes	0-10	0
Excess Asphalt	0-10	0
Polished Aggregate	0-5	0
Deficient Drainage	0-10	1
Overall Riding Quality (0 is excellent: 10 is very poor)	0-10	4
Sum of Defects:		16

Condition Rating = 100 - Sum of Defects: **Condition Rating** **84**

Other Notes: Large settlement at west side of cul de sac

MPE Engineering Ltd.

APPENDIX E

Video Inspection Assessment

Engineering Ltd.

VILLAGE OF LONGVIEW

SANITARY INSPECTION RATING RESULTS

Video Information		Location			Pipe Description			STRUCTURAL DEFECTS																							SERVICE DEFECTS												CONDITION RATING								
								Joint Displacement			Open Joint			Cracking			Fractures			Breaks (75)	Holes		Deformations			Pipe Collapsed (200)	Sagging			Debris			Protruding Service			Roots			Encrustation			Infiltration			Structural Condition Rating				Service Condition Rating				Overall Condition Rating	
Video date	Pipe ID	Street	From	To	Material	Diameter (mm)	Length (m)	Light (5)	Moderate (15)	Severe (40)	Light (1)	Moderate (2)	Severe (5)	Light (1)	Moderate (2)	Severe (5)	Light (5)	Moderate (15)	Severe (40)		<1/4 Dia (80)	1/4> Dia (165)	Light (20)	Moderate (50)	Severe (100)		Light (10)	Moderate (25)	Severe (50)	Light (3)	Moderate (10)	Severe (25)	Light (3)	Moderate (10)	Severe (25)	Light (3)	Moderate (10)	Severe (25)	Light (3)	Moderate (10)	Severe (25)	Light (3)	Moderate (10)	Severe (25)	Total Structural Score	Mean Structural Score	Peak Structural Score	Structural Condition Rating	Total Service Score	Mean Service Score	Peak Service Score	Service Condition Rating	From 1 (best) to 5 (worst)	DISC
2016.07.28	SP107	Kee Drive	17	16	CT	200	90.7				1				1			1																			1			1			18	0.20	15	2	6	0.07	3	1	2	4
2016.07.28	SP108		16	15	CT	200	121.6																																			0	0.00	0	1	0	0.00	0	1	1	4
2016.07.25	SP131	Morrison Road	22A	22	PVC	150	26.2	1									1																									10	0.38	5	1	0	0.00	0	1	1	1
2016.07.29	SP132		22	21	CT	200	91.8		1					1			1				1		1				1			1							2				1		146	1.59	80	4	53	0.58	20	5	5	1
2016.07.25	SP133		21	20	PVC	200	118.9																				1				1						1			1			25	0.21	25	3	9	0.08	3	1	3	1
2016.07.26	SP134		20	19	CT	200	112.1	1			1				1		1										1										1			1			38	0.34	25	3	6	0.05	3	1	3	1
2016.07.28	SP135		19	18	CT	200	122.1		1		1				1			1									1			1								1				1		43	0.35	15	2	23	0.19	10	3	3	1
2016.07.29	SP109		14	15	CT	200	78.7																				2										1			1			20	0.25	20	2	6	0.08	3	1	2	4
2016.07.29	SP136		18	14	CT	200	100.3	1			1			2				1											1									1			1			75	0.75	50	4	6	0.06	3	1	4	4
2016.07.29	SP110	Westview Place	14	51	CT/PVC	200	42.4							1			1												1													56	1.32	50	4	0	0.00	0	1	4	4
2016.07.29	SP101	Between West View Place and Lift Station	52	51	PE	200	44.8																						1													50	1.12	50	4	0	0.00	0	1	4	4
2016.07.29	SP102		52	53	PE	200	64.3																					1														25	0.39	25	3	0	0.00	0	1	3	4
2016.07.29	SP103		53	54	PVC	200	11.5	1																																		5	0.43	5	1	0	0.00	0	1	1	4
2016.07.29	SP105		54	55	PVC	200	38.3																																			0	0.00	0	1	0	0.00	0	1	1	4
2016.07.29	SP167		55	56	PVC	200	16.9																				1															10	0.59	10	2	0	0.00	0	1	2	4
2016.07.29	SP171		56	LS	PVC	200	2.9																																			0	0.00	0	1	0	0.00	0	1	1	4
2016.07.27	SP166		39	56	PVC	200	70.2																				1															10	0.14	10	2	0	0.00	0	1	2	3
2016.07.27	SP104	Riverview Place	40	39	PVC	200	69.6																																	2			0	0.00	0	1	6	0.09	6	2	2	3
2016.07.27	SP127		38	39	CON	200	73.6	1																			1										1			2			15	0.20	10	2	23	0.31	20	4	4	3
2016.07.26	SP115	Highwood Drive	32	33	CT/CON	200	67.3	1						2			1															1						1			2			24	0.36	15	2	26	0.39	20	4	4	2
2016.07.26	SP116		33	34	CON	200	66.20	1						2			1										1										1			1			34	0.51	15	2	13	0.20	10	3	3	2
2016.07.26	SP118		34	35	CON	200	90.00							2													2										2			1			22	0.24	20	2	16	0.18	10	3	3	2
2016.07.27	SP124		35	36	CON	200	89.2							1			1											1		2				1				1			1			31	0.35	25	3	22	0.25	10	3	3	2
2016.07.27	SP125		36	37	CON	200	90.9							1			1											1			1							1			2			31	0.34	25	3	26	0.29	20	4	4	3
2016.07.27	SP126		37	38	CON	200	85.0																				1			1							1			2			10	0.12	10	2	26	0.31	20	4	4	3
2017.07.26	SP158	Between West View Place a	32	45	PVC	200	84.6	1																			1													1			15	0.18	10	2	3	0.04	3	1	2	1
2017.07.26	SP157		48	45	PVC	200	110.1	1						1														1														31	0.28	25	3	0	0.00	0	1	3	1
2017.07.26	SP112	Little New York Estates	48	49	PVC	200	72.9	1						1																							1			1			6	0.08	5	1	13	0.18	10	3	3	1
2017.07.26	SP114		48	50	PVC	200	50.7																1						1													70	1.38	50	4	0	0.00	0	1	4	1
2017.07.26	SP113		46	50	PVC	150	47.0	1																				1						1			1						30	0.64	25	3	6	0.13	3	1	3	1
2017.07.27	SP156		47	46	PVC	150	35.2		1			1									1							1		1		1			1				1			147	4.18	80	5	26	0.74	10	3	5	1
2017.07.27	SP123	Longview Drive	31	35	PVC	200	97.0																				0.5															5	0.05	5	1	0	0.00	0	1	1	2
2016.07.26	SP137		31	27	CT	200	96.7		1					1			1											1			1						1			1			57	0.59	25	3	16	0.17	10	3	3	2
2017.07.27	SP122	Royalties Crescent	31	30	CT	200	66.5	2						1			1				1							1			1						1			1			132	1.98	80	4	9	0.14	3	1	4	2
2016.07.26	SP121		29	30	CT	200	57.5	1			1			1			1											1				1					1			1			37	0.64	25	3	16	0.28	10	3	3	2
2016.07.26	SP120		29	28	CT	200	77.0							1			2											1			1						2			1			22	0.29	10	2	15	0.19	6	2	2	2
2016.07.26	SP119		28	27	CT	200	120.0	1			1			1				1										1			1						2				1		48	0.40	25	3	22	0.18	10	3	3	2
2016.07.27	SP138	Twin Cities Drive	27	26	CT	200	83.9	2			1			1			1										1							1						2			38	0.45	15	2	16	0.19	10	3	3	3
2016.07.27	SP139		26	25	CT	200	63.1	1					1			1			1								1								1		1				1			80	1.27	40	3	38	0.60	25	5	5	3
2016.07.28	SP140		25	24	CT	200	121.5	1				2			1			1										1			1				1						1			51	0.42	25	3	19	0.16	10	3	3	3
2016.07.28	SP143	Foothills Drive	24	23	CT	200	32.0	1			1			1														1															57	1.78	50	4	3	0.09	3	1	4	4
2016.07.28	SP144		23	18	CT/PVC	200	65.1		1			1			1			1											1			1						2			1			59	0.91	25	3	15	0.23	6	2	3	4
2016.07.28	SP142		42	24	CT/PVC	200	113.0			1		1				1		1										1			1						1			1			112	0.99	50	4	12	0.11	3	2	4	3
2016.07.28	SP141	Mountain View Place	42	43	CT	200	97.5	1				1				1		1			1						2			1				1						1			127	1.30	80	4	19	0.19	10	3	4	3
2016.07.26	SP154	Malmberg Place	58	57	PVC	200	91.2																				0.5															5	0.05	5	1	0	0.00	0	1	1	2
2016.07.26	SP155		57	44	PVC	200	28.0																																			0	0.00	0	1	0	0.00	0	1	1	2
2016.07.26	SP117		44	34	PVC	200	68.5																				1															10	0.15	10	2	0	0.00	0	1	2	2

APPENDIX F

Cost Estimates

Village of Longview

COST ESTIMATE - Water & Wastewater Pipeline Replacement Projects
SUMMARY

11-May-17

SUMMARY		
Phase 1 - Twin Cities Dr., Mountain View Pl., Foothills Dr.	$	1,040,000
Phase 2 - Highwood Dr.	$	1,140,000
Phase 3 - Morrison Dr. (south of Foothills Dr.), Kee Dr.	$	1,480,000
Phase 4 - Morrison Dr. (north of Foothills Dr.)	$	1,620,000
Phase 5 - Royalties Cr. / Longview Dr.	$	950,000
Phase 6 - Trailer Park and Highway 541 crossing	$	620,000
TOTAL PROJECT COST ESTIMATE	**$**	**6,850,000**

Village of Longview
COST ESTIMATE - Water & Wastewater Pipeline Replacement Projects

Phase 1 - Twin Cities Dr., Mountain View Pl., Foothills Dr.

	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Phase 1 - Twin Cities Dr., Mountain View Pl., Foothills Dr.					
1	Mobilization and Demobilization	1	LS	$ 40,000	$ 40,000
2	Temporary Water Servicing	1	LS	$ 9,900	$ 9,900
3	Asphalt Removal and Disposal	5100	m2	$ 6	$ 30,600
4	200mm PVC SDR35 Sanitary Sewer	500	m	$ 200	$ 100,000
5	150mm Water Main	500	m	$ 200	$ 100,000
6	Remove and Dispose Existing Manholes	6	each	$ 600	$ 3,600
7	Tie-in to Existing Water Main	2	each	$ 1,500	$ 3,000
8	Reconnect and replace Ex Water and Wastewater Services	33	each	$ 3,000	$ 99,000
9	150mm gate valves	2	each	$ 3,000	$ 6,000
10	Replace Fire Hydrant	1	each	$ 9,000	$ 9,000
11	Type 5A Manholes	21	vm	$ 2,300	$ 48,300
12	Tie Ex Sanitary Sewer to Manholes	2	each	$ 1,500	$ 3,000
13	Road Core	5100	m2	$ 4	$ 20,400
14	Subgrade Preparation	5100	m2	$ 2.5	$ 12,750
15	Sub-Base Gravel (300mm compacted to 98% SPD)	1530	m3	$ 50	$ 76,500
16	Base Gravel (50mm compacted to 98% SPD)	255	m3	$ 80	$ 20,400
17	Asphalt c/w Prime Coat (90mm depth)	5100	m2	$ 29	$ 147,900
		SUBTOTAL			**$ 730,000**
GEOTECHNICAL TESTING (3%)					**$ 22,000**
CONTINGENCY (20%)					**$ 150,400**
TOTAL ENGINEERING (15%)					**$ 135,000**
		GRAND TOTAL			**$ 1,040,000**

Village of Longview
COST ESTIMATE - Water & Wastewater Pipeline Replacement Projects

Phase 2 - Highwood Dr.

	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Phase 2 - Highwood Dr.					
1	Mobilization and Demobilization	1	LS	$ 40,000	$ 40,000
2	Temporary Water Servicing	1	LS	$ 13,800	$ 13,800
3	Asphalt Removal and Disposal	5150	m2	$ 6	$ 30,900
4	200mm PVC SDR35 Sanitary Sewer	490	m	$ 200	$ 98,000
5	150mm Water Main	490	m	$ 200	$ 98,000
6	Remove and Dispose Existing Manholes	7	each	$ 600	$ 4,200
7	Tie-in to Existing Water Main	4	each	$ 1,500	$ 6,000
8	Reconnect and replace Ex Water and Wastewater Services	46	each	$ 3,000	$ 138,000
9	150mm gate valves	5	each	$ 3,000	$ 15,000
10	Replace Fire Hydrant	2	each	$ 9,000	$ 18,000
11	Type 5A Manholes	24.5	vm	$ 2,300	$ 56,350
12	Tie Ex Sanitary Sewer to Manholes	4	each	$ 1,500	$ 6,000
13	Road Core	5150	m2	$ 4	$ 20,600
14	Subgrade Preparation	5150	m2	$ 2.5	$ 12,875
15	Sub-Base Gravel (300mm compacted to 98% SPD)	1545	m3	$ 50	$ 77,250
16	Base Gravel (50mm compacted to 98% SPD)	258	m3	$ 80	$ 20,600
17	Asphalt c/w Prime Coat (90mm depth)	5150	m2	$ 29	$ 149,350
		SUBTOTAL			**$ 805,000**
GEOTECHNICAL TESTING (3%)					**$ 24,000**
CONTINGENCY (20%)					**$ 165,800**
TOTAL ENGINEERING (15%)					**$ 149,000**
		GRAND TOTAL			**$ 1,140,000**

Village of Longview
COST ESTIMATE - Water & Wastewater Pipeline Replacement Projects

Phase 3 - Morrison Dr. (south of Foothills Dr.), Kee Dr.

	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Phase 3 - Morrison Dr. (south of Foothills Dr.), Kee Dr.					
1	Mobilization and Demobilization	1	LS	$ 50,000	$ 50,000
2	Temporary Water Servicing	1	LS	$ 15,000	$ 15,000
3	Asphalt Sawcut	850	m	$ 15	$ 12,750
4	Asphalt Removal and Disposal	4185	m2	$ 15	$ 62,775
5	200mm PVC SDR35 Sanitary Sewer	455	m	$ 200	$ 91,000
6	150mm Water Main	455	m	$ 200	$ 91,000
7	Remove and Dispose Existing Manholes	6	each	$ 600	$ 3,600
8	Tie-in to Existing Water Main	2	each	$ 1,500	$ 3,000
9	Reconnect and replace Ex Water and Wastewater Services	16	each	$ 3,000	$ 48,000
10	150mm gate valves	4	each	$ 3,000	$ 12,000
11	Replace Fire Hydrant (and new hydrant on Kee Dr.)	2	each	$ 9,000	$ 18,000
12	Type 5A Manholes	21	vm	$ 2,300	$ 48,300
13	Tie Ex Sanitary Sewer to Manholes	2	each	$ 1,500	$ 3,000
14	Road Core	4185	m2	$ 4	$ 16,740
15	Subgrade Preparation	4185	m2	$ 2.5	$ 10,463
16	Sub-Base Gravel (350mm compacted to 98% SPD)	1465	m3	$ 50	$ 73,238
17	Base Gravel (150mm compacted to 98% SPD)	628	m3	$ 80	$ 50,220
18	Asphalt c/w Prime Coat (120mm depth)	4185	m2	$ 40	$ 167,400
19	Asphalt Overlay across whole width	10400	m2	$ 20	$ 208,000
20	Traffic Accomodation	1	LS	$ 60,000	$ 60,000
		SUBTOTAL			**$ 1,044,000**
GEOTECHNICAL TESTING (3%)					**$ 31,000**
CONTINGENCY (20%)					**$ 215,000**
TOTAL ENGINEERING (15%)					**$ 194,000**
		GRAND TOTAL			**$ 1,480,000**

Village of Longview
COST ESTIMATE - Water & Wastewater Pipeline Replacement Projects

Phase 4 - Morrison Dr. (north of Foothills Dr.)

	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Phase 4 - Morrison Dr. (north of Foothills Dr.)					
1	Mobilization and Demobilization	1	LS	$ 50,000	$ 50,000
2	Temporary Water Servicing	1	LS	$ 15,000	$ 15,000
3	Asphalt Sawcut	1020	m	$ 15	$ 15,300
4	Asphalt Removal and Disposal	4500	m2	$ 15	$ 67,500
5	200mm PVC SDR35 Sanitary Sewer	500	m	$ 200	$ 100,000
6	150mm Water Main	500	m	$ 200	$ 100,000
7	Remove and Dispose Existing Manholes	6	each	$ 600	$ 3,600
8	Tie-in to Existing Water Main	1	each	$ 1,500	$ 1,500
9	Reconnect and replace Ex Water and Wastewater Services	30	each	$ 3,000	$ 90,000
10	150mm gate valves	1	each	$ 3,000	$ 3,000
11	Replace Fire Hydrant	2	each	$ 9,000	$ 18,000
12	Type 5A Manholes	21	vm	$ 2,300	$ 48,300
13	Tie Ex Sanitary Sewer to Manholes	1	each	$ 1,500	$ 1,500
14	Road Core	4680	m2	$ 4	$ 18,720
15	Subgrade Preparation	4680	m2	$ 2.5	$ 11,700
16	Sub-Base Gravel (350mm compacted to 98% SPD)	1638	m3	$ 50	$ 81,900
17	Base Gravel (150mm compacted to 98% SPD)	702	m3	$ 80	$ 56,160
18	Asphalt c/w Prime Coat (120mm depth)	4680	m2	$ 40	$ 187,200
19	Asphalt Overlay across whole width	10400	m2	$ 20	$ 208,000
20	Traffic Accomodation	1	LS	$ 60,000	$ 60,000
		SUBTOTAL			**$ 1,137,000**
GEOTECHNICAL TESTING (3%)					**$ 34,000**
CONTINGENCY (20%)					**$ 234,200**
TOTAL ENGINEERING (15%)					**$ 211,000**
		GRAND TOTAL			**$ 1,620,000**

Village of Longview
COST ESTIMATE - Water & Wastewater Pipeline Replacement Projects

Phase 5 - Royalties Cr. / Longview Dr.

	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Phase 5 - Royalties Cr. / Longview Dr.					
1	Mobilization and Demobilization	1	LS	$ 40,000	$ 40,000
2	Temporary Water Servicing	1	LS	$ 6,300	$ 6,300
3	Asphalt Removal and Disposal	5202	m2	$ 6	$ 31,209
4	200mm PVC SDR35 Sanitary Sewer	405	m	$ 200	$ 81,000
5	150mm Water Main	410	m	$ 200	$ 82,000
6	Remove and Dispose Existing Manholes	5	each	$ 600	$ 3,000
7	Tie-in to Existing Water Main	3	each	$ 1,500	$ 4,500
8	Reconnect and replace Ex Water and Wastewater Services	21	each	$ 3,000	$ 63,000
9	150mm gate valves	3	each	$ 3,000	$ 9,000
10	Replace Fire Hydrant	2	each	$ 9,000	$ 18,000
11	Type 5A Manholes	17.5	vm	$ 2,300	$ 40,250
12	Tie Ex Sanitary Sewer to Manholes	2	each	$ 1,500	$ 3,000
13	Road Core	5202	m2	$ 4	$ 20,806
14	Subgrade Preparation	5202	m2	$ 2.5	$ 13,004
15	Sub-Base Gravel (300mm compacted to 98% SPD)	1560	m3	$ 50	$ 78,023
16	Base Gravel (50mm compacted to 98% SPD)	260	m3	$ 80	$ 20,806
17	Asphalt c/w Prime Coat (90mm depth)	5202	m2	$ 29	$ 150,844
		SUBTOTAL			**$ 665,000**
GEOTECHNICAL TESTING (3%)					**$ 20,000**
CONTINGENCY (20%)					**$ 137,000**
TOTAL ENGINEERING (15%)					**$ 123,000**
		GRAND TOTAL			**$ 950,000**

Village of Longview
COST ESTIMATE - Water & Wastewater Pipeline Replacement Projects

Phase 6 - Trailer Park and Highway 541 crossing

	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	COST
Phase 6 - Trailer Park and Highway 541 crossing					
1	Mobilization and Demobilization	1	LS	$ 40,000	$ 40,000
2	Asphalt Removal and Disposal	0	m2	$ 6	$ -
3	200mm PVC SDR35 Sanitary Sewer	395	m	$ 200	$ 79,000
4	150mm Water Main	395	m	$ 200	$ 79,000
5	Hwy 541 Crossing - Sanitary	1	LS	$ 50,000	$ 50,000
6	Hwy 541 Crossing - Water	1	LS	$ 45,000	$ 45,000
7	Remove and Dispose Existing Manholes	6	each	$ 600	$ 3,600
8	Tie-in to Existing Water Main	1	each	$ 1,500	$ 1,500
9	Reconnect and replace Ex Water and Wastewater Services	20	each	$ 3,000	$ 60,000
10	150mm gate valves	3	each	$ 3,000	$ 9,000
11	Replace Fire Hydrant	2	each	$ 9,000	$ 18,000
12	Type 5A Manholes	21	vm	$ 2,300	$ 48,300
13	Tie Ex Sanitary Sewer to Manholes	1	each	$ 1,500	$ 1,500
14	Road Core	0	m2	$ 4	$ -
15	Subgrade Preparation	0	m2	$ 2.5	$ -
16	Sub-Base Gravel (250mm compacted to 98% SPD)	0	m3	$ 50	$ -
17	Base Gravel (50mm compacted to 98% SPD)	0	m3	$ 80	$ -
18	Asphalt c/w Prime Coat (90mm depth)	0	m2	$ 29	$ -
		SUBTOTAL			**$ 435,000**
GEOTECHNICAL TESTING (3%)					**$ 13,000**
CONTINGENCY (20%)					**$ 89,600**
TOTAL ENGINEERING (15%)					**$ 81,000**
		GRAND TOTAL			**$ 620,000**