

INFRASTRUCTURE ASSESSMENT REPORT



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Executive Summary

In 2022, Town of Pictou staff reviewed and updated the street database that included condition ratings. Several budget options for varying levels of service were considered for the Town's street network based on a 10-year average condition model. Due to the significant backlog (24.2% of streets) that have failed pavement condition index significant funding is required to eliminate the backlog while still focusing on the maintenance and expansion (storm sewer separation and water distribution line improvements) of the primary arterial streets in Town. The Town's water and wastewater lines are significant age with an average age of approximately 80 years (average life expectancy of a line is 75 to 100 years). To reduce this backlog utility projects must be done along side the pavement projects

From the data collected three tables (Table 10, 11 and 12) provide recommended near future projects based on three street types: arterials and collectors, local streets with undersized watermains and failed local streets only requiring street replacement for council consideration.

The following are recommendations the Town should consider:

- Review and update the existing sub-division bylaw and engineering specifications (2012).
- Approving projects a year in advance. This will allow for time to prepare drawings and tender packages prior to the start of the next fiscal year, allowing for earlier tender posting.
- Continued focus of large projects.
- Increase funding to maintain average pavement condition index (PCI). This approach will improve the average PCI distribution and reduce the backlog to significantly lower levels over a 25-year period.
- Consider water and wastewater lines when selecting streets.

1.0 Street Assessment

1.1 Introduction

This report was prepared to provide the Town of Pictou Council with a snapshot of the condition of existing paved Town streets and to provide future capital recommendations and financial demands.

The scope of this report includes;

- Identify and assess existing paved streets;
- Identify streets needing repair or replacement;
- Provide estimate for costing;
- Establish capital priority list and work plan; and
- Integrate street assessment into Town GIS.

1.2 Introduction

The Town of Pictou, located on the Northumberland Shore of Nova Scotia, Canada and is accessed through Highway 106 on the west end of the Town. Highway 106 is maintained by the Province of Nova Scotia Public Works.

The Town owns and maintains 37.8 km of paved streets and 2 km of gravel streets.

The Town of Pictou has three classifications of streets as follows:

- Local – Provides direct property access and access thru subdivisions.
- Collector – Distributes traffic from local streets to arterials.
- Arterial – Conveys traffic throughout one area to another with limited access to properties.

1.3 Methodology

The street assessment follows the criteria developed by Halifax Regional Municipality (HRM) Pavement Surface Condition Rating Guide (2018) using a modified scoring criteria and primarily focusing on pavement distress manifestation. Three areas of distress that were inspected are surface distress (cracking, defects, potholes etc.), roughness and rutting.

1.4 Pavement Condition Index (PCI)

The pavement condition index rating is based on the distress manifestation observations. The index is out of ten with lower numbers indicating better street conditions. Appendix A presents the PCI rating for all town streets.

Table 1 - Pavement Condition Index

PCI	Pavement Condition Description
1 to 2	Very good – no to minor maintenance required
3 to 4	Good – basic maintenance required
5 to 6	Fair – basic maintenance / resurfacing required
7 to 8	Poor – resurfacing / reconstruction required
9 to 10	Failed – Reconstruction required

Table 2 - Classification Summary

Classification	Number of Segments	Number of km	Percent
Arterial	52	6.2	16.4%
Collector	85	9.2	24.3%
Local	188	22.4	59.3%

1.5 Observations and Results

Town pavement conditions are present in Table 3 and 4 and in Appendix A.

Table 3 - Pavement Condition Summary

PCI	Pavement Condition Description	Number of Segments (325 total)	Street Length (km) (37.8 total)	% Street Network (based of km)
1 to 2	Very good – no to minor maintenance required	74	8.87	23.5%
3 to 4	Good – Basic maintenance required	38	5.74	15.2%
5 to 6	Fair –Basic maintenance / resurfacing required	60	5.47	14.4%
7 to 8	Poor – resurfacing / reconstruction required	69	8.57	22.7%

9 to 10	Failed – reconstruction required	84	9.15	24.2%
Average PCI: 6				

Table 4 - Streets with PCI greater than 7

Street Name	Classification	PCI	Length (m)
Acadia	Local	7	274.2
Alfred	Local	8	216.4
Bark	Local	9	190.1
Battery	Local	10	111
Birch Hill Dr	Local	10	106.7
Browns Point Rd	Collector	8	600
Campbell Ct	Local	10	53.4
Cedar St	Local	10	507.5
Chapel St	Local	7	196.3
Chestnut St	Local	9	302.4
Cole St	Local	9	109.8
Constitution St	Local	10	121.6
Creighton St North	Local	7	99.4
Creighton St South	Local	10	81.6
Dawson St	Local	9	253.9
Dufferin St	Local	10	104.9
Dunromin Terr	Local	8	389.8
Elliott St	Local	9	1049.1
Elm St	Local	9	517

Fairview Ct	Local	10	129.6
Farm St	Local	10	76.3
Forest Dr	Local	10	125.9
Front St	Local	10	130.7
Geroge Hill Dr	Local	10	63.6
George St	Local	7	113.3
Gill Ct	Local	10	75
Grange St	Local	7	245.4
Haliburton St	Local	8	76.4
Harbour Cres	Local	10	235.2
Hector Ave	Local	8	117.7
High St	Local	7	311.6
Hill St	Local	9	170.5
James St	Local	7	100.6
Kinnear St	Local	10	71.9
Louise St	Local	7	239.5
Maple St	Local	8	264.7
North St	Local	8	92
Norway Point Rd	Local	8	462.8
Oak St	Collector	8	657
Oakridge Ct	Local	10	199.7
Oakridge Terr	Local	10	164.2
Palmerston	Local	8	62
Patlass Pl	Local	10	48.3
Patterson St	Collector	9	985

Pine St	Local	7	117.9
Pleasant St	Local	9	153.6
Poplar	Local	7	257.2
Prince Albert St	Local	10	143.1
Prince St	Collector	9	410.9
Princeton Crt	Local	10	113.1
Reade St	Local	8	188.8
Rowan Lane	Local	10	63.9
School St	Local	8	146.7
Sherwood Dr	Local	10	154.1
Sinclair St	Local	10	102
Smelters Lane	Local	10	172.4
St. Andrews St	Local	9	692.5
St. Stephan St	Local	8	62.3
Summit Dr	Local	10	156.9
Swantee Dr	Local	10	289.7
Tank St	Local	9	101.3
Taylor St	Local	10	73.7
Union St	Collector	8.5	664.2
Victoria St	Local	8	63.6
Wallis Dr	Local	10	92.4
Wellington St	Arterial	7	269.3
Welsford St	Collector	8	1021.5
West River Road	Arterial	7	533.2
Westwood Cres	Local	10	92.9

Westwood Dr	Local	10	294.3
Wilmot St	Local	10	131.7
Windemere St	Local	10	80.4
Young Ave	Local	10	220.6

Pavement condition indexes presented in table 4 represent average indexes across the length of the street, there may be localized areas within the street that show greater or lesser condition.

1.6 Condition Discussion

Table 5 summarizes the average condition of each street classification. The current average PCI is 6 across all street types showing an average PCI of fair. It should be noted that the distribution of the pavement condition leans heavily to the extremes. This is due to the recent increase in capital funding in the last 6 years and a lack of funding prior to 2016 (capital budget below \$100,000). There is a considerable backlog of streets with 24.2 percent failed and another 22.7 percent approaching a failed index.

Table 5 - Classification PCI Summary

Classification	Number of Segments	PCI
Local	188	7
Collector	85	6
Arterial	52	3.5
Total Streets	325	6

Sources of street failure are streets that were originally constructed in the 1970's to the 1990's were not constructed to the standards set out in the Sub-Division Bylaw at the time (See appendix B 1994 Town of Pictou Engineering Standards, oldest available copy). The latest version of the Sub-Division Bylaw was last updated in 2012. The following are areas where the subdivision standards were not followed:

- Section 2.2 and 2.3 the subbase layer was not properly prepared with the streets built (ex: Sea Birch Drive) on top of stumps and other organic material and minimal to no compaction was completed on the subbase.
- Section 2.6 were not followed, requiring approximately 10 inches of gravel base layer, for the most part streets in Town the base layer varies from 0 to 6 inches in thickness and is composed typically of either Type A gravels or sands.

- Section 2.9 were not followed as well the asphalt thickness specification of 3.46 inches were not used, instead asphalt thickness varied between 1.5 to 2 inches thick.

Past maintenance methods and renewal projects are also a source of street failure / premature street deterioration. Several streets in Pictou have been resurfaced / patched (sometimes multiple times) that do not have adequate base layers, this results in significant rutting and alligator cracking issues continuously reoccurring.

In addition, paving over the existing street results in the surrounding grade of the driveways, shoulders, sidewalks, curbs, and ditches being altered. This has resulted in curbs and sidewalks being buried in order to raise the surrounding area to the new street grade.

The cost per linear foot of curb and sidewalk are comparable to streets however they have a significantly longer lifespan. Raising the grade also changes the effectiveness of ditches and shoulders causing the water flow velocity to increase due to the increased slope of the shoulder/ditch. This results in erosion of the ditches and sediment buildup downstream from the higher elevation of the ditch.

The Town should not be accepting streets from developers that are incomplete (gravel) or not built to the Subdivision Bylaw specifications.

1.7 Rehabilitation and Reconstruction Costs

Cost estimates provided are based on the latest 2023 capital rates and include 15 percent for HST and a 15 to 30 percent contingency based on project complexity and design status. To note 2023 rates had considerable inflation (between 50 to 250 percent on various items) compared to 2021.

Table 6 summarizes the costs for re-construction of collector and arterial streets with an index of 7 or greater.

Table 6 - Summary of Collector and Arterial Re-construction Costs

Street Name	Classification	PCI	Length	Cost
Browns Point Rd	Collector	8	450	\$575,500
Oak St	Collector	8	657	\$839,000
Patterson St	Collector	9	985	\$1,028,000
Prince St	Collector	9	410.9	\$579,000
Union St	Collector	8.5	664.2	\$850,000
Wellington St	Arterial	7	269.3	\$385,000
Welsford St	Collector	8	1021.5	\$1,455,000
West River Road	Arterial	7	533.2	\$1,007,000

The cost to re-construct all streets listed in Table 6 would be \$6,718,500 for a total cost for all streets in Table 4 would be \$21,992,500. This cost only includes street costs and no utility replacement.

1.8 Budget and Performance analysis

The Town’s capital budget should be set to address the future needs of the town while addressing the backlog of failed streets. Currently the backlog is at 24.7 percent and is expected to increase to approximately 40 percent over the next ten years at current funding levels.

The following funding scenarios will be presented:

- Existing Funding Level;
- Maintain current network average (fair) and reduced backlog; and
- Maintain a network average of 4 (good).

Table 7 and Figure 1 summarize the three budget options.

Table 7 - Budget Options

Budget Scenario	Budget year 1	Replacement percentage	Estimate average PCI at year 10	Estimated Backlog at year 10
Existing Funding	\$800,000	2.2%	8.0	40%
Maintain existing average PCI	\$1,435,000	4	6.0	16%
Improved average	\$2,232,000	6.22	4.0	5%

***Notes:**

Existing funding assumes 5% inflation year over year.

Existing funding is sourced from capital and water budgets.

Maintained average and improved average funding assumes funding increases / decreases with inflation.

Budget included 15% HST and 15 to 30 % contingency.

Assumed 4 percent asphalt deterioration rate (3 to 5 percent typically range).

Backlog includes any streets with a rating of 9 or higher.

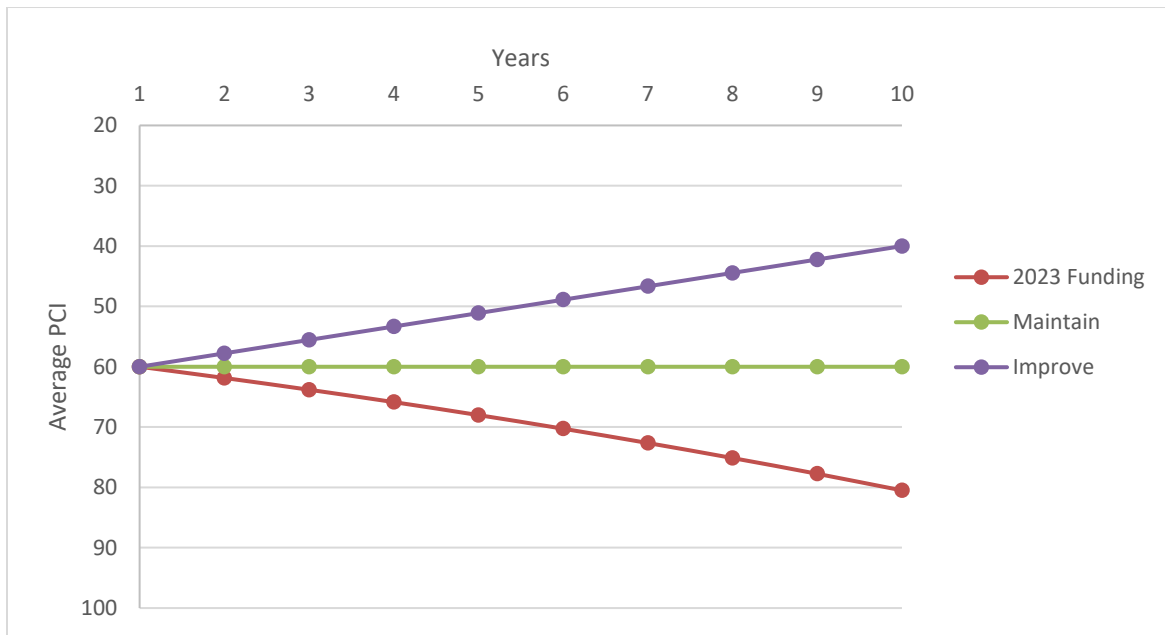


Figure 1 - Average PCI vs Time model

As shown in Table 7 and Figure 1 the current funding level will result in the continued deterioration of the streets in Pictou and a near doubling of the percent of failed streets over a ten-year period. To maintain the current PCI the budget would have to increase 80% to \$1,435,000. To note 2023 rate had considerable inflation (between 50 to 250 percent on various items) compared to 2021.

If delaying the capital replacement of streets in Pictou is not increased carries the following risks:

- Asphalt streets converting in to gravel streets;
- Increased operation maintenance requirements;
- Increase vehicle maintenance costs;
- Reduced street network safety;
- Increase in rehabilitation costs; and
- Increase disruption to street users.

2.0 Utility Distribution Assessment

2.1 Introduction

This section was prepared to provide The Town of Pictou Council a snapshot of the condition of existing underground utility distribution and transmission lines (water, sanitary sewer, and storm sewer) condition and to provide future capital recommendations and financial demands.

The scope of this report includes;

- Identify and assess existing underground utility lines;
- Identify lines needing replacement;
- Establish capital priority list and work plan; and
- Integrate utility line assessment into Town GIS.

2.2 Background

The four utility lines reviewed in this report are as follow:

- Water Distribution Lines – Delivers treated water to customers. The Town/Utility owns 37.3 km of water distributions lines.
- Water Transmission Lines – Conveys water from the water sources (wells) to the water treatment plant. The Town/Utility owns 10.5 km of water transmission lines
- Sanitary Sewer Lines– Conveys sewer to the lift stations and wastewater treatment plant. The Town owner 37.4 km of sewer lines
- Storm Sewer lines – Conveys Storm water to watercourses. The Town owns 2.2 km of storm sewer lines.

2.3 Methodology

The utility line assessment is based on break history and the age of the infrastructure for water distribution and transmission lines. The index is based on break frequency and flow severity. The water break index is summarized in Table 8. Appendix B shows the age of the water distribution and transmission lines. There is very limited data on the age of the sewer lines, for this report it is assumed that the age of the sewer lines roughly matches the age of the water line in the area. Sanitary sewer line breaks are rare with frequent issues being plugging due to objects entering the lines that shouldn't be flushed or lines sagging / improper line grade. Line sagging / improper grade locations will have to be identified in the future with camera inspection to quantify problem areas.

Table 8 – Waterline Pipe Assessment Table

Rating	Water Break Frequency	Severity (flow range l/min)
Low	1 or less break per 10 years	<150
Mid	2 breaks per 10 years	150-1000
High	More than 2 breaks per 10 years	>1000

2.4 Observations and Results

Table 9 - Summary of problem waterlines

Location	Line Type	Break Frequency	Severity	Age (approx.)	Length of Line (m)
West River Road	Watermain	High	High	120 Years	500
Union Street	Watermain	High	Low	75 Years	670
Water Street (West end)*	Watermain	Mid	High	122 years	400
Constitution Street	Watermain	Mid	Mid	120	120
Popular Street	Watermain	Mid	Low	75	410
Louise St	Watermain	Mid	Low	120 Years	640
Average line age: 80 years +/- 10 years					
*Break frequency and severity on Water St (West) has reduced significantly since the pressure reducing valves were installed in 2019					

2.5 Condition Discussion

2.5.1 Water Distribution

There are two areas within the Town that have high waterline break frequencies which are:

- The south portion of West River Road and the surrounding intersections and
- The “Heights” (the area between Welsford Street and Union Street and between Maple Street and Denoon Street.)

The contributing factors to the West River Road line failures are primarily driven by the age of the pipe and the pressure. To a lesser extent the pipe installation is a contributing factor due to heavy equipment

not existing, the pipes from that era are usually placed on bedrock or backfilled with bedrock with no bedding used underneath the pipe. The pipe material is not a factor in the failure of the watermain.

The contributing factors for the “Heights” waterline failures are driven by the material type (ductile iron) and construction. Early ductile iron waterlines have a history of early failures due to the native soil conditions (corrosive) and issues relating to the fabrication of the pipes during early production runs (irregular pipe wall thickness and concrete lining thickness). The construction issues encountered in the area are the result of the area originally being constructed for temporary war time housing during the 1940’s. Due to this quick construction, waterlines are often encountered wedged under boulders or with no bedding and rock fill on top of the pipes.

2.5.2 Water Transmission

The water transmission line has shown very little to no issues, with only one break in 25 years. However, parts of the line are 120 years old. The transmission lines consist of cast iron pipe and PVC plastic pipe. There currently are hydraulic issues with the wells and transmission lines that are being investigated.

2.5.3 Sanitary Sewer

The main issues with sanitary/combined sewer system are that many mains made of clay (pre 1990 approximately) have significant ground water infiltration issues due to clay pipes having no seal or gaskets at the bells. This permits inflow and infiltrations or I&I. This I&I has resulted in the average daily flows at the wastewater plant being roughly 2,000 m³ a day during extended dry weather periods, while the average water consumption is only 1,000 m³.

The main cause of sanitary sewer line failure (blockages not resulting from improper objects entering the sanitary sewer line) are lines that have sags or low / inverted grades. Sanitary sewer line collapse is a rare occurrence and has not been observed in the last 5 years (no recorded data beyond 5 years). Sanitary sewer line failures have been infrequent and isolated to areas with sagging and low grades. A future camera inspection program will be needed to identify these areas.

A solution, where appropriate, would be to convert the existing sanitary sewer to storm lines and install a new plastic sewer line. The main consideration with this approach is ensuring that there is a nearby approved discharge location or existing storm system.

2.5.4 Storm Sewer

Storm sewer lines are limited in the Town of Pictou with three lines existing, two in the downtown and one in the northeast corner of Town. For wastewater separation the two major sources of storm water entering the sanitary system are the central part of Town between West River Road and Wellington Street above Church Street and the “Heights”.

3.0 Recommendations

Town council should continue with improving the arterial and collector streets that would enable the creation of trunk storm water separation. Council should also consider aligning the replacement of watermains, that are prone to breaks, with asphalt street replacement.

The following is a summary of the priority projects for the next 10 years to consider.

Table 10 is a summary of projects that includes underground and sidewalk infrastructure to be replaced in addition to the asphalt.

Table 11 is a summary of local streets with undersized watermains (4 inch) and poor to failed asphalt conditions.

Table 12 is a summary of potential filler projects that only require asphalt and base replacement.

Table 10 - Priority Collector / Arterial Projects including underground infrastructure

Priority	Street Name	PCI	Road cost (including base)	Other costs (underground, sidewalk, curb)	Total	Timeframe	Comments
1	Coleraine Street	6	\$450,000	\$1,250,000	\$1,700,000	1 to 2 yrs	Required to complete Denoon Street storm line
2	West River Road	7	\$650,000	\$2,650,000	\$3,300,000	2 to 3 yrs	Multiyear project
3	Union Street	8.5	\$750,000	\$4,150,000	\$4,900,000	3 to 6 yrs	Multiyear project Cost can be reduced if existing sewer can be used as storm line
4	Welsford Street	8	\$500,000	\$2,800,000	\$3,300,000	4 to 7 yrs	Multiyear project
5	Constitution Street	10	\$100,000	\$350,000	\$450,000	2 to 5 years	
6	Caladh Avenue	3	\$850,000	\$1,400,000	\$2,250,000		Future consideration

	(form Market Street to Coleraine)						for street realignment and raising elevation to protect against future sea level rise
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Table 11 - Local Street projects that include replacement of undersized waterline

Priority	Street Name	PCI	Pavement cost	Other costs (underground)	Total
1	Patlass Place	10	\$140,000	\$105,000	\$245,000
2	West Maple Street	9	\$115,000	\$140,000	\$255,000

Table 12 - Local Streets that do not need underground infrastructure

Priority	Street Name	PCI	Pavement cost
1	Forest Street	10	\$150,000
2	Campbell Court	10	\$120,000
3	George Hill Drive	10	\$140,000
4	Wallis Drive	10	\$195,000
5	Sherwood Drive	10	\$290,000
6	Oakridge Terrace and Court	10	\$625,000
7	Westwood Drive and Crescent	10	\$700,000
8	Princeton Court	10	\$250,000
9	Smelters Lane	10	\$320,000
10	Dunromin Terrace	10	\$295,000
11	Hector Ave	10	\$165,000

12	Taylor Drive	10	\$75,000
13	Gil Court	10	\$75,000

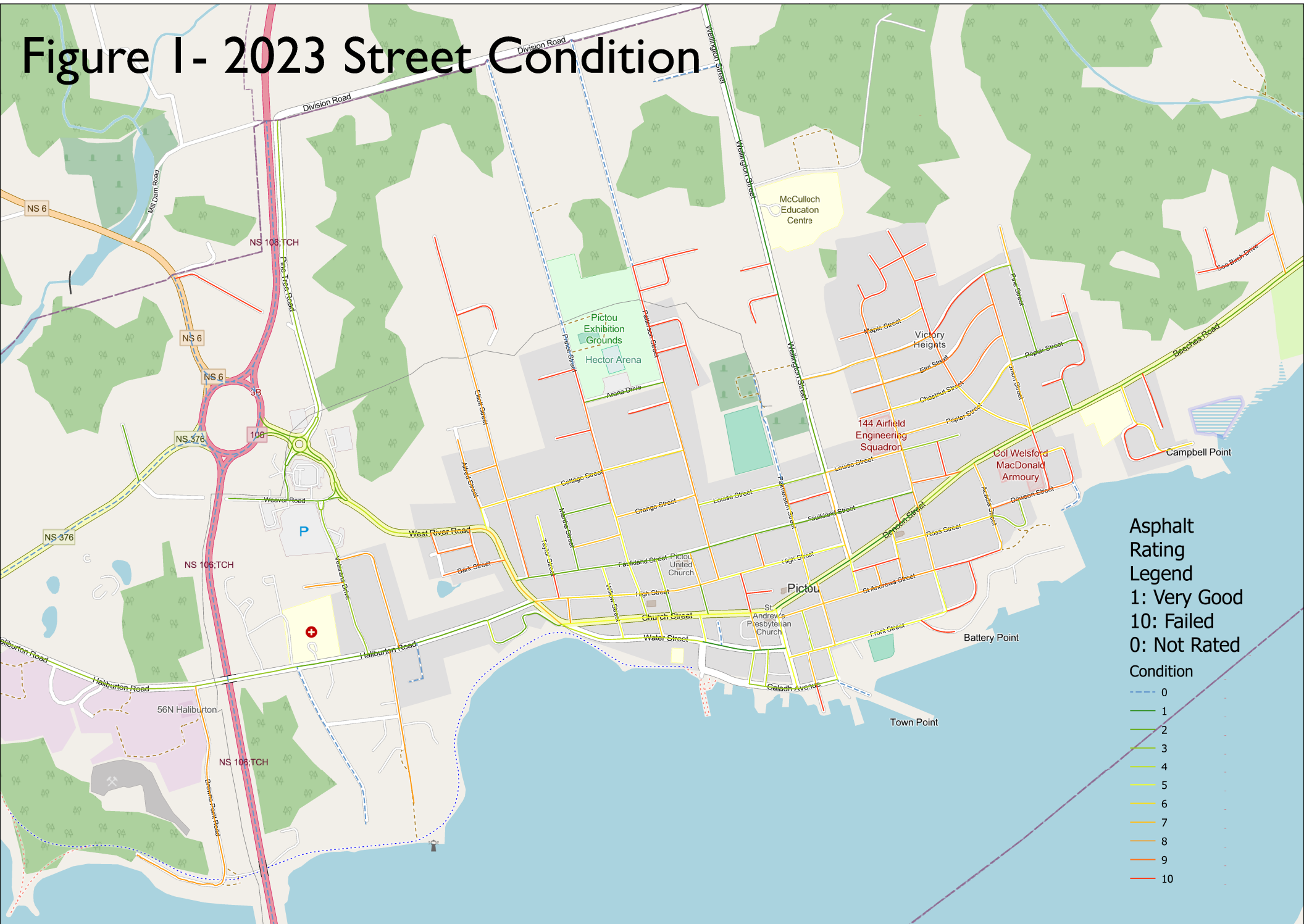
Project priorities will change based on future developments, street use and Town Priorities

The following are recommendations the Town should consider:

- Review and update the existing sub-division bylaw and engineering specifications (2012).
- Approving projects a year in advance. This will allow for time to prepare drawings and tender packages prior to the start of the next fiscal year, allowing for earlier tender posting.
- Continued focus of large projects.
- Increase funding to maintain average pavement condition index (PCI). This approach will improve the average PCI distribution and reduce the backlog to significantly lower levels over a 25-year period.
- Consider water and wastewater lines when selecting streets

Appendix A: Street rating and classification maps

Figure I- 2023 Street Condition



Asphalt Rating Legend

1: Very Good
 10: Failed
 0: Not Rated

Condition

- 0: Dashed blue line
- 1: Light green line
- 2: Green line
- 3: Yellow-green line
- 4: Yellow line
- 5: Orange-yellow line
- 6: Orange line
- 7: Red-orange line
- 8: Red line
- 9: Dark red line
- 10: Red line with white dashes

Appendix B: Waterline Map - Age

Appendix B: Waterline Map - Age



Appendix C: Sanitary Sewer Map

Appendix C: Sanitary Sewer Map



Appendix D: Storm Water Map

Appendix D: Storm Water Map



Appendix E: 1994 Sub Division By-Law

SCHEDULE "D"

TOWN OF PICTOU; ENGINEERING SPECIFICATIONS

The Town of Pictou has adopted the "Standard Specifications for Municipal Services" produced by the Joint Committee on Contract Documents which serves as the basic guideline for the construction of roads and instillation of municipal services for the Town. In the event of a discrepancy between Schedule "D" and the Standard Specifications for Municipal Services, the latter document shall prevail.

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Section 1: DRAWING SPECIFICATIONS

- (1.1) All drawings submitted shall be drawn on proper drafting paper and shall contain:
- a) Plan view of recommended scale of 1:500 or 1:200. 1:500 preferred
 - b) Profile view to a vertical scale in the ratio of vertical to horizontal of 1:10
 - c) Location Map
 - d) Legend for plan and profile
 - e) A north arrow
 - f) Provisions for notes, revisions, dates, scale and drawing title
 - g) All existing watercourses and their direction of flow
 - h) Two points of known chainage on the center line of street to be related to the N.S. Coordinate Survey System
 - i) Survey monument number and elevation from which vertical elevations were derived
 - j) Street lines and lot boundaries
- (1.2) All drawings shall contain a plan and profile view of all proposed services (cross-section and details as required)
- (1.3) All drawings shall be stamped and signed by a Professional Engineer registered in the Province of Nova Scotia
- (1.4) All engineering drawings submitted shall be drawn on one of the following standard sheet sizes:
- A0 841 mm x 1189 mm (33.11 in x 46.81 in)
 - A1 594 mm x 841 mm (23.39 in x 33.11 in)
 - A2 420 mm x 594 mm (16.54 in x 23.39 in)

(1.5) All "as constructed" drawings shall be prepared on dlar reproducible film, minimum 1 mm thickness, drawn to an appropriate scale and shall include:

- a) All items, contained in Part 1, Section 1.1.
- b) Plan and profile view of all "as constructed" services.
- c) Rock profile where applicable.
- d) A cross-section and details.
- e) The stamp and signature of Professional Engineer registered in the Province of Nova Scotia.

Section 2: STREET SPECIFICATIONS (SD-1 to SD-4)

(2.1) The Town of _____ road classification and basic criteria shall be as follows:

	<u>Designation R-O-W Width</u>	<u>Pavement Width</u>
Collector & Local	15.24 m - (50 ft)	6.71 m (22 ft) face of curb to face of curb
Cul-de-sac	Minimum radius of 15.24 m (50 ft)	Minimum radius of 10.97 m (36 ft) from center of bulb to face of curb

(2.2) All clearing and grubbing operations, including the removal of rock, shall be undertaken to the full extent of the street right-of-way. All rocks, trees, stumps and other organic matter removed during the clearing and grubbing operations shall be transported entirely from the site.

(2.3) The top 300 mm (12 in) of the proposed subgrade shall be compacted to 98% standard proctor and graded with a 2% crown along the center line at an elevation of a minimum of 338 mm (13.31 in) below the finished grade of the street. Where rock exists to the subgrade, it shall be fractured to 300 mm (12 in) below subgrade and graded.

(2.4) All slopes in cut and fill sections shall be constructed outside the street right-of-way and shall be a minimum of 2:1 horizontal to vertical or as otherwise required for less stable material.

Rock cuts shall be a minimum of 1:4 or as otherwise required. All overhanging and/or loose rocks shall be removed and, in areas where a minimum of 1:4 cannot be obtained, slope protection shall be required.

(2.5) Except as specified in Section 2.3, in fill sections, all fill material shall be compacted in uniform layers of 300 mm (12 in) and compacted to 95% standard proctor density. It shall be evenly distributed to ensure proper mixing of rocks and fill materials so that proper compaction and consolidation can be achieved. Under no circumstances shall rock migration, creating voided areas, be permitted around underground structures or elsewhere. No rock fill exceeding 300 mm (12 in) in any dimension shall be placed within the top 600 mm (24 in) of subgrade elevation.

(2.6) Under stable conditions, the base course gravel shall consist of Class "C"

and Class "A" material in compacted minimum layers of 150 mm (5.91 in) and 100 mm (3.94 in) respectively, compacted to 100% standard density, and graded with a 2% crown along the center line street.

(2.7) The required depth of base course gravels is directly dependent upon the conditions of the subgrade. Therefore, the specific design shall be determined by a Geotechnical Engineering Firm prior to placement and paving.

The gradation of the Class "C" and Class "A" gravel materials shall be as follows:

Sieve Size	% of Weight Passing	
	Class "A"	Class "C"
56.0 -	-	100
28.0	-	60 - 80
20.0	100	-
14.0	50 - 85	-
5.0	20 - 50	25 - 45
0.160 -	0 - 10	0 - 10
0.080 -	0 - 7	-

(2.8) The maximum allowable grade of any street shall be 10% with 4% being the maximum for 30 m (100 ft) prior to the intersection of two center lines. The minimum grade of any street shall be 0.5%.

(2.9) All streets shall contain standard curb and gutter, as shown on SD-2 and SD-3, and as specified in section 9 and paved with a minimum of 88 mm (3.46 in) hot-mix asphalt. Area behind the curb extending 3.12 m (10ft) (to street line) shall be filled with material not exceeding 100 mm (4in) in any dimension and graded at 2% to the top of the curb. Asphalt design, placement, sampling and testing shall be in accordance with Department of Transportation Standard Specifications, Division 4, Section 4. Testing to be performed by a qualified testing company and the test results submitted to the Town of Pictou for review.

(2.10) All concrete surface structures shall be a minimum of 30 MPa, 6% air-entrained, 76 mm (3in) slump (except for mechanical extruders), cured with

a curing compound in accordance with Standard Specifications. Cold weather protection methods CAN/CSA A23.1 must be followed when air temperature is expected to fall below 5 degrees C.

(2.11) Class "A" and "C" gravel sampling and testing shall be in accordance with CSA and Department of Transportation Standards. Testing (sieve analysis, Proctor, compaction, etc.) to be performed by a qualified testing company and the test results submitted to the Town of Pictou for review.

(2.12) Sodding shall be placed from the back of the curb to the street line at 2% to the top of curb. Where driveway openings exist in the curb and gutter, sod shall not be placed in the driveway. Sodding shall be installed in accordance with the criteria as set out in Section 11 of these Specifications and Standard Drawing SD-1.

(2.13) Street signs shall be placed at all intersections. The signs will show street names and shall be as shown on Standard Drawing SD-4.

Section 3: SANITARY SEWER SPECIFICATIONS (SD-5 to SD-9, SD-12 and SD-13)

Sanitary sewer systems shall conform to the following specification and design criteria.

(3.1) The sanitary sewer system shall be designed for the peak dry weather flow based on:

- a) A maximum population density of 45 persons per gross hectare;
- b) a per capita flow of 340 litres/day;
- c) an infiltration allowance of 0.14 litres/second/gross hectare;
- d) peak domestic sewage flows to be calculated by the following equation:

$$Q(d) = \frac{PqM}{86.4} + IA$$

where:

Q(d) = peak domestic sewage flow (including extraneous flow) in L/s;

P = design population in thousands;

q = average daily per capita domestic flow in litres/capita per day (exclusive of extraneous flow);

M = peaking factor, as derived from the Harman Formula

$$M = 1 + \frac{14}{4+P}^{0.5}$$

The minimum permissible peaking factor shall be 2.0.

I = unit of peak extraneous flow, in litres/second per hectare;

A = tributary area in gross hectares.

(3.2) The sanitary sewer main pipe and fittings shall be:

- a) Polyvinyl chloride (PVC) DR 28 200 mm and larger certified to

CSA B182.2-M.

- b) Non-reinforced concrete to ASTM C 14 or CSA A257.1M specifications with bell and spigot joint and flexible rubber gasket.
- c) Reinforced concrete to ASTM C76 or CSA A257.2M specifications with bell and spigot joint and flexible rubber gasket.

The minimum size of the main shall be 200 mm (8in).

- (3.3) All pipe shall be laid at a uniform vertical grade and horizontal alignment in a compacted gravel bedding placed in an undisturbed or approved trench bottom. Gravel bedding along the sides of the pipe shall be installed and compacted in such a way as not to alter the alignment or grade of the pipe. Bedding shall extend to 300 mm (12in) above top of pipe for full trench width and be compacted to 95% standard Proctor density. Further backfilling shall be placed in layers to achieve a 95% standard Proctor

density with the following exceptions:

- .1 Top 300 mm below subgrade to 98% standard Proctor density.
- .2 Gravel under paved surface to 100% standard Proctor density.
- .3 Clear stone to 70% relative density.

Work shall be carried out in a manner which ensures that no rock migration will occur around manhole structures. Refer to standard drawing

SD-5.

When manhole or water main structures are located within 304.8 mm (12in) of each other, this area must be backfilled and compacted using Class "A" or 3/4" clear stone gravel.

All pipe shall be laid in accordance with Nova Scotia Road Builders Association Standard Specifications for Municipal Service Section 02517 sub-section 3.3.

- (3.4) All sanitary sewer mains shall have a minimum grade of one half (0.5) percent.

- (3.5) Sanitary sewer flow velocities shall be a minimum of two (2') (.6m) feet per second and a maximum of fifteen (15') (4.57m) feet per second.

- (3.6) All manholes, see Drawings SD-6 & SD-7, shall be standard A.S.T.M. C-478 and shall have a precast or cast-in-place base. Manhole diameter sizes shall be in conformance with Standard Drawing SD-6 maximum pipe size chart. All manholes shall be constructed using precast

sections and
cone section.

conform to the 110
minimum of 150 mm

"O" ring gaskets and topped with 900 mm (36in) eccentric
Where flat top capping rings are to be used, they shall
series loading requirement. Grade rings shall be a

(6in) thick with final adjustment being completed using poured in place concrete or an approved non-shrink grout. The standard MH frame and cover for roadways shall be ASTM A48. All ring joints shall be grouted. Manhole ladders shall conform to Standard Drawing SD-8 or approved equal.

(3.7) Manholes shall be installed at all changes in grade or alignment, at all intersections and at intervals not exceeding ninety (90) metres (300ft). Installation of Manholes shall be in accordance with N.S. Road Builders Association Standard Specifications for Municipal Services Section 02515 Section 3.3.

(3.8) Internal drop precast manholes (Drawing - SD-9) shall be sized to ensure a minimum width of 1000 mm (40in) for inside edge of internal drop to the opposite inside wall of the manhole.

(3.9) Sanitary sewer service laterals shall be a minimum of 100 mm (4in) in size, connected to the main at an angle of 90 degrees and connections to the main shall be by using an in-line "Tee" or "Wye" connector. All the laterals shall enter the main at spring line or above. Long radius 22 1/2 degrees bends shall be used for installation of service laterals. Sanitary sewer service laterals shall be filled with a watertight plug or cap at termination point and a 38 mm x 89 mm (2in x 4in) marker stake at end of service extending to 600 mm (24in) above finished grade. The stake shall be red with SAN marked in black.

(3.10) The sanitary service lateral shall be:

- a) Polyvinyl chloride (PVC)DR 35 with rubber gasket bell and spigot joint:
 - i) < 150 mm certified to CSA B182.1 - M
 - ii) > 200 mm certified to CSA B 182.2 - M"; and
- b) Non-reinforced concrete to ASTM C14 or CSA A257.1M specification with rubber gasket bell and spigot joint.
- c) Reinforced concrete to ASTM C76 or CSA A257.2M specification with rubber gasket bell and spigot joint.

The sanitary sewer lateral shall be laid at a minimum grade of 2%, graded uniformly to the main in a compacted gravel bedding and backfilled in accordance with Standard Drawings SD-12 and SD-13.

- (3.11) Sanitary service laterals connected into manholes shall enter the manhole at the top or the benching. When service laterals enter manholes, a pipe stub shall be incorporated to ensure a flexible joint within 450 mm (18in) of the outside wall of the manhole.
- (3.12) Sewage pumping stations, where necessary, shall be designed and constructed in accordance with Standard Engineering Principles.
- (3.13) Where existing topography dictates a need to service a dwelling unit utilizing a forcemain, the forcemain service shall be entirely upon private property, connected to a gravity service lateral at the street line.
- (3.14) The subdivider shall not bury any pipe or appurtenances until they have been inspected by the designated representative of the Certifying Engineer.
- (3.15) Testing (sewer analysis, Proctor, compaction, etc.) to be performed by a qualified testing company and the test results submitted to the Town of Pictou for review. Submit infiltration and exfiltration test results to the Town of Pictou for review.

Section 4: STORM SEWER AND CULVERT SPECIFICATIONS (SD-5 to SD-9 and SD-12 to SD-14)

- (4.1) All foundation drains shall be connected to the storm sewer system.
- (4.2) The storm sewer main (Drawing -SD-5) shall be installed parallel to the center line of the street and offset from the sanitary sewer main by a minimum of 300 mm (12in). The minimum depth of the storm sewer main will be 2 meters (6.5ft).
- (4.3) The storm sewer main shall be Polyvinyl chloride (PVC) DR 28, 200 mm and larger, certified to CSA B182.2;
- (4.4) All pipe shall be laid at a uniform vertical grade and horizontal alignment in a compacted gravel bedding placed in an undisturbed or approved trench bottom. Gravel bedding along the sides of the pipe shall be installed and compacted in such a way as not to alter the alignment or grade of the pipe. Bedding shall extend to 300 mm (12in) above top of pipe for full trench with and be compacted to 95% standard Proctor density with the following exceptions:
1. Top 300 mm below subgrade to 98% standard Proctor density.
 2. Gravel under paved surface to 100% standard Proctor density.
 3. Clear stone to 70% relative density.
- Further backfill to be placed in layers to achieve a 95% standard Proctor density with the above noted exceptions. Work shall be carried out in a manner which ensures that no rock migration will occur around manhole structures. When manhole or water main structures are located within 304.8 mm (12in) of each other, this area shall be backfilled and compacted using Class "A" or 3/4" clear stone gravels. All pipe shall be laid in accordance with N.S. Roadbuilders Association Standard Specification for Municipal Services Section 02516 Sub section 3.3.
- (4.5) All manholes (Drawings - SD-6, SD-7) shall be standard A.S.T.M. C-478 and shall have a precast or cast-in-place base. Manhole diameter sizes shall be in conformance with Standard Drawing SD-6, maximum pipe size chart. All manholes shall be constructed using precast sections and "O" ring gaskets and topped with a 900 mm (36in) eccentric cone section. Where flat top capping rings are to be used, they shall conform to the 110 series loading requirement. Grade rings shall be a minimum of 150 mm (6in) thick with final adjustment being completed using poured in place concrete or an approved non-shrink grout. All frames, covers, and gratings shall conform to the standard ASTM A 48. All ring joints shall be grouted.
- Manhole ladders shall conform to Standard Drawing SD-8 or approved equal.

(4.6) Manholes shall be installed at all changes in grade or alignment, at all intersections and at intervals not exceeding ninety (90) metres (300ft). Installation of manholes shall be in accordance with N.S. Roadbuilders Association Standard Specifications for Municipal Services Section 02515 Section 3.3.

(4.7) Internal drop precast manholes (Drawing - SD-9) shall be sized to ensure a minimum width of 1000 mm (40in) from inside edge of internal drop to the opposite inside wall of the manhole.

(4.8) Polyvinyl chloride (PVC) DR 35 with rubber gasket bell and spigot joint.

i) < 150 mm certified to CSA B182.1M

ii) 200 mm and greater certified to CSA B182.2-M"

Storm sewer service laterals shall be a minimum of 100 mm (4in) in size, connected to the main at an angle of 90 degrees and connections to the main shall be by using an in-line "tee" or "wye" connector.

1/2 Storm termination green
All laterals shall enter the main at spring line or above. Long radius 22 degrees bends shall be used for installation of service laterals. service laterals shall be fitted with a watertight plug or cap at point and a 38 mm x 89 mm (2in x 4in) marker stake at end of service extending to 600 mm (24in) above finished grade. The stake shall be with STORM marked in black.

(4.9) The storm sewer lateral shall be laid at a minimum grade of 2%, graded uniformly to the main in a compacted gravel bedding and backfilled in accordance with Standard Drawing SD-12 and SD-13.

(4.10) All catch basins (Drawing - SD-14) shall be located in the gutter line of the street. The capping ring shall be 110 series highway loading and the frame and grating shall be to ASTM A 48 standards. All catch basins shall be ASTM C478 standards and shall be 600 x 600 mm (24in x 24in).

(4.11) Catch basins shall be installed in sufficient numbers so as to prevent flooding of the road surface with a maximum distance between catch basins of 90 metres (300ft). Double catch basins shall be installed at intersections where the preceding street grade exceeds 8%.

- (4.12) All catchbasin lead pipes shall have a minimum diameter of 250 mm (10in) and shall be ASTM C-14 or ASTM C-76 gasketed concrete pipe or SDR 35 PVC. Catch basin leads shall have a minimum bury of 1 metre (3.2ft) and shall enter the closest storm manhole. The invert of catch basin lead shall not exceed the invert out at the manhole by more than 1 metre (3.2ft).

No catch basin lead shall protrude into the manhole or catch basin by more than 75 mm (3in) and shall be grouted and finished on the inside and outside of the structure. Catch-basin leads at the manhole shall incorporate a flexible joint within 450 mm (18in) of the outside wall of the manhole.

Where the connecting lead pipe to a manhole services two or more catch basins together, the minimum diameter of this connection lead pipe shall be 300 mm (12in).

- (4.13) Culvert pipes shall be new, meeting ASTM C14 or ASTM C76 concrete pipe or CAN3 G401 corrugated steel pipe. The minimum diameter for a culvert pipe shall be 300 mm (12in).
- (4.14) The subdivider shall not bury any pipe or appurtenances until they have been inspected by the designated representative of the Certifying Engineer.
- (4.15) Testing (sieve analysis, Proctor, compaction, etc.) to be performed by a qualified testing company and the test results submitted to the Town of Pictou for review.
- (4.16) Non-reinforced concrete pipe should also reference CAN/CSA A257.1, and reinforced pipe should also reference CAN/CSA A257.2.

Section 5: WATER SYSTEM SPECIFICATIONS (SD-1, 5, 12, 15 and 16)

- (5.1) The water main shall be installed parallel to the centre line of the street and offset from the sanitary sewer mains by a minimum of 300 mm (12in) vertically (water main above the sewer main) and 450 mm (18in) horizontally. Refer to standard drawing SD-5.
- (5.2) The distribution system should be looped if possible. When dead-end water mains are required the water pipe should have a negative slope to the looped section of the distribution system to prevent accumulation of debris in the dead-end section.
- (5.3) Sectionalizing valves should be so located as to minimize isolated areas in the event part of the system must be shut down for repairs. Typically valves are to be located at road intersections and at 150 m (500ft) intervals.
- (5.4) The minimum depth of cover over the water main will be 1.5 metres (5ft).
- (5.5) The water main shall have a minimum diameter of 200 mm (8in) and shall be:
- a) Ductile iron pipe: to AWWA C151, cement mortar lined.
 - b) Ductile iron fittings: to AWWA C110, cement mortar lined, minimum pressure rating 1035 kPa.
 - c) Cement mortar lining: to AWWA C104.
- (5.6) Joints shall be mechanical or push-on in accordance with AWWA C-111, flanged where indicated, to AWWA C110 with Class 125 flanged ends to ANSI/ASME B16.1
- (5.7) All pipe shall be laid in a compact gravel bedding placed in an undisturbed or approved trench bottom. Gravel bedding along the sides of the pipe shall be installed and compacted in such a way as not to alter the alignment of the pipe. Bedding shall extend to 300 mm (12in) above top of pipe for full trench width and be compacted to 95% standard Proctor density with the following exceptions:
- .1 Top 300 mm below subgrade to 98% standard Proctor density.
 - .2 Gravel under paved surface to 100% standard Proctor density.
 - .3 Clear stone to 70% relative density.

Provide concrete thrust blocks to undisturbed ground on all tees, bends, plugs and caps. Construct as indicated on Standard Drawing SD-1 and keep joints and couplings free of concrete.

etc.
mm
using

Further backfill to be placed in 200 mm (8in) layers to achieve a 95% standard Proctor density and shall be carried out in a manner which ensure that no rock migration will occur around valves and fittings. When manholes and water main structures are located within 300 (12in) of each other, this area shall be backfilled and compacted Class "A" 20 mm (.8) clear stone gravel.

(5.8)

(1) Buried gate valves shall be to AWWA C500, minimum pressure rating 1035 kPa or AWWA C509 up to 300 mm (12in), minimum working pressure rating 1380 kPa and as follows:

seals.

- a) Body: cast-iron with mechanical joint ends.
- b) Mechanism (AWWA C500): bronze mounted, solid wedge or double disc gates, non-rising spindle, and O-ring seals.
- c) Mechanism (AWWA C509): wedge disc with resilient rubber seat ring and machined seating surface, non-rising spindle, and O-ring seals.
- d) Direction of opening: counterclockwise
- e) Operating nut: 50 mm square.
- f) Provide centering disc.

(2)

Gate valves in chamber shall be to AWWA C500, minimum working pressure rating 1035 kPa or AWWA C509 up to 300 mm, minimum working pressure rating, 1380 kPa and as follows:

- a) Body: cast-iron with Class 125 flanged ends to ANSI/ASME B16.1.
- b) Mechanism (AWWA C500): bronze mounted, solid wedge or double disc gates, O.S. & Y., rising stem, and hand wheel.
- c) Mechanism (AWWA C509): wedge disc with resilient rubber seat ring and machined seating surface, O.S. & Y., rising stem and hand wheel.
- d) Direction of opening: counterclockwise.

(5.9)

Valve boxes shall be to AWWA C500 and as follows:

- a) Cast-iron, slide type, adjustable for depth of pipe below finished grade. Minimum adjustment 450 mm (18in).
- b) Covers marked "Water".
- c) Lugged to prevent turning and rolling of cover, and cover notched to suit.

(5.10)

Valve chambers to be gasketed precast concrete sections to ASTM C478M with ladder rungs cast integral with unit. Cover to be marked

- "WATER".
- (5.11) Water service pipe shall be:
- a) Copper tubing to ASTM B88, type K annealed, minimum pressure rating 1035 kPa.
 - b) Polyethylene pipe to CSA B137.1 type PE, series 160.
- (5.12) Construct service connections at right angles to water main. Tappings on ductile iron pipe may be threaded without service clamps. Corporation stops: Brass to ASTM B62, compression type, inlet threads to C800, to be installed at main on service lateral. Install taps on main at 2 o'clock or 10 o'clock position only, not closer to a joint nor closer to adjacent service connections than recommended by manufacturer, or 1 m (3.3ft), whichever is greater. Install service pipe in "Goose Neck" form "laid over" into horizontal position. Refer to Standard Drawing SD-12.
- (5.13) The keg-type curb stop brass material is to ASTM B62 with drains and adjustable bituminous coated cast iron service box with stem to be placed 300 mm (12in) from property line within street right-of-way for each service lateral. Top of cast iron box to be marked "WATER". Place temporary location markers 38mm x 89mm (2in x 4in) stake from pipe elevation to .600 mm (2ft) above grade at ends of unconnected water lines. Paint exposed portion of marker BLUE with designation "Water Service Line" in black.
- (5.14) Hydrants to be M67 McAvity hydrant with two 2 1/2" hose nozzles and 1 N.S. Standard Pumper Nozzle with 6" mechanical joint. Hydrants to open counter clockwise. Depth of bury 1.8 M. Hydrants to be painted red.
- (5.15) Install hydrants in accordance with AWWA Manual of Practice with 150 mm (6in) gate valve and cast iron valve box on hydrant service lead. Hydrants to be set plumb with hose outlets parallel with edge of pavement or curb line with pumper connection facing roadway and with body flange set at elevation of 50 mm (2in) above final grade. Place concrete thrust blocks as indicated on Standard Drawing SD-15. Provide a 1 m x 1 m x 0.5 m (3ft x 3ft x 1.5ft) deep drainage pit backfilled with coarse gravel or crushed stone to a level 150 mm (6in) above drain holes of a hydrant. Locate hydrants so that any potential fire can be reached from two hydrants, each serving no more than 90 m (300ft) of hose.
- (5.16) The subdivider shall not bury any pipe or appurtenances until they have been inspected by the designated representative of the Certifying Engineer.

(5.17) Flushing and disinfecting of water mains shall be performed by the contractor and witnessed by the designated representative of the Engineer. The mains will be flushed with a sufficient flow velocity of 1.5 m/sec. (5ft/sec), within pipe for 10 min. or materials have been removed and flushed water is clear. After flushing has been completed disinfection of water mains shall be to AWWA C651 and in accordance with N.S. Roadbuilders Association Standard Specifications for Municipal Service section 02518 Section 3.10.

(5.18) Testing (sieve analysis, Proctor, compaction, etc.) to be performed by a qualified testing company and the test results submitted to the Town of Pictou for review. Submit Hydrostatic and leakage test results to the Town of Pictou for review.

(5.19) Connection to existing mains will be by the Town of Pictou at the sub-dividers cost.

Section 6: PIPE TESTING

- (6.1) Notify the Certifying Engineer at least 24 hours in advance of all proposed tests. Perform tests in presence of Certifying Engineer or his designate.
- (6.2) Immediately following the tests, submit the test results to the Town of Pictou for review.
- (6.3) **SANITARY SEWER TESTING**

- (1) Test each section of sewer. A section is the length of pipe between successive manholes or termination points, including service connections.
- (2) Flush sewers and related appurtenances to remove foreign materials.
- (3) Low Pressure Air Testing.

CAUTION:

FOR SAFETY OF PERSONNEL AND PUBLIC, OBSERVE PROPER PRECAUTIONS DURING AIR TESTING. USE TEST EQUIPMENT DESIGNED TO OPERATE ABOVE GROUND. DO NOT PERMIT PERSONNEL IN TRENCH DURING TESTING. DO NOT AIR TEST PIPE WITH DIAMETER GREATER THAN 600 MM (24IN).

- a) Provide air testing equipment meeting the following requirements:
 - i) Air Blower: 14 litres/sec, maximum pressure 70 kPa continuous.
 - ii) Pressure Relief Valve: Sized to relieve full blower capacity at maximum blower pressure. Range 20 - 70 kPa, adjustable.
 - iii) Pressure Gauges: Range 0 to 70 kPa with accuracy +/- 0.25 kPa.
- b) Provide plugs at each end of section, with one plug equipped for air inlet connection.
- c) Fill test section slowly until a constant pressure of 28 kPa is reached. If ground water is above section being tested, Engineer may recommend increase in air pressure.
- d) Allow minimum 2 minutes for air temperature to stabilize, adding only amount of air required to

maintain pressure.

- e) After 2 minute period, shut off air supply.
- f) Decrease pressure to 24 kPa. Measure time required for pressure to reach 17 kPa. Minimum time allowed for pressure drop is as follows:

Pipe Diameter		Minimum Time Min:Sec
mm	in	
100	4	1:53
150	6	2:50
200	8	3:47
250	10	4:43
300	12	5:40
375	15	7:05
450	18	8:30
525	21	9:55
600	24	11:20

- g) Locate and repair defects if test fails. Retest.
- h) Repair visible leaks regardless of test results.

(6.4) WATER MAIN TESTING

- a) Test after services and hydrants are installed.
- b) Backfill prior to testing.
- c) If length of test section exceeds 400 metres (1312ft) allowable leakage must not exceed allowable leakage for 400 metres (1312ft). All valves must be pressure tested including hydrant valves.
- d) Open all valves in test section.
- e) Expel air from main by slowly filling with potable water. Install corporation stops at high points where no air-vacuum release valves are installed. After testing, remove corporation stops and install plugs.
- f) Apply test pressure of 1035 kPa or pressure equal to 1.5 times working pressure, whichever is greater, measured at lowest point in test section. Maintain pressure by pumping potable water from suitable container of known volume and record amount of water

used for period of two hours.

- g) Allowable leakage for pipeline is determined by the following formula:

$$L = \frac{(SD) \times P \text{ or } P0.5}{727,500}$$

where: L = allowable leakage in litres/hour
S = length of pipe in metres
D = nominal diameter of pipe in mm.
P = test pressure in kPa

- h) Allowable leakage for closed metal seated valves is 1.2 ml per mm of nominal valve diameter per hour.
- i) Locate and repair defects if test fails and retest.
- j) Repair visible leaks regardless of test results.

Section 7: WALKWAY SPECIFICATIONS (SD-17 and 18)

- (7.1) The minimum width of a walkway right-of-way shall be 3.0 metres (10ft).
Where municipal sewer or water systems are to be constructed within the walkway right-of-way, the minimum width shall be 8 metres (26.25ft).
- (7.2) As much as possible, the constructed portion of the walkway shall be centrally located within the right-of-way.
- (7.3) Where possible, all manholes and water appurtenances shall be to the sides of the 1500 mm (5ft) asphalt walkway.
- (7.4) Where possible, and with consideration of Item (7.10), the total width of the right-of-way shall be graded in such a way as to control surface and watercourse drainage within the walkway right-of-way and adjacent properties. This can be accomplished using culverts, drains, swales and/or catch basins.
- (7.5) The walkway shall be constructed in accordance with SD-17 and 18 as follows:
- a) Compacted thickness of 150 mm (6in) Class "A" gravel base, 1800 mm (70in) wide and compacted to 98% standard Proctor density;
 - b) Compacted thickness of 50 mm (2in) thickness, hot-mix asphalt, 1500 mm (5ft) wide.
- (7.6) The maximum grade for a walkway shall not exceed fifteen (15%) percent. Where site topography dictated grades of more than fifteen (15%) percent, concrete steps of uniform rise and run and handrails shall be installed.
- (7.7) Both sides of an asphalt walkway shall be sodded from the edge of the walkway to the edge of the right-of-way (fence), if feasible.
- (7.8) All reset structures within the walkway easement shall be adjusted to +/- 6 mm (.25in) of finish grade.
- (7.9) All walkways shall be constructed at the time of the installation of the services and streets. Natural vegetation of the area shall be preserved during walkway construction, where possible. Natural trees and shrubbery shall remain and clearing and grubbing shall be restricted to the construction.

(7.10)
lighting,

Walkways shall be oriented so as to make use of the existing street
where possible.

Section 8: CURB AND GUTTER SPECIFICATIONS (SD-2 and 3)

- (8.1) Concrete curb and gutter construction shall conform to the following specifications and as per Standard Drawings SD-2 and SD-3.
- (8.2) Curb and gutter shall be constructed of 30 MPa concrete, 6% air-entrained and 75 mm (3in) slump. Slump shall be decreased when mechanical extruders are used.
- (8.3) Gravel base shall be Class "A" gravel, evenly graded, compacted to 100% standard Proctor density, and extending 150 mm (6in) outside the face of the gutter and the back of the curb. Testing (sieve analysis, Proctor, compaction, etc.) to be performed by a qualified testing company and the test results submitted to the Town of _____ for review.
- (8.4) Residential driveway openings shall be 3.75 metres (12ft) wide for "single" driveways and 5 metres (16ft) wide for "double" driveways, with a 300 mm (12in) taper on each end.
- (8.5) Commercial driveway opening widths shall be 3 metres (10 ft.) for one-way traffic and 6 metres (20 ft.) for two-way traffic. The maximum width of a commercial driveway opening shall not exceed 9 metres (30ft).
- (8.6) Pedestrian ramps shall be installed at all intersections constructed with 1200 mm (48in) low profile curb and a 300 mm (12in) taper in both ends.
- (8.7) Concrete curb and gutter shall be a continuous pour with control joints of one quarter the thickness every 3 M (10ft). Control joints shall be installed using steel template plates or by saw cutting.
- (8.8) Where concrete sidewalk abuts concrete curb and gutter, the control joints of the curb and gutter shall match alternate sidewalk control joints.
- (8.9) All concrete sampling and testing shall be in accordance with CSA CAN3-A23.2. Concrete testing to be performed by a qualified testing company and the test results submitted to the Town of Pictou for review.

Section 9: EASEMENTS

- (9.1) Service mains installed outside of the street right-of-way shall be facilitated through the provision of an easement having a minimum width of 8 metres (26.25ft).
- (9.2) Where service mains installed outside of the street right-of-way are located within an easement or right-of-way that is also to serve as a walkway, the minimum width of the easement or right-of-way shall be 8 metres (26.25ft). Refer to Section 7 of these Specifications.
- (9.3) For service main easements without walkways, the total width and length of the easement shall be graded in such a way as to control watercourse and surface drainage, place topsoil and sod to the Town of Pictou specifications;
- (9.4) All manholes, and water chambers and valve, shall be adjusted to 6 mm (.25in) of finish grade.

Section 10: SODDING SPECIFICATIONS RE SERVICE INSTALLATION

- (10.1) Excavated and/or fill areas shall be evenly graded and compacted to 100 mm (4in) below finished grade.
- (10.2) Topsoil shall be medium loam capable of supporting good agricultural growth and have a pH of 5.5 to 7.5 and minimum thickness when placed of 100 mm (4in).
- (10.3) Land lime and fertilizer shall be applied using separate applications and evenly cultivated throughout the depth of the topsoil at the following application rate.
- a) Lime $50 \text{ kg}/100 \text{ m}^2$; and
 - b) Fertilizer $15\text{kg}/100 \text{ m}^2$.
- (10.4) Topsoil shall be compacted to 12 mm (.5in)of finished grade, then the top 25 mm (1in) shall be loosened by raking or cultivating.
- (10.5) Sod shall be nursery sods of not less than 40% Kentucky Blue Grass, free of weeds, and with no surface soil visible when mowed to height of 50 mm (2in).
- (10.6) Sod shall be placed with staggered joints perpendicular to slope in a close knitted pattern. There shall be no open areas and sods shall match evenly into existing conditions. In addition, when:
- a) Sodding on slopes greater than 1:2, the sods shall be secured with wooden pegs; and
 - b) Sodding on slopes greater than 1:3, the sods shall be secured with poultry mesh in strips from top to bottom of slopes and then pegged.
- (10.7) Sod shall be rolled to consolidate and remove irregularities in grade.
- (10.8) Sod shall be watered within four (4) hours of placement, to obtain moisture penetration into top 100 mm (4in) of topsoil.
- (10.9) Sod will be accepted upon completion of the third mowing provided that
- a) Growth is properly established,
 - b) Area is free of bare and dead spots and without weeds, and
 - c) No surface soil is visible when grass has been cut to a height of 50 mm (2in). Areas sodded in the fall will be accepted the following

that spring, one month after start of growing season, provided acceptance conditions 10.9, a), b), and c) are fulfilled.

Section 11: EROSION CONTROL MEASURES RE SERVICE INSTALLATION

- (11.1) Erosion and sediment control measures for the installation of services that takes place on lands that drain directly into lakes, streams, rivers or any existing water course must be approved by the Public Works Superintendent in accordance with sound engineering practices.
- (11.2) The construction of the installation of services shall make optimum use of existing topography and vegetation and minimize cut and fill operations. During the construction, the design is to prevent/minimize surface water flows across the construction site or from the construction directly to adjacent watercourses.
- (11.3) The construction, maintenance and use of buffers and other surface water flow control measures adjacent to all existing watercourses shall be incorporated into the design of the service installation of lands adjacent to watercourses.
- (11.4) Storm water management systems shall be an integral part of the overall service installation construction. Measures such as temporary diversionary channels and earthen cofferdams are to be used to prevent upstream surface water from traversing construction sites.
- (11.5) Diversionary channels constructed in erodible or silt forming materials shall be stabilized with protective rock, plastic sheeting or other materials before any flow is diverted.
- (11.6) During service installation construction, on-site surface water shall be directed to settling ponds or sediment traps prior to entering an existing watercourse. Settling ponds shall be constructed to provide storage generally to a size of one sixteenth (1/16) acre for every acre of exposed construction area.
- (11.7) Site disturbance for street construction shall be kept to an absolute minimum by minimizing clearing and grubbing operations and cut and fill situations.
- (11.8) Diversionary channels directing water to sediment traps or settling ponds shall be constructed prior to cut and fill operations and shall contain filter trap measures such a straw bales.
- (11.9) Street construction at any given time shall be limited to 365 metres (2000ft) for streets parallel to the contours and 153 metres (500ft) for streets perpendicular to the contours and brought to base course for graveling before new street construction may begin.
- (11.10) All surplus excavation material shall be removed from the construction

site within one (1) week of the time of excavation.

- (11.11) Excavated material required for backfilling shall be neatly piled and covered with polyethylene or other suitable material to be approved by the Public Works Superintendent in accordance with sound engineering practices.
- (11.12) Immediately following the excavation, backfilling, grading and construction of streets and services, base course graveling shall be undertaken. Hydroseeding of slopes of more than 2:1 shall be undertaken within one (1) week of base course graveling.
- (11.13) Erosion and sediment control measures shall be properly operated and maintained during construction and remain functional after construction until the Public Works Superintendent is satisfied that the land has stabilized.
- (11.14) In the dewatering of excavated areas, water shall not be discharged directly into existing watercourses. Dewatering of excavated areas shall be undertaken in a manner designed to remove suspended silt.

For examples of more extensive erosion control measures, refer to the Province of Nova Scotia Erosion and Sediment Control Manual and Guidelines for Use on Construction Sites.

SECTION 12: LIST OF STANDARD DRAWINGS

SD-1	Typical Cross Section of a finished residential street
SD-2	Concrete Curb & Gutter - cross section detail
SD-3	Concrete Gutters - Cross Section at driveway ramp
SD-4	Street Sign
SD-5	Trench Details
SD-6	Precast Manhole with Cone Section
SD-7	Precast Manhole with Flat Top
SD-8	Standard Manhole Ladder
SD-9	Precast Manhole with Inside Drop
SD-10	Precast Manhole with Outside Drop
SD-11	Cast in Place Base for Precast Manhole
SD-12	Typical Lateral Connection
SD-13	Service Lateral Details
SD-14	Catchbasin Details
SD-15	Standard Hydrant and Valve
SD-16	Standard Thrust Blocks for Watermains
SD-17	Typical Walkway - cross section
SD-18	Concrete Sidewalk

NOTE: In all respects, the criteria set out by the Standard Specification for Municipal Servicing by the Nova Scotia Road Builders Association and the Nova Scotia Consulting Engineering Association shall prevail should there be any discrepancy with the attached standard drawings.