The Village of
PORT CLEMENTS
"Gateway to the Wilderness"

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7:00 PM, Monday, December 4th, 2023
Committee of the Whole

AGENDA

This meeting of the Council of the Village of Port Clements being held on the traditional territory of the Haida People.

1. **ADOPT AGENDA**

2. **REPORTS & DISCUSSIONS**
D-1-Water/Sewer
   - *Andrew Hudson, Grant Writer, presentation on funding sources*
   - *Sean O'Donoghue, Public Works Superintendent, presentation on Tingley St. asbestos water line & sewer system*
   - *2005 McElhanney – preliminary design & cost estimate sewer line extension for Bayview Drive Rural Subdivision*

VILLAGE OF PORT CLEMENTS

PRELIMINARY DESIGN & COST ESTIMATE

SEWER LINE EXTENSION

RURAL SUBDIVISION - BAYVIEW DRIVE

(FINAL ISSUE)

McElhanney Consulting Services Ltd
Suite #1 – 5008 Pohle Avenue
Terrace BC
V8G 4S8

2321-00739-0

April 2005

McElhanney

April 22, 2005
File: 2321-00739-0

The Village of Port Clements
37 A, Cedar Avenue West
Box 198,
Port Clements, B.C.
V0T 1R0

Attention: **Ms. Dana Schmidt**

Dear Ms. Schmidt:

Subject: **Sewer Line Extension – Rural Subdivision, Bayview Drive**
Final Report Submission

We are pleased to include herewith are ten (10) copies of our report for the "Sewer Line Extension – Rural Subdivision – Bayview Drive", as well as ten (10) copies of the full size layout drawings for the low-pressure alternate.

The report includes reviews of the existing conditions, proposed design criteria, evaluations of number of options and preliminary cost estimates for these options. The recommendations made in the report are based on economic and environmental considerations and involves departures from the present practices existing so far within the Village's infrastructure.

A discussion of this report was held in your offices on February 15, 2005. During our review of the report for Sewer Extension, a general preference was expressed for the low-pressure sewage system. Also a request was made to include the Campground in the sewer extension project. The final version of the report includes an estimate of the cost to extend the low-pressure sewer to the campground at a future date.

This completes the work undertaken under the scope of work of this part of the contract. We shall be very pleased to assist you with the detailed design and the construction of the project when a decision is made to proceed.

In the mean time, if you have any questions, please contact me.

Yours truly,

McElhanney Consulting Services Ltd

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
A. W. G. HANNA

Albert W. G. Hanna, P.Eng
Senior Project Manager

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SEWER LINE EXTENSION

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

This report studies the options and costs of providing sanitary sewage collection system to the 24-residential lots along Bayview Road, presently using septic tanks and tile disposal fields.

Two alternative options for the sewage collection systems were evaluated and preliminary designs and cost estimates are detailed in this report. The alternatives are:

- A gravity flow system with pump lift stations
- A low-pressure system with individual pumping units

The gravity flow system is composed of 200 mm laterals, several manholes and due to the relatively flat topography, it must include two lift stations and force mains.

The low-pressure sewer system consists of a small diameter (35mm to 75mm) force main that is installed to follow the land contour at a relatively shallow depth. The system requires installing a grinder pump at each residence to convey wastewater to the low-pressure sewer system.

The total estimated costs for each alternatives based on preliminary designs are as follows:

Alternative I: Conventional Gravity System	$638,000
Alternative II: Low Pressure Sewer System	$420,000

Evaluations of these alternatives from the environmental, economic, property owners and community point of views indicate the advantage of the low-pressure sewer system option.

It is recommended that the Low-pressure sewer system be selected for construction to serve the 24 remote lots along Bay view Drive. The Low-pressure system has been installed in many municipalities in British Colombia and has a proven record of successful operations.

At a meeting with the Village of Port Clements Council in February 2005, a preference was expressed for the low-pressure sewage system. Also a request was made to include the Campground in the sewer extension project.

A separate assessment was for to extend the low-pressure sewer system to the Campground (probable location will be about 550 to 600 metres to the south of the last residential lot on Bayview Drive). The cost will depend on the

timing of the construction, which may be sometimes in the future and not necessarily as part of the contract to service the 24-lots.

The additional cost to extend the low-pressure sewer to the campground will be in the order of $35,000 to $42,000, in current dollars excluding inflation.

A number of issues need to be considered and discussed within the community and council in connection with the required grinding pumps needed at each residence being served, cost sharing of these pumps, if required, and maintenance requirements on private properties.

2.0 INTRODUCTION

McElhanney Consultant Services Ltd (MSCL) was commissioned by the Village of Port Clements to evaluate extending the sanitary sewer service to properties located along Bayview Drive south of Alder Avenue.

This report studies the options and costs of providing sanitary sewage collection system to the 24-residential lots along Bayview Road, presently using septic tanks and tile disposal fields. To this end, we have examined the existing conditions, and reviewed the design criteria to determine optimum type and layout for a system to collect sewage and transport it to the existing sewer system just north of Alder Avenue.

This report presents the evaluations of two alternative options for the sewage collection systems:

- A gravity flow system with pump lift stations
- A low-pressure system with individual pumping units

Descriptions of these two systems, along with preliminary cost estimates are provided in this report. The proposed systems can be extended to serve the Sunset Park campground.

3.0 EXISTING CONDITIONS

The existing sewer system in the Village of Port Clements consists of a gravity flow laterals, manholes and three (3) lift stations delivering the wastewater to a lagoon located in the industrial park area. The current boundary of the piped sewer is at the intersection of Alder Avenue and Bayview Drive.

An existing watermain and hydrants were installed along Bayview Drive, in the early 1980's, to serve the existing single-family residents. The watermain is located approximately 6.0 metres away from the property lines and adjacent to the road ditch.

South of Alder Avenue, individual septic tanks and tile disposal fields serve the 24 single-family residential lots. The newly developed Sunset Park campground is located further south along Bayview Drive.

Septic tanks and tile fields used by the lots on Bayview Drive appear to have problems with septic odours.

The relatively flat topography along Bayview Drive suggests that strictly gravity-sewer will not be feasible, and more than one lift station will be

required. The available topographic survey performed for the Village of Port Clements in the year 2002 was used in preparing the preliminary alternative systems presented in this report.

4.0 SEPTIC CONDITIONS & ODOUR CONTROL

Concerns with septic conditions in low-flow waste water system must be addressed in the design of the system and adequate measures applied to ensure low-maintenance operation.

Odour complaints from collection systems, pump stations, force mains and small wastewater treatment plants are generally caused by the release of hydrogen sulfide (H2S) gas. A slime layer will develop on the submerged walls of gravity sewers and force mains if the velocity of the wastewater through the pipe is too low to scour the sides.

Wastewater velocity directly impacts wastewater detention time within the sewer, the amount of grit and organic solids deposition (both of which tend to further reduce wastewater velocity and increase depth of flow), and the extent of slime layer buildup within the submerged portion of the sewer. Velocity thus affects formation of dissolved sulfide and also the release of hydrogen sulfide gas into the sewer atmosphere.

Pump station wet wells are also affected in this regard. The longer the detention time, the greater the likelihood that the wastewater will become septic. Unless the pump suction pipes and wet well geometry are appropriately designed, the accumulation of organic matter will promote the generation of dissolved sulfide and hydrogen sulfide gas.

Force mains, inverted siphons and other surcharged pipes are normally completely full of wastewater, and because this condition does not allow re-aeration from the sewer atmosphere, dissolved oxygen levels in the wastewater become depleted, and significant quantities of dissolved sulfide can be generated if detention time is excessive.

Good design and maintenance practices will reduce sulfide problems in collection systems without the use of chemical addition or air treatment. In general, pipeline design should adhere to the following:

a) Limit the use of closed conduit systems (force mains, siphons, and surcharged sewers). If a closed conduit system must be used, limit its length and provide adequate velocity to scour the pipe.

b) Limiting the length of force mains in raw wastewater conveyance systems is probably the single most important factor in minimizing sulfide release from collection systems.

c) Wastewater velocities in both gravity and pressure pipes must be adequate to prevent deposition and accumulation of solids, especially during periods of low flow.

The minimum acceptable velocity for small sewers (less than 450mm diameter) is 0.6 metre/second (2.0 fps) at initial peak flow conditions.

The primary means of minimizing sulfide formation in force mains is maintenance of scouring velocities. It is recommended that force mains be designed with a velocity between 0.9 and 1.5 metre/second (3 to 5 fps). A velocity of 0.6 m/s is acceptable with regard to odour control on short force mains (less than 300 m), but on longer force mains the minimum velocity should be as recommended above.

The wastewater discharged from the force main should enter the receiving manhole at the invert or below the water level to reduce turbulence. Interior drop pipes shall be used to lower forcemain discharge elevation to manhole invert.

Pump station wet wells should be designed to limit detention time and prevent the deposition of solids in order to minimize sulfide production. If the station and force main has the potential to be an odour source, then appropriate actions should be taken which may include reducing the pump cycle times, using variable speed pumps or decreasing detention time by adjusting the pump level switches.

5.0 DESIGN CRITERIA

The design standards to be applied in the final design of the sewage collection system should be compatible with the practices applied in similar localities and comply with the Village of Port Clements existing Bylaws. The design criteria used for costing the sewage collection alternatives presented in this report are summarized below.

Design Loading

For a single-family homes, the sewage average loading will be determined on the basis of a population of 3 persons per home and an average per capita sewage flow of 360 L/capita/day (80 lgpc/day).

Peak flows are 4.0 times the average daily per capita flow. Thus the peak flow per a single-family home is 4 x 3 x 360 = 4,320 Litre/day (960 lgpd).

Infiltration

For gravity flow sewer system, the sewer is to be designed for an additional flow of 0.2 L/second/hectare. This flow does not apply to low-pressure or forced main pipes.

Manholes

Manholes are to be spaced no greater than 120 metres apart and are required also in the following positions:

- All changes in grades or pipe sizes
- All intersection and changes in grades
- All terminations

Sewer Pipe Grades & Flow Velocities

For gravity sewer, the minimum velocity of 0.6 m/s and a minimum pipe size of 200 mm diameter dictate the grades required. A minimum grade of 0.5% will be used to meet the design criteria and aide in pipe cleanness with reasonable maintenance intervals.

Forcemains shall be designed for a minimum of 0.9 m/s velocity and a detention time not exceeding 12 hours for odour control

Sewer Depths & Separations from Watermain

The location of the ground water table along Bayview Drive is not known at this time, and will need to be established before the final design is undertaken.

The minimum depth of cover over the sewer pipes shall not be less than the following:

- Gravity flow laterals = 1.5 metre
- Forced main and Low Pressure sewer pipes = 1.0 metre

We have limited the maximum depth of the gravity sewer pipe to about 4.0 m to limit excavation depth, costs and reduce potential work below ground water table.

The separation of sewer collection pipes and the supply watermain must conform to the requirements of the Northern Health Authority guidelines. The requirements are as follows:

- **Parallel Lines:** Watermains should be laid at least 3 metres (10 feet) horizontally from any sanitary or storm sewer. Where this horizontal separation is not possible, the bottom of the watermain should be at least 45

cm (18 inches) above the top of the sewer and sufficiently to one side of the sewer to allow for sewer repairs without disturbing the watermain.

If this vertical separation is not possible, the sewer should be of the same service capability as the watermain, with pressure class joints designed to remain watertight if the groundwater table periodically rises above the sewer. The pressure sewer section should be pressure tested before backfilling. Other precautions, such as a watermain with improved joints and higher strength may be needed.

- **Crossings:** Where a watermain crosses a sanitary or storm sewer, the pipes should be laid with the watermain crossing over the sewer, and with the middle of pipe lengths located at the crossing point, to maximize the separation between joints. Where a minimum 3 metre joint separation and/or a minimum 45 cm clear vertical separation either over or under the sewer is not possible at the crossing, precautions to improve water tightness of the sewer joints and structural improvements such as higher strength watermain and/or sewer at the crossing area may be needed. All joints within 3 metres of the crossing should be wrapped with "Denso" tape or approved equivalent to improve protection.

- **Manholes and Service Connections:** In situations where the normal separation distances are not possible, the bottom portion of manholes, manhole connections to sewers, service connections to sewers and joints in sewage service connections should all be designed to not leak.

Economic Criteria

Where all of the technical criteria can be met with a number of different schemes, the scheme which can be constructed at the least overall capital cost will be judged to be the most desirable.

6.0 DESIGN OPTIONS

A number of technologies are available for providing community sewers to flat, low-laying areas. Among these technologies, two options are in use in municipalities across British Columbia.

1. Conventional Gravity System
2. Low-pressure System.

The **conventional system** of gravity sewers, pump lift stations and force main has been in use in the Village of Port Clements for many years. A preliminary design and a cost estimate has been prepared for this option and labelled **Alternative I** in the subsequent presentation.

The **low-pressure system** has been gaining wide use in a number of municipalities in BC on account of its lower initial construction costs and operating costs not any different from those associated with the conventional gravity system. The low-pressure system is composed of small grinder pumps installed in each residence and is interconnected with small low-pressure conduits that can be installed in relatively shallow trenches and following the natural topography of the land. Descriptive literature of the system is included in the Appendices to this report. A preliminary design and a cost estimate has been prepared and labelled **Alternative II**.

7.0 SYSTEM LAYOUTS

7.1 Gravity Sewer System

Preliminary drawings for a conventional gravity system are included in Appendix A. The system is composed of the following elements:

a) Approximately 1400 metres of 200 mm diam PVC SDR 35 sewer lateral installed about 0.6m beside and below the existing watermain.
b) 13 manholes and cleanouts varying in depth from a 1.5 metre minimum to 4.0 metres maximum.
c) Two lift stations, each equipped with a 2-pumps and necessary accessories.
d) Two forcemains, 510m and 480m in lengths, that interconnect the lift stations and join the existing gravity system north of Alder Street.

The location of the main sewer lateral, the manholes and lift stations would be between the watermain and the road ditch, with the watermain at least 0.45m above the sewer line as per the health authority regulations. The excavation depths will be over 4.0 metres at certain locations, and impacts during construction on the existing watermain and the road will have to be factored in by appropriate shoring and protection.

Sizing of the lift stations and the forcemains were preformed to ensure that detention times would not result in septic conditions and release of odour. The total detention time in the system would be less than 12 hours; with the detention time in each force main is approximately 4 hours each.

7.2 Low Pressure Pumped System

Preliminary sketches for the low-pressure gravity system are included in Appendix B, together with descriptive literature by the supplier. The system is composed of the following elements:

a) Individual grinder pump installed outside each residence. A total of 24 pumps will be required, one for each lot. The system can be expanded as required by the addition of pumps at other locations.
b) Each pump is connected to the low-pressure pipe by a service lateral as shown in the drawing.
c) Flushing stations will be included at a two locations for cleaning and maintenance.
d) An air/vacuum release is installed at the high point of the low-pressure conduit.
e) The low-pressure conduits will vary in size from 35mm diam to 75mm diam SDR11 HDPE pipes progressively as the flow accumulates downstream.

Since no manholes are required for this system, the location of the low-pressure sewer line can be just outside the property lines and hence more than 4.0 metres away from the watermain.

Crossings of the watermain by the sewer line can be essentially eliminated. The shallow trench required for this system, and the wide separation from the watermain, will affect savings in installation costs and speed up the construction.

The total detention time of the sewer in the small low-pressure piping has been calculated to ensure that septic conditions would not develop. The estimated total detention time under average flow conditions is calculated to be less than 12 hours and meets the design criteria established.

8.0 ESTIMATED CONSTRUCTION COSTS

8.1 Gravity Sewer System

The estimated costs for the total construction of the project including the supply of material and equipment, installations, contractor overhead costs, contingencies and engineering/ project management and supervision costs are summarized in Table I.

These costs are preliminary costs and are based on in-house information available from previously constructed projects in the northern part of British Columbia. Construction costs vary widely depending on the site conditions, the economic circumstances and competition at the time of tender. These factors cannot be predicted in advance and additional consultation with local contractor will be required as the design is finalized and approved.

Table I
DESIGN COST ESTIMATE
ALTERNATIVE 1 - GRAVITY SYSTEM

	Quantity	Unit	Rate/unit	Amount	
Mob/Demob					
Include Insurance & Bonding	LS			$10,000	$10,000
Gravity System					
200 mm Sewer laterals PVC SDR 35	1400	m	$130	$182,000	
Include Pipe supply, Trenching,					
Pipe installation and testing					$182,000
Sanitary Sewer					
Manholes					
1.5 m deep C/O 1	1	ea	$3,500	$3,500	
2.0 m deep C/O 2 and 3	2	ea	$4,000	$8,000	
3.0 m deep C/O 4	1	ea	$5,000	$5,000	
2.1 m deep Manholes	2	ea	$4,100	$8,200	
2.7 m deep Manholes	2	ea	$4,700	$9,400	
3.5 m deep Manhole	1	ea	$5,500	$5,500	
4.0 m deep Manholes	4	ea	$6,000	$24,000	
					$63,600
Lift Stations & force Main					
Force Main	980	m	$80	$78,400	
Lift Stations, complete	2	ea	$55,000	$110,000	
					$188,400
Sub Total					$424,500
CONTINGENCY				$111,000	$111,000
Engineering, Surveying, Project Mgmt, Tendering, Contract Award & Construction Inspections				$83,000	$83,000
Estimated Total Cost					**$638,000**

8.2 Low Pressure Pumped System

The estimated total construction cost of the low-pressure system is presented in Table II below. The supply costs of equipment were provided by John Brooks Canada who are the Canadian representative for "Environment | One" (E/one) Corporation.

Table II
DESIGN COST ESTIMATE
ALTERNATIVE 2 - LOW PRESSURE SEWER SYSTEM

	Quantity	Unit	Rate/unit	Amount	
Mob/Demob					
Include Insurance & Bonding	LS			$10,000	$10,000
Low Pressure System					
Valves					
Flushing Stations	2	ea	$4,800	$9,600	
Air/Vacuum Release	1	ea	$4,400	$4,400	$14,000
Pumps & Accessories					
Pump units - 2010-93	24	ea	$5,700	$136,800	
Pump panels	24	ea	$2,000	$48,000	
Service laterals, 35 mm diam	24	ea	$660	$15,840	
Lateral Kits	24	ea	$1,200	$28,800	$229,440
Piping					
35 mm Diam SDR 11 HDPE	75	m	$33	$2,490	
40 mm Diam SDR 11 HDPE	130	m	$34	$4,420	
50 mm Diam SDR 11 HDPE	830	m	$35	$29,050	
75 mm Diam SDR 11 HDPE	520	m	$37	$19,240	$55,200
Sub Total					$308,640
CONTINGENCY				$67,900	$67,900
Engineering, Project Mgmt, Tendering, Contract Award & Construction Inspections				$43,460	$43,460
Estimated Total Cost					**$420,000**

8.3 Comparison of the Two Systems

Sewage System	Advantages	Disadvantages
Alternative I: **Conventional Gravity System** Gravity 200mm diameter sewer, manholes, two lift stations and force mains, located in the road right-of way, offset and below the existing water main.	• Flushing of system not required	• Minimum pipe size of 200 mm • Deep manholes • Lift station required • Electrical power is also required • Higher construction costs • **Estimated Construction cost is $638,000**
Alternative II: **Low Pressure Sewer System** Consists of a small diameter force main that is typically installed to follow land contours just outside the property line. The system requires installing a grinder pump at each residence to convey wastewater to the low-pressure sewer system.	• Pipe sizes from 35mm to 75mm • Layout independent of topography • Reduced excavation compared to gravity • Sewer system infiltration greatly reduced • Eliminates manholes • Lower construction costs than other alternatives • **Estimated Construction Cost is $420,000**	• Effluent pump or grinder pump needed at each residence • Electrical power required • Air release valves needed • Flushing connections required • Power outage disturbs service

Comparing the two alternative systems proposed above from a number of point views can be summarized as follows:

Environmentally:
Alternative II is preferred since the volume of sewer in the small diameter pressured pipes will be less than that contained in the force mains transferring the sewer from the lift stations to the existing sewer connection.

Community:
Any of the alternatives are preferable over the use of septic tanks

Residential property Owners:
The property owners may prefer Alternative I, which does not require installation of a small grinder pump on their property and any associated maintenance requirements.

Economically:
Alternative II is preferred due to lower installed capital cost; approximately 66% of the cost of Alternative I.

The economic advantages of Alternative II, with savings in the order of $218,000, as well as the environmental benefits, suggest that this system should be the preferred option for installation.

It is recognized that the Village of Port Clements has in the past installed only gravity systems and is familiar with its operation. However, the Low-pressure system has been installed in many municipalities in British Colombia and has a proven record of successful operations. Low-pressure pumps have been installed in Prince Rupert, Terrace and extensively used in North Vancouver, among many other users.

8.4 Sanitary Service to the Campgrounds.

The existing Sunset Park and campgrounds on Bay View Drive is approximately 600m south of the last residential lot. The campgrounds have 6 RV sites and 4 tent sites and water is available.

The Village Council is considering plans to extend the sanitary service to the Campground. Also being considered is the construction of one (1) small toilet/shower building. The location and construction schedule for this building is not yet finalized.

It is obvious that a gravity system to serve the campgrounds will be very costly since an additional lift station will be required, and therefore was not considered further. A low-pressure sewer system is estimated and its cost is summarized in Table III herein below.

Table III
DESIGN COST ESTIMATE
ALTERNATIVE 2 - LOW PRESSURE SEWER SYSTEM
ADDITIONAL SERVICE TO CAMPGROUND

	Quantity	Unit	Rate/unit	Amount	
Mob/Demob					
Include Insurance & Bonding	LS		Included in main contract		
Low Pressure System					
Valves					
Flushing Stations	Not required for this extension				
Air/Vacuum Release	1	ea	$4,400	$4,400	
					$4,400
Pumps & Accessories					
Pump units - 2010-93	1	ea	$5,700	$5,700	
Pump panels	1	ea	$2,000	$2,000	
Service laterals, 35 mm diam	1	ea	$660	$660	
Lateral Kits	1	ea	$1,200	$1,200	
					$9,560
Piping					
35 mm Diam SDR 11 HDPE	600	m	$33	$19,920	
Road Asphalt Restoration	8	m2	$100	$800	
					$20,720
Sub Total					$34,680
CONTINGENCY		Included in main contract			$320
Engineering, Project Mgmt, Tendering, Contract Award & Construction Inspections		Included in main contract			
Estimated Total Cost					**$35,000**

The above estimated cost will be affected by the contractual arrangement and cost increases if the contracts are not combined. The cost can be 20% higher and in the range of $35,000 to $42,000.

9.0 CONCLUSIONS & RECOMMENDATIONS

Recommended Sewer System
It is recommended that the Low-pressure sewer system (Alternative II) be selected for construction to serve the 24 private lots along Bayview Drive. This recommendation is based on the economic advantages offered by that system and the proven reliability and services in other municipalities in British Columbia.

Service to Sunset Park
The Low-pressure system can be extended to serve the campsites when a toilet/shower building is constructed. A preliminary cost is assessed and included in the report.

Resident Ownership of Grinder Pumps
A grinder pump stations is required at each residence. The ownership and responsibility for operation and maintenance of the grinder pump normally rests with the homeowner, in a manner similar to the present septic tanks and tile fields. The Village should consider creating a service agreement clearly providing for the operation and maintenance of the grinder pump stations to be the responsibility of the homeowner.

Service Agreement and Warranty
As part of the agreement for the homeowner to assume the responsibility of the grinder pump operation and maintenance; the Village should include a 5-year warranty and service agreement as part of the pump supplier's responsibilities. Naturally, this is an important issue to the homeowners, who are not likely to have experience with grinder pumps, and therefore might have some apprehension about assuming the responsibility without some support from the Village. The warranty provided by the manufacturer should include a 100 percent unconditional parts and labour guarantee. The 5-year service agreement to include annual maintenance of the pump station, emergency service, a 24-hour service telephone number and an O&M manual for the grinder pump station with a quick checklist for self-help.

Final Design Requirements
Finally, it should be pointed out herein that the preliminary drawings included in this report are not intended for construction. Further site information are required which, depending on the alternative selected, will include additional ground survey and details of the individual services at each residential unit along Bayview Drive.

APPENDIX A

Preliminary Drawings

Alternative I

Conventional Gravity System

CLIENT: # VILLAGE OF PORT CLEMENTS

DISCRIPTION: ## SANITARY SEWER EXTENSION
ALTERNATIVE #1
GRAVITY SEWER SYSTEM

MCSL Project No.: 2321-00739-0

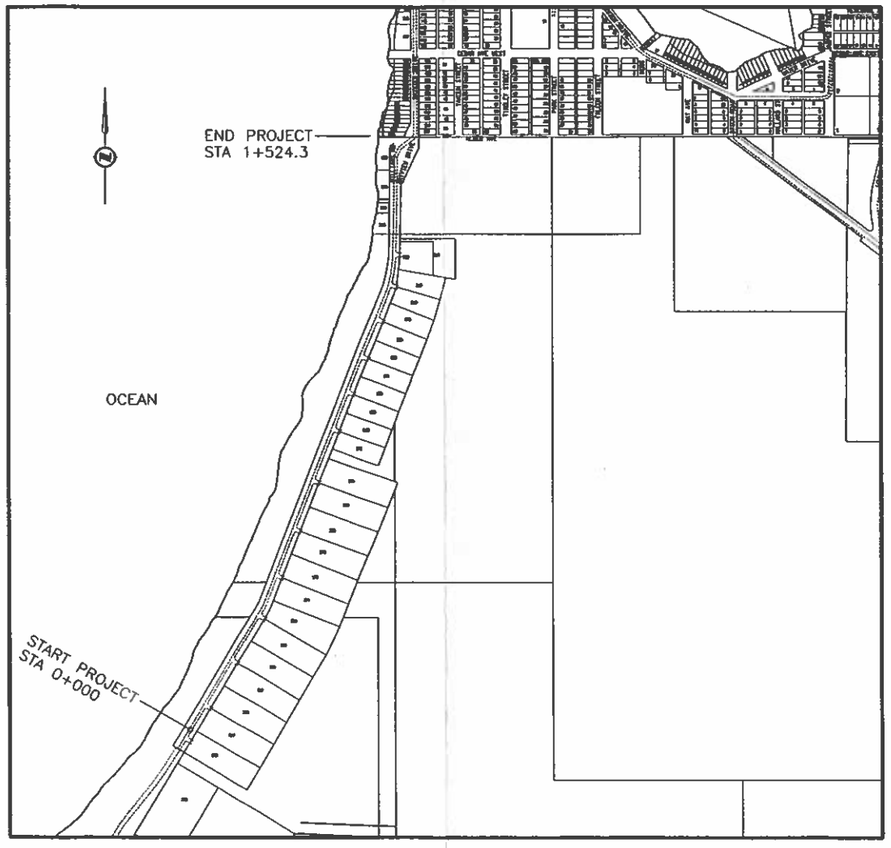
DRAWING INDEX:

SURVEY NOTES:

1. GROUND PROFILE AND ELEVATIONS ARE FROM SURVEY BASED ON ASSUMED ELEVATION OF 100 @ INVERT OF EXISTING CLEANOUT. SURVEY IS ALONG SHOULDER OF ROAD.
2. PROFILE OF WATERMAIN IS OBTAINED FROM PRELIMINARY DRAWINGS BY STANLEY ASSOCIATES, DATED 1980.
3. GROUND AND WATERMAIN ELEVATIONS SHOWN ARE APPROXIMATE ONLY AND NOT SUITABLE FOR FINAL DESIGN OR CONSTRUCTION.
4. AN ACCURATE GROUND SURVEY WILL BE REQUIRED FOR THE FINAL DESIGN.

GEOTECHNICAL NOTES:

1. NO INFORMATION AVAILABLE REGARDING GROUND WATER LEVELS OR BED ROCK ELEVATIONS.



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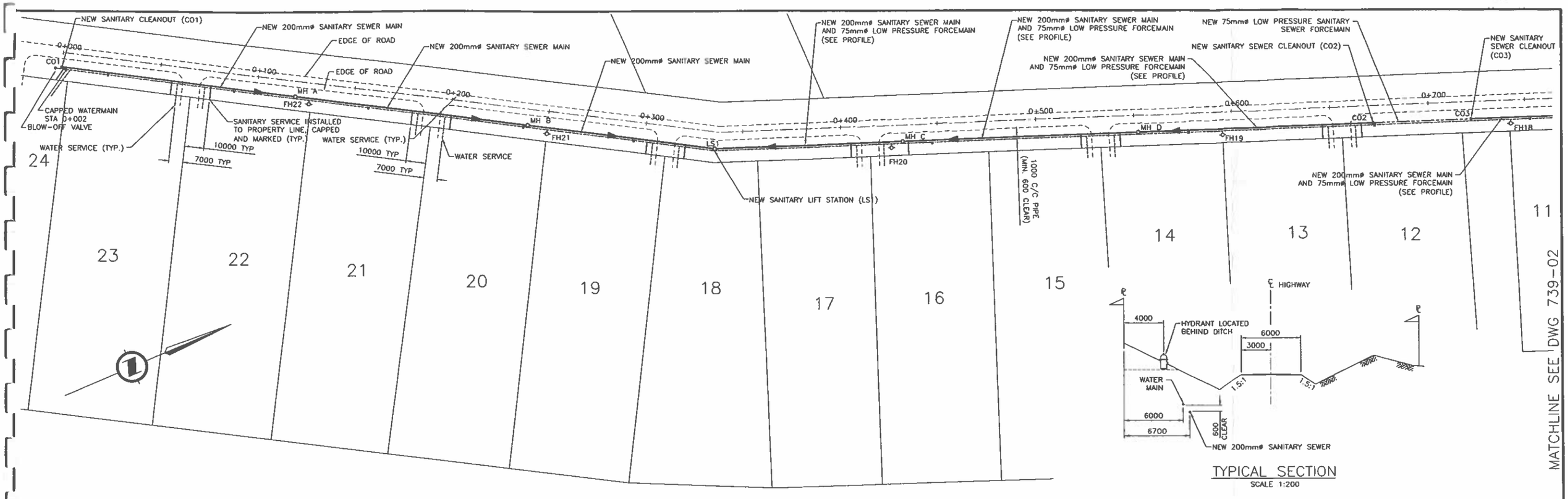

TYPICAL SECTION
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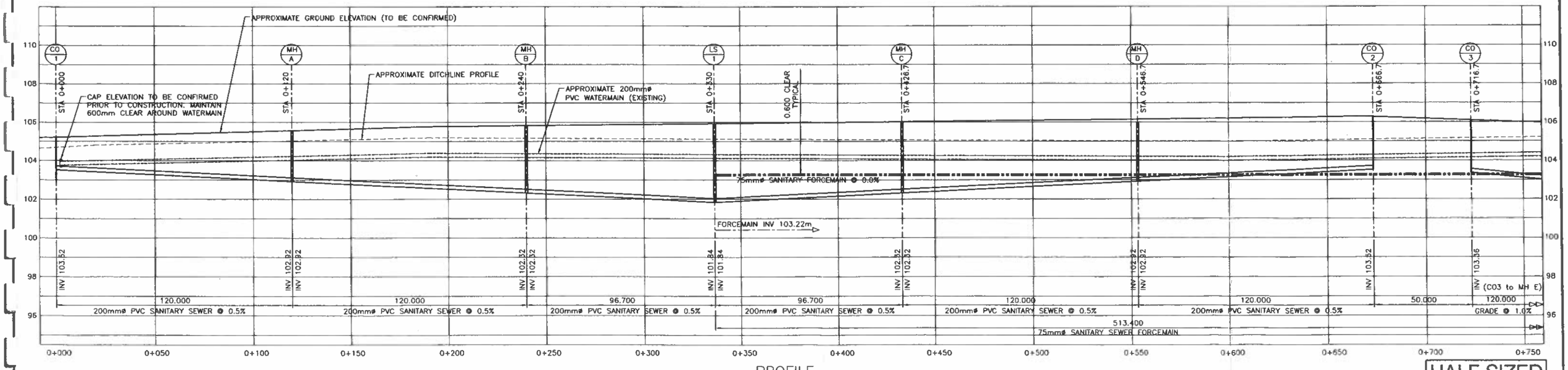
PLAN



PROFILE

HALF SIZED

No.	Date	Revision	Dr

McElhanney
McElhanney Consulting Services Ltd.
SUITE #1-5008 POHLE AVENUE
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PH (250) 635-7163
FAX (250) 635-9586

Designed: AWGH	Checked: AWGH	Date: 01/17/05
Drawn: RJH	Surveyed: OTHERS	

SCALE (H)1:1000 (V)1:100
0 10 20 30 40 50 60 70 80m
(ALL DIMENSIONS ARE IN METRES)

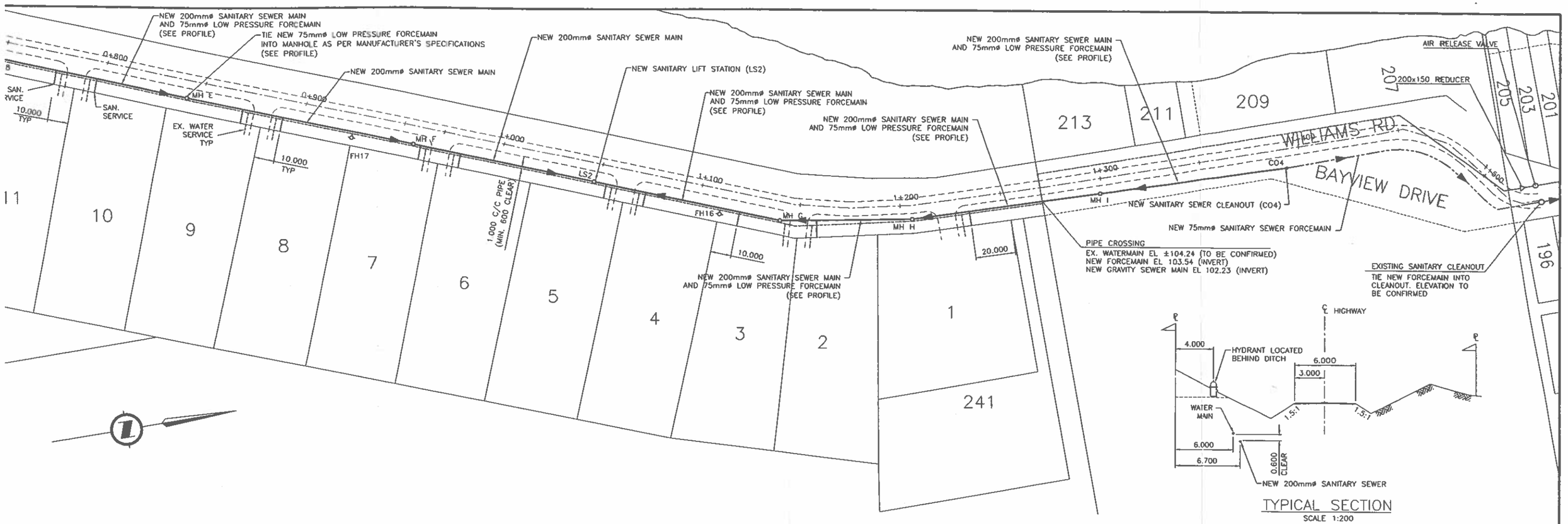
Approved Sealed

VILLAGE OF PORT CLEMENTS

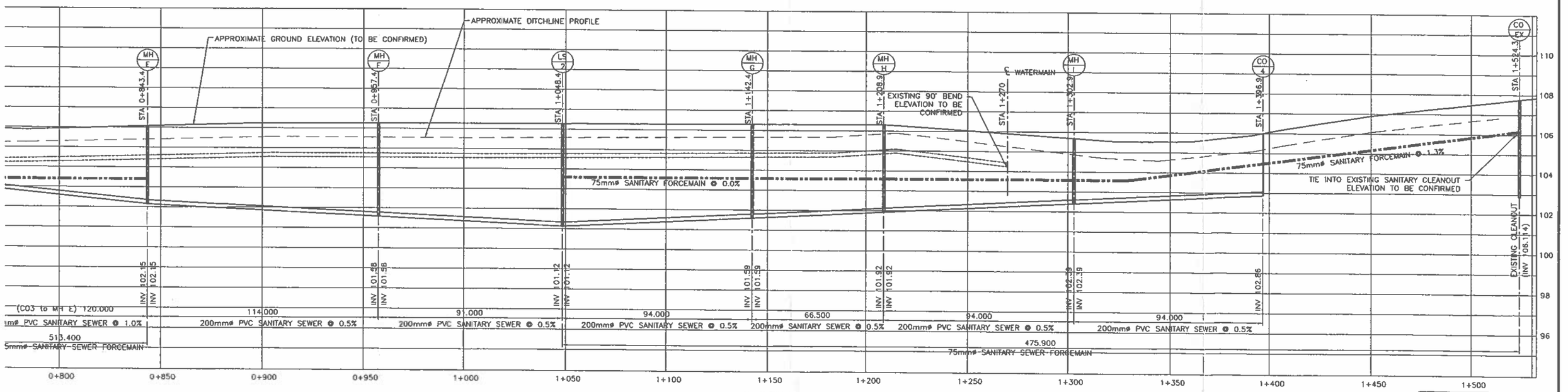
SANITARY SEWER EXTENSION ALTERNATIVE #1 GRAVITY SEWER SYSTEM

PLAN & PROFILE - STA 0+000 to STA 0+750

Client Project No
Client Drawing No
MCSL Project No 2321-00739-0
Drawing No 739-ALT1-01
Sheet - of - Revision
Unless all prints bearing previous number



TYPICAL SECTION
SCALE 1:200



PROFILE

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Designed: AWGH	Checked: AWGH	Date: 01/17/05
Drawn: RJH	Surveyed: OTHERS	

SCALE (H)1:1000 (V)1:100
0 10 20 30 40 50 60 70 80m
(ALL DIMENSIONS ARE IN METRES)

Approved Sealed

VILLAGE OF PORT CLEMENTS

SANITARY SEWER EXTENSION ALTERNATIVE #1 GRAVITY SEWER SYSTEM

PLAN & PROFILE - STA 0+750 to STA 1+524.3

Client Project No
Client Drawing No
MCSL Project No. 2321-00739-0
Drawing No. 739-ALT1-02
Sheet - of -
Revision

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APPENDIX B

Preliminary Drawings

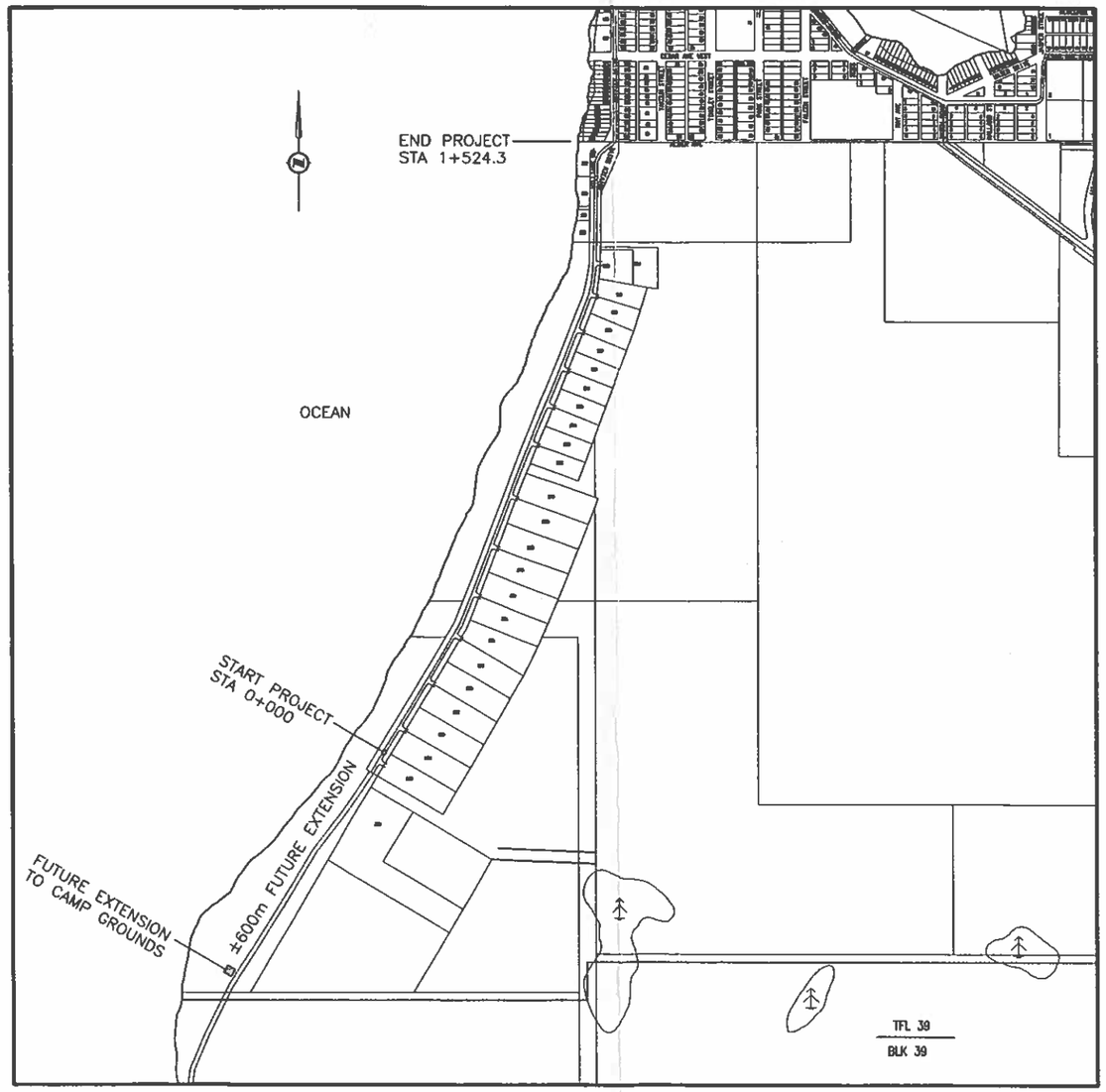
Alternative II

Low-pressure Sewer System

CLIENT: # VILLAGE OF PORT CLEMENTS

DISCRIPTION: ## SANITARY SEWER EXTENSION
ALTERNATIVE #2
LOW PRESSURE PUMPED SYSTEM

MCSL Project No.: 2321-00739-0



DRAWING INDEX:

739-ALT2-01	PLAN & DETAILS
739-ALT2-02	FUTURE SANITARY SEWER EXTENSION TO CAMP GROUNDS

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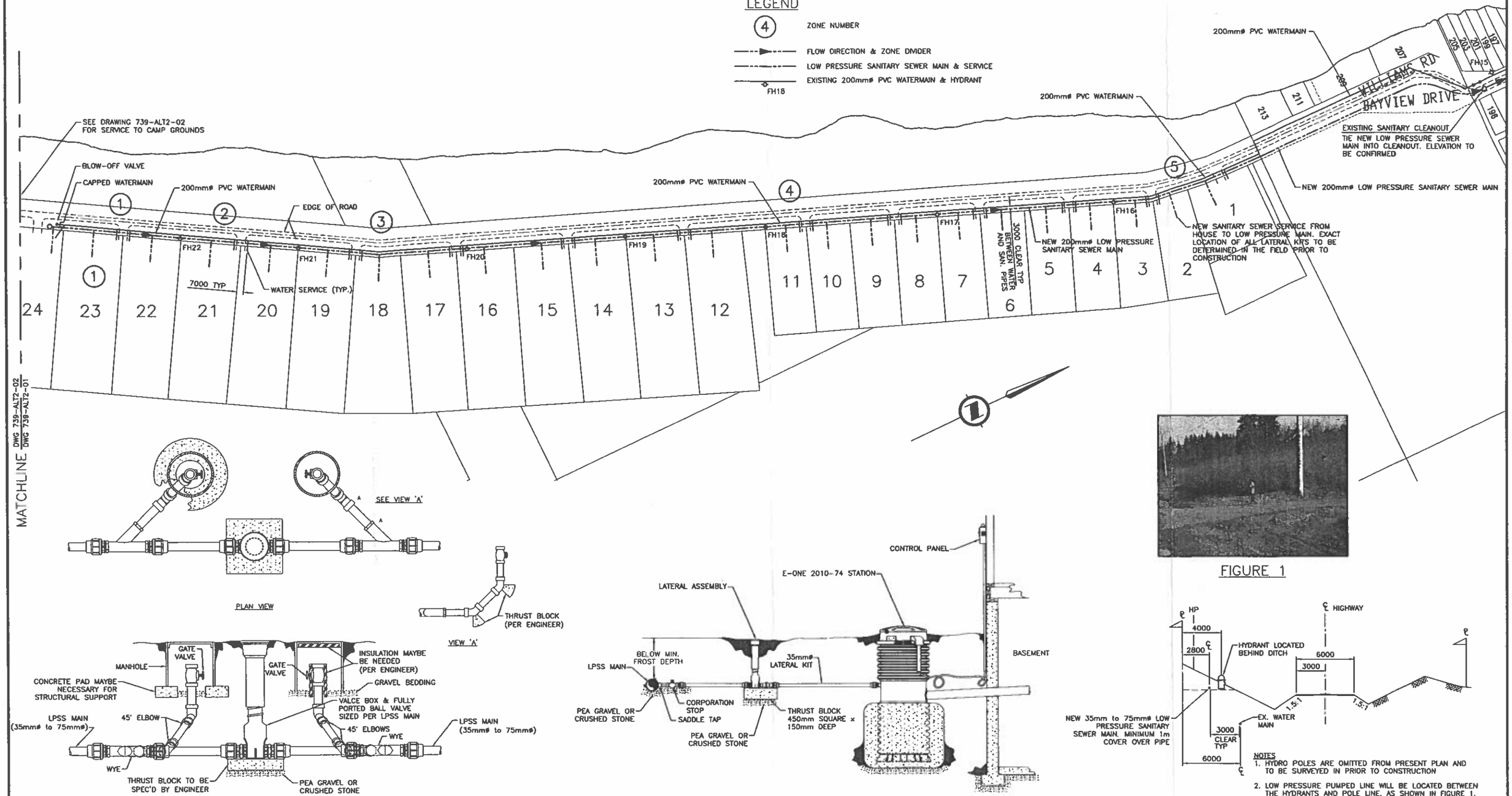
LEGEND

(4) ZONE NUMBER

FLOW DIRECTION & ZONE DIVIDER

LOW PRESSURE SANITARY SEWER MAIN & SERVICE

EXISTING 200mmø PVC WATERMAIN & HYDRANT FH18



TYPICAL FLUSHING CONNECTION ON LPSS MAIN

NOT TO SCALE

TYPICAL LATERAL INSTALLATION

NOT TO SCALE

FIGURE 1

NOTES

1. HYDRO POLES ARE OMITTED FROM PRESENT PLAN AND TO BE SURVEYED IN PRIOR TO CONSTRUCTION
2. LOW PRESSURE PUMPED LINE WILL BE LOCATED BETWEEN THE HYDRANTS AND POLE LINE, AS SHOWN IN FIGURE 1. ADEQUATE SHORING OF POLE LINE MUST BE APPLIED DURING CONSTRUCTION AND BC HYDRO ADVISED IN ADVANCE.

TYPICAL SECTION

SCALE 1:100

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SCALE 1:2000

0 20 40 60 80 100 120 140 160m

(ALL DIMENSIONS ARE IN METRES)

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VILLAGE OF PORT CLEMENTS

SANITARY SEWER EXTENSION ALTERNATIVE #2

LOW PRESSURE PUMPED SYSTEM

PLAN & DETAILS

Client Project No

Client Drawing No

MCSL Project No. 2321-00739-0

Drawing No. 739-ALT2-01

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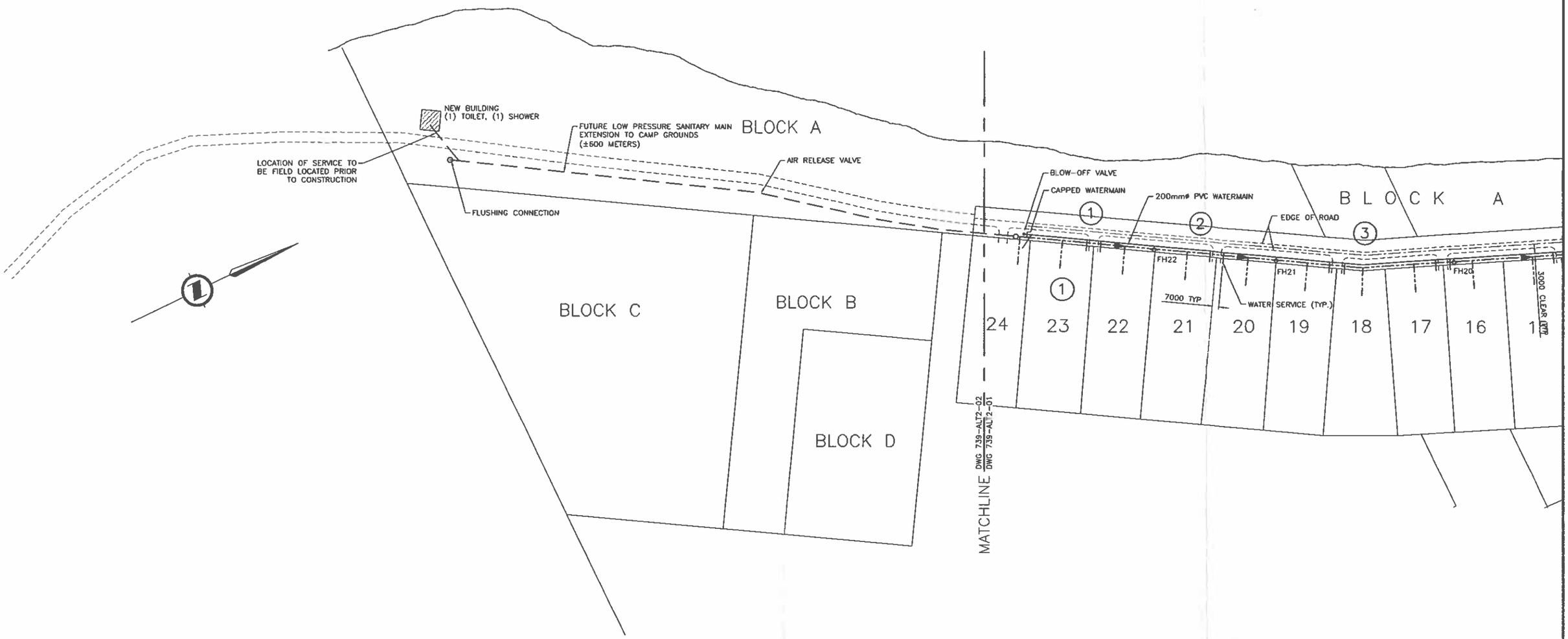

LEGEND

- (4) ZONE NUMBER
- FLOW DIRECTION & ZONE DIVIDER
- LOW PRESSURE SANITARY SEWER MAIN & SERVICE
- EXISTING 200mmø PVC WATERMAIN & HYDRANT FH18

HALF SIZED

No.	Date	Revision	Dr.

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SCALE 1:2000
0 20 40 60 80 100 120 140 160m
(ALL DIMENSIONS ARE IN METRES)

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VILLAGE OF PORT CLEMENTS

FUTURE SANITARY SEWER EXTENSION TO CAMP GROUNDS
LOW PRESSURE PUMPED SYSTEM
PLAN

Client Project No
Client Drawing No
MCSL Project No. 2321-00739-0
Drawing No. 739-ALT2-02
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