Mountain View County

RURAL SUBDIVISION WATER & WASTEWATER SERVICING GUIDELINES & STANDARDS

Mountain View COUNTY

Building Rural Better

January 2010

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Section 2. RURAL SUBDIVISION WATER & WASTEWATER SERVICING – GUIDELINES & STANDARDS

1. INTRODUCTION

1.1 General

BSEI received written authorization from Mountain View County on February 6, 2008 to proceed with the preparation of Rural Subdivision Water & Wastewater Servicing Guidelines & Standards for stand alone (*one lot*) and communal (*multi-lot*) rural developments. The Terms of Reference which were addressed in a December 3, 2007 letter to BSEI are as follow. (*It should be noted that BSEI has taken the liberty of replacing the term "sanitary" with the currently used term "wastewater". The changes are shown in italics*).

a) Set of Standard Specification for *wastewater* and water services for stand alone and communal rural systems. These systems will be County owned and operated.

- Proposed line sizes in relation to lot numbers.
- Drawings of alignments for underground services
- Standard drawing of the proposed PUL for communal services.
- Standard drawing of the proposed *wastewater* holding tanks for communal services.
- Standard drawing of the proposed water holding tanks for communal services.
- Make reference to the Alberta Environment and City of Calgary Specifications for construction and operation of water/*wastewater* services.
- Recommend water supply amount for each lot.
- Calculate proposed *wastewater* volume for each lot.
- Basic design templates for subdivision with lots numbering 4, 10, 15, 20, 25, 30, 50, 80, 100, 150, 200, 240.

b) Comparison Report: Stand Alone vs. Communal Services

- Produce a report for County council outlining the costs to construct stand alone and communal multi lot subdivisions.
- Produce an average cost to construct a single *wastewater* holding tank on a lot.
- Produce an average cost to construct a communal system for subdivisions with lots numbering 4, 10, 15, 20, 25, 30, 50, 80, 100, 150, 200, and 240.
- Produce a graph and explanation of a "break even point" where the construction of a communal system is more cost effective than the creation of multiple stand alone systems.
- Pro & Cons from health perspective of operating a water utility vs. multiple private cisterns."

We understand that Council discourages the use of wastewater facilities involving on-site ground disposal systems such as tile fields and treatment mounds but will consider allowing this method for smaller subdivisions. The preferred methods of handling wastewater include but are not necessarily limited to the following:

- trucking of untreated wastewater from a holding tank to a wastewater treatment facility with the requirement that provision be made to facilitate pumping of untreated wastewater to a regional pipeline collection system when economically feasibly;
- pumping of untreated wastewater from a holding tank to a regional pipeline collection system terminating at a wastewater treatment facility; and
- provision of an on-site wastewater treatment facility with final disposal by means of irrigation on adjacent lands or discharge to a surface water body or wetlands.

We were also advised that a non- potable water supply must be provided for fire protection purposes.

BSEI also added a two lot subdivision to the list of subdivisions. The reason for this is that a shared water service for two lots is considered to be a communal system and as such requires Alberta Environment approval.

1.2 Reference Guidelines, Standards and Specifications

The Rural Subdivision - Water & Wastewater Servicing – Guidelines & Standards makes reference to the following documents relative to requirements for design, materials used, construction and operation of water and wastewater services. It is recommended that the Development Agreement contain a section stating that the Developer shall be governed by the MVC guidelines and standards as well as these documents which are in force and effect as of the date of the agreement. Exceptions to the guidelines, standards and specifications should be noted in this section.

- Guidelines for Canadian Drinking Water Quality.
- The January, 2006 Alberta Environment Standards & Guidelines for Municipal Waterworks, Wastewater & Storm Drainage Systems.
- Water Act – the purpose of this Act is to support and promote the conservation and management of water, including the wise allocation and use of surface or ground water. The diversion and use of surface or ground water for communal water systems in Alberta requires a license under this Act.
- The City of Calgary – Standard Specifications – Waterworks Construction – current edition.
- The City of Calgary – Standard Specifications – Sewer Construction – current edition.
- Alberta Private Sewage Systems – Standard of Practice – 2009 and Handbook for the Alberta Private Sewage Systems – Standard of Practice – 2009 or current editions. These documents have been included as a reference related to the sizing and design of holding tanks as well as package treatment plants for communal systems. These documents also detail the design and operation of septic tanks, tile fields and treatment mounds and would apply in the event that the use of a ground disposal system for individual lots in a subdivision up to five (5) lots or a communal system up to fifty (50) lots is the most viable approach.
- Public Health Act.

1.3 Water & Wastewater Services - Approvals

Mountain View County is responsible for approval of the following water services:

- water systems that use a regional treated water pipeline, treated water trucking or a high quality groundwater source and service up to 14 lots. (*Provincial Health Authority approval is also required)*; and

- the use of groundwater wells for individual lots in rural subdivisions.

Based on the foregoing, the County will be required to establish a review/approval process administered totally by in-house staff or administered jointly by in-house staff and a private contractor.

Alberta Environment approval (*under the Environmental Protection and Enhancement Act*) and Mountain View County approval are required for the following water & wastewater services:

- wastewater systems (*it is noted that Alberta Environment approval may not be required for smaller communal systems*);

- water systems that use a regional treated water pipeline, treated water trucking or a high quality groundwater source and service more than 14 lots; and

- water systems that use a surface water supply, a GWUDI groundwater source, or a non-GWUDI groundwater supply that does not satisfy the requirements of the Guidelines for Canadian Drinking Water Quality and service more than one lot.

Alberta Environment approval and licensing are required under the Water Act for the diversion and use of surface or ground water for communal systems servicing multi-lot rural subdivisions.

Licensing of groundwater wells for individual lots is not required under this act. However, Alberta Environment does require that the Developer of a rural subdivision with six or more individually serviced lots per quarter section, engage a Hydrogeological engineer registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta to conduct a groundwater evaluation study and submit a report to the local authority stating that there is adequate water for the total number of lots being developed.

The Provincial Health Authority (PHA) is responsible for the application of the Public Health Act of Alberta. The role of the PHA under the Act applies to all drinking water systems where there is a concern about health impacts or disease transmission.

1.4 Communal Water & Wastewater Services – Ownership and Operation

Council's decision to take over ownership and operation of communal systems is commendable as this removes the requirement for establishing individual water & wastewater co-ops. This ensures that the users will receive consistent and reliable long term service. The procedure for taking over ownership of the services should be addressed in a Development Agreement.

Certification of County Staff responsible for operation of the systems will be required. This can be arranged through Alberta Environment.

1.5 Communal Water & Wastewater Services – Design and Construction

The Developer must arrange for a Professional Engineer licensed by the Association of Professional Engineers, Geologist and Geophysicists of Alberta to practice engineering in the Province of Alberta, to design and supervise construction of water and wastewater services for rural subdivisions. This requirement should be noted in a Development Agreement.

It is recommended that Council consider taking over the responsibility for the design and construction of major components of the required water and wastewater services (*i.e. water and wastewater treatment and pumping systems*) with the total cost borne by the Developer. The City of Airdrie has found this to be a very effective means of ensuring the quality and standardization of wastewater pumping stations. This matter should, if Council decides to proceed in this manner, be dealt with in detail in a Development Agreement.

1.6 Deliverables

The **"Rural Subdivision - Water & Wastewater Servicing - Guidelines & Standards"** and the **"Rural Subdivision - Water & Wastewater Servicing - Comparison Report - Stand Alone Versus Communal Services"** are presented as separate documents in Sections 2 and 3 respectively.

Mountain View County

RURAL SUBDIVISION WATER AND WASTEWATER SERVICING GUIDELINES AND STANDARDS

Mountain View COUNTY

Building Rural Better

January 2010

FOREWORD

Mountain view County adopted the Rural Subdivision Water & Wastewater Services Guidelines & Standards on August 12, 2009.

The objective of this document is to provide Developers of rural subdivisions with information and direction relative to the design and construction of water and wastewater services in order to ensure:

- public health and environmental protection; and
- standardization of servicing in rural subdivisions to provide cost effectiveness in the areas of operation and maintenance. This is important as the County intends to assume ownership and operation of the systems following construction.

County approval must be obtained prior to the start of construction.

Unless otherwise noted in the Development Agreement, the design, materials used, construction and operation of water and wastewater services are to comply with the requirements of this document as well as the following:

- Guidelines for Canadian Drinking Water Quality
- The January, 2006 Alberta Environment Standards & Guidelines for Municipal Waterworks, Wastewater & Storm Drainage Systems (*available from the Queens' Printer Bookstore*).
- Water Act – the purpose of this Act is to support and promote the conservation and management of water, including the wise allocation and use of surface or ground water. The diversion and use of surface or ground water for communal water systems in Alberta requires a license under this Act (*available from the Queen's Printer Bookstore*). Licensing is administered by Alberta Environment.

  Licensing of groundwater wells for individual lots is not required under this Act.

  Alberta Environment does require that the Developer of a rural subdivision with six or more individually serviced lots per quarter section engage a Hydrogeological engineer registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta to conduct a groundwater evaluation study and submit a report to the local authority (*in this case Mountain View County*) stating that there is adequate water for the number of lots being developed.
- The City of Calgary – Standard Specifications – Waterworks Construction – current edition (*available online at www.calgaryonlinestore.com*).
- The City of Calgary – Standard Specifications – Sewer Construction – current edition (*available* online at www.calgaryonlinestore.com).
- Alberta Private Sewage Systems – Standard of Practice – 2009 and Handbook for Alberta Private Sewage Systems – Standard of Practice – 2009 (*or current editions*). These documents have been included as a reference related to the sizing and design of holding tanks, package treatment plants and treated wastewater ground disposal systems for communal systems (*published by the Safety Codes Council*).
- Public Health Act of Alberta (*available from the Queen's Printer Bookstore*).

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Definitions/Abbreviations

Abbreviations

AENV	Alberta Environment
Cg	Canadian gallons
Cgpm	Canadian gallons per minute
CM	cubic metres
EPEA	Environmental Protection and Enhancement Act
GWUDI	Groundwater Under the Direct Influence of Surface Water
kPa	kilopascal
L	litres
L/M	liters per minute
ℓ/s	liters per second
MAC	maximum acceptable concentration
mg/l	parts per million
Min.	minimum
mm	millimeter
MVC	Mountain View County
No.	number
psi	pounds per square inch
PUL	Public Utility Lot
USgpm	United States gallons per minute
WA	Water Act

Definitions

Communal Services	refers to sharing of centralized services by all lots within a rural subdivision
Stand Alone Services	refers to separate services for each lot within a rural subdivision
High Quality Groundwater Supply	refers to a groundwater water supply that is not under the direct influence of surface water (*non-GWUDI*) and meets the Guidelines for Canadian Drinking Water Quality (*i.e. contains no parameters exceeding the Maximum Acceptable Concentration*)

Section 1 WATER SERVICING

1.1 General

Water services for a communal rural system will generally include the following.

- water supply source;
- water treatment;
- treated water storage;
- distribution pumps; and
- water distribution mains and service connections

These are covered in detail in Sections 1.3 to 1.6.

Treated water storage reservoir is to be located on a PUL within the subdivision. Refer to drawing in Appendix "A".

It should be noted that provision of a non-potable water supply for fire protection purposes is required. A drawing of a typical non-potable supply and dry hydrant for fire protection is provided in Appendix "A".

Water service for a stand alone rural system will generally include a water supply source, a cistern for storage and a pressure system for distribution. The quantity of water, extent of treatment and volume of the cistern provided are at the discretion of the owner.

1.2 Minimum Design Requirements

The minimum requirements to be used for sizing of water services are:

- Number of persons per serviced lot — 4
- Average day demand per person — 340 L (*75 Cg*)
- Maximum day demand — 2.0 times average day demand

(*the maximum day demand is used to determine the required supply rate, storage volumes and pumping requirements*)

- Peak hour demand rate ℓ/s (*Cgpm*) — 2.5 times the maximum day demand divided by 86400 for ℓ/s (*1440 for gpm*)

(*the peak hour demand rate is used to determine distribution line sizing as well as pumping requirements*)

The service population, average day demand L (*Cg*), maximum day demand L and ℓ/s (*Cg and Cgpm*) and peak hour demand for rural subdivisions ranging in size from 2 to 240 lots are summarized in Tables 1.1 (a) and 1.1 (b).

Table 1.1 (a)					
Number of Lots	*Service Population*	*Average Day Demand L*	*Maximum Day Demand L*	*Maximum Day Demand ℓ/s*	*Peak Hour Demand ℓ/s*
2	8	2,720	5,440	0.1	0.2
4	16	5,440	10,880	0.1	0.3
10	40	13,600	27,200	0.3	0.8
15	60	20,400	40,800	0.5	1.2
20	80	27,200	54,400	0.6	1.6
25	100	34,000	68,000	0.8	2.0
30	120	40,800	81,600	0.9	2.4
50	200	68,000	136,000	1.6	3.9
80	320	108,800	217,600	2.5	6.3
100	400	136,000	272,000	3.1	7.9
150	600	204,000	408,000	4.7	11.8
200	800	272,000	544,000	6.3	15.7
240	960	326,400	652,800	7.6	18.9

Table 1.1 (b)					
Number of Lots	*Service Population*	*Average Day Demand Cg*	*Maximum Day Demand Cg*	*Maximum Day Demand Cgpm*	*Peak Hour Demand Cgpm*
2	8	600	1,200	0.8	2.1
4	16	1,200	2,400	1.7	4.2
10	40	3,000	6,000	4.2	10.4
15	60	4,500	9,000	6.3	15.6
20	80	6,000	12,000	8.3	20.8
25	100	7,500	15,000	10.4	26.0
30	120	9,000	18,000	12.5	31.3
50	200	15,000	30,000	20.8	52.1
80	320	24,000	48,000	33.3	83.3
100	400	30,000	60,000	41.7	104.2
150	600	45,000	90,000	62.5	156.3
200	800	60,000	120,000	83.3	208.3
240	960	72,000	144,000	100.	250.0

1.3 Water Supply Sources

1. Regional Treated Water Pipeline

This is the preferred method of providing treated water to rural subdivisions.

2. Trucking of Treated Water

Trucking of treated water to a communal storage reservoir/pumping station is an acceptable means for smaller developments where service by a regional pipeline is not available. (*Refer to Section 1.3.7 for additional information*)

3. Groundwater Well

This refers to a high quality groundwater source.

4. Non-GWUDI Well

This refers to a groundwater source that is not under the direct influence of surface water but has one or more parameters exceeding the MAC set down in the Guidelines for Canadian Drinking Water Quality.

5. GWUDI Well

This refers to a groundwater supply that is under the direct influence of surface water.

6. Surface Water

This refers to a water supply taken from a lake, stream or dugout.

7. Recommendations

Recommendations with respect to the acceptable types of supply for rural subdivisions ranging in size from 2 to 240 lots are summarized in Table 1.2.

Table 1.2

Number of Lots	*Pipeline Tr. Water*	*Trucking Tr. Water*	*Ground – Water Well*	*Non GWUDI Well*	*GWUDI Raw Water*	*Surface Water*
2	Yes	Yes	**	No	No	No
4	Yes	Yes	**	No	No	No
10	Yes	**	Yes	**	**	**
15	Yes	**	Yes	**	**	**
20	Yes	No	Yes	**	**	**
25	Yes	No	Yes	Yes	Yes	Yes
30	Yes	No	Yes	Yes	Yes	Yes
50	Yes	No	Yes	Yes	Yes	Yes
80	Yes	No	Yes	Yes	Yes	Yes
100	Yes	No	Yes	Yes	Yes	Yes
150	Yes	No	Yes	Yes	Yes	Yes
200	Yes	No	Yes	Yes	Yes	Yes
240	Yes	No	Yes	Yes	Yes	Yes

Note: Tr. Treated

The double asterisk indicates that a comparison of the cost for trucking water versus the provision of an on-site water treatment system should be carried out before a final decision is made.

1.4 Water Treatment Requirements

Water treatment for communal rural systems must comply with the January 2006 Alberta Environment Standards & Guidelines for Municipal Waterworks, Wastewater & Storm drainage Systems (*or current edition*).

A re-chlorination system is to be provided for potable water supplies obtained from a regional pipeline or by trucking.

1.5 Treated Water Storage

The minimum storage volume required is equal to twice the maximum daily demand at full build out.

The minimum treated water storage requirements for communal rural systems ranging in size from 2 to 240 lots are summarized in Tables 1.3 (a) and 1.3 (b).

Table 1.3 (a)

Number of Lots	*Service Population*	*Average Day Demand L*	*Maximum Day Demand L*	*Min. Storage Volume L*	*Min. Storage Volume CM*
2	8	2,720	5,440	10,880	11
4	16	5,440	10,880	21,760	22
10	40	13,600	27,200	54,400	55
15	60	20,400	40,800	81,600	82
20	80	27,200	54,400	108,800	109
25	100	34,000	68,000	136,000	136
30	120	40,800	81,600	163,200	164
50	200	68,000	136,000	272,000	272
80	320	108,800	217,600	435,200	436
100	400	136,000	272,000	544,000	544
150	600	204,000	408,000	816,000	816
200	800	272,000	544,000	1,088,000	1,088
240	960	326,400	652,800	1,305,600	1,306

Table 1.3 (b)

Number of Lots	*Service Population*	*Average Day Demand Cg*	*Maximum Day Demand Cg*	*Min. Storage Volume Cg*
2	8	600	1,200	2,400
4	16	1,200	2,400	4,800
10	40	3,000	6,000	12,000
15	60	4,500	9,000	18,000
20	80	6,000	12,000	24,000
25	100	7,500	15,000	30,000
30	120	9,000	18,000	36,000
50	200	15,000	30,000	60,000
80	320	24,000	48,000	96,000
100	400	30,000	60,000	120,000
150	600	45,000	90,000	180,000
200	800	60,000	120,000	240,000
240	960	72,000	144,000	288,000

Developer is to provide equipment for remote monitoring of water levels for a system that is supplied with treated water by trucking.

Drawings of typical water storage reservoirs are provided in Appendix "A".

Water reservoir is to be located within the subdivision on a PUL. Refer to drawing in Appendix "A".

1.6 Distribution Pumping System

The distribution pumping system to consist of at least three vertical turbines, variable speed pumps each capable of maintaining system pressure at 350 – 425 kPa (*50 – 60 psi*) during peak hour demands.

Standby power or an auxiliary engine should be provided to maintain supply during power outages.

A drawing of a typical pumping system is provided in Appendix "A".

1.7 Distribution Mains and Service Connections

The minimum sizes of water distribution mains for service areas ranging in size from 2 to 240 lots are shown in Table 1.4.

The sizing is based on:

- single main servicing (*i.e. no looping*);
- peak hour demand rate throughout the entire length of main; and
- a maximum head loss in the order of (*3 to 4 psi per 100 feet of main*)

Table 1.4

Number of Lots	*Service Population*	*Peak Hour Demand Cgpm*	*Peak Hour Demand USgpm*	*Min. Pipe Diameter inches*
2	8	2.1	2.5	3
4	16	4.2	5.0	3
10	40	10.4	12.5	3
15	60	15.6	18.8	3
20	80	20.8	25.0	3
25	100	26.0	31.3	3
30	120	31.3	37.5	3
50	200	52.1	62.5	3
80	320	83.2	100	3
100	400	104.2	125.0	3
150	600	156.3	187.5	4
200	800	208.3	250.0	4
240	960	250.0	300.0	6

Distribution mains are to be looped as required by the County to enhance system reliability.

Shut-off valves are required to allow isolation of sections of the distribution system for repairs. The number of lots isolated not to exceed 15 to 20.

Yard hydrants are to be installed at regular intervals and at the end of dead end mains for flushing purposes.

Air release valves may be required.

A service connection is to be installed to each lot (*minimum size-one inch*).

Unless otherwise approved, the design, materials used and construction of the water distribution system and service connections to be in accordance with AENV Standards & Guidelines and The City of Calgary – Standard Specifications – Waterworks Construction – current edition.

Refer to drawings in Appendix "A" showing standard alignments for underground services.

1.8 Approvals

Mountain View County approval and Provincial Health Authority approval are required for the following:

- water systems that use a regional treated water pipeline, treated water trucking or a high quality groundwater source and service up to 14 lots; and
- use of groundwater wells for individual lots in rural subdivisions.

Alberta Environment approval (*under the Environmental Protection and Enhancement Act*) and Mountain View County approval are required for the following water services:

- water systems that use a regional treated water pipeline, treated water trucking or a high quality groundwater source and service more than 14 lots;
- water systems that use a surface water supply and service more than one lot;
- water systems that use a groundwater source considered to be under the direct influence of surface water (*GWUDI*) and service more than one lot; and
- water systems which use a non-GWUDI groundwater source that has one or more parameters exceeding the MAC set down in the Guidelines for Canadian Drinking Water Quality and service more than one lot.

Alberta Environment (*under the Water Act*) requires that an approval and a license be obtained for the diversion and use of surface or ground water for communal systems servicing multi-lot rural subdivisions.

Licensing of groundwater wells for individual lots is not required under this Act. Alberta Environment does require that the Developer of a rural subdivision with six or more individually serviced lots per quarter section, engage a Hydrogeological engineer registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta to conduct a groundwater evaluation study and submit a report to the local authority (*in this case Mountain View County*) stating that there is adequate water for the number of lots being developed.

Approval requirements are summarized in Table 1.5.

Table 1.5					
Water Supply Source	*Number of Lots*	*AENV under the EPEA*	*AENV under the WA*	*MVC*	*Provincial Health Authority*
Communal Systems					
Regional Treated Water Pipeline **	2 to 14 15 plus	No Yes	No No	Yes Yes	Yes No
Trucking of Treated Water **	2 to 14 15 plus	No Yes	No No	Yes Yes	Yes No
High Quality Groundwater Well **	2 to 14 15 plus	No Yes	Yes Yes	Yes Yes	Yes No
Non – GWUDI Well **	2 plus	Yes	Yes	Yes	No
GWUDI Well **	2 plus	Yes	Yes	Yes	No
Surface Water **	2 plus	Yes	Yes	Yes	No
Stand Alone Systems in a Rural Subdivision					
Individual Groundwater Wells per Quarter Section	1 to 5 6 plus	No No	No Yes	Yes Yes	Yes Yes

** Refer to Section 1.3 & 1.8 for additional information.

The Provincial Health Authority (*PHA*) is responsible for the application of the Public Health Act of Alberta. The role of the PHA under the Public Health Act applies to all drinking water systems where there is a concern about health impacts or disease transmission.

Section 2 WASTEWATER SERVICING

2.1 General

Wastewater services for a communal rural system will consist of:

- a wastewater collection system;
- a wastewater holding tank with disposal of wastewater by trucking to an Alberta environment approved treatment facility **or**
- a wastewater holding tank complete with a pump station to transfer wastewater to a regional pipeline collection system **or**
- an onsite wastewater treatment and disposal system

A stand alone system will consist of a separate holding tank for each lot with disposal of wastewater by means of an on-site ground disposal system or if this is not possible by trucking to an Alberta Environment approved treatment facility.

2.2 Minimum Design Requirements

The minimum requirements to be used for sizing of wastewater services are:

- Number of persons per serviced lot – 4
- Average daily wastewater volume per person – 340 L (*75 Cg*) (*the average day wastewater volume is used for sizing holding tanks, ground disposal systems and wastewater stabilization ponds).*
- Peak hour wastewater flow rate equal to 3.5 times the average day flow rate (*the peak hour flow rate is used for sizing of collection lines, pumping stations and mechanical wastewater treatment plants*).

The service population, average daily wastewater volume and peak hour flow rate for subdivisions ranging in size from 1 to 240 lots are summarized in Tables 2.1 (a) and 2.1 (b).

Table 2.1 (a)

Number of Lots	*Service Population*	*Average Day Wastewater Volume L*	*Average Wastewater Flow Rate L/m*	*Peak Wastewater Flow Rate L/m*
1	4	1,360	-	-
2	8	2,720	1.9	7
4	16	5,440	3.8	13
10	40	13,600	9.4	33
15	60	20,400	14.2	50
20	80	27,200	18.9	66
25	100	34,000	23.6	83
30	120	40,800	28.3	99
50	200	68,000	47.2	165
80	320	108,800	75.6	265
100	400	136,000	94.4	331
150	600	204,000	141.7	496
200	800	272,000	188.9	661
240	960	326,400	226.7	793

Table 2.1 (b)				
Number of Lots	*Service Population*	*Average Day Wastewater Volume Cg*	*Average Wastewater Flow rate Cgpm*	*Peak Wastewater Flow Rate Cgpm*
1	4	300	-	-
2	8	600	1	2
4	16	1,200	1	3
10	40	3,000	3	8
15	60	4,500	4	11
20	80	6,000	5	15
25	100	7,500	6	19
30	120	9,000	7	22
50	200	15,000	11	37
80	320	24,000	17	59
100	400	30,000	21	73
150	600	45,000	32	110
200	800	60,000	42	146
240	960	72,000	50	175

2.3 Wastewater Collection

1. General

The following collection methods are acceptable:

- low pressure system;
- gravity flow system;
- combination of low pressure and gravity flow systems.

2. Low Pressure System

A low pressure system requires the following:

- a holding tank with grinder pump on each lot. A performance specification for a grinder pump is provided in Appendix "B".
- a 50mm *(two inch*) diameter service line from the grinder pump complete with an isolation valve;
- a low pressure wastewater collection system consisting of 75mm (*three inch*) and/or 100mm *(four inch*) diameter mains located within the road rights-of-way and equipped with air relief/air vacuum valves as required to remove air and prevent negative pressures:
- a communal wastewater holding tank located within the subdivision on a PUL. Refer to drawing in Appendix "A".

3. Gravity Flow System

Gravity flow system consists of:

- a 100 mm (*four inch*) diameter service connection from each lot to a 200 mm (*eight inch*) diameter collection main located within the road rights-of-way;
- a communal wastewater holding tank located within the subdivision on a PUL. Refer to drawing in Appendix "A".

4. Design, Materials and Construction

Unless otherwise noted in the Development Agreement, the design, materials used and construction of wastewater collection mains and service connections will be in accordance with the requirements of:

- The January 2006 Alberta Environment Standards & Guidelines for Water, Wastewater & Storm Drainage Systems (*or current edition*);
- The City of Calgary – Standard Specifications – Waterworks Construction – current edition (*for pressure lines*);
- The City of Calgary – Standard Specifications – Sewer Construction – current edition (*for gravity flow lines*); and
- The Alberta Private Sewage Systems – Standard of Practice – 1999 and Alberta Private Sewage Systems – Standard of Practice Handbook – 1999 or current editions.

5. Alignments for Underground Services

Refer to drawings in Appendix "A" showing standard alignments for underground services.

2.4 Wastewater Disposal

1. Wastewater Volumes

Tables 2.2 (a) and (b) summarize the expected average daily volumes of wastewater in L and Cg and the cumulative volumes for periods of two to seven days for rural subdivisions ranging in size from 2 to 240 lots.

Table 2.2 (a)

No. of Lots	*Service Population*	*Wastewater Volume – L*						
		1-Day	*2-Days*	*3-Days*	*4-Days*	*5-Days*	*6-Days*	*7-Days*
2	8	2,720	5,440	8,160	10,880	13,600	16,320	19040
4	16	5,440	10,880	16,320	21,760	27,200	32,640	38,080
10	40	13,600	27,200	40,800	54,400	68,000	81,600	95,200
15	60	20,400	40,800	61,200	81,600	102,000	122,400	142,800
20	80	27,200	54,400	81,600	108,800	136,000	163,200	190,400
25	100	34,000	68,000	102,000	136,000	170,000	204,000	238,000
30	120	40,800	81,600	122,400	163,200	204,000	244,800	285,600
50	200	68,000	136,000	204,000	272,000	340,000	408,000	476,000
80	320	108,800	217,600	326,400	435,200	544,000	652,800	761,600
100	400	136,000	272,000	408,000	544,000	680,000	816,000	952,000
150	600	204,000	408,000	612,000	816,000	1,020,000	1,224,000	1,428,000
200	800	272,000	544,000	816,000	1,088,000	1,360,000	1,632,000	1,904,000
240	960	326,400	652,800	979,200	1,305,600	1,632,000	1,958,400	2,284,800

Table 2.2 (b)

No. of Lots	Service Population	Wastewater Volume – Cg						
		1-Day	2-Days	3-Days	4-Days	5-Days	6-Days	7-Days
2	8	600	1,200	1,800	2,400	3,000	3,600	4,200
4	16	1,200	2,400	3,600	4,800	6,000	7,200	8,400
10	40	3,000	6,000	9,000	12,000	15,000	18,000	21,000
15	60	4,500	9,000	13,500	18,000	22,500	27,000	31,500
20	80	6,000	12,000	18,000	24,000	30,000	36,000	42,000
25	100	7,500	15,000	22,500	30,000	37,500	45,000	52,500
30	120	9,000	18,000	27,000	36,000	45,000	54,000	63,000
50	200	15,000	30,000	45,000	60,000	75,000	90,000	105,000
80	320	24,000	48,000	72,000	96,000	120,000	144,000	168,000
100	400	30,000	60,000	90,000	120,000	150,000	180,000	210,000
150	600	45,000	90,000	135,000	180,000	225,000	270,000	315,000
200	800	60,000	120,000	180,000	240,000	300,000	360,000	420,000
240	960	72,000	144,000	216,000	288,000	360,000	432,000	504,000

2. Trucking Wastewater

Table 2.3 summarizes the number of daily trips required for a 22,727 L (*5,000 Cg*) tanker truck to dispose of the average daily volume of untreated wastewater accumulated over periods of 1 to 7 days. The highlighted section of the table indicates the maximum number of lots which should be serviced by tanker truck for each storage period (*i.e. daily pick-up recommended for 50 lots*).

Table 2.3

No. of Lots	Service Population	Daily Tanker Truck Trips Required						
		1-Day of storage	2-Days of storage	3-Days of storage	4-Days of storage	5-Days of storage	6-Days of storage	7-Day of storage s
2	8	1.0	1.0	1.0	1.0	1.0	1.0	1.0
4	16	1.0	1.0	1.0	1.0	2.0	2.0	2.0
10	40	1.0	2.0	2.0	3.0	3.0	4.0	5.0
15	60	1.0	2.0	3.0	4.0	5.0	6.0	7.0
20	80	2.0	3.0	4.0	5.0	6.0	8.0	9.0
25	100	2.0	3.0	5.0	6.0	8.0	9.0	11.0
30	120	2.0	4.0	6.0	8.0	9.0	11.0	13.0
50	200	3.0	6.0	9.0	12.0	15.0	18.0	21.0
80	320	5.0	10.0	15.0	20.0	24.0	29.0	34.0
100	400	6.0	12.0	18.0	24.0	30.0	37.0	42.0
150	600	9.0	18.0	27.0	36.0	45.0	54.0	63.0
200	800	12.0	24.0	36.0	48.0	60.0	72.0	84.0
240	960	15.0	29.0	44.0	58.0	72.0	87.0	101.0

3. **Regional Pipeline Wastewater Collection System**

This is the preferred method of disposal and should be implemented when it is economically feasible.

4. **On-Site Wastewater Treatment and Disposal**

This involves construction of an on-site wastewater treatment plant and a treated wastewater disposal method meeting Alberta Environment Standards and Guidelines.

5. **Recommendations**

Recommendations with respect to the acceptable methods of handling wastewater for rural subdivisions ranging in size from 1 to 240 lots are summarized in Table 2.4.

Table 2.4

No. of Lots per Quarter Section	*Trucking Wastewater*	*Regional Pipeline Wastewater Collection System*	*On-Site Wastewater Treatment & Disposal System*	*On-Site Wastewater Ground Disposal System*
1	Yes	No	No	Yes*
2 to 5	Yes	Yes	No	Yes*
6 to 50	Yes	Yes	No	Yes**
51 to 240	No	Yes	Yes	No

* Approved stand alone system ** Approved communal system

2.5 Communal Wastewater Holding Tanks

The minimum volume of an untreated wastewater holding tank is equal to twice the average daily volume.

Holding tanks for trucking disposal systems are to be designed to facilitate the addition of a pumping station for future transferring of untreated wastewater to a regional pipeline collection system.

Holding tanks for systems involving disposal to a regional pipeline wastewater collection system to be equipped with a pumping system consisting of two pumps each having a capacity equal to the peak flow rate (*100% standby system*) and a back-up power generator.

Holding tanks to be equipped with a vent and an odor control system.

Equipment for remote monitoring of wastewater levels to be provided.

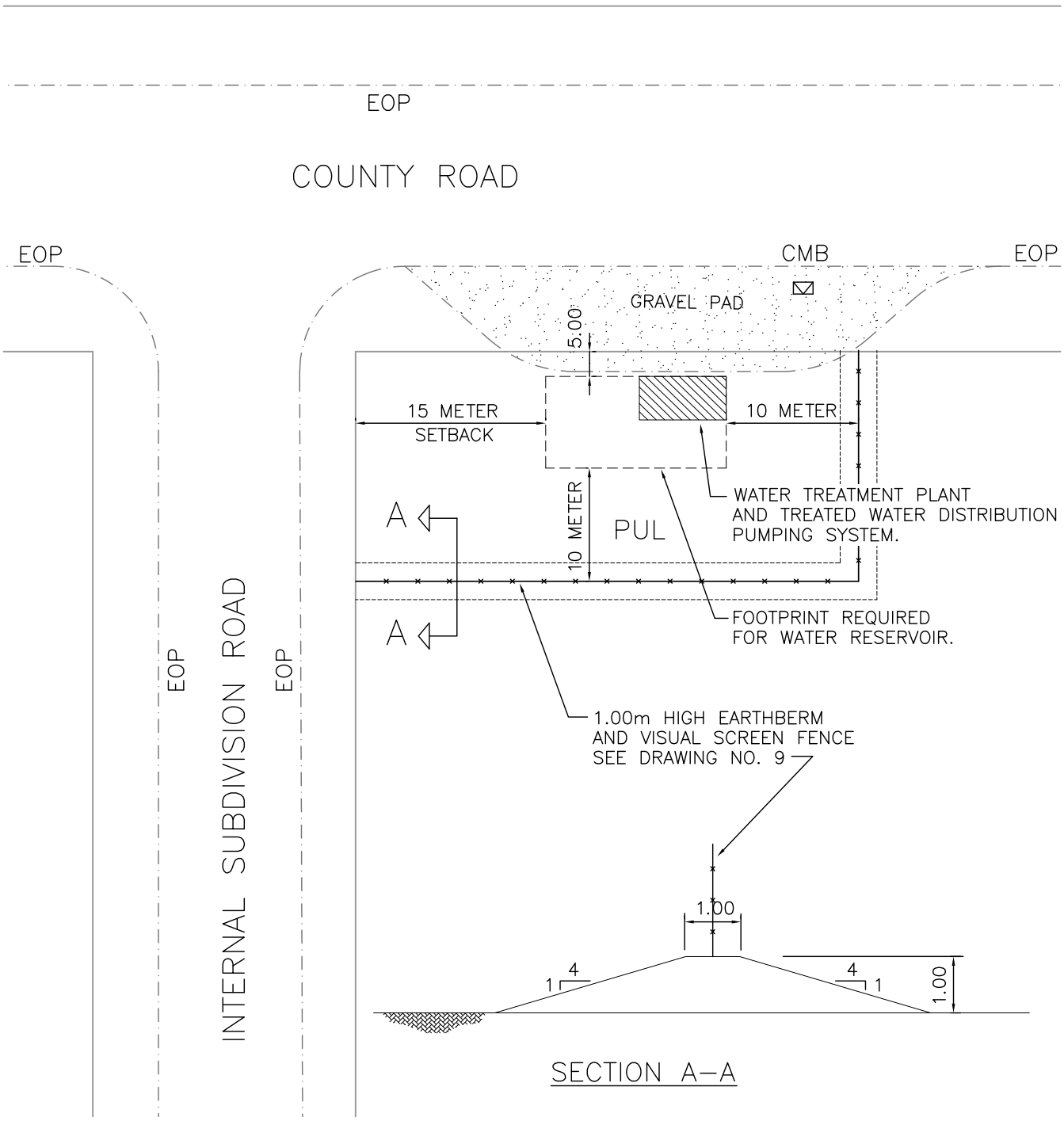
A drawing of a typical wastewater holding tank is provided in Appendix "A".

Set backs required for treatment plants do not apply to holding tanks.

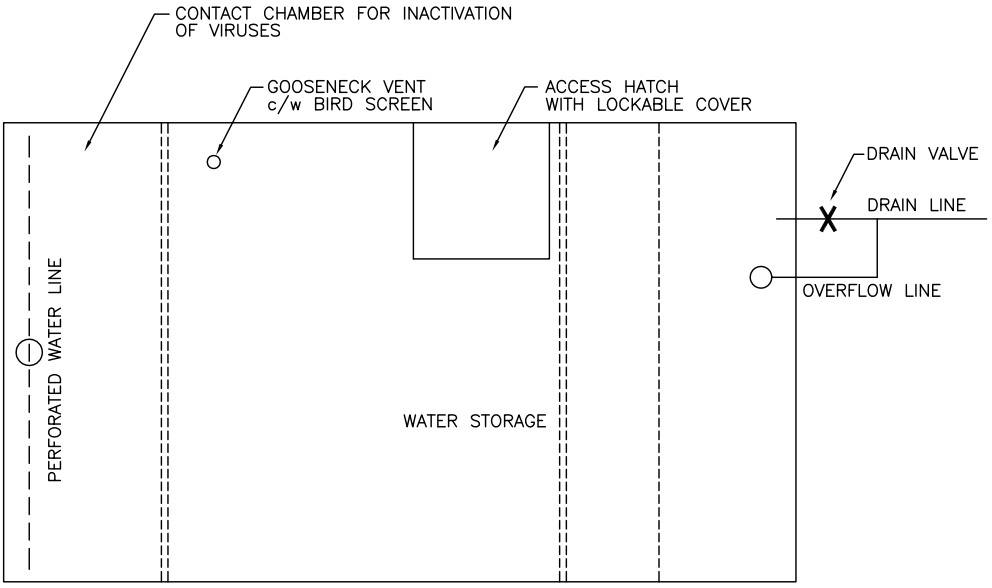
2.6 Approvals

Alberta Environment and Mountain View County approvals are required. It is noted that Alberta Environment approval may not be required for smaller communal wastewater systems. The Developer must contacted Alberta Environment for direction in this regard and advise MVC accordingly.

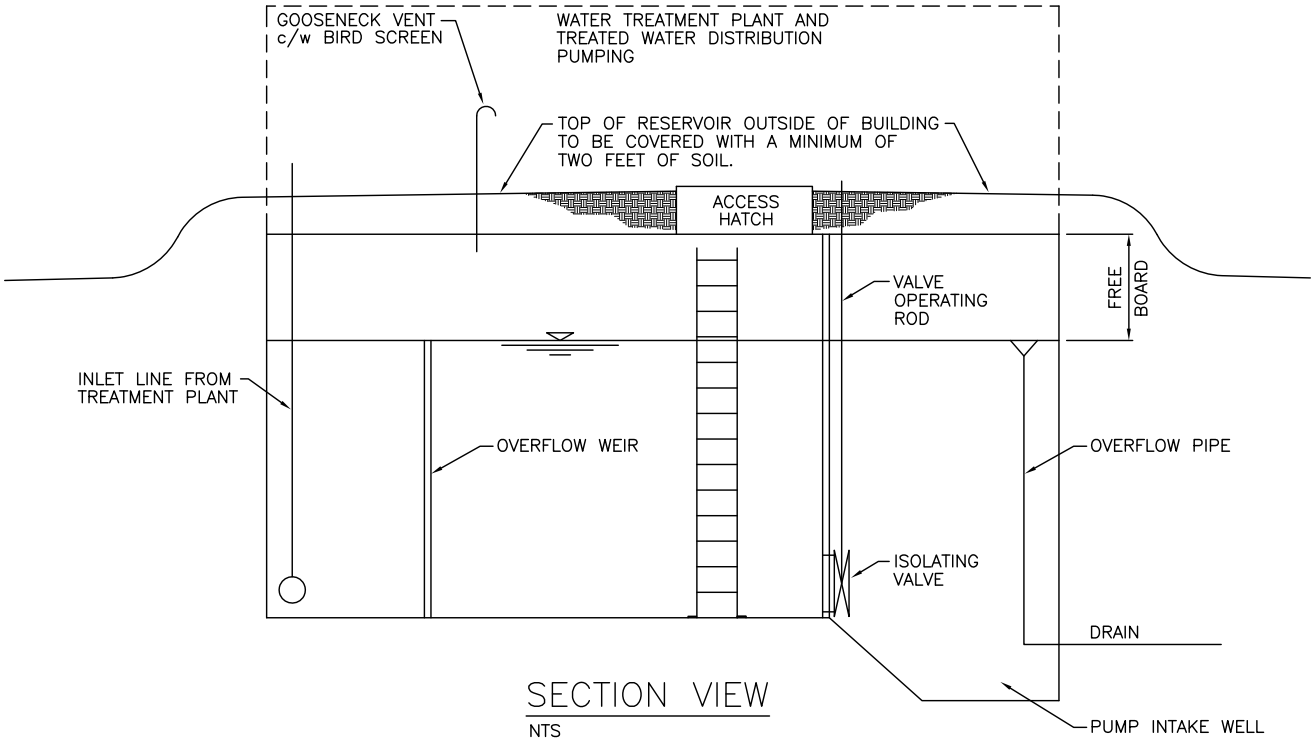
Appendix “A” Drawings



TYPICAL LAYOUT AND SIZE OF A PUBLIC UTILITY LOT FOR TREATED WATER STORAGE RESERVOIR.

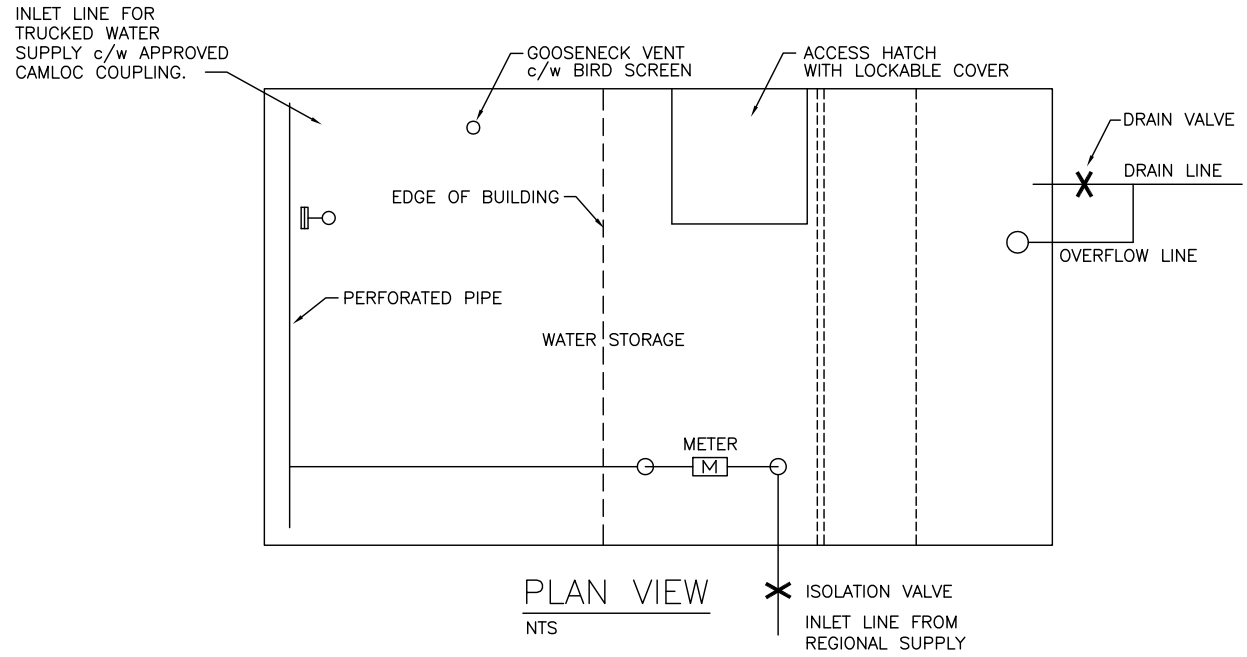


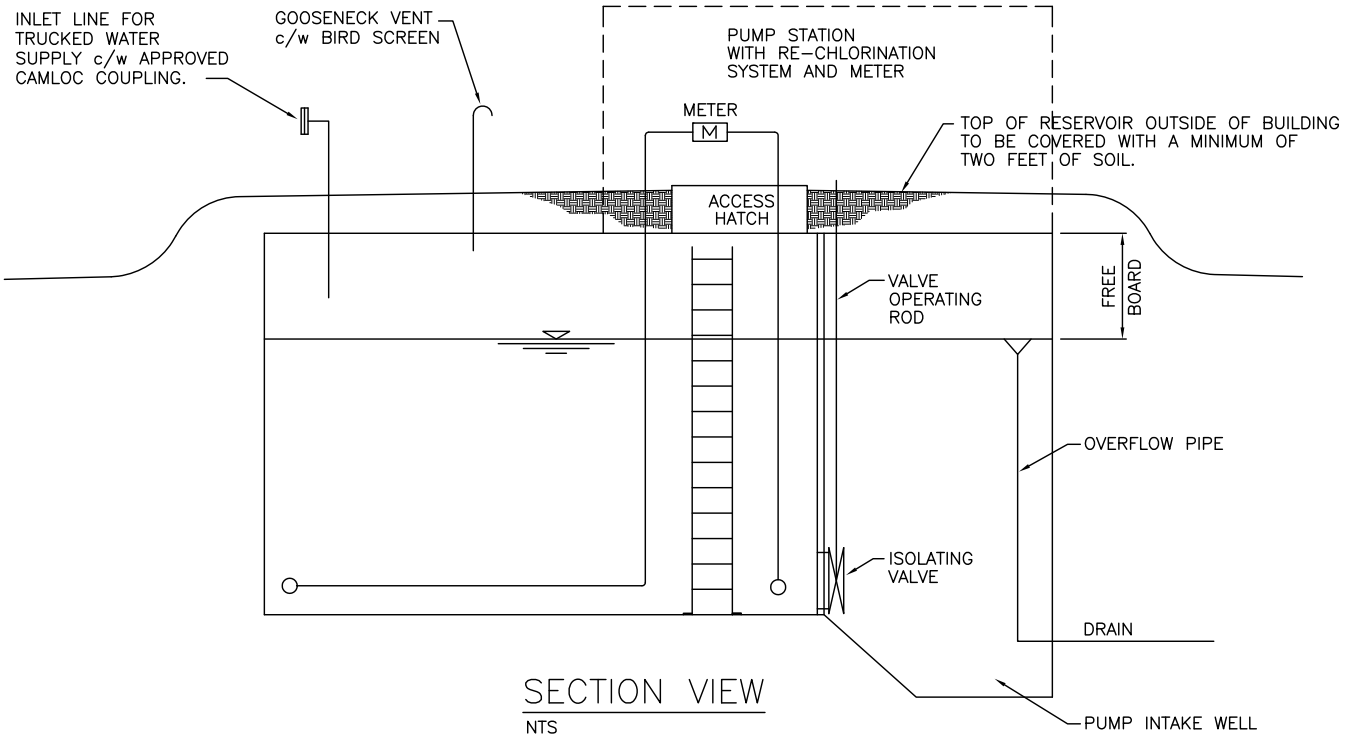
PLAN VIEW
NTS



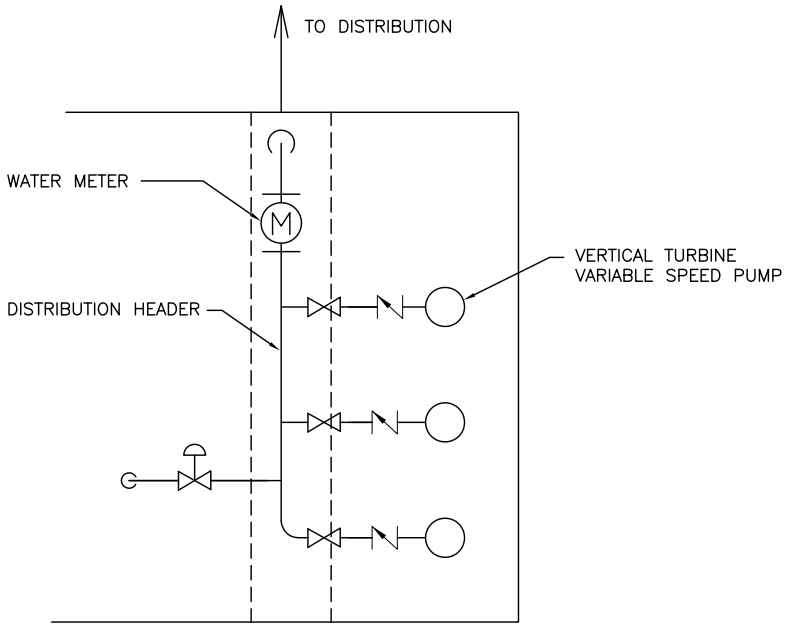
SECTION VIEW
NTS

TYPICAL TREATED WATER STORAGE RESERVOIR BELOW WATER TREATMENT PLANT

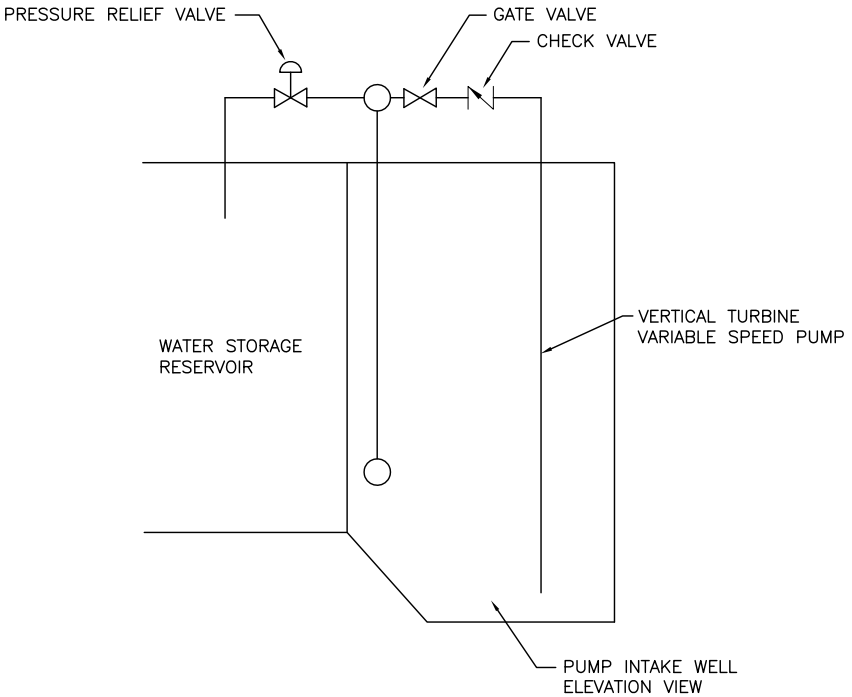




TYPICAL TREATED WATER STORAGE RESERVOIR FOR PIPED AND TRUCKED SUPPLY

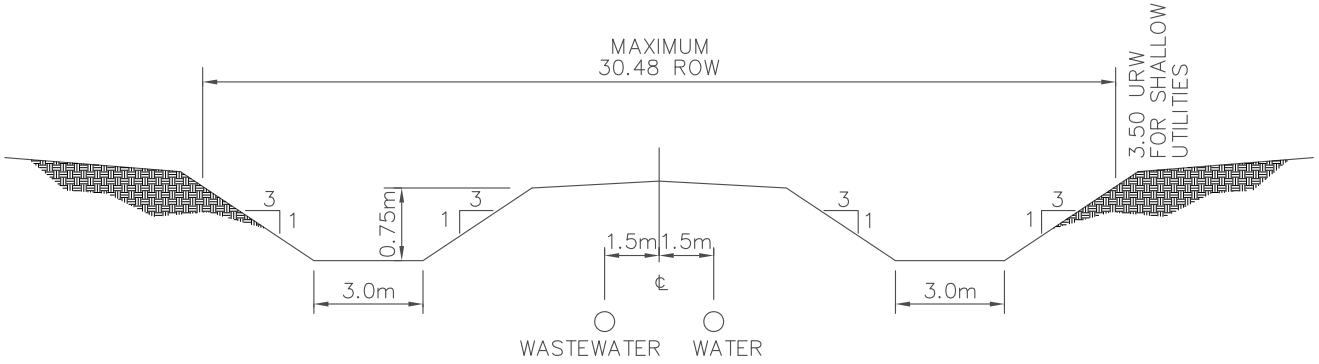


PLAN VIEW
NTS

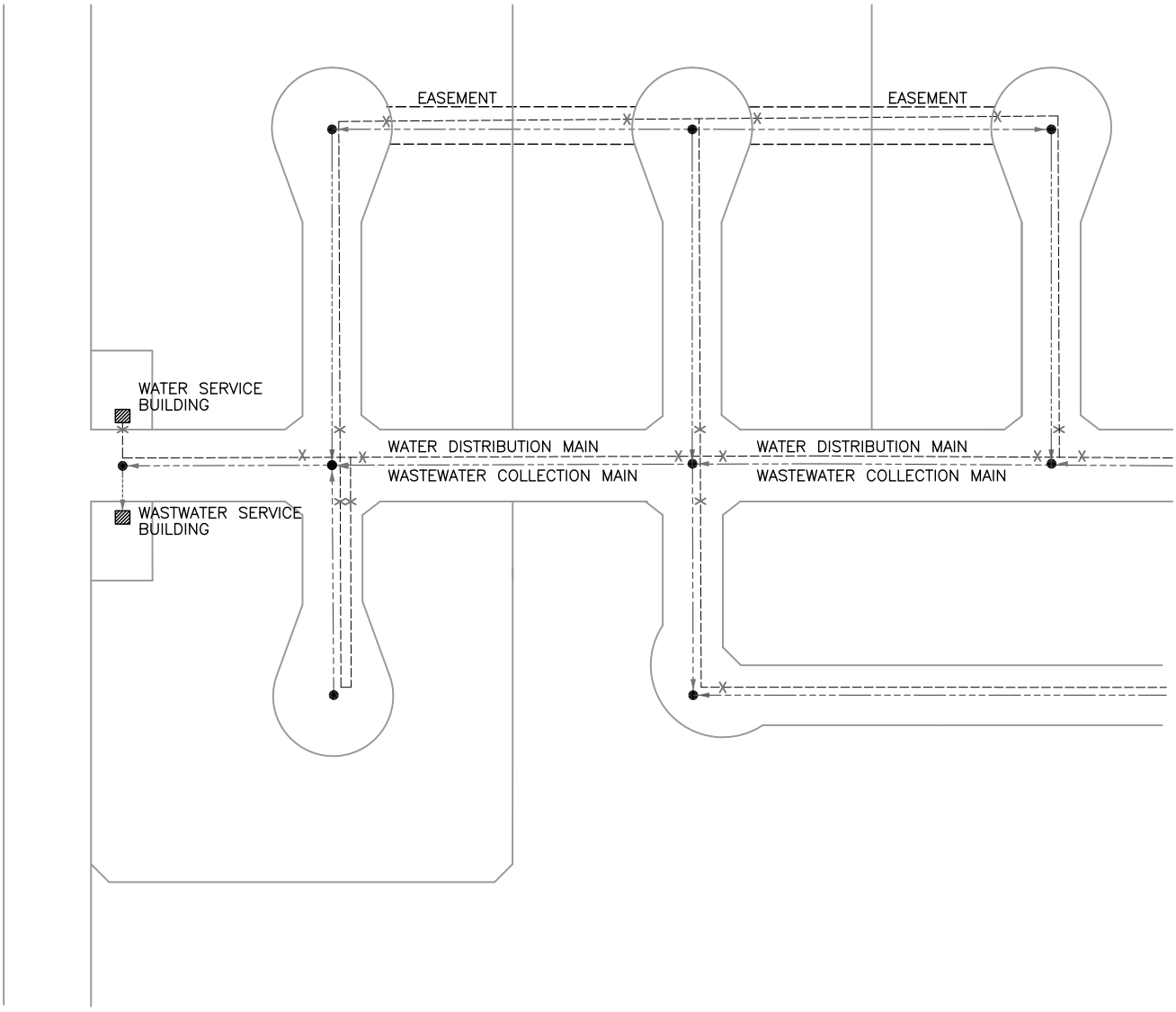


SECTION VIEW
NTS

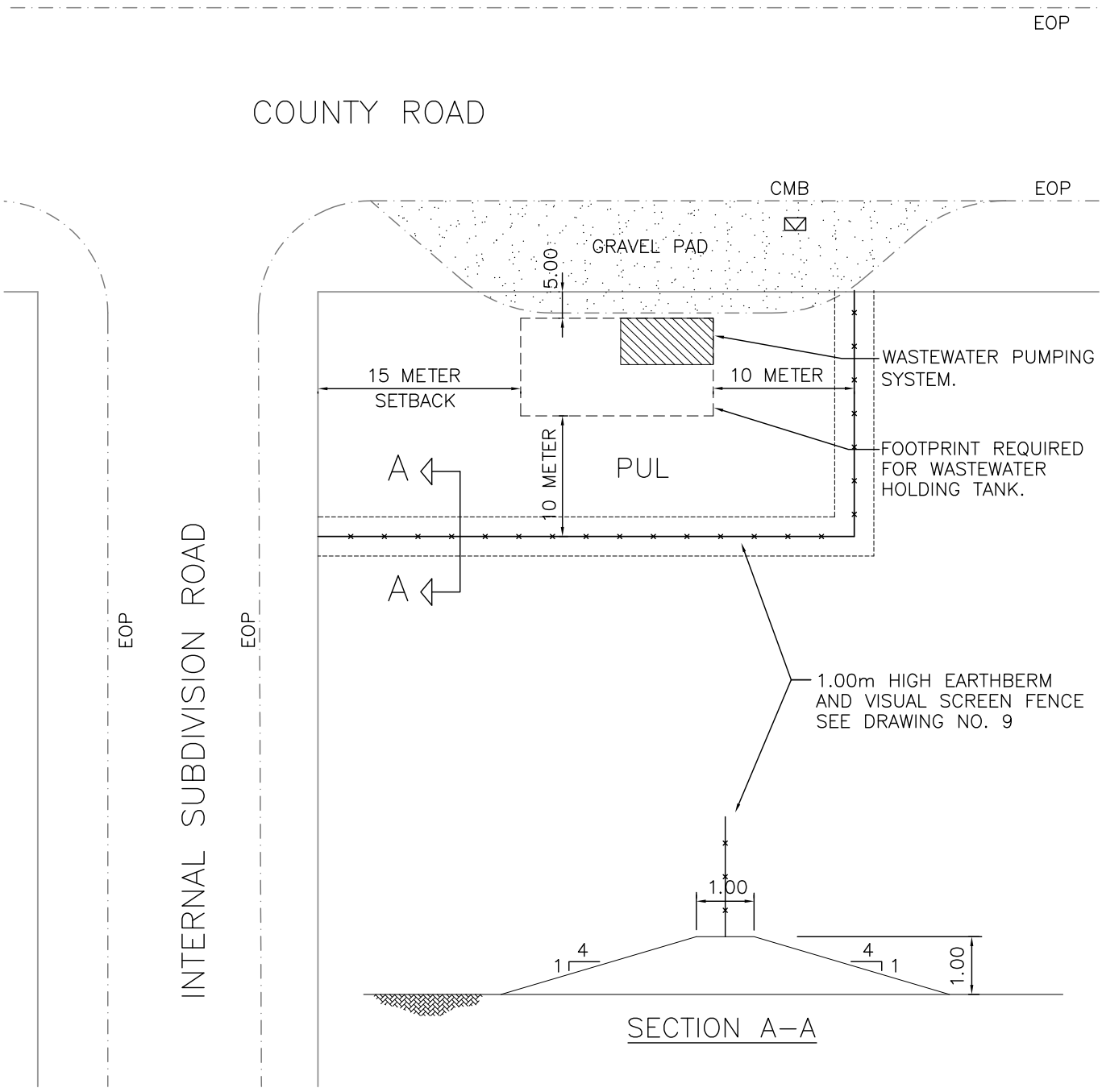
SCHEMATIC OF A TYPICAL TREATED WATER DISTRIBUTION PUMPING SYSTEM



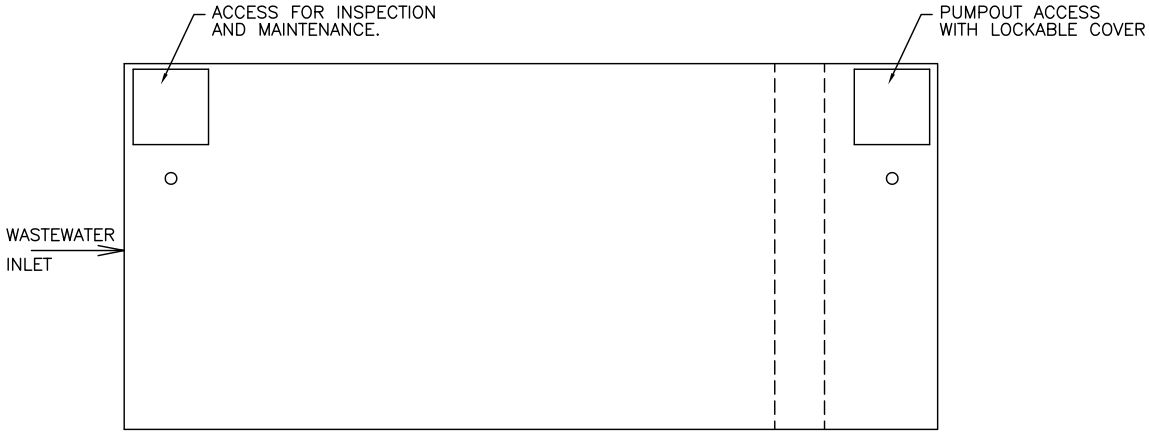
STANDARD ALIGNMENT FOR
UNDERGROUND SERVICES



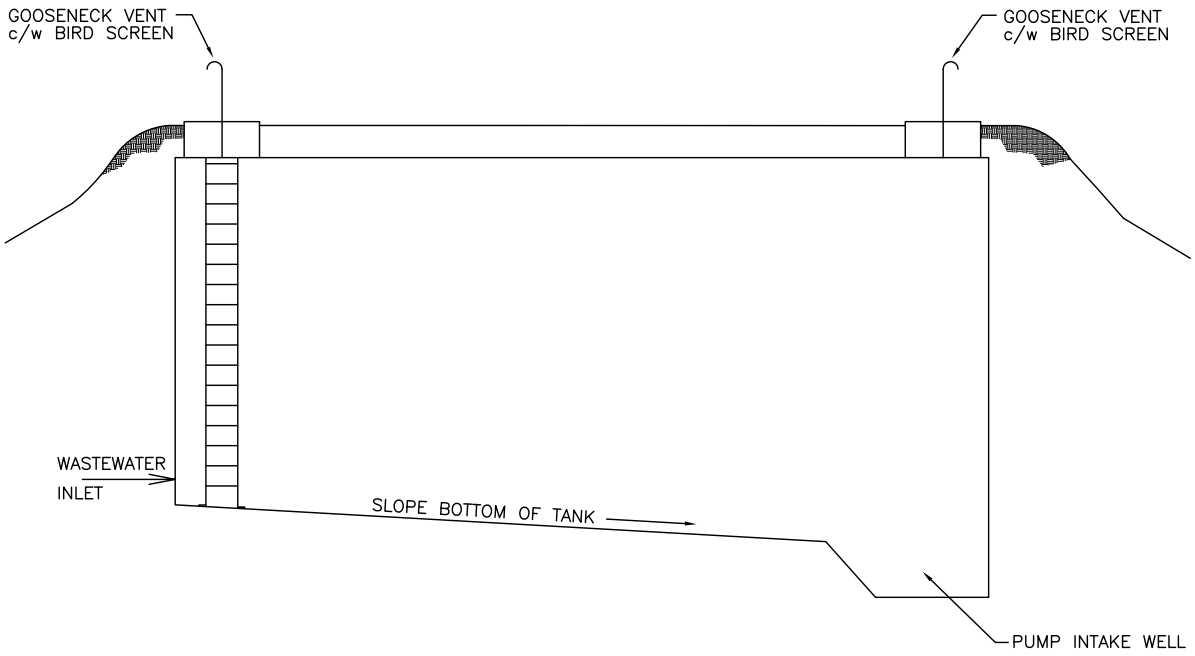
TYPICAL LAYOUT OF UNDERGROUND SERVICES.



TYPICAL SITE LAYOUT AND SIZE OF A PUBLIC UTILITY LOT FOR A WASTEWATER HOLDING TANK.

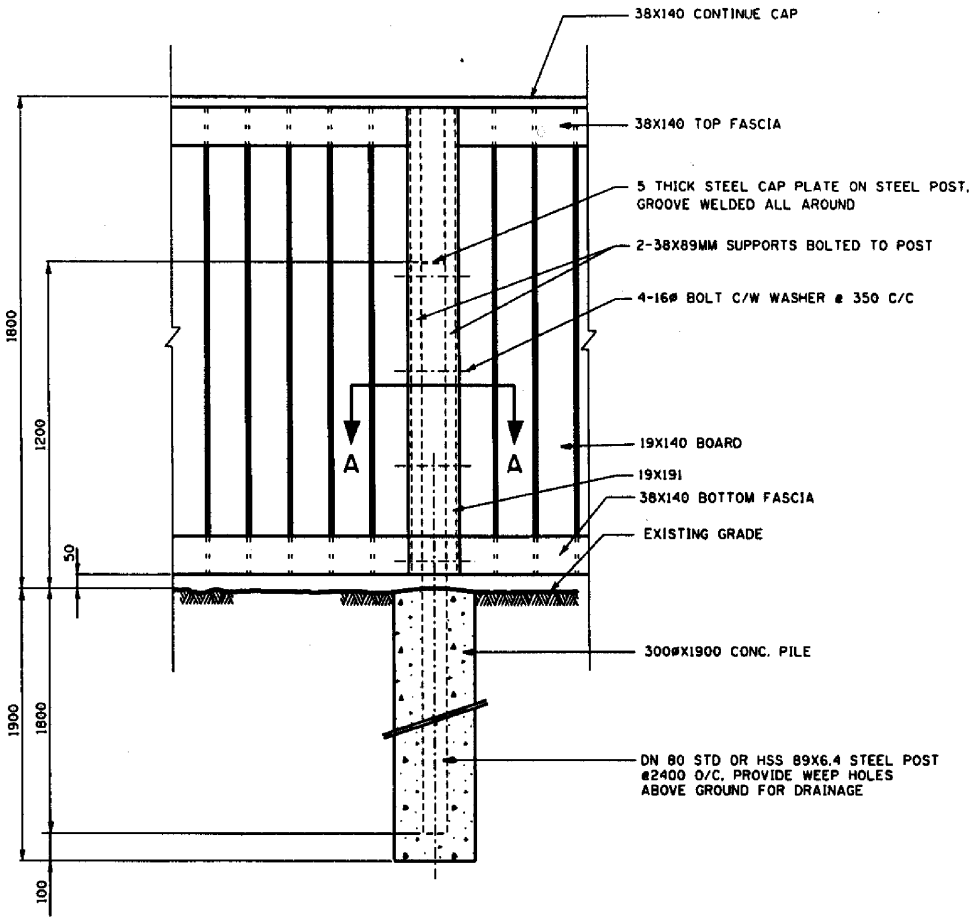


PLAN VIEW
NTS

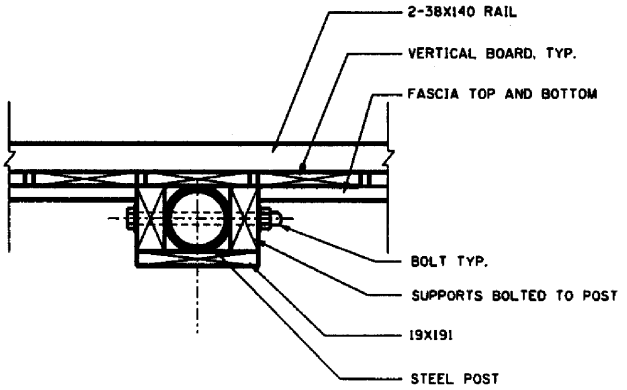


SECTION VIEW
NTS

TYPICAL WASTEWATER HOLDING TANK.



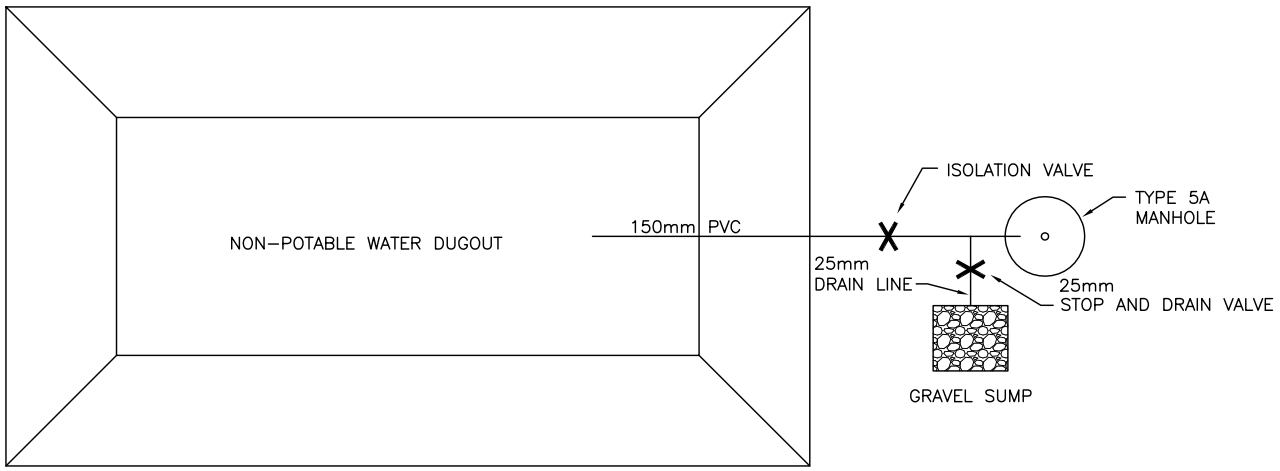
ELEVATION

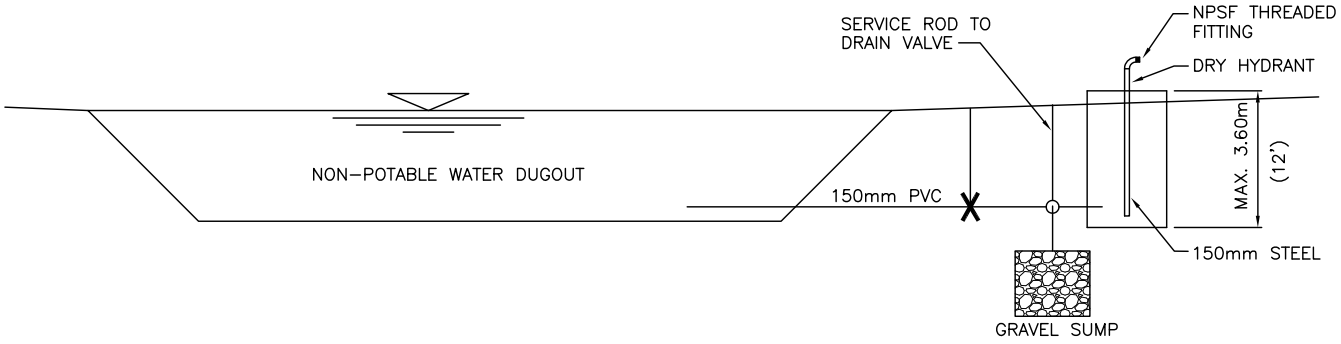


SECTION A-A

GENERAL CONSTRUCTION NOTES

1. CONCRETE MATERIALS, QUALITY, MIXING, PLACING & OTHER CONSTRUCTION PRACTICES TO CONFORM TO CSA STANDARD CAN3-A23.1 CURRENT EDITION.
2. USE TYPE 50 PORTLAND CEMENT MEETING THE REQUIREMENTS OF C.S.A. STANDARD A5. CONCRETE STRENGTH TO BE A MINIMUM 25 MPa AT 28 DAYS WITH A MAXIMUM SLUMP OF 100mm.
3. AIR ENTRAINMENT TO BE 4 - 7% CONFORMING TO THE REQUIREMENTS OF C.S.A. STANDARDS.
4. REINFORCING STEEL TO BE DEFORMED BARS MEETING THE REQUIREMENTS OF C.S.A. STANDARD G30.18M GRADE 400
5. ALL LUMBER, SUBJECT TO APPROVAL OF THE ENGINEER WITH RESPECT TO QUALITY, MOISTURE CONTENT & APPEARANCE TO BE SPECIFIED IN ACCORDANCE WITH C.S.A. STANDARD O 141
   (a) BOARDS TO BE TONGUE & GROOVE No. 2 OR BETTER STRUCTURAL GRADE S-P-F DESIGNATION CSA1-686-M88.
   (b) POST TO BE No. 2 OR BETTER STRUCTURAL GRADE S-P-F DESIGNATION CSA1-686-M88 AND PRESSURE TREATED.
   (c) ALL LUMBER TO BE KILN DRIED TO 19% MOISTURE CONTENT PRIOR TO ERECTION.
6. FOR SPECIFICATIONS ON PRESSURE TREATED WOOD REFER TO WOOD PRODUCT SPECIFICATIONS AND APPLICABLE CODES AND STANDARDS.
7. ALL NAILS TO BE GALVANIZED SCREW NAILS.
8. ALL STEEL TO CONFORM TO C.S.A. G40.21-M.
9. ALL STEEL AND BOLTS C/W NUTS AND WASHERS TO BE GALVANIZED.
10. GALVANIZING TO COFORM TO C.S.A. G164.





TYPICAL NON-POTABLE WATER SUPPLY
AND DRY HYDRANT FOR FIRE PROTECTION

Appendix “B” Grinder Pump

GRINDER

The grinder pump shall be a heavy duty pump modified to he used as a grinder. The grinder pump shall contain special cutters to reduce sewage to a fine slurry. The stationary cutter shall consist of hardened 316 "L" stainless steel and the rotary cutter shall consist of chrome alloyed cast iron. The cutter materials shall provide maximum corrosion and abrasion resistance. The remaining portion of the grinder pumps, with the exception of seal materials and wet end (*volute, impeller, rotary and stationary cutter*), shall be similar to the heavy duty pumps used in larger pump stations for daily operation.

REQUIREMENTS

The submersible non-clog wastewater pump shall be equipped with a one kW, submersible electric motor connected for operation on 120 volts, single phase, 60 hertz with 16 m of submersible SOW or SUBCAB cable suitable for submersible pump applications. The power cable shall be sized according to CSA standards and carry a CSA Approval. The pump shall be supplied with a mating cast iron 2 inch discharge connection and be capable of delivering 0.6 L/s at 10 m TDH. Shut off head shall be 30 m (*minimum*). Each pump shall be fitted with 10 m of steel lifting chain. The working load of the lifting system shall be 50% greater than the pump unit weight. (*Note: condition point to be in accordance with site specific requirements*).

PUMP DESIGN

Grinder pump(s) shall be available in the following two configurations:

1. MP - Guide Bar Mounting - 2" Discharge.
2. MF - Free Standing - 1½ " Discharge.

The MP Grinder pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact. Sealing of the discharge interface with a diaphragm, 0-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor.

APPROVALS

The pump/motor assembly shall have CSA approval as one unit per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. An approval of the motor unit only will not be acceptable.

The pump/motor unit shall be approved by CSA for service in Class I, Division 2. Groups A, B, C or D hazardous locations.

PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 30, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel. All metal surfaces coming into contact with the pumpage, other than stainless steel, shall be protected by a factory applied spray coating of alkyd primer with a synthetic resin enamel finish on the exterior of the pump.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber 0-rings. Fittings will be the result of controlled compression of rubber 0-rings in two planes and 0-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical 0-rings, grease or other devices shall be used.

MOTOR

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, EEMAC B type. Liquid filled motors shall not be considered equivalent. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155°C (*311°F*). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for

handling pumped media of 40°C (*104°F*) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (*260°F*) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The motor and pump shall be designed and manufactured by the same source.

The combined service factor (*combined effect of voltage frequency and specific gravity*) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (*104°F*) ambient and with a temperature rise not to exceed 80°C.

The power cable shall be sized according to the CEC and CSA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 20 meters.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

CABLE ENTRY SEAL

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

COOLING SYSTEM

Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

VOLUTE

Pump volute shall be single-piece grey cast iron, ASTM 48-76, Class 30, non-concentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.

IMPELLER

The impeller shall be of gray cast iron, ASTM 48-76, Class 30, dynamically balanced, single-shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Mass moment of inertia calculations shall be provided by the pump manufacturer upon request. Impeller shall be taper collet fitted and retained with an Allen head bolt. All impellers shall he coated with an acrylic dispersion zinc phosphate primer.

PUMP SHAFT

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI type 420 stainless steel.

The use of stainless steel sleeves to protect a lesser grade of shaft material will not be considered equal.

MECHANICAL SEAL

The pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating ceramic ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary carbon seal ring and one positively driven rotating ceramic seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: 'shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to affect sealing shall be used.

The pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load. The seal lubricant shall be non-toxic and FDA approved for potable water applications.

BEARINGS

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Sleeve or single row lower bearings are not acceptable.

PROTECTION

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (*260°F*) the thermal switches shall open, stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (*FLS*) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will send an alarm and, if desired, stop the motor. USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 140°C (*284°F*) SHALL NOT BE ALLOWED.

The thermal switches and FLS shall be connected to a monitoring unit mounted in the control panel.

TESTS

The pump shall be tested for proper operation at rated power supply values and for electrical and mechanical integrity prior to shipment. On demand, the pump supplier will supply the following test results:

- Partial hydraulic test curve, proving that the pump meets the operating conditions in accordance with Hydraulic Institute norms;
- Current and power consumed during the test.

EXPERIENCE

The pump manufacturer shall have several units of similar type pumps installed and operating for no less than five years in Canada.

Preference will be given to the supplier who can offer temporary pump replacement on short notice from an existing rental fleet, containing an adequate inventory of pumps and accessories.

Preference will also be given to the supplier who can offer local parts and labour service by factory trained technicians.

CONTROL

A control system specifically designed for pumping stations, such as supplied by Flygt, LOGIMAC or MacTec, must be used in order to provide monitoring and transfer to a back-up pump when required, to ensure a maximum degree of protection and assurance of continuity of service.

The following control features can be provided if required:

- registration and alarming of pump protection features;
- alternation to back-up pump;
- surveillance of the power supply quality (*low/high voltage, phase unbalance and failure*);
- registration of power consumption;
- storage of operating data, including power consumption, duration and frequency of operation of each pump;
- analysis of the stored data to detect long term trends and provide maintenance recommendations;
- telemetry.