# COUNTY OF LETHBRIDGE
# IN THE PROVINCE OF ALBERTA

## BY-LAW NO. 1362

### A BY-LAW OF THE COUNTY OF LETHBRIDGE BEING A BY-LAW PURSUANT TO SECTION 633(1) OF THE MUNICIPAL GOVERNMENT ACT, CHAPTER M.26.1

WHEREAS Stewart Weir Engineering on behalf of Edgewood Stables Ltd. wishes to develop a country residential subdivision on Block 1, Plan 9912364 located in the S.W. ¼ of Section 29, Township 9, Range 21, and West of the Fourth Meridian;

AND WHEREAS the County's Municipal Development Plan requires that developers prepare an Area Structure Plan to ensure sound development occurs;

AND WHEREAS the Municipal Development Plan also suggests country residential areas be located on poor quality farm land and adjacent to geotechnical sound coulee edges;

AND WHEREAS the landowner/developer has submitted the "**Edgewood Stables Area Structure Plan**" which contains engineering, survey and geotechnical information to support above conditions;

NOW THEREFORE BE IT RESOLVED that the Council of the County of Lethbridge does hereby adopt the "**Edgewood Stables Area Structure Plan**" attached as "Appendix A".

GIVEN first reading this 24th day of January, 2011.

Reeve

County Manager

GIVEN second reading this 17th day of March, 2011.

Reeve

County Manager

GIVEN third reading this 21st day of April, 2011.

Reeve

County Manager

Stewart Weir

# Edgewood Stables

# Area Structure Plan

Bylaw No. 1362

County of Lethbridge

Portion SW 29-9-21 W4M

**Prepared For: Edgewood Stables**

**Prepared By: Stewart Weir**

**Our File No: LB35 33737**

**Date: April 11, 2011**

Naturally Resourceful

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## FIGURES



## APPENDICES

# 1.0 INTRODUCTION

## 1.1 Plan Purpose

The Area Structure Plan (ASP) is intended to provide the framework to establish the transition of the poor agricultural lands currently designated Lethbridge Urban Fringe to Grouped Country Residential use. This ASP will provide development and implementation guidelines and a framework for the Developer to efficiently and, in an environmentally responsible manner, create a new Country Residential Subdivision.

This ASP provides a framework for the development of a parcel of land in the County of Lethbridge located in the SW 29-9-21 W4M, being legally described as Lot 9, Block 1, Plan 991 2364. The ASP will guide land use and infrastructure development of the subject site, facilitate the protection of the portion of the plan area adjacent to tributary coulee valleys to the north, and demonstrate the way in which new development will integrate into the surrounding land use. The ASP will also contain a conceptual subdivision design for the plan area in accordance with the County of Lethbridge standards.

The Area Structure Plan has been prepared in accordance with the provisions of Section 633 of the Municipal Government Act, which states the following:

*Area structure plan*

*"633(1) For the purpose of providing a framework for subsequent subdivision and development of an area of land, a council may by bylaw adopt an area structure plan.*

*(2) An area structure plan*

*(a) must describe*

*(i) the sequence of development proposed for the area,*

*(ii) the land uses proposed for the area, either generally or with respect to specific parts of the area,*

*(iii) the density of population proposed for the area either generally or with specific parts of the area, and*

*(iv) the general location of major transportation routes and public utilities,*

*and*

*(b) may contain any other matters the council considers necessary."*

## 1.2 Plan Vision and Objectives

### 1.2.1 Vision

Vision Statement: To provide a high quality grouped country residential development within the County of Lethbridge striking a balance between existing land uses, recreational pursuits and protection of the environment and which is in line with similar developments in place in the two parcels of land to the north.

### 1.2.2 ASP Objectives

- Maintain or enhance the quality of life within and adjacent to the ASP area,
- Provide mechanisms to ensure the quality of surface and groundwater is not impacted by the proposed development,
- Minimize the impacts on neighbouring properties and the community at large.

## 1.3 Plan Area

The ASP applies to a portion of the SW 29-9-21 W4M, legally described as Lot 9, Block 1, Plan 991 2364, which is located in the south western region of the County of Lethbridge, immediately north of the City of Lethbridge boundary. The subject lands are contained in a single Certificate of Title containing ± 15.95 hectares (39.41 Acres). The location is highlighted in Figure 01.

SW 29-9-21 W4M


**Figure 1 - Project Area**

The ASP area is primarily a rural agricultural landscape with small land holdings. The site is bounded by The City of Lethbridge corporate limits to the south, tributary coulee valleys of the Oldman River to the North and West and farmed agricultural land to the east. Country Residential subdivisions are located to the north of the proposed development. Road access to the site is available from Township Road 94 and Range Road 214A. Figure 02 illustrates the plan area's local context.

## 2.0 EXISTING CONDITIONS

### 2.1 Surface Geology and Topography

The proposed Edgewood Stables development is bounded on the north by tributary coulee valleys, comprising the Old Man River Valley; to the south by municipal Township Road 94; to the east by municipal Range Road 214A and

to the west by a local gravel access road. The existing site supports prairie grasses with an overall gradient towards the coulee valleys.

The lands are primarily vacant agricultural with a number of tree stands in the coulees. The predominant land use in the surrounding area is agricultural, interspersed with pockets of country residential developments. The landform is gently rolling pasture characterized by minor depressions and hollows.

The plan area drains to the North into the Oldman River valley. Minor depressions and hollows pond small amounts of water, but ultimately drain into the surface soils. This soil is reported to have very rapid permeability rates. The geotechnical report did not indicate a high water table in this area.

The area south of the top of the coulee bank has no environmental, topographical, or physical constraints that would inhibit the proposed use of these lands for residential purposes. The lands lying north of the development setback line (as determined by the Development Setback Assessment – Appendix A) will be protected from development impact by dedicating the lands as Municipal Reserve (MR) and Environmental Reserve (ER).

The Development Setback Assessment, completed by EBA Engineering Consultants of Lethbridge, concluded that a setback of 4H:1V (4 metres horizontal distance to 1 metre vertical difference) would be appropriate for this site. This restriction takes into account the recommendations of the City of Lethbridge Bylaw #5277, specifically with regards to translational failures along the top of the Lenzie Silts deposit. This assumed failure line extends from the contact elevation at the slope face to the existing ground surface at prairie level.

A second factor would require a minimum setback distance of 6 metres form the Top of Bank to protect developed property from shallow crest failures. The contact elevation of the Lenzie Silts deposit has been taken by EBA as elevation 875.0 m. This contact elevation is based on published data from the AMEC report conducted as part of the development of City Bylaw #5277.

Based on the various aspects of the slope stability analysis conducted for the development, a development setback line using the minimum requirements of Bylaw #5277 was recommended. This setback line was established by extending a 4H:1V line from topographic elevation 875 m. Where this line extends less than 6.0m from the Top of Bank, the minimum recommended setback distance is 6.0 m.

The EBA report also provided recommended development guidelines for the area within the Development Setback line which are consistent with an Environmental and Municipal Reserve dedication.

Figure 04 depicts the topography of the plan area and shows the established Development Setback line.

## 2.2 Existing Land Use

The existing Land Use Area is zoned as Lethbridge Urban Fringe (LUF). The ASP area is covered with prairie grasses and slopes toward the coulee valleys to the north/north west. The western portion of the site is currently in use as a boarding stable whereas the eastern portion is currently used for pasture and is vacant, except for the dugout located on the south central portion of the property.

The proposed development will be developed in a single phase with the existing stable and out-buildings in the western portion of the site left as one large lot.

## 2.3 Existing Services and Utilities

There is a local water line supplying potable water from the City of Lethbridge owned by the County of Lethbridge Rural Water Association Ltd. near the development area. The water line runs parallel to Range Road 214A just east of the subdivision.

There currently is no regional municipal sanitary service in the area. Local wastewater is disposed via septic tanks and septic fields or mound systems.

The development area is bounded by gravel roadways on the south by Township Road 94 and on the east by Range Road 214A. Range Road 214A is paralleled by a gas pipeline and waterline to the east of the road.

The site is bisected by two gas pipeline right-of-ways. A high pressure gas line (GL 32 AP) owned by ATCO Pipelines and a low pressure gas pipeline (2602IC) owned by ATCO Gas bisect the development area. ATCO has no plans to move the gas lines and the setbacks and restrictions associated with the existence of these lines have been incorporated into the conceptual plan for the lot design.

A low pressure gas service line owned by ATCO Gas services the existing facilities located in the western portion of the site.

Regional storm water is managed through the use of open drainage ditches adjacent to municipal roads.

## 2.4 County of Lethbridge Policy Framework

### 2.4.1 Municipal Development Plan

The County of Lethbridge Municipal Development Plan's (MDP) Special Planning Areas map shows the plan area as "Area B". The MDP identifies Area B as being well suited to highway service type development. The MDP also states, "Land uses other than agricultural may be considered if conditions can be demonstrated that altering the land use is a sound consideration". The proposed Isolated Country Residential development proposed is a logical use for this area and would serve to complement similar developments to the north.

### 2.4.2 County of Lethbridge Municipal Development Plan

According to Section 6.3.3 (c) l of The County of Lethbridge MDP:

"*The County shall encourage the design of residential areas that provide open space and incorporate natural areas while minimizing fragmentation and safeguarding the environmental sustainability of the area under development".*

This proposed development of 14 lots, comprised of 1 Public Utility Lot, one MR lot, one ER lot and 11 residential lots, varying in size from 0.7 ha (1.73 Acres) to 4.7 hectares (11.61 Acres), along with the preservation of the natural state of the coulees and areas contained within the Development Setback line, would satisfy the MDP.

### 2.4.3 Land Use Bylaw

The County of Lethbridge Land Use Bylaw (LUB) shows the subject site districted as LUF.

The LUB states:

*"Grouped country residential uses will be encouraged to locate within the areas shown in the municipal development plan as being areas where confined feeding operations are restricted. In these areas, with an approved area structure plan, council may redesignate parcels of land having consideration for:*

*(i) protection of high quality agricultural land,*

*(ii) comments from affected persons,*

*(iii) effects on the irrigation system."*

Site suitable testing is required before subdivision approval and includes but is not limited to water supply, water table levels, percolation rates, contours, environmental impact assessments and review of past mining activities. The Land Use By-law states that the minimum parcel size is 0.40 ha (1 acre).

#### 2.4.4 Intermunicipal Development Plan (County Bylaw #1254)

As this development is directly adjacent to the limits of the City of Lethbridge and thus falls within the boundaries of the Intermunicipal Development Plan, comments from the City of Lethbridge have been taken into account.

### 2.5 Issues Arising From Public Process

#### 2.5.1 Public Hearing

The public hearing for the Edgewood Stables development was held March 17, 2011 in the County of Lethbridge council chambers. The public hearing was attended by approximately 30 local residents, the developer and representatives from Stewart Weir & Co Ltd. Comments from the public hearing are summarized below:

- Residents to the west expressed concerns with the density of the proposed subdivision.
- One resident to the west would prefer not to have a subdivision opposite their driveway.
- All residents expressed the need for architectural controls.

## 3.0 DEVELOPMENT CONCEPT

### 3.1 Plan Goals

The goals of this Area Structure Plan are as follows:

1. To provide a detailed framework for future development within the plan boundaries that is consistent with the objectives outlined in the County of Lethbridge Municipal Development Plan.
2. To ensure that development is compatible with existing land uses.
3. To provide efficient and economically feasible servicing options for the plan area.
4. To maintain a safe development setback from the coulee valley.

### 3.2 Land use Concepts

The concept for the plan area is residential rural estate development with a net density of 1 unit per 1.13 hectare. The MR dedication would amount to approximately 16% which exceeds the MGA requirement of 10%.

The proposed development consists of 14 lots, comprised of one Public Utility Lot, one MR lot, one ER lot and 11 residential lots.

Each residential lot meets the bylaw's minimum requirement of 1 acre of developable area.

## 4.0 POLICY

### 4.1 Environment

The adjacent coulee valley is tributary to the Oldman River and will be carefully protected throughout the development of the plan area. A Development Setback Assessment conducted by EBA Engineering Consultants Ltd. provided a recommended development setback from the top of bank based on site reconnaissance, stability analysis and assumed post-development groundwater conditions. The area between the coulees and the Development Setback line will be protected through the dedication of an Environmental Reserve (ER) and a Municipal Reserve (MR), which will restrict the use and development of those areas. The County will assume ownership of the Reserve lands.

### 4.2 Residential

The plan area is generally a rural, agricultural landscape with some similar country residential developments to the north. The current policies, provisions and regulations of the Municipal Development Plan and Land Use Bylaw will apply to the proposed country residential subdivision.

### 4.3 Municipal Reserve

The developer is prepared to dedicate the lands between the development setback line and the top of bank as Municipal Reserve (MR). The vision for the MR is as a link between the river valley trails in Pavan Park and the areas to the north and east of the development. The proposed trails would be located to the north of the City of Lethbridge's cemetery located in the NE ¼ Sec. 19-9-21 W4M. This link would provide a safe route for recreational users to gain access to the river valley and the Park. See Figure 7.

### 4.4 Environment Reserve

The area between the top of bank and the coulees will be protected through the dedication of the lands as ER.

### 4.5 Roadways

The nearest provincial highway to the development area is Secondary Highway 843 located approximately 3.3 km east of the development.

The primary access to the subdivision will be from Range Road 214A and 13th Street North. Both accesses are gravel surfaces. No off-site improvements to the County owned roads are anticipated. The internal road will require asphalt surfacing, to be provided at the developer's expense. Where possible, the developer will provide shared approaches for those parcels gaining access from the County roads.

### 4.6 Potable Water

County of Lethbridge Rural Water Association Ltd. (CLRWA) has a rural potable water distribution line running parallel to Range Road 214A. The developer has placed a deposit to ensure service from the CLRWA and provide priority to the development when allocating resources within the CLRWA's water license.

If the CLRWA has insufficient capacity to provide water service to the Edgewood Stables development water will be the responsibility of the individual lot owners to have potable water provided by truck haul to private cisterns located within each property.

### 4.7 Wastewater

A site assessment was performed by means of a geotechnical investigation. Soil samples were collected for laboratory testing. The results from the site assessment and soil sample tests support on-site sewage treatment by private on site sewage treatment mound systems. See Appendix B.

The means of selecting an on site sewer system will be in accordance with "Alberta Private Sewage Systems Standard of Practice 2009". The sewer systems will be engineered to meet these standards. Based on the soil logs collected and defined within the soils investigation report, the site has mixed soil compositions. Half of the test pits indicated soils classified as heavy clay; the remainder of the test holes indicated marginal

conformance with Safety Codes Council 2009 Handbook for design and construction of septic disposal fields. In general terms site specific soil testing would be required to support in-field septic systems at time of construction or an alternative means of providing a disposal field is adopted, such as a septic field mound system.

Treatment mounds are an effective method in difficult soil conditions such as too fast or too slow soil percolation rates. The percolation rate for the plan area is 0.53 minutes per 25mm (1 inch). According to the "Alberta Private Sewage Systems Standard of Practice 2009" handbook a percolation rate in the range of 5 to 60 minutes per 25mm (1 inch) is necessary for the proper operation and long term success of a disposal field. Therefore a treatment mound for the plan area will be a viable method of effluent treatment and disposal. Despite the clay content the site is heavily dispersed with large rock lenses which aid in the drainage and dispersal of surface water.

A sewage treatment mound is a seepage bed elevated by clean sand fill to provide an adequate separation distance between the clay and rock layer in the mound and the barrier layer such as saturated soil conditions or bedrock. The mound must be carefully constructed to provide adequate sewage treatment. A treatment mound includes a layer of specifically graded, clean sand that the effluent is spread over then slowly percolates through as more effluent is applied. This provides an excellent aerobic environment for the removal of organic loading in the sewage effluent. It operates similar to a sand filter in removing the organic loading.

Once the organic loading has been removed by the sand layer, higher long term infiltration rates into the soil can be achieved. The sand layer is overlain with gravel or chambers to assist in the distribution of the effluent over the entire surface of the sand layer and provide a brief storage area for the effluent as it is pumped onto the mound. This is then covered and a side berm created using loamy sand. The covering soil (the loamy sand) must be very porous to assure good aerobic conditions in the sand layer.

## 4.8 Storm Water Management

### 4.8.1 Existing Drainage

Contours generated from the site topographic survey indicate natural drainage toward the North West of the site, draining into the coulee valley. Existing ground slope varies from 1.5% to 8.0%.

Figure 05 shows existing surface drainage paths within and around the proposed subdivision.

### 4.8.2 Proposed Storm Water Management

#### Overview

The County of Lethbridge Engineering Guidelines and Minimun Servicing Standards (May, 2009) requires new development areas to be designed using the major/minor system concept, and shall be of sufficient capacity to carry storm runoff from the ultimate development.

#### Minor System

In general, a minor system is designed for drainage to accommodate the runoff, which would occur in relative frequent (e.g. 1:5 year) return period rainfall events and snowmelt during spring season. More specifically, the minor system is typically applied to the buried drainage network of local and trunk sewers, inlets and street gutters, which have traditionally provided conveyance of storm water runoff from road surface.

#### Major System

The major system is designed to control flooding and to accommodate runoff rates and volumes for a 100-year return period rainfall event. For instance, when the rate of storm runoff generated by less frequent, more intense, rainfall events may exceed the capacity of the minor system, subsequent ponding may occur in depression areas or follow whatever overflow escape route is available.

#### Runoff Control

The increased rate of runoff can usually be controlled by means of stormwater retention facilities that temporarily hold the excess runoff and release it at a controlled rate. Normally, the form of runoff control includes:

- Catchbasin inlet control
- Detention/Retention pond
- Infiltration areas

Wet or dry retention ponds are the most commonly used for runoff control. They are used for temporary storage of excess runoff which is released at a pre-defined rate. In less frequent cases where discharge is not feasible, a retention facility is constructed, where evaporation and infiltration maintain water levels.

We propose to utilize a wet pond system constructed for storage of stormwater runoff, to provide the added benefit of sediment settling and reduction of organic contaminants. Dry ponds only retain storm water during the actual rainfall event and are not considered to provide treatment benefits. As the configuration requirements for dry ponds tend to be less restrictive than those for wet ponds, the dry pond storage concept can be applied in a very linear form, such as natural or manmade channel.

### Design Considerations

The majority of surface runoff will be captured and directed to the proposed detention pond located in the low lying terrain, in the northwest corner of the proposed subdivision. This facility would be designed to accommodate current drainage patterns and the intention of improving quality of storm water effluent before it discharges into Oldman River.

The proposed detention pond will centralize the collection of storm water and be designed to have adequate water available for fire protection. The proposed location will be accessible to emergency vehicles serving the proposed subdivision as well as future development.

Since this is only a preliminary conceptual study other concerns should be included for Municipal Reserves (MR), Environmental Reserves (ER) and flood plain level. All these factors need to be verified and investigated during the detailed design.

### Other Considerations

In urban areas without an underground storm water system, road side ditches provide drainage for both the minor and major storm water systems. Comments from the City of Lethbridge indicated that driveway access onto lots have in the past caused issues with ditch drainage. The subdivision will minimize accesses from municipal roads as shown on Figure 3. Culverts under these accesses will be sized correctly to not impede ditch drainage.

### 4.8.3 Proposed System

Storm drainage system for the proposed subdivision will incorporate the concept as outlined previously. Individual lots will be graded for positive drainage into the roadside ditches/municipal reserve. Lot grading design will prevent any lot to lot drainage. Due to the natural gradient the proposed layout favors walk out basement developments. Split lot drainage will be incorporated into the design. There will be controlled drainage from driveways and walkways to roadside ditches, and all other areas will follow natural drainage patterns.

A detention pond will be designed to accommodate the 1:100 year storm event and to control discharge from the subdivision to under the allowable limit.

Figure 05 provides the proposed drainage directions and the location of the Storm Pond. Final location and sizing of the pond will be determined during the detailed design phase. It should be noted that the area of the PUL can be adjusted to accommodate an appropriately sized storm pond.

The Storm Water Management Plan has been prepared in accordance with Alberta Environment requirements. At the time of subdivision approval, the developer will obtain any approvals required under the Water Act.

### 4.8.4 Existing Dugout

It is anticipated that the existing dugout will be filled in prior to the development of Lot 4.

## 4.9 Fire Protection

The County of Lethbridge Municipal Development Plan (Bylaw #1331) under Section 6.16.3 Policies requires:

*Fire Protection – The County shall require an applicant/developer to provide a plan or method for fire protection / suppression, which meets the guidelines set forth in the County Municipal Engineering Guidelines and Minimum Servicing Standards.*

## 4.10 Summary

The following table provides a statistical overview of the area and percentages of gross developable area by land use in the plan area.

**Table 4.1 Land Use Area Estimate**

| Land Use Category | Total (ha) | % |
|---|---|---|
| Gross Development Area (GDA) | 15.95 | 100 |
| ER / MR | 2.59 | 16.3 |
| Residential Lots | 12.48 | 78.2 |
| Internal Roadways | 0.27 | 1.7 |
| Storm Ponds (PUL) | 0.61 | 3.8 |

## 5.0 IMPLEMENTATION

The re-designation to Group Country Residential was adopted on March 17 under Bylaw 1363. Upon adoption of the Area Structure Plan, the developer will submit an application for subdivision.

### 5.1 Subdivision and Development

5.1.1 All developers shall be required to enter into development agreements with the County as a condition of subdivision approval.

5.1.2 Detailed engineering drawings and specifications for roads, water, sanitary sewer, storm sewer, and shallow utilities shall be prepared by the developer and approved by the County prior to executing the development agreement on the subject lands.

5.1.3 As the lot sizes and yields identified in this plan are conceptual, a development of 11 residential lots, one Public Utility lot, one MR lot and one ER lot shall be permitted in the plan area without amendment to this ASP.

5.1.4 In order to minimize direct access to the County roads, shared access will be provided where possible.

5.1.5 All development must meet the County of Lethbridge Engineering Guidelines and Minimum Servicing Standards (May, 2009)

## 6.0 ENVIRONMENTAL ASSESSMENT

Approximately 16 hectares of grassed pasture and a previously developed horse stable encompass the plan area. The predominant land use in the surrounding area is agricultural, interspersed with pockets of County residential developments.

The plan area has no sign of surface contamination. There are two gas pipeline right of ways that bisect the property, running from southwest to northeast. One is a high pressure gas line and the other a low pressure line. ATCO Gas has no plans to move the pipelines. Crossing agreements will be required for driveways crossing the pipeline in the east cul-de-sac. No development will be allowed on the right of ways. There are no active well heads, leases, or abandoned leases in the plan area.

## 7.0 MINIMUM SERVICING STANDARD

The County of Lethbridge Land Use Bylaw No. 1211 for Grouped Country Residential (GCR) states that the minimum parcel size is 0.4 ha (1 acre). The minimum setback for side yards is 6.1 meters (20 ft.) and for front yards is 15.2 meters (50 ft).

Site suitability testing is required before subdivision approval and includes but is not limited to water supply, water table levels, percolation rates, contours, environmental impact assessment, etc.

## 8.0 FIRE PROTECTION

Each development must have adequate water available for fire protection. For residential developments the requirement is generally 4000 gallons (15.14 m3) of usable water per household. The plan area of 11 lots will have a requirement of 40,000 gallons (227.10 m3) available for fire protection. In addition to providing the required water (which must be available for use at all times) the developer will be required to provide access to it; this will require the construction of an approach, the installation of one dry fire hydrant. The storm pond will require safety measures such as berms and fencing at the County's discretion. According to the County design guidelines and construction standards for subdivision developments fire protection requirements are to be in accordance with the NFPA 1142. The design of fire pond would also need to be in accordance with Alberta Environment's wet pond standards in the publication entitled "Storm Water Management Guidelines for the Province of Alberta".

Some general design parameters to consider for fire ponds are:

a) Maximum 4:1 to 5:1 side slopes above active storage zone
b) Maximum 5:1 to 7:1 interior side slopes in active storage zone
c) Maximum 3:1 exterior side slopes
d) Permanent depth to be a maximum of 3.0m and a minimum of 2.0m
e) Maximum water level should be below adjacent house basement footings.

Incorporated into the design of the fire pond will be a dry hydrant. A dry hydrant is a non-pressurized pipe system permanently installed in ponds that provide a suction supply of water to a fire department tank truck. In any area without water mains and domestic fire hydrants, the dry hydrant concept can provide a simple cost-effective solution to the need for access to water sources without delay.

## 9.0 ARCHITECURAL CONTROLS

Further to concerns expressed at the Public Hearing, the Developer has provided proposed Architectural Controls which are attached as Appendix D.

## 10.0 CONCLUSION

The proposed site meets with the requirements established in the Municipal Development Plan and Land Use Bylaw of Lethbridge County for the development of a “County Residential” multi-lot subdivision. The site investigation and soils investigation performed indicate the site is suitable for this purpose.

# FIGURES

LOT 1
BLOCK 4
PLAN 951 2579

LOT 2
BLOCK 4
PLAN 991 1484

LOT 3
BLOCK 4
PLAN 991 1484

N.E. 1/4 SEC. 29
9-21-4

29
9-21-4

LOT 1
PLAN 971 0469

LOT 5
BLOCK 1
PLAN 901 0426

LOT 6

LOT 7

LOT 8
BLOCK 1
PLAN 901 0426

PROPOSED
DEVELOPMENT
AREA

S.W. 1/4 SEC. 29
9-21-4

CANADIAN PACIFIC RAIWAY PLAN RY 136

COUNTY OF LETHBRIDGE

CITY OF LETHBRIDGE

| ENGINEERING RECORD | | |
|---|---|---|
| DESCRIPTION | INITIALS | DATE |
| SURVEYED | | |
| DESIGNED | | |
| DRAWN | BP/JES | 10/07/28 |
| CHECKED | CP | 10/07/28 |
| APP'D BY | | |
| ISSUED FOR CONSTRUCTION | | |
| ISSUED FOR APPROVAL | | |

CONSULTANT

Stewart Weir

Naturally Resourceful

PERMIT TO PRACTICE
PERMIT NUMBER P 292
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

FILE No.: LB35.33737

EDGEWOOD STABLES LTD.

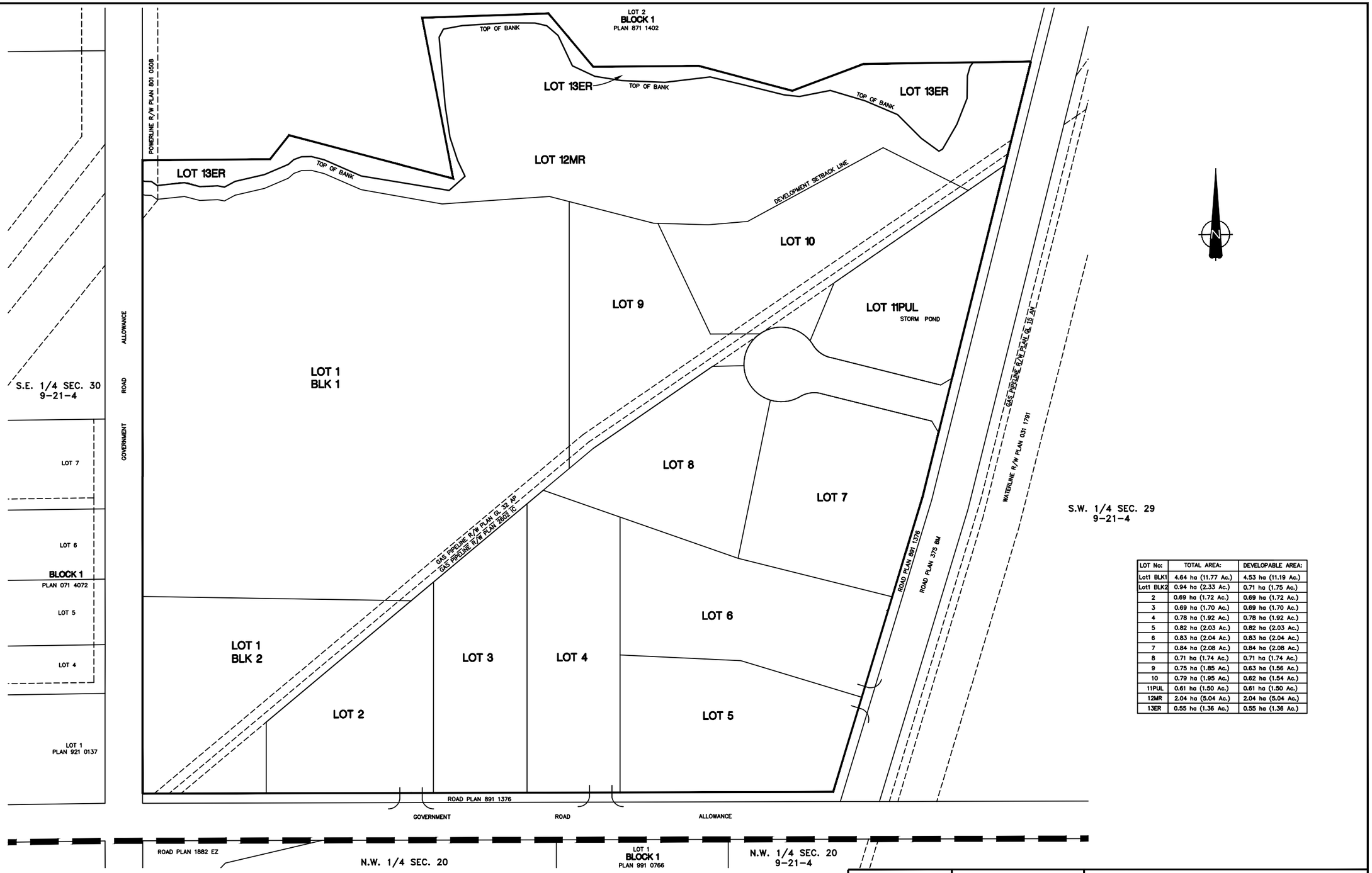
OVERALL PLAN
OF
PROPOSED SUBDIVISION AND AREA
LOT 9, BLOCK 1, PLAN 991 2364
(S.W. 1/4 SEC. 29 – TWP. 9 – RGE. 21 – W. 4M.)
COUNTY OF LETHBRIDGE – ALBERTA

SCALE: 1:5000

FIGURE 2

\\Swg.ca\files\Jobs\35000\33737 LB35 Edgewood Stables Ltd\CAD\33737-Figure 2+3 PLAN-jec-Rec3.dwg

DATE: November 3, 2010




| LOT No: | TOTAL AREA: | DEVELOPABLE AREA: |
|---|---|---|
| Lot1 BLK1 | 4.64 ha (11.77 Ac.) | 4.53 ha (11.19 Ac.) |
| Lot1 BLK2 | 0.94 ha (2.33 Ac.) | 0.71 ha (1.75 Ac.) |
| 2 | 0.69 ha (1.72 Ac.) | 0.69 ha (1.72 Ac.) |
| 3 | 0.69 ha (1.70 Ac.) | 0.69 ha (1.70 Ac.) |
| 4 | 0.78 ha (1.92 Ac.) | 0.78 ha (1.92 Ac.) |
| 5 | 0.82 ha (2.03 Ac.) | 0.82 ha (2.03 Ac.) |
| 6 | 0.83 ha (2.04 Ac.) | 0.83 ha (2.04 Ac.) |
| 7 | 0.84 ha (2.08 Ac.) | 0.84 ha (2.08 Ac.) |
| 8 | 0.71 ha (1.74 Ac.) | 0.71 ha (1.74 Ac.) |
| 9 | 0.75 ha (1.85 Ac.) | 0.63 ha (1.56 Ac.) |
| 10 | 0.79 ha (1.95 Ac.) | 0.62 ha (1.54 Ac.) |
| 11PUL | 0.61 ha (1.50 Ac.) | 0.61 ha (1.50 Ac.) |
| 12MR | 2.04 ha (5.04 Ac.) | 2.04 ha (5.04 Ac.) |
| 13ER | 0.55 ha (1.36 Ac.) | 0.55 ha (1.36 Ac.) |

| ENGINEERING RECORD | | |
|---|---|---|
| DESCRIPTION | INITIALS | DATE |
| SURVEYED | | |
| DESIGNED | | |
| DRAWN | BP/JES | 10/07/28 |
| CHECKED | CP | 10/07/28 |
| APP'D BY | | |
| ISSUED FOR CONSTRUCTION | | |
| ISSUED FOR APPROVAL | | |

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FILE No.: LB35.33737

# EDGEWOOD STABLES LTD.

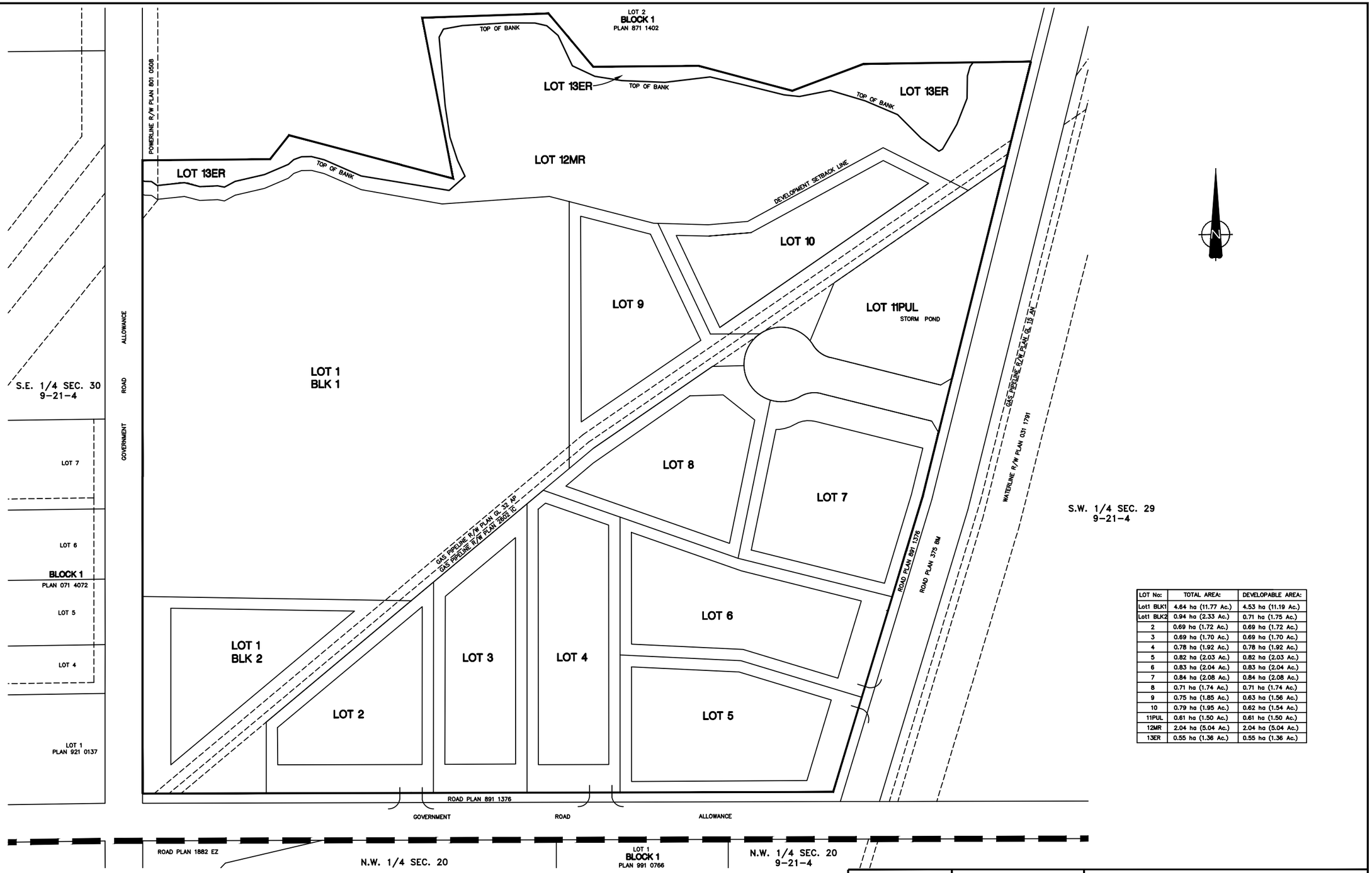
CONCEPT PLAN
OF
PROPOSED SUBDIVISION
LOT 9, BLOCK 1, PLAN 991 2364
(S.W. 1/4 SEC. 29 – TWP. 9 – RGE. 21 – W. 4M.)
COUNTY OF LETHBRIDGE – ALBERTA

SCALE: 1:2000

FIGURE 3

\\Swgs.ca\files\Jobs\35000\33737 LB35 Edgewood Stables Ltd\CAD\33737-Figure 2+3 PLAN-jec-Rec3.dwg

DATE: November 3, 2010




| LOT No: | TOTAL AREA: | DEVELOPABLE AREA: |
|---|---|---|
| Lot1 BLK1 | 4.64 ha (11.77 Ac.) | 4.53 ha (11.19 Ac.) |
| Lot1 BLK2 | 0.94 ha (2.33 Ac.) | 0.71 ha (1.75 Ac.) |
| 2 | 0.69 ha (1.72 Ac.) | 0.69 ha (1.72 Ac.) |
| 3 | 0.69 ha (1.70 Ac.) | 0.69 ha (1.70 Ac.) |
| 4 | 0.78 ha (1.92 Ac.) | 0.78 ha (1.92 Ac.) |
| 5 | 0.82 ha (2.03 Ac.) | 0.82 ha (2.03 Ac.) |
| 6 | 0.83 ha (2.04 Ac.) | 0.83 ha (2.04 Ac.) |
| 7 | 0.84 ha (2.08 Ac.) | 0.84 ha (2.08 Ac.) |
| 8 | 0.71 ha (1.74 Ac.) | 0.71 ha (1.74 Ac.) |
| 9 | 0.75 ha (1.85 Ac.) | 0.63 ha (1.56 Ac.) |
| 10 | 0.79 ha (1.95 Ac.) | 0.62 ha (1.54 Ac.) |
| 11PUL | 0.61 ha (1.50 Ac.) | 0.61 ha (1.50 Ac.) |
| 12MR | 2.04 ha (5.04 Ac.) | 2.04 ha (5.04 Ac.) |
| 13ER | 0.55 ha (1.36 Ac.) | 0.55 ha (1.36 Ac.) |

| ENGINEERING RECORD | | |
|---|---|---|
| DESCRIPTION | INITIALS | DATE |
| SURVEYED | | |
| DESIGNED | | |
| DRAWN | BP/JES | 10/07/28 |
| CHECKED | CP | 10/07/28 |
| APP'D BY | | |
| ISSUED FOR CONSTRUCTION | | |
| ISSUED FOR APPROVAL | | |

CONSULTANT

Stewart Weir

Naturally Resourceful

PERMIT TO PRACTICE
PERMIT NUMBER P 292
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

FILE No.: LB35.33737

EDGEWOOD STABLES LTD.

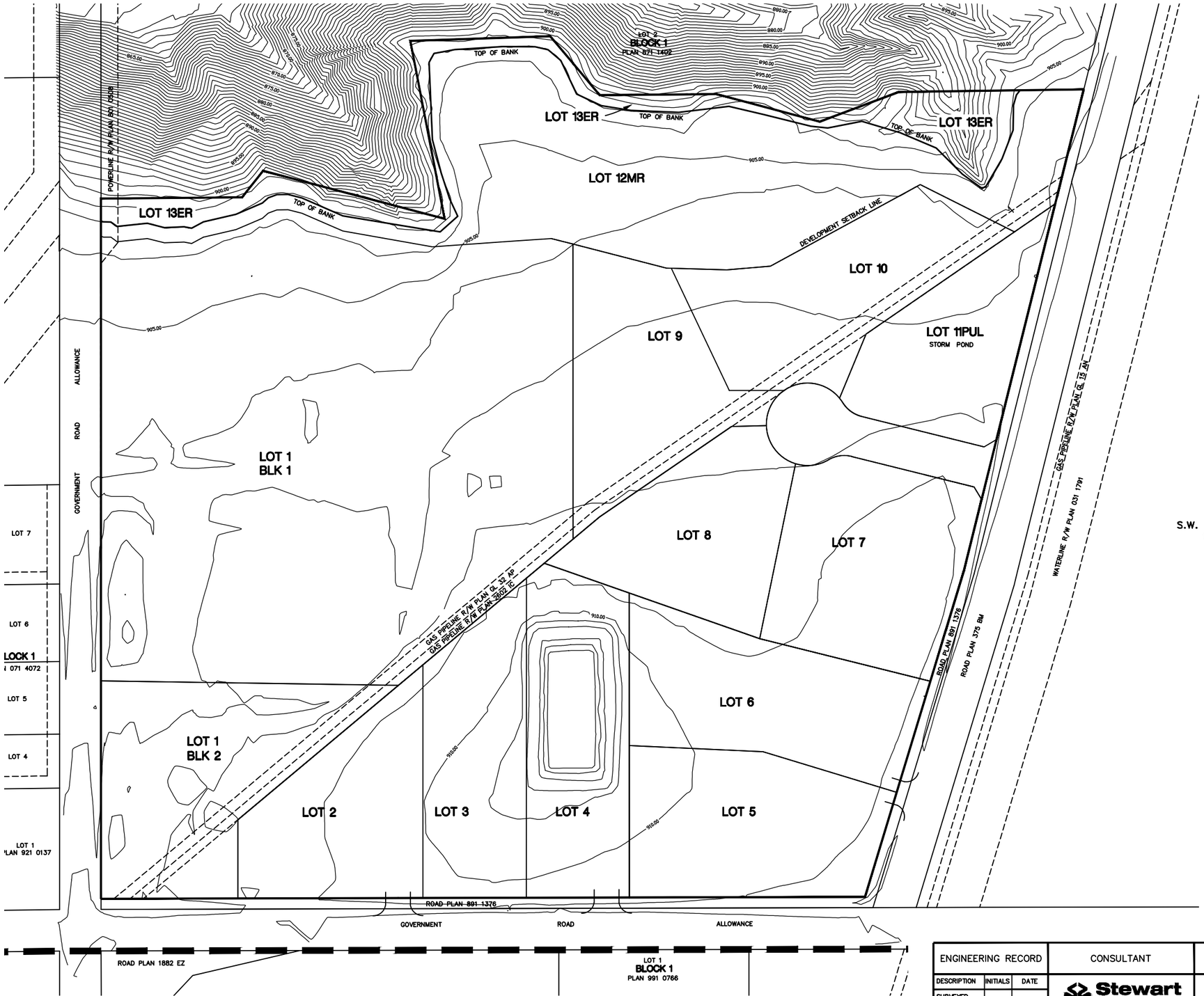
CONCEPT PLAN
OF
PROPOSED SUBDIVISION
LOT 9, BLOCK 1, PLAN 991 2364
(S.W. 1/4 SEC. 29 – TWP. 9 – RGE. 21 – W. 4M.)
COUNTY OF LETHBRIDGE – ALBERTA

SCALE: 1:2000

FIGURE 3a

\\Swgs.ca\files\Jobs\35000\33737 LB35 Edgewood Stables Ltd\CAD\33737-Figure 2+3 PLAN-Jec-Rec3.dwg

DATE: November 3, 2010




\\Swp.ca\Res\Jobs\33000\33737 LB35 Edgewood Stables Ltd\CAD\33737-Figures 4+5+6+7 PLAN-JAD-REC2.dwg

DATE: November 3, 2010

| ENGINEERING RECORD | | |
|---|---|---|
| DESCRIPTION | INITIALS | DATE |
| SURVEYED | | |
| DESIGNED | | |
| DRAWN | BP/JES | 10/07/28 |
| CHECKED | CP | 10/07/28 |
| APP'D BY | | |
| ISSUED FOR CONSTRUCTION | | |
| ISSUED FOR APPROVAL | | |

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PERMIT NUMBER P 292
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

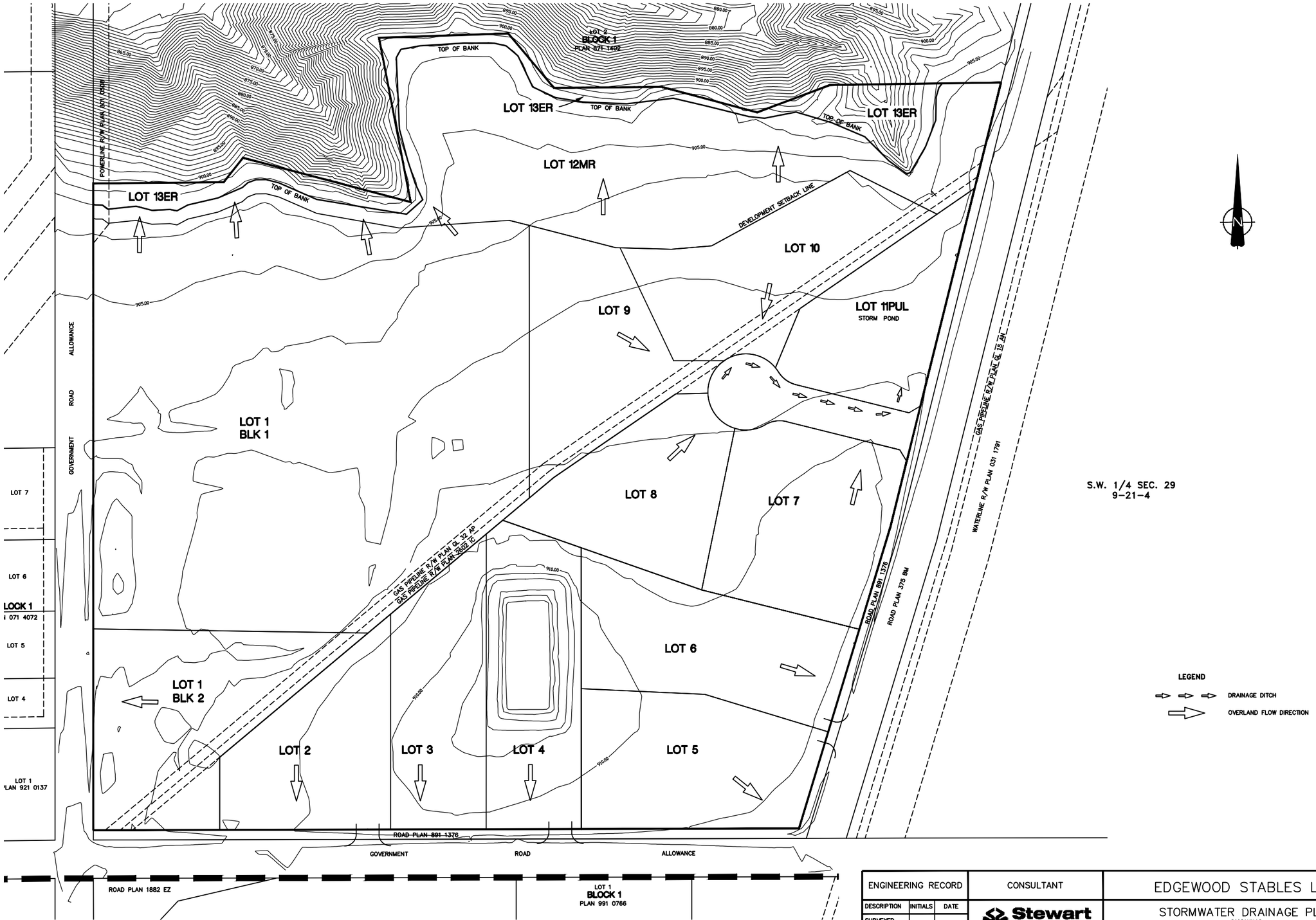
FILE No.: LB35.33737

# EDGEWOOD STABLES LTD.

CONTOUR PLAN
SHOWING
PROPOSED SUBDIVISION
OF
LOT 9, BLOCK 1, PLAN 991 2364
(S.W. 1/4 SEC. 29 – TWP. 9 – RGE. 21 – W. 4M.)
COUNTY OF LETHBRIDGE – ALBERTA

SCALE: 1:2000

FIGURE 4




\\Sag.ca\Res\Jobs\33000\33737 LB35 Edgewood Stables Ltd\CAD\33737-Figures 4+5+6+7 PLAN-JAD-REC2.dwg

DATE: November 3, 2010

| ENGINEERING RECORD | | |
|---|---|---|
| DESCRIPTION | INITIALS | DATE |
| SURVEYED | | |
| DESIGNED | | |
| DRAWN | BP/JES | 10/07/28 |
| CHECKED | CP | 10/07/28 |
| APP'D BY | | |
| ISSUED FOR CONSTRUCTION | | |
| ISSUED FOR APPROVAL | | |

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The Association of Professional Engineers, Geologists and Geophysicists of Alberta

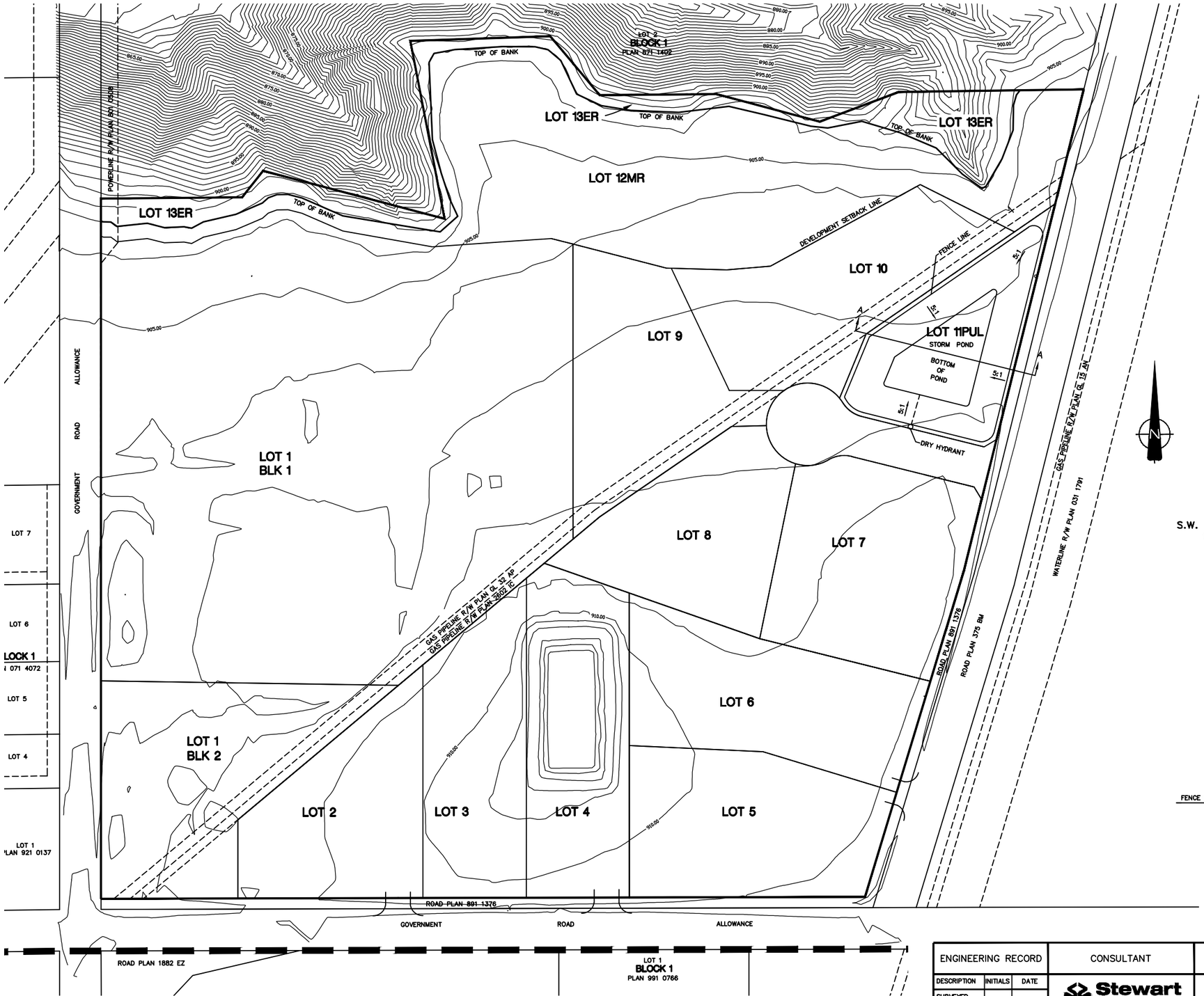
FILE No.: LB35.33737

# EDGEWOOD STABLES LTD.

STORMWATER DRAINAGE PLAN
SHOWING
PROPOSED SUBDIVISION
OF
LOT 9, BLOCK 1, PLAN 991 2364
(S.W. 1/4 SEC. 29 – TWP. 9 – RGE. 21 – W. 4M.)
COUNTY OF LETHBRIDGE – ALBERTA

SCALE: 1:2000

FIGURE 5

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|---|---|---|
| DESCRIPTION | INITIALS | DATE |
| SURVEYED | | |
| DESIGNED | | |
| DRAWN | BP/JES | 10/07/28 |
| CHECKED | CP | 10/07/28 |
| APP'D BY | | |
| ISSUED FOR CONSTRUCTION | | |
| ISSUED FOR APPROVAL | | |

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PERMIT NUMBER P 292
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

FILE No.: LB35.33737

# EDGEWOOD STABLES LTD.

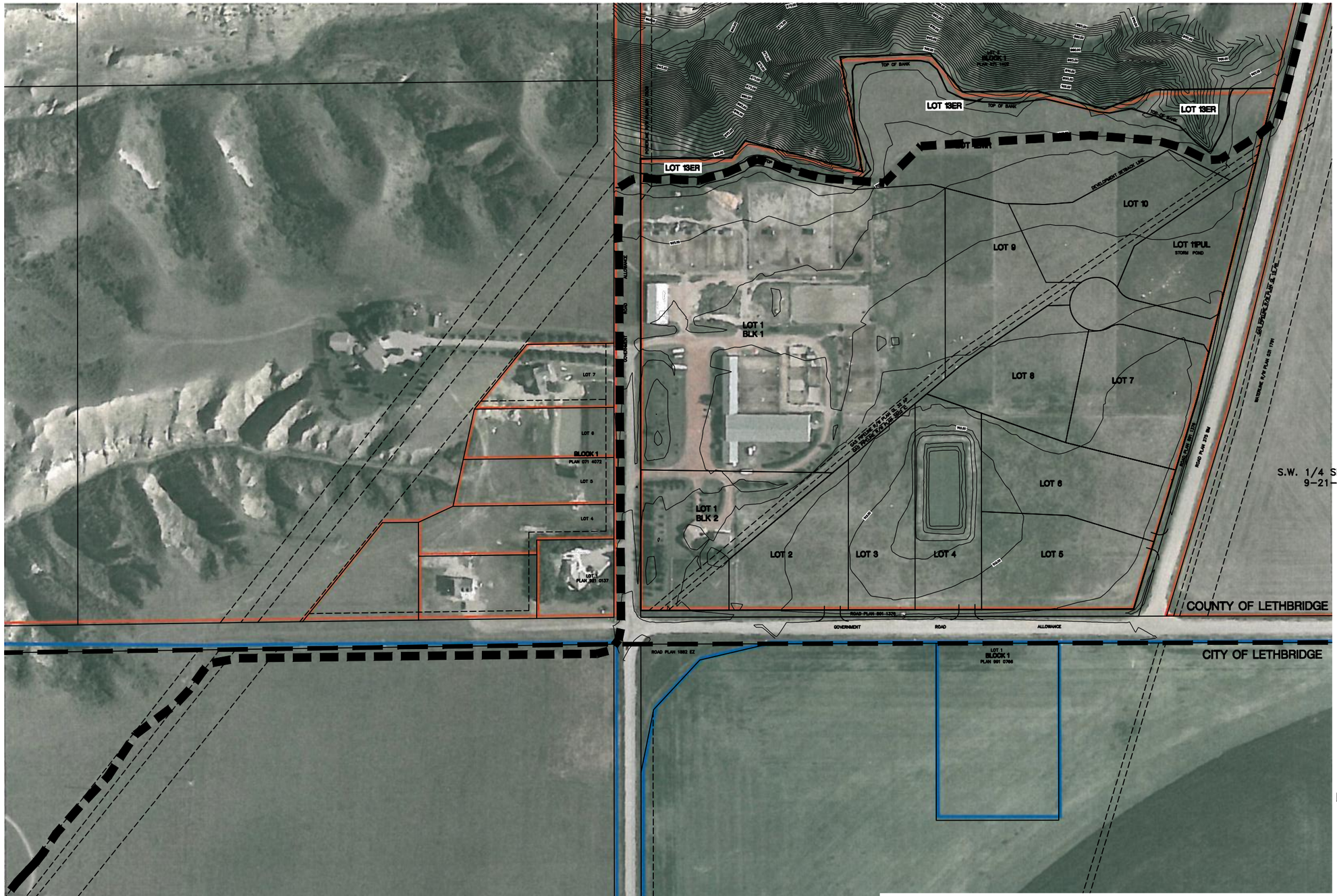
PLAN
SHOWING
FIRE PROTECTION POND
OF
LOT 9, BLOCK 1, PLAN 991 2364
(S.W. 1/4 SEC. 29 – TWP. 9 – RGE. 21 – W. 4M.)
COUNTY OF LETHBRIDGE – ALBERTA

SCALE: 1:2000

FIGURE 6

\\Swg.ca\files\Jobs\30000\33737 LB35 Edgewood Stables Ltd\CAD\33737-Figures 4+5+6+7 PLAN-JAD-REC2.dwg

DATE: November 3, 2010




| ENGINEERING RECORD | | |
|---|---|---|
| DESCRIPTION | INITIALS | DATE |
| SURVEYED | | |
| DESIGNED | | |
| DRAWN | BP/JES | 10/07/28 |
| CHECKED | CP | 10/07/28 |
| APP'D BY | | |
| ISSUED FOR CONSTRUCTION | | |
| ISSUED FOR APPROVAL | | |

CONSULTANT

Stewart Weir

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PERMIT TO PRACTICE
PERMIT NUMBER P 292
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

FILE No.: LB35.33737

EDGEWOOD STABLES LTD.

PLAN
SHOWING
TRAIL SYSTEM
LINK TO PAVEN PARK
OF
LOT 9, BLOCK 1, PLAN 991 2364
(S.W. 1/4 SEC. 29 – TWP. 9 – RGE. 21 – W. 4M.)
COUNTY OF LETHBRIDGE – ALBERTA

SCALE: 1:3000

FIGURE 7

\\Swgc.ca\Res\Jobs\35000\33737 LB35 Edgewood Stables Ltd\CAD\33737-Figures 4+5+6+7 PLAN-JAD-REC2.dwg

DATE: January 11, 2011

# APPENDIX 'A'

## DEVELOPMENT SETBACK ASSESSMENT

**Stewart Weir**

**ISSUED FOR USE**

# DEVELOPMENT SETBACK ASSESSMENT
# EDGEWOOD STABLES SUBDIVISION
# LETHBRIDGE, ALBERTA

**L12101748**

**April 2010**

EBA Engineering Consultants Ltd.
p. 403.329.9009 • f. 403.328.8817
442 - 10 Street N • Lethbridge, Alberta T1H 2C7 • CANADA

## TABLE OF CONTENTS

## 1.0 INTRODUCTION

This report presents the results of a geotechnical slope stability assessment conducted by EBA Engineering Consultants Ltd. (EBA) for a proposed rural residential development to be located north of Lethbridge, Alberta.

The scope of work for the slope stability assessment was outlined in a proposal issued to Mrs. Connie Petersen, P.Eng, of Stewart Weir. The objective was to determine the stability of the slopes abutting the proposed development area and to recommend appropriate minimum development setback distance requirements from the Top of Bank[1].

The minimum development setback distance requirements were established from a slope stability assessment conducted for this site, as well as a review of the recommended setback guidelines established by the City of Lethbridge Bylaw #5277, "River Valley Area Redevelopment Plan" (RVARP), as adopted on July 26, 2004 by the City of Lethbridge.

Authorization to proceed with this evaluation was provided by Mrs. Petersen.

## 2.0 PROJECT DETAILS AND SCOPE OF WORK

The property is located in the County of Lethbridge, Alberta, in Lot 9, Block 1, Plan 9912364, within the SW ¼ of Section 29, Township 9, Range 21, W4M. The subject site is shown on Figure 1. The proposed development is bounded to the north by tributary coulee valleys, comprising the Oldman River Valley, to the south by Township Road 94, to the east by Range Road 214A, and to the west by a gravel driveway.

Given the proximity of the adjacent slopes to the development, the scope of work for this evaluation included visual reconnaissance of the development site and surrounding slopes, as well as a geotechnical review of the adjacent slopes' stability. As part of EBA's review of the RVARP guidelines, the evaluation also considered the recommendations pertaining to safe development setbacks as detailed in the study conducted by AMEC Earth and Environmental Limited (AMEC) entitled "City of Lethbridge Phase II Development Setback Assessment Oldman River Valley Slopes" issued in November 2002. The guidelines were considered in the recommendations for development setback distances for this development.

## 3.0 SITE DESCRIPTION

### 3.1 SURFACE DESCRIPTION

Visual site reconnaissance was completed by EBA's geotechnical engineers, Mr. Nana Addo, E.I.T. and Mr. Trevor Curtis, E.I.T. on March 23, 2010. A number of photographs were taken during the site reconnaissance conducted by EBA for this evaluation and are included in this report.

[1] Top of Bank: means the line where the general trend of the slope changes from greater than 15% to less than 15%, as determined by field survey.

The development property was covered with prairie grasses, with an overall surface gradient towards the coulee valleys, generally to the north/northwest. The west portion of the site was noted to be in use as a horse ranch. There is a retention pond east of the horse ranch, as shown on Figure 1. EBA understands that both the ranch and retention pond are to remain post development. A gas pipeline right-of-way bisects the property, running form southwest to northeast, as shown on Figure 1.

To the north/northwest of the site is a deeply incised coulee draw, which extends towards the Oldman River Valley to the west. Based on a topographical map provided by Mike Spencer Geometric (Spencer), the northern slope extends downward for approximately 40 m. Figure 2 depicts the three slope profiles surveyed for this development by Spencer. The general slope profiles in the middle and lower zones are approximately 1.5 horizontal to 1 vertical (1.5H:1V), as surveyed by Spencer. The upper portions of the slope appear to average approximately 3 horizontal to 1 vertical (3H:1V), with some localized steeper sections. The slope faces are well vegetated with prairie grasses, weeds, and some shrubs. Small, isolated surficial slumps, skin failures, and cracks were noted within the slope faces, attributed to surficial precipitation runoff and desiccation. Areas of heavy brush cover, shown on the photographs, are indications of trace water seepage out of the slope face.

As part of the evaluation, EBA reviewed aerial photographs taken of the project area between 1950 and present day. The review indicated that the subject property has remained undeveloped with respect to structures or rural development, with adjacent lands being used for crop cultivation and ranch land. There appears to be no evidence of significant slope instabilities within the slopes bordering the property (north-facing slopes), however, some more severe slope failures, comprising surficial slope face slumping, were noted within the south-facing slopes on the opposite side of the coulee draw. Further discussion on slope stability is presented in subsequent sections of this report.

## 4.0 SUBSURFACE CONDITIONS

### 4.1 GEOLOGY

EBA reviewed published reports regarding the geological history of the Lethbridge area. A brief summary, in descending order, of the general stratigraphy is presented below.

- Lacustrine Deposit; a fine-grained Lacustrine deposit overlies the Buffalo Lake Till, with thickness varying from non-existent to 8 m.
- Buffalo Lake Till; characterized by a lack of cohesion which often leads to slumping of this deposit. A single period of consolidation has resulted in the development of vertical stress cracks, well oxidized, with some limited bedding.
- Lenzie Silts; unit consists of buff, stratified, calcareous silt and silty sand. The deposit includes black or grey varved clays and poorly sorted till-like colluvium with coarse fragments. This is a glacial lake deposit that formed in a peri-glacial (prior to deposition

of Buffalo Lake Till) lake environment during a temporary halt, as continental ice advanced. Overlying the cross-bedded sediments are lake clays deposited in thin, well-bedded laminae. Based on the AMEC report data, the elevation of the top of the Lenzie layer is approximately 875 m.

- Labuma Till; columnar, massive till, which is hard as a result of consolidation pressure from overlying ice, deposited during Laurentide glaciation.
- Basal Till; massive till, hard, brown to grey.
- Saskatchewan Sands and Gravels; clean, well-sorted and bedded, rounded to subrounded river gravel deposit with a sandy matrix. The depth of this layer appears to be below the base of valley elevation.
- Oldman Formation Bedrock; relatively massive, sedimentary deposit in both brackish and freshwater environments (non-marine), light grey to light brownish grey in colour, contains cross-bedded silty clay shales, siltstones, calcareous sandstones, ironstones, bentonitic clay, and coal layers. The depth of bedrock is well below the base of coulee valley elevation in this area.

### 4.2 MINING ACTIVITY

Research was conducted to review the possible existence of mine workings within the boundary of the proposed development area using a publication (#88 – 45) by ERCB (Coal Mine Atlas, Operating and Abandoned Coal Mines in Alberta, 1988). Based on this publication, there was an underground mine, #1219, located on the NW ¼ of Sec. 29-9-21, W4M. EBA recommends further review of coal mine workings underlying the site boundaries prior to any development.

## 5.0 SLOPE STABILITY EVALUATION

### 5.1 GENERAL

EBA's scope of work included a review of the present stability of the coulee slopes abutting the perimeter limits of the site (primarily north perimeter) and of any potential future slope instability affecting development on the property (i.e., setback requirements).

The recommendations for stability analyses and appropriate development setback limits, as presented in Bylaw #5277 (referenced in Section 1.0) were also reviewed by EBA and incorporated as part of EBA's recommendations. The slope stability analysis and review is discussed in the following sections. The minimum factor of safety (FOS) recommended for slope instability affecting the property is 1.5, which is considered acceptable by current engineering practices.

## 5.2 PRESENT SLOPE STABILITY

The present stability of the slopes adjacent to the development area has been reviewed, based on site reconnaissance and analytical techniques for circular and block failures. Visual observations of the slopes in the project area generally indicate the slopes are currently stable, as evidenced by a lack of recent slope instability (visual reconnaissance and aerial photograph review), excepting some minor skin failures.

The current stability of the slopes adjacent to the proposed development footprint has been evaluated by means of limit equilibrium analyses. It is noted that potential failure surfaces (block or circular) within the upper soil deposits, as well as deep seated failures have been analyzed. It is noted that slope instabilities founded on the bedrock are not considered relevant for this development, considering the depth of bedrock (in excess of 5 m and below the valley base).

Representative soil parameters were selected for the analytical review. It should be noted that these parameters represent an assumed soil profile, as no borehole exploration was conducted as part of this evaluation. Stability analyses have been developed from a collaboration of local geotechnical experience.

The slope stability analyses, using representative soil parameters, indicate that the existing slopes are currently stable, corroborating the existing visual evidence noted during the site reconnaissance. The analyses indicate FOS for shallow slope face failures are slightly higher than 1.0 for the slope faces, using the soil strength parameters assumed for this evaluation. With respect to moderate depth instability affecting the slope crests, the factor of safety is approximately 1.5. Deeper seated failures indicate factors of safety affecting the slope crest of greater than 1.7.

## 5.3 IMPACT OF DEVELOPMENT ON SLOPE STABILITY

As the moisture content of a soil mass approaches saturation, the friction between soil particles decreases thus reducing the soils strength and ability to resist slope movements. Any increase in the level of soil saturation will reduce the stability of the slopes.

Development of the site will bring about changes in the factors which contribute to the present stability of the slopes. Evaporation of soil moisture will be reduced by the presence of ground cover such as the proposed building(s) and roadway structures. Irrigation and possible leakage of water from underground utilities in addition to septic fields will increase the amount of water infiltrating the site subsoils. This combination of reduced evaporation of subsoil moisture and increased infiltration of water to the subsoils is considered to be the most significant influence of development on the factors that contribute to the present stability of the slopes. Increasing soil moisture content produces a reduction in the total cohesion, as the apparent cohesion is reduced or lost, and an increase in the pore pressure ratio reduces the effective stress. The result is a corresponding decrease in the factor of safety. Post development conditions, including a general increase in soil saturation, have been considered in this stability analysis.

## 5.4 DEVELOPMENT SETBACK REQUIREMENTS

Based on the stability analysis and findings during the site reconnaissance, as well as assumed post-development groundwater conditions, appropriate development setbacks were derived for the slopes with the setback limits measured from the Top of Bank.

In addition, two other factors were given consideration in determining the recommending minimum development setback limits for this development. The first was taking into account the recommendations of the City of Lethbridge Bylaw #5277, specifically with regards to translational failures along the top of the Lenzie Silts deposit. Where the Lenzie Silts contact elevation is encountered, the worst case scenario for an instability impacting property at the Top of Bank is represented by a 4H:1V assumed failure line, extending from the contact elevation at the slope face to the existing ground surface at prairie level.

The second factor would require a minimum setback distance of 6 m from the Top of Bank to protect developed property from shallow crest failures.

As noted, given the depth of bedrock well below the coulee valley elevation, the Bylaw requirements for bedrock failures are not considered to apply.

The contact elevation of the Lenzie Silts deposit has been taken by EBA as elevation 875.0 m. This contact elevation is based on published data from the AMEC report conducted as part of the development of City Bylaw #5277.

Based on the various aspects of the slope stability analysis conducted for the development, as provided in this report, a development setback line using the minimum requirements of Bylaw #5277 is recommended, as shown on Figure 1. This setback line was established by extending a 4H:1V line from topographic elevation 875 m. Where this line extends less than 6.0 m from the Top of Bank, the minimum recommended setback distance is 6.0 m.

## 5.5 RECOMMENDED DEVELOPMENT GUIDELINES

Figure 1 presents the minimum recommended setback line recommended. Precautionary measures which should also be included in this development (with respect to slope stability issues) are outlined as follows.

- Any fill excavated during development should not be disposed of within the development restriction zone unless directed otherwise after a review by the project's geotechnical engineer. The development restriction zone is the area of land between the development setback line and the Top of Bank and on the slopes.
- Positive grading should be provided to ensure surface drainage from the development is directed as either sheet flow over the crest of the slopes or away from the slopes into a stormwater management facility.
- All utilities and plumbing should be carefully installed and inspected to ensure they are in good working order.

- Irrigation within the restrictive development zone should be prohibited.
- The development recommendations of this geotechnical report should be closely adhered to.

The upper coulee slopes should be treated as a restricted development zone. This involves:

- No excavation on the valley slope without review by a geotechnical engineer;
- No clearing of vegetation;
- No fill to be placed on the crest of the slopes or on the slopes;
- No water is to be discharged directly on to the slope face; and
- Maintain vegetation cover along the crest and on the slope.

Notwithstanding the setback distances recommended, some sloughing and slope movements will occur. The development will result in a general increase in the degree of saturation of the site subsoils which may cause minor sloughing of the top portion of the slope. The setback distance is not intended to prevent failure of the slope but rather to prevent such failures from directly affecting developed areas of the site.

## 6.0 REVIEW OF DESIGN AND CONSTRUCTION

EBA should be given the opportunity to review the final footprint location of any structures proposed for the site, as well as details of the design and specifications related to geotechnical aspects of this project, prior to development of the site.

## 7.0 LIMITATIONS

Recommendations presented herein are based on a geotechnical evaluation comprising a field reconnaissance and a review of geotechnical data from literature sources and historical air photos. The conditions discussed in this report are considered to be reasonably representative of the site. If, however, conditions other than those reported are noted during subsequent phases of the project, EBA should be notified and given the opportunity to review our current recommendations in light of new findings. Recommendations presented herein may not be valid if an adequate level of monitoring is not provided during development of the site.

This report and its contents are intended for the sole use of Stewart Weir and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Stewart Weir and their agents, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the General Conditions provided in Appendix A of this report.

## 8.0 CLOSURE

We trust this report satisfies your present requirements. We would be pleased to provide further information that may be needed during design and to advise on the geotechnical aspects of specifications for inclusion in contract documents. Should you require additional information or monitoring services, please do not hesitate to contact our office.

Respectfully submitted,
EBA Engineering Consultants Ltd.

Prepared by:

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Project Engineer
Engineering Practice
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Reviewed by:

PROFESSIONAL ENGINEER ALBERTA
JAMES A. RYAN

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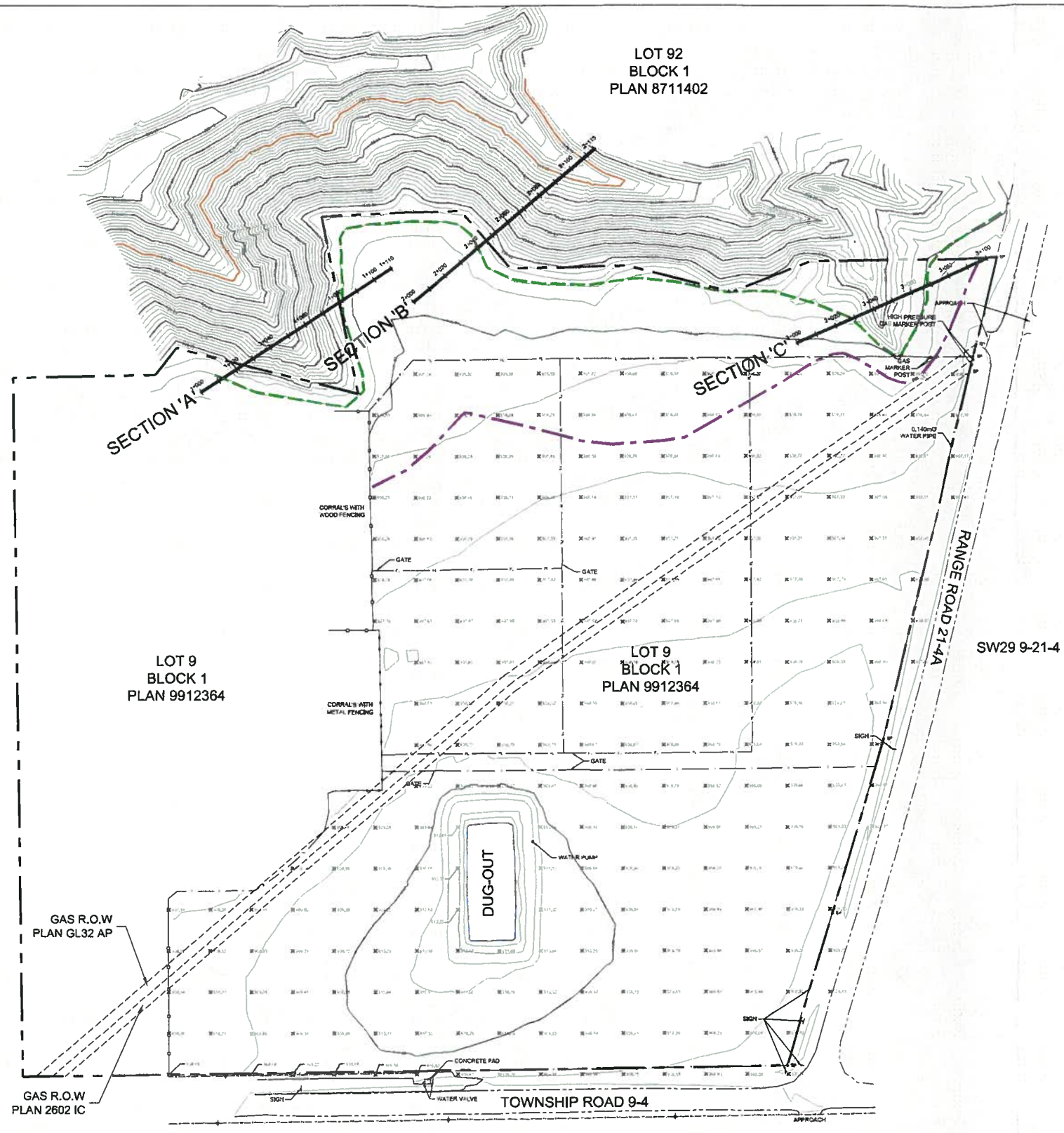
Senior Project Engineer
Engineering Practice
Direct Line: 403.203.3305 x871
jryan@eba.ca

/hms

PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.
Signature: _____
Date: April 19, 2010.
PERMIT NUMBER: P245
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

# FIGURES




0 50 100m

SCALE 1:2500

LEGEND

- DEVELOPMENT SETBACK LINE
- APPROXIMATE TOP OF BANK
- LENZIE SILT LAYER EL 875 m.

CLIENT

Stewart Weir

EGDEWOOD STABLES SUBDIVISION
SLOPE STABILITY ASSESSMENT

SITE PLAN

EBA Engineering Consultants Ltd.

| PROJECT NO. | DWN | CKD | REV |
|---|---|---|---|
| L12101748 | LCH | NA | 0 |
| OFFICE: Lethbridge | DATE: April 7, 2010 | | |

Figure 1

\\lethbridge\drafting\L121 Projects\L12101748\L12101748_FIG1.2_R0.dwg

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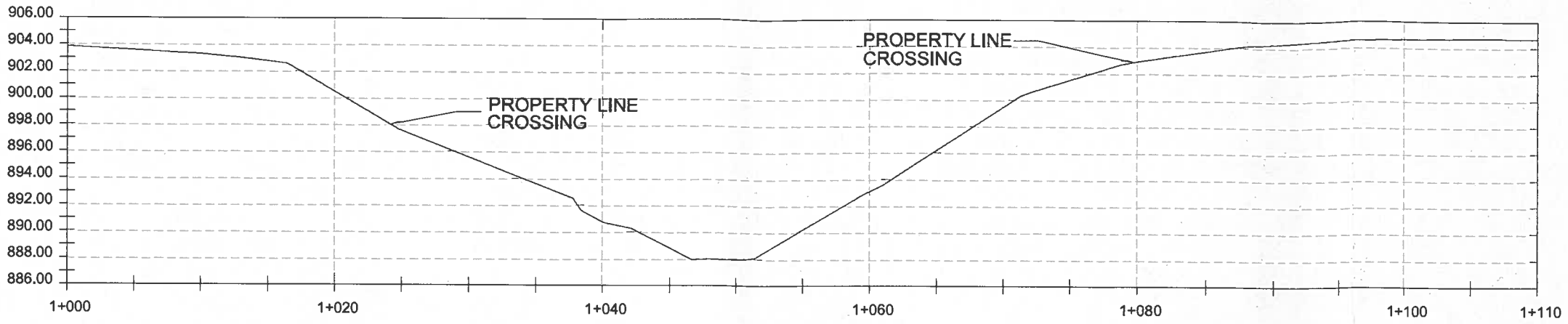


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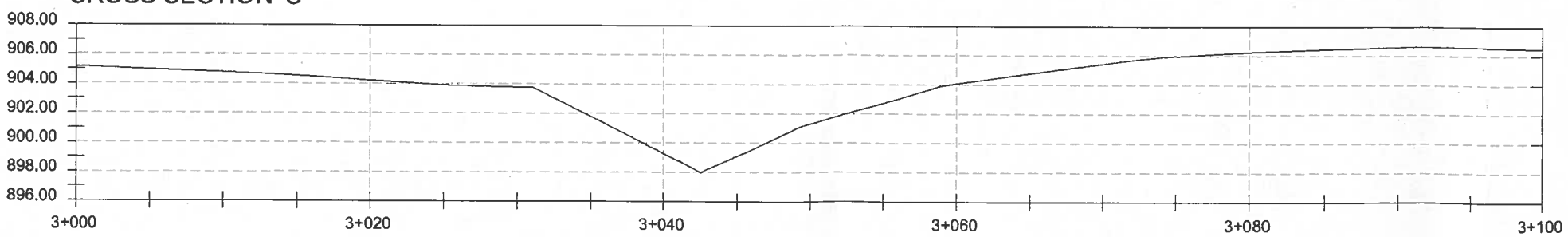
## CROSS SECTION 'C'

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SCALE 1:400

\\Lethbridge\drafting\L 121 Projects\L12101748\L12101748_FIG1.2_R0.dwg

CLIENT

Stewart Weir

EGDEWOOD STABLES SUBDIVISION
SLOPE STABILITY ASSESSMENT

SLOPE PROFILES

EBA Engineering Consultants Ltd.

| PROJECT NO. | DWN | CKD | REV |
|---|---|---|---|
| L12101748 | LCH | NA | 0 |
| OFFICE: Lethbridge | DATE: April 7, 2010 | | |

Figure 2

# APPENDIX

## APPENDIX A GEOTECHNICAL REPORT – GENERAL CONDITIONS

## GEOTECHNICAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

### 1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

### 2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

### 3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

### 4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

### 5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

### 6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

## 7.0 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgemental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

## 8.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

## 9.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

## 10.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

## 11.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

## 12.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

## 13.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

## 14.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

# APPENDIX

## APPENDIX B SITE PHOTOGRAPHS

**Photo 1**
Vegetation along North Perimeter Slopes (Looking South)

**Photo 2**
North Perimeter Slopes (Looking West)

**Photo 3**
North Perimeter Slopes (Looking East)

**Photo 4**
Skin Failures on North Perimeter Slopes (Looking South)

# APPENDIX 'B'

## SEPTIC FIELD FEASIBILITY ASSESSMENT

Stewart Weir

ISSUED FOR USE

# SEPTIC FIELD FEASIBILITY ASSESSMENT
# EDGEWOOD STABLES
# LETHBRIDGE, ALBERTA

L12101796

July 2010

EBA Engineering Consultants Ltd.
p. 403.329.9009 • f. 403.328.8817
442 - 10 Street N • Lethbridge, Alberta T1H 2C7 • CANADA

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### FIGURES



### APPENDICES

## 1.0 INTRODUCTION

This report presents the results of a septic field feasibility assessment conducted by EBA Engineering Consultants Ltd. (EBA) for a proposed residential subdivision development to be located in Lot 9, Block 1, Plan 9912364, in the SW ¼ of Section 29-009-21 W4M, north of Lethbridge, Alberta.

The scope of work for this evaluation was described in a proposal issued to Ms. Connie Petersen of Stewart Weir on June 22, 2010 (EBA File: PL12101796). The original proposal was modified and re-issued after discussions with Stewart Weir. The objective of this evaluation was to assess the feasibility of septic disposal fields for the proposed residential development.

Authorization to proceed with this evaluation was provided by Ms. Petersen on behalf of Mr. Daryl Dennis.

## 2.0 PROJECT DETAILS AND SCOPE OF WORK

Based on discussions with Stewart Weir, it is understood that the County of Lethbridge requires a septic field feasibility assessment be conducted to determine if the site soils are suitable for septic fields.

The requested work scope for this assessment comprised the sampling of soils from six (6) testpits, a laboratory program to assist in classifying the subsurface soils, and a report providing recommendations on soil suitability for septic fields.

## 3.0 GEOTECHNICAL FIELD WORK

The fieldwork for this evaluation was carried out on July 7, 2010. EBA's field representative was Mr. Jackson Meadows, C.E.T.

Six testpits were dug by Mr. Dennis within the estimated septic disposal field footprints in select locations to depths below ground surface of approximately 1 m (BH001 through BH004) and 3 m (BH005 and BH006). The approximate testpit locations (as selected on site by Mr. Dennis) are shown on Figure 1.

In all of the testpits, disturbed grab samples were obtained at a depth of 600 mm below ground surface. All soil samples were visually classified in the field and the individual soil strata and the interfaces between them were noted. The testpit logs are presented in Appendix B. An explanation of the terms and symbols used on the testpit logs is also included in Appendix B.

A slotted 25 mm diameter PVC standpipe was installed in each of the 3 m testpits in order to monitor groundwater levels.

Classification tests, including hydrometer analysis, were subsequently performed in the laboratory on samples collected from the testpits to aid in the determination of soil properties. The results of the laboratory tests are presented on the testpit logs in Appendix B and are discussed in this report.

## 4.0 SITE AND SUBSURFACE CONDITIONS

### 4.1 SITE CONDITIONS

The proposed development property is bounded to the north by tributary coulee valleys, comprising the Oldman River Valley, to the south by Township Road 94, to the east by Range Road 214A, and to the west by a gravel driveway.

The property was covered with prairie grasses, with an overall surface gradient towards the coulee valleys, generally to the north/northwest. The west portion of the site was noted to be in use as a horse ranch. There is a retention pond east of the horse ranch, as shown on Figure 1. EBA understands that both the ranch and retention pond are to remain post development. A gas pipeline right-of-way (ROW) bisects the property, running from southwest to northeast, as shown on Figure 1.

### 4.2 GROUNDWATER CONDITIONS

Groundwater levels were measured within the standpipes on July 14, 2010. The following table summarizes the groundwater monitoring data.

TABLE 1: GROUNDWATER LEVELS

| Borehole Number | Depth of Standpipe (m) | Groundwater Monitoring Data July 14, 2010 |
|---|---|---|
| | | Depth to Groundwater (m) |
| 005 | 3.0 | Dry |
| 006 | 3.0 | Dry |

### 4.3 SEPTIC FIELD ANALYSIS

EBA performed soil texture analyses on soil samples obtained from the proposed septic disposal field sites. The hydrometer/grain size analyses results are included in Appendix C. The results are indicated in the following table.

TABLE 2: SOIL TEXTURE ANALYSIS

| Borehole Number | % Sand | % Silt | % Clay | Soil Classification |
|---|---|---|---|---|
| 001 | 30 | 45 | 25 | Loam |
| 002 | 35 | 39 | 26 | Loam |
| 003 | 6 | 62 | 32 | Silty Clay Loam |
| 004 | 4 | 61 | 35 | Silty Clay Loam |
| 005 | 17 | 55 | 28 | Silty Loam |
| 006 | 6 | 50 | 44 | Silty Clay |

The soil samples were classified as above (referenced from Figure 8.1.1.10. of the Alberta Private Sewage Systems Standard of Practice 2009 Handbook). Based on these classifications, the surficial soils at the BH001, BH002, and BH005 generally satisfy the requirements of the Safety Code Council (as required by the 2009 Handbook) for design and construction of a septic disposal field. However, the surficial soils at BH003, BH004, and BH006 do not satisfy the Safety Code's requirements for septic disposal fields due to unacceptably high clay content.

In all areas where surficial soils did not meet the Safety Code's requirements (BH003, BH004, and BH006), consideration should be given to relocating the septic disposal fields to acceptable areas or alternate means of establishing a disposal field, such as construction of a septic field mound or other such industry acceptable measures be considered.

The 2009 Handbook stipulates that when using the results of a soil texture classification (determined in Figure 8.1.1.10 of the Handbook) to size a system, the disposal field shall be sized so that the effluent loading rate per day shall not exceed the following rates:

- 40.7 L per square meter (0.83 Imperial gallons per square foot) in loam to clay textured soils (BH001, BH002, and BH005).

Furthermore, the soil infiltration surface loading rates should not exceed the amounts set out in Table 8.1.10 based on the soil characteristics identified in this evaluation. In addition, the natural separation between the point of effluent infiltration into the soil and the groundwater should be a minimum of 1.5 m. Given the groundwater levels (dry to 3 m depth), all six sites meet the natural separation requirements.

It is recommended that the specific site selection of the proposed septic fields be carefully considered by the septic field installer to satisfy these requirements and those of the Regulations Having Jurisdiction [Municipality, Alberta Environment (AENV), Alberta Labour]. This requirement is in accordance with the provincial regulations, which state that two percolation tests are required within the final footprint of the field by the installer. Following the site-specific testing, the septic disposal field should be designed and sized accordingly by the disposal field designer. It is further recommended that the design footprint of any building structures be determined once the final disposal field is selected, to ensure the appropriate gravity flow or pumping requirements are satisfied.

During installation of the weeping trenches, the installer should pay close attention to the soil conditions to define the extent of high plastic clay layers which generally indicate areas with percolation rates below the minimum guidelines. These should be reported to the disposal field designer for review prior to completion of the septic disposal field.

The information provided herein is intended to be a preliminary assessment of the feasibility of septic disposal fields for the proposed development as per the provincial regulations. Site specific municipal regulations or siting requirement guidelines with respect to the local health unit, if applicable, have not been addressed.

## 5.0 LIMITATIONS

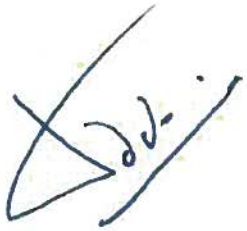
This report and its contents are intended for the sole use of Stewart Weir and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Stewart Weir, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA's Services Agreement and in the General Conditions provided in Appendix A of this report.

## 6.0 CLOSURE

We trust this report satisfies your present requirements. Should you require additional information or monitoring services, please do not hesitate to contact our office.

Respectfully submitted,
EBA Engineering Consultants Ltd.

Prepared by:



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July 22, 2010

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/hms

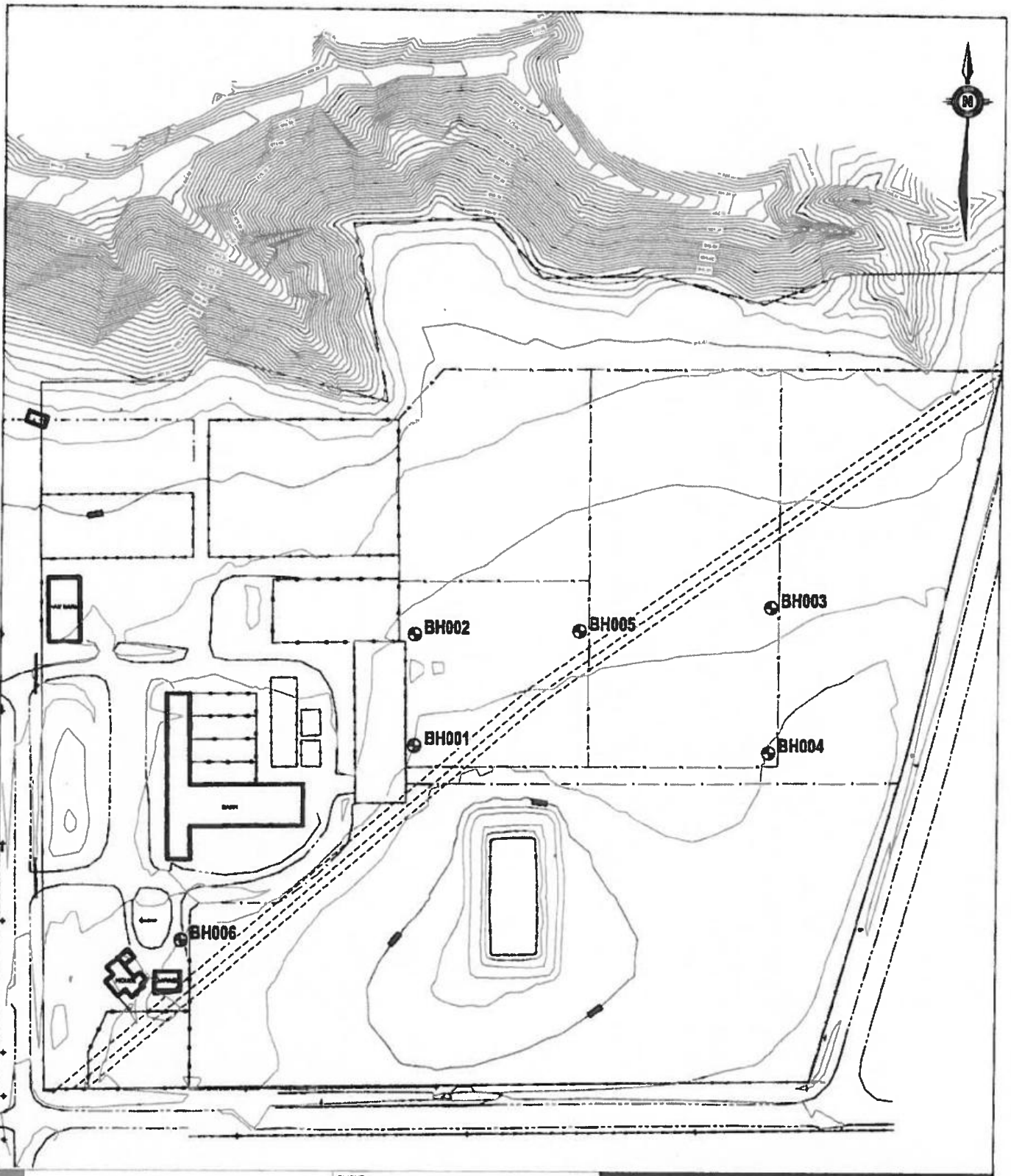
PERMIT TO PRACTICE
EBA ENGINEERING CONSULTANTS LTD.

Signature

Date July 23, 2010

PERMIT NUMBER: P245
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

# FIGURE




LEGEND

BH# BOREHOLE LOCATION

0 50 100m

SCALE 1:2500

CLIENT

Stuart Weir & Co. Ltd.

PROPOSED SEPTIC FIELD FEASIBILITY STUDY

SITE PLAN AND BOREHOLE LOCATIONS

EBA Engineering Consultants Ltd.

| PROJECT NO | DWN | CKD | REV |
|---|---|---|---|
| L12101798 | LCH | JC | 0 |
| OFFICE: EBA-Lethbridge | DATE: July 19, 2010 | | |

Figure 1

\\lethbridgedrafting\L\121 Projects\L12101798\L12101798_FIG1_R0.dwg

# APPENDIX A

## APPENDIX A GEOTECHNICAL REPORT – GENERAL CONDITIONS

## GEOTECHNICAL REPORT - GENERAL CONDITIONS

This report incorporates and is subject to these "General Conditions".

### 1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

### 2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future sofware and hardware systems.

### 3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

### 4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

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Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

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## 14.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

## 15.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

# APPENDIX B

APPENDIX B BOREHOLE LOGS

# TERMS USED ON BOREHOLE LOGS

## TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

| DESCRIPTIVE TERM | RELATIVE DENSITY | N (blows per 0.3m) |
|---|---|---|
| Very Loose | 0 to 20% | 0 to 4 |
| Loose | 20 to 40% | 4 to 10 |
| Compact | 40 to 75% | 10 to 30 |
| Dense | 75 to 90% | 30 to 50 |
| Very Dense | 90 to 100% | greater than 50 |

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

---

FINE GRAINED SOILS (major portion passing 0.075mm sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

| DESCRIPTIVE TERM | UNCONFINED COMPRESSIVE STRENGTH (kPa) |
|---|---|
| Very Soft | Less Than 25 |
| Soft | 25 to 50 |
| Firm | 50 to 100 |
| Stiff | 100 to 200 |
| Very Stiff | 200 to 400 |
| Hard | Greater Than 400 |

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

## GENERAL DESCRIPTIVE TERMS

| | |
|---|---|
| Slickensided | - having inclined planes of weakness that are slick and glossy in appearance. |
| Fissured | - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical. |
| Laminated | - composed of thin layers of varying colour and texture. |
| Interbedded | - composed of alternate layers of different soil types. |
| Calcareous | - containing appreciable quantities of calcium carbonate. |
| Well Graded | - having wide range in grain sizes and substantial amounts of intermediate particle sizes. |
| Poorly graded | - predominantly of one grain size, or having a range of sizes with some intermediate size missing. |

eba

# MODIFIED UNIFIED SOIL CLASSIFICATION

| MAJOR DIVISION | | | GROUP SYMBOL | TYPICAL DESCRIPTION |
|---|---|---|---|---|
| COARSE-GRAINED SOILS More than 50% retained on 75 µm sieve* | GRAVELS 50% or more of coarse fraction retained on 4.75 mm sieve | CLEAN GRAVELS | GW | Well-graded gravels and gravel-sand mixtures, little or no fines |
| | | | GP | Poorly graded gravels and gravel-sand mixtures, little or no fines |
| | | GRAVELS WITH FINES | GM | Silty gravels, gravel-sand-silt mixtures |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures |
| | SANDS More than 50% of coarse fraction passes 4.75 mm sieve | CLEAN SANDS | SW | Well-graded sands and gravelly sands, little or no fines |
| | | | SP | Poorly graded sands and gravelly sands, little or no fines |
| | | SANDS WITH FINES | SM | Silty sands, sand-silt mixtures |
| | | | SC | Clayey sands, sand-clay mixtures |
| FINE-GRAINED SOILS (by behavior) 50% or more passes 75 µm sieve* | SILTS Liquid limit <50 | | ML | Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity |
| | SILTS Liquid limit >50 | | MH | Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts |
| | CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit <30 | | CL | Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit 30-50 | | CI | Inorganic clays of medium plasticity, silty clays |
| | CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit >50 | | CH | Inorganic clays of high plasticity, fat clays |
| | ORGANIC SILTS AND CLAYS Liquid limit <50 | | OL | Organic silts and organic silty clays of low plasticity |
| | ORGANIC SILTS AND CLAYS Liquid limit >50 | | OH | Organic clays of medium to high plasticity |
| HIGHLY ORGANIC SOILS | | | PT | Peat and other highly organic soils |

## LABORATORY CLASSIFICATION CRITERIA

Classification on basis of percentage of fines

Less than 5% Pass 75 µm sieve — GW, GP, SW, SP

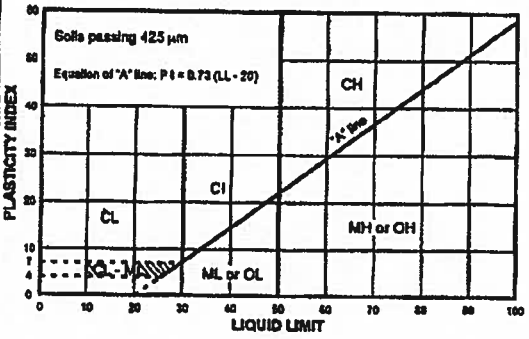
More than 12% Pass 75 µm sieve — GM, GC, SM, SC

5% to 12% Pass 75 µm sieve — Borderline Classification requiring use of dual symbols

| | | |
|---|---|---|
| $C_U = D_{60}/D_{10}$ Greater than 4<br>$C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 | | |
| Not meeting both criteria for GW | | |
| Atterberg limits plot below "A" line or plasticity index less than 4 | Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols | |
| Atterberg limits plot above "A" line or plasticity index greater than 7 | | |
| $C_U = D_{60}/D_{10}$ Greater than 6<br>$C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 | | |
| Not meeting both criteria for SW | | |
| Atterberg limits plot below "A" line or plasticity index less than 4 | Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols | |
| Atterberg limits plot above "A" line or plasticity index greater than 7 | | |

For classification of fine-grained soils and fine fraction of coarse-grained soils.

PLASTICITY CHART




*Based on the material passing the 75 mm sieve
Reference: ASTM Designation D2487, for identification procedure see D2488. USC as modified by PFRA

## SOIL COMPONENTS

| FRACTION | SIEVE SIZE PASSING | SIEVE SIZE RETAINED | DEFINING RANGES OF PERCENTAGE BY MASS OF MINOR COMPONENTS PERCENTAGE | DESCRIPTOR |
|---|---|---|---|---|
| GRAVEL | | | >35 % | "and" |
| coarse | 75 mm | 19 mm | 21 to 35 % | "y-adjective" |
| fine | 19 mm | 4.75 mm | 10 to 20 % | "some" |
| SAND | | | >0 to 10 % | "trace" |
| coarse | 4.75 mm | 2.00 mm | | |
| medium | 2.00 mm | 425 µm | | |
| fine | 425 µm | 75 µm | | |
| SILT (non plastic) or CLAY (plastic) | 75 µm | | as above but by behavior | |

## OVERSIZE MATERIAL

Rounded or subrounded

COBBLES 75 mm to 300 mm
BOULDERS > 300 mm

Not rounded

ROCK FRAGMENTS >75 mm
ROCKS > 0.76 cubic metre in volume

EBA Engineering Consultants Ltd.

| PROJECT: SEPTIC FIELD FEASIBILITY STUDY | CLIENT: STEWART, WEIR & CO. LTD. | PROJECT NO. - BOREHOLE NO. |
|---|---|---|
| LOCATION: SW 1/4 29-9-21-W4M | DRILL METHOD: 150mm SOLID STEM AUGER | L12101796 - 10BH001 |
| CITY: LETHBRIDGE, AB | PROJECT ENGINEER: NANA ADDO | |

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NUMBER | MOISTURE CONTENT (PLASTIC M.C. LIQUID, 20 40 60 80) | STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400 | Depth (ft) |
|---|---|---|---|---|---|---|
| 0 | TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics | | | | | 0 |
| | CLAY - silty, trace to some sand, very moist, firm, medium to high plastic, light brown to grey brown | | B1 | | | |
| 1 | End of Borehole @ 1.0m | | | | | 5 |
| | No Seepage or Sloughing on Completion | | | | | |
| 2 | | | | | | |
| 3 | | | | | | 10 |
| 3.5 | | | | | | 11 |

eba

LOGGED BY: JKM | COMPLETION DEPTH: 1m

REVIEWED BY: NA | COMPLETE: 7/7/2010

DRAWING NO: B1 | Page 1 of 1

| | | |
|---|---|---|
| PROJECT: SEPTIC FIELD FEASIBILITY STUDY | CLIENT: STEWART, WEIR & CO. LTD. | PROJECT NO. - BOREHOLE NO. |
| LOCATION: SW 1/4 29-9-21-W4M | DRILL METHOD: 150mm SOLID STEM AUGER | L12101796 - 10BH002 |
| CITY: LETHBRIDGE, AB | PROJECT ENGINEER: NANA ADDO | |

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NUMBER | MOISTURE CONTENT (PLASTIC M.C. LIQUID 20 40 60 80) | STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400 | Depth (ft) |
|---|---|---|---|---|---|---|
| 0 | TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics | | | | | 0 |
| | CLAY - silty, some sand to sandy, damp to moist, stiff to very stiff, medium plastic, brown, roots and root hairs | | B1 | | | |
| 1 | End of Borehole @ 1.0m | | | | | |
| | No Seepage or Sloughing on Completion | | | | | 5 |
| 2 | | | | | | |
| 3 | | | | | | 10 |
| 3.5 | | | | | | 11 |

| | | |
|---|---|---|
| eba | LOGGED BY: JKM | COMPLETION DEPTH: 1m |
| | REVIEWED BY: NA | COMPLETE: 7/7/2010 |
| | DRAWING NO: B2 | Page 1 of 1 |

| PROJECT: SEPTIC FIELD FEASIBILITY STUDY | CLIENT: STEWART, WEIR & CO. LTD. | PROJECT NO. - BOREHOLE NO. |
|---|---|---|
| LOCATION: SW 1/4 29-9-21-W4M | DRILL METHOD: 150mm SOLID STEM AUGER | L12101796 - 10BH003 |
| CITY: LETHBRIDGE, AB | PROJECT ENGINEER: NANA ADDO | |

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NUMBER | MOISTURE CONTENT (PLASTIC M.C. LIQUID 20 40 60 80) | STANDARD PENETRATION (N-value) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400 | Depth (ft) |
|---|---|---|---|---|---|---|
| 0 | TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics | | | | | 0 |
| | CLAY - silty, some sand to sandy, damp to moist, very stiff, medium plastic, light brown to brown, white precipitates | | B1 | | | |
| 1 | End of Borehole @ 1.0m | | | | | 5 |
| | No Seepage or Sloughing on Completion | | | | | |
| 2 | | | | | | |
| 3 | | | | | | 10 |
| 3.5 | | | | | | 11 |

| | | |
|---|---|---|
| eba | LOGGED BY: JKM | COMPLETION DEPTH: 1m |
| | REVIEWED BY: NA | COMPLETE: 7/7/2010 |
| | DRAWING NO: B3 | Page 1 of 1 |

| PROJECT: SEPTIC FIELD FEASIBILITY STUDY | CLIENT: STEWART, WEIR & CO. LTD. | PROJECT NO. - BOREHOLE NO. |
|---|---|---|
| LOCATION: SW 1/4 29-9-21-W4M | DRILL METHOD: 150mm SOLID STEM AUGER | L12101796 - 10BH004 |
| CITY: LETHBRIDGE, AB | PROJECT ENGINEER: NANA ADDO | |

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NUMBER | MOISTURE CONTENT (PLASTIC M.C. LIQUID 20 40 60 80) | STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400 | Depth (ft) |
|---|---|---|---|---|---|---|
| 0 | TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics | | | | | 0 |
| | CLAY - silty, some sand to sandy, damp to moist, very stiff, medium plastic, light brown, white precipitates, occasional sand lenses | | B1 | | | |
| 1 | End of Borehole @ 1.0m | | | | | 5 |
| | No Seepage or Sloughing on Completion | | | | | |
| 2 | | | | | | |
| 3 | | | | | | 10 |
| 3.5 | | | | | | 11 |

| | | |
|---|---|---|
| eba | LOGGED BY: JKM | COMPLETION DEPTH: 1m |
| | REVIEWED BY: NA | COMPLETE: 7/7/2010 |
| | DRAWING NO: B4 | Page 1 of 1 |

| PROJECT: SEPTIC FIELD FEASIBILITY STUDY | CLIENT: STEWART, WEIR & CO. LTD. | PROJECT NO. - BOREHOLE NO. |
|---|---|---|
| LOCATION: SW 1/4 29-9-21-W4M | DRILL METHOD: 150mm SOLID STEM AUGER | L12101796 - 10BH005 |
| CITY: LETHBRIDGE, AB | PROJECT ENGINEER: NANA ADDO | |

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NUMBER | MOISTURE CONTENT (PLASTIC M.C. LIQUID 20 40 60 80) | STANDARD PENETRATION (N) 20 40 60 80 / UNCONFINED (kPa) 50 100 150 200 / POCKET PEN. (kPa) 100 200 300 400 | Depth (ft) |
|---|---|---|---|---|---|---|
| 0 | TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics | | | | | 0 |
| | CLAY - silty, some sand to sandy, damp, very stiff, medium plastic, light brown to brown, white precipitates | | B1 | | | |
| 1 | | | | | | |
| | | | | | | 5 |
| 2 | CLAY (TILL) - silty, some sand, trace gravel, damp to moist, very stiff, medium plastic, brown, coal and oxide specks, occasional sand pockets to 20mm, white precipitates | | | | | |
| | | | | | | 10 |
| 3 | End of Borehole @ 1.0m | | | | | |
| | No Seepage or Sloughing on Completion<br>Slotted PVC Standpipe Installed to 3.0m<br>Borehole Measured Dry July 14, 2010 | | | | | |
| 3.5 | | | | | | 11 |

| | | |
|---|---|---|
| eba | LOGGED BY: JKM | COMPLETION DEPTH: 3m |
| | REVIEWED BY: NA | COMPLETE: 7/7/2010 |
| | DRAWING NO: B5 | Page 1 of 1 |

| | | |
|---|---|---|
| PROJECT: SEPTIC FIELD FEASIBILITY STUDY | CLIENT: STEWART, WEIR & CO. LTD. | PROJECT NO. - BOREHOLE NO. |
| LOCATION: SW 1/4 29-9-21-W4M | DRILL METHOD: 150mm SOLID STEM AUGER | L12101796 - 10BH006 |
| CITY: LETHBRIDGE, AB | PROJECT ENGINEER: NANA ADDO | |

SAMPLE TYPE: DISTURBED | NO RECOVERY | SPT | A-CASING | SHELBY TUBE | CORE

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NUMBER | MOISTURE CONTENT (PLASTIC M.C. LIQUID 20 40 60 80) | STANDARD PENETRATION (N) 20 40 60 80; UNCONFINED (kPa) 50 100 150 200; POCKET PEN. (kPa) 100 200 300 400 | Depth (ft) |
|---|---|---|---|---|---|---|
| 0 | TOPSOIL - clay, silty, sandy, moist, dark brown, roots, organics | | | | | 0 |
| | CLAY (FILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown to dark brown, coal and oxide specks, occasional sand lenses red shale specks | | | | | |
| 1 | CLAY - silty, some sand, moist to very moist, firm to stiff, medium plastic, brown to dark brown | | B1 | | | 5 |
| 2 | CLAY (TILL) - silty, some sand, trace gravel, moist, stiff, medium plastic, brown to dark brown, coal and oxide specks, occasional sand lenses | | | | | |
| 3 | End of Borehole @ 1.0m | | | | | 10 |
| | No Seepage or Sloughing on Completion<br>Slotted PVC Standpipe Installed to 3.0m<br>Borehole Measured Dry July 14, 2010 | | | | | |
| 3.5 | | | | | | 11 |

| | |
|---|---|
| LOGGED BY: JKM | COMPLETION DEPTH: 3m |
| REVIEWED BY: NA | COMPLETE: 7/7/2010 |
| DRAWING NO: B6 | Page 1 of 1 |

# APPENDIX C

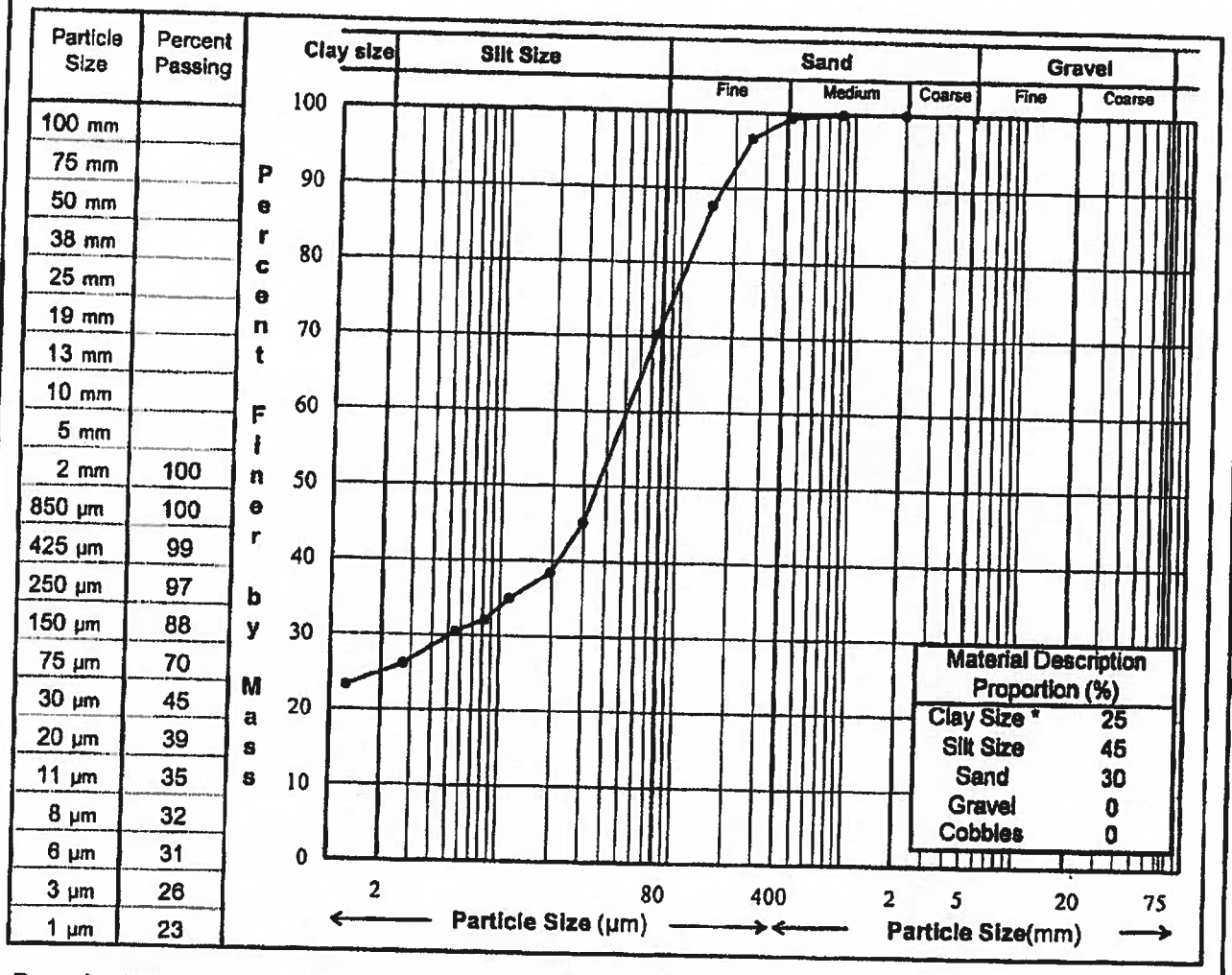
APPENDIX C LABORATORY RESULTS

# PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

| | | | |
|---|---|---|---|
| Project: | Septic Field Feasibility Assmt. | Sample No.: | |
| Client: | Stewart Weir & Company | Borehole/ TP: | 10BH001 |
| Project No.: | L12101796 | Depth: | 0.6-0.9m |
| Location: | N-5513320 E-0368913 | Date Tested | July 12, 10 By: AF |
| Description **: | clay, silty, some sand | | |

| Particle Size | Percent Passing |
|---|---|
| 100 mm | |
| 75 mm | |
| 50 mm | |
| 38 mm | |
| 25 mm | |
| 19 mm | |
| 13 mm | |
| 10 mm | |
| 5 mm | |
| 2 mm | 100 |
| 850 µm | 100 |
| 425 µm | 99 |
| 250 µm | 97 |
| 150 µm | 88 |
| 75 µm | 70 |
| 30 µm | 45 |
| 20 µm | 39 |
| 11 µm | 35 |
| 8 µm | 32 |
| 6 µm | 31 |
| 3 µm | 26 |
| 1 µm | 23 |




**Remarks:** * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to EBA description protocols.

**Reviewed By:** _____ P.Eng.



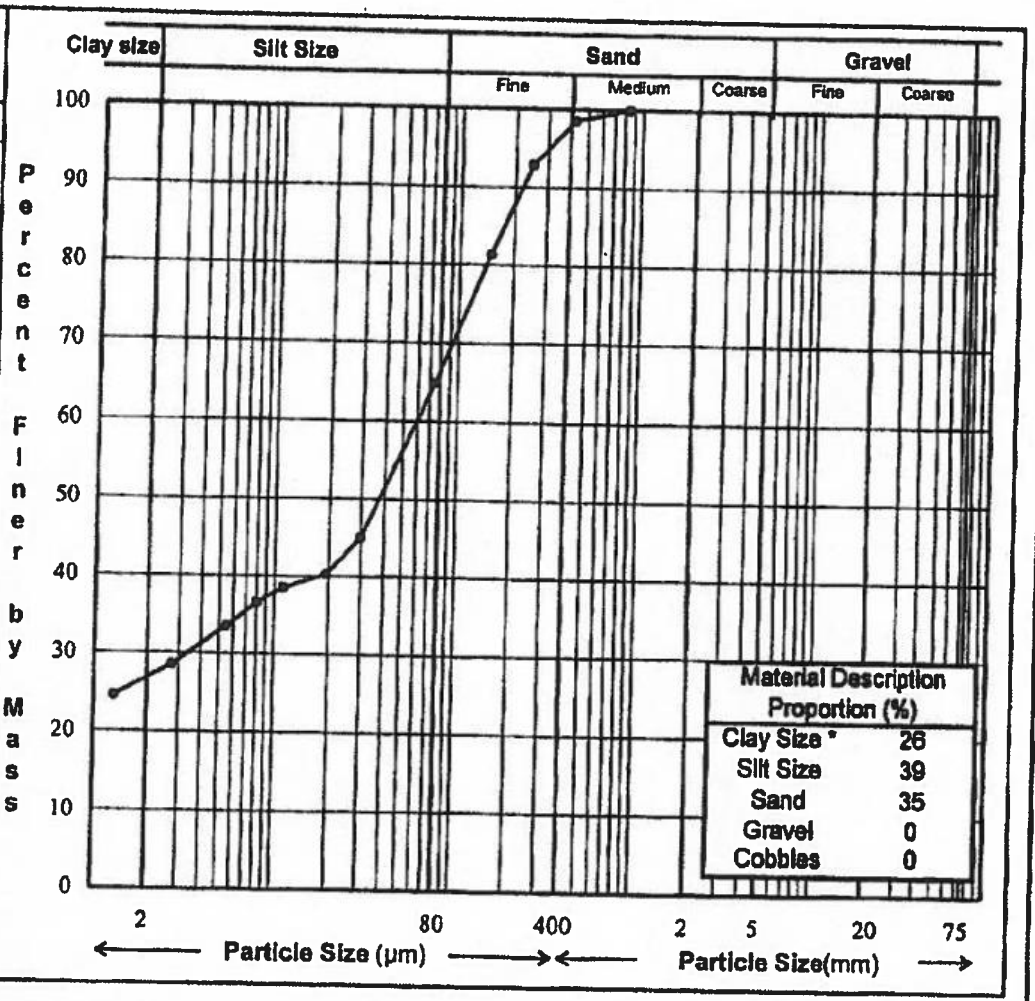
EBA Engineering Consultants Ltd. eba

# PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

| | | | |
|---|---|---|---|
| Project: | Septic Field Feasibility Assmt. | Sample No.: | |
| Client: | Stewart Weir & Company | Borehole/ TP: | 10BH002 |
| Project No.: | L12101796 | Depth: | 0.6-0.9m |
| Location: | N-5513407 E-0368916 | Date Tested | July 12, 10 By: AF |
| Description **: | clay, silty, some sand | | |

| Particle Size | Percent Passing |
|---|---|
| 100 mm | |
| 75 mm | |
| 50 mm | |
| 38 mm | |
| 25 mm | |
| 19 mm | |
| 13 mm | |
| 10 mm | |
| 5 mm | |
| 2 mm | |
| 850 µm | 100 |
| 425 µm | 99 |
| 250 µm | 93 |
| 150 µm | 81 |
| 75 µm | 65 |
| 30 µm | 45 |
| 19 µm | 40 |
| 11 µm | 38 |
| 8 µm | 37 |
| 6 µm | 34 |
| 3 µm | 29 |
| 1 µm | 25 |




**Remarks:** * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to EBA description protocols.

**Reviewed By:** _____ P.Eng.



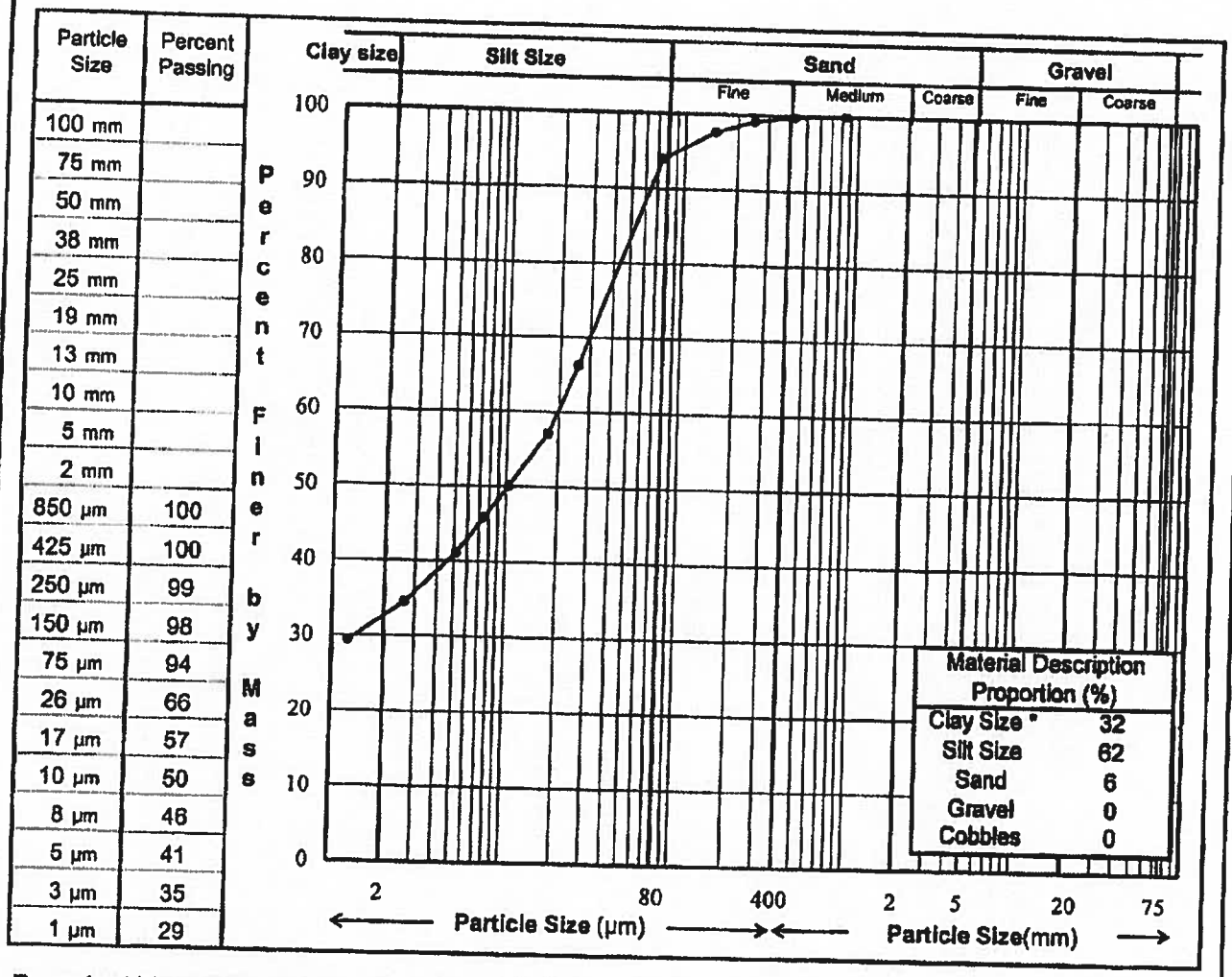
EBA Engineering Consultants Ltd. eba

# PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

| | | | |
|---|---|---|---|
| Project: | Septic Field Feasibility Assmt. Edgewoo | Sample No.: | |
| Client: | Stewart Weir & Company | Borehole/ TP: | 10BH003 |
| Project No.: | L12101796 | Depth: | 0.6-0.9m |
| Location: | N-5513306 E-0369004 | Date Tested | July 12, 10 By: AF |
| Description **: | clay, silty, tace sand | | |

| Particle Size | Percent Passing |
|---|---|
| 100 mm | |
| 75 mm | |
| 50 mm | |
| 38 mm | |
| 25 mm | |
| 19 mm | |
| 13 mm | |
| 10 mm | |
| 5 mm | |
| 2 mm | |
| 850 µm | 100 |
| 425 µm | 100 |
| 250 µm | 99 |
| 150 µm | 98 |
| 75 µm | 94 |
| 26 µm | 66 |
| 17 µm | 57 |
| 10 µm | 50 |
| 8 µm | 46 |
| 5 µm | 41 |
| 3 µm | 35 |
| 1 µm | 29 |




**Remarks:** * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to EBA description protocols.

**Reviewed By:** _____ P.Eng.



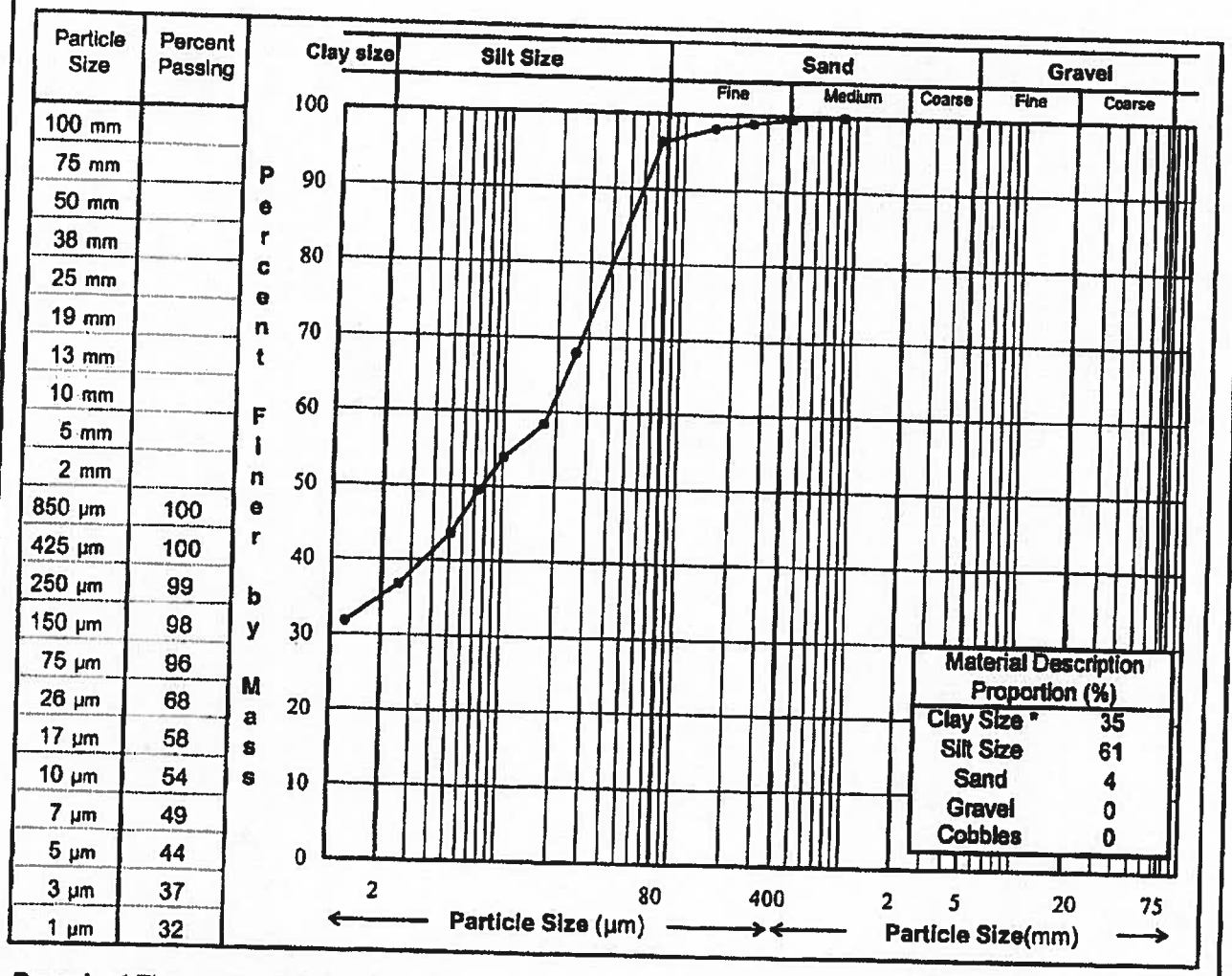
EBA Engineering Consultants Ltd. eba

# PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

| | | | |
|---|---|---|---|
| Project: | Septic Field Feasibility Assmt. Edgewoo | Sample No.: | |
| Client: | Stewart Weir & Company | Borehole/ TP: | 10bh004 |
| Project No.: | L12101796 | Depth: | 0.6-0.9m |
| Location: | N5513296 E-0369040 | Date Tested | July 12, 10 By: AF |
| Description **: | clay, silty, trace sand | | |

| Particle Size | Percent Passing |
|---|---|
| 100 mm | |
| 75 mm | |
| 50 mm | |
| 38 mm | |
| 25 mm | |
| 19 mm | |
| 13 mm | |
| 10 mm | |
| 5 mm | |
| 2 mm | |
| 850 µm | 100 |
| 425 µm | 100 |
| 250 µm | 99 |
| 150 µm | 98 |
| 75 µm | 96 |
| 26 µm | 68 |
| 17 µm | 58 |
| 10 µm | 54 |
| 7 µm | 49 |
| 5 µm | 44 |
| 3 µm | 37 |
| 1 µm | 32 |




**Remarks:** * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to EBA description protocols.

**Reviewed By:** _____ P.Eng.



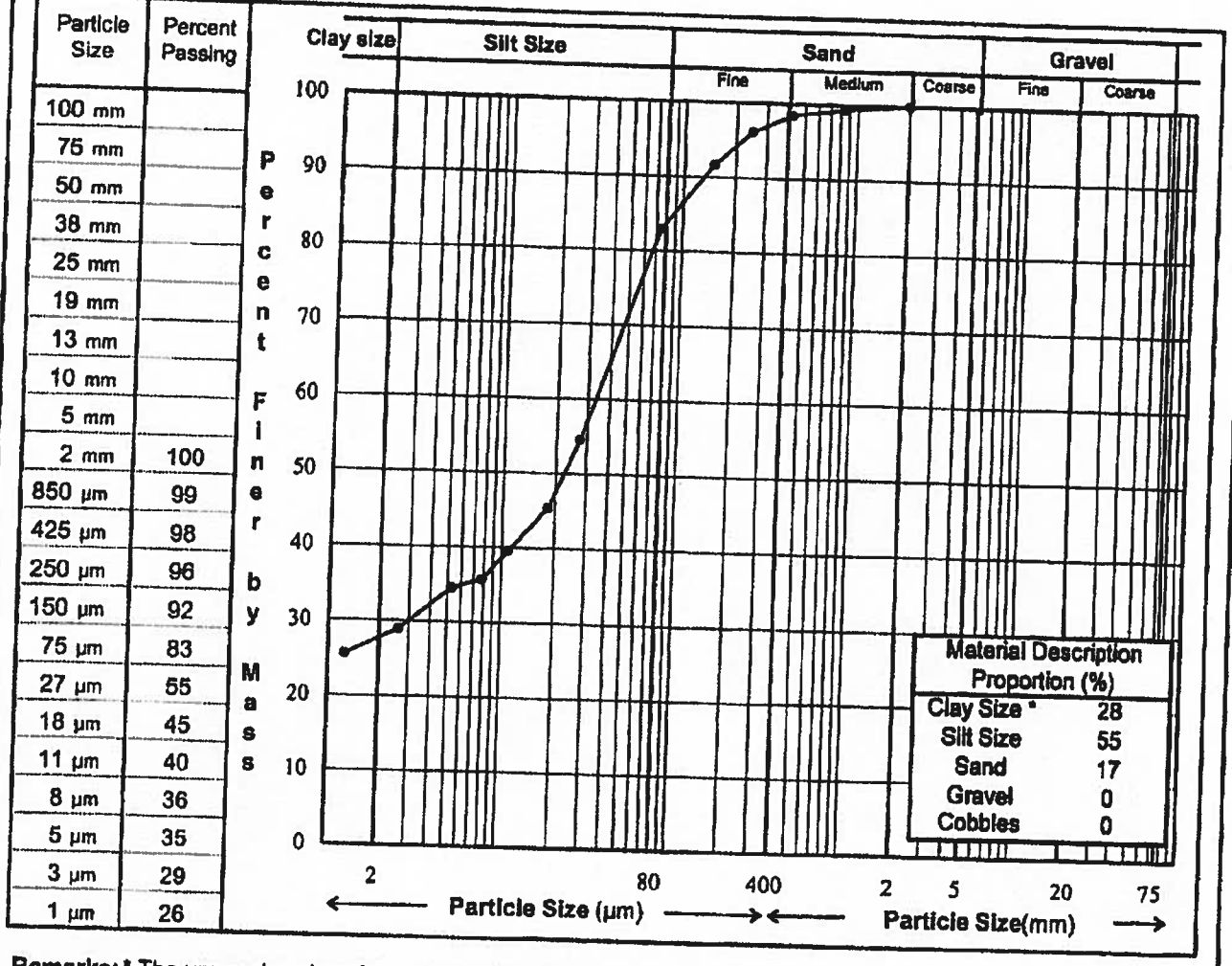
EBA Engineering Consultants Ltd. eba

# PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

| | | | |
|---|---|---|---|
| Project: | Septic Field Feasibility Assmt. | Sample No.: | |
| Client: | Stewart Weir & Company | Borehole/ TP: | 10BH005 |
| Project No.: | L12101796 | Depth: | 0.6-0.9m |
| Location: | N-5513444 E-0369011 | Date Tested | July 12, 10 By: AF |
| Description **: | clay, silty, some sand | | |

| Particle Size | Percent Passing |
|---|---|
| 100 mm | |
| 75 mm | |
| 50 mm | |
| 38 mm | |
| 25 mm | |
| 19 mm | |
| 13 mm | |
| 10 mm | |
| 5 mm | |
| 2 mm | 100 |
| 850 µm | 99 |
| 425 µm | 98 |
| 250 µm | 96 |
| 150 µm | 92 |
| 75 µm | 83 |
| 27 µm | 55 |
| 18 µm | 45 |
| 11 µm | 40 |
| 8 µm | 36 |
| 5 µm | 35 |
| 3 µm | 29 |
| 1 µm | 26 |




**Remarks:** * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to EBA description protocols.

**Reviewed By:** _____ P.Eng.



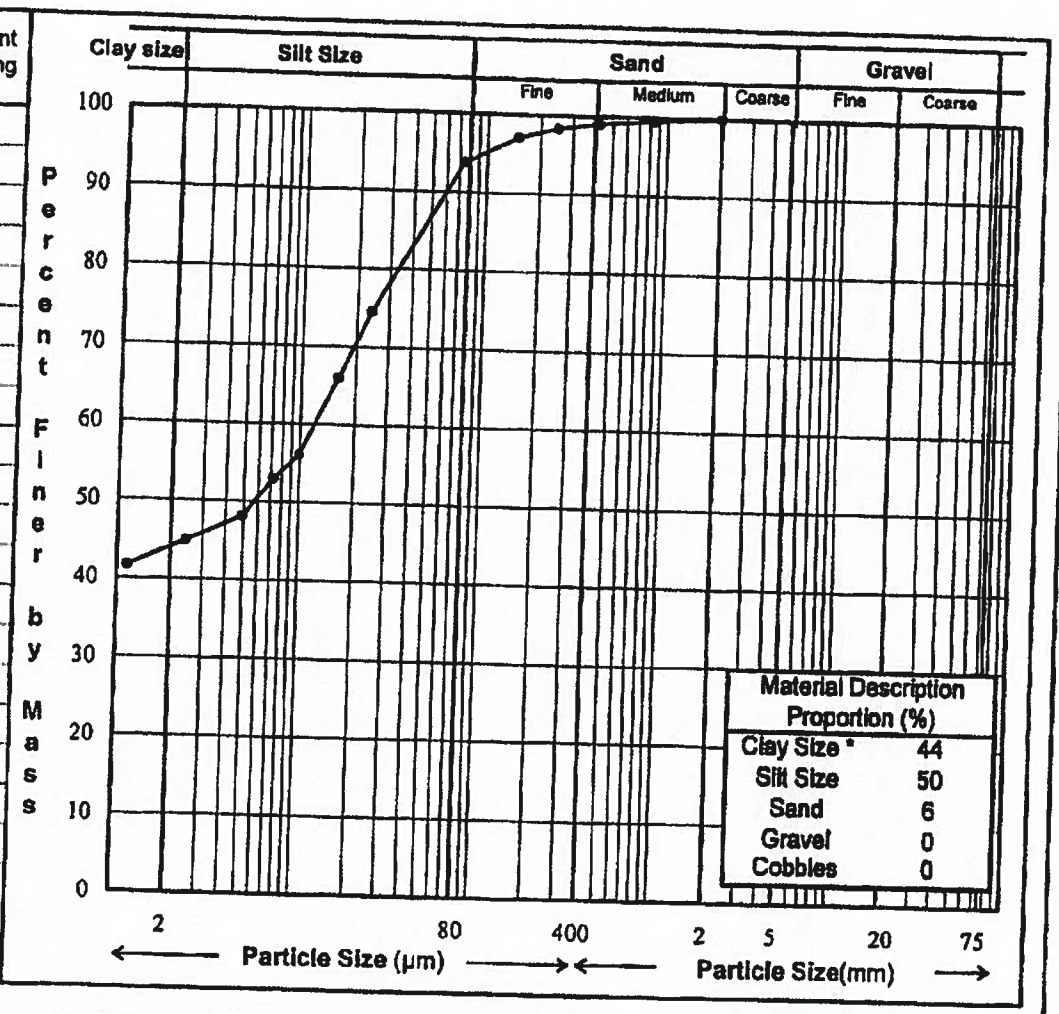
EBA Engineering Consultants Ltd. eba

# PARTICLE SIZE ANALYSIS (Hydrometer) TEST REPORT

ASTM D422

| | | | |
|---|---|---|---|
| Project: | Septic Field Feasibility Assmt. | Sample No.: | |
| Client: | Stewart Weir & Company | Borehole/ TP: | 10BH006 |
| Project No.: | L12101796 | Depth: | 0.6-0.9m |
| Location: | N-5513231 E-0368713 | Date Tested | July 12, 10 By: AF |
| Description **: | clay and silt, trace sand | | |

| Particle Size | Percent Passing |
|---|---|
| 100 mm | |
| 75 mm | |
| 50 mm | |
| 38 mm | |
| 25 mm | |
| 19 mm | |
| 13 mm | |
| 10 mm | |
| 5 mm | |
| 2 mm | 100 |
| 850 µm | 100 |
| 425 µm | 99 |
| 250 µm | 98 |
| 150 µm | 97 |
| 75 µm | 94 |
| 24 µm | 75 |
| 16 µm | 66 |
| 10 µm | 56 |
| 7 µm | 53 |
| 5 µm | 48 |
| 2 µm | 45 |
| 1 µm | 42 |




**Remarks:** * The upper clay size of 2 µm is as per the Canadian Foundation Manual.

** The description is behaviour based & subject to EBA description protocols.

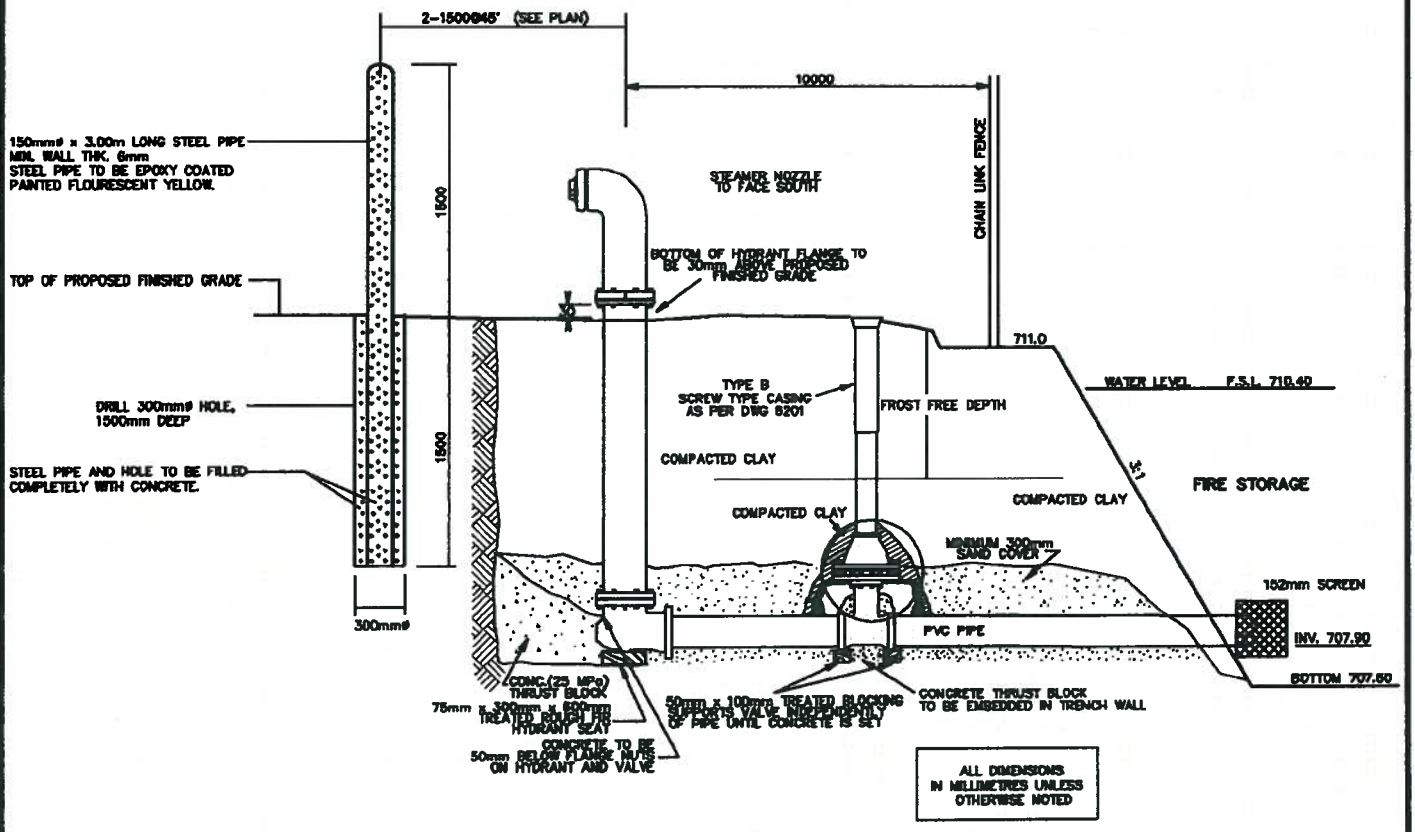
**Reviewed By:** _____ P.Eng.



EBA Engineering Consultants Ltd. eba

# APPENDIX 'C'

## DRY HYDRANT DETAILS




NOTES:

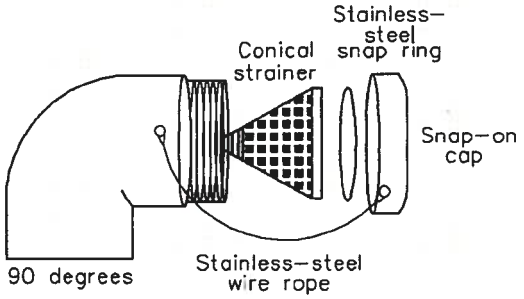
1. GRADE AT BOTTOM OF HYDRANT FLANGE IS 30mm PLUS 20mm PER METRE DISTANCE FROM FACE OF CURB ABOVE ESTABLISHED (EXISTING OR PROPOSED) CURB TOP ELEVATION.
2. SEE DRAWING 6303 FOR CATHODIC PROTECTION REQUIREMENTS

# COUNTY OF LETHBRIDGE

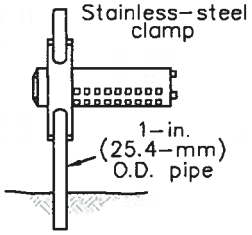
## General Municipal Servicing Standards

| | | | |
|---|---|---|---|
| Rev. | Stewart Weir | TYPICAL DRY HYDRANT CONNECTION | |
| Rev. | | | |
| Rev. | | | |
| Rev. | File No.: | Design: | Approved: |
| Date: 2008 | Drawn: JES | Scale NTS | Figure 3053 |

\\Swgcal\Files\Jobs\33000\33737 LB35 Edgewood Stables Ltd\CAD\Hydrant Details\3053-Dry Hydrant Connection with Guard Post.dwg

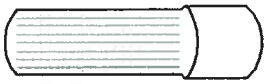



Dry hydrant head #227
[Specify 90 degrees, 45 degrees,or straight and 4½-in.(114-mm), 5-in.(127-mm),or 6-in.(152-mm) NH male thread]




Strainer support clamp #230

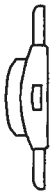
6-in. (152mm) PVC dry hydrant strainer #224 (for horizontal installations)



6-in. (152mm) barrel strainer #234 (for vertical installations)

## SUCTION HOSE ADOPTERS

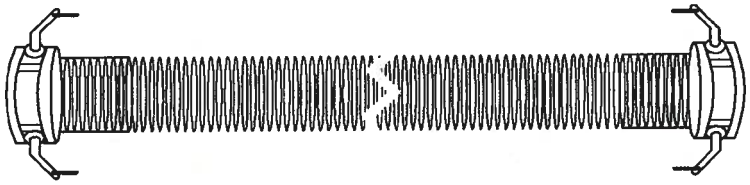
Long-handle quick connect #225Q [specify size 4-in.-6in. (101.5mm-152mm)]



Long-handle female to male NST thread #225FM [specify size 2½-in.-6in. (63.5mm-152mm)]

Long-handle double female swivel NST thread #225DF [specify size 2½-in.-6in. (63.5mm-152mm)]


Reflective signs: 6-in.x12-in. (152-mmx304.8-mm) self adhesive label #229L; 12-in.x16-in. (304.8-mmx406-mm) aluminum sign (less post) #229S



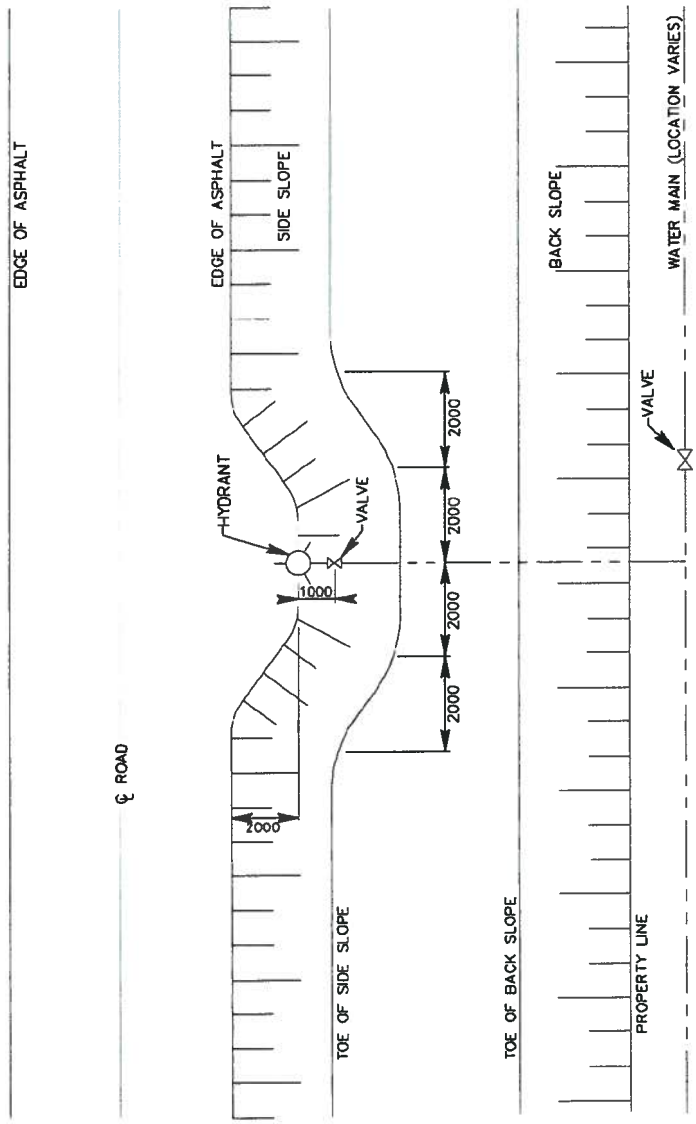
10-ft(3.05-m) flex-suction hose (clear) #226
[specify hose diameter 4 in. (102mm), 5 in.(127mm), or 6 in.(152mm) and NH threads or quick-locking couplings]

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

# COUNTY OF LETHBRIDGE

General Municipal Servicing Standards

| | | | |
|---|---|---|---|
| Rev. | Stewart Weir | DRY HYDRANT CONNECTION DETAIL | |
| Rev. | | | |
| Rev. | | | |
| Rev. | File No.: | Design: | Approved: |
| Date: 2008 | Drawn: EPL | Scale NTS | Figure 3054 |




NOTE:

1. WATER MAIN AND HYDRANTS MAY BE LOCATED EITHER SIDE OF ROAD
2. STREET LIGHTS TO BE OPPOSITE SIDE OF WATERMAIN.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED

# COUNTY OF LETHBRIDGE

General Municipal Servicing Standards

| | | | | |
|---|---|---|---|---|
| Rev. | Stewart Weir | | TYPICAL SHOULDER WIDENING FOR FIRE HYDRANT–RURAL STANDARD | |
| Rev. | | | | |
| Rev. | | | | |
| Rev. | File No.: | Design: | Approved: | Figure 3055 |
| Date: 2008 | Drawn: T.L.B. | Scale NTS | | |

# APPENDIX 'D'

## ARCHITECTURAL CONTROLS

**RESTRICTIVE COVENANT AND ARCHITECTURAL CONTROLS**

**EDGEWOOD ESTATES**

THIS AGREEMENT made this ___ day of _____, 2011.

BETWEEN:

**EDGEWOOD STABLES LTD.**
(Grantor)

-and-

**EDGEWOOD STABLES LTD.**
(Grantee)

**WHEREAS EDGEWOOD STABLES LTD.** (at the time of the registration of these Restrictive Covenants and Architectural Controls) is the registered owner of the development known as **EDGEWOOD ESTATES** situated in the County of Lethbridge, in the Province of Alberta (hereinafter called the "Subdivision"), and is in the process of developing the Subdivision into a series of country residential lots;

**AND WHEREAS** the controls contained herein are intended to implement standards of appearance and quality in the Subdivision by attaching certain restrictions, covenants and conditions restrictive in nature in respect of the exterior design, use (to the extent that use is a function of design) and development, to each lot located within the Subdivision (hereinafter referred to as a "Lot", or referred to as the said "Lands" when referring collectively to all of the lots located within the Subdivision) and each and every part thereof and the buildings, structures, improvements and premises to be erected on each and every part of the Lands;

**AND WHEREAS** the restrictions, covenants and conditions herein are not meant to detract or derogate in any way from any applicable laws, regulations or by-laws (including but not limited to land use by-laws of the County of Lethbridge or the City of Lethbridge as may be enacted from time to time), but are in addition and supplementary to, the restrictions, covenants and conditions contained in any such laws, regulations and by-laws;

**AND WHEREAS** the Grantor covenants with the Grantee to observe and comply with the following restrictions and architectural controls, the burden of which shall run with each of the lots:

**PLAN 111 _____, Block 2, Lots 1-10 INCLUSIVE**

**EXCEPTING THEREOUT ALL MINES AND MINERALS**

**( S.W. ¼ SEC. 29, TWP. 9, RGE. 21, W4M)**

hereinafter called the "Lands".

This covenant shall be binding upon and inure to the benefit of the respective heirs, executors, administers, successors and assigns of the parties.

**BUILDING SPECIFICATIONS**

1. No residence shall be constructed on the Lands which encroaches upon or straddles the property line with any lot adjacent to it on either side, regardless of ownership of the adjacent lot.

2. No residence shall be constructed on the Lands which shall have a floor area above grade of less than 2000 square feet. The measurements may include the outer walls of the residence but shall exclude any garage, patio, porch, or the like part of a building. Only one detached dwelling may be erected on a lot. All other County of Lethbridge Bylaws will apply.

3. No building shall be constructed on the Lands more than two stories above front-grade.

4. No mobile home, trailer, manufactured home, or previously built residence or building or structure shall be allowed to be placed upon or moved onto any of the aforedescribed Lands (quality house packages which require substantial on-site construction and assembly may be permitted with the approval of the Development Manager).

5. A granny suite or legal suite may be constructed upon the said Lands, but must:

    i Be approved under the County of Lethbridge Land Use Bylaw, accompanied by an approved development permit from the County.

    ii Exist within the framework of the home itself, such as a suite above the garage or in the basement, indistinguishable to an onlooker from the street; or

    iii Exist within the said Lands, but outside of the main residence and conform with the exterior finish and overall look of the main residence and fall within the proper permitted setbacks of the municipality and must be no more than 900 square feet (83.612 square meters) and must be included as part of the overall design concept of the house and yard development and must be approved in size and location by the Development Manager and must have sufficient parking on the said Lands.

6. Lot owners must consult the Development Manager for any building development that incorporates a walk-out basement, prior to proceeding with construction, to determine if the same is permitted, and if so, what requirements there may be with respect to the same.

7. No building shall be constructed upon the said Lands until the "Plot and Design Plan" has been approved by the Development Manager. The Plot and Design Plan must be approved in accordance with the overall plan and layout of the development as determined by the Development Manager. In particular, the orientation of the driveway and garage of each residence will be determined by the Development Manager to ensure maximum green space exists between adjacent Lands. The decision of the

Development Manager is final. It is strongly recommended that the owner seek direction from the Development Manager prior to making final decisions regarding a house plan.

8. Each residence constructed on the Lands is encouraged to be designed so as to explore the potential of each lot to arrive at a design which resolves the needs of the family intended to occupy the residence in terms of layout and finish. The design of the residence shall reflect the unique features of each lot in terms of view, orientation, climate, access and integration of indoors with outdoor space. Each home design must be conceived as a simple and honest expression of present day architectural forms and without the use of eclectic or regional styles.

9. Exterior finishes will be approved on case-by-case basis.

**SETBACKS**

10. All buildings or structures shall be within the parameters of the building envelope and must comply with the Land Use Bylaw of the County of Lethbridge in force at the time of the granting of the Development Permit.

**ROOFING MATERIALS**

11. No roof shall be constructed on any residence on said Lands with a roof pitch of less than 5:12. No metal cladding or metal sheeting on the roof area shall be permitted unless approved by the Development Manager. Tar and gravel roofing, and rolled roofing are not acceptable. Acceptable roofing materials include:

    i architectural asphalt shingles;

    ii laminate shingles;

    iii concrete tiles;

    iv shakes;

    v slate tiles; or

    vi metal roofing simulating slate, shakes, or shingles

12. The roof colour of any permanent structure (including but not limited to the residential dwelling and garage) located on a Lot shall be compatible with the colour of the exterior finish of the residential dwelling on such Lot.

**GARAGE**

13. No garage shall be constructed on the Lands unless it is a minimum of double attached or detached garage of the minimum dimensions of 6.7056 meters by 7.3152 meters (22 feet by 24 feet) and must be included as part of the overall design concept of the house and yard development and the exterior finish must be similar to that of the main residence and the roof line and pitch of the roof on the garage must be compatible with the design of the main residence.

14. Any detached garage or other outbuilding must be set back no less than 7.62 meters (25 feet) from the property line.

15. Any detached garage being built on the property must be approved in size and location by the Development Manager.

16. The Lands shall not be used for the storage of

- Abandoned vehicles or equipment, non-functioning vehicles or equipment, auto or truck bodies, and other vehicles or equipment not currently in a functioning state; and
- Gasoline, diesel fuel or similar fuel or volatile, explosive or dangerous substances other than those used for ordinary household or acreage purposes in quantities reasonably appropriate for ordinary household or acreage use.

**CODE & BY-LAW COMPLIANCE**

17. No building shall be constructed on the Lands unless it meets or exceeds the Alberta Building Code and complies with all By-laws of the County of Lethbridge, in the Province of Alberta. Prior to construction of a building (including accessory structures such as detached garages, shed, etc.) the lot owner must obtain all necessary local, provincial and federal permits including a development permit from the County of Lethbridge, regardless of obtaining approval for construction by the "Development Manager."

**LANDSCAPING**

**18.** A "Landscaping plan" for the front portion of each yard must be included with each Design Plan showing the driveways, sidewalks, fencing, ground cover and planting material. No ponds will be allowed on the lots.

**FENCING & LIGHTING**

19. No individual fence shall be constructed which does not comply with the Land Use By-Law of the County of Lethbridge and the location of which must be approved by the Development Manager. All fences must be maintained in a structurally sound and esthetically pleasing condition. No lot owner is required to construct a fence.

20. All fencing materials must be approved by the Development Manager. The approved materials are a 4 ft. in height, polyester powder coated black chain link fence for any back and side yards. Simulated wrought iron, stone or brick will be accepted for architectural feature fences. It is preferred that trees and shrubs be used wherever windbreak or privacy is desired.

21. If Lot owners choose to have a lighted gate post(s), the light(s) must coordinate with the chosen streetlights. The placement and height will be standard throughout the subdivision to provide a consistency of light. The developer will supply the details per request.

**ANIMALS**

22. Owners of any lot may keep domestic animals, but domestic animals are restricted to dogs and cats.

**LOT GRADING AND RETAINING WALLS**

23. No construction shall be carried out on the Lands until a "lot grading" plan is approved by the Development Manager. The plan must include the finished floor levels for all levels of the house including the bottom of footings and garage elevations. The finished sod grades at the house must be shown as well as arrows indicating drainage patterns, or swales. The grade at each corner of the lot shall be compatible with that of its neighboring land as to achieve efficient service water drainage away from that house and other developments and must not change existing drain patterns or block or interfere in any with the drainage ditch along the boulevard. Any deviation from the recommended grade levels must be presented in writing to the Development Manager and a written decision must be required before any deviation from the recommended grade levels is carried out on the said Lands. The cost of retaining walls situated on a Lot shall be the responsibility of the Lot Owner. All retaining walls and their foundations are to be within Lot boundaries. Landowners are responsible for ensuring that drainage courses are protected and maintained. Landowners are responsible for adhering to final lot grade requirements.

24. Any Owner which has an easement for a drainage corridor on their Lot shall not suffer or permit dirt, fill, loan, gravel, paper, other debris, weeds snow, ice, or slush (collectively referred to as "material") to fill or other wise accumulate or remain upon the said lands and which would:

- Restrict, impair, impede, alter or otherwise interfere with the drainage across said lands including, without limiting the generality of the foregoing drainage a grass swale, concrete or asphalt gutter or other drainage gutter or other drainage control structure which may be erected on the said lands.

- Alter, remove, damage or other wise interfere with any drainage control fence, grass swale, concrete or asphalt drainage gutter or other drainage control structure which may be erected on the said lands.

**PROCEDURE FOR DEVELOPMENT APPROVALS**

25. All parties constructing any structure on the aforedescribed Lands must submit the following to the Development Manager:

- Plot and design plan showing all building locations, setbacks, driveways, sidewalks, fences and Landscaping;
- Lot grading plan, showing all grades and lot corner elevations;
- Landscaping plan showing the Landscaping design of the front portion of the yard;
- House plans showing the layout of each level including roof design and dimensions including:
  - i Building elevation of each side of the house showing window types and sizes, finishes, roof, elevations, chimneys, flues and vents; and

ii Cross sections showing foundation and footing elevations and all dimensions, in particular the relationship between all levels including the garage;

- Completed development and permit application forms; and
- A sample or description of all exterior finishing material including colour schemes.

26. All requested and provided information will be processed by the Development Manager within one week of receipt if the information is deemed acceptable. If the application does not comply with the Architectural Controls or other by-laws and regulations, then the application will be returned to the applicant marked "unacceptable".

27. No Lot Owner shall submit an Application to the Development Manager that does not include the requirements contained in Paragraph 32 above.

28. The decision of the Development Manager is final and binding and, in order to avoid delays, it is recommended that a preliminary consultation be made with the Development Manager prior to the application submission.

29. There shall be no deviation from the plans contained in an approved Application unless the same is consented to in writing by the Development Manager.

30. In the event:

- a building on the property is not completed in its entirety in accordance with the Architectural Controls and the approved plans, or
- the workmanship on the building is judged by the Development Manager at its sole discretion to be incompatible with the Architectural Control;

The Developer may, but is not obligated to;

- Complete the building in accordance with the Architectural Controls, or the approved plans, as the case may be; or
- Replace the unacceptable workmanship, all at the purchaser's expense.

31. Any monies expended by the Developer to complete the building in accordance with the Architectural Controls, or the approved plans, as the case may be, or replace unacceptable workmanship shall become a charge on the building being built and a caveat or other charging document may be registered by the Developer against title to the property and the Developer may apply the Architectural Controls Security Deposit to any such monies expended; and, take all steps available to it at law to collect any other such monies so expended.

Prior to construction of a building (including accessory structures such as detached garages, shed, etc.) the lot owner must obtain all necessary local, provincial and federal permits including a development permit from the County of Lethbridge, regardless of obtaining approval for construction by the "Development Manager."

## MAINTENANCE

32. Every lot owner shall keep his lot, including gardens and all improvements thereon, in good order and repair including but not limited to the seeding, watering and mowing of grass, the pruning and cutting of all trees and shrubbery, and the painting, or other appropriate external care, of all buildings and other structures in the manner and with the frequency that is consistent with good property management.

33. All lots/acreages must be cared for in a husbandly manner in order to maintain high quality land investments

## GENERAL

34. The Developer and the Development Manager shall be responsible for the interpretation of the Architectural Controls and may modify any of the provisions stated therein at their sole discretion. Any dispute which may arise in connection with the Architectural Controls shall be determined by the Developer whose decision shall be final and binding.

35. Failure on the part of the Developer or the Development Manager to enforce promptly and fully the conditions, covenants, and restrictions of the Architectural Controls shall not be deemed to be a waiver of the right of the Developer to enforce the conditions, covenants and restrictions of the Architectural Controls.

36. All owners shall be expected to take normal precautions to prevent damage to installed improvements. In particular, they shall:

    - Protect all service lines including telephone, cable, electricity, gas, and water lines on the owner's property and extending to the adjoining Lands.
    - Protect driveway accesses, culverts, roads, ditches, etc., when it is necessary for vehicles to be driven across them.
    - Keep the road in front of the lot clean during construction, and keep the ditch and catch basin free of debris and in working order at all times.
    - Avoid placing excess soil or constructions debris on adjacent lots.

37. Any damage to installed improvements noticed prior to construction must be identified to the Development Manager at the time of discovery. The Manager will record the damage, and attempt to identify the party responsible for causing the damage. If this can be determined, the Development Manager will attempt to recover the cost to repair the damage from the party causing the damage. Any damage to improvements not identified prior to construction will be assumed to be caused by the owner, unless the owner can identify a third party who caused the damage. If the Development Manager is unable to recover the cost to repair the damage from the third party, the owner shall become responsible for the cost of the repair. Any damage caused by the owner must be repaired at the owner's cost.

38. The Lot Owner shall take all measures necessary to protect any and all survey pins located on each Lot. If it is required to replace a damaged or missing survey pin, the same must be done by an Alberta Land Surveyor, and the cost of the same shall be at the sole expense of the Lot Owner.

39. Any owner of any lot within the Development may enforce the Architectural Controls or other Controls of this Restrictive Covenant.

40. Each lot shall be deemed to form part of a Building Scheme, the land use and building restrictions and conditions contained in the Restrictive Covenants and Architectural Controls shall be deemed to be covenants running with each of the lots and shall be binding upon each individual owner of each lot and for the benefit of the owners of all the other lots set out herein and their successors in title or such subsequent plan of subdivision of the same area as may hereinafter be filed. The Developer, or any inspection agency contract by it, shall in its sole discretion determine the date when completion of construction has occurred.

41. Notice from the Development Manager as required in this document may be affected by personal service, regular mail to the last address provided by the Owner to the Development Manager, or by posting the Notice to the Door of the dwelling located upon the Owner's lands. Notice from the Owner to the Development Manager as required in this document shall be affected by personal service upon the Development Manager.

42. Should any one or more provisions of this Restrictive Covenant be determined to be illegal, unenforceable or otherwise invalid, the same will be severed, but all other provisions will remain in effect.

**43. IT IS NOT THE INTENTION OF THESE RESTRICTIVE COVENANTS OR ARCHITECTURAL CONTROLS TO IMPOSE ANY LIABILITIES ON THE DEVELOPER OR THE DEVELOPMENT MANAGER.**

44. Time shall be of the essence of these Restrictive Covenants and Architectural Controls.

45. The failure by the Developer, Development Manager or any consultant hired in connection with these Controls to require performance of any provision of these Controls shall not affect their right to require performance at any time thereafter, nor shall a waiver of any breach or default of these Controls constitute a waiver of any subsequent breach or default or a waiver of the provision itself unless the subsequent breach or default was waived in writing by the Development Manager.

46. If a lot has natural drainage, access must be granted for maintenance, if maintenance is required.

**PROPOSED TIME LINE SCHEDULE FOR DEVELOPMENT UPON THE AFORESAID LAND**

47. Purchase of Lands by Owner.

48. Initial consultation with the Development Manager.

49. Drawings (Plot and Design Plan, Driveway Placement, Grading Plan, House Plan, etc.) completed with a Stamp of Approval by Development Manager.

50. Upon title being made available, and upon receipt of the required permits, the builder can proceed with the construction phase that must be completed within four (4) years of the Closing Date.

51. Upon completion of the house and other structures in accordance with the approved plans and permits, the Owner of the Lands notifies the Development Manager that he can make an inspection.

52. After inspection and acceptable completion within the terms of the Restrictive Covenant and Architectural Controls set out herein, the Architectural Control deposit shall be refunded by the Development Manager to the owner.

IN WITNESS WHEREOF the Grantor and Grantee have set their hands and seals effective as of this _____ day of _____, 2011.

**GRANTOR**
Edgewood Stables Ltd.

_____
Signature

Seal

**GRANTEE**
Edgewood Stables Ltd.

_____
Signature

Seal

BEST SMALL & MEDIUM EMPLOYERS IN CANADA

info@swg.ca
www.swg.ca

Stewart Weir

# LETHBRIDGE COUNTY
# IN THE PROVINCE OF ALBERTA

## BY-LAW NO. 24-013

### A BY-LAW OF LETHBRIDGE COUNTY BEING A BY-LAW PURSUANT TO SECTION 633(1) OF THE MUNICIPAL GOVERNMENT ACT, REVISED STATUTES OF ALBERTA 2000, CHAPTER M.26

Bylaw 24-013 of Lethbridge County, being a Bylaw for the purposed of amending the Edgewood Stables Area Structure Plan Bylaw 1362.

WHEREAS the landowners wish to further subdivide Plan 1312563, Block 1, Lot 1, contained within the Edgewood Stables Area Structure Plan;

AND WHEREAS the County's Municipal Development Plan requires that developers prepare an amendment to the Area Structure Plan to ensure sound development occurs within the County;

AND WHEREAS the landowner/developer have prepared amendment to the "Edgewood Stables Area Structure Plan" which contains engineering, survey, and geotechnical information to support the above conditions.

NOW THEREFORE BE IT RESOLVED, under the Authority and subject to the provisions of the Municipal Government Act, Revised Statutes of Alberta, 2000, Chapter M-26, as amended, the Council of Lethbridge County in the Province of Alberta duly assembled does hereby enact the following:

1. The "Edgewood Stables Area Structure Plan" as amended by Bylaw No.24-013, is attached as "Schedule A".
2. The Amendments in "Schedule A" are in addition to the plans and policies of Bylaw 1362 (Edgewood Stables Area Structure Plan).

GIVEN first reading this 17th day of October, 2024.

Reeve

CAO

GIVEN second reading this 21 day of November, 2024.

Reeve

CAO

GIVEN third reading this 21 day of November, 2024.

Reeve

CAO

# EDGEWOOD STABLES AREA STRUCTURE PLAN AMENDMENT - HIRSCHE 4 LOT - GROUPED COUNTRY RESIDENTIAL SUBDIVISION
# SW ¼-29-9-21-W4

Submitted to
Lethbridge County


**PREPARED FOR:**
**Tyler Hirsche**
Hirsche Holdings Ltd.
94010 RR 215
Lethbridge, AB T1J 5R

**PREPARED BY:**
**Hasegawa Engineering**
1220 – 31 Street North
Lethbridge, AB T1H 5J8

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APPENDICES

# 1. VISION

The proposed Hirsche grouped country residential subdivision amendment to the Edgewood Stables Area Structure Plan (ASP) has been developed through rigorous planning and careful consideration of the needs of the future property owners while considering the potential impact to neighboring existing landowners. This work complies with the current planning and design requirements set forth in the original ASP. The focus in developing this plan was to put forward a development proposal which would minimize the impact on area infrastructure, ensure a good fit with adjacent land uses and ultimately provide Lethbridge County with a cost-effective model for future acreage development.

The proposed Hirsche subdivision is a Grouped Country Residential development proposed to be developed on Lot 1 Block 1 Plan 131 2563 (SW-29-9-21-W4) within Lethbridge County along the north boundary of the City of Lethbridge. The goal of this development is to subdivide the existing 4.65ha. (11.49ac.) lot into four new country residential lots to create an environment where residents can enjoy the peace and quiet of country residential living, while maintaining easy and convenient access to the municipality of Lethbridge. Key to achieving this goal is sizing the lots to a 2-acre minimum to allow for the low density feeling of the area. This lower density also minimizes the environmental impact and gives a feeling of integrating into the natural environment.

In addition, the planning of the development was purposely kept at low density to match the existing surrounding properties. Maintaining similar density allows for expansion of development in the area without changing the feel that country residential exudes.

Overall, the development concept acknowledges and seeks to positively integrate with the existing natural and built conditions in the area while successfully offering a diverse range of housing opportunities to satisfy a broad demand for country residency. The proposal and plan have been designed to:

- Offer a new high-quality rural residential area to Lethbridge County residents
- Be compatible and complimentary with existing adjacent country residential acreages which similarly enjoy the enviable location.

# 2. INTRODUCTION

This Amendment to the Edgewood Stables ASP has been prepared by Hasegawa Engineering Ltd. on behalf of Tyler Hirsche to describe the development concept and municipal servicing strategy to be provided for the proposed grouped country residential development. The site (Lot 1 Block 1 Plan 131 2563) lies at SW-29-9-21-W4, bordered by 62nd Avenue North to the south and Range Road 215 to the west. Range Road 215 turns into 13th Street North in the City of Lethbridge to the south of 62nd Avenue North (refer to Figure 1 in Appendix A). The site is bordered by residential properties to the east and west and tributary coulee valleys to the north. Lands to the south are agricultural use. This Amendment describes the ultimate development of the subject lands, which are contained within the existing parcel (refer to Figure 2 in Appendix A).

As the development is intended to have four lots, an Amendment to the existing Area Structure Plan is required under Section 6.2 of the Municipal Development Plan of Lethbridge County. In addition, the proposed subdivision is governed by the Edgewood Stables ASP framework dating back to 2011 which applies to a portion of the SW 29-9-21 W4M, legally described as Lot 9, Block 1, Plan 991 2364. The subject lands are contained in a single Certificate of Title containing 4.65 hectares (11.49 acres). Refer to Appendix B for complete land title document.

A key aspect of this ASP is to show how the proposed development will work within the framework of the Edgewood Stables ASP and highlight any areas where it deviates from it. The Amendment will provide a basis for evaluation of future applications for subdivision of parcels and building development.

# 3. PLANS, DRAWINGS, AND CONCEPT

## 3.1 PLANS AND DRAWINGS

To illustrate the location of the property, site drainage, and the proposed subdivision layout, seven figures have been prepared. The figures are provided in *Appendix A* and are as follows:

- Figure 1 – Area Map
- Figure 2 – Existing Lots and Topography
- Figure 3 – Legal Plan - Existing
- Figure 4 – Conceptual Lot Layout
- Figure 5 – Grading & Drainage Plan
- Figure 6 – Servicing Plan

These plans are conceptual in nature and are to be used for planning purposes only. Upon Amendment acceptance, detailed design plans will be prepared and submitted with any subdivision application.

## 3.2 EXISTING CONDITIONS

The proposal is designed with the existing conditions of the land in mind. The impact on adjacent landowners and residents was carefully considered in the preparation of the plan.

The lands within the boundaries of the proposed Amendment are currently occupied by “The Stables at Pavan Park” which operates as a recreational equestrian facility complete with an arena building, horse pens/stables, and a hay barn structure. Adjacent landowners include:

- To the north – tributary coulees of the Oldman River valley
- To the east and west – country residential lot acreages.
- To the south – agricultural farmland

The boundary of the proposed Amendment area is the boundary of the single parcel containing the lands to be developed.

## 3.3 DEVELOPMENT OBJECTIVES

Preferred Development Concept

The preferred development concept appears in Figure 4 in Appendix A. Note that the lot layouts are tentative and may vary slightly due to design considerations. The ultimate development will create approximately 3.60 ha (8.90 acres) of net developable area. The proposed subdivision is bordered on the north by existing coulee fingers which feed into the Oldman River valley. A slope stability assessment was performed by Hasegawa Engineering using the RVARP setback criteria for lenzie silt conditions for the Stafford Coulee area. This setback determined the extent of developable lands on the north side of the property. The land area between the back of these lots and the top of coulee bank is to be dedicated as municipal reserve.

Due to the RVARP, top of coulee setback on the north side of the development, there was insufficient remaining area to create 3 new, 2acre, lots as proposed. To resolve this issue, a 0.13ac. (522m$^2$) portion of existing Lot 1 Block 2, to the south, is to be borrowed to allow proposed lot 3 to meet the required 2.0 ac. minimum size. The remainder of the land is dedicated to the road right of way.

Lot sizes will be a minimum of 0.81 ha (2.0 acres) in size with one lot being considerably larger. The result is a proposed 4-lot development. The proposed lots will be accessed from Range Road 215 (refer to Figure 2).

Land Use Classification

The existing land use classification of the land for the proposed development is GCR (Grouped Country Residential).

Lethbridge County Municipal Development Plan

The Lethbridge County Municipal Development Plan contains directives for residential development. The location of the proposed development meets these directives for the following reasons:

- The site is located adjacent to an existing area of Country Residential Development
- The site does not contain any sensitive environmental, cultural or historical features.

## 3.4 POPULATION ESTIMATES

With 4 residential use lots, and assuming a dwelling on each lot, the estimated population for the development at full build out is 10 additional residents based on an assumed population of 2.5 people per household

## 3.5 PROPOSED LAND USE AREAS

The distribution of land use within the proposed Amendment is shown in *Table 1* below.

Table 1. Land Use Statistics

| | Hectares (Acres) | Percent of Gross Area |
|---|---|---|
| **Gross Developable Area** | **4.65 (11.49)** | **100%** |
| **Net Developable Area** | **4.65 (11.49)** | **100%** |
| Country Residential Lots 1-4 | 3.60 (8.90) | 77% |
| Road Right of Way | 0.31 (0.76) | 7% |
| Municipal Reserve | 0.74 (1.83) | 16% |
| **Total** | **4.65 (11.49** | **100%** |
| Area borrowed from Existing Lot 1 Blk 2 for proposed Lot 3 | 0.05 (0.12) | **1%** |
| **Total** | **4.7 (11.61)** | **101%** |

# 4. SERVICING

To determine the viability of this development, preliminary evaluations have been performed with respect to servicing. Key service items include sewer, water, natural gas, telephone, television, and electric. Additional information on services is included in this section.

## 4.1 SANITARY SEWER SYSTEM

Sanitary sewage from each lot will be handled by individual private sewage treatment systems which meet or exceed the Alberta Private Sewage System Standard of Practice (2015). All systems will be approved as meeting these required standards prior to installation.

County development requirements indicate that prior to building on a lot, a soil test is required to determine the suitability of soil for supporting a septic field system. For the purpose of this Amendment, one borehole was advanced on each proposed lot, and soil samples taken to be analyzed to provide a representative indication of soil suitability for septic field. Prior to the development of each parcel, additional soil testing will be required. The soil characteristics, as detailed in this section, verify the suitability of the soil for this type of disposal system and supply the base design criterion for the required septic fields.

BDT Engineering conducted fieldwork for the septic feasibility at the subject property on February 21, 2024. Soil samples were taken from four boreholes, one on each proposed new lot, on the property (refer to Figure 4 in Appendix A for borehole locations). Classification tests including natural moisture content tests, Atterberg limits tests, and particle size distribution analyses were subsequently performed on the collected borehole samples at BDT's Lethbridge laboratory to aid in the determination of engineering properties.

The general subsurface stratigraphy comprised of topsoil, overlying clay, overlying clay till with occasional, discontinuous interbedded layers of sand, in descending order. Based on soil texture analysis, the soil can be generally classified as a loam.

The soils were classified using the soil texture classification triangle (Figure 8.1.1.10, Alberta Private Sewage System Standard of Practice 2015) and then that was used to determine Hydraulic Linear loading rates for the area. The results of this analysis are shown in Table 1 below.

Based on soil, groundwater, and site topography conditions, it is BDT's conclusion that the site should be considered a Suitability Type 2 – Moderate and as such, should adequately support a septic treatment system long-term.

Septic fields and septic tanks are to be designed, installed, and operated as per Alberta Private Sewage Systems Standard of Practice latest edition. Figure 4 in *Appendix A* shows approximate septic field sizes and locations on each lot based on estimated population of each lot.

## 4.2 WATER SYSTEMS

### *4.2.1 Potable Water*

Potable water will be supplied to the subdivision via the existing 2" Rural Water Association treated water service which is located at the south side of existing riding arena building (see Fig. 5 in Appendix A). Lots 2,3, & 4 will be serviced by this waterline while lot 1 will have a cistern and have water trucked to site.

Raw Water System

There is no access to raw water rights from the SMRID for irrigation water at this time. An agreement will have to be negotiated in the future.

## 4.3 NATURAL GAS

The site is bordered to the south by two gas pipeline rights-of-way. A high-pressure gas line (GL 32 AP) owned by ATCO Pipelines and a low-pressure gas pipeline (2602IC) owned by ATCO Gas bisect the development area. ATCO has no plans to move the gas lines, and the setbacks and restrictions associated with the existence of these lines have been incorporated into the conceptual plan for the lot design.

A low-pressure gas service line owned by ATCO Gas services the existing facilities located in the riding arena building at the property.

Each landowner will pay for the installation of natural gas distribution infrastructure to their lot. ATCO Gas will distribute natural gas within the development and lot purchasers will be able to select a retailer for natural gas supply. An existing ATCO high pressure natural gas line runs through the east side of the development which is a potential tie in point for servicing of the residential use lots within the subdivision.

## 4.4 ELECTRICAL POWER

The existing electrical service for the area is overhead power lines. Fortis Alberta Inc. will provide services to the proposed subdivision and services to each property line off the existing infrastructure (refer to Figure 4).

Electrical services are to be provided by the lot owner, not by the developer.

## 4.5 TELEPHONE

Telus will provide services to the lots, but each individual owner must apply for the service when building.

## 4.6 SOLID WASTE DISPOSAL

Lot purchasers will be responsible for making arrangements for solid waste disposal. The City of Lethbridge Regional Solid waste facility is located approximately 6 km driving distance from the development. Alternatively, lot purchasers may contract with a private solid waste hauler.

## 4.7 MAIL DELIVERY

At the time of subdivision an application will be made to Canada Post for mail service to the development. The design of the subdivision will include an appropriate location per Canada Post guidelines. A community mailbox area at the entrance to the development will likely be required.

# 5. ROADS AND TRANSPORTATION

## 5.1 EXTERNAL ROADS

The nearest provincial highway to the development area is Secondary Highway 843 located approximately 3 km east of the development. The primary access to the subdivision will be from Range Road 215 which extends to the north from 13th Street North in the City of Lethbridge. Both accesses are gravel surfaces. No off-site improvements to the County owned roads are anticipated. The internal road servicing the lots will be gravel surfaced, to be provided at the developer's expense. Where possible, the developer will provide shared approaches for those parcels gaining access from the County roads.

# 6. SITE DRAINAGE AND GRADING

The objective of the stormwater management design is to ensure that there is no impact on the surrounding properties and landowners from changing the drainage pattern within the development.

This analysis was based on creating a total of four (4) lots. All drainage onsite will conform to Lethbridge County and Alberta Environment and Parks requirements. The intent of stormwater management for the development is to control runoff with the use of stormwater management retention areas such that runoff is contained and released only when permission is granted. A Site Drainage Analysis was completed for the site (*Appendix D*) and is summarized below.

## 6.1 SITE DRAINAGE

A survey of the subject property was conducted on Sept. 11, 2023, to determine existing ground topography and drainage courses. Drainage around the existing buildings, corals, and gravel roads is ultimately directed to the northwest and draining into the coulee valley. Existing ground slope varies from 0.7% to 8.0%

The proposed drainage plan utilizes the existing topography and established drainage courses were possible. Lots 1 & 2, on the north side of the development, are designed to be split drainage lots conveying a portion of the front lot drainage south into the roadside ditch and then west toward range road 215. The back half of lots 1 & 2 drain to the north across the property line and across the municipal reserve land and into the coulee drawing into the Oldman River valley. Lot 3 is also split drainage with the front half draining to the east into the roadside ditch, and the back half draining to the west. There is a 3-meter-wide grass swale along the east property lines of Lot 2 & 3 which directions overland flow to the north, and offsite. Lot 4, on the southside of the road, directs surface drainage to the north and into the roadside ditch, then west toward the existing ditch system along the east side of range road 215. The stormwater is then diverted north through a culvert under the newly constructed gravel road into the existing ditch system along the east side of Range Road 215.

A combination of lot grading, grass swales, roadside ditches, & culverts will be used to convey overland storm water from the four proposed lots toward the coulee draw to the north. Figure 5 in Appendix A shows the topography of the site and proposed grading and infrastructure. There are no stormwater retention areas such as dry or wet ponds as part of the design. The overall drainage plan for the proposed subdivision is designed to work within the major storm system of the Edgewood Stables ASP.

## 6.2 DRAINAGE MODELING

To determine the post-development drainage requirements for the proposed 4-lot subdivision, a hydrologic model of the site was prepared using a combination of GPS surveys, GeoHECHMS, and PCSWMM software. GeoHECHMS software was used to divide the resulting surface into sub basins. The software also generates flowpaths and average slopes for each sub basin. To determine the peak runoff from each basin, surface runoff analysis was performed followed by runoff modelling using PC SWMM hydrologic modeling software package. The hydrologic model of the site post-development was then analyzed using a 1:100 year 24-hour design storm event. The complete hydrological and site drainage analysis report is included in Appendix D.

The stormwater management area was designed to retain runoff volume generated and ensure that peak flow remains below predevelopment flow rates. The hydrologic model will be reviewed during the detailed design stage to confirm the required capacity of the overland drainage system and culverts.

# 7. ENVIRONMENTAL ASSESSMENT

The existing lot area of 4.65 ha. is currently occupied by the “Stables of Pavan Park” recreational equestrian complex. This is comprised of a riding arena building, stables, a large riding/training area, and a hay barn. Gravel roads provide access to these amenities within the park. The remaining land is covered with grass and tress/shrubs. Since this is all developed land there is no need for additional environmental assessments

The proposed subdivision area has no sign of surface contamination. There are two gas pipelines right of ways that border the property on the south side, running from southwest to northeast. One is a high-pressure gas line and the other a low-pressure line. ATCO Gas has no plans to move the pipelines. There are no active well heads, leases, or abandoned leases in the plan area.

# 8. MINIMUM SERVICING STANDARD

The subject property is zoned Grouped Country Residential (GCR) land use. As per Lethbridge County Land Use Bylaw No. 1404, the minimum lot size is 0.8ha. (2.0ac.) of developable land, with a maximum flexible parcel size of 1.2 to 4.05ha. (3.0 to 10ac.). The minimum setback for side yards is 6.1 meters (20 ft.) and for front yards is 15.2 meters (50 ft), as per the Edgewood Stables ASP.

Site suitability testing is required before subdivision approval and includes but is not limited to water supply, water table levels, percolation rates, contours, environmental impact assessment, etc.

# 9. FIRE PROTECTION

Fire protection for the proposed subdivision will be provided by the existing storm pond and dry hydrant located approximately 150 meters east of the eastern most property line (refer to Figure 5 in Appendix A for locations).

# 10. ARCHITECTURAL CONTROLS

Architectural control for the proposed subdivision will use the same rules and conditions of the Edgewood Stables ASP which have been included in Appendix E.

# 11. CONCLUSION

The proposed 4-Lot residential subdivision meets with the requirements established in the Municipal Development Plan and Land Use Bylaw of Lethbridge County for the development of a “County Residential” multi-lot subdivision. It also works within the framework of the Edgewood Stables Area Structure Plan. The site investigation and soils investigation performed indicate the site is suitable for this purpose.

# APPENDIX A

## FIGURES

| ISSUE | DRAWING STATUS / REVISION | DATE (YY/MM/DD) | BY |
|---|---|---|---|
| A | FOR REPORT | 24/09/11 | MDO |

| DESIGNED | DRAWN | CHECKED | APPROVED | SCALE AND SHEET SIZE |
|---|---|---|---|---|
| MH | MDO | MH | MH | NTS - 11x17 |


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CLIENT: TYLER HIRSCHE

PROJECT: PROPOSED 4 LOT SUBDIVISION
LOT 1 BLOCK 1 PLAN 131 2563

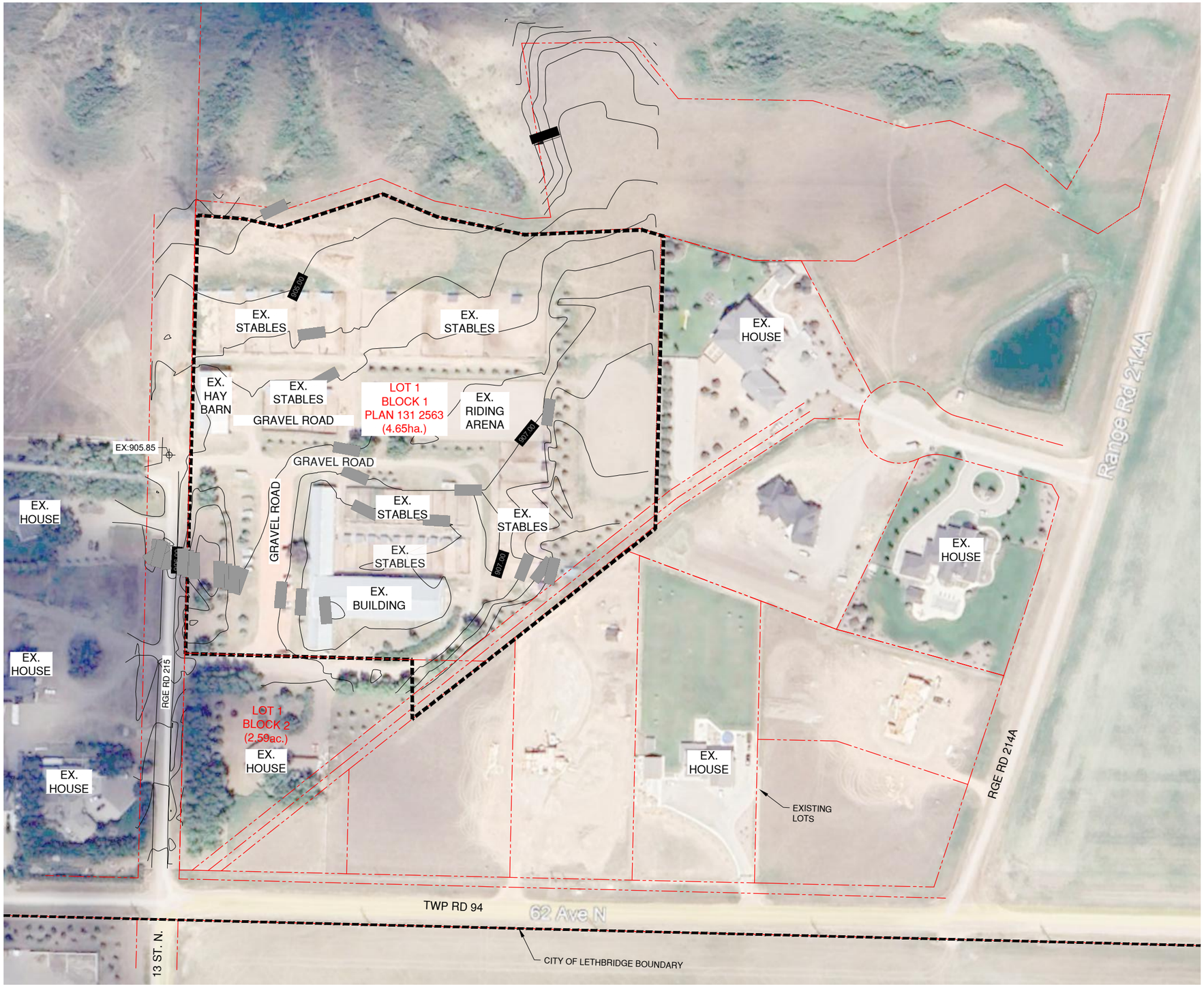
DRAWING: AREA MAP

PROJECT NUMBER: 21-062

SHEET NUMBER: FIG. 1

| ISSUE | DRAWING STATUS / REVISION | DATE (YY/MM/DD) | BY |
|---|---|---|---|
| A | FOR REPORT | 24/09/11 | MDO |

| DESIGNED | DRAWN | CHECKED | APPROVED | SCALE AND SHEET SIZE |
|---|---|---|---|---|
| MH | MDO | MH | MH | 1:2,000 - 11x17 |




**LEGEND**

- PROPOSED DEVELOPMENT BOUNDARY
- EXISTING GROUND CONTOURS - 0.5m INTERVALS
- EXISTING LOTS

0 20 40 60 80 100 200

SCALE=1:2,000

NOTE:

- ALL DIMENSIONS SHOWN ARE IN METERS (m) UNLESS OTHERWISE NOTED
- AIR PHOTO IMAGE IS SHOWN FOR REFERENCE ONLY AND MAY NOT REFLECT CURRENT SITE CONDITIONS
- SCALE AND ROTATION ARE APPROXIMATE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CLIENT: TYLER HIRSCHE

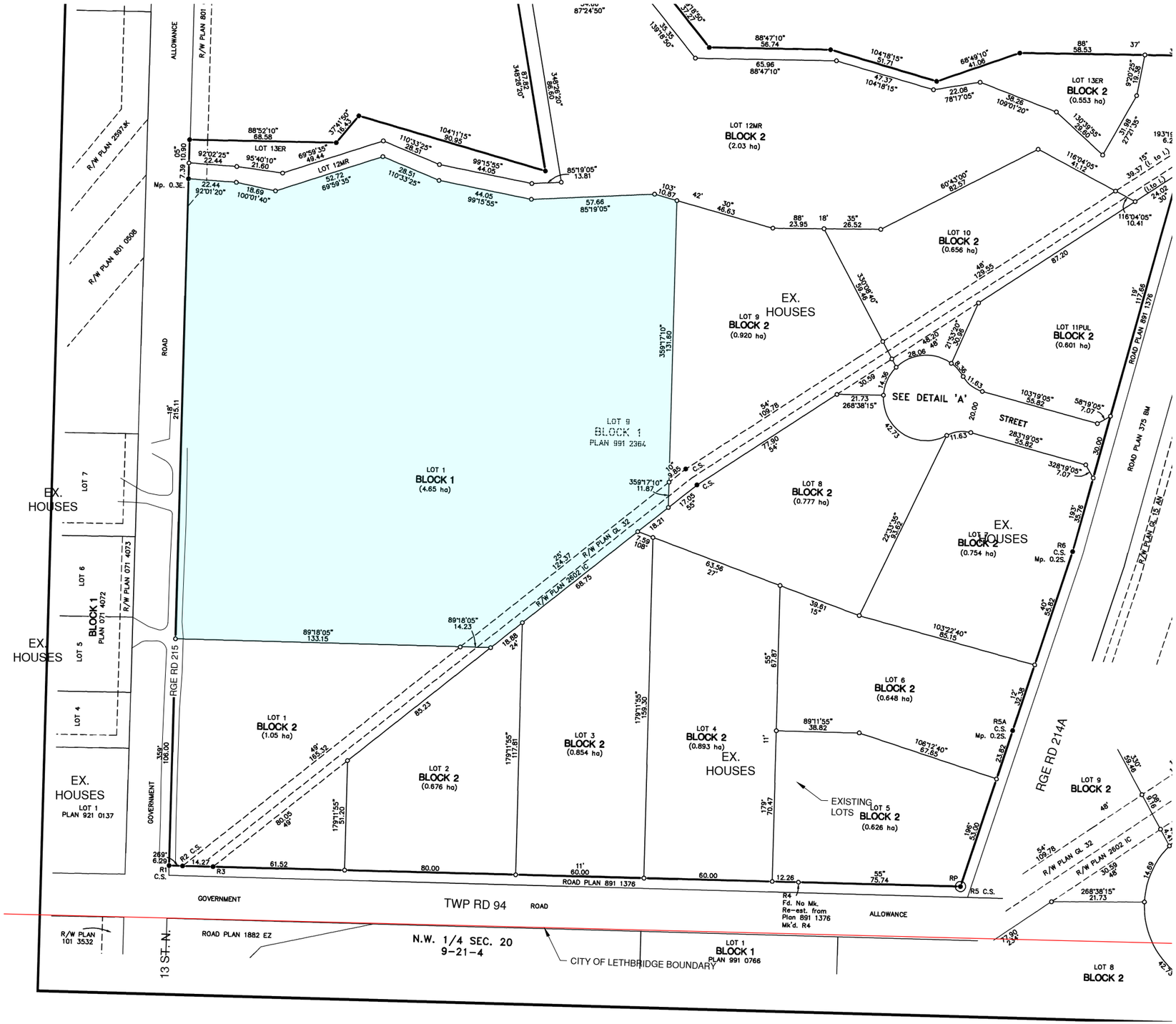
PROJECT: PROPOSED 4 LOT SUBDIVISION
LOT 1 BLOCK 1 PLAN 131 2563

DRAWING: EXISTING LOTS & TOPOGRAPHY

| PROJECT NUMBER | SHEET NUMBER |
|---|---|
| 21-062 | FIG. 2 |

| ISSUE | DRAWING STATUS / REVISION | DATE (YY/MM/DD) | BY |
|---|---|---|---|
| A | FOR REPORT | 24/09/11 | MDO |

| DESIGNED | DRAWN | CHECKED | APPROVED | SCALE AND SHEET SIZE |
|---|---|---|---|---|
| MH | MDO | MH | MH | 1:2,000 - 11x17 |




**LEGEND**

PROPOSED SUBDIVISION AREA

NOTE:

- ALL DIMENSIONS SHOWN ARE IN METERS (m) UNLESS OTHERWISE NOTED
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- SCALE AND ROTATION ARE APPROXIMATE


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CLIENT: TYLER HIRSCHE

PROJECT:

# PROPOSED 4 LOT SUBDIVISION

LOT 1 BLOCK 1 PLAN 131 2563

DRAWING:

## LEGAL PLAN - EXISTING

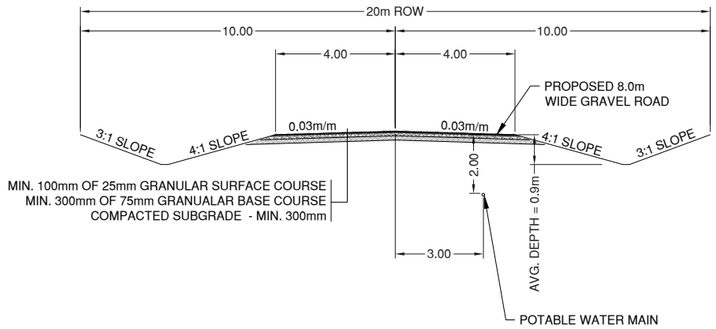
| PROJECT NUMBER | SHEET NUMBER |
|---|---|
| 21-062 | FIG. 3 |


1. SLOPE STABILITY SETBACK LINE AS DETERMINED BY RVARP SETBACK CRITERIA.
2. 1.91ac. AREA NORTH OF SLOPE STABILITY SETBACK TO TOP OF COULEE BANK TO BE DEDICATED AS MUNICIPAL RESERVE.

| ISSUE | DRAWING STATUS / REVISION | DATE (YY/MM/DD) | BY |
|---|---|---|---|
| A | FOR REPORT | 24/09/11 | MDO |

| DESIGNED | DRAWN | CHECKED | APPROVED | SCALE AND SHEET SIZE |
|---|---|---|---|---|
| MH | MDO | MH | MH | 1:2,000 - 11x17 |

NOTE:
- HOUSE AND SEPTIC FIELD SIZES & LOCATIONS SHOWN ARE FOR REFERENCE ONLY.
- SEPTIC (SOIL BASED TREATMENT) FIELD SUITABILITY TO BE DETERMINED AS PER ALBERTA PRIVATE SEWAGE SYSTEMS STANDARD OF PRACTICE - DECEMBER 2015 EDITION.




8.0m WIDE GRAVEL ROAD CROSS-SECTION
SCALE: 1:200

NOTE:
- ALL DIMENSIONS SHOWN ARE IN METERS (m) UNLESS OTHERWISE NOTED
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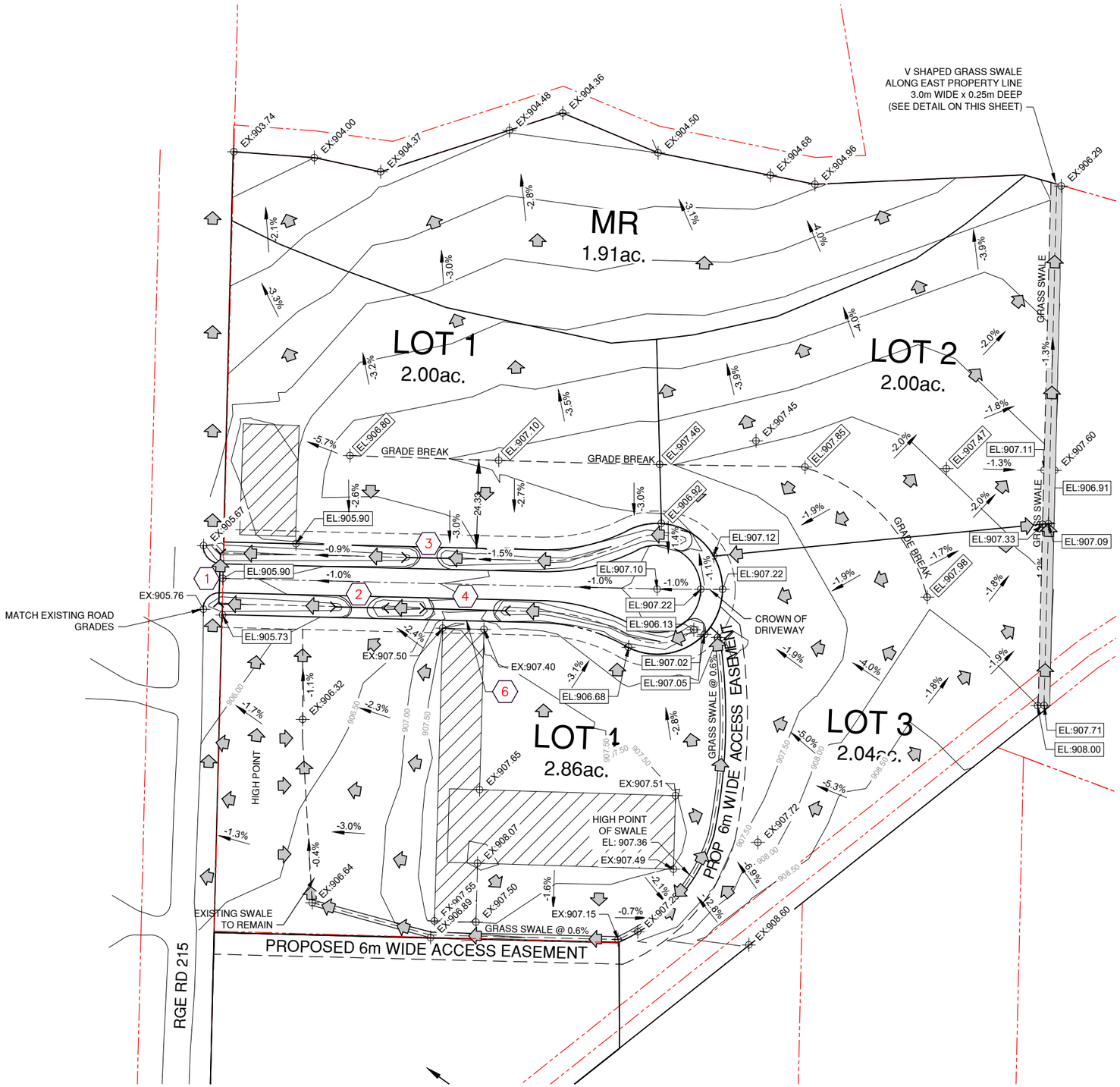
CLIENT: TYLER HIRSCHE

PROJECT
# PROPOSED 4 LOT SUBDIVISION
LOT 1 BLOCK 1 PLAN 131 2563

DRAWING
# CONCEPTUAL LOT LAYOUT

PROJECT NUMBER: 21-062

SHEET NUMBER: FIG. 4

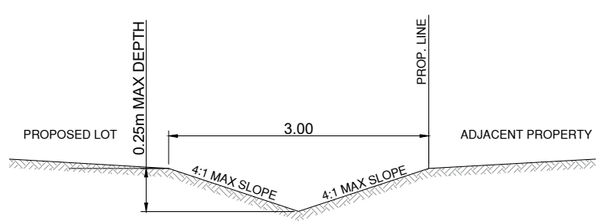



KEYNOTES:

1. CULVERT 1
   L=14.0m S=0.6%
   INV IN: 904.94
   INV OUT: 904.85
2. CULVERT 2
   L=11.0m S=1.0%
   INV IN: 905.38
   INV OUT: 905.27
3. CULVERT 3
   L=12.0m S=1.0%
   INV IN: 905.39
   INV OUT: 905.27
4. CULVERT 4
   L=22.5m S=1.0%
   INV IN: 905.69
   INV OUT: 905.47
5. CULVERT 5
   L=13.0m S=1.0%
   INV IN: 906.01
   INV OUT: 905.88
6. GRADE AWAY FROM EXISTING BUILDING AT 5:1 MAX SLOPE

**LEGEND**

- EX:916.50 — EX. GROUND SPOT ELEVATIONS
- EL:916.50 — PROPOSED FINISH GROUND ELEVATION
- 0.6% — PROPOSED FINISH GROUND SLOPE
- PROPOSED FINISH GROUND CONTOURS 0.5m INTERVALS
- PROPOSED CULVERT - 600mm Ø CSP C/W RIP RAP AT EACH END
- OVERLAND DRAINAGE DIRECTION




3m WIDE GRASS REAR YARD SWALE
SCALE: NTS

**LEGEND**

- EXISTING GROUND CONTOURS - 0.5m INTERVALS
- EXISTING LOTS
- PROPOSED LOTS

0 12.5 25 37.5 50 62.5 125

SCALE=1:1,250

| ISSUE | DRAWING STATUS / REVISION | DATE (YY/MM/DD) | BY |
|---|---|---|---|
| A | FOR REPORT | 24/09/11 | MDO |

| DESIGNED | DRAWN | CHECKED | APPROVED | SCALE AND SHEET SIZE |
|---|---|---|---|---|
| MH | MDO | MH | MH | 1:1,250 - 11x17 |

Lethbrige County Requirements

- All drainage culverts will be rip-rapped at both inlet and outlet. The size and type of rip-rap will conform to good engineering practice and acceptable to the County. Refer to Section 2.3.9 Rip Rap.
- Minimum size of roadway culvert will be 600 mm (wall thickness 1.6 mm or as required by the loading criteria).
- Minimum size of entrance culvert will be 500 mm (wall thickness 1.6 mm or as required by the loading criteria).
- Culverts will be placed so that the minimum distance from the finished grade of the roadway to the top of the pipe will be not less than one-half the diameter of the pipe or a minimum of 300 mm, whichever is greater, unless approved otherwise

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CLIENT: TYLER HIRSCHE

PROJECT:
# PROPOSED 4 LOT SUBDIVISION
LOT 1 BLOCK 1 PLAN 131 2563

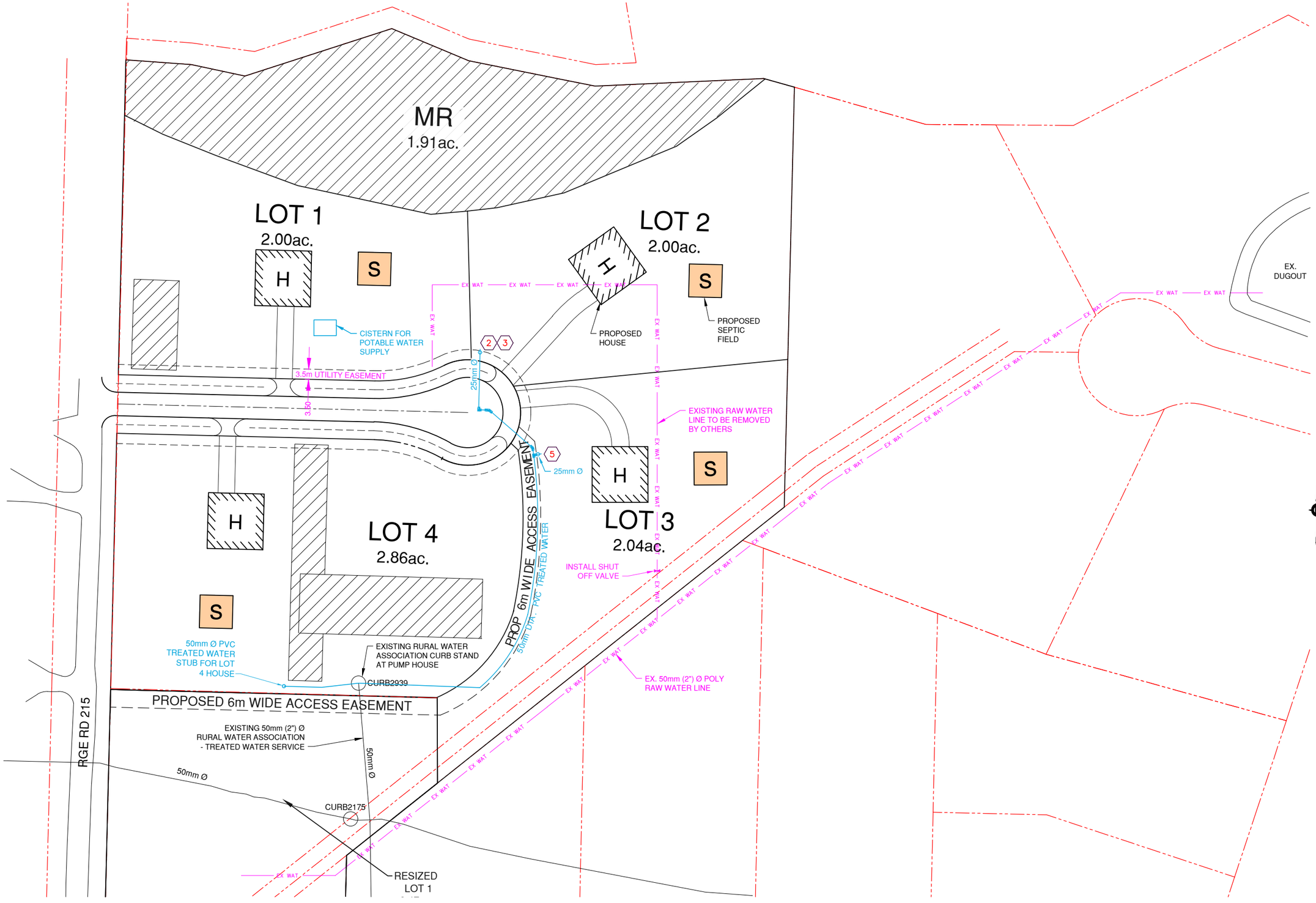
DRAWING:
# GRADING & DRAINAGE PLAN

PROJECT NUMBER: 21-062

SHEET NUMBER: FIG. 5

| ISSUE | DRAWING STATUS / REVISION | DATE (YY/MM/DD) | BY |
|---|---|---|---|
| A | FOR REPORT | 24/09/11 | MDO |

| DESIGNED | DRAWN | CHECKED | APPROVED | SCALE AND SHEET SIZE |
|---|---|---|---|---|
| MH | MDO | MH | MH | 1:1,250 - 11x17 |




**KEYNOTES**

1. TERMINATE EXISTING WATERLINE, INSTALL TEE, AND SERVICE EXTENSION INTO LOT 3, AND CAP FOR FUTURE SERVICE CONNECTION TO HOUSE.
2. EXTEND SERVICES 0.5m PAST UTILITY EASEMENT.
3. 25mm Ø SERVICE CONNECTIONS TO BE COPPER TUBING, MUNICIPEX OR IPEX BLUE 904 PEX. CURB STANDS TO BE PLACED AT BACK OF 3.5m UTILITY EASEMENT.
4. 50mm TO 25mm Ø SELF TAPPING SADDLE ELECTRIC-FUSED TO 50mm Ø MAIN. SADDLE C/W 25mm Ø SERVICE EXTENSION AND CURB STAND
5. 25mm Ø SERVICE CONNECTIONS TO BE COPPER TUBING, MUNICIPEX OR IPEX BLUE 904 PEX. EXTEND SERVICE 0.5m PAST 6m WIDE ACCESS EASEMENT

NOTE:
- HOUSE AND SEPTIC FIELD SIZES & LOCATIONS SHOWN ARE FOR REFERENCE ONLY.
- SEPTIC (SOIL BASED TREATMENT) FIELD SUITABILITY TO BE DETERMINED AS PER ALBERTA PRIVATE SEWAGE SYSTEMS STANDARD OF PRACTICE - DECEMBER 2015 EDITION.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CLIENT: TYLER HIRSCHE

PROJECT: PROPOSED 4 LOT SUBDIVISION
LOT 1 BLOCK 1 PLAN 131 2563

DRAWING: SERVICING PLAN

| PROJECT NUMBER | SHEET NUMBER |
|---|---|
| 21-062 | FIG. 6 |

# APPENDIX B

## LAND TITLES

# LAND TITLE CERTIFICATE

S

| LINC | SHORT LEGAL | TITLE NUMBER |
|---|---|---|
| 0035 841 204 | 1312563;1;1 | 211 215 744 |

LEGAL DESCRIPTION
PLAN 1312563
BLOCK 1
LOT 1
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 4.65 HECTARES (11.49 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 4;21;9;29;SW

MUNICIPALITY: LETHBRIDGE COUNTY

REFERENCE NUMBER: 131 249 801

---

REGISTERED OWNER(S)

| REGISTRATION | DATE(DMY) | DOCUMENT TYPE | VALUE | CONSIDERATION |
|---|---|---|---|---|
| 211 215 744 | 01/11/2021 | TRANSFER OF LAND | | SEE INSTRUMENT |

OWNERS

HIRSCHE HOLDINGS LTD.
OF 94010 RANGE ROAD 215
LETHBRIDGE COUNTY
ALBERTA T1J 5R4

---

ENCUMBRANCES, LIENS & INTERESTS

| REGISTRATION NUMBER | DATE (D/M/Y) | PARTICULARS |
|---|---|---|
| 2311BD . | 27/08/1914 | UTILITY RIGHT OF WAY<br>GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED.<br>AS TO PORTION OR PLAN:GL32 |
| 2834IC . | 19/09/1960 | UTILITY RIGHT OF WAY<br>GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. |

( CONTINUED )

| REGISTRATION NUMBER | DATE (D/M/Y) | PARTICULARS |
|---|---|---|
| | | AS TO PORTION OR PLAN:2602IC<br>"SUBJECT TO" |
| 761 094 355 | 26/07/1976 | IRRIGATION ORDER/NOTICE<br>THIS PROPERTY IS INCLUDED IN THE ST. MARY RIVER IRRIGATION DISTRICT |
| 801 081 823 | 30/05/1980 | UTILITY RIGHT OF WAY<br>GRANTEE - ALTALINK MANAGEMENT LTD.<br>2611 - 3 AVE SE<br>CALGARY<br>ALBERTA T2A7W7<br>AS TO PORTION OR PLAN:8010508<br>"TAKES PRIORITY OF CAVEAT 781197547 REGISTERED ON 5/12/78"<br>(DATA UPDATED BY: TRANSFER OF UTILITY RIGHT OF WAY 021161676)<br>(DATA UPDATED BY: CHANGE OF ADDRESS 091107691) |
| 841 146 222 | 30/08/1984 | UTILITY RIGHT OF WAY<br>GRANTEE - CANADIAN WESTERN NATURAL GAS COMPANY LIMITED. |
| 131 249 605 | 01/10/2013 | CAVEAT<br>RE : DEVELOPMENT AGREEMENT PURSUANT TO MUNICIPAL GOVERNMENT ACT<br>CAVEATOR - COUNTY OF LETHBRIDGE.<br>100, 905-4 AVENUE SOUTH<br>LETHBRIDGE<br>ALBERTA T1J4E4 |
| 131 249 804 | 01/10/2013 | UTILITY RIGHT OF WAY<br>GRANTEE - COUNTY OF LETHBRIDGE.<br>AS TO PORTION OR PLAN:1312564 |
| 131 249 805 | 01/10/2013 | UTILITY RIGHT OF WAY<br>GRANTEE - FORTISALBERTA INC.<br>AS TO PORTION OR PLAN:1312564 |
| 131 249 807 | 01/10/2013 | UTILITY RIGHT OF WAY<br>GRANTEE - ATCO GAS AND PIPELINES LTD.<br>AS TO PORTION OR PLAN:1312565 |
| 171 196 947 | 02/09/2017 | UTILITY RIGHT OF WAY<br>GRANTEE - COUNTY OF LETHBRIDGE RURAL WATER ASSOCIATION LIMITED. |
| 211 215 745 | 01/11/2021 | MORTGAGE<br>MORTGAGEE - ATB FINANCIAL.<br>8008-104 ST |

( CONTINUED )

REGISTRATION
NUMBER DATE (D/M/Y) PARTICULARS

EDMONTON
ALBERTA T6E4E2
ORIGINAL PRINCIPAL AMOUNT: $900,000

TOTAL INSTRUMENTS: 011

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 23 DAY OF FEBRUARY, 2024 AT 04:14 P.M.

ORDER NUMBER: 49813636

CUSTOMER FILE NUMBER:

*END OF CERTIFICATE*

# APPENDIX C

# GEOTECHNICAL EVALUATION

# GEOTECHNICAL EVALUATION
# LOT 1 BLOCK 1 PLAN 331 2364
# LETHBRIDGE COUNTY, ALBERTA

Prepared for: Hasegawa Consulting Professional Engineers
March, 2024
2024-016

BDT Engineering Ltd.
allardchrisbdt@outlook.com

## CONTENTS

## 1.0 INTRODUCTION

This report presents the results of a geotechnical evaluation conducted by BDT Engineering Ltd. (BDT) for a proposed soil-based sewage treatment system servicing for four proposed residential lots at lot 1 block 1 plan 331 2364, in Lethbridge County, Alberta. The proposed lots range in size from approximately 2.0 to 4.32 acres, a conceptual lot layout is included in Appendix A.

The scope of work for this evaluation was outlined in a proposal emailed to Mike Oler of Hasegawa Consulting Professional Engineers (Hasegawa) on February 5, 2024. The objective of this evaluation was to determine the general subsurface conditions in the area of the proposed development and assess the feasibility of a soil-based sewage treatment system.

Authorization to proceed with this work was received by email on February 6, 2024.

## 2.0 PROJECT DETAILS AND SCOPE OF WORK

It is understood that the proposed development will consist of the design and construction of a private sewage treatment system for the future residential development of the above noted lot.

The scope of work for this evaluation included drilling four (4) boreholes, a laboratory program to assist in classifying subsurface soils and a discussion of the feasibility of sewage treatment system.

## 3.0 GEOTECHNICAL FIELD AND LABORATORY WORK

The fieldwork for this evaluation was carried out on February 21, 2024 using a truck mounted solid stem auger drill rig contracted from Chilako Drilling Services Ltd. of Coaldale, Alberta. The drill rig was equipped with 150 mm diameter solid stem continuous flight augers. The borehole locations are presented on Figure 1, in Appendix A.

Four boreholes, BH001 to BH004, were drilled at proposed septic field locations across the site. The boreholes were advanced to depths of 4.57 m below the existing ground surface.

Disturbed grab samples were obtained from each borehole at 0.75 m intervals. All soil samples were visually classified in the field, and the individual soil strata and the interface between them were noted. The borehole logs are presented in Appendix B. An explanation of the terms and symbols used on the borehole logs is also included in Appendix B.

A slotted 25 mm diameter PVC standpipe was installed in each of the boreholes to monitor groundwater levels. Auger cuttings were used to backfill around the standpipes and the boreholes were sealed at the surface with approximately 600 mm of bentonite chips.

Classification tests including natural moisture content tests, Atterberg limits tests, and particle size distribution analysis' were subsequently performed on the collected borehole samples at BDT's Lethbridge Laboratory to aid in the determination of engineering properties. All laboratory results are noted on the borehole logs or separately in Appendix B.

# 4.0 SITE AND SUBSURFACE CONDITIONS

## 4.1 SITE DESCRIPTION & TOPOGRAPHY

The site is located at lot 1 block 1 plan 331 2364 north of the intersection of 13 Street North and 62 Avenue North in Lethbridge County, Alberta. The site has a slight slope (<8%) to the coulees to the north, sloping towards the Oldman River.

## 4.2 SOIL CONDITIONS

It should be noted that geological conditions are innately variable. At the time of preparation of this report, information on subsurface stratigraphy was available only at discreet borehole locations. In order to develop recommendations from this information, it is necessary to make some assumptions concerning conditions other than at the borehole locations. Adequate field reviews should be provided during design and construction of the treatment system to check that these assumptions are reasonable.

The general subsurface stratigraphy comprised of topsoil, overlying clay, overlying clay till with occasional, discontinuous interbedded layers of sand, in descending order. Based on soil texture analysis, the soils can be generally classified as a loam. The following sections provide a summary of the soils encountered in the borehole logs. A more detailed description is provided on the borehole logs in Appendix B.

### 4.2.1 TOPSOIL

Topsoil was encountered at the surface in BH001, BH002, and BH003 and ranged in thickness from 50 mm to 200 mm. The topsoil was described as containing organics and was moist, and brown.

### 4.2.2 SHALE FILL

Shale Fill was encountered at the surface in BH004 and was approximately 75 mm in thickness. The shale was described as moist and red.

### 4.2.3 CLAY

Clay was encountered below the topsoil and was encountered up to depths of approximately 1.5 m to 3.0 m below the existing ground surface. The clay was silty with a trace of sand, firm to hard, damp to very moist, medium plastic, massive, and light brown. The results of the grain size analysis carried out on a representative sample of the clay indicated a textural composition of 35% sand, 43% silt, and 22% clay. Using Figure 2 of the Model Process for Subdivision Approval and Private Sewage, the upper clay has a textural classification of L (loam).

### 4.2.4 CLAY TILL

Clay till was encountered in all boreholes beneath the clay, present to the maximum depth drilled. The clay till was silty with a trace of sand and gravel. The clay till was, firm to hard, medium plastic, and moist to very moist. The clay till was massive, and olive brown with white precipitates. Coal and oxide stains were also noted throughout the clay till.

### 4.3 GROUNDWATER CONDITIONS

At the time of drilling, no sloughing was noted in any of the boreholes. The groundwater levels were measured on March 12, 2024. Table 4.3 summarizes the groundwater monitoring data.

Table 4.3 Groundwater Monitoring Data – March 12, 2024

| Borehole Number | Depth of Standpipe (m) | Depth to Groundwater (m) |
|---|---|---|
| BH001 | 4.50 | 4.45 |
| BH002 | 4.50 | Dry |
| BH003 | 4.50 | Dry |
| BH004 | 4.50 | 3.96 |

BH002 and BH003's monitoring wells were found to be dry and BH001 and BH004 showed groundwater depths of 4.45 to 3.96 m, respectively. Additionally, there were no other indicators of a high water table (i.e. mottling, gleying, etc.) noted in the field observations. Based on the results of the field drilling program and the measured groundwater levels, it is expected that the site should have adequate vertical separation throughout.

#### 4.3.1 SPRINGS AND WELLS

No springs were observed on the site at the time of preparing this report. Based on records found on the Alberta Water Well Database, one well, GIC Well ID 1170005, was identified approximately 625 m west in the river bottom below the site. All available historic well records are provided in Appendix C.

## 5.0 DISCUSSION

### 5.1 POTENTIAL FOR GROUNDWATER MOUNDING

Based on soil descriptions, it is expected that groundwater mounding should not be an issue due to soil texture.

### 5.2 PREVIOUS SOILS REPORTS

At the time of preparing this report, no previous soil reports were available for review.

### 5.3 PROXIMITY TO EXISTING STRUCTURES / WATER BODIES

The site sits adjacent to 2 properties directly to the south. Each of these properties has a home sitting approximately 50 m and 141 m away from the nearest proposed septic field location.

Situated to the west/northwest of the site is the Oldman River. The river is approximately 1.3 km from the closest part of the site (northwest corner of property line).

Site plans illustrating the location of the wells and houses are included in Figure 1 in Appendix A.

### 5.4 Potential for Nutrient Loading

Based on the expected development, it is not anticipated that the nutrient loading added by the proposed treatment system will have any impact on aquifers or bodies of water in the area.

### 5.5 Vertical Separation From Restricting Conditions

As per Alberta Private Sewage Systems Standard of Practice, a soil-based treatment system within 2 km of a river requires a minimum of 900 mm (3 ft) of vertical separation from any restrictive condition. The upper clay (loam) was found to be present to depths of 1.5 m to 3.0 m overlying the massive clay till. Based on the results of the field drilling program, it is expected that the site should have adequate vertical separation throughout from any restricting conditions.

### 5.6 Septic Fields

The Safety Codes Council's, Alberta Private Sewage Systems Standard of Practice, 2021, notes that percolation testing can be used in support of a design that used site specific investigation. Previous percolation testing conducted on similar soils indicated percolation rates of between 5 mins/cm (gravel) up to 24 mins/cm (clay), which indicates the area surficial soils may be suitable for septic field development.

For design purposes, groundwater is expected to be measured below 4.0 m from the ground surface and is not expected to impact the design of the fields. The slopes of the area are less than 12%. Soils within the top 900 mm of the surface are generally considered to be loam.

During installation of the weeping trenches, the installer should pay close attention to the soil conditions encountered, to define the extent of any silt or sand pockets (areas subject to faster percolation rates) or medium to high plastic clays (areas of slower percolation rates). These should be immediately reported to the disposal field designer for review prior to completion of the septic disposal field.

## 6.0 CONCLUSION

Based on soil, groundwater, and site topography conditions as outlined in Table 3 of the Model Processing for Subdivision Approval and Private Sewage, it is BDT's conclusion that the site should be considered a Suitability Type 2 – Moderate and as such, should adequately support a septic treatment system long-term. See attached suitability type assessment chart in Appendix D.

## 7.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully Submitted,

Christopher Allard, C.E.T.

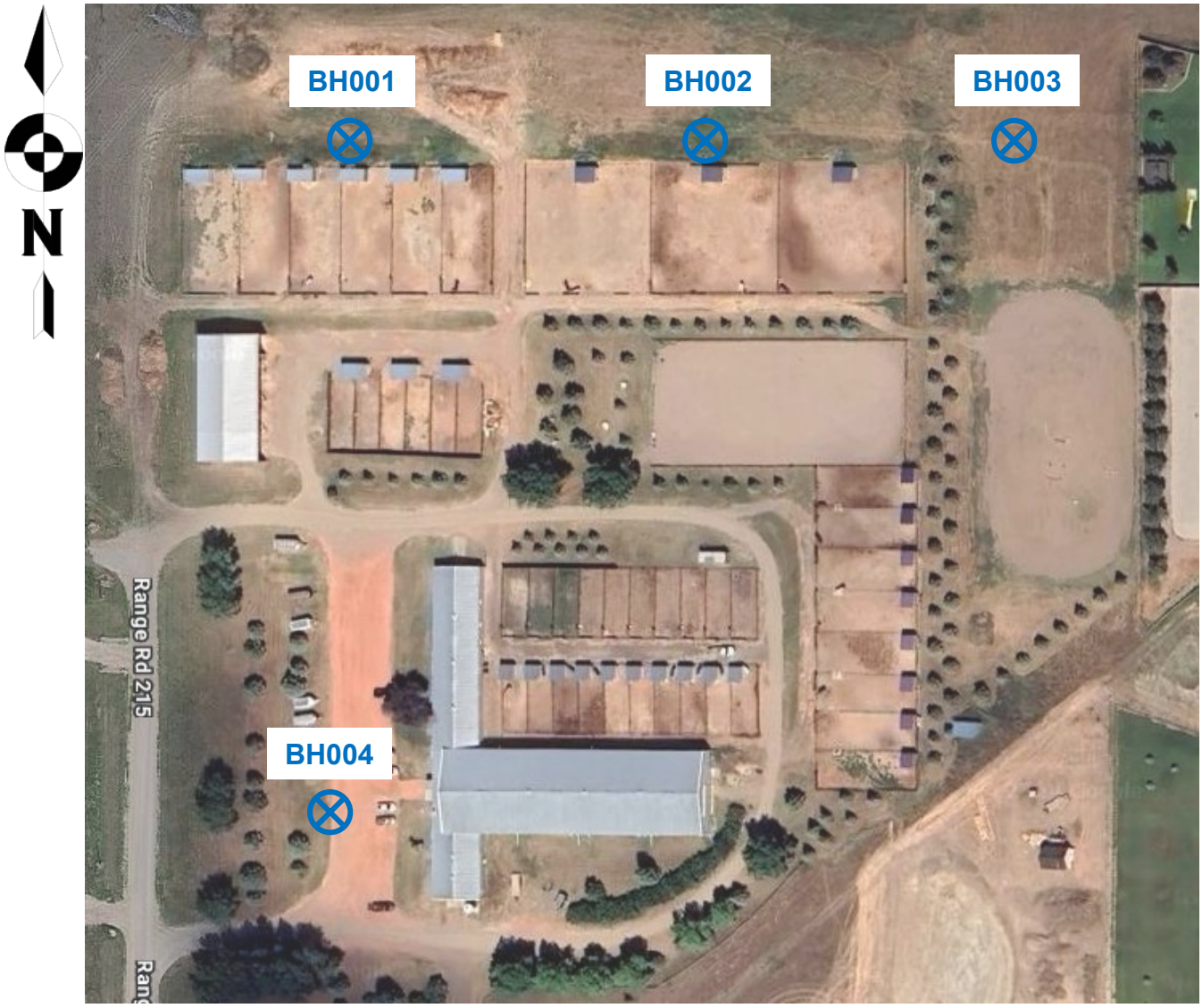
Lab Manager

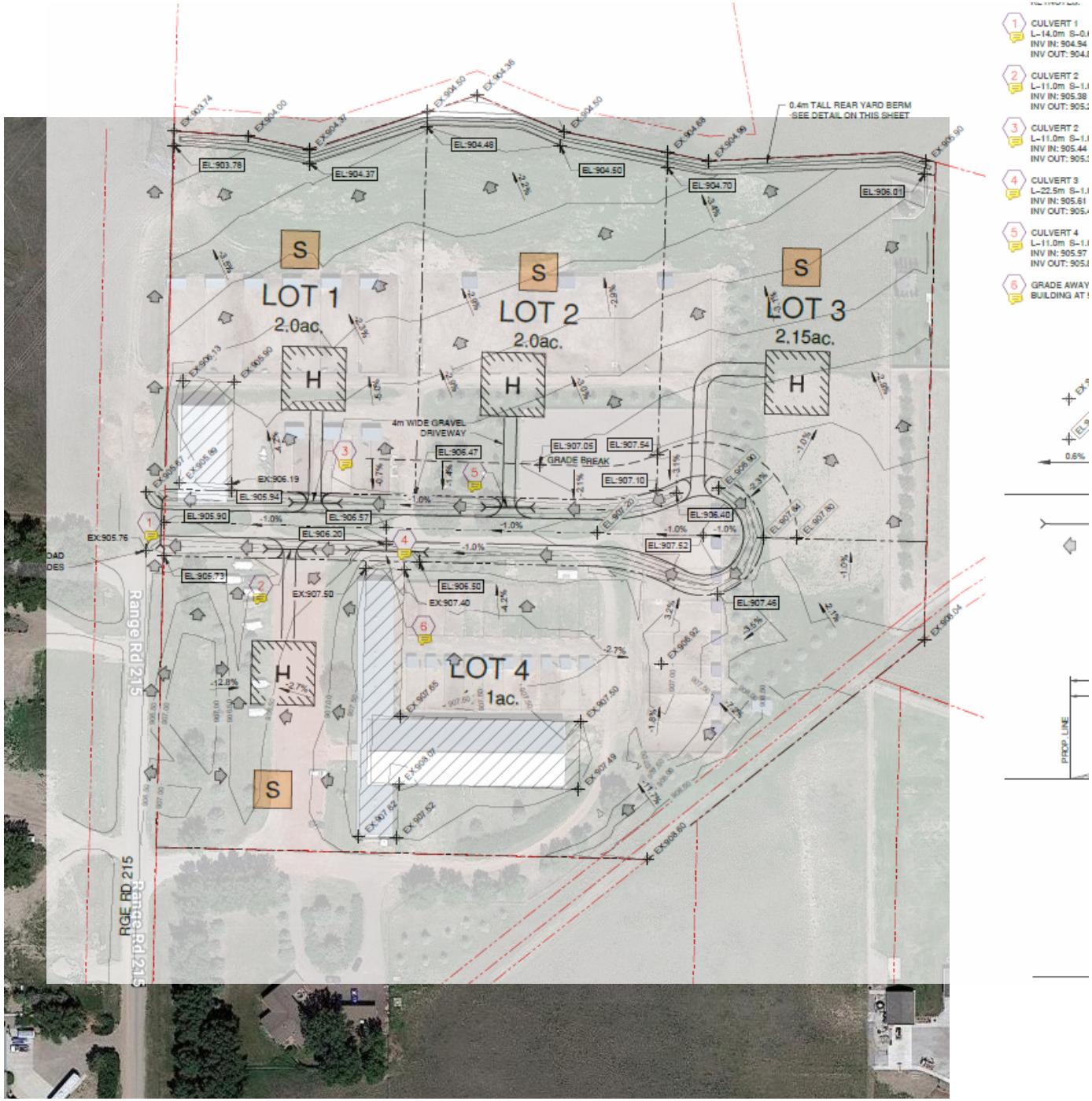
BDT Engineering Ltd.

Mark Hasegawa, P.Eng.

# APPENDIX A – SITE PLAN SHOWING BOREHOLE LOCATIONS & LOT LAYOUT

**Figure 1 – Site Plan**
**Borehole Locations**




LOT 1
2.0ac.
LOT 2
2.0ac.
LOT 3
2.15ac.
LOT 4
1ac.
0.4m TALL REAR YARD BERM
SEE DETAIL ON THIS SHEET
4m WIDE GRAVEL
DRIVEWAY
GRADE BREAK
Range Rd 215
RGE RD 215
PROP. LINE
1 CULVERT 1
2 CULVERT 2
3 CULVERT 2
4 CULVERT 3
5 CULVERT 4
6 GRADE AWAY

# APPENDIX B – BOREHOLE LOGS AND TEST RESULTS

| | | |
|---|---|---|
| Project: Hirsche Lots Development Septic Fields | | BOREHOLE NO: **BH001** |
| Client: Hasegawa Consulting Professional Engineers | | PROJECT NO: 2024-016 |
| | Solid Stem Auger | ELEVATION: |

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) Water Level | SOIL SYMBOL | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NO | BLOWS /150 mm | PLASTIC M.C. LIQUID (20 40 60 80) | ▲ VANE SHEAR (kPa) ▲ 100 200 300 400<br>■ BLOW COUNT ■ 20 40 60 80<br>◆ UNCONF. SHEAR STR. (kPa) ◆ 100 200 300 400<br>● 0.5 x POCKETPEN. (kPa) ● 100 200 300 400 | OTHER DATA | SLOTTED PIEZOMETER | Elevation (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Topsoil (50 mm) | | | | | | | | |
| | | Clay - silty, trace sand, stiff, damp, medium plastic, light brown | | B1 | | | | | | |
| 1 | | | | B2 | | | | | | |
| | | Clay Till - silty, trace sand and gravel, very stiff, moist, medium plastic, olive brown, coal inclusions and oxide staining throughout. | | B3 | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | B4 | | | | | | |
| | | - firm to stiff, moist to very moist | | B5 | | | | | | |
| 4 | | | | | | | | | | |
| | | | | B6 | | | | | | |
| 5 | | End of borehole at 4.57 m, no sloughing or seepage. Standpipe installed to 4.57 m. Groundwater was measured at 4.45 m when monitored on March 12, 2024. | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |

| | |
|---|---|
| LOGGED BY: CA | COMPLETION DEPTH: 4.57 m |
| REVIEWED BY: BDT | COMPLETION DATE: 24-2-21 |
| | Page 1 of 1 |

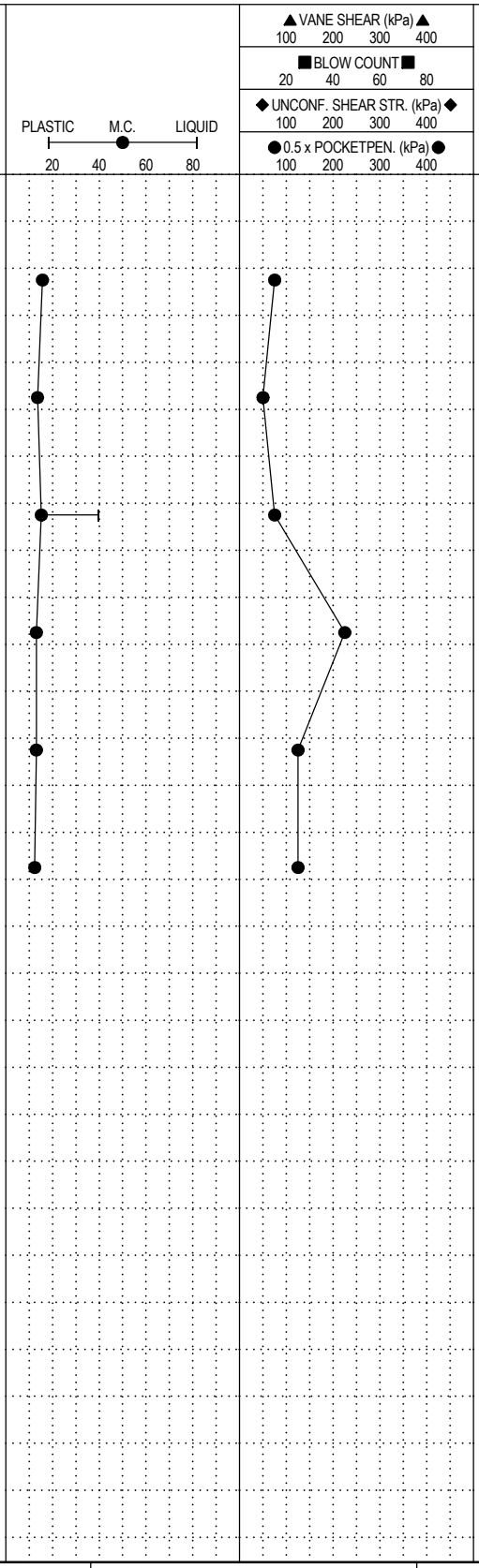
AB TRANS BOREHOLE LOG HIRSCHE DEVELOPMENT SEPTIC FIELDS.GPJ AB_TRANS.GDT 24-3-12

| | | |
|---|---|---|
| Project: Hirsche Lots Development Septic Fields | | BOREHOLE NO: **BH002** |
| Client: Hasegawa Consulting Professional Engineers | | PROJECT NO: 2024-016 |
| | Solid Stem Auger | ELEVATION: |

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL SYMBOL | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NO | BLOWS /150 mm | OTHER DATA | SLOTTED PIEZOMETER | Elevation (m) |
|---|---|---|---|---|---|---|---|---|
| 0 | | Topsoil (200 mm) | | | | | | |
| | | Clay - silty, trace sand, stiff, moist, medium plastic, light brown | | B1 | | | | |
| 1 | | | | B2 | | Soil Texture: Loam | | |
| 2 | | Clay Till - silty, trace sand and gravel, very stiff, moist, medium plastic, olive brown, coal inclusions and oxide staining throughout | | B3 | | | | |
| 3 | | - very stiff to hard | | B4 | | | | |
| 4 | | | | B5 | | | | |
| | | | | B6 | | | | |
| 5 | | End of borehole at 4.57 m, no sloughing or seepage. Standpipe installed to 4.57 m. Standpipe dry when monitored on March 12, 2024. | | | | | | |
| 6 | | | | | | | | |
| 7 | | | | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |




| | |
|---|---|
| LOGGED BY: CA | COMPLETION DEPTH: 4.57 m |
| REVIEWED BY: BDT | COMPLETION DATE: 24-2-21 |
| | Page 1 of 1 |

AB TRANS BOREHOLE LOG HIRSCHE DEVELOPMENT SEPTIC FIELDS.GPJ AB_TRANS.GDT 24-3-12

| | | |
|---|---|---|
| Project: Hirsche Lots Development Septic Fields | | BOREHOLE NO: **BH003** |
| Client: Hasegawa Consulting Professional Engineers | | PROJECT NO: 2024-016 |
| | Solid Stem Auger | ELEVATION: |

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) | SOIL SYMBOL | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NO | BLOWS /150 mm |
|---|---|---|---|---|---|
| 0 | | Topsoil (150 mm) | | | |
| | | Clay - silty, trace sand, stiff, damp, medium plastic, light brown | | B1 | |
| 1 | | | | | |
| | | - firm to stiff, moist | | B2 | |
| 2 | | | | B3 | |
| | | Clay Till - silty, trace sand and gravel, very stiff, moist, medium plastic, olive brown, coal inclusions and oxide staining throughout | | B4 | |
| 3 | | | | | |
| | | | | B5 | |
| 4 | | | | | |
| | | | | B6 | |
| 5 | | End of borehole at 4.57 m, no sloughing or seepage. Standpipe installed to 4.57 m. Standpipe dry when monitored on March 12, 2024. | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |

PLASTIC — M.C. — LIQUID (20 40 60 80)

▲ VANE SHEAR (kPa) ▲ (100 200 300 400)

■ BLOW COUNT ■ (20 40 60 80)

◆ UNCONF. SHEAR STR. (kPa) ◆ (100 200 300 400)

● 0.5 x POCKETPEN. (kPa) ● (100 200 300 400)

OTHER DATA

SLOTTED PIEZOMETER

Elevation (m)

| | |
|---|---|
| LOGGED BY: CA | COMPLETION DEPTH: 4.57 m |
| REVIEWED BY: BDT | COMPLETION DATE: 24-2-21 |
| | Page 1 of 1 |

AB TRANS BOREHOLE LOG HIRSCHE DEVELOPMENT SEPTIC FIELDS.GPJ AB_TRANS.GDT 24-3-12

| | | |
|---|---|---|
| Project: Hirsche Lots Development Septic Fields | | BOREHOLE NO: **BH004** |
| Client: Hasegawa Consulting Professional Engineers | | PROJECT NO: 2024-016 |
| | Solid Stem Auger | ELEVATION: |

SAMPLE TYPE: SHELBY TUBE | CORE SAMPLE | SPT SAMPLE | GRAB SAMPLE | NO RECOVERY

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

| Depth (m) Water Level | SOIL SYMBOL | SOIL DESCRIPTION | SAMPLE TYPE | SAMPLE NO | BLOWS /150 mm | PLASTIC M.C. LIQUID (20 40 60 80) | ▲ VANE SHEAR (kPa) ▲ (100 200 300 400) ■ BLOW COUNT ■ (20 40 60 80) ◆ UNCONF. SHEAR STR. (kPa) ◆ (100 200 300 400) ● 0.5 x POCKETPEN. (kPa) ● (100 200 300 400) | OTHER DATA | SLOTTED PIEZOMETER | Elevation (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | Shale Fill (75 mm) | | | | | | | | |
| | | Clay - silty, trace sand, stiff to hard, moist, medium plastic, light brown | | B1 | | | | | | |
| 1 | | | | B2 | | | | | | |
| 2 | | - very moist | | B3 | | | | | | |
| 3 | | | | B4 | | | | | | |
| | | Clay Till - silty, trace sand and gravel, very stiff, moist, medium plastic, olive brown, coal inclusions and oxide staining throughout | | B5 | | | | | | |
| 4 | | - hard | | | | | | | | |
| | | | | B6 | | | | | | |
| 5 | | End of borehole at 4.57 m, no sloughing or seepage. Standpipe installed to 4.57 m. Groundwater was measured at 3.96 m when monitored on March 12, 2024. | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |

| | |
|---|---|
| LOGGED BY: CA | COMPLETION DEPTH: 4.57 m |
| REVIEWED BY: BDT | COMPLETION DATE: 24-2-21 |
| | Page 1 of 1 |

AB TRANS BOREHOLE LOG HIRSCHE DEVELOPMENT SEPTIC FIELDS.GPJ AB_TRANS.GDT 24-3-12

# TERMS USED ON BOREHOLE LOGS

## TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

| DESCRIPTIVE TERM | RELATIVE DENSITY | N (blows per 0.3m) |
|---|---|---|
| Very Loose | 0 TO 20% | 0 to 4 |
| Loose | 20 TO 40% | 4 to 10 |
| Compact | 40 TO 75% | 10 to 30 |
| Dense | 75 TO 90% | 30 to 50 |
| Very Dense | 90 TO 100% | greater than 50 |

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

---

FINE GRAINED SOILS (major portion passing 0.075mm sieve): Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

| DESCRIPTIVE TERM | UNCONFINED COMPRESSIVE STRENGTH (KPA) |
|---|---|
| Very Soft | Less than 25 |
| Soft | 25 to 50 |
| Firm | 50 to 100 |
| Stiff | 100 to 200 |
| Very Stiff | 200 to 400 |
| Hard | Greater than 400 |

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

---

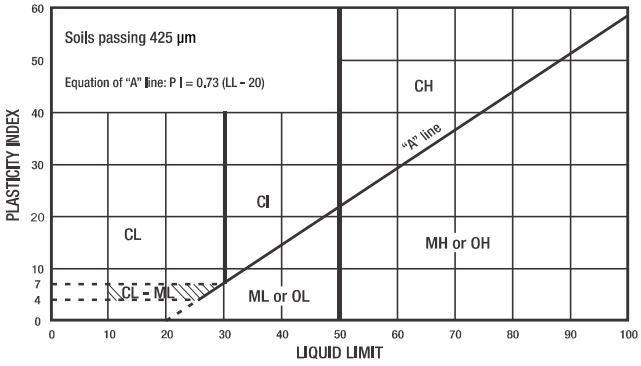
## GENERAL DESCRIPTIVE TERMS

Slickensided - having inclined planes of weakness that are slick and glossy in appearance.
Fissured - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.
Laminated - composed of thin layers of varying colour and texture.
Interbedded - composed of alternate layers of different soil types.
Calcareous - containing appreciable quantities of calcium carbonate.;
Well graded - having wide range in grain sizes and substantial amounts of intermediate particle sizes.
Poorly graded - predominantly of one grain size, or having a range of sizes with some intermediate size missing.

# MODIFIED UNIFIED SOIL CLASSIFICATION

| MAJOR DIVISION | | | GROUP SYMBOL | TYPICAL DESCRIPTION | LABORATORY CLASSIFICATION CRITERIA | | |
|---|---|---|---|---|---|---|---|
| COARSE-GRAINED SOILS More than 50% retained on 75 µm sieve* | GRAVELS 50% or more of coarse fraction retained on 4.75 mm sieve | CLEAN GRAVELS | GW | Well-graded gravels and gravel-sand mixtures, little or no fines | Classification on basis of percentage of fines: Less than 5% Pass 75 µm sieve; More than 12% Pass 75 µm sieve; 5% to 12% Pass 75 µm sieve. GW, GP, SW, SP GM, GC, SM, SC Borderline Classification requiring use of dual symbols | $C_U = D_{60} / D_{10}$ Greater than 4<br>$C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 | |
| | | | GP | Poorly graded gravels and gravel-sand mixtures, little or no fines | | Not meeting both criteria for GW | |
| | | GRAVELS WITH FINES | GM | Silty gravels, gravel-sand-silt mixtures | | Atterberg limits plot below "A" line or plasticity index less than 4 | Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols |
| | | | GC | Clayey gravels, gravel-sand-clay mixtures | | Atterberg limits plot above "A" line or plasticity index greater than 7 | |
| | SANDS More than 50% of coarse fraction passes 4.75 mm sieve | CLEAN SANDS | SW | Well-graded sands and gravelly sands, little or no fines | | $C_U = D_{60}/D_{10}$ Greater than 6<br>$C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3 | |
| | | | SP | Poorly graded sands and gravelly sands, little or no fines | | Not meeting both criteria for SW | |
| | | SANDS WITH FINES | SM | Silty sands, sand-silt mixtures | | Atterberg limits plot below "A" line or plasticity index less than 4 | Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols |
| | | | SC | Clayey sands, sand-clay mixtures | | Atterberg limits plot above "A" line or plasticity index greater than 7 | |
| FINE-GRAINED SOILS (by behavior) 50% or more passes 75 µm sieve* | SILTS Liquid limit <50 | | ML | Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity | For classification of fine-grained soils and fine fraction of coarse-grained soils. | | |
| | SILTS Liquid limit >50 | | MH | Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts | | | |
| | CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit <30 | | CL | Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays | | | |
| | CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit 30-50 | | CI | Inorganic clays of medium plasticity, silty clays | | | |
| | CLAYS Above "A" line on plasticity chart negligible organic content Liquid limit >50 | | CH | Inorganic clays of high plasticity, fat clays | | | |
| | ORGANIC SILTS AND CLAYS Liquid limit <50 | | OL | Organic silts and organic silty clays of low plasticity | | | |
| | ORGANIC SILTS AND CLAYS Liquid limit >50 | | OH | Organic clays of medium to high plasticity | | | |
| HIGHLY ORGANIC SOILS | | | PT | Peat and other highly organic soils | | | |

PLASTICITY CHART




*Based on the material passing the 75 mm sieve
Reference: ASTM Designation D2487, for identification procedure see D2488. USC as modified by PFRA

## SOIL COMPONENTS

| FRACTION | SIEVE SIZE PASSING | SIEVE SIZE RETAINED | DEFINING RANGES OF PERCENTAGE BY MASS OF MINOR COMPONENTS: PERCENTAGE | DESCRIPTOR |
|---|---|---|---|---|
| GRAVEL | | | | |
| coarse | 75 mm | 19 mm | >35 % | "and" |
| fine | 19 mm | 4.75 mm | 21 to 35 % | "y-adjective" |
| SAND | | | | |
| coarse | 4.75 mm | 2.00 mm | 10 to 20 % | "some" |
| medium | 2.00 mm | 425 µm | | |
| fine | 425 µm | 75 µm | >0 to 10 % | "trace" |
| SILT (non plastic) or CLAY (plastic) | 75 µm | | as above but by behavior | |

## OVERSIZE MATERIAL

Rounded or subrounded

| | |
|---|---|
| COBBLES | 75 mm to 300 mm |
| BOULDERS | > 300 mm |

Not rounded

| | |
|---|---|
| ROCK FRAGMENTS | >75 mm |
| ROCKS | > 0.76 cubic metre in volume |

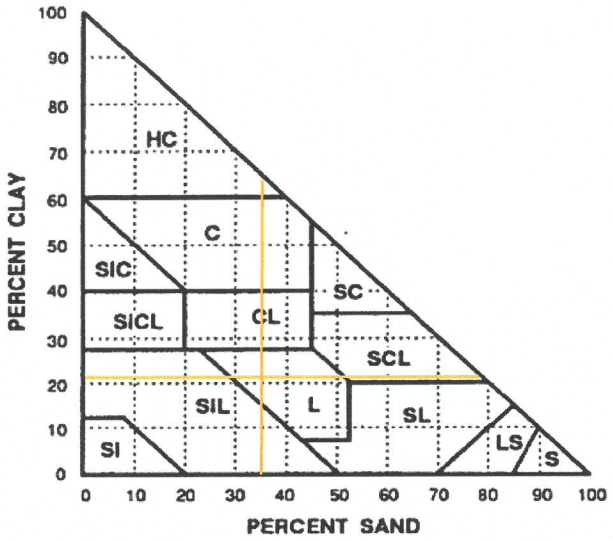
# Particle Size Distribution
# ASTM D6913 & D7925-21e1

## BDT Engineering Ltd.

Bay G - 1710 31 St N, Lethbridge, AB T1H 5H1

**Project Name / No.:** 4 Lot Development - Septic Suitability
**Client:** Hasegawa Consulting Professional Engineers
**Sample No.:** 2B2
**Sample Location:** BH002 - ~1.5 m below existing ground
**Material Type:** Loam

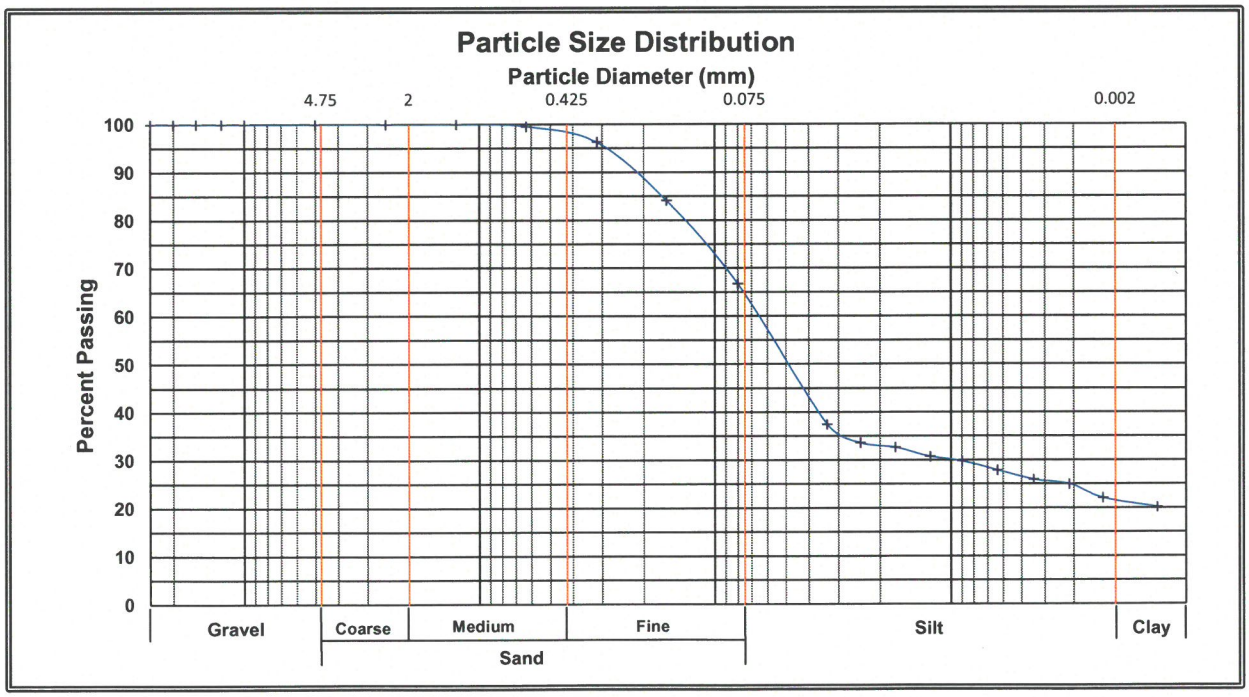
**Field Technician:** Christopher Allard
**Lab Technician:** Christopher Allard




| Soil Composition | |
|---|---|
| Gravel | |
| Sands | 35% |
| Silt | 43% |
| Clay | 22% |

**Remarks:**

Additional information available upon request.




**Reviewed:**

Christopher Allard, C.E.T.

# APPENDIX C – HISTORIC WELL RECORDS

# Water Well Drilling Report

View in Metric | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 1170005
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

## Well Identification and Location

Measurement in Imperial

| Owner Name | Address | Town | Province | Country | Postal Code |
|---|---|---|---|---|---|
| PAVAN, LEROY & SANDRA | RR 8 - 4412 | LETHBRIDGE | ALBERTA | CA | T1J 4P4 |

| Location | 1/4 or LSD | SEC | TWP | RGE | W of MER | Lot | Block | Plan | Additional Description |
|---|---|---|---|---|---|---|---|---|---|
| | SE | 30 | 9 | 21 | 4 | | | | TEST HOLE #1 |

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.758056 Longitude -112.832500
How Location Obtained
Differential corrected handheld GPS 5-10m

Elevation 2661.00 ft
How Elevation Obtained
Differential corrected handheld GPS 5-10m

## Drilling Information

**Method of Drilling**
Rotary - Air

**Proposed Well Use**
Observation

**Type of Work**
Test Hole-Decommissioned
View Decommissioning Report

Plugged 2005/11/10
Plugged with Cuttings
Amount

## Formation Log

Measurement in Imperial

| Depth from ground level (ft) | Water Bearing | Lithology Description |
|---|---|---|
| 14.00 | | Tan Alluvial Silt |
| 20.00 | | Dark Gray Bearpaw Bedrock |

## Yield Test Summary

Measurement in Imperial

Recommended Pump Rate igpm

| Test Date | Water Removal Rate (igpm) | Static Water Level (ft) |
|---|---|---|
| | | |

## Well Completion

Measurement in Imperial

| Total Depth Drilled | Finished Well Depth | Start Date | End Date |
|---|---|---|---|
| 20.00 ft | | 2005/11/10 | 2005/11/10 |

**Borehole**

| Diameter (in) | From (ft) | To (ft) |
|---|---|---|
| 6.00 | 0.00 | 20.00 |

**Surface Casing (if applicable)**
Size OD : in
Wall Thickness : in
Bottom at : ft

**Well Casing/Liner**
Size OD : in
Wall Thickness : in
Top at : ft
Bottom at : ft

**Perforations**

| From (ft) | To (ft) | Diameter or Slot Width(in) | Slot Length (in) | Hole or Slot Interval(in) |
|---|---|---|---|---|
| | | | | |

Perforated by

**Annular Seal**
Placed from ft to ft
Amount

Other Seals

| Type | At (ft) |
|---|---|
| | |

**Screen Type**
Size OD : in

| From (ft) | To (ft) | Slot Size (in) |
|---|---|---|
| | | |

Attachment
Top Fittings
Bottom Fittings

**Pack**
Type
Grain Size
Amount

## Contractor Certification

Name of Journeyman responsible for drilling/construction of well
KEVIN BLAND

Certification No
VC3171

Company Name
CAMFIELD DRILLING SERVICES LTD.

Copy of Well report provided to owner

Date approval holder signed

# Water Well Drilling Report

View in Metric | Export to Excel

The driller supplies the data contained in this report. The Province disclaims responsibility for its accuracy. The information on this report will be retained in a public database.

GIC Well ID 1170005
GoA Well Tag No.
Drilling Company Well ID
Date Report Received

GOWN ID

## Well Identification and Location

Measurement in Imperial

| Owner Name | Address | Town | Province | Country | Postal Code |
|---|---|---|---|---|---|
| PAVAN, LEROY & SANDRA | RR 8 - 4412 | LETHBRIDGE | ALBERTA | CA | T1J 4P4 |

| Location | 1/4 or LSD | SEC | TWP | RGE | W of MER | Lot | Block | Plan | Additional Description |
|---|---|---|---|---|---|---|---|---|---|
| | SE | 30 | 9 | 21 | 4 | | | | TEST HOLE #1 |

Measured from Boundary of
ft from
ft from

GPS Coordinates in Decimal Degrees (NAD 83)
Latitude 49.758056 Longitude -112.832500
How Location Obtained
Differential corrected handheld GPS 5-10m

Elevation 2661.00 ft
How Elevation Obtained
Differential corrected handheld GPS 5-10m

## Additional Information

Measurement in Imperial

Distance From Top of Casing to Ground Level in
Is Artesian Flow
Rate igpm
Is Flow Control Installed
Describe

Recommended Pump Rate igpm
Recommended Pump Intake Depth (From TOC) ft
Pump Installed
Type
Depth ft
Make
H.P.
Model (Output Rating)

Did you Encounter Saline Water (>4000 ppm TDS)
Depth ft
Gas
Depth ft
Well Disinfected Upon Completion
Geophysical Log Taken
Remedial Action Taken
Submitted to ESRD

Sample Collected for Potability
Submitted to ESRD

Additional Comments on Well
PULLED CASING BACKFILLED HOLE WITH CUTTINGS & BENT. CHIPS

## Yield Test

Taken From Ground Level | Measurement in Imperial

| Test Date | Start Time | Static Water Level |
|---|---|---|
| | | ft |

**Method of Water Removal**
Type
Removal Rate igpm
Depth Withdrawn From ft

If water removal period was < 2 hours, explain why

## Water Diverted for Drilling

| Water Source | Amount Taken | Diversion Date & Time |
|---|---|---|
| | ig | |

## Contractor Certification

Name of Journeyman responsible for drilling/construction of well
KEVIN BLAND

Certification No
VC3171

Company Name
CAMFIELD DRILLING SERVICES LTD.

Copy of Well report provided to owner
Date approval holder signed

## APPENDIX D – SUITABILITY TYPE ASSESSMENT CHART

| Site Variable | Suitability Type 2 - Moderate Characteristics | Site Characteristics |
|---|---|---|
| Soil texture and structure<br>See Table 7A.1.5 in Private Sewage System Standard of Practice (PSSSP) for suitable soil texture classifications. | Soil texture is finer or coarser than ideal but is still suited for treatment field use.<br>Texture class in this type typically includes sandy clay loam, clay loam, loamy coarse sand.<br>Structure is a medium to strong grade of Blocky, granular, prismatic or columnar | Soil texture classified as a loam. |
| Depth of Suitable Soil | Soil is moderately suitable to at least 2.5 m (8 feet) in depth to bedrock, impermeable layers, or saturated soils. Limited suitability at depths below 1.5m (5 feet) may be present. | Soil is suitable to 4.5 m. |
| Hydraulic Capability of Soil<br>Soil characteristics are required to rate permeability. | Soils are rated as well drained and have good to moderate permeability. | Site soil is expected to have moderate permeability. |
| Soil Horizons | Soil horizons have moderate textural contrast and mild stratification of materials and indicators that suggest moderate restriction to vertical water movement | See sections 4.2 of report. |
| Depth to Water Table | No indication of saturated soil conditions or water table to a depth greater than 2.5 m (8 ft.) | See table 4.3 Groundwater Monitoring Data. |
| Topography of proposed site | Land has a slight slope (0 – 8%) that is convex in nature | Land has a slight slope of <8% |
| Flooding | None, protected | None, protected. |
| Density | Existing or planned development of a moderate density. Surrounding density less than 30 parcels per ¼ section. | Planned development - low density residential. |
| Encumbrances<br>(ie. Wells, water sources, surface water, buildings, property lines, lines of easement, interceptors or drainage ditches, cuts, banks, fills, driveways or parking areas, existing on-site sewage systems, or underground utilities) | Encumbrances cause moderate siting limitations but sufficient setbacks exist and two suitable sites for on-site sewage systems have been identified. | Sufficient room for setbacks from identified encumberances. |
| Parcel Size | Sufficient parcel size | Large parcel size. |
| Surface Water | Effect on surface water is not a concern with proper on-site system design and siting. On-site location is not limited by required separation from surface water body. | Development site >1,300 m from water body, no impact to surface water is expected. |

# APPENDIX D

## HYDROLOGICAL & SITE DRAINAGE ANALYSIS

# HYDROLOGICAL and SITE DRAINAGE ANALYSIS

Tyler Hirsche Subdivision

HASEGAWA
CONSULTING PROFESSIONAL ENGINEERS

**PREPARED FOR:**
**Tyler Hirsche**
Hirsche Holdings Ltd.
94010 RR 215
Lethbridge, AB T1J 5R

**PREPARED BY:**
**Hasegawa Engineering**
1220 – 31st Street North
Lethbridge, Alberta T1H 5J8

# Issue/Revision Log

| Issue/Revision # | Issued By | Date | Issue / Revision Description |
|---|---|---|---|
| 1 | M. Hasegawa | 2024-03-07 | |
| | | | |
| | | | |
| | | | |

# Report Authors

**Report Prepared By:**

Dave Chalmers, CET.
Hasegawa Engineering

**Report Reviewed and Approved By:**

Mark Hasegawa, P.Eng.
Hasegawa Engineering

# TABLE OF CONTENTS

# 1.0 Introduction

On behalf of Tyler Hirsche, Hasegawa Engineering (HE) has completed storm water modeling for a proposed 4-lot subdivision just north of Lethbridge, Alberta.

# 2.0 Site Conditions

The site consists of approximately 11.5 acres of land accessed off of 13 Street and 62 Avenue North as shown in Figure 1 (Appendix A). At this location, 62 Avenue North forms the north boundary for the City of Lethbridge. Presently, the land is used as an equestrian facility with outdoor riding areas and outdoor pens. Impervious surfaces consist of horse shelters in each of the outdoor pens, a large enclosed arena, a hay barn and graveled local roadways.

The proposed subdivision would keep the hay barn and arena while dividing the land into a 1.9 acre municipal reserve area on the north and 4 lots arranged around a central east/west road running into the subdivision as shown in Figure 2. Lots 1-3 are approximately 2 acres each and Lot 4 is 2.86 acres. The existing hay barn remains as part of Lot 1 and the existing riding arena is part of Lot 4. The existing ground generally slopes at about 2% to the northwest with runoff flowing into a coulee bordering the development to the north.

# 3.0 Surface Runoff Design Criteria

## 3.1 Onsite Runoff

The existing site was surveyed using GPS. GeoHECHMS software was used to divide the resulting surface into sub basins. The software also generates flowpaths and average slopes for each sub basin. The footprint of roofed structures were treated as impervious areas and graveled roads were assumed to be 70% impervious, other areas were modeled as pervious surface. The results show several flows converging to form two main flow paths to the coulee edge. These were modeled flowing separately down the coulee and joining at the coulee bottom. A plan view of the predevelopment model is included as Figure 3 in the Appendix.

In order to determine the peak runoff from each basin, surface runoff analysis was performed followed by runoff modelling using PCSWMM software. Rainfall intensity data used in modelling was obtained from a 24 hour/100 year modified Chicago storm. This design storm is a synthetic storm event that is derived from Lethbridge data obtained from Environment Canada and is used for City of Lethbridge runoff modelling. This storm event has a time step of 5 minutes, a total rainfall of 110 mm and a peak intensity of 255 mm/hour occurring at 0.3 of storm duration – the rainfall distribution can be seen in upper part of Figure 5 which shows rainfall intensities through the storm.

Standard values for infiltration in typical soils were obtained from City of Lethbridge (Design Standards 2021). Manning's N was set as follows:

- For pervious areas, an N of 0.05 was used if the permeable area in the subcatchment was predominately bare soil in riding areas, changing to 0.15 if the permeable area was predominately grassed areas.
- For subcatchments where the impervious area was predominately roof surfaces, an N of 0.01 was used compared to 0.03 if the impervious surface was mostly gravel roads.

An initial moisture deficit of 0.25 was assumed for non-irrigated land. Sheet flow was assumed on the lots with ditch flow modeled along the roads south and west of the property, and as the flow starts down the coulee. Using the design storm and these assumptions, the predevelopment model returns a peak flow of 1.249 m3/sec at the outfall (coulee bottom).

A post development runoff model was created using the proposed design surface. Lots 1-3 have a grade break to create split drainage flowing generally to the front and rear of the lots. In the model, runoff flowing to the front of the lots is captured in a 0.8m deep ditch on either side of the proposed east/west development road which flows west into the existing ditch of the County road. Runoff flowing to the rear of Lot 1 is released northwest into the County ditch or north into the municipal reserve where it joins runoff heading north into the coulee. In the back of Lot 2, runoff flows either north into the municipal reserve or northeast to the back property line where is captured by a 0.25m deep swale running along the east side of the development. Runoff in the back of Lot 3 also is captured by this swale and directed north to the northeast corner of the development where it continues into the coulee. A swale is also recommended along the property line between Lot 2 and 3 to keep runoff in each lot from flowing across the neighboring lot. Runoff in the rear of Lot 4 flows south to existing drainage routes south of the development or west into the County ditch.

Each lot is divided into several subcatchments dictated by slope direction or other flow paths such as buildings, outlet culverts or swales. Soil suction head and conductivity remained unchanged from the predevelopment model, moisture deficit was assumed to decrease to 0.15 for irrigated lawns. A single Manning's N of 0.15 for native grass was used for pervious surfaces; for pervious surfaces, N remained at 0.01 (roofs) or 0.03 (gravel roads). Each lot was assumed to have 345 $m^2$ 100% impervious surface in the house footprint. Driveways on each lot were modeled as gravel roads with 70% impervious surface. The hay barn and arena facility are to remain and were again modeled as impervious surfaces in the appropriate subcatchments.

Sheet flow was again assumed across the lots with ditch flow in the swales, along the proposed central road, along the roads south and west of the property, and as the flow starts down the coulee. Other existing ditches around the periphery (south and west) are not well defined in the topo provided and were modeled as 0.3m deep, 3.4m across the top and 1m across the bottom. Culverts were modeled where roads and approaches cross the ditches. The proposed central east/west road was modeled as 70% impervious gravel surface with 100% pervious ditches. Based on the design surface, these are V-ditches 0.8m deep and 6m wide at the top.

Offsite flow was not anticipated to be a factor and was not modeled. A plan view outline of the resulting post development model is included in the Appendix as Figure 4. Key input parameters for SWMM analysis along with summaries of the post development computer simulations are included in Appendix B.

# 4.0 Surface Runoff Results

Table A below compares pre and post-development runoff at the individual outflow locations where runoff leaves the site as well as combined runoff at the coulee bottom outflow. Table A shows a decrease in volume at several individual outflow locations (as a result of the development altering the flowpaths) but the overall volume increases as expected. However, it can also be seen that even where volumes increase, post development peak outflows throughout are kept at or below predevelopment rates.

**Table A: Pre/Post Runoff Outflow Comparisons at Coulee Bottom**

| | Peak Development Outflow Rate | | Total Outflow Volume | |
|---|---|---|---|---|
| | **Pre Dev** | **Post Dev** | **Pre Dev** | **Post Dev** |
| Lot 4 South Outflow | 0.110 $m^3$/sec | 0.097 $m^3$/sec | 157 $m^3$ | 131 $m^3$ |
| Lot 4 SW Outflow | 0.162 $m^3$/sec | 0.130 $m^3$/sec | 249 $m^3$ | 196 $m^3$ |
| Municipal Reserve NW Outflow | 0.862 $m^3$/sec | 0.794 $m^3$/sec | 2179 $m^3$ | 2593 $m^3$ |
| Lot 2 NE Outflow | 0.399 $m^3$/sec | 0.372 $m^3$/sec | 885 $m^3$ | 1013 $m^3$ |
| Combined Total Outflow at Coulee Bottom Outflow | 1.249 $m^3$/sec | 1.151 $m^3$/sec | 3062 $m^3$ | 3605 $m^3$ |

Post-development flows are shown graphically in Figures 5 of Appendix A. This is followed by Figure 6 which compares pre and post-development total flows at the coulee bottom outflow and allows a comparison of flow duration.

The culverts as modeled consist of 600mm corrugated metal culverts under the approaches of lots 1 and 4, and twin 600mm culverts under the main approach into the development – as noted above, the County ditch along the west side is poorly defined here and may not be deep enough for 600mm culverts. Also note that the model shows some minor flooding north of this culvert; this ditch should be evaluated and remediated if necessary to allow proper flow.

# 5.0 Conclusion

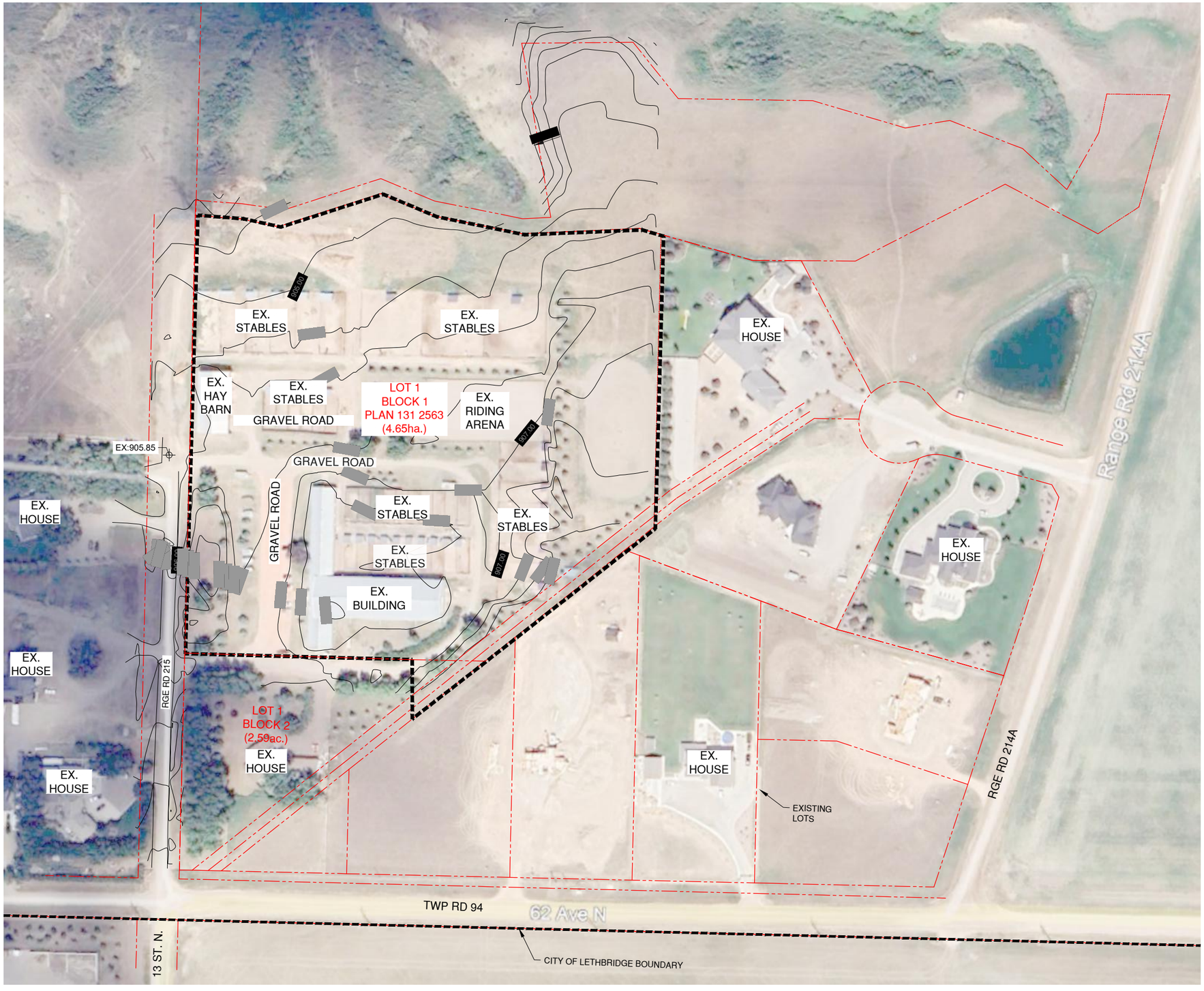
Runoff modeling shows that the proposed development can be designed to compensate for increases in post development runoff rates. Peak flows can be attenuated to below predevelopment levels. These benefits exist in storms below the 100 year storm also.

# APPENDICES

# APPENDIX A-FIGURES

| ISSUE | DRAWING STATUS / REVISION | DATE (YY/MM/DD) | BY |
|---|---|---|---|
| A | FOR REPORT | 24/09/11 | MDO |

| DESIGNED | DRAWN | CHECKED | APPROVED | SCALE AND SHEET SIZE |
|---|---|---|---|---|
| MH | MDO | MH | MH | 1:2,000 - 11x17 |




0 20 40 60 80 100 200

SCALE=1:2,000

**LEGEND**

- PROPOSED DEVELOPMENT BOUNDARY
- EXISTING GROUND CONTOURS - 0.5m INTERVALS
- EXISTING LOTS

NOTE:

- ALL DIMENSIONS SHOWN ARE IN METERS (m) UNLESS OTHERWISE NOTED
- AIR PHOTO IMAGE IS SHOWN FOR REFERENCE ONLY AND MAY NOT REFLECT CURRENT SITE CONDITIONS
- SCALE AND ROTATION ARE APPROXIMATE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CLIENT: TYLER HIRSCHE

PROJECT: PROPOSED 4 LOT SUBDIVISION
LOT 1 BLOCK 1 PLAN 131 2563

DRAWING: EXISTING LOTS & TOPOGRAPHY

| PROJECT NUMBER | SHEET NUMBER |
|---|---|
| 21-062 | FIG. 1 |

KEYNOTES:

1. CULVERT 1
L=14.0m S=0.6%
INV IN: 904.94
INV OUT: 904.85

2. CULVERT 2
L=11.0m S=1.0%
INV IN: 905.38
INV OUT: 905.27

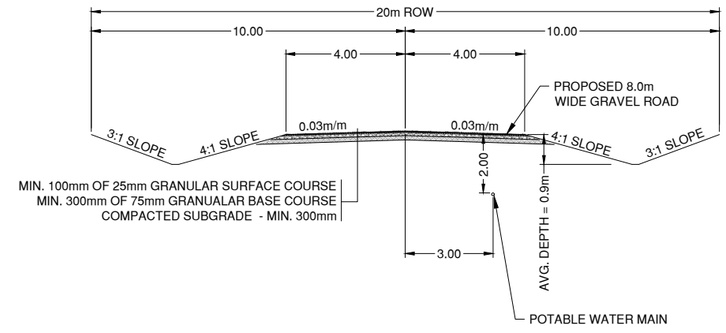
3. CULVERT 3
L=12.0m S=1.0%
INV IN: 905.39
INV OUT: 905.27

4. CULVERT 4
L=22.5m S=1.0%
INV IN: 905.69
INV OUT: 905.47

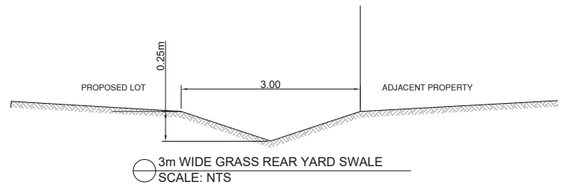
5. SLOPE STABILITY SETBACK LINE AS DETERMINED BY RVARP SETBACK CRITERIA.

6. 1.91ac. AREA NORTH OF SLOPE STABILITY SETBACK TO TOP OF COULEE BANK TO BE DEDICATED AS MUNICIPAL RESERVE.

NOTE:
- HOUSE AND SEPTIC FIELD SIZES & LOCATIONS SHOWN ARE FOR REFERENCE ONLY.
- SEPTIC (SOIL BASED TREATMENT) FIELD SUITABILITY TO BE DETERMINED AS PER ALBERTA PRIVATE SEWAGE SYSTEMS STANDARD OF PRACTICE - DECEMBER 2015 EDITION.




8.0m WIDE GRAVEL ROAD CROSS-SECTION
SCALE: 1:200




3m WIDE GRASS REAR YARD SWALE
SCALE: NTS

NOTE:
- ALL DIMENSIONS SHOWN ARE IN METERS (m) UNLESS OTHERWISE NOTED
- AIR PHOTO IMAGE IS SHOWN FOR REFERENCE ONLY AND MAY NOT REFLECT CURRENT SITE CONDITIONS
- SCALE AND ROTATION ARE APPROXIMATE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CLIENT: TYLER HIRSCHE

PROJECT
# PROPOSED LOT LAYOUT
LOT 1 BLOCK 1 PLAN 131 2563

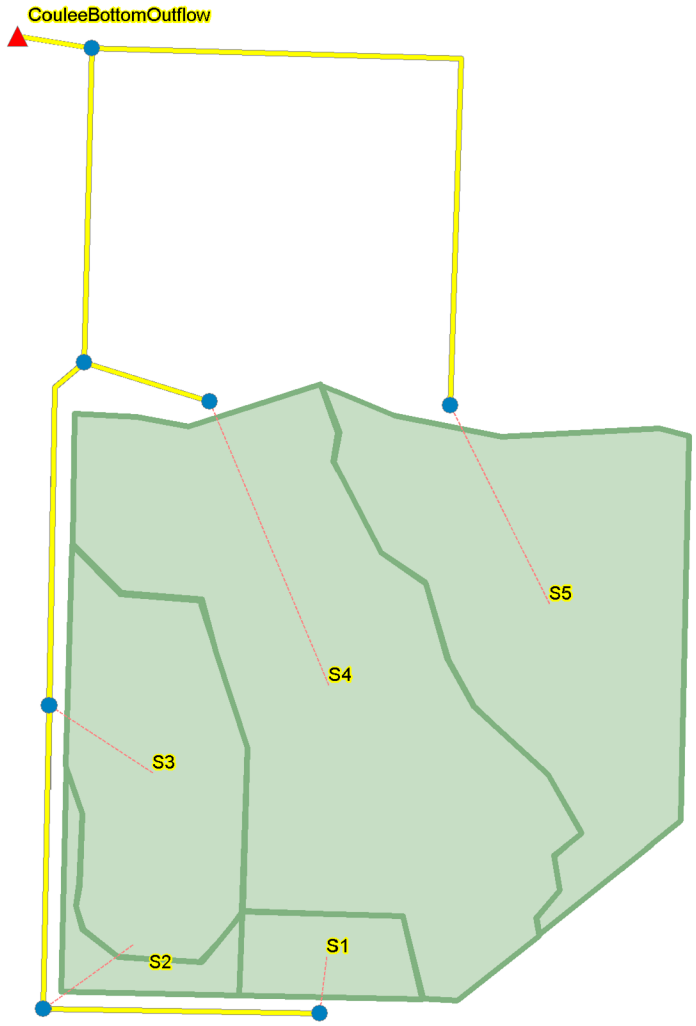
DRAWING
# CONCEPTUAL LOT LAYOUT

PROJECT NUMBER: 21-062

SHEET NUMBER: FIG. 2

# APPENDIX B-SWMM SUMMARIES

Figure 3 - Predevelopment Runoff Model





LEGEND

- Subcatchments
- Conduits
- Outfalls
- Junctions

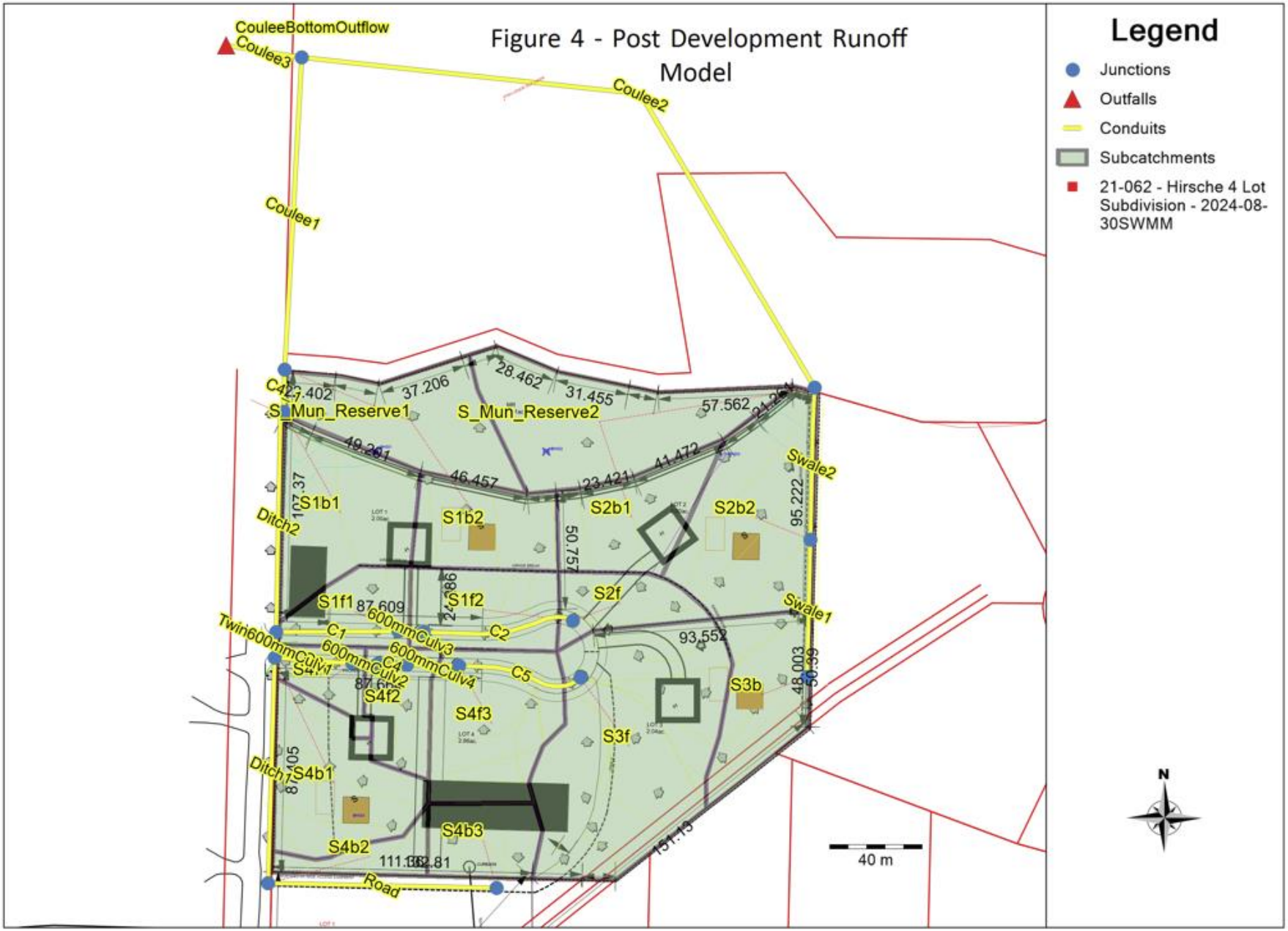


Figure 4 - Post Development Runoff Model
CouleeBottomOutflow
Coulee3
Coulee2
Coulee1
S_Mun_Reserve1
S_Mun_Reserve2
S1b1
S1b2
S2b1
S2b2
S1f1
S1f2
S2f
S3b
S3f
S4f1
S4f2
S4f3
S4b1
S4b2
S4b3
Ditch1
Ditch2
Swale1
Swale2
Twin600mmCulv1
600mmCulv2
600mmCulv3
600mmCulv4
C1
C2
C4
C5
Road
37.206
28.462
31.455
57.562
49.261
46.457
23.421
41.472
107.37
95.222
50.757
87.609
93.552
48.003
50.39
87.105
111.382
151.15
40 m
N
Legend
Junctions
Outfalls
Conduits
Subcatchments
21-062 - Hirsche 4 Lot Subdivision - 2024-08-30SWMM

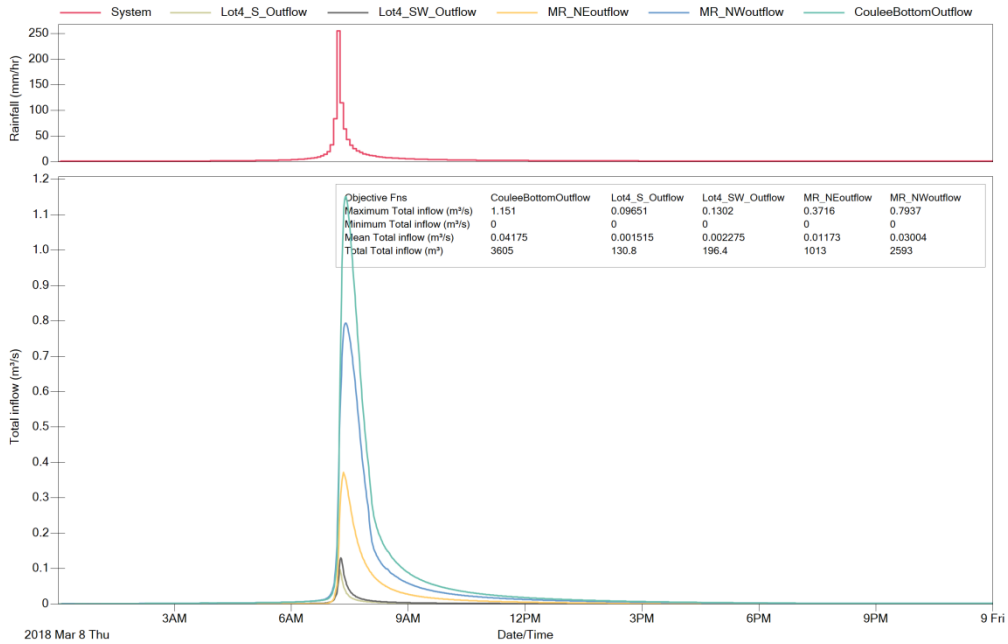



Figure 5 – Design Storm Rainfall (top) with Resulting Runoff at Outflow Locations in Post Development Model

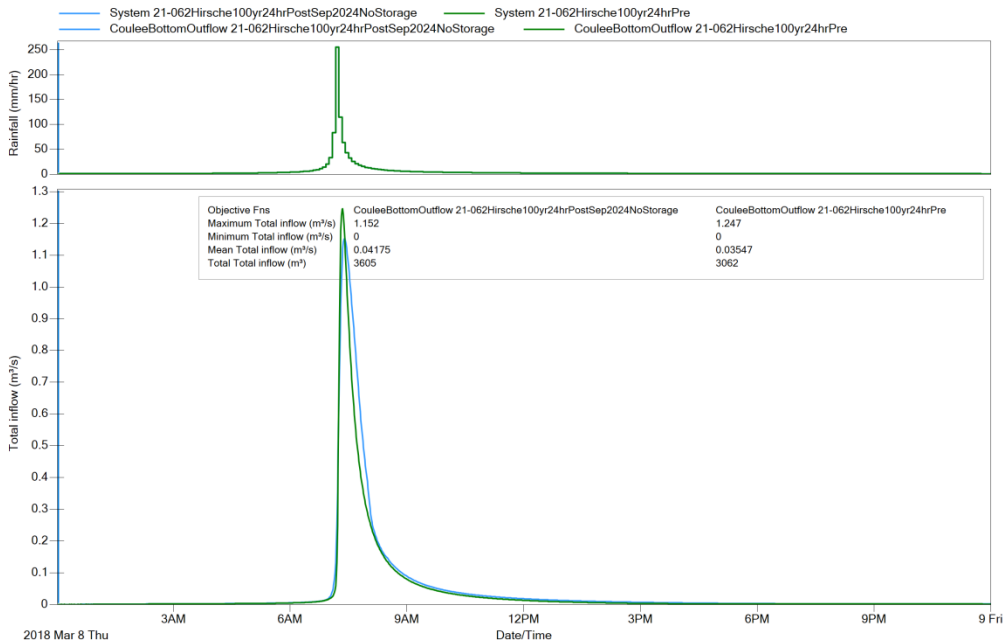



Figure 6 – Design Storm Rainfall Comparing Resulting Pre and Post Development Runoff in Coulee Bottom

```
[TITLE]
21-062 Hirsche Subdivision Post Dev Model - Lot Storage
Allowable Release = 1.249 m3/sec

[OPTIONS]
;;Options             Value
;;------------------- ------------
FLOW_UNITS           CMS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        YES
SKIP_STEADY_STATE    NO

START_DATE           03/08/2018
START_TIME           00:00:00
REPORT_START_DATE    03/08/2018
REPORT_START_TIME    00:00:00
END_DATE             03/09/2018
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         5

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT         0.0
DRY_ONLY         NO
```

[RAINGAGES]

| ;;Name | Rain Type | Time Intrvl | Snow Catch | Data Source |
|---|---|---|---|---|
| 100yr24hr | INTENSITY | 0:05 | 1.0 | TIMESERIES 100yr24hr |

[SUBCATCHMENTS]

| ;;Name | Raingage | Outlet | Total Area | Pcnt. Imperv | Width | Pcnt. Slope | Curb Length | Snow Pack |
|---|---|---|---|---|---|---|---|---|
| S_Mun_Reserve1 | 100yr24hr | MR_NWoutflow | 0.329681 | 0 | 25.814 | 2.19 | 0 | |
| S_Mun_Reserve2 | 100yr24hr | MR_NEoutflow | 0.449419 | 0 | 35.189 | 2.19 | 0 | |
| S1b1 | 100yr24hr | J21 | 0.3452 | 15.5 | 69.04 | 5.9 | 0 | |
| S1b2 | 100yr24hr | S_Mun_Reserve1 | 0.2217 | 7.8 | 63.343 | 5.1 | 0 | |
| S1f1 | 100yr24hr | J9 | 0.1557 | 42.8 | 62.28 | 2.6 | 0 | |
| S1f2 | 100yr24hr | J11 | 0.2182 | 57.7 | 87.28 | 2.7 | 0 | |
| S2b1 | 100yr24hr | S_Mun_Reserve2 | 0.2369 | 9.3 | 67.686 | 5.3 | 0 | |
| S2b2 | 100yr24hr | J25 | 0.4502 | 3.8 | 46.896 | 2.1 | 0 | |
| S2f | 100yr24hr | J11 | 0.1376 | 12.9 | 26.98 | 1.9 | 0 | |
| S3b | 100yr24hr | J7 | 0.2464 | 0 | 41.763 | 1.8 | 0 | |
| S3f | 100yr24hr | J16 | 0.72 | 12.6 | 73.469 | 4.05 | 0 | |
| S4b1 | 100yr24hr | J3 | 0.3255 | 5.3 | 48.582 | 2.6 | 0 | |
| S4b2 | 100yr24hr | Lot4_SW_Outflow | 0.0833 | 15.4 | 19.833 | 2.8 | 0 | |
| S4b3 | 100yr24hr | Lot4_S_Outflow | 0.149 | 40.9 | 59.6 | 2.12 | 0 | |
| S4f1 | 100yr24hr | J20 | 0.0964 | 24 | 30.125 | 1.8 | 0 | |
| S4f2 | 100yr24hr | J19 | 0.1462 | 37.8 | 32.489 | 4.3 | 0 | |
| S4f3 | 100yr24hr | J17 | 0.3349 | 27 | 49.25 | 2.43 | 0 | |

[SUBAREAS]

| ;;Subcatchment | N-Imperv | N-Perv | S-Imperv | S-Perv | PctZero | RouteTo | PctRouted |
|---|---|---|---|---|---|---|---|
| S_Mun_Reserve1 | 0.01 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S_Mun_Reserve2 | 0.01 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S1b1 | 0.01 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S1b2 | 0.01 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S1f1 | 0.03 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S1f2 | 0.03 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S2b1 | 0.01 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S2b2 | 0.01 | 0.15 | 1 | 3 | 25 | OUTLET | |
| S2f | 0.03 | 0.15 | 1 | 3 | 25 | OUTLET | |

```
S3b              0.03       0.15       1          3          25         OUTLET
S3f              0.01       0.15       1          3          25         OUTLET
S4b1             0.03       0.15       1          3          25         OUTLET
S4b2             0.01       0.15       1          3          25         OUTLET
S4b3             0.01       0.15       1          3          25         OUTLET
S4f1             0.03       0.15       1          3          25         OUTLET
S4f2             0.01       0.15       1          3          25         OUTLET
S4f3             0.03       0.15       1          3          25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
S_Mun_Reserve1   292.2      0.5        0.15
S_Mun_Reserve2   292.2      0.5        0.15
S1b1             292.2      0.5        0.15
S1b2             292.2      0.5        0.15
S1f1             292.2      0.5        0.15
S1f2             292.2      0.5        0.15
S2b1             292.2      0.5        0.15
S2b2             292.2      0.5        0.15
S2f              292.2      0.5        0.15
S3b              292.2      0.5        0.15
S3f              292.2      0.5        0.15
S4b1             292.2      0.5        0.15
S4b2             292.2      0.5        0.15
S4b3             292.2      0.5        0.15
S4f1             292.2      0.5        0.15
S4f2             292.2      0.5        0.15
S4f3             292.2      0.5        0.15

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
J_CouleeBottom   883.6      0.3        0          0          100
J10              905.39     0.8        0          0          0
J11              906.536    0.8        0          0          0
J16              906.1      0.8        0          0          0
J17              905.69     0.8        0          0          50
J18              905.47     0.8        0          0          50
J19              905.38     0.8        0          0          50
```

```
J20               905.27     0.8        0          0          50
J21               904.6      0.375      0          0          0
J25               906.6      0.25       0          0          0
J3                904.94     0.8        0          0          50
J7                907.39     0.25       0          0          0
J8                904.85     0.8        0          0          100
J9                905.27     0.8        0          0          0
Lot4_S_Outflow    907.17     0.3        0          0          100
Lot4_SW_Outflow   906.51     0.3        0          0          100
MR_NEoutflow      906.01     0.25       0          0          0
MR_NWoutflow      903.74     0.3        0          0          0

[OUTFALLS]
;;                Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- --------
CouleeBottomOutflow 881.6    NORMAL                      NO

[CONDUITS]
;;                Inlet            Outlet                      Manning    Inlet      Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset     Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ---------
-
600mmCulv2        J19              J20              11         0.01       0          0          0          0
600mmCulv3        J10              J9               12         0.01       0          0          0          0
600mmCulv4        J17              J18              22.5       0.01       0          0          0          0
C1                J9               J8               52.235     0.01       0          0          0          0
C2                J11              J10              65.263     0.01       0          0          0          0
C3                J20              J3               33.184     0.01       0          0          0          0
C4                J18              J19              12.33      0.01       0          0          0          0
C4_1              J21              MR_NWoutflow     19         0.01       0          0          0          0
C5                J16              J17              54.252     0.01       0          0          0          0
Coulee1           MR_NWoutflow     J_CouleeBottom   140        0.01       0          0          0          0
Coulee2           MR_NEoutflow     J_CouleeBottom   220        0.01       0          0          0          0
Coulee3           J_CouleeBottom   CouleeBottomOutflow 15      0.01       0          0          0          0
Ditch1            Lot4_SW_Outflow  J3               96.499     0.01       0          0          0          0
Ditch2            J8               J21              94.833     0.01       0          0          0          0
Road              Lot4_S_Outflow   Lot4_SW_Outflow  97.849     0.01       0          0          0          0
Swale1            J7               J25              54         0.01       0          0          0          0
Swale2            J25              MR_NEoutflow     49         0.01       0          0          0          0
Twin600mmCulv1    J3               J8               14         0.01       0          0          0          0
```

```
[XSECTIONS]
;;Link            Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;--------------- ------------ ---------------- ---------- ---------- ---------- ----------
600mmCulv2        CIRCULAR     0.6              0          0          0          1          5
600mmCulv3        CIRCULAR     0.6              0          0          0          1          5
600mmCulv4        CIRCULAR     0.6              0          0          0          1          5
C1                IRREGULAR    .8m_ditch        0          0          0          1
C2                IRREGULAR    .8m_ditch        0          0          0          1
C3                IRREGULAR    .8m_ditch        0          0          0          1
C4                IRREGULAR    .8m_ditch        0          0          0          1
C4_1              IRREGULAR    .3m_ditch        0          0          0          1
C5                IRREGULAR    .8m_ditch        0          0          0          1
Coulee1           IRREGULAR    .3m_ditch        0          0          0          1
Coulee2           IRREGULAR    0.2m_swale       0          0          0          1
Coulee3           IRREGULAR    .3m_ditch        0          0          0          1
Ditch1            IRREGULAR    .3m_ditch        0          0          0          1
Ditch2            IRREGULAR    .3m_ditch        0          0          0          1
Road              IRREGULAR    .3m_ditch        0          0          0          1
Swale1            IRREGULAR    0.25m_swale      0          0          0          1
Swale2            IRREGULAR    0.25m_swale      0          0          0          1
Twin600mmCulv1    CIRCULAR     0.6              0          0          0          2          5

[TRANSECTS]
;;Transect Data in HEC-2 format
;
NC 0.03     0.03     0.03
X1 .25m_berm         3        0        0        0.0      0.0      0        0        0
GR 0.25     0        0        13       0.25     15
;
NC 0.03     0.03     0.03
X1 .3m_ditch         4        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.3      0        0        1.2      0        2.2      0.3      3.4
;
NC 0.04     0.04     0.04
X1 .8m_ditch         3        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.8      0        0        3        0.8      6
;
NC 0.03     0.03     0.03
X1 0.25m_swale       3        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.25     0        0        1.5      0.25     3
```

```
;
NC 0.03     0.03     0.03
X1 0.2m_swale        4        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.2      0        0        1        0        2        0.2      3
;
NC 0.04     0.04     0.04
X1 RearLotSwale      3        0.0      0.0      0.0      0.0      0.0      0.0      0.0
GR 0.4      0        0        8        0.4      8.6
;
NC 0.04     0.04     0.04
X1 sheetflow         4        0        0        0.0      0.0      0        0        0
GR 0.1      0        0        1        0        9        0.1      10

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate
;;-------------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Berm1            Storage    0          1
Berm1                       0.2        129
Berm1                       0.4        524

Berm2            Storage    0          7
Berm2                       0.2        143
Berm2                       0.4        425

Berm3            Storage    0          6
Berm3                       0.2        82
Berm3                       0.4        161

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
100yr24hr                   0:00       0
100yr24hr                   0:05       0.763
100yr24hr                   0:10       0.771
100yr24hr                   0:15       0.779
100yr24hr                   0:20       0.787
100yr24hr                   0:25       0.796
```

| | | |
|---|---|---|
| 100yr24hr | 0:30 | 0.804 |
| 100yr24hr | 0:35 | 0.813 |
| 100yr24hr | 0:40 | 0.822 |
| 100yr24hr | 0:45 | 0.831 |
| 100yr24hr | 0:50 | 0.841 |
| 100yr24hr | 0:55 | 0.851 |
| 100yr24hr | 1:00 | 0.861 |
| 100yr24hr | 1:05 | 0.871 |
| 100yr24hr | 1:10 | 0.881 |
| 100yr24hr | 1:15 | 0.892 |
| 100yr24hr | 1:20 | 0.903 |
| 100yr24hr | 1:25 | 0.914 |
| 100yr24hr | 1:30 | 0.926 |
| 100yr24hr | 1:35 | 0.938 |
| 100yr24hr | 1:40 | 0.95 |
| 100yr24hr | 1:45 | 0.963 |
| 100yr24hr | 1:50 | 0.976 |
| 100yr24hr | 1:55 | 0.99 |
| 100yr24hr | 2:00 | 1.004 |
| 100yr24hr | 2:05 | 1.018 |
| 100yr24hr | 2:10 | 1.033 |
| 100yr24hr | 2:15 | 1.048 |
| 100yr24hr | 2:20 | 1.064 |
| 100yr24hr | 2:25 | 1.08 |
| 100yr24hr | 2:30 | 1.097 |
| 100yr24hr | 2:35 | 1.114 |
| 100yr24hr | 2:40 | 1.132 |
| 100yr24hr | 2:45 | 1.151 |
| 100yr24hr | 2:50 | 1.17 |
| 100yr24hr | 2:55 | 1.191 |
| 100yr24hr | 3:00 | 1.211 |
| 100yr24hr | 3:05 | 1.233 |
| 100yr24hr | 3:10 | 1.256 |
| 100yr24hr | 3:15 | 1.279 |
| 100yr24hr | 3:20 | 1.304 |
| 100yr24hr | 3:25 | 1.329 |
| 100yr24hr | 3:30 | 1.356 |
| 100yr24hr | 3:35 | 1.384 |
| 100yr24hr | 3:40 | 1.413 |
| 100yr24hr | 3:45 | 1.443 |
| 100yr24hr | 3:50 | 1.475 |

| | | |
|---|---|---|
| 100yr24hr | 3:55 | 1.509 |
| 100yr24hr | 4:00 | 1.544 |
| 100yr24hr | 4:05 | 1.581 |
| 100yr24hr | 4:10 | 1.62 |
| 100yr24hr | 4:15 | 1.661 |
| 100yr24hr | 4:20 | 1.705 |
| 100yr24hr | 4:25 | 1.751 |
| 100yr24hr | 4:30 | 1.8 |
| 100yr24hr | 4:35 | 1.853 |
| 100yr24hr | 4:40 | 1.908 |
| 100yr24hr | 4:45 | 1.967 |
| 100yr24hr | 4:50 | 2.031 |
| 100yr24hr | 4:55 | 2.099 |
| 100yr24hr | 5:00 | 2.172 |
| 100yr24hr | 5:05 | 2.251 |
| 100yr24hr | 5:10 | 2.337 |
| 100yr24hr | 5:15 | 2.43 |
| 100yr24hr | 5:20 | 2.532 |
| 100yr24hr | 5:25 | 2.643 |
| 100yr24hr | 5:30 | 2.765 |
| 100yr24hr | 5:35 | 2.9 |
| 100yr24hr | 5:40 | 3.051 |
| 100yr24hr | 5:45 | 3.219 |
| 100yr24hr | 5:50 | 3.409 |
| 100yr24hr | 5:55 | 3.625 |
| 100yr24hr | 6:00 | 3.873 |
| 100yr24hr | 6:05 | 4.159 |
| 100yr24hr | 6:10 | 4.496 |
| 100yr24hr | 6:15 | 4.897 |
| 100yr24hr | 6:20 | 5.383 |
| 100yr24hr | 6:25 | 5.985 |
| 100yr24hr | 6:30 | 6.748 |
| 100yr24hr | 6:35 | 7.75 |
| 100yr24hr | 6:40 | 9.123 |
| 100yr24hr | 6:45 | 11.117 |
| 100yr24hr | 6:50 | 14.266 |
| 100yr24hr | 6:55 | 19.931 |
| 100yr24hr | 7:00 | 32.779 |
| 100yr24hr | 7:05 | 83.515 |
| 100yr24hr | 7:10 | 255.206 |
| 100yr24hr | 7:15 | 114.934 |

| | | |
|---|---|---|
| 100yr24hr | 7:20 | 63.946 |
| 100yr24hr | 7:25 | 43.017 |
| 100yr24hr | 7:30 | 31.998 |
| 100yr24hr | 7:35 | 25.321 |
| 100yr24hr | 7:40 | 20.889 |
| 100yr24hr | 7:45 | 17.754 |
| 100yr24hr | 7:50 | 15.429 |
| 100yr24hr | 7:55 | 13.641 |
| 100yr24hr | 8:00 | 12.226 |
| 100yr24hr | 8:05 | 11.08 |
| 100yr24hr | 8:10 | 10.134 |
| 100yr24hr | 8:15 | 9.34 |
| 100yr24hr | 8:20 | 8.665 |
| 100yr24hr | 8:25 | 8.083 |
| 100yr24hr | 8:30 | 7.577 |
| 100yr24hr | 8:35 | 7.133 |
| 100yr24hr | 8:40 | 6.74 |
| 100yr24hr | 8:45 | 6.39 |
| 100yr24hr | 8:50 | 6.077 |
| 100yr24hr | 8:55 | 5.794 |
| 100yr24hr | 9:00 | 5.538 |
| 100yr24hr | 9:05 | 5.304 |
| 100yr24hr | 9:10 | 5.091 |
| 100yr24hr | 9:15 | 4.895 |
| 100yr24hr | 9:20 | 4.714 |
| 100yr24hr | 9:25 | 4.547 |
| 100yr24hr | 9:30 | 4.392 |
| 100yr24hr | 9:35 | 4.248 |
| 100yr24hr | 9:40 | 4.114 |
| 100yr24hr | 9:45 | 3.989 |
| 100yr24hr | 9:50 | 3.871 |
| 100yr24hr | 9:55 | 3.761 |
| 100yr24hr | 10:00 | 3.657 |
| 100yr24hr | 10:05 | 3.559 |
| 100yr24hr | 10:10 | 3.467 |
| 100yr24hr | 10:15 | 3.38 |
| 100yr24hr | 10:20 | 3.297 |
| 100yr24hr | 10:25 | 3.219 |
| 100yr24hr | 10:30 | 3.144 |
| 100yr24hr | 10:35 | 3.073 |
| 100yr24hr | 10:40 | 3.006 |

| | | |
|---|---|---|
| 100yr24hr | 10:45 | 2.941 |
| 100yr24hr | 10:50 | 2.88 |
| 100yr24hr | 10:55 | 2.821 |
| 100yr24hr | 11:00 | 2.765 |
| 100yr24hr | 11:05 | 2.711 |
| 100yr24hr | 11:10 | 2.659 |
| 100yr24hr | 11:15 | 2.61 |
| 100yr24hr | 11:20 | 2.562 |
| 100yr24hr | 11:25 | 2.516 |
| 100yr24hr | 11:30 | 2.472 |
| 100yr24hr | 11:35 | 2.43 |
| 100yr24hr | 11:40 | 2.389 |
| 100yr24hr | 11:45 | 2.35 |
| 100yr24hr | 11:50 | 2.312 |
| 100yr24hr | 11:55 | 2.275 |
| 100yr24hr | 12:00 | 2.24 |
| 100yr24hr | 12:05 | 2.205 |
| 100yr24hr | 12:10 | 2.172 |
| 100yr24hr | 12:15 | 2.14 |
| 100yr24hr | 12:20 | 2.109 |
| 100yr24hr | 12:25 | 2.079 |
| 100yr24hr | 12:30 | 2.05 |
| 100yr24hr | 12:35 | 2.021 |
| 100yr24hr | 12:40 | 1.994 |
| 100yr24hr | 12:45 | 1.967 |
| 100yr24hr | 12:50 | 1.941 |
| 100yr24hr | 12:55 | 1.916 |
| 100yr24hr | 13:00 | 1.892 |
| 100yr24hr | 13:05 | 1.868 |
| 100yr24hr | 13:10 | 1.845 |
| 100yr24hr | 13:15 | 1.822 |
| 100yr24hr | 13:20 | 1.8 |
| 100yr24hr | 13:25 | 1.779 |
| 100yr24hr | 13:30 | 1.758 |
| 100yr24hr | 13:35 | 1.738 |
| 100yr24hr | 13:40 | 1.718 |
| 100yr24hr | 13:45 | 1.699 |
| 100yr24hr | 13:50 | 1.68 |
| 100yr24hr | 13:55 | 1.661 |
| 100yr24hr | 14:00 | 1.643 |
| 100yr24hr | 14:05 | 1.626 |

| | | |
|---|---|---|
| 100yr24hr | 14:10 | 1.609 |
| 100yr24hr | 14:15 | 1.592 |
| 100yr24hr | 14:20 | 1.576 |
| 100yr24hr | 14:25 | 1.56 |
| 100yr24hr | 14:30 | 1.544 |
| 100yr24hr | 14:35 | 1.529 |
| 100yr24hr | 14:40 | 1.514 |
| 100yr24hr | 14:45 | 1.499 |
| 100yr24hr | 14:50 | 1.485 |
| 100yr24hr | 14:55 | 1.47 |
| 100yr24hr | 15:00 | 1.457 |
| 100yr24hr | 15:05 | 1.443 |
| 100yr24hr | 15:10 | 1.43 |
| 100yr24hr | 15:15 | 1.417 |
| 100yr24hr | 15:20 | 1.404 |
| 100yr24hr | 15:25 | 1.392 |
| 100yr24hr | 15:30 | 1.38 |
| 100yr24hr | 15:35 | 1.368 |
| 100yr24hr | 15:40 | 1.356 |
| 100yr24hr | 15:45 | 1.344 |
| 100yr24hr | 15:50 | 1.333 |
| 100yr24hr | 15:55 | 1.322 |
| 100yr24hr | 16:00 | 1.311 |
| 100yr24hr | 16:05 | 1.3 |
| 100yr24hr | 16:10 | 1.289 |
| 100yr24hr | 16:15 | 1.279 |
| 100yr24hr | 16:20 | 1.269 |
| 100yr24hr | 16:25 | 1.259 |
| 100yr24hr | 16:30 | 1.249 |
| 100yr24hr | 16:35 | 1.239 |
| 100yr24hr | 16:40 | 1.23 |
| 100yr24hr | 16:45 | 1.221 |
| 100yr24hr | 16:50 | 1.211 |
| 100yr24hr | 16:55 | 1.202 |
| 100yr24hr | 17:00 | 1.193 |
| 100yr24hr | 17:05 | 1.185 |
| 100yr24hr | 17:10 | 1.176 |
| 100yr24hr | 17:15 | 1.168 |
| 100yr24hr | 17:20 | 1.159 |
| 100yr24hr | 17:25 | 1.151 |
| 100yr24hr | 17:30 | 1.143 |

| | | |
|---|---|---|
| 100yr24hr | 17:35 | 1.135 |
| 100yr24hr | 17:40 | 1.127 |
| 100yr24hr | 17:45 | 1.119 |
| 100yr24hr | 17:50 | 1.112 |
| 100yr24hr | 17:55 | 1.104 |
| 100yr24hr | 18:00 | 1.097 |
| 100yr24hr | 18:05 | 1.089 |
| 100yr24hr | 18:10 | 1.082 |
| 100yr24hr | 18:15 | 1.075 |
| 100yr24hr | 18:20 | 1.068 |
| 100yr24hr | 18:25 | 1.061 |
| 100yr24hr | 18:30 | 1.055 |
| 100yr24hr | 18:35 | 1.048 |
| 100yr24hr | 18:40 | 1.041 |
| 100yr24hr | 18:45 | 1.035 |
| 100yr24hr | 18:50 | 1.028 |
| 100yr24hr | 18:55 | 1.022 |
| 100yr24hr | 19:00 | 1.015 |
| 100yr24hr | 19:05 | 1.01 |
| 100yr24hr | 19:10 | 1.004 |
| 100yr24hr | 19:15 | 0.998 |
| 100yr24hr | 19:20 | 0.992 |
| 100yr24hr | 19:25 | 0.986 |
| 100yr24hr | 19:30 | 0.98 |
| 100yr24hr | 19:35 | 0.974 |
| 100yr24hr | 19:40 | 0.969 |
| 100yr24hr | 19:45 | 0.963 |
| 100yr24hr | 19:50 | 0.958 |
| 100yr24hr | 19:55 | 0.952 |
| 100yr24hr | 20:00 | 0.947 |
| 100yr24hr | 20:05 | 0.942 |
| 100yr24hr | 20:10 | 0.936 |
| 100yr24hr | 20:15 | 0.931 |
| 100yr24hr | 20:20 | 0.926 |
| 100yr24hr | 20:25 | 0.921 |
| 100yr24hr | 20:30 | 0.916 |
| 100yr24hr | 20:35 | 0.911 |
| 100yr24hr | 20:40 | 0.908 |
| 100yr24hr | 20:45 | 0.901 |
| 100yr24hr | 20:50 | 0.897 |
| 100yr24hr | 20:55 | 0.892 |

```
100yr24hr                   21:00      0.887
100yr24hr                   21:05      0.883
100yr24hr                   21:10      0.878
100yr24hr                   21:15      0.874
100yr24hr                   21:20      0.869
100yr24hr                   21:25      0.865
100yr24hr                   21:30      0.861
100yr24hr                   21:35      0.856
100yr24hr                   21:40      0.852
100yr24hr                   21:45      0.848
100yr24hr                   21:50      0.844
100yr24hr                   21:55      0.84
100yr24hr                   22:00      0.835
100yr24hr                   22:05      0.831
100yr24hr                   22:10      0.827
100yr24hr                   22:15      0.823
100yr24hr                   22:20      0.82
100yr24hr                   22:25      0.816
100yr24hr                   22:30      0.812
100yr24hr                   22:35      0.808
100yr24hr                   22:40      0.804
100yr24hr                   22:45      0.801
100yr24hr                   22:50      0.797
100yr24hr                   22:55      0.793
100yr24hr                   23:00      0.79
100yr24hr                   23:05      0.786
100yr24hr                   23:10      0.783
100yr24hr                   23:15      0.779
100yr24hr                   23:20      0.776
100yr24hr                   23:25      0.772
100yr24hr                   23:30      0.769
100yr24hr                   23:35      0.766
100yr24hr                   23:40      0.762
100yr24hr                   23:45      0.759
100yr24hr                   23:50      0.756
100yr24hr                   23:55      0.752
100yr24hr                   24:00      0.749

[REPORT]
;;Reporting Options
INPUT      NO
```

```
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       84824.1623       5513927.9699     85113.7417       5514336.2481
UNITS            Meters

[COORDINATES]
;;Node           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
J_CouleeBottom   84879.761        5514302.706
J10              84931.924        5514056.256
J11              84995.913        5514061.122
J16              84999.181        5514036.633
J17              84947.206        5514041.843
J18              84924.825        5514042.15
J19              84912.482        5514042.588
J20              84901.365        5514042.806
J21              84872.048        5514150.65
J25              85097.683        5514095.809
J3               84868.209        5514045.16
J7               85096.369        5514036.89
J8               84868.833        5514056.101
J9               84921.155        5514056.525
Lot4_S_Outflow   84963.332        5513946.528
Lot4_SW_Outflow  84865.336        5513948.538
MR_NEoutflow     85099.587        5514161.01
MR_NWoutflow     84872.466        5514168.862
CouleeBottomOutflow 84847.325        5514307.69

[VERTICES]
;;Link           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
C2               84992.422        5514062.463
C2               84988.834        5514062.762
C2               84984.707        5514062.164
C2               84979.863        5514060.13
```

```
C2               84968.5          5514056.303
C2               84957.137        5514055.466
C5               84997.718        5514035.475
C5               84995.725        5514034.287
C5               84992.908        5514033.304
C5               84990.568        5514033.038
C5               84987.339        5514033.038
C5               84984.169        5514033.696
C5               84977.83         5514036.627
C5               84970.653        5514039.557
C5               84962.579        5514041.172
Coulee2          85024.751        5514286.946
Ditch2           84870.481        5514148.021
Swale2           85098.799        5514144.352

[POLYGONS]
;;Subcatchment   X-Coord          Y-Coord
;;-------------- ---------------- ----------------
S_Mun_Reserve1   84955.018        5514160.111
S_Mun_Reserve1   84976.43         5514115.464
S_Mun_Reserve1   84976.08         5514115.427
S_Mun_Reserve1   84930.664        5514125.115
S_Mun_Reserve1   84872.8          5514148.794
S_Mun_Reserve1   84873.456        5514167.971
S_Mun_Reserve1   84896.49         5514165.835
S_Mun_Reserve1   84913.084        5514162.709
S_Mun_Reserve1   84951.548        5514175.074
S_Mun_Reserve1   84955.018        5514160.111
S_Mun_Reserve2   84955.018        5514160.111
S_Mun_Reserve2   84951.548        5514175.074
S_Mun_Reserve2   84963.196        5514178.818
S_Mun_Reserve2   84989.833        5514167.751
S_Mun_Reserve2   85032.585        5514159.008
S_Mun_Reserve2   85090.151        5514161.602
S_Mun_Reserve2   85060.905        5514139.133
S_Mun_Reserve2   85021.782        5514122.75
S_Mun_Reserve2   84999.615        5514117.922
S_Mun_Reserve2   84976.43         5514115.464
S_Mun_Reserve2   84955.018        5514160.111
S1b1             84930.674        5514125.113
S1b1             84926.546        5514083.996
```

| | | |
|---|---|---|
| S1b1 | 84904.523 | 5514084.615 |
| S1b1 | 84889.878 | 5514075.449 |
| S1b1 | 84870.287 | 5514060.641 |
| S1b1 | 84871.146 | 5514100.433 |
| S1b1 | 84872.8 | 5514148.794 |
| S1b1 | 84930.664 | 5514125.115 |
| S1b1 | 84930.674 | 5514125.113 |
| S1b2 | 84926.546 | 5514083.996 |
| S1b2 | 84930.674 | 5514125.113 |
| S1b2 | 84976.08 | 5514115.427 |
| S1b2 | 84988.959 | 5514116.792 |
| S1b2 | 84989.768 | 5514082.221 |
| S1b2 | 84926.546 | 5514083.996 |
| S1f1 | 84926.534 | 5514083.997 |
| S1f1 | 84925.76 | 5514049.307 |
| S1f1 | 84869.333 | 5514050.701 |
| S1f1 | 84870.287 | 5514060.641 |
| S1f1 | 84889.878 | 5514075.449 |
| S1f1 | 84904.523 | 5514084.615 |
| S1f1 | 84926.534 | 5514083.997 |
| S1f2 | 84925.76 | 5514049.307 |
| S1f2 | 84926.534 | 5514083.997 |
| S1f2 | 84989.767 | 5514082.221 |
| S1f2 | 84990.176 | 5514065.732 |
| S1f2 | 84989.069 | 5514047.807 |
| S1f2 | 84925.76 | 5514049.307 |
| S2b1 | 85045.094 | 5514103.099 |
| S2b1 | 85033.76 | 5514079.569 |
| S2b1 | 85028.199 | 5514081.304 |
| S2b1 | 84991.111 | 5514082.183 |
| S2b1 | 84989.768 | 5514082.221 |
| S2b1 | 84988.959 | 5514116.792 |
| S2b1 | 84999.615 | 5514117.922 |
| S2b1 | 85021.782 | 5514122.75 |
| S2b1 | 85060.905 | 5514139.133 |
| S2b1 | 85061.298 | 5514139.434 |
| S2b1 | 85045.094 | 5514103.099 |
| S2b2 | 85045.094 | 5514103.099 |
| S2b2 | 85061.298 | 5514139.434 |
| S2b2 | 85090.151 | 5514161.602 |
| S2b2 | 85090.606 | 5514161.622 |

| | | |
|---|---|---|
| S2b2 | 85100.579 | 5514158.939 |
| S2b2 | 85098.365 | 5514065.781 |
| S2b2 | 85056.372 | 5514061.727 |
| S2b2 | 85052.359 | 5514066.585 |
| S2b2 | 85043.091 | 5514074.756 |
| S2b2 | 85036.318 | 5514078.772 |
| S2b2 | 85033.76 | 5514079.569 |
| S2b2 | 85045.094 | 5514103.099 |
| S2f | 84990.176 | 5514065.732 |
| S2f | 84989.767 | 5514082.221 |
| S2f | 85028.199 | 5514081.304 |
| S2f | 85036.318 | 5514078.772 |
| S2f | 85043.091 | 5514074.756 |
| S2f | 85052.359 | 5514066.585 |
| S2f | 85056.372 | 5514061.727 |
| S2f | 85004.61 | 5514056.87 |
| S2f | 84989.069 | 5514047.807 |
| S2f | 84990.176 | 5514065.732 |
| S3b | 85063.701 | 5514038.823 |
| S3b | 85064.336 | 5514042.45 |
| S3b | 85062.517 | 5514048.971 |
| S3b | 85060.394 | 5514054.885 |
| S3b | 85057.968 | 5514058.524 |
| S3b | 85056.372 | 5514061.727 |
| S3b | 85098.365 | 5514065.781 |
| S3b | 85097.224 | 5514015.448 |
| S3b | 85067.222 | 5513991.385 |
| S3b | 85053.094 | 5513980.314 |
| S3b | 85052.976 | 5513993.705 |
| S3b | 85058.846 | 5514011.598 |
| S3b | 85063.701 | 5514038.823 |
| S3f | 85053.094 | 5513980.314 |
| S3f | 85014.311 | 5513949.924 |
| S3f | 84978.385 | 5513950.237 |
| S3f | 84982.935 | 5513971.057 |
| S3f | 84977.13 | 5513991.353 |
| S3f | 84978.623 | 5513996.214 |
| S3f | 84983.232 | 5514007.38 |
| S3f | 84992.678 | 5514016.714 |
| S3f | 84991.999 | 5514035.947 |
| S3f | 84989.069 | 5514047.807 |

| | | |
|---|---|---|
| S3f | 85004.61 | 5514056.87 |
| S3f | 85056.372 | 5514061.727 |
| S3f | 85057.968 | 5514058.524 |
| S3f | 85060.394 | 5514054.885 |
| S3f | 85062.517 | 5514048.971 |
| S3f | 85064.336 | 5514042.45 |
| S3f | 85063.701 | 5514038.823 |
| S3f | 85058.846 | 5514011.598 |
| S3f | 85052.976 | 5513993.705 |
| S3f | 85053.094 | 5513980.314 |
| S4b1 | 84901.09 | 5514010.737 |
| S4b1 | 84909.675 | 5514010.635 |
| S4b1 | 84909.674 | 5514010.596 |
| S4b1 | 84909.45 | 5514001.927 |
| S4b1 | 84909.417 | 5514001.116 |
| S4b1 | 84934.271 | 5513992.513 |
| S4b1 | 84934.077 | 5513982.621 |
| S4b1 | 84923.171 | 5513968.576 |
| S4b1 | 84903.067 | 5513964.949 |
| S4b1 | 84892.247 | 5513959.687 |
| S4b1 | 84885.684 | 5513958.738 |
| S4b1 | 84867.471 | 5513962.279 |
| S4b1 | 84869.034 | 5514036.488 |
| S4b1 | 84901.173 | 5514019.739 |
| S4b1 | 84901.09 | 5514010.737 |
| S4b2 | 84934.077 | 5513982.621 |
| S4b2 | 84933.516 | 5513951.453 |
| S4b2 | 84867.016 | 5513953.239 |
| S4b2 | 84867.471 | 5513962.279 |
| S4b2 | 84885.684 | 5513958.738 |
| S4b2 | 84892.247 | 5513959.687 |
| S4b2 | 84903.067 | 5513964.949 |
| S4b2 | 84923.171 | 5513968.576 |
| S4b2 | 84934.077 | 5513982.621 |
| S4b3 | 84933.516 | 5513951.453 |
| S4b3 | 84934.077 | 5513982.621 |
| S4b3 | 84979.583 | 5513982.775 |
| S4b3 | 84982.935 | 5513971.057 |
| S4b3 | 84978.385 | 5513950.237 |
| S4b3 | 84933.516 | 5513951.453 |
| S4f1 | 84901.173 | 5514019.739 |

```
S4f1             84869.034        5514036.488
S4f1             84869.333        5514050.701
S4f1             84907.098        5514049.719
S4f1             84906.439        5514020.366
S4f1             84909.935        5514020.153
S4f1             84909.675        5514010.635
S4f1             84901.09         5514010.737
S4f1             84901.173        5514019.739
S4f2             84907.098        5514049.719
S4f2             84941.334        5514048.962
S4f2             84935.122        5514035.938
S4f2             84934.271        5513992.513
S4f2             84909.417        5514001.116
S4f2             84909.935        5514020.153
S4f2             84906.439        5514020.366
S4f2             84907.098        5514049.719
S4f3             84977.13         5513991.353
S4f3             84979.583        5513982.775
S4f3             84934.077        5513982.621
S4f3             84935.122        5514035.938
S4f3             84941.334        5514048.962
S4f3             84989.069        5514047.807
S4f3             84991.999        5514035.947
S4f3             84992.678        5514016.714
S4f3             84983.232        5514007.38
S4f3             84978.623        5513996.214
S4f3             84977.13         5513991.353

[SYMBOLS]
;;Gage           X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

```
[TITLE]
21-062 Hirsche Subdivision Predev Model


[OPTIONS]
FLOW_UNITS           CMS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         DYNWAVE
START_DATE           3/8/2018
START_TIME           00:00
REPORT_START_DATE    3/8/2018
REPORT_START_TIME    00:00
END_DATE             3/9/2018
END_TIME             00:00
SWEEP_START          1/1
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:01:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         5
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type          Parameters
;;------------- ----------
CONSTANT     0.0
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
100yr24hr        INTENSITY 0:05   1.0    TIMESERIES 100yr24hr

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.            Pcnt.    Curb     Snow
```

```
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
S1               100yr24hr        Lot4_S_Outflow   0.1973   38.4     54.806   2        0
S3               100yr24hr        J3               0.8122   28.7     79.627   2        0
S5               100yr24hr        MR_NEoutflow     1.45     1.5      78.804   2        0
S4               100yr24hr        J5               2.051    9.9      69.291   2        0
S2               100yr24hr        Lot4_SW_Outflow  0.1413   8.6      39.25    2        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
S1               0.01       0.15       1          10         25         OUTLET
S3               0.03       0.15       1          10         25         OUTLET
S5               0.01       0.05       1          10         25         OUTLET
S4               0.01       0.05       1          10         25         OUTLET
S2               0.03       0.15       1          10         25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
S1               292.2      0.5        0.25
S3               292.2      0.5        0.25
S5               292.2      0.5        0.25
S4               292.2      0.5        0.25
S2               292.2      0.5        0.25

[JUNCTIONS]
;;               Invert     Max.       Init.      Surcharge  Ponded
;;Name           Elev.      Depth      Depth      Depth      Area
;;-------------- ---------- ---------- ---------- ---------- ----------
MR_NEoutflow     904.56     0.3        0          0          100
J3               905.58     0.3        0          0          0
Lot4_S_Outflow   907.17     0.3        0          0          100
MR_NWoutflow     902.72     0.3        0          0          100
Lot4_SW_Outflow  906.51     0.3        0          0          100
J_CouleeBottom   883.6      0.3        0          0          100
J5               904.35     0.1        0          0          0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
CouleeBottomOutflow 881.6      NORMAL                      NO

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet     Init.      Max.
```

```
;;Name           Node             Node             Length     N          Offset     Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
Berm_4           MR_NEoutflow     J_CouleeBottom   220        0.01       0          0          0          0
C1               J3               MR_NWoutflow     126        0.01       0          0          0          0
C2               Lot4_S_Outflow   Lot4_SW_Outflow  99         0.01       0          0          0          0
C3               Lot4_SW_Outflow  J3               112        0.01       0          0          0          0
C4               MR_NWoutflow     J_CouleeBottom   140        0.01       0          0          0          0
C5               J_CouleeBottom   CouleeBottomOutflow 15         0.01       0          0          0          0
C6               J5               MR_NWoutflow     60         0.01       0          0.19       0          0

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
Berm_4           IRREGULAR    .2m_swale        0          0          0          1
C1               IRREGULAR    0.3m_ditch       0          0          0          1
C2               IRREGULAR    0.3m_ditch       0          0          0          1
C3               IRREGULAR    0.3m_ditch       0          0          0          1
C4               IRREGULAR    0.3m_ditch       0          0          0          1
C5               IRREGULAR    0.3m_ditch       0          0          0          1
C6               IRREGULAR    sheetflow        0          0          0          1

[TRANSECTS]

NC 0.03     0.03     0.03
X1 .25m_berm        3        0        0        0.0       0.0       0        0        0
GR 0.25     0        0        13       0.25     15

NC 0.03     0.03     0.03
X1 .2m_swale        4        0.0      0.0      0.0       0.0       0.0      0.0      0.0
GR 0.2      0        0        1        0        2        0.2      3

NC 0.04     0.04     0.04
X1 sheetflow        4        0        0        0.0       0.0       0        0        0
GR 0.1      0        0        1        0        9        0.1      10

NC 0.03     0.03     0.03
X1 0.3m_ditch       4        0.0      0.0      0.0       0.0       0.0      0.0      0.0
GR 0.3      0        0        1.2      0        2.2      0.3      3.4

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate
;;-------------- ---------- ---------- ---------- ----------

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
```

| | | |
|---|---|---|
| 100yr24hr | 0:00 | 0 |
| 100yr24hr | 0:05 | 0.763 |
| 100yr24hr | 0:10 | 0.771 |
| 100yr24hr | 0:15 | 0.779 |
| 100yr24hr | 0:20 | 0.787 |
| 100yr24hr | 0:25 | 0.796 |
| 100yr24hr | 0:30 | 0.804 |
| 100yr24hr | 0:35 | 0.813 |
| 100yr24hr | 0:40 | 0.822 |
| 100yr24hr | 0:45 | 0.831 |
| 100yr24hr | 0:50 | 0.841 |
| 100yr24hr | 0:55 | 0.851 |
| 100yr24hr | 1:00 | 0.861 |
| 100yr24hr | 1:05 | 0.871 |
| 100yr24hr | 1:10 | 0.881 |
| 100yr24hr | 1:15 | 0.892 |
| 100yr24hr | 1:20 | 0.903 |
| 100yr24hr | 1:25 | 0.914 |
| 100yr24hr | 1:30 | 0.926 |
| 100yr24hr | 1:35 | 0.938 |
| 100yr24hr | 1:40 | 0.95 |
| 100yr24hr | 1:45 | 0.963 |
| 100yr24hr | 1:50 | 0.976 |
| 100yr24hr | 1:55 | 0.99 |
| 100yr24hr | 2:00 | 1.004 |
| 100yr24hr | 2:05 | 1.018 |
| 100yr24hr | 2:10 | 1.033 |
| 100yr24hr | 2:15 | 1.048 |
| 100yr24hr | 2:20 | 1.064 |
| 100yr24hr | 2:25 | 1.08 |
| 100yr24hr | 2:30 | 1.097 |
| 100yr24hr | 2:35 | 1.114 |
| 100yr24hr | 2:40 | 1.132 |
| 100yr24hr | 2:45 | 1.151 |
| 100yr24hr | 2:50 | 1.17 |
| 100yr24hr | 2:55 | 1.191 |
| 100yr24hr | 3:00 | 1.211 |
| 100yr24hr | 3:05 | 1.233 |
| 100yr24hr | 3:10 | 1.256 |
| 100yr24hr | 3:15 | 1.279 |
| 100yr24hr | 3:20 | 1.304 |
| 100yr24hr | 3:25 | 1.329 |
| 100yr24hr | 3:30 | 1.356 |
| 100yr24hr | 3:35 | 1.384 |
| 100yr24hr | 3:40 | 1.413 |
| 100yr24hr | 3:45 | 1.443 |

| | | |
|---|---|---|
| 100yr24hr | 3:50 | 1.475 |
| 100yr24hr | 3:55 | 1.509 |
| 100yr24hr | 4:00 | 1.544 |
| 100yr24hr | 4:05 | 1.581 |
| 100yr24hr | 4:10 | 1.62 |
| 100yr24hr | 4:15 | 1.661 |
| 100yr24hr | 4:20 | 1.705 |
| 100yr24hr | 4:25 | 1.751 |
| 100yr24hr | 4:30 | 1.8 |
| 100yr24hr | 4:35 | 1.853 |
| 100yr24hr | 4:40 | 1.908 |
| 100yr24hr | 4:45 | 1.967 |
| 100yr24hr | 4:50 | 2.031 |
| 100yr24hr | 4:55 | 2.099 |
| 100yr24hr | 5:00 | 2.172 |
| 100yr24hr | 5:05 | 2.251 |
| 100yr24hr | 5:10 | 2.337 |
| 100yr24hr | 5:15 | 2.43 |
| 100yr24hr | 5:20 | 2.532 |
| 100yr24hr | 5:25 | 2.643 |
| 100yr24hr | 5:30 | 2.765 |
| 100yr24hr | 5:35 | 2.9 |
| 100yr24hr | 5:40 | 3.051 |
| 100yr24hr | 5:45 | 3.219 |
| 100yr24hr | 5:50 | 3.409 |
| 100yr24hr | 5:55 | 3.625 |
| 100yr24hr | 6:00 | 3.873 |
| 100yr24hr | 6:05 | 4.159 |
| 100yr24hr | 6:10 | 4.496 |
| 100yr24hr | 6:15 | 4.897 |
| 100yr24hr | 6:20 | 5.383 |
| 100yr24hr | 6:25 | 5.985 |
| 100yr24hr | 6:30 | 6.748 |
| 100yr24hr | 6:35 | 7.75 |
| 100yr24hr | 6:40 | 9.123 |
| 100yr24hr | 6:45 | 11.117 |
| 100yr24hr | 6:50 | 14.266 |
| 100yr24hr | 6:55 | 19.931 |
| 100yr24hr | 7:00 | 32.779 |
| 100yr24hr | 7:05 | 83.515 |
| 100yr24hr | 7:10 | 255.206 |
| 100yr24hr | 7:15 | 114.934 |
| 100yr24hr | 7:20 | 63.946 |
| 100yr24hr | 7:25 | 43.017 |
| 100yr24hr | 7:30 | 31.998 |
| 100yr24hr | 7:35 | 25.321 |

| | | |
|---|---|---|
| 100yr24hr | 7:40 | 20.889 |
| 100yr24hr | 7:45 | 17.754 |
| 100yr24hr | 7:50 | 15.429 |
| 100yr24hr | 7:55 | 13.641 |
| 100yr24hr | 8:00 | 12.226 |
| 100yr24hr | 8:05 | 11.08 |
| 100yr24hr | 8:10 | 10.134 |
| 100yr24hr | 8:15 | 9.34 |
| 100yr24hr | 8:20 | 8.665 |
| 100yr24hr | 8:25 | 8.083 |
| 100yr24hr | 8:30 | 7.577 |
| 100yr24hr | 8:35 | 7.133 |
| 100yr24hr | 8:40 | 6.74 |
| 100yr24hr | 8:45 | 6.39 |
| 100yr24hr | 8:50 | 6.077 |
| 100yr24hr | 8:55 | 5.794 |
| 100yr24hr | 9:00 | 5.538 |
| 100yr24hr | 9:05 | 5.304 |
| 100yr24hr | 9:10 | 5.091 |
| 100yr24hr | 9:15 | 4.895 |
| 100yr24hr | 9:20 | 4.714 |
| 100yr24hr | 9:25 | 4.547 |
| 100yr24hr | 9:30 | 4.392 |
| 100yr24hr | 9:35 | 4.248 |
| 100yr24hr | 9:40 | 4.114 |
| 100yr24hr | 9:45 | 3.989 |
| 100yr24hr | 9:50 | 3.871 |
| 100yr24hr | 9:55 | 3.761 |
| 100yr24hr | 10:00 | 3.657 |
| 100yr24hr | 10:05 | 3.559 |
| 100yr24hr | 10:10 | 3.467 |
| 100yr24hr | 10:15 | 3.38 |
| 100yr24hr | 10:20 | 3.297 |
| 100yr24hr | 10:25 | 3.219 |
| 100yr24hr | 10:30 | 3.144 |
| 100yr24hr | 10:35 | 3.073 |
| 100yr24hr | 10:40 | 3.006 |
| 100yr24hr | 10:45 | 2.941 |
| 100yr24hr | 10:50 | 2.88 |
| 100yr24hr | 10:55 | 2.821 |
| 100yr24hr | 11:00 | 2.765 |
| 100yr24hr | 11:05 | 2.711 |
| 100yr24hr | 11:10 | 2.659 |
| 100yr24hr | 11:15 | 2.61 |
| 100yr24hr | 11:20 | 2.562 |
| 100yr24hr | 11:25 | 2.516 |

| | | |
|---|---|---|
| 100yr24hr | 11:30 | 2.472 |
| 100yr24hr | 11:35 | 2.43 |
| 100yr24hr | 11:40 | 2.389 |
| 100yr24hr | 11:45 | 2.35 |
| 100yr24hr | 11:50 | 2.312 |
| 100yr24hr | 11:55 | 2.275 |
| 100yr24hr | 12:00 | 2.24 |
| 100yr24hr | 12:05 | 2.205 |
| 100yr24hr | 12:10 | 2.172 |
| 100yr24hr | 12:15 | 2.14 |
| 100yr24hr | 12:20 | 2.109 |
| 100yr24hr | 12:25 | 2.079 |
| 100yr24hr | 12:30 | 2.05 |
| 100yr24hr | 12:35 | 2.021 |
| 100yr24hr | 12:40 | 1.994 |
| 100yr24hr | 12:45 | 1.967 |
| 100yr24hr | 12:50 | 1.941 |
| 100yr24hr | 12:55 | 1.916 |
| 100yr24hr | 13:00 | 1.892 |
| 100yr24hr | 13:05 | 1.868 |
| 100yr24hr | 13:10 | 1.845 |
| 100yr24hr | 13:15 | 1.822 |
| 100yr24hr | 13:20 | 1.8 |
| 100yr24hr | 13:25 | 1.779 |
| 100yr24hr | 13:30 | 1.758 |
| 100yr24hr | 13:35 | 1.738 |
| 100yr24hr | 13:40 | 1.718 |
| 100yr24hr | 13:45 | 1.699 |
| 100yr24hr | 13:50 | 1.68 |
| 100yr24hr | 13:55 | 1.661 |
| 100yr24hr | 14:00 | 1.643 |
| 100yr24hr | 14:05 | 1.626 |
| 100yr24hr | 14:10 | 1.609 |
| 100yr24hr | 14:15 | 1.592 |
| 100yr24hr | 14:20 | 1.576 |
| 100yr24hr | 14:25 | 1.56 |
| 100yr24hr | 14:30 | 1.544 |
| 100yr24hr | 14:35 | 1.529 |
| 100yr24hr | 14:40 | 1.514 |
| 100yr24hr | 14:45 | 1.499 |
| 100yr24hr | 14:50 | 1.485 |
| 100yr24hr | 14:55 | 1.47 |
| 100yr24hr | 15:00 | 1.457 |
| 100yr24hr | 15:05 | 1.443 |
| 100yr24hr | 15:10 | 1.43 |
| 100yr24hr | 15:15 | 1.417 |

| | | |
|---|---|---|
| 100yr24hr | 15:20 | 1.404 |
| 100yr24hr | 15:25 | 1.392 |
| 100yr24hr | 15:30 | 1.38 |
| 100yr24hr | 15:35 | 1.368 |
| 100yr24hr | 15:40 | 1.356 |
| 100yr24hr | 15:45 | 1.344 |
| 100yr24hr | 15:50 | 1.333 |
| 100yr24hr | 15:55 | 1.322 |
| 100yr24hr | 16:00 | 1.311 |
| 100yr24hr | 16:05 | 1.3 |
| 100yr24hr | 16:10 | 1.289 |
| 100yr24hr | 16:15 | 1.279 |
| 100yr24hr | 16:20 | 1.269 |
| 100yr24hr | 16:25 | 1.259 |
| 100yr24hr | 16:30 | 1.249 |
| 100yr24hr | 16:35 | 1.239 |
| 100yr24hr | 16:40 | 1.23 |
| 100yr24hr | 16:45 | 1.221 |
| 100yr24hr | 16:50 | 1.211 |
| 100yr24hr | 16:55 | 1.202 |
| 100yr24hr | 17:00 | 1.193 |
| 100yr24hr | 17:05 | 1.185 |
| 100yr24hr | 17:10 | 1.176 |
| 100yr24hr | 17:15 | 1.168 |
| 100yr24hr | 17:20 | 1.159 |
| 100yr24hr | 17:25 | 1.151 |
| 100yr24hr | 17:30 | 1.143 |
| 100yr24hr | 17:35 | 1.135 |
| 100yr24hr | 17:40 | 1.127 |
| 100yr24hr | 17:45 | 1.119 |
| 100yr24hr | 17:50 | 1.112 |
| 100yr24hr | 17:55 | 1.104 |
| 100yr24hr | 18:00 | 1.097 |
| 100yr24hr | 18:05 | 1.089 |
| 100yr24hr | 18:10 | 1.082 |
| 100yr24hr | 18:15 | 1.075 |
| 100yr24hr | 18:20 | 1.068 |
| 100yr24hr | 18:25 | 1.061 |
| 100yr24hr | 18:30 | 1.055 |
| 100yr24hr | 18:35 | 1.048 |
| 100yr24hr | 18:40 | 1.041 |
| 100yr24hr | 18:45 | 1.035 |
| 100yr24hr | 18:50 | 1.028 |
| 100yr24hr | 18:55 | 1.022 |
| 100yr24hr | 19:00 | 1.015 |
| 100yr24hr | 19:05 | 1.01 |

| | | |
|---|---|---|
| 100yr24hr | 19:10 | 1.004 |
| 100yr24hr | 19:15 | 0.998 |
| 100yr24hr | 19:20 | 0.992 |
| 100yr24hr | 19:25 | 0.986 |
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[REPORT]
INPUT      NO
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SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS       0               0               10000           10000
UNITS            None

[COORDINATES]
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;;-------------- ---------------- ----------------
MR_NEoutflow     450.98          -190.344
J3               208.309         -372.101
Lot4_S_Outflow   372.134         -558.311
MR_NWoutflow     229.407         -164.65
Lot4_SW_Outflow  204.522         -555.85
J_CouleeBottom   234.197         25.6
J5               305.372         -187.926
CouleeBottomOutflow 189.097         33.265

[VERTICES]
;;Link           X-Coord         Y-Coord
;;-------------- ---------------- ----------------
Berm_4           457.712         19.356
C1               211.49          -179.582
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[Polygons]

| ;;Subcatchment | X-Coord | Y-Coord |
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| S1 | 323.197 | -547.516 |
| S1 | 325.182 | -497.561 |
| S1 | 325.739 | -496.874 |
| S1 | 422.411 | -499.603 |
| S1 | 434.106 | -549.888 |
| S1 | 323.197 | -547.516 |
| S3 | 251.298 | -304.534 |
| S3 | 300.029 | -308.415 |
| S3 | 300.515 | -311.566 |
| S3 | 328.06 | -397.683 |
| S3 | 324.825 | -497.085 |
| S3 | 314.691 | -511.1 |
| S3 | 298.519 | -528.134 |
| S3 | 249.573 | -523.822 |
| S3 | 228.873 | -507.65 |
| S3 | 224.345 | -493.635 |
| S3 | 226.717 | -481.344 |
| S3 | 228.226 | -437.573 |
| S3 | 218.308 | -408.68 |
| S3 | 222.094 | -274.868 |
| S3 | 251.298 | -304.534 |
| S5 | 383.915 | -206.554 |
| S5 | 373.344 | -178.44 |
| S5 | 417.203 | -196.658 |
| S5 | 482.111 | -209.244 |
| S5 | 577.776 | -204.242 |
| S5 | 595.488 | -209.072 |
| S5 | 590.68 | -441.749 |
| S5 | 504.924 | -510.956 |
| S5 | 503.346 | -500.745 |
| S5 | 516.616 | -485.001 |
| S5 | 513.692 | -463.634 |
| S5 | 530.335 | -449.014 |
| S5 | 511.218 | -415.502 |
| S5 | 465.784 | -372.993 |
| S5 | 449.815 | -344.203 |
| S5 | 435.871 | -297.421 |
| S5 | 409.33 | -279.652 |
| S5 | 380.091 | -224.773 |
| S5 | 383.915 | -206.554 |
| S4 | 517.411 | -483.983 |
| S4 | 502.828 | -500.786 |
| S4 | 505.002 | -511.491 |

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S4               455.183          -550.549
S4               434.857          -549.752
S4               422.502          -499.933
S4               325.464          -496.609
S4               328.377          -397.632
S4               309.206          -339.825
S4               300.653          -307.972
S4               252.302          -304.009
S4               222.439          -274.146
S4               223.435          -195.508
S4               261.255          -197.393
S4               292.64           -203.416
S4               372.53           -177.737
S4               382.992          -207.221
S4               380.139          -224.34
S4               409.305          -279.502
S4               436.252          -298.524
S4               449.25           -343.858
S4               464.785          -372.391
S4               510.119          -413.921
S4               530.409          -449.428
S4               513.606          -462.743
S4               517.411          -483.983
S2               325.182          -497.561
S2               323.197          -547.516
S2               215.423          -545.21
S2               218.541          -409.947
S2               228.286          -437.623
S2               226.337          -479.333
S2               224.388          -493.366
S2               228.286          -507.789
S2               250.116          -524.55
S2               300.791          -527.669
S2               325.182          -497.561

[SYMBOLS]
;;Gage            X-Coord          Y-Coord
;;-------------- ---------------- ----------------
```

# APPENDIX E

# ARCHITECTURAL CONTROLS

**RESTRICTIVE COVENANT AND ARCHITECTURAL CONTROLS**

**EDGEWOOD ESTATES**

THIS AGREEMENT made this ___ day of _____, 2011.

BETWEEN:

**EDGEWOOD STABLES LTD.**
(Grantor)

-and-

**EDGEWOOD STABLES LTD.**
(Grantee)

**WHEREAS EDGEWOOD STABLES LTD.** (at the time of the registration of these Restrictive Covenants and Architectural Controls) is the registered owner of the development known as **EDGEWOOD ESTATES** situated in the County of Lethbridge, in the Province of Alberta (hereinafter called the "Subdivision"), and is in the process of developing the Subdivision into a series of country residential lots;

**AND WHEREAS** the controls contained herein are intended to implement standards of appearance and quality in the Subdivision by attaching certain restrictions, covenants and conditions restrictive in nature in respect of the exterior design, use (to the extent that use is a function of design) and development, to each lot located within the Subdivision (hereinafter referred to as a "Lot", or referred to as the said "Lands" when referring collectively to all of the lots located within the Subdivision) and each and every part thereof and the buildings, structures, improvements and premises to be erected on each and every part of the Lands;

**AND WHEREAS** the restrictions, covenants and conditions herein are not meant to detract or derogate in any way from any applicable laws, regulations or by-laws (including but not limited to land use by-laws of the County of Lethbridge or the City of Lethbridge as may be enacted from time to time), but are in addition and supplementary to, the restrictions, covenants and conditions contained in any such laws, regulations and by-laws;

**AND WHEREAS** the Grantor covenants with the Grantee to observe and comply with the following restrictions and architectural controls, the burden of which shall run with each of the lots:

**PLAN 111 _____, Block 2, Lots 1-10 INCLUSIVE**

**EXCEPTING THEREOUT ALL MINES AND MINERALS**

**( S.W. ¼ SEC. 29, TWP. 9, RGE. 21, W4M)**

hereinafter called the "Lands".

This covenant shall be binding upon and inure to the benefit of the respective heirs, executors, administers, successors and assigns of the parties.

**BUILDING SPECIFICATIONS**

1. No residence shall be constructed on the Lands which encroaches upon or straddles the property line with any lot adjacent to it on either side, regardless of ownership of the adjacent lot.

2. No residence shall be constructed on the Lands which shall have a floor area above grade of less than 2000 square feet. The measurements may include the outer walls of the residence but shall exclude any garage, patio, porch, or the like part of a building. Only one detached dwelling may be erected on a lot. All other County of Lethbridge Bylaws will apply.

3. No building shall be constructed on the Lands more than two stories above front-grade.

4. No mobile home, trailer, manufactured home, or previously built residence or building or structure shall be allowed to be placed upon or moved onto any of the aforedescribed Lands (quality house packages which require substantial on-site construction and assembly may be permitted with the approval of the Development Manager).

5. A granny suite or legal suite may be constructed upon the said Lands, but must:

    i Be approved under the County of Lethbridge Land Use Bylaw, accompanied by an approved development permit from the County.

    ii Exist within the framework of the home itself, such as a suite above the garage or in the basement, indistinguishable to an onlooker from the street; or

    iii Exist within the said Lands, but outside of the main residence and conform with the exterior finish and overall look of the main residence and fall within the proper permitted setbacks of the municipality and must be no more than 900 square feet (83.612 square meters) and must be included as part of the overall design concept of the house and yard development and must be approved in size and location by the Development Manager and must have sufficient parking on the said Lands.

6. Lot owners must consult the Development Manager for any building development that incorporates a walk-out basement, prior to proceeding with construction, to determine if the same is permitted, and if so, what requirements there may be with respect to the same.

7. No building shall be constructed upon the said Lands until the "Plot and Design Plan" has been approved by the Development Manager. The Plot and Design Plan must be approved in accordance with the overall plan and layout of the development as determined by the Development Manager. In particular, the orientation of the driveway and garage of each residence will be determined by the Development Manager to ensure maximum green space exists between adjacent Lands. The decision of the

Development Manager is final. It is strongly recommended that the owner seek direction from the Development Manager prior to making final decisions regarding a house plan.

8. Each residence constructed on the Lands is encouraged to be designed so as to explore the potential of each lot to arrive at a design which resolves the needs of the family intended to occupy the residence in terms of layout and finish. The design of the residence shall reflect the unique features of each lot in terms of view, orientation, climate, access and integration of indoors with outdoor space. Each home design must be conceived as a simple and honest expression of present day architectural forms and without the use of eclectic or regional styles.

9. Exterior finishes will be approved on case-by-case basis.

**SETBACKS**

10. All buildings or structures shall be within the parameters of the building envelope and must comply with the Land Use Bylaw of the County of Lethbridge in force at the time of the granting of the Development Permit.

**ROOFING MATERIALS**

11. No roof shall be constructed on any residence on said Lands with a roof pitch of less than 5:12. No metal cladding or metal sheeting on the roof area shall be permitted unless approved by the Development Manager. Tar and gravel roofing, and rolled roofing are not acceptable. Acceptable roofing materials include:

    i architectural asphalt shingles;

    ii laminate shingles;

    iii concrete tiles;

    iv shakes;

    v slate tiles; or

    vi metal roofing simulating slate, shakes, or shingles

12. The roof colour of any permanent structure (including but not limited to the residential dwelling and garage) located on a Lot shall be compatible with the colour of the exterior finish of the residential dwelling on such Lot.

**GARAGE**

13. No garage shall be constructed on the Lands unless it is a minimum of double attached or detached garage of the minimum dimensions of 6.7056 meters by 7.3152 meters (22 feet by 24 feet) and must be included as part of the overall design concept of the house and yard development and the exterior finish must be similar to that of the main residence and the roof line and pitch of the roof on the garage must be compatible with the design of the main residence.

14. Any detached garage or other outbuilding must be set back no less than 7.62 meters (25 feet) from the property line.

15. Any detached garage being built on the property must be approved in size and location by the Development Manager.

16. The Lands shall not be used for the storage of

- Abandoned vehicles or equipment, non-functioning vehicles or equipment, auto or truck bodies, and other vehicles or equipment not currently in a functioning state; and
- Gasoline, diesel fuel or similar fuel or volatile, explosive or dangerous substances other than those used for ordinary household or acreage purposes in quantities reasonably appropriate for ordinary household or acreage use.

**CODE & BY-LAW COMPLIANCE**

17. No building shall be constructed on the Lands unless it meets or exceeds the Alberta Building Code and complies with all By-laws of the County of Lethbridge, in the Province of Alberta. Prior to construction of a building (including accessory structures such as detached garages, shed, etc.) the lot owner must obtain all necessary local, provincial and federal permits including a development permit from the County of Lethbridge, regardless of obtaining approval for construction by the "Development Manager."

**LANDSCAPING**

**18.** A "Landscaping plan" for the front portion of each yard must be included with each Design Plan showing the driveways, sidewalks, fencing, ground cover and planting material. No ponds will be allowed on the lots.

**FENCING & LIGHTING**

19. No individual fence shall be constructed which does not comply with the Land Use By-Law of the County of Lethbridge and the location of which must be approved by the Development Manager. All fences must be maintained in a structurally sound and esthetically pleasing condition. No lot owner is required to construct a fence.

20. All fencing materials must be approved by the Development Manager. The approved materials are a 4 ft. in height, polyester powder coated black chain link fence for any back and side yards. Simulated wrought iron, stone or brick will be accepted for architectural feature fences. It is preferred that trees and shrubs be used wherever windbreak or privacy is desired.

21. If Lot owners choose to have a lighted gate post(s), the light(s) must coordinate with the chosen streetlights. The placement and height will be standard throughout the subdivision to provide a consistency of light. The developer will supply the details per request.

**ANIMALS**

22. Owners of any lot may keep domestic animals, but domestic animals are restricted to dogs and cats.

**LOT GRADING AND RETAINING WALLS**

23. No construction shall be carried out on the Lands until a "lot grading" plan is approved by the Development Manager. The plan must include the finished floor levels for all levels of the house including the bottom of footings and garage elevations. The finished sod grades at the house must be shown as well as arrows indicating drainage patterns, or swales. The grade at each corner of the lot shall be compatible with that of its neighboring land as to achieve efficient service water drainage away from that house and other developments and must not change existing drain patterns or block or interfere in any with the drainage ditch along the boulevard. Any deviation from the recommended grade levels must be presented in writing to the Development Manager and a written decision must be required before any deviation from the recommended grade levels is carried out on the said Lands. The cost of retaining walls situated on a Lot shall be the responsibility of the Lot Owner. All retaining walls and their foundations are to be within Lot boundaries. Landowners are responsible for ensuring that drainage courses are protected and maintained. Landowners are responsible for adhering to final lot grade requirements.

24. Any Owner which has an easement for a drainage corridor on their Lot shall not suffer or permit dirt, fill, loan, gravel, paper, other debris, weeds snow, ice, or slush (collectively referred to as "material") to fill or other wise accumulate or remain upon the said lands and which would:

- Restrict, impair, impede, alter or otherwise interfere with the drainage across said lands including, without limiting the generality of the foregoing drainage a grass swale, concrete or asphalt gutter or other drainage gutter or other drainage control structure which may be erected on the said lands.

- Alter, remove, damage or other wise interfere with any drainage control fence, grass swale, concrete or asphalt drainage gutter or other drainage control structure which may be erected on the said lands.

**PROCEDURE FOR DEVELOPMENT APPROVALS**

25. All parties constructing any structure on the aforedescribed Lands must submit the following to the Development Manager:

- Plot and design plan showing all building locations, setbacks, driveways, sidewalks, fences and Landscaping;
- Lot grading plan, showing all grades and lot corner elevations;
- Landscaping plan showing the Landscaping design of the front portion of the yard;
- House plans showing the layout of each level including roof design and dimensions including:
  - i Building elevation of each side of the house showing window types and sizes, finishes, roof, elevations, chimneys, flues and vents; and

ii Cross sections showing foundation and footing elevations and all dimensions, in particular the relationship between all levels including the garage;

- Completed development and permit application forms; and
- A sample or description of all exterior finishing material including colour schemes.

26. All requested and provided information will be processed by the Development Manager within one week of receipt if the information is deemed acceptable. If the application does not comply with the Architectural Controls or other by-laws and regulations, then the application will be returned to the applicant marked "unacceptable".

27. No Lot Owner shall submit an Application to the Development Manager that does not include the requirements contained in Paragraph 32 above.

28. The decision of the Development Manager is final and binding and, in order to avoid delays, it is recommended that a preliminary consultation be made with the Development Manager prior to the application submission.

29. There shall be no deviation from the plans contained in an approved Application unless the same is consented to in writing by the Development Manager.

30. In the event:

- a building on the property is not completed in its entirety in accordance with the Architectural Controls and the approved plans, or
- the workmanship on the building is judged by the Development Manager at its sole discretion to be incompatible with the Architectural Control;

The Developer may, but is not obligated to;

- Complete the building in accordance with the Architectural Controls, or the approved plans, as the case may be; or
- Replace the unacceptable workmanship, all at the purchaser's expense.

31. Any monies expended by the Developer to complete the building in accordance with the Architectural Controls, or the approved plans, as the case may be, or replace unacceptable workmanship shall become a charge on the building being built and a caveat or other charging document may be registered by the Developer against title to the property and the Developer may apply the Architectural Controls Security Deposit to any such monies expended; and, take all steps available to it at law to collect any other such monies so expended.

Prior to construction of a building (including accessory structures such as detached garages, shed, etc.) the lot owner must obtain all necessary local, provincial and federal permits including a development permit from the County of Lethbridge, regardless of obtaining approval for construction by the "Development Manager."

## MAINTENANCE

32. Every lot owner shall keep his lot, including gardens and all improvements thereon, in good order and repair including but not limited to the seeding, watering and mowing of grass, the pruning and cutting of all trees and shrubbery, and the painting, or other appropriate external care, of all buildings and other structures in the manner and with the frequency that is consistent with good property management.

33. All lots/acreages must be cared for in a husbandly manner in order to maintain high quality land investments

## GENERAL

34. The Developer and the Development Manager shall be responsible for the interpretation of the Architectural Controls and may modify any of the provisions stated therein at their sole discretion. Any dispute which may arise in connection with the Architectural Controls shall be determined by the Developer whose decision shall be final and binding.

35. Failure on the part of the Developer or the Development Manager to enforce promptly and fully the conditions, covenants, and restrictions of the Architectural Controls shall not be deemed to be a waiver of the right of the Developer to enforce the conditions, covenants and restrictions of the Architectural Controls.

36. All owners shall be expected to take normal precautions to prevent damage to installed improvements. In particular, they shall:

    - Protect all service lines including telephone, cable, electricity, gas, and water lines on the owner's property and extending to the adjoining Lands.
    - Protect driveway accesses, culverts, roads, ditches, etc., when it is necessary for vehicles to be driven across them.
    - Keep the road in front of the lot clean during construction, and keep the ditch and catch basin free of debris and in working order at all times.
    - Avoid placing excess soil or constructions debris on adjacent lots.

37. Any damage to installed improvements noticed prior to construction must be identified to the Development Manager at the time of discovery. The Manager will record the damage, and attempt to identify the party responsible for causing the damage. If this can be determined, the Development Manager will attempt to recover the cost to repair the damage from the party causing the damage. Any damage to improvements not identified prior to construction will be assumed to be caused by the owner, unless the owner can identify a third party who caused the damage. If the Development Manager is unable to recover the cost to repair the damage from the third party, the owner shall become responsible for the cost of the repair. Any damage caused by the owner must be repaired at the owner's cost.

38. The Lot Owner shall take all measures necessary to protect any and all survey pins located on each Lot. If it is required to replace a damaged or missing survey pin, the same must be done by an Alberta Land Surveyor, and the cost of the same shall be at the sole expense of the Lot Owner.

39. Any owner of any lot within the Development may enforce the Architectural Controls or other Controls of this Restrictive Covenant.

40. Each lot shall be deemed to form part of a Building Scheme, the land use and building restrictions and conditions contained in the Restrictive Covenants and Architectural Controls shall be deemed to be covenants running with each of the lots and shall be binding upon each individual owner of each lot and for the benefit of the owners of all the other lots set out herein and their successors in title or such subsequent plan of subdivision of the same area as may hereinafter be filed. The Developer, or any inspection agency contract by it, shall in its sole discretion determine the date when completion of construction has occurred.

41. Notice from the Development Manager as required in this document may be affected by personal service, regular mail to the last address provided by the Owner to the Development Manager, or by posting the Notice to the Door of the dwelling located upon the Owner's lands. Notice from the Owner to the Development Manager as required in this document shall be affected by personal service upon the Development Manager.

42. Should any one or more provisions of this Restrictive Covenant be determined to be illegal, unenforceable or otherwise invalid, the same will be severed, but all other provisions will remain in effect.

**43. IT IS NOT THE INTENTION OF THESE RESTRICTIVE COVENANTS OR ARCHITECTURAL CONTROLS TO IMPOSE ANY LIABILITIES ON THE DEVELOPER OR THE DEVELOPMENT MANAGER.**

44. Time shall be of the essence of these Restrictive Covenants and Architectural Controls.

45. The failure by the Developer, Development Manager or any consultant hired in connection with these Controls to require performance of any provision of these Controls shall not affect their right to require performance at any time thereafter, nor shall a waiver of any breach or default of these Controls constitute a waiver of any subsequent breach or default or a waiver of the provision itself unless the subsequent breach or default was waived in writing by the Development Manager.

46. If a lot has natural drainage, access must be granted for maintenance, if maintenance is required.

**PROPOSED TIME LINE SCHEDULE FOR DEVELOPMENT UPON THE AFORESAID LAND**

47. Purchase of Lands by Owner.

48. Initial consultation with the Development Manager.

49. Drawings (Plot and Design Plan, Driveway Placement, Grading Plan, House Plan, etc.) completed with a Stamp of Approval by Development Manager.

50. Upon title being made available, and upon receipt of the required permits, the builder can proceed with the construction phase that must be completed within four (4) years of the Closing Date.

51. Upon completion of the house and other structures in accordance with the approved plans and permits, the Owner of the Lands notifies the Development Manager that he can make an inspection.

52. After inspection and acceptable completion within the terms of the Restrictive Covenant and Architectural Controls set out herein, the Architectural Control deposit shall be refunded by the Development Manager to the owner.

IN WITNESS WHEREOF the Grantor and Grantee have set their hands and seals effective as of this _____ day of _____, 2011.

**GRANTOR**
Edgewood Stables Ltd.

_____
Signature

Seal

**GRANTEE**
Edgewood Stables Ltd.

_____
Signature

Seal

BEST SMALL & MEDIUM EMPLOYERS IN CANADA

info@swg.ca
www.swg.ca

Stewart Weir