Fawn Meadows

Outline Plan

Part Two

July 2010
Updated March 2012

for

Pt E ½ -4-53-2-W5
Parkland County

by

Fawn Meadows Development Ltd.

Prepared by
The Norcan Group Inc.

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FAWN MEADOWS DEVELOPMENT LTD. PART 11 INDEX

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Supportive Living Standards

McLEOD & COMPANY

September 14, 2009

VIA E-MAIL: norcan@lincsat.com

Norcan Consulting Group
2209, Hwy 16, Parkland County
Box 38, Site 219, RR2
Carvel, Alberta
T0E 0H0

Attention: Frank Florkewich

Dear Sir:

Re: Fawn Meadows Condominium Project - File No. 074457

You have asked me to confirm my understanding of the various phases comprising the above noted development.

I understand the various components to be as follows:

SINGLE DETACHED HOMES

I understand this project is to be comprised of individual bare land Condominium Units. Each owner will be responsible for the exterior of the building including roofs, siding and all landscaping and utilities on the Unit. The Condominium Corporation will repair and maintain the common roadways and all utility services to the Unit boundaries.

VILLAS AND TOWNHOMES

I understand that this project will be individual bare land Condominium Units with the Condominium Corporation responsible for repair and maintenance of the exteriors of the buildings and all landscaping on the Units. The Condominium Corporation will be responsible to repair and maintain the common roadways and all utility services to the interior finishing of the buildings.

APARTMENT CONDOMINIUMS

I understand that this project will consist of approximately 140 apartment Condominium Units which will be a conventional condominium project whereby an owner will own the interior finishing of their Unit inwards. The structure of the building together with the exterior, all parking, the common roadways, all common utilities and all landscaping will be common property which will be the responsibility of the Corporation to repair and maintain.

McLEOD & COMPANY

October 13, 2009

Fawn Meadows Development Inc.
Suite 607, 4603 Varsity Drive NW
Calgary, Alberta T3A 2V7

Attention: Barry Ibsen (via email)
Ambrose Comchi (via email)

Dear Sirs:

Re: Fawn Meadows - File No. 74457

Further to our letter of September 14, 2009, concerning the above noted development, we wish to clarify certain matters.

Separate Condominium Corporations

We understand that the intent of the whole development is to have an aging-in-place facility. Each phase would have different rights and responsibilities as outlined in our previous letter of September 14, 2009. To accomplish this, firstly, a subdivision plan would need to be registered to create entirely separate parcels for each phase. The common roadway and any common utility installations would also be on a separate parcel. Then, separate condominium plans would be registered for each phase, creating separate Condominium Corporations that would all share in the use of the roadway and utilities. Each phase would have separate Bylaws and rules and regulations governing it and would be drafted specifically to accommodate the physical characteristics of the phase as well as the intent as to the services to be provided to unit owners. The *Condominium Property Act* requires extensive disclosure to proposed purchasers so that they know exactly what they are buying at the time they enter into purchase agreements.

Enforcement of Condominium Bylaws

A Condominium Corporation has very powerful methods to enforce its Bylaws against defaulting or non-compliant owners.

If the Bylaws so provide, the corporation may levy a monetary or non-monetary sanction or may pursue an owner to change behaviour or force something to be done. The Condominium Corporation also has broad powers to enforce the payment of condominium contributions and in the event an owner does not pay, the unit may be put up for sale with the Condominium Corporation ranking in priority over a mortgage company to recover its outstanding condominium fees. Any violation of the Bylaws such as the keeping of pets, the placement of RV's, enforcement regarding extra vehicles, noise, unsightly yards, the use of snowmobiles, etc., would all be matters dealt with in the Bylaws of a Condominium Corporation and the

Corporation could take legal action to make an owner comply with the Bylaws. The Criminal Law of Canada still applies to any condominium project with regard to any criminal activities that might take place on a condominium project.

We trust that the aforegoing clarifies some matters with regard to this project.

Yours very truly,
McLEOD & COMPANY LLP

Heather M. Bonnycastle Q.C.

Direct: (403) 873-3703
bonnycastle@mcleod-law com
Assistant: Stephanie Koole
Direct: (403) 254-3834
skoole@mcleod-law com

HMB/sdk

CHARTWELL
SENIORS HOUSING REIT

Western Canada Office
#350-220 Cambie Street
Vancouver, B.C.
V6B 2M9

Tel: (604) 648-2273
Fax:(604) 648-2277

November 3, 2009

Barrie G. Ibsen
Director & General Manager
Fawn Meadows Development Inc.
By E-mail

RE: Management Services-Seniors Housing Project

Dear Mr. Ibsen:

As you know, Chartwell owns and or operates a range of independent seniors living communities, assisted living seniors housing and long term care residences across North America. We offer our residents a safe and rewarding lifestyle in a seniors housing community that they are proud to call home.

From our conversations on several occasions, Chartwell may very well be interested in providing Management Services for your proposed building; however, it would be premature for us to offer any service to you until you have obtained County approval of your project. As we have discussed, we need to know the number of each lifestyle you would be constructing and what Levels of Services you would be offering to the residents.

Once you have all this in place and are well underway with the first two phases and have commenced building of the Independent and Supportive Living Building, we would certainly look at a Management Services Contract.

I might also suggest the considerable experience of Chartwell Seniors Housing may assist you through a consultative process which could expedite your project in many different ways. As you said before, you do not need to reinvent the wheel, just make it better if you can.

Thank you for choosing Chartwell; we look forward to working with you in the future.

Yours truly,

Chartwell Seniors Housing REIT

Donna Marasco
Senior Vice-President Operations

HEAD OFFICE
100 Milverton Drive, Suite 700
Mississauga, Ontario
L5R 4H1
Tel: (905) 501-9219
Fax: (905)501-0813

PARKLAND COUNTY
Where Opportunity Awaits

APPLICANT'S AUTHORIZATION

I / We, Fawn Meadows Development Inc.
being the registered owner/s of lands legally described as:

Lot	Block	Plan	Subdivision	
NW / NE / SW / SE (please indicate) Pt E ½	Section 4	Township 53	Range 2	WM 5

do hereby authorize Norcan Consulting Group Inc. to make application subdivision affecting the above noted property.

Dated this 3rd day of February, 2010.

Ambrose W. Conacki, Director	Barrie G. Ilsen, Director
Signature of Registered Owner	Signature of Registered Owner

RIGHT OF ENTRY AUTHORIZATION

The registered owner/s consent to the Right of Entry by an authorized person of Parkland County for the purpose of a land s inspection relative to the proposed application for subdivision.

In accordance with the Municipal Government Act of Alberta and Parkland County's subdivision application requirements t Right of Entry Authorization must be completed, signed and returned with the Subdivision Approval Application.

I / We, Fawn Meadows Development Inc.

do [✓] / do not [ ] (please indicate) grant consent for an authorized person of Parkland County to enter upon the subject lands for the purpose of a site inspection and evaluation regarding the proposed subdivision.

Lot	Block	Plan	Subdivision	
NW / NE / SW / SE Pt E ½	Section 4	Township 53	Range 2	WM 5

Dated this 3rd day of February 2010

Ambrose W. Conacki, Director	Barrie G. Ilsen, Director
Signature of Registered Owner	Signature of Registered Owner

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 814 537	5;2;53;4;NE	042 286 912

LEGAL DESCRIPTION

MERIDIAN 5 RANGE 2 TOWNSHIP 53
SECTION 4
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
(A) THE NORTHERLY 693 FEET THROUGHOUT
CONTAINING 17.0 HECTARES (42 ACRES) MORE OR LESS
(B) 0.624 HECTARES (1.54 ACRES) MORE OR LESS AS SHOWN
ON ROAD PLAN 466JY
EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: PARKLAND COUNTY

REFERENCE NUMBER: 832 050 645

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
042 286 912	12/07/2004	TRANSFER OF LAND	$197,965	SEE INSTRUMENT

OWNERS

FAWN MEADOWS DEVELOPMENT INC..
OF 3215 UTAH PLACE NW
CALGARY
ALBERTA T2N 4A8

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
052 267 815	05/07/2005	CAVEAT RE : AGREEMENT CHARGING LAND CAVEATOR - AMBROSE WILLIAM COMCHI 3215 UTAH PLACE NW CALGARY ALBERTA T2N4A8
082 319 992	01/08/2008	MORTGAGE MORTGAGEE - AXCESS MORTGAGE FUND LTD.. SUITE 1410, 10665 SOUTHPORT ROAD SW CALGARY ALBERTA T2W4Y1 AS TO 60/580 MORTGAGEE - B2B TRUST. 404, 130 ADELAIDE ST WEST TORONTO ONTARIO M5H3P5 MORTGAGEE - CANADIAN WESTERN TRUST COMPANY. 600 - 750 CANCIE STREET VANCOUVER BRITISH COLUMBIA V6B4Y7 MORTGAGEE - WILLIAM HEALEY MORTGAGEE - CHRISTIAN STEVENSON MORTGAGEE - MARLENE STEVENSON MORTGAGEE - RAYMOND STEVENSON ALL OF : C/O AXCESS CAPITAL PARTNERS 1410, 10655 SOUTHPORT RD SW CALGARY ALBERTA T2W4Y1 AS TO 520/580 ORIGINAL PRINCIPAL AMOUNT: $580,000 (DATA UPDATED BY: TRANSFER OF MORTGAGE 102107963)
082 319 993	01/08/2008	CAVEAT RE : ASSIGNMENT OF RENTS AND LEASES CAVEATOR - B2B TRUST. C/O 212, 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - CANADIAN WESTERN TRUST COMPANY. 212 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - WILLIAM HEALEY

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		CAVEATOR - CHRISTIAN STEVENSON CAVEATOR - MARLENE STEVENSON CAVEATOR - RAYMOND STEVENSON ALL OF : C/O #212, 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - GREENTREE MORTGAGE CORPORATION. C/O 212, 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 AGENT - DOUGLAS M SEFCIK
082 360 125	21/08/2008	POSTPONEMENT OF CAVE 052267815 TO MORT 082319992 CAVE 082319993
112 380 928	25/11/2011	WRIT CREDITOR - CALIBRE DRILLING LTD.. 431 SOUTH AVENUE SPRUCE GROVE ALBERTA T7X3B3 DEBTOR - FAWN MEADOWS DEVELOPMENT INC.. 3215 UTAH PLACE NW CALGARY ALBERTA T2N4A8 AMOUNT: $38,663 AND COSTS IF ANY ACTION NUMBER: 1103 07382

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE
REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED
HEREIN THIS 5 DAY OF MARCH, 2012 AT 10:48 A.M.

ORDER NUMBER:20739743

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

(CONTINUED)

THIS ELECTRONICALLY TRANSMITTED LAND TITLES PRODUCT IS INTENDED FOR THE SOLE USE OF THE ORIGINAL PURCHASER, AND NONE OTHER, SUBJECT TO WHAT IS SET OUT IN THE PARAGRAPH BELOW.

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Fawn Meadows

"A quality of Life - Country Style"

Fawn Meadows Development Inc.
Suite 607, 4603 Varsity Drive N. W., Calgary, Alberta, Canada, T3A 2V7
Tel: (877) 843-3999 Fax: (403) 210-0087 Email: fmd@fbirealty.com

COMMUNICATIONS WITH THE RESIDENTS OF PARKLAND COUNTY

I. Three Public Meetings Were Held: February 18, 2005; April 18, 2009; May 26, 2009.

A. **Issues.** These similar issues arose at all of the three public meetings.

1. **Water Supply.** What adverse effects might Fawn Meadows Estates' water wells have on the neighbouring wells?
2. **Traffic.** What will be the effect of increased traffic from the high population density?
3. **Visual Effects.** What will be the visual effects of the residences in the development?
4. **Sewage Treatment.** How will the sewage system work, and what about odors from waste water ponds? Will the sewage contaminate the water reservoir?
5. **Condominiums.** How tall is your condominium going to be?

B. **Responses to the issues.**

1. **Water Supply.** Water flow tests on the two wells drilled on Fawn Meadows Estates revealed that a surplus supply of water is available for the population density being planned. Furthermore, tests proved that the new second well, the production well, had a radius of influence of water depletion that did not extend beyond the perimeter of Fawn Meadows Estates. That is, water pumped out by the new development would have practically no effect on the volume of water available to neighboring wells.
2. **Traffic.** A Traffic Impact Assessment concluded that the roads currently servicing the proposed development were adequate and did not require any upgrading. Also, at the meetings, the presenters pointed out that the aging residents in the Senior's Lodge would probably not be driving vehicles any longer. A bus would be provided for their trips off site.

3. **Visual Effects.** In response to a query about visual effects, NORCAN Consulting assured the residents living directly across Highway 770 from Fawn Meadows that planned tree planting in addition to trees already along the highway would shield the development. Also, the location of homes and their design would have minimal impact on neighbors.

4. **Sewage Treatment.** The representative from the water and sewage consulting company explained the workings of the proposed system and assured the attendees that the water reservoir would not be contaminated. He also responded to questions about where the proposed system is currently being used.

5. **Condominiums.** The Bareland Condominium concept was defined as a form of ownership of land and building space. It would not be a high rise building. Residents would own a lot and also part interest in all of the common lands, roads, services, utilities, park areas, recreational facilities, and other improvements. When a condominium plan would get registered with the land titles office, an administrative board would be automatically created. The board's purpose would be to manage the affairs of the Condominium Corporation, which would be made up of the owners of the individual units or lots. All Condominium Corporations are governed by "The Condominium Properties Act."

II. Email Supporting the Development.

On Wed, Mar 24, 2010 at 8:24 AM, Elaine Aronyk <EAronyk@psd70.ab.ca> wrote:

Excellent. We are very supportive of the project and are glad to see you haven't been beaten to failure; sometime a small vocal group can change the whole face of a meeting. When we retire this is exactly the type of place we would want. Please keep us on your information updates. All the best with the project.

Terry & Elaine Aronyk

Submitted by Ambrose Comchi & Barrie Ibsen,

Directors of Fawn Meadows Development Inc.

July 13, 2010

May 2009

Country Living · City Style

Fawn Meadows Estates News

Fawn Meadows – The Concept

Fawn Meadows is a new development that is being proposed just west of Stony Plain, near Carvel Corner. The project is in the planning stages and requires community consultation for Parkland County approval. Community consultation is under way to obtain input from area residents.

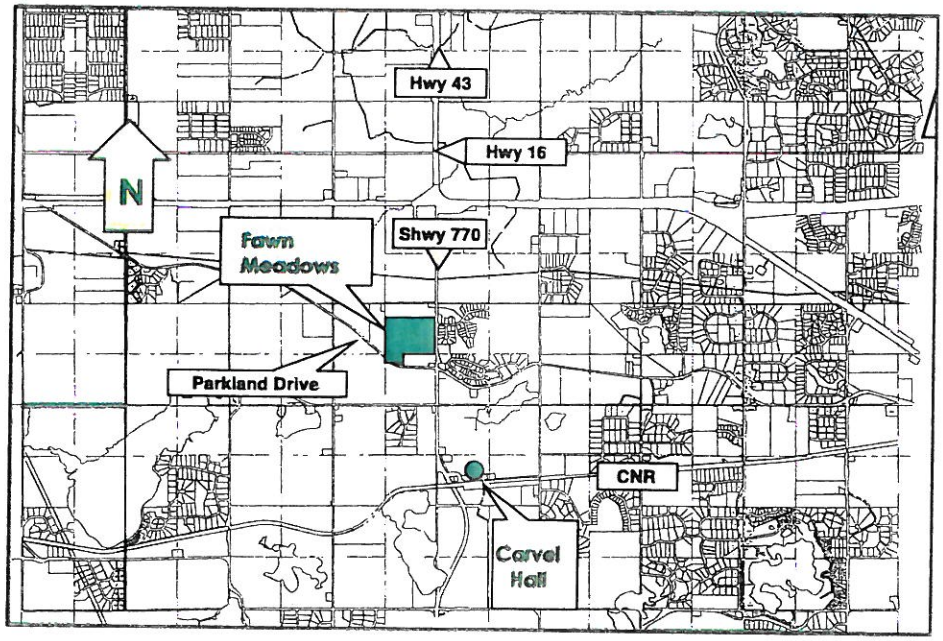
The subdivision is designed to meet the needs of aging and elderly rural residents aged 50 and over through the provision of supportive living services. It is an innovative concept that encourages seniors to stay in a rural community and remain independent for as long as possible. This concept is called "aging in place," meaning residents do not need to leave their community in order to receive higher levels of daily living support.

Quick Facts

Fawn Meadows will have four types of dwellings within the complex:

- 35 detached residences
- 20 semi-detached residences
- 56 villa-style residences
- 140 apartment-style residences

Total projected population:
450-500 residents in 251 living units, depending on singles/couples mix.



Who is best suited for Fawn Meadows?

Fawn Meadows is targeted to healthy, mobile and aging adults who may need some level of supportive living services now or in the future. Typical residents will include:

- Healthy, mobile adults (age 50 plus) who wish to live independently.
- Aging adults who want freedom from yard work and outdoor maintenance.
- Aging adults who want some meals supplied and may need scheduled health and personal care services such as home care, bathing assistance and medication support.

Supportive Living in Parkland County

Currently there are few to no support services available to rural seniors in Alberta. In many areas, home care and personal/domestic services are only offered on a *scheduled basis* – that is, by specific appointment times and for specific purposes. However, many seniors find they need services on a more frequent or unscheduled basis, or would like more support with meal preparation and social interaction.

Seniors often have to move to urban centres to access more complete support services. Many are required to leave their local community if they need supportive living services beyond basic home care. For this reason, **Fawn Meadows** is proposing to build a large, urban-standard facility just west of Stony Plain to give rural residents the same access to supportive living services as urban seniors.

Water Management Plan

Fawn Meadows will incorporate high environmental standards for potable, waste and storm water.

Potable (household) water will be drawn from a local aquifer, then treated and distributed to residences via a low-pressure trickle system.

Wastewater will be collected from each residence and piped to an on-site treatment facility. Following a three-stage treatment process, the cleaned water will be dispersed into the soil, thereby replenishing the area aquifer.

Stormwater will be collected, treated and then stored primarily for fire protection use and secondarily for irrigation.

Full environmental and engineering studies have either been completed or are under way to manage domestic water and wastewater.

Fawn Meadows Public Meeting

Tuesday, May 26
Carvel Hall

6:30 p.m. Display Viewing
7:30 p.m. Presentation, Q & A

On-Site Amenities

Fawn Meadows will be a lifestyle and recreational centre for adults aged 50 and over. More than 50% of the property will be left in its natural, undeveloped state so residents can enjoy the trees, wildlife and rolling hills on the property. There will be extensive walking and hiking trails for a truly outdoor experience.

Residents will have access to a full range of services and supports. The community consultation process will help identify the priorities of residents, which might include:

- Indoor and outdoor recreation areas for games, exercise, and social activities
- On-site retail services such as a coffee shop, convenience store, and CarMan Corner Gas
- On-site RV and mini storage
- On-site staff, such as personal care aides and licensed practical nurses
- On-site and local community mini-bus

Home Ownership Facts

Fawn Meadows will be a condominium community. This refers to the *legal relationship between owners* and not the style of physical structure. In the case of Fawn Meadows, there will be a mix of detached, semi-detached, villa, and apartment-style units, all under condominium governance.

In a condominium development, residents own their dwelling and sometimes their lot, as well as a percentage interest in the common areas (roadways, grounds, recreation centre, etc.). The development is managed by a condominium corporation, which includes a board of elected member-owners. The board has the authority to collect monthly condominium fees from residents to pay for common and operational expenses, as well as the power to enforce the bylaws of the corporation. Prospective homeowners, before purchasing a lot or residence, must agree in writing to abide by the bylaws and regulations of the condominium corporation.

Detached and semi-detached units are designed for relatively independent, mobile residents who wish to maintain their own property.

Villa style units are designed for independent, mobile residents who no longer want to manage their own gardening and exterior maintenance.

Apartment-style units are designed for residents who prefer a smaller living unit and those who are less independent.

The purchase price and associated condominium fees for all units will be determined at a later date, taking into consideration market pricing, construction costs, and each resident's desired level of supportive living services.

Fawn Meadows Estates

Project Overview

Fawn Meadows – Who's Who

- Developers:
  - Barrie Ibsen & Ambrose Comchi
- Project Manager:
  - Norcan Consulting
    - Frank Florkewich (Project Manager)
    - Other engineering & project consultants
- Communications Consultant:
  - Lechelt Group
    - Leah Lechelt

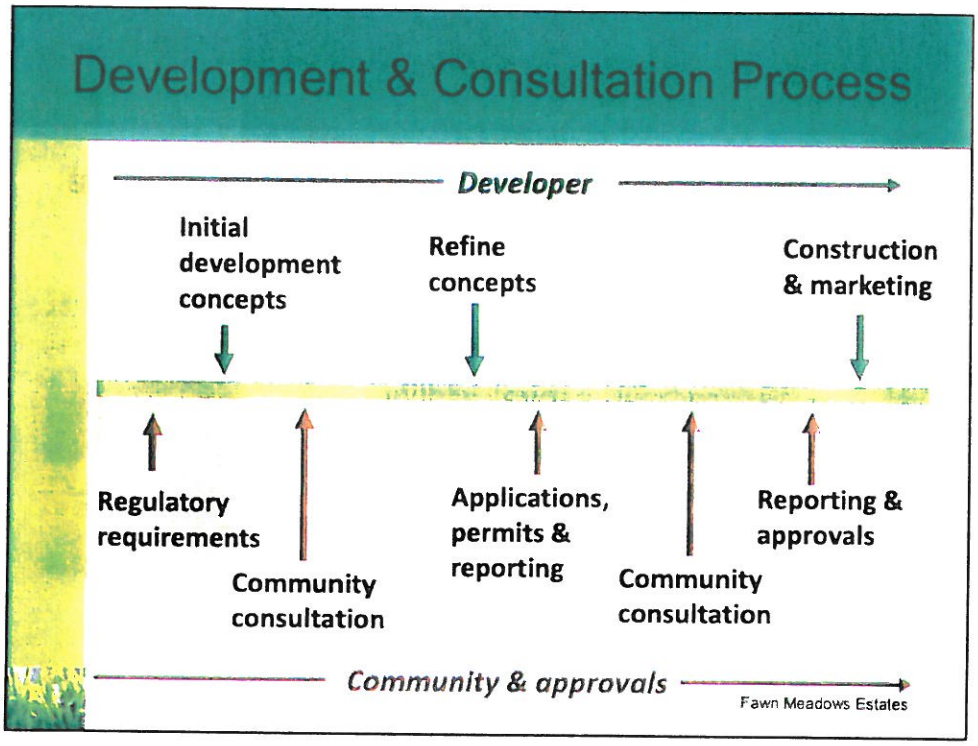
Agenda

- Project overview & status
- Follow-up from Apr. 18 mtg
- Q & A session with technical experts
- Community input
- Next steps & decisions

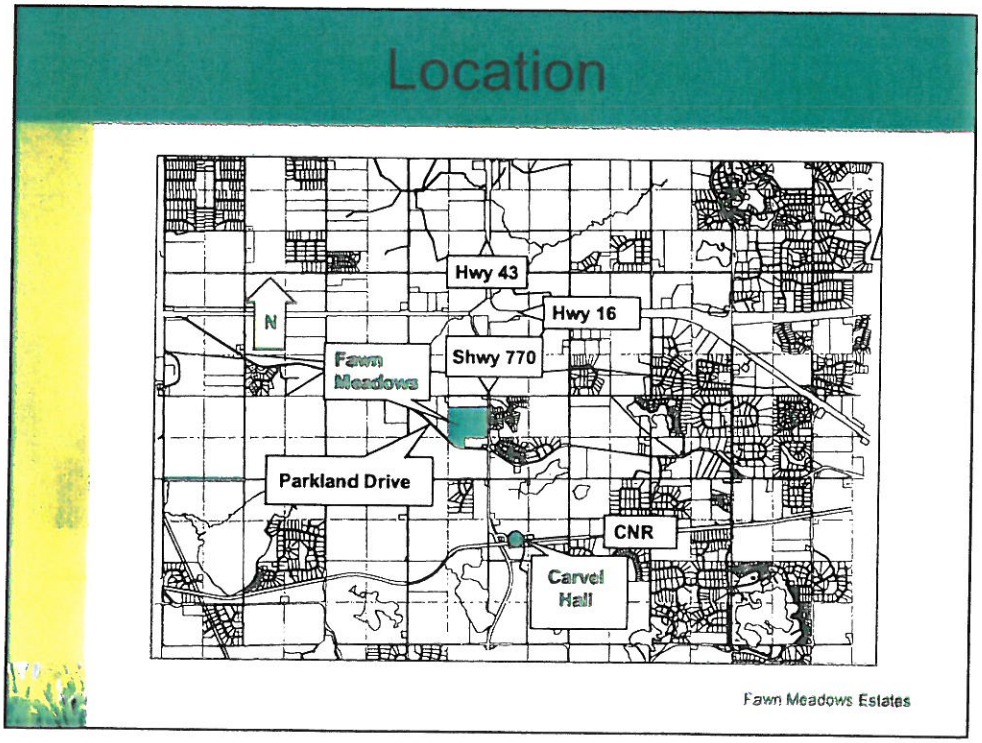
Consultation Process To-Date

- Email follow-up
- May 2009 - Newsletter #1
- April 2009 - Community mtg
- 2005 - Community mtg

Development & Consultation Process



Location



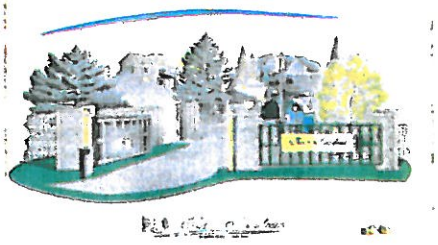
Quick Facts

- Proposed development – applying for approval
- For independent adults (50+) & aging seniors
- Key features:
  - More than 50% undeveloped/natural
  - Walking trails, natural wildlife
  - Complete lifestyle, recreation social activities
  - On-site supportive living services
  - RV parking and mini-storage on site

Fawn Meadows Estates

Quick Facts

- Condominium style of ownership
  - Legal rules, not physical structure
- 4 types of dwellings:
  - Detached
  - Semi-detached
  - Villa style
  - Apartment-style



Fawn Meadows Estates

Development Plan

Land Use Statistics

Land Use	Ha	Acres	%	Living Units
Residential – SF	6.8	16.9	13.4	35
Residential – Semi Detach	7.8	19.3	15.3	76
Residential – Specialized	2.6	6.3	5.0	140
Commercial	2.2	5.0	4.0	N/A
Conservation Reserve	16.0	39.5	31.2	
Roads & Utilities	7.8	19.3	15.3	
Open Space – Common	8.0	19.8	15.8	
Gross Title Area	51.18	126.46	100.0	

Fawn Meadows Estates

Population Projections

- 450 – 500 residents in total, depending on # singles/couples
- Proposed unit breakdown (subject to change)
  - Detached: 35 units
  - Semi-detached: 20 units
  - Villa style: 56 units
  - Apartment-style: 140 units

  Total: 251 units

Demographic Profile

- Healthy, mobile, independent adults 50+
- Aging adults wanting:
  - Help with outdoor maintenance & yard work
  - Some supplied meals
  - Scheduled personal & health care services
- Key concept: age in place

Ownership Information

- Purchased and owned as private condominium
- Purchaser owns:
  - Dwelling
  - Portion of common areas
  - May or may not own lot
- Re-sell privately if/when vacating
- Pricing TBD: fair market value for dwelling
- Supportive living services: additional fee

Fawn Meadows Estates

Current Seniors' Living Facilities

- Poor access in rural areas
- Support role of adult children
- Differing support/care needs within a couple
- Generally poor natural, recreational environment

Fawn Meadows Estates

Fawn Meadows Services

- Personal services for independence
  - Snow shoveling & lawn maintenance
  - Meals
  - Home care & nurse visits
- Social/recreational supports
  - Social activities
  - Outdoor recreational areas
- Safety and security
  - Staff and neighbours checking in
- Transportation support

Fawn Meadows Estates

Fawn Meadows Is For:

- Independent and semi-independent adults
- Lower-level support/care needs
- Scheduled support
- Normal cognitive function
- Moderate/good mobility

Fawn Meadows Estates

Why This Location?

- Family owned land
- Developers: More than 100-year family histories in this area
- Developer's vision:

  age-in-place facility in a rural setting
- Capacity for natural/unspoiled landscape

Fawn Meadows Estates

Comprehensive Water Assessment

- Water Needs: potable, fire and irrigation
- Water Sources: wells, stormwater and treated wastewater
- Assessment: balance need and source
- Goal: minimize groundwater use and maximize other sources to meet needs

Fawn Meadows will exceed current environmental standards

Fawn Meadows Estates

Water Management Approach

- High environmental standards
- Water conservation
- Stormwater capture, reclamation & re-use
- Stormwater storage for fire & irrigation
- Wastewater returned to soil for infiltration
- Open to other ideas

Potable Water

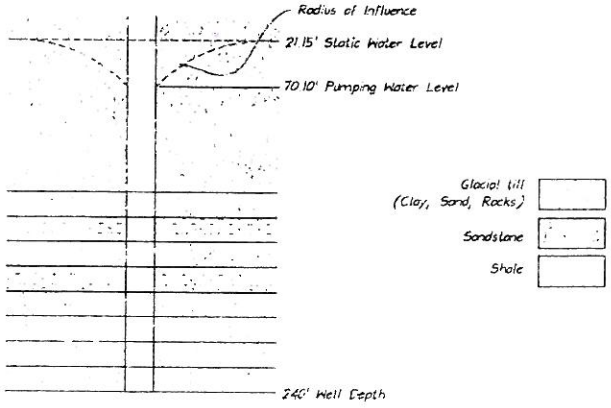
- Source: water wells
- Distributed via low-pressure trickle-system
- Goal: no impact on existing wells (volume and pressure) at peak load
- Studies ongoing

Water Well Testing

- 72-hour pump test conducted to determine effects of groundwater pumping
  - New well installed and pumped
  - Backup well used for monitoring
  - Neighboring wells more than 150 metres away will not be affected

Fawn Meadows Estates

Groundwater Use

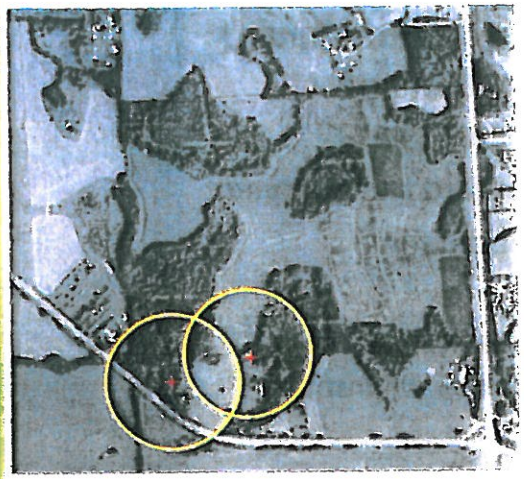


280-foot test well

- According to AENV guidelines, well can safely pump 70 GPM
- Development needs 50 GPM

Fawn Meadows Estates

Radius of Influence



- Preliminary studies indicate the limit of influence is no greater than 150 metres.

Fawn Meadows Estates

Wastewater

- Collected from each residence
- Piped to on-site treatment facility
- 3-stage treatment process
- Cleaned water dispersed into soil
- Continuous replenishing of area aquifer

Fawn Meadows Estates

Wastewater Management

Collection	Treatment	Disposal
		
Low Pressure Sewer	Engineered Wetland	Soil Disposal

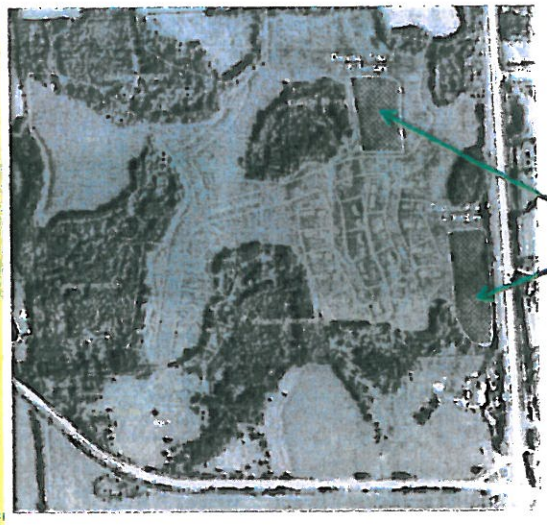
Fawn Meadows Estates

Treated Wastewater Disposal

- Disposal underground through infiltration beds

Fawn Meadows Estates

Wastewater Disposal Areas

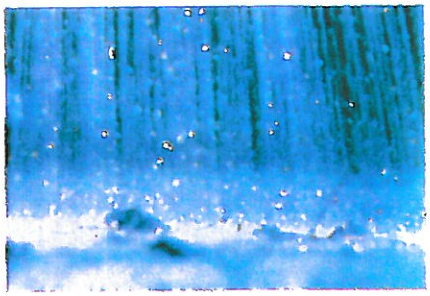


- Disposal Areas = 2.15 HA
- Need: 2 HA

Fawn Meadows Estates

Stormwater

- Collected and treated on-site
- Stored for fire protection
- Surplus for local irrigation



Fawn Meadows Estates

Vehicle Traffic

- Traffic Impact Assessment under way
- Traffic influences:
  - Retired/non-working residents
  - Predominantly empty nesters
  - Supportive living: some no longer driving
  - On-site amenities reduce # trips off property
  - Mini bus for local transportation

Fawn Meadows Estates

Community Questions – Apr. Meeting

- Number of potential residents
- Potable water supply
- Impact on area wells
- Trucking in water
- Traffic impact
- Visual impact
- Market pricing
- Health care questions

QUESTIONS

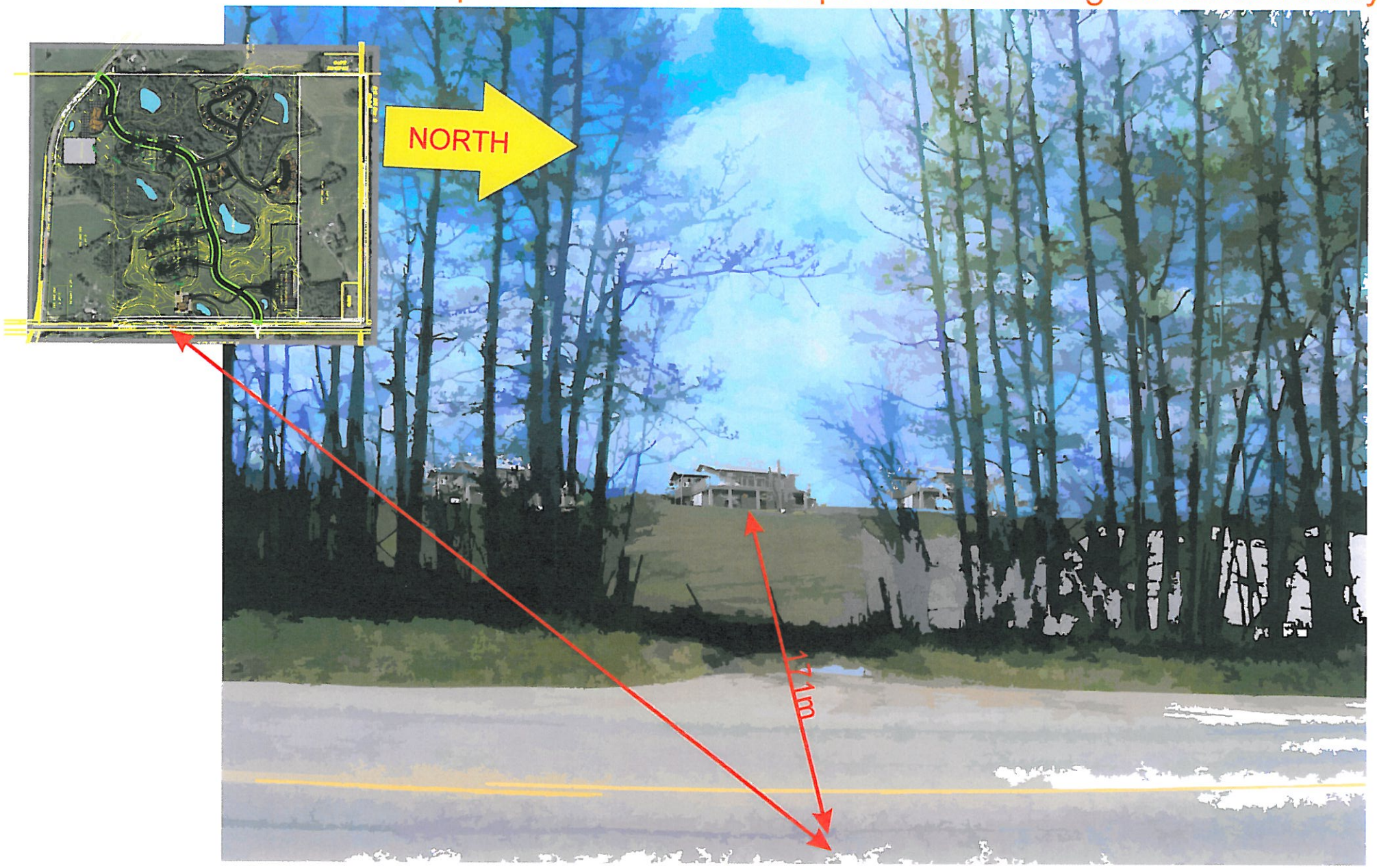
Fawn Meadows Estates

Next Steps

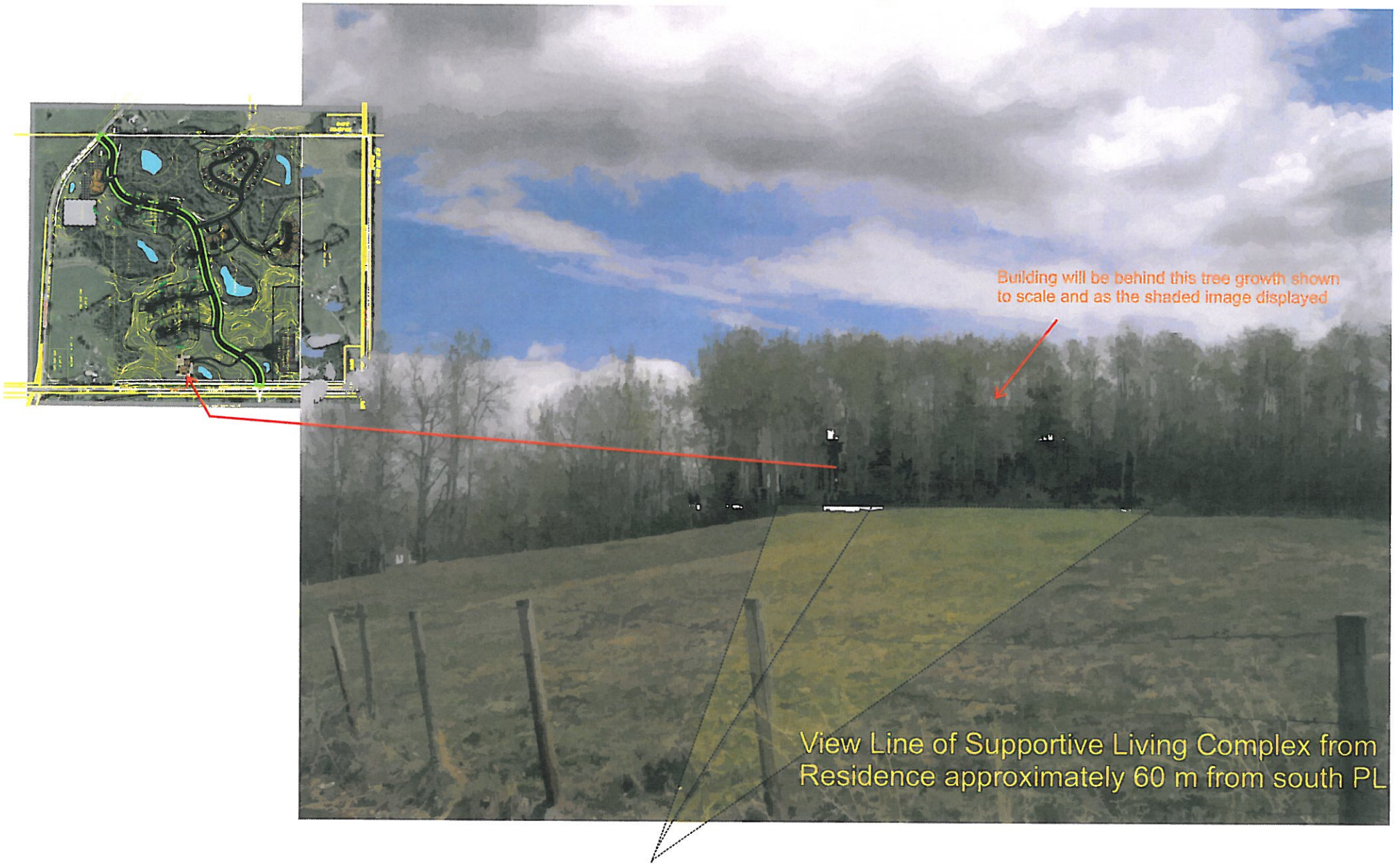
- Q & A session today
- Written summary (distribute via email)
- Sign up for updates & notices
- Continued meetings

Fawn Meadows Estates

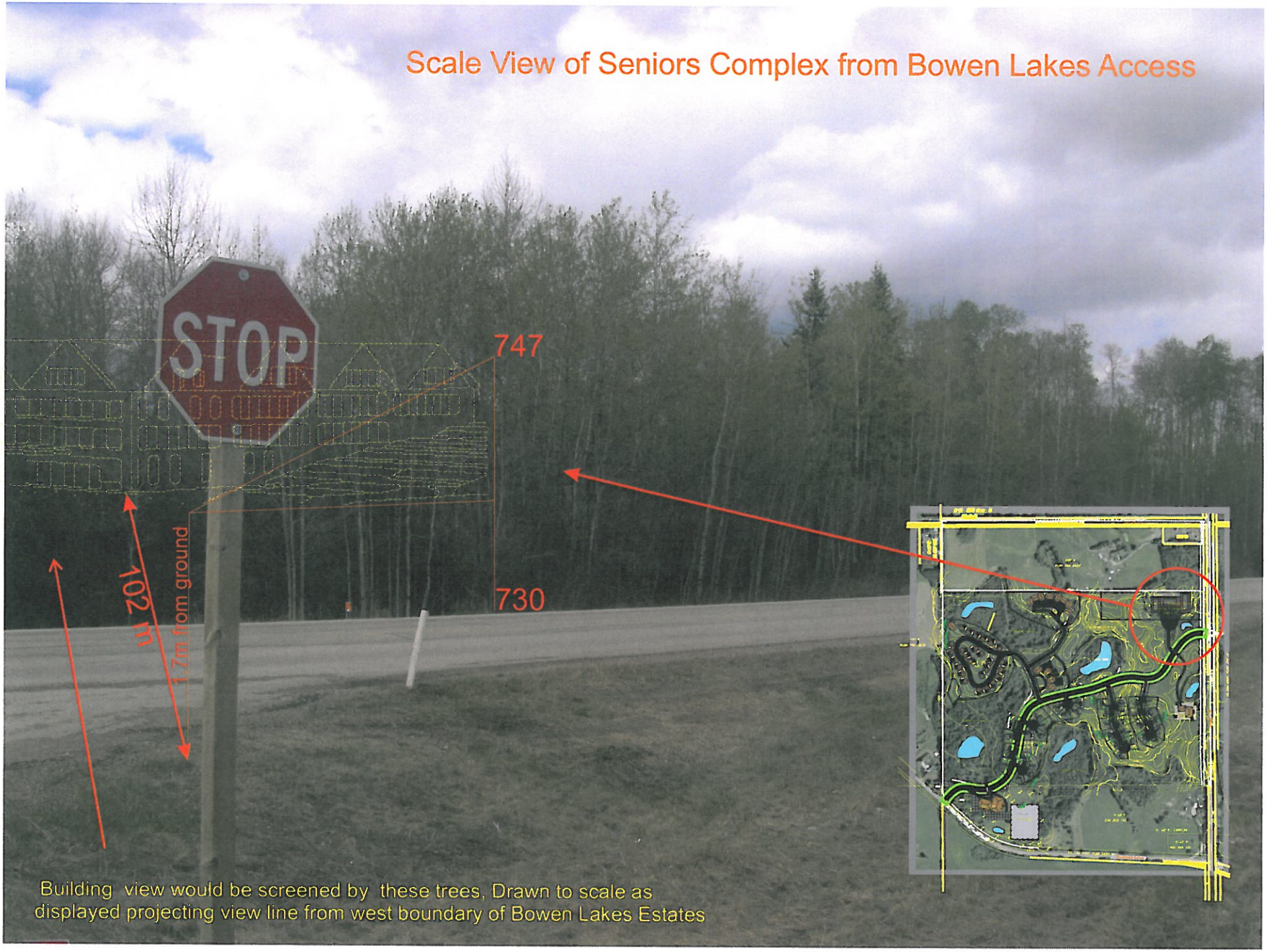
Proposed View of development from Hargreaves driveway



Proposed View of development from neighbors yard to the north



Scale View of Seniors Complex from Bowen Lakes Access



Fawn Meadows

"A quality of Life - Country Style"

Fawn Meadows Development Inc.
Suite 607, 4603 Varsity Drive N. W., Calgary, Alberta, Canada, T3A 2V7
Tel: (877) 843-3999 Fax: (403) 210-0087 Email: fmd@fbirealty.com

July 13, 2010

To Whom It May Concern:

RE: DEVELOPERS INTENT

As part of our submission for the development called Fawn Meadows Estates, please find the following:

The supportive living building which will be called the LeMar Centre will be a condominium complex in which each suite will be owned individually and which will provide independent living accommodations for each resident or each couple who might reside therein.

Below, please find a description of the suites and attributes thereof upon completion:

Suites

- Number of suites: 140
- Unfurnished Studio, One & two bedroom
- Heat, electricity & water included
- All suites pre-wired for phone, cable & internet
- Ensuite bathroom with tub or shower
- Full kitchen Amenities
- Elevators
- Emergency response system
- Fire alarm system
- Sprinkler system
- Emergency lighting
- Pets allowed
- Smoke free environment
- Wheelchair accessibility

Common Areas

- Dining room
- Lounges
- Exercise room
- Movie theatre
- Library
- Non-denominational Chapel

Outdoor Enjoyment

- Attractive Landscaped grounds
- Walking Trails
- Parks
- Gardening Plots
- Well treed natural areas with picnic tables
- Outdoor Recreational Activities
- Community Centre
- On-site cafe, convenience store and gas bar

Services Included:

- On-site Administrator
- 24 hour emergency response
- Daily Dinner Service and refreshments all day
- Licensed Practical Nurse on Staff (8:00 AM-4:00 PM)
- Maintenance Services
- Snow removal in the winter
- Daily Safety Checks
- Monthly calendar of social, cultural and recreational activities and outings
- Smoke free environment
- Air conditioning in common area
- Parking for residents and visitors

Dining

- Access to self serve refreshment area
- Full service dining room with 2 seatings

For Fee Services Menu:

- Laundromat Facilities
- Weekly bus service to local shopping
- Private family dining room available
- Weekly housekeeping including:
  vacuuming, light dusting, cleaning of bathrooms,
  kitchenette surfaces floors and change and laundry of bed linens

Extra Services Available:

The following list of extra services will be made available by providing space on the lower level for independent businesses to lease:

- Hair Salon and Barber Shop
- Manicures, Pedicures and Massage
- Doctors Office including reception room and 2 examination rooms

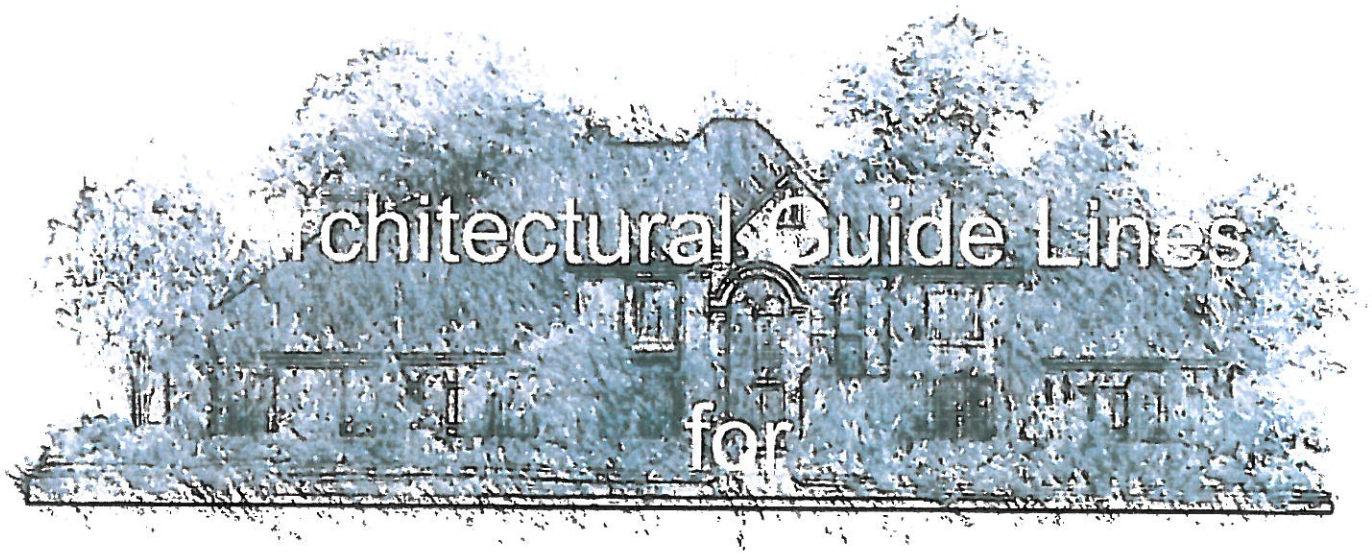
It is our hope that several doctors may see a benefit in coming to the LeMar Centre on a weekly basis with a high concentration of clients available in the immediate area.

The extra services provided will be available for the entire community of Fawn Meadows Estates on an appointment basis only and people from the surrounding area may also book appointments on a first come first serve basis

Submitted by Ambrose Comchi & Barrie Ibsen,

Directors of Fawn Meadows Development Inc.

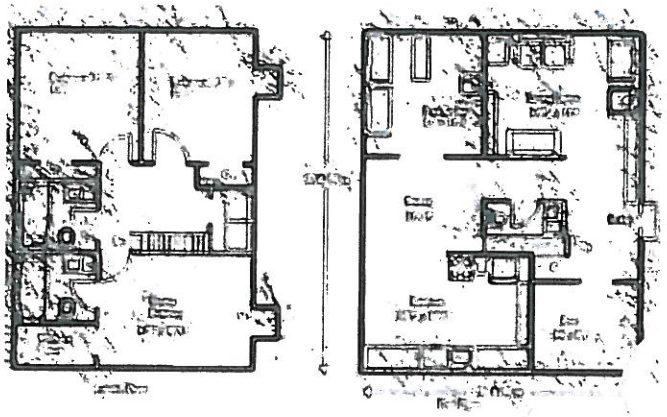
July 13, 2010

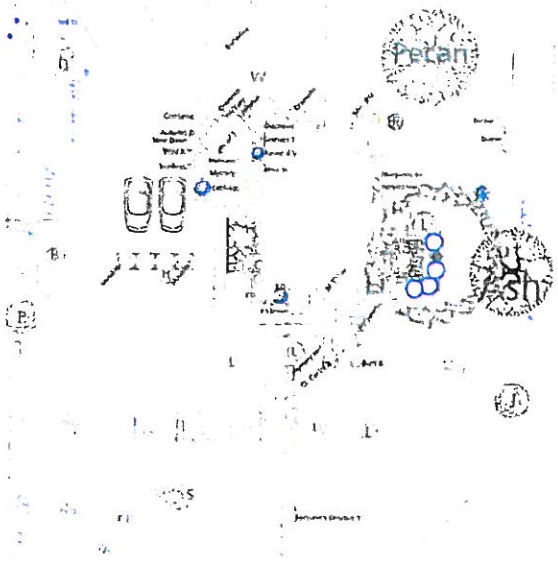


Architectural Guide Lines

for

Tarver Meadows





No sale is to be represented as final to a prospective purchaser until the final approval of the plans, elevations, lot siting and color scheme has been given by Fawn Meadows The home builder shall be fully and solely responsible for such representations.

The information contained herein is intended as a guide. Neither Fawn Meadows nor its designated Consultant shall have any liability whatsoever for any defect or lack of suitability in any of the materials or products suggested by or required by these guidelines. Fawn Meadows and its designated Consultant make no representation or warranties as to the accuracy of completeness of this information. The enforcement of these guidelines and interpretation of same shall be at the sole discretion of Fawn Meadows.

Fawn Meadows reserves the right to revise these guidelines without notice.

Fawn Meadows

"A quality of Life - Country Style"

Table of Contents

1.0 Introduction

Fawn Meadows Development Inc.'s vision for Fawn Meadows is the creation of a naturally beautiful haven for homeowners. A neighbourhood with extensive parks and natural reserves, professional landscaping with mature trees, indigenous plants and colorful flowers, all enhancing the natural characteristics of the land.

A handsome stone entry gate provides a dramatic sense of arrival in Fawn Meadows. Its views and peaceful setting, along with neighborhood natural areas and tree-lined walking pats, create natural beauty and special places where families can enjoy their leisure time.

Fawn Meadows Development's vision is also reflected in thoughtful architectural guidelines which enhance the visual appeal of neighborhood streets and preserve value.

The intent of these guidelines is to direct proportions, architectural elements and materials of the neighborhood to present an expression of harmony. The general architectural theme will encourage homes of traditional styling with thoughtful attention to detail. Through consistent new home quality, exterior styling and massing, these architectural guidelines perserve the overall integrity of the neighborhood; while permitting the flexibility for homes to reflect the unique preferences and dreams of their owners.

2.0 Design Guidelines

2.1 Siting

Siting should reflect careful consideration of lot characteristics, relationship and orientation. Building mass, siting and style may be adjusted on a lot to lot basis to enhance the streetscape. Setback may be increased accordingly.

2.2 Dwelling Unit Size

Houses are to have a consistency of apparent volume. As such, house widths and sizes must relate logically and proportionately to the lot and adjacent houses. The minimum house width must be within two feet of the building pocket maximum.

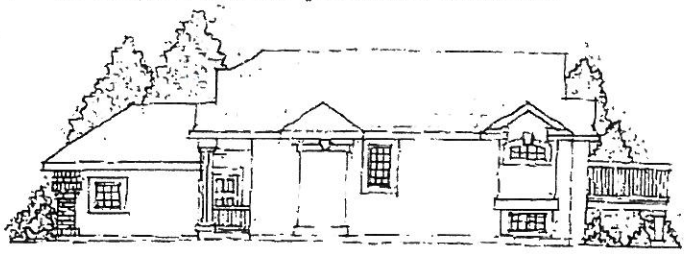
For the estate product the minimum house sizes calculated above grade shall be:

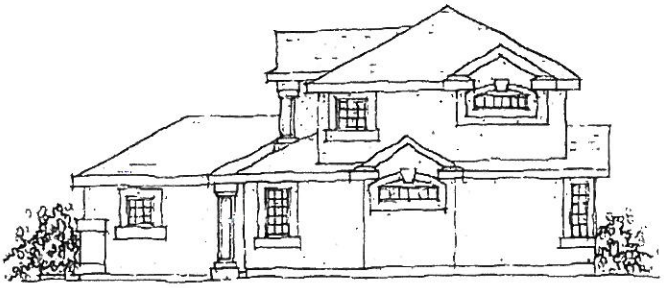
*Bungalow - 1400 sq. ft
* 1 ½ Storey - 1900 sq. ft
* 2 storey - 2160 sq. ft
* Bi-level- 1400 sq. ft.

2.3 Corner Lots

Houses on corner lots require special design consideration because of their high visibility. Bungalows or 1 ½ storey models are encouraged, however all model types will be considered on the basis of their unique suitability to these locations.

Flanking side elevations must reflect appropriate wall heights, window placement and detail treatments consistent with the front elevations.





Two storey models on corners will require substantial variation in wall planes. Second floor should be set back from the vertical plane of the lower level to provide roof mass between floors.

2.4 Repetition

Similar elevations may not be repeated within two lots of each other or directly across the street.

Repetitive use of elevations will be monitored to ensure interesting streetscapes. Modification to elevation treatments may be required accordingly.

2.5 High Visibility, Special Considerations

High visibility rear/side elevations require special design consideration. Elevations at these locations must avoid expanses of blank wall space and corporate attention to detailing

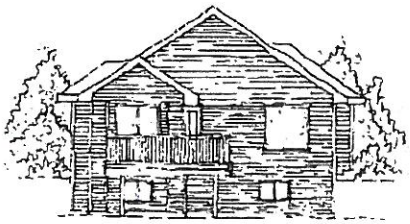
Standard elevation

Modified for high visibility

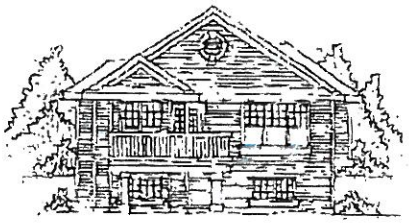
These high visibility locations include homes abutting parks and backing onto public spaces as noted on the lot plan.

Standard elevation

Modified for high visibility



Standard elevation



Modified for high visibility

The rear elevations of Lots backing towards S. Hwy. 770 and Parkland Drive should avoid large expanses of blank wall space and incorporate appropriate overhangs on all roofs. Homes designated "W" on the lot plan will require the siting of a walkout basement model.

Homes with walkout basement designs must incorporate a combination of architectural measures to address three storey appearance in highly visible settings.

These measures include:

* variation in wall planes
* downhill sloping roofs
* dormers
* decks and decorative posts/columns
* decorative windows
* absence of blank wall space

2.6 Lot Grading

Lot grading must be in strict conformance with the approved grading plans. Grade variations should be absorbed within the building mass, to miniiuze steeper slopes and contrast between lots.

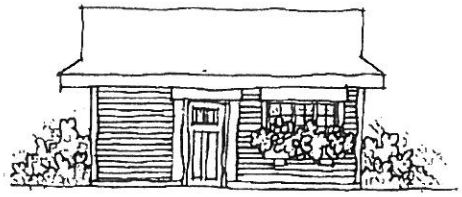
All lot plans and stakeouts must be done by the designated surveyor to provide consistency in establishing building elevations throughout the subdivision. The builder is responsible for meeting the required grade elevations and ensuring drainage patterns are maintained within the property lines to the satisfaction of Parkland County & Fawn Meadows. An approved final grading certificate is a prerequisite for final inspection and release of security deposit by Fawn Meadows

Retaining walls are the responsibility of the property owner and must not compromise the grading design and drainage of the lot. In the event retaining walls are required, such shall be approved by the Developer prior to construction.

Special attention is to be given the treatment of exposed concrete foundation walls. A maximum of 2'6" of parged concrete will be permitted on all elevations of the home. Variation in grade and basement design may require the cladding material be lowered or extended to within 2'6" of ground level.

Front entry steps are to be a maximum of three risers per set in the estate and move-up product. Where the grade elevation calls for more than three risers, the run must be split. Exceptions to this requirement may be granted in consideration of unique design and/or topography. A maximum of four risers per set shall be the standard on the starter homes.

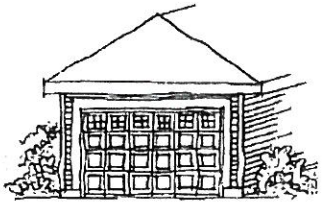
2.7 Driveways, Garages, Walkways



For designated lots, detached garages should be consistent in style, finish and color with the design of the house.

Garage pads will be a minimum 20'0" X 24'0" poured concrete, provided concurrent with the house construction.

The approach to the garage door from the laneway must be paved with paving stone, or other pervious material approved by Fawn Meadows.



The estate homes must be provided with a double attached garage, constructed concurrently with the home and located in accordance with the garage location plan. Designs with front drive garages should envelope the garage within the design of the home to integrate and minimize the garage appearance, while highlighting the architectural features and mass of the house itself. Garage overhead doors are to be sectional with raised panels. The height between garage overhead door and eave line should be kep to 2'0". Where the design exceeds 2'0", special treatment is required.

Front driveways and walkways may be constructed of the following materials:

* concrete paving stone with sand joint, including plain, stamped or colored concrete
* colored concrete pavers
* paving stone

In all cases where colored pavers are used, the colors must be expressly approved by Fawn Meadows.

The walkway to a residence from the roadway, curb or driveway must be a minimum of concrete paving stone, 2'6" in width. Individual patio paving stones will be permitted. with proper joints and space fill materials.

2.8 Roofs

Roof slopes will be a minimum of 6/12. The intent of this requirement is to unify the subdivision by exposing a dominant roof element and to provide an overall composition of roofs sloping towards view, increasing the curb appeal of each individual home.

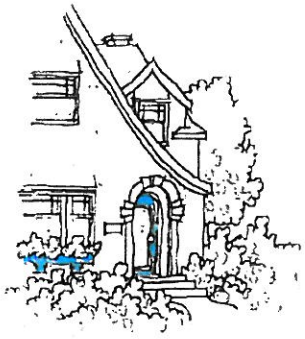
Eave overhangs are to be proportionate to the design of the home but not less than 1'4". Exception to this requirement may be granted in consideration of unique architectural design and detailing.

Facia boards for the homes are to be a minimum of 10". Soffits and fascia may be wood or aluminum in a compatible finish. Eavestrough must be the same color as the fascia.

All furnace and fireplace chimneys must be contained within a corbeled chase, finished in a style consistent with the home design. Corbeling shall, at a minimum, consist of two raised bands (2" x 10" and 2" x 4").

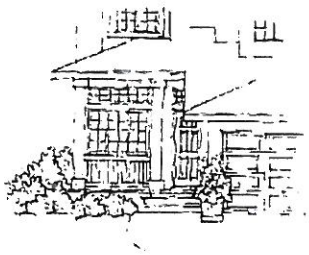
Direct vents for fireplaces should be located out of public view.

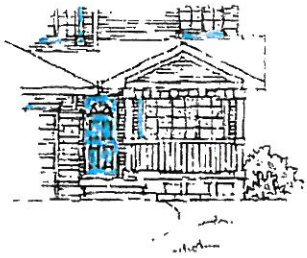
2.9 Architectural Treatments and Entries

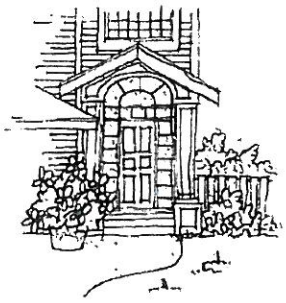


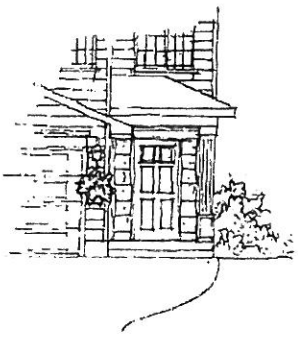
The general architectural theme will encourage homes in traditional styling. Front elevation treatments will reflect architectural features that define entranceways and utilize building components with strong detailing.

Entrance treatments must incorporate a verandah or covered entry. Where the design does not lend itself to this concept, the use of alternate detailing and feature windows will be considered by Fawn Meadows.



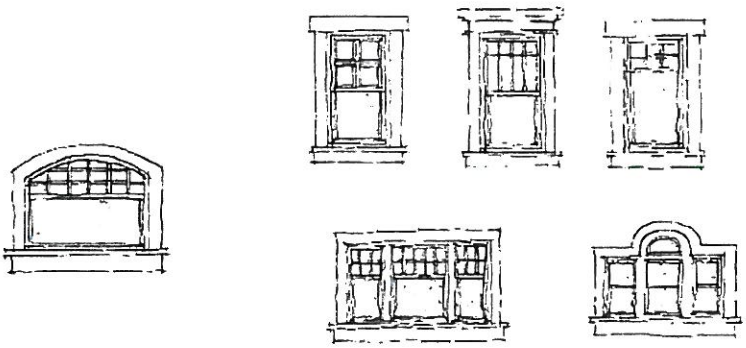






The use of window and door surrounds and/or a combination of battens, trim boards, louvers and brick or stone will be features on all homes.

Wood trim details and surrounds must be in a smooth painted, or clad finish. A minimum 6" width is encouraged, but as details and surrounds should be of appropriate scale, 4" may be permitted.



2.10 Exterior Finishes

Permitted cladding materials include:

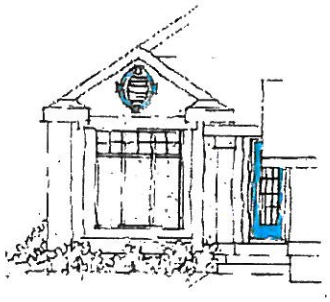
* brick, stone or shale in stacked application
*hardboard siding, prefinished (long life)
machine applied or trowel finish stucco
*stone tile

* Stucco may be used only with detailing that reflects the traditional character of the neighborhood.

Fieldstone and River rock may be considered on an individual basis.

All trim and masonry details must be returned 24" around corners.

Where columns or posts are used on the front or highly visible rear elevations, they are to be of substantial form, ie. to appear load bearing and solid. The base of such columns or posts must rest entirely on the landing or step beneath. Columns and posts should include suitable step details top and bottom.



ging not to exceed 2'6" on all elevations, lower line of cladding accordingly.

The application of a minimum of 200 sq. ft. of brick or stone will be required for all est estate home. Brick or stone should be applied in a panel effect. Exceptional stucco elevations may be exempt from this requirement at the descretion of Fawn Meadows.

2.11 Colors

Color schemes with two tones or a contrast are acceptable. Use of a third accent color is required. Colors will be approved on a lot by lot basis without repetition on adjacent lots. Color combinations have been provided in the Appendix B for reference.

2.12 Accessories

A address plaque is required on every house. The plaques shall be the design and size as supplied by a approved supplier for Fawn Meadows

3.0 Fencing

Lots backing onto a common amenity where the rear property fence is split log or plank will require fencing to match. Wood screen fencing will be permitted, between buildings only on these lots.

Fencing on all other lots should be consistent in design and color with the fencing style established for the subdivision.

4.0 Accessory Buildings

Where visible from a common or public adjacency, accessory buildings must be consistent in style, finish and color with the house.

5.0 Construction Activity

Each builder must inspect the condition of curbs, ditches, cuulverts,sidewalks, street lamps perimeter fence, etc, on or in front of the lot. A written lot inspection report must accompany the application for house plan approval.

The builder is required to maintain the lot in a clean and orderly fashion during construction. The dumping or storage of materials on other lots or on common lands is prohibited.

6.0 Approval Process

All applications must include the following information:

a) completed application form

b) one set of working drawings at 1/4" - 1" scale

c) two copies of the plot plan prepared by Designated Surveyor, at 1:300 scale

d) completed Start Information Form

e) lot inspection report

f) color or material samples as may be required

g) signed declarations include structured wiring requirements

These submissions must be made ten days in advance of the desired construction start date. It is not the purpose of this process to check for compliance with applicable governing statutes and requirements. **Incomplete submissions may be returned without review.** The application and plans will be reviewed for adherance to the guidelines. **Modifications may be requested.** The original plan and forms will be retained on file. A copy of the approved house exterior and approved application form will be returned to the builder. **Any changes to approved plans must be approved in writing prior to implementation.**

7.0 Final Inspection, Security Deposit Return

To initiate the Final Inspection, the following must be done:

a) Construction completed, exterior completed in accordance with these guidelines and as per the house plan approval. Accessories installed.

b) Rough grading certificate and approved grading inspection report from Fawn Meadows.

c) Watervalve exposed and marked.

d) Sidewalks,road lanes, ditches. gutters and curbs in clean condition

e) Address plaque and mailbox installed

f) Written request to Fawn Meadows to perform the final inspection, (must include grading certificate and County approval of same). A copy of the final inspection report will then be forwarded to Fawn Meadows for appropriate action.

8.0 Signage

All informational, directional and showhome signage must be in accordance with signage standards extablished by Fawn Meadows. All three types of signage shall be consistent in design, color and quality and must be designed, produced and erected by Fawn Meadows.

The Builders shall be allowed to display one (1) For Sale sign per lot provided said sign is erected on a suitable stand and not affixed to the house in any manner either during construction or upon completion of same.

All *For Sale* signs must display the Builder's name, corporate logo (if applicable) and telephone number as a minimum standard. The *For Sale* signs must be produced in the Builder's corporate colors and must be manufactured by a professional sign company to ensure consistent quality.

Each *For Sale* sign must not be larger than 32" x 48" prior to being affixed to the stand.

Subtrade and supplier signage will not be permitted to be displayed on the lot or the house in any manner, whatsoever. There will be no exception granted in this request.

9.0 Structured Wiring

The TIA/E1A-570-A Residential Telecommunications Cabling Standard was devised in an effort to standardize cabling infrastructure in the residential environment. A Grade 2 installation meets the requirements for advanced telecommunication and multimedia services such as high speed (broadband) Internet access, networking, closed-circuit security monitoring and multi-room video.

The home will have approved cable infrastructure to support the condominium access control and communication system as well as digital monitoring of utilities.

The purchasers inclusion of the TIA/EIA-570-A Residential Telecommunications Cabling Standard Installation Grade 2 (structured wiring), as approved by Fawn Meadows, is a condition of the purchase agreement and the house plan approval for this community. The exact requirements of this condition will be detailed by Fawn Meadows, or its consultant, at the time of house plan approval. Purchasers warrant their compliance with this condition through the signing of the Agreement for Purchase and Sale, submission of signed declaration at time of house plan application, and acknowledgement of the explicit condition when they obtain their satisfactory final inspection.

10.0 Other

Recreational vehicles and commercial vehicles in excess of 3/4 ton capacity shall not be stored in the front yard or driveway of any property between the building line and the curb, and if otherwise stored on the property for not more than 7 days. Longer term storage will be available with in Fawn Meadows at a designated location.

Appendix A

Neighborhood Context Plans

Appendix B

Colors

Fawn Meadows

"A quality of Life - Country Style"

Suggested Color Combinations

FAWN MEADOWS PT.NE & SE4-53-2-W5

CONDENSED SERVICING DESIGN BRIEF

FILE: NC-145-1

Prepared by:
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Phone 780.458-0013
Fax 780.459-1316

Submitted to:
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Planning & Development Services
Parkland County
53109A Hwy 779
Parkland County, AB T7Z1R1

Revised February 24, 2012

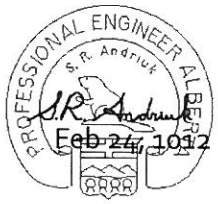
ALTIME ENGINEERING LTD.

A PARTNER OF THE NORCAN GROUP INC .

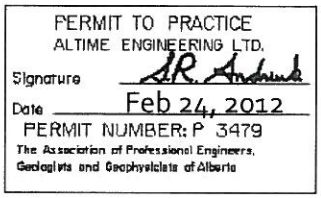
Appendix A - Condensed Servicing Design Brief

CORPORATE AUTHORIZATION

This report "Fawn Meadows" Part of NE & SE4-53-2-W5: Condensed Servicing Design Brief was prepared by Altime Engineering Ltd. for Fawn Meadows Development Inc. The material in it reflects the judgment of Altime Engineering, in light of the information available at the time of preparation. Any use of the information by a third party, or any reliance on or decisions made on it, are the responsibility of such third parties. Altime Engineering accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made, or actions taken, based upon information contained in the report.



PROFESSIONAL SEAL
S.R. Andriuk, P. Eng.



PERMIT TO PRACTICE

Contents

FIGURES

1.0 INTRODUCTION

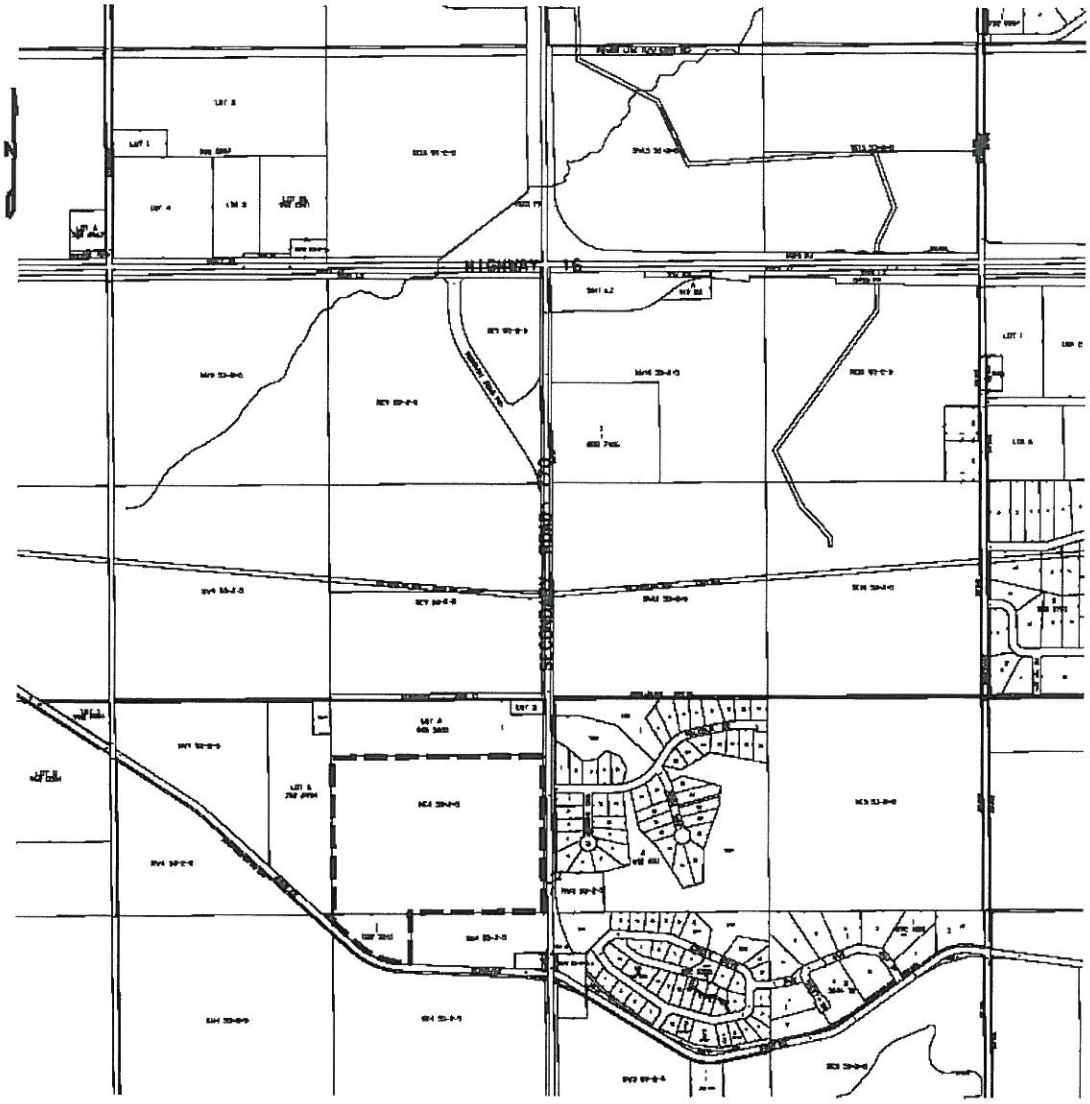
1.1 PURPOSE

The purpose of this Condensed Servicing Design Brief is to articulate the servicing intent for the development of Fawn Meadows. This Brief has been prepared in support of an application to amend policies included within the Parkland County Municipal Development Plan Bylaw No. 37-2007, Jackfish-Mayatan Area Structure Plan Bylaw No. 41-80 and Land Use Bylaw No. 20-2009.

Final engineering design will be in accordance with Parkland County standards and subject to approvals from the County's Engineering Services Department, Alberta Environment and other applicable approving agencies.

1.2 SUBJECT AREA

The subject property is located in the north-central sector of Parkland County and is located on the west side of SHY 770 (Range Road 23), south of Highway 16 on land legally described as Pt. of SE and NE4-53-2-W5 (see **Figure 1 - Location Plan).** The property is comprised of approximately 51.0 hectares. The property is bound to the north, west and south by multi-acre developed parcels; to the east by Secondary Highway 770, with country residential development beyond and to the east SHWY 770.
Portions of the property have historically been utilized as farm land since the early 1950s. The current property owner is Fawn Meadows Development Ltd.



FAWN MEADOWS

PT. NE & SE4-53-2-W5

FIGURE 1

LOCATION PLAN

SCALE: N.T.S. JUNE 2010

ALTIME ENGINEERING LTD.

2.0 BACKGROUND

2.1 PROPOSED DEVELOPMENT

Fawn Meadows will be an environmentally friendly residential community and will feature as the principal land uses 36 single detached residential dwelling units, 24 semi-detached residential dwelling units, 56 living villas consisting of multiplex dwellings (tri and four-plex), a 140 unit adult supported independent living complex, a community centre, recreational vehicle and mini-storage facility, and a convenience store, gas bar & restaurant.
The entire area will be developed within the context of a bare land condominium. This development will occur in 3 phases. **(See Figure 2-Proposed Phase and Population Projections)**

Fawn Meadows
Figure 2
Proposed Phase and Population Projections

Living Units by Phase:

UNIT TOTALS				
Phase	**Single Detached**	**Semi Detached**	**Villa**	**Complex**
1	16	0	28	56
2	10	0	28	84
3	10	24	0	0
Total	36	24	56	140

Population by Phase:

UNIT TOTALS					
Phase	**Single Detached**	**Semi Detached**	**Villa**	**Complex**	**Staff**
1	32	0	56	60	
2	20	0	56	180	
3	20	48	0	0	26
Total	72	48	112	240	26

TOTAL POPULATION: 498 ADULTS

2.2 TOPOGRAPHY

The topography of the property is varied, with some significant slopes throughout.
A Geotechnical Investigation was completed by Hagstrom Geotechnical Services Ltd and has been on going from 2004 to 2009. The geotechnical investigation consisted of a field investigation, laboratory testing, summary of conditions and recommendations relating to site preparation, grading, utilities, groundwater elevations, slopes and building construction. Further details regarding the geotechnical investigation can be found in the briefs provided by Hagstrom Geotechnical Services and Sabatini Geotechnical Services.

2.3 EXISTING INFRASTRUCTURE

In the past Fawn Meadows was pasture land and hay land and therefore had no previous existing infrastructure.

2.3.1 GROUNDWATER WELLS

A Groundwater Well and Aquifer Assessment completed for the subject property by Stantec Engineering in March 2009. Two wells were drilled; one as an observation well and one as a production well. Further details regarding these well can be found in the reports provided by SD Consulting Group.

3.0 WATER DISTRIBUTION SYSTEM

3.1 GENERAL

Water supply is proposed to be sourced from the groundwater wells. The objective for the proposed water distribution system will be to provide treated potable water to the development area in accordance with Alberta Environment guidelines and Parkland County Subdivision Development Standards.

3.2 DESIGN CRITERIA

The design criteria for the water supply includes for distribution, treatment, pumping and storage are as follows:

Domestic Water Usage based on 0.378 cubic metres per capita per day

	Single Detached	Semi Detached	Villa	Complex	Staff	Total
Phase 1	12.1	0.0	21.2	15.1		48.4
Phase 2	7.6	0.0	21.2	75.6		104.3
Phase 3	7.6	18.1	0.0	0.0	9.8	204.1
Totals	27.2	18.1	42.3	90.7	9.8	188.2

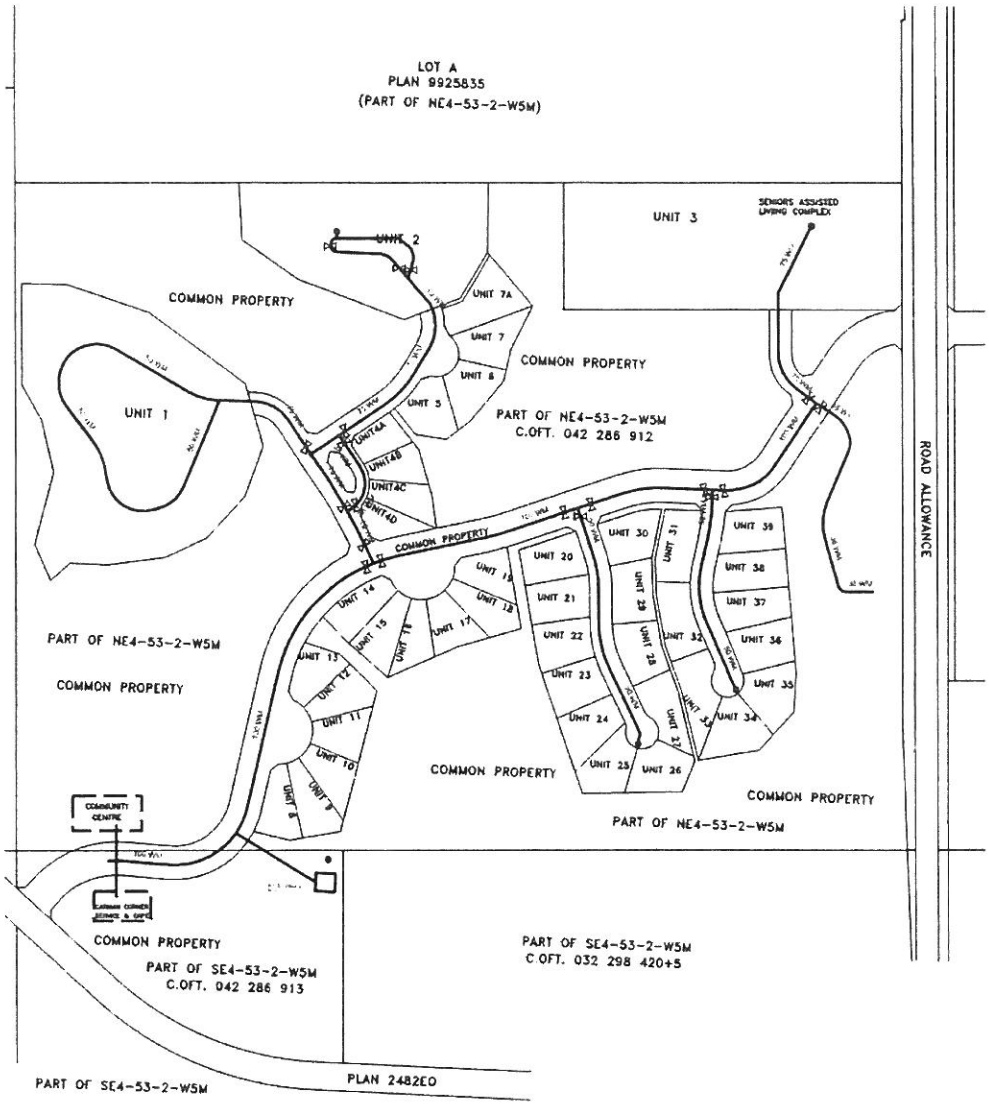
Units are cubic metres

Total Cubic Metres Per day	188.2
Average Cubic Metres Per Minute	0.131
Peak Cubic Metres Per Minute	0.392

3.3 WATER SUPPLY, DISTRIBUTION, TREATMENT AND STORAGE

The water supply system will consist of components to supply, treat, pump and distribute potable water throughout the development. The water treatment plant will consist of the water treatment building, water disinfection system and water distribution pumps. There will also be a metering system and underground storage tanks.

Water service shall be provided to all dwellings via a community distribution system that is operational on a year round basis. Water distribution system will be a "Trickle System" which provides each dwelling with potable water at a rate of 2.27 liters per minute (0.5 gallons per minute) (720 Imperial gallons per day). Each dwelling will have a cistern and pressure system. A condominium association shall be incorporated to manage, operate and maintain the water supply, the water treatment facility and water distribution system. This same condominium association will also manage, operate and maintain the wastewater collection, wastewater treatment and treated effluent disposal system. The condominium association will employ a licensed water and wastewater technician/utility company to operate and maintain both the water and wastewater systems. The water system shall be designed to the standards set by Alberta Environment and the County, and constructed at the sole expense of the developer. (see **Figure 3 - Water Servicing and Figure 3A-Water Treatment Site Plan)**

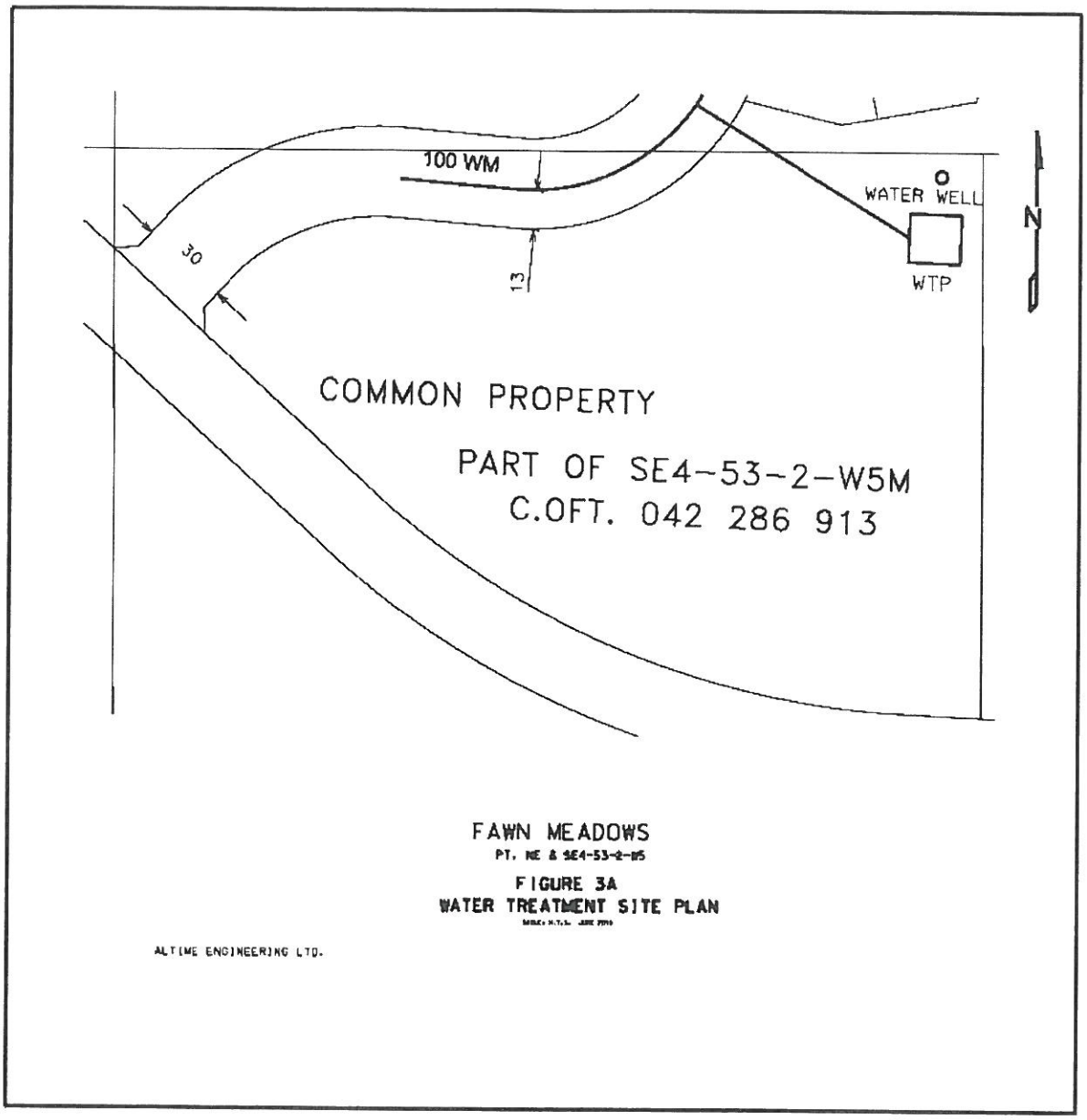


FAWN MEADOWS

PT. NE & SE4-53-2-W5

FIGURE 3
WATER SERVICING PLAN

ALTINE ENGINEERING LTD.



FAWN MEADOWS

PT. NE & SE4-53-2-W5

FIGURE 3A

WATER TREATMENT SITE PLAN

ALTIME ENGINEERING LTD.

4.0 WASTEWATER SYSTEM

4.1 GENERAL

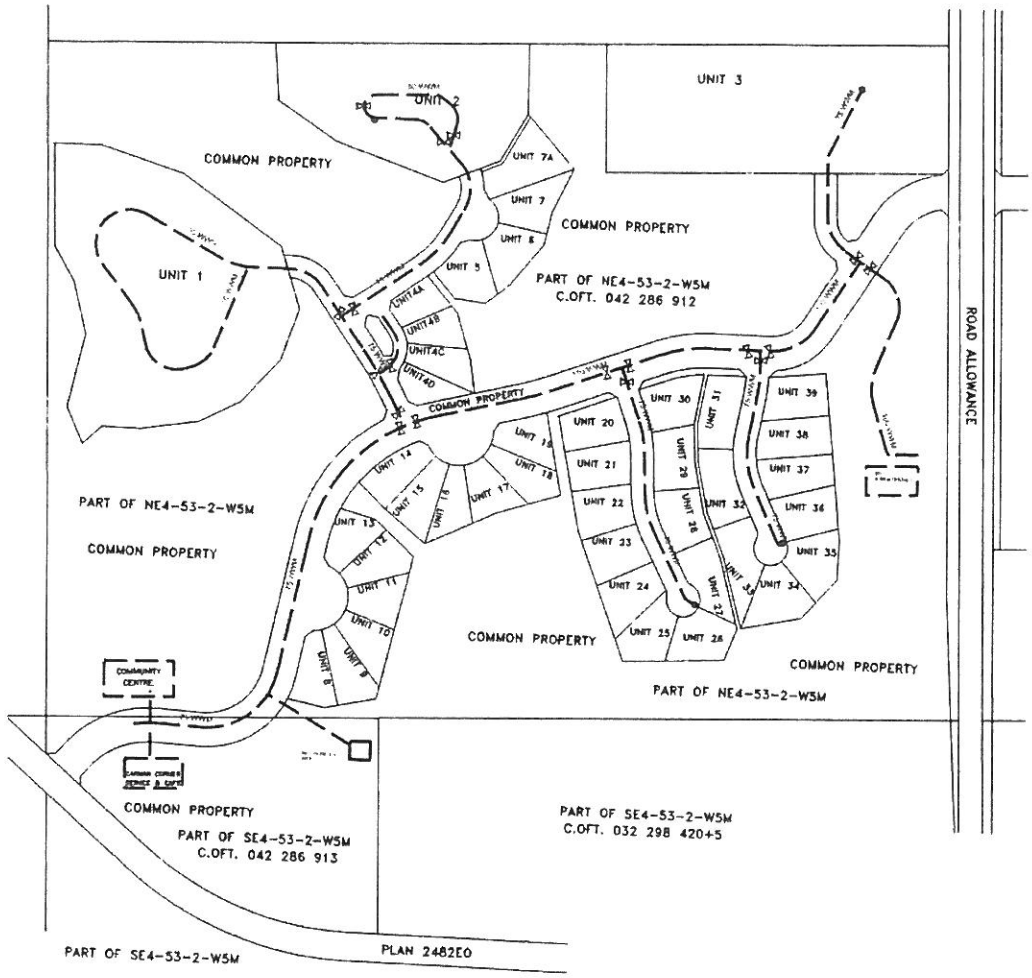
Wastewater will be accommodated by septic tanks located on each lot. The effluent from each septic tank will be pumped to a wastewater treatment facility and the treated effluent being disposed of by soil absorption methods. The wastewater collection system from the dwellings shall be provided by the developer and installed at the sole expense of the developer. The wastewater collection system will be the "STEP" system that is Septic Tank Effluent Pumping. This system comprises of a septic tank which separates the solids and greases from the effluent, a small submersible pump moves the liquid effluent via small diameter plastic pipes to the wastewater treatment facility. The wastewater collection system will be designed, located, and approved in accordance with Provincial and Municipal requirements, and are to be owned by the condominium association with exclusive use and operating costs being the responsibility of each dwelling owner.

Prior to subdivision approval, the developer shall provide confirmation that effluent from the Plan Area will be received by a wastewater treatment facility acceptable to Alberta Environment and the County. This same condominium association will also manage, operate and maintain the wastewater collection, wastewater treatment and treated effluent disposal system. The condominium association will employ a licensed wastewater technician to operate and maintain the wastewater system.

4.2 DESIGN CRITERIA

The design for the wastewater system is based on the following criteria:

- Individual septic tanks located on each lot.
- Scheduled clean out of the septic tanks as required.
- Septic tanks with a storage capacity equal to an average day of wastewater volume.
- The wastewater effluent from the septic tanks will be treated on site. (see **Figure 4-Wastewater Servicing Plan and Figure 4A – Wastewater Treatment Site Plan)**



FAWN MEADOWS

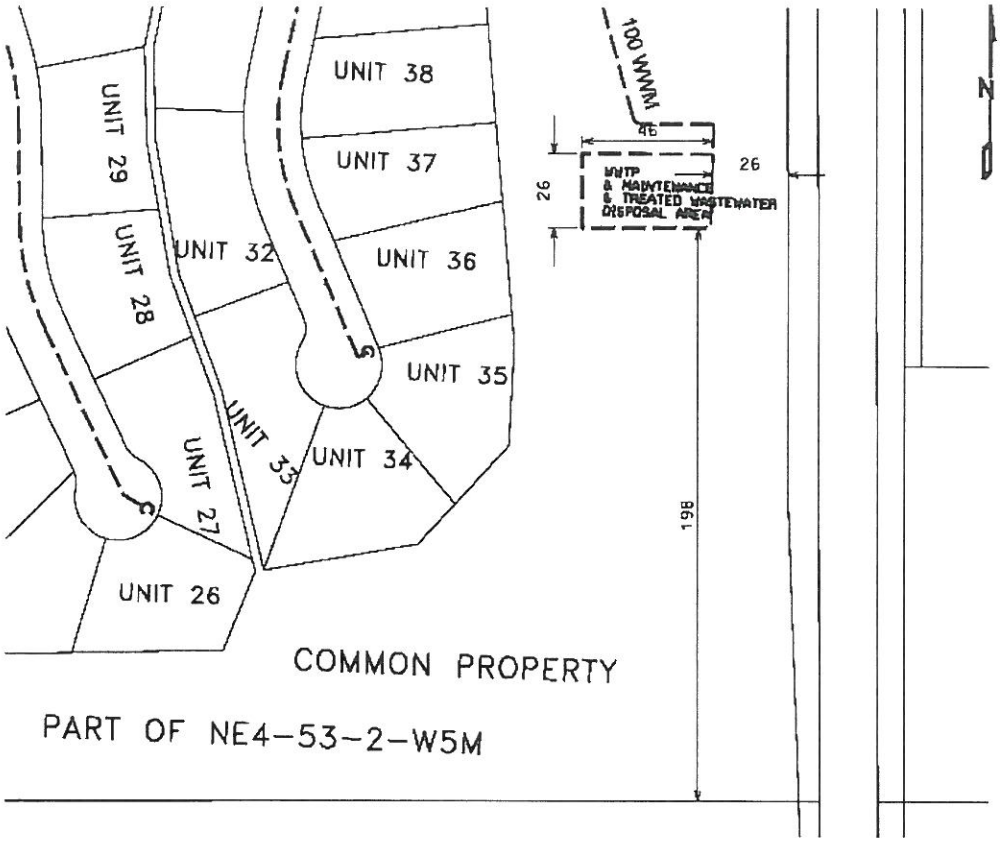
PT. NE & SE4-53-2-W5

FIGURE 4

WASTEWATER SERVICING PLAN

ALTIME ENGINEERING LTD

SCALE N.T.S. JUNE 20[illegible]



FAWN MEADOWS

Pt. NE & SE4-53-2-W5

FIGURE 4A

WASTEWATER TREATMENT SITE PLAN

5.0 STORMWATER MANAGEMENT SYSTEM AND FIRE PROTECTION

5.1 GENERAL

Altime Engineering Ltd. has prepared a preliminary stormwater management report for the proposed development. The purpose of the report is to present the stormwater drainage concepts that will form the basis of the drainage plan that will service the community. Storm water management will be based upon the principle of minimizing the amount of disturbance to the natural surface drainage patterns and to maximize opportunities for infiltration of storm water into the sub-soil and near surface aquifer.

Runoff that is collected via drainage swales and roadside ditches will drain to stormwater detention facilities that will be constructed in the existing low areas of each catchment area. The development as a whole will be designed such that all runoff up to and including the 1:100 year storm event will be contained on site and discharged at predevelopment rates. However, the development detention facilities will be designed with appropriately located emergency spillways. All stormwater management within the Plan Area shall be designed and constructed to Alberta Environment and County servicing standards.

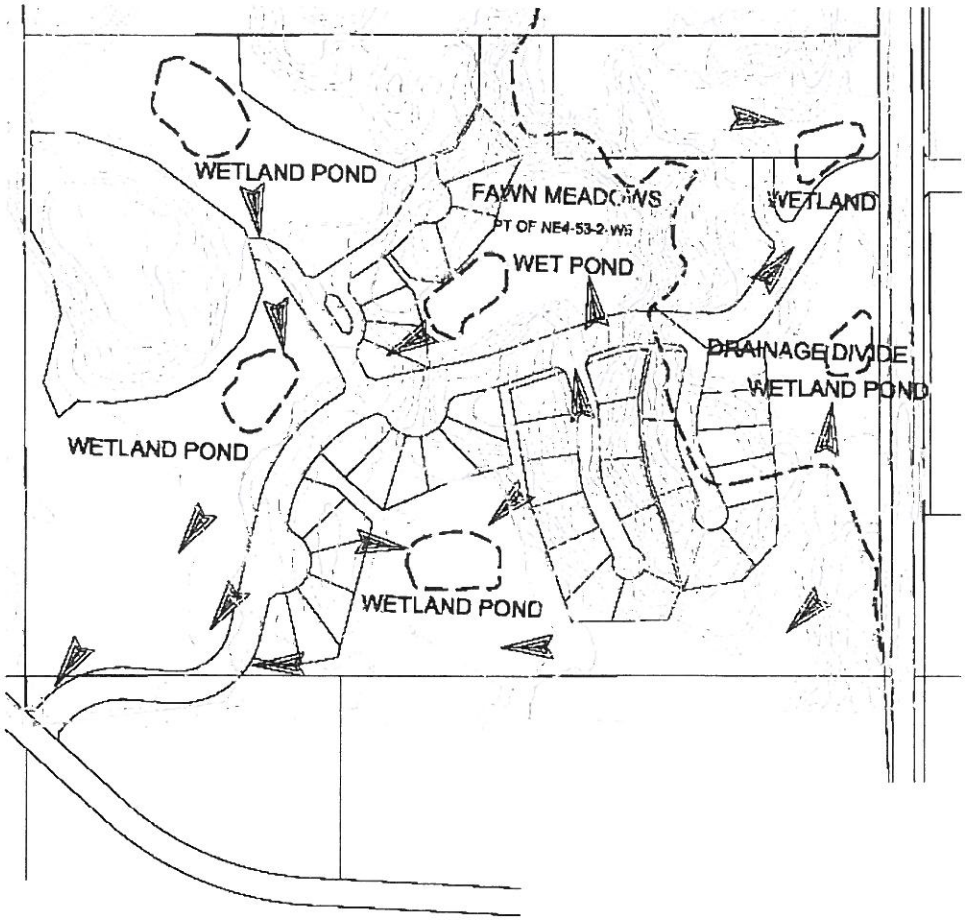
The post-development stormwater runoff rate from the Plan Area shall be no greater than the pre-development rate with a quality consistent with Alberta Environment guidelines. Stormwater management facilities shall be designed to utilize standing water. The stormwater management facilities shall be constructed at the sole expense of the developer.

5.2 DESIGN CRITERIA

The stormwater management system for Fawn Meadows will be designed in accordance with Alberta Environment Stormwater Management Guidelines and Parkland County's Subdivision Development Standards and will generally be comprised of a major (overland) system designed to convey 1 in 100 year storm runoff.

5.3 FIRE PROTECTION

Fire protection will be provided by using a stormwater wet pond as "fire pond" which is located on the center of the site and will have a permanent water depth of 2 meters. A dry hydrant and access point for a tank truck will be provided with sufficient storage to meet minimal fire standards. **(See Figure 5 - Stormwater Management and Fire Supply Ponds)**



FAWN MEADOWS

PT. NE & SE4-53-2-W5

FIGURE 5

STORMWATER MANAGEMENT PLAN

AND FIRE SUPPLY POND

ALTIME ENGINEERING LTD

SCALE: N.T.S. JUNE 2010

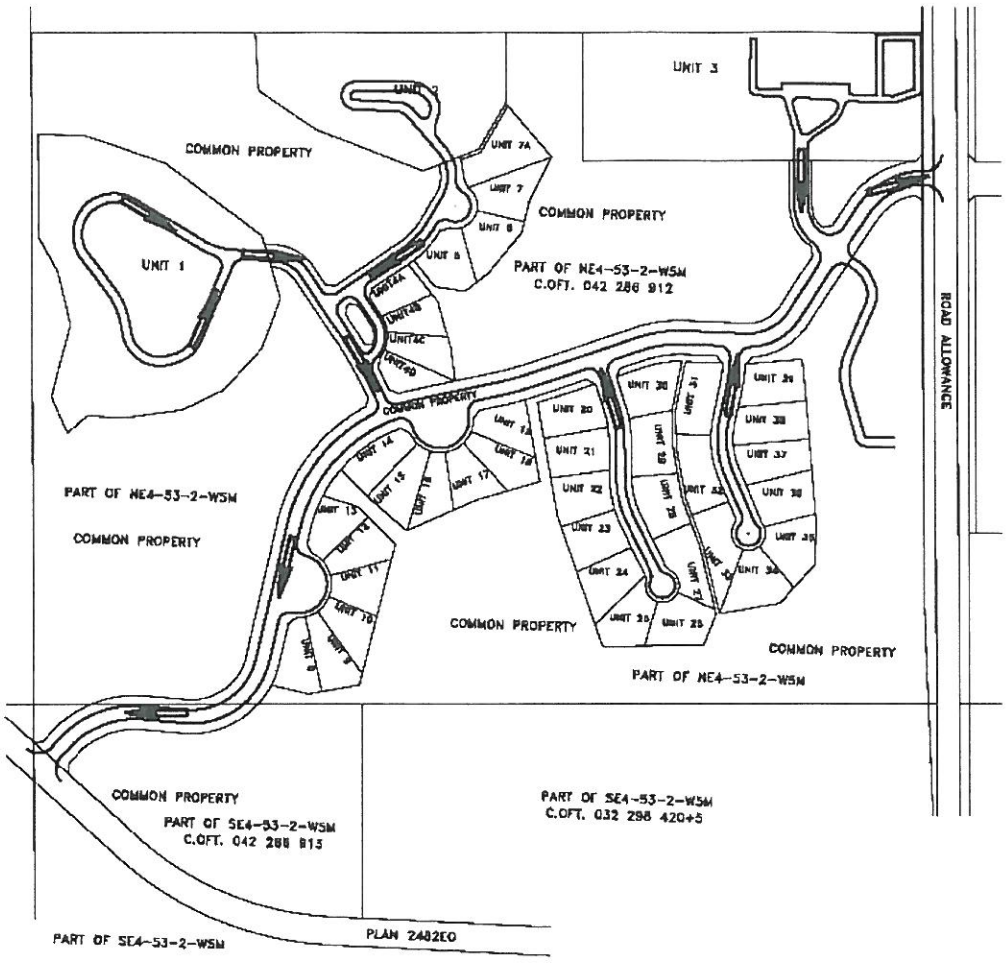
6.0 ROADWAYS AND TRAFFIC FLOW

6.1 GENERAL

Fawn Meadows will be serviced by a hard surface road network. As a gated community, both entrances will have electronically controlled gates. Access codes for EMS and other service providers will be provided. The east gate located in the northeast portion of Fawn Meadows will only be accessible for EMS services or other emergency.

A stone finished metal gate on a remote control system will be constructed upon completion of the access road at each entrance.

All the internal roads within Fawn Meadows will be constructed to an engineered internal road standard which includes a 7 metre (23 ft.) hard surfaced top, within a utility and transportation width of 30 m and 20m. **(See Figure 6 Roads and Traffic Flow Plan and Figure 6A-Typical Road Cross Section)**



FAWN MEADOWS

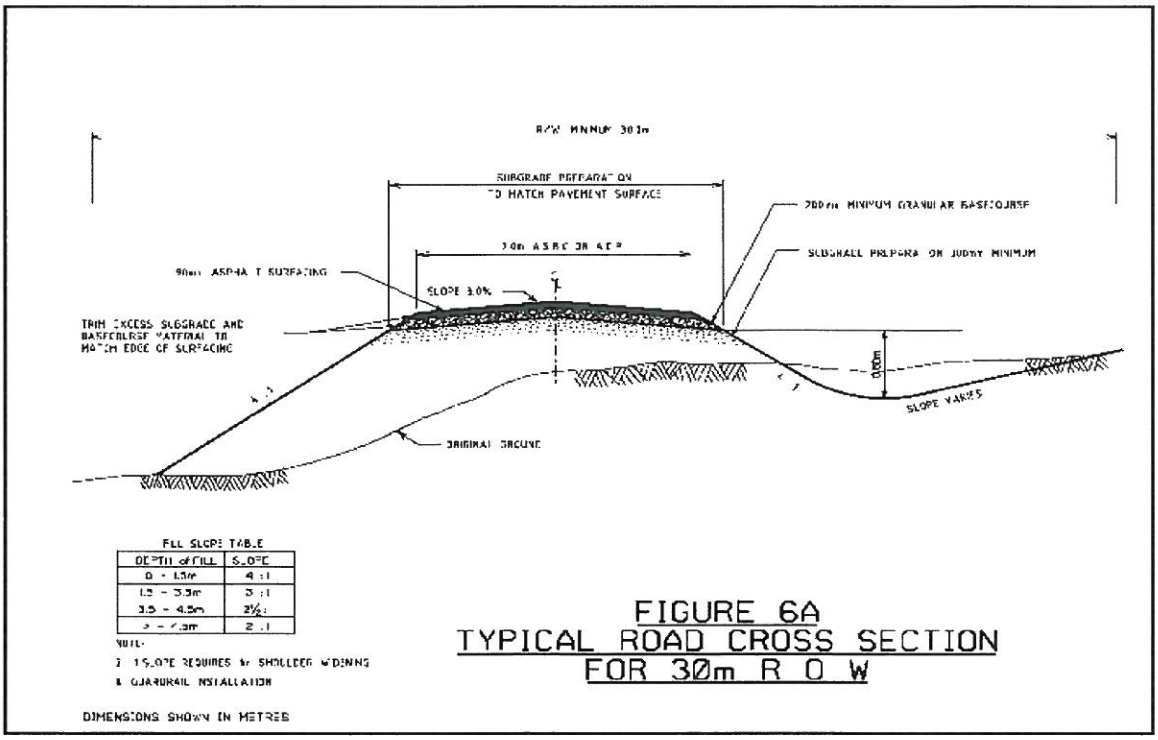
PT. NE & SE4-53-2-W5

FIGURE 6

ROADS AND TRAFFIC FLOW PLAN

SCALE: N.T.S. JUNE 2010

ALTIME ENGINEERING LTD.



FILL SLOPE TABLE

DEPTH of FILL	SLOPE
0 - 1.5m	4 : 1
1.5 - 3.5m	3 : 1
3.5 - 4.5m	2½ : 1
> 4.5m	2 : 1

NOTE:

1. SLOPE REQUIRES 1m SHOULDER WIDENING
2. GUARDRAIL INSTALLATION

DIMENSIONS SHOWN IN METRES

FIGURE 6A
TYPICAL ROAD CROSS SECTION
FOR 30m R O W

FAWN MEADOWS

Pt. of NE & SE4-53-2-W5, Parkland County

Preliminary Stormwater Management Report

Prepared By:

Altime Engineering Ltd
A Partner of the Norcan Group Inc.

#223, 86 Mckenney Avenue
St. Albert, AB
T8N 2T7

Submitted: January 2012
AEL FILE NO. NC-145-02

Altime Engineering Ltd.

January 30, 2012

Parkland County
53109A SH779
Parkland County, Alberta
T7Z 1R1

Attention: Mr. Stephen Fegyverneki, RPP MCIP
Senior Planner, Planning & Development Services
Dear Sir:

Re: Preliminary Stormwater Management Report – Fawn Meadows
Pt. of NE & SE4-53-2-W5, Parkland County

Enclosed please find a copy of the Preliminary Stormwater Management Report in support of the proposed subdivision development under Water Act.

Please contact the undersigned should you have any questions or comments pertaining to the enclosed report.

Yours truly,

PROFESSIONAL ENGINEER ALBERTA
L.J. REN
January 30, 2012

PERMIT TO PRACTICE
ALTIME ENGINEERING LTD.
Signature S.R. Andrusk
Date January 30, 2012
PERMIT NUMBER: P 3479
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

L.J.Ren, M.Eng., P.Eng.
LJR/ljr

Enclosures

TABLE OF CONTENTS

1.0 INTRODUCTION

This report is intended to outline the methodology to develop the on-site drainage and stormwater management (SWM) system for the proposed subdivision development. This report presents the design of the site plan and SWM system based on the topographical information received from Western Topographic Ltd. and visual site observations.

2.0 DESCRIPTION OF STUDY AREA

2.1 LOCATION AND SITE DESCRIPTION

The proposed development "Fawn Meadows" is located on Pt. of SE & NE4-53-2-W5 in Parkland County. The property is comprised of approximately 51.0 hectares. The subject land is bound to the north, west and south by agriculture land; to the east by Second Highway 770, with county residential development beyond and to the east of SHWY 770.

The property is currently used for agriculture and features a significant area of tree cover. The land has historically been used for forage crop and pasture.

2.2 TOPOGRAPHY AND DRAINAGE

The land at Fawn Meadows is very rolling and features an overall relief of about 20 metres. The highest point at Fawn Meadows is a ridge located in the southeast of the property. The lowest elevation in Fawn Meadows is in the southwest corner of the property.

There are five low lying areas in Fawn Meadows. The main feature of each low lying area is a small forest consisting of a mixture of black poplar, birch and black spruce trees. Surrounding each low lying area is forest cover. There is no definite drainage pattern across the site.

The soil profile of the site consists of a thin layer of topsoil that ranged from 18 to 67 cm in depth. Clay lenses of variable thickness and silt lenses are common beneath the topsoil level. Groundwater was found to be variable throughout the site with none of the sites having a high water table.

3.0 STORMWATER MANAGEMENT CRITERIA

The criteria used in the design of the proposed subdivision stormwater management follows the Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems (January 2006), Storm Water Management Guidelines for the Province of Alberta (January 1999) and Subdivision Development and Engineering Standards of Parkland County.

4.0 PROPOSED STORMWATER MANAGEMENT STRATEGY

The postdevelopment subject land will increase in impervious area and as a result runoff rate will be greater than the predevelopment rate. To restrict the runoff flow rate and to maximize opportunities for infiltration of stormwater into the sub-soil and near surface aquifer, a Stormwater Management Plan has been prepared. (Please refer to attached Stormwater

Management Plan). The drainage of the subject site in general is divided into two basins by a ridge, an east drainage basin and a west drainage basin. The east drainage basin contains approximately 9.6 hectare of land and drains to an existing wetland in the northeast corner. The west drainage basin is comprised of 37.4 hectare of land and drains to the southwest. Constructed wetland ponds and a wet pond with 2m permanent water depth are proposed to receive the runoff of 1 in 100 year storm event and provide sediment removal treatment to the stormwater before it is released. The location, size, storage, outlet structure and other details of the ponds will be determined later in the detailed design.

5.0 EROSION AND SEDIMENT CONTROL

The potential of erosion and sedimentation is high during site preparation and/or construction of roads and buildings. The storm runoff from the development area will flow overland and in the road ditches. Erosion and sedimentation control measures need to be put in place to contain the transport of sediment within the site boundaries during construction activities.

The following measures should be addressed at the time of construction.

1. Silt fences shall be placed as required to contain sediment transport and should be inspected regularly and any damages repaired.
2. Any disturbed soil surfaces shall be regularly watered to provide dust control. Watering shall be done daily, if required, by having water trucks on site and carrying out frequent checks.
3. Construction of a mud mat shall be placed at the site entrance in order to promote self-cleaning of truck tires when leaving the site.
4. Any piles of dirt or soil stock piled on site during construction for more than 14 days will be seeded to prevent erosion.

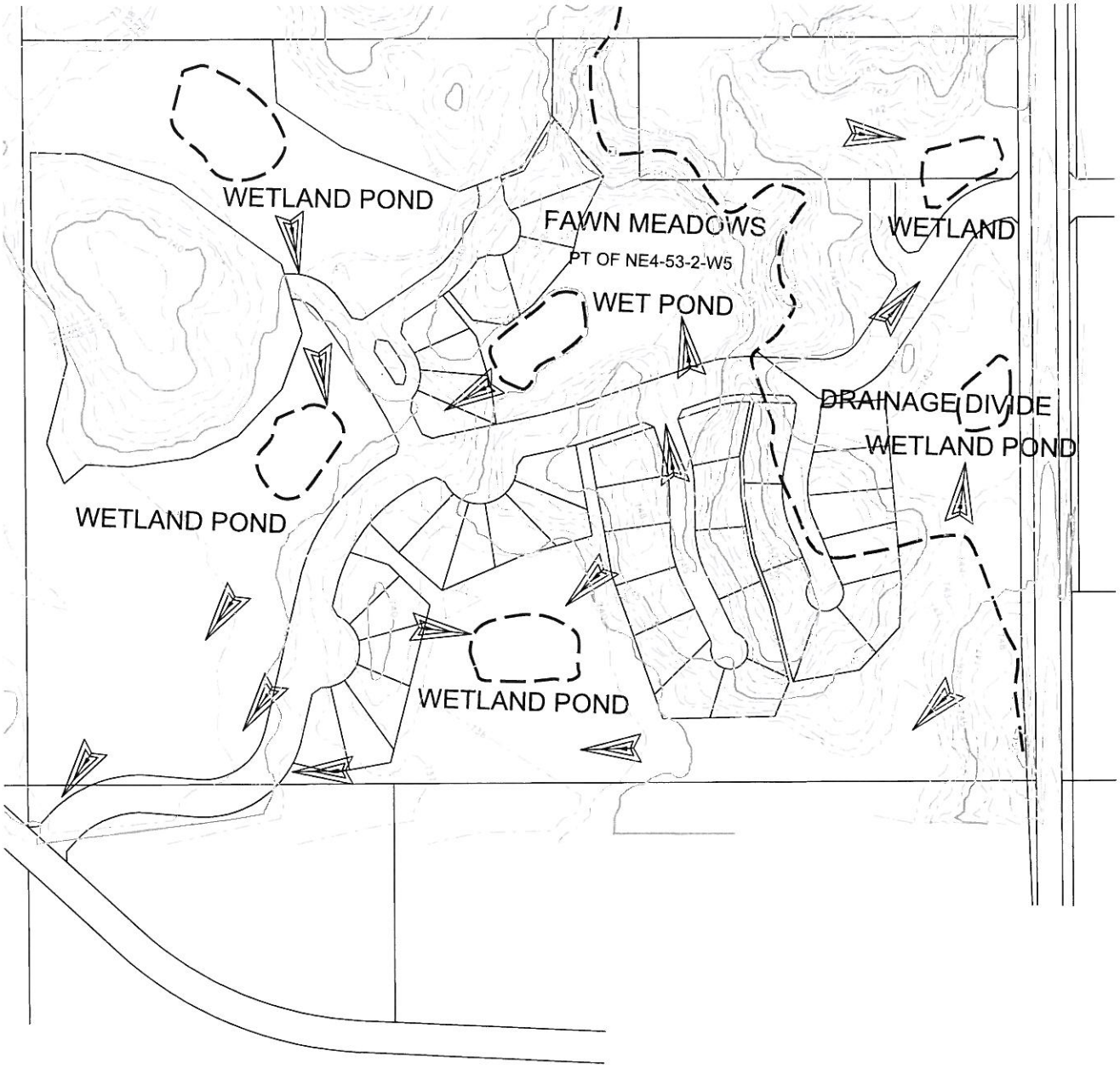
6.0 CONCLUSION AND RECOMMANDATION

It is noted that there is no definite drainage pattern in the subject land. In general two drainage basins are identified. The east drainage basin drains to an existing wetland, and the west drainage basin drains to proposed stromwater management ponds for quality and quantity control before water leaves the site. It is suggested the erosion and sediment control measures as outlined above be applied during construction period to contain sediments onsite and minimize adverse effect on the downstream and receiving water bodies.

7.0 DISCLOSURE

This report was prepared for Fawn Meadows subdivision development to provide a storm water management Plan in Pt. of NE & SE4-53-2-W5.

The services provided by Altime Engineering Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No warranty expressed or implied is made.



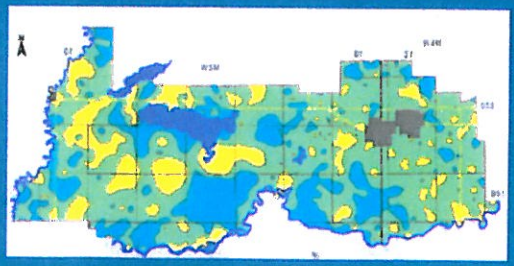
FAWN MEADOWS

PT. NE & SE4-53-2-W5

STORMWATER MANAGEMENT PLAN

ALTIME ENGINEERING LTD.

SCALE: N.T.S. JUNE 2010



Groundwater Supply Analysis

Fawn Meadows

August 2009 REVISED February 2012

REPORT TO	**NorCan Consulting**
FOR	**Groundwater Supply Analysis**
ON	**Fawn Meadows Development (NC-145)**
PRINCIPAL CONTACT	**Frank Florkewich** **NorCan Consulting Group**

August 2009, REVISED January 2012

SD Consulting Group
796 Cherokee Ave
Saint Paul, MN 55107

Stantec
White Bear Lake, MN 55015

I hereby certify that this report was prepared by me or under my direct supervision and that I am duly Registered Professional Engineer under the laws of the Province of Alberta.

Bryan DeSmet

Bryan DeSmet, P. Eng., SD Consulting Group — Alberta Permit to Practice #P10913

Table of Contents

1.0 Introduction

Stantec NAWE was retained by Fawn Meadows Development Corporation through NorCan Consulting as water supply and wastewater consultants. The scope of these services includes the completion of a groundwater supply analysis in support of an application under the *Water Act* for a groundwater diversion license. All revisions to this report were completed by SD Consulting Group.

The purpose of this analysis is to provide information on the capacity of the groundwater aquifer and its ability to meet the potable water demands of the proposed Fawn Meadows Development. This report provides information on site characteristics, locations and ownership of local wells, as well as pump test, water quality and well impact information. Reference materials include the Alberta Environment Water Well Database, The Parkland County Regional Groundwater Assessment other published geology and hydrogeology texts and figures.

The proposed development is located south of Highway 16 and west of Highway 43 in Parkland County. Location maps and property boundaries are provided in **Figure 1.1**.

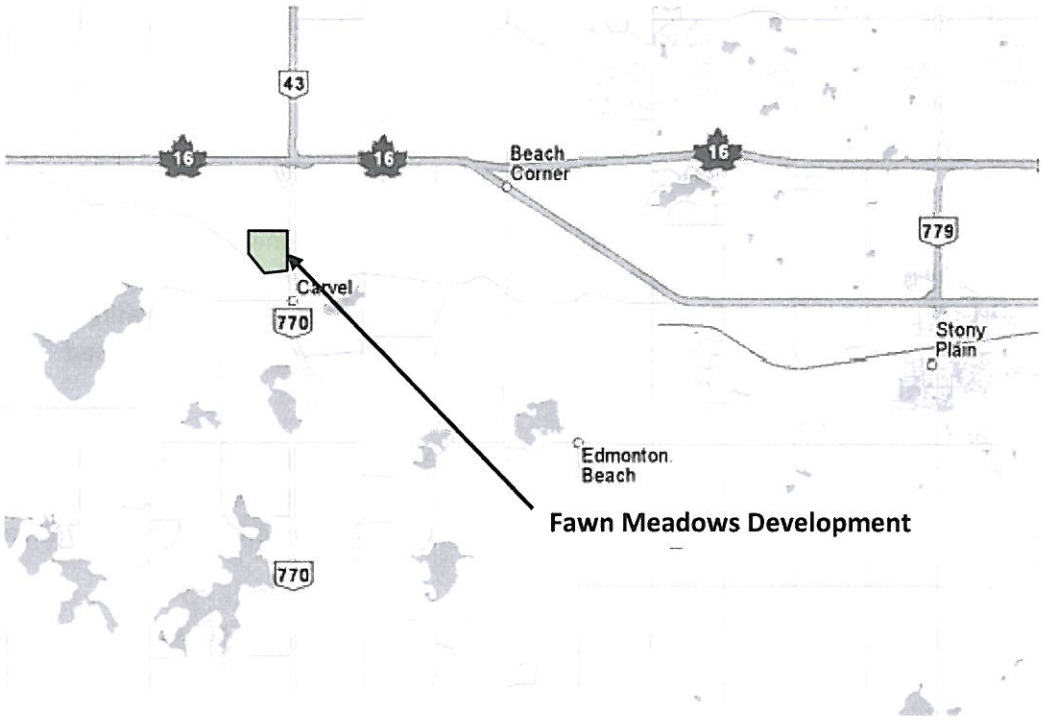


FIGURE 1.1 FAWN MEADOWS LOCATION

1.1 PROPOSED WATER SUPPLY

1.1.1 Water Demands

Current development plans include 35 single family detached dwellings, 20 semi-detached dwellings, 56 villa style dwellings, and 140 apartments. As shown in **Table 1.1, this equates to an average daily flow of 177 m^3/day and an average flow of 0.123 m^3/min.** As discussed later in this report, the production well can produce a sustainable yield of 0.46 m^3/min, which is more than enough to meet the demands of the development and not cause negative impacts to neighboring wells.

Table 1.1: Water Demands

Unit Type	# of Units	Residents /Dwelling	Total Residents	Water Demand Per Capita (m^3/day)	Total Water Demand (m^3/day)
Detached Dwellings	35	2	70	0.378	26.5
Semi-Detached Dwellings	24	2	48	0.378	18.1
Villa-Style Dwellings	56	2	112	0.378	42.4
Apartment-Style	100	2	200	0.378	75.6
Dwellings	40	1	40	0.378	15.1
Totals	**255**	**-**	**470**	**-**	**177.7**

1.1.2 Groundwater Sources

As shown in **Figure 1.2**, two groundwater wells have been installed on the property:

- Observation Well (AENV ID #1165411) – Installed on June 12, 2008 to a depth of 73.1 feet, the well has a casing diameter of 18 centimeters. This well installation was exploratory for preliminary water supply determination. The observation well was used as an observation well during the 2009 pump testing and will be used as a backup domestic supply well in the development.

- Production Well 2 (AENV ID# TBD) – Installed on May 13, 2009 to a depth of 84.4 feet, this well is intended for use as the primary water supply well. This well was installed with a 26 centimeter casing diameter and was test pumped for 72 hours with a 24 hour recovery period.

Both wells are installed into the interlayered sandstone and shales of the Horseshoe Formation. Five separate sandstone units are discharging into the production well casing. The two wells are 244 meters apart.

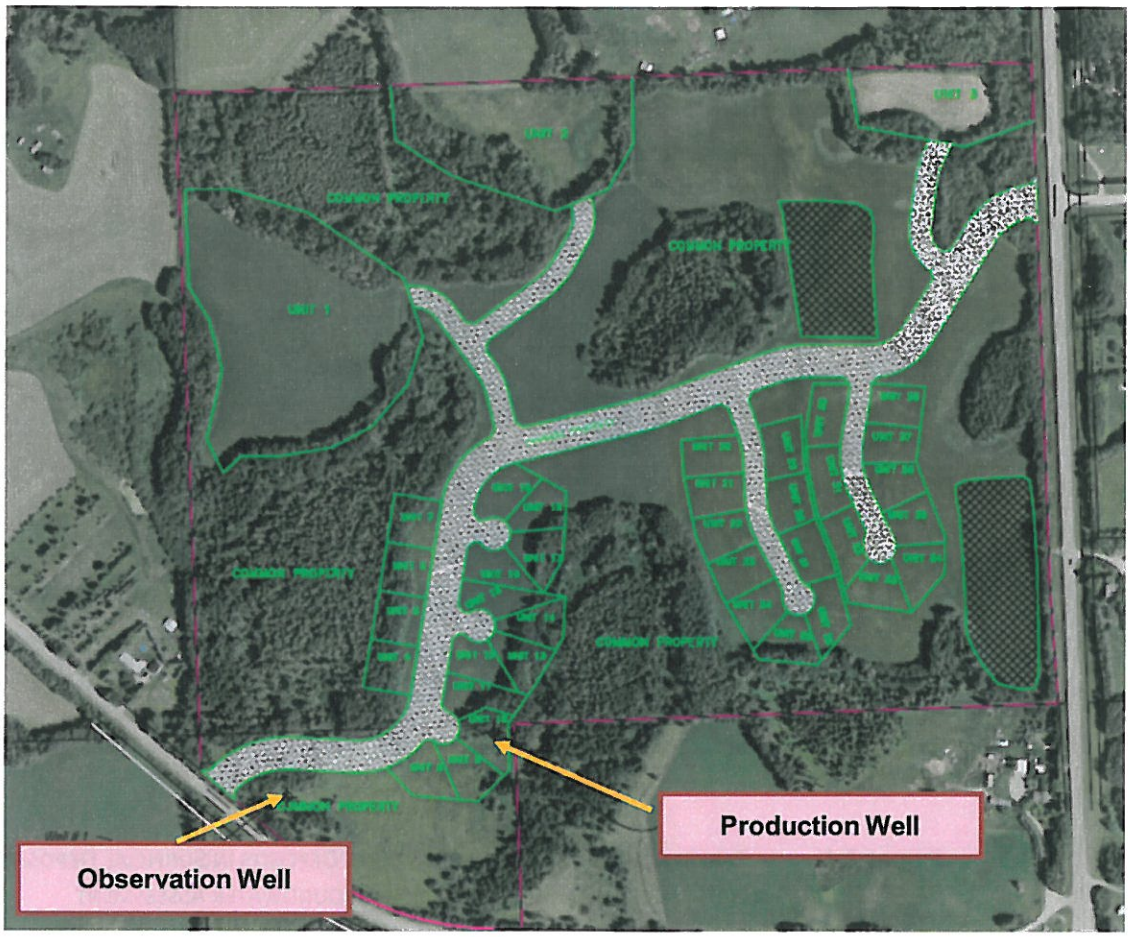


FIGURE 1.2 FAWN MEADOWS WELL LOCATIONS

2.0 Site Geology and Hydrogeology

2.1 SITE GEOLOGY

2.1.1 Local Surficial Geology

Fawn Meadows is located on the western edge of the Alberta Plains in a landscape characterized by rolling hills, river terraces, hummocky moraines, and numerous lakes/wetlands. Surficial geology is dominated by glacial till, lacustrine and outwash deposits from the Wisconsin Glaciation. Locally, the Fawn Meadows site is on the western edge of a large outwash deposit. Therefore, surficial materials consist of silt, sand and gravel. Approximately 10-50% of the surficial deposits consist of sand and gravel. Surficial deposits at Fawn Meadows have an average thickness of 20 meters over bedrock. **Figure 2.1** shows the amount of sand and gravel

in surficial deposits throughout the county; the location of the proposed Fawn Meadows development is noted.

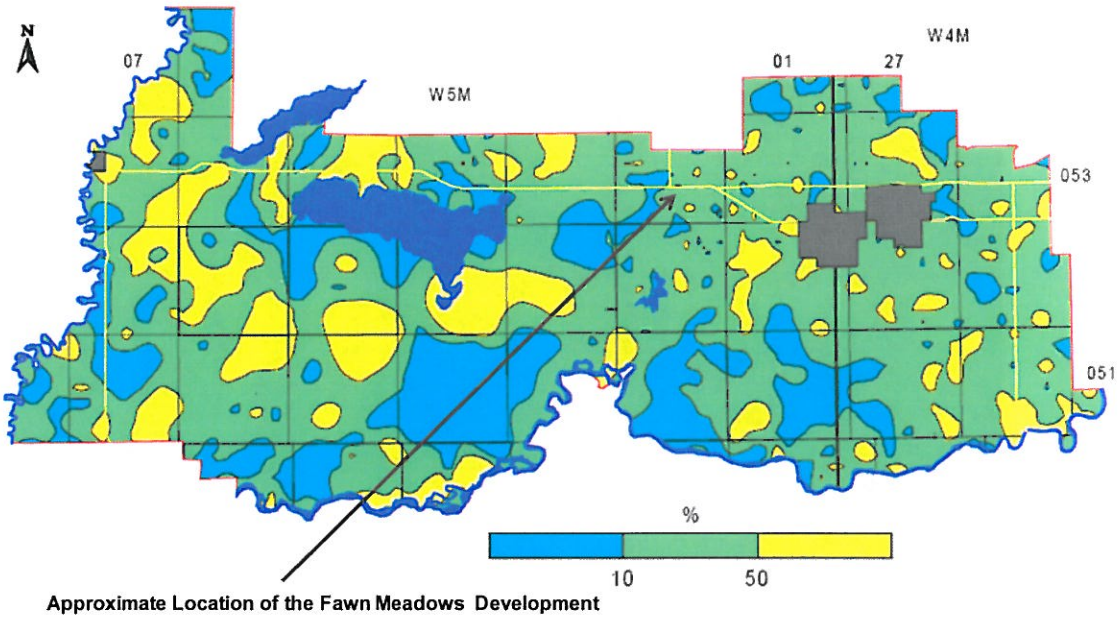


FIGURE 2.1 PARKLAND COUNTY SAND AND GRAVEL DEPOSITS IN SURFICIAL DEPOSITS
FIGURE SOURCE: PARKLAND COUNTY REGIONAL GROUNDWATER ASSESSMENT

2.1.2 Local Bedrock Geology

According to the Parkland County Regional Groundwater Assessment and the Research Council of Alberta's "Hydrogeology of the Wabamun Lake Area", Fawn Meadows is underlain by the Edmonton Group, a series of bedrock units consisting of alternating sandstone, siltstone and shale layers. The first bedrock unit, the Upper Horseshoe Formation is encountered at a depth of 20 meters and is approximately 80 meters at its thickest point. Below the Upper Horseshoe Formation, the Middle and Lower Horseshoe formations are encountered to a depth of approximately 300-500 meters below ground surface. The Bearspaw Formation is encountered below the Horseshoe and is the lowest bedrock unit typically studied in the area. A Parkland County bedrock map is provided in **Figure 2.2.**

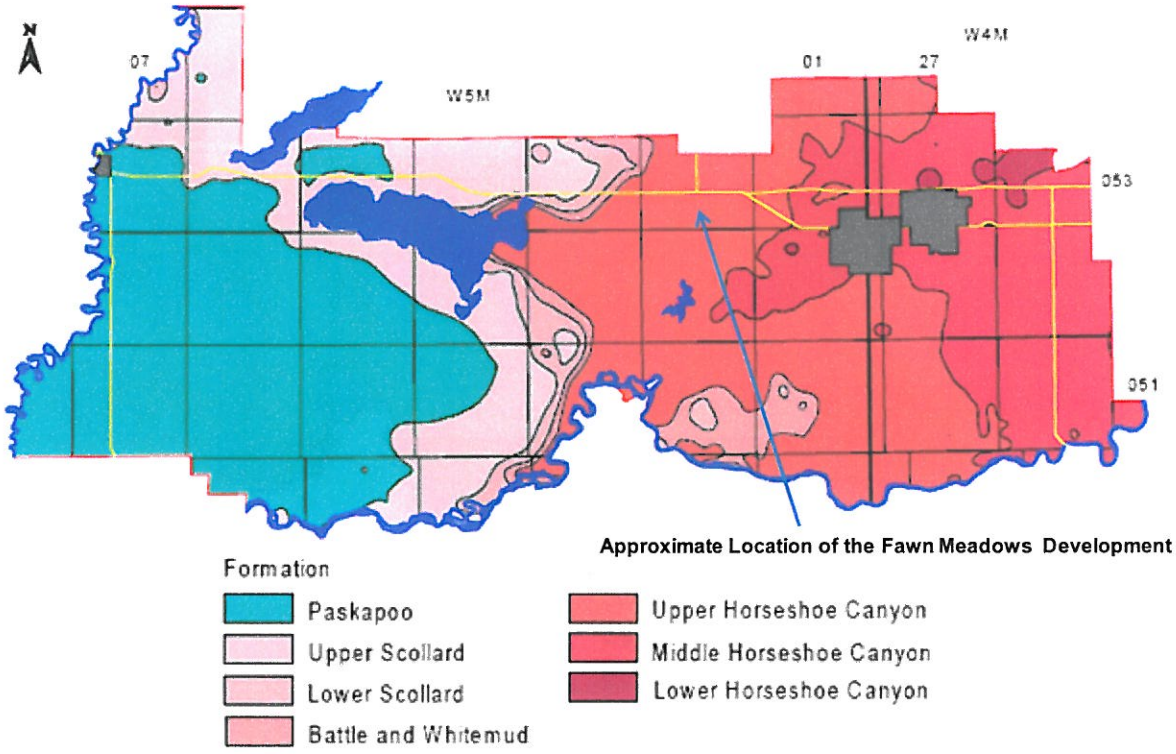


FIGURE 2.2 PARKLAND COUNTY BEDROCK GEOLOGY
FIGURE SOURCE: PARKLAND COUNTY REGIONAL GROUNDWATER ASSESSMENT

2.2 SITE HYDROGEOLOGY

Drinking water at Fawn Meadows will be provided by the Horseshoe Canyon Aquifer, which consists of three distinct bedrock formations. The upper, middle and lower Horseshoe Canyon Aquifers are the porous and permeable parts of the formation. The source aquifer consists of alternating layers of porous sandstone and impermeably shale/siltstone. Well casings typically intersect several sandstone layers that provide potable water and the entire system functions as a leaky confined aquifer. These aquifers are encountered at depths between 20-300 meters below ground surface and this aquifer is the most common bedrock aquifer in this region of Parkland County.

According to the Parkland County Regional Groundwater Assessment, the aquifer recharge/discharge for the Horseshoe Canyon formations, and the surficial deposits, discharge from the bedrock occurs over and area smaller than 10% of the County. **Figure 2.3** shows the recharge and discharge areas for the Upper Horseshoe Canyon Aquifer.

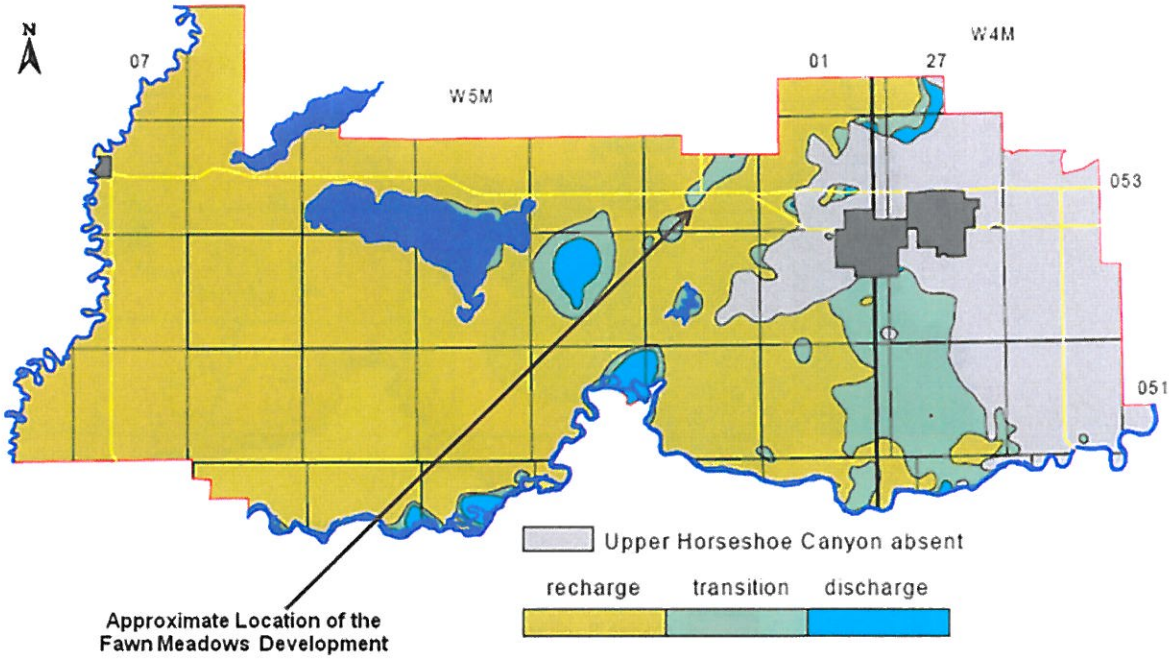


FIGURE 2.3 RECHARGE/DISCHARGE AREAS BETWEEN SURFICIAL DEPOSITS AND UPPER HORSESHOE CANYON AQUIFER
FIGURE SOURCE: PARKLAND COUNTY REGIONAL GROUNDWATER ASSESSMENT

3.0 Well Survey

According to the Parkland County Regional Groundwater Assessment, of the 3,107 recorded water wells in the county, 1,617 were defined as being constructed in the bedrock aquifer. Of these bedrock wells, 640 are located in the Upper Horseshoe Canyon Aquifer, 485 in the Middle Horseshoe Canyon Aquifer and 79 in the Lower Horseshoe Canyon Aquifer.

The Alberta Environment Well Database has been utilized to identify wells drilled within a 1 km radius of the well for the proposed Fawn Meadows Development. Field verification has not been completed so it is likely that not all of these wells are in use. **Figure 3.1** shows the general location of wells within this radius. **Table 3.1** summarizes the data on the known wells within this area. Individual water well drilling reports and maps are located in **Appendix A** of this report. Exact well locations will not be known until field verification. However, approximate well locations are provided for reference to the production well.

TABLE 3.1 NEIGHBORING WELL LOCATION DATA

Owner's Name	Well ID	Legal Land Location	Date (DD MM YY)	Well Depth	Original Non-Pumping Water Level
Onyschuk, Andy	0351132	NW-04-53-02-W5	18 05 1990	210	36
Enders, Dave	0352280	SW-03-53-02-W5	02 08 1990	280	60
Franks, Gary	0353715	SW-03-53-02-W5	12 09 1990	260	65
Enders, Dave	0363257	SW-03-53-02-W5	15 05 1989	215	60
Chaput, Ralph	0365507	SW-03-53-02-W5	11 06 1992	260	59
Taylor, Robert	0365688	NW-03-53-02-W5	17 07 1992	205	48
Hawkins, Doug	0366255	SW-03-53-02-W5	18 08 1992	242	43
Chubaty, Mike	0368748	SW-03-53-02-W5	13 11 1992	240	63
Enders, Dave	0380523	SW-03-53-02-W5	14 03 1994	240	70
Bleker, Ernie, Jr.	0418277	SW-03-53-02-W5	04 10 1995	319	99
Carvel Dev	0459689	04-03-53-02-W5	25 06 1979	220	65.4
Stecyck, Fred	0459702	SW-03-53-02-W5	30 03 1971	190	54
Bleker, Ernie	0459710	SW-03-53-02-W5	11 06 1980	256	75
Enders, Dave	0459713	SW-03-53-02-W5	28 11 1989	285	55
Scott, Bertha	0459723	13-03-53-02-W5	07 12 1983	120	15
McDonald, Evan	0459734	12-03-53-02-W5	18 08 1983	220	40
Adams, Jack	0459744	SW-04-53-02-W5	23 08 1985	198	75
Bell, Jack	0459745	12-04-53-02-W5	17 08 1981	240	147
Turlock, S.	0459747	NW-04-53-02-W5	26 05 1967	170	18
Solar, Const	0459748	14-04-53-02-W5	26 09 1976	120	19
Wasylyshyn, Steve	0459749	NW-04-53-02-W5	17 08 1963	124	32
Enders, Dave/CDK Const	0466661	SW-03-53-02-W5	10 08 1994	260	65
Enders, Dave	0467926	SW-03-53-02-W5	26 09 1995	240	40
Shenfield, Tim	0494989	SW-03-53-02-W5	06 05 1999	220	85
Bates, Gerlad	0495847	SW-03-53-02-W5	13 10 1999	220	42.1
Willow Peak Homes	0496508	SW-03-53-02-W5	14 07 2000	265	42.2
Mercier, Ron	1165150	03-03-53-02-W5	21 02 2002	240	77.7
Ostermayer, Craig & Pat	1165151	NW-04-53-02-W5	18 05 2003	140	32.48
Phillps, Ross and Sarah	1495171	05-03-053-02-W5	21 06 2005	320	72.08
Taylor, Trudy	1715041	12-03-53-02-W5	26 02 2003	195	20.013

1. Standard units are used as they are specified on all well logs

4.0 Pumping Test and Water Level Monitoring

4.1 TESTING PROCEDURES

Two pump tests have been completed at the Fawn Meadows Development. The first test occurred in the Observation Well on June 24th, 2008 and the well was pumped for 26 hours until steady state

conditions were reached. Recovery in the well was monitored over an 18 hour period before monitoring equipment was removed from the well. Only one well had been installed at this time, so this test was completed as a single well aquifer test.

Following the installation of the Production Well in May of 2009, a second pump test was completed on May 21, 2009. The production well was pumped for 72 hours and the first well was monitored as an observation well. Recovery was monitored in both wells over a 24 hour period. The water well drilling report for both wells is provided in **Appendix B**, and the pump testing field reports are located in **Appendix C** of this report. All test monitoring was completed at intervals specified in the *Alberta Groundwater Evaluation Guidelines*.

4.2 AQUIFER PARAMETERS

Table 4.1 summarizes the results of the tests performed. All hydraulic parameters have been calculated utilizing the computer software AQTESOLV v4.5.

TABLE 4.1 AQUIFER PARAMETERS

Well	Length of Test (hrs)	Discharge Rate (m^3/min)	Analytical Procedure	Transmissivity(m^2/d)	Storativity	Observation Well?
Observation	26	0.113	Hantush	14.67	NA[1]	No
Production	72	0.227	Hantush	26.05	.0008714	Yes
			Theis	26.05	.0008712	Yes

1 – Unable to calculate storativity without observation wells

Using the equation T = KB, the hydraulic conductivity of the groundwater aquifer was calculated. Using a T value of 26.05 and a saturated thickness of 72 meters, the hydraulic conductivity is calculated to be 0.361 m/day, or 0.000004183 m/sec. This is consistent with textbook values for sandstone aquifers (3 x10-10 – 6 x 10-10), so it appears to be appropriate for this analysis.

4.2.1 Sustainable Yield

The theoretical long-term safe yield (Q_{20}) of the production well has been calculated using the Farvolden Method and the results of the aquifer testing. The equations and calculations using this method are shown below.

Equation 4.1 Farvolden Method

$$Q_{20} = (0.68) \times T \times H \times (0.7)$$

T = Transmissivity *H = Distance from top of aquifer to the pre pumping water level*

Using the Farvolden Method, a Q_{20} of 0.460 m^3/min is calculated as the safe yield. As mentioned previously, the new development will require a peak flow of approximately 0.30 m^3/min. Based upon the results of this analysis, **the production well has the ability (with**

adequate pump capacity) to support a flow of 0.460 m^3/min and meet the demands of the new development. If additional water supply is needed, the observation well will serve as the backup production well.

4.2.2 Radius of Influence Modeling (Well Impact Assessment)

The radius of influence of the production well was modeled using the Theis Distance Drawdown Method. Pumping rate, transmissivity, and storativity were all utilized in the software to estimate the extent of the affected area. Using this data, the predicted radius of influence is 1038 meters from the Production well. However, past a distance of 234 meters, drawdown is minimal (<1.5 meters) and will not unreasonably interfere with neighboring groundwater supplies.

On **Figure 4.1**, the radius of influence has been broken down into three zones: major, minor and minimal impact areas. The major impact area consist of drawdown greater than 1.5 meters is **contained within the property boundaries to a distance of 234 meters from the production well**. The minor impact area shows an estimated drawdown of 1.5 meters or less and the minimal impact area consists of impact less than 0.2 meters and extends to a distance of 1038.15 meters, and which aquifer impact is predicted. Graphically, this is shown as a circle in **Figure 4.1**. Realistically, the radius of impact is an elongated circle in the direction of groundwater flow, which is generally northwest to southeast in the Horseshoe Aquifer.

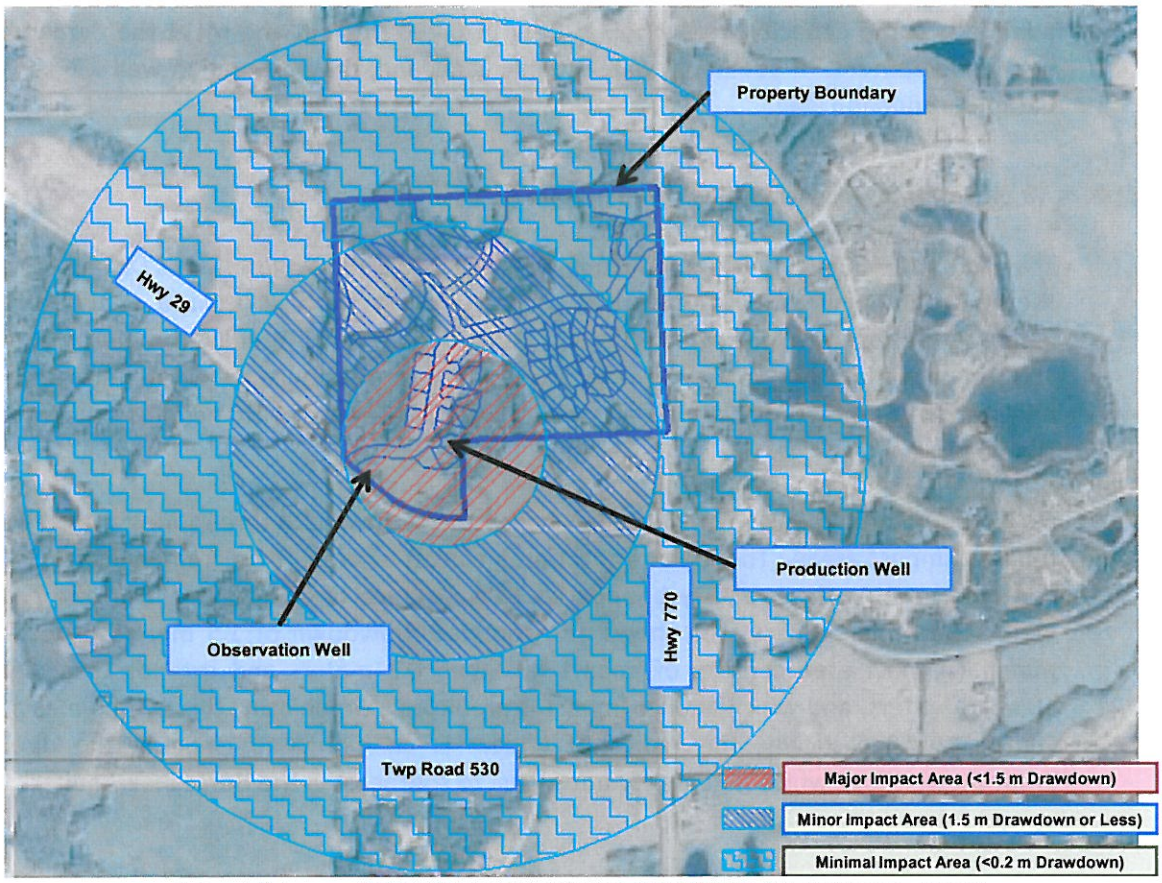


FIGURE 4.1 FAWN MEADOWS MAJOR AND MINOR WELL IMPACT AREAS

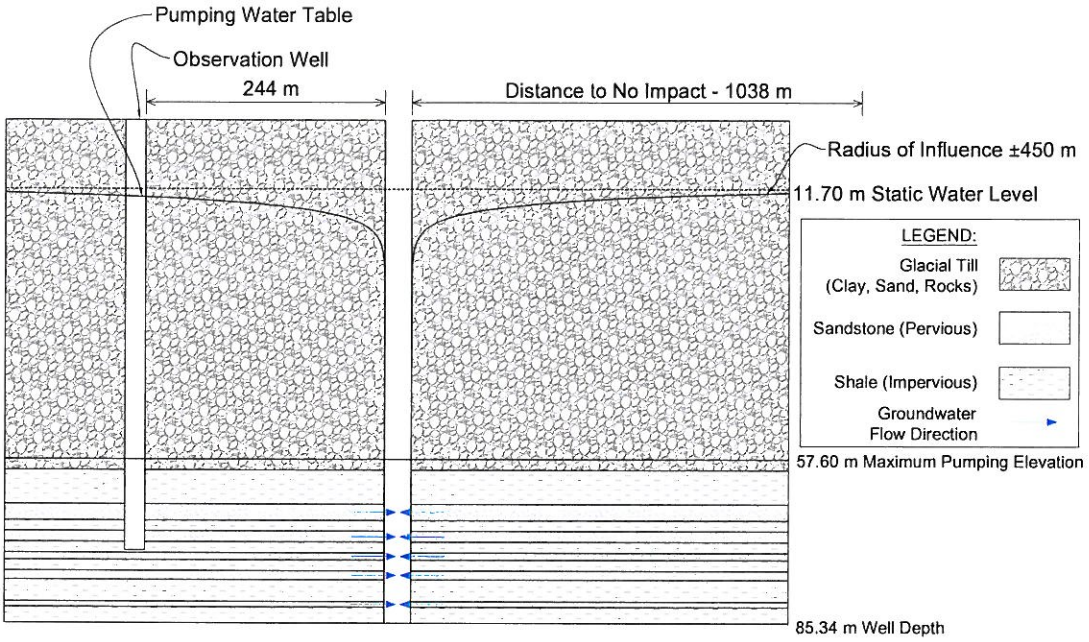


FIGURE 4.2 FAWN MEADOWS WELL CROSS SECTION

5.0 Water Quality Assessment

Water samples were taken from the production wells immediately before completion of the pump test at 72 hours. These samples were analyzed by Kaizen Labs for routine heavy metals and bacterial content. Lab reports are provided in **Appendix D** of this report. Groundwater quality from the production well is consistent with the Horseshoe Formation.

Water quality results indicate levels of sodium and total dissolved soils (TDS) that exceed Canadian Drinking Water Quality Standards. Groundwater is classified as sodium- bicarbonate water with high levels of sodium, TDS, and in some cases (not for this project), sulfate. Water treatment will likely be necessary to bring TDS levels down to potable standards.

6.0 Conclusions

Two wells have been installed and pump tested at the proposed Fawn Meadows Development. The following conclusions summarize the results of the well installation and pump testing:

- The new development will require a peak flow of approximately 0.123 m^3/min According to this study, well #2 has the ability to support a flow of 0.46 m^3/min and meet the demands of the development.

- The predicted radius of influence is 1038 meters from the production well. However, past a distance of 244 meters, drawdown is minimal (<1.5 m). **For example, the maximum impact predicted for the nearest wells east of Highway 770 is less than 0.2 meters of drawdown.**

- The average flow from the development will be approximately 0.123 m^3/min(27 igpm). Considering that the pump test was completed at a rate of 0.22 m^3/min (49 ipgm), the average pumping rate will have considerably less impact than observed in **Figure 4.1**. It is likely that at low pumping rates, the impact will be limited to the boundaries of the project. In addition, all modeling assumed consistent pumping conditions. In reality, the well will be pumped intermittently to feed water storage and treatment facilities. The pumps will not consistently run as they did during the pump testing.

- Groundwater usage will be further limited by the reuse of stormwater for domestic irrigation and fire protection. Groundwater will not be used for domestic irrigation. Stormwater will be harvested from roofs and collected in storage tanks to feed domestic irrigation in the summer and maintain a dead storage for fire protection via a sprinkler system. Refer to the *Fawn Meadows Integrated Water Management Plan* for further information on the water savings.

- Aquifer testing and analysis indicate that a diversion of 190 m^3/day (0.13 m^3/min) is sustainable and will not unreasonably interfere with neighboring groundwater supplies.

- Water quality results indicate values of sodium and total dissolved solids in exceedance of Canadian Drinking Water Quality Standards. Water treatment will be necessary before use as potable water.

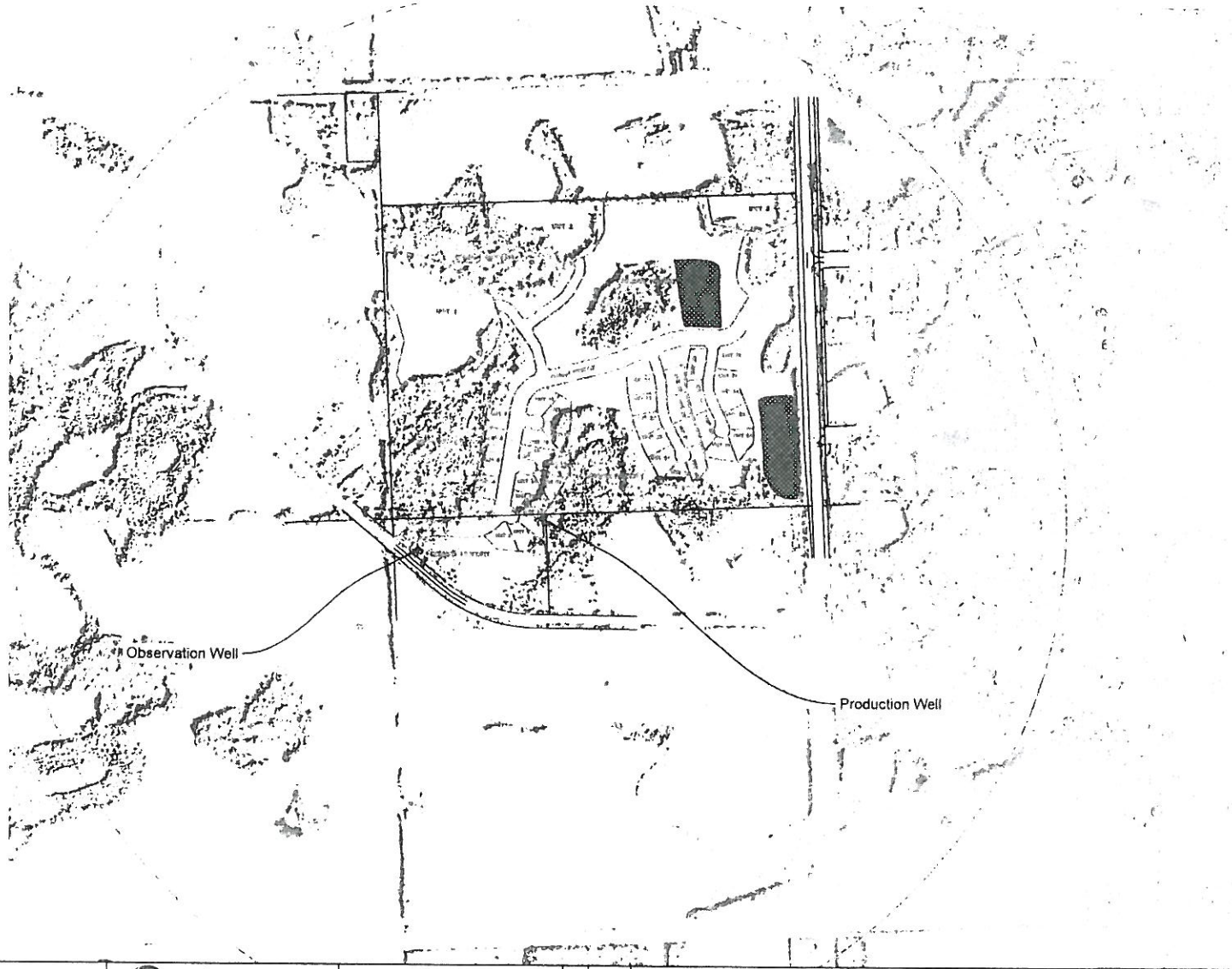
7.0 Closure

This report presents results of the Hydrogeologic Investigation at the Fawn Meadows Development and is intended for presentation to Parkland County and Alberta Environment for a groundwater diversion license pursuant to the Alberta *Water Act*.

This report also incorporates field data collected by others and this information is assumed to be accurate for the purposes of this report. This work was carried out using commonly accepted hydrogeologic practices and no other warranty is made as to these professional services. Any third party use of this report, or decisions made based upon it, are the responsibility of such third parties. Stantec accepts no responsibility for damages, if any, suffered by third parties as a result of decisions made based on this report.

Appendix A

Water Well Map and Drilling Reports



Stantec

Rev	Date	Description

Fawn Meadows

Figure G

103403-C01.dwg

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	1165150
Map Verified:	Map
Date Report Received:	2006/10/25
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: CALIBRE DRILLING LTD.		Drilling Company Approval No.: 128944
Mailing Address: BOX 4083	City or Town: SPRUCE GROVE ALBERTA CANADA	Postal Code: T7X 3B3
WellOwner's Name: MERCIER, RON	Well Location Identifier: LAKE COUNTRY PROPERTIES	
P.O. Box Number:	Mailing Address: SITE 218 RR 1 BOX 27	Postal Code: T0E 0H0
City: CARVEL	Province: AB	Country: CA

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
03	03	053	02	5

Location in Quarter: FT from N Boundary; FT from E Boundary

Lot	Block	Plan
10	3	8020386

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used: Unknown
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 500 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
62	Brownish Yellow Till
71	Brown Fine Grained Sand
92	Brownish Yellow Till
102	Blue Gray Till
151	Gray Medium Grained Sand
159	Dark Gray Clay
166	Dark Gray Shale
177	Medium Grained Sandstone
184	Light Gray Shale
188	Medium Grained Sandstone
194	Green Shale
207	Light Gray Shale
216	Medium Grained Sandstone
224	Green Shale
233	Medium Grained Sandstone
240	Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 2002/02/20	Date Completed (yyyy/mm/dd): 2002/02/21
Well Depth: 240 FT	Borehole Diameter: 8.75 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.39 Inches	Wall Thickness: 0.237 Inches
Bottom at: 190 FT	Top: 185 FT Bottom: 240 FT
Perforations from: 194 FT to: 233 FT	Perforations Size: 0.062 Inches x 12 Inches
from: FT to: FT	Inches x Inches
from: FT to: FT	Inches x Inches

Perforated by: Saw

Seal: Bentonite Chips/Tablets from: 0 FT to: 190 FT
Seal: Unknown from: FT to: FT
Seal: Unknown from: FT to: FT

Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches

Screen Installation Method: Unknown

Fittings Top: Unknown	Bottom: Unknown
Pack: Unknown Grain Size:	Amount: Unknown

Geophysical Log Taken:
Retained on Files:

Additional Test and/or Pump Data
Chemistries taken By Driller: No
Held: Documents Held:

Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches

Comments:
AIR TEST 10 GPM @ 39.98 METERS. SEAL - BENTONITE PRODUCT & CUTTINGS BOREHOLE DIAMETER - 8.75" & 4.875" ANTICIPATED REQUIREMENT PER DAY - 300 TO 500 GALLONS

6. Well Yield

Test Date (yyyy/mm/dd): 2002/02/21	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	77.789 FT
Rate of water removal:	10 Gallons/Min
Depth of pump intake:	140.092 FT
Water level at end of pumping:	131.1 FT
Distance from top of casing to ground level:	19.685 Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:Sec	Recovery
0:00	131.168
1:00	125.689
2:00	116.831
3:00	108.858
4:00	104.364
5:00	99.77
6:00	95.407
7:00	92.159
8:00	90.453
9:00	88.615
10:00	87.041
12:00	84.35
14:00	82.808
16:00	81.496
20:00	80.479
25:00	79.626
30:00	78.707
35:00	78.248
40:00	78.051
50:00	77.822
60:00	77.789
75:00	77.789
90:00	77.789
105:00	77.789
120:00	77.789

Total Drawdown: 53.379 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 7 Gallons/Min

Recommended pump intake: 137.795 FT

Type Pump Installed

7. Contractor Certification

Driller's Name: RANDY REIDLINGER

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	1165151
Map Verified.	Not Verified
Date Report Received:	2006/10/25
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: CALIBRE DRILLING LTD.		Drilling Company Approval No.: 128944
Mailing Address: BOX 4083	City or Town: SPRUCE GROVE ALBERTA CANADA	Postal Code: T7X 3B3
WellOwner's Name: OSTERMAYER, CRAIG & PAT	Well Location Identifier:	
P.O. Box Number:	Mailing Address: SITE 270 RR 2 BOX 25	Postal Code: T7Z 1X2
City: STONY PLAIN	Province: AB	Country: CA

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
NW	04	053	02	5

Location in Quarter
FT from N Boundary
FT from E Boundary

Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used: Unknown
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
19	Brownish Yellow Clay
83	Blue Gray Clay
101	Blue Gray Till
108	Green Shale
111	Fine Grained Sandstone
113	Green Shale
115	Fine Grained Sandstone
121	See Comments Sandstone
124	Coarse Grained Sandstone
127	Greenish Gray Shale
131	Light Gray Shale
140	Coarse Grained Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 2003/05/18	Date Completed (yyyy/mm/dd): 2003/05/18
Well Depth: 140 FT	Borehole Diameter: 8.75 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.39 Inches	Wall Thickness: 0.237 Inches
Bottom at: 105 FT	Top: 100 FT Bottom: 140 FT
Perforations from: 111 FT to: 140 FT from: FT to: FT from: FT to: FT	Perforations Size: 0.125 Inches x 12 Inches Inches x Inches Inches x Inches
Perforated by: Saw	
Seal: Bentonite Chips/Tablets from: 0 FT	to: 105 FT
Seal: Unknown from: FT	to: FT
Seal: Unknown from: FT	to: FT
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Installation Method: Unknown	
Fittings Top: Unknown	Bottom: Unknown
Pack: Unknown Grain Size:	Amount: Unknown
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held:	Documents Held:
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments: AIR TEST 12 GPM @ 18 METERS , 25 GPM @ 30 METERS. 115' - 121' HARD MG SS BOREHOLE DIAMETER - 8.75" & 4.875" SEAL - BENTONITE PRODUCT & CUTTINGS	

6. Well Yield

Test Date (yyyy/mm/dd): 2003/05/18	Start Time: 7:55 PM
Test Method: Air	
Non pumping static level:	32.48 FT
Rate of water removal:	12 Gallons/Min
Depth of pump intake:	59.055 FT
Water level at end of pumping:	48.32 FT
Distance from top of casing to ground level:	27.559 Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:	Sec Recovery
0:00	48.327
1:00	42.028
2:00	39.862
3:00	39.14
4:00	37.959
5:00	37.27
6:00	36.745
7:00	36.45
8:00	36.122
9:00	35.827
10:00	35.663
12:00	35.4
14:00	35.105
16:00	34.875
20:00	34.613
25:00	34.35
30:00	34.121
35:00	33.957
40:00	33.825
50:00	33.629
60:00	32.48
75:00	32.48
90:00	32.48
105:00	32.48
120:00	32.48

Total Drawdown: 15.846 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 10 Gallons/Min

Recommended pump intake: 82.021 FT

Type Pump Installed

7. Contractor Certification

Driller's Name: RANDY REIDLINGER

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0351132
Map Verified:	Not Verified
Date Report Received:	1990/06/19
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		Drilling Company Approval No.: 118900
Mailing Address: BOX 4, SITE 5, RR 1	City or Town: CALAHOO AB CA	Postal Code: T0G 0J0
WellOwner's Name: ONYSCHUK, ANDY	Well Location Identifier:	
P.O. Box Number:	Mailing Address: RR1 CARVEL	Postal Code: T0E 0H0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
NW	04	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot | Block | Plan

Well Elev: FT | How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: | Materials Used:

Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

Method of Drilling: Rotary

Flowing Well: No | Rate: Gallons
Gas Present: | Oil Present:

4. Formation Log

Depth from ground level (feet)	Lithology Description
17	Brown Silt
28	Gray Clay
137	Shale
142	Green Shale
145	Gray Shale
155	Gray Sandstone
168	Green Shale
190	Fractured Shale
201	Gray Sandstone
210	Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1990/05/16	Date Completed (yyyy/mm/dd): 1990/05/18
Well Depth: 210 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0 Inches	Wall Thickness: 0.25 Inches
Bottom at: 160 FT	Top: 156 FT Bottom: 210 FT
Perforations	Perforations Size:
from: 168 FT to: 210 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches

Perforated by: Other

Seal: Shale Trap
from: 0 FT to: 160 FT
Seal:
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT

Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches

Screen Installation Method:

Fittings
Top: | Bottom:

Pack:
Grain Size: | Amount: 0

Geophysical Log Taken:
Retained on Files:

Additional Test and/or Pump Data
Chemistries taken By Driller: No
Held: 1 | Documents Held: 2

Pitless Adapter Type:
Drop Pipe Type:
Length: FT | Diameter: Inches

Comments:

6. Well Yield

Test Date (yyyy/mm/dd): 1990/05/18	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	36 FT
Rate of water removal:	8 Gallons/Min
Depth of pump intake:	0 FT
Water level at end of pumping:	140 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 104 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 8 Gallons/Min

Recommended pump intake: 0 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.: 357

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0352280
Map Verified:	Map
Date Report Received:	1990/10/16
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: D&D WATER WELL DRILLING & SERVICING LTD.		Drilling Company Approval No.: 96030
Mailing Address: BOX 12, SITE 502, RR 5	City or Town: STONY PLAIN AB CA	Postal Code: T7Z 1X5
WellOwner's Name: ENDERS, DAVE	Well Location Identifier:	
P.O. Box Number:	Mailing Address: RR2, CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
6	6	

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: — Materials Used:
Method of Drilling: Rotary
Flowing Well: No — Rate: Gallons
Gas Present: — Oil Present:

Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

6. Well Yield

Test Date (yyyy/mm/dd): 1990/08/02 — Start Time: 11:00 AM
Test Method: Air
Non pumping static level: 60 FT
Rate of water removal: 15 Gallons/Min
Depth of pump intake: 0 FT
Water level at end of pumping: 160 FT
Distance from top of casing to ground level: Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 100 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Gallons/Min
Recommended pump intake: 0 FT
Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
38	Yellow Clay
128	Blue Silty Clay
133	Green Sandy Shale
139	Gray Sandy Shale
141	Green Sandy Shale
164	Green Shale
169	Sandstone
178	Green Shale
180	Sandstone
209	Green Shale
215	Sandstone
219	Gray Shale
229	Sandstone
235	Gray Shale
243	Sandstone
247	Gray Shale
253	Sandstone
267	Green Shale
274	Sandstone
280	Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1990/08/01	Date Completed (yyyy/mm/dd): 1990/08/02
Well Depth: 280 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.37 Inches	Wall Thickness: 0.248 Inches
Bottom at: 156 FT	Top: 154 FT Bottom: 280 FT
Perforations from: 150 FT to: 275 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0.062 Inches x 10 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by: Other	
Seal: Shale Trap from: 0 FT	to: 156 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount: 0
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments: Well located in Lake Country Estates.	

7. Contractor Certification

Driller's Name:	UNKNOWN DRILLER
Certification No.:	WR4434

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0365507
Map Verified:	Map
Date Report Received:	1992/08/06
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		Drilling Company Approval No.: 118900
Mailing Address: BOX 4, SITE 5, RR 1	City or Town: CALAHOO AB CA	Postal Code: T0G 0J0
WellOwner's Name: CHAPUT, RALPH	Well Location Identifier:	
P.O. Box Number:	Mailing Address: LAKE COUNTRY ESTATES, CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
4	4	

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: — Materials Used:
Method of Drilling: Rotary
Flowing Well: No — Rate: Gallons
Gas Present: No — Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
23	Brown Silty Clay
25	Gray Silty Clay
45	Brown Silty Clay
125	Gray Silty Clay
128	Gravel
136	Clay
148	Green Shale
156	Gray Shale
162	Gray Sandstone
170	Green Shale
193	Fractured Shale
197	Green Shale
208	Greenish Gray Shale
213	Gray Sandstone
224	Green Shale
239	Gray Sandstone
253	Shale
257	Gray Sandstone
260	Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1992/06/10	Date Completed (yyyy/mm/dd): 1992/06/11
Well Depth: 260 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.5 Inches	Wall Thickness: 0.25 Inches
Bottom at: 197 FT	Top: 191 FT Bottom: 260 FT
Perforations from: 200 FT to: 260 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0.062 Inches x 1 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by: Saw	
Seal: Shale Trap & Bentonite from: 0 FT	to: 194 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

6. Well Yield

Test Date (yyyy/mm/dd): 1992/06/11	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	59 FT
Rate of water removal:	9 Gallons/Min
Depth of pump intake:	190 FT
Water level at end of pumping:	126 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 67 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 9 Gallons/Min

Recommended pump intake: 160 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0365688
Map Verified:	Not Verified
Date Report Received:	1993/03/01
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: RODCO DRILLING		Drilling Company Approval No.: 121074
Mailing Address: BOX 5168	City or Town: SPRUCE GROVE AB CA	Postal Code: T7X 3A3
WellOwner's Name: TAYLOR, ROBERT	Well Location Identifier:	
P.O. Box Number: 32	Mailing Address: SITE 118 RR1, CARVEL	Postal Code: T0E 0H0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
NW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
17	2	8120011

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: — Materials Used:
Method of Drilling: Rotary
Flowing Well: No — Rate: Gallons
Gas Present: No — Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 200 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
18	Sandy Clay
105	Blue Clay
135	Gravel
203	Shale
205	Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 1992/07/17	Date Completed (yyyy/mm/dd): 1992/07/17
Well Depth: 205 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.375 Inches	Wall Thickness: 0.25 Inches
Bottom at: 150 FT	Top: 145 FT Bottom: 205 FT

Perforations — Perforations Size:
from: 185 FT to: 205 FT — 0.02 Inches x 2.5 Inches
from: 0 FT to: 0 FT — 0 Inches x 0 Inches
from: 0 FT to: 0 FT — 0 Inches x 0 Inches

Perforated by: Machine

Seal: Driven & Shale Trap
from: 0 FT to: 150 FT
Seal:
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT

Screen Type: — Screen ID: 0 Inches
from: 0 FT to: 0 FT — Slot Size: 0 Inches
Screen Type: — Screen ID: 0 Inches
from: 0 FT to: 0 FT — Slot Size: 0 Inches

Screen Installation Method:

Fittings
Top: — Bottom:

Pack:
Grain Size: — Amount:

Geophysical Log Taken:
Retained on Files:

Additional Test and/or Pump Data
Chemistries taken By Driller: No
Held: 1 — Documents Held: 2

Pitless Adapter Type:
Drop Pipe Type:
Length: FT — Diameter: Inches

Comments:

6. Well Yield

Test Date (yyyy/mm/dd): 1992/07/17 — Start Time: 11:00 AM
Test Method: Air
Non pumping static level: 48 FT
Rate of water removal: 5 Gallons/Min
Depth of pump intake: 195 FT
Water level at end of pumping: 195 FT
Distance from top of casing to ground level: Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 147 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 5 Gallons/Min
Recommended pump intake: 180 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.: 50770

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0366255
Map Verified:	Map
Date Report Received:	1992/10/09
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: D&D WATER WELL DRILLING & SERVICING LTD.		Drilling Company Approval No.: 96030
Mailing Address: BOX 12, SITE 502, RR 5	City or Town: STONY PLAIN AB CA	Postal Code: T7Z 1X5
WellOwner's Name: HAWKINS, DOUG	Well Location Identifier:	
P.O. Box Number: 703	Mailing Address: LAKE COUNTRY EST, STONY PLAIN	Postal Code: T0E 2G0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
7	5	8020386

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: — Materials Used:
Method of Drilling: Rotary
Flowing Well: No — Rate: Gallons
Gas Present: No — Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
78	Yellow Clay
87	Sand
134	Blue Clay
153	Green Shale
159	Sandstone
166	Gray Shale
171	Sandstone
184	Gray Shale
207	Green Shale
231	Sandstone
242	Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1992/08/18	Date Completed (yyyy/mm/dd): 1992/08/18
Well Depth: 242 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.375 Inches	Wall Thickness: 0.248 Inches
Bottom at: 150 FT	Top: 148 FT Bottom: 242 FT
Perforations from: 165 FT to: 230 FT	Perforations Size: 0.125 Inches x 10 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
Perforated by: Saw	
Seal: Shale Trap & Bentonite from: 0 FT	to: 150 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 1	Documents Held: 2
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

6. Well Yield

Test Date (yyyy/mm/dd): 1992/08/18	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	43 FT
Rate of water removal:	20 Gallons/Min
Depth of pump intake:	150 FT
Water level at end of pumping:	95 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 52 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Gallons/Min

Recommended pump intake: 100 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0368748
Map Verified:	Map
Date Report Received:	1993/03/11
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		Drilling Company Approval No.: 118900
Mailing Address: BOX 4, SITE 5, RR 1	City or Town: CALAHOO AB CA	Postal Code: T0G 0J0
WellOwner's Name: CHUBATY, MIKE	Well Location Identifier:	
P.O. Box Number:	Mailing Address: LAKE COUNTRY EST, STONY PLAIN	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
8	4	

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: — Materials Used:
Method of Drilling: Rotary
Flowing Well: No — Rate: Gallons
Gas Present: No — Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
18	Brown Clay
119	Gray Clay & Silt
122	Sand
137	Green Shale
146	Gray Sandstone
149	Gray Shale
156	Gray Sandstone
164	Green Shale
175	Gray Shale
185	Green Shale
196	Gray Sandstone
205	Green Shale
208	Gray Sandstone
210	Gray Shale
213	Gray Sandstone
221	Shale
230	Gray Sandstone
240	Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1992/11/12	Date Completed (yyyy/mm/dd): 1992/11/13
Well Depth: 240 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.5 Inches	Wall Thickness: 0.25 Inches
Bottom at: 180 FT	Top: 178 FT Bottom: 240 FT
Perforations from: 185 FT to: 240 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0.062 Inches x 1 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by: Saw	
Seal: Shale Trap & Bentonite from: 177 FT	to: 180 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

6. Well Yield

Test Date (yyyy/mm/dd): 1992/11/13	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	63 FT
Rate of water removal:	8 Gallons/Min
Depth of pump intake:	175 FT
Water level at end of pumping:	131 FT

Distance from top of casing to ground level: Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 68 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 8 Gallons/Min

Recommended pump intake: 175 FT

Type Pump Installed
Pump Type:
Pump Model
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0380523
Map Verified:	Map
Date Report Received:	1994/06/20
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: KAP'S DRILLING LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: ENDERS, DAVE	Well Location Identifier:	
P.O. Box Number:	Mailing Address: RR2, CARVEL	Postal Code: T0E 0H0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
2	4	

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 500 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
50	Brown Sandy Clay
127	Coarse Grained Sand
153	Blue Clay
166	Shale
173	Sandstone
189	Shale
196	Sandstone
208	Shale
238	Sandstone
240	Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1994/03/14	Date Completed (yyyy/mm/dd): 1994/03/14
Well Depth: 240 FT	Borehole Diameter: 0 Inches
Casing Type: Steel	Liner Type: Plastic
Size OD: 4.5 Inches	Size OD: 3.5 Inches
Wall Thickness: 0.156 Inches	Wall Thickness: 0.25 Inches
Bottom at: 201 FT	Top: 200 FT Bottom: 240 FT
Perforations from: 201 FT to: 239 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0.093 Inches x 3 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by: Saw	
Seal: Driven from: 0 FT Seal: from: 0 FT Seal: from: 0 FT	to: 200 FT to: 0 FT to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

6. Well Yield

Test Date (yyyy/mm/dd): 1994/03/14	Start Time: 11:00 AM
Test Method: Bailer & Air	
Non pumping static level:	70 FT
Rate of water removal:	7 Gallons/Min
Depth of pump intake:	160 FT
Water level at end of pumping:	160 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:	Sec Recovery
1:00	163.055
2:00	151.244
3:00	140.746
4:00	131.231
5:00	123.357
6:00	114.827
7:00	113.515
8:00	106.953
9:00	102.688
10:00	95.144
12:00	92.847
14:00	88.91
16:00	85.958
20:00	82.677
25:00	75.459
30:00	74.803
35:00	74.474
40:00	73.687
50:00	73.359

Total Drawdown: 90 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 7 Gallons/Min

Recommended pump intake: 160 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name:	UNKNOWN DRILLER
Certification No.:	WA7502

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0418277
Map Verified:	Not Verified
Date Report Received:	1995/11/22
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: GERALD MCGINN DRILLING LTD.		Drilling Company Approval No.: 120047
Mailing Address: 4910 50 AVENUE	City or Town: STONY PLAIN ALBERTA CANADA	Postal Code: T7Z 1S9
WellOwner's Name: BLEKER, ERNIE JR	Well Location Identifier:	
P.O. Box Number: 12	Mailing Address: RR1, CARVEL	Postal Code: T0E 0H0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 300 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
50	Yellow Clay
95	Blue Clay
190	Sand
197	Blue Clay & Rocks
205	Green Shale
222	Gray Sandy Shale
253	Green Shale
256	Gray Sandy Shale
265	Green Shale
270	Gray Sandy Shale
285	Greenish Gray Shale
305	Gray Sandy Shale
310	Green Shale
312	Sandstone
319	Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1995/09/26	Date Completed (yyyy/mm/dd): 1995/09/28
Well Depth: 319 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 5 Inches
Wall Thickness: 0.36 Inches	Wall Thickness: 0.26 Inches
Bottom at: 278 FT	Top: 271 FT Bottom: 316 FT
Perforations	Perforations Size:
from: 278 FT to: 316 FT	0.062 Inches x 12 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
Perforated by: Saw	
Seal: Formation Seal from: 0 FT	to: 278 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches

Comments:
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 18"

6. Well Yield

Test Date (yyyy/mm/dd): 1995/10/04	Start Time: 11:00 AM
Test Method: Bailer & Air	
Non pumping static level:	99 FT
Rate of water removal:	3.5 Gallons/Min
Depth of pump intake:	260 FT
Water level at end of pumping:	225 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)

Elapsed Time Drawdown Minutes:Sec	Recovery
0:00	225
1:00	205
2:00	193
3:00	180
4:00	162
6:00	154
7:00	146
8:00	141
9:00	135
10:00	130
12:00	125
14:00	122
16:00	117
20:00	115
25:00	113
30:00	110
35:00	107
40:00	105
50:00	104
60:00	103
75:00	101
90:00	99
120:00	99

Total Drawdown: 126 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 3 Gallons/Min

Recommended pump intake: 225 FT

Type Pump Installed
Pump Type:
Pump Model:

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.: 3824

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459689
Map Verified:	Not Verified
Date Report Received:	1979/09/03
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		Drilling Company Approval No.: 118900
Mailing Address: BOX 4, SITE 5, RR 1	City or Town: CALAHOO AB CA	Postal Code: T0G 0J0
WellOwner's Name: CARVEL DEV	Well Location Identifier:	
P.O. Box Number:	Mailing Address: RR1, CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
04	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: 2450 FT
How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day: 0 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
51	Brown Silty Clay
98	Gray Silty Clay
129	Fine Grained Sand
162	Gray Clay & Rocks
187	Green Shale
199	Light Gray Sandstone
220	Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1979/06/25	Date Completed (yyyy/mm/dd): 1979/06/25
Well Depth: 220 FT	Borehole Diameter: 0 Inches
Casing Type: Galvanized Steel	Liner Type: Steel
Size OD: 4.5 Inches	Size OD: 3.56 Inches
Wall Thickness: 0 Inches	Wall Thickness: 0 Inches
Bottom at: 180 FT	Top: 0 FT Bottom: 220 FT

Perforations
from: 190 FT to: 220 FT — Perforations Size: 0 Inches x 0 Inches
from: 0 FT to: 0 FT — 0 Inches x 0 Inches
from: 0 FT to: 0 FT — 0 Inches x 0 Inches
Perforated by: Torch

Seal: Driven
from: 0 FT to: 180 FT
Seal:
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT

Screen Type:
from: 0 FT to: 0 FT — Screen ID: 0 Inches, Slot Size: 0 Inches
Screen Type:
from: 0 FT to: 0 FT — Screen ID: 0 Inches, Slot Size: 0 Inches
Screen Installation Method:

Fittings
Top: Bottom:
Pack:
Grain Size: Amount:
Geophysical Log Taken:
Retained on Files:
Additional Test and/or Pump Data
Chemistries taken By Driller: Yes
Held: 1 Documents Held: 3
Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches

Comments:
DRILLER REPORTS WATER IS HARD

6. Well Yield

Test Date (yyyy/mm/dd): 1979/06/25
Start Time: 11:00 AM
Test Method: Pump
Non pumping static level: 65.4 FT
Rate of water removal: 10 Gallons/Min
Depth of pump intake: 0 FT
Water level at end of pumping: 75 FT
Distance from top of casing to ground level: Inches

Depth To water level (feet)	Elapsed Time Drawdown Minutes:Sec Recovery
69.81	1:00
70.58	2:00
70.99	3:00
71.29	4:00
71.49	5:00
71.59	6:00
71.79	7:00
71.9	8:00
72.01	9:00
72.09	10:00
72.44	15:00
72.69	20:00
72.86	25:00
73	30:00
73.24	40:00
73.4	50:00
73.54	60:00
73.73	75:00
73.83	90:00
74	105:00
74.09	120:00
74.23	140:00
74.42	180:00
74.54	240:00
74.8	300:00

Total Drawdown: 10 FT
If water removal was less than 2 hr duration, reason why:
Recommended pumping rate: 0 Gallons/Min
Recommended pump intake: 0 FT
Type Pump Installed
Pump Type:

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459702
Map Verified:	Not Verified
Date Report Received:	1971/06/08
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MCGINNIS ROBERT		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: STECYCK, FRED	Well Location Identifier:	
P.O. Box Number:	Mailing Address: STONY PLAIN	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

6. Well Yield

Test Date (yyyy/mm/dd): 1971/03/30
Start Time: 11:00 AM
Test Method: Unknown
Non pumping static level: 54 FT
Rate of water removal: 5.5 Gallons/Min
Depth of pump intake: 0 FT
Water level at end of pumping: 158 FT
Distance from top of casing to ground level: Inches
Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 104 FT
If water removal was less than 2 hr duration, reason why:
Recommended pumping rate: 0 Gallons/Min
Recommended pump intake: 120 FT
Type Pump Installed
Pump Type: SUB
Pump Model:
H.P.: 1/4
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
30	Brown Clay & Rocks
70	Gray Silty Clay
128	Sand
130	Gravel
147	Gray Sandy Clay & Rocks
157	Blue Shale
159	Blue Sandy Shale
161	Gray Rocks
166	Gray Sandy Shale
172	Blue Shale
176	Gray Sandy Shale
190	Blue Shale & Rocks

5. Well Completion

Date Started(yyyy/mm/dd):
Date Completed (yyyy/mm/dd): 1971/03/30
Well Depth: 190 FT
Borehole Diameter: 0 Inches
Casing Type: Steel
Liner Type:
Size OD: 4.56 Inches
Size OD: 0 Inches
Wall Thickness: 0 Inches
Wall Thickness: 0 Inches
Bottom at: 157 FT
Top: 0 FT Bottom: 0 FT
Perforations
from: 0 FT to: 0 FT
from: 0 FT to: 0 FT
from: 0 FT to: 0 FT
Perforations Size:
0 Inches x 0 Inches
0 Inches x 0 Inches
0 Inches x 0 Inches
Perforated by:
Seal: Driven
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT
Screen Type:
from: 0 FT to: 0 FT
Screen ID: 0 Inches
Slot Size: 0 Inches
Screen Type:
from: 0 FT to: 0 FT
Screen ID: 0 Inches
Slot Size: 0 Inches
Screen Installation Method:
Fittings
Top:
Bottom:
Pack:
Grain Size:
Amount:
Geophysical Log Taken:
Retained on Files:
Additional Test and/or Pump Data
Chemistries taken By Driller: Yes
Held: 0
Documents Held: 1
Pitless Adapter Type:
Drop Pipe Type:
Length: FT
Diameter: 1 Inches
Comments:
DRILLER REPORTS WATER IS MEDIUM SOFT

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.: 2004

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459710
Map Verified:	Map
Date Report Received:	1980/06/30
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: GERALD MCGINN DRILLING LTD.		Drilling Company Approval No.: 120047
Mailing Address: 4910 50 AVENUE	City or Town: STONY PLAIN ALBERTA CANADA	Postal Code: T7Z 1S9
WellOwner's Name: BLEKER, ERNIE	Well Location Identifier:	
P.O. Box Number:	Mailing Address: RR1, CARVEL	Postal Code: T0E 0H0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

6. Well Yield

Test Date (yyyy/mm/dd): 1980/06/11	Start Time: 11:00 AM
Test Method: Unknown	
Non pumping static level:	75 FT
Rate of water removal:	5 Gallons/Min
Depth of pump intake:	125 FT
Water level at end of pumping:	125 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 50 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Gallons/Min

Recommended pump intake: 0 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
20	Yellow Clay
133	Blue Clay
150	Sand
194	Sandy Clay
196	Hard Formation
207	Greenish Gray Shale
221	Gray Sandy Shale
230	Green Shale
250	Gray Sandy Shale & Sandstone
256	Gray Hard Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1980/06/10	Date Completed (yyyy/mm/dd): 1980/06/11
Well Depth: 256 FT	Borehole Diameter: 0 Inches
Casing Type: Steel	Liner Type: Galvanized Steel
Size OD: 5.56 Inches	Size OD: 4.5 Inches
Wall Thickness: 0 Inches	Wall Thickness: 0 Inches
Bottom at: 228 FT	Top: 0 FT Bottom: 256 FT

Perforations
from: 228 FT to: 256 FT
from: 0 FT to: 0 FT
from: 0 FT to: 0 FT
Perforations Size:
0.063 Inches x 12 Inches
0 Inches x 0 Inches
0 Inches x 0 Inches

Perforated by: Torch

Seal: Formation Seal
from: 0 FT to: 228 FT
Seal:
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT

Screen Type:
from: 0 FT to: 0 FT
Screen ID: 0 Inches
Slot Size: 0 Inches

Screen Type:
from: 0 FT to: 0 FT
Screen ID: 0 Inches
Slot Size: 0 Inches

Screen Installation Method:

Fittings
Top: Bottom:

Pack:
Grain Size: Amount:

Geophysical Log Taken:
Retained on Files:

Additional Test and/or Pump Data
Chemistries taken By Driller: No
Held: 0 Documents Held: 1

Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches

Comments:

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459713
Map Verified:	Not Verified
Date Report Received:	1989/12/07
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: D&D WATER WELL DRILLING & SERVICING LTD.		Drilling Company Approval No.: 96030
Mailing Address: BOX 12, SITE 502, RR 5	City or Town: STONY PLAIN AB CA	Postal Code: T7Z 1X5
WellOwner's Name: ENDERS, DAVE	Well Location Identifier:	
P.O. Box Number:	Mailing Address: STONY PLAIN	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: FT How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No Rate: Gallons
Gas Present: No Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

6. Well Yield

Test Date (yyyy/mm/dd): 1989/11/28	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	55 FT
Rate of water removal:	6 Gallons/Min
Depth of pump intake:	140 FT
Water level at end of pumping:	140 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 95 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Gallons/Min
Recommended pump intake: 0 FT
Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
48	Yellow Sandy Clay
97	Blue Clay
105	Unknown
148	Blue Clay
174	Green Shale
193	Sandstone
224	Gray Shale
248	Sandstone
267	Gray Shale
274	Sandstone
285	Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1989/11/28	Date Completed (yyyy/mm/dd): 1989/11/28
Well Depth: 285 FT	Borehole Diameter: 0 Inches
Casing Type: Galvanized Steel	Liner Type: Plastic
Size OD: 4.5 Inches	Size OD: 3.5 Inches
Wall Thickness: 0.156 Inches	Wall Thickness: 0.216 Inches
Bottom at: 163 FT	Top: 160 FT Bottom: 285 FT
Perforations from: 170 FT to: 280 FT	Perforations Size: 0.063 Inches x 10 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
Perforated by: Machine	
Seal: Welded Collar from: 0 FT	to: 163 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Water Well Drilling Report

Alberta Environment

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Well I.D.:	0459723
Map Verified:	Not Verified
Date Report Received:	1984/06/04
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: GROVE DRILLING ENTERPRISES (1980) LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: SCOTT, BERTHA	Well Location Identifier:	
P.O. Box Number:	Mailing Address: CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
13	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: FT

How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:

Method of Drilling: Rotary

Flowing Well: No
Gas Present: No

Rate: Gallons
Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

6. Well Yield

Test Date (yyyy/mm/dd): 1983/12/07
Start Time: 11:00 AM
Test Method: Bailer

Non pumping static level: 15 FT

Rate of water removal: 7 Gallons/Min

Depth of pump intake: 100 FT

Water level at end of pumping: FT

Distance from top of casing to ground level: Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 0 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 7 Gallons/Min

Recommended pump intake: 100 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
94	Clay
105	Sand
120	Clay

5. Well Completion

Date Started(yyyy/mm/dd): 1983/12/07	Date Completed (yyyy/mm/dd): 1983/12/07
Well Depth: 120 FT	Borehole Diameter: 0 Inches
Casing Type: Steel	Liner Type:
Size OD: 4.56 Inches	Size OD: 0 Inches
Wall Thickness: 0.141 Inches	Wall Thickness: 0 Inches
Bottom at: 101 FT	Top: 0 FT Bottom: 0 FT
Perforations from: 0 FT to: 0 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0 Inches x 0 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by:	
Seal: from: 0 FT Seal: from: 0 FT Seal: from: 0 FT	to: 0 FT to: 0 FT to: 0 FT
Screen Type: Stainless Steel from: 101 FT to: 105 FT	Screen ID: 4 Inches Slot Size: 0.01 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top: Welded	Bottom: Plug
Pack: Sand Grain Size:	Amount: 0.25 Yards
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: Yes Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments: DRILLER REPORTS WATER IS MEDIUM HARD	

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459734
Map Verified:	Map
Date Report Received:	1983/10/05
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		Drilling Company Approval No.: 118900
Mailing Address: BOX 4, SITE 5, RR 1	City or Town: CALAHOO AB CA	Postal Code: T0G 0J0
WellOwner's Name: MCDONALD, EVAN	Well Location Identifier:	
P.O. Box Number: 18	Mailing Address: BOWEN LAKE ESTATES, CARVEL	Postal Code: T0E 0H0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
12	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
13	2	8120011

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: — Materials Used:
Method of Drilling: Rotary
Flowing Well: No — Rate: Gallons
Gas Present: No — Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 100 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
18	Brown Clay
41	Blue Clay
133	Blue Sandy Clay
136	Green Shale
148	Light Gray Sandstone
163	Gray Shale
175	Light Gray Sandstone
188	Greenish Gray Shale
196	Light Gray Sandstone
204	Gray Shale
214	Light Gray Sandstone
220	Gray Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1983/08/17	Date Completed (yyyy/mm/dd): 1983/08/18
Well Depth: 220 FT	Borehole Diameter: 0 Inches
Casing Type: Galvanized Steel	Liner Type: Plastic
Size OD: 4.5 Inches	Size OD: 3.5 Inches
Wall Thickness: 0 Inches	Wall Thickness: 0 Inches
Bottom at: 180 FT	Top: 178 FT Bottom: 220 FT
Perforations from: 180 FT to: 220 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0 Inches x 0 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches

Perforated by: Machine
Seal: Driven from: 0 FT to: 180 FT
Seal: from: 0 FT to: 0 FT
Seal: from: 0 FT to: 0 FT
Screen Type: from: 0 FT to: 0 FT — Screen ID: 0 Inches, Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT — Screen ID: 0 Inches, Slot Size: 0 Inches
Screen Installation Method:
Fittings Top: Bottom:
Pack: Grain Size: Amount:
Geophysical Log Taken:
Retained on Files:
Additional Test and/or Pump Data
Chemistries taken By Driller: Yes
Held: 1 Documents Held: 2
Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches
Comments:
DRILLER REPORTS WATER IS MEDIUM HARD

6. Well Yield

Test Date (yyyy/mm/dd): 1983/08/18	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	40 FT
Rate of water removal:	10 Gallons/Min
Depth of pump intake:	150 FT
Water level at end of pumping:	150 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 110 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 50 Gallons/Min
Recommended pump intake: 110 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459744
Map Verified:	Not Verified
Date Report Received:	1985/12/03
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: KAP'S DRILLING LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: ADAMS, JACK	Well Location Identifier:	
P.O. Box Number:	Mailing Address:	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SW	04	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary
Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

6. Well Yield

Test Date (yyyy/mm/dd):	Start Time:
1985/08/23	11:00 AM

Test Method: Bailer
Non pumping static level: 75 FT
Rate of water removal: 7 Gallons/Min
Depth of pump intake: 140 FT
Water level at end of pumping: 140 FT
Distance from top of casing to ground level: Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 65 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 7 Gallons/Min
Recommended pump intake: 160 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
28	Clay
37	Sand & Gravel
45	Clay
47	Sand
55	Clay
63	Sand & Gravel
96	Clay & Sand
100	Shale
115	Clay & Rocks
132	Sand & Gravel
143	Shale
145	Sandstone
168	Shale
175	Sandstone
178	Shale
180	Sandstone
184	Shale
193	Sandstone
198	Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1985/08/22	Date Completed (yyyy/mm/dd): 1985/08/23
Well Depth: 198 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 5.5 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.38 Inches	Wall Thickness: 0.25 Inches
Bottom at: 153 FT	Top: 150 FT Bottom: 198 FT
Perforations from: 153 FT to: 198 FT	Perforations Size: 0.09 Inches x 3 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
Perforated by: Machine	
Seal: Formation Seal from: 0 FT	to: 153 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459745
Map Verified:	Not Verified
Date Report Received:	1981/11/30
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: BLAKEMAN'S, NORM DRILLING LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: BELL, JACK	Well Location Identifier:	
P.O. Box Number:	Mailing Address: CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
12	04	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: 2418 FT
How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
22	Brown Clay
85	Blue Clay
115	Silty Clay
184	Sand
205	Gray Shale
218	Brittle Shale
225	Gray Shale
234	Blue Sandstone
235	Coal
240	Blue Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 1981/08/16	Date Completed (yyyy/mm/dd): 1981/08/17
Well Depth: 240 FT	Borehole Diameter: 0 Inches
Casing Type: Galvanized Steel	Liner Type:
Size OD: 4.5 Inches	Size OD: 0 Inches
Wall Thickness: 0.141 Inches	Wall Thickness: 0 Inches
Bottom at: 200 FT	Top: 0 FT Bottom: 0 FT
Perforations from: 0 FT to: 0 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0 Inches x 0 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by:	
Seal: Driven from: 198 FT	to: 200 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: Yes Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments: DRILLER REPORTS WATER IS MEDIUM HARD	

6. Well Yield

Test Date (yyyy/mm/dd): 1981/08/17	Start Time: 11:00 AM
Test Method: Bailer	
Non pumping static level:	147 FT
Rate of water removal:	5 Gallons/Min
Depth of pump intake:	195 FT
Water level at end of pumping:	195 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 38 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 5 Gallons/Min

Recommended pump intake: 198 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0459747
Map Verified:	Not Verified
Date Report Received:	
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MCGINNIS ROBERT		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: TURLOCK, S.	Well Location Identifier:	
P.O. Box Number:	Mailing Address: RR1, CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
NW	04	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: 2420 FT
How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic & Stock
Anticipated Water Requirements/day 0 Gallons

6. Well Yield

Test Date (yyyy/mm/dd): 1967/05/26
Start Time: 11:00 AM
Test Method: Unknown
Non pumping static level: 18 FT
Rate of water removal: 3 Gallons/Min
Depth of pump intake: 0 FT
Water level at end of pumping: FT
Distance from top of casing to ground level: Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 0 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Gallons/Min
Recommended pump intake: 66 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
16	Brown Sandy Clay
90	Blue Silty Clay
100	Brown Sandy Clay
110	Brown Sandy Clay & Rocks
135	Gray Sandy Clay
149	Saskatchewan Sand & Gravel
154	Blue Shale
160	Gray Shale
170	Blue Water Bearing Sand & Shale

5. Well Completion

Date Started(yyyy/mm/dd):
Date Completed (yyyy/mm/dd): 1967/05/26
Well Depth: 170 FT
Borehole Diameter: 0 Inches
Casing Type: Steel
Liner Type:
Size OD: 4.56 Inches
Size OD: 0 Inches
Wall Thickness: 0 Inches
Wall Thickness: 0 Inches
Bottom at: 154 FT
Top: 0 FT Bottom: 0 FT

Perforations
from: 0 FT to: 0 FT
from: 0 FT to: 0 FT
from: 0 FT to: 0 FT
Perforations Size:
0 Inches x 0 Inches
0 Inches x 0 Inches
0 Inches x 0 Inches

Perforated by:
Seal:
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT
Seal:
from: 0 FT to: 0 FT
Screen Type:
from: 0 FT to: 0 FT
Screen ID: 0 Inches
Slot Size: 0 Inches
Screen Type:
from: 0 FT to: 0 FT
Screen ID: 0 Inches
Slot Size: 0 Inches
Screen Installation Method:
Fittings
Top: Bottom:
Pack:
Grain Size: Amount:
Geophysical Log Taken:
Retained on Files:
Additional Test and/or Pump Data
Chemistries taken By Driller: Yes
Held: 0 Documents Held: 1
Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches
Comments:
DRILLER REPORTS WATER IS SOFT

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Alberta Environment

Well I.D.:	0459748
Map Verified:	Not Verified
Date Report Received:	
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: GROVE DRILLING ENTERPRISES (1980) LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: SOLAR, CONST	Well Location Identifier:	
P.O. Box Number:	Mailing Address: EDMONTON	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westol M
14	04	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: 2425 FT
How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
80	Clay
88	Sand
94	Clay
100	Sand
108	Clay
118	Sand
120	Clay

5. Well Completion

Date Started(yyyy/mm/dd):	Date Completed (yyyy/mm/dd): 1976/09/29
Well Depth: 120 FT	Borehole Diameter: 0 Inches
Casing Type: Steel	Liner Type:
Size OD: 4.56 Inches	Size OD: 0 Inches
Wall Thickness: 0.141 Inches	Wall Thickness: 0 Inches
Bottom at: 114 FT	Top: 0 FT Bottom: 0 FT
Perforations from: 0 FT to: 0 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0 Inches x 0 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by:	
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: Stainless Steel from: 114 FT to: 118 FT	Screen ID: 3 Inches Slot Size: 0.01 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top: Welded	Bottom: Plug
Pack: Jet Sand Grain Size:	Amount: 0.25 Yards
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: Yes Held: 1	Documents Held: 5
Pitless Adapter Type: Drop Pipe Type: Length: 110 FT	Diameter: 1 Inches
Comments: driller reports water is hard	

6. Well Yield

Test Date (yyyy/mm/dd): 1976/09/26
Start Time: 11:00 AM
Test Method: Pump

Non pumping static level: 19 FT

Rate of water removal: 4.5 Gallons/Min

Depth of pump intake: 100 FT

Water level at end of pumping: 100 FT

Distance from top of casing to ground level: Inches

Depth To water level (feet) Drawdown	Elapsed Time Minutes:Sec	Recovery
24.78	1:00	
30.29	2:00	
35.15	3:00	
39.49	4:00	
43.45	5:00	
47.02	6:00	
50.18	7:00	
53.2	8:00	
55.99	9:00	
58.44	10:00	
68.25	15:00	
74.27	20:00	
78.48	25:00	
81.24	30:00	
84.91	40:00	
86.97	50:00	
88.14	60:00	
89.34	75:00	
90.29	90:00	
90.92	105:00	
90.87	120:00	
91.22	150:00	
91.48	180:00	
93.29	210:00	
92.87	240:00	

Total Drawdown: 81 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Gallons/Min

Recommended pump intake: 108 FT

Type Pump Installed

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Alberta Environment

Well I.D.:	0459749
Map Verified:	Not Verified
Date Report Received:	
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: SCHELLENBERGER M		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: WASYLYSHYN, STEVE	Well Location Identifier:	
P.O. Box Number:	Mailing Address: CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westot M
NW	04	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: 2400 FT
How Obtain: Estimated

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 0 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
92	Clay
98	Sand
105	Clay
110	Sand
115	Clay
121	Shale
124	Sandstone

5. Well Completion

Date Started(yyyy/mm/dd):	Date Completed (yyyy/mm/dd): 1963/08/17
Well Depth: 124 FT	Borehole Diameter: 0 Inches
Casing Type: Steel	Liner Type:
Size OD: 3.56 Inches	Size OD: 0 Inches
Wall Thickness: 0 Inches	Wall Thickness: 0 Inches
Bottom at: 122 FT	Top: 0 FT Bottom: 0 FT
Perforations	Perforations Size:
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
Perforated by:	
Seal: Driven from: 0 FT	to: 122 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: Yes Held: 1	Documents Held: 4
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments: DRILLER REPORTS WATER IS SOFT	

6. Well Yield

Test Date (yyyy/mm/dd): 1963/08/17	Start Time: 11:00 AM
Test Method: Unknown	
Non pumping static level:	32 FT
Rate of water removal:	4 Gallons/Min
Depth of pump intake:	0 FT
Water level at end of pumping:	40 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time
Drawdown Minutes:Sec Recovery
Total Drawdown: 8 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 0 Gallons/Min

Recommended pump intake: 0 FT

Type Pump Installed
Pump Type: JET
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.:

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0466661
Map Verified:	Map
Date Report Received:	1996/09/23
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: KAP'S DRILLING LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: ENDERS, DAVE/CDK CONSTR	Well Location Identifier:	
P.O. Box Number:	Mailing Address: RR2, CARVEL	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev. FT | How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No Rate: Gallons
Gas Present: No Oil Present: No

Proposed well use: Domestic & Stock
Anticipated Water Requirements/day 150 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
30	Brown Sandy Clay
85	Gray Fine Grained Sand
105	Blue Clay
135	Gravel
150	Blue Clay
188	Shale
191	Sandstone
224	Shale
228	Sandstone
238	Shale
246	Sandstone
260	Sandy Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1994/08/09	Date Completed (yyyy/mm/dd): 1994/08/10
Well Depth: 260 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.39 Inches	Wall Thickness: 0.25 Inches
Bottom at: 161 FT	Top: 158 FT Bottom: 260 FT
Perforations	Perforations Size:
from: 162 FT to: 260 FT	0.093 Inches x 3 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
Perforated by: Saw	
Seal: Driven from: 0 FT	to: 161 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

6. Well Yield

Test Date (yyyy/mm/dd): 1994/08/10	Start Time: 11:00 AM
Test Method: Bailer & Air	
Non pumping static level:	65 FT
Rate of water removal:	5 Gallons/Min
Depth of pump intake:	150 FT
Water level at end of pumping:	150 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)
Elapsed Time Drawdown Minutes: Sec Recovery

1:00	104.984
2:00	97.768
3:00	92.519
4:00	87.926
6:00	81.364
7:00	78.74
8:00	76.935
10:00	74.146
12:00	72.047
16:00	69.881
20:00	68.733

Total Drawdown: 85 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 5 Gallons/Min

Recommended pump intake: 160 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.: VA5702

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0467926
Map Verified:	Not Verified
Date Report Received:	1997/09/05
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: KAP'S DRILLING LTD.		Drilling Company Approval No.:
Mailing Address:	City or Town:	Postal Code:
WellOwner's Name: ENDERS, DAVE	Well Location Identifier:	
P.O. Box Number:	Mailing Address: STONY PLAIN	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 300 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
18	Brown Till
136	Gray Sandy Till
141	Shale
149	Sandstone
165	Shale
174	Sandstone
190	Shale
194	Sandstone
228	Shale
237	Sandstone
240	Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1995/09/25	Date Completed (yyyy/mm/dd): 1995/09/26
Well Depth: 240 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.39 Inches	Wall Thickness: 0.25 Inches
Bottom at: 156 FT	Top: 154 FT Bottom: 240 FT
Perforations from: 220 FT to: 237 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0.125 Inches x 3 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by: Saw	
Seal: Driven & Bentonite from: 0 FT	to: 156 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments: DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 18".	

6. Well Yield

Test Date (yyyy/mm/dd): 1995/09/26	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	40 FT
Rate of water removal:	10 Gallons/Min
Depth of pump intake:	220 FT
Water level at end of pumping:	215 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:Sec	Recovery
1:00	137.793
2:00	124.669
3:00	119.748
4:00	112.53
5:00	106.297
6:00	100.391
7:00	95.144
8:00	90.879
9:00	86.942
10:00	83.333
12:00	77.427
14:00	72.834
16:00	69.225
20:00	64.304
25:00	58.726
30:00	55.446
35:00	53.805
40:00	54.954
50:00	51.837
60:00	51.509
120:00	39.993

Total Drawdown: 175 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 7 Gallons/Min

Recommended pump intake: 200 FT

Type Pump Installed
Pump Type:
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0494989
Map Verified:	Not Verified
Date Report Received:	1999/09/07
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: COBOB PUMPS & SERVICES LTD.		Drilling Company Approval No.: 118857
Mailing Address: 51517 RANGE ROAD 275	City or Town: STONY PLAIN AB CA	Postal Code: T7Z 1Z5
WellOwner's Name: SHENFIELD, TIM	Well Location Identifier:	
P.O. Box Number: 14	Mailing Address: SITE 218 RR1, CARVEL	Postal Code: T0E 0H0
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
1	4	8020386

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 400 Gallons

6. Well Yield

Test Date (yyyy/mm/dd): 1999/05/06
Start Time: 11:00 AM
Test Method: Bailer
Non pumping static level: 85 FT
Rate of water removal: 30 Gallons/Min
Depth of pump intake: 180 FT
Water level at end of pumping: 180 FT
Distance from top of casing to ground level: Inches

Depth To water level (feet)

Elapsed Time Drawdown Minutes:	Sec	Recovery
85	0:00	180
180	1:00	117
180	2:00	95
180	3:00	90
180	4:00	87
180	5:00	86
180	6:00	85.5
180	7:00	85.5
180	120:00	85

Total Drawdown: 95 FT
If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 20 Gallons/Min
Recommended pump intake: 170 FT
Type Pump Installed
Pump Type: SUB
Pump Model: GOULD 7GS07422
H.P.:
Any further pumptest information?

4. Formation Log

Depth from ground level (feet)	Lithology Description
55	Brown Clay
75	Gray Clay & Sand
101	Gray Sand
125	Gray Sandstone
127	Coal
131	Dark Gray Shale
150	Dark Gray Clay
154	Clay & Gravel
162	Gray Shale
165	Green Shale
167	Gray Shale
170	Green Shale
172	Gray Shale
175	Gray Sandstone
178	Green Shale
186	Gray Shale
196	Sandstone
199	Gray Shale
206	Green Shale
209	Sandstone
211	Gray Shale
215	Sandstone
220	Gray Shale

5. Well Completion

Date Started(yyyy/mm/dd): 1999/05/05	Date Completed (yyyy/mm/dd): 1999/05/06
Well Depth: 220 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.394 Inches	Wall Thickness: 0.27 Inches
Bottom at: 178 FT	Top: 170 FT Bottom: 220 FT

Perforations	Perforations Size:
from: 180 FT to: 200 FT	0.01 Inches x 2.5 Inches
from: 200 FT to: 220 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches

Perforated by: Machine
Seal: Driven & Bentonite from: 160 FT to: 178 FT
Seal: from: 0 FT to: 0 FT
Seal: from: 0 FT to: 0 FT

Screen Type:	Screen ID: 0 Inches
from: 0 FT to: 0 FT	Slot Size: 0 Inches
Screen Type:	Screen ID: 0 Inches
from: 0 FT to: 0 FT	Slot Size: 0 Inches

Screen Installation Method:
Fittings
Top: Bottom:
Pack:
Grain Size: Amount:
Geophysical Log Taken:
Retained on Files:
Additional Test and/or Pump Data
Chemistries taken By Driller: No
Held: 0 Documents Held: 1
Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches
Comments:
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 2'.

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.: 12521C

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0495847
Map Verified:	Not Verified
Date Report Received:	2000/01/20
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: RODCO DRILLING		Drilling Company Approval No.: 121074
Mailing Address: BOX 5168	City or Town: SPRUCE GROVE AB CA	Postal Code: T7X 3A3
WellOwner's Name: BATES, GERALD	Well Location Identifier:	
P.O. Box Number:	Mailing Address: STONY PLAIN	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot	Block	Plan
17	4	

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 250 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
30	Sandy Clay
37	Blue Clay
75	Silty Clay
147	Blue Clay
155	Dirty Sand
160	Gray Shale
162	Green Shale
179	Gray Shale
180	Hard Sandstone
184	Gray Shale
194	Green Shale
196	Sandstone
198	Brown Shale
205	Green Shale
208	Sandy Shale
212	Green Shale
220	Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 1999/10/11	Date Completed (yyyy/mm/dd): 1999/10/13
Well Depth: 220 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.375 Inches	Wall Thickness: 0.25 Inches
Bottom at: 161 FT	Top: 151 FT Bottom: 220 FT
Perforations from: 180 FT to: 220 FT from: 0 FT to: 0 FT from: 0 FT to: 0 FT	Perforations Size: 0 Inches x 0.125 Inches 0 Inches x 0 Inches 0 Inches x 0 Inches
Perforated by: Hand Drill	
Seal: Drive Shoe from: 160 FT	to: 161 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches

Comments:
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 2'.

6. Well Yield

Test Date (yyyy/mm/dd): 1999/10/13	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	42.1 FT
Rate of water removal:	5 Gallons/Min
Depth of pump intake:	210 FT
Water level at end of pumping:	210 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)	Elapsed Time Drawdown Minutes:Sec	Recovery
	0:00	210
	3:00	173.17
	4:00	166.92
	5:00	158.92
	6:00	153
	7:00	146.67
	8:00	140.42
	9:00	134.5
	10:00	128.67
	12:00	119.08
	14:00	109.92
	16:00	100.83
	20:00	89.17
	25:00	77.17
	30:00	67.83
	35:00	61.75
	40:00	57.67
	50:00	52.58
	60:00	50.08
	75:00	48.42
210	120:00	

Total Drawdown: 168 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 5 Gallons/Min

Recommended pump intake: 190 FT

Type Pump Installed
Pump Type: SUB
Pump Model:
H.P.:
Any further pumptest information?

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER
Certification No.: 5977O

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	0496508
Map Verified:	Not Verified
Date Report Received:	2000/07/25
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: RODCO DRILLING		Drilling Company Approval No.: 121074
Mailing Address: BOX 5168	City or Town: SPRUCE GROVE AB CA	Postal Code: T7X 3A3
WellOwner's Name: WILLOW PEAK HOMES	Well Location Identifier:	
P.O. Box Number:	Mailing Address: STONY PLAIN	Postal Code:
City:	Province:	Country:

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
SW	03	053	02	5

Location in Quarter
0 FT from Boundary
0 FT from Boundary

Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used:
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day 300 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
65	Silty Clay
65	Silty Clay
95	Blue Clay
95	Blue Clay
97	Gravel
97	Gravel
145	Blue Clay
145	Blue Clay
155	Gray Shale
155	Gray Shale
161	Silty Shale
161	Silty Shale
163	Green Shale
163	Green Shale
168	Silty Shale
168	Silty Shale
172	Sandstone
172	Sandstone
175	Hard Sandstone
175	Hard Sandstone
181	Shale
181	Shale
182	Green Shale
182	Green Shale
190	Silty Shale
190	Silty Shale
191	Hard Sandstone
191	Hard Sandstone
194	Silty Shale
194	Silty Shale
205	Green Shale
205	Green Shale
207	Brown Shale
207	Brown Shale
209	Green Shale
209	Green Shale
220	Gray Shale
220	Gray Shale
231	Sandstone
231	Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 2000/06/26	Date Completed (yyyy/mm/dd): 2000/06/28
Well Depth: 265 FT	Borehole Diameter: 0 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.375 Inches	Wall Thickness: 0.25 Inches
Bottom at: 195 FT	Top: 185 FT Bottom: 265 FT
Perforations from: 245 FT to: 265 FT	Perforations Size: 0 Inches x 0.125 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
from: 0 FT to: 0 FT	0 Inches x 0 Inches
Perforated by: Hand Drill	
Seal: Driven from: 194 FT	to: 195 FT
Seal: from: 0 FT	to: 0 FT
Seal: from: 0 FT	to: 0 FT
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Type: from: 0 FT to: 0 FT	Screen ID: 0 Inches Slot Size: 0 Inches
Screen Installation Method:	
Fittings Top:	Bottom:
Pack: Grain Size:	Amount:
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held: 0	Documents Held: 1
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches

Comments:
DRILLER REPORTS DISTANCE FROM TOP OF CASING TO GROUND LEVEL: 2'.

6. Well Yield

Test Date (yyyy/mm/dd): 2000/07/14	Start Time: 11:00 AM
Test Method: Pump	
Non pumping static level:	42.2 FT
Rate of water removal:	3.5 Gallons/Min
Depth of pump intake:	235 FT
Water level at end of pumping:	135.7 FT
Distance from top of casing to ground level:	Inches

Depth To water level (feet)	Elapsed Time Drawdown Minutes:Sec	Recovery
42.67	0:00	135.75
46.17	1:00	132.33
49.42	2:00	129.83
52.17	3:00	127.08
55	4:00	124.5
57.25	5:00	122.17
60	6:00	119.75
62.08	7:00	117.42
64.25	8:00	115
66.25	9:00	113.17
68.33	10:00	111.08
72.17	12:00	107.25
75.5	14:00	103.67
78.75	16:00	100.25
84.75	20:00	94.25
90.67	25:00	88
96.08	30:00	82.5
101.33	35:00	77.83
104.92	40:00	73.83
111.83	50:00	67.83
117.42	60:00	63.33
124	75:00	58.5
129.08	90:00	55.25
132.83	105:00	
135.75	120:00	

Total Drawdown: 93 FT

If water removal was less than 2 hr duration, reason why

Recommended pumping rate: 3 Gallons/Min

Recommended pump intake: 235 FT

Type Pump Installed

7. Contractor Certification

Driller's Name: UNKNOWN DRILLER

Alberta Environment

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	1165150
Map Verified:	Map
Date Report Received:	2006/10/25
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: CALIBRE DRILLING LTD.		Drilling Company Approval No.: 128944
Mailing Address: BOX 4083	City or Town: SPRUCE GROVE ALBERTA CANADA	Postal Code: T7X 3B3
WellOwner's Name: MERCIER, RON	Well Location Identifier: LAKE COUNTRY PROPERTIES	
P.O. Box Number:	Mailing Address: SITE 218 RR 1 BOX 27	Postal Code: T0E 0H0
City: CARVEL	Province: AB	Country: CA

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westot M
03	03	053	02	5

Location in Quarter: FT from N Boundary; FT from E Boundary

Lot	Block	Plan
10	3	8020386

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used: Unknown

Method of Drilling: Rotary

Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day 500 Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
62	Brownish Yellow Till
71	Brown Fine Grained Sand
92	Brownish Yellow Till
102	Blue Gray Till
151	Gray Medium Grained Sand
159	Dark Gray Clay
166	Dark Gray Shale
177	Medium Grained Sandstone
184	Light Gray Shale
188	Medium Grained Sandstone
194	Green Shale
207	Light Gray Shale
216	Medium Grained Sandstone
224	Green Shale
233	Medium Grained Sandstone
240	Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 2002/02/20	Date Completed (yyyy/mm/dd): 2002/02/21
Well Depth: 240 FT	Borehole Diameter: 8.75 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.39 Inches	Wall Thickness: 0.237 Inches
Bottom at: 190 FT	Top: 185 FT Bottom: 240 FT
Perforations from: 194 FT to: 233 FT from: FT to: FT from: FT to: FT	Perforations Size: 0.062 Inches x 12 Inches Inches x Inches Inches x Inches
Perforated by: Saw	
Seal: Bentonite Chips/Tablets from: 0 FT	to: 190 FT
Seal: Unknown from: FT	to: FT
Seal: Unknown from: FT	to: FT
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Installation Method: Unknown	
Fittings Top: Unknown	Bottom: Unknown
Pack: Unknown Grain Size:	Amount: Unknown
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held:	Documents Held:
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches

Comments:
AIR TEST 10 GPM @ 39.98 METERS. SEAL - BENTONITE PRODUCT & CUTTINGS BOREHOLE DIAMETER - 8.75" & 4.875" ANTICIPATED REQUIREMENT PER DAY - 300 TO 500 GALLONS

6. Well Yield

Test Date (yyyy/mm/dd): 2002/02/21	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	77.789 FT
Rate of water removal:	10 Gallons/Min
Depth of pump intake:	140.092 FT
Water level at end of pumping:	131.1 FT
Distance from top of casing to ground level:	19.685 Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:Sec	Recovery
0:00	131.168
1:00	125.689
2:00	116.831
3:00	108.858
4:00	104.364
5:00	99.77
6:00	95.407
7:00	92.159
8:00	90.453
9:00	88.615
10:00	87.041
12:00	84.35
14:00	82.808
16:00	81.496
20:00	80.479
25:00	79.626
30:00	78.707
35:00	78.248
40:00	78.051
50:00	77.822
60:00	77.789
75:00	77.789
90:00	77.789
105:00	77.789
120:00	77.789

Total Drawdown: 53.379 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 7 Gallons/Min

Recommended pump intake: 137.795 FT

Type Pump Installed

7. Contractor Certification

Driller's Name: RANDY REIDLINGER

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	1165151
Map Verified:	Not Verified
Date Report Received:	2006/10/25
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: CALIBRE DRILLING LTD.		Drilling Company Approval No.: 128944
Mailing Address: BOX 4083	City or Town: SPRUCE GROVE ALBERTA CANADA	Postal Code: T7X 3B3
WellOwner's Name: OSTERMAYER, CRAIG & PAT	Well Location Identifier:	
P.O. Box Number:	Mailing Address: SITE 270 RR 2 BOX 25	Postal Code: T7Z 1X2
City: STONY PLAIN	Province: AB	Country: CA

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
NW	04	053	02	5

Location in Quarter
FT from N Boundary
FT from E Boundary
Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used: Unknown
Method of Drilling: Rotary
Flowing Well: No
Rate: Gallons
Gas Present: No
Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
19	Brownish Yellow Clay
83	Blue Gray Clay
101	Blue Gray Till
108	Green Shale
111	Fine Grained Sandstone
113	Green Shale
115	Fine Grained Sandstone
121	See Comments Sandstone
124	Coarse Grained Sandstone
127	Greenish Gray Shale
131	Light Gray Shale
140	Coarse Grained Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 2003/05/18	Date Completed (yyyy/mm/dd): 2003/05/18
Well Depth: 140 FT	Borehole Diameter: 8.75 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.39 Inches	Wall Thickness: 0.237 Inches
Bottom at: 105 FT	Top: 100 FT Bottom: 140 FT
Perforations from: 111 FT to: 140 FT	Perforations Size: 0.125 Inches x 12 Inches
from: FT to: FT	Inches x Inches
from: FT to: FT	Inches x Inches

Perforated by: Saw

Seal: Bentonite Chips/Tablets from: 0 FT to: 105 FT
Seal: Unknown from: FT to: FT
Seal: Unknown from: FT to: FT

Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches

Screen Installation Method: Unknown

Fittings
Top: Unknown Bottom: Unknown
Pack: Unknown
Grain Size: Amount: Unknown

Geophysical Log Taken:
Retained on Files:

Additional Test and/or Pump Data
Chemistries taken By Driller: No
Held: Documents Held:

Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches

Comments:
AIR TEST 12 GPM @ 18 METERS , 25 GPM @ 30 METERS. 115' - 121' HARD MG SS BOREHOLE DIAMETER - 8.75" & 4.875" SEAL - BENTONITE PRODUCT & CUTTINGS

6. Well Yield

Test Date (yyyy/mm/dd): 2003/05/18	Start Time: 7:55 PM
Test Method: Air	
Non pumping static level:	32.48 FT
Rate of water removal:	12 Gallons/Min
Depth of pump intake:	59.055 FT
Water level at end of pumping:	48.32 FT
Distance from top of casing to ground level:	27.559 Inches

Depth To water level (feet) Drawdown	Elapsed Time Minutes:Sec	Recovery
	0:00	48.327
	1:00	42.028
	2:00	39.862
	3:00	39.14
	4:00	37.959
	5:00	37.27
	6:00	36.745
	7:00	36.45
	8:00	36.122
	9:00	35.827
	10:00	35.663
	12:00	35.4
	14:00	35.105
	16:00	34.875
	20:00	34.613
	25:00	34.35
	30:00	34.121
	35:00	33.957
	40:00	33.825
	50:00	33.629
	60:00	32.48
	75:00	32.48
	90:00	32.48
	105:00	32.48
	120:00	32.48

Total Drawdown: 15.846 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 10 Gallons/Min

Recommended pump intake: 82.021 FT

Type Pump Installed

7. Contractor Certification

Driller's Name: RANDY REIDLINGER

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	1495171
Map Verified:	Map
Date Report Received:	2006/11/09
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: MAR-WAYNE WATER WELL DRILLING SERVICES LTD.		Drilling Company Approval No.: 118900
Mailing Address: BOX 4, SITE 5, RR 1	City or Town: CALAHOO AB CA	Postal Code: T0G 0J0
WellOwner's Name: PHILLPS, ROSS & SARAH	Well Location Identifier:	
P.O. Box Number: 33	Mailing Address: SITE 218, RR 1	Postal Code: T0E 0H0
City: CARVEL	Province: AB	Country: CA

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
05	03	053	02	5

Location in Quarter
FT from N Boundary
FT from E Boundary

Lot	Block	Plan
2	4	8020386

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: Materials Used: Unknown
Method of Drilling: Rotary
Flowing Well: No Rate: Gallons
Gas Present: No Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
48	Brown Silty Clay
65	Gray Clay
80	Mixed Clay & Silt
105	Fine Grained Sand
155	Gray Sandy Clay
158	Gray Shale
161	Gray Sandstone
165	Green Shale
169	Gray Sandstone
171	Gray Shale
178	Gray Sandstone
184	Green Shale
194	Greenish Gray Medium Grained Shale
200	Gray Sandstone
207	Gray Shale
209	Gray Sandstone
215	Gray Shale
218	Gray Sandstone
219	Green Shale
230	Gray Sandstone
232	Green Shale
262	Gray Sandstone
267	Green Shale
276	Gray Sandstone
277	Green Shale
282	Gray Sandstone
295	Green Shale
297	Gray Sandstone
312	Green Shale
317	Gray Sandstone
320	Brownish Gray Shale

5. Well Completion

Date Started(yyyy/mm/dd): 2005/06/20	Date Completed (yyyy/mm/dd): 2005/06/21
Well Depth: 320 FT	Borehole Diameter: 5.125 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.5 Inches	Wall Thickness: 0.25 Inches
Bottom at: 263 FT	Top: 260 FT Bottom: 320 FT
Perforations from: 270 FT to: 317 FT from: FT to: FT from: FT to: FT	Perforations Size: 0.125 Inches x 12 Inches Inches x Inches Inches x Inches

Perforated by: Saw

Seal: Shale Trap & Bentonite from: 0 FT to: 263 FT
Seal: Cuttings from: 0 FT to: 263 FT
Seal: Unknown from: FT to: FT

Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches

Screen Installation Method: Unknown
Fittings
Top: Unknown Bottom: Unknown
Pack: Unknown
Grain Size: Amount: Unknown
Geophysical Log Taken:
Retained on Files:
Additional Test and/or Pump Data
Chemistries taken By Driller: No
Held: Documents Held:
Pitless Adapter Type:
Drop Pipe Type:
Length: FT Diameter: Inches
Comments:
PLAN: LAKE COUNTRY EST

6. Well Yield

Test Date (yyyy/mm/dd): 2005/06/21	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	72.08 FT
Rate of water removal:	10 Gallons/Min
Depth of pump intake:	318.209 FT
Water level at end of pumping:	288.7 FT
Distance from top of casing to ground level:	14.961 Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:	Sec Recovery
0:00	288.714
1:00	273.064
2:00	263.222
3:00	252.69
4:00	243.471
5:00	234.416
6:00	226.444
7:00	218.996
8:00	211.647
9:00	205.151
10:00	198.885
12:00	187.533
14:00	177.789
16:00	168.799
20:00	154.035
25:00	139.993
30:00	128.871
35:00	120.472
40:00	113.484
50:00	103.773
60:00	97.08
75:00	90.518
90:00	86.385
105:00	83.629

Total Drawdown: 216.634 FT
If water removal was less than 2 hr duration, reason why.

Recommended pumping rate: 8 Gallons/Min
Recommended pump intake: 216.535 FT
Type Pump Installed
Pump Type:

7. Contractor Certification

Driller's Name: TERRY BERGSTREISER
Certification No.: 11955A

Water Well Drilling Report

Alberta Environment

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

Well I.D.:	1715041
Map Verified:	Map
Date Report Received:	2006/10/12
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: SUMMERS DRILLING LTD.		Drilling Company Approval No.: 119554
Mailing Address: BOX 3172	City or Town: STONY PLAIN AB CA	Postal Code: T7Z 1L4
WellOwner's Name: TAYLOR, TRUDY	Well Location Identifier: BOWEN LAKE EST	
P.O. Box Number: 21	Mailing Address: SITE 11 RR1	Postal Code:
City: CARVEL	Province: AB	Country: CA

2. Well Location

1/4 or LSD	Sec	Twp	Rge	Westof M
12	03	053	02	5

Location in Quarter
FT from N Boundary
FT from E Boundary

Lot	Block	Plan
9	2	8120011

Well Elev: FT — How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed: — Materials Used: Unknown
Method of Drilling: Rotary
Flowing Well: No — Rate: Gallons
Gas Present: No — Oil Present: No

Proposed well use: Domestic
Anticipated Water Requirements/day Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
35	Silty Clay
70	Brown Silty Clay
71	Coal
115	Gray Silty Sand
120	Gravel
135	Silty Clay
150	Gray Shale
180	Green Shale
195	Sandstone

5. Well Completion

Date Started(yyyy/mm/dd): 2003/02/25	Date Completed (yyyy/mm/dd): 2003/02/26
Well Depth: 195 FT	Borehole Diameter: 7.875 Inches
Casing Type: Plastic	Liner Type: Plastic
Size OD: 6 Inches	Size OD: 4.5 Inches
Wall Thickness: 0.39 Inches	Wall Thickness: 0.288 Inches
Bottom at: 156 FT	Top: 145 FT Bottom: 195 FT
Perforations from: 156 FT to: 195 FT from: FT to: FT from: FT to: FT	Perforations Size: 0.02 Inches x 2 Inches Inches x Inches Inches x Inches
Perforated by: Saw	
Seal: Bentonite Chips/Tablets from: 0 FT	to: 156 FT
Seal: Unknown from: FT	to: FT
Seal: Unknown from: FT	to: FT
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Installation Method: Unknown	
Fittings Top: Unknown	Bottom: Unknown
Pack: Unknown Grain Size:	Amount: Unknown
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held:	Documents Held:
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches
Comments:	

6. Well Yield

Test Date (yyyy/mm/dd): 2003/02/26	Start Time: 11:00 AM
Test Method: Air	
Non pumping static level:	70.013 FT
Rate of water removal:	6.001 Gallons/Min
Depth of pump intake:	180 FT
Water level at end of pumping:	180 FT
Distance from top of casing to ground level:	18 Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:	Sec Recovery
0:00	180
1:00	122
2:00	108
3:00	160
4:00	152
5:00	143
6:00	137
7:00	126
8:00	119
9:00	115
10:00	111
12:00	107
14:00	101
16:00	93
20:00	86
25:00	84
30:00	82
35:00	80
40:00	78
50:00	77
60:00	76
75:00	75
90:00	74
105:00	73
120:00	72

Total Drawdown: 110.007 FT

If water removal was less than 2 hr duration, reason why:

Recommended pumping rate: 3.999 Gallons/Min

Recommended pump intake: 179.987 FT

Type Pump Installed

7. Contractor Certification

Driller's Name: DARIN (NEW) CAOUETTE
Certification No.: 3527713

Appendix B

Production and Observation Well Logs

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy.

The information contained in this "Water Well Drilling Report" is unverified by Alberta Environment

Well I.D.:	1165411
Map Verified:	Not Verified
Date Report Received:	2009/03/05
Measurements:	Imperial

1. Contractor & Well Owner Information

Company Name: CALIBRE DRILLING LTD.		Drilling Company Approval No.: 128944
Mailing Address: BOX 4083	City or Town: SPRUCE GROVE ALBERTA CANADA	Postal Code: T7X 3B3
WellOwner's Name: FAWN MEADOWS DEVELOPMENT INC.	Well Location Identifier:	
P.O. Box Number:	Mailing Address: SUITE 607, 4603 VARSITY DRIVE NW	Postal Code: T3A 2V7
City: CALGARY	Province: AB	Country: CA

2. Well Location

1/4 or LSD	Sec	Twp	Rge	West of M
SE	04	053	02	5

Location in Quarter
FT from N Boundary
FT from E Boundary

Lot Block Plan

Well Elev: FT
How Obtain: Not Obtain

3. Drilling Information

Type of Work: New Well
Reclaimed Well
Date Reclaimed:
Materials Used: Unknown
Method of Drilling: Rotary
Flowing Well: No
Gas Present: No
Rate: Gallons
Oil Present: No
Proposed well use: Domestic
Anticipated Water Requirements/day Gallons

4. Formation Log

Depth from ground level (feet)	Lithology Description
18	Brownish Yellow Till
43	Blue Gray Till
52	Gray Fine Grained Sand
90	Blue Gray Till
151	Blue Gray Clay & Rocks
153	Brown Shale
155	Brown Soft Sandstone
165	Light Green Shale
172	Gray Medium Grained Sandstone
175	Green Shale
179	Gray Medium Grained Sandstone
183	Green Shale
188	Gray Medium Grained Sandstone
193	Light Gray Shale
201	Gray Medium Grained Sandstone
217	Light Green Shale
222	Gray Medium Grained Sandstone
225	Green Shale
231	Gray Medium Grained Sandstone
236	Green Medium Grained Shale
240	Dark Green Shale

5. Well Completion

Date Started(yyyy/mm/dd): 2008/06/12	Date Completed (yyyy/mm/dd): 2008/06/13
Well Depth: 240 FT	Borehole Diameter: 8.75 Inches
Casing Type: Steel	Liner Type: Plastic
Size OD: 7 Inches	Size OD: 4.94 Inches
Wall Thickness: 0.231 Inches	Wall Thickness: 0.238 Inches
Bottom at: 159.5 FT	Top: 16 FT Bottom: 240 FT
Perforations from: 165 FT to: 179 FT from: 183 FT to: 201 FT from: 217 FT to: 231 FT	Perforations Size: 0.062 Inches x 12 Inches 0.062 Inches x 12 Inches 0.062 Inches x 12 Inches
Perforated by: Saw	
Seal: Driven from: 0 FT	to: 159.5 FT
Seal: Shale Trap from: FT	to: 18 FT
Seal: Shale Trap from: FT	to: 162 FT
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Type: Unknown from: FT to: FT	Screen ID: Inches Slot Size: Inches
Screen Installation Method: Unknown	
Fittings Top: Unknown	Bottom: Unknown
Pack: Unknown Grain Size.	Amount: Unknown
Geophysical Log Taken: Retained on Files:	
Additional Test and/or Pump Data Chemistries taken By Driller: No Held:	Documents Held.
Pitless Adapter Type: Drop Pipe Type: Length: FT	Diameter: Inches

Comments:
ADDITIONAL BOREHOLE DIAMETER 6.25 INCHES. WATER USED TO DRILL WELL TAKEN FROM SOURCE AT CITY OF SPRUCE GROVE ON THE DAY OF 2008/06/12 AT 7:30 AM. AMOUNT OF WATER TAKEN WAS 9000 LITRES. AIR TEST 30 GPM @ 42.7

6. Well Yield

Test Date (yyyy/mm/dd): 2008/06/13
Start Time: 12:00 PM
Test Method: Air
Non pumping static level: 19.259 FT
Rate of water removal: 30 Gallons/Min
Depth of pump intake: 140.092 FT
Water level at end of pumping: 110.3 FT
Distance from top of casing to ground level: 23.622 Inches

Depth To water level (feet) Elapsed Time Drawdown Minutes:	Sec Recovery
0:00	110.335
1:00	94.849
2:00	72.671
3:00	56.693
4:00	44.062
5:00	40.584
6:00	36.385
7:00	34.711
8:00	31.988
9:00	30.971
10:00	29.954
12:00	28.74
14:00	27.657
16:00	27.034
20:00	26.115
25:00	25.197
30:00	24.738
35:00	24.344
40:00	23.819
50:00	23.064
60:00	22.671
75:00	22.047
90:00	21.588
105:00	21.26
120:00	20.899

Total Drawdown: FT
If water removal was less than 2 hr duration, reason why:
Recommended pumping rate: 20 Gallons/Min
Recommended pump intake: 147.638 FT

(2)

Calibre Drilling Ltd.
Box 4083 Spruce Grove, AB
Phone: 780-960-2992

Longitude N53° 32' 90.7
Latitude W114° 13' 86.1
Elevation 2444 ft

Date: 22May13-20 Customer: Fawn Meadows Development INC.

Location: SE-04-53-02-5 Phone: 403-851-9500 Barry. Rig # 1

From	To	Formation	Comments
0	3	Top Soil	
3	17	Brn/yellow Till	
17	42	Blue/Gray Till	
42	54	med Gray Sand.	
54	88	Blue/Gray Till	
88	157	Blue/Gray Clay w/ Stones	
157	159	yellowish	SH - Shale
159	163	Brn SS	
163	175	Blue/Gray Till	
175	193	Coarse Gray Sand.	SS - Sandstone
193	195	Blue/Gray Clay	
195	197	Yellow SH	
197	214	Green SH	
214	223	mgss	MEDIUM GR
223	229	Green SH	
229	235	mgss	
235	241	Green SH	
241	245	mgss	
245	251	Green SH	
251	256	mgss	
256	262	Dark Green SH	
262	268	med Green SH	
268	271	mgss	
271	277	light Gray SH	
277	280	Brn SH	

till

shale

Shale

shale

SS

27' of Sandstone

From	To	Formation	Comments	Casing
				Liner

Well Depth:	280.
Casing bottom at:	
Sealed Interval:	Bottom:
Screen top:	Bottom:
Liner top:	To:
Perforations from:	
Liner Overlap:	
Total Liner:	
Rate of Water (GPM):	
Static Water level:	
Depth of Pump Intake:	
Water level at end of Test:	
Recommended Pump Intake:	
Casing stick up:	
Total Derrick Hours	

Appendix C

Pumping Test Field Reports

From: Barrie Ibsen [fmd@fbirealty.com]

Sent: Wednesday, July 02, 2008 2:51 PM

To: Sparks, Shane

Subject: Fw: [24 HR TEST

Shane,

There is an error in the data below as it was transposed from the field work sheet.

The value at the 4 minute mark on the draw down column should read 43.60 not 53.60

Talk to you tomorrow.

Barrie

-------Original Message-------

From: Barrie Ibsen
Date: 27/06/2008 10:44:26 AM
To: shanesparks@jacqueswhitford.com
Subject: Fw: [SPAM] 24 HR TEST

-------Original Message-------

From: L&B Water Services Ltd
Date: 06/26/08 12:28:19
To: fmd@fbirealty.com
Subject: [SPAM] 24 HR TEST

L & B WATER SERVICES LTD. PHONE: 780-963-8134

BOX 2503 STONY PLAIN, ALBERTA T7Z 1X9 FAX: 780-963-3414

WATER WELL PUMP TEST

CLIENT:	FAWN MEADOWS DEVELO			WELL LOCATION:	SE 4 53 2-W5	
PUMPING	LAPSE TIME (min's)	RECOVERY	TEST DATE:	JUNE 24/08	START TIME:	12.00 AM
			TEST METHOD:	PROBE		
			MEASUREMENTS: METERS	FEET		
			STATIC			

	0		LEVEL:	21.15'
29.40	0.30		PUMP RATE:	35 GPM (IMPERIAL)
33.55	1	54.30	T.O.C. TO GROUND:	24"
	1.30			
39.50	2	48.35	COMMENTS:	
41.80	3	45.30		WELL IS 7" STEEL CASING
53.60	4	43.60		PRE TESTED WELL AT 35 GPM FOR 1 HR.
44.90	5	42.45		
45.90	6	41.30		
46.70	7	41.00		
47.30	8	40.60		
47.80	9	40.20		
48.25	10	39.90		
48.95	12	39.30		
49.75	15	38.65		
50.70	20	37.85		
51.40	25	37.40		
51.95	30	36.70		
52.50	35	36.25	PUMPING	HOUR'S RECOVERY
52.90	40	35.85	65.30	11 25.75
53.30	45	35.50	65.80	12 25.35
53.65	50	35.15	66.30	13 24.95
54.30	60	34.60	66.70	14 24.65
	Hrs/Min's		67.10	15 24.35
55.00	1.15	33.85	67.60	16 24.15
55.65	1.30	33.25	67.80	17 23.95
56.40	1.45	32.75	68.10	18 23.65
56.90	2	32.20	68.50	19
57.85	2.30	31.35	68.80	20
58.65	3	30.80	69.10	21
59.60	3.30	30.20	69.30	22
60.20	4	29.65	69.50	23
61.15	5	28.85	69.70	24
62.10	6	28.15	69.90	25
62.90	7	27.50	70.10	26
63.60	8	27.20	TRAVEL TIME:	
64.25	9	26.65	START-UP:	SHUTDOWN:
64.30	10	26.05	PUMP TEST:	

L & B WATER SERVICES LTD.

PHONE: 780-963-8134

BOX 2503 STONY PLAIN, ALBERTA T7Z 1X9 FAX: 780-963-3414

WATER WELL PUMP TEST

CLIENT:	FAWN MEADOWS DEVELOPMENT		WELL LOCATION:	SE 4 53 2 W5	
PUMPING	LAPSE TIME (min's)	RECOVERY	TEST DATE:	MAY 21/09	START TIME: 7.00 PM
			TEST METHOD:	PROBE	
			MEASUREMENTS:	METERS	FEET
19.30	0	25.00	STATIC LEVEL:	19.30'	
19.35	1	25.00	PUMP RATE:		
19.35	2	25.00	T.O.C.:	24"	
19.35	3		N 53 32.880' W 114 13.938'		
19.35	4		COMMENTS:	OBSERVATION WELL	
19.40	5				
19.40	6			ELEVATION TO T.O.C. 2395 FT	
	7				
	8				
	9				
	10				
	15				
	20				
	25	25.00			
	30	25.00			
	40	25.00			
	50				
19.40	60				
19.45	75				
19.45	90				
19.45	105				
19.45	120				

	HOURS		PUMPING	HOURS	RECOVERY	
19.50	2 1/2		21.60	20	23.80	
19.55	3		21.80	22	23.70	
19.55	3 1/2		21.95	24	23.60	
19.60	4	25.00	22.30	28		
19.70	5	24.90	22.65	32		
19.80	6	24.85	22.95	36		
19.90	7	24.80	23.50	42		
20.20	8	24.70	23.80	48		
20.40	9	24.60	24.20	56		
20.50	10	24.50	24.60	64		
20.60	11	24.40	25.00	72		
20.75	12	24.35				
20.95	14	24.25	TRAVEL TIME:			
21.20	16	24.10	START-UP:		SHUTDOWN:	
21.40	18	23.95	PUMP TEST:			

Data Set: V:\1918\active\1034043 Fawn Meadows\Water\Pump Test\Fawn Meadows OBWELL.aqt
Date: 05/26/09
Time: 14:56:24

PROJECT INFORMATION

Company: Fawn Meadows Development, Inc
Location: Carvel, AB
Test Date: 5-21-09
Test Well: Production Well

AQUIFER DATA

Saturated Thickness: 236.6 ft
Anisotropy Ratio (Kz/Kr): 0.1
Aquitard Thickness (b'): 10. ft
Aquitard Thickness (b"): 10. ft

PUMPING WELL DATA

No. of pumping wells: 1

Pumping Well No. 1: Production Well

X Location: 0. ft
Y Location: 0. ft

Casing Radius: 0.66 ft
Well Radius: 0.66 ft

Fully Penetrating Well

No. of pumping periods: 2

Pumping Period Data

Time (min)	Rate (gal/min)	Time (min)	Rate (gal/min)
0.	60.	4320.	0.

OBSERVATION WELL DATA

No. of observation wells: 1

Observation Well No. 1: OB Well

X Location: 650. ft
Y Location: 0. ft

Radial distance from Production Well: 650. ft

Fully Penetrating Well

No. of Observations: 51

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
1.	0.05	360.	0.5
2.	0.05	420.	0.6
3.	0.05	480.	0.9
4.	0.05	540.	1.1
5.	0.1	600.	1.2
6.	0.1	660.	1.3
7.	0.1	720.	1.45
8.	0.1	840.	1.65
9.	0.1	960.	1.9
10.	0.1	1080.	2.1
15.	0.1	1200.	2.3
20.	0.1	1320.	2.5
25.	0.1	1440.	2.65
30.	0.1	1680.	3.
40.	0.1	1920.	3.35
50.	0.1	2160.	3.65
60.	0.1	2520.	4.2
75.	0.15	2880.	4.5
90.	0.15	3360.	4.9
105.	0.15	3840.	5.3
120.	0.15	4320.	5.7
150.	0.2	4321.	5.7
180.	0.25	4620.	5.6
210.	0.25	4680.	5.55
240.	0.3	5520.	4.5
300.	0.4		

SOLUTION

Pumping Test
Aquifer Model: Leaky
Solution Method: Hantush

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	226.8	ft^2/day
S	0.000643	
r/B'	0.1	
ß'	0.1	
r/B"	0.	
ß"	0.	

K = T/b = 0.9585 ft/day (0.0003381 cm/sec)
Ss = S/b = 2.718E-6 1/ft
K'/b' = 3.727E-9 min^{-1}
K' = 5.368E-5 ft/day

AUTOMATIC ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	Std. Error	Approx. C.I.	t-Ratio	
T	280.5	74.86	+/- 150.6	3.747	ft^2/day
S	0.0008714	0.0001605	+/- 0.0003229	5.429	
r/B'	1.0E-5	0.1212	+/- 0.2439	8.249E-5	
ß'	1.0E-5	0.07361	+/- 0.1481	0.0001359	
r/B"	0.	not estimated			
ß"	0.	not estimated			

C.I. is approximate 95% confidence interval for parameter
t-ratio = estimate/std. error
No estimation window

K = T/b = 1.186 ft/day (0.0004183 cm/sec)
Ss = S/b = 3.683E-6 1/ft
K'/b' = 4.611E-17 min^{-1}
K' = 6.639E-13 ft/day

Parameter Correlations

	T	S	r/B'	ß'
T	1.00	0.99	0.00	-1.00
S	0.99	1.00	0.00	-1.00
r/B'	0.00	0.00	1.00	0.00
ß'	-1.00	-1.00	0.00	1.00

Residual Statistics

for weighted residuals

Sum of Squares ... 0.6907 ft^2
Variance ..... 0.0147 ft^2
Std. Deviation ..... 0.1212 ft
Mean ..... 0.06657 ft
No. of Residuals... 51
No. of Estimates... 4

Appendix D

Water Quality Lab Reports

333 - 50th Avenue SE
Calgary, AB T2G 2B3
Phone (403) 297-0868
Fax (403) 297-0869
E-mail: kaizenlab@kaizenenviro.com

KaizenLAB

ANALYTICAL DATA REPORT

Client Company: L & B Water Services Ltd. **Date Received:** May 25 2009 **Lab File #:** 119089

Client Contact: Bill Riedlinger **Date Reported:**

Client Project #: Fawn Meadows Development, SE 4-53-2W5

Sample ID: 119089-1, Fawn Meadows @ 12:00pm

Date Sampled: May 24, 2009

Parameter Name	Units	Results
Total Kjeldahl Nitrogen	mg/L	1.3
Ammonia-N	mg/L	0.14
Sulphide (H2S)	mg/L	<0.005
Phenol Total	mg/L	TBA

Package Name: Total Metals in Water

Parameter Name	Units	Results
Total Aluminium (Al)	mg/L	0.065
Total Antimony (Sb)	mg/L	0.0003
Total Arsenic (As)	mg/L	0.0045
Total Barium (Ba)	mg/L	0.012
Total Beryllium (Be)	mg/L	<0.0005
Total Boron (B)	mg/L	0.3826
Total Cadmium (Cd)	mg/L	0.0037
Total Chromium (Cr)	mg/L	<0.005
Total Cobalt (Co)	mg/L	0.0003
Total Copper (Cu)	mg/L	0.0178
Total Iron (Fe)	mg/L	0.141
Total Lead (Pb)	mg/L	0.0041
Total Manganese (Mn)	mg/L	0.0137
Total Molybdenum (Mo)	mg/L	0.0006
Total Nickel (Ni)	mg/L	<0.0004
Total Selenium (Se)	mg/L	<0.0009
Total Silver (Ag)	mg/L	0.0002
Total Strontium (Sr)	mg/L	0.096
Total Thallium (Tl)	mg/L	<0.0003
Total Tin (Sn)	mg/L	<0.0002
Total Vanadium (V)	mg/L	0.0006
Total Zinc (Zn)	mg/L	0.09

Appendix D

Water Quality Lab Reports

333 - 50th Avenue SE
Calgary, AB T2G 2B3
Phone (403) 297-0868
Fax (403) 297-0869
E-mail: kaizenlab@kaizenenviro.com

KaizenLAB

ANALYTICAL DATA REPORT

Client Company: L & B Water Services Ltd. **Date Sampled:** May 24, 2009 **Lab File #:** 119089

Client Contact: Bill Riedlinger **Date Received:** May 25, 2009

Client Project #: Fawn Meadows Development, SE 4-53-2W5 **Date Reported:**

Sample ID: 119089-1, Fawn Meadows @ 12:00pm

Parameters	Units	Results	CDWQG* Guideline Limits
pH @ 25°C		8.1	6.5-8.5 (AO)
EC @ 25°C	mS/cm	2.09	
Sodium	mg/L	**389**	≤200 (AO)
Potassium	mg/L	0.91	
Calcium	mg/L	5.80	
Magnesium	mg/L	0.49	
Iron (dissolved)	mg/L	<0.01	≤0.3 (AO)
Fluoride	mg/L	0.95	1.5 (MAC)
Chloride	mg/L	0.66	≤250 (AO)
Nitrite	mg/L	<0.01	3.2 (MAC)
Nitrate	mg/L	<0.01	45 (MAC)
Phosphate	mg/L	<0.01	
Carbonate	mg/L	<0.01	
Bicarbonate	mg/L	764	
Sulphate	mg/L	374	≤500 (AO)
Total Alkalinity as $CaCO_3$	mg/L	634	
Total Hardness as $CaCO_3$	mg/L	16.5	
Total Dissolved Solids	mg/L	**1152**	≤500 (AO)
Odor (physical)		Odorless	
Turbidity (physical)		Few Sediments	
Appearance (physical)		Colorless	
Microbiology			
Total Coliforms	CFU/100 mL	<1	0 (MAC)
Fecal Coliforms	CFU/100 mL	<1	0 (MAC)

Comments on Water Quality

The highlighted parameter(s) exceed the limit(s) - a suitable treatment system may be used to remove these parameters

*CDWQG = Canadian Drinking Water Quality Guidelines, CCME 2006
MAC = Maximum Acceptable Concentration (affects health), AO = Aesthetic Objective (does not affect health but affects color, taste etc.)

QA/QC Reviewed By: _____

Lab Manager:

Note: The results in this report relate only to the items tested. Information is available for any items in 5.10.2 of ISO/IEC 17025 that cannot be put on a test report.

Detailed test methodologies and QA/QC data available upon request.

333 - 50th Avenue SE
Calgary, AB T2G 2B3
Phone (403) 297-0868
Fax (403) 297-0869
E-mail: kaizenlab@kaizenenviro.com

KaizenLAB

Sample ID: 119089-1, Fawn Meadows @ 12:00pm

Date Sampled: May 24, 2009

Package Name: Dissolved Metals In Water

Parameter Name	Units	Results
Dissolved Aluminium	mg/L	<0.003
Dissolved Antimony	mg/L	<0.0002
Dissolved Arsenic	mg/L	<0.0004
Dissolved Barium	mg/L	0.008
Dissolved Beryllium	mg/L	<0.0005
Dissolved Boron	mg/L	0.3704
Dissolved Cadmium	mg/L	<0.0002
Dissolved Chromium	mg/L	<0.005
Dissolved Cobalt	mg/L	<0.0003
Dissolved Copper	mg/L	0.0097
Dissolved Iron	mg/L	<0.002
Dissolved Lead	mg/L	<0.0004
Dissolved Manganese	mg/L	0.0097
Dissolved Molybdenum	mg/L	0.0005
Dissolved Nickel	mg/L	<0.0004
Dissolved Selenium	mg/L	<0.0009
Dissolved Silver	mg/L	<0.0001
Dissolved Strontium	mg/L	0.092
Dissolved Thallium	mg/L	<0.0003
Dissolved Tin	mg/L	<0.0002
Dissolved Uranium	mg/L	<0.0003
Dissolved Vanadium	mg/L	<0.0002
Dissolved Zinc	mg/L	<0.02

Comments:

Phenols were subcontracted to a third party laboratory.

Test Methodologies*:

Ammonia (water): Based on APHA 4500-NH3
Dissolved Metals: Based on APHA 3120B
Sulphide: Based on APHA 4500- SE-Auto Colorimetry
TKN (water): Based on APHA 4500-N-C
Total metals (water): Based on APHA 3030E & 3120B
Total Phenol (water): Based on APHA 5530

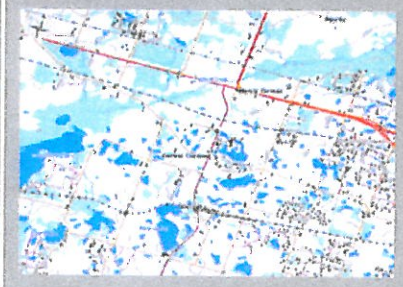
QA/QC Reviewed By: _____

Lab Manager:

Note: The results in this report relate only to the items tested. Information is available for any items in 5.10.2 of ISO/IEC 17025 that cannot be put on a test report.
*Detailed test methodologies and QA/QC data available upon request.

PARKLAND COUNTY

Where Opportunity Awaits



Wastewater System Analysis

Fawn Meadows

Project NC-145

February 2012

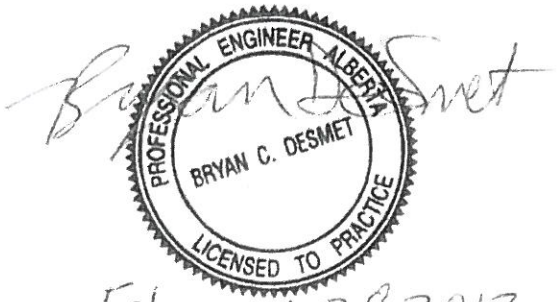
REPORT TO	**NorCan Consulting**
FOR	**Wastewater System Analysis**
ON	**Fawn Meadows Development (NC-145)**
PRINCIPAL CONTACT	**Frank Florkewich** **NorCan Consulting Group**

February 2008

Revised February 2012

SD Consulting Group – Canada, Inc
796 Cherokee Ave
St. Paul, MN 55107

I hereby certify that this report was prepared by me or under my direct supervision and that I am duly Registered Professional Engineer under the laws of the Province of Alberta.



February 28, 2012

Bryan DeSmet, P. Eng., SD Consulting Group — Alberta Permit to Practice #P10913

TABLE OF CONTENTS

APPENDICES

Executive Summary

Report Purpose

The purpose of this report is to provide an evaluation of the costs and benefits of various options for a community water and wastewater system at the Fawn Meadows Development. This report contains information and analyses on wastewater characteristics, quantities, and treatment alternatives.

Estimated Wastewater Flows

It is assumed that there will only be domestic wastewater from residential development entering the wastewater facility. Wastewater design flows, based on water demand, are summarized in **Table ES-1**. Alberta's *Standard of Practice for Onsite Wastewater 2009* specifies a minimum flow of 0.34 m^3/day per person (75 igpd). Therefore, the design flow of 0.378 m^3/day per person, based on water demand, is a conservative assumption for the calculation of wastewater flow.

Table ES-1 Estimated Wastewater Flows

Unit Type	# of Units	Residents/ Dwelling	Total Residents	Wastewater Flow Per Capita (m^3/day)	Total Wastewater Flow (m^3/day)
Detached Dwellings	36	2	72	0.378	27.2
Semi-Detached Dwellings	24	2	48	0.378	18.1
Villa-Style Dwellings	56	2	112	0.378	42.4
Apartment-Style Dwellings	100	2	200	0.378	75.6
	40	1	40	0.378	15.1
Staff – Supportive Living Centre	-	-	10	0.378	3.78
Staff – Café and Gas Bar			2	0.378	0.76
Condominium Maintenance Staff			4	0.378	1.51
Rec Center and Community Hall			10	0.378	3.78
Totals	**256**	**-**	**498**	**-**	**188.23**

Onsite Soils Evaluation

On December 13, 2007, Jacques Whitford NAWE conducted a soils investigation consisting of 16 pits on the proposed development site. For the recommended disposal area, a soil loading rate of 13.2 liters per day per square meter is recommended due to the clay loam soils. **Results from the soils investigation indicate that soil disposal is feasible at Fawn Meadows**.

Wastewater Treatment Facility Options Evaluated

The wastewater treatment process can be divided into three categories: collection, treatment, and disposal. Collection system options are not evaluated in this report.

The wastewater treatment stages include primary and secondary treatment. Primary treatment will be handled by the septic tanks. Three secondary treatment options have been evaluated, and are summarized is **Table ES-2**. We recommend that an application is sent to Alberta Environment to install an AdvanTex Treatment System. Both the total capital and life cycle costs are the lowest of the four treatment system alternatives. The AdvanTex system is an approved technology in Alberta and has over 500 installations.

Two disposal options are evaluated in this report, and are summarized in **Table ES-2**. Soil disposal is feasible at Fawn Meadows. The soils investigation has identified sufficient area to support the installation of a soil disposal system. JW NAWE recommends using both subsurface drip and chambered trenches for disposal. Drip requires less area to install and has significantly lower total capital costs. However, drip also has much higher maintenance requirements and is more susceptible to freezing. In contrast, trenches have lower maintenance requirements and are less likely to freeze during the winter months.

Table ES-2 Wastewater Technologies Evaluated

Treatment/Disposal Stage	Technologies Evaluated
Primary	Septic Tanks
Secondary	AdvanTex Units
	FAST Units
	Recirculating Gravel Filter
	Coarse Sand Filter
Disposal	Subsurface Drip Irrigation
	Chambered Trenches

Cost and Area Requirements

Each of the technologies listed in **Table ES-2** have been evaluated for both cost and land requirements. **Table ES-3** summarizes the recommended technologies for the community wastewater system. Each of the wastewater system options (left column of **Table ES-3**) includes both secondary treatment and disposal technologies.

Table ES-3 Recommended Wastewater Technology

Treatment / Disposal Stage	Technology	Total Capital Costs	Area, hectares
Secondary	AdvanTex	$ 991,206	0.3
Disposal	Chambered Trenches	$ 1,080,476	2.0
	Totals:	**$ 2,071.682**	**2.3**

1.0 Introduction and Existing Site Conditions

A new development, Fawn Meadows, is being proposed by Mr. Barrie Ibsen and Mr. Ambrose Comchi. The property is located south of Highway 16 and west of Highway 770 (West of Edmonton, Alberta). The ultimate build-out for the development will include:

- 36 Detached Single Family Homes
- 24 Semi-Detached Dwellings
- 56 Villa Style Dwellings
- 140 Supportive Living Units
- Café and Gas Bar
- Rec Center and Community Hall

1.1 Purpose of Report

The purpose of this report is to provide an evaluation of the costs and benefits of various options for a community wastewater system at Fawn Meadows. This report contains information and analyses on wastewater characteristics, quantities, and treatment alternatives. Included in the scope of the report are recommendations of the most viable methods of wastewater treatment and disposal.

1.2 Existing Site Conditions

Figure 1-1 is a map of the area surrounding the Fawn Meadows Development. **Figure 1-2** is a topographical map of the surrounding area.

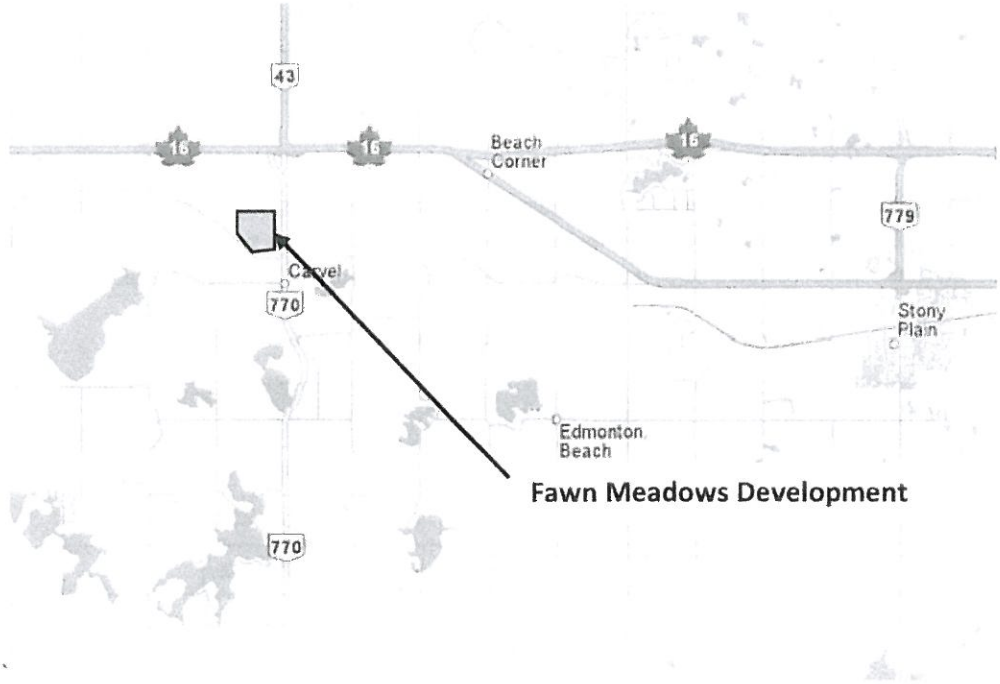


Figure 1-1 Map to the Fawn Meadows Site

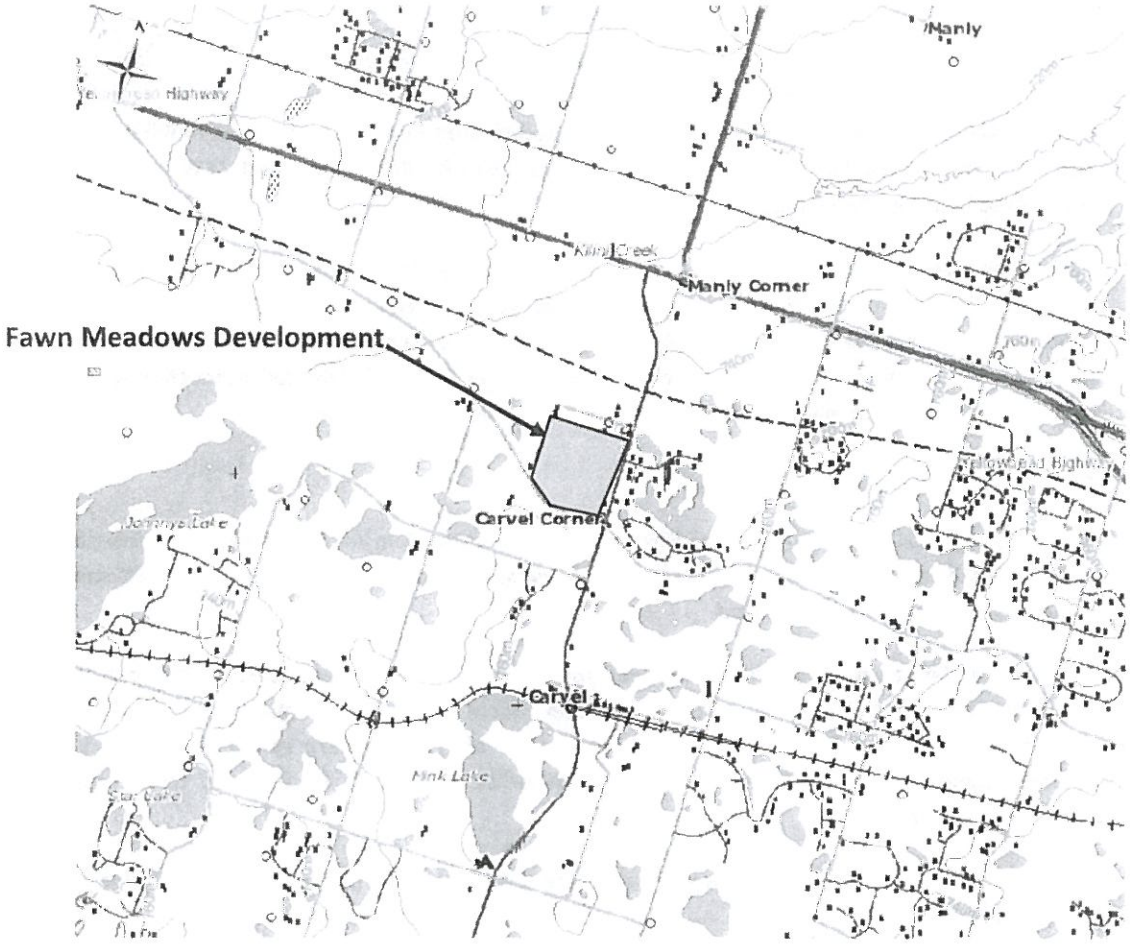


Figure 1-2 Topographical Map of the Fawn Meadows Site and Surrounding Area

1.3 Climate Setting of Project Site

The climate in Parkland County is classified as a warm summer continental climate that experiences wet summers with drier winters. The average temperature in the region is 2.6 degrees Celsius and precipitation averages 468 mm per year, with an average of 338 mm falling between May and September.

1.4 General Information

The permit authority for a wastewater treatment and disposal system is Alberta Environment and Water (AEW). There are three documents that provide design guidance: (1) *Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage System January 2006*, (2) *Alberta Private Sewage Systems Standard of Practice 2009*, and (3) *Municipal Policies and Procedures Manual*.

The regulatory requirements for wastewater facilities, such as the one evaluated in this report for Fawn Meadows, are not completely identified in Alberta. While this system is a private onsite system, the estimated wastewater flow is larger than typical onsite systems; therefore, the regulations governing these systems are

not completely applicable. The other set of standards that exist in Alberta are for municipal wastewater systems; a wastewater facility for the Fawn Meadows Development will not be a public municipal system.

At this time, the SD Consulting Group (SD) is engaged in this permit process in all three regions of AEW. We have established good relationships with AEW and are now accepted as leaders in the decentralized field. In addition, we have received approval for the largest decentralized wastewater project in Alberta, which is also located in Rocky View County. This project was approved by Rocky View and AEW in 2011 and will be constructed in the spring of 2012.

Discussions with AEW have confirmed that provincial approval for a communal system may be granted by AEW upon the developer's application. This approval will be a requirement of Parkland County through the subdivision and endorsement process. Parkland County has indicated that the responsibility of ownership, operation, maintenance, and replacement of the wastewater system will not fall under their jurisdiction. This will be the responsibility of the utility formed by the condominium association.

1.5 Soil Infiltration Requirements

Regulations for soil infiltration systems exist for flows less than 25 m^3/d (5,500 imperial gallons/day), but not greater than 25 m^3. The document, *Alberta Private Sewage Systems Standard of Practice 2009* contains design standards for soil infiltration systems.

The exact regulations governing this proposed disposal facility are unknown. SD Consulting has estimated the size and cost of the drainfield with the 50% reduction (identified below). Septic tanks have been sized at 2.0 times the estimated daily flow unless the manufacturer of the treatment system recommends a different volume. During the design phase of the system, JW NAWE will work with regulators to determine the final sizing of the system.

1) Section 7.1.6: Wastewater effluent entering the drainfield shall have a vertical separation from the groundwater table of:
   i. 0.9 meters if wastewater is treated by a packaged treatment system
   ii. 1.5 meters if wastewater is septic tank effluent
2) Section 7A.1.3: A disposal field when supplied with effluent from a packaged sewage treatment plant may have a 50% reduction in area when effluent is pressure distributed.

2.0 WASTEWATER FACILITY DESIGN CONSIDERATIONS

2.1 DESIGN CONSIDERATIONS

The design flow for wastewater treatment facilities is based on a number of factors. For example, the design flow should consider the number of bedrooms in each house, the current or proposed population, the number of water using appliances, and the number of commercial enterprises. For appropriately sizing the proposed wastewater treatment facilities, projected population is the most important factor. Additional design parameters include the potential for expansion and inflow and infiltration of rainwater and groundwater into a gravity sewer collection system.

2.2 WASTEWATER FLOWS

Projected wastewater flows are summarized **Table 2-1**. Alberta's *Standard of Practice for Onsite Wastewater 2009 (SOP)* specifies a minimum flow of 0.34 m^3/day (75 igpd) per person. Therefore, the design flow of 0.378 m^3/day per person, based on water demand, is a conservative assumption for the calculation of wastewater flow.

According to the SOP, the peak wastewater flow is based on the estimated average daily wastewater flow multiplied by a peaking factor of 4.0. Based on this peaking factor, the peak flow for the development is estimated to be 0.523 m^3/min. This peaking factor is built in to the design capacity and storage in the treatment system to handle peak flow events without overloading the system.

Table 2-1 Estimated Average Daily Wastewater Flows

Unit Type	# of Units	Residents/ Dwelling	Total Residents	Wastewater Flow Per Capita (m^3/day)	Total Wastewater Flow (m^3/day)
Detached Dwellings	36	2	72	0.378	27.2
Semi-Detached Dwellings	24	2	48	0.378	18.1
Villa-Style Dwellings	56	2	112	0.378	42.4
Apartment-Style Dwellings	100	2	200	0.378	75.6
	40	1	40	0.378	15.1
Staff – Supportive Living Centre	-	-	10	0.378	3.78
Staff – Café and Gas Bar			2	0.378	0.76
Condominium Maintenance Staff			4	0.378	1.51
Rec Center and Community Hall			10	0.378	3.78
Totals	**256**	-	**498**	-	**188.23**

2.3 WASTEWATER LOADINGS

The wastewater flows from the proposed Fawn Meadows Development are domestic in strength. The concentrations summarized in **Table 2-2** are a combination of information taken from the US Environmental Protection Agency document *Design Manual: Onsite Wastewater Treatment and Disposal Systems* and *Wastewater Engineering - Treatment, Disposal, and Reuse* (Metcalf and Eddy, Inc., Fourth Edition).

Table 2-2 Typical Domestic Wastewater Concentrations

Parameter	Typical Domestic Wastewater Concentration (mg/L)
BOD_5 (5 day Biochemical Oxygen Demand)	265
TSS (Total Suspended Solids)	300
NH_3-N (Ammonia)	48
TN (Total Nitrogen)	60
TP (Total Phosphorus)	8

3.0 Potential for Soil Infiltration

3.0 Onsite Soils Investigation

On November 29, 2007, Jacques Whitford NAWE conducted a soils investigation consisting of 16 backhoe pits on the proposed development site. The soil pits were analyzed for texture, structure, consistence, root presence, limiting layers, depth to groundwater features, and depth of frost in order to identify the best location for a community wastewater treatment system. The site is characterized by hilly terrain with wetlands in the low lying areas and better drained dry soils on the highlands. A general soil profile for the upland areas is sandy loam topsoil over increasingly fine subsoil. The lowlands had an observed soil profile of silt or fine sandy loam topsoil with silt loam subsoil. Layers of silty clay loam soils were observed in pit 9. These lowlands had water table markers at 48-66 centimeters below ground surface (bgs), making them undesirable for water disposal. The mid slopes across the site were uniform with silt loam soils for the entire depth. Some borings (e.g. pit 2-3, 6-7) had subsoil layers of clay loam as well. Copies of all soil pit logs are provided in **Appendix A** and a soil pit map is provided in **Figure 3-1**.

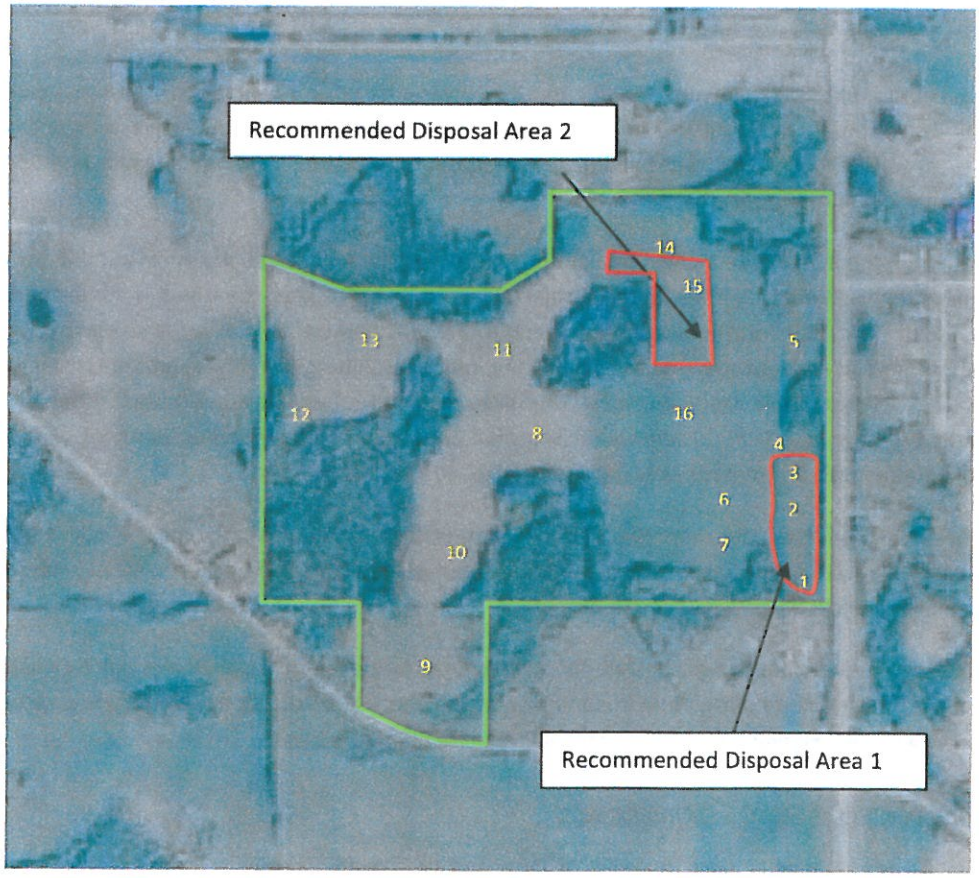


Figure 3-1 Test Pit Locations and Recommended Disposal Area

According to Alberta Environment Requirements, 0.9 meters of separation from the bottom of the drainfield to the depth of seasonal saturation is required for all onsite wastewater systems with soil disposal and pretreatment. Of the 16 soil pits, pits 1-3, 6-7, 10, and 15-16 achieved the necessary

separation distance. Therefore, these areas have been identified as "recommended soil areas" on **Figure 3-1**. A more detailed discussion of each area is provided below:

- "Recommended Disposal Area 1"– Conversations with the property owner indicate that the ideal location for the wastewater treatment and disposal field is along Route 770 where soil pits 1-4 were excavated. Soil Pits 1-3 consisted of well drained silt loam topsoil over loam subsoil. Pit 4 was located near a wetland and was unusable. Evidence of seasonal saturation was observed at approximately 1.3 meters below ground surface in pits 2 and 3 with no evidence observed in pit 1. Roughly 2 hectare was identified as suitable for soil disposal in this area. Additionally, the land surrounding pits 6 and 7 might be utilized for any additional disposal area that may be needed. This area provides approximately 1 hectare for soil disposal.

- "Recommended Disposal Area 2" – Soil pits 15 was excavated in the north central portion of the site. This pits consisted of well drained silt loam and loam soils that might allow for a smaller disposal field for the site's wastewater. Evidence of seasonal saturation was observed at approximately 1 meter in pit 15. Conversations with the land owner indicate that this area is highly unfavorable with the development plan. However, this area may be necessary for soil disposal and provides approximately 1 hectare for soil disposal.

- Un-useable Soils – Soil pits 4-5, 8-9, and 11-14 were investigated and determined to be unsuitable for soil disposal. Generally, the soils were poorly drained and fine textured, which are two characteristics of soils with poor infiltrative abilities. In addition, the required separation distance of 0.9 meters was not met in these soil pits.

Based on the information in **Section 3.1** and **Figure 3-1**, the area of the site most suitable for wastewater infiltration is about of 2.4 hectare. Another 1 hectare has also been identified in the event more area is needed. The soils in other regions of the site are not appropriate for wastewater disposal. For the recommended disposal area, a base soil loading rate of13.2 liters/day/square meter is recommended due to the well structured clay loam soils. The base loading rate was selected based upon soil texture and structure from the *SOP*. Evidence of seasonal saturation (redoximorphic features) was identified at minimum depth of 1 meter below ground surface.

For Fawn Meadows, the wastewater will be treated prior to discharge to the soil and the treated wastewater will be dispersed using pumps instead of gravity. Therefore, the final recommended soil loading rate is 26.4 liters/day/square meter.

Because of the limited area available for soil disposal, two disposal technologies will be evaluated in this report: subsurface drip irrigation and infiltration trenches. **A drip system will require approximately 1.3 hectare to be installed.** A trench system will require about 2 hectare.

3.1 Hydrogeological Components

Hydrogeological information is used to evaluate how the wastewater system will affect existing groundwater conditions at the disposal site and to ensure the site has sufficient capacity to assimilate water in excess of its natural infiltration.

This process begins with a search for information from existing mapping, well logs and soil reports. The depth and direction of groundwater flow are then estimated. Based on this information, the locations of monitoring wells in

relation to the soil disposal system are decided. These monitoring wells are then sampled before startup of the wastewater system to identify background or existing groundwater conditions as a baseline sampling event. Slug testing can be performed to determine the rate of groundwater movement.

An unsaturated portion of the soil must be maintained in order to provide an aerated environment. This unsaturated, aerated zone below the discharge point provides additional filtration, nutrient uptake, adsorption, and ion exchange. For adequate treatment, soils with high permeability, such as coarse and medium sands, require a thicker unsaturated zone compared to less permeable soils like loam.

Designing a large onsite wastewater system requires avoiding the following conditions that can produce hydraulic and treatment failure:

- Lower saturated hydraulic conductivity than anticipated at the water table - saturated hydraulic conductivity measures the ability of a soil to transmit water in saturated conditions.
- Lower saturated hydraulic conductivity from a limiting (restrictive) layer below the discharge point.
- Soil compaction during construction. Soil disturbance and compaction can ruin the soil's natural structure and the soil will lose its ability to infiltrate water.

Some factors that affect the design of a large soil disposal system include:

- *Quality of the Applied Wastewater* – Wastewater treated to primary standards (i.e. septic tank effluent) requires more infiltrative area for the disposal system compared to wastewater treated to secondary standards. A biofilm on the infiltrative surface reduces the saturated hydraulic conductivity of the soil disposal system.
- *Topography of Land and Hydraulic Gradient of Groundwater* – The steeper the hydraulic gradient, the faster groundwater travels and the less likely a mound will form. Level areas with shallow water tables may not be appropriate locations for a large soil disposal system.
- *Limiting Layers below Discharge Point* – In particular, soils with clay and clay loams tend to not allow water to dissipate without forming a mound. Water must travel laterally and vertically fast enough through the soil layer that has the lowest saturated hydraulic conductivity.
- *Soil Structure* – Besides soil texture, the structure of the soil strongly influences percolation rates. A silt loam with platy structure allows less water to percolate than a clay loam with strong structure.
- *Direction of Groundwater Flow* – It is preferable to position the soil disposal system perpendicular to the direction of groundwater flow to allow better groundwater flow beneath the soil disposal system.
- *Shape of Disposal System* – Related to groundwater flow direction, a rectangular-shaped soil disposal system aligned parallel to the ground surface contours is preferable to one that is circular or square-shaped. This reduces the hydraulic linear loading rate.
- *Proximity to a Discharge or Drainage Point* – If the soil disposal system is located in a discharge zone, the potential for mounding is lower than in a recharge zone.
- *Adjoining Surface Water* – Although the discharge of treated water is to the subsurface, wastewater could still impact a nearby body of water. The location of the soil disposal system will determine the potential and in what time frame this could happen. It is proposed that the hydrogeological investigation will consider the time of travel and potential for the subsurface discharge to reach surface water.

Figure 3-2 illustrates the importance of direction of groundwater flow, linear loading rate, and depth to groundwater. *The basic concept is to design a large soil disposal system that can handle the flows applied to it. One basic strategy is to spread out the disposal system.* The higher the flow, the more these hydrogeological factors affect final design of the disposal field.

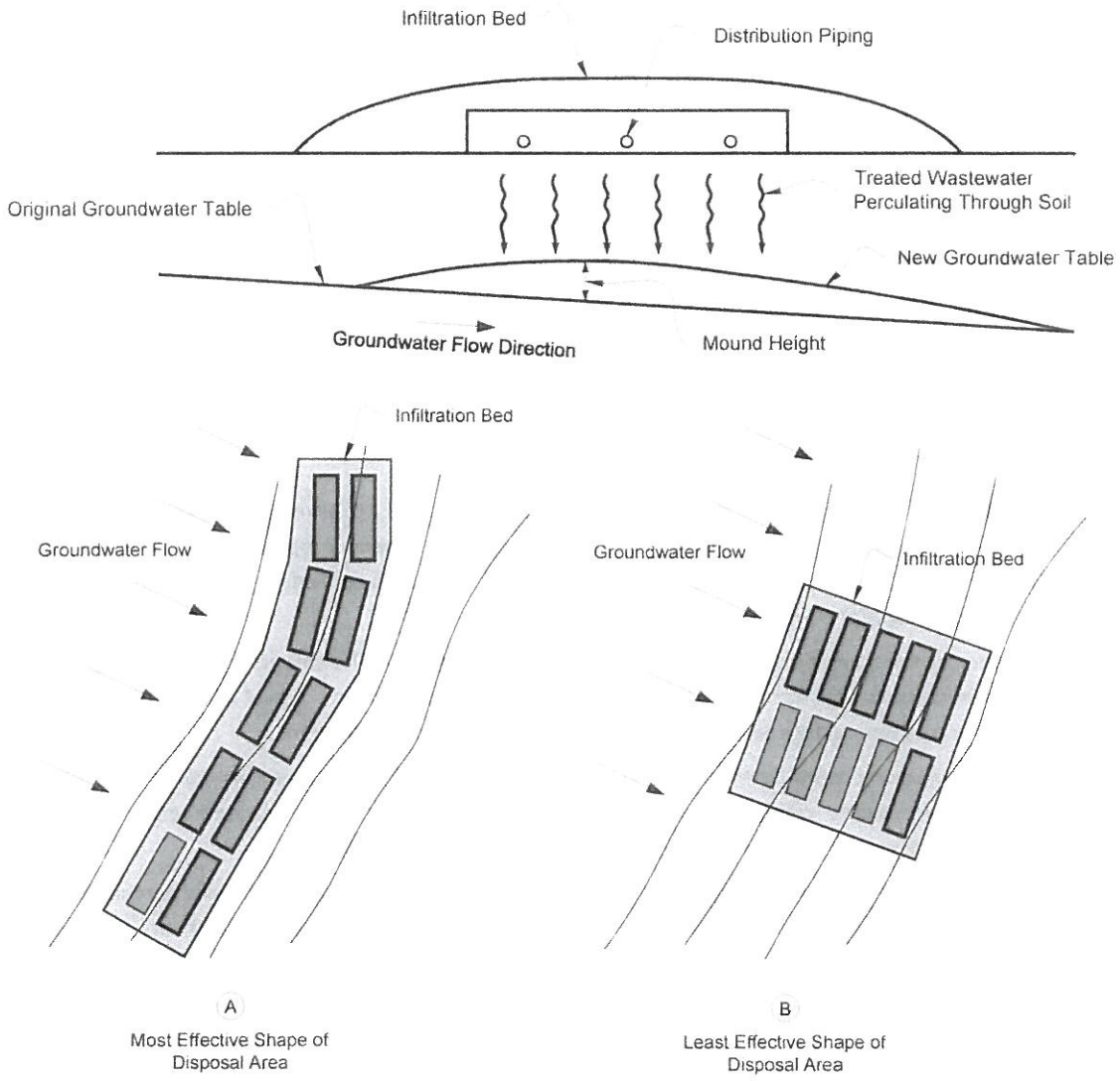


Figure 3-2 Conceptual Drawing of Hydrogeological Issues for Large Soil Disposal Systems

4.0 ONSITE WASTEWATER TREATMENT AND DISPOSAL

The treatment system options evaluated in this report are shown in **Table 4-1**. For any component that lists more than one option, either option could be chosen as a stand-alone technology for that component (for example, for disposal, either drip *or* trenches could be selected).

Table 4-1 Treatment Options Matrix

Treatment/Disposal Stage	Technologies Evaluated
Primary	Septic Tanks
Secondary	AdvanTex Units
	FAST Units
	Recirculating Gravel Filter
	Coarse Sand Filter
Disposal	Subsurface Drip Irrigation
	Infiltration Trenches

4.0 PRIMARY TREATMENT

The first step in the treatment process is to remove large solids from the wastewater. Removal of these solids is accomplished by settling, skimming, or screening. Either septic tanks or mechanical screening can be used for solids removal. For small treatment systems, the same unit processes used for solids removal are also used for primary treatment. Primary treatment removes suspended solids from wastewater that can be easily settled or filtered.

A threshold of 80,000 igpd of wastewater is the typical transition point from a passive primary treatment system (e.g., septic tanks) to one that includes some mechanical components, such as screening. Since the design flow for the Fawn Meadows facility is below this threshold, only septic tanks will be evaluated for primary treatment. Those costs vary, depending on the treatment system and are therefore included in the four cost tables for secondary treatment.

4.1 SECONDARY TREATMENT

The secondary stage of treatment is where Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) are further removed down to concentrations of 25 mg/L each. A number of secondary treatment technologies are capable of treating wastewater with flows and strengths typical of those from the Fawn Meadows development. All of these technologies can be combined with the tertiary treatment and disinfection system evaluated in this report. The following technologies are described along with advantages and disadvantages: AdvanTex, FAST, Recirculating Gravel Filter, and Coarse Sand Filter.

4.1.1 ADVANTEX AEROBIC TREATMENT UNITS

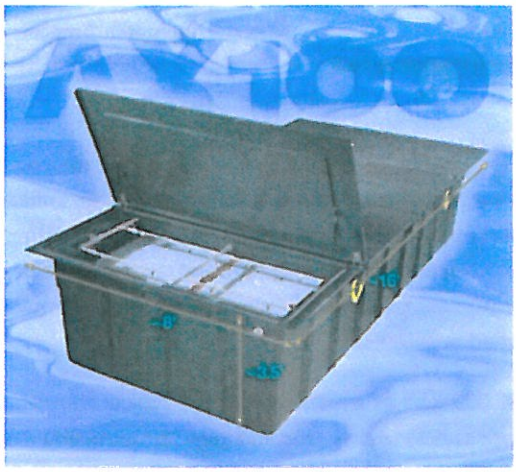
The AdvanTex treatment system has been included in this evaluation. The AdvanTex units are one type of fixed media, attached growth treatment system. Individual fiberglass tanks house a number of textile fabric sheets that provide a medium for bacterial growth. Refer to **Figure 4-1** for a picture of the AdvanTex unit. The advantages and disadvantages of these systems include:

Advantages of "AdvanTex Unit":

- Minimal land area requirement
- Capable of a high level of treatment
- Prepackaged unit is simple to install
- Textile fabric easily replaceable
- Single home model (AX-20) has NSF 40 certification, which increases likelihood of approval from Alberta Environment
- Approved technology in Alberta

Disadvantages of "AdvanTex Unit":

- More complex piping and valving than other options
- No carbon cycle benefits
- Continual operation of aeration equipment needed to maintain treatment



Source: Orenco Systems Inc.

Figure 4-1 AdvanTex Treatment Unit

4.1.2 Fast Aerobic Treatment Units

The FAST (Fixed Activated Sludge Treatment) system has been included in this evaluation. FAST units are another type of fixed media, attached growth treatment system. The media is placed inside a concrete or fiberglass tank and air is injected into the media to provide oxygen to the bacteria. A major advantage to this system is that there are already wastewater facilities in Alberta over 35 m^3/day per day that use this technology. Refer to **Figure 4-2** for a picture of the FAST unit. The advantages and disadvantages of these systems include:

Advantages of "FAST Unit":

- Minimal land area requirement
- Capable of a high level of treatment
- Simple to operate
- Simple installation for contractor

- Single home models have NSF 40 certification, which increases likelihood of approval from Alberta Environment

Disadvantages of "FAST Unit":

- Odor control can be an issue
- Large blowers increase cost of operations
- No carbon cycle benefits
- Continual operation of aeration equipment needed to maintain treatment
- Less operational flexibility without a recycle loop
- Less aesthetically pleasing

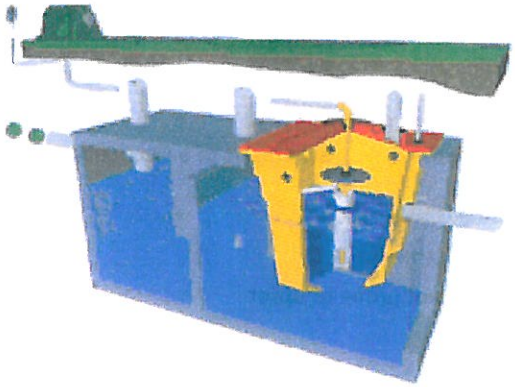


Figure 4-2 FAST Treatment Unit

4.1.3 Recirculating Gravel Filter

Recirculating gravel filters, also known as vertical flow treatment wetlands, are considered "attached growth" filters for advanced waste treatment of wastewater. Attached growth filters use a bed of media for bacteria to attach to and grow. The most common media are sand, gravel or peat. Effluent from the septic tank flows through a filter tank into a recirculation pump tank and is pressure distributed across the top of the attached growth filter media. The wastewater flows vertically through the media and is collected at the bottom to be returned to the filter tank. The treated wastewater cycles through the tanks and filter 5 to 12 times, depending on treatment requirements. In cold climates like Alberta, the filter bed must be covered to prevent freezing. Refer to **Figure 4-3** for a schematic of a recirculating gravel filter, and **Figure 4-4** for a photo.

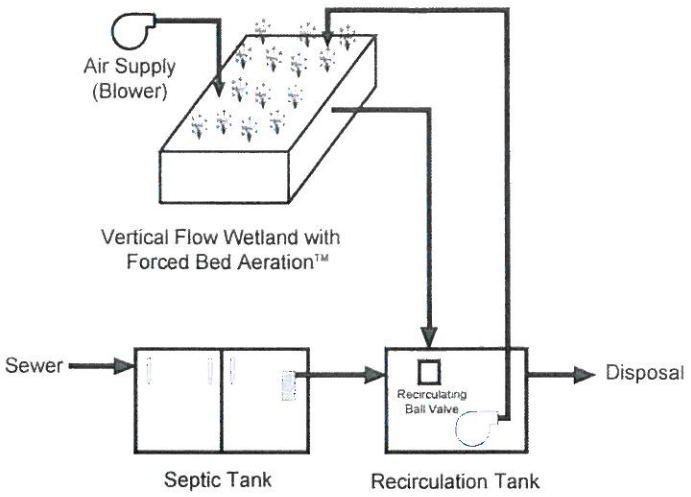


Figure 4-3 Schematic of a Recirculating Gravel Filter

Advantages to "Recirculating Gravel Filters":

- Small land area requirement
- Consistent operation not prone to upset
- Favorable aesthetics
- Reliable treatment
- Moderate detention times
- Has nitrogen removal capability

Disadvantages to "Recirculating Gravel Filters":

- Moderate operation and maintenance costs
- Alberta Environment may not be familiar with this technology
- Approval time will likely be longer compared to other technologies evaluated in this report
- Fine media like peat or sand may experience clogging over time
- Requires recirculation pumps, blowers and controls

Figure 4-4 Photo of a Recirculating Gravel Filter in Minnesota

4.1.4 Coarse Sand Filter

A single pass sand filter consists of a lined basin filled with sand. The wastewater flows vertically through the sand bed where treatment occurs through filtering action and bacterial decomposition. The bacteria are attached to the sand media. In a sand filter, the water only passes through the system once before being sent to the disposal area.

Sand filters are a well accepted technology in Canada and the United States. Two types of single pass sand filters are described in the *Alberta Private Sewage Systems Standard of Practice 1999 Handbook*: coarse sand filters and fine sand filters. Because coarse sand filters are less likely to clog and have lower sizing requirements, only coarse sand filters were evaluated in this report.

Advantages to "Sand Filters":

- Simple to operate
- Reasonable operation and maintenance requirements
- High level of treatment
- Accepted technology in Alberta

Disadvantages to "Sand Filters":

- Requires dosing pumps and controls
- Large space requirements
- Moderate aesthetics

4.2 Soil Infiltration

For soil infiltration, the soil dispersal options are limited to at-grade infiltration beds or subsurface drip irrigation. These soil infiltration technologies, along with the advantages and disadvantages of each, are discussed herein.

4.2.1 Subsurface Drip Irrigation

Drip irrigation utilizes specialized tubing that is placed into the ground to dispose of water over a large area. The tubing is usually 1.27 cm in diameter with emitters placed every 61 cm. The water is pumped to pressurize the tubing and distribute water evenly at a specific volume and rate. The tubing is placed between 30 cm and 61 cm below the surface. Greater depth reduces the potential for rodent damage.

Advantages of "Subsurface Drip Irrigation":

- Easy to install with little construction impacts
- Can be installed around trees or in odd shapes
- Works in most soil types
- Can apply wastewater over a large area
- Can be installed on slopes up to 20 percent
- Additional treatment accomplished in the soil

Disadvantages of "Subsurface Drip Irrigation":

- More complicated than other disposal methods
- Higher maintenance requirements
- Requires dosing pumps and controls
- Greater potential to freeze if not properly designed, installed, and operated

- Rodents can damage tubing
- May need substantial quantities of soil brought in to achieve adequate cover

4.2.2 Chambered Infiltration Trenches

Chambered infiltration trenches use a series of perforated pipes that pressure dose the bed. Infiltration chamber trenches are placed over the perforated pipes 14-22 centimeters into the topsoil. A chambered system does not require gravel; instead clean fill is placed on the chambers. The treated water percolates through the clean fill and into native soil. By partially placing the chambers into the topsoil, sidewall seepage is increased and the potential for mounding decreases. An example of infiltration trenches is provided in **Figure 4-5**.

Advantages of "Chambered Infiltration Trenches":

- Efficient use of disposal area
- Pressure doses water over a large area
- Able to utilize upper layers of soil for infiltration
- Increases sidewall seepage
- Easy to install chambers and piping
- Has large capacity to handle variable flows

Disadvantages of "Chambered Infiltration Trenches":

- Require placing sand or fill material beneath and/or over chambers
- Require dosing pumps and controls
- Require more area compared to drip

Figure 4-5 Installation of Chambered Infiltration Trench

5.0 WASTEWATER FACILITY AREA REQUIREMENTS

The estimated area requirements for each component evaluated in this analysis are summarized in **Table 5-1**. Due to the size of the proposed development, the land requirements of some technologies evaluated are large. Particularly, the soil infiltration system for treated water disposal requires a significant amount of land for installation.

Table 5-1 Wastewater System Area Requirements

Treatment/Disposal Stage	Technology	Area Requirements, hectares [2]
Secondary [1]	AdvanTex Units	0.2
	FAST Units	0.2
	Recirculating Gravel Filter	0.3
	Coarse Sand Filter	0.5
Disposal	Subsurface Drip Primary	1.3
	Subsurface Drip Back-up (Recommended)	0.7
	Infiltration Trenches Primary	2.0
	Infiltration Trenches Back-up (Recommended)	1.0

(1) Septic tanks are included in the secondary treatment options.
(2) Approximate areas only.

6.0 Cost Evaluation

The estimated costs shown in this section for the water and wastewater treatment alternatives will include construction, engineering and operation, maintenance and replacement (OM&R) costs. In determining the cost-effectiveness of the various alternatives, cost will be presented in terms of year 2008 total capital costs, annual costs, OM&R costs, and total life cycle cost.

Preliminary construction costs are based on 2008 construction costs. Various material and equipment manufacturers and suppliers were contacted for information affecting cost estimates. Published and unpublished cost data for similar kinds of construction were also utilized.

Increases in construction costs due to inflation are not taken into account. The cost estimates presented are meant to guide the decision making process and to establish a budget for funding. After preparation of final drawings and specifications, the Engineer's Estimate of Construction Costs will be prepared. The final cost will be known only after bids are received.

6.0 Financial Terms Used in This Report

JW NAWE has included definitions of standard terminology to properly evaluate the figures calculated in this report. Below is a listing of these terms.

Construction Cost – The anticipated cost to build (construct) the facilities identified. Since construction costs are incurred at the beginning of the project, construction costs are a capital cost.

Total Capital Cost – The anticipated total of all capital costs. This includes the construction cost as well as the non-construction items such as contingencies, engineering, permitting, bidding, construction observation, legal, and administrative costs.

Annual Operating and Monitoring (OM&R) Costs – The annual (cost per year) total for items such as labor, laboratory (analytical), and utilities (gas and electric).

Present Worth of Annual O&M – The amount of money that would have to be deposited in the bank today to pay for all of the annual O&M over the next 30 years.

Life Cycle Cost – The *total capital cost* added to the *present worth of the annual OM&R*. Life cycle costs are used to identify the most cost-effective alternatives over the project period. The life cycle cost approach allows low construction/high OM&R cost alternatives to be compared on an "apples-to-apples" basis with high construction/low OM&R cost alternatives.

Contingency – A percentage of construction costs reserved for unforeseen project costs due to site conditions and construction. In this report, it was assumed that the Owner will have a contingency added to the overall cost of the project. Therefore, no contingency was included in the total capital costs.

6.1 Wastewater System Costs

Table 6-1 summarizes the estimated total capital costs of the individual wastewater system components for the proposed development. **Appendix B** of this report contains the line-item cost tables that developed the costs

presented below. **Table 6-3** summaries the estimated yearly operations and maintenance costs of each component of the wastewater system evaluated.

Table 6-1 Wastewater System Total Capital Costs

Stage	Technology	Estimated Total Capital Cost
Treatment	AdvanTex Units	$ 991,206
	FAST Units	$ 1,276,332
	Recirculating Gravel Filter	$ 1,095,917
	Coarse Sand Filter	$ 1,059,490
Disposal	Subsurface Drip Irrigation	$ 553,094
	Infiltration Beds	$ 1,085,476

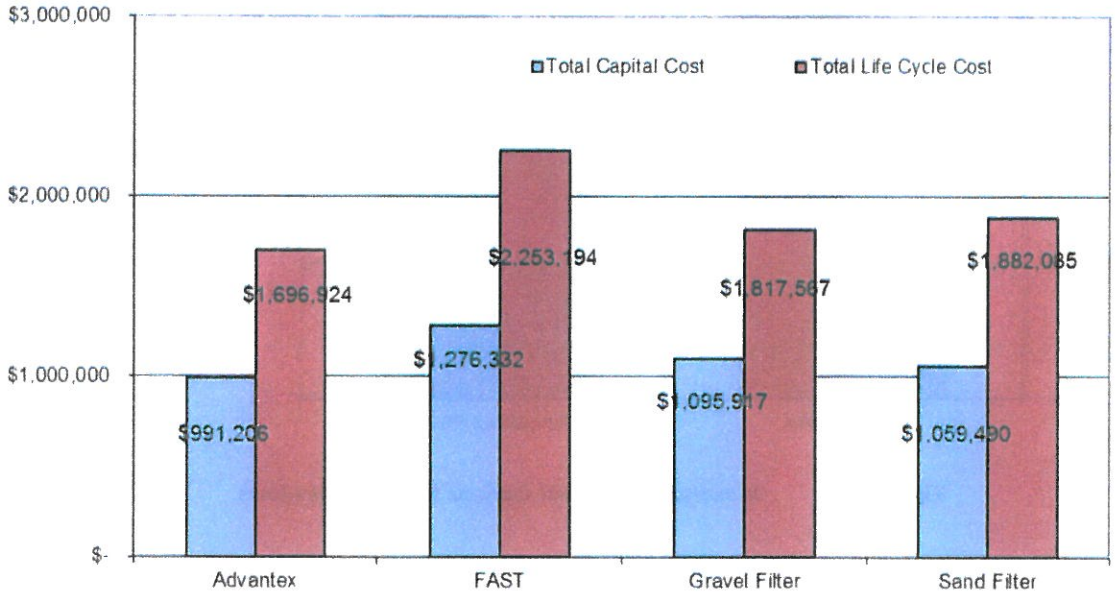


Figure 6-1 Wastewater Treatment Options for Fawn Meadows

Table 6-2 Wastewater System Yearly Operations and Maintenance Costs

Stage	Technology	Estimated Annual O&M Costs
Treatment	AdvanTex Units	$ 17,757
	FAST Units	$ 27,048
	Recirculating Gravel Filter	$ 18,226
	Coarse Sand Filter	$ 23,171
Disposal	Subsurface Drip Irrigation	$ 28,430
	Infiltration Beds	$ 10,128

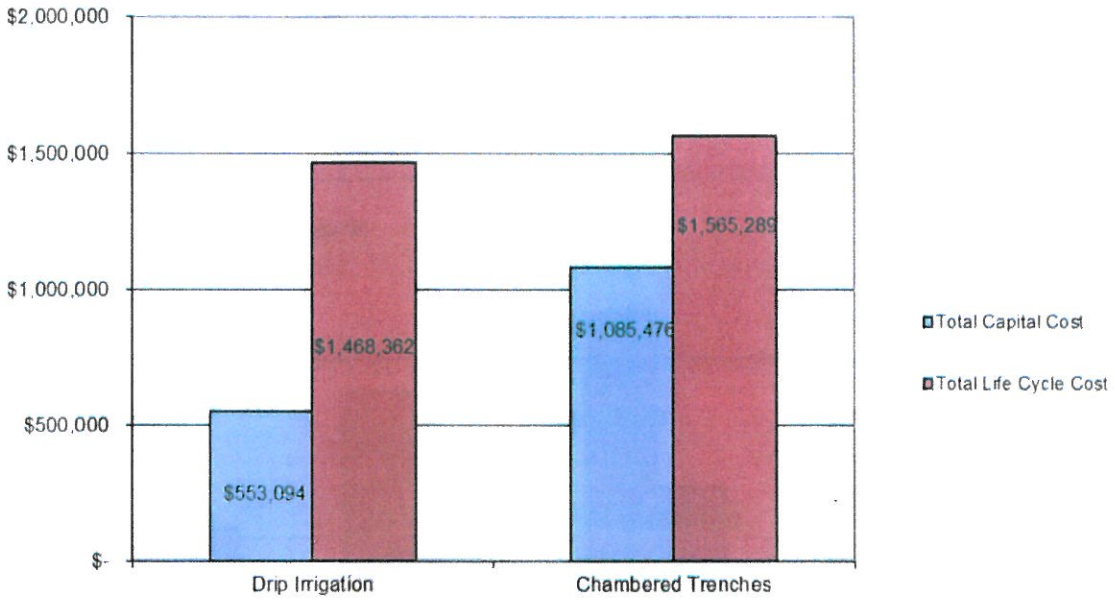


Figure 9-2 Wastewater Disposal Options for Fawn Meadows

6.2 Operational and Fiscal Management

All wastewater treatment systems require monitoring, operational adjustments, replacement of components, and fiscal management. Responsible management is essential to meet the requirements of governmental agencies, homeowners, and the environment. Without proper management, water and wastewater systems will have financial hardships, premature failure, environmental degradation, and potential health risks. Governmental officials are becoming increasingly concerned with the management of water and wastewater systems.

Fiscal management includes not only securing funding for the capital cost of the installation of the water and wastewater system, but also ensuring that sufficient funds are available for ongoing operation and maintenance, replacement of parts, and capital replacement when the system reaches the end of its

useful life. The amount of money set aside for capital replacement varies depending on how and when the money is invested. It is ultimately the responsibility of the developer to determine how much to charge each user per month.

7.0 RECOMMENDATIONS

This report evaluates wastewater options and costs for the proposed Fawn Meadows Development. Recommendations for the development are based on total capital and yearly operations and maintenance costs as well as land requirements. The costs and area requirements presented in this section are for a system to treat all of the wastewater from the development (188.23 m^3/day).

7.0 WASTEWATER SYSTEM RECOMMENDATIONS

SD recommends that Fawn Meadows approach Alberta Environment on the potential to install an AdvanTex treatment system. Both its total capital and life cycle costs are the lowest of the four treatment system alternatives. Alberta Environment is very familiar with this technology and there are over 500 installation in Alberta.

Soil disposal is feasible at Fawn Meadows. The soils investigation has identified sufficient area to support the installation of a soil disposal system. SD recommends using infiltration trenches for disposal. Drip requires less area to install and has significantly lower total capital costs. However, drip also has much higher maintenance requirements and is more susceptible to freezing. In contrast, trenches have lower maintenance requirements and are less likely to freeze during the winter months. A combination of both technologies may be feasible as well and will be investigated during the design phase.

Table 7-1 Wastewater System Costs and Area Requirements

Treatment / Disposal Stage	Technology	Total Capital Costs	Area, hectares
Secondary	AdvanTex	$ 991,206	0.3
Disposal	Chambered Trenches	$ 1,080,476	2.0
	Totals:	**$ 2,071.682**	**2.3**

APPENDIX A
SOIL PIT LOGS

SOIL DESCRIPTION REPORT

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Client Name: Fawn Meadows	**Soil Eval Date: 11/29/07**	**Vegetation: Forest and Fallow**	**Parent Material: Glacial Till**
Location: Parkland County		**Slope:** Variable	**Slope Form: Multiple Slopes**
Lot legal Description: Section 4, T52, R02		**System Loading Rate (l/m^2/day):13.2**	**Shallowest Groundwater: 48.2 cm**

Site Conditions

Disturbed Soil? No	**Floodplain?** No	**Soil Survey Map Unit:** Orthic Gray Luvisols	**Map Unit Observed in Field?No**

BORING NUMBER: 1

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-81	10YR4/3		Si Lo	2mbk	Mfr	1vf	gw	
B1	81-110	10YR4/3		Fi Sa Lo	2mbk	Mfr	1vf	Gw	
B2	110-180	10YR4/4		Si Lo	1mbk	Mfr	0	Gw	CaCO3 deposits

Recommended Soil Loading Rate: 13.2 l/day/m^2 Redoximorphic Features Observed at N/A below ground surface (bgs).

BORING NUMBER: 2

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-50	10YR4/3		Si Lo	2mbk	Mfr	1vf	Gw	25 cm Frost
B1	50-96	10YR5/4		Si Lo	2mbk	Mfr	1vf	Gw	
B2	96-127	10YR5/4		Cl Lo	2mbk	Mfr	1vf	Gw	
B3	127-175	10YR5/2	C2P 10YR 5/8	Si Lo	2mbk	Mfr	0	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2 Redoximorphic Features Observed at 130 cm below ground surface (bgs).

JW NAWE Soil Description Report, continued

BORING NUMBER: 3

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-37	10YR3/3		Si Lo			1vf	Gw	Frost to 38 cm
B1	37-82	10YR4/3	F1F 10YR5/2	Cl Lo	2fbk	Mfr	1vf	Gw	
B2	82-150	10YR5/4	C2D 10YR5/2 & C2P 10YR5/8	Si Lo	2mbk	Mvfr	1vf	Gw	
B3	150-200	10YR5/2	C2P 10YR5/8	Si Lo	2mbk	Mvfr	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2 Redoximorphic Features Observed at 130 cm below ground surface (bgs).

BORING NUMBER: 4

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-25	10YR3/2		Peat			1m	Gw	Frost to 12 cm
B1	25-50	10YR3/1		Si Lo	2mbk	Mfr	1m	Gw	
B2	50-120	10YR5/8	C2P 10YR5/2 & C2D 10YR4/6	Si Lo	1mbk	Mfr	1vf	Gw	
B3	120-200	10YR5/4	C2D 10YR5/2 & C2P 10YR5/8	Si Lo	0m	Mfi	0	Gw	
B4	200-212	10YR5/2	C2P 10YR5/8	Si Lo	0m	Mfi	0	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2 Redoximorphic Features Observed at 50 cm below ground surface (bgs).

BORING NUMBER: 5

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-25	10YR3/3		Si Lo	2mbk		1vf	Gw	
B1	25-70	10YR5/4	C1D 10YR5/2 & 4/6	Fi Sa Lo	2fbk	Mvfr	1vf	Gw	30 cm Frost
B2	60-157	10YR5/4	C1D 10YR5/2 & 4/6	Si Cl Lo	1mbk	Mfi	1vf	Gw	
B3	157-220	10YR5/2	C1P 10YR4/6	Si Lo	0m	Mfi	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2 Redoximorphic Features Observed at 60 cm below ground surface (bgs).

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JW NAWE Soil Description Report, continued

BORING NUMBER: 6

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-30	10YR3/3		Si Lo	2mbk	Mfr	1vf	Gw	Frost to 27 cm
B1	30-55	10YR6/3		Fi Sa Lo	2mbk	Ds	1vf	Gw	
B2	55—105	10YR4/4	C1D 10YR5/2	Cl Lo	2mbk	Mfr	1vf	Gw	
B3	105-157	10YR6/3	F2D 10YR5/1	Si Lo	2mbk	Dh	1vf	Gw	
B4	157-225	10YR6/3	C2D 10YR6/1 & C2P 10YR5/8	Si Lo	1mbk	Dh	0	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 160 cm below ground surface (bgs).

BORING NUMBER: 7

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-48	10YR4/3		Fi Sa Lo	2mgr	Mvfr	1vf	Gw	30 cm Frost
B1	49-72	10YR4/3		Fi Sa Lo	2fbk	Mvfr	1vf	Gw	
B2	72-95	10YR6/3		Fi Sa Lo	2fbk	Ds	1vf	Gw	
B3	95-115	10YR4/4		Cl Lo	2mbk	Mfr	1vf	Gw	
C	115-175	10YR6/3	F2D 10YR5/1 & F2P 10YR5/8	Si Lo	2mbk	Dh	1vf	Gw	
C	175-225	10YR6/3	F2D 10YR5/1 & F2P 10YR5/8	Si Lo	1mbk	Ds	0	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 150 cm below ground surface (bgs).

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JW NAWE Soil Description Report, continued

BORING NUMBER: 8

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-22	10YR3/3		Si Lo			2m	Gw	
B1	22-70	10YR5/4	C1D 10YR5/2 & C1P 10YR5/8	Si Lo	2mbk	Dh	2f	Gw	Frost to 30 cm"
B2	70-101	10YR5/4	C1D 10YR5/2 & C1P 10YR5/8	Si Lo	1mbk	Dh	1f	Gw	
B3	101-135	10YR5/4	C2D 10YR5/2 & C2P 10YR5/8	Si Lo	2mbk	Dh	1vf	Gw	
B4	135-162	10YR5/4	C2D 10YR5/2 & C2P 10YR5/8	Si Lo	2mbk	Dh	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 50 cm below ground surface (bgs).

BORING NUMBER: 9

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-48	10YR4/1		Fi Sa Lo	2mgr	Mfr	1vf	Gw	Frost to 40 cm
B1	48-117	10YR5/1	C1P 10YR4/6	Fi Sa Lo	1mbk	Mfr	1vf	Gw	
B2	117-162	10YR4/6	C2P 10YR5/2	Fi Sa Lo	1mbk	Mfr	1vf	Gw	
C	162-188	10YR5/4	C2D 10YR5/2 & C2P 10YR5/8	Si Lo	0m	Mfi	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 65 cm below ground surface (bgs).

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JW NAWE Soil Description Report, continued

BORING NUMBER: 10

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-23	10YR3/3					1f	Gw	
B1	23-72	10YR5/4		Fi Sa Lo	1mbk	Mvfr	1f	Gw	Frost to 30 cm
B2	72-97	10YR4/4		Si Lo	2mbk	Mfr	1f	Gw	
B3	97-132	10YR4/4		Si Lo	1mbk	Mfr	1vf	Gw	
B4	132-150	10YR5/3		Si Lo	1mbk	Ds	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at N/A below ground surface (bgs).

BORING NUMBER: 11

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-15	10YR3/3					1m	Gw	
B1	15-80	10YR6/3	F1F 10YR5/2 & F1P 10YR5/8	Si Lo	2mbk	Dh	1f	Gw	Frost to 33 cm CaCO3 deposits
B2	80-162	10YR6/3	F1F 10YR5/2 & F1P 10YR5/8	Si Lo	1mbk	Dh	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 73 cm below ground surface (bgs).

BORING NUMBER: 12

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-30	10YR3/3					1m	Gw	Frost to 30 cm
B1	30-50	10YR4/3		Fi Sa Lo	2mbk	Mfr	1m	Gw	
B2	50-120	10YR4/3	F2F 10YR5/2 & F2D 10YR4/6	Fi Sa Lo	1mbk	Mfr	1vf	Gw	
B3	120-165	10YR5/4	F2D 10YR5/2 & 4/6	Si Lo	2mbk	Mfr	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 58 cm below ground surface (bgs).

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JW NAWE Soil Description Report, continued

BORING NUMBER: 13

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-39	10YR3/3					2f	Gw	Frost to 33 cm
B1	39-60	10YR6/3		Sa Lo	2mbk	Dh	1vf	Gw	
B2	60-90	10YR6/3	F1D 10YR5/1 & F1P 10YR5/8	Si Lo	2fbk	Dh	1vf	Gw	
B3	90-132	10YR6/3	F1D 10YR5/1 & F1P 10YR5/8	Si Lo	2mbk	Ds	1vf	Gw	
B4	132-164	10YR6/3	F1D 10YR5/1 & F1P 10YR5/8	Si Lo	1mbk	Dh	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 75 cm below ground surface (bgs).

BORING NUMBER: 14

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-20	10YR3/3					1vf	Gw	
B1	20-55	10YR5/4	C1D 10YR5/2 & C1P 10YR5/8	Sa Lo	2fbk	Mfr	1vf	Gw	Frost to 27 cm
B2	55-90	10YR5/4	C2D 10YR5/2 & C2P 10YR5/8	Fi Sa Lo	2fbk	Mfr	1vf	Gw	
B3	90-175	10YR5/2	C2P 10YR5/8	Fi Sa Lo	1fbk	Mfi	1vf	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 50 cm below ground surface (bgs).

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JW NAWE Soil Description Report, continued

BORING NUMBER: 15

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-35	10YR3/2		Sa Lo	2mbk	Mfr	1vf	Gw	Frost to 28 cm
B1	35-70	10YR4/3		Sa Lo	2mbk	Mvfr	1vf	Gw	
B2	70-123	10YR6/4	C2D 10YR5/2 & C2P 10YR5/8	Loam	2mbk	Mfr	1vf	Gw	
B3	123-157	10YR4/4	C2D 10YR5/2 & 4/6	Fi Sa Lo	1mbk	Mfr	0	Gw	
B4	157-185	10YR4/4	C2D 10YR5/2 & 4/6	Fi Sa Lo	0m	Mfi	0	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 94 cm below ground surface (bgs).

BORING NUMBER: 16

Horizon	Depth (cm)	Dominant Color	Mottles (Qu. Sz. Cont. Color)	Texture	Structure (Gr.Sz.Sh.)	Consist-ency	Roots	Boundary	Remarks
A	0-12	10YR3/3					1m	Gw	
B1	12-75	10YR6/3		Si Lo	2mbk	Dh	1vf	Gw	Frost to 28 cm
B2	75-140	10YR6/3		Si Lo	2mbk	Ds	1vf	Gw	
B3	140-237	10YR6/3	F2D 10YR5/1 & 4/6	Si Lo	1mbk	Dm	0	Gw	

Recommended Soil Loading Rate: 13.2 l/day/m^2

Redoximorphic Features Observed at 175 cm below ground surface (bgs).

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JW NAWE Soil Description Report, continued

NAWE Field Recommendation: On November 29, 2007, Jacques Whitford conducted a field investigation for the Fawn Meadows Property located 15 kilometers west of Stony Plain, AB. The Fawn Meadows property consists of 30 hectares of land and is currently being evaluated for development of residential and elderly communities.

Sixteen test pits were dug by backhoe across the site. These test pits were evaluated for color, texture, structure, consistency, roots, depth to groundwater features, and frost in order to identify the best location for a community wastewater treatment system. The site is characterized by hilly terrain with wetlands in the low lying areas and better drained dry soils on the highlands. A general soil profile for the upland areas is sandy loam topsoils over increasingly fine subsoils. The lowlands had an observed soil profile of silt or fine sandy loam topsoils with silt loam subsoils. Layers of silty clay loam soils were observed in pit 9. These lowlands had water table markers at48-65 cm below ground surface (bgs), making them undesirable for water disposal. The mid slopes across the site were uniform with silt loam soils for the entire depth. Some borings (e.g. pit 2-3, 6-7) had subsoil layers of clay loam.

Conversations with the property owner indicate that the ideal location of a wastewater treatment and disposal field is on the slope along route 770 where pits 1-4 were excavated. Due to the clay loam soil layers in pits 2 and 3, a soil loading rate of 13.2 l/day/m^2 is recommended by Alberta Environment. The area near pit 4 is unsuitable for disposal as it is a natural wetland. Seasonal groundwater indicators were observed at 125 and 126 cm bgs in pits 2 and 3 giving adequate depth for water disposal. Additionally, the land surrounding pits 6 and 7 might be utilized at the same loading rate if needed for additional disposal area.

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JW NAWE Soil Description Report, continued

SOIL MODIFIER DEFINITIONS

MOTTLES (Qu, Sz, Cont. Color)

Quantity:
Few - <2% - **f**
Common – 2-20% - **c**
Many - >20% - **m**

Size:
Fine - **1**
Medium - **2**

Contrast:
Faint - **f**
Distinct - **d**
Prominent - **p**

TEXTURE

Fine sand – **fi sa**
Medium sand – **med sa**
Coarse sand – **co sa**
Sandy loam – **sa lo**
Loam – **lo**
Silt loam – **si lo**
Silt - **si**
Sandy clay loam – **sa cl lo**
Silty clay loam – **si cl lo**
Clay loam – **cl lo**
Clay - **cl**

STRUCTURE (Gr, Sz, Sh.)

Grade:
Structureless - **0**
Weak -**1**
Moderate - **2**
Strong -**3**

Size:
Very fine - **vf**
Fine - **f**
Medium - **m**
Coarse - **c**
Very coarse - **vc**

Shape:
Platy - **Pl**
Prismatic - **Pr**
Columnar - **Cpr**
Blocky - **Bk**
Angular blocky -**Abk**
Subangular Blocky - **Sbk**
Granular - **Gr**
Single grain - **Sg**
Massive - **m**

SOIL MODIFIER DEFINITIONS (cont.)

CONSISTENCE

Moist
Loose - **ml**
Very friable - **mvfr**
Friable - **mfr**
Firm - **mfi**
Very firm - **mvi**
Extremely firm - **mefi**

Dry
Loose - **dl**
Soft - **ds**
Slightly hard - **dsh**
Hard - **dh**
Very hard - **dvh**
Extremely hard - **deh**

ROOTS

Quantity
Few - **1**
Common - **2**
Many - **3**

Size
Very fine - **vf**
Fine - **f**
Medium - **m**
Coarse - **co**

BOUNDARY

Distinctness
Abrupt -**a**
Clear - **c**
Gradual - **g**
Diffuse - **d**

Topography
Smooth - **s**
Wavy - **w**
Irregular - **i**
Broken - **b**

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APPENDIX B
COST TABLES FOR WASTEWATER SYSTEM

Table C.1

Treatment System — **Packaged Sewage Treatment Plant**
Engineer's Opinion of Cost — **Option 1: AdvanTex**

Project: Fawn Meadows
Flow: 41,405 Imperial gpd

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Raw Sewage Manhole	1	units	$ 1,500.00	$ 1,500
Septic Tanks	100,000	imp gallons	$ 1.67	$ 167,000
AdvanTex Pods (AX100)	24	units	$ 22,000.00	$ 528,000
Pumping Equipment	1	ls	$ 20,000.00	$ 20,000
Recirculating Ball Valve	2	units	$ 1,000.00	$ 2,000
Ventilation Fan Assembly	2	units	$ 3,000.00	$ 6,000
Miscellaneous Piping	1	ls	$ 7,200.00	$ 7,200
Flow Measurement	1	ls	$ 13,200.00	$ 13,200
Fencing	800	m	$ 9.00	$ 7,200
Site Work	0.37	Ha	$ 10,000.00	$ 3,747
Control Building	1	ls	$ 15,000.00	$ 15,000
Recirculation Tank	30,000	imp gallons	$ 1.67	$ 50,100
Site Electric and Advantex Control Panel	1	ls	$ 12,000.00	$ 12,000
CONSTRUCTION SUBTOTAL				**$ 832,947**
Contingency			0%	$ -
Engineering, Permitting, and Bidding Services			12%	$ 99,954
Construction Observation			5%	$ 41,647
Surveying and Testing			2%	$ 16,659
CAPITAL COST TOTAL				**$ 991,206**
Annual Service Calls	6	calls	$ 177	$ 1,062
Annual Service Provider Costs	72	hours	$ 75	$ 5,400
Annual Utilities (single phase power)	58,138	kwh	$ 0.11	$ 6,395
Sampling and Analytical Costs				$ 2,400
Septic Tank Pumping	25,000	imp gallons	$ 0.10	$ 2,500
ANNUAL OPERATION AND MAINTENANCE COSTS				**$ 17,757**
Present Worth Capital Replacement	50%	Replacement	$ 832,947	$ 416,473
Present Worth of Annual O&M	30	years @	4.5%	$ 289,244
TOTAL LIFE CYCLE COST				**$ 1,696,924**

Notes:
1) Fiberglass reinforced plastic tanks assumed to be installed. Cost estimate includes accessways.
2) Flow measurement assumed to be ultrasonic flow meter and flume inside concrete vault.

Table C.2

Treatment System — **Packaged Sewage Treatment Plant**
Engineer's Opinion of Cost — **Option 2: FAST**

Project: Fawn Meadows
Flow: 41,405 Imperial gpd

ITEM	QUANTITY	UNIT		UNIT PRICE		TOTAL PRICE
Raw Sewage Manhole	1	units		$ 1,500.00	$	1,500
Subtotal for Service and Equipment Scope of Supply (see items below)					$	688,565
Equalization Tanks	50,000	imp gallons				
Pumps and Controls	2	units				
MicroFAST 9.0 with Tanks & 5 HP Blowers	5	units				
Dosing/Recirculation Tank	20,000	imp gallons				
One Year Maintenance/Monitoring Package	1	ls				
Training Package/Shop Drawings	1	ls				
Taxes, Delivery, and Labor Expenses				50%	$	344,283
Fencing	500	m		$ 9.00	$	4,500
Control Building	1	ls		$ 15,000.00	$	15,000
Site Electric	7	units		$ 1,000.00	$	7,000
Flow Measurement	1	ls		$ 13,200.00	$	13,200
CONSTRUCTION SUBTOTAL					**$**	**1,072,548**
Contingency				0%	$	-
Engineering, Permitting, and Bidding Services				12%	$	128,706
Construction Observation				5%	$	53,627
Surveying and Testing				2%	$	21,451
CAPITAL COST TOTAL					**$**	**1,276,332**
Annual Service Calls	6	calls		$ 177	$	1,062
Annual Service Provider Costs	54	hours		$ 75	$	4,050
Annual Utilities (single phase power)	154,877	kwh		$ 0.11	$	17,036
Sampling and Analytical Costs					$	2,400
Septic Tank Pumping	25,000	imp gallons		$ 0.10	$	2,500
ANNUAL OPERATION AND MAINTENANCE COSTS					**$**	**27,048**
Present Worth Capital Replacement	50%	Replacement		$ 1,072,548	$	536,274
Present Worth of Annual O&M	30	years	@	4.5%	$	440,589
TOTAL LIFE CYCLE COST					**$**	**2,253,194**

Notes:

1) Concrete coated, fiberglass tanks assumed to be installed. Cost estimate includes accessways.

2) Flow measurement assumed to be ultrasonic flow meter and flume inside concrete vault.

Table C.3

Treatment System — **Recirculating Gravel Filter**

Engineer's Opinion of Cost

Project: Fawn Meadows
Flow: 41,405 Imperial gpd

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Raw Sewage Manhole	1	units	$ 1,500.00	$ 1,500
Septic Tanks	100,000	imp gallons	$ 1.67	$ 167,000
Recirculation Tank	21,000	imp gallons	$ 1.67	$ 35,070
Recirculating Ball Valve	2	units	$ 1,000.00	$ 2,000
Gravel	2,140	cu. m	$ 55.00	$ 117,700
Liner	27,725	sq. m	$ 1.15	$ 31,884
Geotextile	27,725	sq. m	$ 0.25	$ 6,931
4x8 Plywood Sheet	148	each	$ 50.00	$ 7,400
4x8 Styrofoam Sheet	148	each	$ 50.00	$ 7,400
Mulch	474	cu. m	$ 40.00	$ 18,963
Earthwork	2,140	cu. M	$ 5.00	$ 10,700
Distribution Piping	6,400	m	$ 6.00	$ 38,400
Infiltration Chambers	6,400	m	$ 7.00	$ 44,800
Underdrain Piping	3,200	m	$ 10.00	$ 32,000
Recirc. Pumps/Controls	8	units	$ 4,000.00	$ 32,000
Aeration System	5	units	$ 40,000.00	$ 200,000
Blower Enclosure	5	units	$ 2,000.00	$ 10,000
Plants	5,000	each	$ 6.00	$ 30,000
Fencing	900	m	$ 9.00	$ 8,100
Site Work	0.90	ha	$ 10,000.00	$ 9,000
Control Building	1	ls	$ 15,000.00	$ 15,000
Site Electric	12	units	$ 1,000.00	$ 12,000
Flow Measurement	1	ls	$ 13,200.00	$ 13,200
CONSTRUCTION SUBTOTAL				**$ 849,548**
Contingency			10%	$ 84,955
Engineering, Permitting, and Bidding Services			12%	$ 101,946
Construction Observation			5%	$ 42,477
Surveying and Testing			2%	$ 16,991
CAPITAL COST TOTAL				**$ 1,095,917**
Annual Service Calls	6	calls	$ 177	$ 1,062
Annual Service Provider Costs	72	hours	$ 75	$ 5,400
Annual Utilities (single phase power)	62,397	kwh	$ 0.11	$ 6,864
Sampling and Analytical Costs				$ 2,400
Septic Tank Pumping	25,000	imp gallons	$ 0.10	$ 2,500
ANNUAL OPERATION AND MAINTENANCE COSTS				**$ 18,226**
Present Worth Capital Replacement	50%	Replacement	$ 849,548	$ 424,774
Present Worth of Annual O&M	30	years @	4.5%	$ 296,877
TOTAL LIFE CYCLE COST				**$ 1,817,567**

Notes:

1) Fiberglass reinforced plastic tanks assumed to be installed. Cost estimate includes accessways.

Table C.4

Treatment System — **Coarse Sand Filter**

Engineer's Opinion of Cost

Project: Fawn Meadows
Flow: 41,405 Imperial gpd

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Raw Sewage Manhole	1	units	$ 1,500.00	$ 1,500
Septic Tanks	100,000	imp gallons	$ 1.67	$ 167,000
Pump Tank	24,000	imp gallons	$ 1.67	$ 40,080
Pumps and Controls	12	units	$ 4,000.00	$ 48,000
Sand	2,667	cu.m	$ 40.00	$ 106,667
Gravel	1,111	cu.m	$ 45.00	$ 50,000
Geotextile	41,464	m	$ 0.25	$ 10,366
Liner	41,464	sq. m	$ 0.85	$ 35,245
Mulch	889	cu.m	$ 40.00	$ 35,556
4x8 Plywood Sheet	128	each	$ 50.00	$ 6,375
4x8 Styrofoam Sheet	128	each	$ 50.00	$ 6,375
Drainbed Rock	889	cu.m	$ 45.00	$ 40,000
Earthwork	6,000	cu.m	$ 5.00	$ 30,000
Distribution Piping	12,000	m	$ 6.00	$ 72,000
Infiltration Chambers	12,000	m	$ 7.00	$ 84,000
Underdrain Piping	6,000	m	$ 10.00	$ 60,000
Aeration System	6	units	$ 8,900.00	$ 53,400
Site Work	1.08	ha	$ 10,000.00	$ 10,764
Control Building	1	ls	$ 15,000.00	$ 15,000
Site Electric	18	units	$ 1,000.00	$ 18,000
Flow Measurement	1	ls	$ 13,200.00	$ 13,200
CONSTRUCTION SUBTOTAL				**$ 890,328**
Contingency			0%	$ -
Engineering, Permitting, and Bidding Services			12%	$ 106,839
Construction Observation			5%	$ 44,516
Surveying and Testing			2%	$ 17,807
CAPITAL COST TOTAL				**$ 1,059,490**
Annual Service Calls	6	calls	$ 177	$ 1,062
Annual Service Provider Costs	108	hours	$ 75	$ 8,100
Annual Utilities (single phase power)	82,810	kwh	$ 0.11	$ 9,109
Sampling and Analytical Costs				$ 2,400
Septic Tank Pumping	25,000	imp gallons	$ 0.10	$ 2,500
ANNUAL OPERATION AND MAINTENANCE COSTS				**$ 23,171**
Present Worth Capital Replacement	50%	Replacement	$ 890,328	$ 445,164
Present Worth of Annual O&M	30	years @	4.5%	$ 377,431
TOTAL LIFE CYCLE COST				**$ 1,882,085**

Notes:

1) Fiberglass reinforced plastic tanks assumed to be installed. Cost estimate includes accessways.

2) Flow measurement assumed to be ultrasonic flow meter and flume inside concrete vault.

Table C.5

Disposal System — Drip Irrigation

Engineer's Opinion of Cost

Project: Fawn Meadows

Flow: 41,405 Imperial gpd

ITEM	QUANTITY	UNIT		UNIT PRICE		TOTAL PRICE
Transfer Pump Tank	24,000	imp gallons		$ 1.67	$	40,080
Duplex Pump Station	1	ls		$ 10,000.00	$	10,000
Forcemain to Dosing Tanks	2,000	m		$ 14.00	$	28,000
Emitter Tubing	54,000	m		$ 1.50	$	81,000
Pumps and Controls	9	units		$ 4,000.00	$	36,000
Dosing Tank	30,000	imp gallons		$ 1.67	$	50,100
Supply Manifold	8,100	m		$ 10.00	$	81,000
Return Manifold	8,100	m		$ 10.00	$	81,000
Air/Vacuum Relief Valves	18	units		$ 100.00	$	1,800
Site Work	1.8	ha		$ 10,000.00	$	18,000
Fencing	1,800	m		$ 9.00	$	16,200
Site Electric	9	units		$ 1,000.00	$	9,000
Monitoring Wells	6	units		$ 2,000.00	$	12,000
CONSTRUCTION SUBTOTAL					**$**	**452,180**
Contingency				0%	$	-
Engineering, Permitting, and Bidding Services				12%	$	54,262
Construction Observation				5%	$	22,609
Hydrogeological Investigation	1	ls		$ 15,000	$	15,000
Surveying and Testing				2%	$	9,044
CAPITAL COST TOTAL					**$**	**553,094**
Annual Service Calls	6	calls		$ 443	$	2,655
Annual Service Provider Costs	270	hours		$ 75	$	20,250
Annual Utilities (single phase power)	50,224	kwh		$ 0.11	$	5,525
ANNUAL OPERATION AND MAINTENANCE COSTS					**$**	**28,430**
Present Worth Capital Replacement	100%	Replacement		$ 452,180	$	452,180
Present Worth of Annual O&M	30	years	@	4.5%	$	463,088
TOTAL LIFE CYCLE COST					**$**	**1,468,362**

Notes:

1) Fiberglass reinforced plastic tanks assumed to be installed. Cost estimate includes accessways.

Table C.6

Disposal System — Chambered Trenches

Engineer's Opinion of Cost

Project: Fawn Meadows

Flow: 41,405 Imperial gpd

ITEM	QUANTITY	UNIT	UNIT PRICE	TOTAL PRICE
Transfer Pump Tank	24,000	imp gallons	$ 1.67	$ 40,080
Duplex Pump Station	1	ls	$ 10,000.00	$ 10,000
Forcemain to Dosing Tanks	2,000	m	$ 14.00	$ 28,000
Infiltration Chambers	36,000	m	$ 7.00	$ 252,000
Sand (3 inch Blanket)	1,000	cu.m	$ 45.00	$ 45,000
Soil Cover (6 inches)	2,000	cu.m	$ 40.00	$ 80,000
Earthwork	4,000	cu.m	$ 5.00	$ 20,000
Supply Manifold	1,200	m	$ 14.00	$ 16,800
PVC Distribution Piping	36,000	m	$ 6.00	$ 216,000
Fencing	2,000	m	$ 9.00	$ 18,000
Site Work	2.8	ha	$ 10,000.00	$ 28,000
Dosing Tank	24,000	imp gallons	$ 1.67	$ 40,080
Pumps / Controls	12	units	$ 4,000.00	$ 48,000
Forcemain	2,400	m	$ 14.00	$ 33,600
Site Electric	12	units	$ 1,000.00	$ 12,000
Monitoring Wells	6	units	$ 2,000.00	$ 12,000
CONSTRUCTION SUBTOTAL				**$ 899,560**
Contingency			0%	$ -
Engineering, Permitting, and Bidding Services			12%	$ 107,947
Construction Observation			5%	$ 44,978
Hydrogeological Investigation	1	ls	$ 15,000	$ 15,000
Surveying and Testing			2%	$ 17,991
CAPITAL COST TOTAL				**$ 1,085,476**
Annual Service Calls	6	calls	$ 177	$ 1,062
Annual Service Provider Costs	108	hours	$ 75	$ 8,100
Annual Utilities (single phase power)	8,778	kwh	$ 0.11	$ 966
ANNUAL OPERATION AND MAINTENANCE COSTS				**$ 10,128**
Present Worth Capital Replacement	35%	Replacement	$ 899,560	$ 314,846
Present Worth of Annual O&M	30	years @	4.5%	$ 164,967
TOTAL LIFE CYCLE COST				**$ 1,565,289**

Notes:

1) Fiberglass reinforced plastic tanks assumed to be installed. Cost estimate includes accessways.

2) Average values used for sand blanket and soil cover quantities.

Hagstrom Geotechnical Services Ltd.
5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3
Tel: (780) 996-5621• Fax: (780) 475-5671
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Nor Can Consulting Group Inc.
Box 38, Site 219, RR2
Carvel, Alberta
T0E 0H0

March 3, 2012
Our File: H0907-280
Your File: NC-145

Attention: **Mr. Frank Florkewich**

Dear Sirs:

Re: Review of Slope Stability and Groundwater Table Considerations
For Cluster Residential Single and Multi-Family Units
Proposed Country Residential Subdivision – Fawn Meadows
Portion of NE and SE 4-53-2-W5M
Parkland County, Alberta

As requested, we have reviewed a proposed concept plan relative to slope stability and high groundwater considerations for the above referenced site. Specifically, we were requested to comment on the site adequacy for proposed cluster development relative to slope stability matters and high groundwater table conditions. Our comments do not pertain to proposed large buildings such as community services building, seniors living complex, water treatment plant and maintenance plant since a detailed site investigation was carried out for each facility. In this case, site grading, new fill, etc. will be was carried out as part of site development and construction.

There were two reports prepared by Hagstrom Geotechnical Services Ltd. (HGSL) for this site that were reviewed for the purposes of this assignment and these reports were submitted in September and October, 2009. One report was entitled "Geotechnical Site Investigation for Building Foundations and Roadways, Proposed Country Residential Subdivision –Fawn Meadows, Portion of NE and SE 4-53-2-W5M , Parkland County, Alberta", dated September 12, 2009. Another report was entitled "Slope Stability Assessment, Proposed Country Residential Subdivision, Fawn Meadows, Portion of Ne and SE 4-53-2-W5M, Parkland County, Alberta" dated October 14, 2009. During these two investigations, there were a total of nineteen boreholes drilled to depths of 4.5 and 12.0 metres across the site. It is noted that another report was issued on May 13, 2004 by Sabatini Earth Technologies Inc. for traditional country residential lots of which this information is considered to be out dated. A report that reflects the current concept plan should be carried out at a later date.

The current concept plan calls for a cluster conservation adult-oriented residential subdivision with privately owned potable water and sanitary sewer services. There will be total of five clusters located on the site that take advantage of topographic high features on the site, refer to Plate 1, attached. One

cluster will consist of numerous single family units and are located in the south east quadrant. These units are located on two large hills that have slopes inclined at 12 degrees or less. Based on slope stability calculations, the slope stability report indicated that no development setback restrictions or set-back distances are considered necessary for proposed lots on the site.

The groundwater table conditions across the site are summarized in Table 1, below and are approximate borehole locations are shown on Plate 1, attached. The results show that Boreholes 09-1 and 09-4 had a groundwater table depth less 2.1 metres. These two boreholes were located in the south west corner and north west quadrant. Based on this information, the areas of undevelopable lands were plotted and are shown on Plate 1, attached. As shown, there are five separate areas that are considered undevelopable for this type of development.

TABLE 1: SUMMARY OF BOREHOLE WATER LEVELS

Borehole Number	t= 9 and 10 Days Later	Borehole Number	t = 9 and 10 Days Later
09-1	2.0	09-11	4.4 (dry)
09-2	4.4(dry)	09-12	4.4 (dry)
09-3	4.4(dry)	09-13	4.3 (dry)
09-4	2.0	09-14	3.0
09-5	4.3(dry)	09-201	11.5 (dry)
09-6	4.3(dry)	09-202	11.8 (dry)
09-7	4.3(dry)	09-203	11.7 (dry)
09-8	4.4 (dry)	09-204	11.8 (dry)
09-9	4.2 (dry)	09-205	11.6 (dry)
09-10	4.3 (dry)		

Based on the above information, the proposed cluster developments are located outside the areas that are considered undevelopable. Therefore, the sites selected for the five clusters are considered adequate relative to shallow groundwater table and slope stability issues.

Yours truly,
Hagstrom Geotechnical Services Ltd.

PROFESSIONAL ENGINEER ALBERTA MERLE HAGSTROM March 3, 2012

Merle Hagstrom, B.Sc., P.Eng.
Senior Engineering Geologist

PERMIT TO PRACTICE
Hagstrom Geotechnical Services Ltd.
Signature Merle Hagstrom
Date March 3, 2012
PERMIT NUMBER: P 6693
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Attachments: Plate 1

Hagstrom Geotechnical Services Ltd.
5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3
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Norcan Consulting Group Ltd.
Box 38, Site 219, RR2
Carvel, Alberta
T0E 0H0

March 1, 2012
Our File: H0907-280
Your File: NC-145

Attention: **Mr. Frank Florkewich**

Dear Sir:

Re: Slope Stability Assessment
Proposed Country Residential Subdivision
Fawn Meadows
Portion of NE and SE 4-53-2-W5M
Parkland County, Alberta

1.0 INTRODUCTION

Hagstrom Geotechnical Services Ltd (hereinafter referred to as HGSL) was retained by Mr. Frank Florkewich of Norcan Consulting Group to carry out a slope stability assessment at the above referenced property. The purpose of the work was to determine the soil and groundwater conditions along slopes greater than 15 percent, determine the factor of safety against slope failure and to provide building development guidelines. Field drilling was carried out on August 5, 2009 and final water table measurements were taken on August 14, 2009.

2.0 BACKGROUND INFORMATION

2.1 Site Description

The proposed country residential subdivision contains about 52.6 hectares of agricultural land that occupies a portion of the northeast and southeast quarters of Section 4, Township 53, Range 2, West of the Fifth Meridian. The site is bounded on the east by Highway 770 and on the south by Parkland Drive. The site is open, vacant hayland and contains four large groups of trees and marshes that cover about 30 to 35 percent of the site. The site topography is moderately rolling with slopes typically less than 12 degrees (21 percent). No definite drainage pattern is apparent on the site.

It is understood that the proposed development is to consist of cluster type lots of about 36 single family residential homes, numerous duplex, semi detached and supportive living units. The lot boundaries have not been finalized although the sizes will range from 0.30 to 0.58 acres in area. It is further understood that the development will be serviced with centralized private sanitary sewers and potable water systems. Other facilities such as a community services building and assisted seniors living complex are proposed for the site.

3.0 SURFICIAL GEOLOGY

According to published surficial geology reports[1], the terrain in the area is broadly classified as ice-contact, undivided fluvial and lacustrine deposits consisting of gravel, sand, silt and clay and local till that are up to 25 meters thick. The deposits are in intermittent supraglacial lakes and streams, or at margins of ice-floored proglacial lakes. The local topography is classified as undulating to hummocky.

3.1 Scope of Work

The scope of work for the foregoing investigation included site reconnaissance, field drilling, laboratory testing, data analyses and slope stability assessment. Specifically, the scope of work consisted of the slope stability assessment is to determine the factor of safety against slope failure and to provide general design and construction recommendations.

4.0 FIELD EXPLORATION AND LABORATORY TESTING

4.1 Field Drilling

Five boreholes (Boreholes 09-201 to 09-205) were drilled on the site to depths of 12.0 metres on August 5, 2009 using a truck mounted drill rig equipped with continuous flyte, 150-millimeter diameter, solid-stem augers. Supervision of the drilling, soil sampling, and logging of the various soil strata were conducted by Mr. Merle Hagstrom, P. Eng. of HGSL. The soil encountered during drilling was classified in accordance with the Modified Unified Soil Classification System described on Plates 1 and 2, Appendix A. The soil and groundwater results are presented on borehole logs, (Plates 203 to 207A, Appendix A). A site plan showing the approximate borehole locations is presented on Plate 208, Appendix A.

Soil sampling for laboratory analysis generally consisted of disturbed auger soil samples at 0.75 meter intervals obtained from all five boreholes. In addition, pocket penetrometer (PP) readings were taken on intact cohesive soil samples at approximately 0.75 meter intervals from all boreholes to obtain an indication of the unconfined compressive strength (Q_u) of the soil. Other laboratory tests consisted of Atterberg limit tests.

Groundwater conditions were monitored during drilling, at drilling completion, 3 to 7 hours later and 9 days later. The individual results are presented on the borehole logs in Appendix A.

5.0 SOIL CONDITIONS

A total of five boreholes were drilled at the crest of the slopes of which the approximate location of the boreholes is shown on Plate 208, Appendix A. The subsoil profile encountered in the five boreholes generally consisted of thin cover of topsoil over silt followed by an extensive deposit of clay that extended below the bottom of boreholes. A 0.5 metres thick sand layer was encountered in the bottom of Borehole 09-201.

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[1] Shetsen, I. 1990. Quaternary Geology, Central Alberta, Alberta Research Council. Map Scale 1:500000

A detailed description of the encountered stratigraphy is presented on the borehole logs in Appendix A and is further discussed in the following sections. It is noted that the soil properties discussed below such as internal friction angle and cohesion dictating slope stability are based on empirical correlation and pending verification based on slope stability analysis.

5.1 Topsoil

Topsoil was encountered in all five boreholes at the ground surface and extended to depths ranging from 5 to 17 centimeters. The topsoil was generally described as silty, dry, compressible, and dark brown to black in colour. Greater thick of topsoil may be encountered between borehole locations.

5.2 Silt

Silt was encountered below the topsoil in all five boreholes at depths ranging from 0.1 to 0.2 metres and extended to depths ranging from 2.7 to 8.5 metres. The silt was generally described as sandy, with a trace to some clay, medium dense and light brown in colour. Occasional sand and clay lenses were encountered within the silt. In-situ moisture contents in the silt ranged from 7 to 18 percent with most of the values between 13 and 17 percent. Two Atterberg limit tests conducted in the silt yielded liquid limits of 28 and 29 percent and plastic limits of 15 and 16 percent. The silt can be conservatively allocated an internal friction angle of 27 degrees and cohesion of 0 kPa.

5.3 Clay

Clay was encountered below the silt at variable depths and extended beyond the termination depth of four boreholes. The clay was described as silty, medium plasticity, stiff to hard consistency, damp to moist, with occasional silt and sand lenses and dark grey in colour. Some rust staining, gravel chips and clay till like clay lenses were encountered within the clay. In-situ moisture contents in the clay ranged from 11 to 26 percent. Pocket penetrometer readings in the clay ranged from 195 to 480 kPa thus confirming stiff to hard consistency. An internal friction angle of 25 degrees and cohesion of 0 kPa can be conservatively applied to the clay present on the site.

54 Sand

A 0.5 metre thick sand layer was encountered at the bottom of Borehole 09-201 and extended below the termination depth of the borehole. The sand was described as silty, coarse grained, damp, loose in relative density, and dark brown in colour. In-situ moisture contents in the sand were about 11 percent. The sand can be conservatively allocated an internal friction angle of 28 degrees and cohesion of 0 kPa.

6.0 GROUNDWATER CONDITIONS

The groundwater conditions encountered in the five boreholes are summarized in Table 1, below. As shown, the groundwater conditions extended below the termination depth of all boreholes and thus the ground water conditions are considered to be low at the site. In general, groundwater

levels can be expected to be highest during the spring due to snowmelt, or following periods of frequent or prolonged rainfall. The levels will generally decrease until the late fall at which time the lowest levels are expected and will continue over the winter months. The present groundwater measurements are considered to be slightly below normal conditions.

TABLE 1
SUMMARY OF GROUNDWATER OBSERVATIONS

Borehole Number	Depth of Groundwater Seepage (m)	Water Levels After Drilling Completion (m)	
		t = 0 hours	t = 9 days
09-201	Nil	11.8 (dry)	11.5 (dry)
09-202	Nil	11.8 (dry)	11.8 (dry)
09-203	Nil	11.8 (dry)	11.7 (dry)
09-204	Nil	11.8 (dry)	11.8 (dry)
09-205	Nil	11.9 (dry)	11.6 (dry)

7.0 SLOPE EVALUATION

7.1 Potential Impacts on Slope Stability

There are moderately steep slopes within the study area that are situated in two distinct areas of the site where cluster type homes will be constructed. There were five deep boreholes drilled in the tow areas of which the approximate location of the boreholes are shown on Plate 208, Appendix A. The soil conditions across these slopes generally consist of a thin cover of topsoil over variable thick layers of predominately silt and clay with low groundwater conditions.

There are several factors, which are listed below that could potentially lead to instability of the slopes on this site. Such factors include:

1. Placement of fill soils near the crest-of-slope.

2. Disturbance of the existing vegetation on the slope or near the crest of a slope.

3. An increase in groundwater level and therefore increase in pore pressures within the soil due to general lot grading, general development of the site including excessive lawn watering, ponding of water, construction of swimming pools or leaking utility lines near the crest-of-slope.

4. Excessive surface runoff over the crest-of-slope leading to increased groundwater infiltration into the slope and possible surficial erosion and sloughing.

5. Removal or erosion at the toe of the slope.

All of the factors above can, to some degree, be controlled to minimize the negative impact on the stability of the adjacent slopes. The above factors were considered in the evaluation process to identify potential modes and degrees of slope instability on the site. Erosion at the toe of the slope is not considered to be a factor. Other factors such as loading the crest of the slope; removal at the toe of the slope; disturbance to the vegetation on the slope; an increase in groundwater levels and excessive surface runoff over the crest of slope can be controlled by proper planning and general maintenance of each proposed residential lot.

7.2 Slope Stability Analysis

An infinite slope stability analysis was undertaken on different cross sections for this project. A slope is generally considered stable if it possesses a factor-of-safety of 1.5 or greater.

Based on the information obtained from the drilling program, site reconnaissance and laboratory testing, soil properties were estimated for the various soil strata. A soil strength parameter of internal angle of friction of 27 degrees, 25 degrees and 28 degrees was assigned for the silt, clay and sand, respectively. The groundwater table was assumed at depth of 10.0 metres below ground surface.

The slope inclinations for the analysis were between 8 and 12 degrees (15 and 21 percent). The results of the slope stability analysis indicate that the factor of safety against slope failure is greater than 1.9. Based on the results of the analysis, the slopes on the site are considered stable and possess a factor-of-safety greater than 1.5 under the worst anticipated groundwater conditions. Therefore, no development setback restrictions or set-back distances are considered necessary for proposed lots on the site where the slopes are steeper than 8 degrees (15 percent).

8.0 CLOSURE

The report was based on the findngs at five borehole locations that are located in two different areas of the site that has moderately steep slopes. Should different subsoil and groundwater conditions be encountered during construction, Hagstrom Geotechnical Services Ltd. should be notified immediately and the recommendations submitted herein will be reviewed, and revised if necessary.

This report was prepared for the exclusive use by Nor Can Consulting Group and authorized users for the specific application to the project described in the report. It has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made. It is recommended that a copy of this report be submitted with each lot land title and applied as a restrictive covenant to each lot.

Yours truly,
Hagstrom Geotechnical Services Ltd.

PROFESSIONAL ENGINEER PROVINCE OF ALBERTA

March 1, 2012

Merle Hagstrom, B.Sc., P.Eng.
Senior Engineer

PERMIT TO PRACTICE
Hagstrom Geotechnical Services Ltd.
Signature
Date March 1, 2012
PERMIT NUMBER: P 9893
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

APPENDIX A

Explanation of Field and Laboratory Test Data
Borehole Logs
Site Plan

Explanation of Field and Laboratory Test Data

The following pages are an explanation of the terms and symbols used in the Test Hole Log

Soil Profile and Description

Soil types are described by the Modified Unified Soil Classification System.
(See Plate 2 for terms and symbols)

Soils classified by particle size fall in the following ranges:

BOULDERS - greater than 200 mm	SAND - 0.08 mm to 5 mm
COBBLES - 75 mm to 200 mm	SILT - 0.002 mm to 0.08 mm
GRAVEL - 5 mm to 75 mm	CLAY - finer than 0.002 mm

Additional graphic symbols include:

seepage
water level surface

Soil Sample Type

Standard Penetration Sample (D)

Undisturbed Sample (Shelby) (U)

Bag Sample

Penetration Resistance

Field test indication number of blows (N) of a 140 pound hammer dropping 30 inches (76cm) required to drive a 2 inch (5 cm) O.D. open end sampler a distance of 1 foot (30 cm) from 0.5 to 1.5 feet (15 to 45 cm) into the undisturbed soil. This test is outlined in A.S.T.M., D1568.

Miscellaneous Tests

In this column are summarized results of all the laboratory test as indicated by the following symbols:

HVR	Hydrocarbon Vapour Readings, ppm or % LEL
* MA	Mechanical grain size analysis
G	Specific gravity
k	Coefficient of permeability
PP	Pocket penetrometer strength kg/cm2
* q	Triaxial compression test
* C	Consolidation test
Qu	Unconfined compressive strength kg/cm2
SO_4	Soluble sulphate concentration
γ	Bulk unit weight
γd	Dry unit weigh

* Tests normally summarized on separate data sheets

Modified Unified Classification System For Soils

Major Division			Group Symbol	Graph Symbol	Color Code	Typical Description	Laboratory Classification Criteria	
Coarse-Grained Soils (more than half by weight larger than 200 sieve)	Gravels more than half coarse grains larger than No. 4 sieve	Clean Gravels (little or no fines)	GW		Red	Well graded gravels, little or no fines	$C_U = (D_{60}/D_{10}) > 6$ $C_c = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			GP		Red	Poorly graded gravels, and gravel sand mixtures, little or no fines	Not meeting above requirements	
		Dirty Gravel (with some fines)	GM		Yellow	Silty gravels, gravel-sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			GC		Yellow	Clayey gravels, gravel-sand-(silt) clay mixtures		Above "A" line P.I. more than 7
	Sands more than half fine grains smaller than No. 4 sieve	Clean Sands (little or no fines)	SW		Red	Well graded sands, gravely sands, little or no fines	$C_U = (D_{60}/D_{10}) > 4$ $C_c = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			SP		Red	Poorly graded sands, little or no fines	Not meeting above requirements	
		Dirty Sands (with some fines)	SM		Yellow	Silty sands, sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			SC		Yellow	Clayey sands, sand-(silt) clay mixtures		Above "A" line P.I. more than 7
Fine-Grained Soils (more than half by weight passes 200 sieve)	Silts below "A" line negligible organic content	$W_L < 50\%$	ML		Green	Inorganic silts and very fine sands, rock flour, silty sands of slight plasticity	Classification is based upon plasticity chart	
		$W_L > 50\%$	MH		Blue	Inorganic silts, micaceous or diatomaceous, fine sandy or silty soils		
	Clays above "A" line negligible organic content	$W_L < 30\%$	CL		Green	Inorganic clays of low plasticity, gravelly, sandy, or silty clays, lean clays		
		$30\% < W_L < 50\%$	CI		Green-Blue	Inorganic clays of medium plasticity, silty clays		
		$W_L > 50\%$	CH		Blue	Inorganic clays of high plasticity		
	Organic Silts & Clays bellow "A" line on chart	$W_L < 50\%$	OL		Green	Organic silts and organic silty clays of low plasticity	Whenever the nature of the fine content has not been determined it is designated by the letter "F". E.G. SF is a mixture of sand with silt or clay	
		$W_L > 50\%$	OH		Blue	Organic clays of high plasticity		
Highly Organic Soils			PI		Orange	Peat and other highly organic soils	Strong color or odor, and often fibrous texture	

Bedrock Symbols

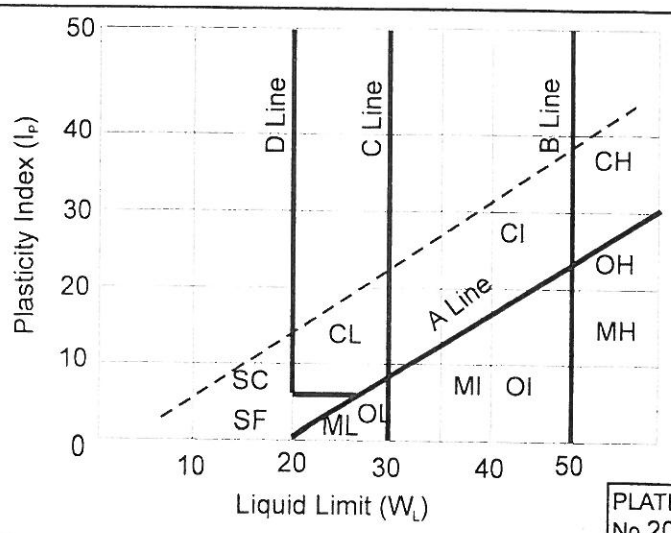
Bedrock (Undifferentiated)

Shale

Sandstone

Siltstone

Coal



Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

PLATE No.202

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009 TECH: MH

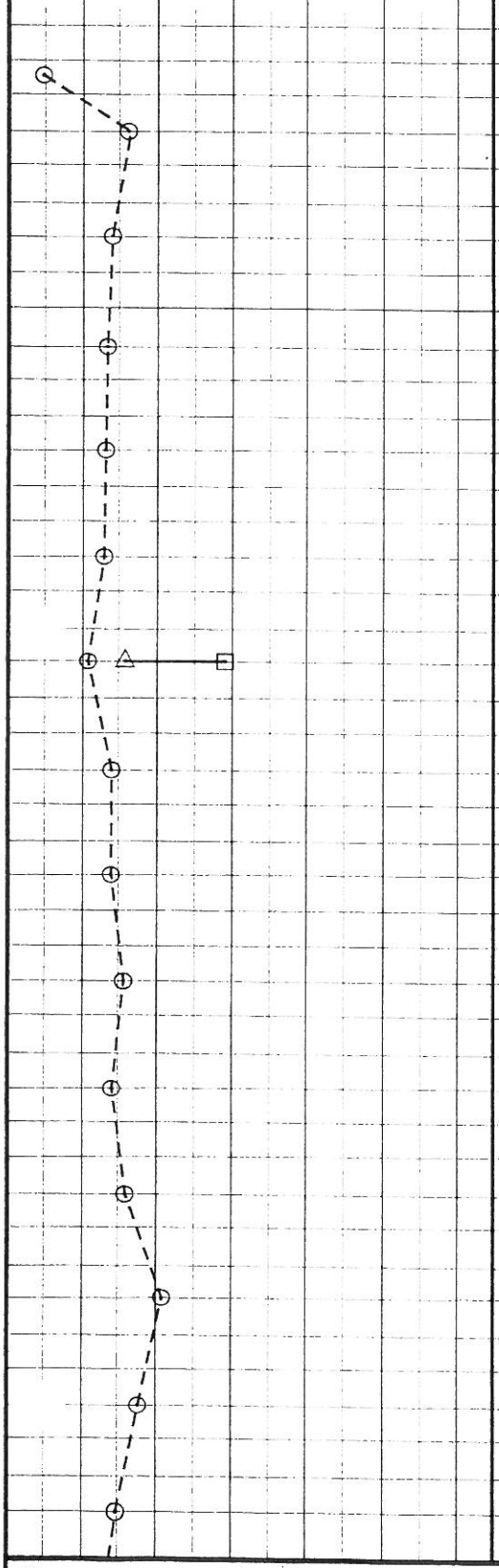
TEST BORING **09-201**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, dark brown, 10 cm thick — 10 cm				
		SILT; sandy, trace of clay, light yellowish brown				
3	1					
		– occasional thin sand lenses				
6	2					
		– dry, loose				
10	3					
	4					
		– dry to damp, loose				
15	5					
		– damp, loose				
20	6					
		– groundwater seepage				
	7	– clay till like				
25						
	8					
		8.5 m				
		CLAY; silty, very stiff, medium plasticity, damp to moist, dark brown				PP = 430 kPa
30	9					
		– clay till like				PP = 360 kPa
	10	– very stiff, medium plasticity, dark brown				
35						PP = 310 kPa

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☐ STANDARD PENETRATION SAMPLE
☐ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **203**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Inc.

PROJECT: Proposed Country Residential Subdivision

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009 TECH: MH

TEST BORING 09-201

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
	11	**CLAY;(continued),** silty, very stiff, medium plasticity, damp to moist, dark brown				
		11.5 m				
		SAND; coarse grained, silty, loose, damp, dark brown				
39	12	– no evidence of groundwater seepage 12.0 m				
		End of Borehole = 12.0 m				
		Slough = 11.8 m, 0 hours				
		Water level = 11.8 m (dry), 0 hours				
		Water level = 11.6 m (dry), 7 hours later				
43	13	Water level = 11.5 m (dry), 9 days later				
46	14					
49	15					
52	16					
55	17					
59	18					
62	19					
66	20					
98	30					

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. 203A

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.: H0907-280
DATE: August 5, 2009 TECH: MH

TEST BORING **09-202**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %
10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT-N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, dark brown, 11 cm thick — 11 cm				
		SILT; sandy, some clay, medium dense, light yellowish brown				
3	1	– frequent carbonate pockets				
6	2					
10	3	– medium dense				
	4					
15		– damp, medium dense, yellowish brown				
	5					
20	6					
	7	– clay layer from 7.2 o 7.4 m, very stiff				
25		– medium dense, dark brown — 7.7 m				
	8	**CLAY;** silty, very stiff, medium plasticity, moist, occasional gravel chips, dark grey				PP = 265 kPa
30	9	– very stiff, occasional silt lenses				PP = 280 kPa
	10					PP = 240 kPa
35		– very stiff, moist, dark brown				PP = 245 kPa

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **204**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Inc

PROJECT: Proposed Country Residential Subdivision

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009 TECH: MH

TEST BORING **09-202**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT-N	MISCELLANEOUS TESTS
	11	**CLAY;(continued),** silty, medium plasticity, very stiff, moist, occasional gravel chips, dark grey				PP = 275 kPa
39	12	– no evidence of groundwater seepage 12.0 m				PP = 280 kPa
		End of Borehole = 12.0 m Slough = 11.8 m, 0 hours Water level = 11.8 m (dry), 0 hours Water level = 11.8 m (dry), 6 hours later Water level = 11.8 m (dry), 9 days later				
43	13					
46	14					
49	15					
52	16					
55	17					
59	18					
62	19					
66	20					
98	30					

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

□ STANDARD PENETRATION SAMPLE
□ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **204A**

Hagstrom Geotechnical Services Ltd.

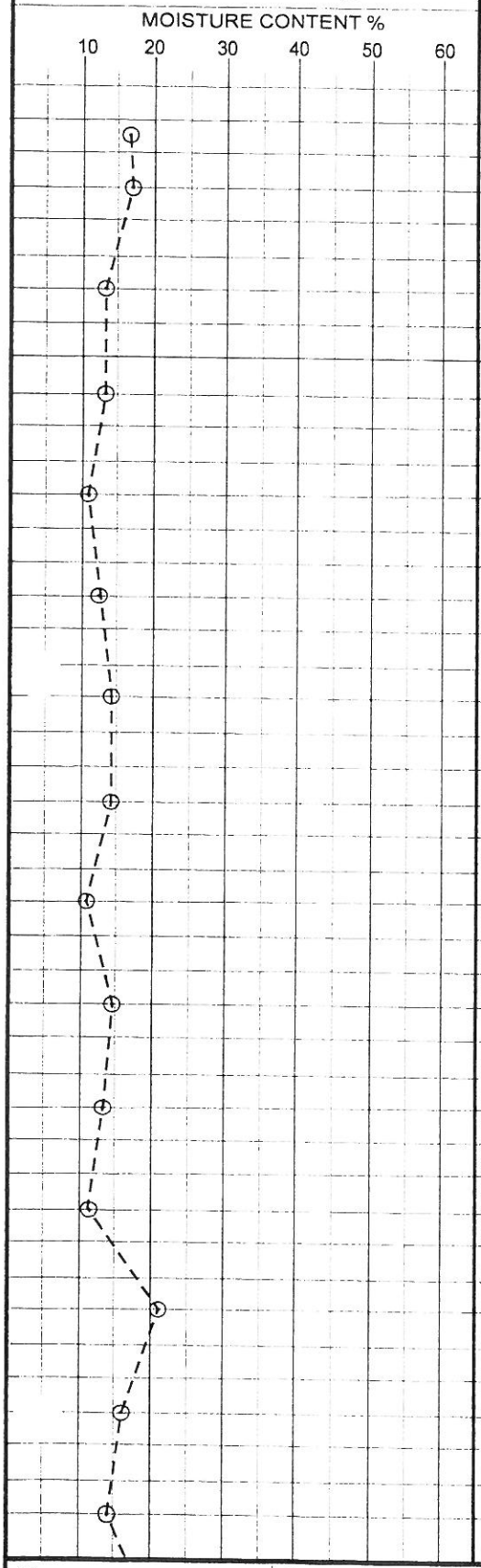
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.	H0907-280
DATE:	August 5, 2009
TECH:	MH

TEST BORING **09-203**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

DATUM:

SURFACE ELEVATION:

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
					TOPSOIL; silty, dry, loose, compressible, dark brown, 10 cm thick (10 cm)
					SILT; sandy, some clay, medium dense, light yellowish brown
3	1				
					– medium dense
6	2				
10	3				
					– occasional clay lenses
	4				
15					
	5				– medium dense
					5.8 m
	6				**CLAY;** silty, very stiff, medium plasticity, damp, occasional gravel chips, dark brown
20					PP = 400 kPa
					PP = 480 kPa
	7				– very stiff, moist
25					– cobble size rock, difficult to drill
					PP = 255 kPa
	8				– very stiff, medium plasticity, dark brown
					PP = 245 kPa
30	9				– stiff, medium plasticity, occasional gravel chips
					PP = 195 kPa
					PP = 210 kPa
	10				
35					– very stiff, moist, dark brown
					PP = 255 kPa

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **205**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Inc.

PROJECT: Proposed Country Residential Subdivision

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009 TECH: MH

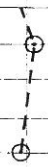
TEST BORING **09-203**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
	11	**CLAY;(continued),** silty, medium plasticity, very stiff, damp, occasional gravel chips, dark brown				PP = 275 kPa
39	12	– no evidence of groundwater seepage 12.0 m				PP = 245 kPa
		End of Borehole = 12.0 m Slough = 11.8 m, 0 hours Water level = 11.8 m (dry), 0 hours Water level = 11.7 m (dry), 5 hours later Water level = 11.7 m (dry), 9 days later				
43	13					
46	14					
49	15					
52	16					
55	17					
59	18					
62	19					
66	20					
98	30					

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **205A**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009 TECH: MH

TEST BORING **09-204**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, compressible, loose, black, 5 cm thick — 5 cm				
		SILT; sandy, clayey, dry, medium dense, light yellowish brown				
3	1					
6	2	– occasional fine sand lenses				
10	3	– damp, medium dense				
	4	4.3 m				
		CLAY; silty, medium plasticity, very stiff, occasional gravel chips, dark brown				
15	5					PP = 315 kPa
		– very stiff				PP = 290 kPa
20	6	– very stiff, moist, medium plasticity, dark brown				PP = 275 kPa
	7					PP = 300 kPa
25						PP = 360 kPa
	8	– clay till like, very stiff, medium plasticity				PP = 340 kPa
30	9					PP = 325 kPa
	10					PP = 280 kPa
35		– very stiff, medium plasticity, dark brown				PP = 300 kPa

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **206**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Inc

PROJECT: Proposed Country Residential Subdivision

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009

TECH: MH

TEST BORING **09-204**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N-	MISCELLANEOUS TESTS
	11	**CLAY;(continued),** silty, medium plasticity, very stiff, damp, occasional gravel chips, dark brown				PP = 325 kPa
39	12	– no evidence of groundwater seepage 12.0 m				PP = 330 kPa
		End of Borehole = 12.0 m Slough = 11.8 m, 0 hours Water level = 11.8 m (dry), 0 hours Water level = 11.7 m (dry), 4 hours later Water level = 11.8 m (dry), 9 days later				
43	13					
46	14					
49	15					
52	16					
55	17					
59	18					
62	19					
66	20					
98	30					

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **206A**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009

TECH: MH

TEST BORING **09-205**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N-	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, black, 17 cm thick — 17 cm				
		SILT; sandy, trace of sand, dry, loose, light brown				
3	1					
		– medium dense, light brown				
6	2					
		2.7 m				
		CLAY; silty, very stiff, medium plasticity, clay till like dark brown				PP = 425 kPa
10	3					
		– very stiff, medium plasticity, dark brown				PP = 380 kPa
	4	– occasional gravel chips and coal chips				
15						PP = 410 kPa
	5					PP = 350 kPa
		– very stiff, medium plasticity, moist				PP = 320 kPa
20	6					
						PP = 320 kPa
	7					
25		– very stiff, occasional silt lenses				PP = 375 kPa
	8					PP = 275 kPa
		– very stiff, dark brown				PP = 300 kPa
30	9					
						PP = 280 kPa
	10					
35						PP = 260 kPa

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
⧗ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **207**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Inc.

PROJECT: Proposed Country Residential Subdivision

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 5, 2009 TECH: MH

TEST BORING **09-205**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
	11	**CLAY;(continued),** silty, very stiff, medium plasticity, clay til like, dark brown – occasional rust stained fissures at 11.0 m				PP = 245 kPa
39	12	– no evidence of groundwater seepage 12.0 m				PP = 240 kPa
		End of Borehole = 12.0 m Slough = 11.9 m, 0 hours Water level = 11.9 m (dry), 0 hours Water level = 11.6 m (dry), 3 hours later Water level = 11.6 m (dry), 9 days later				
43	13					
46	14					
49	15					
52	16					
55	17					
59	18					
62	19					
66	20					
98	30					

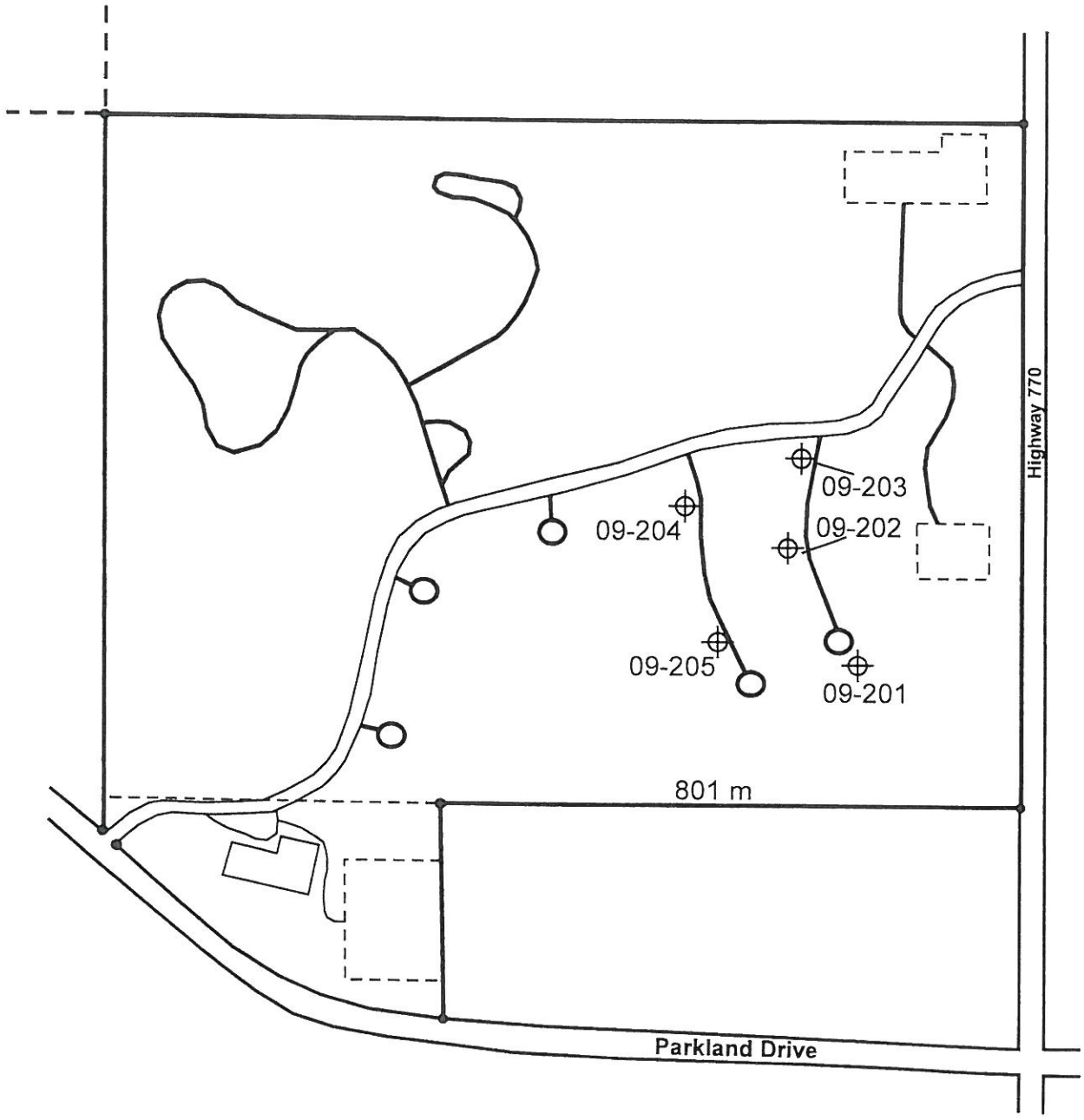
⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **207A**



LEGEND

- Borehole Location
- Site Boundary

Scale: Not to Scale

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue. Edmonton, Alberta T5A 0M3

NOR CAN CONSULTING INC.

Proposed Country Residential Subdivision - Fawn Meadows
Portions of NE & SE 4-53-2-W5M,
Parkland County, Alberta
Site Plan

Job No: H0907-280	Date: August 11, 2009	Plate: 208

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3
Tel: (780) 996-5621• Fax: (780) 475-5671
e-mail: h_gsl@telus.net

Nor Can Consulting Group Inc.
Box 38, Site 219, RR2
Carvel, Alberta
T0E 0H0

March 1, 2012
Our File: H0907-280
Your File: NC-145

Attention: **Mr. Frank Florkewich**

Dear Sirs:

Re: Geotechnical Site Investigation for Building Foundations and Roadways
Proposed Country Residential Subdivision – Fawn Meadows
Portion of NE and SE 4-53-2-W5M
Parkland County, Alberta

1.0 INTRODUCTION

As requested, a geotechnical site investigation was carried out by Hagstrom Geotechnical Services Ltd. (HGSL) for the design and construction of residential building foundations and roadways at the above referenced site. The investigation consisted of drilling a total of fourteen boreholes, soil sampling, laboratory testing, and evaluation of the results. Our recommendations are provided herein.

2.0 PROJECT DESCRIPTION

The proposed country residential subdivision contains about 52.6 hectares of agricultural land that occupies a portion of the northeast and southeast quarters of Section 4, Township 53, Range 2, West of the Fifth Meridian. The site is bounded on the east by Highway 770 and on the south by Parkland Drive. The site is open, vacant hayland and contains four large groups of trees and marsh that cover about 30 to 35 percent of the site. The site topography is moderately rolling with slopes typically less than 12 degrees. No definite drainage pattern is apparent on the site.

It is understood that the proposed development is to consist of cluster type lots that consist of 36 single family residential lots, numerous duplex , semi-detached and supportive living units. The single family units will range in size from 0.30 to 0.58 acres each. It is further understood that the development will be serviced with centralized municipal sanitary sewers and potable water systems. Other facilities such as a community services building and assisted seniors living complex is proposed for the site.

3.0 INVESTIGATION PROCEDURE

Fourteen boreholes were drilled at the subject site on to a depth of 4.5 metres on August 4, 2009. Supervision of drilling, soil sampling, and logging of the various soil strata was performed by Mr. Merle Hagstrom, P. Eng. of HGSL. The soils encountered during drilling were classified in accordance with the Modified Unified Soil Classification System which is explained on Plates 1 and 2, Appendix A. The soil and groundwater conditions encountered during field drilling were recorded and are presented on the borehole logs in Appendix A. The borehole locations are presented on Plate 17, Appendix A.

4.0 SUBSOIL AND GROUNDWATER CONDITIONS

The soil stratigraphy at the borehole locations consist of a thin cover of topsoil over variable thick layers of sand, silt and clay. The topsoil thickness ranged from 7 to 60 centimeters with an average thickness of 26 centimetres. The sand of about 30 centimetres in thickness was encountered in two boreholes and moisture contents in the sand were about 23 percent. The silt was encountered in eight boreholes and ranged in thickness from 0.5 to 4.4 metres. Moisture contents in the silt ranged from 7 to 23 percent. The clay was encountered in nine boreholes and ranged in thickness from 0.6 to 4.4 metres. Moisture contents in the clay ranged from 12 to 38 percent and pocket penetrometers readings in the clay ranged from 105 to 520 kPa. Moisture contents within the silt and clay within the top 1 to 2 metres are expected to be near or slightly below optimum moisture content for recompaction.

The groundwater levels in each borehole location were monitored during drilling, at drilling completion, several hours after drilling and 10 days later. Groundwater seepage was encountered during drilling in two of the fourteen boreholes. A tabular summary of the water table results in each of the boreholes is provided in Table 1, below and as shown, a majority of the stabilized groundwater table levels were below a depth of 4.5 metres. Lithologic descriptions of the subsoils encountered along with water table levels are presented in the boreholes logs, Appendix A.

4.1 CONCRETE

The results from soluble sulphates analyses conducted on fourteen selected soil samples revealed a "negligible" to "moderate" potential for sulphate attack on concrete in contact with native soils at this site. Therefore, all concrete in contact with the native soils relating to building foundations and underground services at this site should be made with CSA Type 50 Sulphate Resistant cement possessing a minimum 56-day compressive strength of 30 MPa. The maximum water cement ratio should be 0.50. An air entrainment agent of 5 to 7 percent is recommended for improved workability and freeze-thaw durability.

TABLE 1: SUMMARY OF BOREHOLE WATER LEVELS

Borehole Number	t= 10 Days Later	Borehole Number	t = 10 Days Later
09-1	2.0	09-8	4.4(dry)
09-2	4.4(dry)	09-9	4.2(dry)
09-3	4.4(dry)	09-10	4.3(dry)
09-4	2.0	09-11	4.4(dry)
09-5	4.3(dry)	09-12	4.4(dry)
09-6	4.3(dry)	09-13	4.3(dry)
09-7	4.3(dry)	09-14	3.0

5.0 RECCOMENDATIONS FOR SITE PREPARATION

The site has localized low areas that may contain a significant amount of topsoil and peat. All topsoil and peat should be removed from building and roadway areas. For the buildings that will have a basement, the excavation should be carefully inspected to ensure that all compressible organic soils and soft material has been removed from the building site.

Estimates of topsoil thickness at the borehole locations may be obtained from the borehole logs. However, it should be expected that the topsoil and organic material thicknesses might vary between the borehole locations. In particular, no boreholes were drilled in the bottom of the marshes/fens and thus significant amounts of compressible topsoil and organic soils may have to be wasted prior to placement of new fill.

Except for lower areas, the native sand, silt, and clay are expected to be suitable for general site grading. Uniformity and compactive effort of the engineered fill are important in minimizing the potential for differential settlement. The engineered fill should be compacted to the following standards.

(1) All site-raising fill under building areas should be placed in 150 mm maximum lifts compacted to at least 98% of standard Proctor maximum dry density within ±2% of its optimum moisture content.

(2) Site raising fill under the parking and roadway areas should be placed in 150 mm maximum lifts compacted thickness and compacted to at least 95% of standard Proctor maximum dry density within ±2% of its optimum moisture content.

(3) General site grading fills outside the building footprint should also be placed in 150 mm lifts compacted thickness and compacted to at least 95% of standard Proctor maximum dry density within ±2% of its optimum moisture content.

(4) All fill used for landscaping purposes needs only moderate compaction (i. e. 92 % of standard Proctor maximum dry density) to ensure future settlements do not adversely

affect design drainage provisions.

6.0 RECOMMENDATIONS FOR BUILDING FOUNDATIONS

Spread footings and cast-in-place concrete friction piles are considered feasible foundation types for new homes in view of the observed soil and groundwater conditions. Design recommendations for spread footings and cast-in-place concrete friction piles are provided in the following sections.

6.1 Spread Footings

Spread footings should be designed and constructed according to the following recommendations:

(1) Footings supporting heated structures should have a minimum soil cover of 1.5 m below finished ground level to provide adequate protection against frost. For unheated structures, exterior and interior footings should be founded at a minimum depth of 2.4 m below finished ground level.

In the case of basements, footings may be founded immediately below basement level provided the minimum depth of 1.5 m below finished exterior grade is maintained.

(2) All footings should be founded on the undisturbed, inorganic, native mineral soils. Footings should not be supported on fill. Where local wet and soft zones are encountered in the footing excavations, it may be necessary to increase the size of the footings or to remove the wet and soft material and replace with lean concrete. Disturbed soil should not be allowed to remain in the footing excavations.

(3) Strip and spread footings may be designed using an allowable bearing capacity of 80 kPa for footings founded in sand, silt or clay at the above noted depths. In no case, should the perimeter strip footings be less than 60 centimeters wide and 30 centimeters thick and should be reinforced with two 10 millimeter longitudinal steel bars.

(4) Footings should be inspected by qualified geotechnical personnel to ensure that the footings are located in suitable native mineral soils.

6.2 Cast-in-Place Concrete Friction Piles

Foundation loads for new homes may be constructed on cast-in-place concrete friction piles. This may be an economical foundation type for any at-grade building development including attached garages to avoid construction of footing excavations. The piles should be designed and installed according to the recommendations given below.

(1) An allowable shaft adhesion of 19 kPa may be used for the design of concrete friction piles in native mineral soils. Shaft adhesion should not be included in the upper 1.5 m of the pile to allow for the possibility of the soil drying and shrinking away from the concrete pile shaft

for potential future settlement. A minimum pile length of 5.5 m below finished site grade for exterior piles is recommended to resist potential frost heave forces. Interior piles should also be 5.0 m deep if installation will be carried out during winter months.

(2) End bearing resistance should not be included in calculating the allowable design load of a straight shaft friction pile.

(3) A minimum pile shaft diameter of 300 mm is recommended to prevent voids from forming during pouring of concrete.

(4) As a minimum and not including structural requirements, a nominal percentage of longitudinal reinforcement (0.5% of the sectional area of the pile shaft) should be provided and is required throughout the top 5.0 metres of the pile shaft to resist potential uplift forces on the pile due to frost action and seasonal moisture variations. If piles are designed as tension elements, the pile reinforcing should be designed to resist the anticipated uplift stresses.

(5) Concrete should be poured immediately after drilling of the pile hole to reduce the risk of groundwater seepage and sloughing soil. It is expected that protective steel casing will be required where the pile drill holes penetrate below the groundwater table in wet sand.

6.3 Concrete Grade Beams

If piles are used to support garage structures, etc., a concrete grade beam is required along the top of the piles. Precautions should be taken to prevent heaving of the grade beams due to frost penetration, where the grade beams will lie less than 1.5 m below the ground surface.

The recommended construction procedure for preventing heave under the grade beam is to use crushable, non-degradable void filler that is incorporated at the base of the grade beam. In this method, the grade beam must be designed in accordance with the crushing strength of the void filler used and the piles must be available to take the resulting uplift.

6.4 Concrete Floor Slabs

Concrete slabs on grade may be supported on the native mineral soils or engineered fill. Some clay soils on the site have a moderate swelling potential and given this, the concrete floor slab should be designed to tolerate some movement and should be separated from the building structure.

A minimum of 100 mm of clean, well-graded sand or gravel is recommended directly beneath the floor slab for a new home. This should be increased to a thickness of 150 mm for a garage floor slab. Coarse material greater than 50 mm in diameter should be avoided directly beneath the floor slab to prevent stress concentrations within the slab. The granular levelling course should be compacted to a uniform dry density of about 98 percent of standard Proctor maximum dry density. A recommended typical gradation is provided in Table 2, below.

TABLE 2:TYPICAL GRADATION FOR SLAB-ON-GRADE FLOORS

SIEVE		% PASSING
1½	38 000 µm	100
3/8	10 000 µm	65-100
No. 4	5 000 µm	50-90
No. 10	2 000 µm	35-75
No. 40	400 µm	10-45
No. 100	150 µm	0-20
No. 200	75 µm	0-5

Other appropriate materials, which fall outside the above recommended gradation limits may be suitable. Alternate materials should, however, be evaluated by a geotechnical engineer prior to use.

6.5 Excavations and Backfilling of Basements

Temporary excavation slopes for basement construction should be cut at 1 horizontal to 1 vertical though the native mineral soils. Occupational Health and Safety regulations for excavations must be followed at all times.

Perimeter drains should be provided on the outside of the footings below the basement floor slab to prevent building up of hydrostatic pressure against the basement walls and promote a dry basement. The drains should be surrounded with at least 200 millimetres of free draining gravel. If the water table is located within 1.0 meter of the bottom of concrete foundations, interior perimeter dains along the strip footing and lateral drains should be provided below the floor slab at a spacing of no more than 4.0 meters apart. It is recommended that at least two test holes be drilled at each home location prior to construction to confirm the soil and groundwater conditions.

The native mineral soils may be used for backfilling around the basement walls provided it is free of organic soils. The soils should be carefully placed and hand tamped in lifts of 300 mm or less to obtain uniform compaction. If compacted backfill is used, the foundation walls should be designed using an equivalent fluid pressure of 10 kN/m^3.

6.6 Subgrade Preparation for Paved Roadways

The clay is highly frost susceptible and the groundwater table in isolated areas of the site are considered to be generally high. In this case, the final grade for the top of asphalt should be constructed at least 1.5 metres above the groundwater table. The final subgrade for roadways should be drained towards drainage swales and ditches to prevent subgrade softening due to water accumulations. Subsequent to subgrade preparation to obtain design grade elevation, all loose or organic material should be removed from beneath paved areas. Proof-rolling of the entire surface area under pavement sections should be carried out to detect any local soft and weak spots. Soft spots

detected as a result of proof-rolling should be excavated and backfilled with general engineered fill. If large subgrade excavation is required, a suggested depth of 300 to 450 mm is recommended followed by placement of a woven geotextile (AMOCO 2002 or equivalent). Granular backfill consisting of 80 mm diameter pit-run should be placed over the geotextile in one lift and compacted using lightweight equipment.

Subsequent to proof-rolling and subgrade repair, the subgrade should be scarified to a depth of no less than 150 mm and recompacted to at least 100 percent of SPMDD at a moisture content of 0 to 2 percent over optimum moisture content. The near surface soils within the top 2.0 to 3.0 metres were found to be near or dry of optimum moisture content. In some areas, some moisture conditioning to optimum moisture content will likely be required to achieve this level of compaction.

Options for subgrade preparation for new roadways should be finalized at the time of construction in order to confirm the subgrade condition. Depending on weather conditions, it may be become necessary to consider Portland cement stabilization. Cement dosage in the order of 10 to15 kilograms per square metre should be expected.

Preparation of the subgrade for roadways should be carried out in segmented areas. This is to avoid loosening of the prepared areas by site traffic before compaction of the subgrade and placement of the granular material have been completed. Protection of the prepared subgrade against precipitation and frost should be undertaken.

6.7 Asphalt Pavement Structure

It is expected that vehicle traffic will consist of low volumes of passenger cars, trucks and garbage trucks corresponding to a road classification of local residential. A 20-year design life, an assumed traffic volume of 3.5×10^4 ESALs and a soaked California Bearing Ratio (CBR) of 3 was used in the design of the pavement structure.

The recommended hot mix pavement structure is as follows:

- 40 mm asphaltic concrete at final acceptance certificate
- 75 mm asphaltic concrete over
- 200 mm crushed granular base course (100% SPMDD)
- 150 mm subgrade preparation (100% of SPMDD)

The properties of the material used in the above roadway structure, should conform to Parkland County specifications or AT & U specifications. All hot mix pavement structures should be compacted to a minimum of 98 percent of the 50 blow Marshall density.

It is recommended that the finished subgrade road surface be sloped at a minimum of 2 percent toward perimeter ditches. The purpose of this is to drain any subsurface water from the subgrade and thereby prevent ponding of water, which could result in softening and/or possible frost heaving of the subgrade. Some deterioration of the road structure may occur prior to placing the final lift of hot mix asphalt from construction traffic loading (i.e. delivery vehicles and concrete trucks). Prior to placing the final lift of asphalt, the existing road surface should be inspected and any deficiencies (i.e.

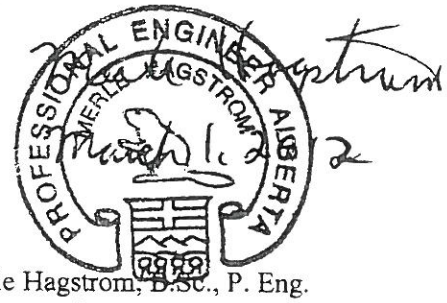
the final lift of asphalt, the existing road surface should be inspected and any deficiencies (i.e. potholes, cracks) should be repaired prior to construction of an asphalt overlay.

7.0 CLOSURE

The letter report was based on the findings at fourteen borehole locations. Should different subsoil and groundwater conditions be encountered during construction, Hagstrom Geotechnical Services Inc. should be notified immediately and the recommendations submitted herein will be reviewed, and revised if necessary.

Should you have any questions or require additional information, do not hesitate to contact our office at (780) 996-5621.

Yours truly,
Hagstrom Geotechnical Services Ltd.



PERMIT TO PRACTICE
Hagstrom Geotechnical Services Ltd.
Signature Merle Hagstrom
Date March 1, 2017
PERMIT NUMBER: P 9693
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

Merle Hagstrom, B.Sc., P. Eng.
Senior Engineer

Distribution: (4) addressee

Attachments: Appendix A

APPENDIX A

Explanation of Field and Laboratory Test Data
Borehole Logs
Site Plan

Explanation of Field and Laboratory Test Data

The following pages are an explanation of the terms and symbols used in the Test Hole Log

Soil Profile and Description

Soil types are described by the Modified Unified Soil Classification System. (See Plate 2 for terms and symbols)

Soils classified by particle size fall in the following ranges:

BOULDERS - greater than 200 mm	SAND - 0.08 mm to 5 mm
COBBLES - 75 mm to 200 mm	SILT - 0.002 mm to 0.08 mm
GRAVEL - 5 mm to 75 mm	CLAY - finer than 0.002 mm

Additional graphic symbols include:

⟶	seepage
⧖	water level surface

Soil Sample Type

	Standard Penetration Sample (D)
	Undisturbed Sample (Shelby) (U)
B	Bag Sample

Penetration Resistance

Field test indication number of blows (N) of a 140 pound hammer dropping 30 inches (76cm) required to drive a 2 inch (5 cm) O.D. open end sampler a distance of 1 foot (30 cm) from 0.5 to 1.5 feet (15 to 45 cm) into the undisturbed soil. This test is outlined in A.S.T.M., D1568.

Miscellaneous Tests

In this column are summarized results of all the laboratory test as indicated by the following symbols:

HVR	Hydrocarbon Vapour Readings, ppm or % LEL
* MA	Mechanical grain size analysis
G	Specific gravity
k	Coefficient of permeability
PP	Pocket penetrometer strength kg/cm2
* q	Triaxial compression test
* C	Consolidation test
Qu	Unconfined compressive strength kg/cm2
SO_4	Soluble sulphate concentration
γ	Bulk unit weight
γd	Dry unit weigh

* Tests normally summarized on separate data sheets

Modified Unified Classification System For Soils

Major Division			Group Symbol	Graph Symbol	Color Code	Typical Description	Laboratory Classification Criteria	
Coarse-Grained Soils (more than half by weight larger than 200 sieve)	Gravels more than half coarse grains larger than No. 4 sieve	Clean Gravels (little or no fines)	GW		Red	Well graded gravels, little or no fines	$C_U = (D_{60}/D_{10}) > 6$ $C_c = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			GP		Red	Poorly graded gravels, and gravel sand mixtures, little or no fines	Not meeting above requirements	
		Dirty Gravel (with some fines)	GM		Yellow	Silty gravels, gravel-sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			GC		Yellow	Clayey gravels, gravel-sand-(silt) clay mixtures		Above "A" line P.I. more than 7
	Sands more than half fine grains smaller than No. 4 sieve	Clean Sands (little or no fines)	SW		Red	Well graded sands, gravely sands, little or no fines	$C_U = (D_{60}/D_{10}) > 4$ $C_c = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			SP		Red	Poorly graded sands, little or no fines	Not meeting above requirements	
		Dirty Sands (with some fines)	SM		Yellow	Silty sands, sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			SC		Yellow	Clayey sands, sand-(silt) clay mixtures		Above "A" line P.I. more than 7
Fine-Grained s (more than half by weight passes 200 sieve)	Silts below "A" line negligible organic content	$W_L < 50\%$	ML		Green	Inorganic silts and very fine sands, rock flour, silty sands of slight plasticity	Classification is based upon plasticity chart	
		$W_L > 50\%$	MH		Blue	Inorganic silts, micaceous or diatomaceous, fine sandy or silty soils		
	Clays above "A" line negligible organic content	$W_L < 30\%$	CL		Green	Inorganic clays of low plasticity, gravelly, sandy, or silty clays, lean clays		
		$30\% < W_L < 50\%$	CI		Green-Blue	Inorganic clays of medium plasticity, silty clays		
		$W_L > 50\%$	CH		Blue	Inorganic clays of high plasticity		
	Organic Silts & Clays bellow "A" line on chart	$W_L < 50\%$	OL		Green	Organic silts and organic silty clays of low plasticity	Whenever the nature of the fine content has not been determined it is designated by the letter "F". E.G. SF is a mixture of sand with silt or clay	
		$W_L > 50\%$	OH		Blue	Organic clays of high plasticity		
Highly Organic Soils			PI		Orange	Peat and other highly organic soils	Strong color or odor, and often fibrous texture	

Bedrock Symbols

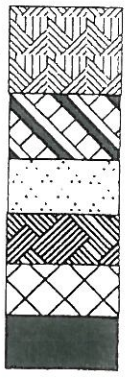
Bedrock (Undifferentiated)

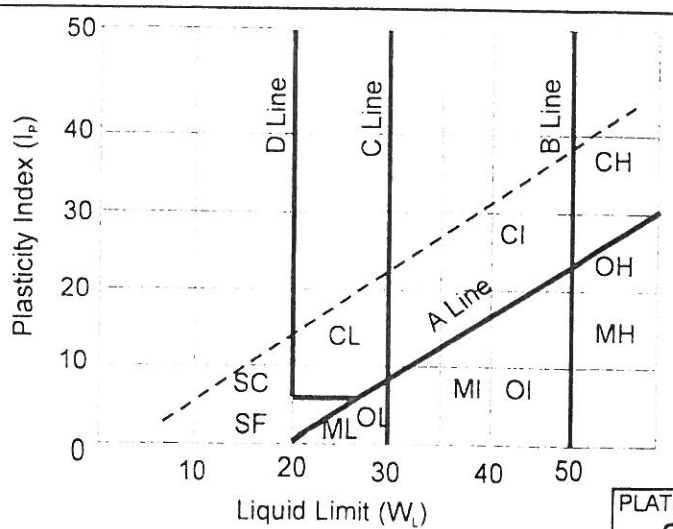
Shale

Sandstone

Siltstone

Coal





Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3

PLATE No. 2

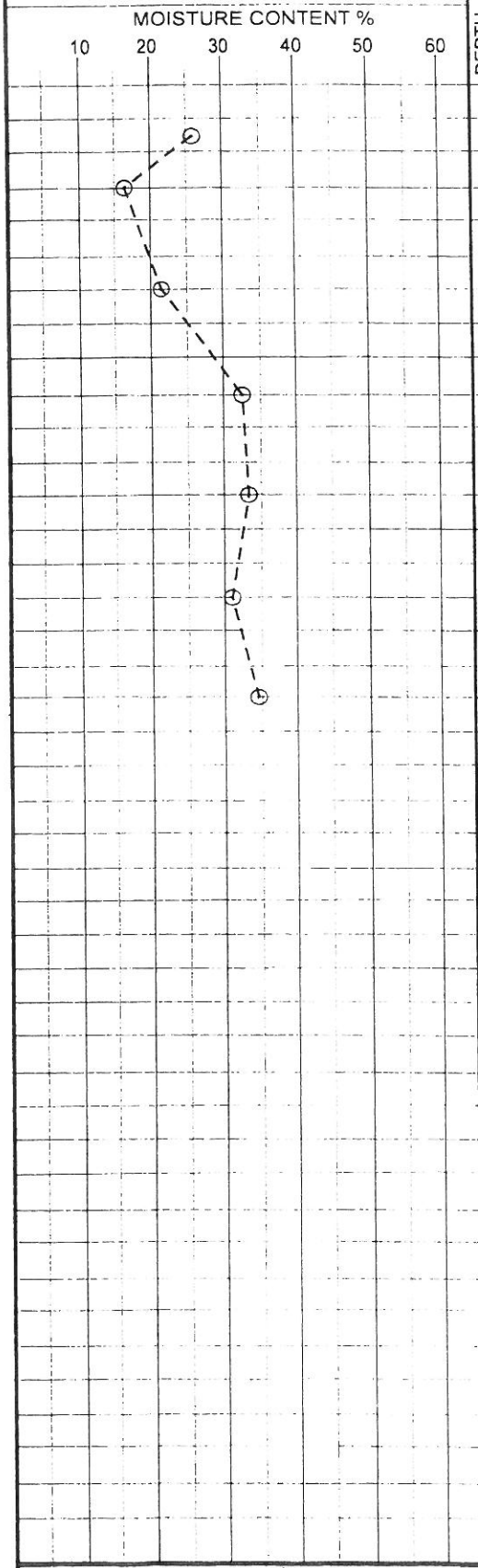
Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT	Nor Can Consulting Group Inc.
PROJECT	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No	H0907-280
DATE	August 4, 2009
TECH: MH	
TEST BORING	0

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DATUM:

SURFACE ELEVATION:

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
3	1				
6	2				SO_4 = 0.12%
					PP = 105 kPa
10	3				PP = 155 kPa
					PP =165 kPa
15	4				PP = 185 kPa
20	6				
25	7				
30	8				
	9				
	10				
35					

TOPSOIL; silty, some sand, compressible, black, 60 cm thick — 60 cm

CLAY; silty, sand, low plasticity, moist, stiff, brown — 90 cm

SAND; clayey, very moist, medium dense, light olive brown — 1.2 m

CLAY; silty, medium plasticity, stiff, moist, occasional silt lenses, dark olive brown

– stiff consistency

– stiff, high plasticity, dark olive brown

– no evidence of groundwater seepage — 4.5 m

End of Borehole = 4.5 m
Slough = 4.4 m, 0 hours
Water level = 4.4m (dry) , 0 hours
Water level = 2.0 m, 7 hours later
Slough = 3.0 m, 7 hours later
Water level = 2.0 m, 10 days later

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE

PLAT No. 3

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT	Nor Can Consulting Group Inc
PROJECT	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.	H0907-280
DATE	August 4, 2009
TECH.	MH

TEST BORING **09-2**

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

DRILL TYPE: B-40 Solid Stem Auger

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM / SURFACE ELEVATION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, dark brown, 20 cm thick — 20 cm				
		SILT; sandy, dry, loose, light yellowish brown — 70 cm				
3	1	**CLAY;** silty, very stiff, light olive brown — 1.7 m				SO_4 = 0.02% PP = 515 kPa
6	2	**SILT;** sandy, some clay, damp, loose, light olive brown				
10	3	– occasional clay lenses — 3.9 m				PP =155 kPa
	4	**CLAY;** silty, medium plasticity, damp, very stiff, dark olive brown – no evidence of groundwater seepage — 4.5 m				PP = 185 kPa
15	5	End of Borehole = 4.5 m Slough = 4.4 m, 0 hours Water level = 4.4m (dry) , 0 hours Water level = 4.4 m (dry), 7 hours later Slough = 4.4 m, 7 hours later Water level = 4.4 m (dry), 10 days later				
20	6					
	7					
25	8					
30	9					
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
⧗ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE

PLATE No. **4**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No: H0907-280

DATE: August 4, 2009

TECH: MH

TEST BORING 0'

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM:

SURFACE ELEVATION:

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, some sand, compressible, black, 20 cm thick — 20 cm				PP = 480 kPa
		CLAY; silty, medium plasticity, very stiff, damp to moist, light olive brown				PP = 325 kPa
3	1					
		– very stiff				PP = 155 kPa SO_4 = 0.14%
6	2					PP = 265 kPa
10	3	– very stiff, medium plasticity, dark olive brown				PP =150 kPa
						PP =185 kPa
	4	– occasional silt lenses – frequent rust stained fissures – no evidence of groundwater seepage — 4.5 m				
15						PP = 125 kPa
	5	End of Borehole = 4.5 m Slough = 4.4 m, 0 hours Water level = 4.4m (dry) , 0 hours Water level = 4.4 m (dry), 6.5 hours later Slough = 4.4 m, 6.5 hours later Water level = 4.4 m (dry), 10 days later				
20	6					
	7					
25						
	8					
30	9					
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLAT No 5

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

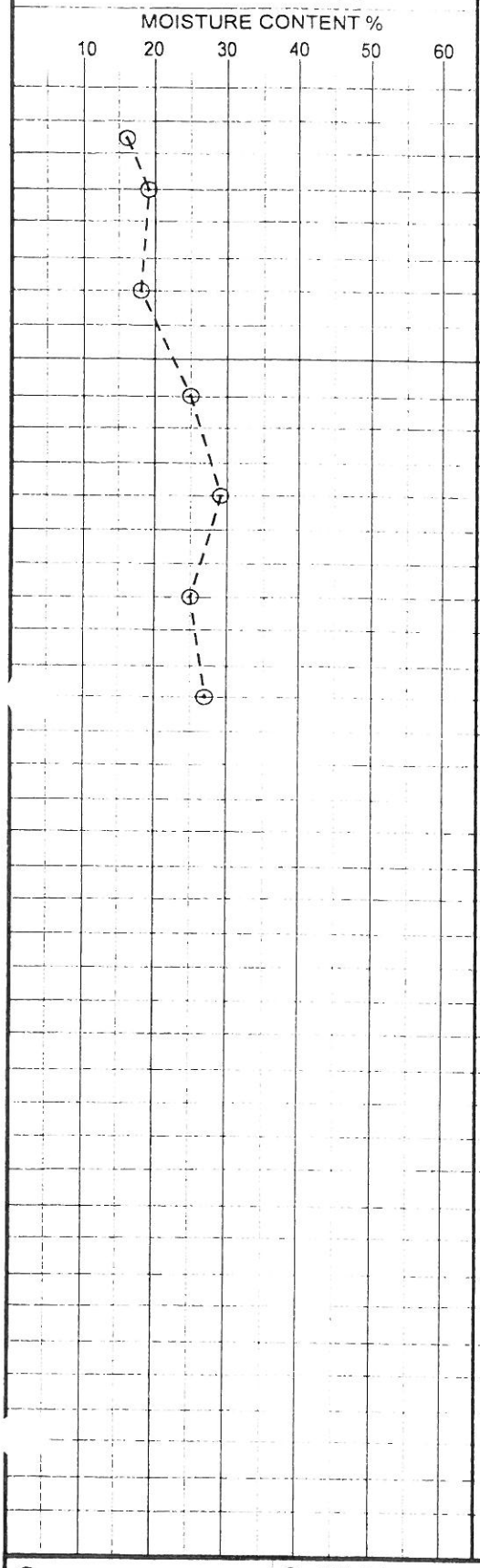
DATE: August 4, 2009

TECH: MH

TEST BORING 09-4

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

DATUM

SURFACE ELEVATION:

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
3	1				
6	2				
10	3				
	4				
15					
	5				
20	6				
	7				
25					
	8				
30	9				
	10				
35					

TOPSOIL; silty, clayey, compressible, black, 26 cm thick — 26 cm

SILT; sandy, some clay, dry, medium dense, light yellowish brown — 1.4 m

CLAY; silty, damp, very stiff, medium plasticity, occasional silt lenses, light olive brown — SO_4 = 0.16%

– very stiff, medium plasticity — PP = 170 kPa

– frequent silt lenses, dark olive brown — PP = 245 kPa

– medium plasticity, very stiff, damp — PP =395 kPa

– no evidence of groundwater seepage — 4.5 m — PP = 340kPa

End of Borehole = 4.5 m

Slough = 4.4 m (dry), 0 hours

Water level = 4.3 m (dry) , 0 hours

Water level = 2.0 m, 6.5 hours later

Slough = 4.4 m, 6.5 hours later

Water level = 2.0 m, 10 days later

TEST RESULTS

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. 6

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

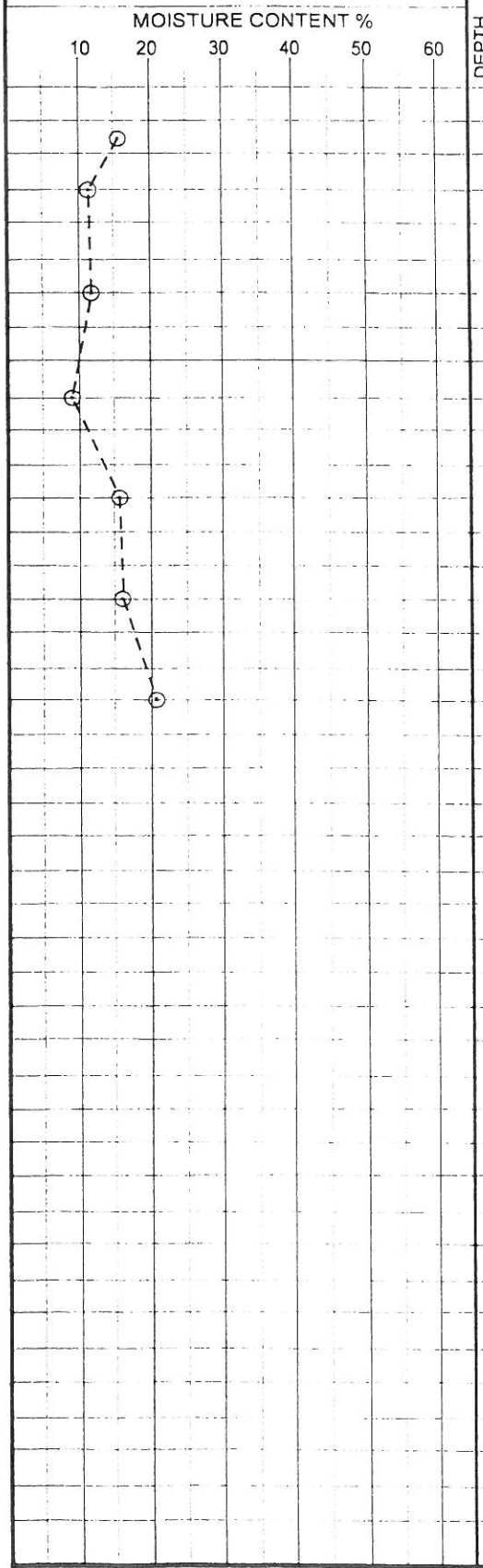
DATE: August 4, 2009

TECH: MH

TEST BORING **09-5**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: SURFACE ELEVATION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, dark brown, 18 cm thick — 18 cm				
3	1	**CLAY;** silty, very stiff, damp, medium plasticity, light olive brown — 1.0 m				PP = 280 kPa SO_4 = 0.08%
		SILT; clayey, some sand, dry, loose, light yellowish brown				
6	2	– medium dense, damp				
10	3	– clay lense from 4.1 to 4.3 m				
	4	– clay lense from 4.1 to 4.3 m				
		– no evidence of groundwater seepage — 4.5 m				
15	5	End of Borehole = 4.5 m Slough = 4.4 m (dry), 0 hours Water level = 4.3 m (dry) , 0 hours Water level = 4.3 m (dry), 6.5 hours later Slough = 4.3 m, 6.5 hours later Water level = 4.3 m (dry), 10 days later				
20	6					
	7					
25						
	8					
30	9					
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No 7

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No: H0907-280
DATE: August 4, 2009
TECH: MH

TEST BORING 09-6

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %
10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM

SURFACE ELEVATION

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
3	1				
6	2				SO_4 = 0.10%
10	3				
15	4				
20	6				
25	8				
30	9				
35	10				

TOPSOIL; silty, some clay, dry, compressible, dark brown, 18 cm thick — 18 cm

SILT; sandy, some clay, dry, desiccated, occasional clay lenses, light yellowish brown

– dry to damp, medium dense

– light yellowish brown, dry

– medium dense, light yellowish brown

– no evidence of groundwater seepage — 4.5 m

End of Borehole = 4.5 m
Slough = 4.5m (dry), 0 hours
Water level = 4.5 m (dry) , 0 hours
Water level = 4.3 m (dry), 6.5 hours later
Slough = 4.3 m, 6.5 hours later
Water level = 4.3 m (dry), 10 days later

TEST RESULTS

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT
Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT
SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE
STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE

PLATE No 8

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue Edmonton Alberta T5A 0M3

CLIENT	Nor Can Consulting Group Inc
PROJECT	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No	H0907-280
DATE	August 4, 2009

TEST BORING 05

TECH MH

DRILL TYPE B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM / SURFACE ELEVATION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, dark brown, 14 cm thick — 14 cm				
		SILT; sandy, some clay, dry, loose, light yellowish brown				SO_4 = 0.08%
3	1					
		– dry, loose, light yellowish borwn				
6	2					
10	3					
		– more clay with depth, dark olive brown				
	4	– loose to medium dense				
		– no evidence of groundwater seepage — 4.5 m				
15	5	End of Borehole = 4.5 m Slough = 4.3 m (dry), 0 hours Water level = 4.3 m (dry) , 0 hours Water level = 4.3 m (dry), 6.5 hours later Slough = 4.3 m, 6.5 hours later Water level = 4.3 m (dry), 10 days later				
20	6					
	7					
25						
	8					
30	9					
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. 9

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT	Nor Can Consulting Group Inc
PROJECT	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No	H0907-280
DATE	August 4, 2009
TECH	MH

TEST BORING **09-8**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM

SURFACE ELEVATION

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
					TOPSOIL; silty, some sand, compressible, dark brown, 7 cm thick 7 cm
					CLAY; silty, damp, very stiff, medium plasticity, occasional silt lenses, dark olive brown
3	1				PP = 295 kPa
					PP = 255 kPa SO_4 = 0.02%
6	2				– stiff to very stiff
					PP = 165 kPa
10	3				– softer with depth, medium plasticity
					PP = 155 kPa
					PP = 235 kPa
	4				– occasional silt lenses, dark olive brown
					– no evidence of groundwater seepage 4.5 m
15					PP = 210 kPa
	5				End of Borehole = 4.5 m Slough = 4.4 m (dry), 0 hours Water level = 4.4 m (dry) , 0 hours Water level = 4.4 m (dry), 6 hours later Slough = 4.4 m, 6 hours later Water level = 4.4 m (dry), 10 days later
20	6				
	7				
25					
	8				
30	9				
	10				
35					

TEST RESULTS

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_o DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **10**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

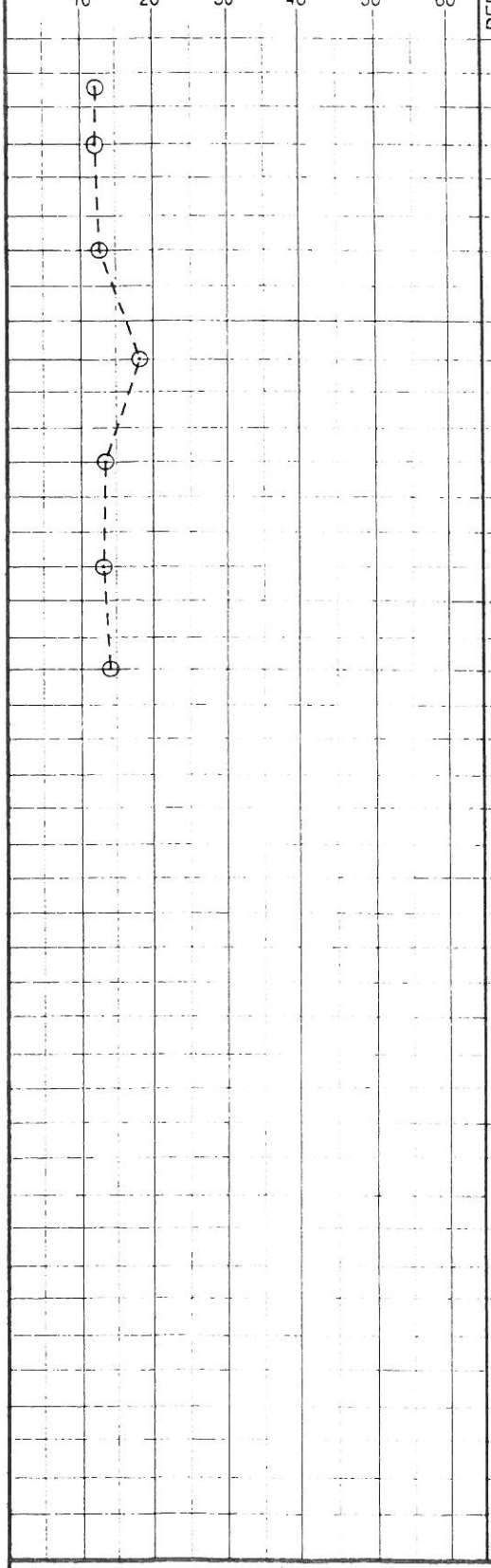
CLIENT: Nor Can Consulting Group Inc.
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.: H0907-280
DATE: August 4, 2009
TECH: MH

TEST BORING 09-9

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM / SURFACE ELEVATION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; clayey, silty, dry, compressible, dark brown, 12 cm thick — 12 cm				
		SILT; some sand, clayey, dry, light yellowish brown				
3	1					
		– clay lense from 1.6 to 1.8 m				SO_4 = 0.04%
6	2					
		– clay lense from 2.5 to 2.7 m				
10	3					
		– damp, medium dense, light olive brown				
	4					
		– no evidence of groundwater seepage — 4.5 m				
15	5	End of Borehole = 4.5 m Slough = 4.4 m (dry), 0 hours Water level = 4.4 m (dry), 0 hours Water level = 4.2 m, 6 hours later Slough = 4.2 m, 6 hours later Water level = 4.2 m (dry), 10 days later				
20	6					
	7					
25						
	8					
30	9					
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE

PLATE No. 11

Hagstrom Geotechnical Services Ltd.

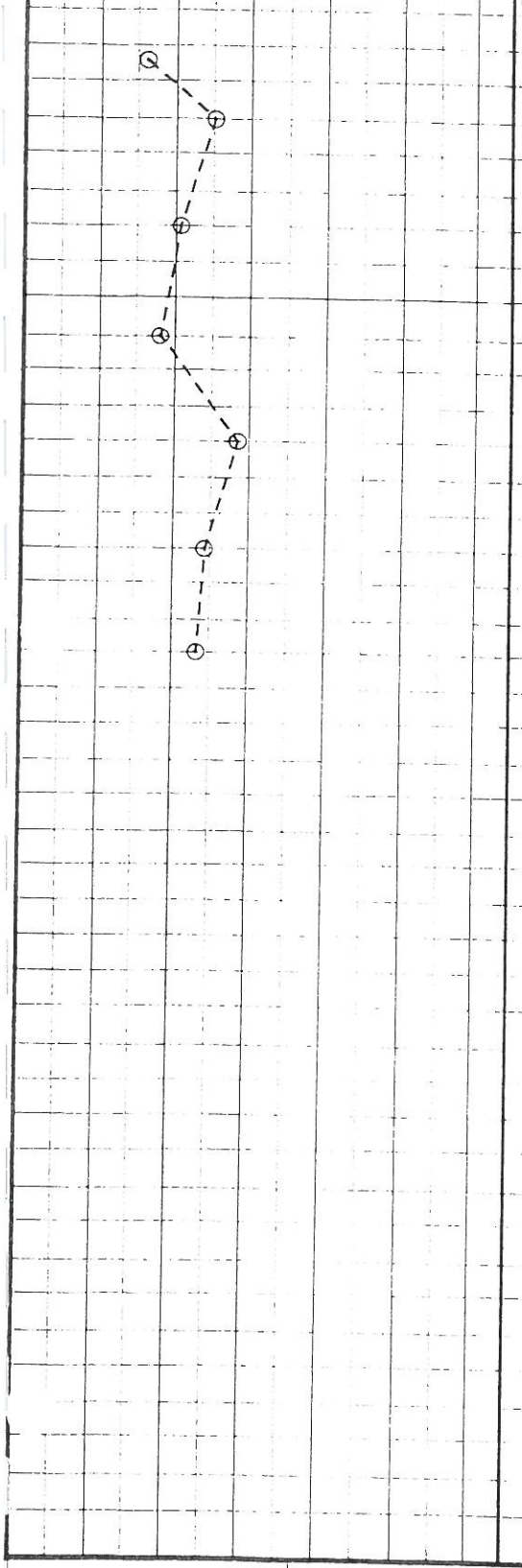
5607 - 134 A Avenue Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc.
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No: H0907-280
DATE: August 4, 2009
TECH: MH

TEST BORING **09-10**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM / SURFACE ELEVATION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, black, 56 cm thick				PP = 520 kPa
		56 cm				
3	1	**CLAY**; silty, medium plasticity, very stiff, damp, occasional silt lenses, dark olive brown				PP = 450 kPa
		– very stiff, frequent rust staining				PP = 230 kPa SO_4 = 0.12%
6	2					PP = 190 kPa
10	3	– stiff to very stiff				PP = 210 kPa
		4.2 m				
	4	**SAND**; fine grained, some clay, medium dense, dark olive brown				PP = 180 kPa
		– free water, loose				
15		4.5 m				
	5	End of Borehole = 4.5 m Slough = 4.4 m (dry), 0 hours Water level = 4.3 m, 0 hours Water level = 4.3 m (dry), 5.5 hours later Slough = 4.3 m, 5.5 hours later Water level = 4.3 m (dry), 10 days later				
20	6					
	7					
25						
	8					
30	9					
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
BAG SAMPLE

PLATE No. **12**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue Edmonton, Alberta T5A 0M3

CLIENT	Nor Can Consulting Group Inc
PROJECT	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No	H0907-280
DATE	August 4, 2009
TECH.	MH

TEST BORING 0

DRILL TYPE B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM

SURFACE ELEVATION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
					SO_4 = 0.02%
3	1				
6	2				
10	3				
	4				
15					
	5				
20	6				
	7				
25					
	8				
30	9				
	10				
35					

TOPSOIL; silty, dry, some clay, compressible, dark brown, 19 cm thick — 19 cm

SILT; sandy, some clay, loose, dry, light yellowish brown

– frequent rust staining

– dry, very dense

– clayey, dry, medium dense to dense

– light olive brown

– no evidence of groundwater seepage — 4.5 m

End of Borehole = 4.5 m
Slough = 4.4 m (dry), 0 hours
Water level = 4.4 m (dry), 0 hours
Water level = 4.4 m (dry), 5.5 hours later
Slough = 4.4 m, 5.5 hours later
Water level = 4.4 m (dry), 10 days later

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLAT No 1

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No: H0907-280

DATE: August 4, 2009

TECH: MH

TEST BORING 09-12

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

DATUM:

SURFACE ELEVATION

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS	SOIL PROFILE & DESCRIPTION
						TOPSOIL; silty, dry, desiccated, compressible, dark brown, 16 cm thick — 16 cm
						SILT; sandy, some clay, medium dense, light yellowish brown
3	1					
					SO_4 = 0.14%	
6	2					– damp, medium dense
10	3					– medium dense to dense, dark olive brown
	4					– dense, occasional clay lenses
15						– no evidence of groundwater seepage — 4.5 m
	5					End of Borehole = 4.5 m Slough = 4.5 m (dry), 0 hours Water level = 4.5 m (dry), 0 hours Water level = 4.4 m (dry), 5.5 hours later Slough = 4.4 m, 5.5 hours later Water level = 4.4 m (dry), 10 days later
20	6					
	7					
25						
	8					
30	9					
	10					
35						

TEST RESULTS

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No 14

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

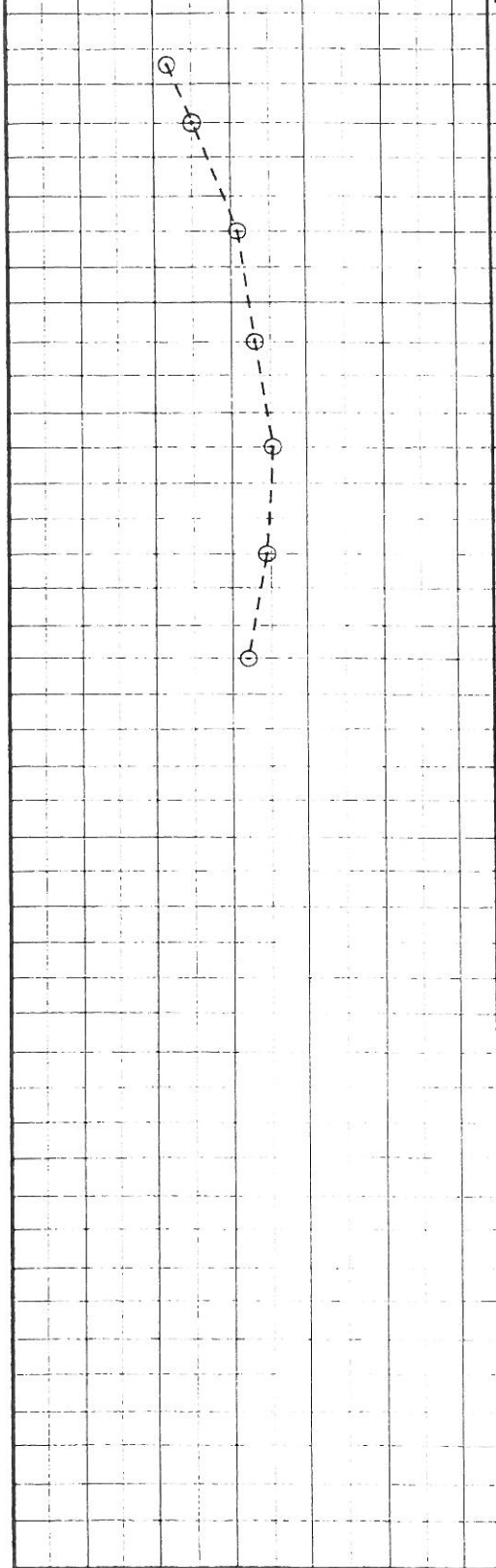
CLIENT	Nor Can Consulting Group Inc
PROJECT	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No	H0907-280
DATE	August 4, 2009
TECH	MH

TEST BORING 09-13

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %



SOIL PROFILE & DESCRIPTION

DATUM

SURFACE ELEVATION

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
					TOPSOIL; silty, damp, compressible, some sand, black, 52 cm thick 52 cm
					CLAY; silty, medium plasticity, damp, very silty, occasional silt lenses, dark olive brown
3	1				PP = 325 kPa
					PP = 310 kPa SO_4 = 0.08%
6	2				– very stiff, medium plasticity
					PP = 175 kPa
					– occasional rust stained fissures
	3				– softer with depth, moist
10					PP = 160 kPa
					PP = 150 kPa
	4				– medium to high plasticity, dark grey
					– no evidence of groundwater seepage 4.5 m
15					PP = 235
	5				End of Borehole = 4.5 m Slough = 4.5 m (dry), 0 hours Water level = 4.5 m (dry), 0 hours Water level = 4.3 m (dry), 5 hours later Slough = 4.3 m, 5 hours later Water level = 4.3 m (dry), 10 days later
20	6				
	7				
25					
	8				
30	9				
	10				
35					

TEST RESULTS

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLAT No 15

Hagstrom Geotechnical Services Ltd.

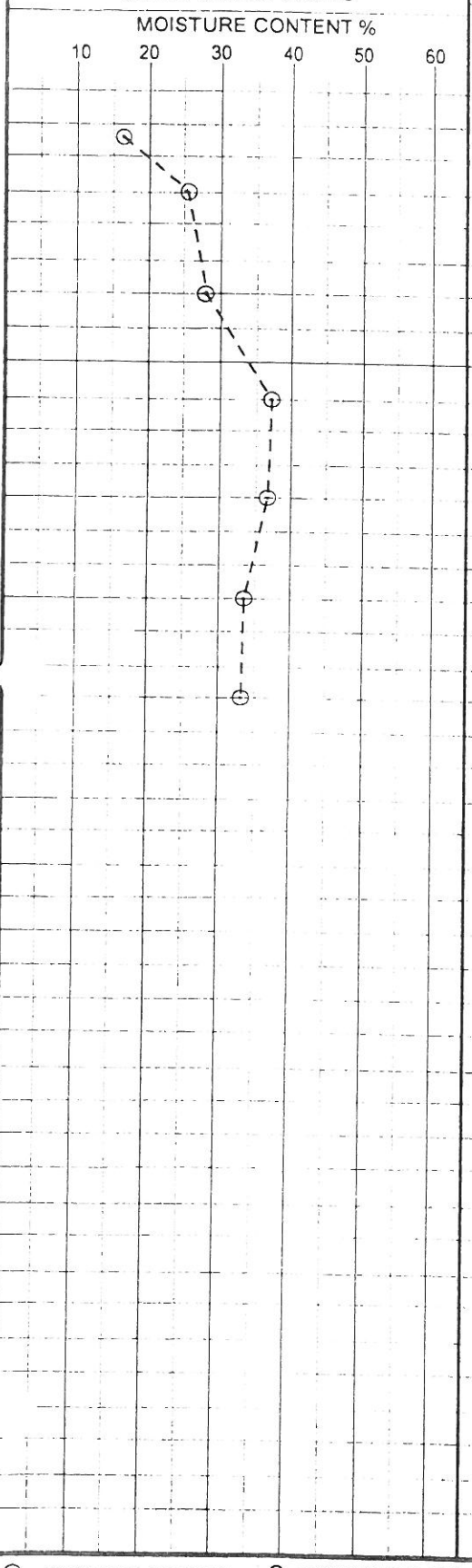
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT	Nor Can Consulting Group Inc
PROJECT	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No	H0907-280
DATE	August 4, 2009
TECH	MH

TEST BORING **09-14**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

DATUM

SURFACE ELEVATION

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS	TEST RESULTS
						PP = 580 kPa
3	1					PP = 480 kPa SO_4 = 0.10%
6	2					PP = 240 kPa
10	3					PP = 100 kPa
15	4					PP = 80 kPa
20	6					PP = 100 kPa
25	7					PP = 70 kPa
30	8					
35	9					
	10					

TOPSOIL; silty, compressible, damp, dark brown, 28 cm thick — 28 cm

CLAY; silty, medium plasticity, damp, very stiff, occasional silt lenses, dark olive brown

– very stiff, occasional silt lenses

– softer with depth

– soft to firm, light olive brown
– groundwater seepage
– softer with depth, dark olive brown at 4.2 m

4.5 m

End of Borehole = 4.5 m
Slough = 4.5 m (dry), 0 hours
Water level = 4.1 m, 0 hours
Water level = 2.9 m, 5 hours later
Slough = 4.2 m, 5 hours later
Water level = 3.0 m, 10 days later

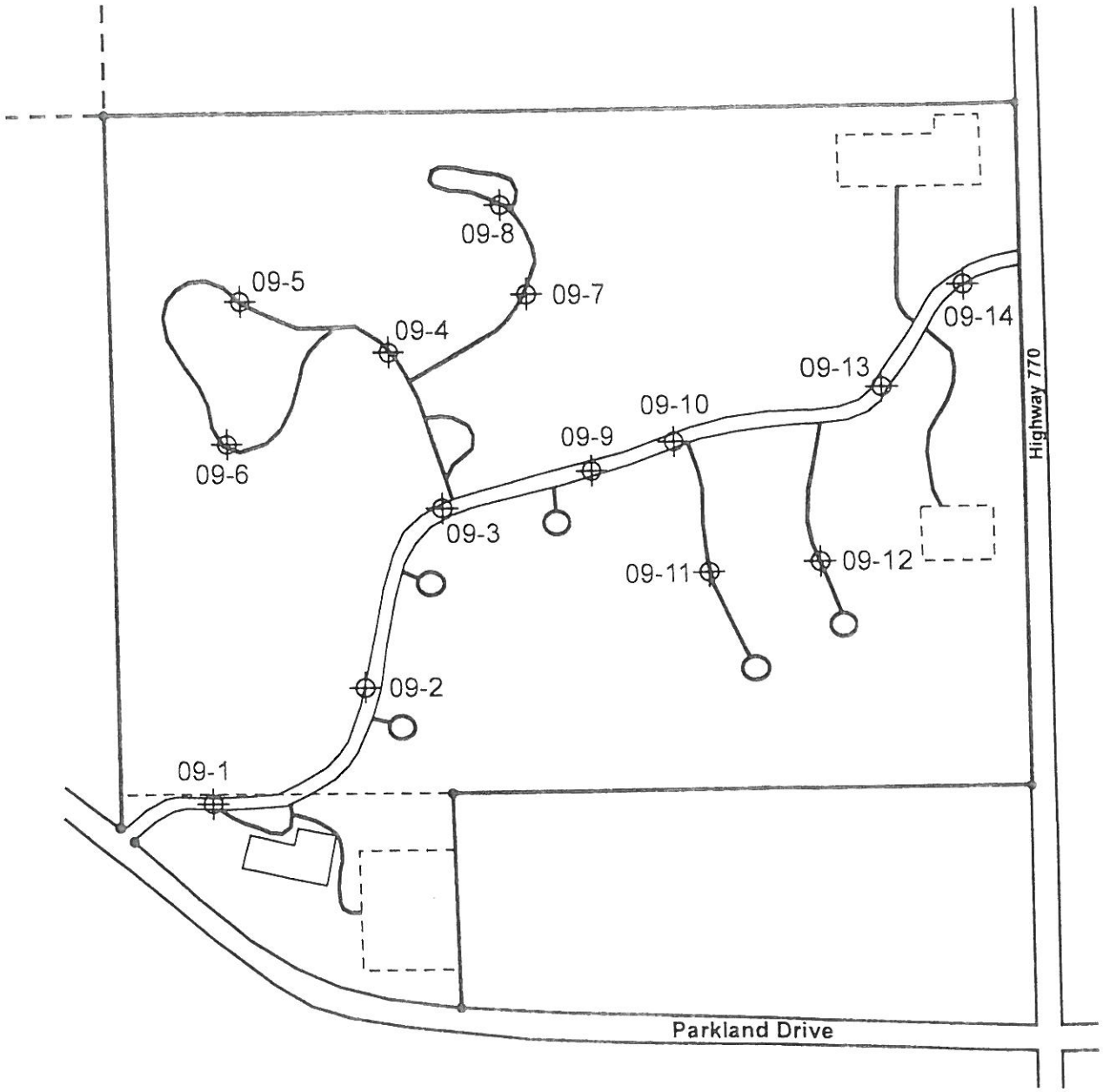
⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

STANDARD PENETRATION SAMPLE
UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **16**



LEGEND

- Borehole Location
- Site Boundary

Scale: Not to Scale

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

NOR CAN CONSULTING INC.
Proposed Country Residential Subdivision - Fawn Meadows
Portions of NE & SE 4-53-2-W5M,
Parkland County, Alberta
Site Plan

Job No: H0907-280	Date: August 10, 2009	Plate: 17

Hagstrom Geotechnical Services Ltd.
5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3
Tel: (780) 996-5621 • Fax: (780) 475-5671
e-mail: h_gsl@telus.net

Norcan Consulting Group Ltd.
Box 38, Site 219, RR2
Gravel, Alberta
T0E OH0

March 1, 2012
Our File: H0907-280

Attention: **Mr. Frank Florkewich**

Dear Sirs:

Re: Geotechnical Site Investigation
For Proposed Facilities
Proposed Country Residential Subdivision
Fawn Meadows
Portions of NE and SE 4-53-2-W5M
Parkland County, Alberta

1.0 INTRODUCTION

As requested, a geotechnical site investigation was carried out by Hagstrom Geotechnical Services Ltd. (HGSL) at the above referenced project. The scope of work for the investigation was to provide an assessment of the soil and groundwater conditions, provide recommendations for alternate foundation systems and preparation of this report. Field drilling was carried out on August 4, 2009 and final water table measurements were taken on October 14, 2009.

2.0 PROJECT DESCRIPTION

The proposed country residential subdivision contains about 52.6 hectares of agricultural land that occupies a portion of the northeast and southeast quarters of Section 4, Township 53, Range 2, West of the Fifth Meridian. The site is bounded on the east by Highway 770 and on the south by Parkland Drive. The site is open, vacant hayland and contains four large groups of trees and marshes that cover about 30 to 35 percent of the site. The site topography is moderately rolling with slopes typically less than 12 degrees (21 percent). No definite drainage pattern is apparent across the site.

It is understood that the proposed development is to consist of cluster type lots of about 55 to 60 residential lots varying in size from 1.0 to 2.5 acres. It is further understood that the development will be serviced with centralized municipal sanitary sewers and potable water systems. In addition, the proposed subdivision will consist of a community services building located in the south west corner, a water treatment plant and maintenance building in the south east corner and a seniors assisted living complex located in the north east corner. The size and

details of each facility were not finalized at the time of report submission.

3.0 INVESTIGATION PROCEDURE

Six deep boreholes were drilled on the site on August 4, 2009. Borehole 09-101and 09-102 were drilled at the proposed services building, Boreholes 09-13 and 09-104 were drilled at the proposed water treatment plant/maintenance building and Boreholes 09-105 and 09-106 were drilled at the proposed seniors assisted living complex (Refer to Plate 109, Appendix A). It is noted that Boreholes 09-105 and 09-106 could not be drilled within the building footprint because of heavy tree cover. The boreholes were drilled to depths of 9.0 metres using a truck mounted drill rig equipped with a continuous flight, 150-millimeter diameter, solid-stem augers. Supervision of drilling, soil sampling, and logging of the various soil strata was performed by Mr. Merle Hagstrom, P. Eng of HGSL. The soils encountered during drilling were classified in accordance with the Modified Unified Soil Classification System described on Plates 1 and 2, Appendix A. The soil and groundwater conditions encountered during field drilling were recorded and are presented on borehole logs, Plates 103 to108, Appendix A. The borehole locations are presented on Plate 109, Appendix A.

Soil sampling for laboratory analysis generally consisted of disturbed auger soil samples at 0.75 meter intervals obtained from all boreholes. In addition, pocket penetrometer (PP) readings were taken on intact cohesive soil samples at approximately 0.75 metre intervals from all boreholes to obtain an indication of the unconfined compressive strength (Q_u) of the soil.

Groundwater conditions were monitored during drilling, at drilling completion, several hours later and 10 days after drilling completion. All of the water level results are presented on the boreholes logs in Appendix A.

In addition to the routine moisture content analysis, the laboratory analyses consisted of twelve soluble sulphates analyses and two Atterberg limit tests. The laboratory analyses results are presented on the borehole logs in Appendix A.

4.0 SUBSOIL AND GROUNDWATER CONDITIONS

The soil profile at the borehole locations generally consist of a thin cover of topsoil over variable thick layers of silt and clay. A thin layer of sand was encountered below the topsoil in one borehole. A description of various soil units and their properties are presented in the paragraphs below.

Topsoil was encountered at the ground surface in all boreholes and extended to depths between 18 and 67 centimeters. The topsoil was described as silty, dry to damp, with some sand, compressible and black in colour. Greater thickness of topsoil may be found between borehole locations.

Clay of variable thickness was encountered at random depths in all boreholes. The clay was described as silty, firm to hard consistency, low to medium plasticity, damp to very moist, brown to dark olive brown in colour. The clay was also noted to have frequent silt lenses with

rust staining and occasional gravel chips. In-situ moisture contents in the clay ranged from 11 to 34 percent. Pocket penetrometer readings taken on intact auger samples of clay revealed approximate unconfined compressive strengths Q_u, ranging from 90 to 515 kPa. Two Atterberg limit tests conducted on clay yielded liquid limits of 44 and 45 percent and plastic limits of 21 and 22 percent (medium plasticity). Based on a review of plastic limits in comparison with the natural moisture contents in the clay, the natural moisture contents are about 5 to 10 percent wet of optimum moisture content (OMC). The clay exhibits moderate compressibility under low to moderate loads. The clay also exhibits moderate swelling potential and thus may lift light loads such as floor slabs given access to free water.

Silt was encountered at variable depths in three of the six boreholes. The site was described as sandy, with some clay, damp to very moist, and pale olive brown to dark grey in colour. Below the groundwater table, the silt was noted to be very sensitive. In-situ moisture contents in the silt ranged from 12 to 32 percent. Pocket penetrometer readings taken on intact auger samples of silt revealed approximate unconfined compressive strengths Q_u, ranging from 115 to 185 kPa. The silt exhibits moderate compressibility under low to moderate loads.

Groundwater conditions were monitored during drilling, at drilling completion, several hours later and 10 days after drilling completion. Groundwater seepage was encountered during drilling in all six boreholes. All water table results are summarized in Table 1, below and the individual results are presented on the borehole logs in Appendix A.

TABLE 1: SUMMARY OF GROUNDWATER OBSERVATIONS

Borehole Number	Depth of Groundwater Seepage (m)	Depth to Water (m)		
		At Drilling Completion	2 to 5 Hours Later	10 Days Later
09-101	4.1	8.7	5.1	4.0
09-102	4.2	6.7	3.8	3.7
09-103	3.6	6.7	2.6	2.4
09-104	8.0	8.8	8.7	5.8
09-105	7.8	5.5	5.5	2.0
09-106	7.0	8.7	8.6	8.6

Based on a review of the above results, the groundwater table is considered to be variable across the site. The results indicate that groundwater may pose problems for caisson pile drill holes and other excavations that are left open for short and extended periods of time at depths below 2.0

metres.

It should be noted that groundwater levels will fluctuate seasonally and in response to climatic conditions and may be at a different depths when construction commences. Accordingly, groundwater levels should be monitored periodically until the start of construction.

4.1 FROST PENETRATION

The expected maximum depth of frost penetration for various soil types is given in Table 2, below. The penetration is based on a freezing index for a 25-year return period of 2200 degrees-days Celsius. The depth of frost penetration assumes a uniform soil type without topsoil or snow cover.

The native mineral soils encountered in the boreholes is considered to be frost susceptible, and with an adequate supply of moisture near the ground surface, significant frost heave may occur.

TABLE 2
ESTIMATED DEPTH OF FROST PENETRATION

Soil Type		Depth of Frost Penetration (m)
In-situ	Clay and Clay Till	2.5
	Silt and Sand	2.9
	Weathered Bedrock	3.0
	Gravel	3.5
Compacted Backfill (95 % SPMDD*)	Clay and Clay Till	2.3
	Silt and Sand	2.7
	Weathered Bedrock	2.9
	Gravel	3.3

*SPMDD- Standard Proctor Maximum Dry Density

5.0 GEOTECHNICAL EVALUATION

All foundation design recommendations presented in this report are based on the assumption that an adequate level of construction monitoring during foundation excavation and installation will be provided, and that all construction will be carried out by a suitably qualified, experienced contactor. An adequate level of construction monitoring is considered to be: (a), design review and full-time monitoring during construction of foundations, and (b), full-time monitoring and compaction testing for earthworks by suitably qualified geotechnical personnel.

The soil conditions at the site are considered to be adequate for the proposed site facilities. The groundwater table is considered to be moderately high. Shallow foundations such as strip and spread footings can be considered for the site. Alternatively, deep foundations such as cast-in-place straight shaft or end bearing concrete piles may be considered.

5.1 SHALLOW FOUNDATIONS

Shallow concrete footings for all three facilities founded on the native mineral soil should be designed based on a net allowable bearing capacity of 90 and 120 kPa for strip and spread footings, respectively. This value utilizes a factor of safety of 3.0. The allowable bearing pressure may be increased by a factor of 1.5 to obtain a factored ultimate bearing resistance. The footings should be constructed at a minimum depth of 1.5 m and 2.5 metres below exterior grade for heated and unheated structures, respectively. It is recommended that footing excavations be inspected by a qualified geotechnical engineer prior to pouring concrete to confirm foundation soil conditions and bearing pressures.

All footings should be founded on the undisturbed, inorganic native mineral soil. Footings must not be placed on any topsoil, uncontrolled fill, organic soils or loose, disturbed or frozen soils. Footing excavations must be protected from frost, desiccation, or the ingress of water. Bearing soils, which become frozen, dried or softened, should be removed and replaced with concrete or the footings should be extended to reach soil in an unaffected condition. It is essential that the foundation soils not be allowed to freeze at any time before or after concrete for the footings have been placed.

5.2 DEEP FOUNDATIONS

Cast-in-place concrete piles can be considered for all three proposed facilities and should be designed as straight shaft concrete friction-type piles using allowable and factored skin friction parameters shown in Table 3, below. No allowance should be made for end bearing on straight shaft piles.

Concrete straight shaft piles should be embedded at least 6.0 and 7.5 metres below grade for heated and unheated foundations, respectively. The minimum center-to-center spacing for concrete cast-in-place piles should be greater than 3 pile diameters. The piles should be at least 400 mm in diameter. Void form that is approximately 100 millimetres thick should be used under a concrete grade beam or pile cap.

TABLE 3
ALLOWABLE SKIN FRICTION FOR CAST-IN-PLACE CONCRETE PILES

Depth Below Existing Grade (m)	Soil Type	Allowable Skin Friction (kPa)	Factored ULS Skin Friction (kPa)
0 to 1.5	Clay/ Silt/Sand	0	0
1.5 to 9.0	Clay/Silt/Sand	21	28

Longitudinal steel reinforcement in the upper 6.0 meters of the pile is recommended to prevent potential uplift forces of the pile due to frost action and seasonal moisture variations. If the piles are designated as tension elements including frost action, longitudinal reinforcing steel should extend into the bottom of the piles, and the piles should be designed to resist the anticipated uplift stresses using the design values provided below.

Concrete for piles should be poured immediately after drilling of the pile hole to reduce the risk of groundwater seepage and sloughing of the soil. Protective steel casing may be required where wet sand and groundwater seepage are encountered.

5.2.1 Settlement Considerations for Concrete Piles

Calculation of the potential settlement pattern is complex and difficult to assess without significant additional laboratory testing and detailed knowledge of the loading and foundation types. For structures supported on native, undisturbed soil, the following comments may be of some value:

- The settlement of an isolated cast-in-place concrete skin friction pile should be no more than 5 mm plus elastic compression of the pile upon full mobilization of shaft resistance.

Differential settlements, rather than total settlements, are usually the governing factor in structural and architectural design. Differential settlements between adjacent columns or wall units are typically about one-half of the values given above.

5.3 SEISMIC SITE CLASSIFICATION

Site classification for soil seismic response for this site is category "D" which is according to the requirements of the National Building Code of Canada (Table 4.1.8.4.A).

5.4 CONCRETE

Chemical testing for water-soluble sulphates concentrations on twelve selected samples of native soil revealed sulphate concentrations of 0.02 to 0.18 percent water-soluble sulphate by dry weight of soil. The results indicated a "negligible to moderate" potential for sulphate attack on concrete in contact with native soils at this site. Therefore, all concrete in contact with the native soils should be made from CSA Type 50 sulphate resistant cement possessing a minimum 56 days compressive strength of 30 MPa. The maximum water cement ratio should be 0.50. An air entrainment agent of 5 to 7 percent is recommended for improved workability and durability. If new fill is brought to the site, it should be tested for soluble sulphates to determine if Type 50 cement is required.

6.0 CLOSURE

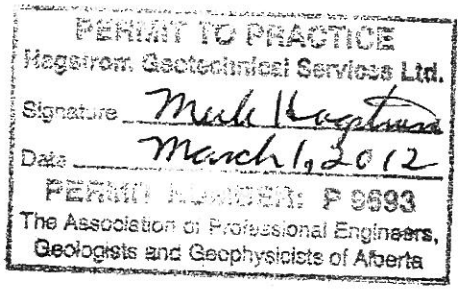
This report is based on the findings at six deep borehole locations. Should different subsoil or groundwater conditions be encountered during construction, Hagstrom Geotechnical Services Ltd. must be notified immediately and the recommendations provided herein will be reviewed and revised as required.

Boreholes could not be drilled within the building footprint for the new seniors assisted living complex and thus is recommended that new boreholes be drilled within the new building footprint. In addition, if the other building locations are changed, it is recommended that new boreholes be drilled. During placement and compaction of new fill, soil compaction tests should

be carried out by a geotechnical engineering firm for all three facilities.

Should you have any questions or require additional information, do not hesitate to contact our office at (780) 996-5621.

Yours truly,
Hagstrom Geotechnical Services Ltd.



Merle Hagstrom, B.Sc. P. Eng.
Senior Engineer

Distribution: (4) addressee

Explanation of Field and Laboratory Test Data

The following pages are an explanation of the terms and symbols used in the Test Hole Log

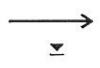
Soil Profile and Description

Soil types are described by the Modified Unified Soil Classification System.
(See Plate 2 for terms and symbols)

Soils classified by particle size fall in the following ranges:

BOULDERS - greater than 200 mm	SAND - 0.08 mm to 5 mm
COBBLES - 75 mm to 200 mm	SILT - 0.002 mm to 0.08 mm
GRAVEL - 5 mm to 75 mm	CLAY - finer than 0.002 mm

Additional graphic symbols include:



seepage
water level surface

Soil Sample Type

Standard Penetration Sample (D)

Undisturbed Sample (Shelby) (U)

Bag Sample

Penetration Resistance

Field test indication number of blows (N) of a 140 pound hammer dropping 30 inches (76cm) required to drive a 2 inch (5 cm) O.D. open end sampler a distance of 1 foot (30 cm) from 0.5 to 1.5 feet (15 to 45 cm) into the undisturbed soil. This test is outlined in A.S.T.M., D1568.

Miscellaneous Tests

In this column are summarized results of all the laboratory test as indicated by the following symbols:

HVR	Hydrocarbon Vapour Readings, ppm or % LEL
* MA	Mechanical grain size analysis
G	Specific gravity
k	Coefficient of permeability
PP	Pocket penetrometer strength kg/cm2
* q	Triaxial compression test
* C	Consolidation test
Qu	Unconfined compressive strength kg/cm2
SO_4	Soluble sulphate concentration
γ	Bulk unit weight
γd	Dry unit weigh

* Tests normally summarized on separate data sheets

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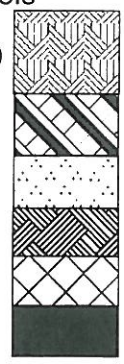
Modified Unified Classification System For Soils

Major Division			Group Symbol	Graph Symbol	Color Code	Typical Description	Laboratory Classification Criteria	
Coarse-Grained Soils (more than half by weight larger than 200 sieve)	Gravels more than half coarse grains larger than No. 4 sieve	Clean Gravels (little or no fines)	GW		Red	Well graded gravels, little or no fines	$C_U = (D_{60}/D_{10}) > 6$ $C_C = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			GP		Red	Poorly graded gravels, and gravel sand mixtures, little or no fines	Not meeting above requirements	
		Dirty Gravel (with some fines)	GM		Yellow	Silty gravels, gravel-sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			GC		Yellow	Clayey gravels, gravel-sand-(silt) clay mixtures		Above "A" line P.I. more than 7
	Sands more than half fine grains smaller than No. 4 sieve	Clean Sands (little or no fines)	SW		Red	Well graded sands, gravely sands, little or no fines	$C_U = (D_{60}/D_{10}) > 4$ $C_C = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			SP		Red	Poorly graded sands, little or no fines	Not meeting above requirements	
		Dirty Sands (with some fines)	SM		Yellow	Silty sands, sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			SC		Yellow	Clayey sands, sand-(silt) clay mixtures		Above "A" line P.I. more than 7
Fine-Grained Soils (more than half by weight passes 200 sieve)	Silts below "A" line negligible organic content	$W_L < 50\%$	ML		Green	Inorganic silts and very fine sands, rock flour, silty sands of slight plasticity	Classification is based upon plasticity chart	
		$W_L > 50\%$	MH		Blue	Inorganic silts, micaceous or diatomaceous, fine sandy or silty soils		
	Clays above "A" line negligible organic content	$W_L < 30\%$	CL		Green	Inorganic clays of low plasticity, gravelly, sandy, or silty clays, lean clays		
		$30\% < W_L < 50\%$	CI		Green-Blue	Inorganic clays of medium plasticity, silty clays		
		$W_L > 50\%$	CH		Blue	Inorganic clays of high plasticity		
	Organic Silts & Clays bellow "A" line on chart	$W_L < 50\%$	OL		Green	Organic silts and organic silty clays of low plasticity	Whenever the nature of the fine content has not been determined it is designated by the letter "F". E.G. SF is a mixture of sand with silt or clay	
		$W_L > 50\%$	OH		Blue	Organic clays of high plasticity		
Highly Organic Soils			PI		Orange	Peat and other highly organic soils	Strong color or odor, and often fibrous texture	

Bedrock Symbols



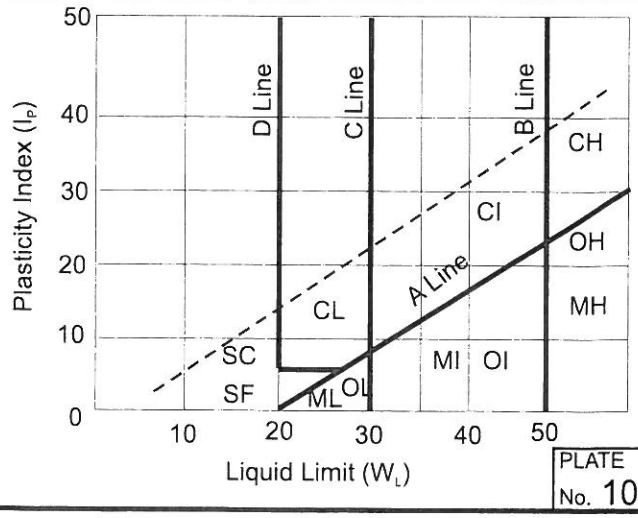


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PLATE No. 102

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

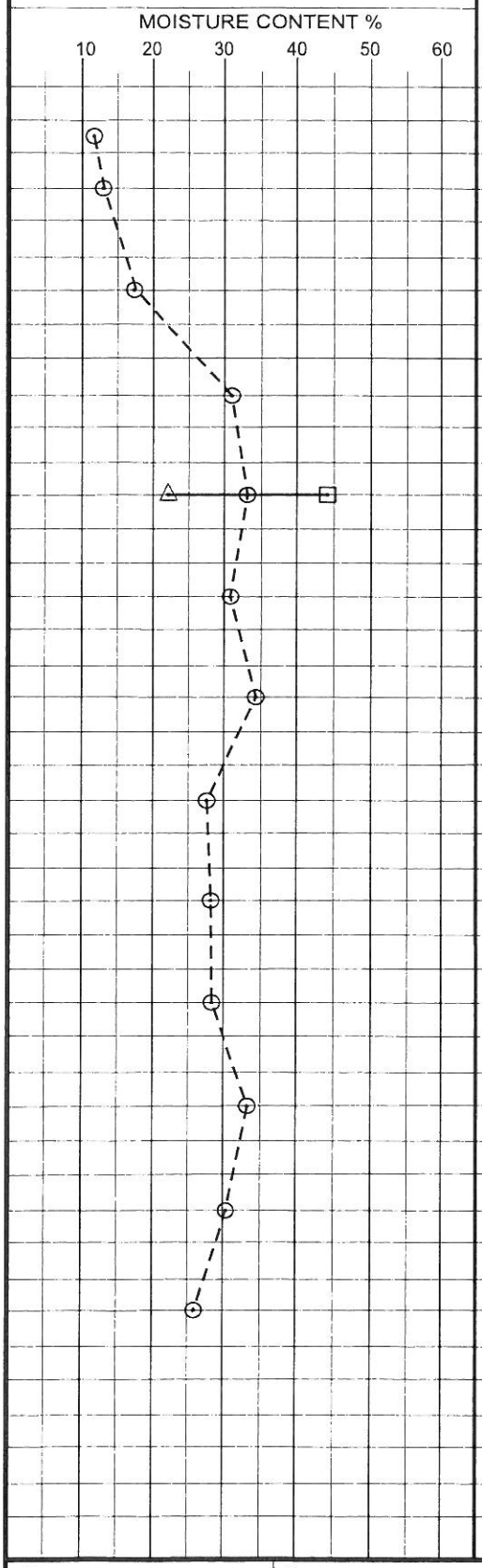
JOB No.: H0907-280

DATE: August 4, 2009 TECH: MH

TEST BORING **09-101**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION (DATUM: / SURFACE ELEVATION:)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	TEST RESULTS: MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, some small roots, black, 38 cm thick — 38 cm				
3	1	**SILT;** some sand, some clay, damp, stiff, pale olive brown				PP = 185 kPa SO_4 = 0.08%
		— 1.8 m				PP = 115 kPa SO_4 = 0.14%
6	2	**CLAY;** silty, stiff, medium plasticity, damp, occasional silt lenses, dark olive brown				PP = 170 kPa
		– very stiff, occasional silt lenses				PP = 135 kPa
10	3	– softer with depth				PP = 170 kPa
	4	– soft to firm, light olive brown – groundwater seepage – softer with depth, dark olive brown at 4.2 m				PP = 90 kPa
15	5	— 5.3 m				PP = 210 kPa
		SILT; sandy, very moist, free water, very sensitive, brown				
20	6					PP = 85 kPa
		- soft to firm				PP = 75 kPa
	7	— 7.7 m				PP = 85 kPa
25		**CLAY;** silty, low plasticity, firm, very moist, dark grey				
	8					PP = 100 kPa
		– stiff, medium plasticity				
	9	— 9.0 m				PP = 115 kPa
30		End of Borehole = 9.0 m Slough = 8.8 m, 0 hours Water level = 8.7 m, 0 hours Water level = 5.1 m, 5 hours later Slough = 5.5 m, 5 hours later Water level = 4.0 m, 10 days later Slough = 5.3 m, 10 days later				
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
⊠ BAG SAMPLE

PLATE No. **103**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

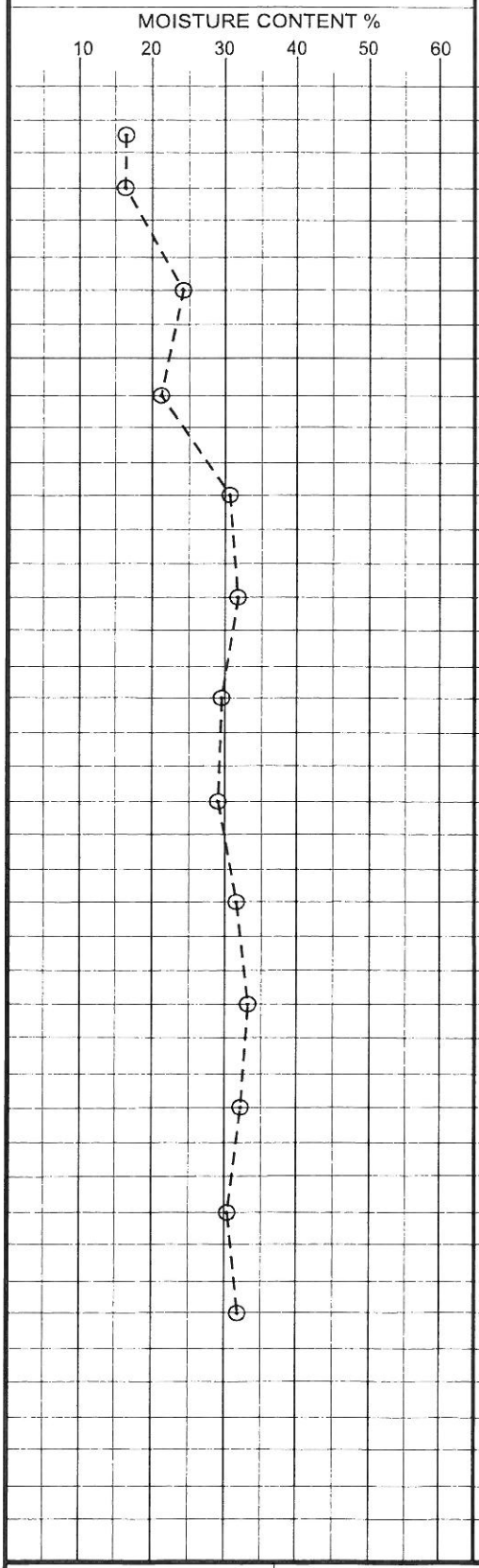
JOB No.: H0907-280

DATE: August 4, 2009 TECH: MH

TEST BORING **09-102**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, compressible, moist, black, 20 cm thick — 20 cm				
		SAND; silty, some clay, medium dense, moist, brown — 80 cm				PP = 375 kPa
3	1	**CLAY;** silty, medium plasticity, very stiff, occasional silt lenses, brown				PP = 240 kPa SO_4 = 0.02%
6	2	- firm to stiff consistency , moister with depth				PP = 145 kPa SO_4 = 0.08%
10	3	– firm, medium plasticity, dark olive brown — 3.4 m				PP = 145 kPa
		SILT; sandy, loose, some clay lenses, dark brown				PP = 130 kPa
	4	– groundwater seepage				
15		— 4.8 m				PP = 115 kPa
	5	**CLAY;** silty, firm to stiff, medium plasticity, moist, brown – silt layer from 5.1 to 5.3 m				PP = 85 kPa
20	6					PP = 125 kPa
		– silt layer from 6.6 to 6.9 m				PP = 105 kPa
	7					
25						PP = 105 kPa
		- stiff consistency				
	8					PP = 155 kPa
		— 9.0 m				
30	9	End of Borehole = 9.0 m Slough = 6.8 m, 0 hours Water level = 6.7 m, 0 hours Water level = 3.8 m, 4 hours later Slough = 3.9 m, 4 hours later				PP = 140 kPa
	10	Water level = 3.7m, 10 days later Slough = 3.8 m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
⧗ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **104**

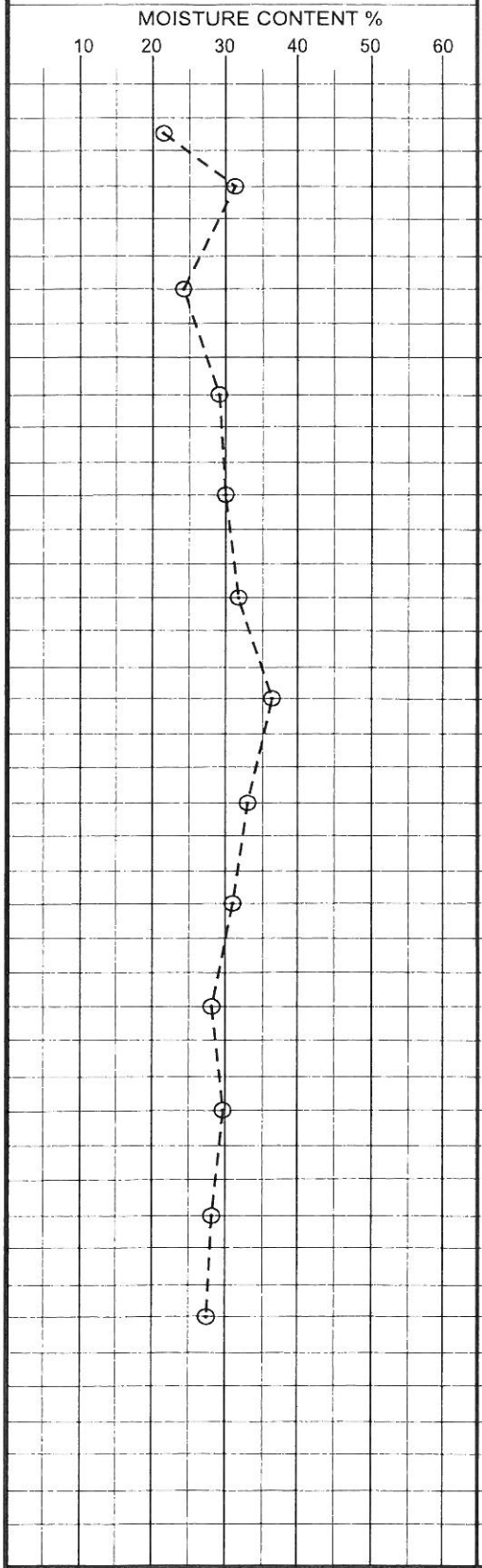
Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.: H0907-280
DATE: August 4, 2009
TECH: MH

TEST BORING **09-103**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT-N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, black, 23 cm thick				
		23 cm				
		CLAY; very silty, medium plasticity, moist, stiff, occasional silt lenses, dark olive brown				PP = 135 kPa
3	1					
		- firm to stiff consistency				PP = 130 kPa SO_4 = 0.18%
6	2					PP = 155 kPa
		– stiff consistency, occasional silt lenses				PP = 220 kPa SO_4 = 0.06%
10	3					
		– groundwater seepage				PP = 170 kPa
	4					
15						PP = 175 kPa
	5	- firm to stiff consistency				PP = 105 kPa
20	6	– stiff, very moist				PP = 175 kPa
		– occasional silt lenses				PP = 135 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– dark grey, very moist				PP = 140 kPa
		9.0 m				PP = 105 kPa
30	9	End of Borehole = 9.0 m Slough = 6.9 m, 0 hours Water level = 6.7 m, 0 hours Water level = 2.6 m, 3 hours later Slough = 2.7 m, 3 hours later Water level = 2.4 m, 10 days later Slough = 2.4 m, 10 days later				
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **105**

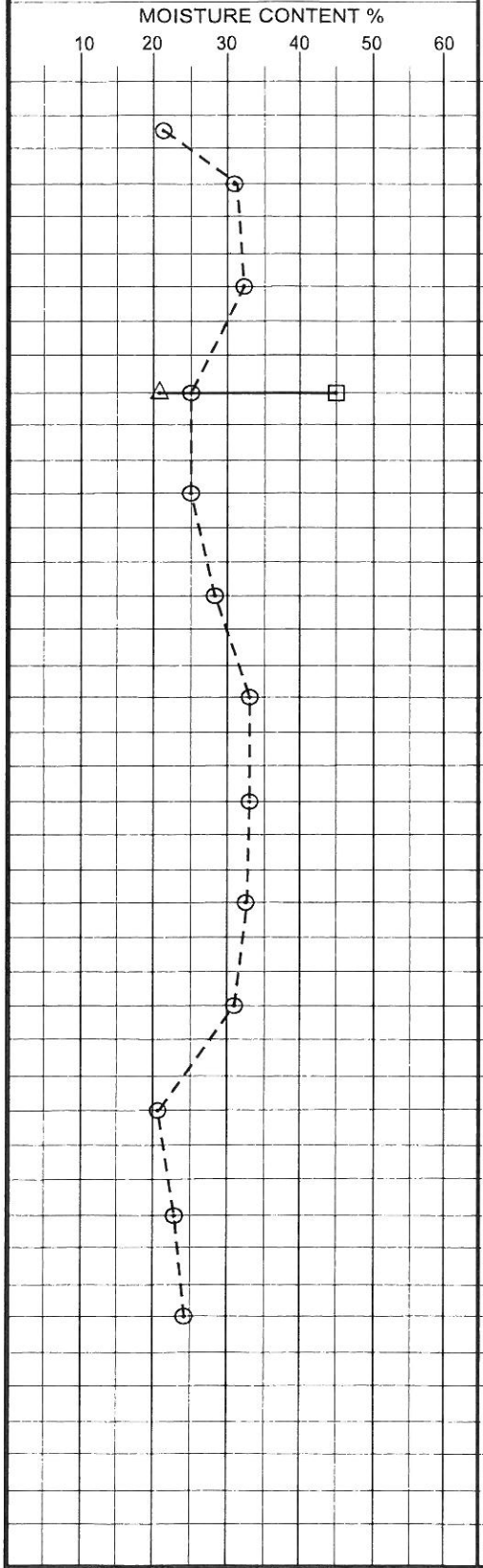
Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-104**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				
		CLAY; silty, very stiff, medium plasticity, frequent rust stained fissures, dark olive brown				PP = 135 kPa SO_4 = 0.12%
3	1					
						PP = 130 kPa SO_4 = 0.04%
6	2	- firm to stiff				PP = 105 kPa
10	3	– low to medium plasticity				PP = 220 kPa
						PP = 190 kPa
	4	4.1 m				
		SILT; clayey, stiff, trace of sand, dark brown				PP = 175 kPa
15		– stiff				
	5	5.1 m				
		CLAY; silty, firm consistency, low plasticity, very moist				PP = 105 kPa
20	6	– stiff, moist, occasional silt lenses				PP = 175 kPa
						PP = 110 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– groundwater seepage				PP = 120 kPa
	9	9.0 m				PP = 105 kPa
30		End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.8 m, 0 hours Water level = 8.7 m, 2.5 hours later Slough = 8.8 m, 2.5 hours later Water level = 5.8, 10 days later Slough = 6.1 m, 10 days later				
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
⊠ BAG SAMPLE

PLATE No. **106**

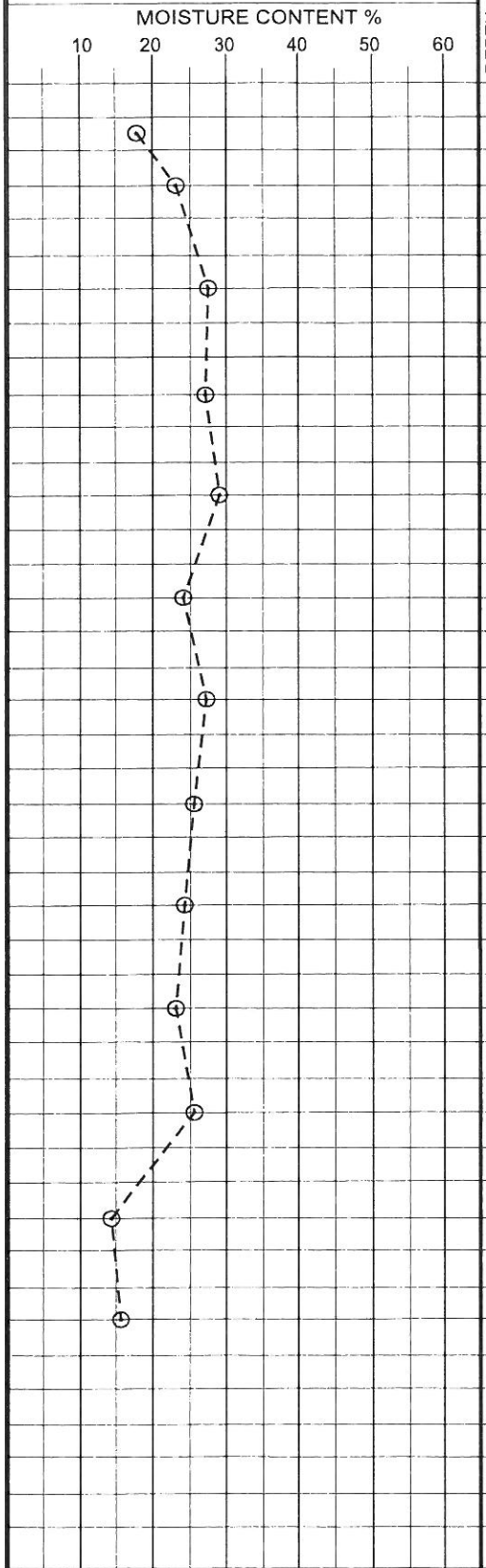
Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-105**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, some sand, compressible, black, 67 cm thick				PP = 480 kPa
		67 cm				
		CLAY; silty, damp, very stiff, medium plasticity, dark olive brown				PP = 320 kPa
3	1					
						PP = 275 kPa SO_4 = 0.02%
6	2	- stiff consistency				
						PP = 120 kPa
						PP = 110 kPa SO_4 = 0.16%
10	3					
		– very moist				PP = 110 kPa
	4					
15						PP = 175 kPa
	5	- very moist, occasional silt lenses				
						PP = 120 kPa
	6					PP = 95 kPa
20						
		- frequent silt lenses and rust staining				PP = 110 kPa
	7					
						PP = 115 kPa
25		– groundwater seepage				
	8	– clay till like, moist, occasional gravel chips, dark grey				PP = 230 kPa
		– very stiff, medium plasticity				
		9.0 m				
	9					PP = 315 kPa
30		End of Borehole = 9.0 m Slough = 9.0 m, 0 hours Water level = 5.5 m, 0 hours Water level = 5.5 m, 2.5 hours later Slough = 5.6 m, 2.5 hours later				
	10	Water level = 2.0 m, 10 days later Slough = 2.1m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
⧗ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **107**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 4, 2009

TECH: MH

TEST BORING **09-106**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT % (10, 20, 30, 40, 50, 60)

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				PP = 530 kPa
3	1	**CLAY;** silty, very stiff, medium plasticity, damp, dark olive brown — 1.1 m				PP = 515 kPa SO_4 = 0.12%
		SILT; sandy, some clay, medium dense, light yellowish brown				
6	2	- damp, medium dense				
10	3	– medium dense				SO_4 = 0.14%
		– dense, light yellowish brown — 3.7 m				
	4	**CLAY;** silty, medium plasticity, moist, very stiff, occasional silt lenses, dark grey				PP = 325 kPa
15						PP = 410 kPa
	5	- very stiff				PP = 375 kPa
20	6	– very stiff				PP = 330 kPa
						PP = 345 kPa
	7	– groundwater seepage				
25		– clay till like				PP = 385kPa
	8	– very stiff, moist, occasional gravel chips				PP = 385 kPa
	9	9.0 m				PP = 325 kPa
30		End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.7 m, 0 hours Water level = 8.6 m, 2 hours later Slough = 8.5 m, 2 hours later				
	10	Water level = 8.6 m, 10 days later Slough = 8.7 m, 10 days later				
35						

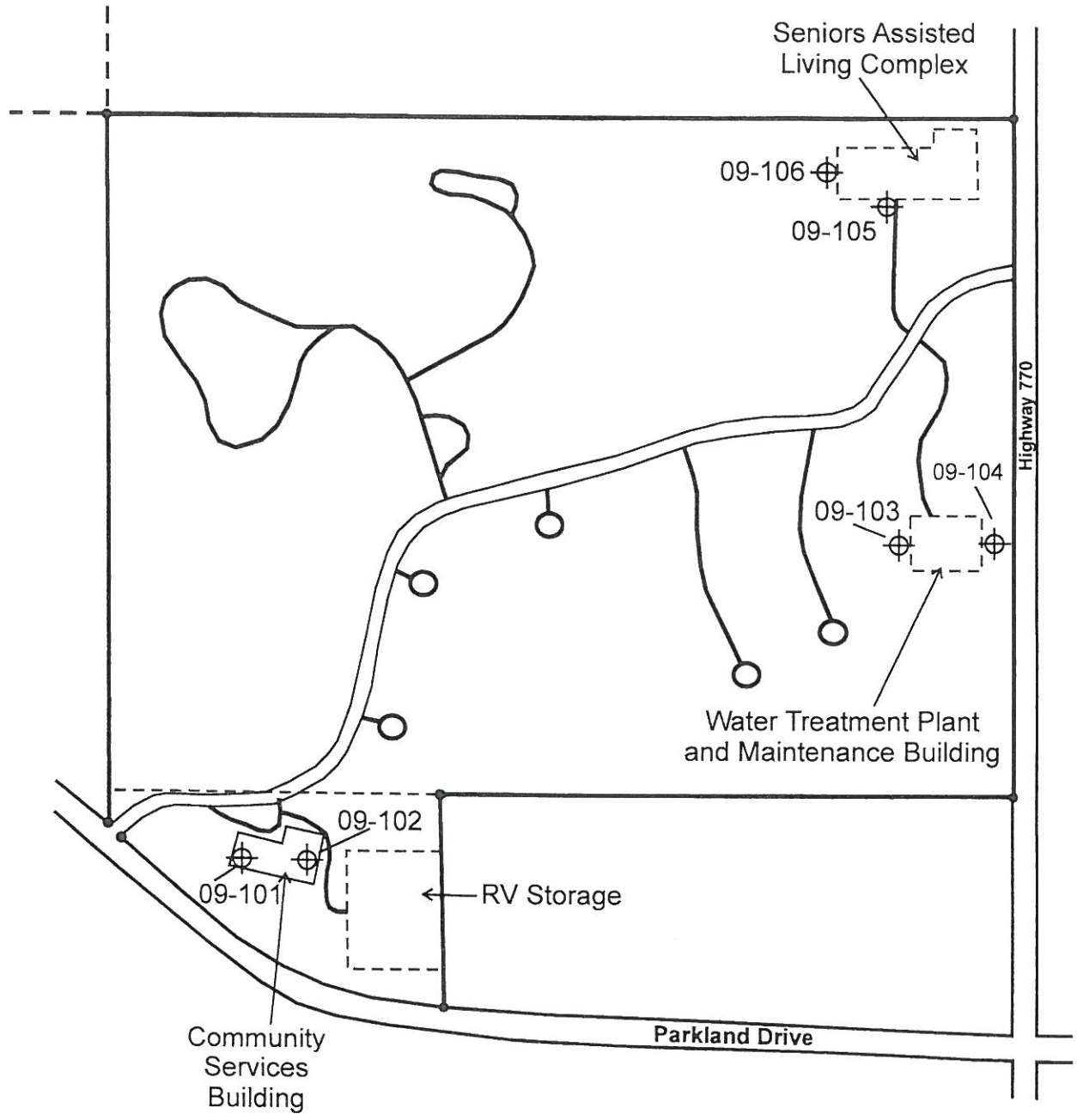
⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No.**108**



LEGEND

- Borehole Location
- Site Boundary

Scale: Not to scale

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

NOR CAN CONSULTING INC.
Proposed Country Residential Subdivision - Fawn Meadows
Portions of NE & SE 4-53-2-W5M,
Parkland County, Alberta
Site Plan

Job No: H0907-280	Date: August 11, 2009	Plate: 109

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0022 814 537	5;2;53;4;NE	042 286 912

LEGAL DESCRIPTION

MERIDIAN 5 RANGE 2 TOWNSHIP 53
SECTION 4
QUARTER NORTH EAST
CONTAINING 64.7 HECTARES (160 ACRES) MORE OR LESS
EXCEPTING THEREOUT:
(A) THE NORTHERLY 693 FEET THROUGHOUT
CONTAINING 17.0 HECTARES (42 ACRES) MORE OR LESS
(B) 0.624 HECTARES (1.54 ACRES) MORE OR LESS AS SHOWN
ON ROAD PLAN 466JY
EXCEPTING THEREOUT ALL MINES AND MINERALS

ESTATE: FEE SIMPLE

MUNICIPALITY: PARKLAND COUNTY

REFERENCE NUMBER: 832 050 645

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
042 286 912	12/07/2004	TRANSFER OF LAND	$197,965	SEE INSTRUMENT

OWNERS

FAWN MEADOWS DEVELOPMENT INC..
OF 3215 UTAH PLACE NW
CALGARY
ALBERTA T2N 4A8

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
052 267 815	05/07/2005	CAVEAT RE : AGREEMENT CHARGING LAND CAVEATOR - AMBROSE WILLIAM COMCHI 3215 UTAH PLACE NW CALGARY ALBERTA T2N4A8
082 319 992	01/08/2008	MORTGAGE MORTGAGEE - AXCESS MORTGAGE FUND LTD.. SUITE 1410, 10665 SOUTHPORT ROAD SW CALGARY ALBERTA T2W4Y1 AS TO 60/580 MORTGAGEE - B2B TRUST. 404, 130 ADELAIDE ST WEST TORONTO ONTARIO M5H3P5 MORTGAGEE - CANADIAN WESTERN TRUST COMPANY. 600 - 750 CANCIE STREET VANCOUVER BRITISH COLUMBIA V6B4Y7 MORTGAGEE - WILLIAM HEALEY MORTGAGEE - CHRISTIAN STEVENSON MORTGAGEE - MARLENE STEVENSON MORTGAGEE - RAYMOND STEVENSON ALL OF : C/O AXCESS CAPITAL PARTNERS 1410, 10655 SOUTHPORT RD SW CALGARY ALBERTA T2W4Y1 AS TO 520/580 ORIGINAL PRINCIPAL AMOUNT: $580,000 (DATA UPDATED BY: TRANSFER OF MORTGAGE 102107963)
082 319 993	01/08/2008	CAVEAT RE : ASSIGNMENT OF RENTS AND LEASES CAVEATOR - B2B TRUST. C/O 212, 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - CANADIAN WESTERN TRUST COMPANY. 212 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - WILLIAM HEALEY

(CONTINUED)

REGISTRATION NUMBER | DATE (D/M/Y) | PARTICULARS

CAVEATOR - CHRISTIAN STEVENSON
CAVEATOR - MARLENE STEVENSON
CAVEATOR - RAYMOND STEVENSON
ALL OF :
C/O #212, 20 SUNPARK PLAZA SE
CALGARY
ALBERTA T2X3T2
CAVEATOR - GREENTREE MORTGAGE CORPORATION.
C/O 212, 20 SUNPARK PLAZA SE
CALGARY
ALBERTA T2X3T2
AGENT - DOUGLAS M SEFCIK

082 360 125 | 21/08/2008 | POSTPONEMENT
OF CAVE 052267815
TO MORT 082319992 CAVE 082319993

112 380 928 | 25/11/2011 | WRIT
CREDITOR - CALIBRE DRILLING LTD..
431 SOUTH AVENUE
SPRUCE GROVE
ALBERTA T7X3B3
DEBTOR - FAWN MEADOWS DEVELOPMENT INC..
3215 UTAH PLACE NW
CALGARY
ALBERTA T2N4A8
AMOUNT: $38,663 AND COSTS IF ANY
ACTION NUMBER: 1103 07382

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 5 DAY OF MARCH, 2012 AT 10:48 A.M.

ORDER NUMBER:20739743

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

(CONTINUED)

THIS ELECTRONICALLY TRANSMITTED LAND TITLES PRODUCT IS INTENDED FOR THE SOLE USE OF THE ORIGINAL PURCHASER, AND NONE OTHER, SUBJECT TO WHAT IS SET OUT IN THE PARAGRAPH BELOW.

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LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0029 960 656	0323261;1;1	042 286 913

LEGAL DESCRIPTION
PLAN 0323261
BLOCK 1
LOT 1
EXCEPTING THEREOUT ALL MINES AND MINERALS
AREA: 4.048 HECTARES (10 ACRES) MORE OR LESS

ESTATE: FEE SIMPLE
ATS REFERENCE: 5;2;53;4;SE

MUNICIPALITY: PARKLAND COUNTY

REFERENCE NUMBER: 032 218 815

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
042 286 913	12/07/2004	TRANSFER OF LAND	$90,000	CASH/MORTGAGE

OWNERS

FAWN MEADOWS DEVELOPMENT INC..
OF 3215 UTAH PLACE NW
CALGARY
ALBERTA T2N 4A8

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
752 145 223	15/10/1975	UTILITY RIGHT OF WAY GRANTEE - WEST PARKLAND GAS CO-OP LTD.
082 319 992	01/08/2008	MORTGAGE

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		MORTGAGEE - AXCESS MORTGAGE FUND LTD.. SUITE 1410, 10665 SOUTHPORT ROAD SW CALGARY ALBERTA T2W4Y1 AS TO 60/580 MORTGAGEE - B2B TRUST. 404, 130 ADELAIDE ST WEST TORONTO ONTARIO M5H3P5 MORTGAGEE - CANADIAN WESTERN TRUST COMPANY. 600 - 750 CANCIE STREET VANCOUVER BRITISH COLUMBIA V6B4Y7 MORTGAGEE - WILLIAM HEALEY MORTGAGEE - CHRISTIAN STEVENSON MORTGAGEE - MARLENE STEVENSON MORTGAGEE - RAYMOND STEVENSON ALL OF : C/O AXCESS CAPITAL PARTNERS 1410, 10655 SOUTHPORT RD SW CALGARY ALBERTA T2W4Y1 AS TO 520/580 ORIGINAL PRINCIPAL AMOUNT: $580,000 (DATA UPDATED BY: TRANSFER OF MORTGAGE 102107963)
082 319 993	01/08/2008	CAVEAT RE : ASSIGNMENT OF RENTS AND LEASES CAVEATOR - B2B TRUST. C/O 212, 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - CANADIAN WESTERN TRUST COMPANY. 212 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - WILLIAM HEALEY CAVEATOR - CHRISTIAN STEVENSON CAVEATOR - MARLENE STEVENSON CAVEATOR - RAYMOND STEVENSON ALL OF : C/O #212, 20 SUNPARK PLAZA SE CALGARY ALBERTA T2X3T2 CAVEATOR - GREENTREE MORTGAGE CORPORATION. C/O 212, 20 SUNPARK PLAZA SE

(CONTINUED)

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
		CALGARY ALBERTA T2X3T2 AGENT - DOUGLAS M SEFCIK
102 113 781	09/04/2010	CAVEAT RE : AGREEMENT CHARGING LAND CAVEATOR - L & B WATER SERVICES LTD.. C/O MAIN STREET LAW OFFICES BOX 4307,115 MAIN ST SPRUCE GROVE ALBERTA T7X3A7 AGENT - FRANK C DEANGELIS
112 380 928	25/11/2011	WRIT CREDITOR - CALIBRE DRILLING LTD.. 431 SOUTH AVENUE SPRUCE GROVE ALBERTA T7X3B3 DEBTOR - FAWN MEADOWS DEVELOPMENT INC.. 3215 UTAH PLACE NW CALGARY ALBERTA T2N4A8 AMOUNT: $38,663 AND COSTS IF ANY ACTION NUMBER: 1103 07382

TOTAL INSTRUMENTS: 005

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 5 DAY OF MARCH, 2012 AT 10:48 A.M.

ORDER NUMBER:20739743

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

(CONTINUED)

THE ABOVE PROVISIONS DO NOT PROHIBIT THE ORIGINAL PURCHASER FROM INCLUDING THIS UNMODIFIED PRODUCT IN ANY REPORT, OPINION, APPRAISAL OR OTHER ADVICE PREPARED BY THE ORIGINAL PURCHASER AS PART OF THE ORIGINAL PURCHASER APPLYING PROFESSIONAL, CONSULTING OR TECHNICAL EXPERTISE FOR THE BENEFIT OF CLIENT(S).

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3
Tel: (780) 996-5621 • Fax: (780) 475-5671
e-mail: h_gsl@telus.net

Norcan Consulting Group Ltd.
Box 38, Site 219, RR2
Gravel, Alberta
T0E OH0

March 1, 2012
Our File: H0907-280

Attention: **Mr. Frank Florkewich**

Dear Sirs:

Re: Geotechnical Site Investigation
For Proposed Facilities
Proposed Country Residential Subdivision
Fawn Meadows
Portions of NE and SE 4-53-2-W5M
Parkland County, Alberta

1.0 INTRODUCTION

As requested, a geotechnical site investigation was carried out by Hagstrom Geotechnical Services Ltd. (HGSL) at the above referenced project. The scope of work for the investigation was to provide an assessment of the soil and groundwater conditions, provide recommendations for alternate foundation systems and preparation of this report. Field drilling was carried out on August 4, 2009 and final water table measurements were taken on October 14, 2009.

2.0 PROJECT DESCRIPTION

The proposed country residential subdivision contains about 52.6 hectares of agricultural land that occupies a portion of the northeast and southeast quarters of Section 4, Township 53, Range 2, West of the Fifth Meridian. The site is bounded on the east by Highway 770 and on the south by Parkland Drive. The site is open, vacant hayland and contains four large groups of trees and marshes that cover about 30 to 35 percent of the site. The site topography is moderately rolling with slopes typically less than 12 degrees (21 percent). No definite drainage pattern is apparent across the site.

It is understood that the proposed development is to consist of cluster type lots of about 55 to 60 residential lots varying in size from 1.0 to 2.5 acres. It is further understood that the development will be serviced with centralized municipal sanitary sewers and potable water systems. In addition, the proposed subdivision will consist of a community services building located in the south west corner, a water treatment plant and maintenance building in the south east corner and a seniors assisted living complex located in the north east corner. The size and

details of each facility were not finalized at the time of report submission.

3.0 INVESTIGATION PROCEDURE

Six deep boreholes were drilled on the site on August 4, 2009. Borehole 09-101and 09-102 were drilled at the proposed services building, Boreholes 09-13 and 09-104 were drilled at the proposed water treatment plant/maintenance building and Boreholes 09-105 and 09-106 were drilled at the proposed seniors assisted living complex (Refer to Plate 109, Appendix A). It is noted that Boreholes 09-105 and 09-106 could not be drilled within the building footprint because of heavy tree cover. The boreholes were drilled to depths of 9.0 metres using a truck mounted drill rig equipped with a continuous flight, 150-millimeter diameter, solid-stem augers. Supervision of drilling, soil sampling, and logging of the various soil strata was performed by Mr. Merle Hagstrom, P. Eng of HGSL. The soils encountered during drilling were classified in accordance with the Modified Unified Soil Classification System described on Plates 1 and 2, Appendix A. The soil and groundwater conditions encountered during field drilling were recorded and are presented on borehole logs, Plates 103 to108, Appendix A. The borehole locations are presented on Plate 109, Appendix A.

Soil sampling for laboratory analysis generally consisted of disturbed auger soil samples at 0.75 meter intervals obtained from all boreholes. In addition, pocket penetrometer (PP) readings were taken on intact cohesive soil samples at approximately 0.75 metre intervals from all boreholes to obtain an indication of the unconfined compressive strength (Q_u) of the soil.

Groundwater conditions were monitored during drilling, at drilling completion, several hours later and 10 days after drilling completion. All of the water level results are presented on the boreholes logs in Appendix A.

In addition to the routine moisture content analysis, the laboratory analyses consisted of twelve soluble sulphates analyses and two Atterberg limit tests. The laboratory analyses results are presented on the borehole logs in Appendix A.

4.0 SUBSOIL AND GROUNDWATER CONDITIONS

The soil profile at the borehole locations generally consist of a thin cover of topsoil over variable thick layers of silt and clay. A thin layer of sand was encountered below the topsoil in one borehole. A description of various soil units and their properties are presented in the paragraphs below.

Topsoil was encountered at the ground surface in all boreholes and extended to depths between 18 and 67 centimeters. The topsoil was described as silty, dry to damp, with some sand, compressible and black in colour. Greater thickness of topsoil may be found between borehole locations.

Clay of variable thickness was encountered at random depths in all boreholes. The clay was described as silty, firm to hard consistency, low to medium plasticity, damp to very moist, brown to dark olive brown in colour. The clay was also noted to have frequent silt lenses with

rust staining and occasional gravel chips. In-situ moisture contents in the clay ranged from 11 to 34 percent. Pocket penetrometer readings taken on intact auger samples of clay revealed approximate unconfined compressive strengths Q_u, ranging from 90 to 515 kPa. Two Atterberg limit tests conducted on clay yielded liquid limits of 44 and 45 percent and plastic limits of 21 and 22 percent (medium plasticity). Based on a review of plastic limits in comparison with the natural moisture contents in the clay, the natural moisture contents are about 5 to 10 percent wet of optimum moisture content (OMC). The clay exhibits moderate compressibility under low to moderate loads. The clay also exhibits moderate swelling potential and thus may lift light loads such as floor slabs given access to free water.

Silt was encountered at variable depths in three of the six boreholes. The site was described as sandy, with some clay, damp to very moist, and pale olive brown to dark grey in colour. Below the groundwater table, the silt was noted to be very sensitive. In-situ moisture contents in the silt ranged from 12 to 32 percent. Pocket penetrometer readings taken on intact auger samples of silt revealed approximate unconfined compressive strengths Q_u, ranging from 115 to 185 kPa. The silt exhibits moderate compressibility under low to moderate loads.

Groundwater conditions were monitored during drilling, at drilling completion, several hours later and 10 days after drilling completion. Groundwater seepage was encountered during drilling in all six boreholes. All water table results are summarized in Table 1, below and the individual results are presented on the borehole logs in Appendix A.

TABLE 1: SUMMARY OF GROUNDWATER OBSERVATIONS

Borehole Number	Depth of Groundwater Seepage (m)	Depth to Water (m)		
		At Drilling Completion	2 to 5 Hours Later	10 Days Later
09-101	4.1	8.7	5.1	4.0
09-102	4.2	6.7	3.8	3.7
09-103	3.6	6.7	2.6	2.4
09-104	8.0	8.8	8.7	5.8
09-105	7.8	5.5	5.5	2.0
09-106	7.0	8.7	8.6	8.6

Based on a review of the above results, the groundwater table is considered to be variable across the site. The results indicate that groundwater may pose problems for caisson pile drill holes and other excavations that are left open for short and extended periods of time at depths below 2.0

metres.

It should be noted that groundwater levels will fluctuate seasonally and in response to climatic conditions and may be at a different depths when construction commences. Accordingly, groundwater levels should be monitored periodically until the start of construction.

4.1 FROST PENETRATION

The expected maximum depth of frost penetration for various soil types is given in Table 2, below. The penetration is based on a freezing index for a 25-year return period of 2200 degrees-days Celsius. The depth of frost penetration assumes a uniform soil type without topsoil or snow cover.

The native mineral soils encountered in the boreholes is considered to be frost susceptible, and with an adequate supply of moisture near the ground surface, significant frost heave may occur.

TABLE 2
ESTIMATED DEPTH OF FROST PENETRATION

Soil Type		Depth of Frost Penetration (m)
In-situ	Clay and Clay Till	2.5
	Silt and Sand	2.9
	Weathered Bedrock	3.0
	Gravel	3.5
Compacted Backfill (95 % SPMDD*)	Clay and Clay Till	2.3
	Silt and Sand	2.7
	Weathered Bedrock	2.9
	Gravel	3.3

*SPMDD- Standard Proctor Maximum Dry Density

5.0 GEOTECHNICAL EVALUATION

All foundation design recommendations presented in this report are based on the assumption that an adequate level of construction monitoring during foundation excavation and installation will be provided, and that all construction will be carried out by a suitably qualified, experienced contactor. An adequate level of construction monitoring is considered to be: (a), design review and full-time monitoring during construction of foundations, and (b), full-time monitoring and compaction testing for earthworks by suitably qualified geotechnical personnel.

The soil conditions at the site are considered to be adequate for the proposed site facilities. The groundwater table is considered to be moderately high. Shallow foundations such as strip and spread footings can be considered for the site. Alternatively, deep foundations such as cast-in-place straight shaft or end bearing concrete piles may be considered.

5.1 SHALLOW FOUNDATIONS

Shallow concrete footings for all three facilities founded on the native mineral soil should be designed based on a net allowable bearing capacity of 90 and 120 kPa for strip and spread footings, respectively. This value utilizes a factor of safety of 3.0. The allowable bearing pressure may be increased by a factor of 1.5 to obtain a factored ultimate bearing resistance. The footings should be constructed at a minimum depth of 1.5 m and 2.5 metres below exterior grade for heated and unheated structures, respectively. It is recommended that footing excavations be inspected by a qualified geotechnical engineer prior to pouring concrete to confirm foundation soil conditions and bearing pressures.

All footings should be founded on the undisturbed, inorganic native mineral soil. Footings must not be placed on any topsoil, uncontrolled fill, organic soils or loose, disturbed or frozen soils. Footing excavations must be protected from frost, desiccation, or the ingress of water. Bearing soils, which become frozen, dried or softened, should be removed and replaced with concrete or the footings should be extended to reach soil in an unaffected condition. It is essential that the foundation soils not be allowed to freeze at any time before or after concrete for the footings have been placed.

5.2 DEEP FOUNDATIONS

Cast-in-place concrete piles can be considered for all three proposed facilities and should be designed as straight shaft concrete friction-type piles using allowable and factored skin friction parameters shown in Table 3, below. No allowance should be made for end bearing on straight shaft piles.

Concrete straight shaft piles should be embedded at least 6.0 and 7.5 metres below grade for heated and unheated foundations, respectively. The minimum center-to-center spacing for concrete cast-in-place piles should be greater than 3 pile diameters. The piles should be at least 400 mm in diameter. Void form that is approximately 100 millimetres thick should be used under a concrete grade beam or pile cap.

TABLE 3
ALLOWABLE SKIN FRICTION FOR CAST-IN-PLACE CONCRETE PILES

Depth Below Existing Grade (m)	Soil Type	Allowable Skin Friction (kPa)	Factored ULS Skin Friction (kPa)
0 to 1.5	Clay/ Silt/Sand	0	0
1.5 to 9.0	Clay/Silt/Sand	21	28

Longitudinal steel reinforcement in the upper 6.0 meters of the pile is recommended to prevent potential uplift forces of the pile due to frost action and seasonal moisture variations. If the piles are designated as tension elements including frost action, longitudinal reinforcing steel should extend into the bottom of the piles, and the piles should be designed to resist the anticipated uplift stresses using the design values provided below.

Concrete for piles should be poured immediately after drilling of the pile hole to reduce the risk of groundwater seepage and sloughing of the soil. Protective steel casing may be required where wet sand and groundwater seepage are encountered.

5.2.1 Settlement Considerations for Concrete Piles

Calculation of the potential settlement pattern is complex and difficult to assess without significant additional laboratory testing and detailed knowledge of the loading and foundation types. For structures supported on native, undisturbed soil, the following comments may be of some value:

- The settlement of an isolated cast-in-place concrete skin friction pile should be no more than 5 mm plus elastic compression of the pile upon full mobilization of shaft resistance.

Differential settlements, rather than total settlements, are usually the governing factor in structural and architectural design. Differential settlements between adjacent columns or wall units are typically about one-half of the values given above.

5.3 SEISMIC SITE CLASSIFICATION

Site classification for soil seismic response for this site is category "D" which is according to the requirements of the National Building Code of Canada (Table 4.1.8.4.A).

5.4 CONCRETE

Chemical testing for water-soluble sulphates concentrations on twelve selected samples of native soil revealed sulphate concentrations of 0.02 to 0.18 percent water-soluble sulphate by dry weight of soil. The results indicated a "negligible to moderate" potential for sulphate attack on concrete in contact with native soils at this site. Therefore, all concrete in contact with the native soils should be made from CSA Type 50 sulphate resistant cement possessing a minimum 56 days compressive strength of 30 MPa. The maximum water cement ratio should be 0.50. An air entrainment agent of 5 to 7 percent is recommended for improved workability and durability. If new fill is brought to the site, it should be tested for soluble sulphates to determine if Type 50 cement is required.

6.0 CLOSURE

This report is based on the findings at six deep borehole locations. Should different subsoil or groundwater conditions be encountered during construction, Hagstrom Geotechnical Services Ltd. must be notified immediately and the recommendations provided herein will be reviewed and revised as required.

Boreholes could not be drilled within the building footprint for the new seniors assisted living complex and thus is recommended that new boreholes be drilled within the new building footprint. In addition, if the other building locations are changed, it is recommended that new boreholes be drilled. During placement and compaction of new fill, soil compaction tests should

Explanation of Field and Laboratory Test Data

The following pages are an explanation of the terms and symbols used in the Test Hole Log

Soil Profile and Description

Soil types are described by the Modified Unified Soil Classification System.
(See Plate 2 for terms and symbols)

Soils classified by particle size fall in the following ranges:

BOULDERS - greater than 200 mm	SAND - 0.08 mm to 5 mm
COBBLES - 75 mm to 200 mm	SILT - 0.002 mm to 0.08 mm
GRAVEL - 5 mm to 75 mm	CLAY - finer than 0.002 mm

Additional graphic symbols include:

seepage
water level surface

Soil Sample Type

Standard Penetration Sample (D)

Undisturbed Sample (Shelby) (U)

Bag Sample

Penetration Resistance

Field test indication number of blows (N) of a 140 pound hammer dropping 30 inches (76cm) required to drive a 2 inch (5 cm) O.D. open end sampler a distance of 1 foot (30 cm) from 0.5 to 1.5 feet (15 to 45 cm) into the undisturbed soil. This test is outlined in A.S.T.M., D1568.

Miscellaneous Tests

In this column are summarized results of all the laboratory test as indicated by the following symbols:

HVR	Hydrocarbon Vapour Readings, ppm or % LEL
* MA	Mechanical grain size analysis
G	Specific gravity
k	Coefficient of permeability
PP	Pocket penetrometer strength kg/cm2
* q	Triaxial compression test
* C	Consolidation test
Qu	Unconfined compressive strength kg/cm2
SO_4	Soluble sulphate concentration
γ	Bulk unit weight
γd	Dry unit weigh

* Tests normally summarized on separate data sheets

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

Modified Unified Classification System For Soils

Major Division			Group Symbol	Graph Symbol	Color Code	Typical Description	Laboratory Classification Criteria	
Coarse-Grained Soils (more than half by weight larger than 200 sieve)	Gravels more than half coarse grains larger than No. 4 sieve	Clean Gravels (little or no fines)	GW		Red	Well graded gravels, little or no fines	$C_U = (D_{60}/D_{10}) > 6$ $C_C = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			GP		Red	Poorly graded gravels, and gravel sand mixtures, little or no fines	Not meeting above requirements	
		Dirty Gravel (with some fines)	GM		Yellow	Silty gravels, gravel-sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			GC		Yellow	Clayey gravels, gravel-sand-(silt) clay mixtures		Above "A" line P.I. more than 7
	Sands more than half fine grains smaller than No. 4 sieve	Clean Sands (little or no fines)	SW		Red	Well graded sands, gravely sands, little or no fines	$C_U = (D_{60}/D_{10}) > 4$ $C_C = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			SP		Red	Poorly graded sands, little or no fines	Not meeting above requirements	
		Dirty Sands (with some fines)	SM		Yellow	Silty sands, sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			SC		Yellow	Clayey sands, sand-(silt) clay mixtures		Above "A" line P.I. more than 7
Fine-Grained Soils (more than half by weight passes 200 sieve)	Silts below "A" line negligible organic content	$W_L < 50\%$	ML		Green	Inorganic silts and very fine sands, rock flour, silty sands of slight plasticity	Classification is based upon plasticity chart	
		$W_L > 50\%$	MH		Blue	Inorganic silts, micaceous or diatomaceous, fine sandy or silty soils		
	Clays above "A" line negligible organic content	$W_L < 30\%$	CL		Green	Inorganic clays of low plasticity, gravelly, sandy, or silty clays, lean clays		
		$30\% < W_L < 50\%$	CI		Green-Blue	Inorganic clays of medium plasticity, silty clays		
		$W_L > 50\%$	CH		Blue	Inorganic clays of high plasticity		
	Organic Silts & Clays bellow "A" line on chart	$W_L < 50\%$	OL		Green	Organic silts and organic silty clays of low plasticity	Whenever the nature of the fine content has not been determined it is designated by the letter "F". E.G. SF is a mixture of sand with silt or clay	
		$W_L > 50\%$	OH		Blue	Organic clays of high plasticity		
Highly Organic Soils			PI		Orange	Peat and other highly organic soils	Strong color or odor, and often fibrous texture	

Bedrock Symbols

Bedrock (Undifferentiated)

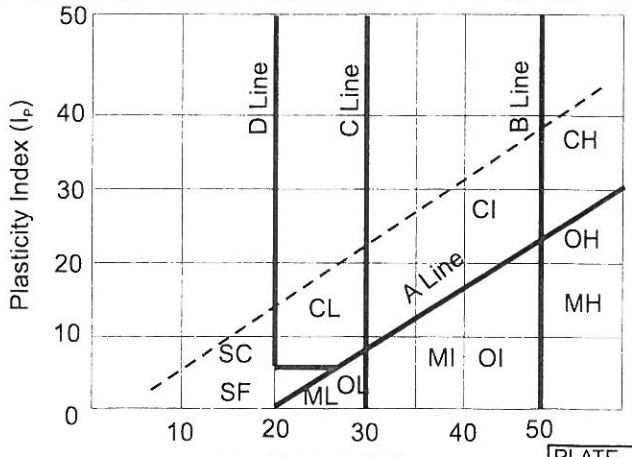
Shale

Sandstone

Siltstone

Fill

Coal



Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

PLATE No. 102

Hagstrom Geotechnical Services Ltd.

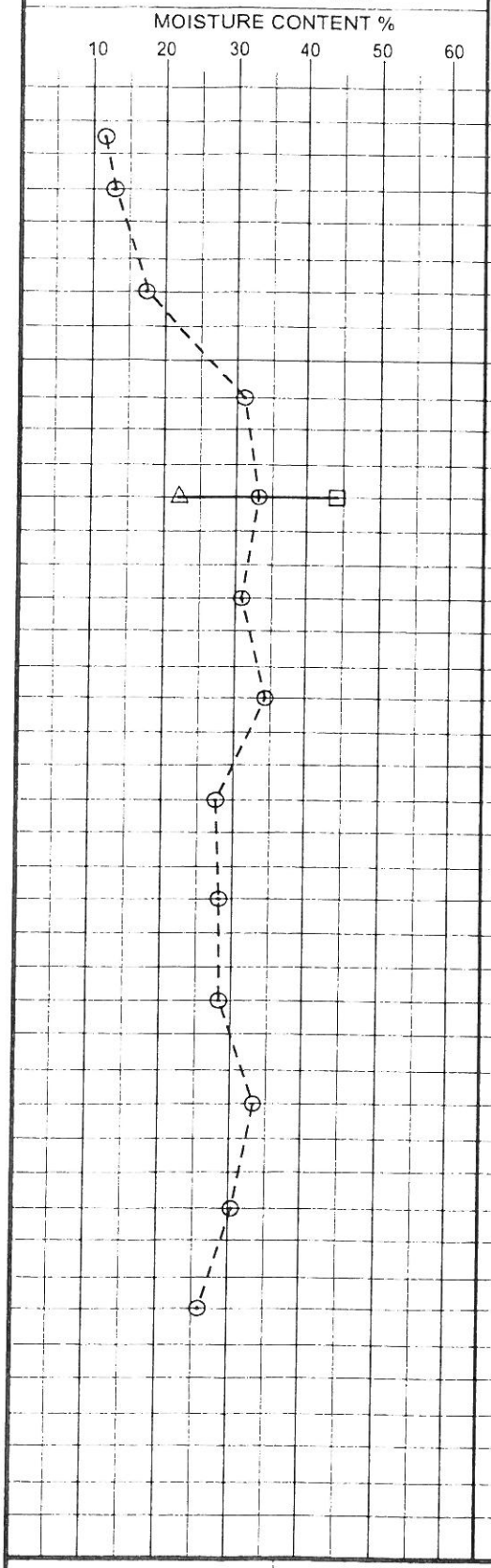
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-101**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DATUM:

SURFACE ELEVATION:

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
3	1				PP = 185 kPa SO_4 = 0.08%
					PP = 115 kPa SO_4 = 0.14%
6	2				PP = 170 kPa
10	3				PP = 135 kPa
					PP = 170 kPa
15	5				PP = 90 kPa
					PP = 210 kPa
20	6				PP = 85 kPa
					PP = 75 kPa
25	7				PP = 85 kPa
					PP = 100 kPa
30	9				PP = 115 kPa
35	10				

TOPSOIL; silty, damp, compressible, some small roots, black, 38 cm thick — 38 cm

SILT; some sand, some clay, damp, stiff, pale olive brown — 1.8 m

CLAY; silty, stiff, medium plasticity, damp, occasional silt lenses, dark olive brown

– very stiff, occasional silt lenses

– softer with depth

– soft to firm, light olive brown
– groundwater seepage
– softer with depth, dark olive brown at 4.2 m — 5.3 m

SILT; sandy, very moist, free water, very sensitive, brown

- soft to firm — 7.7 m

CLAY; silty, low plasticity, firm, very moist, dark grey

– stiff, medium plasticity — 9.0 m

End of Borehole = 9.0 m
Slough = 8.8 m, 0 hours
Water level = 8.7 m, 0 hours
Water level = 5.1 m, 5 hours later
Slough = 5.5 m, 5 hours later
Water level = 4.0 m, 10 days later
Slough = 5.3 m, 10 days later

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **103**

Hagstrom Geotechnical Services Ltd.

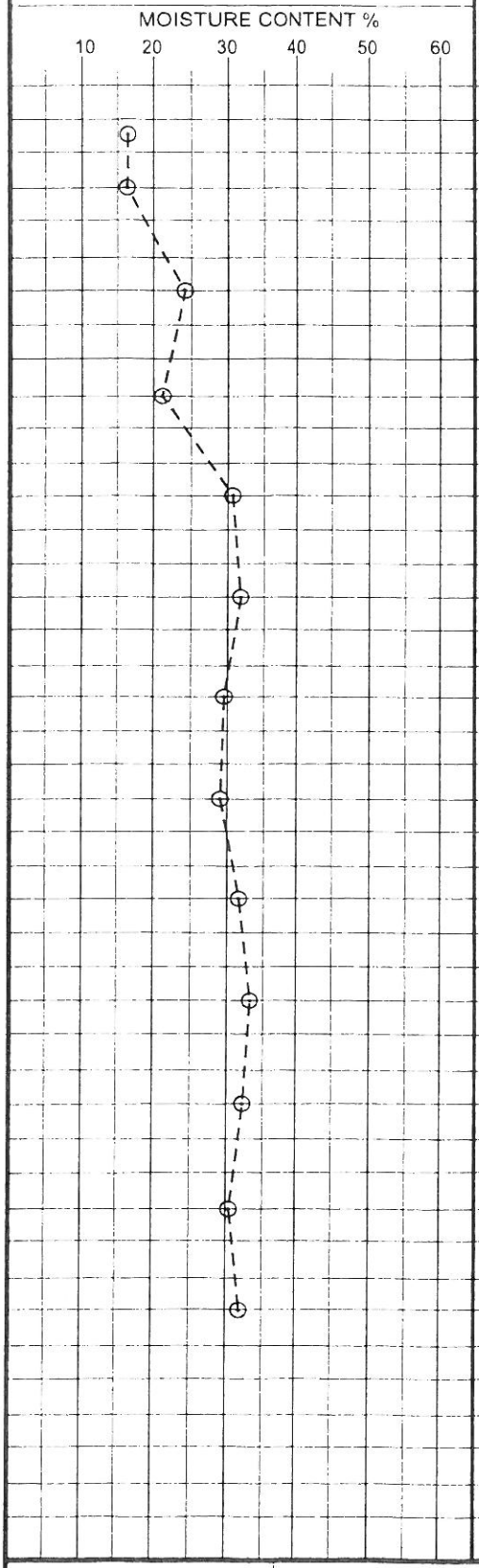
5607 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-102**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, compressible, moist, black, 20 cm thick — 20 cm				
		SAND; silty, some clay, medium dense, moist, brown — 80 cm				PP = 375 kPa
3	1	**CLAY;** silty, medium plasticity, very stiff, occasional silt lenses, brown				PP = 240 kPa SO_4 = 0.02%
6	2	- firm to stiff consistency , moister with depth				PP = 145 kPa SO_4 = 0.08%
10	3	– firm, medium plasticity, dark olive brown — 3.4 m				PP = 145 kPa
		SILT; sandy, loose, some clay lenses, dark brown				PP = 130 kPa
15	4	– groundwater seepage — 4.8 m				PP = 115 kPa
	5	**CLAY;** silty, firm to stiff, medium plasticity, moist, brown – silt layer from 5.1 to 5.3 m				PP = 85 kPa
20	6					PP = 125 kPa
		– silt layer from 6.6 to 6.9 m				PP = 105 kPa
	7					
25						PP = 105 kPa
	8	- stiff consistency				
						PP = 155 kPa
	9	— 9.0 m				
30		End of Borehole = 9.0 m Slough = 6.8 m, 0 hours Water level = 6.7 m, 0 hours Water level = 3.8 m, 4 hours later Slough = 3.9 m, 4 hours later				PP = 140 kPa
	10	Water level = 3.7m, 10 days later Slough = 3.8 m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
⧗ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **104**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-103**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, black, 23 cm thick				
		23 cm				
		CLAY; very silty, medium plasticity, moist, stiff, occasional silt lenses, dark olive brown				PP = 135 kPa
3	1					
		- firm to stiff consistency				PP = 130 kPa SO_4 = 0.18%
6	2					PP = 155 kPa
		– stiff consistency, occasional silt lenses				
10	3					PP = 220 kPa SO_4 = 0.06%
		– groundwater seepage				PP = 170 kPa
15	4					PP = 175 kPa
	5	- firm to stiff consistency				PP = 105 kPa
20	6	– stiff, very moist				PP = 175 kPa
		– occasional silt lenses				PP = 135 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– dark grey, very moist				PP = 140 kPa
		9.0 m				PP = 105 kPa
30	9	End of Borehole = 9.0 m Slough = 6.9 m, 0 hours Water level = 6.7 m, 0 hours Water level = 2.6 m, 3 hours later Slough = 2.7 m, 3 hours later Water level = 2.4 m, 10 days later Slough = 2.4 m, 10 days later				
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **105**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 4, 2009 TECH: MH

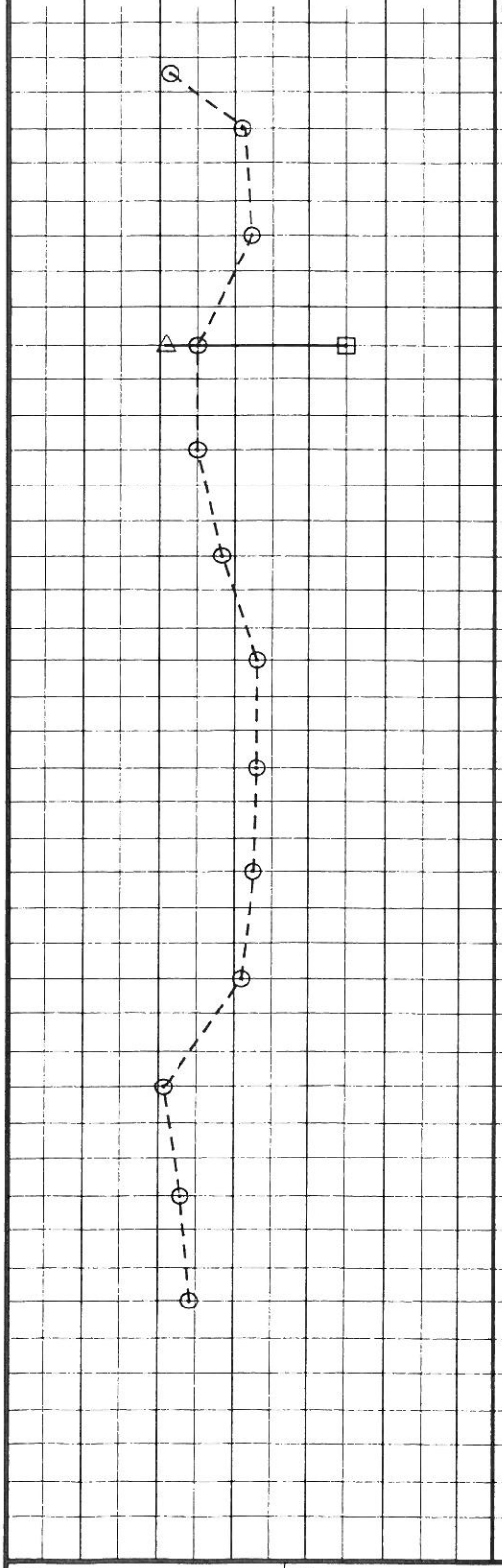
TEST BORING **09-104**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				
		CLAY; silty, very stiff, medium plasticity, frequent rust stained fissures, dark olive brown				PP = 135 kPa SO_4 = 0.12%
3	1					
						PP = 130 kPa SO_4 = 0.04%
6	2	- firm to stiff				PP = 105 kPa
10	3	– low to medium plasticity				PP = 220 kPa
						PP = 190 kPa
	4	4.1 m				
		SILT; clayey, stiff, trace of sand, dark brown				
15						PP = 175 kPa
		– stiff				
	5	5.1 m				
		CLAY; silty, firm consistency, low plasticity, very moist				PP = 105 kPa
20	6	– stiff, moist, occasional silt lenses				PP = 175 kPa
						PP = 110 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– groundwater seepage				PP = 120 kPa
	9	9.0 m				PP = 105 kPa
30		End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.8 m, 0 hours Water level = 8.7 m, 2.5 hours later Slough = 8.8 m, 2.5 hours later Water level = 5.8, 10 days later Slough = 6.1 m, 10 days later				
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No.**106**

Hagstrom Geotechnical Services Ltd.

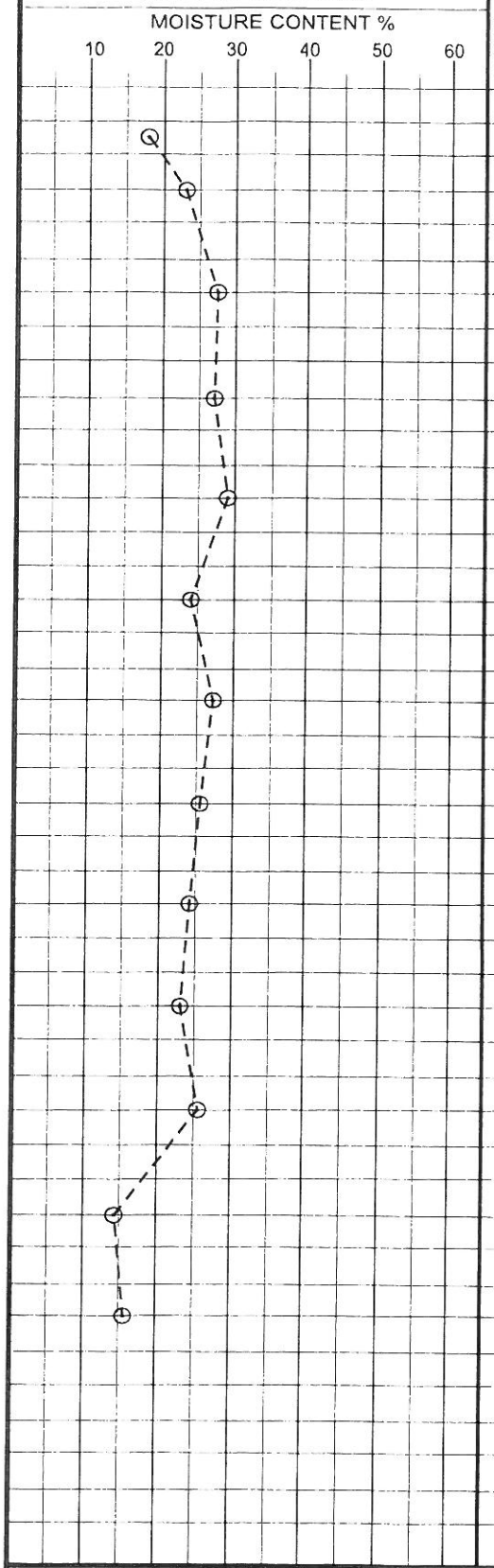
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH: MH	

TEST BORING **09-105**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, some sand, compressible, black, 67 cm thick				PP = 480 kPa
		67 cm				
		CLAY; silty, damp, very stiff, medium plasticity, dark olive brown				PP = 320 kPa
3	1					
						PP = 275 kPa SO_4 = 0.02%
6	2	- stiff consistency				
						PP = 120 kPa
						PP = 110 kPa SO_4 = 0.16%
10	3					
		– very moist				
						PP = 110 kPa
	4					
						PP = 175 kPa
15						
	5	- very moist, occasional silt lenses				
						PP = 120 kPa
						PP = 95 kPa
20	6					
		- frequent silt lenses and rust staining				
						PP = 110 kPa
	7					
						PP = 115 kPa
25						
		– groundwater seepage				
	8	– clay till like, moist, occasional gravel chips, dark grey				PP = 230 kPa
		– very stiff, medium plasticity				
		9.0 m				
30	9	End of Borehole = 9.0 m				PP = 315 kPa
		Slough = 9.0 m, 0 hours				
		Water level = 5.5 m, 0 hours				
		Water level = 5.5 m, 2.5 hours later				
		Slough = 5.6 m, 2.5 hours later				
	10	Water level = 2.0 m, 10 days later				
		Slough = 2.1m, 10 days later				
35						

⊙ MOISTURE CONTENT ⊡ LIQUID LIMIT △ PLASTIC LIMIT	Q_u UNCONFINED COMPRESSION γ_d DRY UNIT WEIGHT	SO_4 SULPHATE CONTENT ▼ WATER TABLE N PENETRATION RESISTANCE	☒ STANDARD PENETRATION SAMPLE ▨ UNDISTURBED SAMPLE (SHELBY) BS BAG SAMPLE	PLATE No. **107**

Hagstrom Geotechnical Services Ltd.

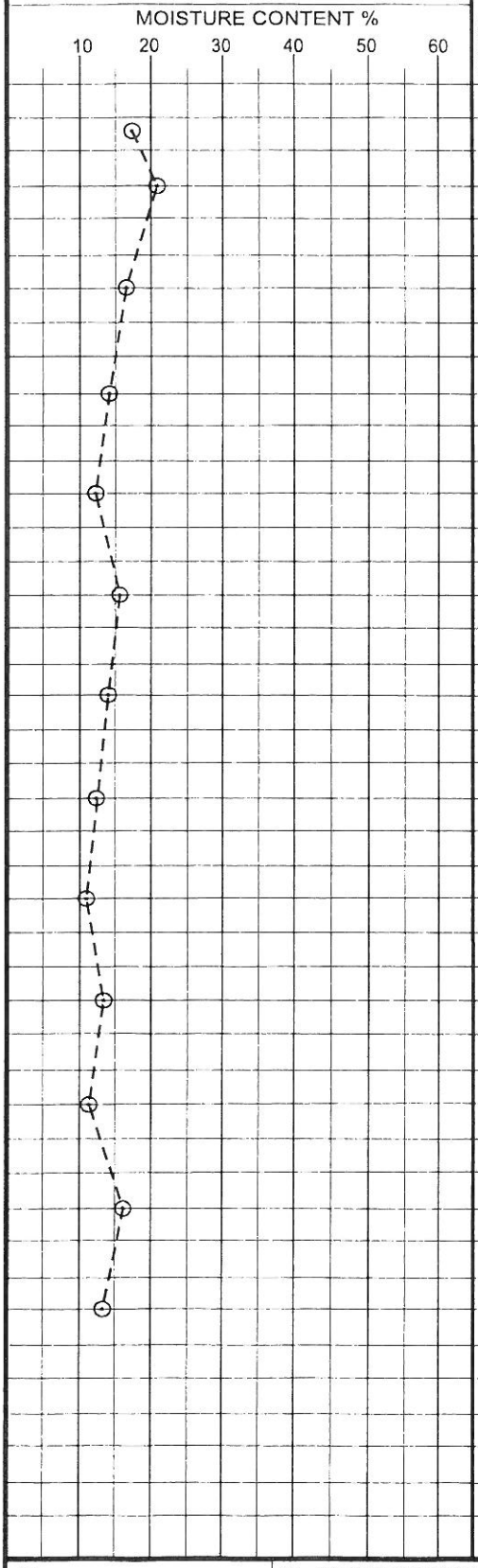
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-106**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION DATUM: SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	TEST RESULTS MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				PP = 530 kPa
		CLAY; silty, very stiff, medium plasticity, damp, dark olive brown				PP = 515 kPa SO_4 = 0.12%
3	1	1.1 m				
		SILT; sandy, some clay, medium dense, light yellowish brown				
6	2	- damp, medium dense				
		– medium dense				SO_4 = 0.14%
10	3	– dense, light yellowish brown 3.7 m				
		CLAY; silty, medium plasticity, moist, very stiff, occasional silt lenses, dark grey				PP = 325 kPa
	4					PP = 410 kPa
15						
	5	- very stiff				PP = 375 kPa
	6	– very stiff				PP = 330 kPa
20						
						PP = 345 kPa
	7	– groundwater seepage				
		– clay till like				PP = 385kPa
25						
	8	– very stiff, moist, occasional gravel chips				PP = 385 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.7 m, 0 hours Water level = 8.6 m, 2 hours later Slough = 8.5 m, 2 hours later				PP = 325 kPa
	10	Water level = 8.6 m, 10 days later Slough = 8.7 m, 10 days later				
35						

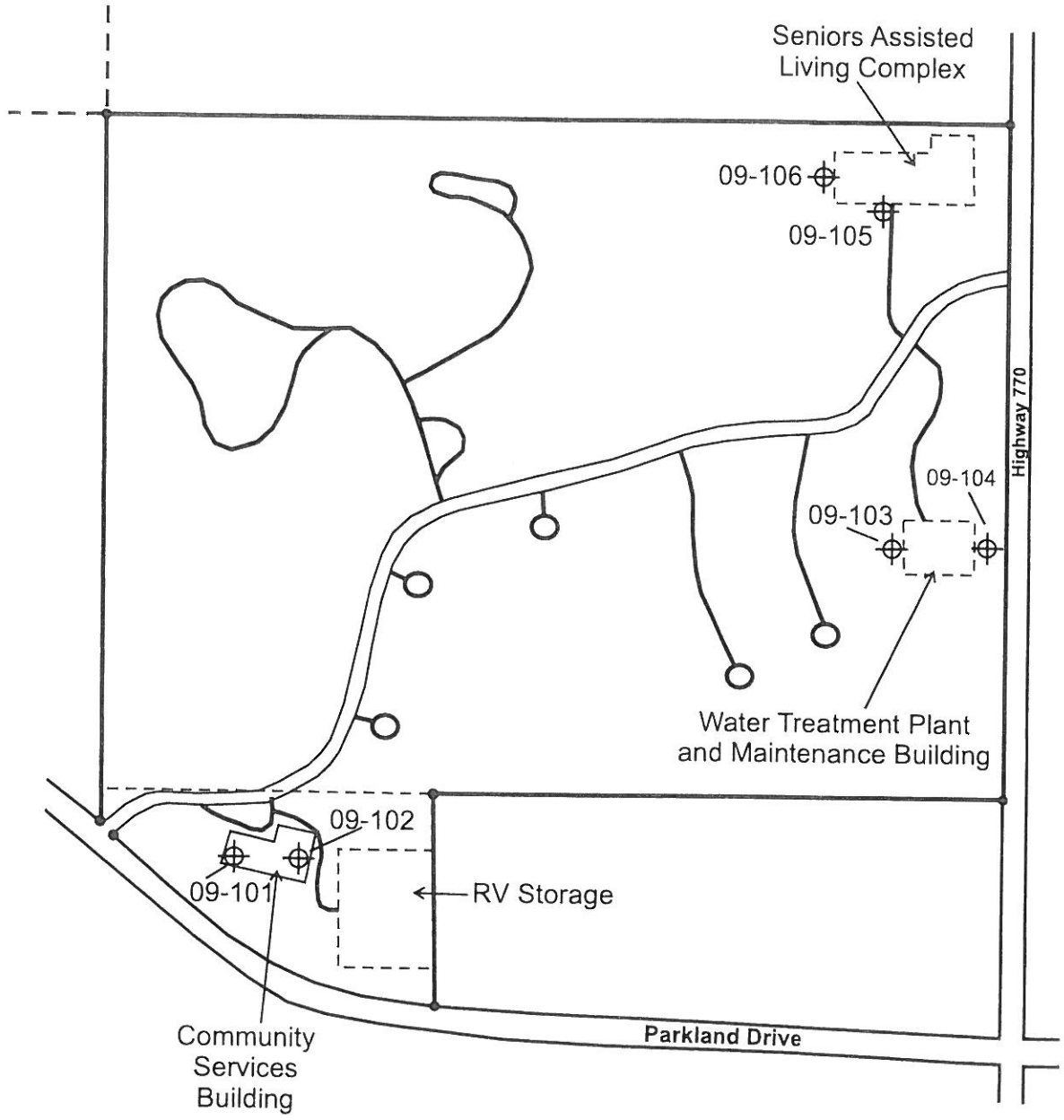
⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No.**108**



LEGEND

- Borehole Location
- Site Boundary

Scale: Not to scale

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

NOR CAN CONSULTING INC.
Proposed Country Residential Subdivision - Fawn Meadows
Portions of NE & SE 4-53-2-W5M,
Parkland County, Alberta
Site Plan

Job No: H0907-280	Date: August 11, 2009	Plate: 109

Hagstrom Geotechnical Services Ltd.

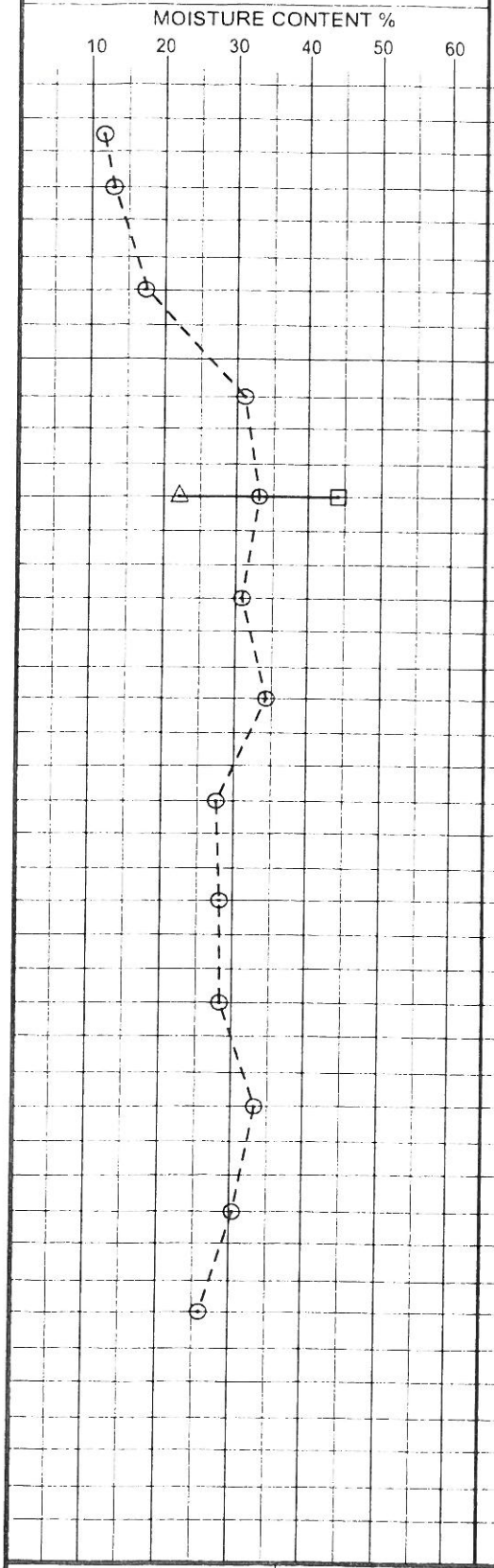
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH.	MH

TEST BORING **09-101**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, some small roots, black, 38 cm thick 38 cm				
3	1	**SILT;** some sand, some clay, damp, stiff, pale olive brown				PP = 185 kPa SO_4 = 0.08%
		1.8 m				PP = 115 kPa SO_4 = 0.14%
6	2	**CLAY;** silty, stiff, medium plasticity, damp, occasional silt lenses, dark olive brown				PP = 170 kPa
10	3	– very stiff, occasional silt lenses				PP = 135 kPa
		– softer with depth				PP = 170 kPa
15	4	– soft to firm, light olive brown – groundwater seepage – softer with depth, dark olive brown at 4.2 m				PP = 90 kPa
	5	5.3 m				PP = 210 kPa
20	6	**SILT;** sandy, very moist, free water, very sensitive, brown				PP = 85 kPa
		- soft to firm				PP = 75 kPa
25	7	7.7 m				PP = 85 kPa
	8	**CLAY;** silty, low plasticity, firm, very moist, dark grey				PP = 100 kPa
		– stiff, medium plasticity				
30	9	9.0 m End of Borehole = 9.0 m Slough = 8.8 m, 0 hours Water level = 8.7 m, 0 hours Water level = 5.1 m, 5 hours later Slough = 5.5 m, 5 hours later Water level = 4.0 m, 10 days later Slough = 5.3 m, 10 days later				PP = 115 kPa
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **103**

Hagstrom Geotechnical Services Ltd.

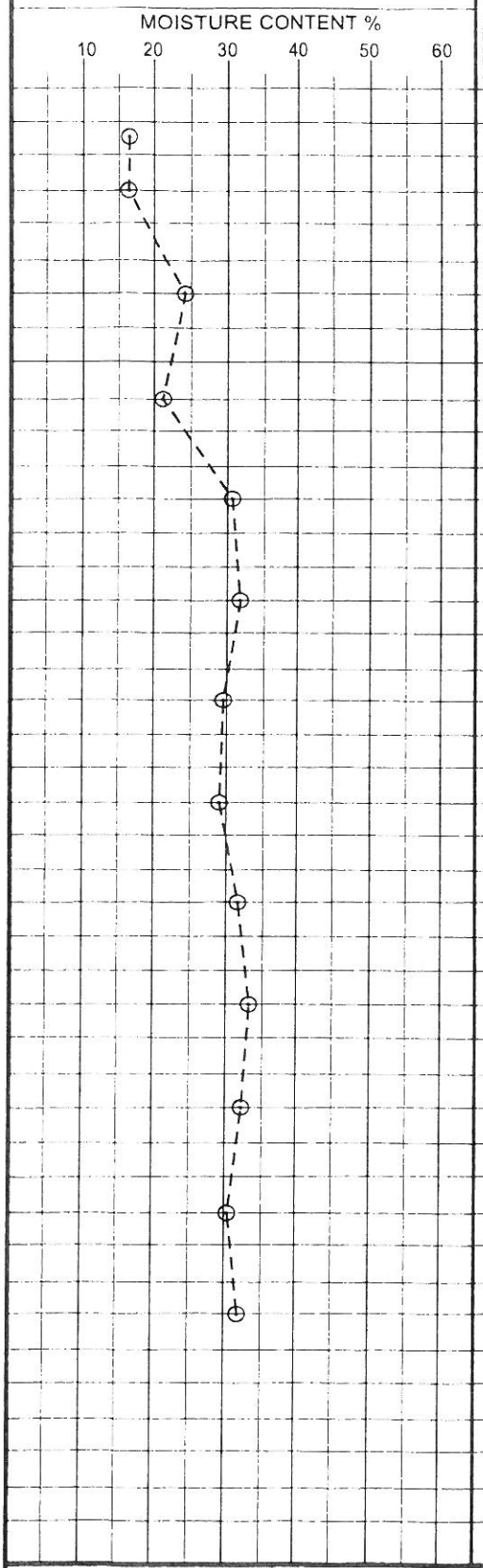
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-102**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, compressible, moist, black, 20 cm thick — 20 cm				
		SAND; silty, some clay, medium dense, moist, brown — 80 cm				PP = 375 kPa
3	1	**CLAY;** silty, medium plasticity, very stiff, occasional silt lenses, brown				PP = 240 kPa SO_4 = 0.02%
6	2	- firm to stiff consistency , moister with depth				PP = 145 kPa SO_4 = 0.08%
10	3	– firm, medium plasticity, dark olive brown — 3.4 m				PP = 145 kPa
		SILT; sandy, loose, some clay lenses, dark brown				PP = 130 kPa
	4	– groundwater seepage				
15		— 4.8 m				PP = 115 kPa
	5	**CLAY;** silty, firm to stiff, medium plasticity, moist, brown – silt layer from 5.1 to 5.3 m				PP = 85 kPa
20	6					PP = 125 kPa
		– silt layer from 6.6 to 6.9 m				PP = 105 kPa
	7					
25						PP = 105 kPa
	8	- stiff consistency				
		— 9.0 m				PP = 155 kPa
30	9	End of Borehole = 9.0 m Slough = 6.8 m, 0 hours Water level = 6.7 m, 0 hours Water level = 3.8 m, 4 hours later Slough = 3.9 m, 4 hours later				PP = 140 kPa
	10	Water level = 3.7m, 10 days later Slough = 3.8 m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
⧗ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **104**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT: Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 4, 2009

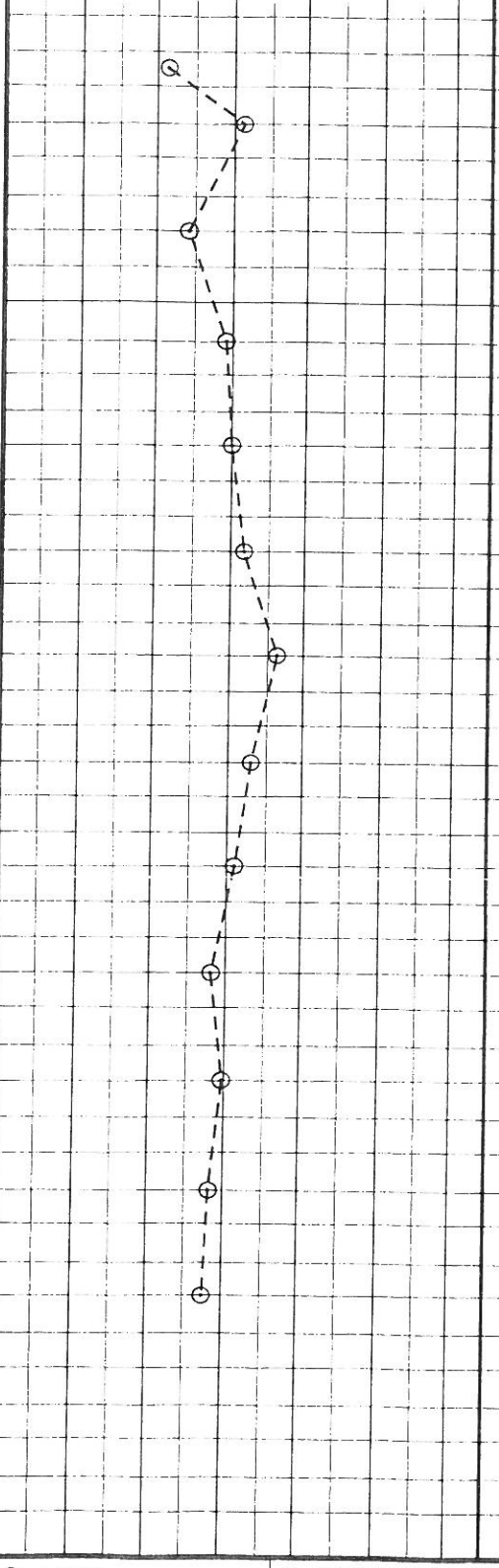
TECH: MH

TEST BORING 09-103

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION (DATUM / SURFACE ELEVATION)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	TEST RESULTS: MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, black, 23 cm thick				
		23 cm				
		CLAY; very silty, medium plasticity, moist, stiff, occasional silt lenses, dark olive brown				PP = 135 kPa
3	1					
		- firm to stiff consistency				PP = 130 kPa SO_4 = 0.18%
6	2					PP = 155 kPa
		– stiff consistency, occasional silt lenses				
10	3					PP = 220 kPa SO_4 = 0.06%
		– groundwater seepage				PP = 170 kPa
15	4					PP = 175 kPa
	5	- firm to stiff consistency				PP = 105 kPa
20	6	– stiff, very moist				PP = 175 kPa
		– occasional silt lenses				PP = 135 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– dark grey, very moist				PP = 140 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m Slough = 6.9 m, 0 hours Water level = 6.7 m, 0 hours Water level = 2.6 m, 3 hours later Slough = 2.7 m, 3 hours later Water level = 2.4 m, 10 days later Slough = 2.4 m, 10 days later				PP = 105 kPa
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
☒ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. 105

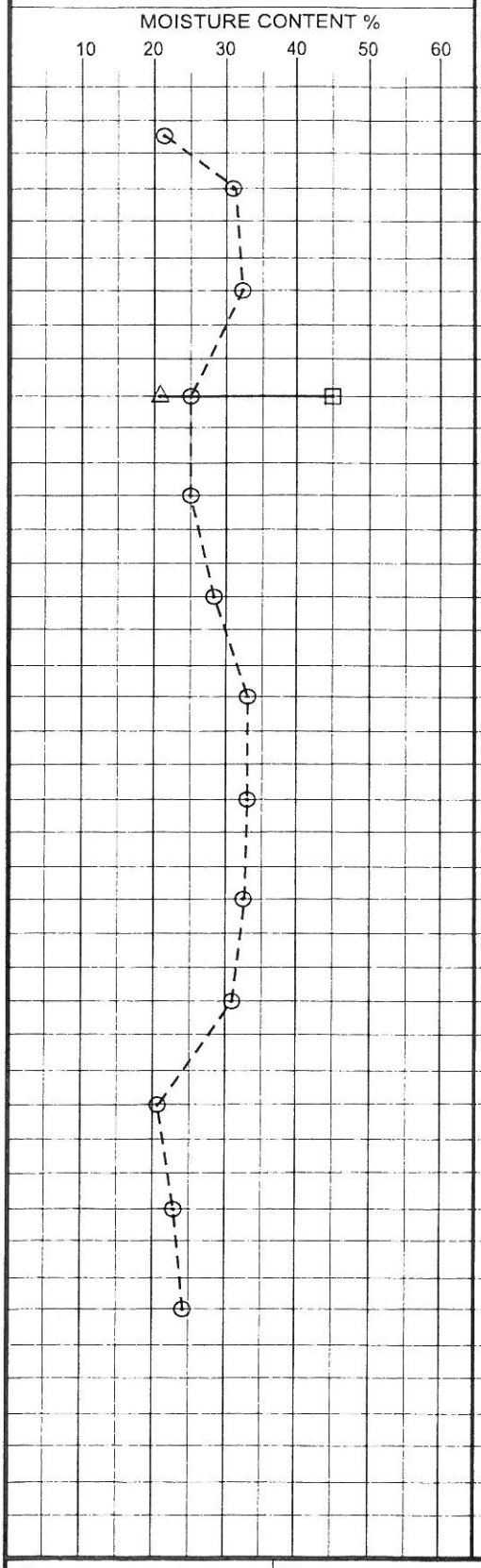
Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.: H0907-280
DATE: August 4, 2009 TECH: MH

TEST BORING **09-104**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				
		CLAY; silty, very stiff, medium plasticity, frequent rust stained fissures, dark olive brown				PP = 135 kPa SO_4 = 0.12%
3	1					PP = 130 kPa SO_4 = 0.04%
6	2	- firm to stiff				PP = 105 kPa
10	3	– low to medium plasticity				PP = 220 kPa
						PP = 190 kPa
	4	4.1 m				
		SILT; clayey, stiff, trace of sand, dark brown				PP = 175 kPa
15	5	– stiff — 5.1 m				
		CLAY; silty, firm consistency, low plasticity, very moist				PP = 105 kPa
20	6	– stiff, moist, occasional silt lenses				PP = 175 kPa
						PP = 110 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– groundwater seepage				PP = 120 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.8 m, 0 hours Water level = 8.7 m, 2.5 hours later Slough = 8.8 m, 2.5 hours later Water level = 5.8, 10 days later Slough = 6.1 m, 10 days later				PP = 105 kPa
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **106**

Hagstrom Geotechnical Services Ltd.

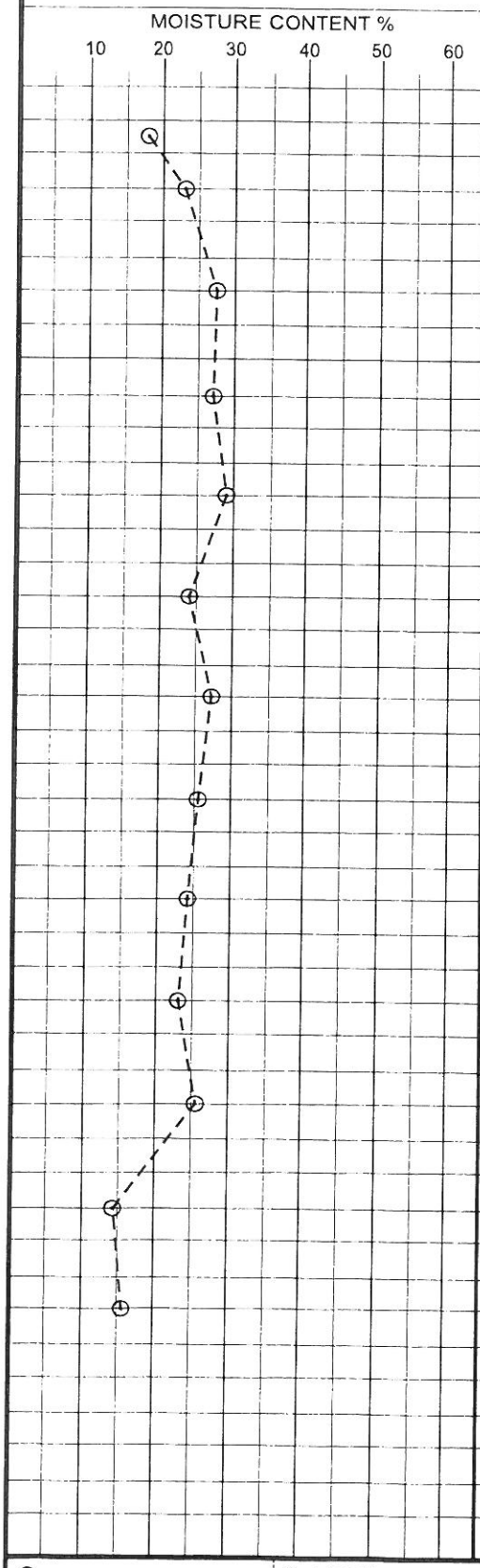
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-105**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT-N	MISCELLANEOUS TESTS
		TOPSOIL; silty, some sand, compressible, black, 67 cm thick				PP = 480 kPa
		67 cm				
		CLAY; silty, damp, very stiff, medium plasticity, dark olive brown				PP = 320 kPa
3	1					
						PP = 275 kPa SO_4 = 0.02%
6	2	- stiff consistency				
						PP = 120 kPa
						PP = 110 kPa SO_4 = 0.16%
10	3	– very moist				
						PP = 110 kPa
	4					
15						PP = 175 kPa
	5	- very moist, occasional silt lenses				
						PP = 120 kPa
20	6					PP = 95 kPa
		- frequent silt lenses and rust staining				
						PP = 110 kPa
	7					
25						PP = 115 kPa
		– groundwater seepage				
	8	– clay till like, moist, occasional gravel chips, dark grey				PP = 230 kPa
		– very stiff, medium plasticity				
		9.0 m				
	9	End of Borehole = 9.0 m				PP = 315 kPa
30		Slough = 9.0 m, 0 hours				
		Water level = 5.5 m, 0 hours				
		Water level = 5.5 m, 2.5 hours later				
		Slough = 5.6 m, 2.5 hours later				
	10	Water level = 2.0 m, 10 days later				
		Slough = 2.1m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No.**107**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-106**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				PP = 530 kPa
3	1	**CLAY;** silty, very stiff, medium plasticity, damp, dark olive brown — 1.1 m				PP = 515 kPa SO_4 = 0.12%
6	2	**SILT;** sandy, some clay, medium dense, light yellowish brown - damp, medium dense				
10	3	– medium dense				SO_4 = 0.14%
		– dense, light yellowish brown — 3.7 m				
	4	**CLAY;** silty, medium plasticity, moist, very stiff, occasional silt lenses, dark grey				PP = 325 kPa
15						PP = 410 kPa
	5	- very stiff				PP = 375 kPa
20	6	– very stiff				PP = 330 kPa
						PP = 345 kPa
	7	– groundwater seepage				
25		– clay till like				PP = 385kPa
	8	– very stiff, moist, occasional gravel chips				PP = 385 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.7 m, 0 hours Water level = 8.6 m, 2 hours later Slough = 8.5 m, 2 hours later				PP = 325 kPa
	10	Water level = 8.6 m, 10 days later Slough = 8.7 m, 10 days later				
35						

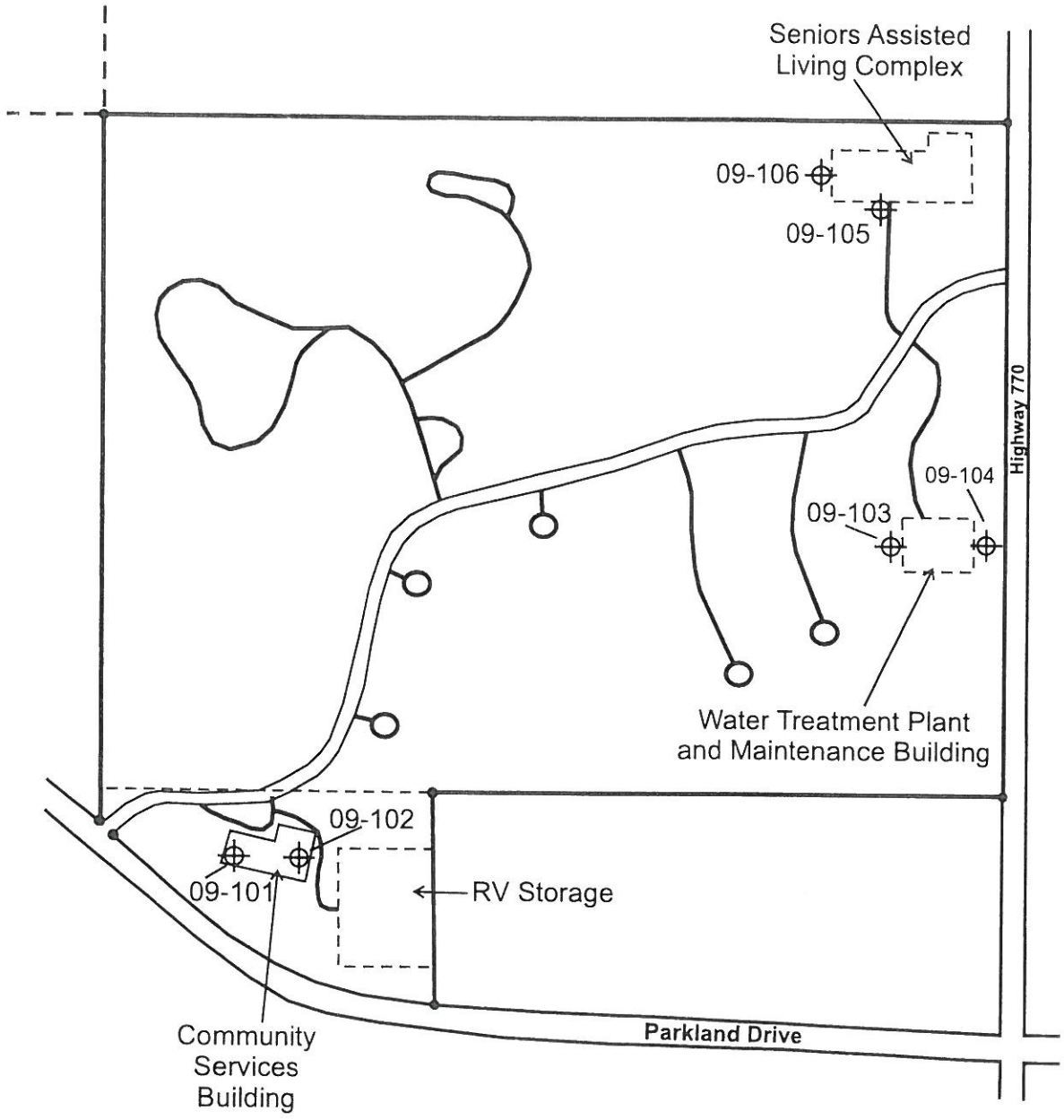
⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
BS BAG SAMPLE

PLATE No.**108**



LEGEND

- Borehole Location
- Site Boundary

Scale: Not to scale

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

NOR CAN CONSULTING INC.

Proposed Country Residential Subdivision - Fawn Meadows
Portions of NE & SE 4-53-2-W5M,
Parkland County, Alberta
Site Plan

Job No: H0907-280	Date: August 11, 2009	Plate: 109

Hagstrom Geotechnical Services Ltd.

5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3
Tel: (780) 996-5621 • Fax: (780) 475-5671
e-mail: h_gsl@telus.net

Norcan Consulting Group Ltd.
Box 38, Site 219, RR2
Gravel, Alberta
T0E OH0

March 1, 2012
Our File: H0907-280

Attention: **Mr. Frank Florkewich**

Dear Sirs:

Re: Geotechnical Site Investigation
For Proposed Facilities
Proposed Country Residential Subdivision
Fawn Meadows
Portions of NE and SE 4-53-2-W5M
Parkland County, Alberta

1.0 INTRODUCTION

As requested, a geotechnical site investigation was carried out by Hagstrom Geotechnical Services Ltd. (HGSL) at the above referenced project. The scope of work for the investigation was to provide an assessment of the soil and groundwater conditions, provide recommendations for alternate foundation systems and preparation of this report. Field drilling was carried out on August 4, 2009 and final water table measurements were taken on October 14, 2009.

2.0 PROJECT DESCRIPTION

The proposed country residential subdivision contains about 52.6 hectares of agricultural land that occupies a portion of the northeast and southeast quarters of Section 4, Township 53, Range 2, West of the Fifth Meridian. The site is bounded on the east by Highway 770 and on the south by Parkland Drive. The site is open, vacant hayland and contains four large groups of trees and marshes that cover about 30 to 35 percent of the site. The site topography is moderately rolling with slopes typically less than 12 degrees (21 percent). No definite drainage pattern is apparent across the site.

It is understood that the proposed development is to consist of cluster type lots of about 55 to 60 residential lots varying in size from 1.0 to 2.5 acres. It is further understood that the development will be serviced with centralized municipal sanitary sewers and potable water systems. In addition, the proposed subdivision will consist of a community services building located in the south west corner, a water treatment plant and maintenance building in the south east corner and a seniors assisted living complex located in the north east corner. The size and

details of each facility were not finalized at the time of report submission.

3.0 INVESTIGATION PROCEDURE

Six deep boreholes were drilled on the site on August 4, 2009. Borehole 09-101and 09-102 were drilled at the proposed services building, Boreholes 09-13 and 09-104 were drilled at the proposed water treatment plant/maintenance building and Boreholes 09-105 and 09-106 were drilled at the proposed seniors assisted living complex (Refer to Plate 109, Appendix A). It is noted that Boreholes 09-105 and 09-106 could not be drilled within the building footprint because of heavy tree cover. The boreholes were drilled to depths of 9.0 metres using a truck mounted drill rig equipped with a continuous flight, 150-millimeter diameter, solid-stem augers. Supervision of drilling, soil sampling, and logging of the various soil strata was performed by Mr. Merle Hagstrom, P. Eng of HGSL. The soils encountered during drilling were classified in accordance with the Modified Unified Soil Classification System described on Plates 1 and 2, Appendix A. The soil and groundwater conditions encountered during field drilling were recorded and are presented on borehole logs, Plates 103 to108, Appendix A. The borehole locations are presented on Plate 109, Appendix A.

Soil sampling for laboratory analysis generally consisted of disturbed auger soil samples at 0.75 meter intervals obtained from all boreholes. In addition, pocket penetrometer (PP) readings were taken on intact cohesive soil samples at approximately 0.75 metre intervals from all boreholes to obtain an indication of the unconfined compressive strength (Q_u) of the soil.

Groundwater conditions were monitored during drilling, at drilling completion, several hours later and 10 days after drilling completion. All of the water level results are presented on the boreholes logs in Appendix A.

In addition to the routine moisture content analysis, the laboratory analyses consisted of twelve soluble sulphates analyses and two Atterberg limit tests. The laboratory analyses results are presented on the borehole logs in Appendix A.

4.0 SUBSOIL AND GROUNDWATER CONDITIONS

The soil profile at the borehole locations generally consist of a thin cover of topsoil over variable thick layers of silt and clay. A thin layer of sand was encountered below the topsoil in one borehole. A description of various soil units and their properties are presented in the paragraphs below.

Topsoil was encountered at the ground surface in all boreholes and extended to depths between 18 and 67 centimeters. The topsoil was described as silty, dry to damp, with some sand, compressible and black in colour. Greater thickness of topsoil may be found between borehole locations.

Clay of variable thickness was encountered at random depths in all boreholes. The clay was described as silty, firm to hard consistency, low to medium plasticity, damp to very moist, brown to dark olive brown in colour. The clay was also noted to have frequent silt lenses with

rust staining and occasional gravel chips. In-situ moisture contents in the clay ranged from 11 to 34 percent. Pocket penetrometer readings taken on intact auger samples of clay revealed approximate unconfined compressive strengths Q_u, ranging from 90 to 515 kPa. Two Atterberg limit tests conducted on clay yielded liquid limits of 44 and 45 percent and plastic limits of 21 and 22 percent (medium plasticity). Based on a review of plastic limits in comparison with the natural moisture contents in the clay, the natural moisture contents are about 5 to 10 percent wet of optimum moisture content (OMC). The clay exhibits moderate compressibility under low to moderate loads. The clay also exhibits moderate swelling potential and thus may lift light loads such as floor slabs given access to free water.

Silt was encountered at variable depths in three of the six boreholes. The site was described as sandy, with some clay, damp to very moist, and pale olive brown to dark grey in colour. Below the groundwater table, the silt was noted to be very sensitive. In-situ moisture contents in the silt ranged from 12 to 32 percent. Pocket penetrometer readings taken on intact auger samples of silt revealed approximate unconfined compressive strengths Q_u, ranging from 115 to 185 kPa. The silt exhibits moderate compressibility under low to moderate loads.

Groundwater conditions were monitored during drilling, at drilling completion, several hours later and 10 days after drilling completion. Groundwater seepage was encountered during drilling in all six boreholes. All water table results are summarized in Table 1, below and the individual results are presented on the borehole logs in Appendix A.

TABLE 1: SUMMARY OF GROUNDWATER OBSERVATIONS

Borehole Number	Depth of Groundwater Seepage (m)	Depth to Water (m)		
		At Drilling Completion	2 to 5 Hours Later	10 Days Later
09-101	4.1	8.7	5.1	4.0
09-102	4.2	6.7	3.8	3.7
09-103	3.6	6.7	2.6	2.4
09-104	8.0	8.8	8.7	5.8
09-105	7.8	5.5	5.5	2.0
09-106	7.0	8.7	8.6	8.6

Based on a review of the above results, the groundwater table is considered to be variable across the site. The results indicate that groundwater may pose problems for caisson pile drill holes and other excavations that are left open for short and extended periods of time at depths below 2.0

metres.

It should be noted that groundwater levels will fluctuate seasonally and in response to climatic conditions and may be at a different depths when construction commences. Accordingly, groundwater levels should be monitored periodically until the start of construction.

4.1 FROST PENETRATION

The expected maximum depth of frost penetration for various soil types is given in Table 2, below. The penetration is based on a freezing index for a 25-year return period of 2200 degrees-days Celsius. The depth of frost penetration assumes a uniform soil type without topsoil or snow cover.

The native mineral soils encountered in the boreholes is considered to be frost susceptible, and with an adequate supply of moisture near the ground surface, significant frost heave may occur.

TABLE 2
ESTIMATED DEPTH OF FROST PENETRATION

Soil Type		Depth of Frost Penetration (m)
In-situ	Clay and Clay Till	2.5
	Silt and Sand	2.9
	Weathered Bedrock	3.0
	Gravel	3.5
Compacted Backfill (95 % SPMDD*)	Clay and Clay Till	2.3
	Silt and Sand	2.7
	Weathered Bedrock	2.9
	Gravel	3.3

*SPMDD- Standard Proctor Maximum Dry Density

5.0 GEOTECHNICAL EVALUATION

All foundation design recommendations presented in this report are based on the assumption that an adequate level of construction monitoring during foundation excavation and installation will be provided, and that all construction will be carried out by a suitably qualified, experienced contactor. An adequate level of construction monitoring is considered to be: (a), design review and full-time monitoring during construction of foundations, and (b), full-time monitoring and compaction testing for earthworks by suitably qualified geotechnical personnel.

The soil conditions at the site are considered to be adequate for the proposed site facilities. The groundwater table is considered to be moderately high. Shallow foundations such as strip and spread footings can be considered for the site. Alternatively, deep foundations such as cast-in-place straight shaft or end bearing concrete piles may be considered.

5.1 SHALLOW FOUNDATIONS

Shallow concrete footings for all three facilities founded on the native mineral soil should be designed based on a net allowable bearing capacity of 90 and 120 kPa for strip and spread footings, respectively. This value utilizes a factor of safety of 3.0. The allowable bearing pressure may be increased by a factor of 1.5 to obtain a factored ultimate bearing resistance. The footings should be constructed at a minimum depth of 1.5 m and 2.5 metres below exterior grade for heated and unheated structures, respectively. It is recommended that footing excavations be inspected by a qualified geotechnical engineer prior to pouring concrete to confirm foundation soil conditions and bearing pressures.

All footings should be founded on the undisturbed, inorganic native mineral soil. Footings must not be placed on any topsoil, uncontrolled fill, organic soils or loose, disturbed or frozen soils. Footing excavations must be protected from frost, desiccation, or the ingress of water. Bearing soils, which become frozen, dried or softened, should be removed and replaced with concrete or the footings should be extended to reach soil in an unaffected condition. It is essential that the foundation soils not be allowed to freeze at any time before or after concrete for the footings have been placed.

5.2 DEEP FOUNDATIONS

Cast-in-place concrete piles can be considered for all three proposed facilities and should be designed as straight shaft concrete friction-type piles using allowable and factored skin friction parameters shown in Table 3, below. No allowance should be made for end bearing on straight shaft piles.

Concrete straight shaft piles should be embedded at least 6.0 and 7.5 metres below grade for heated and unheated foundations, respectively. The minimum center-to-center spacing for concrete cast-in-place piles should be greater than 3 pile diameters. The piles should be at least 400 mm in diameter. Void form that is approximately 100 millimetres thick should be used under a concrete grade beam or pile cap.

TABLE 3
ALLOWABLE SKIN FRICTION FOR CAST-IN-PLACE CONCRETE PILES

Depth Below Existing Grade (m)	Soil Type	Allowable Skin Friction (kPa)	Factored ULS Skin Friction (kPa)
0 to 1.5	Clay/ Silt/Sand	0	0
1.5 to 9.0	Clay/Silt/Sand	21	28

Longitudinal steel reinforcement in the upper 6.0 meters of the pile is recommended to prevent potential uplift forces of the pile due to frost action and seasonal moisture variations. If the piles are designated as tension elements including frost action, longitudinal reinforcing steel should extend into the bottom of the piles, and the piles should be designed to resist the anticipated uplift stresses using the design values provided below.

Concrete for piles should be poured immediately after drilling of the pile hole to reduce the risk of groundwater seepage and sloughing of the soil. Protective steel casing may be required where wet sand and groundwater seepage are encountered.

5.2.1 Settlement Considerations for Concrete Piles

Calculation of the potential settlement pattern is complex and difficult to assess without significant additional laboratory testing and detailed knowledge of the loading and foundation types. For structures supported on native, undisturbed soil, the following comments may be of some value:

- The settlement of an isolated cast-in-place concrete skin friction pile should be no more than 5 mm plus elastic compression of the pile upon full mobilization of shaft resistance.

Differential settlements, rather than total settlements, are usually the governing factor in structural and architectural design. Differential settlements between adjacent columns or wall units are typically about one-half of the values given above.

5.3 SEISMIC SITE CLASSIFICATION

Site classification for soil seismic response for this site is category "D" which is according to the requirements of the National Building Code of Canada (Table 4.1.8.4.A).

5.4 CONCRETE

Chemical testing for water-soluble sulphates concentrations on twelve selected samples of native soil revealed sulphate concentrations of 0.02 to 0.18 percent water-soluble sulphate by dry weight of soil. The results indicated a "negligible to moderate" potential for sulphate attack on concrete in contact with native soils at this site. Therefore, all concrete in contact with the native soils should be made from CSA Type 50 sulphate resistant cement possessing a minimum 56 days compressive strength of 30 MPa. The maximum water cement ratio should be 0.50. An air entrainment agent of 5 to 7 percent is recommended for improved workability and durability. If new fill is brought to the site, it should be tested for soluble sulphates to determine if Type 50 cement is required.

6.0 CLOSURE

This report is based on the findings at six deep borehole locations. Should different subsoil or groundwater conditions be encountered during construction, Hagstrom Geotechnical Services Ltd. must be notified immediately and the recommendations provided herein will be reviewed and revised as required.

Boreholes could not be drilled within the building footprint for the new seniors assisted living complex and thus is recommended that new boreholes be drilled within the new building footprint. In addition, if the other building locations are changed, it is recommended that new boreholes be drilled. During placement and compaction of new fill, soil compaction tests should

Explanation of Field and Laboratory Test Data

The following pages are an explanation of the terms and symbols used in the Test Hole Log

Soil Profile and Description

Soil types are described by the Modified Unified Soil Classification System.
(See Plate 2 for terms and symbols)

Soils classified by particle size fall in the following ranges:

BOULDERS - greater than 200 mm	SAND - 0.08 mm to 5 mm
COBBLES - 75 mm to 200 mm	SILT - 0.002 mm to 0.08 mm
GRAVEL - 5 mm to 75 mm	CLAY - finer than 0.002 mm

Additional graphic symbols include:

seepage
water level surface

Soil Sample Type

Standard Penetration Sample (D)

Undisturbed Sample (Shelby) (U)

Bag Sample

Penetration Resistance

Field test indication number of blows (N) of a 140 pound hammer dropping 30 inches (76cm) required to drive a 2 inch (5 cm) O.D. open end sampler a distance of 1 foot (30 cm) from 0.5 to 1.5 feet (15 to 45 cm) into the undisturbed soil. This test is outlined in A.S.T.M., D1568.

Miscellaneous Tests

In this column are summarized results of all the laboratory test as indicated by the following symbols:

HVR	Hydrocarbon Vapour Readings, ppm or % LEL
* MA	Mechanical grain size analysis
G	Specific gravity
k	Coefficient of permeability
PP	Pocket penetrometer strength kg/cm2
* q	Triaxial compression test
* C	Consolidation test
Qu	Unconfined compressive strength kg/cm2
SO_4	Soluble sulphate concentration
γ	Bulk unit weight
γd	Dry unit weigh

* Tests normally summarized on separate data sheets

Hagstrom Geotechnical Services Ltd.
5607 - 134 A. Avenue, Edmonton, Alberta T5A 0M3

Modified Unified Classification System For Soils

Major Division			Group Symbol	Graph Symbol	Color Code	Typical Description	Laboratory Classification Criteria	
Coarse-Grained Soils (more than half by weight larger than 200 sieve)	Gravels more than half coarse grains larger than No. 4 sieve	Clean Gravels (little or no fines)	GW		Red	Well graded gravels, little or no fines	$C_U = (D_{60}/D_{10}) > 6$ $C_C = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			GP		Red	Poorly graded gravels, and gravel sand mixtures, little or no fines	Not meeting above requirements	
		Dirty Gravel (with some fines)	GM		Yellow	Silty gravels, gravel-sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			GC		Yellow	Clayey gravels, gravel-sand-(silt) clay mixtures		Above "A" line P.I. more than 7
	Sands more than half fine grains smaller than No. 4 sieve	Clean Sands (little or no fines)	SW		Red	Well graded sands, gravely sands, little or no fines	$C_U = (D_{60}/D_{10}) > 4$ $C_C = D_{30}^2/(D_{10}*D_{60}) = 1$ to 3	
			SP		Red	Poorly graded sands, little or no fines	Not meeting above requirements	
		Dirty Sands (with some fines)	SM		Yellow	Silty sands, sand-silt mixtures	Content of fines exceeds 12%	Below "A" line P.I. less than 4
			SC		Yellow	Clayey sands, sand-(silt) clay mixtures		Above "A" line P.I. more than 7
Fine-Grained Soils (more than half by weight passes 200 sieve)	Silts below "A" line negligible organic content	$W_L < 50\%$	ML		Green	Inorganic silts and very fine sands, rock flour, silty sands of slight plasticity	Classification is based upon plasticity chart	
		$W_L > 50\%$	MH		Blue	Inorganic silts, micaceous or diatomaceous, fine sandy or silty soils		
	Clays above "A" line negligible organic content	$W_L < 30\%$	CL		Green	Inorganic clays of low plasticity, gravelly, sandy, or silty clays, lean clays		
		$30\% < W_L < 50\%$	CI		Green-Blue	Inorganic clays of medium plasticity, silty clays		
		$W_L > 50\%$	CH		Blue	Inorganic clays of high plasticity		
	Organic Silts & Clays bellow "A" line on chart	$W_L < 50\%$	OL		Green	Organic silts and organic silty clays of low plasticity	Whenever the nature of the fine content has not been determined it is designated by the letter "F". E.G. SF is a mixture of sand with silt or clay	
		$W_L > 50\%$	OH		Blue	Organic clays of high plasticity		
Highly Organic Soils			PI		Orange	Peat and other highly organic soils	Strong color or odor, and often fibrous texture	

Bedrock Symbols

Bedrock (Undifferentiated)

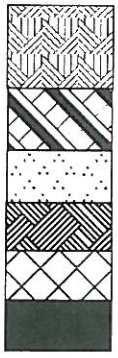
Shale

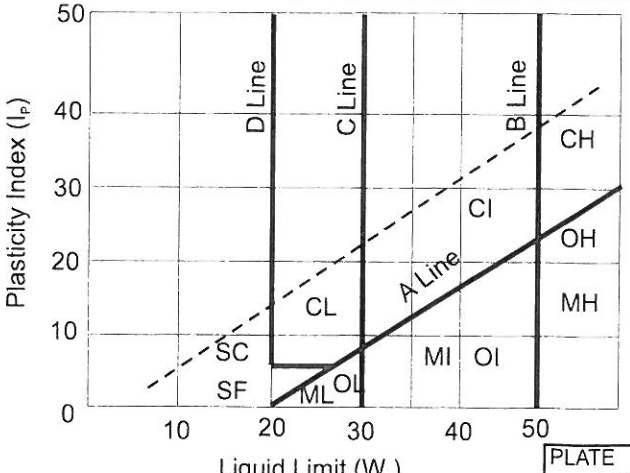
Sandstone

Siltstone

Fill

Coal





Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

PLATE No. 102

Hagstrom Geotechnical Services Ltd.

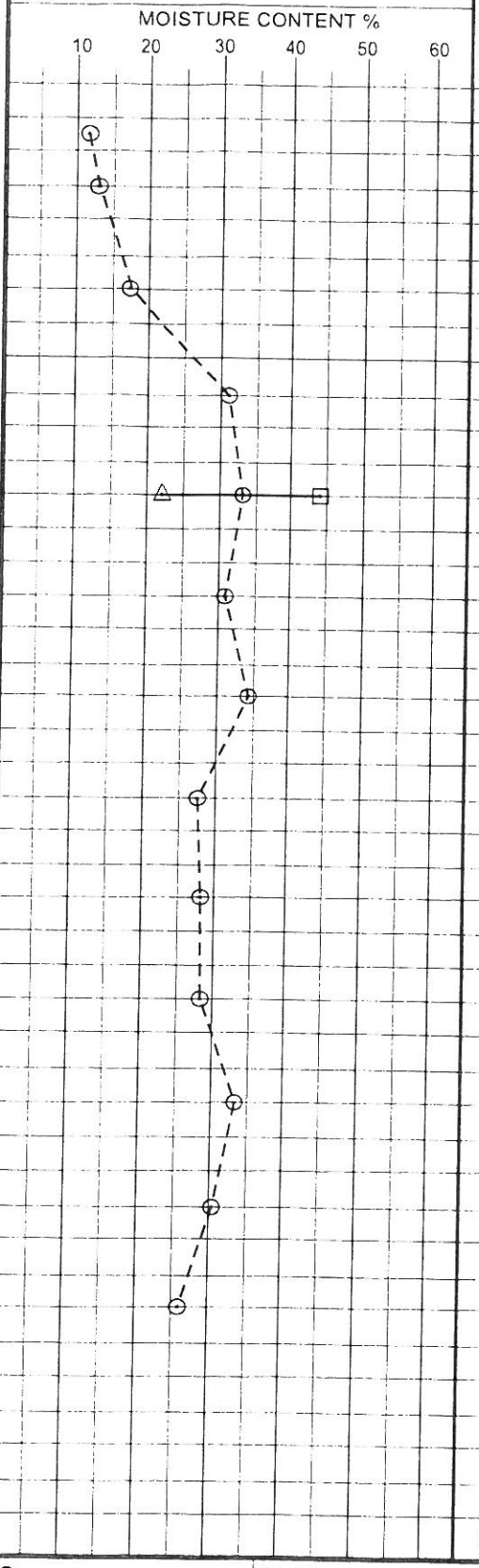
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-101**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

DATUM:

SURFACE ELEVATION:

DEPTH IN FEET	DEPTH (m)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
3	1				PP = 185 kPa SO_4 = 0.08%
					PP = 115 kPa SO_4 = 0.14%
6	2				PP = 170 kPa
10	3				PP = 135 kPa
					PP = 170 kPa
15	5				PP = 90 kPa
					PP = 210 kPa
20	6				PP = 85 kPa
					PP = 75 kPa
25	7				PP = 85 kPa
					PP = 100 kPa
30	9				PP = 115 kPa
	10				
35					

TOPSOIL; silty, damp, compressible, some small roots, black, 38 cm thick — 38 cm

SILT; some sand, some clay, damp, stiff, pale olive brown — 1.8 m

CLAY; silty, stiff, medium plasticity, damp, occasional silt lenses, dark olive brown

– very stiff, occasional silt lenses

– softer with depth

– soft to firm, light olive brown
– groundwater seepage
– softer with depth, dark olive brown at 4.2 m — 5.3 m

SILT; sandy, very moist, free water, very sensitive, brown

- soft to firm — 7.7 m

CLAY; silty, low plasticity, firm, very moist, dark grey

– stiff, medium plasticity — 9.0 m

End of Borehole = 9.0 m
Slough = 8.8 m, 0 hours
Water level = 8.7 m, 0 hours
Water level = 5.1 m, 5 hours later
Slough = 5.5 m, 5 hours later
Water level = 4.0 m, 10 days later
Slough = 5.3 m, 10 days later

TEST RESULTS

⊙ MOISTURE CONTENT ⊡ LIQUID LIMIT △ PLASTIC LIMIT	Q_u UNCONFINED COMPRESSION γ_d DRY UNIT WEIGHT	SO_4 SULPHATE CONTENT ▼ WATER TABLE N PENETRATION RESISTANCE	☒ STANDARD PENETRATION SAMPLE ▽ UNDISTURBED SAMPLE (SHELBY) [B] BAG SAMPLE

PLATE No. **103**

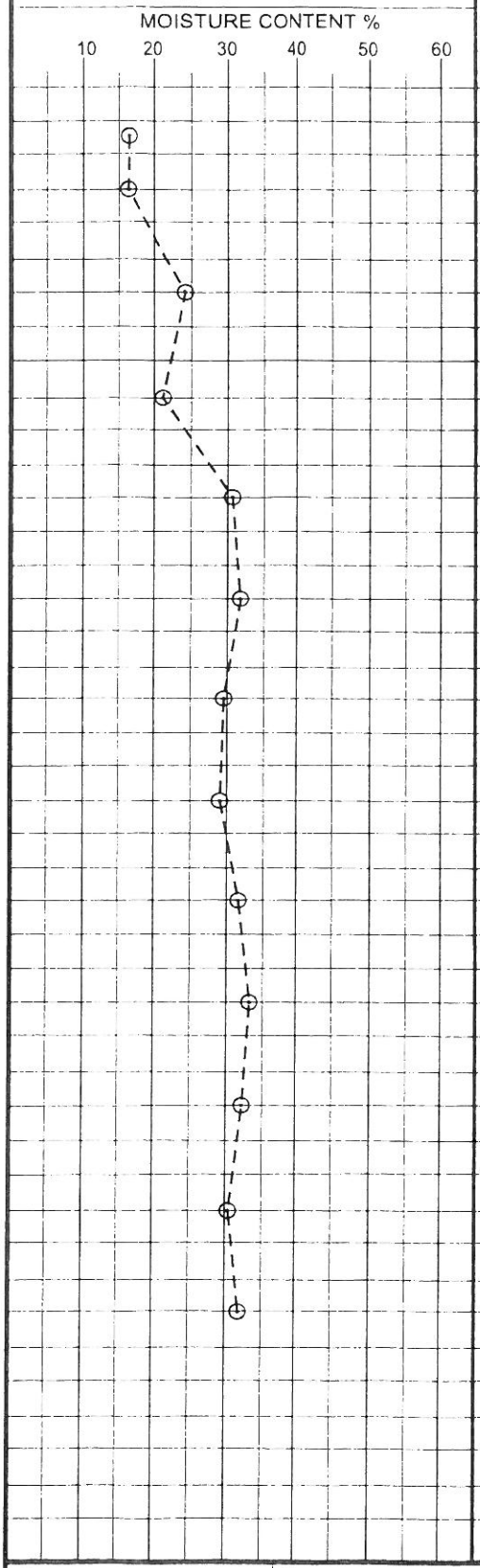
Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-102**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	TEST RESULTS: MISCELLANEOUS TESTS
		DATUM:				
		SURFACE ELEVATION:				
		TOPSOIL; silty, compressible, moist, black, 20 cm thick — 20 cm				
		SAND; silty, some clay, medium dense, moist, brown — 80 cm				PP = 375 kPa
3	1	**CLAY;** silty, medium plasticity, very stiff, occasional silt lenses, brown				PP = 240 kPa SO_4 = 0.02%
6	2	- firm to stiff consistency , moister with depth				PP = 145 kPa SO_4 = 0.08%
10	3	– firm, medium plasticity, dark olive brown — 3.4 m				PP = 145 kPa
		SILT; sandy, loose, some clay lenses, dark brown				PP = 130 kPa
4		– groundwater seepage				
15		— 4.8 m				PP = 115 kPa
	5	**CLAY;** silty, firm to stiff, medium plasticity, moist, brown – silt layer from 5.1 to 5.3 m				PP = 85 kPa
20	6					PP = 125 kPa
		– silt layer from 6.6 to 6.9 m				PP = 105 kPa
	7					
25						PP = 105 kPa
		- stiff consistency				
	8					PP = 155 kPa
		— 9.0 m				
30	9	End of Borehole = 9.0 m Slough = 6.8 m, 0 hours Water level = 6.7 m, 0 hours Water level = 3.8 m, 4 hours later Slough = 3.9 m, 4 hours later				PP = 140 kPa
	10	Water level = 3.7m, 10 days later Slough = 3.8 m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
☒ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **104**

Hagstrom Geotechnical Services Ltd.

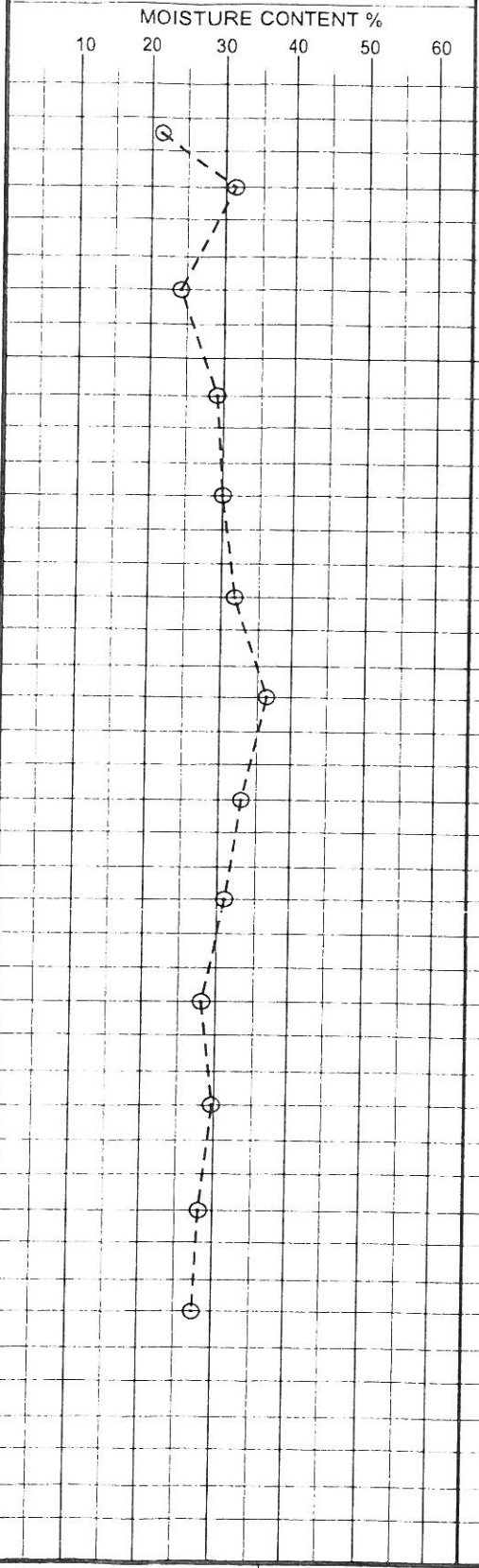
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-103**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, dry, compressible, black, 23 cm thick				
		23 cm				
		CLAY; very silty, medium plasticity, moist, stiff, occasional silt lenses, dark olive brown				
3	1					PP = 135 kPa
		- firm to stiff consistency				PP = 130 kPa SO_4 = 0.18%
6	2					PP = 155 kPa
		– stiff consistency, occasional silt lenses				
10	3					PP = 220 kPa SO_4 = 0.06%
		– groundwater seepage				
	4					PP = 170 kPa
15						PP = 175 kPa
	5	- firm to stiff consistency				
						PP = 105 kPa
20	6	– stiff, very moist				PP = 175 kPa
		– occasional silt lenses				PP = 135 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– dark grey, very moist				PP = 140 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m				PP = 105 kPa
		Slough = 6.9 m, 0 hours				
		Water level = 6.7 m, 0 hours				
		Water level = 2.6 m, 3 hours later				
		Slough = 2.7 m, 3 hours later				
	10	Water level = 2.4 m, 10 days later				
		Slough = 2.4 m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_o DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **105**

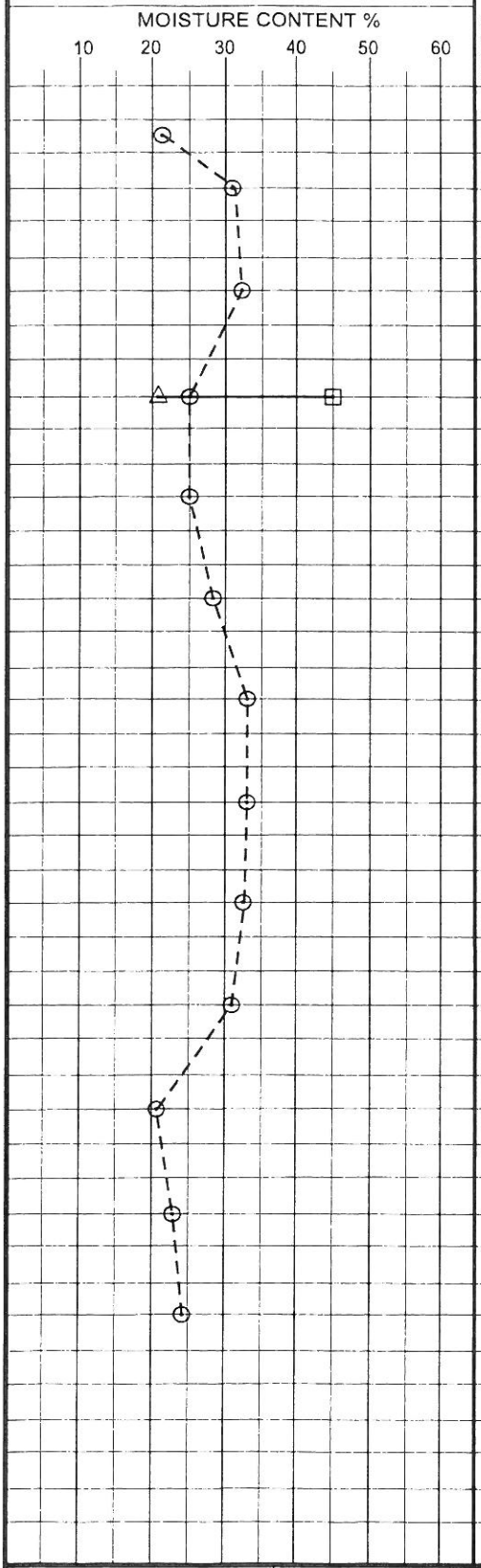
Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.: H0907-280
DATE: August 4, 2009 TECH: MH

TEST BORING **09-104**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				
		CLAY; silty, very stiff, medium plasticity, frequent rust stained fissures, dark olive brown				PP = 135 kPa SO_4 = 0.12%
3	1					
						PP = 130 kPa SO_4 = 0.04%
6	2	- firm to stiff				PP = 105 kPa
10	3	– low to medium plasticity				PP = 220 kPa
						PP = 190 kPa
	4	4.1 m				
		SILT; clayey, stiff, trace of sand, dark brown				
15						PP = 175 kPa
		– stiff				
	5	5.1 m				
		CLAY; silty, firm consistency, low plasticity, very moist				PP = 105 kPa
20	6	– stiff, moist, occasional silt lenses				PP = 175 kPa
						PP = 110 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– groundwater seepage				
						PP = 120 kPa
	9	9.0 m				
30		End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.8 m, 0 hours Water level = 8.7 m, 2.5 hours later Slough = 8.8 m, 2.5 hours later Water level = 5.8, 10 days later Slough = 6.1 m, 10 days later				PP = 105 kPa
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **106**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 4, 2009 TECH: MH

TEST BORING **09-105**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, some sand, compressible, black, 67 cm thick				PP = 480 kPa
		67 cm				
		CLAY; silty, damp, very stiff, medium plasticity, dark olive brown				PP = 320 kPa
3	1					
						PP = 275 kPa SO_4 = 0.02%
6	2	- stiff consistency				
						PP = 120 kPa
						PP = 110 kPa SO_4 = 0.16%
10	3					
		– very moist				
						PP = 110 kPa
	4					
						PP = 175 kPa
15						
	5	- very moist, occasional silt lenses				
						PP = 120 kPa
20	6					PP = 95 kPa
		- frequent silt lenses and rust staining				
						PP = 110 kPa
	7					
						PP = 115 kPa
25						
		– groundwater seepage				
	8	– clay till like, moist, occasional gravel chips, dark grey				PP = 230 kPa
		– very stiff, medium plasticity				
		9.0 m				
30	9	End of Borehole = 9.0 m				PP = 315 kPa
		Slough = 9.0 m, 0 hours				
		Water level = 5.5 m, 0 hours				
		Water level = 5.5 m, 2.5 hours later				
		Slough = 5.6 m, 2.5 hours later				
	10	Water level = 2.0 m, 10 days later				
		Slough = 2.1m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **107**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

JOB No.: H0907-280

DATE: August 4, 2009 TECH: MH

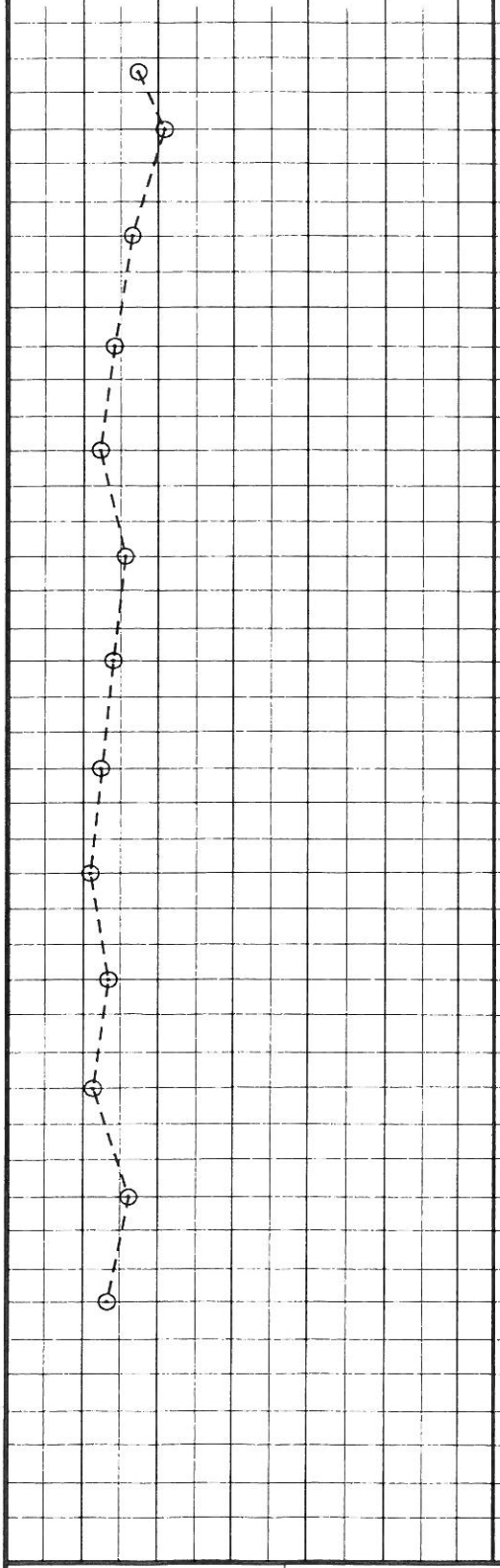
TEST BORING **09-106**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS

MOISTURE CONTENT %

10 20 30 40 50 60



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	TEST RESULTS MISCELLANEOUS TESTS
		DATUM:				
		SURFACE ELEVATION:				
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				PP = 530 kPa
		CLAY; silty, very stiff, medium plasticity, damp, dark olive brown				PP = 515 kPa SO_4 = 0.12%
3	1	1.1 m				
		SILT; sandy, some clay, medium dense, light yellowish brown				
6	2	- damp, medium dense				
		– medium dense				SO_4 = 0.14%
10	3	– dense, light yellowish brown — 3.7 m				
		CLAY; silty, medium plasticity, moist, very stiff, occasional silt lenses, dark grey				PP = 325 kPa
	4					PP = 410 kPa
15		- very stiff				
	5					PP = 375 kPa
		– very stiff				PP = 330 kPa
20	6					PP = 345 kPa
		– groundwater seepage				
	7	– clay till like				PP = 385kPa
25						
	8	– very stiff, moist, occasional gravel chips				PP = 385 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.7 m, 0 hours Water level = 8.6 m, 2 hours later Slough = 8.5 m, 2 hours later				PP = 325 kPa
	10	Water level = 8.6 m, 10 days later Slough = 8.7 m, 10 days later				
35						

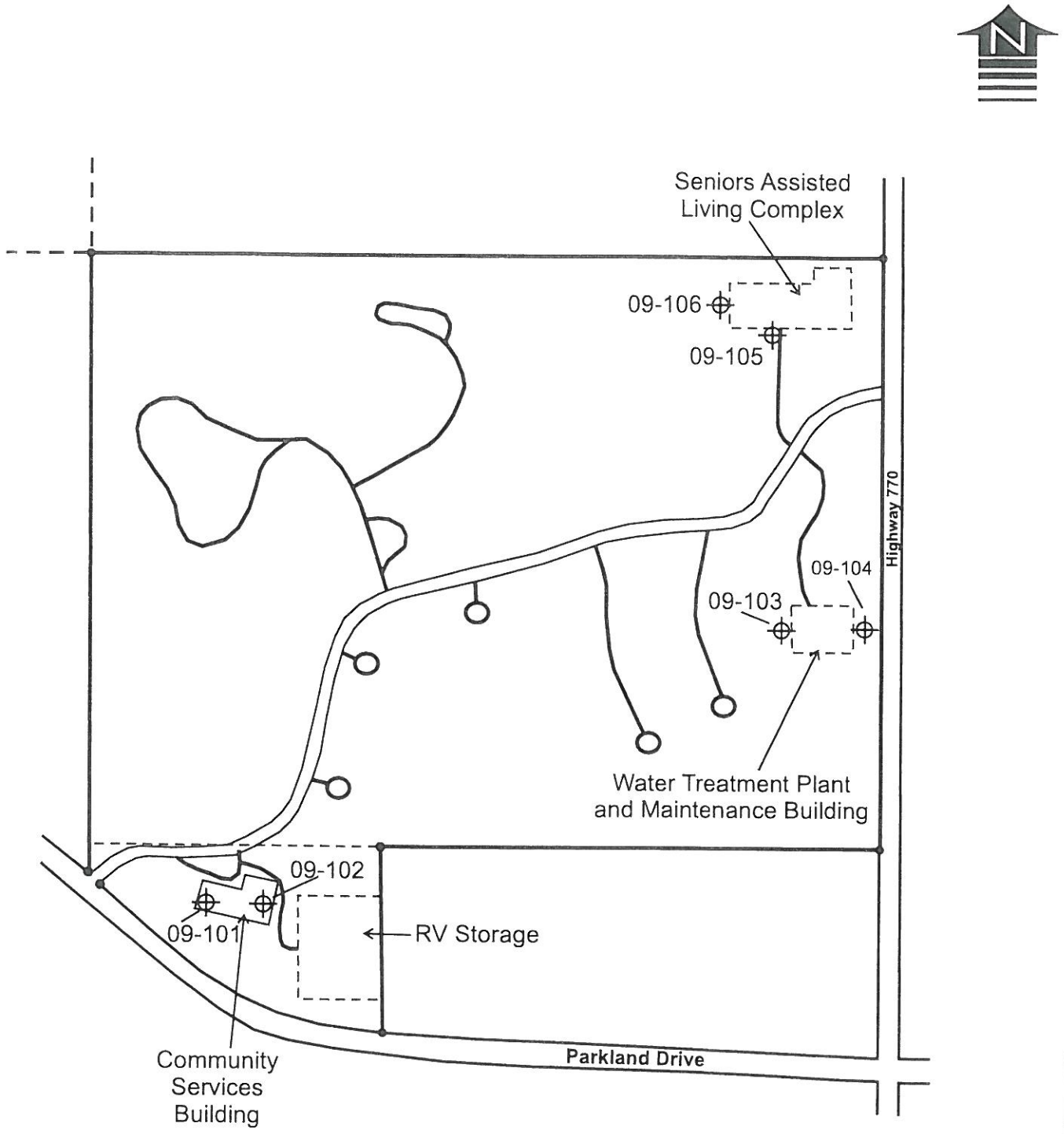
⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No.**108**



LEGEND

- Borehole Location
- Site Boundary

Scale: Not to scale

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

NOR CAN CONSULTING INC.
Proposed Country Residential Subdivision - Fawn Meadows
Portions of NE & SE 4-53-2-W5M,
Parkland County, Alberta
Site Plan

Job No: H0907-280	Date: August 11, 2009	Plate: 109

Hagstrom Geotechnical Services Ltd.

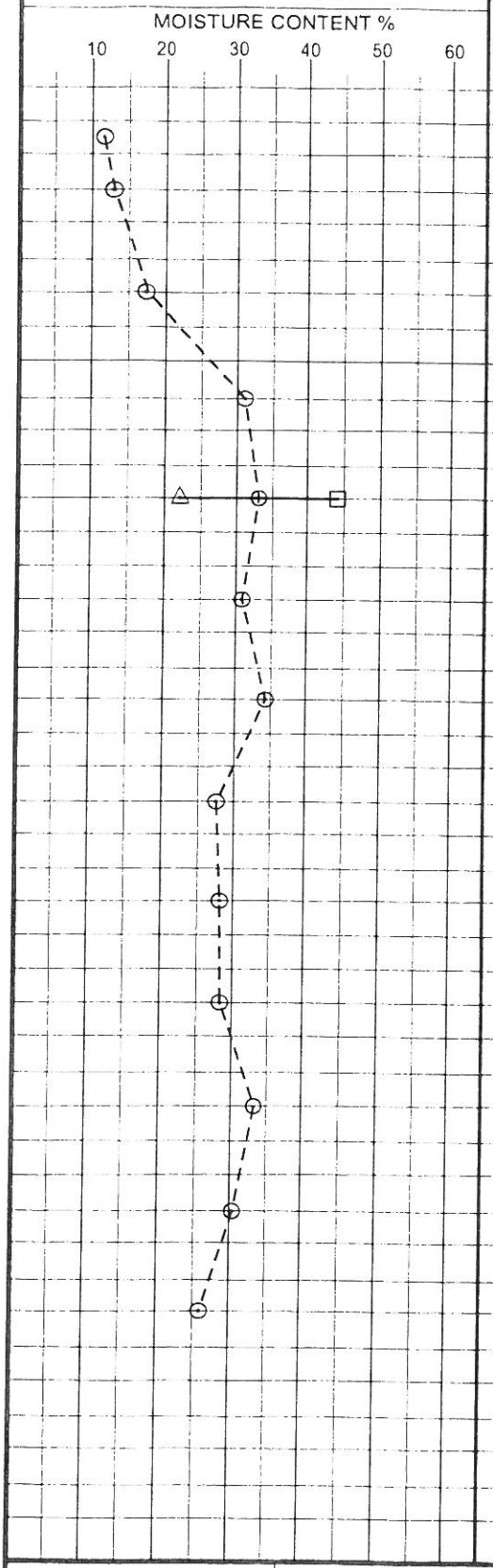
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-101**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT - N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, some small roots, black, 38 cm thick — 38 cm				
3	1	**SILT;** some sand, some clay, damp, stiff, pale olive brown				PP = 185 kPa SO_4 = 0.08%
		— 1.8 m				PP = 115 kPa SO_4 = 0.14%
6	2	**CLAY;** silty, stiff, medium plasticity, damp, occasional silt lenses, dark olive brown				PP = 170 kPa
10	3	– very stiff, occasional silt lenses				PP = 135 kPa
		– softer with depth				PP = 170 kPa
15	4	– soft to firm, light olive brown – groundwater seepage – softer with depth, dark olive brown at 4.2 m				PP = 90 kPa
	5	— 5.3 m				PP = 210 kPa
20	6	**SILT;** sandy, very moist, free water, very sensitive, brown				PP = 85 kPa
		- soft to firm				PP = 75 kPa
25	7	— 7.7 m				PP = 85 kPa
	8	**CLAY;** silty, low plasticity, firm, very moist, dark grey				PP = 100 kPa
		– stiff, medium plasticity				
30	9	— 9.0 m				PP = 115 kPa
		End of Borehole = 9.0 m Slough = 8.8 m, 0 hours Water level = 8.7 m, 0 hours Water level = 5.1 m, 5 hours later Slough = 5.5 m, 5 hours later Water level = 4.0 m, 10 days later Slough = 5.3 m, 10 days later				
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
☒ UNDISTURBED SAMPLE (SHELBY)
B BAG SAMPLE

PLATE No. **103**

Hagstrom Geotechnical Services Ltd.

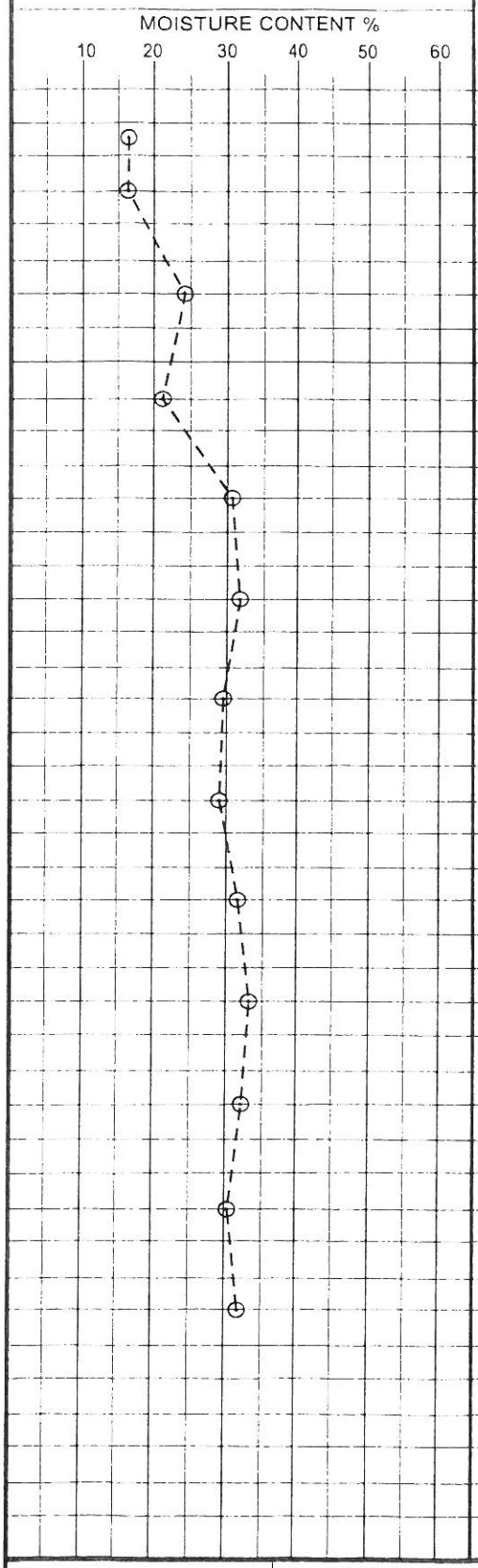
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-102**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION DATUM: SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	TEST RESULTS MISCELLANEOUS TESTS
		TOPSOIL; silty, compressible, moist, black, 20 cm thick 20 cm				
		SAND; silty, some clay, medium dense, moist, brown 80 cm				PP = 375 kPa
3	1	**CLAY;** silty, medium plasticity, very stiff, occasional silt lenses, brown				PP = 240 kPa SO_4 = 0.02%
6	2	- firm to stiff consistency , moister with depth				PP = 145 kPa SO_4 = 0.08%
10	3	– firm, medium plasticity, dark olive brown 3.4 m				PP = 145 kPa
		SILT; sandy, loose, some clay lenses, dark brown				PP = 130 kPa
	4	– groundwater seepage				
15		4.8 m				PP = 115 kPa
	5	**CLAY;** silty, firm to stiff, medium plasticity, moist, brown – silt layer from 5.1 to 5.3 m				PP = 85 kPa
20	6					PP = 125 kPa
		– silt layer from 6.6 to 6.9 m				PP = 105 kPa
	7					
25						PP = 105 kPa
	8	- stiff consistency				PP = 155 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m Slough = 6.8 m, 0 hours Water level = 6.7 m, 0 hours Water level = 3.8 m, 4 hours later Slough = 3.9 m, 4 hours later Water level = 3.7m, 10 days later Slough = 3.8 m, 10 days later				PP = 140 kPa
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
BS BAG SAMPLE

PLATE No. **104**

Hagstrom Geotechnical Services Ltd.

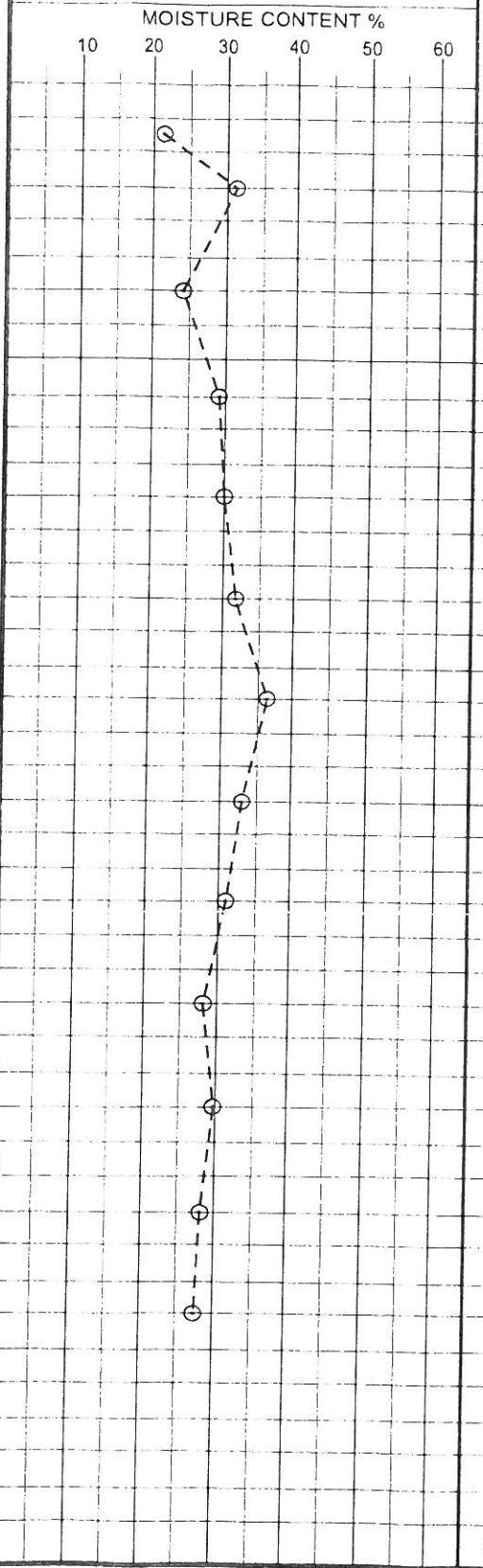
5607 - 134 A Avenue. Edmonton, Alberta T5A 0M3

CLIENT:	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-103**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS ATTERBERG LIMITS



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	TEST RESULTS: MISCELLANEOUS TESTS
		DATUM:				
		SURFACE ELEVATION:				
		TOPSOIL; silty, dry, compressible, black, 23 cm thick				
		23 cm				
		CLAY; very silty, medium plasticity, moist, stiff, occasional silt lenses, dark olive brown				
						PP = 135 kPa
3	1					
		- firm to stiff consistency				PP = 130 kPa SO_4 = 0.18%
6	2					
						PP = 155 kPa
		– stiff consistency, occasional silt lenses				
10	3					PP = 220 kPa SO_4 = 0.06%
		– groundwater seepage				
						PP = 170 kPa
15	4					
						PP = 175 kPa
	5	- firm to stiff consistency				
						PP = 105 kPa
20	6	– stiff, very moist				PP = 175 kPa
		– occasional silt lenses				PP = 135 kPa
	7					
25		– firm consistency				PP = 90 kPa
	8	– dark grey, very moist				PP = 140 kPa
		9.0 m				
30	9	End of Borehole = 9.0 m Slough = 6.9 m, 0 hours Water level = 6.7 m, 0 hours Water level = 2.6 m, 3 hours later Slough = 2.7 m, 3 hours later Water level = 2.4 m, 10 days later Slough = 2.4 m, 10 days later				PP = 105 kPa
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_o DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **105**

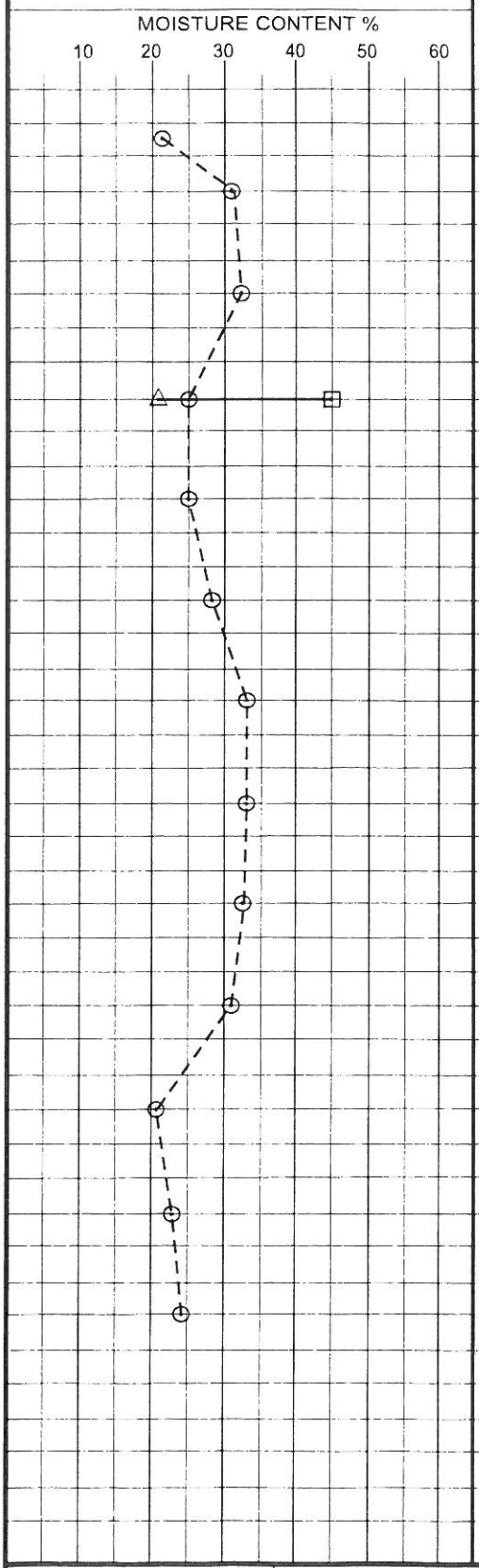
Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.
PROJECT: Proposed Country Residential Subdivision - Fawn Meadows
LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.: H0907-280
DATE: August 4, 2009
TECH: MH

TEST BORING **09-104**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION (DATUM: / SURFACE ELEVATION:)	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT-N	TEST RESULTS: MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick — 18 cm				
		CLAY; silty, very stiff, medium plasticity, frequent rust stained fissures, dark olive brown				PP = 135 kPa SO_4 = 0.12%
3	1					
						PP = 130 kPa SO_4 = 0.04%
6	2	– firm to stiff				PP = 105 kPa
		– low to medium plasticity				PP = 220 kPa
10	3					
						PP = 190 kPa
	4	4.1 m				
		SILT; clayey, stiff, trace of sand, dark brown				PP = 175 kPa
15		– stiff				
	5	5.1 m				
		CLAY; silty, firm consistency, low plasticity, very moist				PP = 105 kPa
	6	– stiff, moist, occasional silt lenses				PP = 175 kPa
20						PP = 110 kPa
	7					
		– firm consistency				PP = 90 kPa
25		– groundwater seepage				
	8					PP = 120 kPa
	9	9.0 m				PP = 105 kPa
30		End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.8 m, 0 hours Water level = 8.7 m, 2.5 hours later Slough = 8.8 m, 2.5 hours later Water level = 5.8, 10 days later Slough = 6.1 m, 10 days later				
	10					
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_c DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
☒ UNDISTURBED SAMPLE (SHELBY)
☒ BAG SAMPLE

PLATE No. **106**

Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT : Nor Can Consulting Group Inc.

PROJECT: Proposed Country Residential Subdivision - Fawn Meadows

LOCATION: Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta

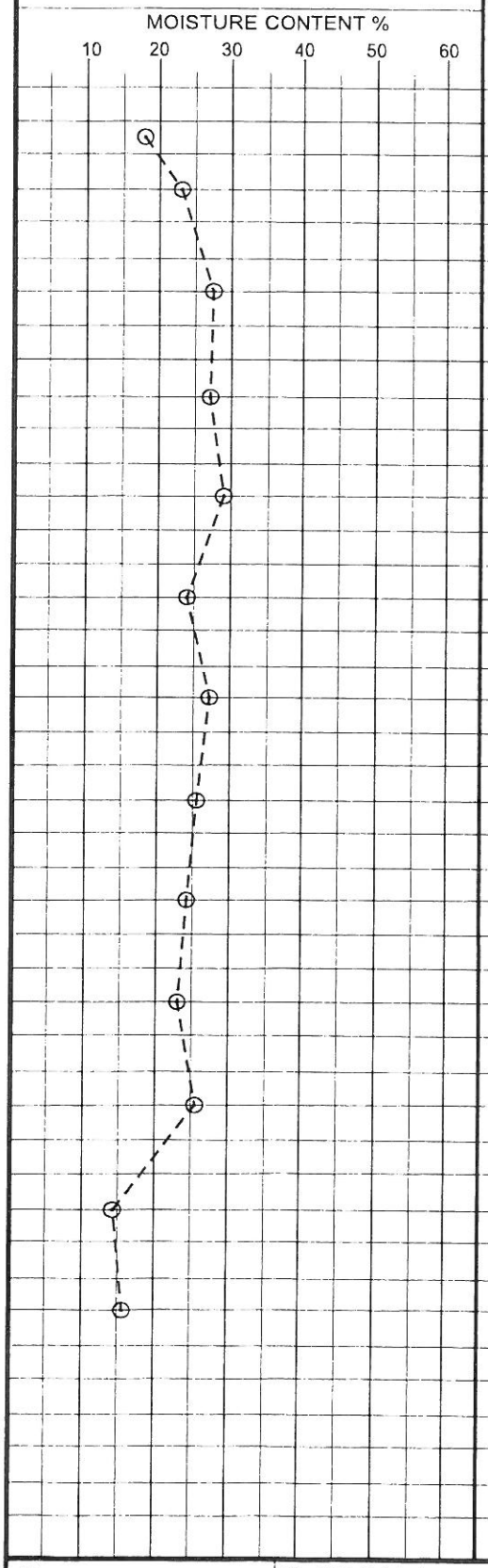
JOB No.: H0907-280

DATE: August 4, 2009 TECH: MH

TEST BORING **09-105**

DRILL TYPE: B-40 Solid Stem Auger

MOISTURE CONDITIONS
ATTERBERG LIMITS



DEPTH IN FEET	DEPTH (m)	SOIL PROFILE & DESCRIPTION	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	TEST RESULTS MISCELLANEOUS TESTS
		DATUM:				
		SURFACE ELEVATION:				
		TOPSOIL; silty, some sand, compressible, black, 67 cm thick				PP = 480 kPa
		67 cm				
		CLAY; silty, damp, very stiff, medium plasticity, dark olive brown				PP = 320 kPa
3	1					PP = 275 kPa SO_4 = 0.02%
6	2	- stiff consistency				PP = 120 kPa
10	3					PP = 110 kPa SO_4 = 0.16%
		– very moist				PP = 110 kPa
15	4					PP = 175 kPa
	5	- very moist, occasional silt lenses				PP = 120 kPa
20	6					PP = 95 kPa
		- frequent silt lenses and rust staining				PP = 110 kPa
	7					
25		– groundwater seepage				PP = 115 kPa
	8	– clay till like, moist, occasional gravel chips, dark grey				PP = 230 kPa
		– very stiff, medium plasticity				
		9.0 m				
30	9	End of Borehole = 9.0 m				PP = 315 kPa
		Slough = 9.0 m, 0 hours				
		Water level = 5.5 m, 0 hours				
		Water level = 5.5 m, 2.5 hours later				
		Slough = 5.6 m, 2.5 hours later				
	10	Water level = 2.0 m, 10 days later				
		Slough = 2.1m, 10 days later				
35						

⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **107**

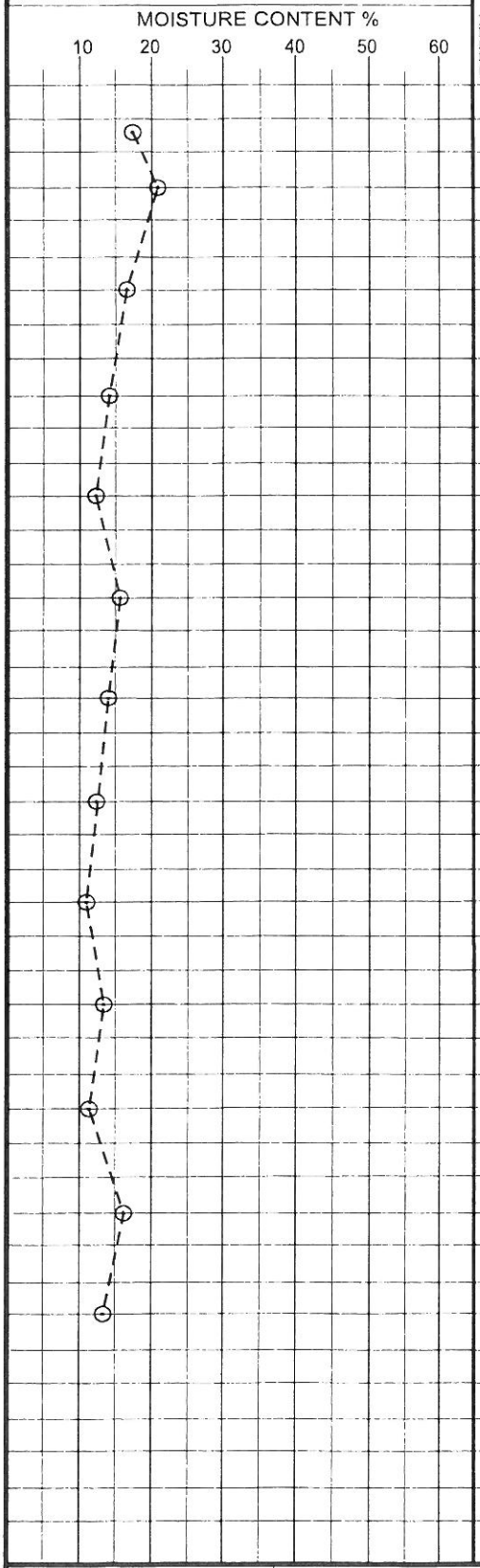
Hagstrom Geotechnical Services Ltd.

5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

CLIENT :	Nor Can Consulting Group Inc.
PROJECT:	Proposed Country Residential Subdivision - Fawn Meadows
LOCATION:	Portions of NE & SE 4-53-2-W5M, Parkland County, Alberta
JOB No.:	H0907-280
DATE:	August 4, 2009
TECH:	MH

TEST BORING **09-106**

MOISTURE CONDITIONS
ATTERBERG LIMITS



DRILL TYPE: B-40 Solid Stem Auger

SOIL PROFILE & DESCRIPTION

TEST RESULTS

DEPTH IN FEET	DEPTH (m)	DATUM: / SURFACE ELEVATION:	SOIL SYMBOL	SAMPLE TYPE	BLOW COUNT -N	MISCELLANEOUS TESTS
		TOPSOIL; silty, damp, compressible, black, 18 cm thick (18 cm)				PP = 530 kPa
		CLAY; silty, very stiff, medium plasticity, damp, dark olive brown				PP = 515 kPa SO_4 = 0.12%
3	1	(1.1 m)				
		SILT; sandy, some clay, medium dense, light yellowish brown				
6	2	- damp, medium dense				
		– medium dense				SO_4 = 0.14%
10	3	– dense, light yellowish brown (3.7 m)				
		CLAY; silty, medium plasticity, moist, very stiff, occasional silt lenses, dark grey				PP = 325 kPa
	4					PP = 410 kPa
15						
	5	- very stiff				PP = 375 kPa
		– very stiff				PP = 330 kPa
20	6					PP = 345 kPa
	7	– groundwater seepage				
		– clay till like				PP = 385kPa
25	8					
		– very stiff, moist, occasional gravel chips				PP = 385 kPa
	9	(9.0 m)				PP = 325 kPa
30		End of Borehole = 9.0 m Slough = 8.9 m, 0 hours Water level = 8.7 m, 0 hours Water level = 8.6 m, 2 hours later Slough = 8.5 m, 2 hours later				
	10	Water level = 8.6 m, 10 days later Slough = 8.7 m, 10 days later				
35						

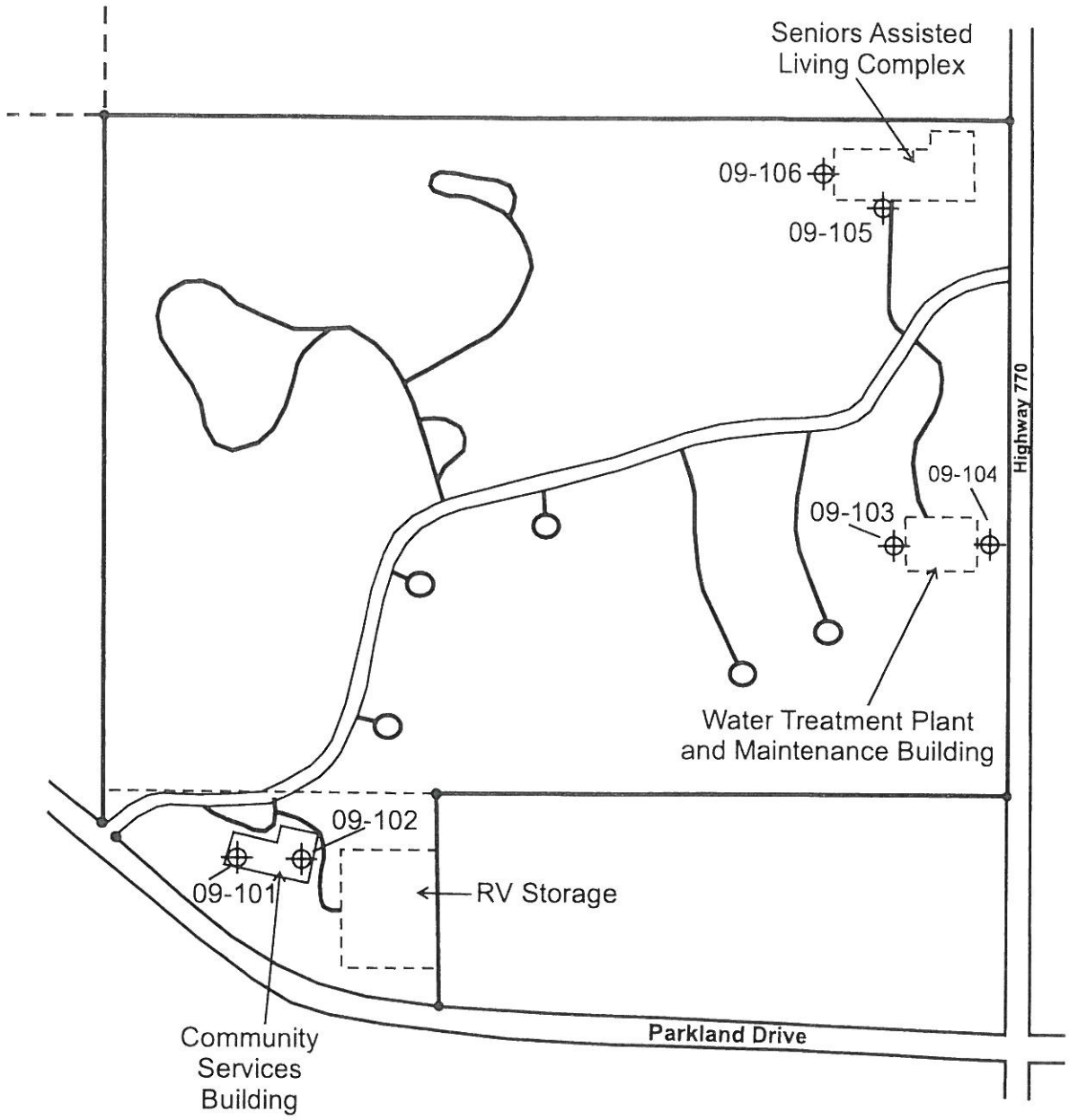
⊙ MOISTURE CONTENT
⊡ LIQUID LIMIT
△ PLASTIC LIMIT

Q_u UNCONFINED COMPRESSION
γ_d DRY UNIT WEIGHT

SO_4 SULPHATE CONTENT
▼ WATER TABLE
N PENETRATION RESISTANCE

☒ STANDARD PENETRATION SAMPLE
▨ UNDISTURBED SAMPLE (SHELBY)
[B] BAG SAMPLE

PLATE No. **108**



LEGEND

- Borehole Location
- Site Boundary

Scale: Not to scale

Hagstrom Geotechnical Services Ltd.
5607 - 134 A Avenue, Edmonton, Alberta T5A 0M3

NOR CAN CONSULTING INC.
Proposed Country Residential Subdivision - Fawn Meadows
Portions of NE & SE 4-53-2-W5M,
Parkland County, Alberta
Site Plan

Job No: H0907-280	Date: August 11, 2009	Plate: 109