Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

NRCB USE ONLY	Application number	Legal land description
☒ Approval ☐ Registration ☐ Authorization ☐ Amendment	LA24002	SE 21-9-26 W4M

APPLICATION DISCLOSURE

This information is collected under the authority of the *Agricultural Operation Practices Act* (AOPA), and is subject to the provisions of the *Freedom of Information and Protection of Privacy Act*. This information is public unless the NRCB grants a written request that certain sections remain private.

Any construction prior to obtaining an NRCB permit is an offence and is subject to enforcement action, including prosecution.

I, the applicant, or applicant's agent, have read and understand the statements above, and I acknowledge that the information provided in this application is true to the best of my knowledge.

Nov 29, 2023
Date of signing

[redacted]
Signature

Van Hulsenbos Farms
Corporate name (if applicable)

Henry Van Hulsenbos
Print name

GENERAL INFORMATION REQUIREMENTS

Proposed facilities: list all proposed confined feeding operation facilities and their dimensions. Indicate whether any of the proposed facilities are additions to existing facilities. (attach additional pages if needed)

Proposed facilities	Dimensions (m) (length, width, and depth)
EAST PENS (18)	153.4 m x 36.9 m
WEST PENS (24)	160.3 m x 36.9 m
NORTH PENS (5)	160.3m x 36.8 m (approx)
NORTH CATCH BASIN	130m x 40m x 2 m
SOUTH CATCH BASIN	105m x 36.6m x 2m

Existing facilities: list **ALL** existing confined feeding operation facilities and their dimensions

Existing facilities	Dimensions (m) (length, width, and depth)	NRCB USE ONLY
~~NORTH ROW (3 pens)~~	~~approx. 92m x 36m~~	
~~MIDDLE ROWS (8 pens)~~	~~approx. 212 m x 82 m~~	
~~SOUTH ROW (5 pens)~~	~~approx. 212m x 37 m~~	

NRCB USE ONLY

See next page for existing facilities.
CFO currently permitted under NRCB issued Approval LA15045 and Authorization LA17054A.

Existing Facilities

1 - Feedlot pens – row B – (237.7 m x 38.1m)
2 - Catch basin (51.8 m x 36.6 m x 2.0 m)
3 - Feedlot pens – row A – (298.7 m x 38.1m)
- ~~Barn I (41.5 m x 14.0 m)~~
- ~~Barn II (48.8 m x 14.6 m)~~
4 - Barn III (75.6 m x 24.2 m)
5 - Feedlot pens (305.0 m x 45.1 m) (39 m x 14.5 m, as per LA15037. Clerical error in LA15045 listed wrong dimensions)
6 - Pole calf barn ~~(39.0 m x 45.1 m)~~
7 - Calf barn (210' x 140') with 18" pit (deep) (77.8 m x 38.2 m x 0.5 m deep)
8 -Transfer pit ~~9~~210' long x 8' wide x 8' deep) (77.8 m x 2.4 m x 2.4 m deep)

- Manure pit (~~x x~~ (16 x 5 x 3m)

Note: Manure pit being re-purposed and no longer being used as a manure collection area.

Note: Barn 1 and 2 have been replaced by calf barn

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If a new facility is replacing an old facility, please explain what will happen to the old facility and when. ☑ N/A

Upon approval of new facility, the far north section of our existing facilities will be discontinued. Please see attached photo. (Highlighted area). Photo #1

The existing catch basin will be expanded.

Construction completion date for proposed facilities July, 2027

Additional information

The applicant is proposing to apply RCC (roller compacted concrete) on top of the soil (applying for a naturally occurring protective layer).

Livestock numbers: Complete only if livestock numbers are different from what was identified in the Part 1 application. Note: if livestock numbers increase in your Part 2 application, a new Part 1 application must be submitted which may result in a loss of priority for minimum distance separation (MDS).

Livestock category and type (Available in the Schedule 2 of the Part 2 Matters Regulation)	**Permitted number**	**Proposed increase or decrease in number (if applicable)**	**Total**
See Part 1			

AO Comment: applicant proposing to remove all beef feeders (1,200) from CFO. Proposing to increase beef feeder calves by 14,000 from 2,500 (total proposed 16,500).

Far Northwest pen area (not highlighted) will not be used to hold animals.

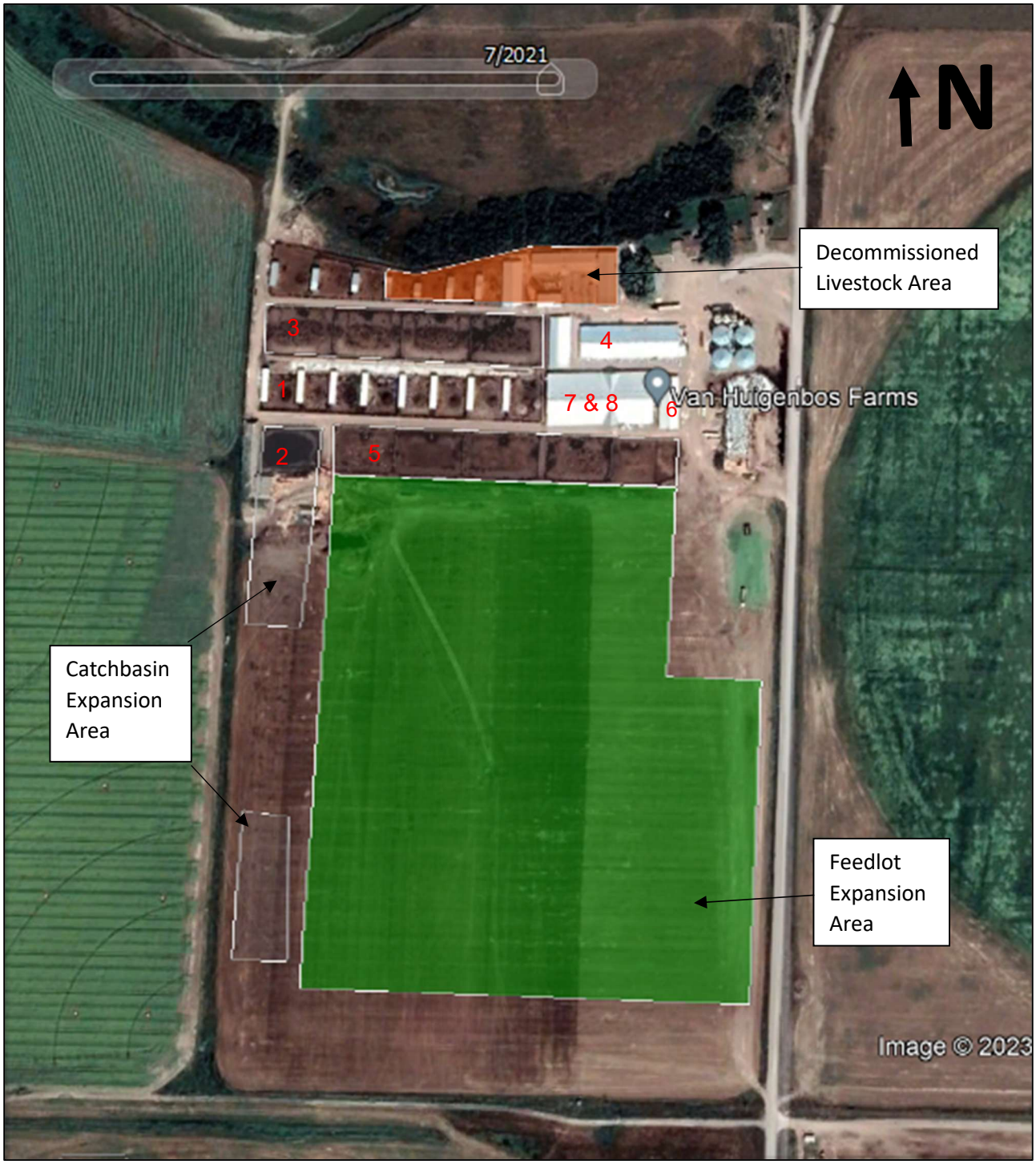

Figure 1 – Van Huigenbos Farms – Proposed Feedlot Expansion Map

Part 2 — Technical Requirements

NRCB Natural Resources Conservation Board

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area, and/or manure storage facility(ies)

DECLARATION AND ACKNOWLEDGMENT OF APPLICANT CONCERNING *WATER ACT* LICENCE

issued by Alberta Environment and Protected Areas (EPA) for a confined feeding operation (CFO)

Date and sign one of the following four options

OPTION 1: Applying through the NRCB for both the AOPA permit and the *Water Act* licence

I **DO** want my water licence application coupled to my AOPA permit application.

Signed this ____day of _____, 20____. _____

Signature of Applicant or Agent

OPTION 2: Processing the AOPA permit and *Water Act* licence separately

1. I (we) acknowledge that the CFO will need a new water licence from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. I (we) request that the NRCB process the AOPA application **independently of** EPA's processing of the CFO's application for a water licence.
3. In making this request, I (we) recognize that, if this AOPA application is granted by the NRCB, the NRCB's decision will not be considered by EPA as improving or enhancing the CFO's eligibility for a water licence under the *Water Act*.
4. I (we) acknowledge that any construction or actions to populate the CFO with livestock pursuant to an AOPA permit in the absence of a *Water Act* licence will **not** be relevant to EPA's consideration of whether to grant the *Water Act* licence application.
5. I (we) acknowledge that any such construction or livestock populating will be at the CFO's sole risk if the *Water Act* licence application is denied or if the operation of the CFO is otherwise deemed to be in violation of the *Water Act*. This risk includes being required to depopulate the CFO and/or to cease further construction, or to remove "works" or "undertakings" (as defined in the *Water Act*).
6. **AS RELEVANT:** I (we) acknowledge that the CFO is located in the South Saskatchewan River Basin and that, pursuant to the *Bow, Oldman and South Saskatchewan River Basin Water Allocation Order* [Alta. Reg. 171/2007], this basin is currently closed to new surface water allocations.
7. **Provide:** Water licence application number(s) _____

Signed this 28 day of November, 2023. [redacted]

Signature of Applicant or Agent

OPTION 3: Additional water licence not required

1. I (we) declare that the CFO will not need a new licence from EPA under the *Water Act* for the development or activity proposed in this AOPA application.
2. **Provide**: Water license number(s) or water conveyance agreement details _____

Signed this ____ day of _____, 20____. _____

Signature of Applicant or Agent

Name	Henry Van Huigenbos
Address	
Legal Land Location	

MDS Spreadsheet based on 2006 AOPA Regulations

Category of Livestock	Type of Livestock	Factor A	Technology Factor	MU	LSU Factor	Number of Animals	LSU
Feedlot Animals	Beef Cows/Finishers (900+ lbs)	0.700	0.700	0.910	0.4459		-
	Beef Feeders (450 - 900 lbs)	0.700	0.700	0.500	0.2450		-
	Beef Feeder Calves (<550 lbs)	0.700	0.700	0.275	0.1348	16,500	2,223.4
	Horses - PMU	0.650	0.700	1.000	0.4550		-
	Horses - Feeders > 750 lbs	0.650	0.700	1.000	0.4550		-
	Horses - Foals < 750 lbs	0.650	0.700	0.300	0.1365		-
	Mules	0.600	0.700	1.000	0.4200		-
	Donkeys	0.600	0.700	0.670	0.2814	-	-
	Bison	0.600	0.700	1.000	0.4200		-
	Other						-
Dairy (*count lactating cows only)	Free Stall – Lactating Cows with all associated dries, heifers, and calves*	0.800	1.100	2.000	1.7600		-
	Free Stall – Lactating Cows with Dry Cows only*	0.800	1.100	1.640	1.4432		-
	Free Stall – Lactating Cows only	0.800	1.100	1.400	1.2320		-
	Tie Stall – Lactating Cows only	0.800	1.000	1.400	1.1200		-
	Loose Housing – Lactating Cows only	0.800	1.000	1.400	1.1200		-
	Dry Cow	0.800	0.700	1.000	0.5600		-
	Replacements – Bred Heifers (Breeding to Calving)	0.800	0.700	0.875	0.4900		-
	Replacements - Growing Heifers (350 lbs to breeding)	0.800	0.700	0.525	0.2940		-
	Calves (< 350 lbs)	0.800	0.700	0.200	0.1120		-
	Other						-
Swine Liquid (*count sows only)	Farrow to finish *	2.000	1.100	1.780	3.9160		-
	Farrow to wean *	2.000	1.100	0.670	1.4740		-
	Farrow only *	2.000	1.100	0.530	1.1660		-
	Feeders/Boars	2.000	1.100	0.200	0.4400		-
	Growers/Roasters	2.000	1.100	0.118	0.2600		-
	Weaners	2.000	1.100	0.055	0.1210		-
	Other						-
Swine Solid (*Count sows only)	Farrow to finish *	2.000	0.800	1.780	2.8480		-
	Farrow to wean *	2.000	0.800	0.670	1.0720		-
	Farrow only *	2.000	0.800	0.530	0.8480		-
	Feeders/Boars	2.000	0.800	0.200	0.3200		-
	Growers/Roasters	2.000	0.800	0.118	0.1888		-
	Weaners	2.000	0.800	0.055	0.0880		-
	Other						-
Poultry	Chicken - Breeders - Solid	1.000	0.700	0.010	0.0070		-
	Chicken - Layers - Liquid (includes associated pullets)	2.000	1.100	0.008	0.0176		-
	Chicken - Layers - (Belt Cage)	2.000	0.700	0.008	0.0112		-
	Chicken - Layers - (Deep Pit)	2.000	0.700	0.008	0.0112		-
	Chicken - Pullets/Broilers	1.000	0.700	0.002	0.0014		-
	Turkey - Toms/Breeders	1.000	0.700	0.020	0.0140		-
	Turkey - Hens (light)	1.000	0.700	0.013	0.0091		-
	Turkey - Broilers	1.000	0.700	0.010	0.0070		-
	Ducks	1.000	0.700	0.010	0.0070		-
	Geese	1.000	0.700	0.020	0.0140		-
	Other						-
Sheep and Goats	Sheep - Ewes/Rams	0.600	0.700	0.200	0.0840		-
	Sheep - Ewes with lambs	0.600	0.700	0.250	0.1050		-
	Sheep - Lambs	0.600	0.700	0.050	0.0210		-
	Sheep - Feeders	0.600	0.700	0.100	0.0420		-
	Goats - Meat/Milk (per Ewe)	0.700	0.700	0.170	0.0833		-
	Goats - Nannies/Billies	0.700	0.700	0.140	0.0686		-
	Goats - Feeders	0.700	0.700	0.077	0.0377		-
	Other						-
Cervid	Elk	0.600	0.700	0.600	0.2520		-
	Deer	0.600	0.700	0.200	0.0840		-
	Other						-
Wild Boar	Feeders	2.000	0.800	0.140	0.2240	-	-
	Sow (farrowing)	2.000	0.800	0.371	0.5936		-
	Other						-
					Total		2,223.4

For New Operations

Dispersion Factor 1

Category	Odour Objective	Distance Feet	Distance Metres
1	41.04	2,243	684
2	54.72	2,991	912
3	68.4	3,739	1,140
4	109.44	5,982	1,823

For Expanding Operations

Dispersion Factor 1

Expansion Factor 0.77

Category	Odour Objective	Distance Feet	Distance Metres
1	41.04	1,727	526
2	54.72	2,303	702
3	68.40	2,879	877
4	109.44	4,606	1,404

MDS with expansion factor for 16,500 beef feeder calves = 526 m.

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DISTANCE OF ANY MANURE STORAGE FACILITY (EXISTING OR PROPOSED) TO NEIGHBOURING RESIDENCES

Neighbour name(s)	Legal land description	Distance (m)	NRCB USE ONLY				
			Zoning (LUB) category	MDS category (1-4)	Distance (m)	Waiver attached (if required)	Meets regulations
Bruce Kostelansky	NE 21-9-26W4M	530					
Lloyd Gunderson	NW 22-9-26W4M	800					
Josh Van Herk	SE 16-9-26W4M	1046					
Jan Weggeman	NW 16-9-26W4M	707					

LAND BASE FOR MANURE AND COMPOST APPLICATION (complete only if an increase in livestock or manure production will occur)

Name of land owner(s)*	Legal land description	Usable area** (ha)	Soil zone ***	NRCB USE ONLY	
				Usable area (ha)	Agreement attached (if required)
Triple VH Farms	See LLD below	440 acres	Irrigated		
Nico & Karie De Wit	See attached manure spreading agreement	260 acres	Irrigated		
			Total		

* If you are **not** the registered landowner, you must attach copies of land use agreements signed by all landowners.

** Available manure spreading area (excluding setback areas from residences, common bodies of water, water wells, etc. as identified in Agdex 096-5 Manure Spreading Regulations)

*** Brown, dark brown, black, grey wooded, or irrigated

Additional information (attach any additional information as required)

TRIPLE VH FARMS

Irrigated Quarters (LLD)

SE 22-9-26W4
NE 15-9-26 W4
SE 15-9-26 W4
NW 15-9-26 W4
SW 15-9-26 W4

Figure 2 – Van Huigenbos Farms – Site Map

Name Henry VanHuigenbos
Address 0
Legal Land
Location

Landbase Requirements (hectares) based on 2006 AOPA requirements

Category of Livestock	Type of Livestock	Number of Animals	Dark Brown & Brown (ha)	Grey Wooded (ha)	Black (ha)	Irrigated (ha)
Feedlot Animals	Cows/Finishers (900+ lbs)	0.0	0.0	0.0	0.0	0.0
	Feeders (450 - 900 lbs)	0.0	0.0	0.0	0.0	0.0
	Feeder Calves (<550 lbs)	16500.0	511.5	429.0	313.5	247.5
	Horses - PMU	0.0	0.0	0.0	0.0	0.0
	Horses - Feeders > 750 lbs	0.0	0.0	0.0	0.0	0.0
	Horses - Foals < 750 lbs	0.0	0.0	0.0	0.0	0.0
	Mules	0.0	0.0	0.0	0.0	0.0
	Donkeys	0.0	0.0	0.0	0.0	0.0
	Bison	0.0	0.0	0.0	0.0	0.0
	Other	0.0				
Dairy (*count lactating cows only)	Free Stall – Lactating Cows with all associated dries, heifers, and calves*	0.0	0.0	0.0	0.0	0.0
	Free Stall – Lactating Cows with Dry Cows only *	0.0	0.0	0.0	0.0	0.0
	Free Stall – Lactating Cows only*	0.0	0.0	0.0	0.0	0.0
	Tie Stall – Lactating Cows only	0.0	0.0	0.0	0.0	0.0
	Loose Housing – Lactating Cows only	0.0	0.0	0.0	0.0	0.0
	Dry Cow (Solid manure)	0.0	0.0	0.0	0.0	0.0
	Dry Cow (Liquid manure)	0.0	0.0	0.0	0.0	0.0
	Replacements – Bred Heifers (Breeding to Calving)	0.0	0.0	0.0	0.0	0.0
	Replacements - Growing Heifers (350 lbs to breeding)	0.0	0.0	0.0	0.0	0.0
	Calves (< 350 lbs)	0.0	0.0	0.0	0.0	0.0
	Other	0.0				
Swine Liquid (*count sows only)	Farrow to finish *	0.0	0.0	0.0	0.0	0.0
	Farrow to wean *	0.0	0.0	0.0	0.0	0.0
	Farrow only *	0.0	0.0	0.0	0.0	0.0
	Feeders/Boars	0.0	0.0	0.0	0.0	0.0
	Growers/Roasters	0.0	0.0	0.0	0.0	0.0
	Weaners	0.0	0.0	0.0	0.0	0.0
	Other	0.0				
Swine Solid (*Count sows only)	Farrow to finish *	0.0	0.0	0.0	0.0	0.0
	Farrow to wean *	0.0	0.0	0.0	0.0	0.0
	Farrow only *	0.0	0.0	0.0	0.0	0.0
	Feeders/Boars	0.0	0.0	0.0	0.0	0.0
	Growers/Roasters	0.0	0.0	0.0	0.0	0.0
	Weaners	0.0	0.0	0.0	0.0	0.0
		0.0				
Poultry	Chicken - Breeders - Solid	0.0	0.0	0.0	0.0	0.0
	Chicken - Layers - Liquid (includes associated pullets)	0.0	0.0	0.0	0.0	0.0
	Chicken - Layers - (Belt Cage)	0.0	0.0	0.0	0.0	0.0
	Chicken - Layers - (Deep Pit)	0.0	0.0	0.0	0.0	0.0
	Chicken - Pullets/Broilers	0.0	0.0	0.0	0.0	0.0
	Turkey - Toms/Breeders	0.0	0.0	0.0	0.0	0.0
	Turkey - Hens (light)	0.0	0.0	0.0	0.0	0.0
	Turkey - Broilers	0.0	0.0	0.0	0.0	0.0
	Ducks	0.0	0.0	0.0	0.0	0.0
	Geese	0.0	0.0	0.0	0.0	0.0
	Other	0.0				
Goats and Sheep	Sheep - Ewes/Rams	0.0	0.0	0.0	0.0	0.0
	Sheep - Ewes with lambs	0.0	0.0	0.0	0.0	0.0
	Sheep - Lambs	0.0	0.0	0.0	0.0	0.0
	Sheep - Feeders	0.0	0.0	0.0	0.0	0.0
	Goats - Meat/Milk (per Ewe)	0.0	0.0	0.0	0.0	0.0
	Goats - Nannies/Billies	0.0	0.0	0.0	0.0	0.0
	Goats - Feeders	0.0	0.0	0.0	0.0	0.0
	Other	0.0				
Cervid	Elk	0.0	0.0	0.0	0.0	0.0
	Deer	0.0	0.0	0.0	0.0	0.0
	Other	0.0				
Wild Boar	Feeders	0.0	0.0	0.0	0.0	0.0
	Sow (farrowing)	0.0	0.0	0.0	0.0	0.0
	Other	0.0				
	Total Hectares		512	429.0	313.5	247.5
	Total Acres		1,264	1060.1	774.7	611.6

Nico De Wit , manure receiver

Length of agreement: This agreement is valid for a time period of 5 years

Legal Land Location	Soil Type[1]	Acres suitable for manure spreading[2]
SE 15-9-27W4	Irrigated	120
NE 15-9-27W4	Irrigated	130

[1] Soil type choices: Dark brown and brown, grey wood, and or irrigated

[2] Land within required setback from water bodies, water wells, residences, etc is not included

Other Comments:

Manure Producer (Confined Feeding Operation) Legal Land Location: SE-21-09-26 W4

Dec 14, 2023 [redacted] Henry Van Hulzenbos

Date (dd/mm/yyyy) Signature Print Name

Manure Receiver - Landowner(s)[3]

Dec. 13 2023 [redacted] Nico de Wit

Date (dd/mm/yyyy) Signature Print Name

Date (dd/mm/yyyy) Signature Print Name

[3] All registered owners of land, or authorized signing authorities must sign

Part 2 — Technical Requirements

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GENERAL ENVIRONMENTAL INFORMATION

(complete this section for the worst case of the existing facility which is the closest to water bodies or water wells and for each of the proposed facilities)

Facility description / name *(as indicated on site plan)*

Existing: Live Stock Corrals **Proposed 1:** Feedlot Expansion

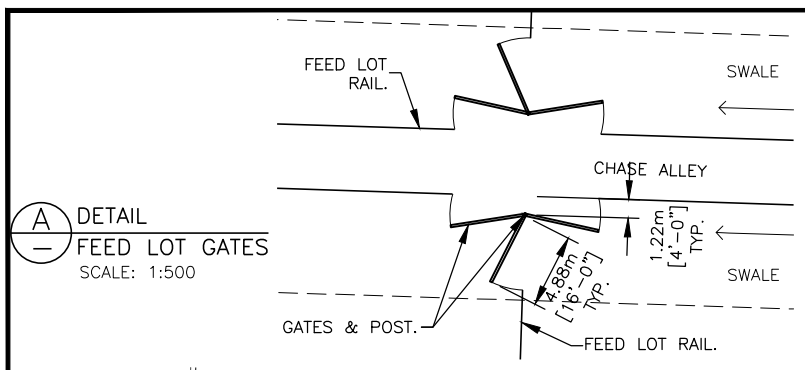
Proposed 2: Catch Basins **Proposed 3:** _____

Facility and environmental risk information		Facilities				NRCB USE ONLY	
		Existing	Proposed 1	Proposed 2	Proposed 3	Meets requirements	Comments
Flood plain information	What is the elevation of the floor of the lowest manure storage or collection facility above the 1:25 year flood plain or the highest known flood level?	☑ >1 m ☐ ≤ 1 m	☑ >1 m ☐ ≤ 1 m	☑ >1 m ☐ ≤ 1 m	☐ > 1 m ☐ ≤ 1 m	☐ YES ☐ NO ☐ YES with exemption	
Surface water information	How many springs are within 100 m of the manure storage facility or manure collection area?	0	0	0		☐ YES ☐ NO ☐ YES with exemption	
	How many water wells are within 100 m of the manure storage facility or manure collection area?	1	0	0		☐ YES ☐ NO ☐ YES with exemption	
	What is the shortest distance from the manure collection or storage facility to a surface water body? (e.g., lake, creek, slough, seasonal)	150 m	330 m	280 m		☐ YES ☐ NO ☐ YES with exemption	
Groundwater information	What is the depth to the water table?		> 3 m	> 3 m		☐ YES ☐ NO ☐ YES with exemption	
	What is the depth to the groundwater resource/aquifer you draw water from?	> 3 m	> 3 m	> 3 m		☐ YES ☐ NO ☐ YES with exemption	

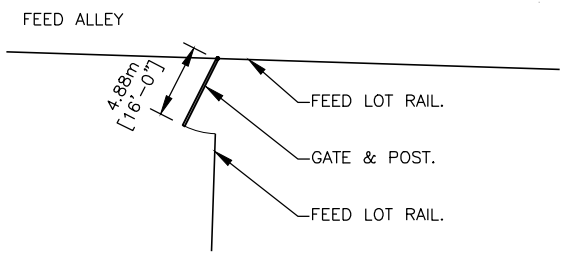
Additional information (attach supporting information, e.g. borehole logs, records, etc. you consider relevant to your application)

See attached soils report - AMEC (Dec 21, 2015)

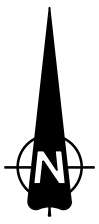
Figure 3 – Van Huigenbos Farms – Area Map – Proposed Feedlot Expansion

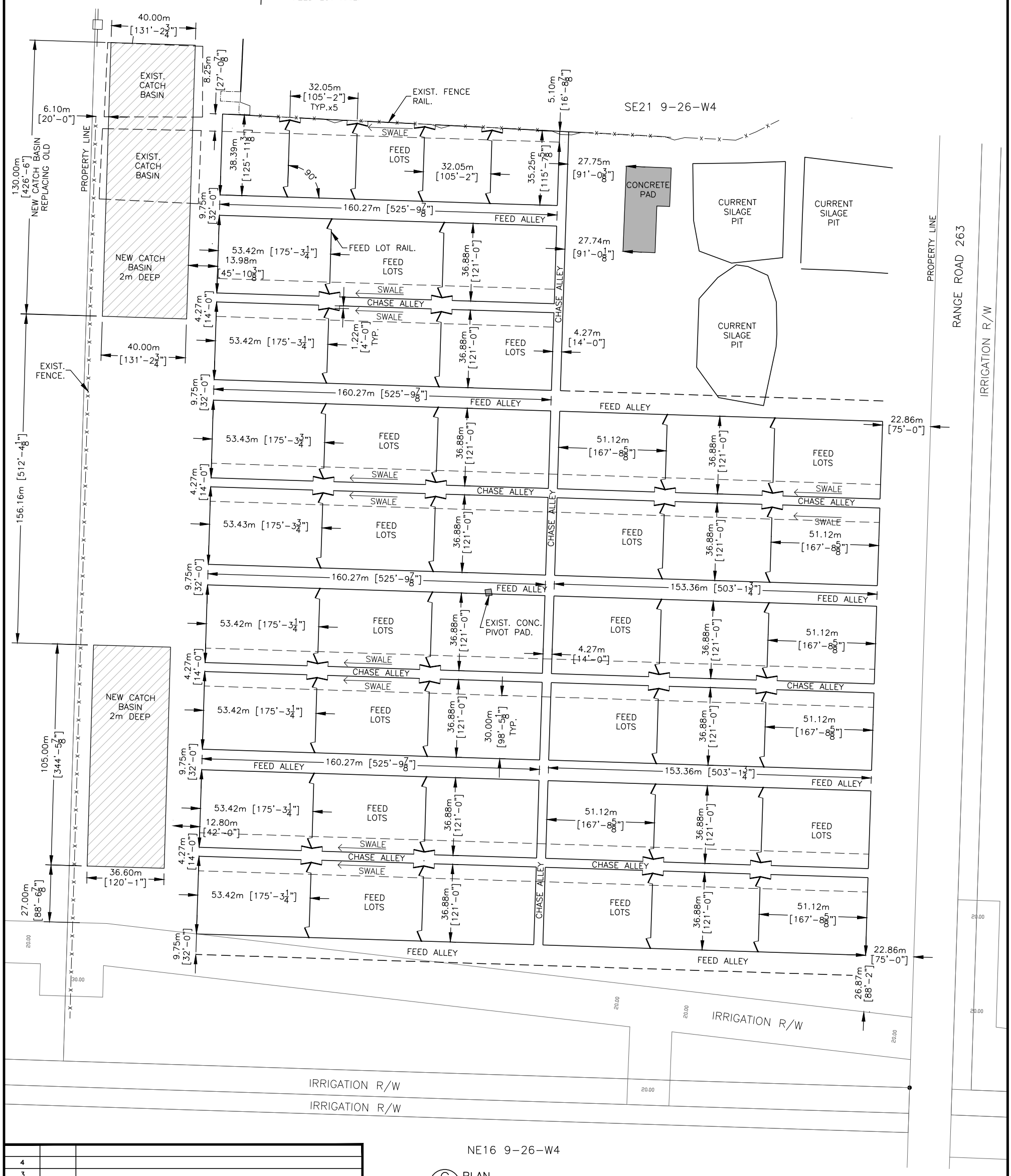


A DETAIL
FEED LOT GATES
SCALE: 1:500



B DETAIL
FEED LOT GATE
SCALE: 1:500





C PLAN
FEED LOTS
SCALE: 1:1800

ISSUE	DATE	REVISION DESCRIPTION
4		
3		
2		
1	20OCT'23	ISSUED FOR REVIEW

LEGEND / NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE DEPTH OF SERVICES PRIOR TO CONSTRUCTION.
2. ALL UNDERGROUND UTILITIES, INCLUDING GAS, OIL, TELUS, ELECTRICAL, MUNICIPAL WATER, ETC., AS SHOWN ON THIS PLAN, ARE BASED ON INFORMATION RECEIVED FROM THE RESPECTIVE AUTHORITIES. NO RESPONSIBILITY IS IMPLIED OR ASSUMED BY THE ENGINEER AS TO LOCATION, OR OMISSIONS. THE CONTRACTOR MUST CONTACT THE VARIOUS UTILITIES FOR ON-SITE INFORMATION AS TO ACTUAL LINE LOCATIONS PRIOR TO STARTING CONSTRUCTION.
3. IT IS THE LANDSCAPER'S RESPONSIBILITY TO ENSURE THAT RUNOFF FOLLOWS THE RECOMMENDED DRAINAGE PATHS AND NO STANDING WATER OCCURS NEAR THE RESIDENCE.

—— x —— x —— x —— EXISTING FENCELINE

WILDE BROTHERS
ENGINEERING LTD.
PERMIT TO PRACTICE
P08438

WILDE BROS. ENGINEERING LTD.
Raymond, Alberta

VAN HUIGENBOS FARMS LTD.

FEED LOT LAYOUT
PROPOSED PLAN & DETAILS

DESIGNED:	DJW
DRAWN:	J.L.J.
SCALE:	AS SHOWN
DATE:	OCTOBER 1, 2023
CHECKED:	DJW
JOB:	9923-18
DIMENSIONS:	METERS
DRAWING No:	1

Part 2 — Technical Requirements

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area and/or manure storage facility(ies)

SOLID MANURE, COMPOST, & COMPOSTING MATERIALS: Barns, feedlots, & storage facilities - Naturally occurring protective layer

*(complete a copy of this section for **EACH** barn, feedlot, and storage facility for solid manure, composting materials, or compost with a naturally occurring protective layer for the liner)*

Facility description / name *(as indicated on site plan)*

1. East Pens (18 total)
2. West Pens (24 total)

Manure storage capacity

	Length (m)	Width (m)	Depth below ground level (m)	**NRCB USE ONLY** Estimated storage capacity (m^3)
1.	153.4	36.9	0	
2.	160.3	36.9	0	
			TOTAL CAPACITY	

☐ I plan to use a short-term solid manure storage (STMS) as part of my manure storage and handling plan for this CFO. (The AOPA requirements for STMS are set out in the NRCB Short-Term Solid Manure Storage Requirements Fact Sheet.

Surface water control systems

Describe the run-on and runoff control system

See attached runoff control plan and calculations

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	7.3 (m)	Provide details (as required) See attached WSP report for borehole locations, calculated equivalent layer thickness, soil textural analyses and permeability test results	
Soil texture	28 % sand	55 % silt	17 % clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested 2.9 - 4.5 m	Hydraulic conductivity (cm/s) 2.2 x 10-7 cm/s	Describe test standard used Modified falling head teat

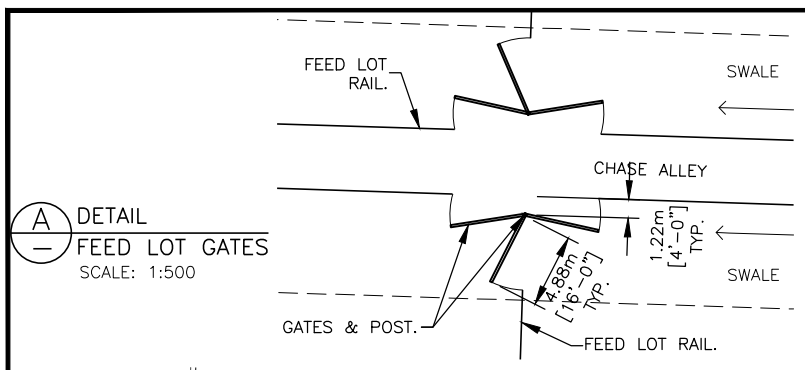
Additional information *(attach copies of soil test reports)*

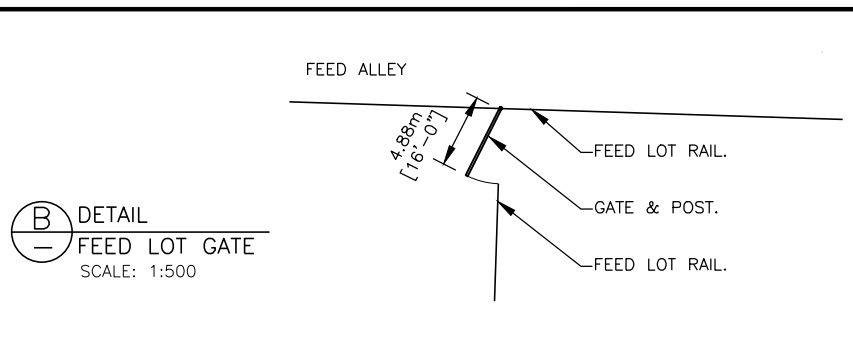
NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

Report attached: ☐ YES ☐ NO





Existing Feedlot Pens

North Catch Basin

North Catchment Pens

South Catch Basin

South Catchment Pens

ISSUE	DATE	REVISION DESCRIPTION
4		
3		
2		
1	20OCT'23	ISSUED FOR REVIEW

LEGEND / NOTES

1. CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE DEPTH OF SERVICES PRIOR TO CONSTRUCTION.
2. ALL UNDERGROUND UTILITIES, INCLUDING GAS, OIL, TELUS, ELECTRICAL, MUNICIPAL WATER, ETC., AS SHOWN ON THIS PLAN, ARE BASED ON INFORMATION RECEIVED FROM THE RESPECTIVE AUTHORITIES. NO RESPONSIBILITY IS IMPLIED OR ASSUMED BY THE ENGINEER AS TO LOCATION, OR OMISSIONS. THE CONTRACTOR MUST CONTACT THE VARIOUS UTILITIES FOR ON-SITE INFORMATION AS TO ACTUAL LINE LOCATIONS PRIOR TO STARTING CONSTRUCTION.
3. IT IS THE LANDSCAPER'S RESPONSIBILITY TO ENSURE THAT RUNOFF FOLLOWS THE RECOMMENDED DRAINAGE PATHS AND NO STANDING WATER OCCURS NEAR THE RESIDENCE.

—— x —— x —— x —— EXISTING FENCELINE

WILDE BROTHERS
ENGINEERING LTD.
PERMIT TO PRACTICE
P08438

WILDE BROS. ENGINEERING LTD.
Raymond, Alberta

VAN HUIGENBOS FARMS LTD.

FEED LOT LAYOUT
PROPOSED PLAN & DETAILS

DESIGNED:	DJW
DRAWN:	J.L.J.
SCALE:	AS SHOWN
DATE:	OCTOBER 1, 2023
CHECKED:	DJW
JOB:	9923-18
DIMENSIONS:	METERS
DRAWING No:	1

Part 2 — Technical Requirements

Application under the *Agricultural Operation Practices Act* for a confined feeding operation, manure collection area and/or manure storage facility(ies)

RUNOFF CONTROL CATCH BASIN: Naturally occurring protective layer

*(complete a copy of this section for **EACH proposed** runoff control catch basin with a naturally occurring protective layer)*

Facility description / name *(as indicated on site plan)*

1. North Catch Basin
2. South Catch Basin
3. _____

Determination of runoff area

Provide a plan and show how you calculated the area contributing to runoff for each catch basin

See attached runoff calculation and site map

Catch basin capacity

	Length (m)	Width (m)	Total depth (m)	Depth below ground level (m)	Slope run:rise			NRCB USE ONLY
					Inside end walls	Inside side walls	Outside walls	Calculated storage capacity (excl. 0.5 m freeboard) (m^3)
1.	130	40	2	2	3:1	3:1	n/a	
2.	150	36.6	2	2	3:1	3;1	n/a	
3.								
							TOTAL CAPACITY	

Naturally occurring protective layer details

Thickness of naturally occurring protective layer	12.3 (m)	Provide details (as required) See attached WSP report for borehole locations, calculated equivalent layer thickness, soil textural analyses and permeability test results	
Soil texture	15 % sand	66 % silt	19 % clay
Hydraulic conductivity - naturally occurring protective layer	Depth and type of soil tested 4.4 - 6.0 m	Hydraulic conductivity (cm/s) 2.0 x 10-7 cm/s	Describe test standard used Modified falling head test

Catch Basin – Design and management requirements can be found in Technical Guideline Agdex 096-101

If soil info differs per facility include additional soils page.

NRCB USE ONLY

Requirements met: ☐ YES ☐ NO

Condition required: ☐ YES ☐ NO

Report attached: ☐ YES ☐ NO

North Catch Basin

Existing catch basin, unauthorized constructed catch basin, and proposed expansion of unauthorized catch basin. Proposed to be all connected.

Catch Basin Dimensions Calculator

Construction Dimensions of Catch Basin	Metric		English Units	
Size of Catch Basin			**Capacity of Catch Basin**	
Length*[4]	130.0	m	426.51	Feet
Width*[4]	40.0	m	131.23	Feet
Total Depth*[4]	2.0	m	6.56	Feet
Water Depth	1.50	m	4.92	Feet
End Slope*[4]	3	run:rise	3	run:rise
Side Slope*[4]	3	run:rise	3	run:rise
Length of Bottom	118.0			
Width of Bottom	28.0			
Total Capacity @ top of Bank	8,456	m^3	298,621	ft^3
			1,860,059	Imp. Gal.

* Only cells in blue can be changed.

Storage Volume of Catch Basin at Design Capacity (without freeboard)			Volume at Freeboard	
Length (Top of liquid level)	127.0	m	416.67	Feet
Width (Top of liquid level)	37.0	m	121.39	Feet
Depth	2.0	m	6.56	Feet
Water Depth	1.50	m	4.92	Feet
End Slope	3	run:rise	3	run:rise
Side Slope	3	run:rise	3	run:rise
Total Volume@ freeboard depth	5,982	m^3	211,252	ft^3
			1,315,856	Imp. Gal.
Surface Area of Liquid Manure	4,699	m^2	50,580	ft^2

Name[1]: Van Huigenbos

Land Location[1]: North Area

Area[2]	Length (m)	Width (m)	Area (m^2)
1	11,321	1	11,321
2	23,660	1	23,660
3	5,900	1	5,900
4	16,000	1	16,000
5	9,000	1	9,000
Total Area			65,881

Select Town[3]: Fort Macleod 90

Design Rainfall: 90 mm

Catch Basin	Length (m)	Width (m)	Area (m^2)
1	130	40	5,200

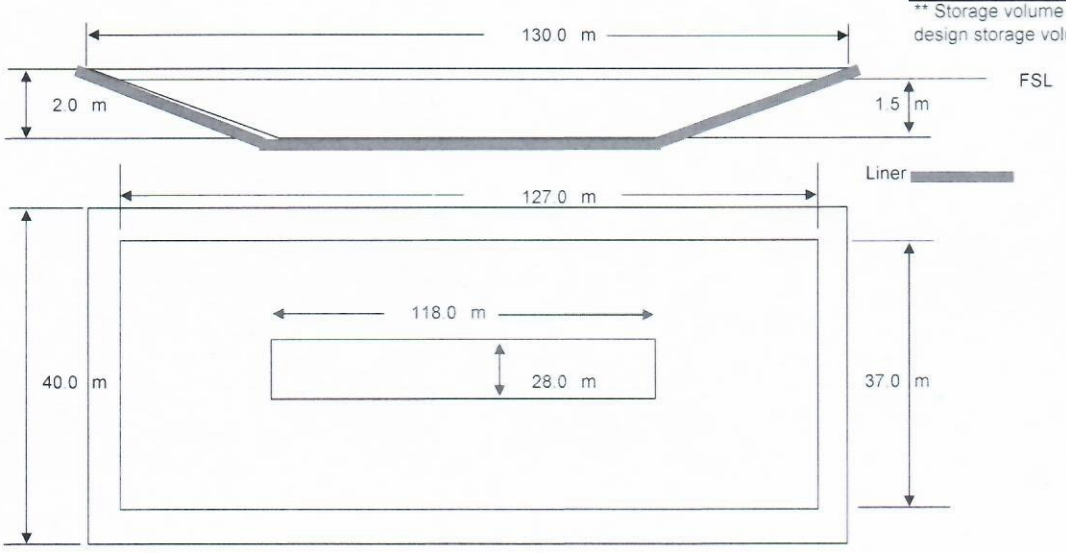
Catch Basin Design Volume
(Feedlot Area(s) only)

3,854 m^3 — 136,104 ft^3

Roller Compacted Concrete (Runoff Coefficient = 1.0)

5,929 m^3 — 209,391 ft^3 — 1,304,261 Imp. Gal.

** Storage volume should be same or slightly greater than design storage volume.



Lines in Black - Catch basin dimension
Lines in Blue - full level

NTS - Not Drawn To Scale

North Area = West Pens + East Pens + North Pens + Existing Corrals

= ((160.3 x 36.9) x 4) + ((153.4 x 36.9) x 2) + (160.3m x 36.8) approx.

+ (16000.m^2 + 9,000.m^2)

= 23,660 m^2 + 11,321 m^2 + 5,900 m^2 + 16,000 m^2 + 9,000 m^2

= 65,881 m^2

Catch Basin Dimensions Calculator

Southern Catch Basin ✓

Construction Dimensions of Catch Basin

Size of Catch Basin	Metric		English Units: Capacity of Catch Basin
Length*[4]	36.6	m	120.08 Feet
Width*[4]	105.0	m	344.49 Feet
Total Depth*[4]	2.0	m	6.56 Feet
Water Depth	1.50	m	4.92 Feet
End Slope*[4]	3	run:rise	3 run:rise
Side Slope*[4]	3	run:rise	3 run:rise
Length of Bottom	24.6		
Width of Bottom	93.0		
Total Capacity @ top of Bank	6,083	m^3	214,812 ft^3
			1,338,028 Imp. Gal.

* Only cells in blue can be changed.

Storage Volume of Catch Basin at Design Capacity (without freeboard)			Volume at Freeboard
Length (Top of liquid level)	33.6	m	110.24 Feet
Width (Top of liquid level)	102.0	m	334.65 Feet
Depth	2.0	m	6.56 Feet
Water Depth	1.50	m	4.92 Feet
End Slope	3	run:rise	3 run:rise
Side Slope	3	run:rise	3 run:rise
Total Volume@ freeboard depth	4,266	m^3	150,652 ft^3
			938,388 Imp. Gal.
Surface Area of Liquid Manure	3,427	m^2	36,890 ft^2

Name[1]: Van Huigenbos

Land Location[1]: South Area

Area[2]	Length (m)	Width (m)	Area (m^2)
1	23,660	1	23,660
2	22,642	1	22,642
3	0	1	0
4	0	1	0
5	0	1	0
Total Area			46,302

Select Town[3]: Fort Macleod 90

Design Rainfall: 90 mm

Catch Basin	Length (m)	Width (m)	Area (m^2)
1	37	105	3,843

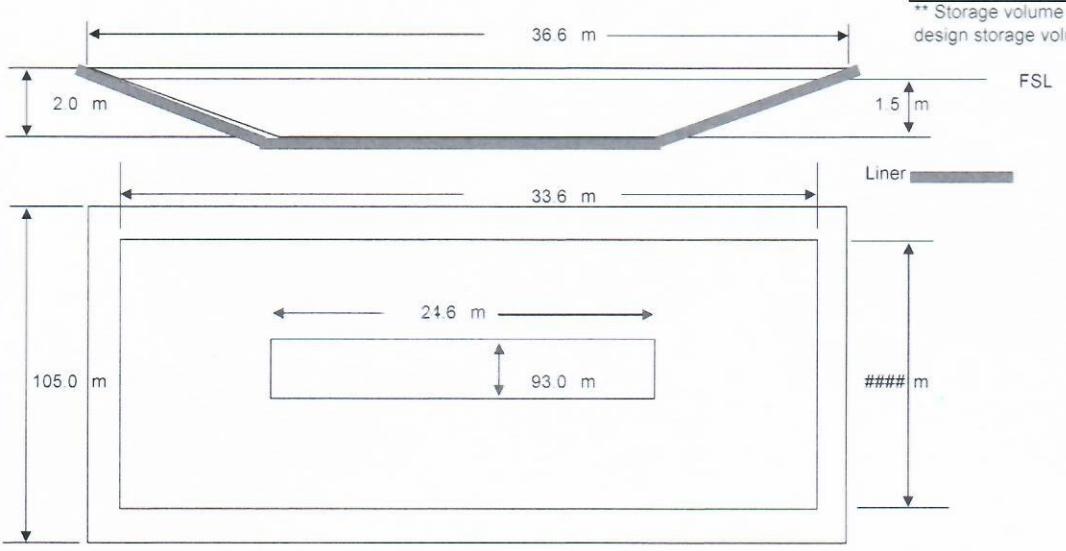
Catch Basin Design Volume
(Feedlot Area(s) only)

2,709 m^3 95,656 ft^3

Roller Compacted Concrete (Runoff Coefficient = 1.0)

4,167 m^3 147,163 ft^3
916,651 Imp. Gal.

** Storage volume should be same or slightly greater than design storage volume.



Lines in Black - Catch basin dimension
Lines in Blue - full level

NTS - Not Drawn To Scale

South Area = West Pens + East Pens
= ((160.3m × 36.9m) × 4) + ((153.4 × 36.9) × 4)
= 23,660 m^2 + 22,642 m^2
= 46,302 m^2

December 21, 2015

AMEC File: BX30375

Van Huigenbos Farms
P.O. Box 2311
Fort Macleod, Alberta T0L 0Z0

Attention: Mr. Garrett Van Huigenbos

Re: Geotechnical Review and Evaluation
Proposed Calf Pens and Catch Basin
SE-21-9-26-W4, near Fort Macleod, Alberta

As requested, Amec Foster Wheeler Environment & Infrastructure has carried out a geotechnical review and evaluation of the above captioned site relative to the required protection of the groundwater resource, as required by the Agricultural Operation Practices Act, AB Reg. 267/2001 (hereinafter referred to as "AOPA").

This letter encompasses the soil conditions associated with a row of recently constructed calf pens, a proposed row of calf pens, and a proposed catch basin, at the general locations illustrated on Figure 1.

In order to demonstrate the suitability of the natural clay soils at the site of the calf barn for consideration as a naturally occurring protective layer, a series of boreholes were advanced at the site on March 24, 2014 and September 9, 2015, at the locations illustrated on Figure 1. The boreholes were advanced by a truck-mounted drill rig owned and operated by Chilako Drilling Services, and extended to depths ranging between about 3 m and 6 m below existing grades. Boreholes VH1-14 to VH9-14 were logged by Mr. Larry DeLong of Chilako Drilling Services Ltd (see attachments), while boreholes VH10-15 to VH16-15 were logged by an Amec geotechnical engineer.

In general, the soils encountered within the current test holes near surface lacustrine silt and sand (to depths of up to 1.5 m below grade), and underlain by low permeable lacustrine clay to the termination depths of the boreholes. A minimum of 1.5 m of clay was encountered at each of the borehole locations

In order to demonstrate the permeability of the subsurface clay soil, 50 mm diameter PVC monitoring wells were constructed in boreholes VH6-14 and VH11-15. Borehole VH6-14 was screened from 2.5 m to 3.9 m depth and borehole VH11-15 was screened from 2.7 m to 3.8 m depth. Well saturation of the 50 mm diameter monitoring well was carried out by filling the monitoring well to the top of the well for several consecutive days. On the third and fourth days, the water depth was measured at a consistent depth of about 0.17 m at VH6-14, and at a depth of about 0.54 m at VH11-15. During the testing, the well locations were protected, and care was taken to ensure that the column of water being monitored in the well was not frozen during the testing.

In order to calculate the permeability of the screened portion of the clay stratum, a modified falling head test (as outlined in the USBR *Engineering Geology Field Manual Volume 2* [2001]) was used. The input variables and output data are outlined on the *In Situ Permeability Test*

Amec Foster Wheeler
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Fax +1 (403) 327-7682
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reports, attached. As outlined on the reports, the results of the *in situ* permeability testing indicate a hydraulic conductivity, k_s, of **2.2 x 10^{-8} cm/s** at borehole VH6-14, and **8.4 x 10^{-8} cm/s** at borehole VH11-15

Using the measured permeability of the clay stratum, the 1.4 m portion of clay which has been screened at VH6-14 has been estimated to represent an equivalent of about 64 m of naturally occurring materials having a hydraulic conductivity of 1 x 10-6 cm/s. This represents natural material protection well in excess of the minimum requirements outlined by the AOPA for solid manure storage (minimum 2 m, Section 9.5-c).

Similarly, the 1.1 m portion of clay which has been screened at VH11-15 has been estimated to represent an equivalent of about 13 m of naturally occurring materials having a hydraulic conductivity of 1 x 10-6 cm/s. This represents natural material protection in excess of the minimum requirements outlined by the AOPA for a catch basin (minimum 5 m, Section 9.5-b).

Conclusion

Based on the results of the current investigation and permeability testing, and our understanding of the site and proposed development at the site, it is AMEC's opinion that the naturally occurring materials at the existing feedlot pens and catch basin satisfy the requirements for a naturally occurring 'protective layer' for the existing pens, as outlined in the AOPA.

It is noted that a layer of near surface silty sand was encountered at the proposed catch basin location. This sand will require removal from the side slope areas at the time of construction, and reconstruction of the upper catch basin side slopes using low permeable clay soils will be required. The existing clay soils below the upper sandy soils is considered suitable for the upper side slope construction. Geotechnical review of the entire catch basin excavation and reconstruction of these upper side slopes is recommended.

We trust this satisfies your present requirements. If you have questions or require further information or clarification, please don't hesitate to contact the undersigned.

Respectfully submitted,

Amec Foster Wheeler Environment & Infrastructure
A division of Amec Foster Wheeler Americas Ltd.

PROFESSIONAL ENGINEER ALBERTA
JOHN LOBBEZOO

Dec 21, 2015

John Lobbezoo, P.Eng.
Geotechnical Engineer

APEGA Permit: P04546

Attachments:
Figure 1 – Borehole Location Plan
In Situ Permeability Test Calculations – VH6-14 & VH11-15
Soil Profile and Parent Material Description, Chilako Drilling Services (VH1-14 to VH9-14)
Test Pit Summary Table (VH10-15 to VH16-15)

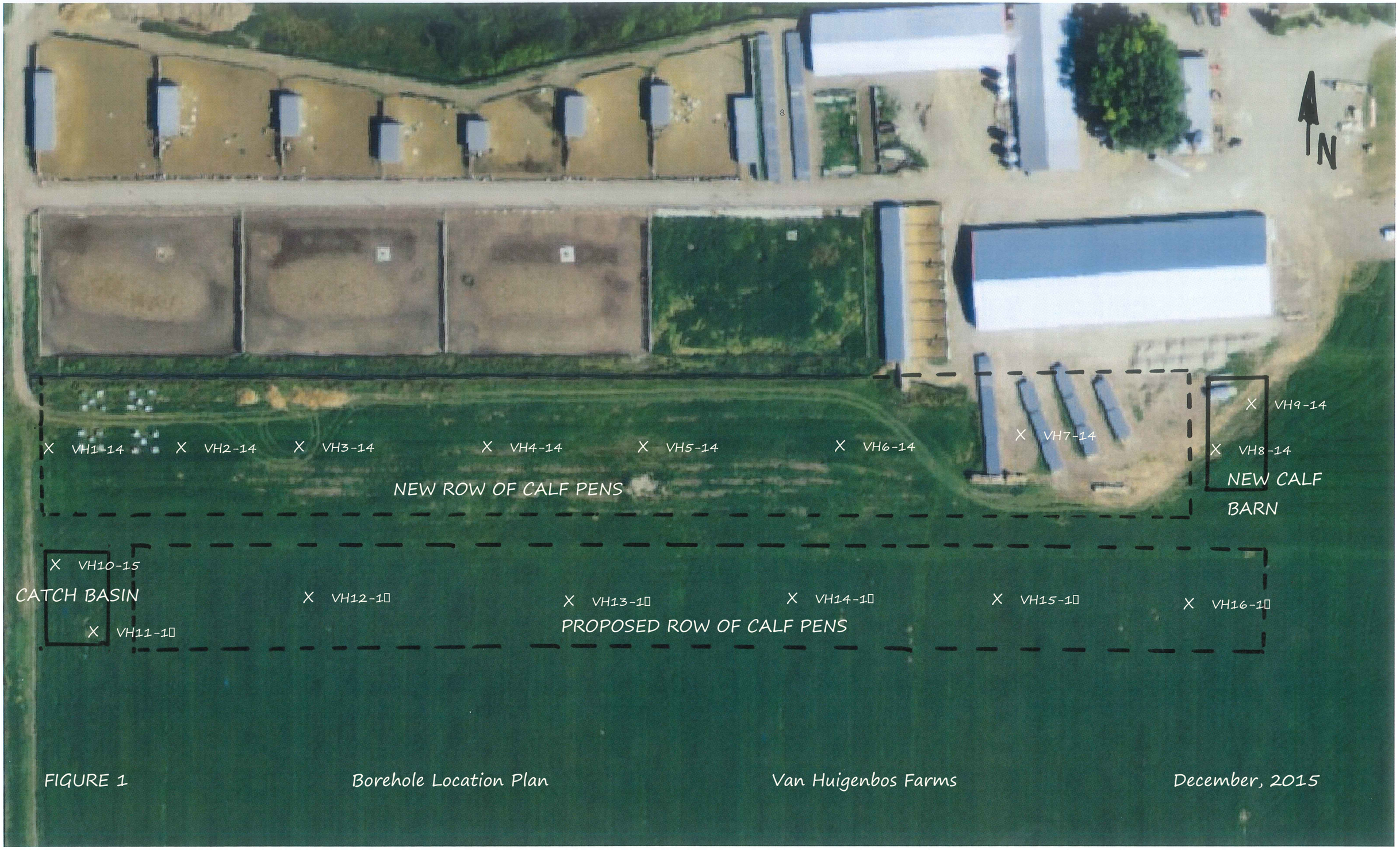


FIGURE 1 Borehole Location Plan Van Huigenbos Farms December, 2015

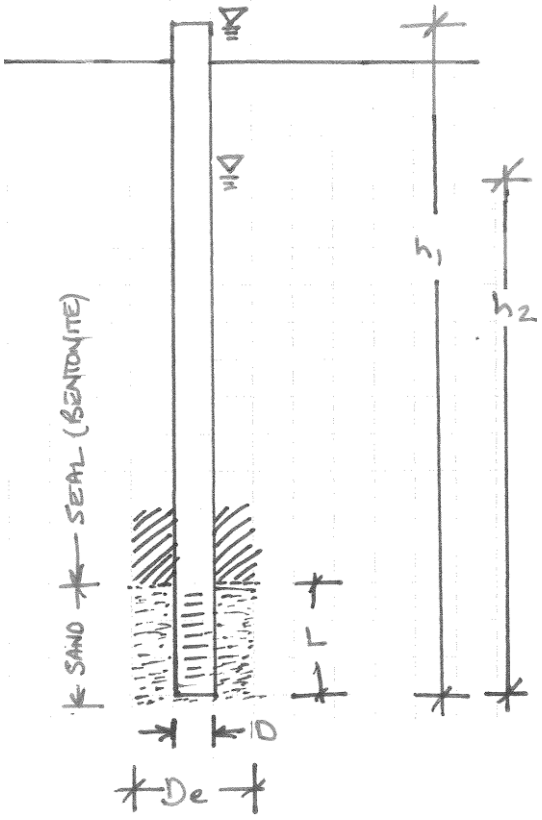
VH6-14

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

taken from USBR Engineering Geology Field Manual Volume 2 (2001)



VH6-14

AMEC File: BX30375

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	1.30	length of sand section (m)
h1	4.60	initial height of water above base of hole (m)
h2	4.43	final height of water above base of hole (m)
t	24.0	time of test (h)

Ks = 2.2E-08 cm/sec

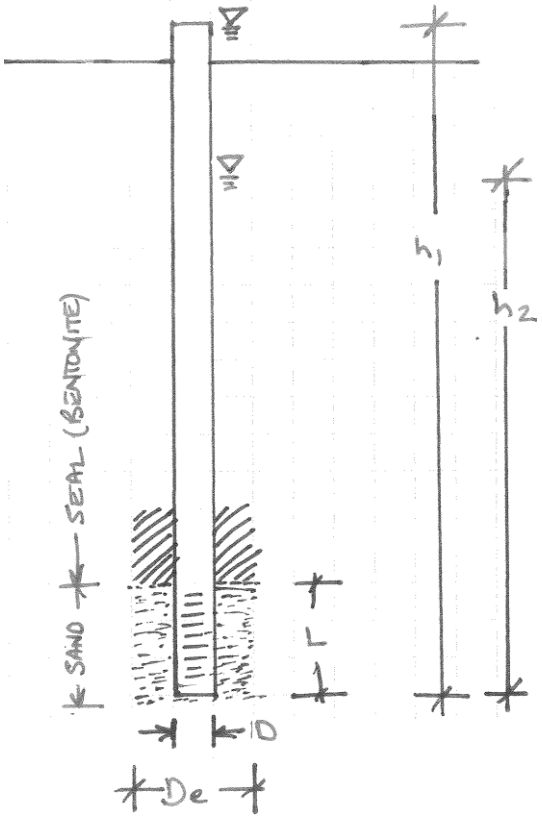
VH11-15

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

taken from USBR Engineering Geology Field Manual Volume 2 (2001)



VH11-15

AMEC File: BX30375

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	1.10	length of sand section (m)
h1	4.40	initial height of water above base of hole (m)
h2	3.86	final height of water above base of hole (m)
t	24.0	time of test (h)

Ks = 8.4E-08 cm/sec

CHILAKO DRILLING SERVICES LTD

Box 942 Coaldale, Alberta, T1M 1M8
(403) 345-3710

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: Van Huigenbos Farms SE21-9-26W4 Date: 24-Mar-14

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VH1-14	West end	0-1.0	FSL	D	Lac		Sand, silty
	of	1.0-1.05	S+Gr	D	Lac		
	proposed	1.05-2.0	SiCL	D	Lac		
	corrals	2.0-3.0	SiCL	VM-Sat	Lac		Med plastic, olive brown
VH2-14	~40m east	0-1.2	FSL	D	Lac		Sand lens @ 1.2m
	of VH-1	1.2-1.5	SiC	M	Lac		Med plastic, olive brown
		1.5-3.0	SiCL	VM-Sat	Lac		Med plastic, olive brown, high plastic layers and silt layers
VH3-14	~40m east	0-1.1	FSL	D	Lac		
	of VH-2	1.1-3.0	SiC	M	Lac		Med-high plastic, olive brown, silt layers VM-Sat @ 1.8m
VH4-14	~40m east	0-0.6	FSL	D	Lac		Some Silt
	of VH-3	0.6-1.5	LFS	SM	Lac	0.6-1.5	Oxidized, trace silt
		1.5-3.0	SiC	VM-Sat	Lac		Med plastic, olive brown, stiff
VH5-14	~40m east	0-1.2	FSL	D	Lac		
	of VH-4	1.2-3.0	SiC	VM-Sat	Lac		Med plastic, olivebrown, stiff, silt lenses WTW Installed
VH6-14	~40m east	0-1.2	FSL	D	Lac		
	of VH-5	1.2-1.5	FSL	VM	Lac		
		1.5-4.0	SiC	VM	Lac	1.5-3.0	Med-high plastic, olive brown, stiff HC Well Total Depth 4.0m Screen 2.5-3.9m Sand 2.7-4.0m Bent 0.6-2.7m Stickup 0.6m
VH7-14	~40m east	0-1.2	FSL	D	Lac		
	of VH-6	1.2-1.5	FM.S	D	Lac		Trace very small gravel
	~10m east of west boundary of proposed barn	1.5-3.0	SCL	VM-Sat	Till	1.5-3.0	Some gravel

VH8-14	~30m NE	0-1.0	FSL	D	Lac		
	of VH-7	1.0-1.4	LM.S	D	Lac		Trace silt, trace gravel
	center of	1.4-3.0	CL	M	Till		Some gravel, sand lenses (VM-Sat), stiff
	proposed						Low-med plastic
	barn						
VH9-14	~30m NE	0-0.3	LFS	D	Lac		
	of VH-8	0.3-1.2	FSL	D	Lac		
	NE corner	1.2-1.6	LM.S	D	Lac		Trace gravel, trace silt
	of proposed	1.6-2.6	SiC	M	Lac		Stiff, med-high plastic
	barn	2.6-3.0	SiCL	VM-Sat	Lac		Firm, med plastic, olive brown

BOREHOLE SUMMARY TABLE (VH10-15 – VH10-16)

Amec File: BX30375
Van Huigenbos Farms
Proposed Catch Basin and Calf Pens, SE21-9-26-W4M near Fort Macleod, Alberta

Borehole VH10-15		
Depth:		
0.0 – 0.9	**SILTY SAND** – fine to medium grained, compact, damp	
0.9 – 4.6	**CLAY** – medium plastic, lacustrine, silty, trace sand, laminations, brown, stiff moist -becoming very silty below 4.3m depth	*Monitoring Well Detail:* 25mm PVC Standpipe to 6.0m depth, hand-slotted
4.6 – 5.0	-gravelly silty and sand, very moist to wet	Groundwater at 4.0m depth, Sept 15, 2015
5.0 – 6.0	**CLAY TILL** – medium plastic, silty, trace sand, trace gravel, coal and oxide inclusions, brown, stiff to very stiff, moist	
6.0	**End of Borehole at 6.0 m depth** *-some seepage from 4.2m depth*	
Borehole VH11-15		
Depth:		
0.0 – 0.8	**SILTY SAND** – fine to medium grained, compact, damp	
0.8 – 4.5	**CLAY** – medium plastic, lacustrine, silty, trace sand, laminations, brown, stiff moist -becoming very silty below 4.2m depth	*Monitoring Well Detail:* 50mm PVC Standpipe Screened: 2.7m – 3.8m Sand Pack: 2.7m – 3.8m Bentonite Seal: 0m – 2.7m Stick-up: 0.6m
4.5 – 5.0	-gravelly silty and sand, very moist to wet	
5.0 – 6.0	**CLAY TILL** – medium plastic, silty, trace sand, trace gravel, coal and oxide inclusions, brown, stiff to very stiff, moist	
6.0	**End of Borehole at 6.0 m depth** *-some seepage from 4.2m depth*	
Borehole VH12-15		
0.0 – 0.9	**SILTY SAND** – fine to medium grained, compact, damp	
0.9 – 3.0	**CLAY** – medium plastic, lacustrine, silty, trace sand, laminations, brown, stiff moist	
3.0	**End of Borehole at 3.0 m depth** *-borehole open and dry upon completion*	

Borehole VH13-15		
0.0 – 1.0 1.0 – 3.0 3.0	**SILTY SAND** – fine to medium grained, compact, damp **CLAY** – medium plastic, lacustrine, silty, trace sand, laminations, brown, stiff moist **End of Borehole at 3.0 m depth** *-borehole open and dry upon completion*	
Borehole VH14-15		
0.0 – 1.0 1.0 – 3.0 3.0	**SILTY SAND** – fine to medium grained, compact, damp **CLAY** – medium plastic, lacustrine, silty, trace sand, laminations, brown, stiff moist **End of Borehole at 3.0 m depth** *-borehole open and dry upon completion*	
Borehole VH15-15		
0.0 – 1.1 1.1 – 3.0 3.0	**SILTY SAND** – fine to medium grained, compact, damp **CLAY** – medium plastic, lacustrine, silty, trace sand, laminations, brown, stiff moist **End of Borehole at 3.0 m depth** *-borehole open and dry upon completion*	
Borehole VH16-15		
0.0 – 1.2 1.12 – 3.0 3.0	**SILTY SAND** – fine to medium grained, compact, damp **CLAY** – medium plastic, lacustrine, silty, trace sand, laminations, brown, stiff moist **End of Borehole at 3.0 m depth** *-borehole open and dry upon completion*	

Table Notes:
-borehole information to be read in conjunction with AMEC report BX30375.
-boreholes advanced using C1172 drill provided by Chilako Drilling Services on September 9, 2015
-see Figure 1 for borehole locations

13 March 2024

WSP File: BX11613

3102 – 12 Avenue North
Lethbridge, Alberta T1H 5V1
T: +1 403 327-7474
www.wsp.com

Van Huigenbos Farms
c/o Linkage Ag Solutions
Box 1120
Coaldale, Alberta T1M 1M9

Attention: Mr. Cody Metheral:

Re: Geotechnical Review and Evaluation
NRCB Permitting of Proposed Pens
SE-21-009-26-W4M, near Fort Macleod, Alberta

As requested, WSP E&I Canada Limited (WSP) has carried out a geotechnical review and evaluation of the above-captioned site relative to the required protection of the groundwater resource, as required by the Agricultural Operation Practices Act, AB Reg. 267/2001 (hereinafter referred to as "AOPA"). This letter describes site soil conditions to support a permit application related to an area of proposed feedlot pens and a proposed catch basin within SE-21-009-26-W4M (refer to Figure 1, attached).

In order to demonstrate the suitability of the naturally existing soils for consideration as a naturally occurring protective layer to the groundwater, fifteen (15) boreholes were advanced at the site on May 1, 2023. The boreholes were advanced at the approximate locations denoted as VF1-23 to VF15-23 on Figure 1, attached.

The boreholes were advanced by a truck-mounted drill rig owned and operated by Chilako Drilling Services and extended to depths ranging between 3.0 m and 9.2 m below existing grades. The boreholes were logged by Larry Delong of Chilako Drilling Services.

In general, the natural mineral soils encountered within the boreholes comprised of a layer of lacustrine sand loam, which was generally underlain by stiff medium plastic clay till below approximately 3.0 m depth. It was noted that perched water and saturated lacustrine soils were encountered to depths of up to about 1.2 m below existing grade. The perched water in this area appears to be localized, and is not considered to be a groundwater resource as defined by the AOPA.

Samples of soil collected from the screened zone of the boreholes VF5-23, VF10-23, VF11-23, and VF14-23 were subjected to laboratory grain size (i.e., hydrometer) analyses. The results (attached) indicate a textural breakdown of approximately:

Table 1: Soil Textural Analyses

Borehole/Depth	% Sand	% Silt	% Clay
VF5-23 / 2.0-3.7m	24	55	21
VF10-23 / 4.5-5.5m	15	66	19
VF11-23 / 3.1-4.0m	28	55	17
VF14-23 / 3.0-4.5m	20	62	18

To measure the *in situ* permeability of the subsurface soils, 50 mm diameter PVC monitoring wells were constructed in boreholes VF5-23, VF10-23, VF11-23, and VF14-23. The test wells were screened at various depths from 2.7 m to 6.0 m below existing grades (see Table 2). Well saturation of the 50 mm diameter monitoring wells was carried out by filling the monitoring well to the top for several consecutive days. After several days of saturation, the 4-hour water drop for the wells ranged between 0.28 m and 0.43 m. The 4-hour water drop for each of the monitoring wells are listed in Table 2.

To calculate the permeability of the screened portion of the clay till strata at the test well locations, a modified falling head test (as outlined in the USBR Engineering Geology Field Manual Volume 2 [2001]) was used. The input variables and output data are outlined on the attached In Situ Permeability Test reports. The results of the permeability testing indicate an *in situ* hydraulic conductivity, k_s, values ranging between 2.0 x 10^{-7} cm/s and 3.6 x 10^{-7} cm/s (see Table 2).

Using the measured permeability of the clay stratum, the equivalent natural soil thicknesses of naturally occurring material having a hydraulic conductivity of 1 x 10^{-6} cm/s (the reference standard in AOPA) at the monitoring well locations has been calculated, and those thickness equivalents are presented in Table 2. As indicated, the equivalent thicknesses range between 6.4 m and 12 m. This represents natural material protection in excess of the minimum requirements outlined by the AOPA for solid manure storage (minimum 2 m, Section 9.5-c) and for catch basins (minimum 5 m, Section 9.5-b).

Table 1: Permeability Test Results

Borehole	4-hr Water Drop in Well (m)	Length of Screened Zone (m)	Depth of Screen (m)	Calculated Permeability	Calculated Equivalent 1x10^{-6} cm/s Thickness (m)
VF5-23	0.43	1.80	2.7 – 4.5	2.7 x 10^{-7} cm/s	6.7
VF10-23	0.28	1.60	4.4 – 6.0	2.0 x 10^{-7} cm/s	12.3
VF11-23	0.36	1.60	2.9 – 4.5	2.2 x 10^{-7} cm/s	7.3
VF14-23	0.40	1.55	2.95 – 4.5	2.5 x 10^{-7} cm/s	6.4

Conclusion

Based on the results of the current investigation, permeability testing, and our understanding of the site and proposed development at the site, it is WSP's opinion that the naturally occurring materials at the site satisfy the AOPA requirements for permitting the proposed pens and proposed catch basin at this location.

We trust that this report satisfies your present requirements. Should you have any questions, please contact the undersigned at your convenience.

Yours truly,

WSP E&I Canada Limited

PROFESSIONAL ENGINEER JOHN P. LOBBEZOO ID 110450 ALBERTA

13 March 2024

John Lobbezoo, P.Eng.
Principal Geotechnical Engineer

Co-authored by:
James Le, EIT
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Reviewed by:
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Senior. Associate, Geotechnical Engineer

PERMIT TO PRACTICE
WSP E&I CANADA LIMITED
RM SIGNATURE:
RM APEGA ID #: 11450
DATE: 13 March 2024
PERMIT NUMBER: P004546
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Attachments
- Figure 1 Borehole Locations
- In Situ Permeability Test Calculations
- Hydrometer Test
- Soil Profile and Parent Material Description, Chilako Drilling Services

Figure 1
Borehole Locations
Van Huigenbos Farms
WSP File: BX11613
May, 2023

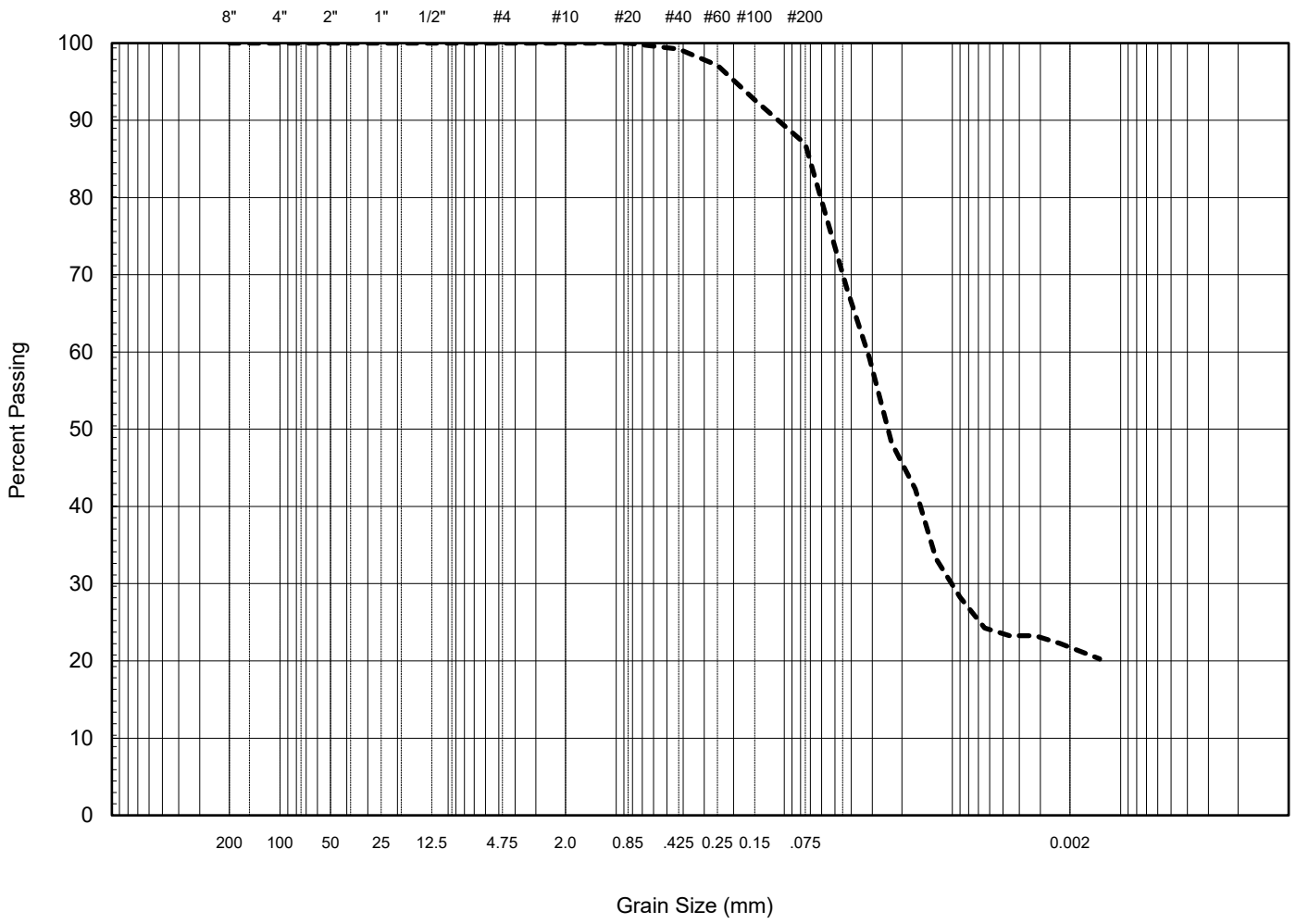
Legend
Feature 1
Feature 2

VF9-23
PROPOSED CATCH BASIN
VF10-23
VF5-23
VF4-23
PROPOSED PENS
VF1-23
VF8-23
SE-21-009-24-W4M
VF11-23
VF12-23
VF7-23
VF3-23
VF2-23
PROPOSED PENS
VF6-23
PROPOSED PENS
VF15-23
VF14-23
VF13-23
Range Rd 263
SW-22-009-24-W4M
N
100 m
Google Earth
Image © 2023 CNES / Airbus

HYDROMETER TEST

WSP E&I Canada Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

D10 =	#N/A	mm	**Gravel**	0	**%**
D30 =	0.0102	mm	**Sand**	13	**%**
D60 =	0.0322	mm	**Silt**	65	**%**
Cu =	#N/A		**Clay**	22	**%**
Cc =	#N/A				

Project No: BX11613
Hole No: VF4-23
Depth (m): 1.5-3.0

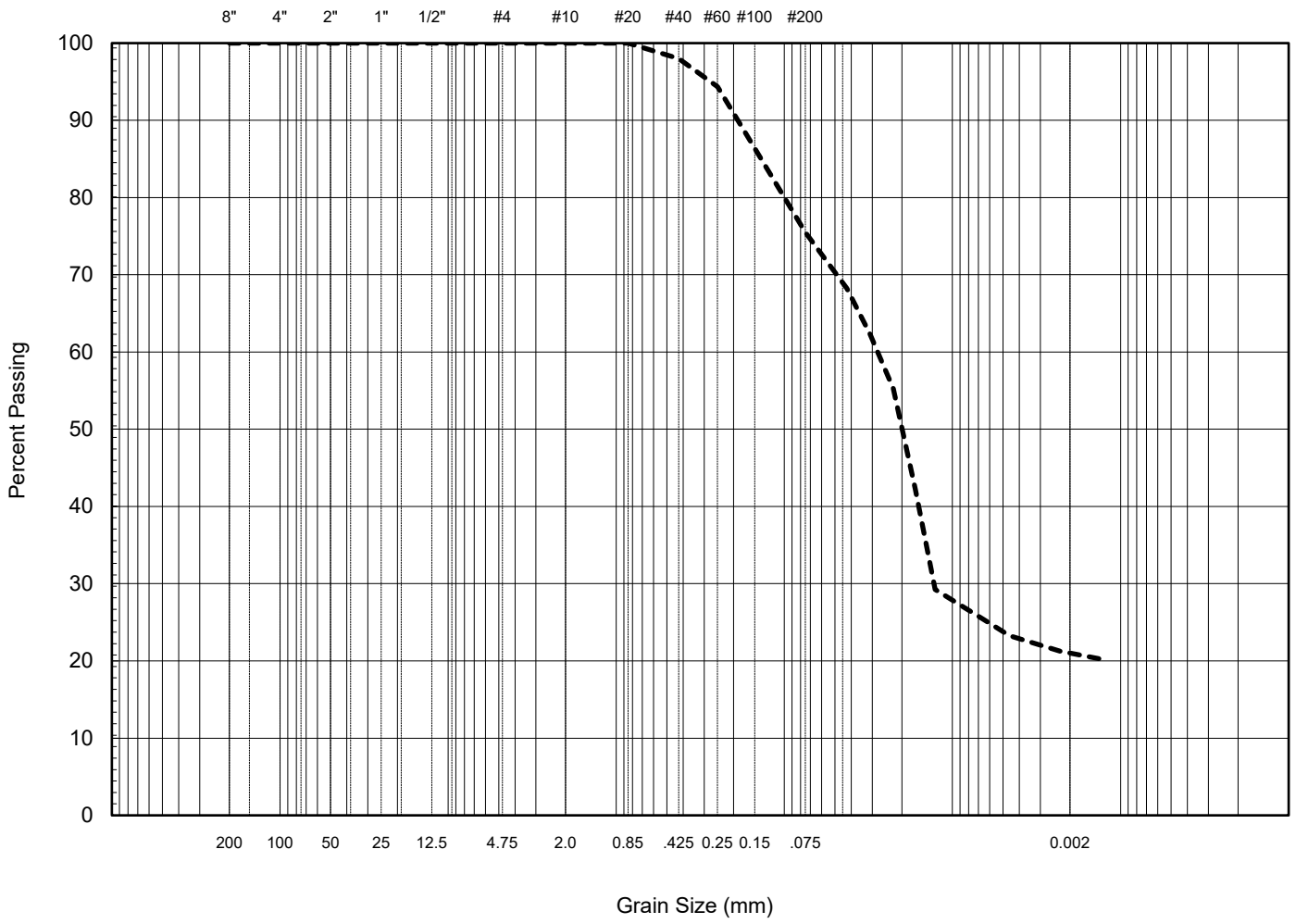
Client: Linkage Ag Solution
Sample: --
Date: June 1, 2023

Tech: TMW

HYDROMETER TEST

WSP E&I Canada Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

D10 =	#N/A	mm	**Gravel**	0	%
D30 =	0.0129	mm	**Sand**	24	%
D60 =	0.0281	mm	**Silt**	55	%
Cu =	#N/A		**Clay**	21	%
Cc =	#N/A				

Project No: BX11613
Hole No: VF4-23
Depth (m): 2.0-3.7

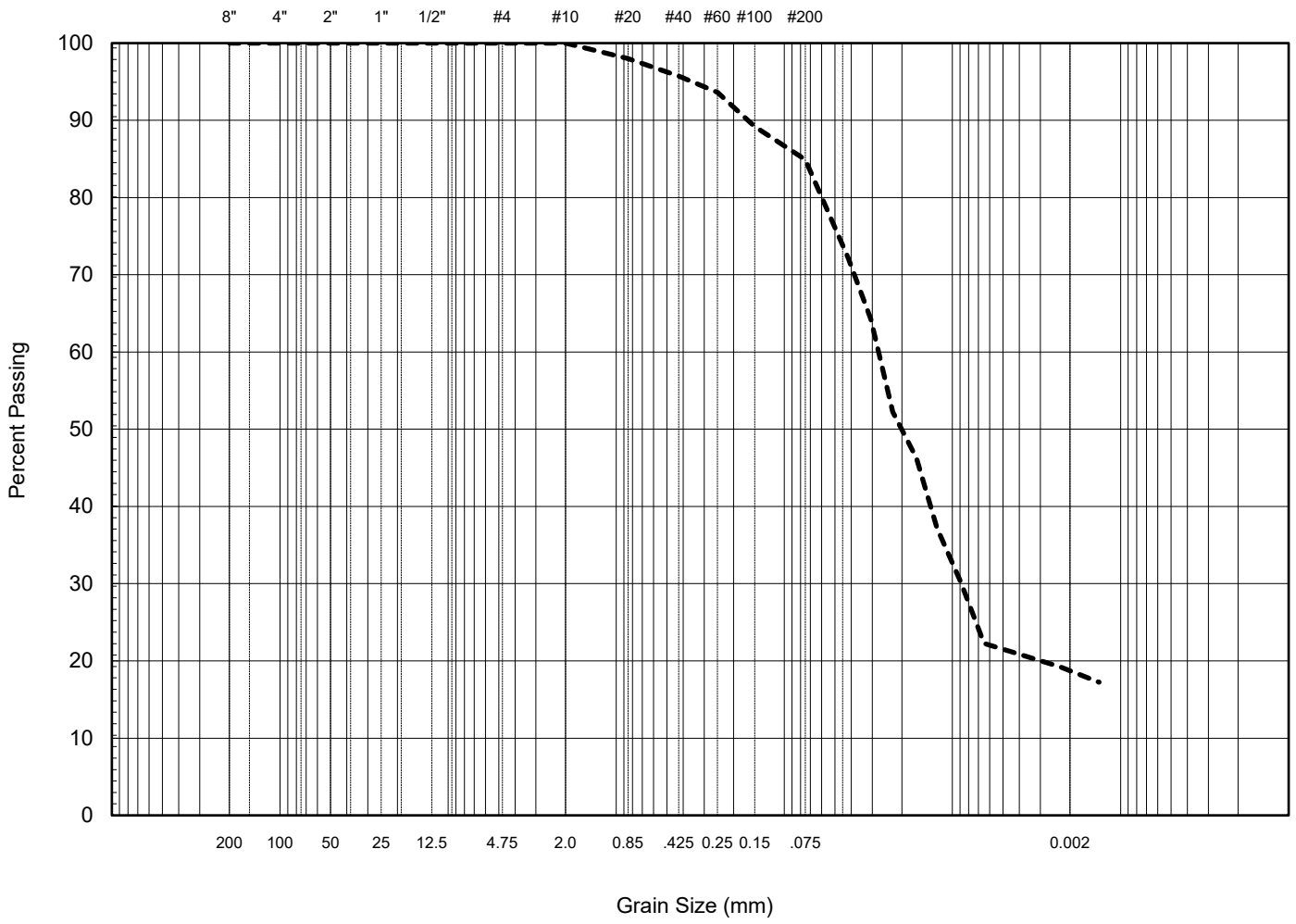
Client: Linkage Ag Solution
Sample: --
Date: June 1, 2023

Tech: TMW

HYDROMETER TEST

WSP E&I Canada Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

D10 =	#N/A	mm	**Gravel**	0	**%**
D30 =	0.0089	mm	**Sand**	15	**%**
D60 =	0.0278	mm	**Silt**	66	**%**
Cu =	#N/A		**Clay**	19	**%**
Cc =	#N/A				

Project No: BX11613
Hole No: VF10-23
Depth (m): 4.5-5.5

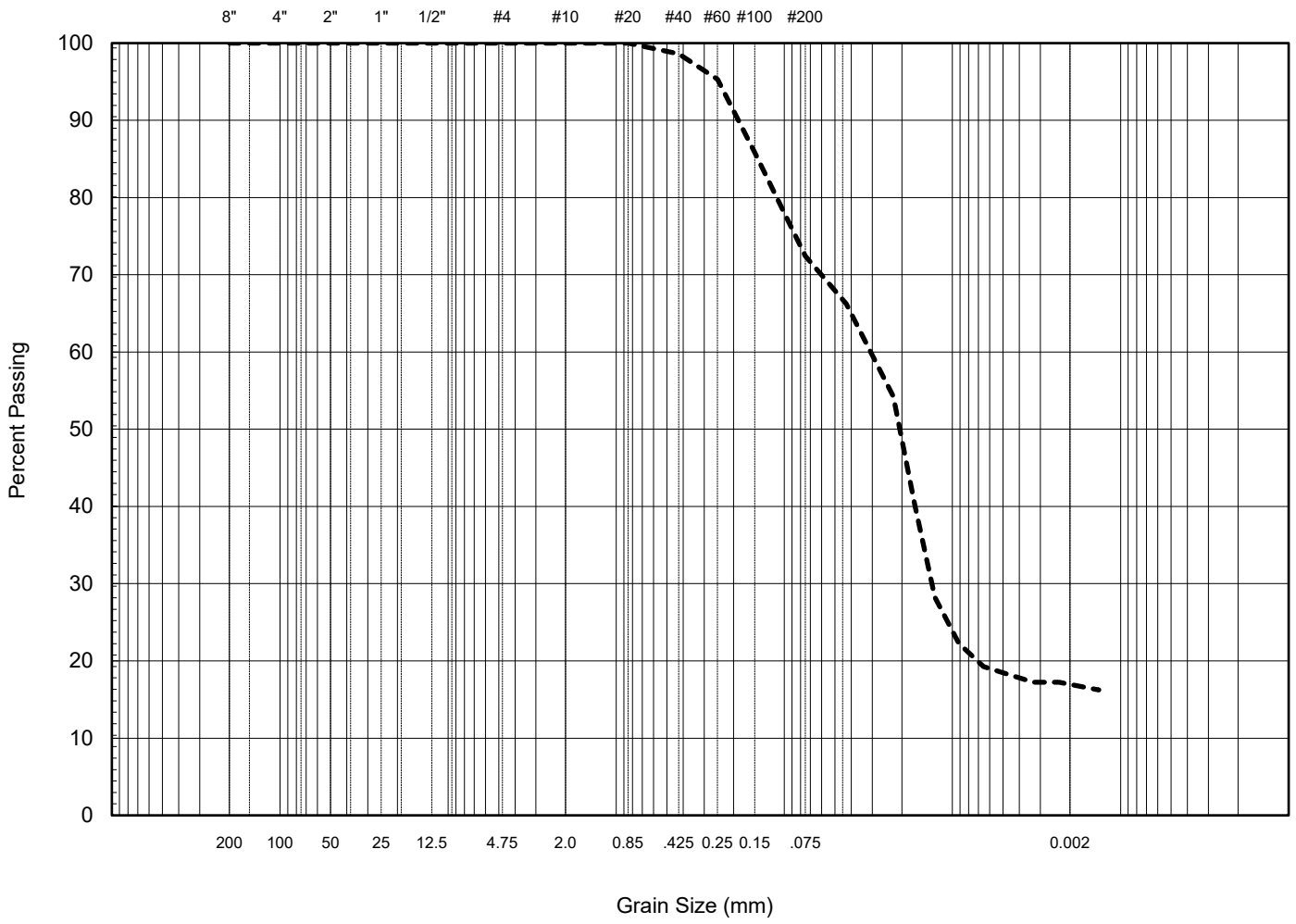
Client: Linkage Ag Solution
Sample: --
Date: June 1, 2023

Tech: TMW

HYDROMETER TEST

WSP E&I Canada Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

D10 =	#N/A	mm	**Gravel**	0	%
D30 =	0.0133	mm	**Sand**	28	%
D60 =	0.0307	mm	**Silt**	55	%
Cu =	#N/A		**Clay**	17	%
Cc =	#N/A				

Project No: BX11613
Hole No: VF11-23
Depth (m): 3.1-4.0

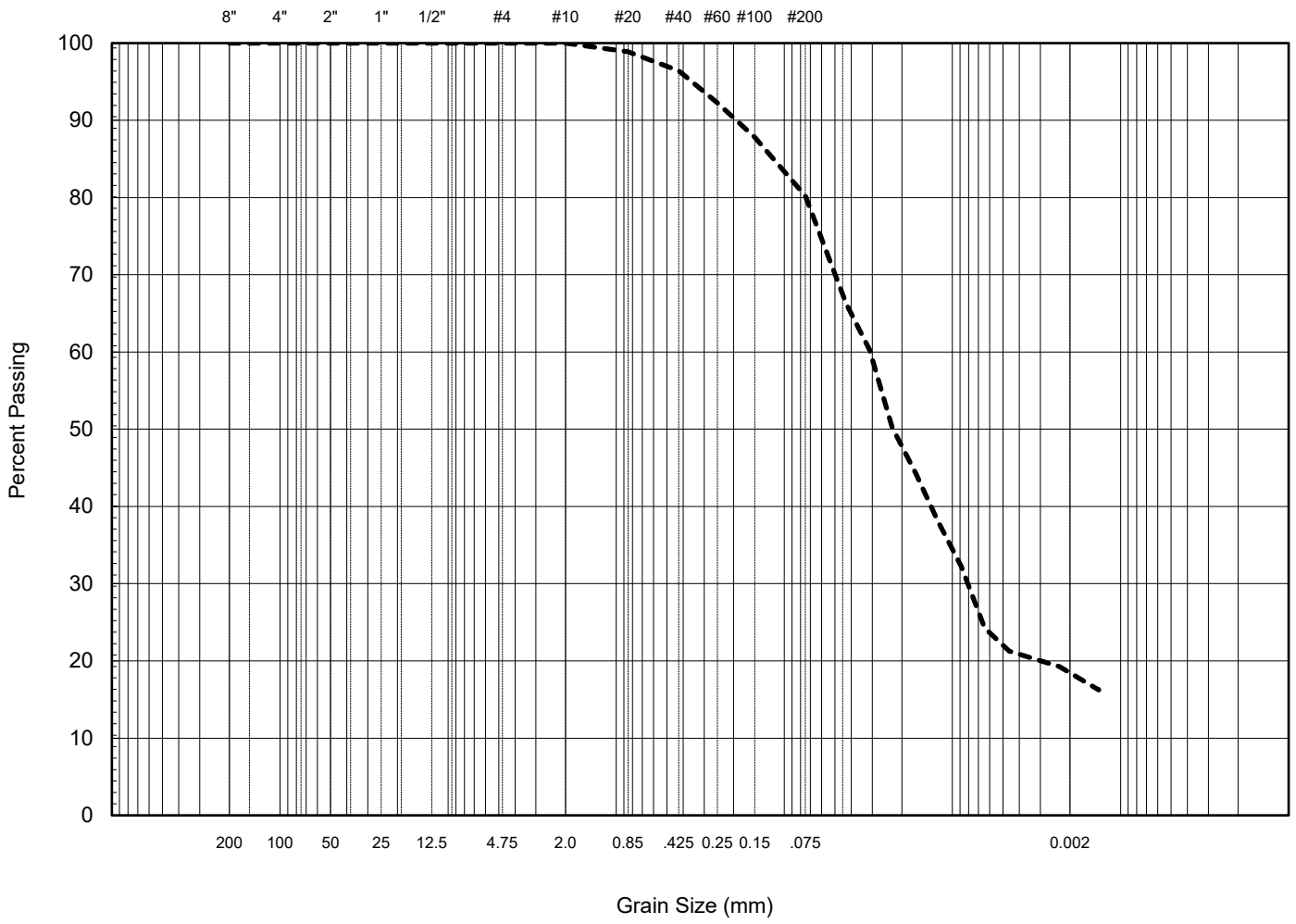
Client: Linkage Ag Solution
Sample: --
Date: June 1, 2023

Tech: TMW

HYDROMETER TEST

WSP E&I Canada Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

D10 =	#N/A	mm	**Gravel**	0	%
D30 =	0.0082	mm	**Sand**	20	%
D60 =	0.0309	mm	**Silt**	62	%
Cu =	#N/A		**Clay**	18	%
Cc =	#N/A				

Project No: BX11613
Hole No: VF14-23
Depth (m): 3.0-4.5

Client: Linkage Ag Solution
Sample: --
Date: June 1, 2023

Tech: TMW

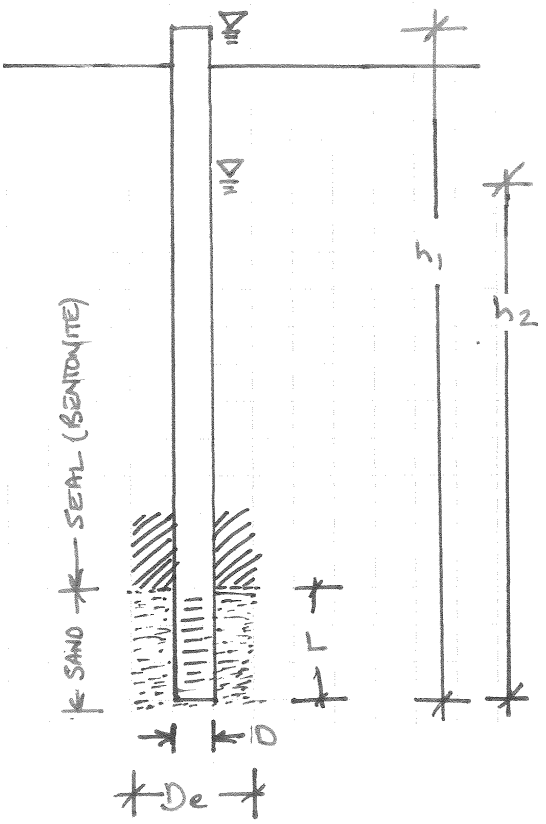
VF5-23

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

taken from USBR Engineering Geology Field Manual Volume 2 (2001)



VF5-23 - VanHuigenbos Farms

WSP File: BX11613

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	1.80	length of sand section (m)
h1	5.10	initial height of water above base of hole (m)
h2	4.67	final height of water above base of hole (m)
t	4.0	time of test (h)

k_s = 2.5E-07 cm/sec

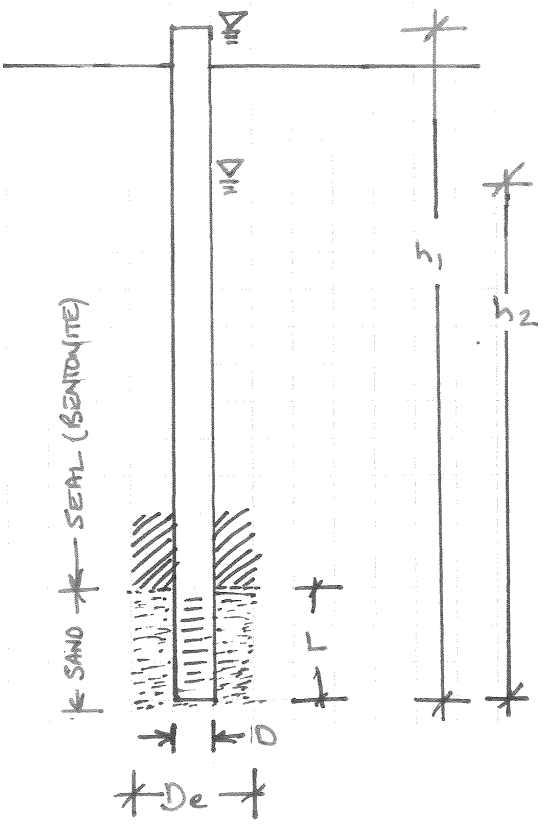
VF10-23

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

taken from USBR Engineering Geology Field Manual Volume 2 (2001)



VF10-23 - VanHuigenbos Farms

WSP File: BX11613

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	1.60	length of sand section (m)
h1	6.60	initial height of water above base of hole (m)
h2	6.32	final height of water above base of hole (m)
t	4.0	time of test (h)

k_s = 1.3E-07 cm/sec

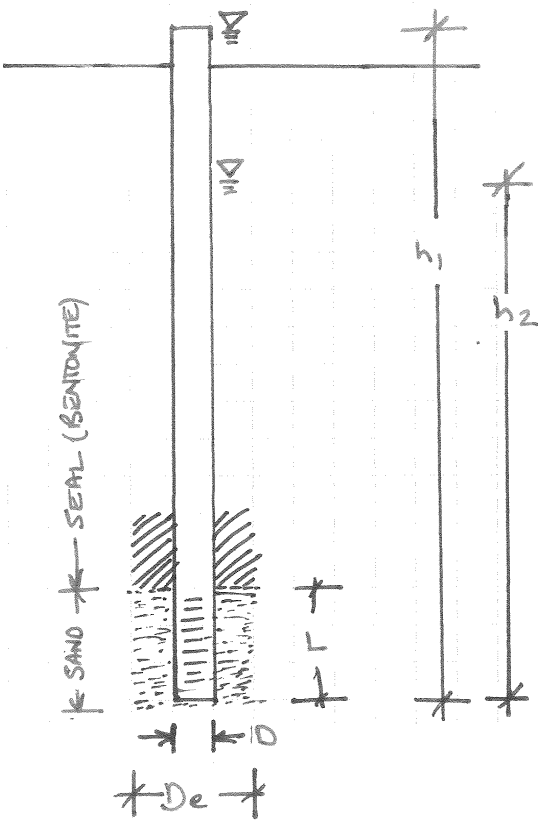
VF11-23

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

taken from USBR Engineering Geology Field Manual Volume 2 (2001)



VF11-23 - VanHuigenbos Farms

WSP File: BX11613

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	1.60	length of sand section (m)
h1	5.10	initial height of water above base of hole (m)
h2	4.74	final height of water above base of hole (m)
t	4.0	time of test (h)

k_s = 2.2E-07 cm/sec

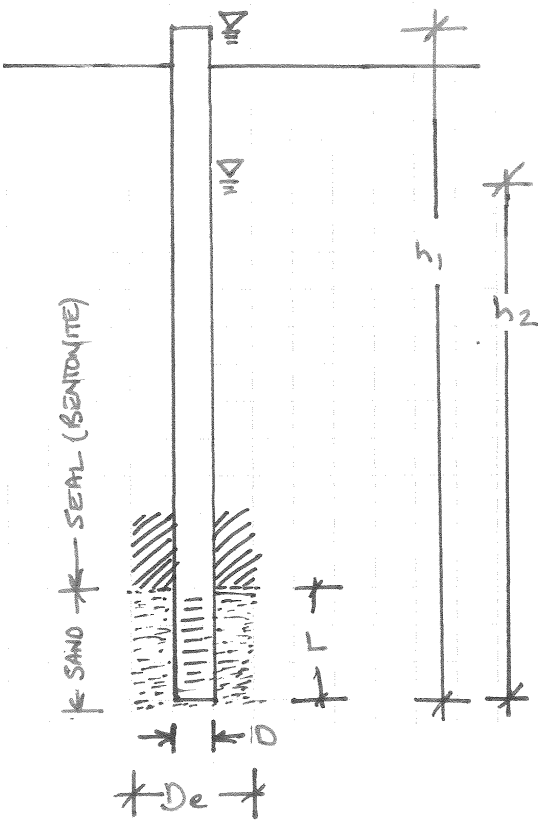
VF14-23

In Situ Permeability Test

Modified Falling Head Permeability Equation

$$K_s = \frac{r^2}{2\ell\Delta t}\left[\frac{\sinh^{-1}\frac{\ell}{r_e}}{2}\ln\left[\frac{2H_1-\ell}{2H_2-\ell}\right]-\ln\left[\frac{2H_1H_2-\ell H_2}{2H_1H_2-\ell H_1}\right]\right]$$

taken from USBR Engineering Geology Field Manual Volume 2 (2001)



VF14-23 - VanHuigenbos Farms

WSP File: BX11613

INPUT VARIABLES

Terms	Value	Definition
D	0.0520	diameter of standpipe (m)
De	0.1500	diameter of borehole (m)
L	1.55	length of sand section (m)
h1	5.10	initial height of water above base of hole (m)
h2	4.70	final height of water above base of hole (m)
t	4.0	time of test (h)

k_s = 2.5E-07 cm/sec

CHILAKO DRILLING SERVICES LTD

Box 942 Coaldale, Alberta, T1M 1M8
(403) 345-3710

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION

Site Location: SE21-9-26W4, Vanhuigenbos Farms Date: 1-May-23

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VF1-23	0322880	0-0.15	LS	M	Topsoil		
	5513240	0.15-1.2	LS	M	Lac		Loose
		1.2-1.3	LS	Sat	Lac		Sat @ clay contact, free water
		1.3-3.0	SiC	M-VM	Lac		Stiff, med-high plastic, olive brown
							Sluff @ 1.2m
VF2-23	0322883	0-0.15	LS	M	Topsoil		
	5513133	0.15-1.2	LS	M	Lac		Loose
		1.2-1.5	LS	Sat	Lac		Loose, free water
		1.5-3.0	SiC	M-VM	Lac		Stiff, med-high plastic, olive brown
							Sluff @ 1.2m
VF3-23	0322809	0-0.15	LS	M	Topsoil		
	5513139	0.15-1.2	LS	M	Lac		Loose
		1.2-1.6	LS	Sat	Lac		Free water
		1.6-3.0	SiC	M	Lac		Stiff, med-high plastic, olive brown
		3.0-4.5	CL-SiCL	M-VM	Till		Stiff, med plastic, brown
							Sluff @ 1.2m
VF4-23	0322801	0-0.15	LS	M	Topsoil		
	5513264	0.15-1.2	LS	M	Lac		Loose
		1.2-1.3	LS	Sat	Lac		Loose
		1.3-3.0	SiC	M-VM	Lac	1.5-3.0	Stiff, high plastic, olive brown
VF5-23	0322702	0-0.15	LS	M	Topsoil		
	5513260	0.15-1.1	LS	M	Lac	0.5-1.0	Loose
		1.1-1.2	LS	Sat	Lac		
		1.2-3.7	SiC	M-VM	Lac	2.0-3.7	V.firm, med-high plastic, olive brown
		3.7-4.5	SiCL	M-VM	Lac		V.firm, med plastic, olive brown, sand streaks
							50mm H.C. Well installed to 4.5m bgs
							Screen: 4.5-3.0m
							Sand: 4.5-2.7m
							Bentonite: 2.7-0.0m
							Stickup: 0.6m
							Hole Diameter: 0.15m
VF6-23	0322696	0-0.15	LS	M	Topsoil		
	5513117	0.15-1.4	LS	M	Lac		Loose
		1.4-1.5	LS	Sat	Lac		Loose
		1.5-3.0	SiC	M-VM	Lac		V.firm, med-high plastic, olive brown

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION (CONTINUED)

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VF7-23	0322625	0-0.15	LS	M	Topsoil		
	5513160	0.15-0.6	LS+Gr	M	Lac		
		0.6-1.1	LS	M	Lac		Loose
		1.1-2.0	LS	Sat	Lac		Free water
		2.0-4.6	SiC	M-VM	Lac		V.firm, high plastic, olive brown
		4.6-5.8	CL-C	M	Till		Stiff, med plastic, dark brown
		5.8-9.0	CL	M	Till		Stiff, med plastic, grey, trace gravel, sat. lenses, sluff and free water @ 1.2m
VF8-23	0322627	0-0.15	LS	M	Topsoil		
	5513223	0.15-1.1	LS	M	Lac		
		1.1-1.5	C.S+Gr	Sat	Lac		Free water
		1.5-2.3	SiC	M-VM	Lac		V.firm, high plastic, olive brown
		2.3-4.7	SiCL	M-VM	Lac		V.firm, high plastic, olive brown
		4.7-9.2	C	M	Till	4.7-6.2	Stiff, med-high plastic, dark brown, trace gravel
							Sluff and Free water @ 1.1m
VF9-23	0322617	0-0.9	LS	M	Lac		
	5513296	0.9-1.0	LS	Sat	Lac		Loose
		1.0-4.3	SiC	VM	Lac		Firm, high plastic, olive brown
		4.3-9.2	C	M	Till		Stiff, med plastic, brown
							Sluff and free water @ 0.9m
VF10-23	0322641	0-0.15	LFS	M	Lac		
	5513263	0.15-1.0	LFS	M	Lac		
		1.0-1.2	LM.S	M	Lac		
		1.2-1.9	LM.S	Sat	Lac		Free water @ 1.2m
		1.9-3.7	SiC	VM	Lac		V. Firm, med plastic, olive brown
		3.7-5.5	CL-C	M	Till	4.5-5.5	Stiff, med plastic, brown
		5.5-6.0	CL-C	M	Till		Stiff, med plastic, gray
							50mm H.C. Well installed to 6.0m BGS
							Screen: 6.0-4.5m
							Sand: 6.0-4.4m
							Bentonite: 4.4-3.2m
							Stickup: 0.6m
							Hole Diameter: 0.15m
VF11-23	0322843	0-0.15	LFS	M	Lac		
	5513160	0.15-1.5	LFS	M	Lac		
		1.5-2.0	LFS	Sat	Lac		Free water @ 1.5m
		2.0-3.1	SiC	M	Lac		Stiff, med plastic, olive brown
		3.1-4.0	SiCL	VM	Lac	3.1-4.0	Stiff, med-high plastic, olive brown
		4.0-4.5	CL-C	M-VM	Till	4.0-4.5	Stiff, med-high plastic, brown, sand streaks
							50mm H.C. Well installed to 4.5m BGS
							Screen: 4.5-3.0m
							Sand: 4.5-2.9m
							Bentonite: 2.9-0.0m
							Stickup: 0.6m
							Hole Diameter: 0.15m

SOIL PROFILE AND PARENT MATERIAL DESCRIPTION (CONTINUED)

Hole #	Location	Depth	Texture	Moisture	Geological	Sample	Remarks
VF12-23	0322950	0-0.15	FSL	M	Lac		
	5513151	0.15-1.0	FSL	M	Lac		
		1.0-1.3	LFS	VM	Lac		
		1.3-1.5	LFS	Sat	Lac		Free water @ 1.3m
		1.5-4.5	SiCL-SiC	M	Lac	3.0-4.5	Stiff, med plastic, olive brown
VF13-23	0322912	0-0.15	LS	M	Topsoil		
	5512994	0.15-0.7	LS	M	Lac		
		0.7-1.5	LS	M	Lac		
		1.5-3.4	SiCL	M-VM	Lac		V. Firm, med plastic, olive brown
		3.4-3.5	CL	VM	Till		V. Firm, med plastic, olive brown
		3.5-4.5	CL-C	M	Till	3.5-4.5	Stiff, med plastic, olive brown
VF14-23	0322816	0-0.15	FLS	M	Topsoil		
	5512971	0.15-0.8	LS+Gr	M	Lac		
		0.8-1.2	SiCL-SiC	M	Lac		Soft, VM, silt lenses
		1.2-2.8	SiCL-SiC	M	Lac		Stiff, med plastic, brown
		2.8-4.5	CL-C	M	Till	3.0-4.5	Stiff, med plastic, brown, sand streaks
							50mm H.C. Well installed to 4.5m BGS
							Screen: 4.5-3.0m
							Sand: 4.5-2.95m
							Bentonite: 2.95-0.0m
							Stickup: 0.6m
							Hole Diameter: 0.15m
VF15-23	0322707	0-0.15	FLS	M	Topsoil		
	5512972	0.15-1.0	FLS	M	Lac		
		1.0-2.6	SiCL	M	Lac		Soft, med plastic, silty layers
		2.6-3.0	CL	M	Till	2.6-3.0	Stiff, med plastic, brown, sand streaks

Legend:

L	Loam
C	Clay
S	Sand
Gr.	Gravel
Si	Silt
F	Fine (sand)
VF	Very Fine (sand)

Eg. VFSCL = Very Fine Sandy Clay Loam