SITE DRAINAGE ANALYSIS
FOR PALMER SUBDIVISION
PORTION OF SW ¼ 13-9-25-4

Environmental
Agricultural
Structural
Civil
Municipal

PREPARED FOR:
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1. INTRODUCTION

On behalf of Alan Palmer, Hasegawa Engineering (HE) has completed this hydrological analysis at the subject site. The site is located as shown in Figure 1. The hydrological analysis includes the following major aspects:

1. Overall site layout and conditions
2. Site topography and runoff
3. Retention pond storage size calculations (if required)

2. SITE CONDITIONS

The site is located to the west of the Hamlet of Orton (refer to Figure 1). The site is vacant and drains at an average grade of 0.8% in the south west direction towards Range Road #251 approximately midway between Township Toad #92 and #92A. The site is bordered by Township Road # 92A on the north, 2nd Street W. of Orton on the east, vacant land to the south and Range Road #251 to the west. Water potentially accumulates at the southern end of the property; however the amount of the accumulation would be insignificant. Ultimately, surface water will flow to the intersection of Range Road #251 and Township Road #92 in the south west corner of the vacant lot to the south.

3. OFFSITE DRAINAGE

Offsite drainage is currently intercepted by 2nd Street West of Orton, Range Road #251 and Township Road #92A and does not impact the site. The vacant lot drains away from the property and will not impact the site as well.

4. SURFACE RUNOFF DESIGN CRITERIA

The total area of the onsite basin is 36.9 acres. In order to determine the volume of runoff from the subject site, surface runoff analysis was performed. Rainfall intensity data was obtained for the City of Lethbridge from the Atmospheric Environment Service, which is part of Environment Canada. The input data for each basin was determined using the site information. Runoff estimations were developed using the NRCS Curve Number Method to determine runoff and Rationale Method to determine peak flow and runoff volume. The basin was analyzed assuming the duration of the storm exceeded the time of concentration and the basin was in hydraulic equilibrium.

Inputs used to calculate runoff are included in Table A1 below. Analysis was conducted for both pre- and post- development conditions. The curve number used for pre-development flow was 74, which represents a composite curve number of B, C, and D grade soils in a good pasture or range. The post-development curve number was 75, which represents urban development at 4.8

acre lots to 7.7 acre lots with the same composite of soil grades with ¼ acre of impermeable area per lot. Key input data used for this analysis is included in Table A1.

Table A1: Runoff Analysis Input Data

	Drainage Basin (acres)	Soil group and (CN)	Comp. Curve number (CCN)	2 year 24 hour storm (inches)	100 year 24 hour storm (inches)	Average Slope (ft/ft)	Percent impervious area
Pre-development	17.3	D (80)	74	2	5	0.008	0%
	9.8	C (74)					
	9.8	B (61)					
Post-development	16.55	D (80)	75	2	5	0.008	4.7%
	9.3	C (74)					
	9.3	B (61)					
	1.75	(98)					

5. SURFACE RUNOFF RESULTS

The results of the surface runoff analysis are provided in this section. Based on these results the amount of increased runoff generated from this low density development is 1.79 acre ft. Peak runoff flow does increase from 27 cfs to 28 cfs but this flow is spread out over the entire property. Based on this analysis it appears that there is no need to create a retention pond. However, it is recommended that all development that includes impervious surfaces (i.e. structures and driveways) be designed to drain to the existing county roads.

Table A2: Runoff Analysis Input Data

	Time of Concentration (Hours)	Peak Flow (cfs)	Runoff Volume (Inches per acre)	Runoff Volume (Acre ft)	Volume of Retention Provided
Pre-development	0.12	27.1	2.37	53.75	NA
Post-development	0.18	28.0	2.45	55.54	NA

6. DRAINAGE STRUCTURE DESIGN AND GRADING

There should be no requirement to build additional drainage structures as a result of this development. However, a post-development flow increase of up to 1.0 cfs will be diverted to the existing drainage ditch on the County access roads. A total flow rate of 28 cfs should be should be accounted for in culvert design for driveways.

Since this is a rural development, grading should be kept to a minimum. However, if possible, developed areas should be graded to drain towards the road access. At the road access,

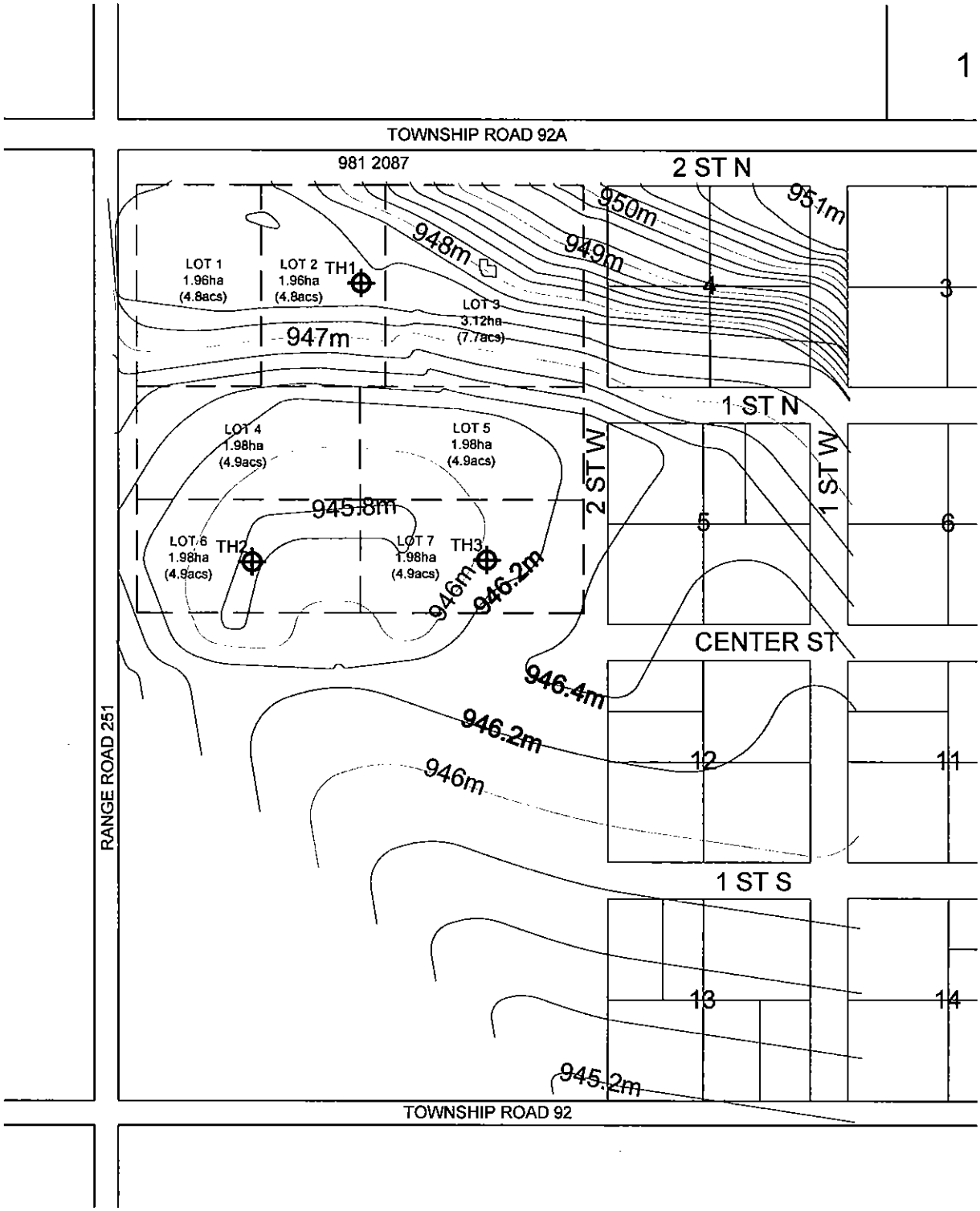
driveways must be designed with a swale or culvert that will not restrict storm water flow in the ditch.

7. CONCLUSIONS AND RECOMMENDATIONS

Surface runoff analysis was conducted on the subject property. The runoff from the property does increase due to low density residential development. However, the increase in volume is relatively insignificant and should not require the construction of a storm water retention pond. However, it is recommended that all development with impervious surfaces (i.e. structures and driveways) be designed to drain to the existing county roads. In addition, driveways designed to access the lots must be designed with a swale or culvert that will not restrict storm water flow in the ditch.

APPENDIX A

SOIL ANALYTICAL RESULTS



TEST HOLE LOCATIONS

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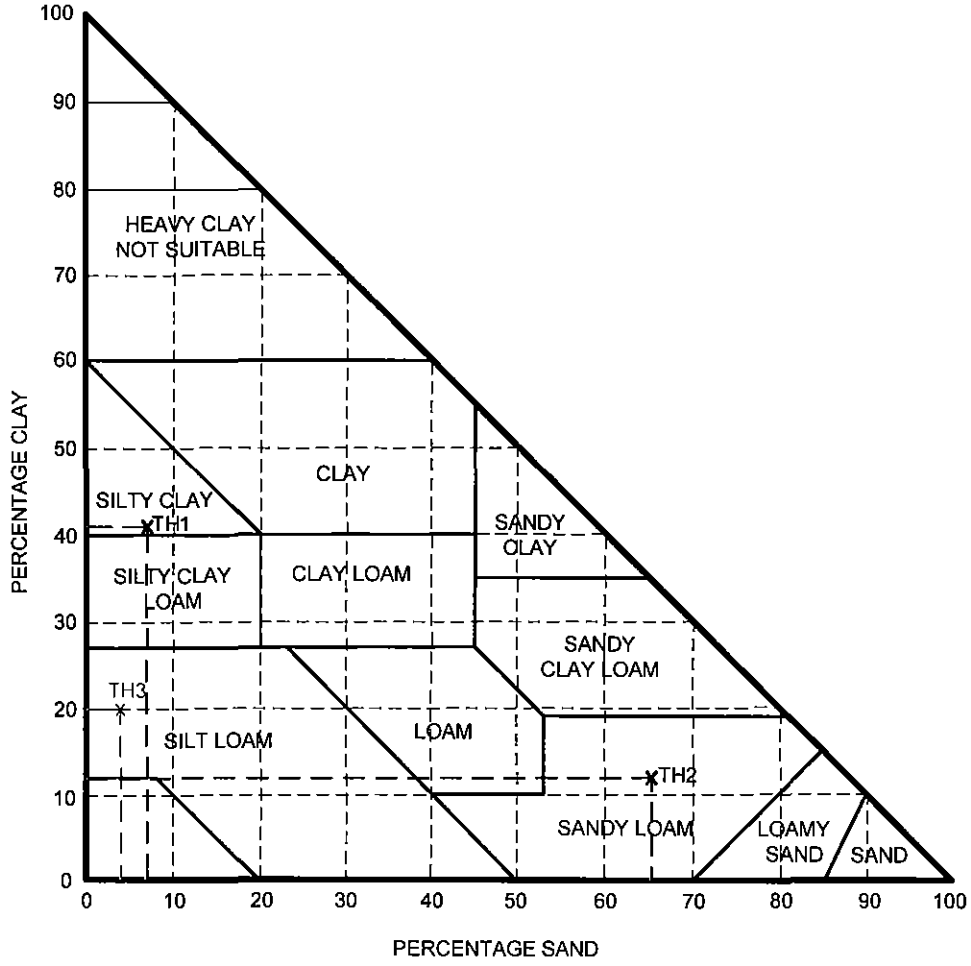
DRAWN	SCALE	SHEET NO.
MDO	NTS	FIGURE 1
CLIENT	PROJECT TITLE	DATE DRAWN
ALAN PALMER	PALMER SUBDIVISION	JULY 2, 2007

FIGURE 7A.1.5.A SOIL TEXTURE CLASSIFICATION TRIANGLE



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DRAWN	SCALE	SHEET NO.
MDO	NTS	FIGURE 2
CLIENT	PROJECT TITLE	DATE DRAWN
ALAN PALMER	PALMER SUBDIVISION	JULY 17, 2007

Standard of Practice	Explanation

7A.1.5. When using the results of a *soil texture classification* to size a system, the *disposal field weeping lateral* trench bottom area shall be sized so that the *effluent* loading rate per day for soil classifications determined in Table 7A.1.5.A. does not exceed, in a soil classified as:

(a) Clay, not suitable without further testing,

S1 (b) Silty Clay, not suitable without further testing,

(c) Silty Clay Loam, not suitable without further testing,

(d) Sandy Clay, not suitable without further testing,

(e) Clay Loam, 10.78 L per square metre (0.22 gal per sq. ft.),

(f) Silt, 12.25 L per square metre (0.25 gal per sq. ft.),

(g) Sandy Clay Loam, 13.72 L per square metre (0.28 gal per sq. ft.),

S3 (h) Silt Loam, 13.72 L per square metre (0.28 gal per sq. ft.),

(i) Loam, 17.15 L per square metre (0.35 gal per sq. ft.),

S2 (j) Sandy Loam, 22.05 L per square metre (0.45 gal per sq. ft.),

(k) Loamy Sand, 30.87 L per square metre (0.63 gal per sq. ft.), and

(l) Sand, not suitable without further testing.

Intent: *Soils classed as not suitable without further testing for a disposal field in this table may have an infiltration rate that will accommodate a disposal field. Further testing such as a percolation test, soil structure, and determining the absence of expandable clays may indicate the soil can accommodate a disposal field.*

See Pg. 37, Article 7.1.4

See Pg. 179, Fig. 7A.1.5.A, Soil Texture Classification Triangle in Appendix "B"

See Pg. 121, Particle or Grain Size Analysis Test in Appendix "B"

See Pg. 129, Sizing the Disposal Field Trench Bottom Area in Appendix "B"

See Pg. 149, Sizing the Infiltration Area in Appendix "B"

To use these loading rates, divide the volume of sewage per day by the given loading rate. (Gallons per day divided by the gallon per sq. ft. loading rate for the soil texture.)

Example of sizing using soil texture loading rates:

4 bedroom house, Silt loam soil.

Example: imperial measures
450 gals per day
loading rate for silt loam = .28 gals. per sq. ft.

450 ÷ 0.28 = 1607.14 sq. ft.

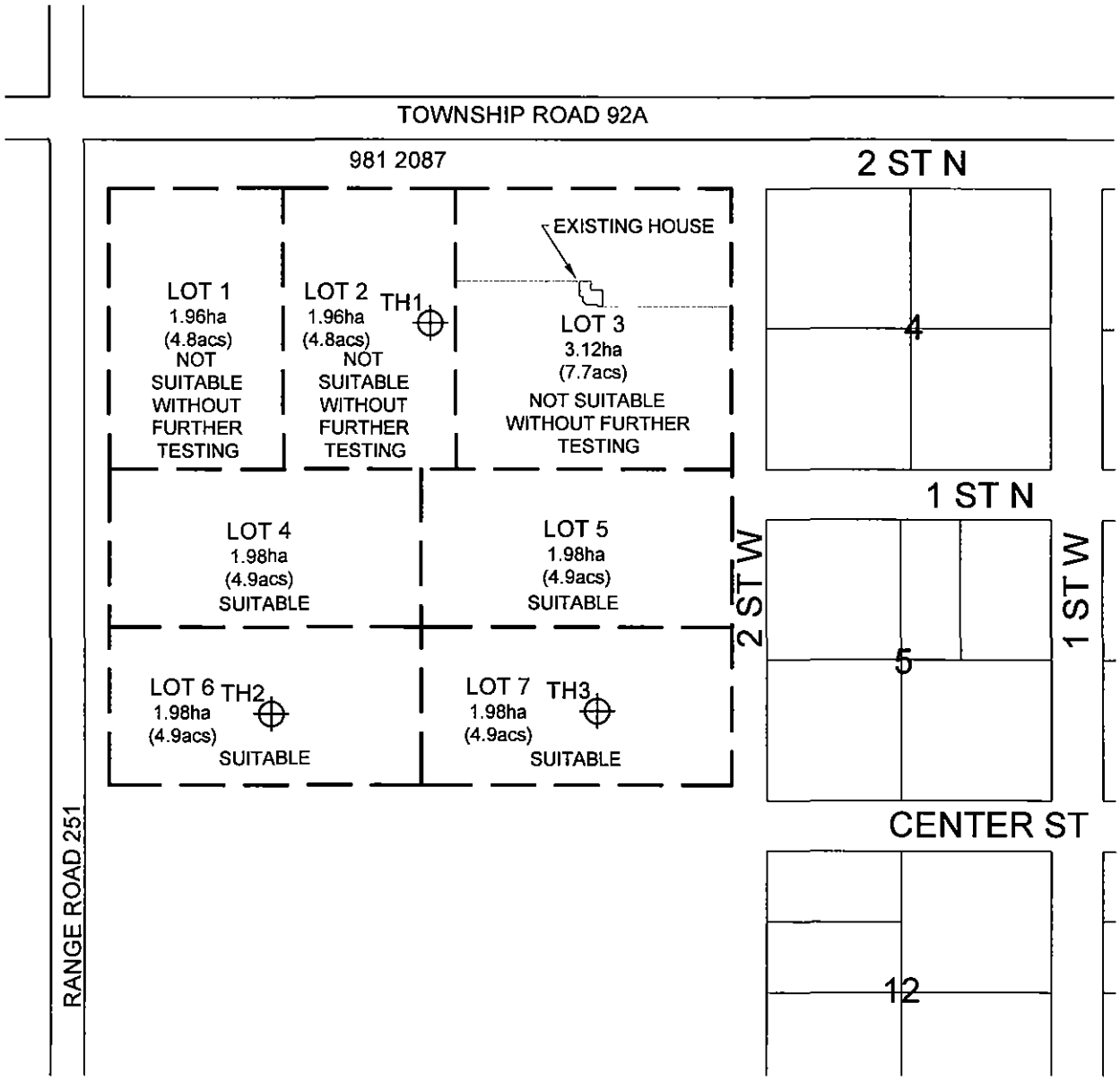
1607.14 sq. ft. of trench bottom area is required for the four bedroom home on silt loam soil.

If 2 foot wide trenches are used 803.6 lineal ft. of disposal field trench is required.

Example: metric measures
2040 litres per day
loading rate for silt loam = .13.72 L per sq. m.

2040 ÷ 13.72 = 148.69 sq. meters

148.69 sq. meters of trench bottom area is required for the four bedroom home on silt loam soil.



SEPTIC FIELD FEASIBILITY

Hasegawa Engineering

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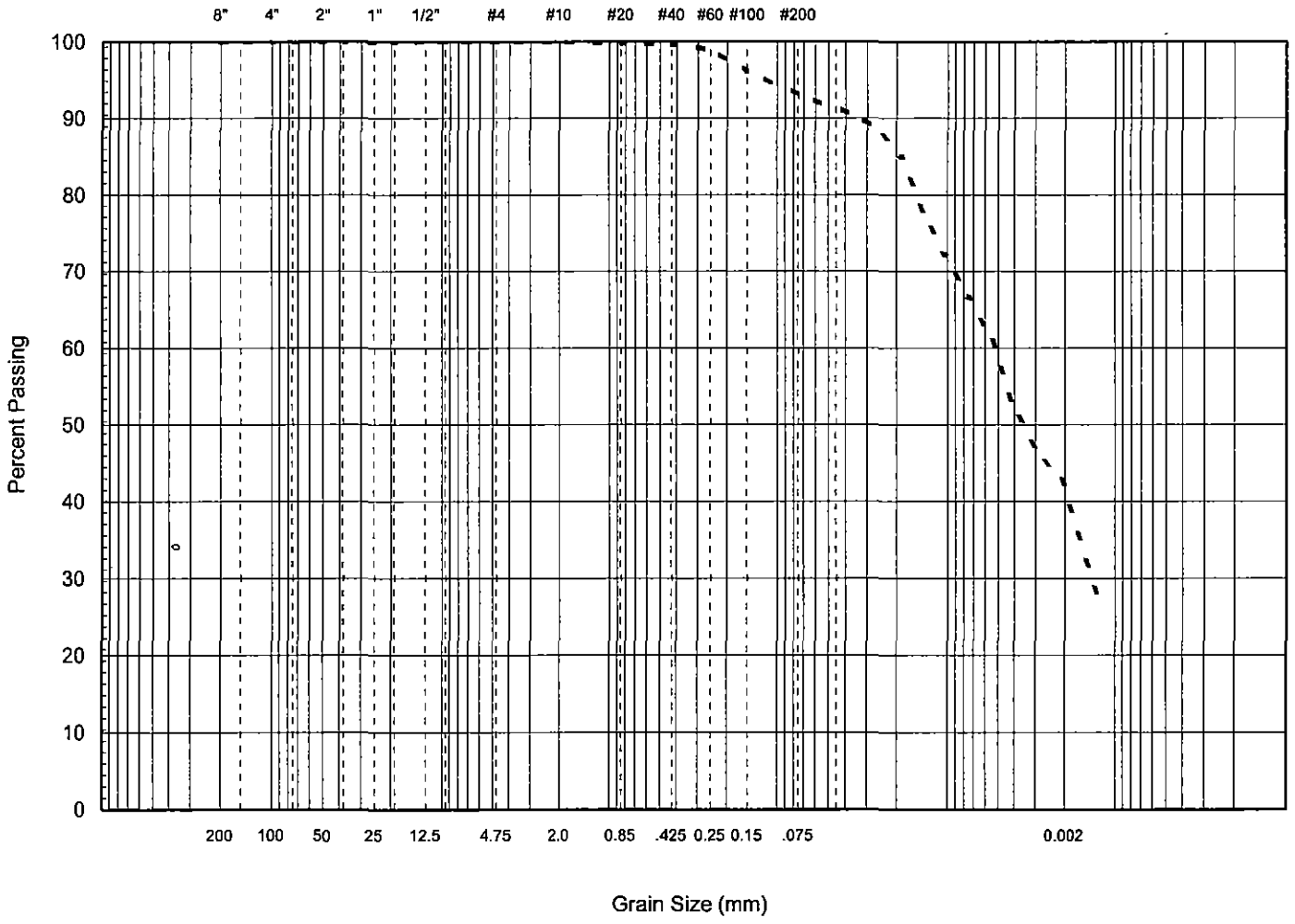
DRAWN	SCALE	SHEET NO.
MDO	NTS	FIGURE 3
CLIENT	PROJECT TITLE	DATE DRAWN
ALAN PALMER	PALMER SUBDIVISION	JULY 19, 2007

HYDROMETER TEST

AMEC Earth & Environmental
a Division of AMEC Americas Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

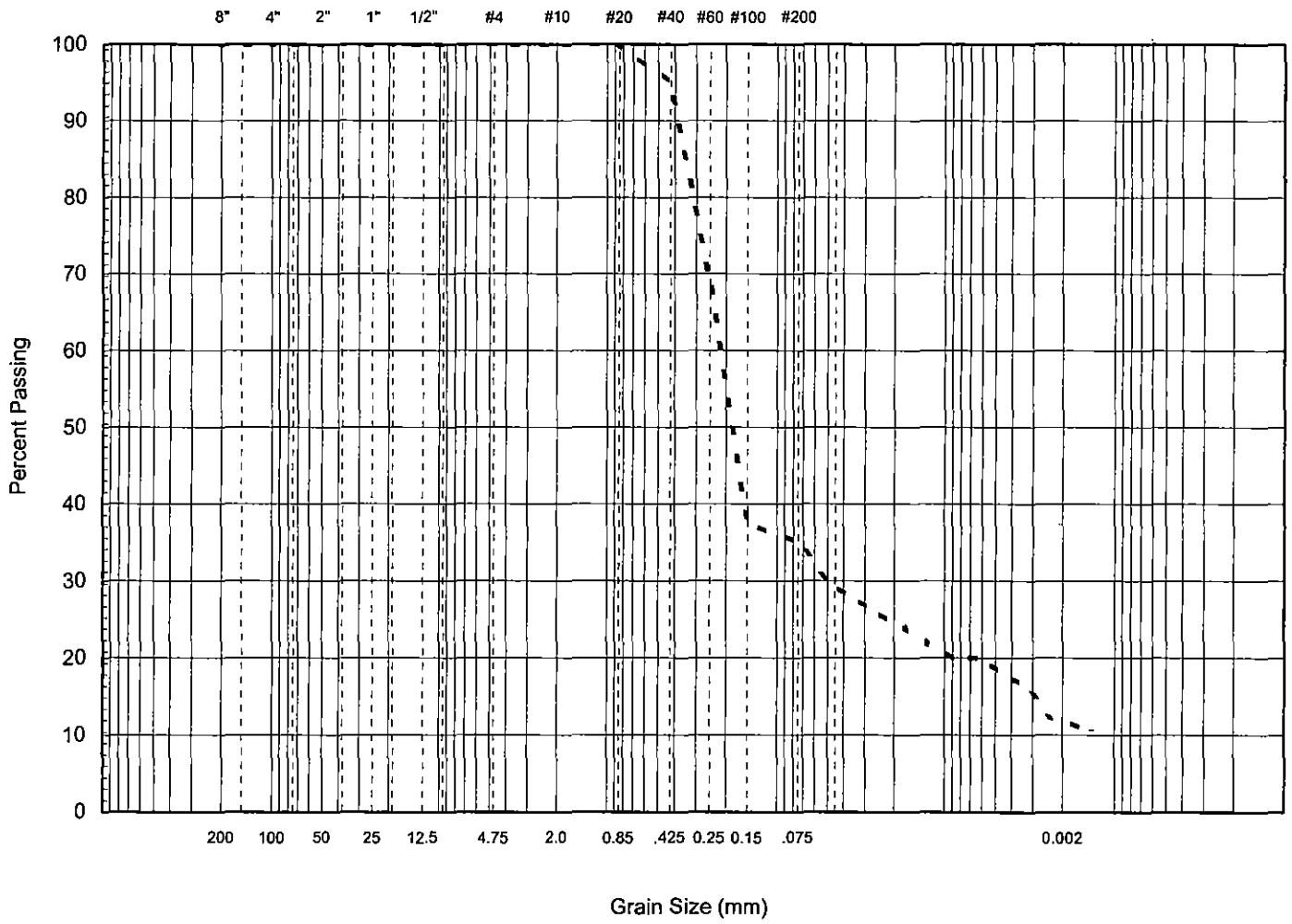
D10 =	#N/A	mm	**Gravel**	0	%
D30 =	#DIV/0!	mm	**Sand**	7	%
D60 =	0.0053	mm	**Silt**	52	%
Cu =	#N/A		**Clay**	41	%
Cc =	#DIV/0!				

Project No: BX10245 **Location:** HASEGAWA
Hole No: **Sample:** S1
Depth (m): **Date:** July 13, 2007 **Tech:** AJ

HYDROMETER TEST

AMEC Earth & Environmental
a Division of AMEC Americas Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

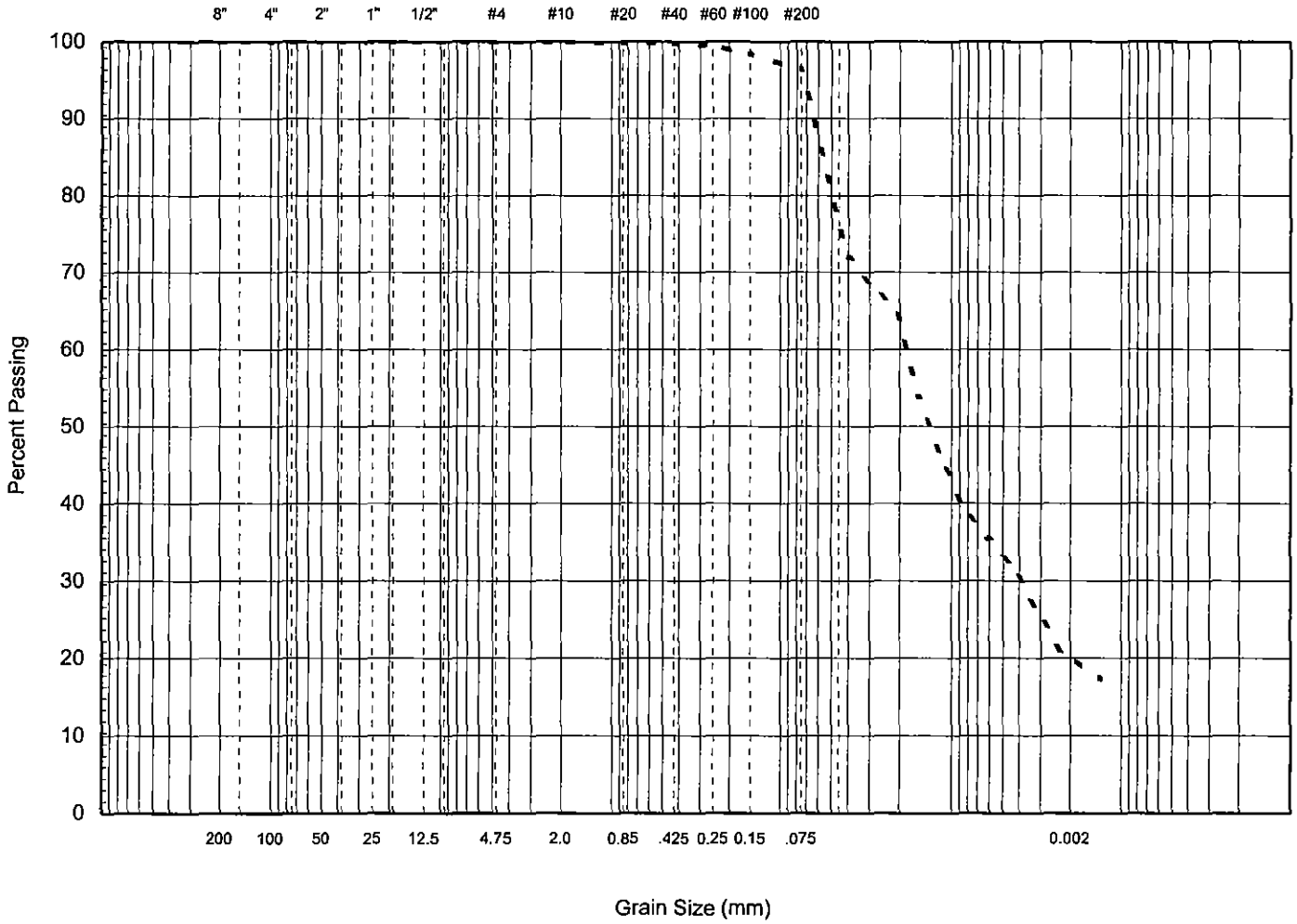
D10 =	#N/A	mm	**Gravel**	0	%
D30 =	0.0502	mm	**Sand**	65	%
D60 =	0.2211	mm	**Silt**	23	%
Cu =	#N/A		**Clay**	12	%
Cc =	#N/A				

Project No: BX10245 **Location:** HASEGAWA
Hole No: **Sample:** S2
Depth (m): **Date:** July 13, 2007 **Tech:** AJ

HYDROMETER TEST

AMEC Earth & Environmental
a Division of AMEC Americas Limited

COBBLES	GRAVEL		SAND			SILT	CLAY
	Coarse	Fine	C	M	F		



Remarks:

Summary

D10 =	#N/A	mm	**Gravel**	0	%
D30 =	0.0039	mm	**Sand**	4	%
D60 =	0.0185	mm	**Silt**	76	%
Cu =	#N/A		**Clay**	20	%
Cc =	#N/A				

Project No: BX10245 **Location:** HASEGAWA
Hole No: **Sample:** S3
Depth (m): **Date:** July 13, 2007 **Tech:** AJ