Western Geotechnical Consultants, Inc.

4181 Saltsprings Drive • Ferndale, WA 98248
Phone (360) 380-2507 • Fax (360) 380-2507

June 26, 2000

Thomco Construction Inc.
18930 66th Avenue NE
Arlington, WA 98223

Attn: Ed Thomas

Re: Report – Geotechnical Feasibility Study
8.2 Acre Parcel
3917 152nd Street Northeast
Marysville, Washington

Western Geotechnical Consultants, Inc. is pleased to present the results of our geotechnical site investigation conducted at the above referenced property. On June 22, 2000, a geotechnical engineer from our firm traveled to the site to oversee the excavation of 7 test pits across the property.

Thomco Construction, Inc. provided us with a site plan for use in performing the investigation. We also reviewed and used information included in a report of a Phase I/Limited Phase II Environmental Site Assessment for the property that was prepared by Giles Engineering Associates, Inc. The property consists of approximately 8.2 acres. There is an access strip, about 95 feet wide along 152nd St that extends northerly for about 253 feet to the main rectangular portion of the property. This rectangular portion extends northerly an additional approximate 1057 feet (1310 feet total distance from 152nd St) and is 317 feet wide. We understand that the property is zoned commercial and development will consist of commercial buildings. Figure 1 is the Site Plan showing the general property layout together with the approximate locations of our test pits.

The purpose of our investigation was to obtain subsurface soil and ground water information for evaluating the feasibility of site development from a geotechnical engineering standpoint and for providing preliminary geotechnical information for general site development. Specifically the scope of our services included:

- Excavating 7 test pits across the site to obtain subsurface information for use in general site development. Piezometers were installed in all the test pits for future water level reading so as to define the seasonal high ground water table.
- Developing continuous logs of subsurface soil and groundwater conditions encountered. Soils encountered were classified in accordance with the Unified Soils Classification System (USCS).

- Performing engineering analyses and laboratory testing as deemed necessary in developing our conclusions and recommendations.
- Preparing this engineering report, which includes a summary of work performed, a description of the subsurface conditions encountered, and our conclusions and recommendations regarding the feasibility of development of the site.

SITE CONDITIONS

Surface Conditions

The property is approximately 8.2 acres in size and it is very nearly level. A single-family home, a garage and a barn are present near the front (southerly) portion of the property. There is an unpaved driveway serving the property from 152nd St NE. The northern half of the property consists of an undeveloped field.

The ground surface is relatively flat and is covered primarily with grasses outside the developed, southerly portion of the property. Two small wetlands were identified on the property, one to the north of the home and the other near the center of the property adjacent to the east property line.

Subsurface Conditions

Subsurface conditions at the site were evaluated by excavating a total of 7 test pits on June 22, 2000, using a rubber tire backhoe with a 3-foot-wide bucket. The approximate locations of the test pits are shown on the attached Site Plan, Figure 1. The test pits were roughly located in the field from the property boundaries. Piezometers were installed in all of the test pits, and the test pits were loosely backfilled upon completion of the explorations.

The soils encountered in the test pits were classified using the Unified Soils Classification System (USCS) and a log was maintained for each test pit. Edited, tabulated test pit logs are included in this report along with a USCS Chart explaining soil descriptions.

The subsurface soil conditions were found to be uniform across the site based on our test pit exploration of the site. The general subsurface profile consists of a topsoil layer consisting of up to 1 foot of dark brown, fine sandy organic SILT with roots (OL by USCS classification). The topsoil is underlain by about 2 to 2.5 feet of silty SANDS with siltier layers (SM/ML by USCS). Three of the test pits identified clayey silt stringers and pockets, within this soil unit (see test pits 2, 5, and 7). This layer is underlain by fine to medium SANDS with a trace of gravel (SP by USCS) with depth, extending from a depth of 3 to 4 feet to the bottom of the test pits. No fill was encountered in any of the test pits during our test pit exploration.

Ground Water Conditions

At the time of our subsurface explorations, ground water was encountered at a uniform depth of about 4 feet below the ground surface in all the test pits. The water table was located within the fine to medium SANDS encountered at 3 to 4 feet below the ground surface. This consistent ground water level on the property reflects the relatively flat surface gradient of the site. Piezometers were installed in each of the test pits for future monitoring of ground water levels. Water levels should be measured during the winter and early spring months to establish the seasonal high ground water level.

Conclusions and Recommendations

General

Based on our geotechnical engineering investigation, we conclude that the site will likely be suitable for development of the type proposed provided good construction practices are used and provided our recommendations are followed. The area contains a high groundwater table, which can be problematic for storm water detention facilities. Foundation soils will provide adequate foundation support for relatively light conventional industrial facilities founded on shallow spread footings. It should be anticipated that some overexcavation might be required if clayey silt pockets are encountered at foundation level. The following sections provide recommended soil and groundwater parameters for storm water detention and general site development.

Storm Water Detention

The ground water table at the property was measured at a uniform depth of 4 feet below the surface at the time of our test pit exploration. Piezometers were installed in all of the test pits for future monitoring of ground water. We recommend the piezometers be read again in the winter/early spring to determine the seasonal high water level. Once the seasonal high water level has been established the detention facilities can be final designed.

The USDA Soil Conservation Service (SCS), "Soil Survey of Snohomish County Area, WA" has classified the near surface soils as Custer fine sandy loam, which the SCS also classifies as a member of Hydrologic Group C.

General Site Development

We make the following recommendations for general site development, in addition to the storm water detention design information provided above. Note that these recommendations are based on the limited scope of subsurface exploration performed as a part of our geotechnical services for this project. Additional subsurface explorations may be necessary for individual buildings once specific site development plans are determined.

Site Preparation

All topsoil and other organic or soft material must be striped away from areas to be occupied by building foundations, paved areas, or other structural improvements. Based on our test pit explorations, we estimate that the stripping depth will be about 1 foot. Note that there could be isolated areas with deeper pockets of organic material (root balls, etc.), old building foundations, abandoned utilities, or unsuitable materials beneath existing structures that will have to be removed. All structural improvements should be founded on firm, non-organic, native soils or on structural fill placed on a properly prepared subgrade.

Fill and Compaction

We have assumed that some structural fill may be required beneath structures and/or paved areas. Structural fill may also be required to obtain proper elevation for the design of storm water detention facilities or to promote positive surface drainage away from structures. Structural fill used to obtain final grade elevations for buildings and other structural improvements (pavements, etc.), must be properly placed and compacted.

Structural fill can be any non-organic, predominantly granular soil that is placed in maximum 8- to 10- inch loose, horizontal lifts and compacted to 95% of maximum dry density as determined by the ASTM D-1557 test procedure. The on-site native, non-organic, sandy soils could be used as structural fill provided the moisture content can be properly controlled and adequate compaction can be achieved.

Foundations

The on site soils will support moderately light structures using conventional shallow spread footings. Typical, 1 to 2 story structures without heavy column loads would be considered moderately light structures. Due to the limited depth and coverage of our test pits, an evaluation of foundations for heavier loaded structures was beyond the scope of this study.

For moderately light structures, conventional shallow spread foundations proportioned in accordance with the Uniform Building Code (UBC) will perform satisfactorily on a properly prepared subgrade in firm, non-organic, native soils or structural fill, as indicated above. Wall footings and column footings should have minimum dimensions of 18 inches and 24, respectively. Continuous footings should not exceed 2 feet in width and isolated spread footings should not exceed 4 feet by 4 feet. These maximum dimensions are appropriate for the depth of subsurface exploration performed in our exploration of the property. These footings may be proportioned using a maximum bearing capacity of 2000 pounds per square foot (psf). All footings should be founded a minimum of 18 inches below the lowest adjacent grade for frost protection. Please note that test pit coverage was not extensive since the site layout is still in the feasibility stage. Once site development plans are known, it may be necessary to excavate additional test pits at known building locations or drill borings if heavy foundation loads will be part of the building design.

Drainage

We recommend that an exterior footing drain system be constructed around the perimeter of all building foundations. The footing drain system is typically constructed with a perforated or slotted pipe placed in clean, free-draining gravel with less than 3% by weight passing the U.S. No. 200 sieve size, based on a wet sieve analysis of that portion passing the U.S. No. 4 Sieve. The perforated or slotted pipe should be placed at or below the level of the base of the footings and 1/2 foot outside the footings. Based on the sandy native soils present on the site, we recommend surrounding the footing drain system with a separation geotextile (Mirafi 4NP or equivalent). If fine-grained soils such as silts or clays are encountered at foundation level, we recommend against the use of a separation geotextile, since fine-grained soils can clog geotextile and make them inoperable.

The footing drains should discharge to the storm drainage system for the property. Roof drainage must not be introduced into the perimeter footing drain, but should be discharged separately to the storm drainage system by tightline. The final ground surface should be graded away from the building to promote surface runoff away from the footing drain system.

Erosion Control

Erosion control during construction of the proposed facilities can be accomplished through placement of proper sedimentation control facilities. We recommend that siltation control facilities, consisting of either hay bales or silt fences, be fabricated around the construction areas. Typical details for siltation control facilities using either hay bales or silt fences are attached to this report.

Siltation devices should be placed down gradient of all construction areas and cleared areas to provide siltation control during construction. All siltation control devices should be maintained in operable condition during construction, and left in operable condition until the site has been revegetated and siltation is no longer a threat. At that time the siltation facilities should be removed.

We appreciate the opportunity to be of assistance to you on this project. We will be glad to discuss a scope of work for monitoring and reporting on the water levels in the piezometers installed at the site, at your request. If final plans require additional geotechnical studies we would be pleased to provide a proposal to perform the work. If you have any questions regarding the contents of this report, or if we can be of further assistance, please contact our office.

Sincerely,

Western Geotechnical Consultants, Inc.

Theodore A. Hammer, P.E.
Geotechnical Engineer

Attachment: Typical Erosion Control Facilities

cc: Higa Engineering, Inc.

File:20781

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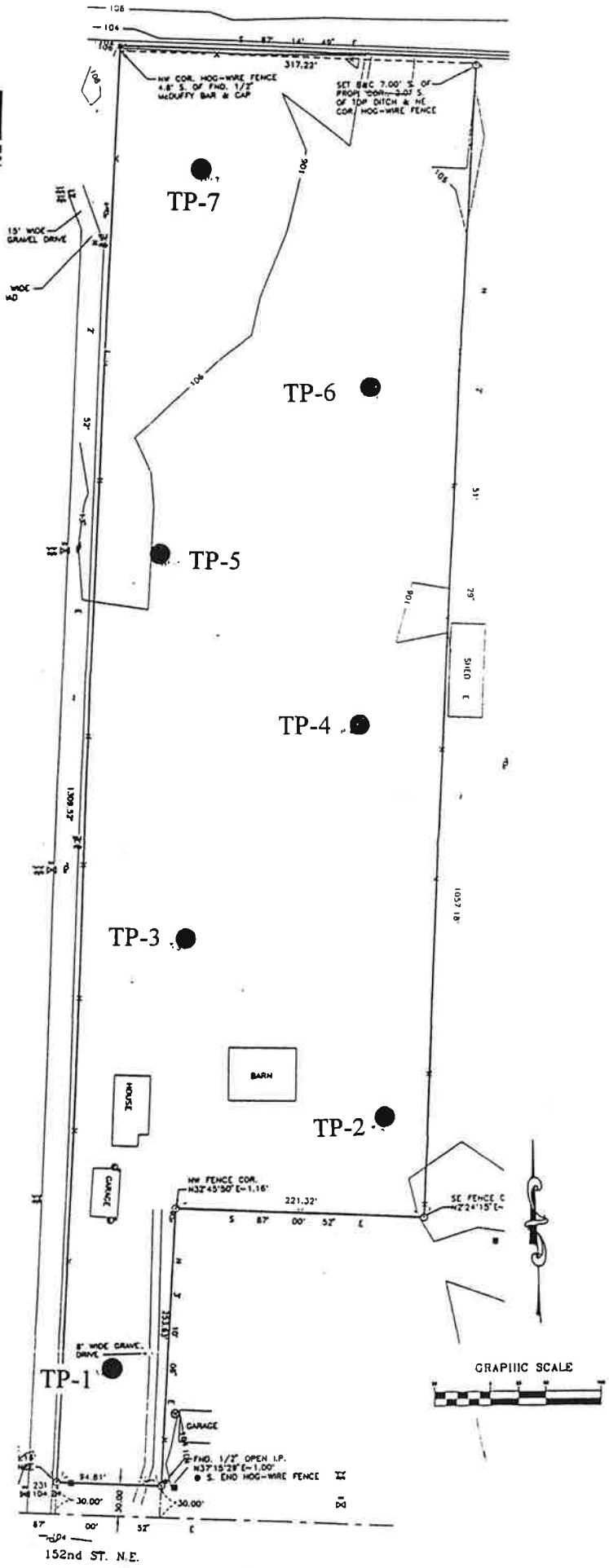
Figure 1
Site Plan
3917 152nd St. NE
Marysville, WA



Source:

Site plan prepared for Northend Logging, by Cascade Surveying & Engineering, Inc., dated 2/21/97

UNIFIED SOIL CLASSIFICATION CHART (USCS)

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES) <5%		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES) <12%		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES) <5%		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES) <12%		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS RO CLAYEY SILTS WITH SLIGHY PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS — LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

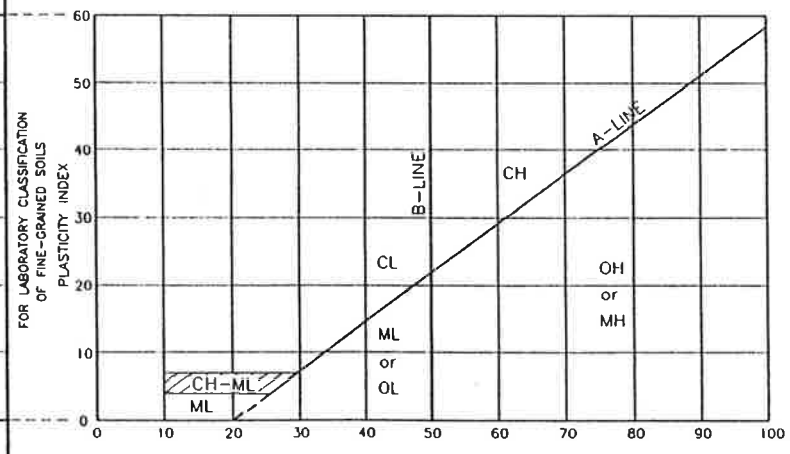
GRADATION CHART

MATERIAL SIZE	PARTICLE SIZE			
	LOWER LIMIT		UPPER LIMIT	
	MILLIMETERS	SIEVE SIZE	MILLIMETERS	SIEVE SIZE
SAND				
FINE	074	#200 •	0.42	#40 •
MEDIUM	0.42	#40 •	2.00	#10 •
COARSE	2.00	#10 •	4.76	#4 •
GRAVEL				
FINE	4.76	#4 •	191	3/4" •
COARSE	191	3/4" •	762	3" •
COBBLES	76.2	3" •	304.8	12" •
BOULDERS	304.8	12" •	914.4	

• U.S. STANDARD • CLEAR SQUARE OPENINGS

5-12% FINES (SILT & CLAY) DUAL CLASS

PLASTICITY CHART



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Key to Test Pit Logs Using the Unified Soil Classification System

DATE: 5/11/95 SCALE: H: N/A V: N/A

A:TEST PITS

Log of Test Pits

			Table A-1 Log of Test Pits		File: Turner	
Test Pit No.	Depth Interval (feet)	USCS Class.	Soil Description	Sample No./ Depth (feet)	Water Content (%)	Pocket Pen. (Kg/sq. cm)
1	0.0-0.9	OL	Dark brown, fine sandy organic SILT and roots (soft) (topsoil)			
	0.9-3.0	SM/ML	Orange brown mottled silty fine SAND with siltier layers (very moist grading wet)	1-1/1.5	20.3	
	3.0-8.5	SP	Gray, fine to medium SAND with trace gravel (wet grading saturated at 4') (sidewall caving)	1-2/4.0 1-3/7.5	23.9 21.9	

Notes:

- Test Pit terminated on 6/22/00 at 8.5 feet
- Test Pit loosely backfilled upon completion
- Ground water seepage encountered at 4.0 feet
- Piezometer installed

			Table A-1 Log of Test Pits		File: Turner	
Test Pit No.	Depth Interval (feet)	USCS Class.	Soil Description	Sample No./ Depth (feet)	Water Content (%)	Pocket Pen. (Kg/sq. cm)
2	0.0-1.0	OL	Dark brown, fine sandy organic SILT and roots (soft) (topsoil)			
	1.0-3.5	SM/ML	Orange brown mottled silty fine SAND with siltier layers and fine sandy clayey silt pockets (very moist grading wet)	2-1/2.0 2-2/2.3	26.6 30.2	
	3.5-8.6	SP	Gray, fine to medium SAND with trace gravel (wet grading saturated at 4') (sidewall caving)	2-3/4.5	29.8	

Notes:

- Test Pit terminated on 6/22/00 at 8.6 feet
- Test Pit loosely backfilled upon completion
- Ground water seepage encountered at 4.0 feet
- Piezometer installed

			Table A-1 **Log of Test Pits**		File: Turner	
Test Pit No.	Depth Interval (feet)	USCS Class.	Soil Description	Sample No./ Depth (feet)	Water Content (%)	Pocket Pen. (Kg/sq. cm)
3	0.0-1.1	OL	Dark brown, fine sandy organic SILT and roots (soft) (topsoil)			
	1.1-3.6	SM/ML	Orange brown mottled silty fine SAND with siltier layers (very moist grading wet)	3-1/1.5	25.5	
	3.5-8.5	SP	Gray, fine to medium SAND with trace gravel (wet grading saturated at 4') (sidewall caving)	3-2/4.5	23.8	

Notes:

- Test Pit terminated on 6/22/00 at 8.5 feet
- Test Pit loosely backfilled upon completion
- Ground water seepage encountered at 4.0 feet
- Piezometer installed

			Table A-1 **Log of Test Pits**		File: Turner	
Test Pit No.	Depth Interval (feet)	USCS Class.	Soil Description	Sample No./ Depth (feet)	Water Content (%)	Pocket Pen. (Kg/sq. cm)
4	0.0-1.0	OL	Dark brown, fine sandy organic SILT and roots (soft) (topsoil)			
	1.0-3.6	SM/ML	Orange brown mottled silty fine SAND with siltier layers (very moist grading wet)	4-1/2.5	22.1	
	3.6-8.5	SP	Gray, fine to medium SAND with trace gravel (wet grading saturated at 4') (sidewall caving)	4-2/5.5	27.8	

Notes:

- Test Pit terminated on 6/22/00 at 8.5 feet
- Test Pit loosely backfilled upon completion
- Ground water seepage encountered at 4.0 feet
- Piezometer installed

			Table A-1 **Log of Test Pits**		File: Turner	
Test Pit No.	Depth Interval (feet)	USCS Class.	Soil Description	Sample No./ Depth (feet)	Water Content (%)	Pocket Pen. (Kg/sq. cm)
5	0.0-1.0	OL	Dark brown, fine sandy organic SILT and roots (soft) (topsoil)			
	1.0-3.5	SM/ML	Orange brown mottled silty fine SAND contains thin clayey silt layers (very moist grading wet)	5-1/2.0	26.2	
	3.5-8.5	SP	Gray, fine to medium SAND with trace gravel (wet grading saturated at 4') (sidewall caving)	5-2/6.5	27.6	

Notes:

- Test Pit terminated on 6/22/00 at 8.5 feet
- Test Pit loosely backfilled upon completion
- Ground water seepage encountered at 4.0 feet
- Piezometer installed

			Table A-1 **Log of Test Pits**		File: Turner	
Test Pit No.	Depth Interval (feet)	USCS Class.	Soil Description	Sample No./ Depth (feet)	Water Content (%)	Pocket Pen. (Kg/sq. cm)
6	0.0-0.6	OL	Dark brown, fine sandy organic SILT and roots (soft) (topsoil)			
	0.6-3.4	SM/ML	Orange brown mottled silty fine SAND with siltier layers (very moist grading wet)	6-1/2.0	22.6	
	3.4-6.6	SP	Gray, fine to medium SAND with trace gravel (wet grading saturated at 4' with heavy seepage) (sidewall caving)	6-2/5.1	24.8	

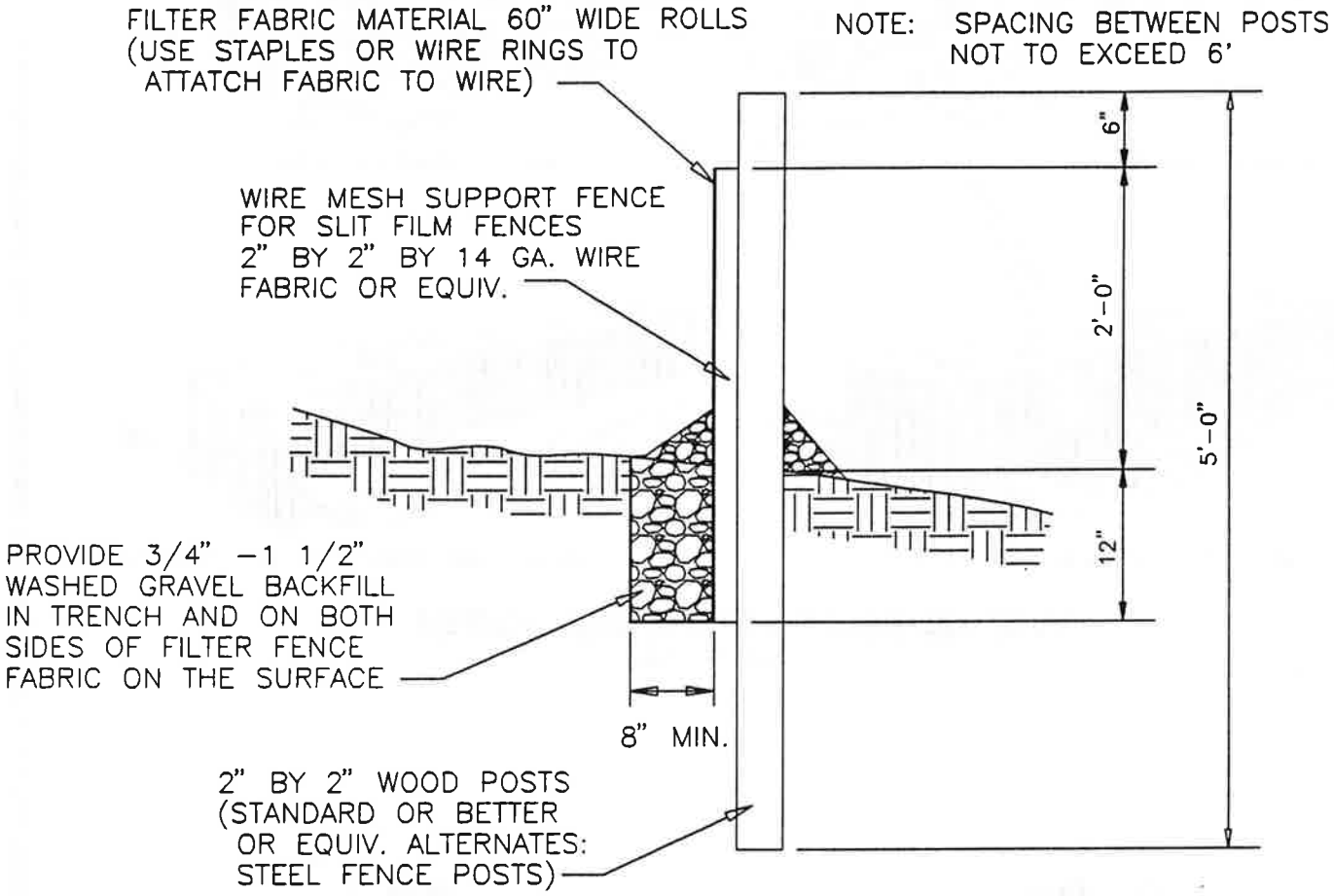
Notes:

- Test Pit terminated on 6/22/00 at 6.6 feet
- Test Pit loosely backfilled upon completion
- Ground water seepage encountered at 4.0 feet
- Piezometer installed

			Table A-1 **Log of Test Pits**		File: Turner	
Test Pit No.	Depth Interval (feet)	USCS Class.	Soil Description	Sample No./ Depth (feet)	Water Content (%)	Pocket Pen. (Kg/sq. cm)
7	0.0-0.9	OL	Dark brown, fine sandy organic SILT and roots (soft) (topsoil)			
	0.9-3.7	SM/ML	Orange brown mottled silty fine SAND with clayey silt layers (very moist grading wet)	7-1/1.8	24.5	
	3.7-7.2	SP	Gray, fine to medium SAND with trace gravel (wet grading saturated at 4') (sidewall caving)	7-2/5.0	22.6	

Notes:

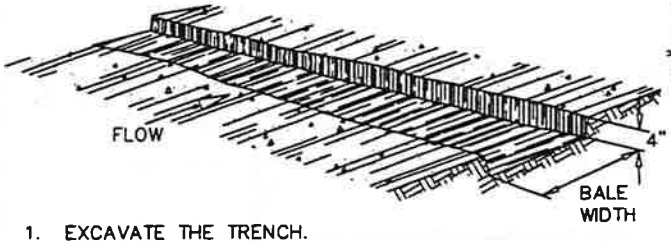
- Test Pit terminated on 6/22/00 at 7.2 feet
- Test Pit loosely backfilled upon completion
- Ground water seepage encountered at 4.0 feet
- Piezometer installed



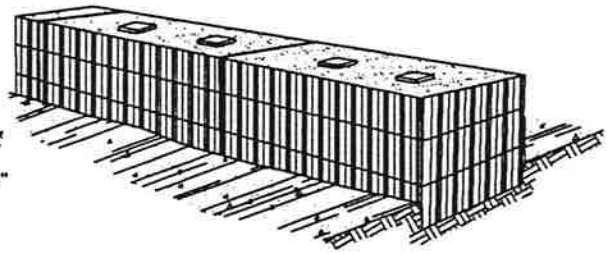
FILTER FABRIC FENCE

NOT DRAWN TO SCALE

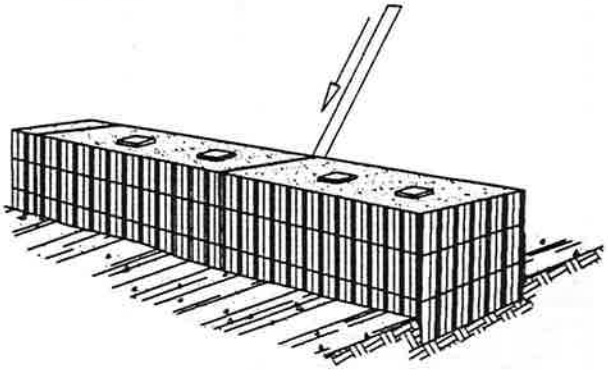
JOB NO.:	**Western Geotechnical Consultants, Inc.**	SEDIMENT CONTROL FILTER FABRIC FENCE
DESIGNED BY:		
DRAWN BY:	*4181 Saltsprings Drive • Ferndale, WA 98248*	
CHECKED BY:	*Phone (360) 380-2507 • Fax (360) 380-2507*	DATE: SCALE: H: N/A V: N/A



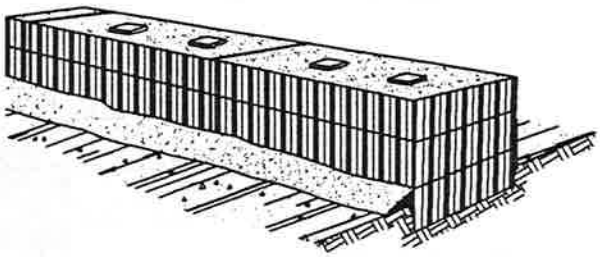
1. EXCAVATE THE TRENCH.



2. PLACE AND STAKE STRAW BALES.



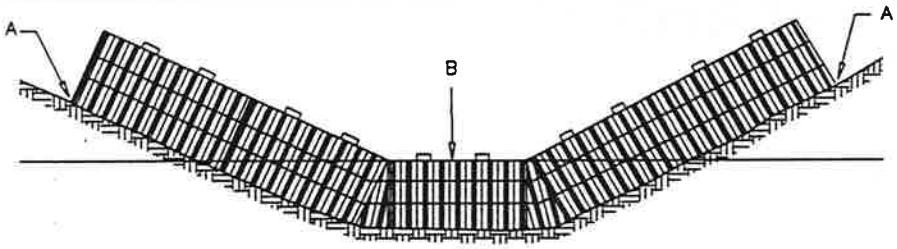
3. WEDGE LOOSE STRAW BETWEEN BALES.



4. BACKFILL AND COMPACT THE EXCAVATED SOIL.

CONSTRUCTION OF A STRAW BALE BARRIER

NOT DRAWN TO SCALE



POINTS A SHOULD BE HIGHER THAN POINT B

PROPER PLACEMENT OF STRAW BALE BARRIER IN DRAINAGE WAY

NOT DRAWN TO SCALE

JOB NO.:	**Western Geotechnical Consultants, Inc.**	SEDIMENT CONTROL STRAW BALE BARRIER
DESIGNED BY:		
DRAWN BY:	*4181 Saltsprings Drive • Ferndale, WA 98248*	
CHECKED BY:	*Phone (360) 380-2507 • Fax (360) 380-2507*	DATE: SCALE: H: N/A V: N/A