MICHAEL E. ELIA, P.E.
CONSULTING ENGINEER
7033 S.W. MACADAM AVE., STE. 105, PORTLAND, OREGON 97219

TEL (503) 246-0621 FAX (503) 246-0686

01-145172 SD
2133 NW 33rd
2825
4

INIE29CA 03900

GT-003471

July 31, 2001

Mr. Steve Case
2133 N.W. 33rd Ave.
Portland, OR 97210

Re: Limited Geotechnical Study
2133 N.W. 33rd Ave.
Portland, OR 97210

Dear Mr. Case

As you requested, and in accordance with our agreement dated July 16, I visited the site at 2133 N.W. 33rd Ave, Portland, Oregon. The visit took place on July 16, 2001. Please see Figure 1 in the Appendix for a map showing the site location.

The purpose of the visit was to perform a walkover survey, accomplish two backhoe test pits, and to visually inspect the existing slope.

This report contains the results of the walkover survey, test pit logs, comments on the stability of the existing slopes and construction recommendations.

Proposed Construction. It is my understanding that you propose to 1) reduce the magnitude of the existing slope by regrading portions of your property and 2) to construct three landscape segmental block retaining walls up to four feet in height.

Background. The site is located in northwest Portland, northeast of Willamette Heights and east of the Tualatin Mountains. "Geologic Map of the Portland Quadrangle, Multnomah and Washington Counties, Oregon, and Clark County, Washington" by M.H. Beeson and others indicates that your property is underlain by Troutdale Formation. Generally, Troutdale Formation is a moderately strong conglomerate interbedded with sandstone, siltstone and claystone. The age of the Troutdale formation at your location is unknown. At other locations in the Portland area, Troutdale Formation has been dated to the Miocene and late Pliocene epochs. The "Soil Survey of Multnomah County, Oregon" records your property as overlain with silty and clayey loam to varying depths.

Site Reconnaissance. The site sloped down toward the north at about 37.5 percent to Saint Helens Road, and down toward the west at about 36 percent to a few feet east of your property line where it became level. The site showed signs of recent grubbing and grading. Surficial soils to the north and west had been rearranged. A few Maple trees were growing from the face of the existing slope and a portion of the site immediately to the west was covered with thick brush.

Subsurface Conditions. Two test pits were excavated using a Takeuchi TB035 trackhoe and a 22-inch wide bucket. The locations of the test pits are shown on Figure 2

in the Appendix. The beginning elevations of both test pits were at the ground surface as it existed on the day of excavation.

The initial three feet of Test Pit No. 1 (TP-1) found brown silty fill, soft to very soft and wet with old wood construction debris. From three to seven feet gray silty fill was encountered, soft and wet with wood debris. The test pit was terminated at seven feet in boulder-sized pieces of basalt, concrete and asphalt in a silty fill matrix. Water was encountered at seven feet. A log for TP-1 can be found as Figure 3 in the Appendix.

Test Pit No. 2 (TP-2) was excavated to nine feet. The first two feet of the test pit encountered brown silty fill, very soft and moist with wood branches and other organics from recent grubbing. From two to six feet a brown sandy silt fill was found, soft and wet. Gray native silt, soft and wet constituted the distance from six to nine feet. The excavation was terminated at nine feet. No groundwater was encountered. A log for TP-2 can be found as Figure 4 in the Appendix.

Slopes. The slope to the north beyond your property was covered with a thick mat of organic debris. Beginning at about the existing sidewalk on the west side of 33rd, the mat extended about 50 or 60 feet to the west. It may be that local residents have used this area as a place to dispose of brush, tree and lawn trimmings, and other organic debris from their yards. At one location on the slope, the debris seemed to be about three or four feet thick. While there were no apparent signs of slope movement, the surface of the ground could not be inspected for cracks or scarps. Some nearby trees appeared to be growing vertically with a slight downhill lean. It is likely that surficial soils have experienced very slow downhill movement, or creep. Very slow movement of surficial soils on hillsides such as this is not unusual.

There were two or three tension cracks and a small scarp of about two inches in height near a change in the slope about 20 feet north of TP-1. It appears that soil had been recently (within the last year or two) disposed of over the change in the slope. This has steepened this portion of the slope. It is likely that with rain, the cracks will fill with water increasing the weight of the loosely placed fill, and cause the face of the slope to slough.

Recommendations.

- The approximate existing slope topography is shown in Figure 5 in the Appendix. A proposed topography shown in Figure 6. The regrading of the existing slope to approximately conform to the proposed topography will likely not cause issues of slope instability. The slopes may be regraded as shown in Figure 6.
- All organic debris, such as tree limbs, brush and berry vines buried in surficial fill soils should be excavated and, if possible, removed from the fill. If the organics cannot be removed from the fill soil, the soil with organics should be removed from the site.
- Recently placed fill free of organics should be excavated and stockpiled on site for later use.
- The exposed ground surface free of organics should be stepped to receive fill. Please see Figure 7 in the Appendix for a conceptual representation of a stepped slope prepared to receive fill.
- If fill is imported from other locations, it should be free of organics. Clean sandy loam is recommended.

- Because the regrading of your site is for landscaping purposes and the existing and proposed topographies are not overly steep, the new fill, free of organic debris, may be placed in four to six-inch thick lifts and each lift tamped with the flat side of a hoe bucket. This method of compaction is crude and produces variable results, but should be adequate for landscape fill. Please see Figures 8, 9 and 10 in the Appendix for cross sections of the proposed topography. The cross sections are referenced to Figure 6.
- Please see Figure 11 in the Appendix for a sketch of the proposed 4 feet high landscaping wall. The proposed wall is a segmental block wall. The leveling pad and backfill should be constructed with 1½"-0" crushed aggregate to the dimensions shown. The leveling pad should be constructed on firm, undisturbed native soil to a minimum thickness of six inches. If the native soil is soft or if the wall is constructed over old fill, the thickness of the leveling pad should be increased to 12 inches. The leveling pad should be placed and compacted in six-inch lifts. Compaction may be accomplished with repeated passes of a small walk-behind vibrating plate compactor.
- A perforated wall drain should be installed at the base of the wall in the backfill. The wall drain should transition to solid pipe as it departs from the wall. The pipe should daylight away from the wall and away from all new and old fill.
- All surface water which originates on impermeable areas such as driveways, walks, and patios, or which may flow onto your property from adjacent properties, should be diverted away from the filled slope and the retaining walls.
- Rainwater gutters and downspouts should be in good functional repair. At each downspout, water should be collected in buried solid pipes and daylighted away from the filled slope and retaining walls.
- During construction, if scarps, cracks or other signs of slope movement are noted, the Engineer should be contacted so the stability of the slope, or slopes, may be reevaluated. If soil conditions differ from those described in this report are encountered, the Engineer should be contacted for additional review.

Comments. The design criteria for small landscape retaining walls and landscaping fills are not as demanding as the design criteria of larger structures which support houses, buildings, roadways and other structures. Landscape retaining walls and fills can settle and shift and may require occasional maintenance.

Additional Work. Any additional inspections or reviews performed by the Engineer, all inspection reports prepared by the Engineer, any additional investigation or review of existing recommendations, any review of drawings or other work requested by the Client or required by the City of Portland will be charged to the Client at the Engineer's usual hourly rate.

I trust that this report meets your needs at this time. If you require additional information or have questions, please call.

Best regards,

Michael E. Elia, P.E.

REGISTERED PROFESSIONAL ENGINEER 17830

OREGON JULY 25, 1995 MICHAEL E. ELIA

EXPIRES: 12-31-01

Appendix

01-137-1

Case Residence at 2133 N.W. 33rd Ave., Portland, Oregon 97210

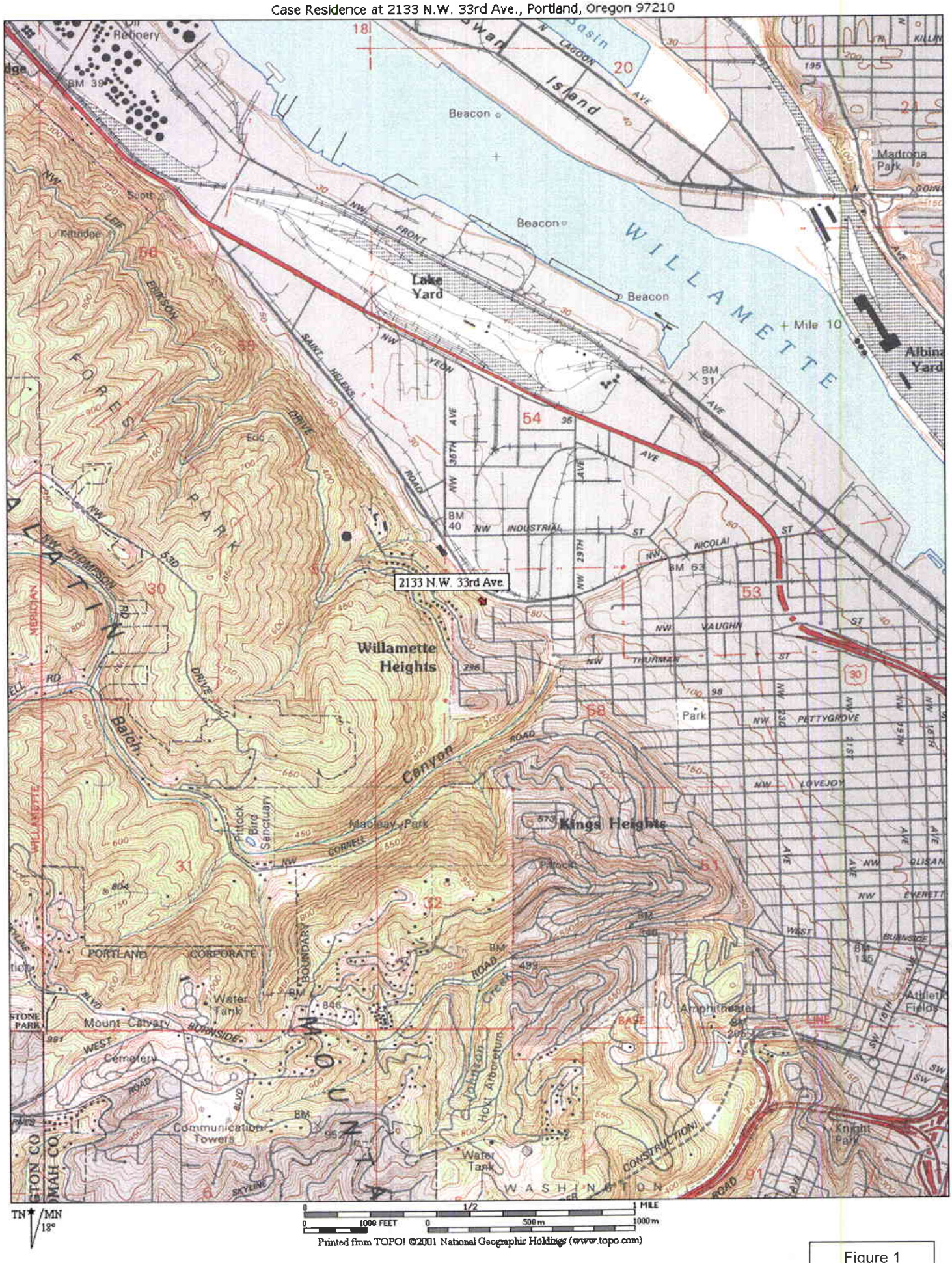

Figure 1

MICHAEL E. ELIA, P.E.
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TEST PIT LOCATIONS

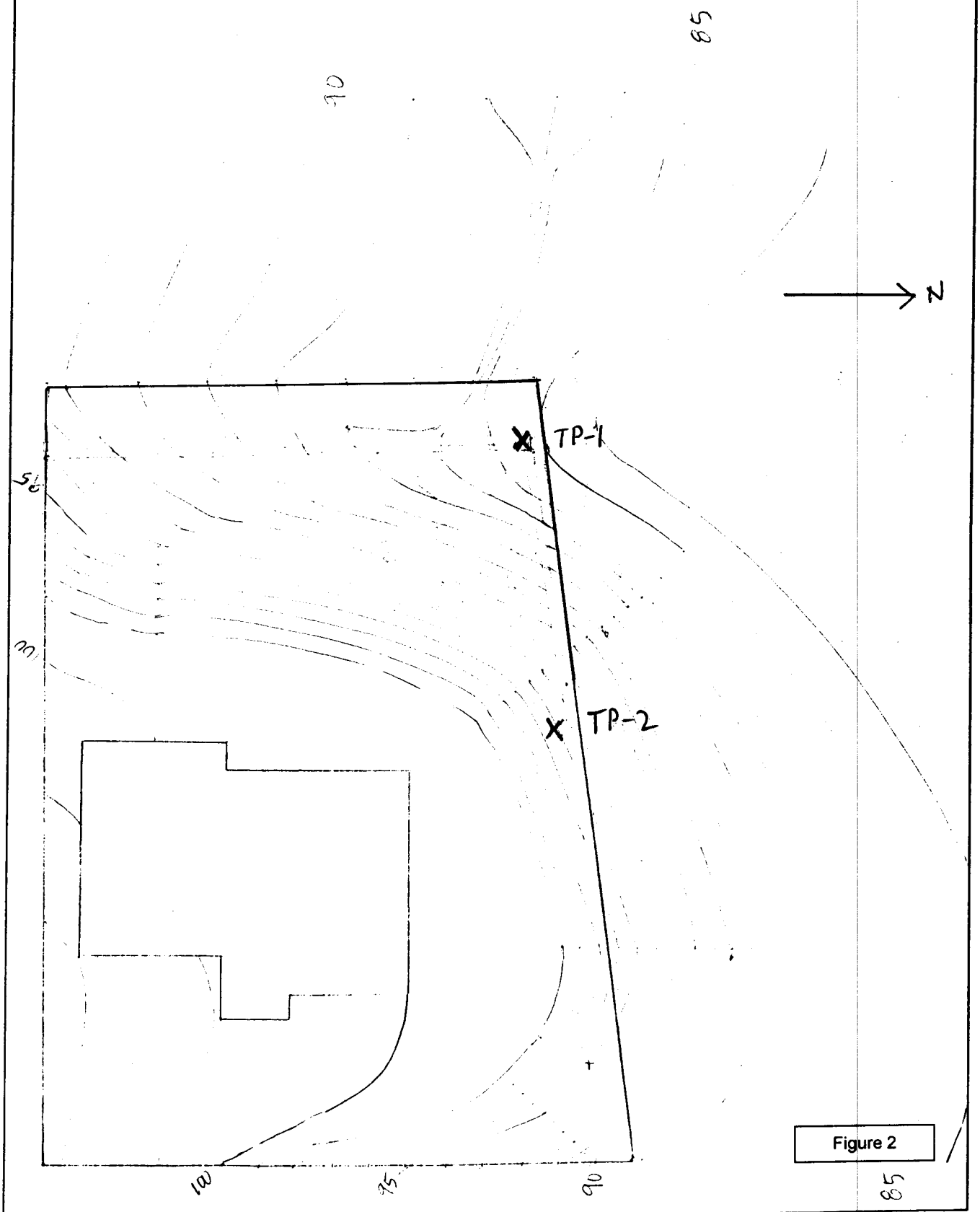

Figure 2

MICHAEL E. ELIA, P.E.
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FIELD EXPLORATION LOG

PROJECT NAME	Case Res	PROJECT NUMBER	01-137
BORING/TEST PIT NO.	TP-1	DATE	7-16-01

DEPTH FT	DEPTH CM	DC/DP N	SAMPLE NO TYPE	WATER LEVEL	SOIL DESCRIPTION	EQUIPMENT/COMMENTS
1	20				Brown silty fill, soft to very soft, wet, old wood construction debris.	Takeuchi TB035 Trackhoe 22-inch wide bucket
	40					
2	60					
	80					
3	100				Gray silty fill, soft, wet, wood construction debris.	
4	20					
	40					
5	60					
	80					
6	200					
7	20				Test pit terminated at 7'-0" in boulder-sized pieces of basalt, concrete and asphalt in a silty fill matrix. Groundwater encountered at 7'-0".	
	40					
8	60					
	80					
9	300					
10	20					
	40					
11	60					
	80					
12	400					
	20					
13	40					
	60					
14	80					
	500					
15	20					
	40					
16						
17						

Figure 3

MICHAEL E. ELIA, P.E.
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FIELD EXPLORATION LOG

PROJECT NAME	Case Res	PROJECT NUMBER	01-137
BORING/TEST PIT NO.	TP-2	DATE	7-16-01

DEPTH FT	DEPTH CM	DC/DP N	SAMPLE NO TYPE	WATER LEVEL	SOIL DESCRIPTION	EQUIPMENT/COMMENTS
1	20, 40, 60				Brown silty fill, very soft, moist, wood branches, organics.	Takeuchi TB035 Trackhoe 22-inch wide bucket
3	80, 100, 20, 40, 60, 80				Brown sandy silt fill, soft,wet.	
7	200, 20, 40, 60				Gray native silt, soft, wet. PP: 750 psf	
10	80, 300, 20, 40, 60, 80				Test pit terminated at 9'-0". No groundwater was encountered.	
13	400, 20, 40, 60, 80					
16	500, 20, 40					

Figure 4

MICHAEL E. ELIA, P.E.
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EXISTING TOPOGRAPHY 1" = 20'

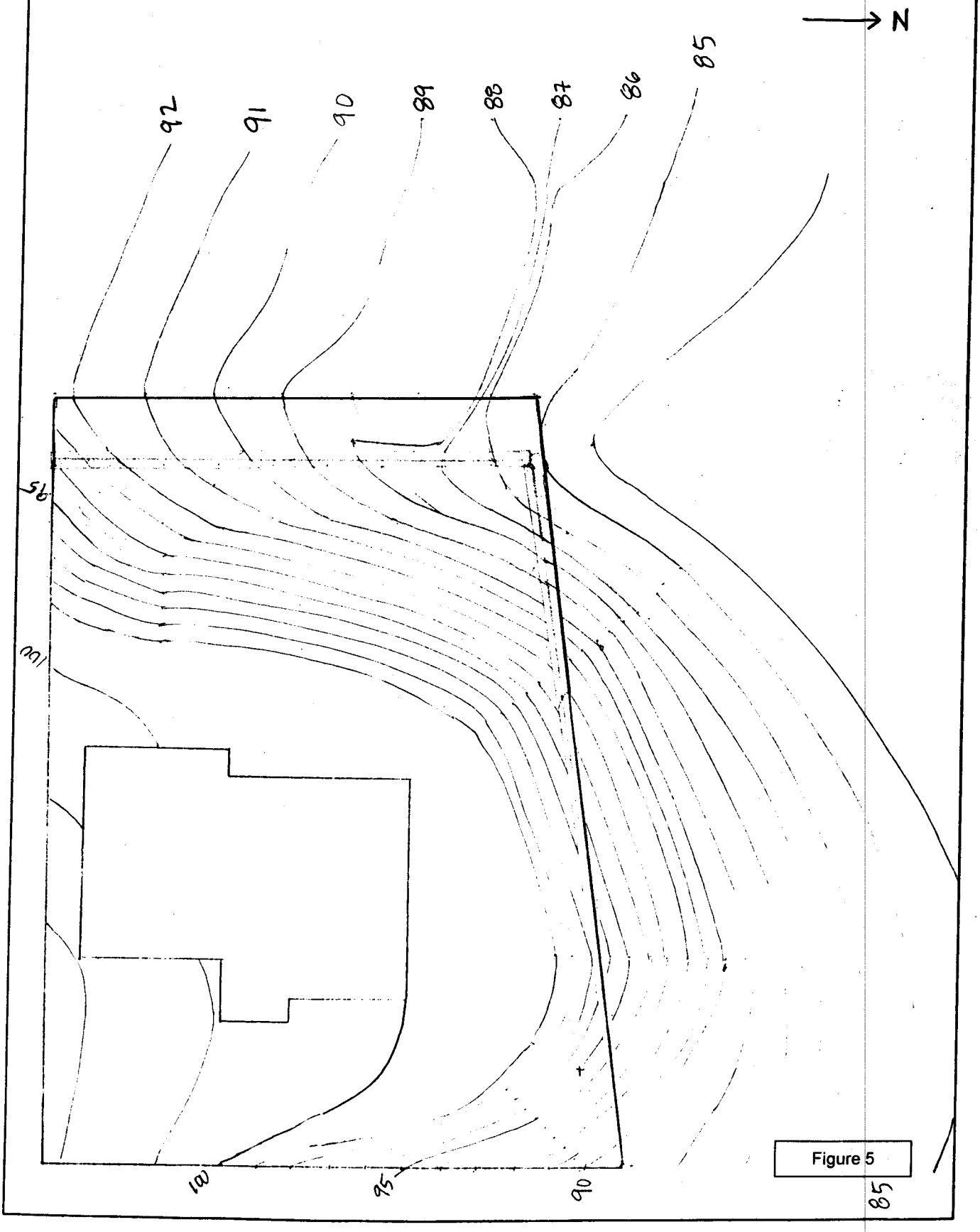

Figure 5

MICHAEL E. ELIA, P.E.
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PROJECT NO-PAGE 01-137

PROPOSED TOPOGRAPHY

1" = 20'

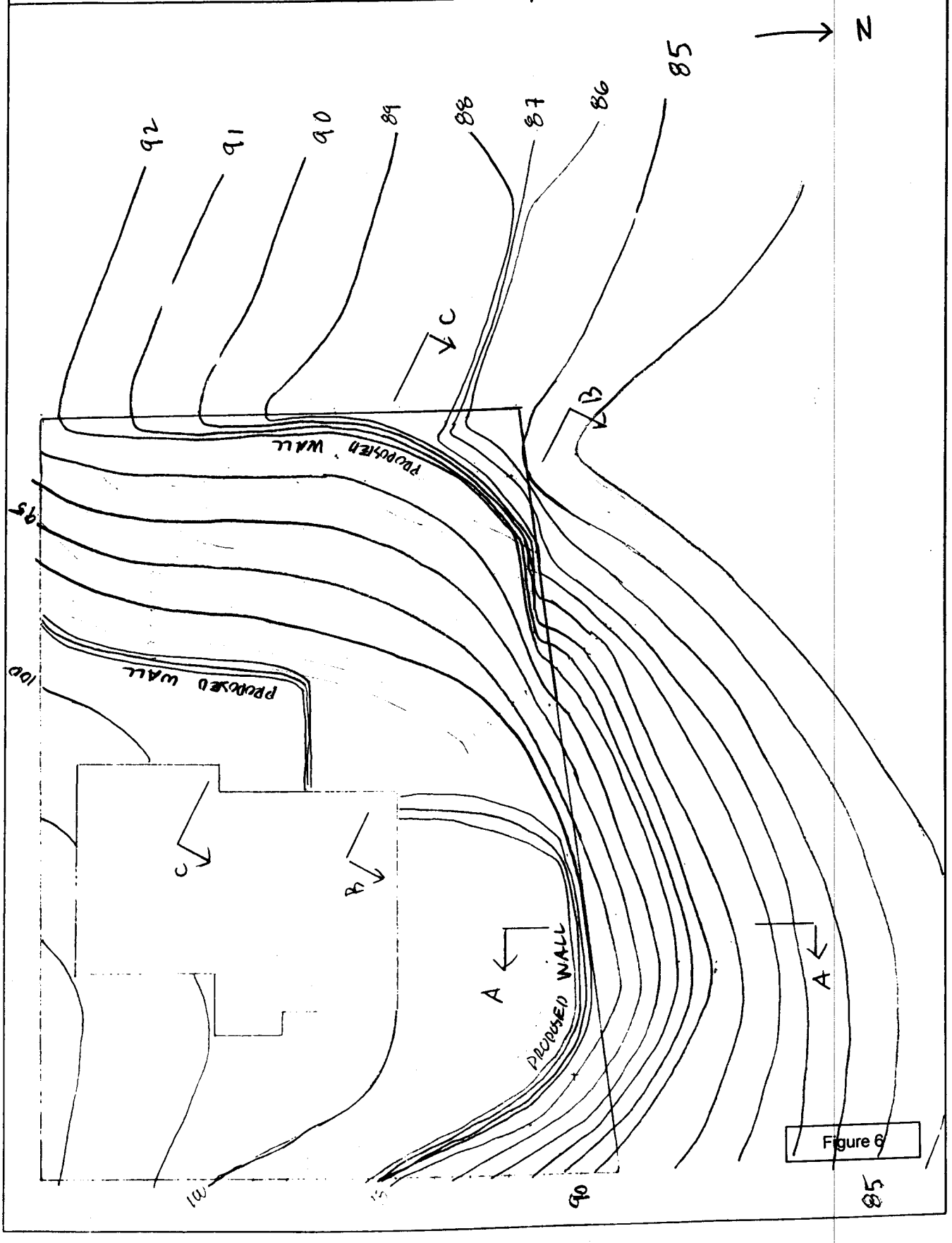

Figure 6

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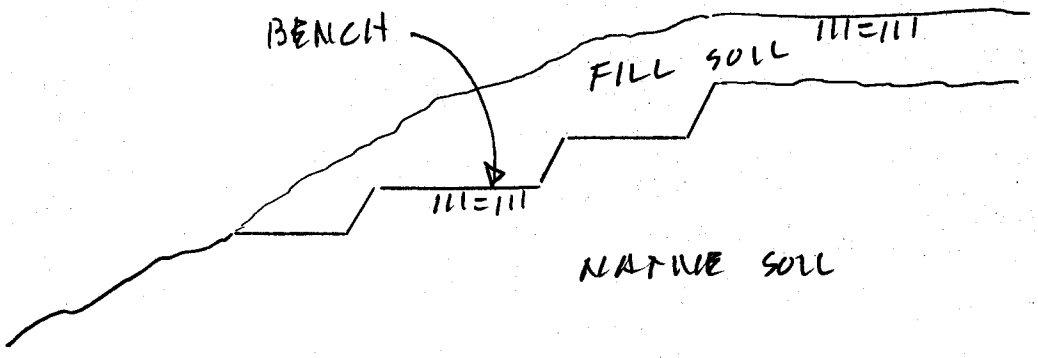
PROJECT NO–PAGE 01-137



BENCHES CUT INTO NATIVE SOIL TO RECEIVE FILL.

Figure 7

MICHAEL E. ELIA, P.E.
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	PROJECT NO-PAGE 01-137

SECTION A-A 1/10" = 1'-0"

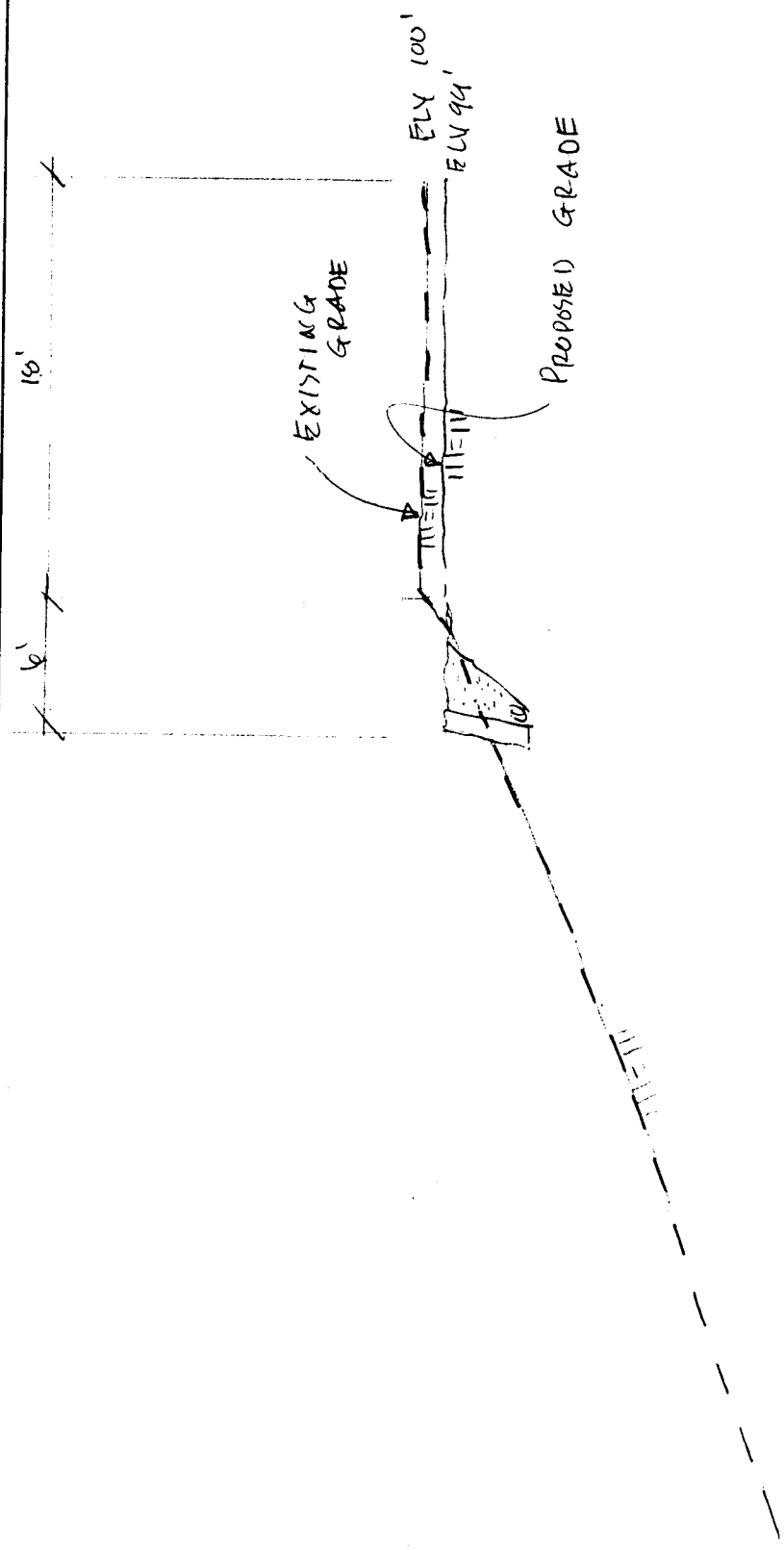

Figure 8

MICHAEL E. ELIA, P.E.
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PROJECT NO-PAGE 01-137

SECTION B-B 1/8" = 1'-0"

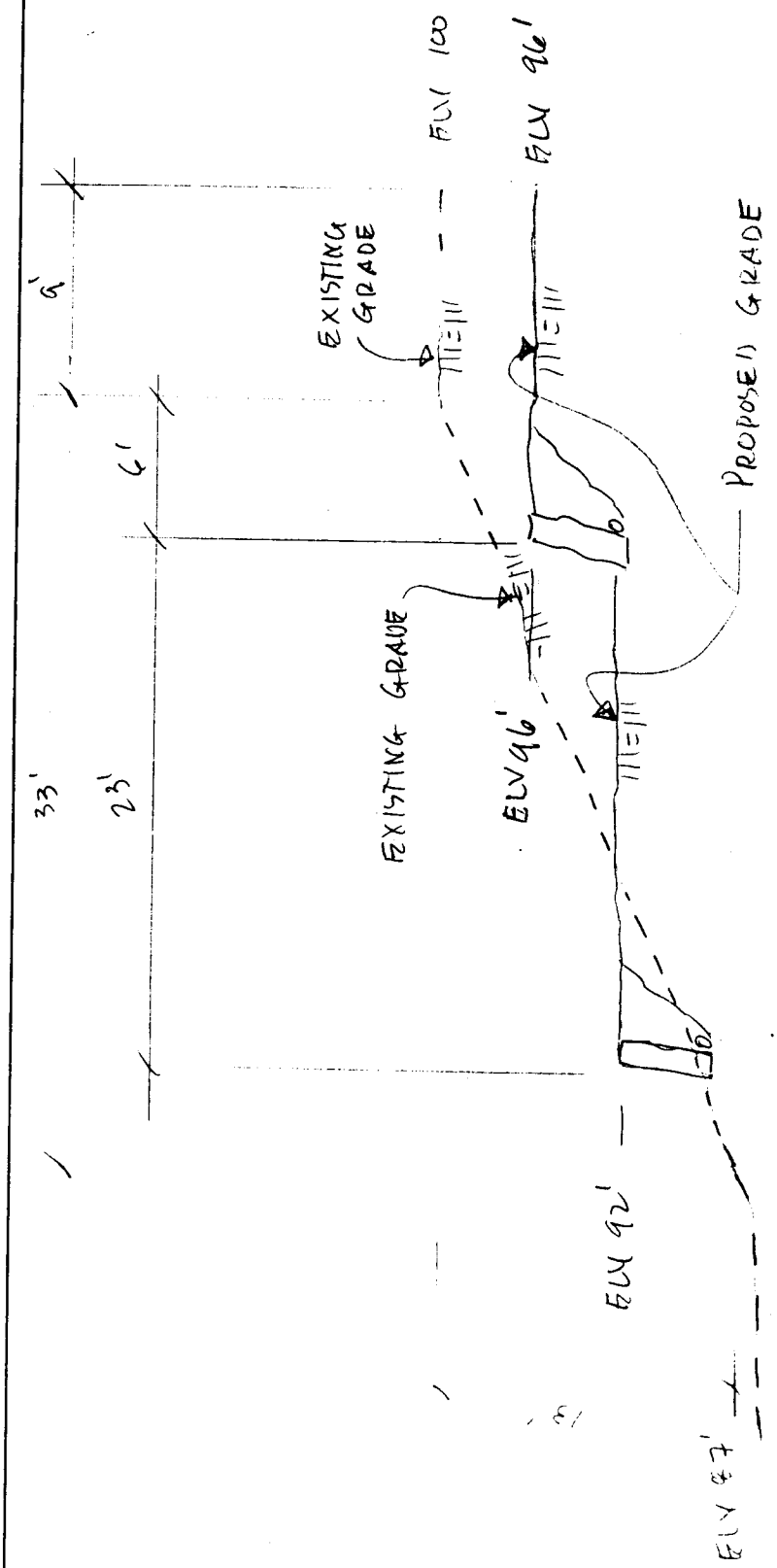

Figure 9

MICHAEL E. ELIA, P.E.
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	PROJECT NO-PAGE 01-137

SECTION C - C 1/8" = 1'-0"

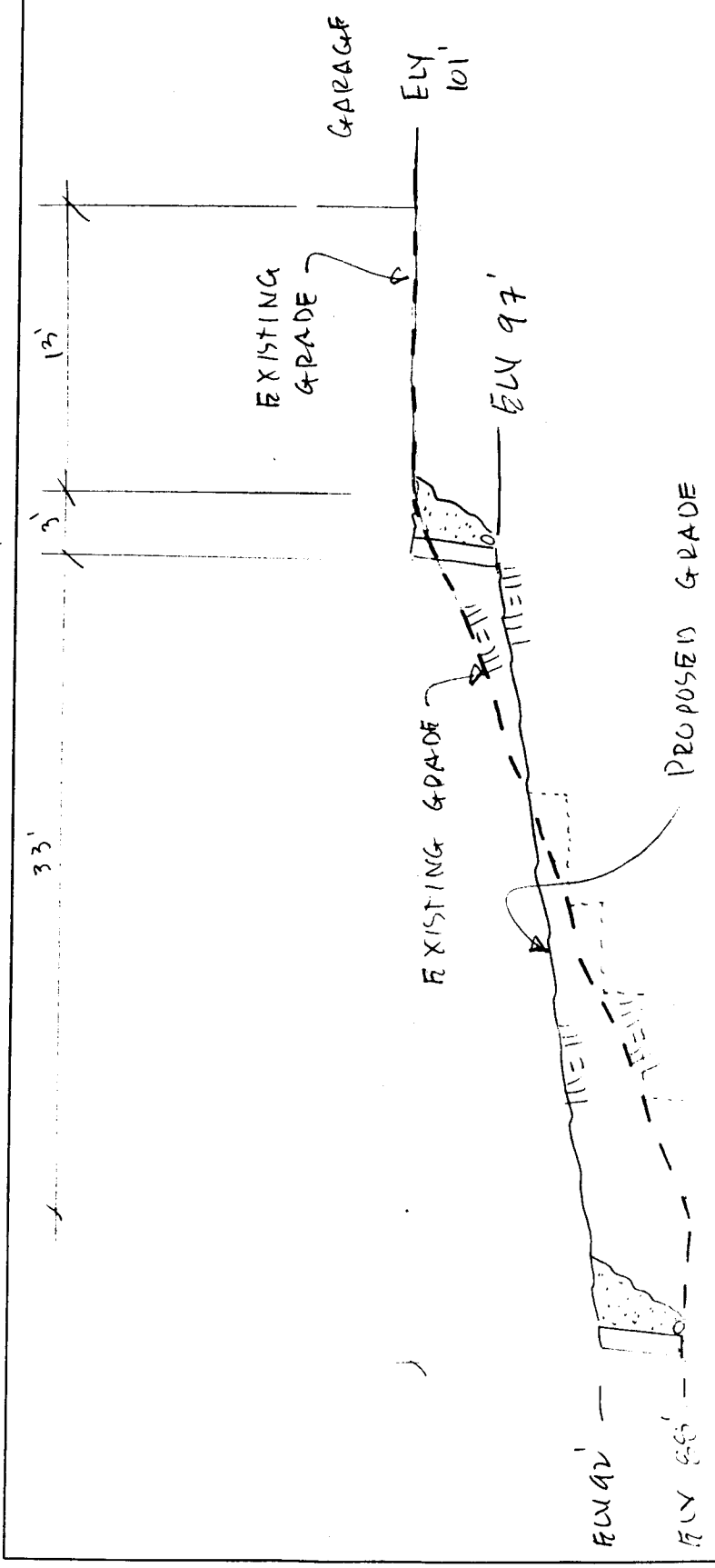


Figure 10

LN 990813115

Licensed to: **Michael Elia**
0138 SW Palatine Hill Road
Portland, OR 97219

License Number: **990813115**

Project Identification:

Project Name: **Case Residence**
Section:
Data Sheet:

Owner: **Steve Case**
Client: **Steve Case**

Prepared by:
Date: **July 27 2001**
Time:

Data file: **c:\srwall3\01-137.dat**

Project Notes:

Four feet high segmental block retaining wall with well-graded 1 1/2" - 0" leveling pad, 12" thick drainage medium, and wall backfill. Native soil cut to 59 degrees from the horizontal. Slope in front of wall at 19 degrees. Backfill slope at 7 degrees.

Type of Structure: **Gravity Segmental Retaining Wall**
Design Methodology: **NCMA Method**

Seismic Analysis Details:

Peak Ground Acceleration (PGA) ratio	**0.00**

Wall Geometry:

Design Wall Height (ft)	**4.0**
Embedment Wall Height (ft)	**0.5**
Exposed Design Wall Height (ft)	**3.5**
Vertical Wall Height including Cap Unit (ft)	**4.33**
Exposed Wall Height including Cap Unit (ft)	**3.83**
Minimum Levelling Pad Thickness (ft)	0.5
Number of Segmental Wall Units	**8**
Hinge Height (ft)	**4.0**
Wall Inclination (degrees)	**9.5**

Slopes:

Front Slope (degrees)	**19.0**
Back Slope (degrees)	**7.0**
Infinite Back Slope	

Uniformly Distributed Surcharges:

Live Load Surcharge	**none**
Dead Load Surcharge	**none**

Soil Data:	*Soil Description:*	*Cohesion (psf)*	*Friction Angle (degrees)*	*Unit Weight (pcf)*
Retained Soil	**Well-graded 1 1/2" - 0"**	N/A	**38.0**	**120.0**
Levelling Pad Soil	**Well-graded 1 1/2" - 0"**	N/A	**40.0**	**125.0**
Foundation Soil	**sand**	**0.0**	**28.0**	**110.0**

Segmental Unit Name:

Segmental Unit Data:

Cap Height (in)	**4.0**
Unit Height (Hu)(in)	**6.0**
Unit Width (Wu)(in)	**12.0**
Unit Length (in)	**16.0**
Setback (in)	**1.0**
Weight (infilled) (lbs)	**68.0**
Unit Weight (infilled) (pcf)	**102.0**
Center of Gravity (in)	**6.0**

Segmental Unit Interface Shear Data:

Properties	*Ultimate Strength Criteria*	*Service State Criteria*
Minimum (lbs/ft)	**500.0**	**500.0**
Friction Angle (degrees)	**45.0**	**45.0**
Maximum (lbs/ft)	**2000.0**	**2000.0**

Design Criteria for External Stability Design Analyses:

FOS Sliding	**1.5**
FOS Overturning	**1.5**
FOS Bearing Capacity	**2.0**
Wall-Retained Soil Interface Friction Factor	**0.67**
Wall-Retained Soil Interface Friction Angle (degrees)	**25.46**
Wall-Levelling Pad Soil Interface Friction Coefficient	**0.7**

Design Criteria for Facing Stability Design Analyses:

FOS Interface Shear (peak load criterion)	**1.5**
FOS Overturning	**1.5**

Coefficients of Earth Pressure and Failure Plane Orientations:

Retained Soil (Ka)	**0.168**
Retained Soil (Ka horizontal component)	**0.161**
Orientation of failure plane from horizontal (degrees)	**56.23**

Results of External Stability Analyses:

	Calculated	*Design Criteria*
FOS Sliding	**1.55**	**1.5 OK**
FOS Overturning	**1.57**	**1.5 OK**
FOS Bearing Capacity	**6.84**	**2.0 OK**
Base Footing Width (Bf) (ft)	**1.5**	N/A
Base Eccentricity (e)(ft)	**0.21**	N/A
Base Eccentricity Ratio (e/Bf')	**0.2**	N/A

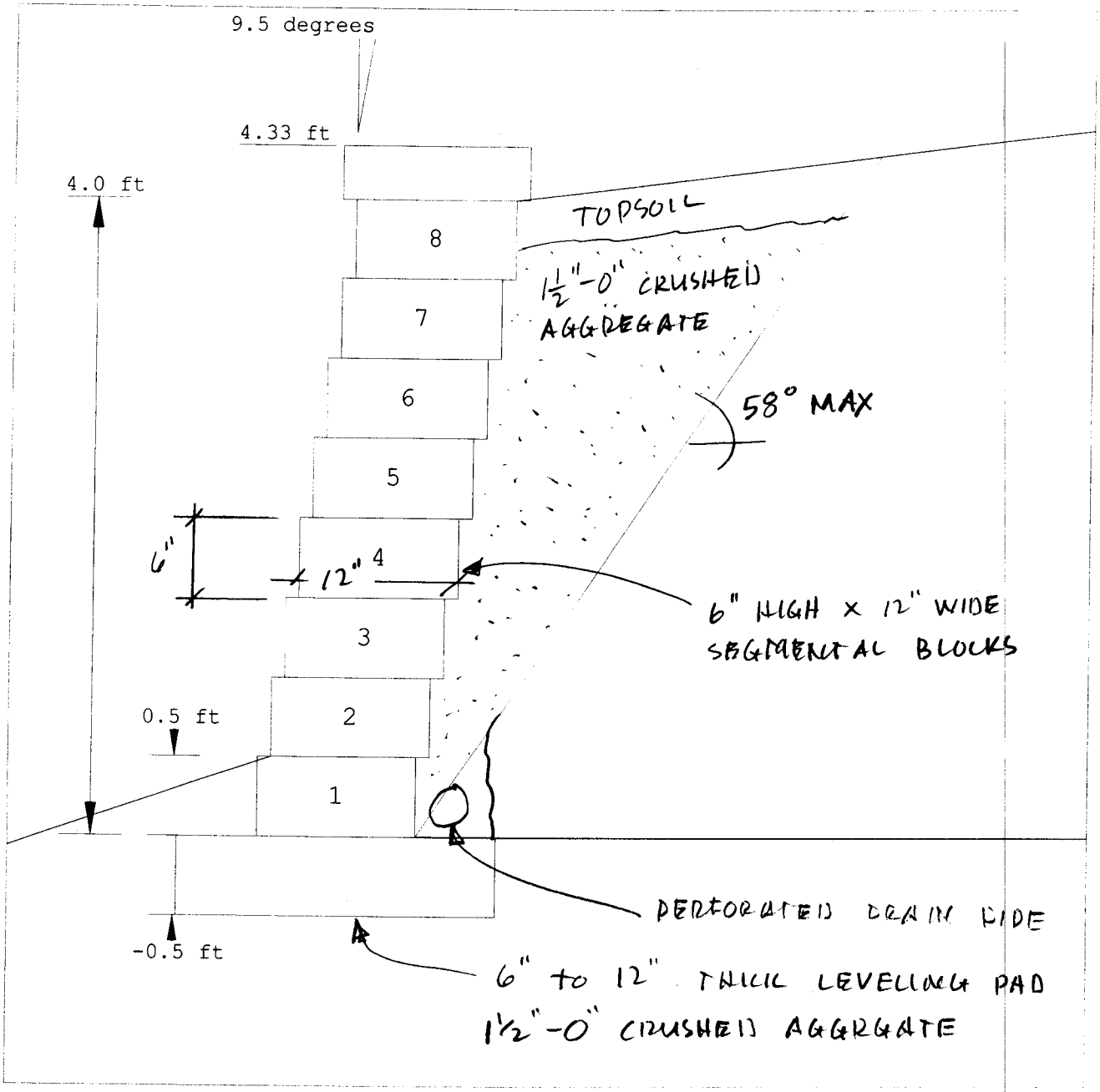
Note: calculated values MEET ALL design criteria

Detailed Results of External Stability Analyses:	*Calculated Values:*
Total Horizontal Force (lbs/ft)	**154.8**
Total Vertical Force (lbs/ft)	**408.0**
Sliding Resistance (lbs/ft)	**239.6**
Driving Moment (lbs-ft/ft)	**206.4**
Resisting Moment (lbs-ft/ft)	**323.0**
Bearing Capacity (psf)	**2604.5**
Maximum Bearing Pressure (psf)	**380.7**

Results of Facing Stability Analyses:

SRW Unit #	*Heel Elev (ft)*	*Geosynthetic Type*	*FOS Over-turning > 1.5*	*FOS Shear (peak) > 1.5*
8	**3.5**	**none**	**63.27**	**>99**
7	**3.0**	**none**	**17.13**	**62.23**
6	**2.5**	**none**	**8.2**	**30.0**
5	**2.0**	**none**	**4.94**	**18.19**
4	**1.5**	**none**	**3.37**	**12.49**
3	**1.0**	**none**	**2.49**	**9.26**
2	**0.5**	**none**	**1.94**	**7.23**
1	**0.0**	**none**	**1.57**	**1.55**

Note: calculated values MEET ALL design criteria



Project Identification:

Project Name: **Case Residence**
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Owner: **Steve Case**
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Prepared by:
Date: **July 27 2001**
Time:

Data file: **c:\srwall3\01-137.dat**

Figure 11