02PD043

Renner & Sperlich Engineering Company
616 Sixth Street • Rapid City, South Dakota 57701 • 605/342-1191

Vern Osterloo
Rapid City Regional Hospital
353 Fairmont Boulevard
Rapid City, 57701

RE: Parking Lot Island Landscaping

Dear Vern:

I am writing in support of your application for a variance to Rapid City's requirement to provide landscaping in parking lot islands. The existing landscaped parking lot islands at the Hospital have caused asphalt failure around the islands due to moisture from rain and snow getting under the asphalt. These islands are not even irrigated.

The new south parking lot contains 22 islands. If these islands are left open, landscaped, and irrigated, there will be a large volume of water percolating through the gravel base course and into the subgrade. The subgrade soils under this parking lot become very unstable when the moisture content is above optimum. We encountered wet subgrade areas during construction and the only way to stabilize the subgrade was to install fabric between the subgrade and the gravel base course.

I am recommending that the Hospital provide the required landscape points outside of the parking pavement.

Sincerely,

Gary Renner

Gary Renner, PE & LS

SIMON CONTRACTORS OF SOUTH DAKOTA

2391 COMMERCE ROAD • BOX 397 • RAPID CITY, SD 57709 • 605/342-3734 • 605/348-5613 FAX

August 26, 2002

Rapid City Regional Hospital
Attn: Vern

Re: Parking lot islands

Due to existing soil conditions at the hospital, we recommend sealing as many islands as possible. The water that enters the islands leeches into the subgrade and migrates out under the asphalt. Soil conditions in this area will not support traffic loads at the higher moisture content. Sealing the islands will reduce subgrade saturations and extend the life of the asphalt.

If you have any questions, please call.

Steve Ringgaard

Cc: File

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
• GEOTECHNICAL
• MATERIALS
• ENVIRONMENTAL

August 28, 2002

Mr. Vern Osterloo
Rapid City Regional Hospital
353 Fairmont Boulevard
Rapid City, South Dakota 57701

Subject: New Parking Lot Islands
Rapid City Regional Hospital
Rapid City, South Dakota
AET No. 18-00909

Dear Vern:

As you are aware, American Engineering Testing (AET) provided the geotechnical study and report for the new parking lot under construction at the Rapid City Regional Airport. In our report dated May 31, 2002, AET recommended the proposed islands within the parking lot be concreted to reduce the potential of water penetrating the pavement subgrade. As the soils at this site consist of a sandy fat clay, intrusion of water into the prepared subgrade soils will significantly reduce the strength of the pavement subgrade. With a loss of subgrade strength the integrity of the pavement section is lost and pavement distress cracks are inevitable.

It is our opinion concreting the parking lot islands will significantly reduce the potential of water penetrating the surrounding subgrade soils. To maintain the design life of the parking lot pavement section it is our opinion this recommendation should be followed in construction.

If you have any questions please call our office at 388-0029.

Sincerely;

Robert Temme P.E.
South Dakota Manager

F:\wp8\Geotechnical\Letters\2002\rcrhpavement.wpd 8/28/02

AMERICAN ENGINEERING TESTING, INC.

Copy

CONSULTANTS
• GEOTECHNICAL
• MATERIALS
• ENVIRONMENTAL

May 31, 2002

Mr. Vern Osterloo
Rapid City Regional Hospital
353 Fairmont Boulevard
Rapid City, South Dakota 57701

Subject: Geotechnical Exploration Program
Proposed Parking Lot
Rapid City Regional Hospital
Rapid City, South Dakota
AET No. 18-00909

Dear Vern:

INTRODUCTION

This letter presents the results of the geotechnical exploration program and pavement design analysis conducted for the proposed parking lot to be constructed just south of the Hospital. This work was conducted based on American Engineering Testing's (AET) proposal dated May 9, 2002, and your verbal authorization to proceed. One additional copy of this letter is being sent to Mr. Gary Renner, Renner & Sperlich Engineering, Rapid City, South Dakota.

PROJECT INFORMATION

Based on the Site Plan provided to our office, it is our understanding the new asphalt parking lot will have approximate dimensions of 685 feet by 240 feet and will be constructed along 5th Street, adjacent to, and just south of the Hospital. A total of 300 parking spaces will be built with primary usage of cars and light trucks with occasional delivery truck traffic.

We understand fill has been placed over approximately the west half of the site. Based on current grades, cuts and fills less than five feet in depth are anticipated to obtain the final parking lot grades.

FIELD EXPLORATION

Eight (8) standard penetration test (SPT) borings were drilled for the project on May 13 and 21, 2002. The borings were drilled at locations selected by AET, and are illustrated on the attached Boring Location Map included as Figure 1 at the end of this letter. The boring elevations were interpolated from the provided Site Plan.

1745 Samco Road • Rapid City, SD 57702 • 605-388-0029 • Fax: 605-388-0064
St. Paul • Duluth • Mankato • Marshall • Pierre • Rapid City • Rochester • Sioux Falls • Wausau

Soil sampling was performed according to the procedures described by ASTM: D 1586. Using this procedure, a two-inch O.D. split barrel sampler is driven into the soil by a 140 pound weight falling 30 inches. After an initial set of six inches, the number of blows required to drive the sampler an additional 12 inches is known as penetration resistance or N value. The N value is an index of the relative density of cohesionless soils and the consistency of cohesive soils.

As the samples were obtained in the field they were visually and manually classified by the crew chief in accordance with ASTM: D 2488. Representative portions of all samples were then sealed and returned to the laboratory for further examination and for verification of the field classification. Included in the Appendix as Figures 2 through 9 are the Logs of the Test Borings indicating the depth and identification of the various strata, the N value, the laboratory test data, water level information and pertinent information regarding the method of maintaining and advancing the drill holes.

The soil samples remaining after the laboratory testing is complete will be retained for a period of one month. At that time they will be discarded. Please advise us in writing if you wish to have us retain them for a longer period of time.

SUBSURFACE CONDITIONS

A brief description of the general subsurface conditions encountered at the boring location follows. We wish to point out that the subsurface conditions at other times and locations at the site may differ from those found at our test boring locations. If different conditions are encountered during construction, it is necessary that you contact us so that our recommendations can be reviewed.

Borings B-1 through B-4 - Underlying a thin basecourse or topsoil layer, the subsurface soils consisted of approximately 5½ to 15 feet of sandy fat clay fill overlying weathered and unweathered shale, associated with the Pierre Formation, to the total depths explored.

Borings B-5 through B-8 - Underlying a thing topsoil layer, the subsurface soils within these borings consisted of weathered and unweathered shale, associated with the Pierre Formation to the total depth explored.

LABORATORY TESTING

Representative samples of the soils encountered were selected for laboratory testing to determine moisture content, and dry density. In addition, two (2) moisture-density curves (proctors) were performed from bulk samples obtained from Borings B-1 and B-7. The laboratory tests were performed in accordance with appropriate American Society for Testing and Materials (ASTM) procedures. The test results can be noted on the attached boring logs opposite the samples upon which the tests were performed.

It is our opinion that the fills encountered within Boring B-1 are representative of the soils which will be present across the site after the anticipated cut and fill work has been performed. The proctor test (ASTM D: 1557) on the bulk sample form Boring B-1 indicated a maximum dry density of 122.2 pounds per cubic foot (pcf) at an optimum moisture content of 13.2 percent. The California Bearing Ratio (CBR) test yielded a value of 1.1 at approximately 95% compaction, as referenced to the moisture-density curve. Individual results can be found at the end of this letter as Figures 10 and 11.

ENGINEERING ANALYSIS AND RECOMMENDATIONS

Site Preparation

The test borings indicate the existing fills are fairly consistent in material and strength with blow counts ranging from 10 to 29. The one exception is a blow count of 6 encountered in Bring B-3 at a depth of 2 ½ feet. It is therefore our opinion, that with proper compaction, the existing fills can be left in place. We do, however, recommend the exposed subgrade in the west half of the proposed parking lot be observed and proof rolled with heavy equipment prior to the placement of additional fills and/or the pavement section.

We recommend that all topsoil/organic matter, any construction debris, and abandoned buried utility lines, if encountered, be removed from within the proposed parking lot footprint. Once this is complete, the exposed subgrades and areas to receive engineered fill should be scarified to a depth of 12 inches, moisture conditioned, and recompacted to at least 92% of the maximum density as determined by ASTM D:1557 (modified proctor).

Approved engineered fill should then be placed as follows. All recommendations are based on the Modified Proctor method (ASTM: D 1557).

1. All engineered fill should be moisture conditioned to +3% of optimum moisture content prior to being placed.

2. All engineered fill should be placed in loose lift thicknesses of eight inches or less. If hand operated compaction equipment is used, the loose lift thickness should be reduced to four inches or less.

3. Each lift should be compacted to at least 92% of maximum proctor density with the final lift compacted to at least 95% of the maximum proctor density.

4. Compaction tests should be performed on alternating lifts to ensure the minimum density is maintained.

Pavement Design Analysis

The following pavement sections are designed based on the "Simplified Guide for the Design of Concrete Pavements" from the American Concrete Pavement Association which is based on the 1997 "AASHTO Guide for the Design of Pavement Structures".

We have not been provided estimated traffic counts for this project for use in the pavement design analysis. We have assumed traffic counts, traffic loads and vehicle types will be similar to the current parking lot located immediately to the north of the site. The pavement section in the current lot is 5 inches of asphalt over 6 inches of base course.

A pavement design life of 20 years was used in design. Each assumed vehicle type and the axle loads used in the calculation of the E18s are listed in the following table. Please notify us if any of the parameters used in the pavement design do not adequately define the anticipated conditions.

Table 1

E 18 CONVERSION Proposed RCRH Parking Lot		
Vehicle Type	**Axle Load/Type (kips/axle)**	**Average Daily Traffic** (day/month/year)
1 Passenger Car	2.00 single 2.00 single	3000/day
2 Utility Truck	2.00 single 5.00 single	25/day
3 Delivery Truck	10.00 single 34.00 single	1/day
Flexible E 18 Total = 37,011		

Calculations indicate a flexible pavement section of either 5.0 inches of asphalt over 7.0 inches of base course gravel is acceptable for the design criteria using a calculated subgrade CBR value of 1.1. We recommend that a rigid pavement section be used at site entrance/access approaches, anticipated high traffic areas, and at any loading/unloading zones. We also recommend the proposed islands within the parking lot be concreted to reduce the potential of water penetrating the pavement subgrade.

Subgrade Preparation
Prior to placement of any pavement sections, we recommend the exposed subgrade be scarified to a depth of 12 inches below existing grade, moisture conditioned to within 3% of optimum moisture content and be compacted to at least 92% of maximum density as determined by ASTM: D 1557.

The prepared subgrade should be proof rolled by a tandem axle dump truck loaded to its capacity. The proof rolling should be observed by our geotechnical engineer to identify areas of soft subgrade.

Any areas that "pump" under the loaded dump truck should be excavated to a depth to be determined by the geotechnical engineer and replaced with coarse clean gravel to stabilize the subgrade. Once the subgrade has been proof rolled and approved by the geotechnical engineer, base course may be placed. The subgrade should be sloped to a catch basin or to the curb to help reduce accumulation of water below the traffic lanes of the pavement.

Base Course
The base course should meet the requirements of the City of Rapid City's Construction Specifications. The granular base course should also be compacted to a minimum of 95% of maximum density as determined by the modified proctor method (ASTM: D 1557).

Precautions
It is our opinion that excessive settlement could occur above underground utility trenches. The exact amount of settlement cannot be predicted; however, we strongly recommend that compaction tests be taken in the trenches to assure that proper compaction does exist.

CONSTRUCTION CONSIDERATIONS

Excavation
Conventional earth moving equipment should be able to perform the anticipated preparation work for the site soils. We recommend that all excavation work be conducted according to the Federal Register, Tuesday, October 31, 1989, Part II, Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Occupational Safety and Health Administration, Standards-Excavation; Final Rule.

Observation & Testing
The construction plans and specifications should be reviewed by our firm to judge the applicability of the recommendations presented in this report.

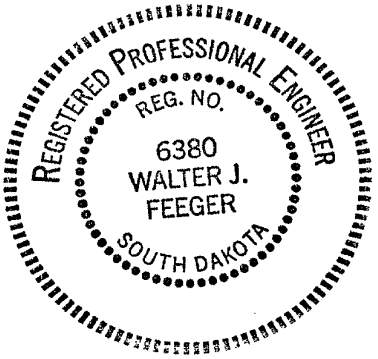
The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to review these potential changes. Soil compaction testing should be performed on new fill placed in order to judge that project specifications for compaction have been satisfied.

CLOSING

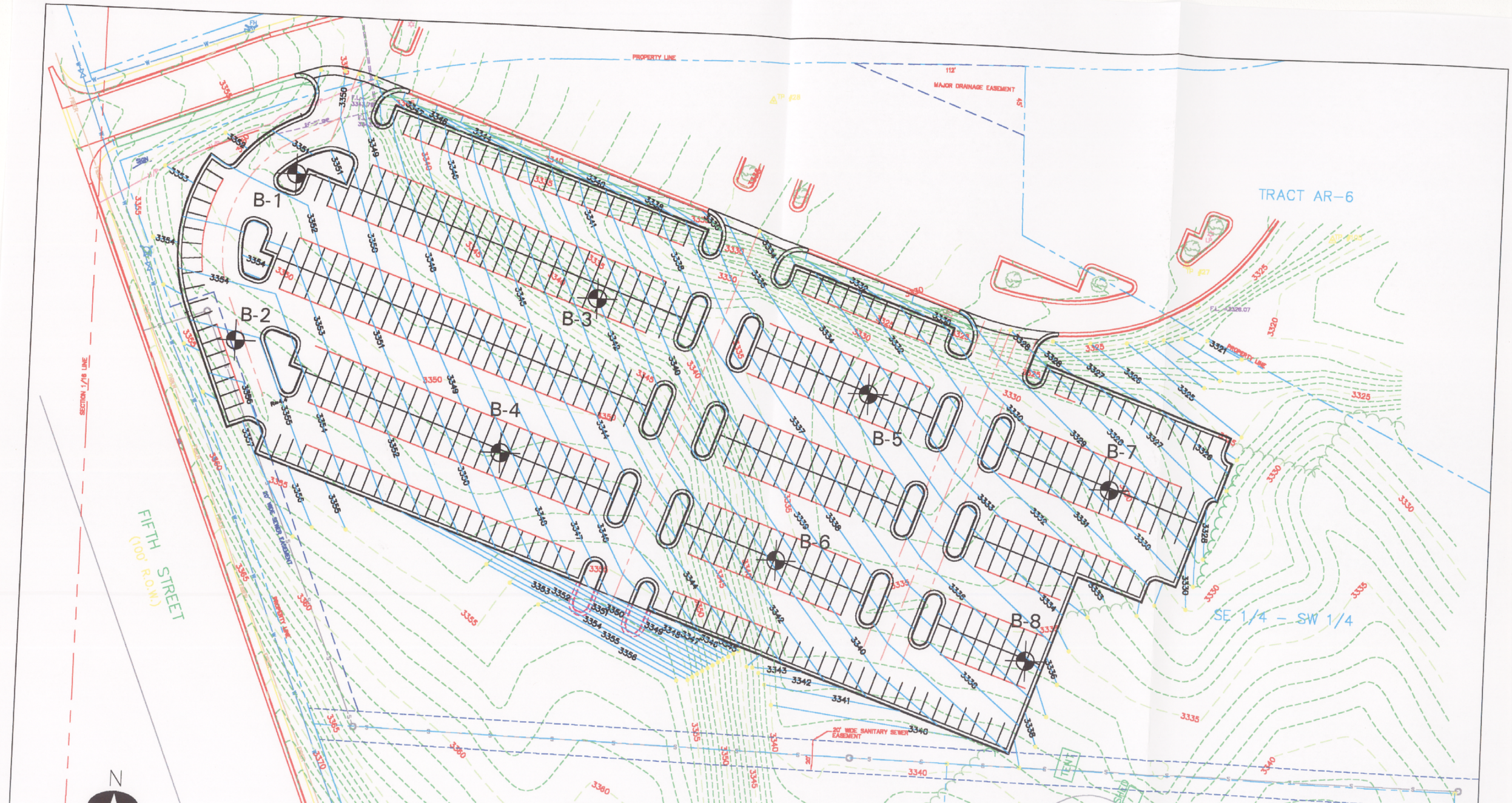
The recommendations contained in this letter represent our professional opinions. These opinions were arrived at in accordance with currently accepted engineering practices at this time and location. Other than this, no warranty is intended or implied. If you have any questions or need additional information, please call our office at (605) 388-0029.

Sincerely,

Walt Feeger, P.E.
Geotechnical Project Manager



Robert Temme, PE
South Dakota Operations Manager



NOTE: THIS IS NOT A LEGAL SURVEY. ALL LOCATIONS ARE APPROXIMATE.

AMERICAN ENGINEERING TESTING, INC.	PROJECT: PROPOSED PARKING LOT, RAPID CITY REGIONAL HOSPITAL, RAPID CITY, SD			AET #: 18-00909
	SUBJECT: BORING LOCATION MAP			DATE: 5/23/02
	SCALE: 1INCH = 60FEET	DRAWN BY: MDK	CHECKED BY: WF	FIGURE 1

FIGURE 2

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B- 1**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

SURFACE ELEVATION: **3348.5**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	**BASECOURSE GRAVEL**	Surfacing									
	FILL-Sandy Fat Clay with Gravel, olive brown, moist (CH)	Fill									
2											
3			11		2L	18	21	102			
4											
5			13		2L	18					
6											
7											
8			16		2L	18	26	90			
9											
10			20		2L	18					
11	**WEATHERED SHALE** (Textural Classification: Fat Clay, olive brown, moist, stiff (CH))	Pierre Formation									
12											
13			18		2L	18					
14											
15			20		2L	18					
16	**SHALE** (Textural Classification: Fat Clay, dark grey, moist, stiff (CH))										
	End of Boring										

DEPTH: **15.0** DRILLING METHOD: **4" FA**

BORING COMPLETED: **5/13/02**

CC: **BT** CA: **CP** Rig: **RC-1**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
5/13/02	**3;15 pm**			**15.0**		**None**

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99

FIGURE 3

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B-2**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

SURFACE ELEVATION: **3352.5**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
	BASECOURSE GRAVEL	Surfacing									
1	**FILL**-Sandy Fat Clay with Gravel, olive brown, moist (CH)	Fill									
2											
3			12		2L	18	23	100			
4											
5			16		2L	18	14	112			
6	**WEATHERED SHALE** (Textural Classification: Fat Clay, olive brown, moist, stiff (CH))	Pierre Formation									
7											
8			16		2L	18					
9	**SHALE** (Textural Classification: Fat Clay, dark grey, moist, stiff (CH))										
10											
11			20		2L	18					
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	**4" FA**	**5/13/02**	**3:55 pm**			**11.5**		**None**
BORING COMPLETED:	**5/13/02**							
CC: **BT**	CA: **CP** Rig: **RC-1**							

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99

FIGURE 4

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B- 3**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

SURFACE ELEVATION: **3339.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
	TOPSOIL-Sandy Fat Clay with Gravel, dark brown, moist, organics present (CH)	Topsoil	6		2L	18					
1	**FILL**-Sandy Fat Clay with Gravel, olive brown to dark grey, moist, organics present (CH)	Fill									
2											
			6		2L	18	22	104			
3											
4											
5			23		2L	18	23	100			
6	**WEATHERED SHALE** (Textural Classification: Fat Clay, olive brown to dark grey, moist, stiff (CH))	Pierre Formation									
7											
			32		2L	18					
8	**SHALE** (Textural Classification: Fat Clay, dark grey, moist, very stiff (CH))										
9											
10			45		2L	18					
11											
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	**4" FA**	**5/21/02**	**11:15 am**			**11.5**		**None**
BORING COMPLETED:	**5/21/02**							
CC: **BT**	CA: **CP** Rig: **RC-1**							

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99

FIGURE 5

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B-4**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

SURFACE ELEVATION: **3351.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	**FILL**-Sandy Fat Clay with Gravel, mottled olive brown to dark grey, moist (CH)	Fill									
2											
3			29		2L	18	16	113			
4											
5			13		2L	18					
6											
7											
8			22		2L	18	20	106			
9											
10			12		2L	18					
11											
12											
13			12		2L	18					
14											
15	**WEATHERED SHALE** (Textural Classification: Fat Clay, dark grey, moist, rather stiff, organics present (CH))	Pierre Formation	13		2L	18					
16											
17	**SHALE** (Textural Classification: Fat Clay, dark grey, moist, stiff (CH))										
18			24		2L	18					
19	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
17.5	**4" FA**	**5/21/02**	**10:10 am**			**19.0**		**None**
BORING COMPLETED:	**5/21/02**							
CC: **BT**	CA: **CP** Rig: **RC-1**							

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99

FIGURE 6

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B- 5**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

DEPTH IN FEET	SURFACE ELEVATION: 3332.0 MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	**TOPSOIL**-Sandy Fat Clay with Gravel, dark brown, moist, organics present (CH)	Topsoil	10		2L	18					
	WEATHERED SHALE (Textural Classification: Fat Clay, mottled olive brown to dark grey, moist, rather stiff, organics present (CH))	Pierre Formation									
2											
3			12		2L	18	25	97			
4											
5	**SHALE** (Textural Classification: Fat Clay, dark grey, moist, very stiff (CH))		26		2L	18	26	92			
6											
7											
8			85		2L	18					
9											
10			71		2L	18					
11											
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	**4" FA**	**5/21/02**	**1;45 pm**			**11.5**		**None**
BORING COMPLETED:	**5/21/02**							
CC: **BT**	CA: **CP** Rig: **RC-1**							

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99

FIGURE 7

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B- 6**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

SURFACE ELEVATION: **3336.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
	TOPSOIL-Sandy Fat Clay with Gravel, dark brown, moist, organics present (CH)	Topsoil									
1	**WEATHERED SHALE** (Textural Classification: Fat Clay, mottled olive brown to dark grey, moist, rather stiff, organics present (CH))	Pierre Formation									
2											
3			11		2L	18	27	97			
4											
5	**SHALE** (Textural Classification: Fat Clay, dark grey, moist, stiff (CH))		13		2L	18					
6											
7											
8			40		2L	18	23	100			
9											
10			41		2L	18					
11											
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	**4" FA**	**5/21/02**	**1:00 pm**			**11.5**		**None**
BORING COMPLETED:	**5/21/02**							
CC: **BT**	CA: **CP** Rig: **RC-1**							

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99

FIGURE 8

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B- 7**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

DEPTH IN FEET	SURFACE ELEVATION: 3330.5 MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	**SHALE** (Textural Classification: Fat Clay, dark grey to black, moist, very stiff to hard (CH))	Pierre Formation									
2											
3			63		2L	18	22	97			
4											
5			65		2L	18	17	110			
6											
7											
8			85		2L	18					
9											
10			50/.5		2L	6					
11											
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	**4" FA**	**5/21/02**	**2:35 pm**			**11.0**		**None**
BORING COMPLETED:	**5/21/02**							
CC: **BT**	CA: **CP** Rig: **RC-1**							

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99

FIGURE 9

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **18-00909** LOG OF BORING NO. **B- 8**

PROJECT: **Proposed Parking Lot; Rapid City Regional Hospital**

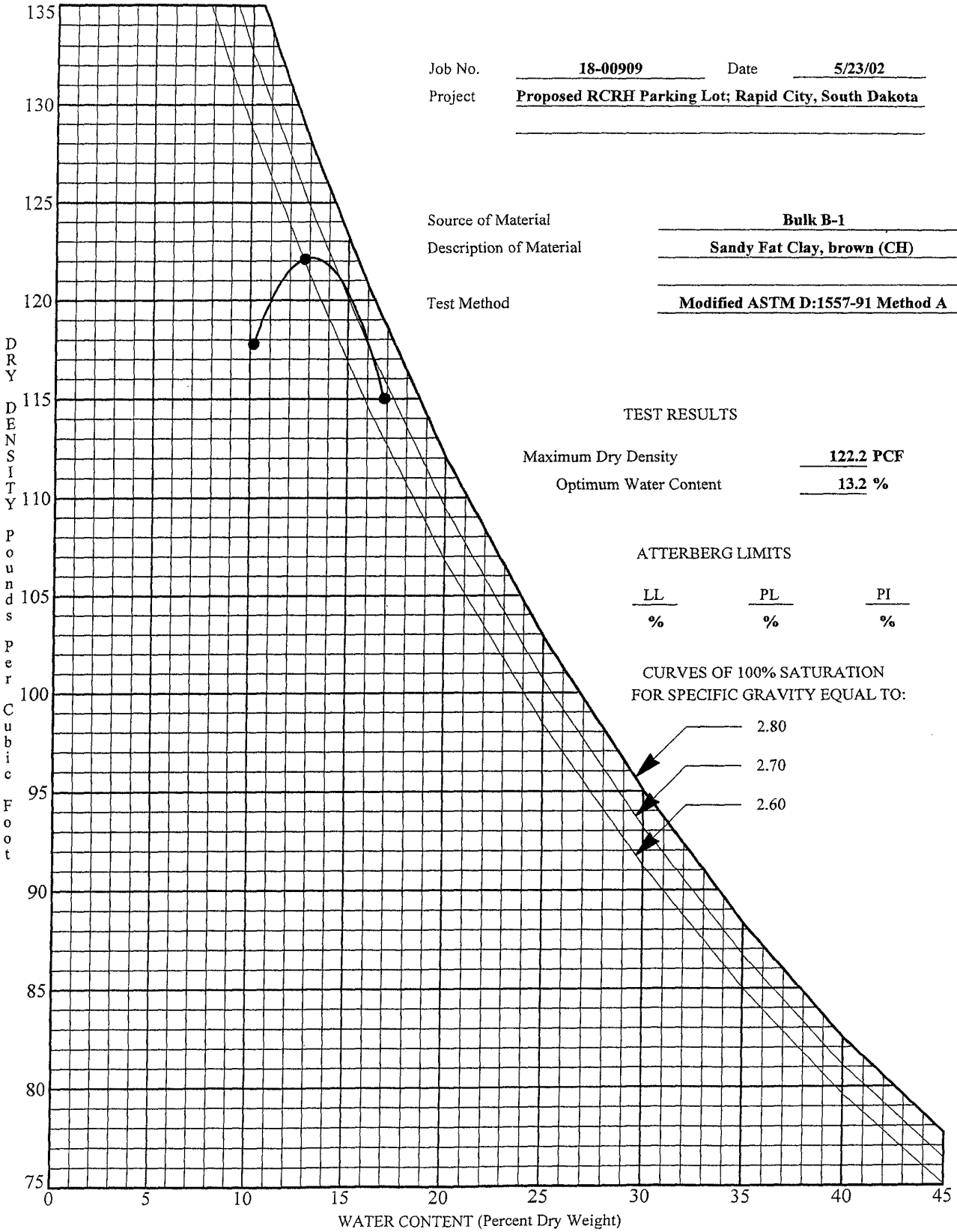
SURFACE ELEVATION: **3336.0**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	GW	SAMPLE TYPE	REC. IN.	FIELD & LABORATORY TESTS WC	DEN	LL	PL	%-200
1	**TOPSOIL**-Sandy Fat Clay with Gravel, dark brown, moist, organics present (CH)	Topsoil									
2	**WEATHERED SHALE** (Textural Classification: Fat Clay, dark grey, moist, stiff (CH))	Pierre Formation									
3			20		2L	18	17	97			
4	**SHALE** (Textural Classification: Fat Clay, dark grey, moist, very stiff (CH))										
5			33		2L	18	25	89			
6											
7											
8			70		2L	18					
9											
10			63		2L	18					
11											
	End of Boring										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
10.0	**4" FA**	**5/21/02**	**3:15 pm**			**11.5**		**None**
BORING COMPLETED:	**5/21/02**							
CC: **BT**	CA: **CP** Rig: **RC-1**							

AET_CORP 18-00909.GPJ AET_CORP.GDT 5/29/02

2/99



Job No. **18-00909** Date **5/23/02**

Project **Proposed RCRH Parking Lot; Rapid City, South Dakota**

Source of Material **Bulk B-1**

Description of Material **Sandy Fat Clay, brown (CH)**

Test Method **Modified ASTM D:1557-91 Method A**

TEST RESULTS

Maximum Dry Density	**122.2 PCF**
Optimum Water Content	**13.2 %**

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

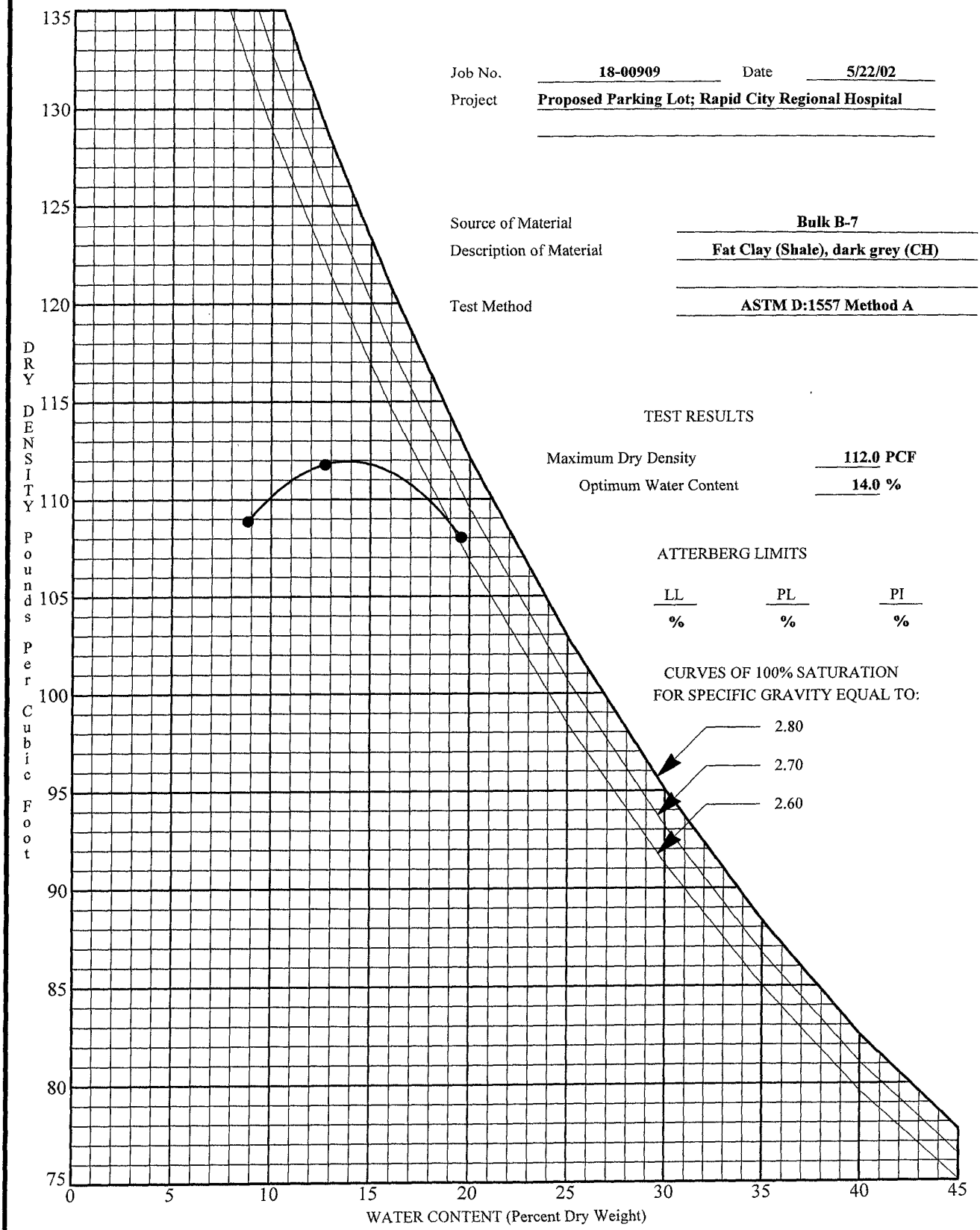
2.80

2.70

2.60

AMERICAN ENGINEERING TESTING, INC.

MOISTURE-DENSITY RELATIONSHIP



Job No. **18-00909** Date **5/22/02**

Project **Proposed Parking Lot; Rapid City Regional Hospital**

Source of Material **Bulk B-7**

Description of Material **Fat Clay (Shale), dark grey (CH)**

Test Method **ASTM D:1557 Method A**

TEST RESULTS

Maximum Dry Density **112.0 PCF**

Optimum Water Content **14.0 %**

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

2.80

2.70

2.60

AMERICAN ENGINEERING TESTING, INC.

MOISTURE-DENSITY RELATIONSHIP

FIGURE 12

CALIFORNIA BEARING RATIO TESTS

PROJECT: Proposed RCRH Parking lot

DATE: May 30, 2002

REPORTED TO: RCRH

LABORATORY NO: Bulk B-1

SAMPLE IDENTIFICATION: Bulk sample from Boring B-1

LABORATORY MOISTURE-DENSITY RELATIONSHIP OF SOIL:
(See attached curve)

Method - ASTM D: 1557-91, Method A
Classification - Sandy Fat Clay, brown (CH)
Maximum Dry Density (pcf) - 122.2
Optimum Moisture (%) - 13.2

CALIFORNIA BEARING RATIO TEST:

Method - ASTM D: 1883
Molding Data:
- Compaction Hammer - 10 lb, manual
- Number of Layers - 5
- Blows per Layer - N/A
- Molding Moisture (%) - 13.6
- Molding Dry Density (pcf) - 116.4
- Relative Compaction (%) - 95.3

Penetration Test:
- Surcharge (lb) - 10
- Bearing Ratio - 1.1
- At 0.1 in penetration (%) - 1.1
- At 0.2 in penetration (%) - 1.1
- At 0.4 in penetration (%) - 0.9

Moisture Content After Penetration:
- Top 1 in of specimen (%) - 27.2
- Total specimen average (%) - 22.2

Swell Test: (4 day soaking)
- Surcharge (lb) - 10
- Swell after 4 days - +8.0%