**From:** Wayne Sullivan
**To:** Chao, Ming-tai
**Subject:** Wayne Co.
**Date:** Thursday, March 28, 2013 10:59:17 AM
**Attachments:** Moisture-Density Permeability Window.pdf

---

Ming.

Hope you are doing well. Please find attached the "permeability windows" that we discussed for the cohesive soil liner for Wayne Co. if you need any additional information, just let me know. I hope to get the rest of the comments to you by the first of next week. I'm waiting on the slope stability analysis.

Thanks and have a good Easter Weekend.

D. Wayne Sullivan
Municipal Engineering Services Co., Inc.
Phone: (919) 772-5393
Fax: (919) 772-1176
email: wsullivan@mesco.com

| Permit No. | Date | Document ID No. |
|---|---|---|
| **96-06** | **April 09, 2013** | **18791** |

Received by an e-mail
Date: **March 28, 2013**
Solid Waste Section
Raleigh Central Office

E²S

ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

March 20, 2013

Mr. David Page
ES & J
1555 Holland Road
Autryville, NC 28318

RE: Moisture-Density Permeability Window
Per SW Section Letter Dated October 3, 2012
Wayne County Municipal Solid (Permit No. 96-06)
Waste Landfill, Phase 3
Wayne County, NC

Dear Mr. Page:

The following discusses the permeability window for the landfill clay liner soils.

The soils used for the landfill liner had standard Proctor maximum dry densities ranging from 97.6pcf to 113.8pcf with optimum moisture of 21.3% and decreasing to 13.9% as the maximum dry density increased. Because of the considerable variation of the borrow soils, the initial permeability tests as reported in our report dated February 21, 2012 and titled "Soil Liner Evaluation", were conducted on varying soil types and layers to aid in delineating unsuitable soils.

The moisture-density permeability window was developed for a range of soil maximum dry density values as this appeared to have the greatest influence on the window (See Attachments A through F). Also, for each individual soil, the semi-log plot of degree of compaction vs permeability were conducted.

Please contact us if you have any questions about this letter and evaluation.

Sincerely,

T. Patrick Shillington

T. Patrick Shillington, P.E.
President

NORTH CAROLINA PROFESSIONAL SEAL 15472 ENGINEER T. PATRICK SHILLINGTON

03/20/13

Attachment A: Soils with Max. Dry Density Ranging from 97.6pcf to 98.6pcf.
Attachment B: Soils with Max. Dry Density Ranging from 101.6pcf to 103.8pcf
Attachment C: Soils with Max. Dry Density Ranging from 104.6pcf to 106.3pcf
Attachment D: Soils with Max. Dry Density Ranging from 107.1pcf to 108.8pcf
Attachment E: Soils with Max. Dry Density Ranging from 109.2pcf to 110.7pcf
Attachment F: Soils with Max. Dry Density Ranging from 111.0pcf to 112.0pcf
Attachment G: Soils with Max. Dry Density Ranging from 113.1pcf to 113.8pcf

**Attachment A: Soils with Max. Dry Density Ranging from 97.6pcf to 98.6pcf**

# ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

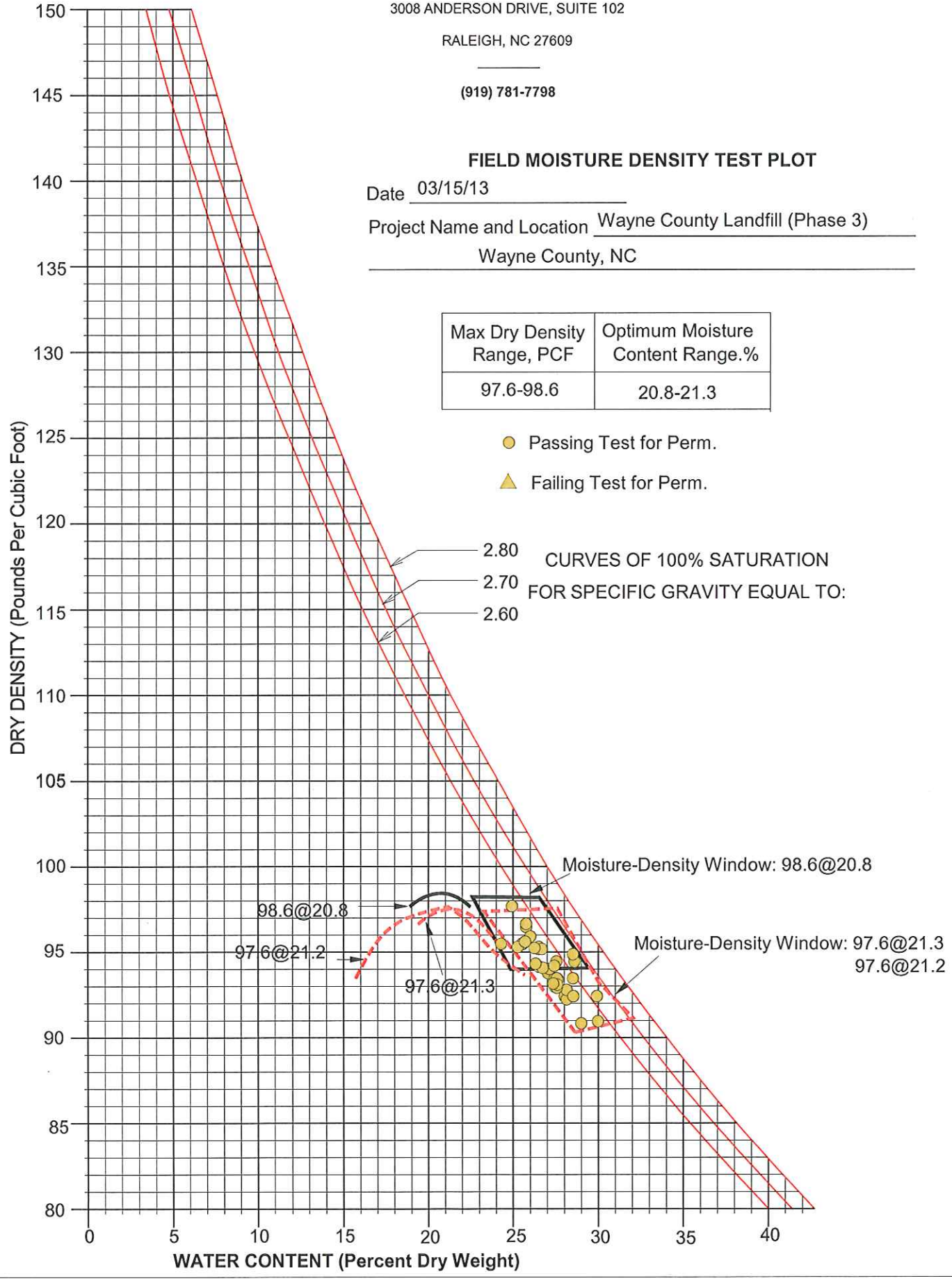
## FIELD MOISTURE DENSITY TEST PLOT

Date 03/15/13

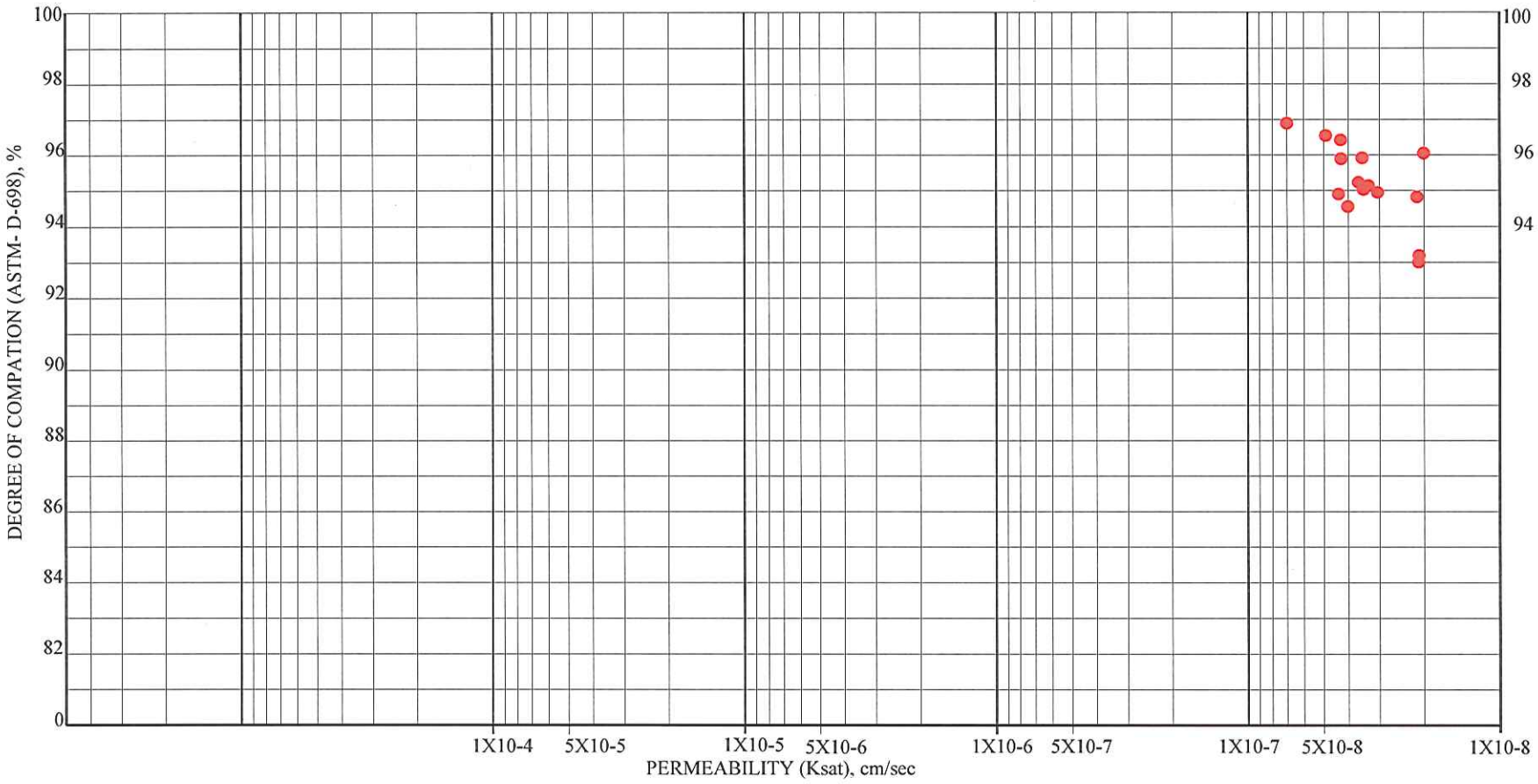
Project Name and Location Wayne County Landfill (Phase 3)

Wayne County, NC

| Max Dry Density Range, PCF | Optimum Moisture Content Range.% |
|---|---|
| 97.6-98.6 | 20.8-21.3 |

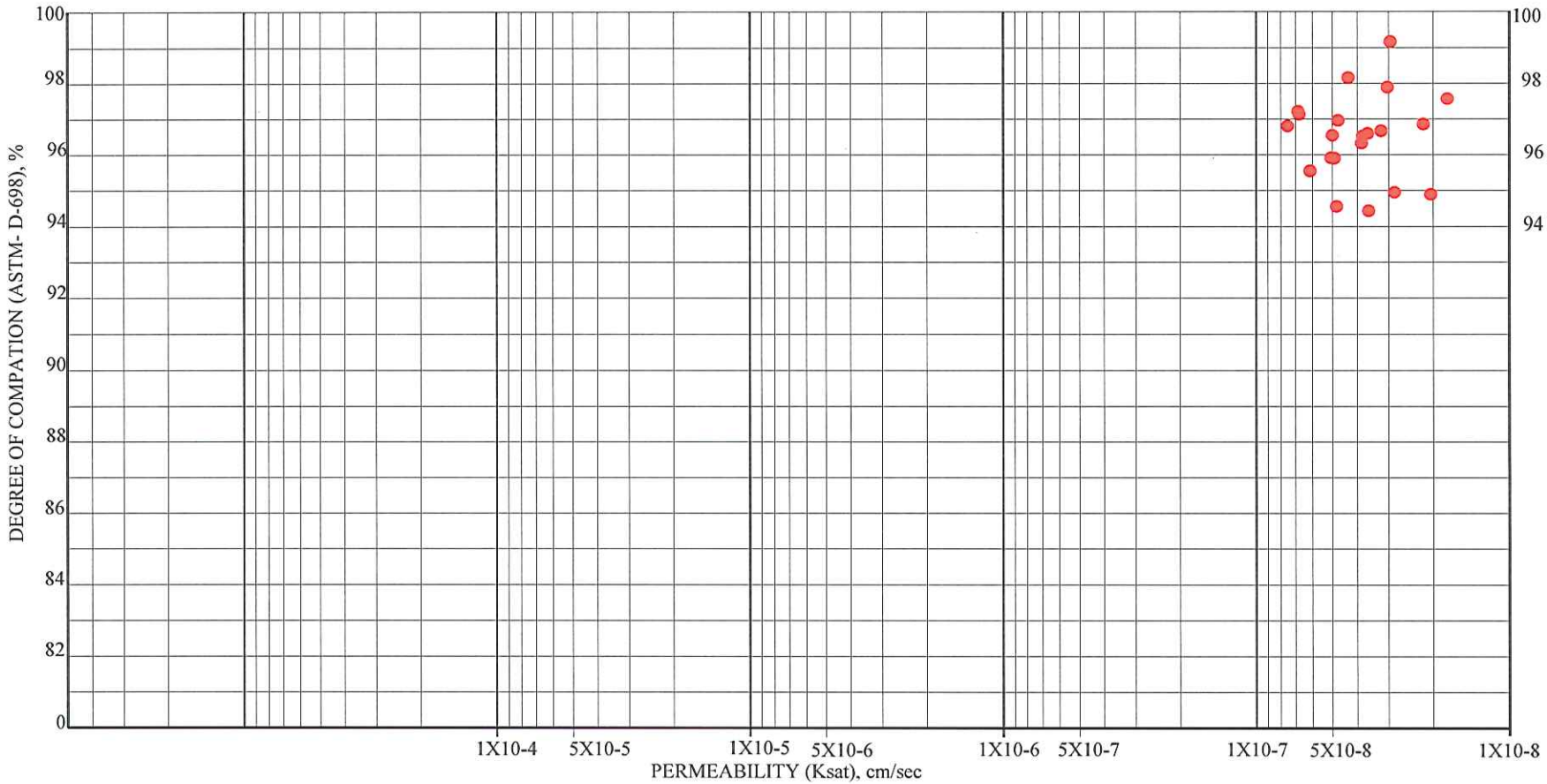


# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 65.4 | 28.2 | 37.2 | 21.3 | 97.6 | 86.0 | 36 | CH | Brown, Maroon, Gray Silty CLAY (CH) |
| 64.0 | 22 | 42 | 21.2 | 97.6 | 66.7 | 35 | CH | Brown, Maroon & Gray CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 55.9 | 32.0 | 23.9 | 20.8 | 98.6 | 72.8 | 33 | CH/MH | Brown & Gray silty CLAY |

**Attachment B: Soils with Max. Dry Density Ranging from 101.6pcf to 103.8pcf**

# ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

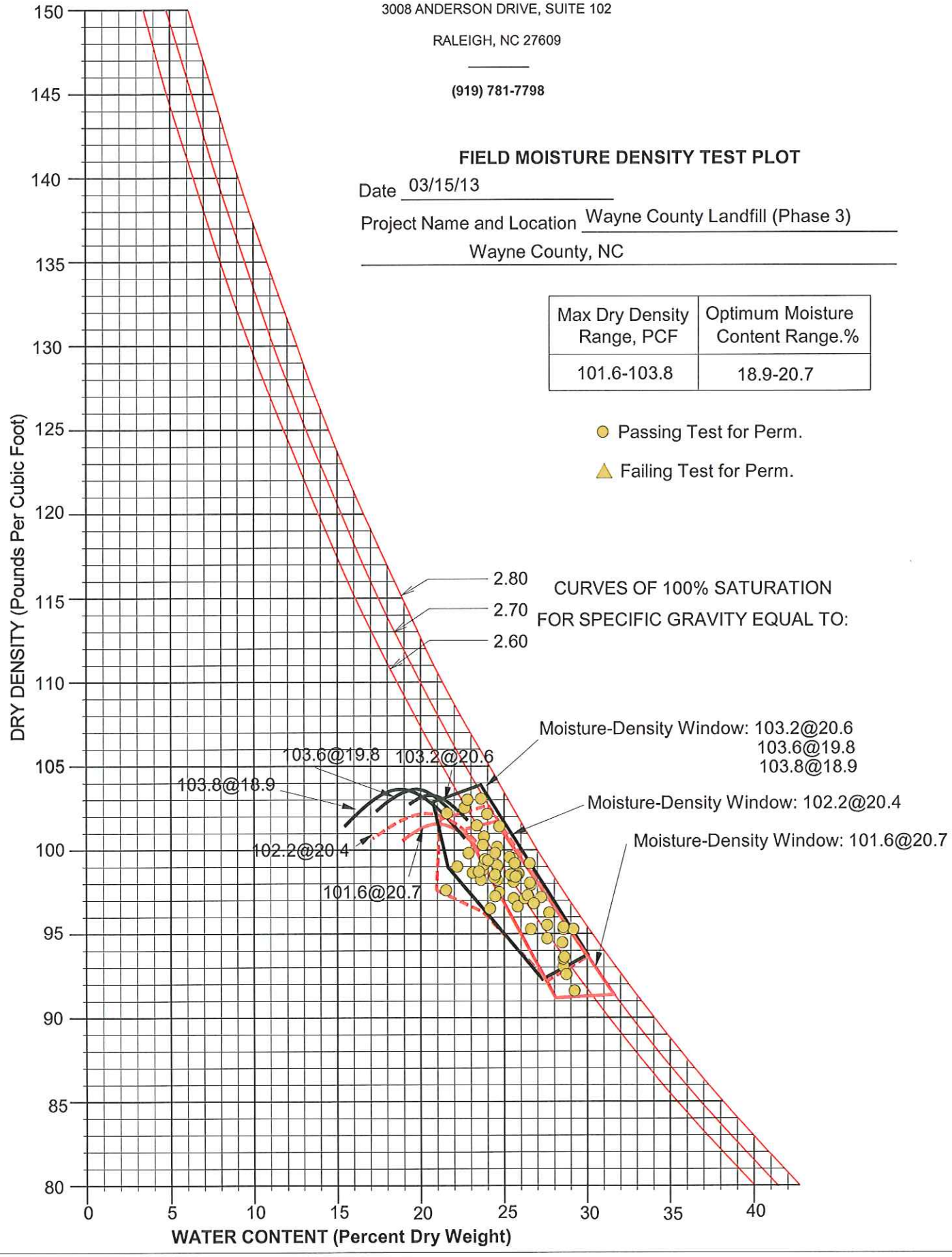
## FIELD MOISTURE DENSITY TEST PLOT

Date 03/15/13

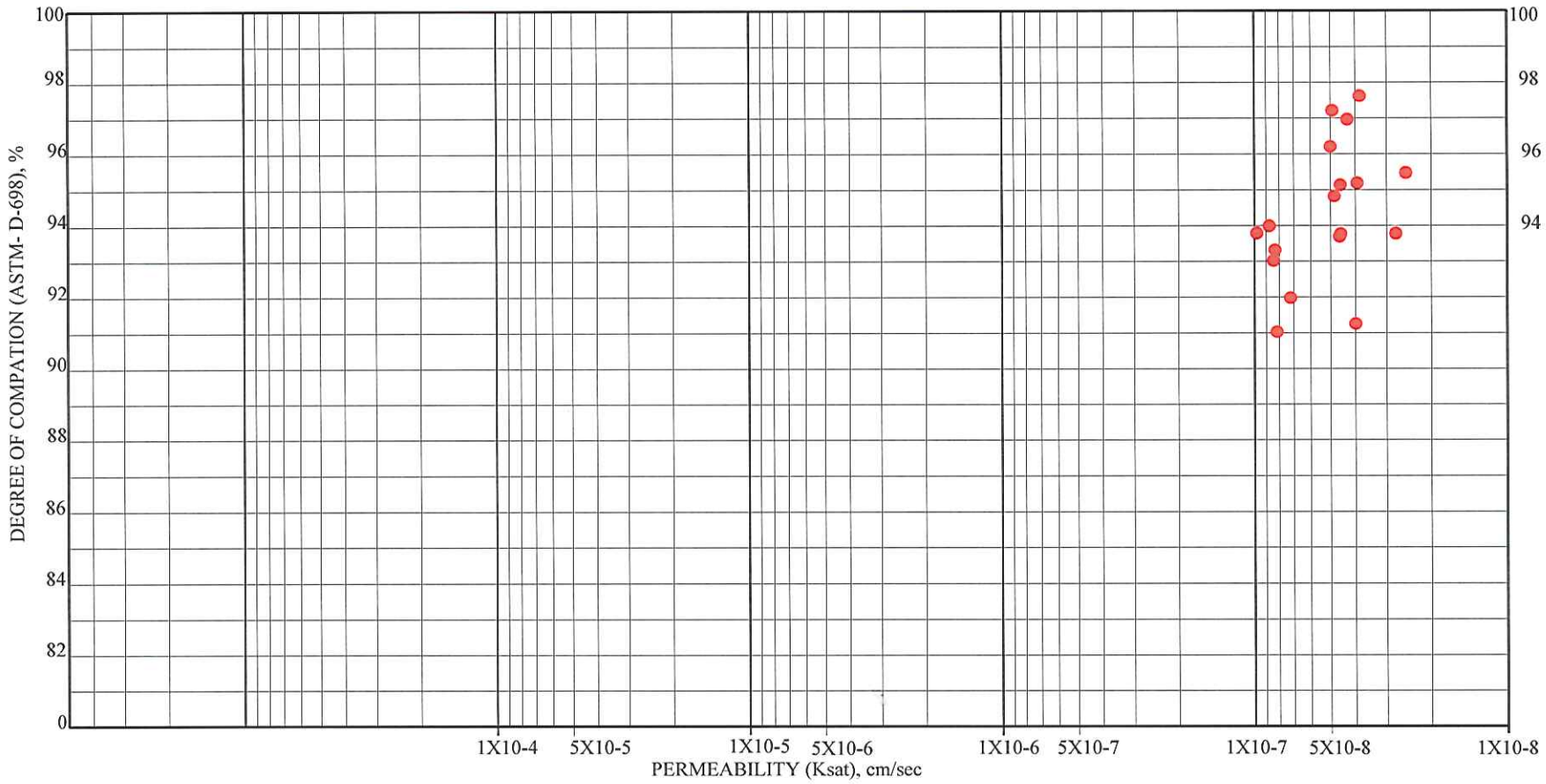
Project Name and Location Wayne County Landfill (Phase 3)

Wayne County, NC

| Max Dry Density Range, PCF | Optimum Moisture Content Range.% |
|---|---|
| 101.6-103.8 | 18.9-20.7 |

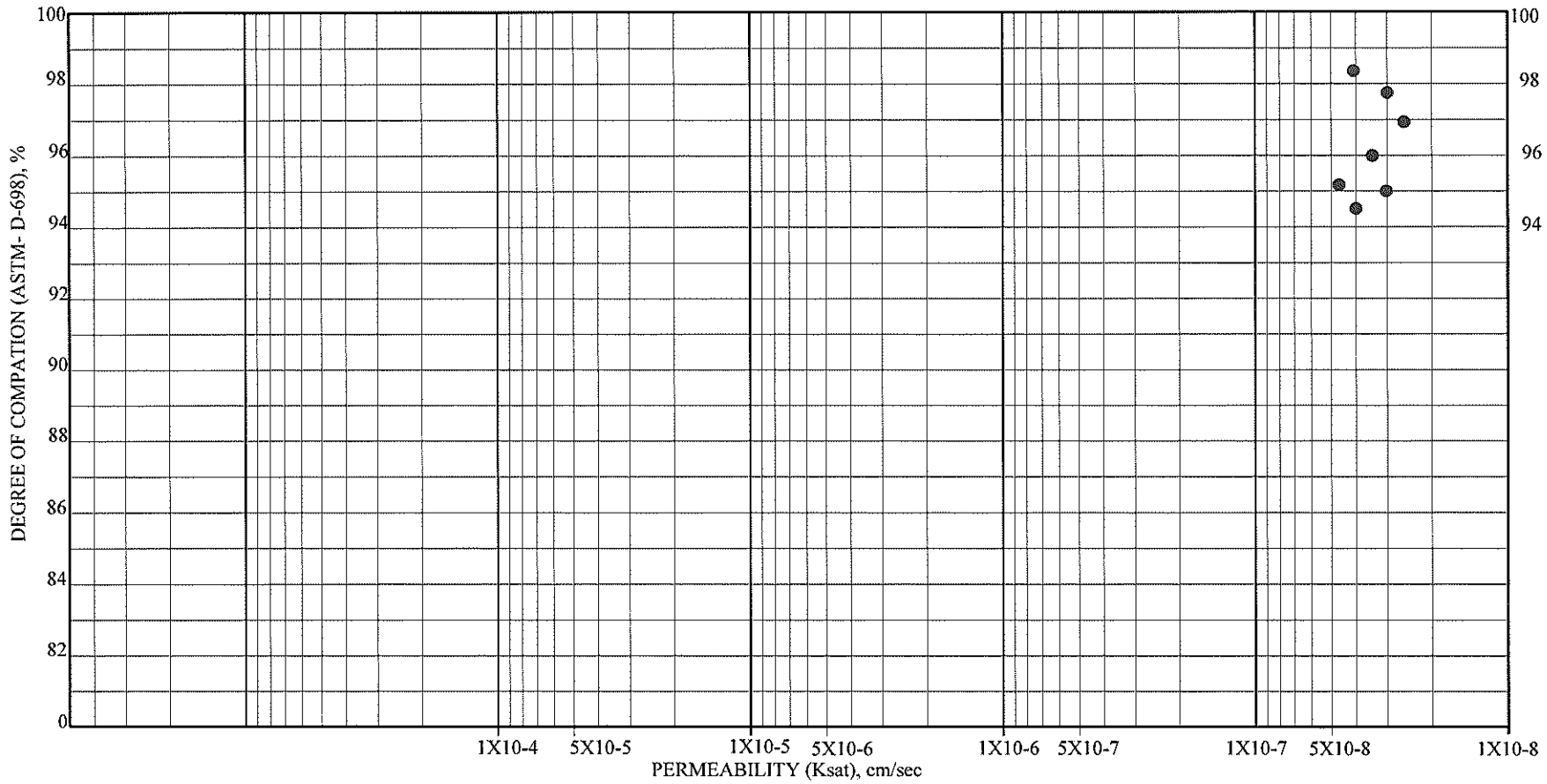


# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



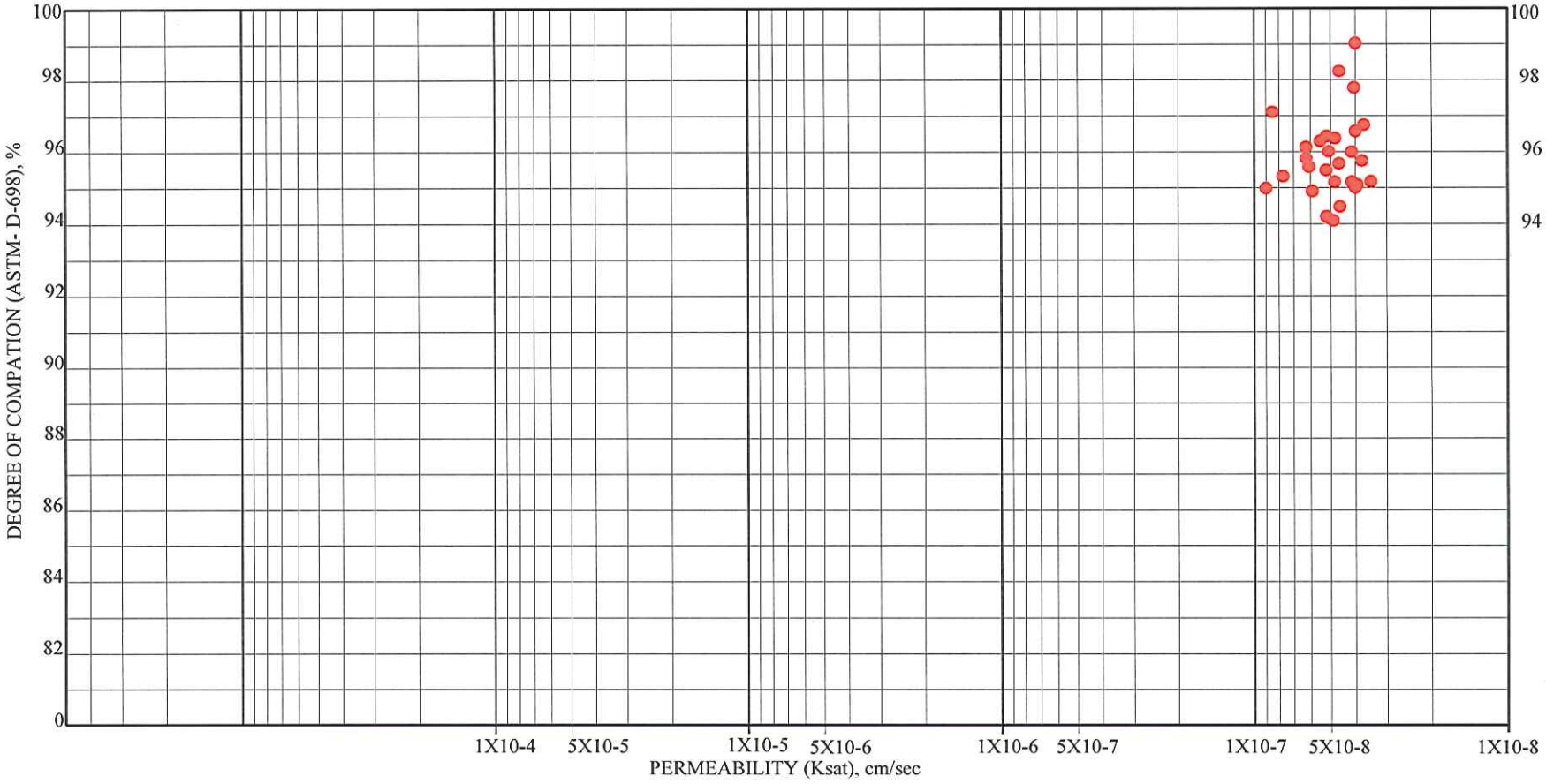

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 20.7 | 101.6 | --- | --- | CH/MH | Reddish-brown silty CLAY trace sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



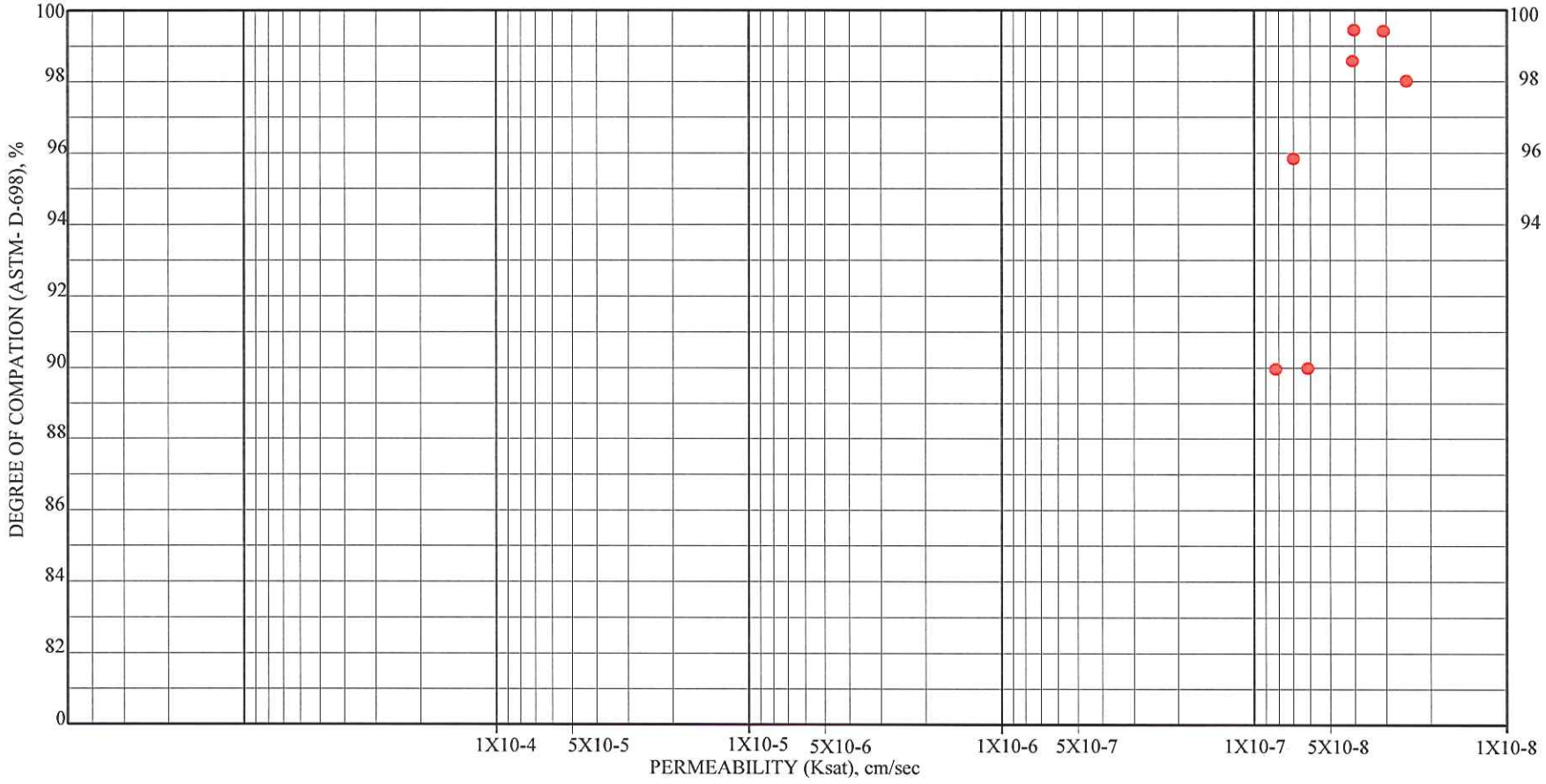

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 52.4 | 29.3 | 23.1 | 20.4 | 102.2 | 82.6 | 33 | CH | Brown and reddish brown silty CLAY little sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



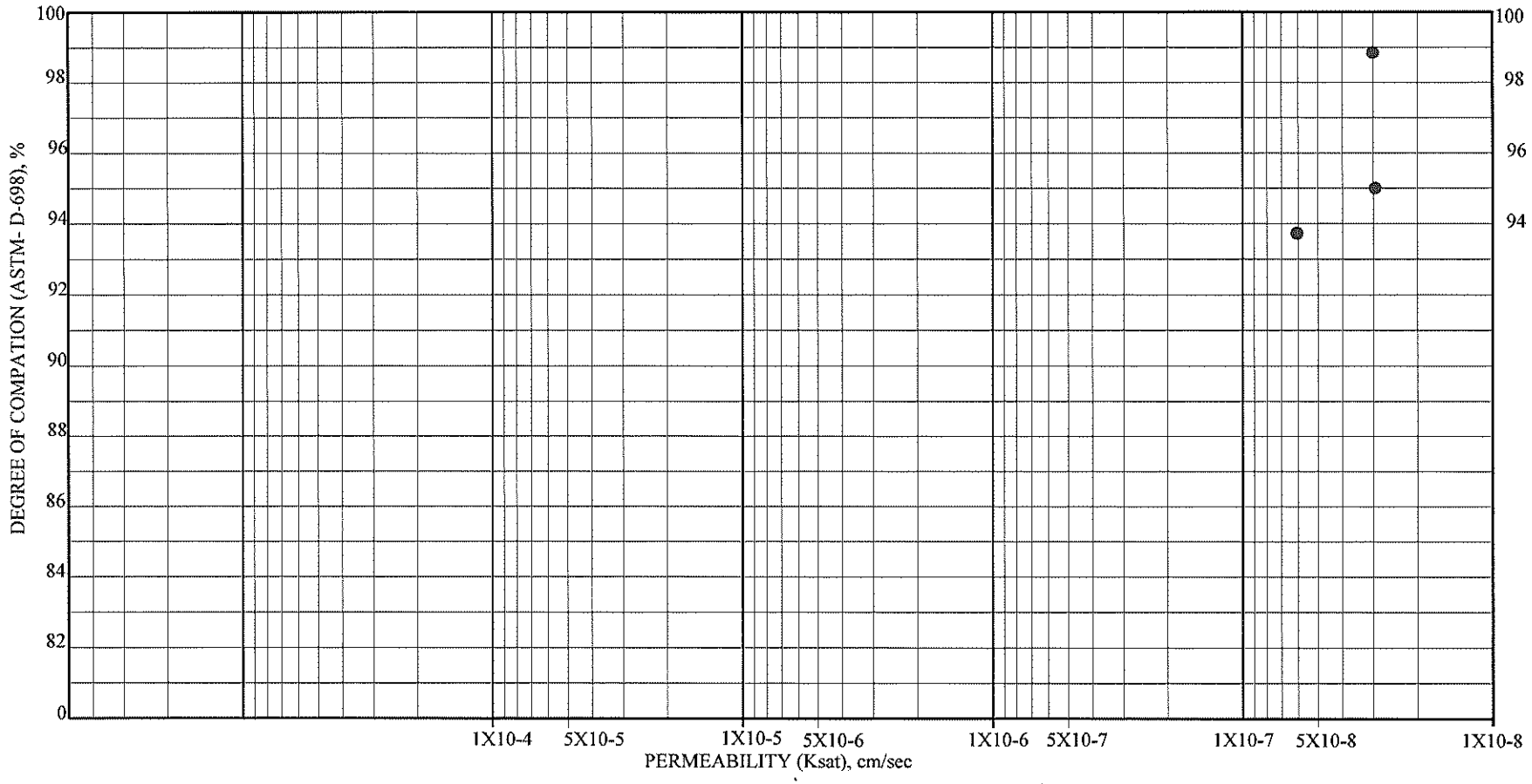

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 53.7 | 25.2 | 28.5 | 20.6 | 103.2 | 74.2 | 32 | CH | Light brown silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 19.8 | 103.6 | --- | --- | CH | Brown and gray silty CLAY, little sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 46.7 | 25.3 | 21.4 | 18.9 | 103.8 | 66.5 | 22 | CL | Light brown silty sandy CLAY |

**Attachment C: Soils with Max. Dry Density Ranging from 104.6pcf to 106.3pcf**

# ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

## FIELD MOISTURE DENSITY TEST PLOT

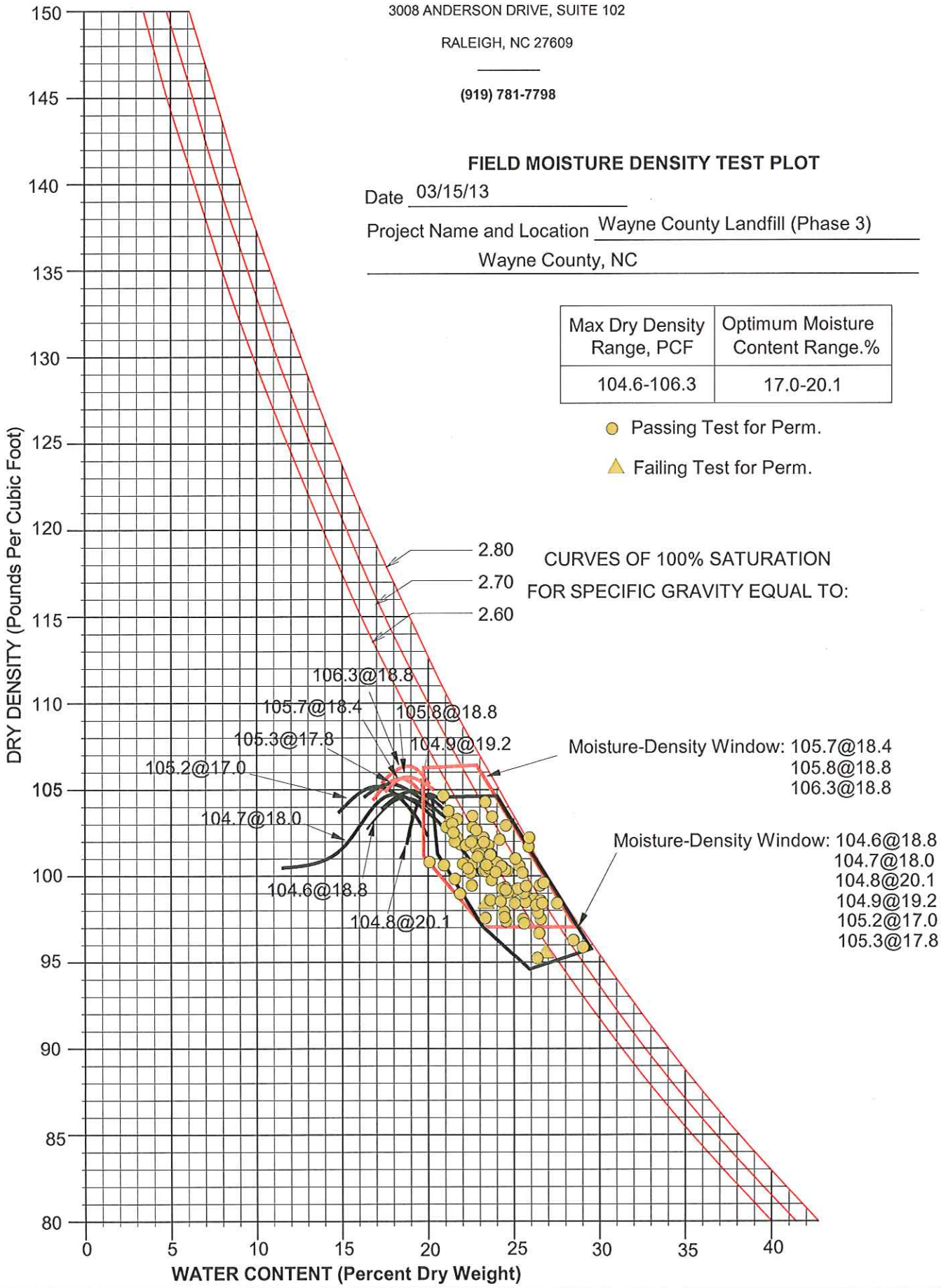
Date 03/15/13

Project Name and Location Wayne County Landfill (Phase 3)
Wayne County, NC

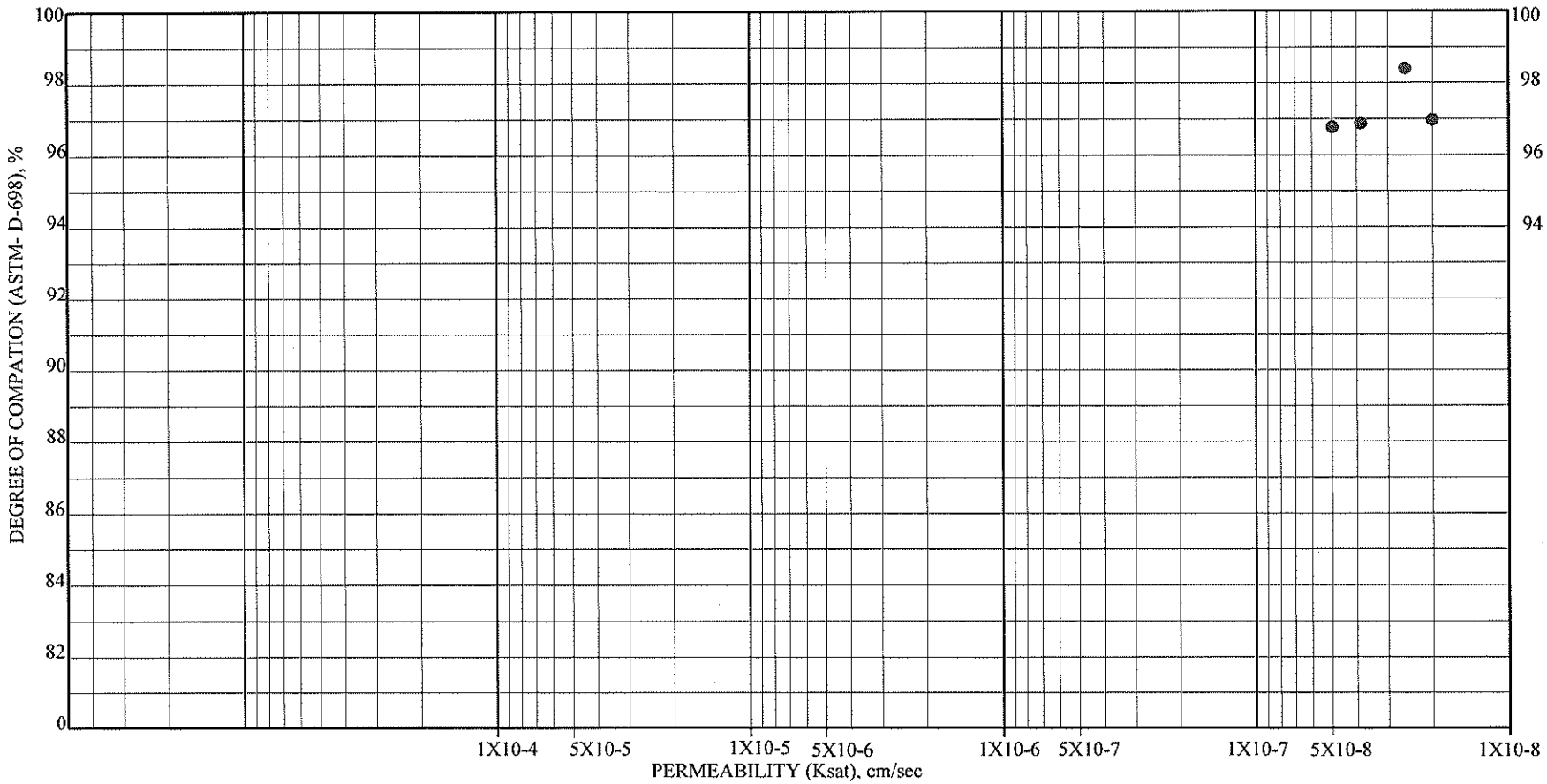
| Max Dry Density Range, PCF | Optimum Moisture Content Range.% |
|---|---|
| 104.6-106.3 | 17.0-20.1 |

● Passing Test for Perm.

▲ Failing Test for Perm.

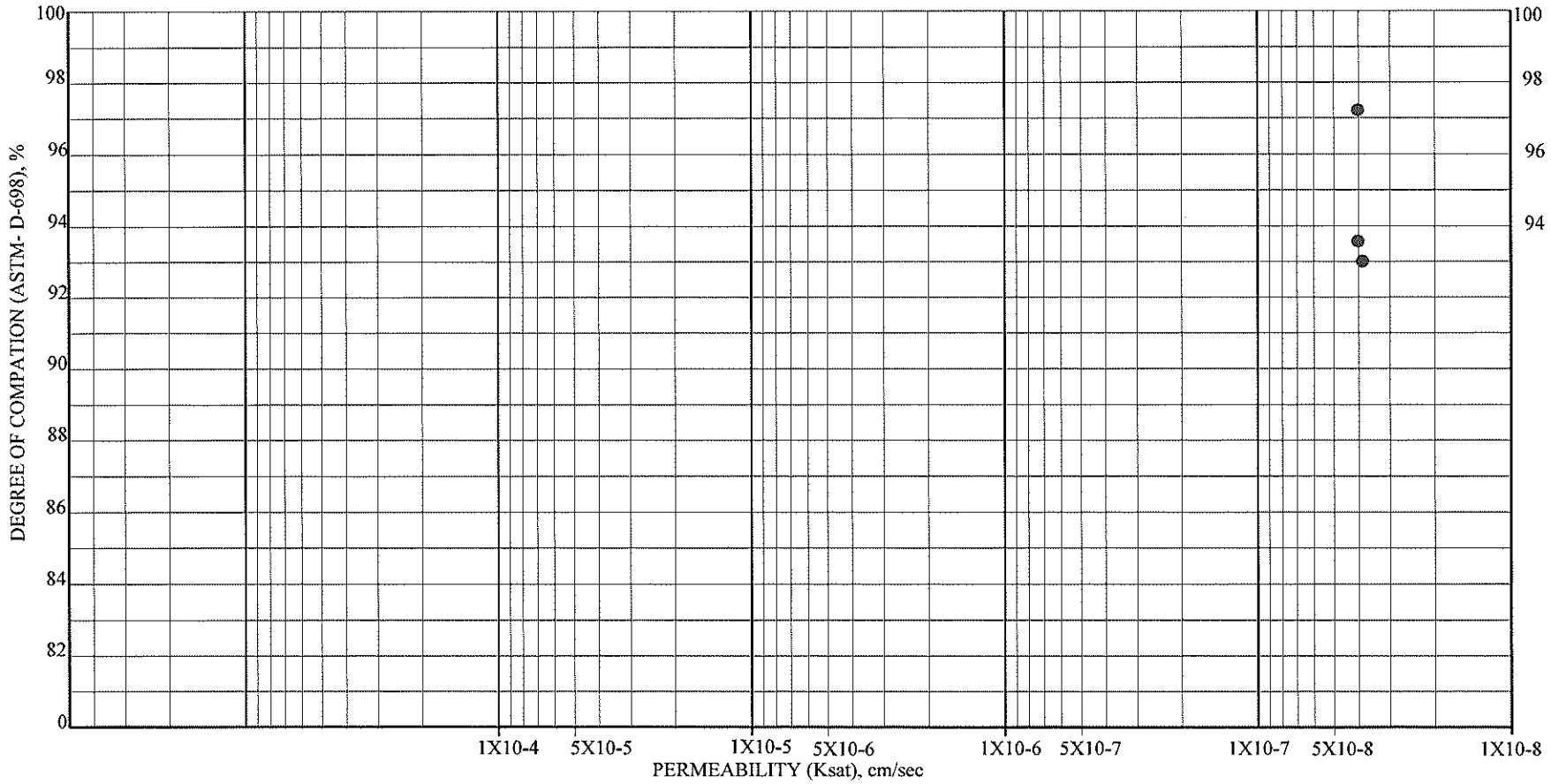


# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



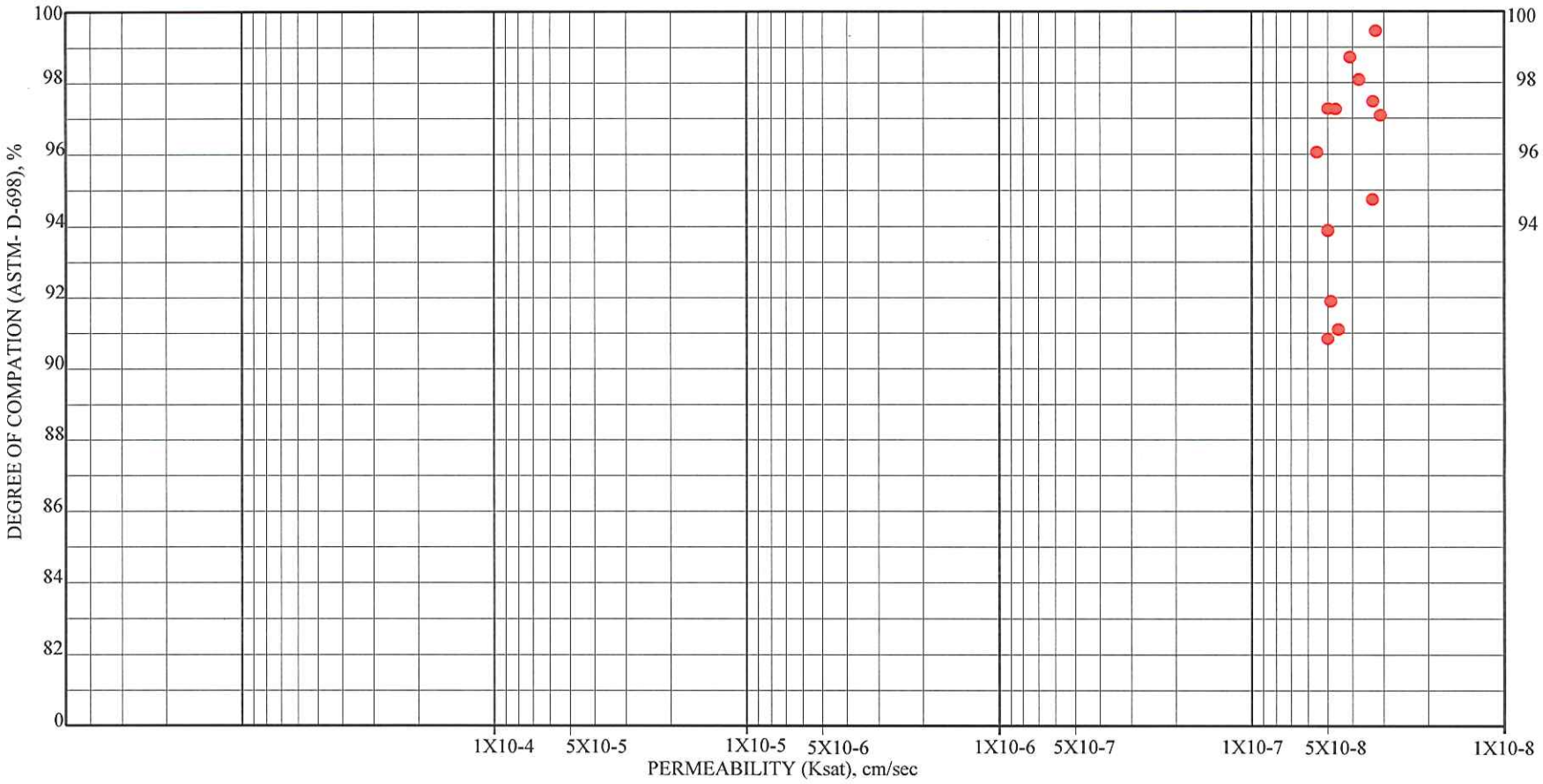

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 59.7 | 25.8 | 33.9 | 18.8 | 104.6 | 74.4 | 34 | CH | Brown, minor gray and red silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



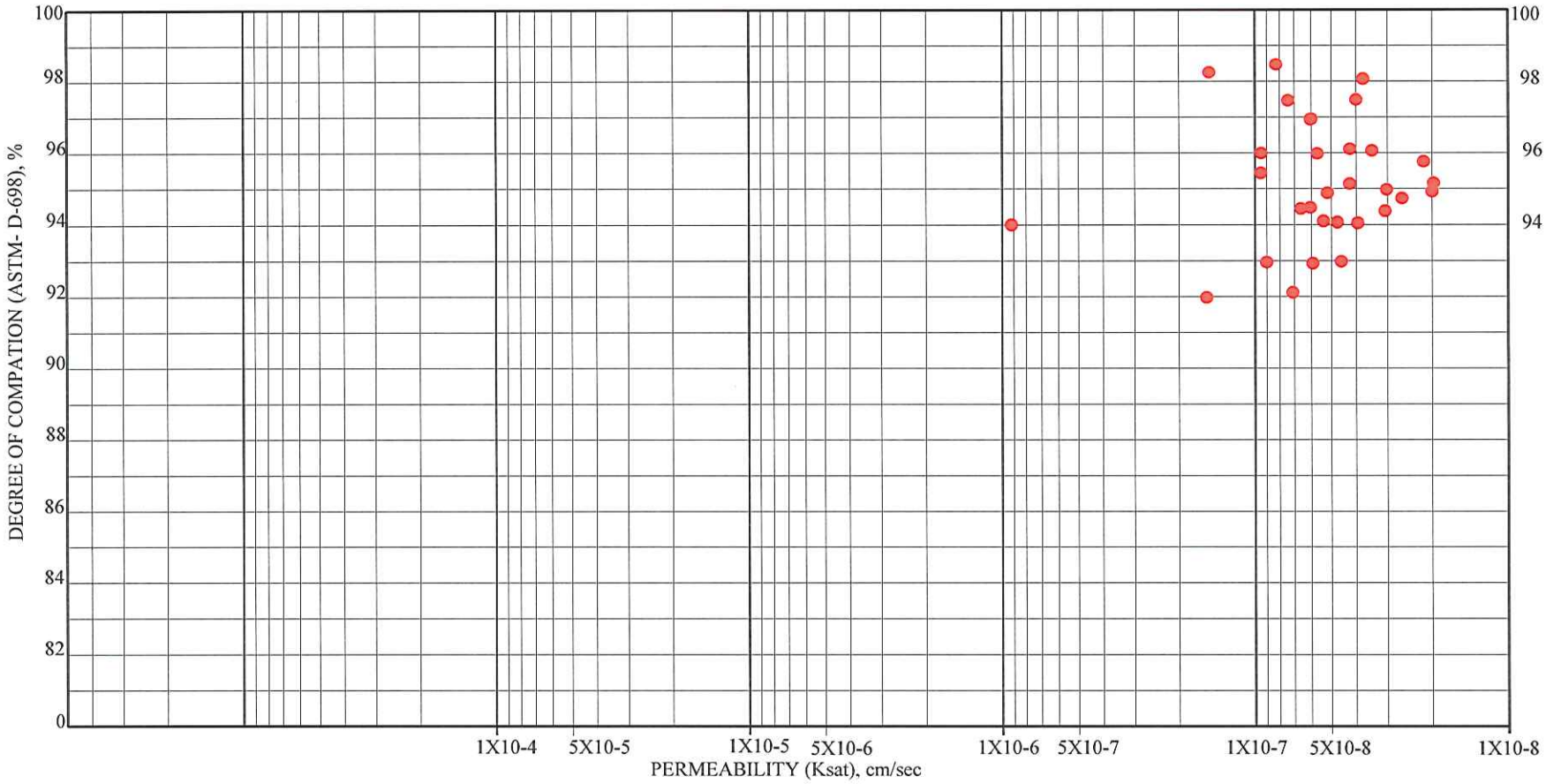

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 42 | 17 | 25 | 18.0 | 104.7 | 66.2 | 22 | CL | Brown, Maroon, & Gray silty sandy CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



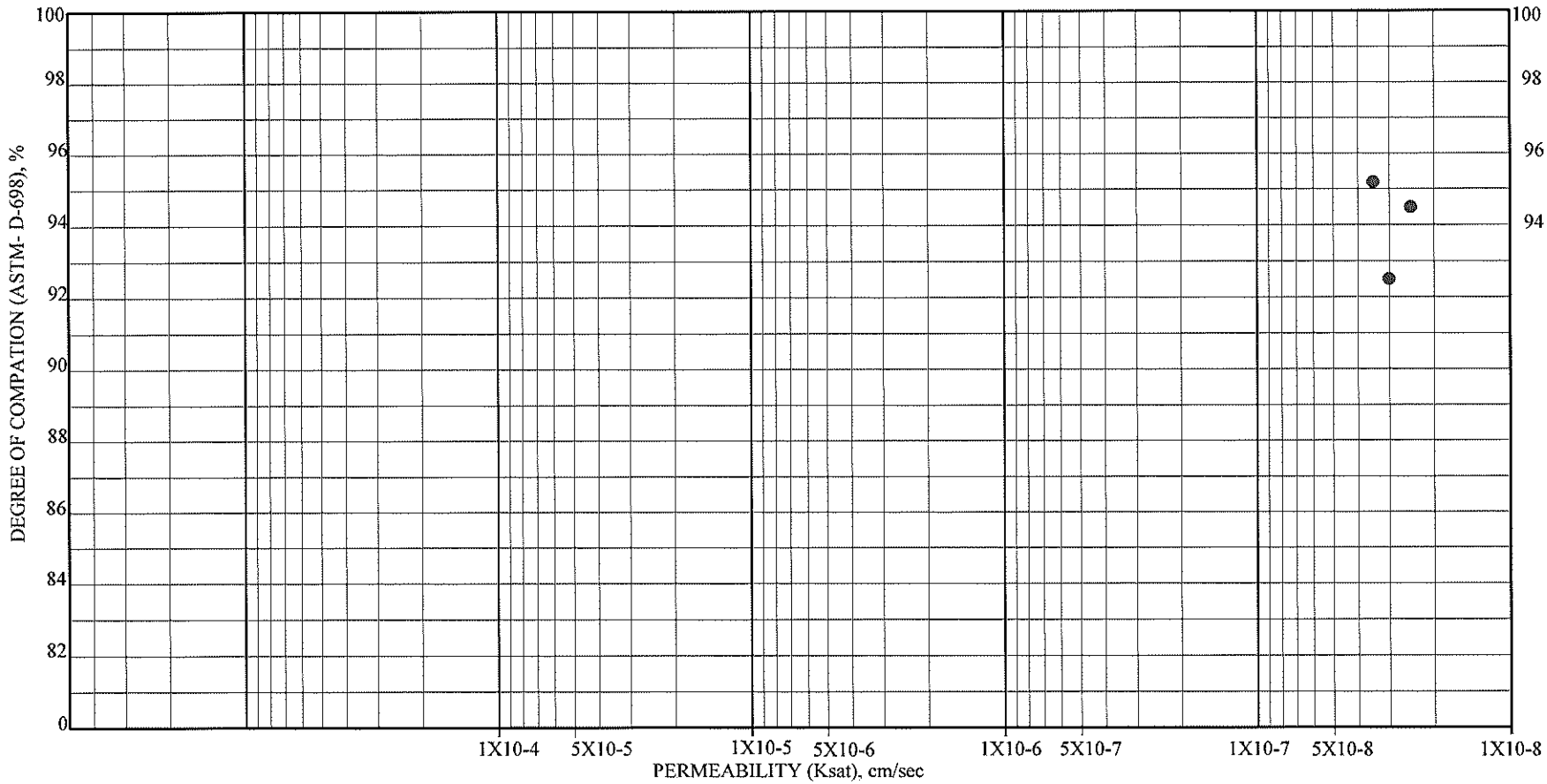

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 20.1 | 104.8 | --- | --- | CH | Brown, maroon, and gray silty CLAY little sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



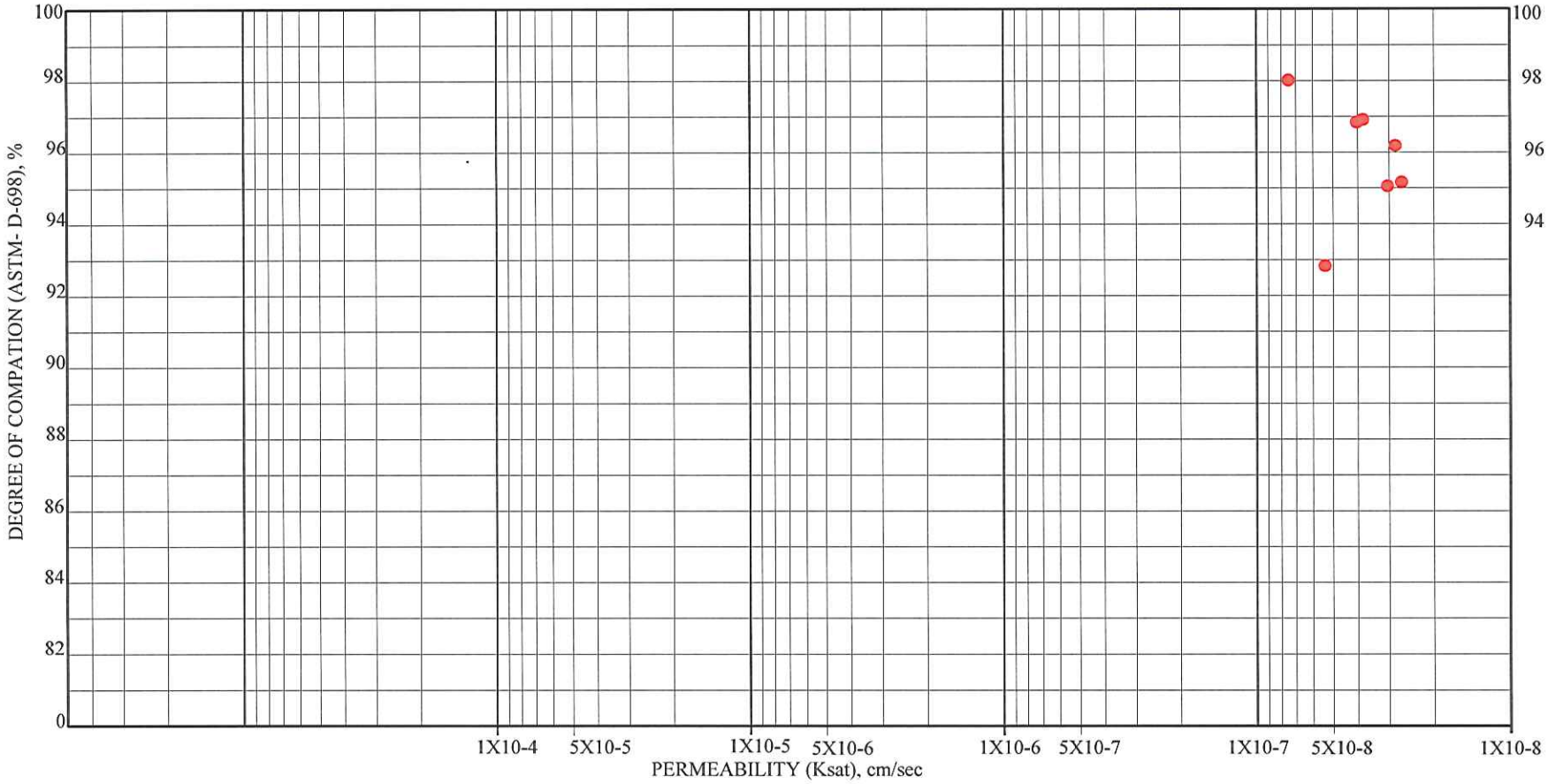

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 19.2 | 104.9 | --- | --- | CH | Brown silty CLAY, little sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



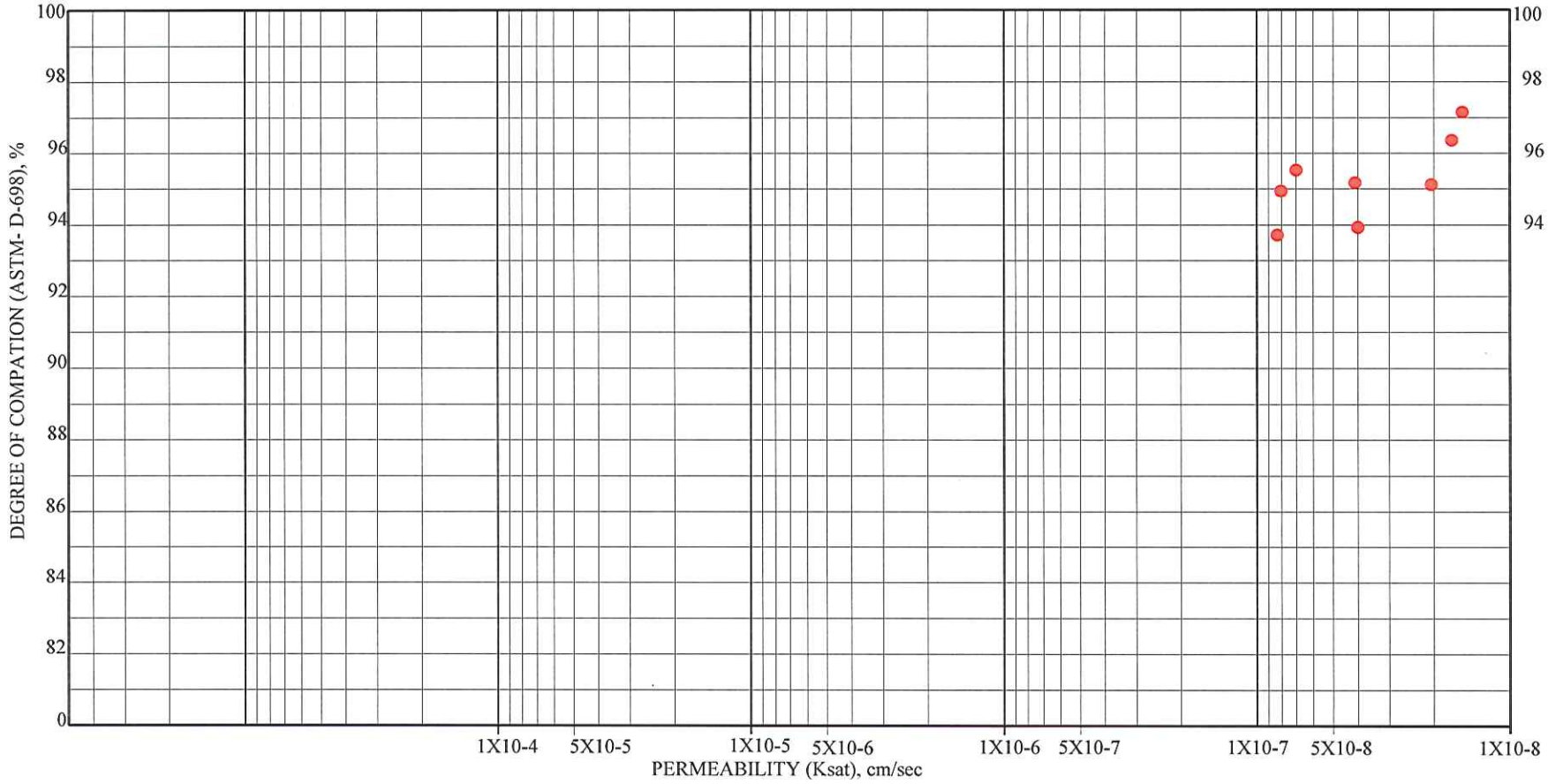

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 17.0 | 105.2 | — | — | CH | Brown, minor gray and red silty CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



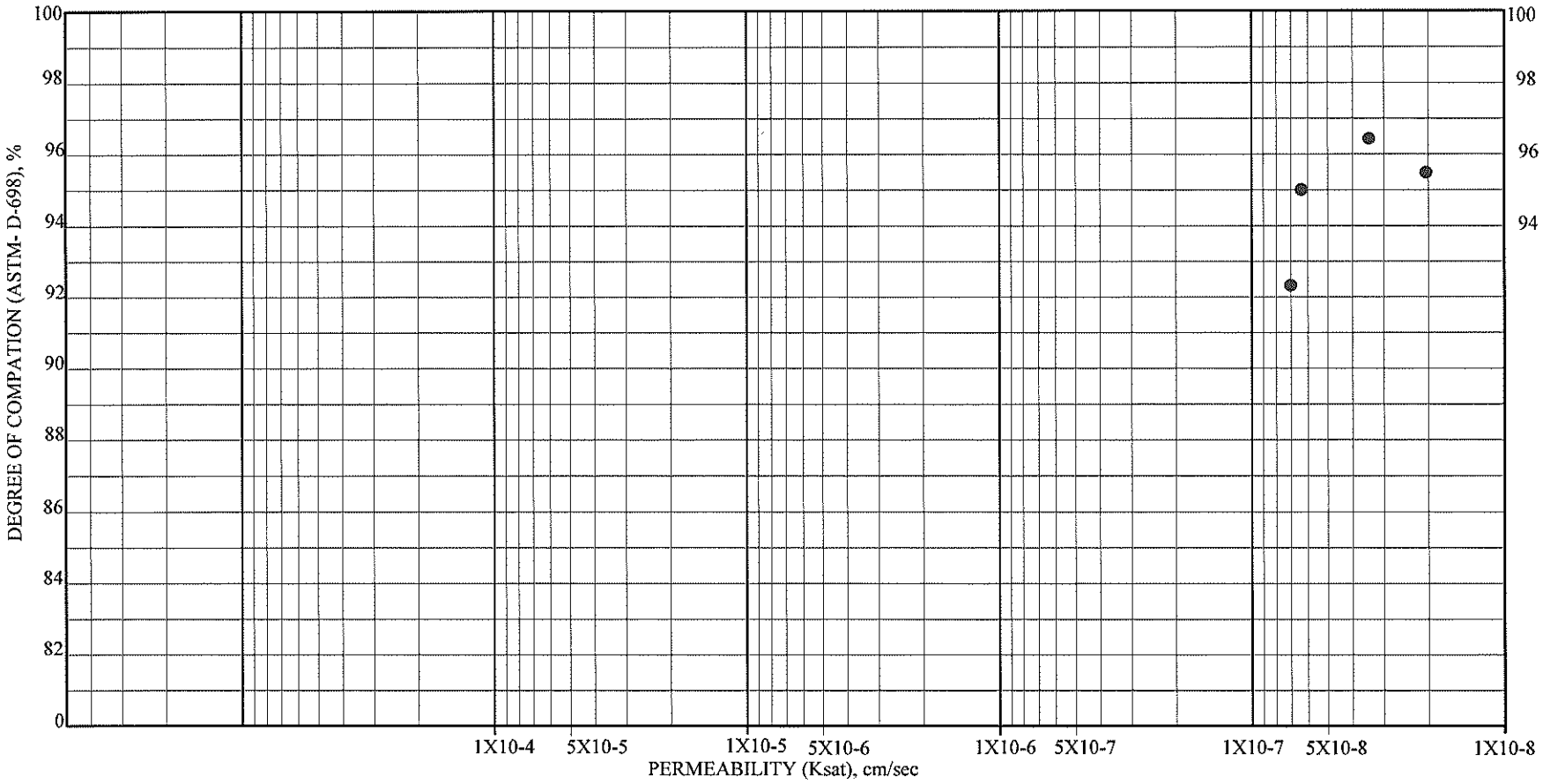

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 52.6 | 26.0 | 26.6 | 17.8 | 105.3 | 78.3 | 34 | CH | Brown silty CLAY, little sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



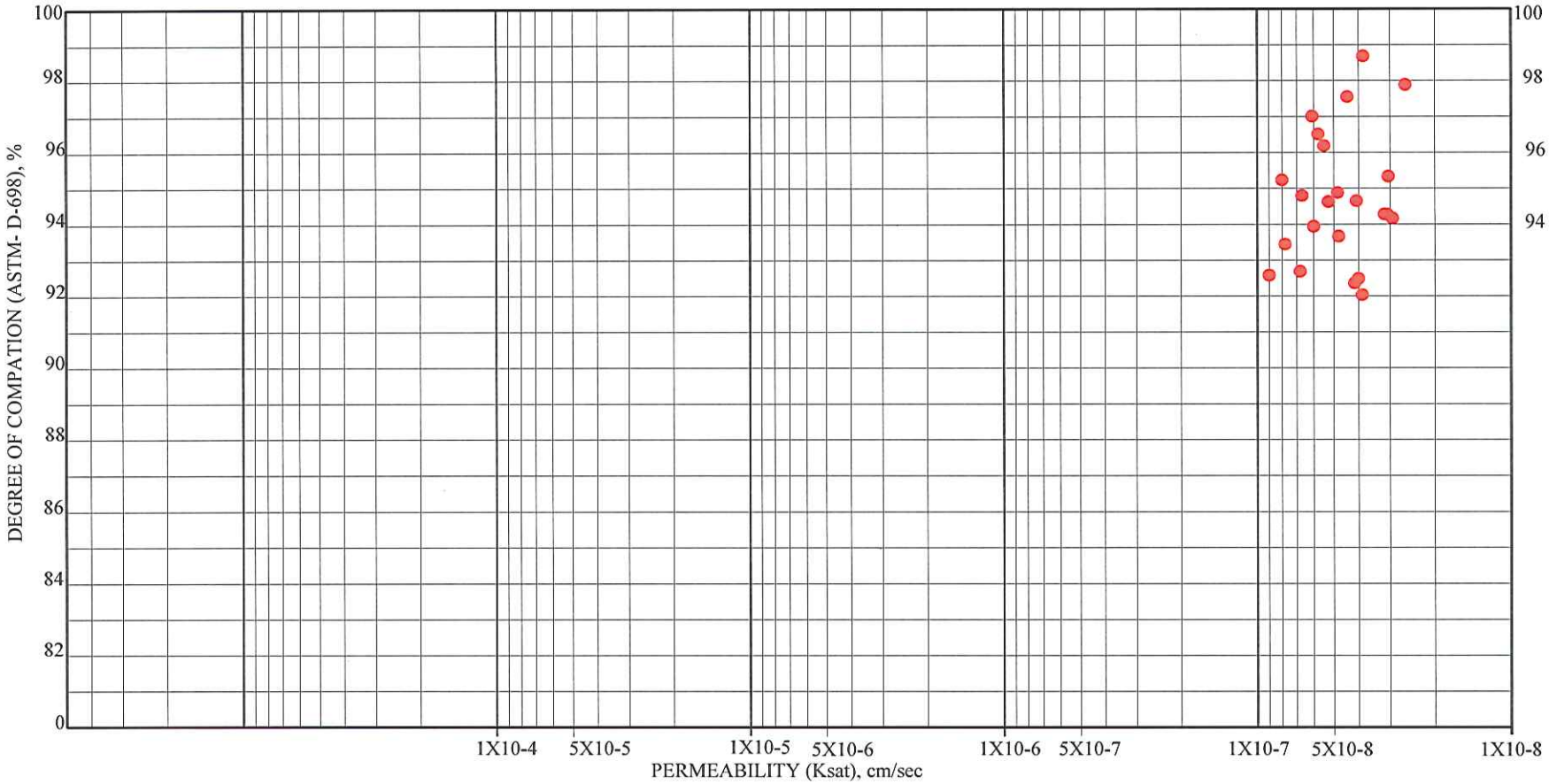

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 18.4 | 105.7 | --- | --- | CH | Gray, minor brown silty CLAY, little sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 18.8 | 105.8 | --- | --- | CH | Brown silty CLAY, little sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 18.8 | 106.3 | --- | --- | CH | Reddish-brown and gray silty CLAY some sand |

**Attachment D: Soils with Max. Dry Density Ranging from 107.1pcf to 108.8pcf**

# ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

## FIELD MOISTURE DENSITY TEST PLOT

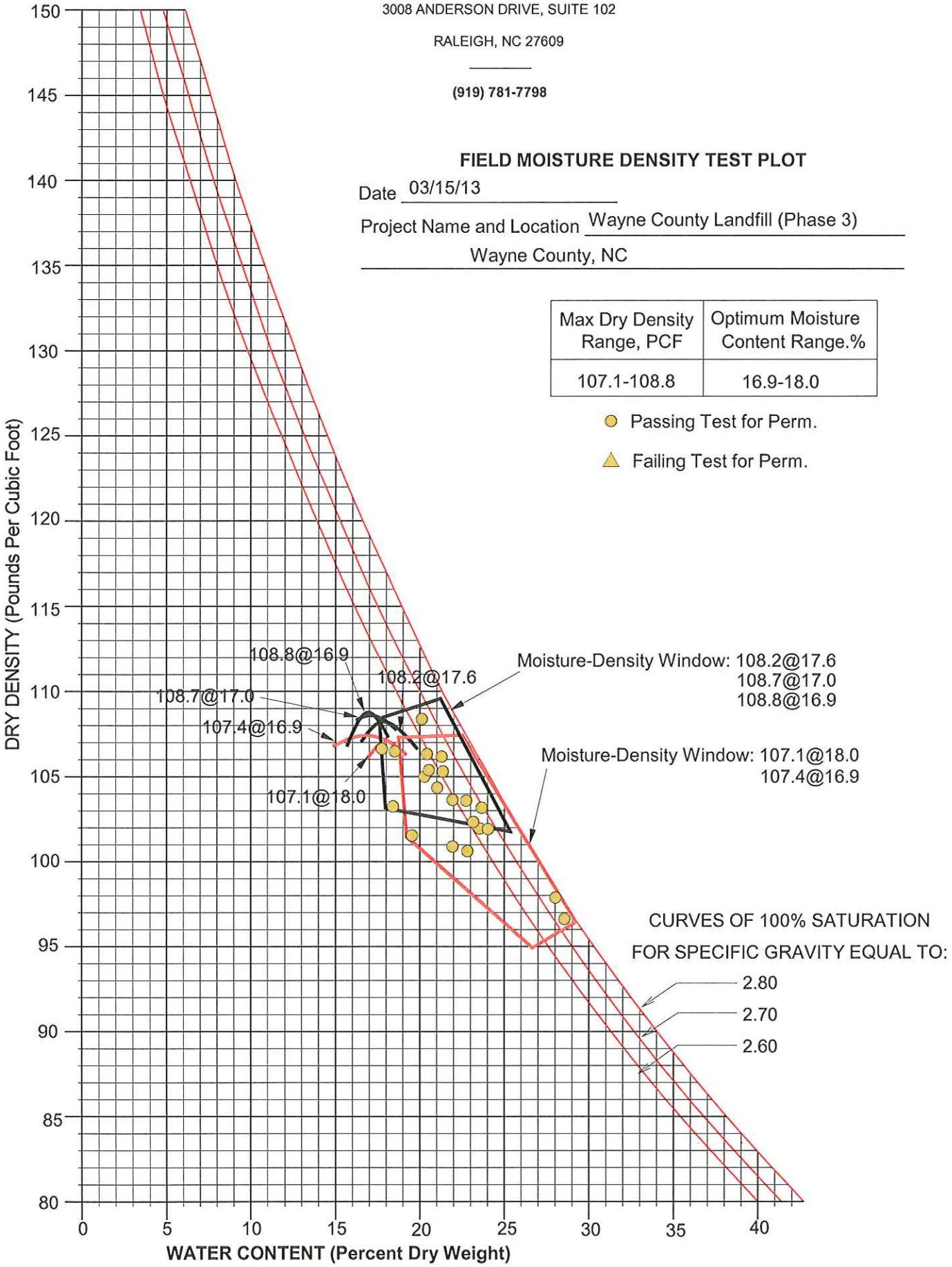
Date 03/15/13

Project Name and Location Wayne County Landfill (Phase 3)
Wayne County, NC

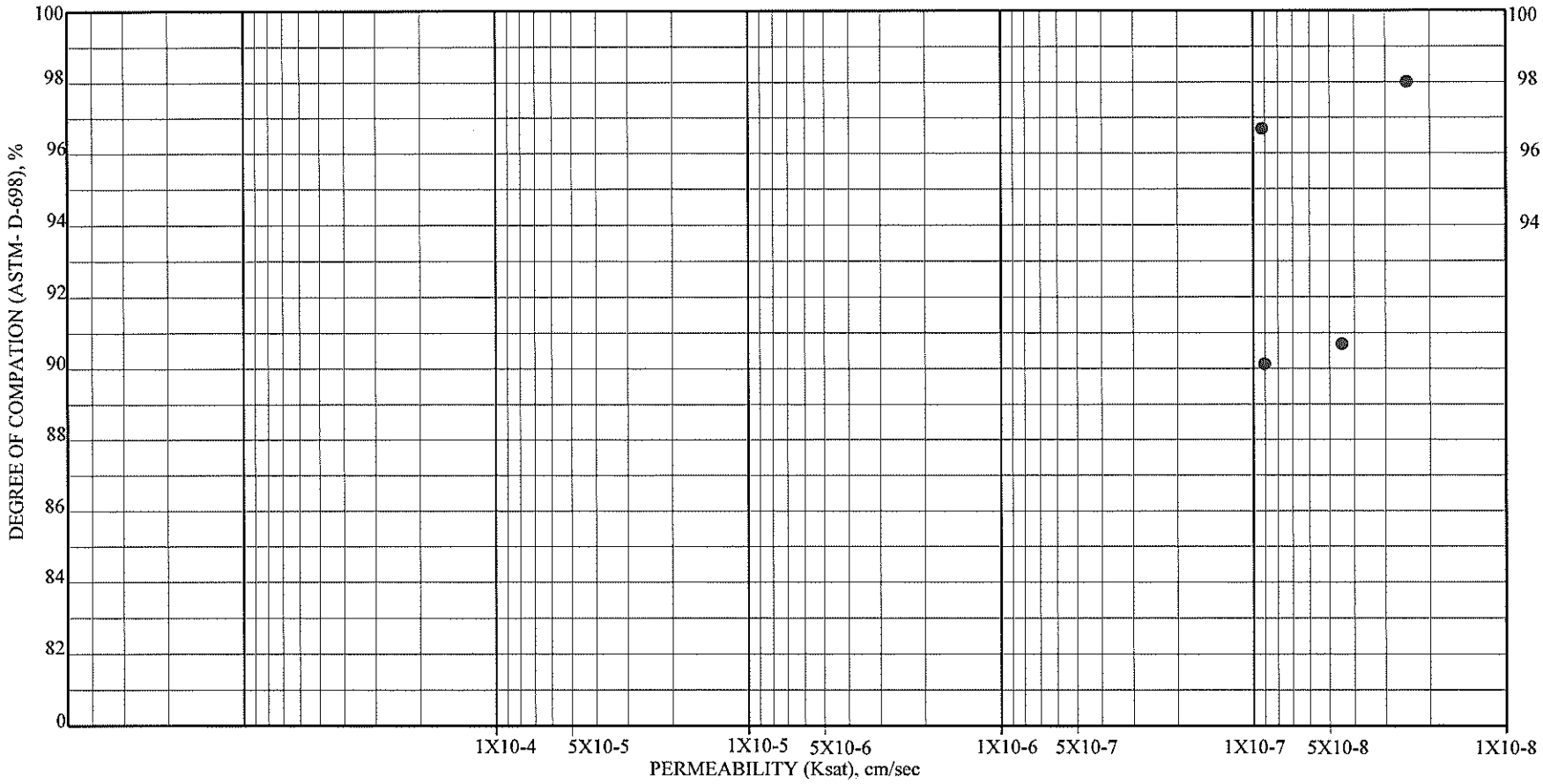
| Max Dry Density Range, PCF | Optimum Moisture Content Range.% |
|---|---|
| 107.1-108.8 | 16.9-18.0 |

● Passing Test for Perm.

▲ Failing Test for Perm.

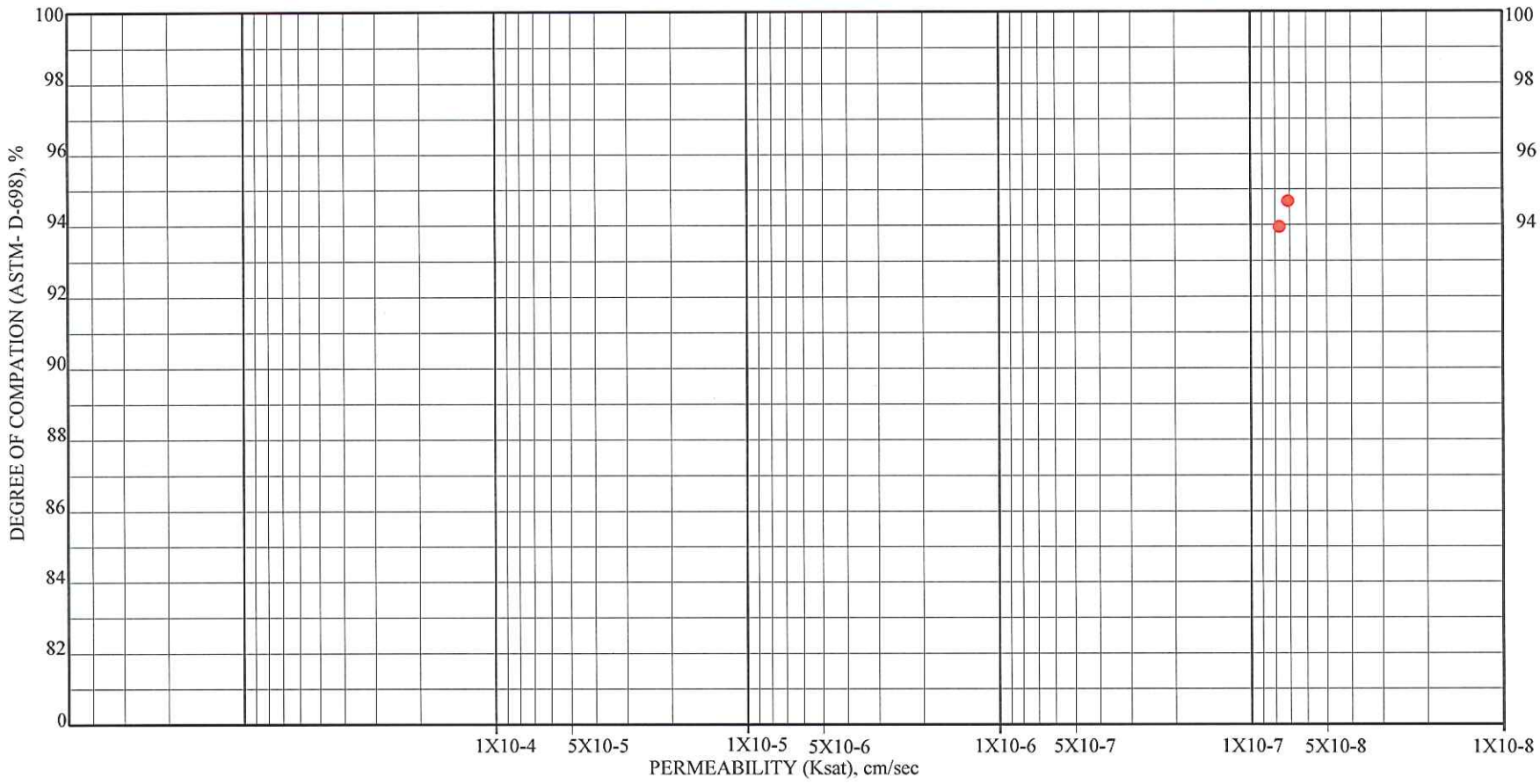


# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



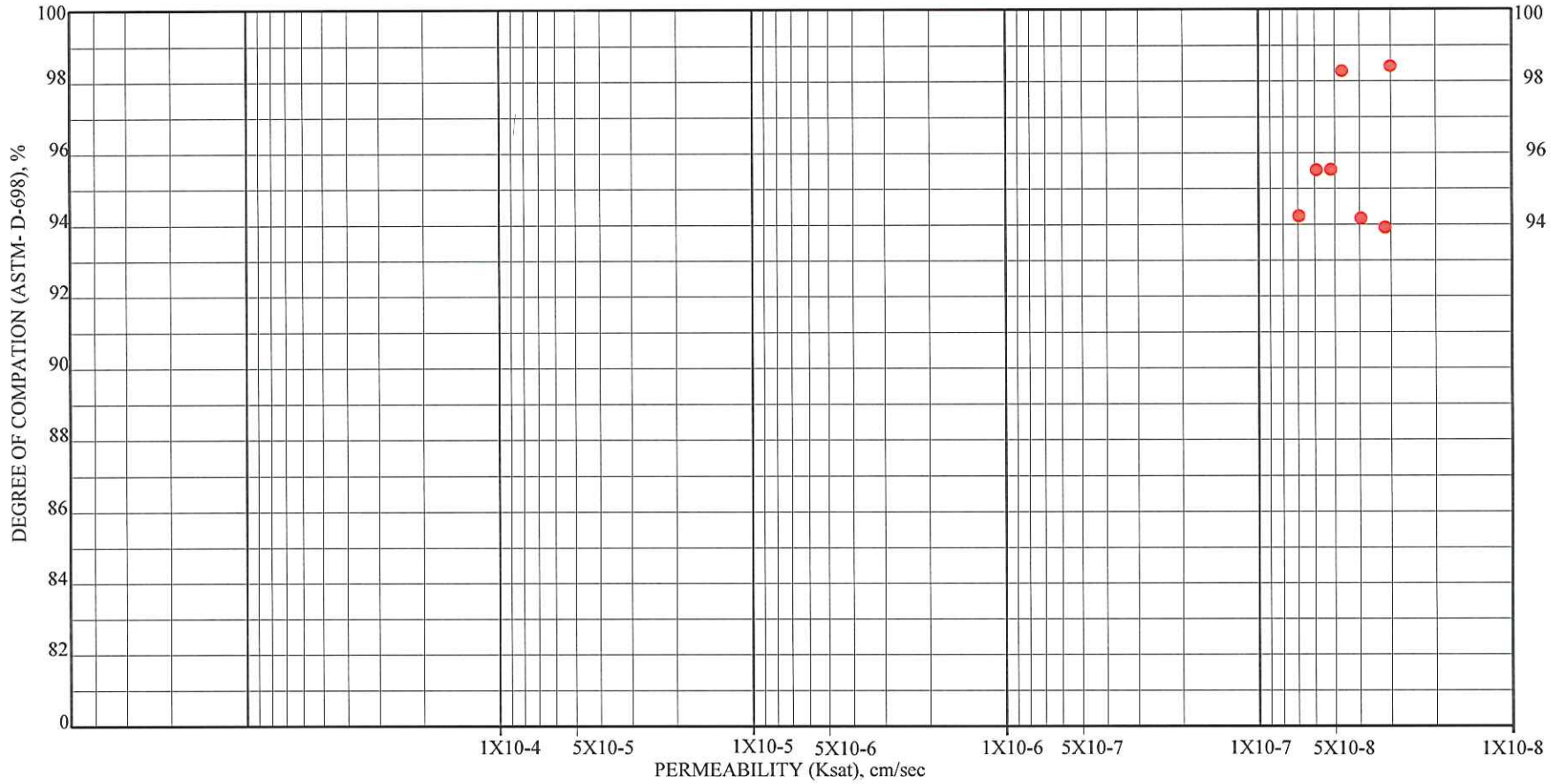

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 18.0 | 107.1 | --- | --- | CH | Brown and light gray silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



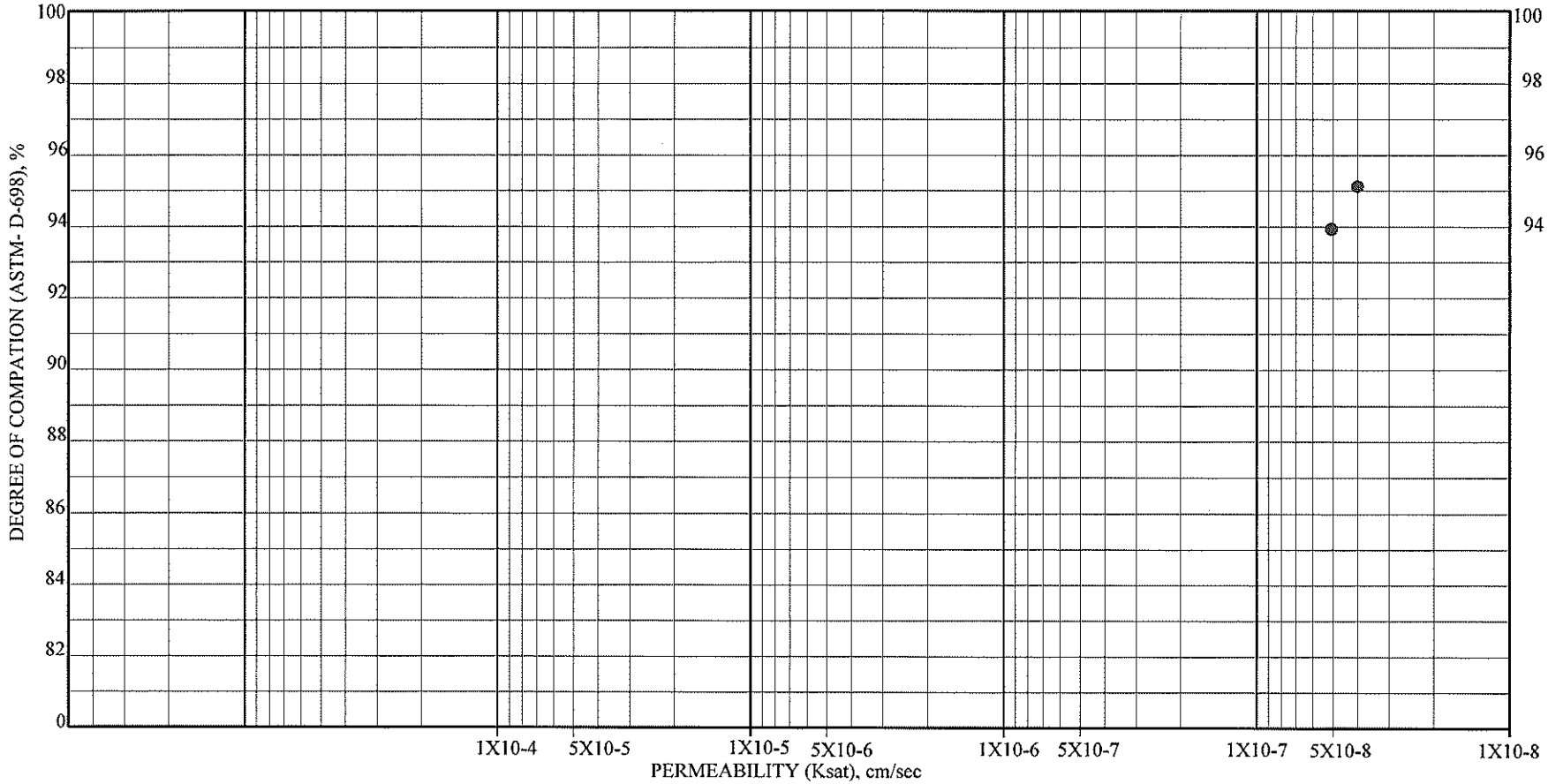

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 50.0 | 22.3 | 27.7 | 16.9 | 107.4 | 80.4 | 28 | CL/CH | Light brown, minor red silty CLAY, |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



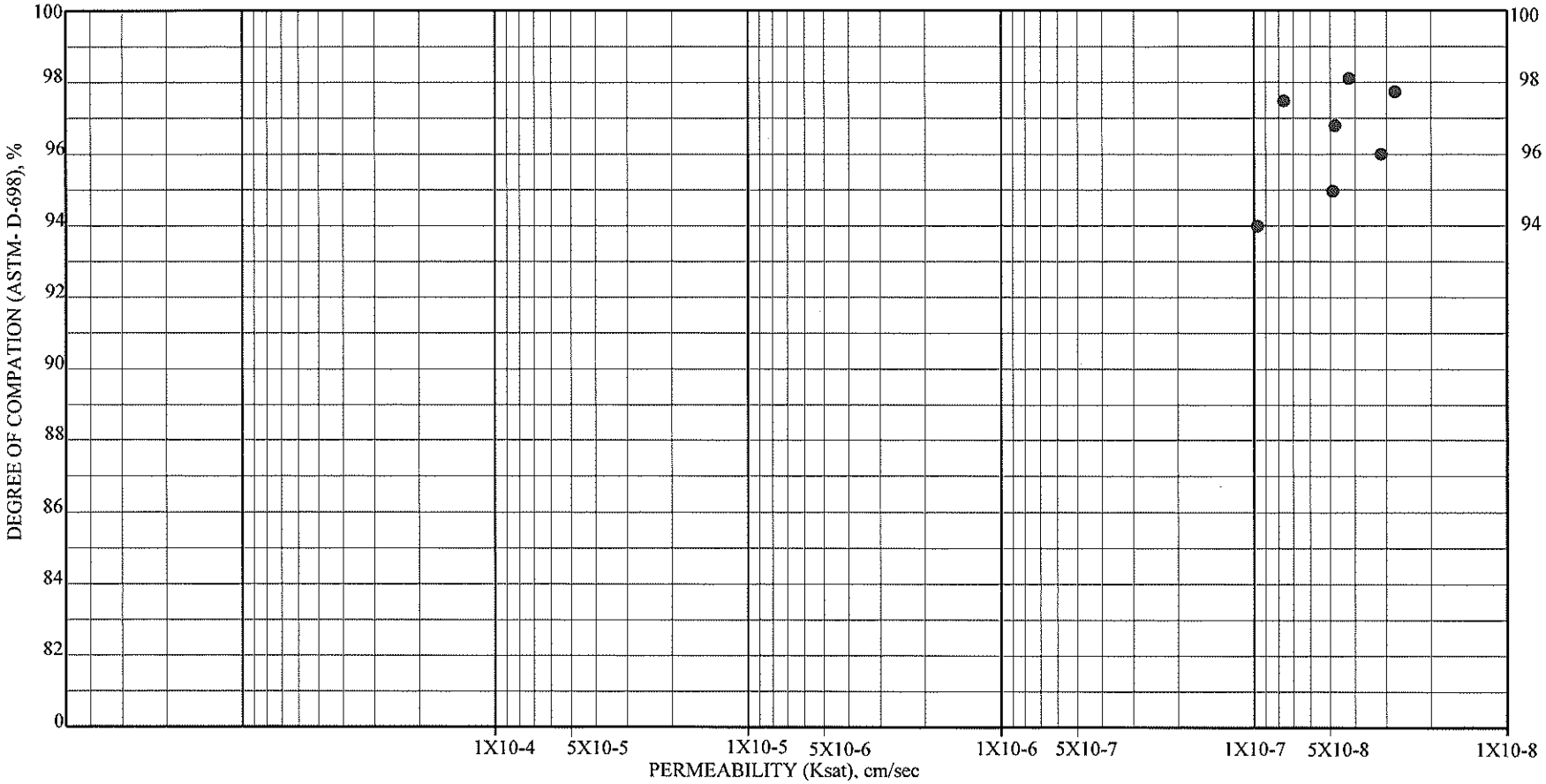

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 47.6 | 24.5 | 23.1 | 17.6 | 108.2 | 65.3 | 39.3 | CL | Light brown and red, silty sandy CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 17.0 | 108.7 | --- | --- | CH | Light brown, minor red silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 43.2 | 24.4 | 28.5 | 16.9 | 108.8 | 67.6 | 23 | CL | Brown and light gray silty sandy CLAY |

**Attachment E: Soils with Max. Dry Density Ranging from 109.2pcf to 110.7pcf**

# ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

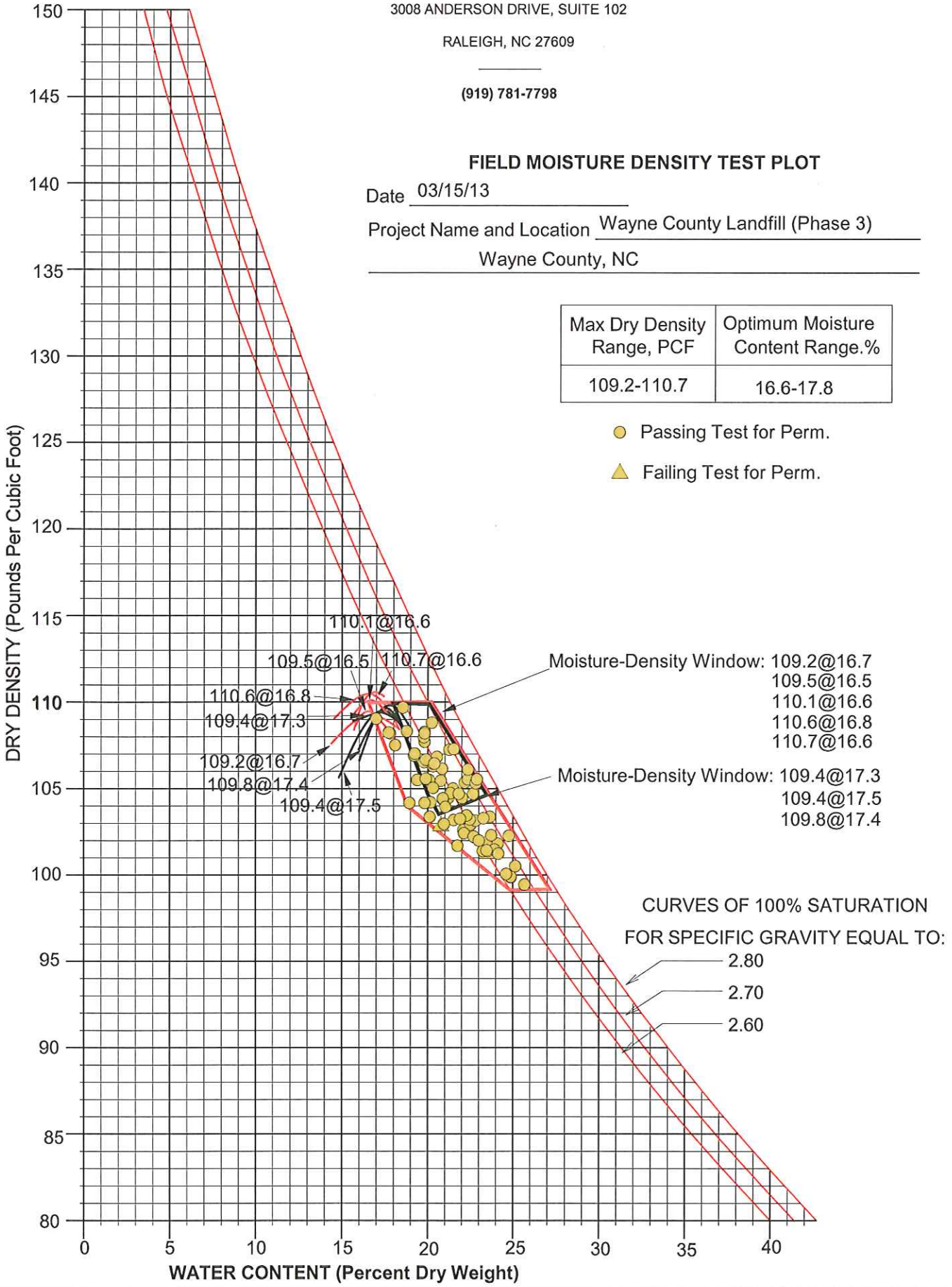
## FIELD MOISTURE DENSITY TEST PLOT

Date 03/15/13

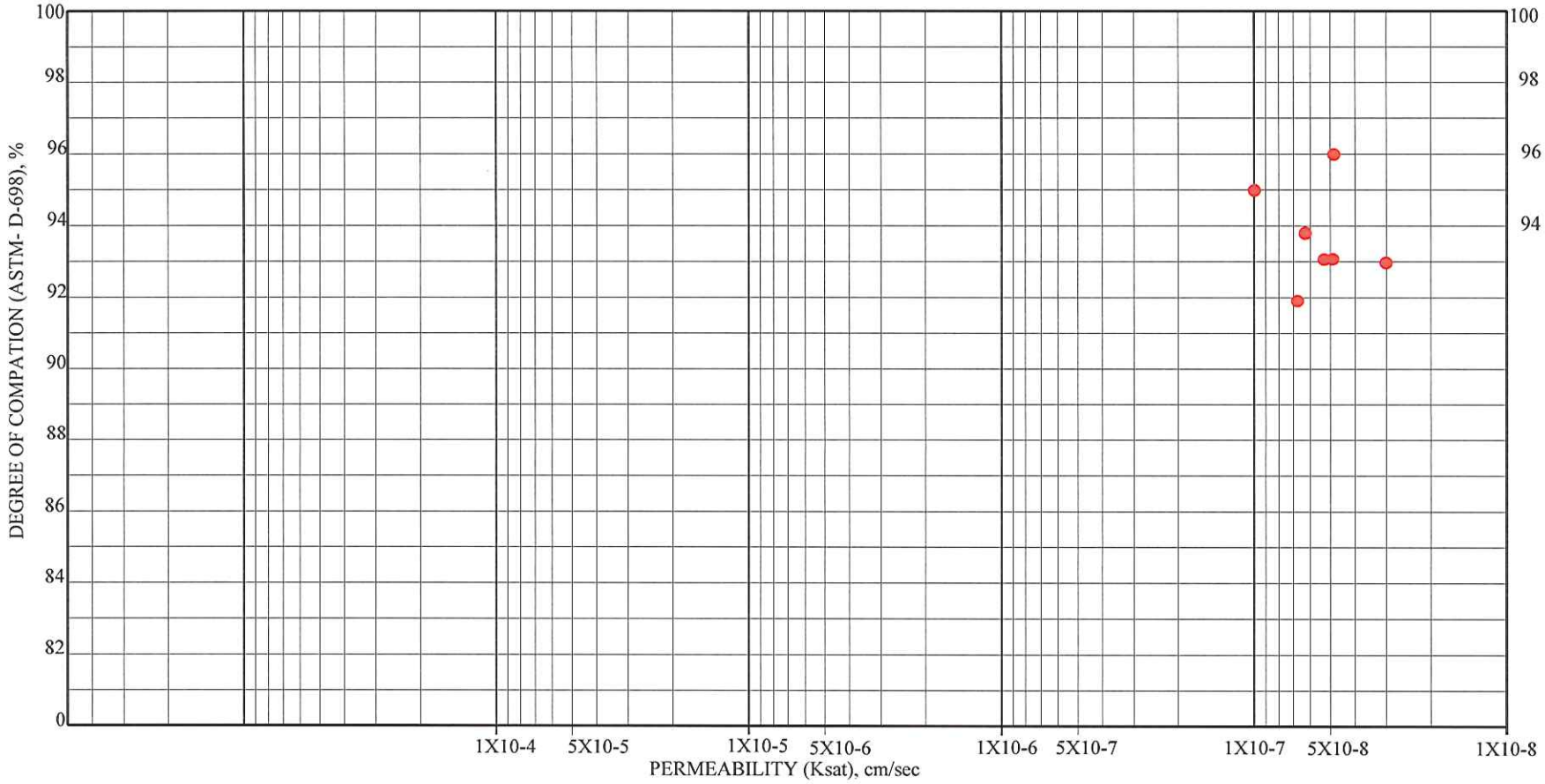
Project Name and Location Wayne County Landfill (Phase 3)

Wayne County, NC

| Max Dry Density Range, PCF | Optimum Moisture Content Range.% |
|---|---|
| 109.2-110.7 | 16.6-17.8 |

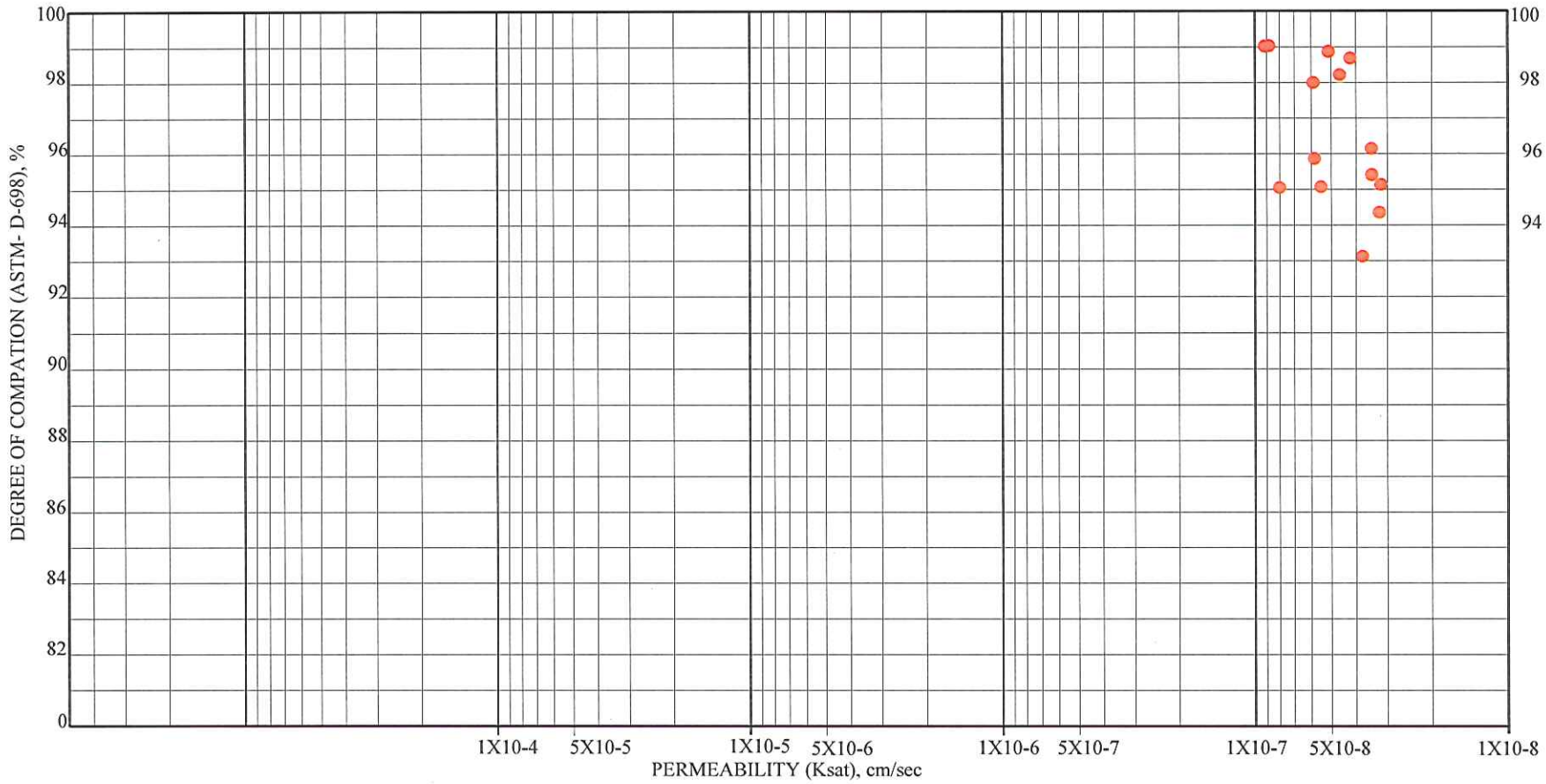


# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



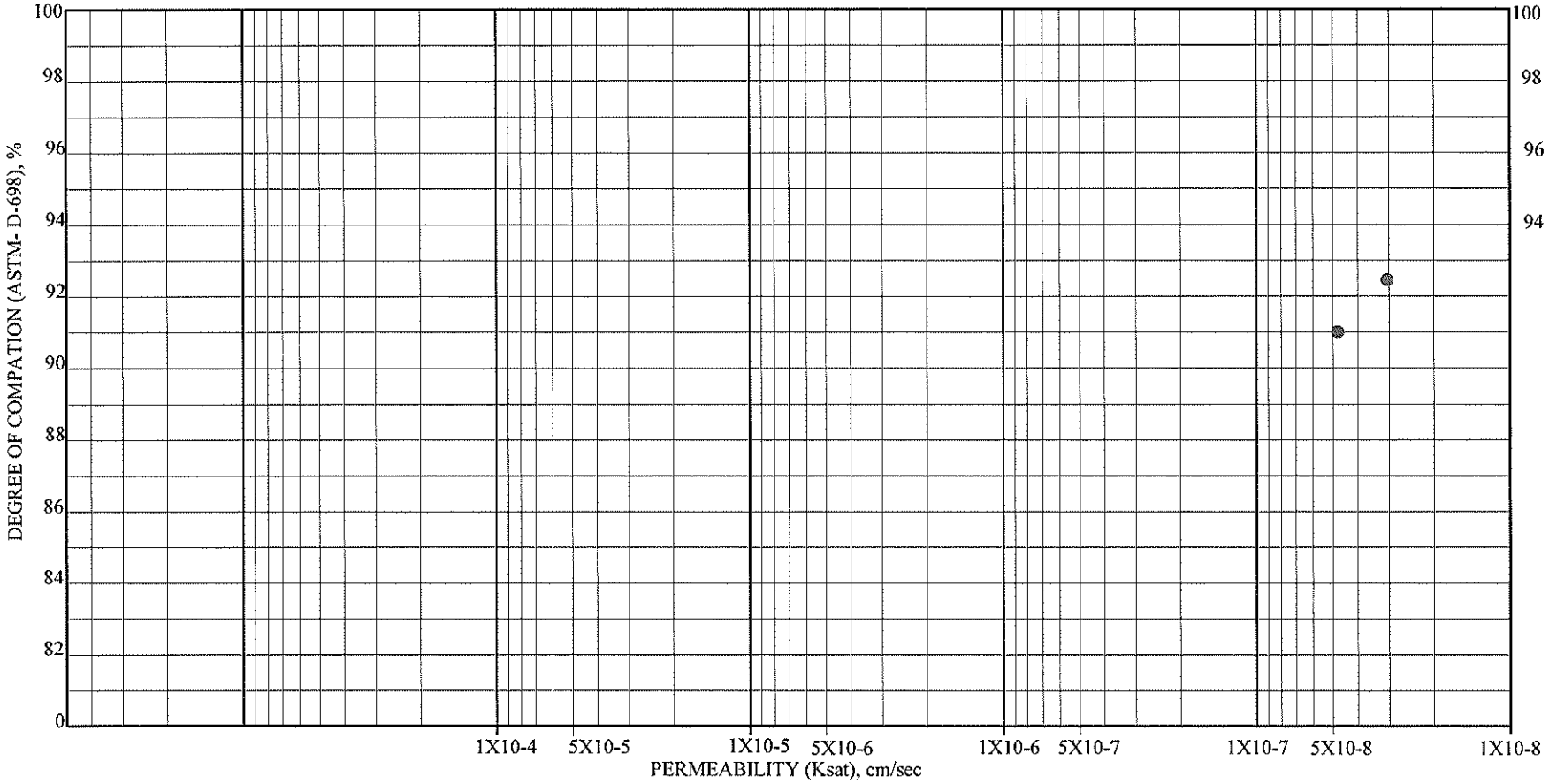

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 16.7 | 109.2 | --- | --- | CH | Brown minor gray silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



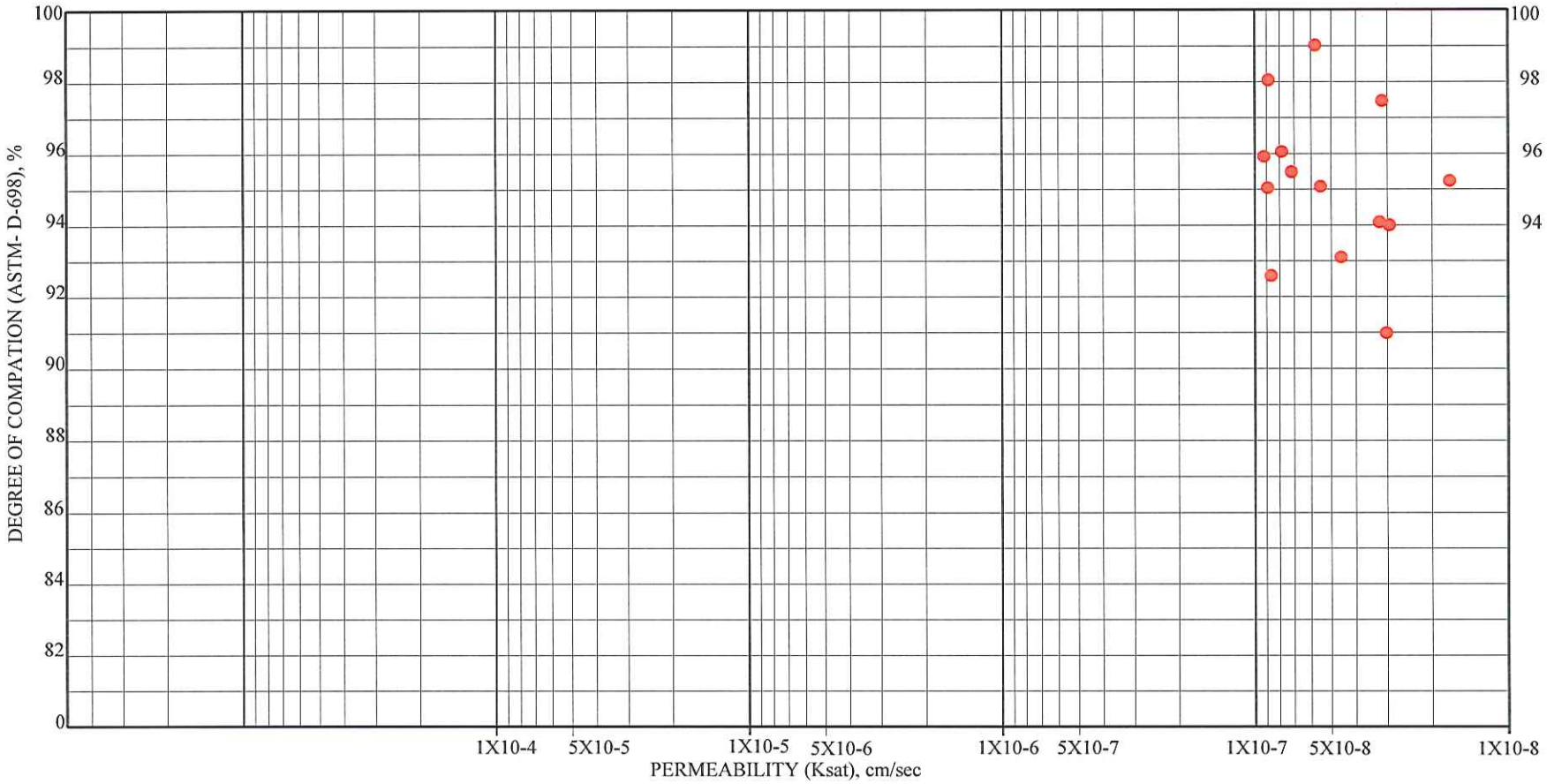

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 51.0 | 21.1 | 29.9 | 17.5 | 109.4 | 63.2 | 30 | CH | Brown, maroon, and gray silty CLAY, some sand |
| -- | -- | -- | 17.3 | 109.4 | -- | -- | CH | Brown, maroon and gray silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



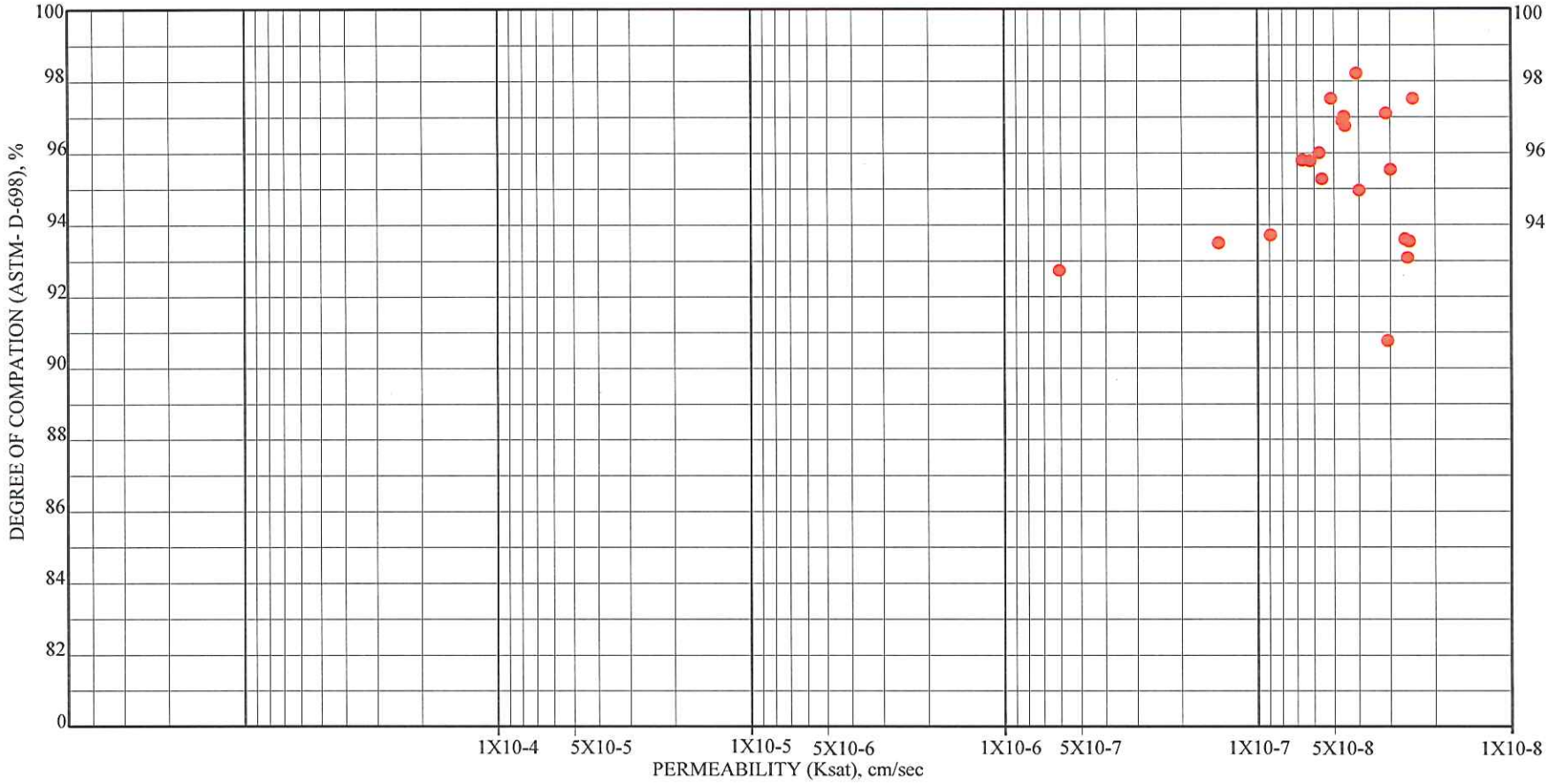

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 16.5 | 109.5 | --- | --- | CH | Brown, minor gray and maroon silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



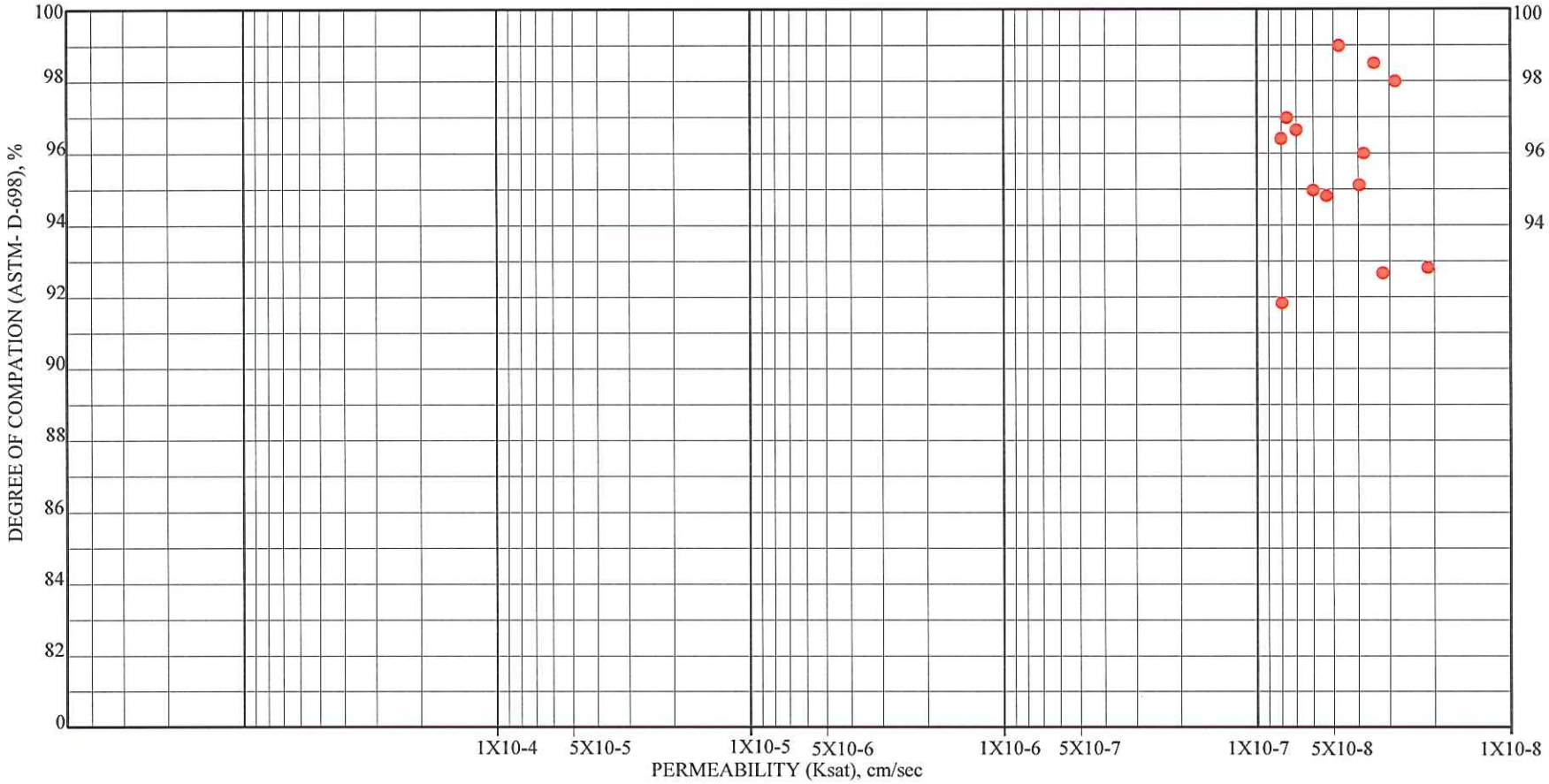

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 51.0 | 27.0 | 24.0 | 17.4 | 109.8 | 73.7 | 27 | CH/MH | Brownminor gray silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



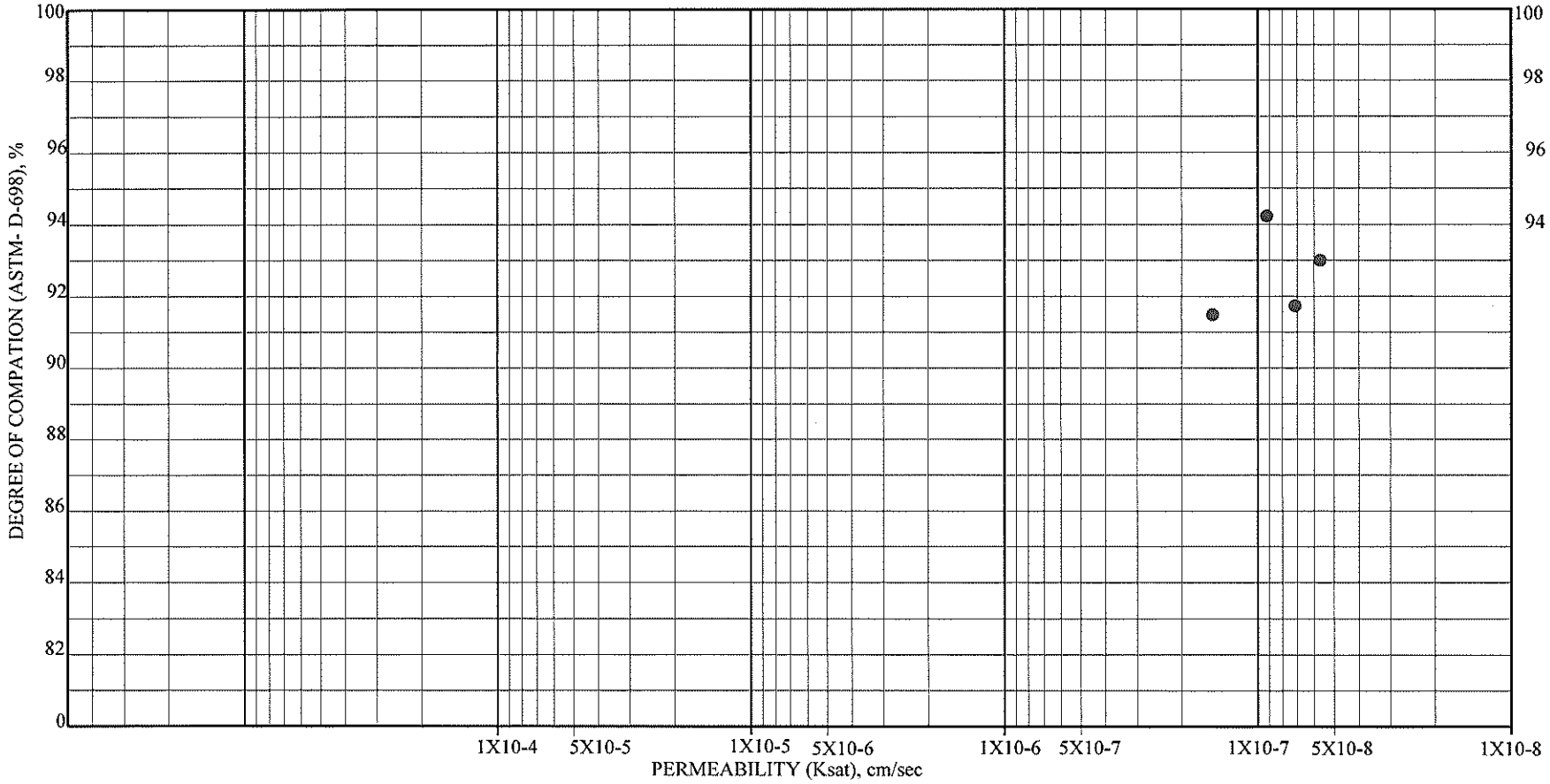

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 16.6 | 110.1 | --- | --- | CH | Light brown, minor gray silty sandy CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 16.8 | 110.6 | --- | --- | CH | Brown, maroon and gray silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 16.6 | 110.7 | --- | --- | CH | Brown and light gray silty CLAY, some sand |

**Attachment F: Soils with Max. Dry Density Ranging from 111.0pcf to 112.0pcf**

# ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

## FIELD MOISTURE DENSITY TEST PLOT

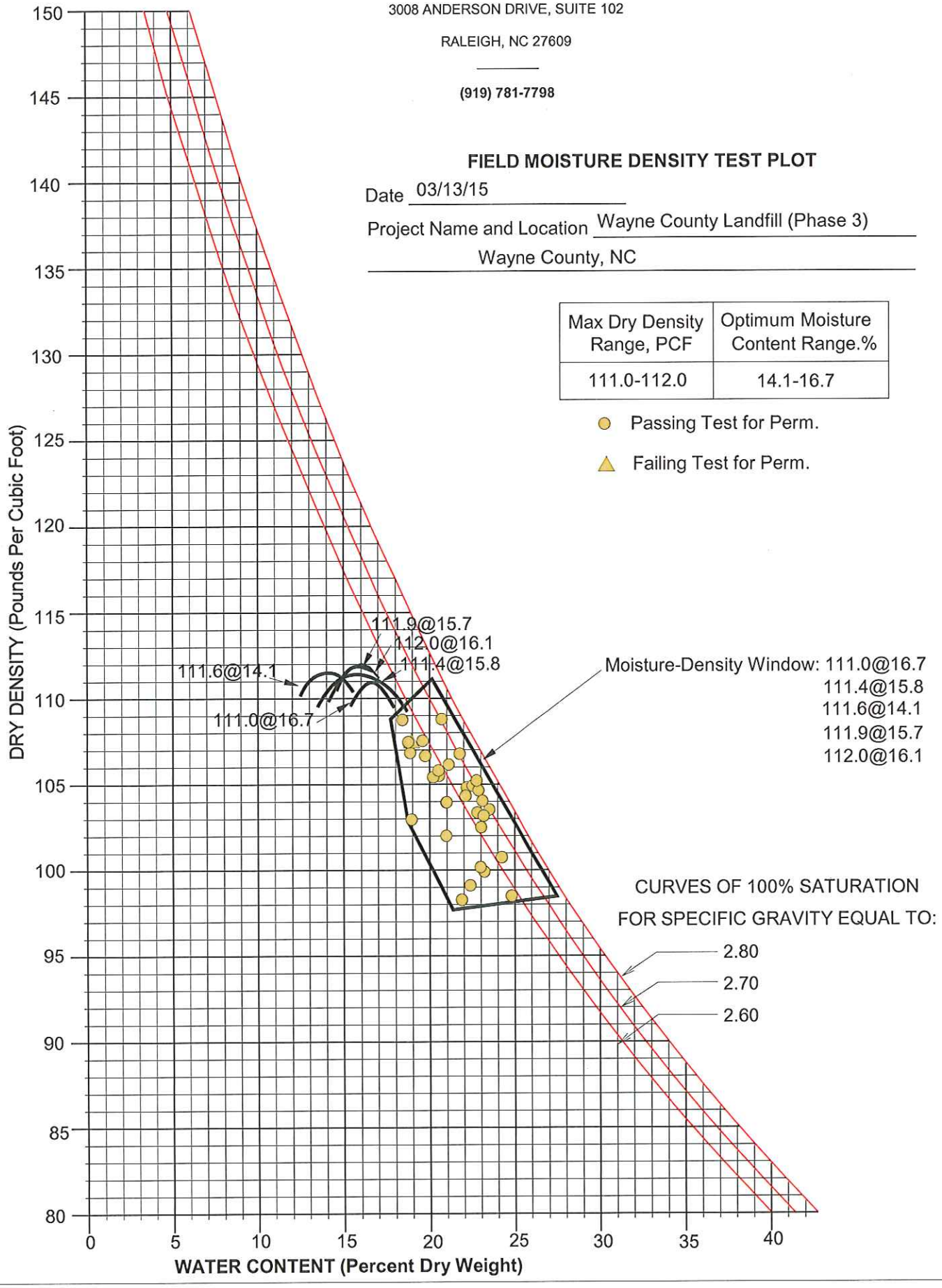
Date 03/13/15

Project Name and Location Wayne County Landfill (Phase 3)
Wayne County, NC

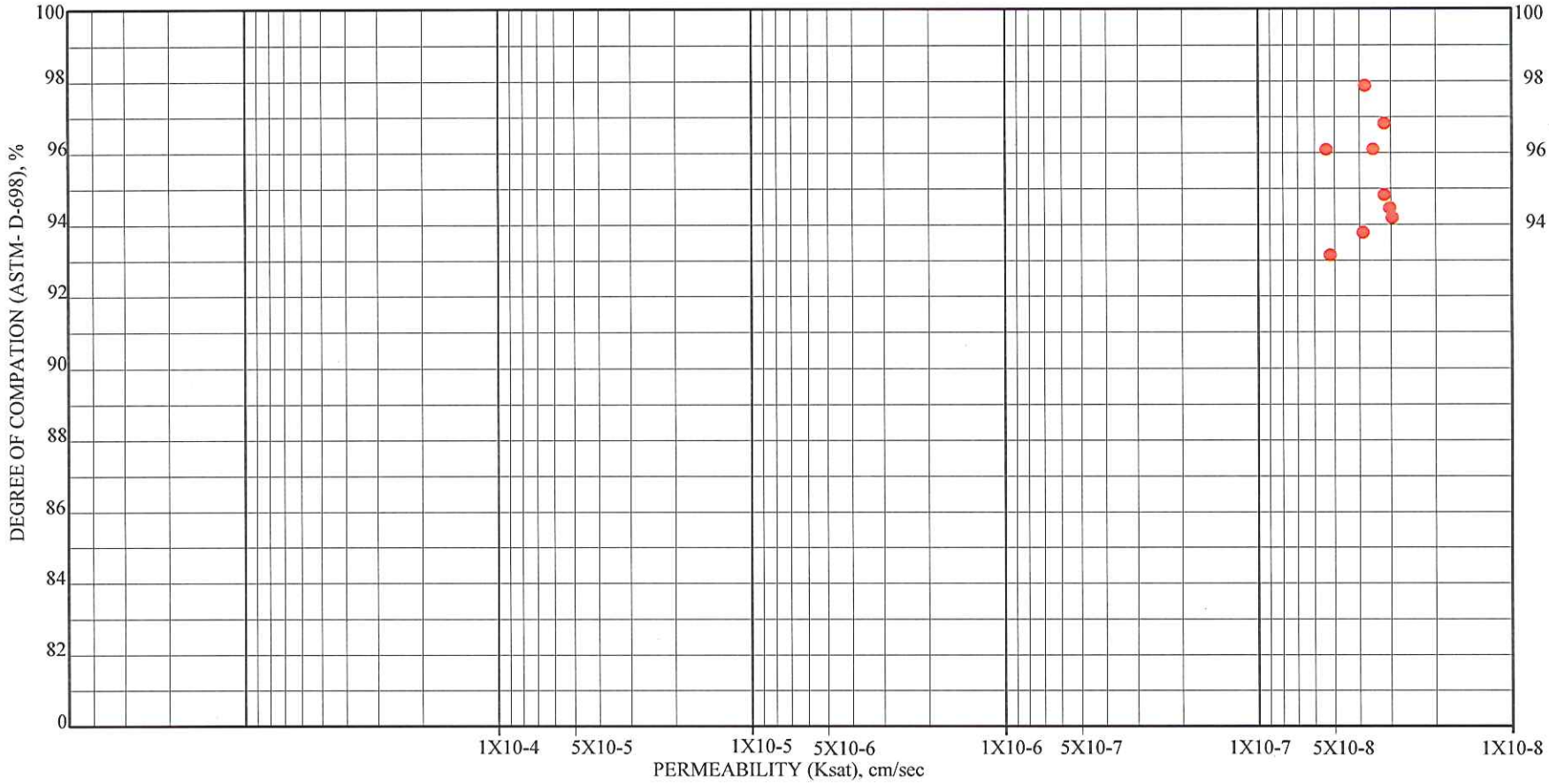
| Max Dry Density Range, PCF | Optimum Moisture Content Range.% |
|---|---|
| 111.0-112.0 | 14.1-16.7 |

● Passing Test for Perm.

▲ Failing Test for Perm.

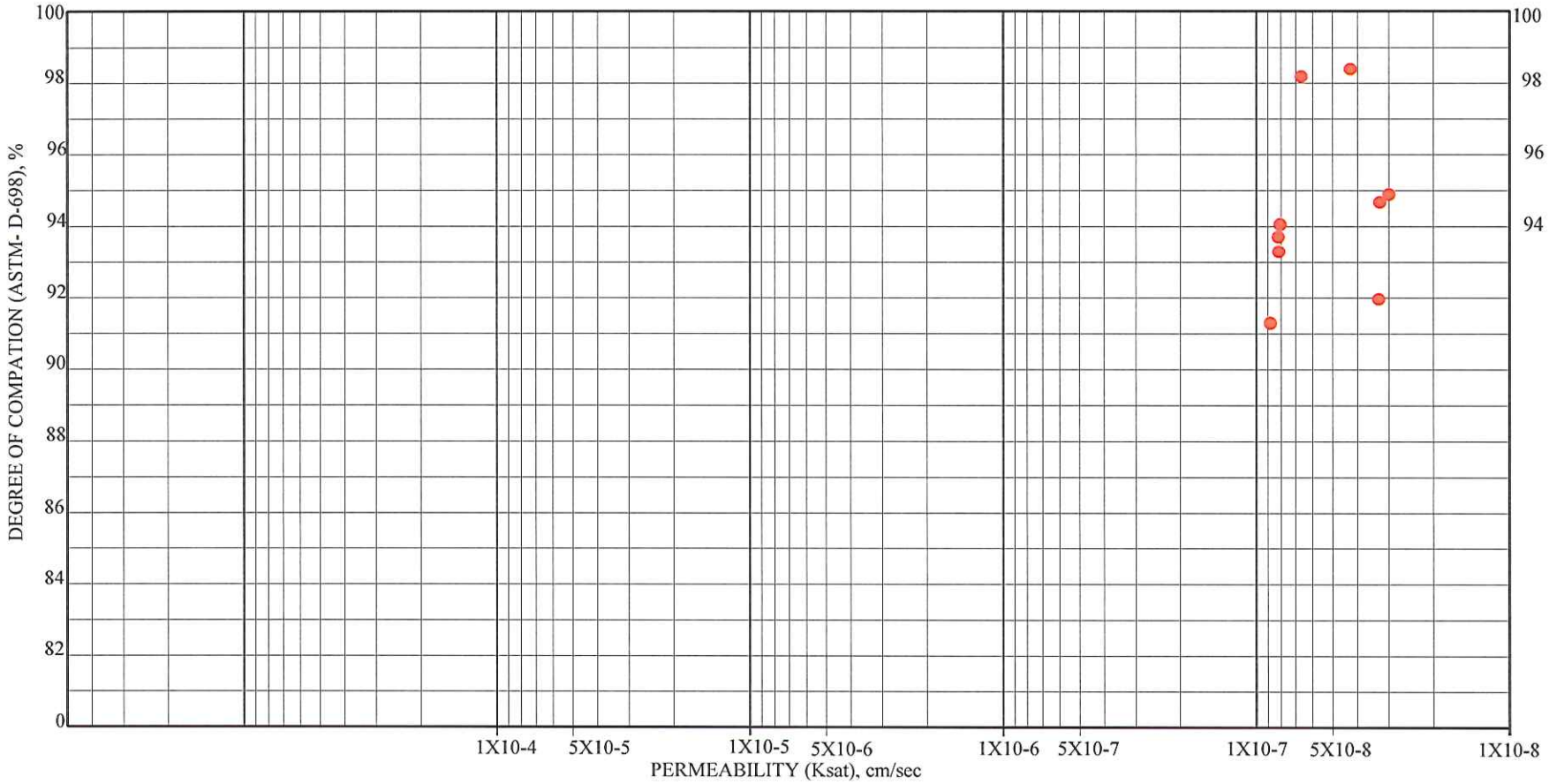


# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



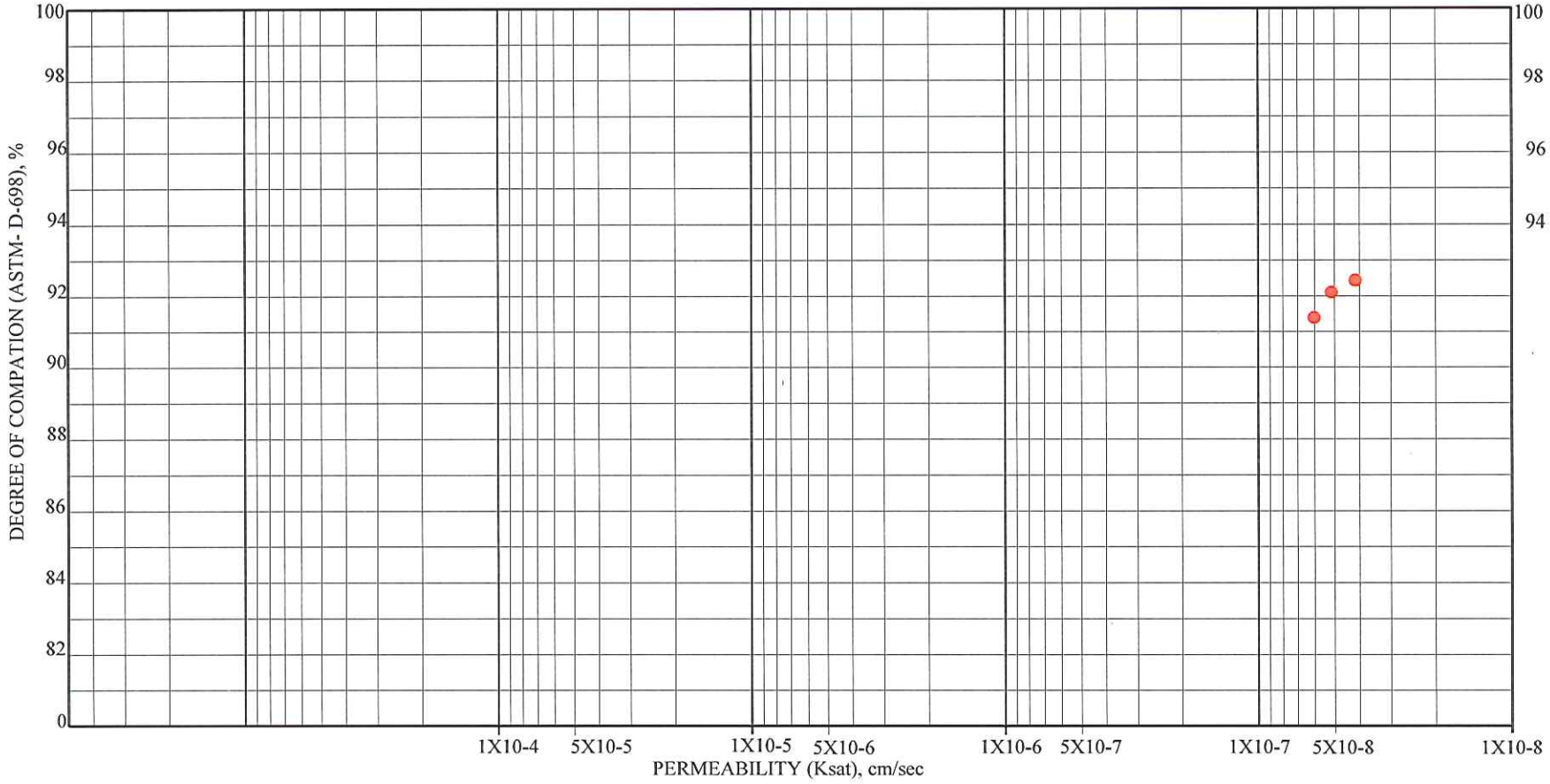

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 16.7 | 111.0 | --- | --- | CH | Brown and maroon silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



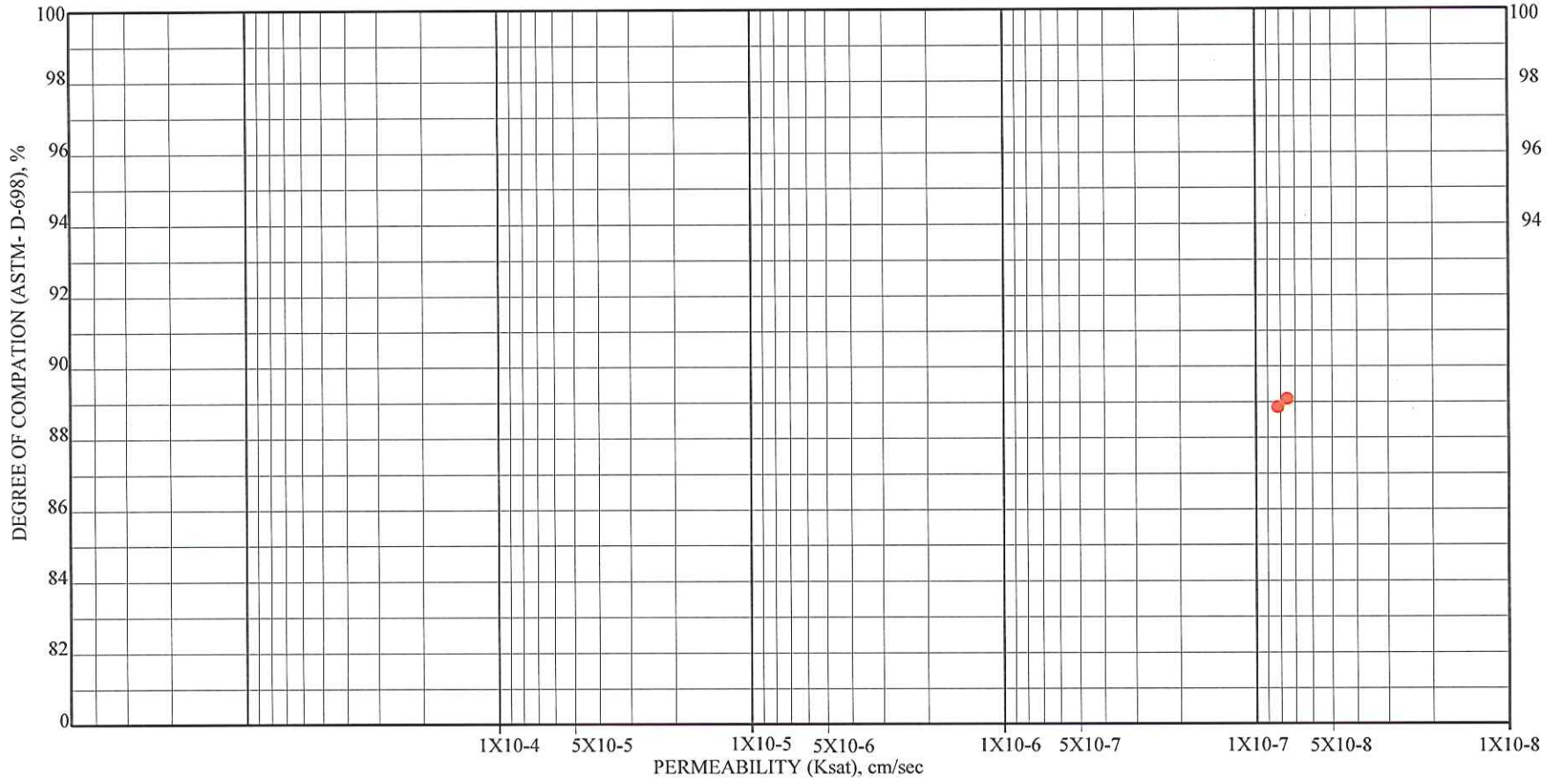

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 15.8 | 111.4 | --- | --- | CH | Brown minor gray and red silty sandy CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



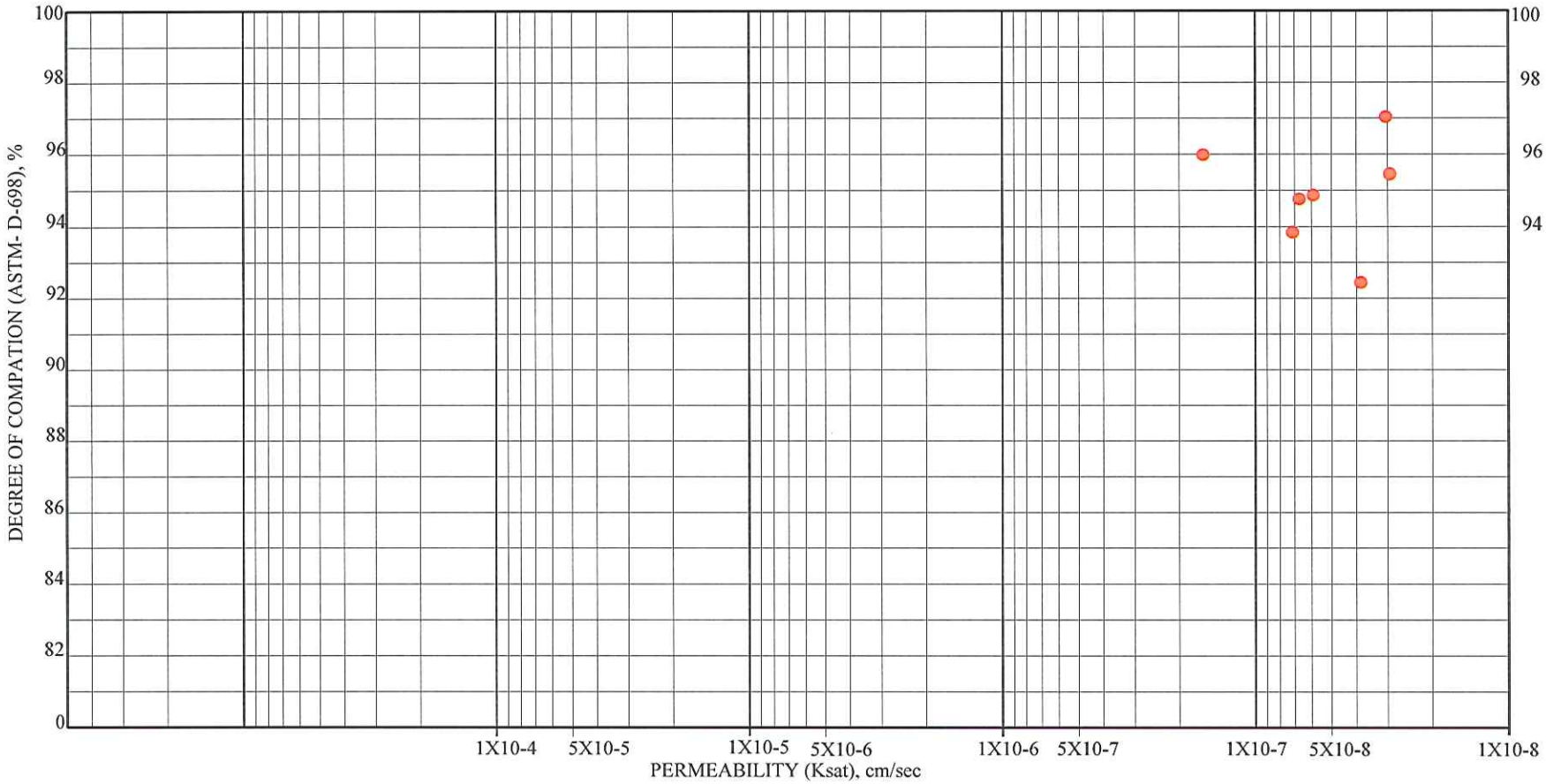

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 53.2 | 23.4 | 29.8 | 14.1 | 111.6 | 71.4 | 29.0 | CH | Brown, minor red and gray silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 15.7 | 111.9 | --- | --- | CH | Brown and gray silty sandy CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 52.9 | 24.4 | 28.5 | 14.8 | 112.0 | 71.6 | 29 | CL | Brown, minor gray silty sandy CLAY |

**Attachment G: Soils with Max. Dry Density Ranging from 113.1pcf to 113.8pcf**

# ENGINEERING & ENVIRONMENTAL SCIENCE COMPANY

3008 ANDERSON DRIVE, SUITE 102

RALEIGH, NC 27609

(919) 781-7798

## FIELD MOISTURE DENSITY TEST PLOT

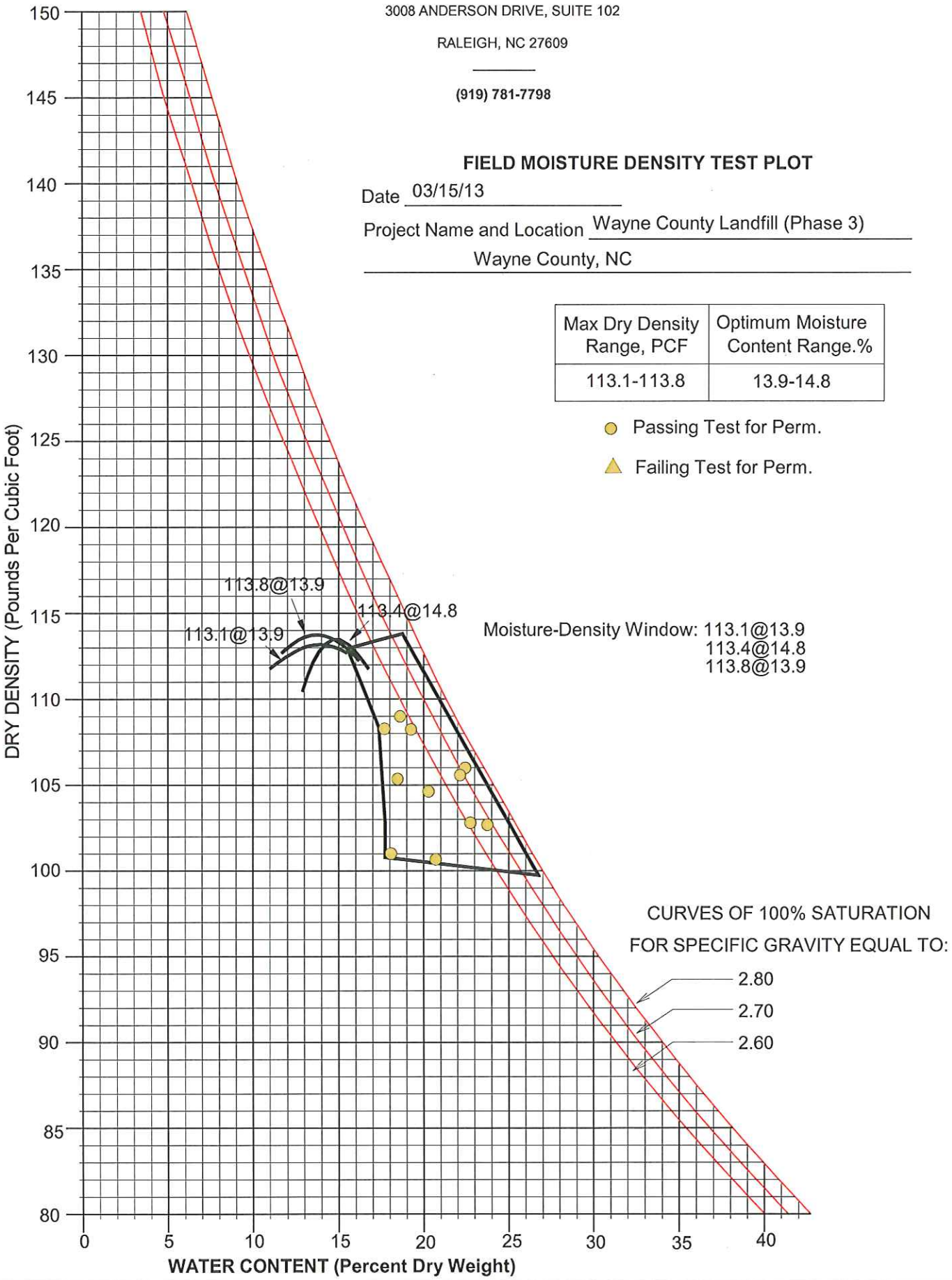
Date 03/15/13

Project Name and Location Wayne County Landfill (Phase 3)
Wayne County, NC

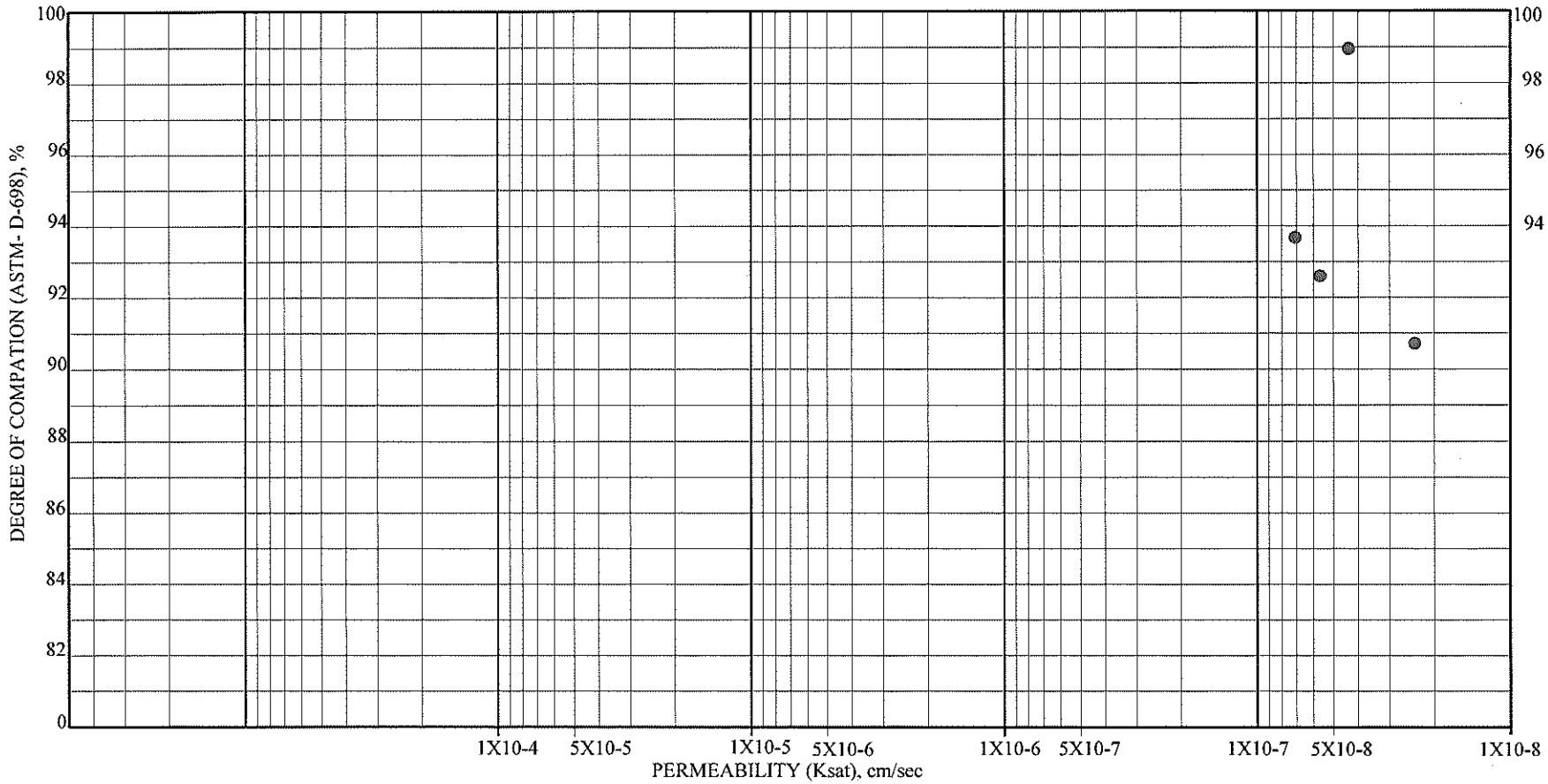
| Max Dry Density Range, PCF | Optimum Moisture Content Range.% |
|---|---|
| 113.1-113.8 | 13.9-14.8 |

Passing Test for Perm.

Failing Test for Perm.

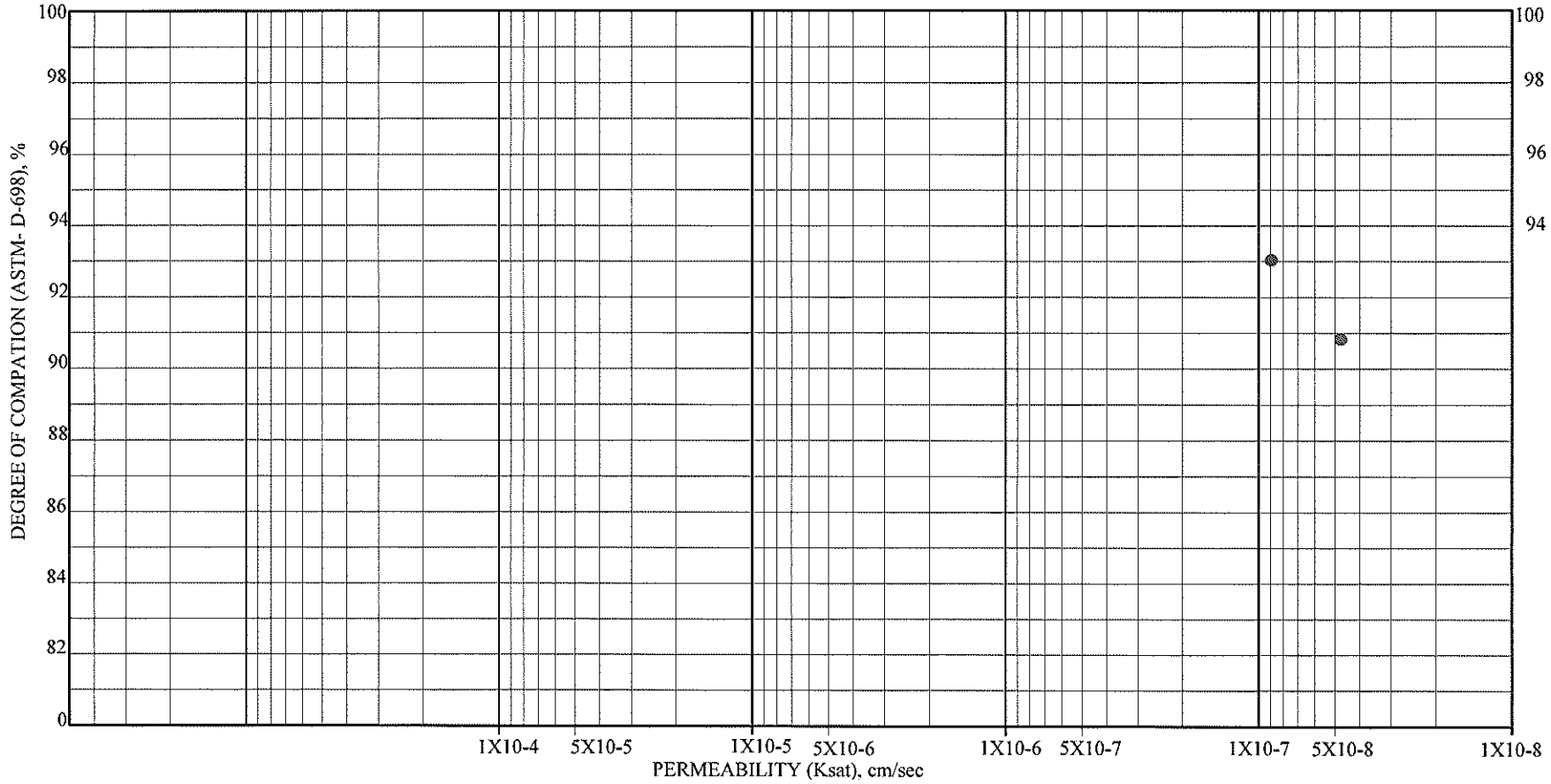


# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC



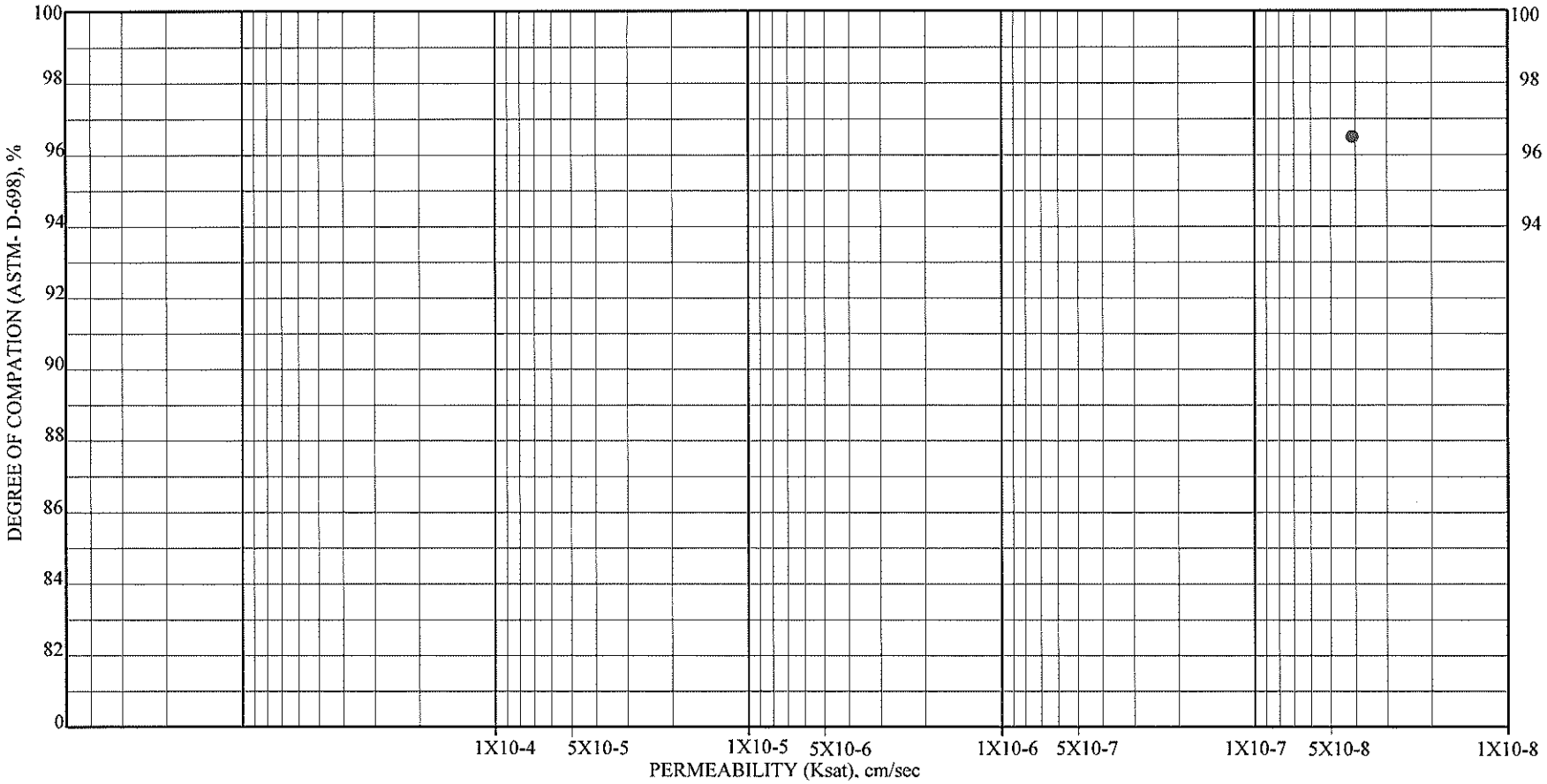

| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 50.7 | 22.8 | 27.9 | 13.9 | 113.1 | 74.6 | 29 | CL/CH | Brown silty CLAY, some sand |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| 45.1 | 19.8 | 25.3 | 14.8 | 113.4 | 62.7 | 24 | CL | Brown, minor gray silty sandy CLAY |

# DEGREE OF COMPACTION (STANDARD PROCTOR), % Vs. PERMEABILITY, CM/SEC




| ATTERBERG LIMITS | | | STANDARD PROCTOR | | % PASSING NO. 200 SEIVE | % CLAY | UNIFIED SOIL CLASS. | Description |
|---|---|---|---|---|---|---|---|---|
| LL,% | PL,% | PI,% | OPT MC,% | MAX. DENSITY,PCF | | | | |
| --- | --- | --- | 13.9 | 113.8 | --- | --- | CL/CH | Brown silty CLAY, some sand |