MORRISON GEOTECHNIC

**Brisbane** | Gold Coast | Maroochydore
Unit 1, 35 Limestone Street (PO Box 3063), Darra Q 4076 **P** (07) 3279 0900 **F** (07) 3279 0955
**ABN** 51 009 878 899
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*Brisbane Office*
*Job No: DL16/218*
*Ref No: 11121*
*Author: L. Slater*

16th November, 2016

Pensar Civil Pty Ltd
PO Box 3950
South Brisbane Qld 4101

**ATTENTION: MR FILIP VUCKOVIC**
Email: filipv@pensar.com.au
Cc: nickm@pensar.com.au

Dear Sir

**RE: LEVEL ONE COMPLIANCE REPORT FOR BULK EARTHWORKS FILLING OPERATIONS FLAGSTONE CITY STAGE 1C, JIMBOOMBA**

**Table of Contents**

## 1.0 INTRODUCTION

### 1.1 General

This report presents results of Level One Earthworks Inspections and associated Compaction Compliance testing carried out on Earthworks Fill placed and compacted to form residential building platforms and embankments below subgrade at Flagstone City Stage 1C, Jimboomba (The Site).

The work was commissioned by Mr. Garren Howell representing Pensar Civil Ltd Pty (The Client), using Purchase Order M16-180.

Earthworks were carried out by The Client.

Earthworks filling operations were carried out intermittently between 15th July 2016 and 18th October 2016.

### 1.2 Previous Earthworks

As far as could be determined on site, no previous earthworks have been carried out at the site.

### 1.3 The Project

Earthworks filling operations at The Site were required to form a residential subdivision including residential lots, new pavements and associated underground services.

Bradford Lees Pty Ltd Earthworks Cut/Fill Plans, Drawing No. C1-S1C-CIL-101, Revision B, dated 15.10.2015, indicates the extents and thickness of fill to be constructed at The Site.

This plan is considered to be a reasonable indication of the actual fill constructed at The Site.

The actual thickness of fill on an individual Lot can be obtained from the Developer as a Lot Disclosure Plan.

The Site is bounded by future residential developments to the East and South; and undeveloped land to the North and West.

**Picture 1: Aerial View of the Site** (Image Source: Nearmap.com)

## 2.0 THE BRIEF

The Brief from the Client was limited to:

- Level One Inspection and Testing of the placement and compaction of fill materials in accordance with AS3798 2007 – "Guidelines on Earthworks for Commercial and Residential Developments",
- Logan City Council Project Specifications
- Relative Density Control Testing in accordance with AS1289 – Testing of Soils for Engineering Purposes and at frequencies required in AS3798 Table 8.1.
- Notes on Bradlees earthworks drawings.

All other design requirements such as CBR and Quality of Materials, site classification, material, settlement assessments and existing filling were not included in the Brief and are therefore excluded from this Report.

## 3.0 METHODOLOGY

Earthworks Inspection and Testing was carried out on the stripped and exposed ground surfaces and during the placement and compaction of fill materials.

Field and laboratory testing included a walk over assessments of the existing ground conditions, observation of filling and compaction activities, field density testing using a nuclear soil moisture density gauge and Hilf compactions. All work was carried out in accordance with AS 3798 (Guidelines on Earthworks for Commercial and Residential Developments) and AS1289 (Testing of Soils for Engineering Purposes).

### 3.1 Stripped Surface Assessment

The fill areas at The Site were observed to be stripped and cleared of all visible organic matter, deleterious, loose and unsuitable materials to depths exposing competent ground.

Natural materials exposed after the stripping and clearing that formed the fill foundation can be summarised as:

- Sandy Clay (CI-CH) very stiff to hard, medium to high plasticity, fine to medium grained sand, grey brown mottled orange red and moist.

Following the stripped surface assessment of the fill areas, the fill foundation was approved for filling using the following process:

- Walk over assessments confirming that the competent ground was exposed.
- Proof roll testing using large sized truck carrying out multiple passes confirming no movement of the exposed natural foundation and existing fill.

**Picture 2: View of the Stripped Surface Prior to Filling Operations**


### 3.2 Filling Operations

Fill materials were sourced from onsite cuts, road box excavations and trench excavations.

Materials used as fill at The Site can be summarised as:

- Sandy Clay (CI), low to medium plasticity, fine to coarse grained sand, grey brown mottled red brown.
- Clayey Sand (SC), fine to coarse grained sand, medium plasticity, with traces of fine to coarse gravels, grey brown mottled orange red.

Placement and compaction of the fill materials was carried out using the following plant:

- Dozer
- Water Trucks
- Cat 815 Compactor
- Scraper
- Excavators
- Articulated Dump Trucks

The fill materials were moisture conditioned at the fill source and during placement to moisture contents suitable for compaction. Deleterious materials such as organics, sticks, roots and over size particles were sorted and removed during placement or were rejected for use. Occasional cobble sized particles may remain in the fill however are not considered to affect the fill as a mass.

Placement of the fill materials was carried out in layers appropriate for the above plant and compacted using the above plant carrying out multiple passes.

Our representative observed the filling process as described above and was assessed to be consistent for the entire thickness of fill.

Field density tests and laboratory compactions were carried out on the fill materials in accordance with Table 5.1 and 8.1 of AS3798 2007 (Guidelines on Earthworks for Commercial and Residential Developments) and tested to AS1289 test methods (Testing of Soils for Engineering Purposes). Testing achieved the required specification of 95% of the Hilf and Dry Density Ratios.

Fill placed and compacted at measured density ratios less than 95% were tyned, moisture conditioned and re-compacted until the required specification was achieved. Retesting was carried out using Random Stratified Location methods.

**Picture 3: View of the Site During Construction**

**Picture 4: View of the Site During Construction**

The Location of the field density tests are shown on the Site Plan contained in Appendix A. These test locations and levels were not obtained by survey and therefore should only be considered as approximate.

## 4.0 STATEMENT OF COMPLIANCE

Our representatives observed the relevant earthworks operations including the stripped surface, fill placement and compaction operations and carried out field density tests and laboratory compaction tests in accordance with the required standard (AS3798, AS1289) and Specification.

It is confirmed that Level 1 Inspection and Testing has been carried out on the earthworks fill to form the residential building platforms and embankments below subgrade. Based on the observations made by our Geotechnicians and the results of the field and laboratory tests, the placed and compacted fill at the above project has, as far as we have been able to assess, been constructed in general accordance with the intent of AS3798 and the Specification.

The fill and the top 150mm of the existing ground can be deemed to be "controlled" in accordance with AS2870.

## 5.0 EXCLUSIONS

This statement does not include any top soil, which may be placed for use as dressing or any other subsequent earthworks after 18th October 2016.

Assessments of material quality such as soaked CBR and site classifications are excluded from this commission.

Our on-site attendance specifically excludes assessments of fill material quality and engineering properties that are outside the requirements of AS3798 - 2007, including soil or fill reactivity and soaked CBR values. We note that the fill materials used may result in unfavourable site classifications and low subgrade design strengths.

Footings and ground slabs for any structures constructed over natural soils or controlled fill should be designed to accommodate the characteristic ground surface movements and settlement potential. Assessments of these design parameters are beyond the scope of this Report.

## 6.0 LIMITATIONS

This Report has been prepared by Morrison Geotechnic Pty Ltd (**Morrison Geotechnic**), and may include contributions from Morrison Geotechnic's officers and employees, sub-contractors, sub-consultants or agents (**Contributors**).

This Report is for the sole benefit and use of Pensar Civil Pty Ltd (**Client**), its designers, clients and relevant statutory authorities for the sole purpose of providing geotechnical advice and recommendations in respect of the Flagstone City Stage 1C, Jimboomba **(Project)**. The Report is only intended to address those issues expressly described in the Brief/ Work Instructions in this Report.

This Report should not be used or relied upon for any other purpose without Morrison Geotechnic's prior written consent. Morrison Geotechnic and the Contributors do not accept any responsibility or liability in any way whatsoever for the use or reliance of this Report by anyone other than the **Client**, its designers, its clients and relevant statutory authorities or by anyone else for any purpose other than that for which it has been prepared.

Except with Morrison Geotechnic's prior written consent, this Report may not be:

(a) released to any other party, whether in whole or in part (other than to the Client's officers, employees, advisers, designers, clients and relevant statutory authorities);

(b) used or relied upon by any other party.

Morrison Geotechnic and the Contributors, do not accept any liability or responsibility whatsoever for, or in respect of, any use or reliance upon this Report by any other party. Morrison Geotechnic is not obliged to enter into discussions with any third party in respect of this Report.

The information (including technical information and information obtained through discussions) on which this report is based has been provided by the Client and third parties. Morrison Geotechnic and the Contributors:

(a) have relied upon and presumed the accuracy of this information;

(b) have not verified the accuracy or reliability of this information (other than as expressly stated in this Report);

(c) have not made any independent investigations or enquiries in respect of those matters of which it has no actual knowledge at the time of giving this Report to the Client; and

(d) make no warranty or guarantee, expressed or implied, as to the accuracy or reliability of this information.

Morrison Geotechnic and the Contributors do not accept responsibility or liability for any incorrect assumptions related to this Report. For the avoidance of doubt, this Report:

(a) is not an environmental, contamination or hazardous materials assessment; may be invalid, incomplete or inaccurate (including errors in the scope of work, investigation methodology, observations, opinions and advice) where the information provided to Morrison Geotechnic was invalid, incomplete or inaccurate;

(b) is limited to observations of those parts of the site described in Section 1.0.

No warranty or guarantee, whether express or implied, is made in respect of the geotechnical data, information, advice, opinions and recommendations present in this Report.

If further information becomes available, or additional assumptions need to be made, Morrison Geotechnic reserves its right to amend this Report.

If you have any queries regarding the above, please contact Michael Morrison at our Brisbane office.

Yours faithfully

**MICHAEL MORRISON** **LYLE SLATER**

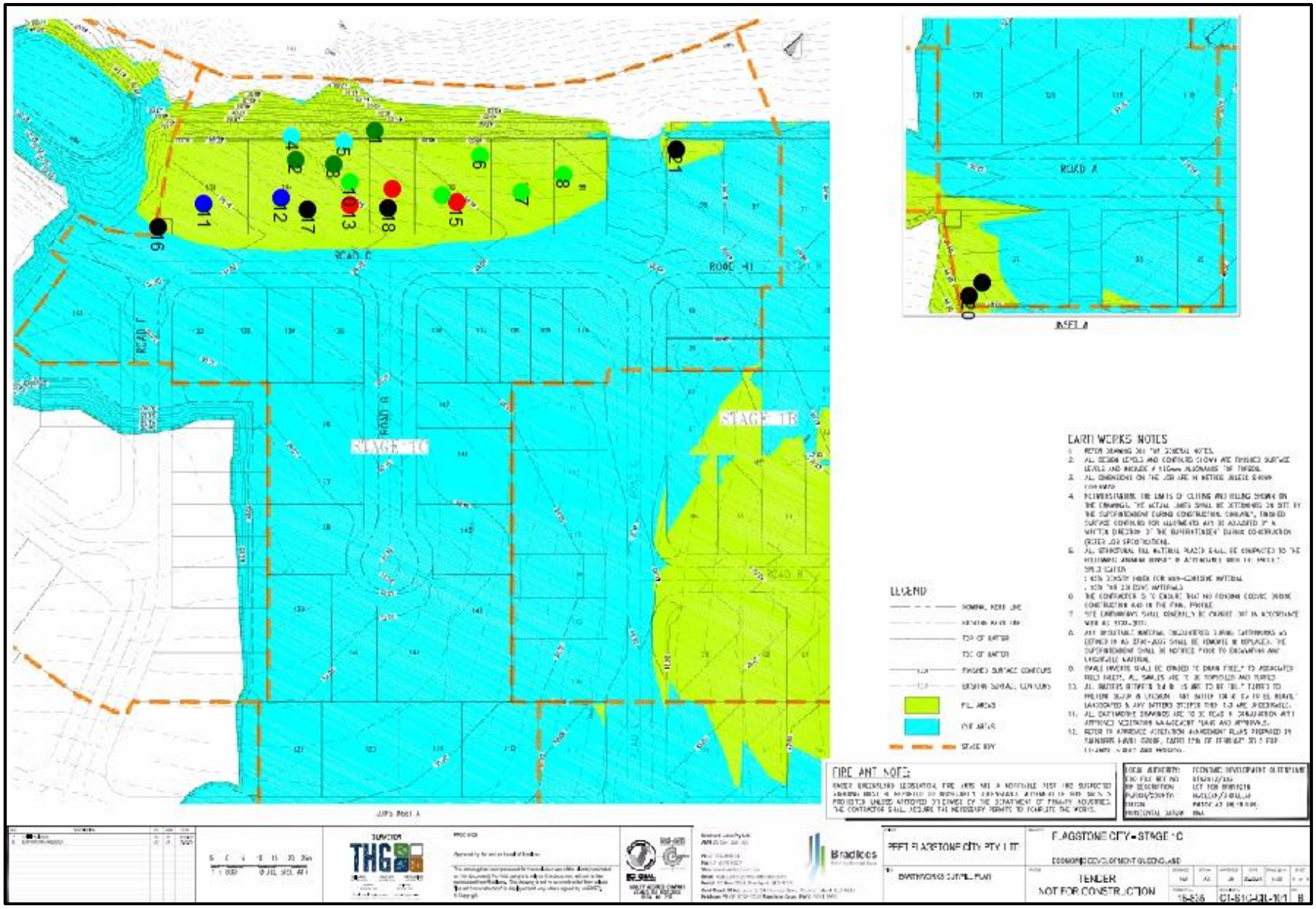
For and on behalf of
**MORRISON GEOTECHNIC PTY LIMITED**

**ATTACHMENTS:**

Appendix A – Site Plan Showing Test Locations
Appendix B – Laboratory Test Results Reports
Brochure – 'Important Information About Your Geotechnical Report'

# APPENDIX A

Site Plan Showing Test Locations


ROAD C
ROAD H1
ROAD J
ROAD G
STAGE 1C
STAGE 1B
ROAD A
INSET A
LEGEND
FILL AREAS
CUT AREAS
STAGE BDY
EARTHWORKS NOTES
FIRE ANT NOTE:
PRET FLAGSTONE CITY PTY LTD
FLAGSTONE CITY - STAGE 1C
EARTHWORKS CUT/FILL PLAN
TENDER
NOT FOR CONSTRUCTION
18-536
C1-810-C3L-101
B

# APPENDIX B

Laboratory Test Results/ Reports

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# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | PENSAR CIVIL PTY LTD | Report Number: | DL16/218 - 1 |
| Address : | P O BOX 3950, SOUTH BRISBANE, QLD, 4101 | Report Date : | 26/07/2016 |
| Project Name : | EARTHWORKS SUPERVISION | Order Number : | M16-180 |
| Project Number : | DL16/218 | Test Method : | AS1289.5.8.1 & 5.7.1 |
| Location: | FLAGSTONE CITY , STAGE 1C | Page 1 of 1 | |

| Sample Number : | 216229 | 216230 | 216231 | 216232 |
|---|---|---|---|---|
| Test Number : | 1 | 2 | 3 | 4 |
| Sampling Method : | - | - | - | - |
| Date Sampled : | 19/07/2016 | 19/07/2016 | 19/07/2016 | 19/07/2016 |
| Date Tested : | 19/07/2016 | 19/07/2016 | 19/07/2016 | 19/07/2016 |
| Material Type : | Allotment Fill | Allotment Fill | Allotment Fill | Allotment Fill |
| Material Source : | On Site | On Site | On Site | On Site |
| Lot Number : | - | - | - | - |
| Sample Location : | E 34226.000<br>N 73592.100<br>RL 45.900 | E 34236.000<br>N 73600.800<br>RL 45.500 | E 34248.700<br>N 73609.100<br>RL 45.900 | E 34220.900<br>N 73591.100<br>RL 46.700 |
| Test Depth (mm ) : | 150 | 150 | 150 | 150 |
| Layer Depth (mm) : | - | - | - | - |
| Maximum Size (mm) : | 19 | 19 | 19 | 19 |
| Oversize Wet (%) : | - | - | - | - |
| Oversize Dry (%) : | - | - | - | - |
| Oversize Density (t/m³) : | - | - | - | - |
| Field Moisture Content (%) : | 14.1 | 14.3 | 12.2 | 11.9 |
| Hilf MDR Number : | 216229 | 216230 | 216231 | 216232 |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 |
| Compactive Effort : | Standard | Standard | Standard | Standard |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 |
| Moisture Method : | AS1289.2.1.1 | AS1289.2.1.1 | AS1289.2.1.1 | AS1289.2.1.1 |
| Moisture Ratio (%) : | 98 | 99 | 99 | 99.5 |
| Field Wet Density (t/m³) : | 2.033 | 2.070 | 2.128 | 2.059 |
| Optimum Moisture Content (%) : | 14.4 | 14.4 | 12.3 | 12.0 |
| Moisture Variation : | 0.2 | 0.1 | 0.1 | 0.1 |
| Peak Converted Wet Density (t/m³) : | 2.120 | 2.141 | 2.146 | 2.140 |
| Hilf Density Ratio (%) : | 96.0 | 96.5 | 99.0 | 96.0 |
| Minimum Specification : | 95 | 95 | 95 | 95 |
| Moisture Specification : | - | - | - | - |
| Site Selection : | - | - | - | - |
| Soil Description : | - | - | - | - |
| Remarks : | - | | | |

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APPROVED SIGNATORY

Mick Morrison (Brisbane) - Director
NATA Accreditation Number
1162 / 1169

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# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | PENSAR CIVIL PTY LTD | Report Number: | DL16/218 - 2 |
| Address : | P O BOX 3950, SOUTH BRISBANE, QLD, 4101 | Report Date : | 26/07/2016 |
| Project Name : | EARTHWORKS SUPERVISION | Order Number : | M16-180 |
| Project Number : | DL16/218 | Test Method : | AS1289.5.8.1 & 5.7.1 |
| Location: | FLAGSTONE CITY , STAGE 1C | Page 1 of 1 | |

| | | | | |
|---|---|---|---|---|
| Sample Number : | 216233 | 216234 | | |
| Test Number : | 5 | 6 | | |
| Sampling Method : | - | - | | |
| Date Sampled : | 19/07/2016 | 19/07/2016 | | |
| Date Tested : | 19/07/2016 | 19/07/2016 | | |
| Material Type : | Allotment Fill | Allotment Fill | | |
| Material Source : | On Site | On Site | | |
| Lot Number : | - | - | | |
| Sample Location : | E 34268.800<br>N 73613.500<br>RL 46.500 | E 34192.800<br>N 73584.700<br>RL 47.200 | | |
| Test Depth (mm ) : | 150 | 150 | | |
| Layer Depth (mm) : | - | - | | |
| Maximum Size (mm) : | 19 | 19 | | |
| Oversize Wet (%) : | - | - | | |
| Oversize Dry (%) : | - | - | | |
| Oversize Density (t/m³) : | - | - | | |
| Field Moisture Content (%) : | 12.2 | 13.2 | | |
| Hilf MDR Number : | 216233 | 216234 | | |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | | |
| Compactive Effort : | Standard | Standard | | |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | | |
| Moisture Method : | AS1289.2.1.1 | AS1289.2.1.1 | | |
| Moisture Ratio (%) : | 98 | 103 | | |
| Field Wet Density (t/m³) : | 2.050 | 2.069 | | |
| Optimum Moisture Content (%) : | 12.4 | 12.8 | | |
| Moisture Variation : | 0.2 | -0.3 | | |
| Peak Converted Wet Density (t/m³) : | 2.122 | 2.153 | | |
| Hilf Density Ratio (%) : | 96.5 | 96.0 | | |
| Minimum Specification : | 95 | 95 | | |
| Moisture Specification : | - | - | | |
| Site Selection : | - | - | | |
| Soil Description : | - | - | | |
| Remarks : | - | | | |

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Mick Morrison (Brisbane) - Director
NATA Accreditation Number
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# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | PENSAR CIVIL PTY LTD | Report Number: | DL16/218 - 3 |
| Address : | P O BOX 3950, SOUTH BRISBANE, QLD, 4101 | Report Date : | 26/07/2016 |
| Project Name : | EARTHWORKS SUPERVISION | Order Number : | M16-180 |
| Project Number : | DL16/218 | Test Method : | AS1289.5.8.1 & 5.7.1 |
| Location: | FLAGSTONE CITY , STAGE 1C | Page 1 of 1 | |

| Sample Number : | 216260 | 216261 | 216262 | 216263 |
|---|---|---|---|---|
| Test Number : | 7 | 8 | 9 | 10 |
| Sampling Method : | - | - | - | - |
| Date Sampled : | 20/07/2016 | 20/07/2016 | 20/07/2016 | 20/07/2016 |
| Date Tested : | 20/07/2016 | 20/07/2016 | 20/07/2016 | 20/07/2016 |
| Material Type : | Allotment Fill | Allotment Fill | Allotment Fill | Allotment Fill |
| Material Source : | On Site | On Site | On Site | On Site |
| Lot Number : | - | - | 101 | 103 |
| Sample Location : | E 34297.500<br>N 73618.500<br>RL 47.300 | E 34280.200<br>N 73613.100<br>RL 47.000 | Lot 101<br>E 34264.300<br>N 73606.800<br>RL 47.400 | Lot 103<br>E 34242.100<br>N 73597.100<br>RL 47.600 |
| Test Depth (mm ) : | 150 | 150 | 150 | 150 |
| Layer Depth (mm) : | - | - | - | - |
| Maximum Size (mm) : | 19 | 19 | 19 | 19 |
| Oversize Wet (%) : | - | - | - | - |
| Oversize Dry (%) : | - | - | - | - |
| Oversize Density (t/m³) : | - | - | - | - |
| Field Moisture Content (%) : | 13.3 | 10.4 | 9.0 | 12.1 |
| Hilf MDR Number : | 216260 | 216261 | 216262 | 216263 |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 |
| Compactive Effort : | Standard | Standard | Standard | Standard |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 |
| Moisture Method : | AS1289.2.1.1 | AS1289.2.1.1 | AS1289.2.1.1 | AS1289.2.1.1 |
| Moisture Ratio (%) : | 96.5 | 82.5 | 85 | 83 |
| Field Wet Density (t/m³) : | 2.075 | 2.176 | 2.029 | 2.063 |
| Optimum Moisture Content (%) : | 13.8 | 12.6 | 10.6 | 14.6 |
| Moisture Variation : | 0.5 | 2.2 | 1.7 | 2.4 |
| Peak Converted Wet Density (t/m³) : | 2.116 | 2.153 | 2.108 | 2.067 |
| Hilf Density Ratio (%) : | 98.0 | 101.0 | 96.0 | 100.0 |
| Minimum Specification : | 95 | 95 | 95 | 95 |
| Moisture Specification : | - | - | - | - |
| Site Selection : | - | - | - | - |
| Soil Description : | - | - | - | - |
| Remarks : | - | | | |

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Mick Morrison (Brisbane) - Director
NATA Accreditation Number
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# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | PENSAR CIVIL PTY LTD | Report Number: | DL16/218 - 4 |
| Address : | P O BOX 3950, SOUTH BRISBANE, QLD, 4101 | Report Date : | 1/08/2016 |
| Project Name : | EARTHWORKS SUPERVISION | Order Number : | M16-180 |
| Project Number : | DL16/218 | Test Method : | AS1289.5.8.1 & 5.7.1 |
| Location: | FLAGSTONE CITY , STAGE 1C | Page 1 of 1 | |

| | | | | |
|---|---|---|---|---|
| Sample Number : | 216327 | 216328 | 216329 | 216330 |
| Test Number : | 11 | 12 | 13 | 14 |
| Sampling Method : | - | - | - | - |
| Date Sampled : | 21/07/2016 | 21/07/2016 | 21/07/2016 | 21/07/2016 |
| Date Tested : | 21/07/2016 | 21/07/2016 | 21/07/2016 | 21/07/2016 |
| Material Type : | Allotment Fill | Allotment Fill | Allotment Fill | Allotment Fill |
| Material Source : | On Site | On Site | On Site | On Site |
| Lot Number : | 105 | 104 | 103 | 102 |
| Sample Location : | Lot 105<br>E 34205.600<br>N 73566.900<br>RL 49.500 | Lot 104<br>E 34221.800<br>N 73573.700<br>RL 49.000 | Lot 103<br>E 34236.700<br>N 73587.200<br>RL 48.500 | Lot 102<br>E 34253.300<br>N 73588.800<br>RL 48.900 |
| Test Depth (mm ) : | 150 | 150 | 150 | 150 |
| Layer Depth (mm) : | - | - | - | - |
| Maximum Size (mm) : | 19 | 19 | 19 | 19 |
| Oversize Wet (%) : | - | - | - | - |
| Oversize Dry (%) : | - | - | - | - |
| Oversize Density (t/m³) : | - | - | - | - |
| Field Moisture Content (%) : | 11.7 | 12.2 | 13.4 | 11.6 |
| Hilf MDR Number : | 216327 | 216328 | 216329 | 216330 |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 |
| Compactive Effort : | Standard | Standard | Standard | Standard |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 |
| Moisture Method : | AS1289.2.1.1 | AS1289.2.1.1 | AS1289.2.1.1 | AS1289.2.1.1 |
| Moisture Ratio (%) : | 97 | 97.5 | 96.5 | 87 |
| Field Wet Density (t/m³) : | 2.128 | 2.056 | 2.119 | 2.036 |
| Optimum Moisture Content (%) : | 12.1 | 12.5 | 13.9 | 13.3 |
| Moisture Variation : | 0.3 | 0.3 | 0.4 | 1.7 |
| Peak Converted Wet Density (t/m³) : | 2.145 | 2.115 | 2.154 | 2.123 |
| Hilf Density Ratio (%) : | 99.0 | 97.0 | 98.5 | 96.0 |
| Minimum Specification : | 95 | 95 | 95 | 95 |
| Moisture Specification : | - | - | - | - |
| Site Selection : | - | - | - | - |
| Soil Description : | - | - | - | - |
| Remarks : | - | | | |

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APPROVED SIGNATORY

Liam Mcdowall (Brisbane) - Branch Manager
NATA Accreditation Number
1162 / 1169

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# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | PENSAR CIVIL PTY LTD | Report Number: | DL16/218 - 5 |
| Address : | P O BOX 3950, SOUTH BRISBANE, QLD, 4101 | Report Date : | 1/08/2016 |
| Project Name : | EARTHWORKS SUPERVISION | Order Number : | M16-180 |
| Project Number : | DL16/218 | Test Method : | AS1289.5.8.1 & 5.7.1 |
| Location: | FLAGSTONE CITY , STAGE 1C | Page 1 of 1 | |

| | | | | |
|---|---|---|---|---|
| Sample Number : | 216331 | | | |
| Test Number : | 15 | | | |
| Sampling Method : | - | | | |
| Date Sampled : | 21/07/2016 | | | |
| Date Tested : | 21/07/2016 | | | |
| Material Type : | Allotment Fill | | | |
| Material Source : | On Site | | | |
| Lot Number : | 101 | | | |
| Sample Location : | Lot 101<br>E 34271.600<br>N 73598.100<br>RL 48.600 | | | |
| Test Depth (mm ) : | 150 | | | |
| Layer Depth (mm) : | - | | | |
| Maximum Size (mm) : | 19.0 | | | |
| Oversize Wet (%) : | - | | | |
| Oversize Dry (%) : | - | | | |
| Oversize Density (t/m³) : | - | | | |
| Field Moisture Content (%) : | 43.1 | | | |
| Hilf MDR Number : | 216331 | | | |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | | | |
| Compactive Effort : | Standard | | | |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | | | |
| Moisture Method : | AS1289.2.1.1 | | | |
| Moisture Ratio (%) : | 101 | | | |
| Field Wet Density (t/m³) : | 2.055 | | | |
| Optimum Moisture Content (%) : | 42.7 | | | |
| Moisture Variation : | -0.3 | | | |
| Peak Converted Wet Density (t/m³) : | 2.153 | | | |
| Hilf Density Ratio (%) : | 95.5 | | | |
| Minimum Specification : | 95 | | | |
| Moisture Specification : | - | | | |
| Site Selection : | - | | | |
| Soil Description : | - | | | |
| Remarks : | - | | | |

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Liam Mcdowall (Brisbane) - Branch Manager
NATA Accreditation Number
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MORRISON GEOTECHNIC

Brisbane | Gold Coast | Brendale | Maroochydore
Unit 1, 35 Limestone Street (PO Box 3063), Darra Q 4076 P (07) 3279 0900 F (07) 3279 0955
ABN 51 009 878 899
www.morrisongeo.com.au

# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | PENSAR CIVIL PTY LTD | Report Number: | DL16/218 - 6 |
| Address : | P O BOX 3950, SOUTH BRISBANE, QLD, 4101 | Report Date : | 1/08/2016 |
| Project Name : | EARTHWORKS SUPERVISION | Order Number : | M16-180 |
| Project Number : | DL16/218 | Test Method : | AS1289.5.8.1 & 5.7.1 |
| Location: | FLAGSTONE CITY , STAGE 1C | Page 1 of 1 | |

| | | | | |
|---|---|---|---|---|
| Sample Number : | 216371 | 216372 | 216373 | |
| Test Number : | 16 | 17 | 18 | |
| Sampling Method : | - | - | - | |
| Date Sampled : | 22/07/2016 | 22/07/2016 | 22/07/2016 | |
| Date Tested : | 22/07/2016 | 22/07/2016 | 22/07/2016 | |
| Material Type : | Allotment Fill | Allotment Fill | Allotment Fill | |
| Material Source : | On Site | On Site | On Site | |
| Lot Number : | 105 | 104 | 103 | |
| Sample Location : | Lot 105<br>E 34202.600<br>N 73568.700<br>RL 50.500 / Final Level | Lot 104<br>E 34230.900<br>N 73574.300<br>RL 49.900 / Final Level | Lot 103<br>E 34248.000<br>N 73585.700<br>RL 49.500 / Final Level | |
| Test Depth (mm ) : | 150 | 150 | 150 | |
| Layer Depth (mm) : | 150 | 150 | 150 | |
| Maximum Size (mm) : | 19 | 19 | 19 | |
| Oversize Wet (%) : | - | - | - | |
| Oversize Dry (%) : | - | - | - | |
| Oversize Density (t/m³) : | - | - | - | |
| Field Moisture Content (%) : | 10.0 | 12.1 | 10.6 | |
| Hilf MDR Number : | 216371 | 216372 | 216373 | |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | |
| Compactive Effort : | Standard | Standard | Standard | |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | |
| Moisture Method : | AS1289.2.1.1 | AS1289.2.1.1 | AS1289.2.1.1 | |
| Moisture Ratio (%) : | 82 | 99.5 | 98.5 | |
| Field Wet Density (t/m³) : | 2.076 | 2.043 | 2.139 | |
| Optimum Moisture Content (%) : | 12.2 | 12.2 | 10.8 | |
| Moisture Variation : | 2.2 | 0.1 | 0.2 | |
| Peak Converted Wet Density (t/m³) : | 2.085 | 2.097 | 2.092 | |
| Hilf Density Ratio (%) : | 99.5 | 97.5 | 102.0 | |
| Minimum Specification : | 95 | 95 | 95 | |
| Moisture Specification : | - | - | - | |
| Site Selection : | - | - | - | |
| Soil Description : | - | - | - | |
| Remarks : | - | | | |

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# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | **PENSAR CIVIL PTY LTD** | Report Number: | **DL16/218 - 7** |
| Address : | **P O BOX 3950, SOUTH BRISBANE, QLD, 4101** | Report Date : | **4/08/2016** |
| Project Name : | **EARTHWORKS SUPERVISION** | Order Number : | **M16-180** |
| Project Number : | **DL16/218** | Test Method : | **AS1289.5.8.1 & 5.7.1** |
| Location: | **FLAGSTONE CITY , STAGE 1C** | **Page 1 of 1** | |

| | | | | |
|---|---|---|---|---|
| Sample Number : | 216539 | | | |
| Test Number : | 19 | | | |
| Sampling Method : | - | | | |
| Date Sampled : | 27/07/2016 | | | |
| Date Tested : | 27/07/2016 | | | |
| Material Type : | **Allotment Fill** | | | |
| Material Source : | **On Site** | | | |
| Lot Number : | 37 | | | |
| Sample Location : | Lot 37<br>6m From South Boundary<br>4m From West Boundary<br>Final Level | | | |
| Test Depth (mm ) : | 150 | | | |
| Layer Depth (mm) : | 150 | | | |
| Maximum Size (mm) : | 19 | | | |
| Oversize Wet (%) : | - | | | |
| Oversize Dry (%) : | - | | | |
| Oversize Density (t/m³) : | - | | | |
| Field Moisture Content (%) : | 11.4 | | | |
| Hilf MDR Number : | 216539 | | | |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | | | |
| Compactive Effort : | Standard | | | |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | | | |
| Moisture Method : | AS1289.2.1.1 | | | |
| Moisture Ratio (%) : | 83 | | | |
| Field Wet Density (t/m³) : | 2.082 | | | |
| Optimum Moisture Content (%) : | 13.7 | | | |
| Moisture Variation : | 2.3 | | | |
| Peak Converted Wet Density (t/m³) : | 2.143 | | | |
| Hilf Density Ratio (%) : | **97.0** | | | |
| Minimum Specification : | 95 | | | |
| Moisture Specification : | - | | | |
| Site Selection : | - | | | |
| Soil Description : | - | | | |
| Remarks : | - | | | |

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# Hilf Density Ratio Report

| | | | |
|---|---|---|---|
| Client : | PENSAR CIVIL PTY LTD | Report Number: | DL16/218 - 8 |
| Address : | P O BOX 3950, SOUTH BRISBANE, QLD, 4101 | Report Date : | 20/10/2016 |
| Project Name : | EARTHWORKS SUPERVISION | Order Number : | M16-180 |
| Project Number : | DL16/218 | Test Method : | AS1289.5.8.1 & 5.7.1 |
| Location: | FLAGSTONE CITY , STAGE 1C | Page 1 of 1 | |

| | | | | |
|---|---|---|---|---|
| Sample Number : | 219749 | 219750 | | |
| Test Number : | 20 | 21 | | |
| Sampling Method : | - | - | | |
| Date Sampled : | 18/10/2016 | 18/10/2016 | | |
| Date Tested : | 18/10/2016 | 18/10/2016 | | |
| Material Type : | Allotment Fill | Allotment Fill | | |
| Material Source : | On Site | On Site | | |
| Lot Number : | 37 | 98 | | |
| Sample Location : | Lot 37<br>2m From South Boundary<br>2m From West Boundary<br>Final Level | Lot 98<br>2m From North Boundary<br>2m From West Boundary<br>Final Level | | |
| Test Depth (mm ) : | 150 | 150 | | |
| Layer Depth (mm) : | - | - | | |
| Maximum Size (mm) : | 19 | 19 | | |
| Oversize Wet (%) : | - | - | | |
| Oversize Dry (%) : | - | - | | |
| Oversize Density (t/m³) : | - | - | | |
| Field Moisture Content (%) : | 9.4 | 6.0 | | |
| Hilf MDR Number : | 219749 | 219750 | | |
| Hilf MDR Method : | AS1289.5.1.1 & 5.7.1 | AS1289.5.1.1 & 5.7.1 | | |
| Compactive Effort : | Standard | Standard | | |
| Field Density Method : | AS1289.5.8.1 & 5.7.1 | AS1289.5.8.1 & 5.7.1 | | |
| Moisture Method : | AS1289.2.1.1 | AS1289.2.1.1 | | |
| Moisture Ratio (%) : | 71 | 55 | | |
| Field Wet Density (t/m³) : | 2.071 | 2.041 | | |
| Optimum Moisture Content (%) : | 13.3 | 10.9 | | |
| Moisture Variation : | 3.8 | 5.1 | | |
| Peak Converted Wet Density (t/m³) : | 2.057 | 2.040 | | |
| Hilf Density Ratio (%) : | 100.5 | 100.0 | | |
| Minimum Specification : | 95 | 95 | | |
| Moisture Specification : | - | - | | |
| Site Selection : | - | - | | |
| Soil Description : | - | - | | |
| Remarks : | - | | | |

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# Important Information about Your

# Geotechnical Engineering Report

*Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.*

*While you cannot eliminate all such risks, you can manage them. The following information is provided to help.*

## Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

## Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

## A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

## Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

## Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

## A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

## A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

## Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

## Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

## Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

## Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

## Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

## Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

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