Memo

To: Mark Iles
From: Jose Pereira
Date: 16/07/2014

RE: HB13604 Macquarie Heads Development Road Upgrade – Additional test pitting at Mill Bay

Dear Mark,

The Department of State Growth has engaged pitt&sherry to develop the design and tender documentation for the upgrade of Macquarie Heads Development Road. Additional test pitting has been requested by the Department of State Growth at Mill Bay to acquire additional information regarding the strength of the subgrade on the foreshore side of the road.

Three test pits were excavated on the foreshore side of Ocean Beach Road at Mill Bay located at the following chainages: 1.5 km, 1.67 km and 1.75 km. Samples of the materials encountered were collected and test pit logs prepared. DCP testing was undertaken where appropriate.

CBR values were estimated for each material type encountered to evaluate subgrade strength. This Memo includes the findings of the additional test pitting works undertaken and analysis of the information collected to determine whether the current pavement design requires alteration and whether additional drainage measures need to be incorporated into the detailed design. The test pit logs have been incorporated into the Pavement Report for inclusion in the tender documents.

- Test Pits Information
  - OBR_1 (chainage 1.5km): The test pit was excavated in the shoulder until the target depth of 1.80m and water inflow was registered at a depth of 1.60m. The subgrade is composed of sand with an estimated CBR value of 8%. A gravel layer approximately 500mm thick with an estimated CBR value of 40% was found over the subgrade.
  - OBR_2 (chainage 1.67km): The test pit was excavated in the shoulder until the target depth of 1.90m and water inflow was registered at a depth of 1.80m. The subgrade is composed of sand with an estimated CBR value of 8%. A gravel layer approximately 600mm thick with an estimated CBR value of 40% was found over the subgrade.
  - OBR_3 (chainage 1.75km): The test pit was excavated in the shoulder until a depth of 1.10m where the excavation had to be interrupted due to loose material collapsing underneath a water main located on the side of the road. The subgrade is composed of sand with an estimated CBR value of 25%. A gravel layer approximately 400mm thick with an estimated CBR value of 40% was found over the subgrade.
• Implications for the current pavement design
  The three test pits excavated indicate an existing granular material over the subgrade with thickness around 400mm and CBR values estimated in 40% which will be used as a good quality Sub Base for the pavement structure. For the section of the road with an existing seal in the vicinity of Mill Bay, a 150mm thick additional layer of Base Class B will be constructed over the existing granular material providing adequate subgrade covering as recommended in the Pavement Investigation report prepared by pitt&sherry (document number: HB13604H004 Pavement rep 31P Rev 01).

  For the areas outside of the existing seal, a new pavement structure has been proposed with 390mm thick of granular material (120mm of Sub Base 2, 120mm of Sub Base1 and 150mm of Base Class B) over an estimated subgrade CBR of 8%, which is considered adequate as it exceeds the minimum recommended value of 300mm associated with the design traffic and subgrade conditions.

  An analysis was undertaken using Circly software to confirm that the existing pavement design does not need modification considering the additional information obtained from these three test pits.

• Implications for the drainage design
  Two of the three test pits excavated showed water inflow at approximately 1.6m deep. As the existing pavement does not indicate signs of deformation and apparent distresses in the surface (NDI condition) in the areas of the test pits, it is unlikely that ground water table will influence the existing and/or proposed pavement structure. However, as the test pits might not be representative of the entire Mill Bay area and also as a risk management factor, it is recommended to include a provisional quantity for rock drainage blanket in the schedule of rates.

Do not hesitate to contact me if further questions arise.

Kind Regards,

Jose Pereira
Senior Pavement Engineer
Classification Symbols and Soil Descriptions

- Based on Unified Soil Classification System
- Relative Density
- Consistency
- Moisture Condition
- Deformation
- Pavement Surface Condition

<table>
<thead>
<tr>
<th>Soil Descriptions</th>
<th>Relative Density</th>
<th>Consistency</th>
<th>Moisture Condition</th>
<th>Deformation</th>
<th>Pavement Surface Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>VL - Very Loose</td>
<td>VL - loose</td>
<td>LD - Dry</td>
<td>&lt;5mm - ND</td>
<td>Intact</td>
<td>Transverse - t</td>
</tr>
<tr>
<td>F - Loose</td>
<td>F - friable</td>
<td>D - Dry</td>
<td>5-10mm - LD</td>
<td>Cracked</td>
<td>Longitudinal - l</td>
</tr>
<tr>
<td>ND - Medium Dense</td>
<td>ND - medium</td>
<td>D - Dense</td>
<td>10-20mm - MD</td>
<td>Patched</td>
<td>&gt;500 - ws</td>
</tr>
<tr>
<td>VD - Very Dense</td>
<td>VD - very dense</td>
<td>D - Dense</td>
<td>&gt;20mm - SD</td>
<td>Seal Break</td>
<td>&gt;2 - g</td>
</tr>
<tr>
<td>VS - Very Soft</td>
<td>VS - very soft</td>
<td>LD - wet</td>
<td></td>
<td></td>
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<tr>
<td>S - Soft</td>
<td>S - soft</td>
<td>D - dry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F - Firm</td>
<td>F - firm</td>
<td>D - dense</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>M - Moist</td>
<td>M - moist</td>
<td>LD - wet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H - Hard</td>
<td>H - hard</td>
<td>D - dense</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VST - Very Stiff</td>
<td>VST - very stiff</td>
<td>D - dense</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fr - Friable</td>
<td>Fr - friable</td>
<td>D - dry</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Vapor Inflow (1.6m)

- Hole terminated at 1.80m at target depth

- Excavation Method: 2.8 m from the centre line
- Date: 12/06/2014
- Northing: 5332255 mN
- Easting: 360375 mE
- Link Number: Lyell Highway
- Chainage: 1.5 m on left hand side, 2.8 m from the centre line

- Table Drains: Left hand side: Inadequate
- Right hand side: Inadequate

- Pavement Condition: ND
- Rut Depth: mm
- Deflection:

- CBR Correlated from Dynamic Cone Penetrometer Measurements

- Graphic Log

- Sketch
**Classification Symbols and Soil Descriptions**

- **Based on Unified Soil Classification System**
- **Relative Density**
- **Consistency**
- **Moisture Condition**
- **Pavement Surface Condition**

**Deformation**
- <5mm - ND
- 5-10mm - LD
- 10-20mm - MD
- >20mm - SD

**Surface Integrity**
- Intact - I
- Alligator - A
- Pothole - P
- Seal Break - B

**Type**
- Transverse - t
- Longitudinal - l

**Spacing (mm)**
- 100-500
- <5.5

**Width (mm)**
- 0.5-2
- >2

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**Diagram**

- **锨-see OBR1/1**
- **锨-see OBR1/2**

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**Material Description**

- **GRAVEL; coarse grained, quartzite, rounded to sub rounded, with coarse sandfines, none plastic, brown. (Pavement and Shoulder material)**
- **SAND; fine to medium grained, grey. (insitu sands)**

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**Graphic Log**

- **Depth (m)**
  - 0.5
  - 1.0
  - 1.5

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**Samples Tests Remarks**

- **Graphic Log**

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**Profiles Sketches**

- **Sketch**

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**Pavement Surface Condition**

- **Deformation**
- **Surface Integrity**

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**Notes**

- Hole terminated at 1.90m at target depth
**Engineering Log - Pavement Pit**

**Project No.:** HB13604

**Client:** Department of Infrastructure Energy and Resources

**Logged By:** Neil Johnson **Date:** 12/06/2014

**Project Name:** Macquarie Heads Road - Mill Bay

**Checked By:** Date:

**Reference Point (CH 0.0):** Lyell Highway **Link Number:**

**Excavation Method:** Excavator (3m x 1.2m) **Chainage:** 1750 m on left hand side 3 m from the centre line

**Excavation collapsing around water main discontinued pit at 1.1m**

**Hole terminated at 1.10m at target depth**

**Classification Symbols and Soil Descriptions**

Based on Unified Soil Classification System

**Relative Density**

- VL - Very Loose
- N - Loose
- MD - Medium Dense
- D - Dense
- VD - Very Dense

**Consistency**

- VL - Very Liquid
- V - Liquid
- S - Silt
- D - Dense
- VH - Very Stiff

**Moisture Condition**

- L - Liquid
- M - Moist
- W - Wet

**Grade:** 2 % **Crossfall:** 3 % **Seal Width:** 6.0 m **Seal Type:** Flush seal

**Left Shoulder Width:** 0.7 m **Right Shoulder Width:** 0.5 m **Left hand side:** At grade **Right hand side:** Cut 3 m high

**Pavement Drainage:** Adequate

**Table Drains:** Left hand side: Inadequate **Right hand side:** Inadequate

**Pavement Condition:** NDI **Rut Depth:** mm **Deflection:**

**Samples** **Tests** **Remarks**

**Depth (m)** **Graphic Log** **Classification Symbol** **Material Description** **Estimated CBR** **Consistency Index**

- 0.5 **GP** GRAVEL; coarse grained, quartzite, rounded to sub rounded, with coarse sand fines, none plastic, brown. (Pavement and Shoulder material) **40**

- 1.0 **D-M** SP-SM SILTY SAND; fine grained, with some coarse, rounded, quartzite gravels, grey. **25**

- 1.5 **Excavation collapsing around water main discontinued pit at 1.1m**

**Hole terminated at 1.10m at target depth**

**Project Name:** Macquarie Heads Road - Mill Bay **Checked By:**

**Date:** 12/06/2014

**Easting:** 360160 mE **Northing:** 5332315 mN

**Pit Number** **OBR_3**

**Samples:**

- B - see OBR1/1

**Tests:**

**Remarks:**

- 0.5

**Classification Symbol**

- GP

**Material Description**

- GRAVEL; coarse grained, quartzite, rounded to sub rounded, with coarse sand fines, none plastic, brown. (Pavement and Shoulder material)

**Estimated CBR**

- 40

**Consistency Index**

- D-M

**Graphic Log**

- Excavation collapsing around water main discontinued pit at 1.1m

**Hole terminated at 1.10m at target depth**

**Sketch**

**Photo**