DIAL Runway 21-03
Runway 21-03

- 1900m long, 46m wide, Code 4C runway
- Asphalt surfacing
- Last overlaid in 2001
- Southern 200m extension constructed 1993
  no overlay since
- Maintenance cost accelerating by Dec 2011
  annual inspection
- Cracksealing and mill and fills
Investigations

• Visual (annual December inspections)
  – Annual survey reveals cracking extending past recent patches
  – Marked increase in crack sealing
  – Asphalt joints opening up
  – Turning nodes in poor condition
  – Drainage at node 03 not effective

• Topo Survey (August 2012)
  – What shape have we got? <0.2% to 3.5% crossfall
Investigations

• Subsurface (Sept 2012)
  – FWD. Subgrade modulus appeared unrealistically high
  – Benkelmen Beam: 187 deflection points from 2005
  – GPR. Confirmed range of pavement materials

• Asphalt
  – 22 Cores (Sept 2012)
  – 17 Additional cores (January 2013)
  – Friction testing close to maintenance level
  – Defining repairs required before overlay
  – Water in asphalt? -Asphalt permeability
Design Constraints

- CAA 139-06 Governing document
  - 5% max end gradients
  - 25mm max edge drop
  - 1.5% 'ideal' crossfall
  - 30km Longitudinal radius, 1% slope, limits on slope change
- Concrete slot drain and cable duct
- Extension has minimal crossfall but no edge drop
- Estimate of debonding extent
- BUDGET $$
Planning

• Needed very early
• Stakeholder Identification – 25 of them!
• Contractor Procurement
• Risks
• Normal aircraft schedule must be keep. 6:50am - 9pm
• Rerouting night postal flights
• Communications with stakeholders and project team
• PCG with sub teams (safety, design, stakeholders)
Design Iterations
The first full overlay option was above budget. THE PROJECT TEAM then looked at 7 more options. Found 1 that would fit the budget.

Richard Roberts, 1/10/2013
Procurement

The Charter
2001 THE LAST OVERLAY
I CANT REMEMBER ANYTHING ABOUT IT AS I HAD JUST STARTED
I WANTED TO REMEMBER THIS ONE AND HOPRFLY GET EVERYONE ELSE TO REMEMBER IT TOO.
Richard Roberts, 1/10/2013
Fulton Hogan
Selected Design - Main Runway
Selected Design - Extension
The first full overlay option was above budget. THE PROJECT TEAM then looked at 7 more options. Found 1 that would fit the budget.

Richard Roberts, 1/10/2013
Communication
Communications

Most critical component of Physical Works

- Text Groups, Facebook, e-mail, telephone
- Protocols for cancellation either before or during works. Default position was work proceeds.
- Runway evacuation trial for emergency flight.
- Serious harm response
- Night diary and previous nights results
- Day team job list
- Runway clear to use
<table>
<thead>
<tr>
<th>No</th>
<th>Issue</th>
<th>Probability</th>
<th>Impact</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Score</th>
<th>Rank</th>
<th>Risk Level</th>
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<tbody>
<tr>
<td>1.1</td>
<td>Unplanned traffic activities</td>
<td>Medium</td>
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<td>3</td>
<td>6</td>
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<td>Non-compliance with safety procedures</td>
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<td>Equipment failure</td>
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<td>Low</td>
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<td>6.5</td>
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<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>Medium</td>
<td>3</td>
<td>3</td>
<td>Medium</td>
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<td>High Level Reasoning</td>
<td>Condition</td>
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</tr>
</tbody>
</table>

**NOTES**
- GND may be issued by CNS indicating runway closure times. GMDP to be prepared dealing operational restrictions and works in progress. Aircraft holds until works complete - established arrival / departure. Emergency evacuation procedures to be agreed with clear communication plan. Aircraft to clear taxiways / runways.

- Aircraft to be towed by CNS indicating runway closure times. GMDP to be prepared dealing operational restrictions and works in progress. Aircraft holds until works complete - established arrival / departure. Emergency evacuation procedures to be agreed with clear communication plan. Aircraft to clear taxiways / runways.

- All aerodrome surface repairs to be completed before runway closure begins. Works to be completed during down time. Works subject to environmental and safety conditions for safety of personnel and passengers. CNS / CNS to be consulted before starting the works.

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SAFETY

WE DEVELOPED THE “FILTHY FIVE”

Moving Plant   Fatigue Kills   Manual Handling
Asphalt Plant   Hot Bitumen
Team Buy-in
The Real Charter

The REAL Charter

COMMUNICATION RELATIONSHIP TRUST
Quality

Mix design

• Design selected based on friction and stability. ‘Column 3’
• High PSV chip and fines imported from Oamaru
• Extensive materials testing before landed
• Lab trials. Gyratory (BFT and VMA) and Marshall (stability, bitumen content, air voids)
• Wheeltracking for rut resistance
• Mobile plant production trials
• On ground compaction trials
• Mix proven
Quality

Nightly sampling
- Lab on site to process each nights production and core samples
- Results available next day to act quickly on any defects

Production testing
- 3 sets of Marshall blocks 1/150t for first 3 nights then 1/300t thereafter
- Bitumen content, stability, grading, air voids, BFT and VMA

Field testing
- Core samples for air voids, RD and thickness
- British pendulum and sand circles each night
- Joint temperature
Preparation over

Let’s get started!
The Programme

- 4 nights of mill and fill starting 13 Feb 2013.
- 1 night of AC Pre-levelling at the extension
- 16 days of runway overlay starting 19 Feb. Cores taken after each night and results reported following day
- Achieved programme with 1 day weather delay
- 11,000 tonnes of AC laid
- 6 days a week work
The Process

- Start on far side, Mill goes first. Up to 120m/night including milling out temporary ramps
- Debonding chased out and swept
- When mill reaches centreline membrane applied
- Asphalt applied to deeper milled areas
- Asphalt laid in 4.6m wide runs in echelon (including ramps) and rolled
- At centreline, decision to continue
- Pavement marking
- Emu parade
Jandre's & Scott's Debonding Ltd
Rejuvenation coat edge treatment
### DIAL – Runway Overlay – Site Diary

**Circulation**
- Richard Roberts: DIAL
- Jan Parsons: Fulton Hogan
- Steve Simpson: DIAL
- Warren Pickering: Fulton Hogan
- John McCall: DIAL
- Scott Payne: Fulton Hogan
- Richard Hooymans: Beca
- Grant Spp: Fulton Hogan
- Jared Van Zyl: Beca
- Richard Fulton: Fulton Hogan
- Tony Walls: Beca
- John Marsh: Beca

**Date:** 19/02 February 2013
**R:** 8
**B:** Graham Motto

**Weather:** Fine, Sunny

<table>
<thead>
<tr>
<th>Previous night’s weather</th>
<th>Station</th>
<th>Date (NZST)</th>
<th>Amount (mm)</th>
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<tr>
<td></td>
<td>Dunedin Aerod (ast)</td>
<td>20130219 0000</td>
<td>0</td>
</tr>
<tr>
<td></td>
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<td>20130219 2000</td>
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**Ground Conditions**

<table>
<thead>
<tr>
<th></th>
<th>Dry</th>
<th>Slump</th>
<th>Wet</th>
<th>Very Wet</th>
</tr>
</thead>
</table>

**Start Time:** Last scheduled flight arrival just after 21:00. Cleared for access runway 31R.

**Rough Time:** 00:45

**Finish unfinished:** 00:45

**Night Scope of work:**
- *B,&:* apply membrane seal and pave fumaroles from 21:25mm (100mm)
- Complete paving of taxiway numbers and ends of threshold min. (peg) achieved by 9am last night. As mark centroid. Turning blade not marked

**Work Completed:**
- Store achieved

**Quality Assurance:**
- Slags from 21mm last night (figure in shaded area participants only)
  - Production results:
    - Sample 278: Complying except BFT 7.5m8 (2-8), VMA 12% (1-4), SBT 6.5m9 (2-4)
    - Sample 279: Complying except BFT 8m8 (2-8), VMA 12% (1-4), SBT 6.5m9 (2-4)
    - Sample 280: Complying except BFT 7.5m8 (2-8), VMA 12% (1-4), SBT 6.5m9 (2-4)
Core results:
4 cores taken. Air voids range from 13 to 4.2% (2-6.5) for 3 cores taken in the mat, 1 core on the joint was 2.9% (7.5). Relative compaction ranged from 90.7% to 101% (90-100) for the mat and was 100.3% on the joint (min 96). Core thickness however ranged from 35-42 (min 30mm). Positions of cores are required to determine if cores are on preleveling or on overlay.

No texture results received from Lot 6.

### Issues Experienced

#### Technical
- Some delaminating found on the milled surface on the first 4.5m width on the far side and near side where milling depth was deepest (65mm). Solution again was to remove some edges back to wall bound material with pade. Membranes on either side of the prelevelled area. FH elected to mill the prelevelled surface to achieve a better bond. Last night some movement of overlay was experienced under rollers resulting in change to roller pattern and longer rolling period to achieve compaction. Membranes on milled existing surface and tack coat only on scabbed prelevelled surface.
- The edge light extension fit 02 on the turning node was removed last night, a plywood cover installed and paved over. This light is in the 2.5% ramp of the overlay which will be removed when the AC into the turning node is completed. The cover has deflected under aircraft movements. The cover was removed and the light reflected.

#### Programme
- Programmed start date was Tuesday 12th Feb. Finish date 22nd March. A total of 10 working nights. No allowance for wet weather. One day delay 12/13 Feb due to production mix outside spec.
- 2-5pm weather delay 15/16 Feb 12:00 - 17:30

#### Site safety & noise
- None.

#### Photo
- Refer Teamviews.

#### Forward works
- 21-22 Feb: 130m long by 36m wide overlay on runway commences
- 22-23 Feb: Continue overlay at 120m/night
- 23-24 Feb: Continue overlay at 130m/night
- 24-25 Feb: Rest day
### Weather and flight delays allowed by the contract

<table>
<thead>
<tr>
<th>Weather and flight delays</th>
<th>Unit</th>
<th>Rate</th>
<th>Quantity</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Accumulative total for weather delays</td>
<td>Day</td>
<td>$0.00</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Accumulative total for flight delays</td>
<td>Day</td>
<td>$0.00</td>
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<td>0</td>
</tr>
</tbody>
</table>

### Format Variations

<table>
<thead>
<tr>
<th>Format Variations</th>
<th>Unit</th>
<th>Rate</th>
<th>Quantity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased milling on patches</td>
<td>$m^2$</td>
<td>To be agreed</td>
<td>235</td>
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</tr>
<tr>
<td>23/24 Feb - 20mm on 235$m^2$</td>
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</tr>
<tr>
<td>14/15 Feb - 20mm on 285$m^2$</td>
<td></td>
<td></td>
<td>285</td>
<td>285</td>
</tr>
<tr>
<td>15/16 Feb - 10mm on 36$m^2$</td>
<td></td>
<td></td>
<td>36</td>
<td>36</td>
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<tr>
<td>27/28 Feb - 10mm on 140$m^2$</td>
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<tr>
<td>27/28 Feb - 20mm on 290$m^2$</td>
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<td>290</td>
<td>290</td>
</tr>
<tr>
<td>aC Pre-leveling over item 2.9</td>
<td>$t$</td>
<td></td>
<td></td>
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<tr>
<td>23/24 Feb - The total area that was pre levelled was approx. 320$m^2$ (1.5 tonnes of aC.)</td>
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<tr>
<td>23/24 Feb - 65 tonnes of aC at lot 10: Subject to Ag built levels and delivery docks.</td>
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<tr>
<td>25/26 Feb - The total area that was pre levelled was approx. 350$m^2$ (17 tonnes of aC.)</td>
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<tr>
<td>25/26 Feb - 18 tonnes of aC at lot 10: Subject to Ag built levels and delivery docks.</td>
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</tr>
<tr>
<td>26/27 Feb - The total area that was pre levelled was approx. 855$m^2$ (17 tonnes of aC.)</td>
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<td></td>
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<tr>
<td>26/27 Feb - 28 tonnes of aC at lot 12: Subject to Ag built levels and delivery docks.</td>
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<tr>
<td>27/28 Feb - The total area that was pre levelled was approx. 892$m^2$</td>
<td></td>
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</tr>
<tr>
<td>Increase in aC from increased milling</td>
<td>$t$</td>
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</tr>
<tr>
<td>13/14 Feb - 20mm on 235$m^2$</td>
<td></td>
<td></td>
<td>11.3</td>
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<td>14/15 Feb - 20mm on 285$m^2$</td>
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<td>13.8</td>
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<td>15/16 Feb - 10mm on 36$m^2$</td>
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<td></td>
<td>0.85</td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>25.95</td>
<td>25.95</td>
</tr>
</tbody>
</table>
Asphalt Core Test Report

Client: SMB, 21-45 Runway Overlay
Private Bag 1923
Dunedin, Otago,

Project: D.I.A.U. - Overlay - Head Ajax

Sample Details

<table>
<thead>
<tr>
<th>Item</th>
<th>Details</th>
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<tbody>
<tr>
<td>Sample No.</td>
<td>1210136-0009</td>
</tr>
<tr>
<td>Asphalt Mix</td>
<td>On-Asphalt AC14 (BECA 03)</td>
</tr>
<tr>
<td>Mix Supplier</td>
<td>Dunedin - Asphalt Plant</td>
</tr>
<tr>
<td>Location</td>
<td>SMB - Zones Lot 7</td>
</tr>
<tr>
<td>Specification</td>
<td>1-4-AC H M 80 O (BECA 1502)</td>
</tr>
<tr>
<td>Technician</td>
<td>Tony Van Alphen</td>
</tr>
<tr>
<td>Sampling Method</td>
<td>As received - not assayed</td>
</tr>
<tr>
<td>Sampling Equipment</td>
<td>No</td>
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</table>

Report No. AC2E000013-0009

Result Summary

<table>
<thead>
<tr>
<th>Test</th>
<th>Details</th>
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<tbody>
<tr>
<td>Average Bulk Specific Gravity</td>
<td>2.516</td>
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<tr>
<td>Average Layer Depth (mm)</td>
<td>40.3</td>
</tr>
<tr>
<td>Average Air Voids [%]</td>
<td>0.2</td>
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<tr>
<td>Average Relative Composition [%]</td>
<td>96.3</td>
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Test Results

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<tr>
<th>Lane</th>
<th>Core Type</th>
<th>Core No.</th>
<th>Core Coverage</th>
<th>Laid Fresh</th>
<th>Laid Depth</th>
<th>Core Specific Gravity</th>
<th>Core Layer Depth (mm)</th>
<th>Core Composition</th>
<th>Core Voids (%)</th>
<th>Core Relative Composition [%]</th>
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<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>1</td>
<td>0.9</td>
<td>1.2</td>
<td>1.6</td>
<td>1.0</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Comments

Core dimensions measurements have been taken using centre cupper. Core samples have been trimmed, otherwise have been tested as received.
### Asphalt Test Report

**Client:**
SMS Runway Overlay
Private Bag 1992
Dundee, WA.

**Project:**
D.U.L. - Overlay - Road Job

---

**Sample Details**

- **Sample ID:** L01015-0008
- **Mix Design D:** HDW-12-50
- **Mix Temp (K):** 190
- **Date/Time Sampled:** 03/28/2015 08:30
- **Sampled Area:** 100
- **Date Tested:** 04/01/2015 08:30
- **Total Test Run:** 400
- **Project Number:** 0001
- **Sampled Amount:** 1000

**Particle Size Distribution**

<table>
<thead>
<tr>
<th>Grain Size</th>
<th>Passing (%)</th>
<th>Limits (%)</th>
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<td>30.0</td>
<td>50.0</td>
<td>0.0 - 100.0</td>
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<tr>
<td>15.0</td>
<td>60.0</td>
<td>0.0 - 100.0</td>
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<tr>
<td>10.0</td>
<td>70.0</td>
<td>0.0 - 100.0</td>
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<td>90.0</td>
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</tr>
<tr>
<td>1.0</td>
<td>95.0</td>
<td>0.0 - 100.0</td>
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**Test Results**

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<th>Description</th>
<th>Method</th>
<th>Result</th>
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<tr>
<td>ASTM D4791-07</td>
<td>Penetration Test</td>
<td>50.0</td>
<td>0.2</td>
</tr>
<tr>
<td>ASTM D5303-07</td>
<td>Dynamic Shear Test</td>
<td>20.0</td>
<td>1.5</td>
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</tbody>
</table>

---

**Components**

The laboratory is not accredited for these tests, consequently the results are not ASTM accredited.

---

Form No: 10106 Version 1 Issued 12/01/2015 Fulton Hogan Ltd
7 Months Planning
53 Staff
450 Loads of Chip
53 Items of Plant
72,834m² of pavement
740 tonnes of Bitumen
First runway to be echelon paved in NZ

60 tonne of Chip
750 tonne of asphalt per per shift
21 Nights Work
11,216 tonne of asphalt
10,324 Man Hours
387 Eggs, 257 sausages & 3 Tomatoes
The Wrap

- Within budget
- Only 1 night lost due to weather
- Consistently achieved asphalt quality. No rework
- No safety LTI
- No incidents to travelling public
- No stakeholder concerns

No-one knew the overlay was even happening
5,000m³ of millings
Success!