Runway Grooving, Norman Wells, NWT

Northwest Territories Transportation

Presentation Outline

- Project timeline
- User concerns
- Problem
- Options
- Grooving
- Results and recommendations

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Timeline

1. Paved in 2006
   - High fines content in aggregate
   - High asphalt content -> smooth surface
   - Paver left ruts along wheel paths
2. May 05, 2007 - B737 hydroplaned
3. Summer 2007 - paving contractor patched ruts
4. April 22, 2010 - B737 hydroplaned
5. July 2010 – conducted runway friction and texture testing
6. Researched remediation options
7. July 06, 2011 - B737 hydroplaned
8. July 14, 2011 - B737 hydroplaned
9. July 26, 2011 started cutting grooves

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User Concerns

Hydroplaning/ Wet Friction

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Incident One

5 May 2007

A B737-200 hydroplaned landing on Runway 27.

- `METAR CYVQ 051700Z 15002KT 2 1/2SM -SN OVC020 M00/M03`
- The runway was wet with a trace of slush
- One thrust reverser did not deploy
- The aircraft stopped with around 30 m to spare.

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Summer 2007 - Ruts

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Summer 2007 - Patches

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Incident Two

22 April 2010

A B737-200 landing on Runway 27 complained of poor braking.

- `METAR CYVQ 221700Z 00000KT 15SM -DZ OVC025 04/02`
- Pilot reported poor braking in patched area
- Runway was bare and wet
- Flight was heavier than usual.

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Problem Assessment

- Friction survey
- Texture survey
- Cross-slope survey

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Friction Survey

Testing Apparatus

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Friction Survey

GripTester

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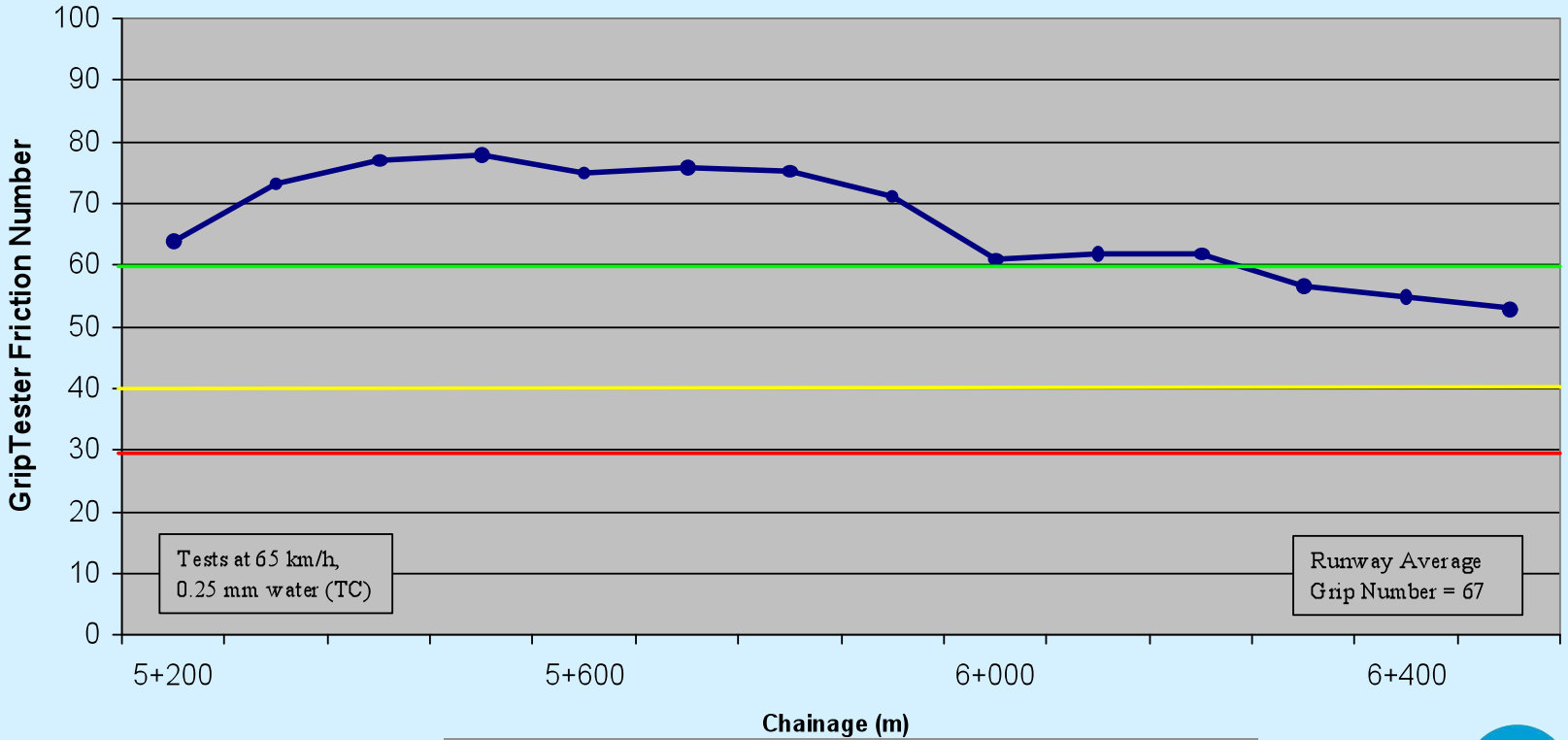
Friction Survey Results

Norman Wells Airport
Runway 09-27, July 5-6 2010
[3m L & R of CL, 0.25mm water]



Transport Canada Maintenance Planning Runway Average Level = 60
Transport Canada Minimum 100m Maintenance Planning Level = 40
Transport Canada Minimum 100m Action Level = 30

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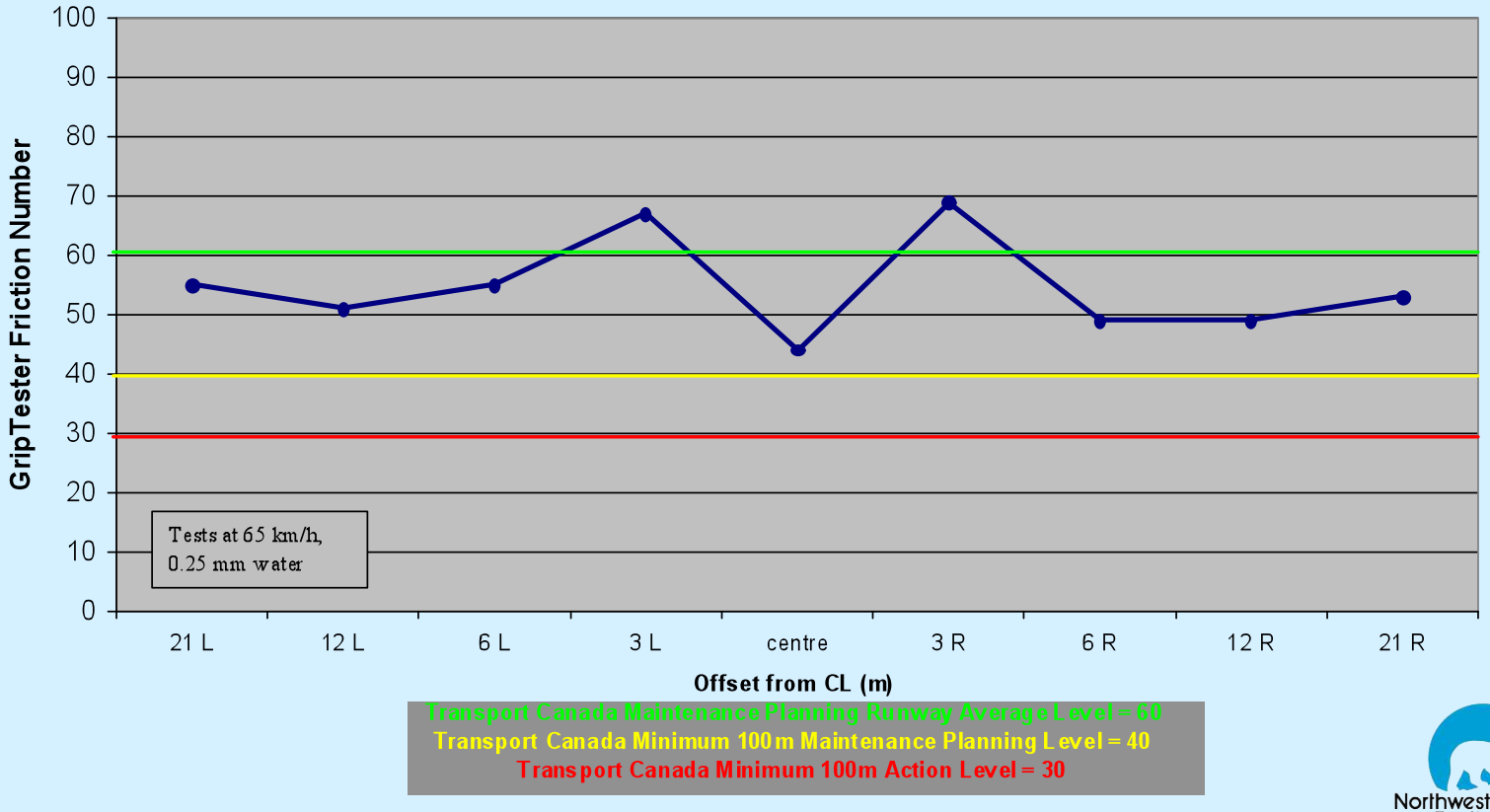
Friction Survey Results

Norman Wells Airport
Runway 09-27, July 5-6 2010
[Multiple Offsets, 0.25mm water]



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Texture Survey

ASTM E2380-05
Outflow Meter

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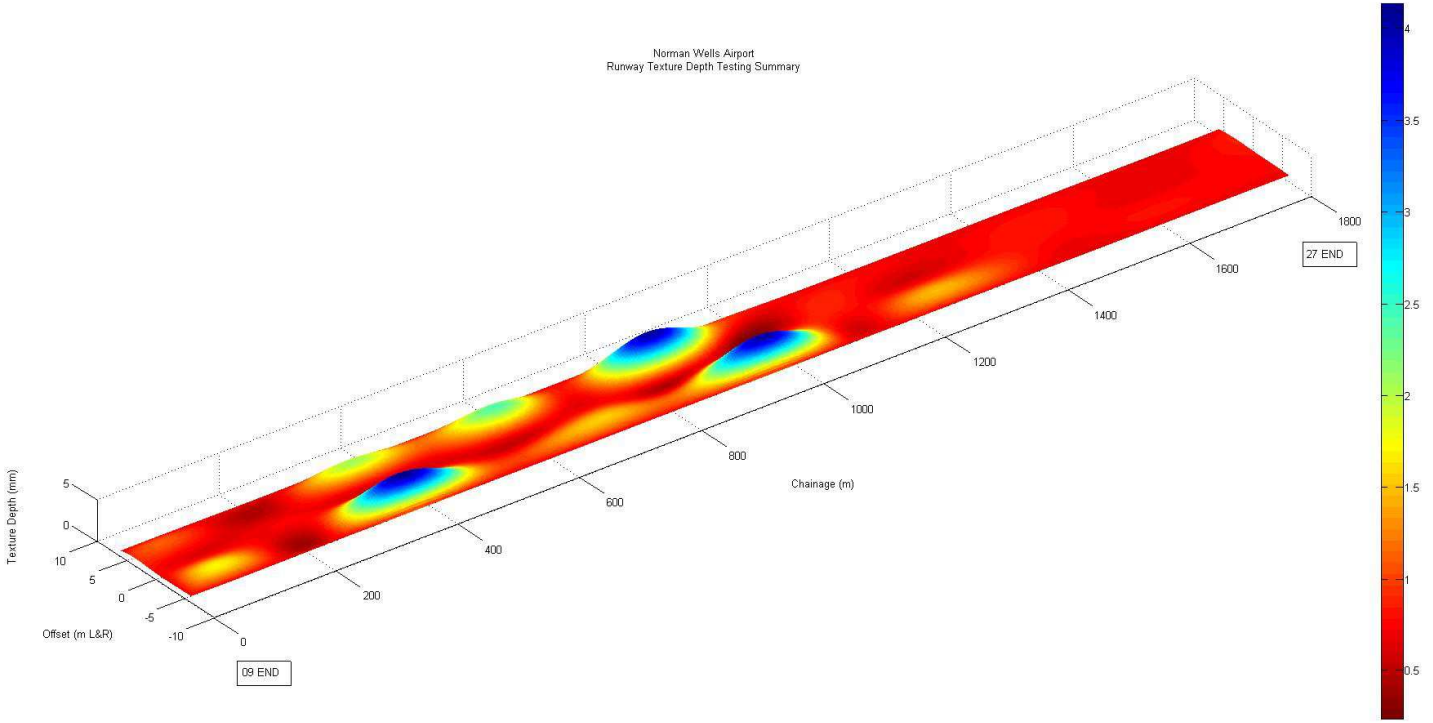
Texture Survey Results



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Cross-Slope Survey

October 2010

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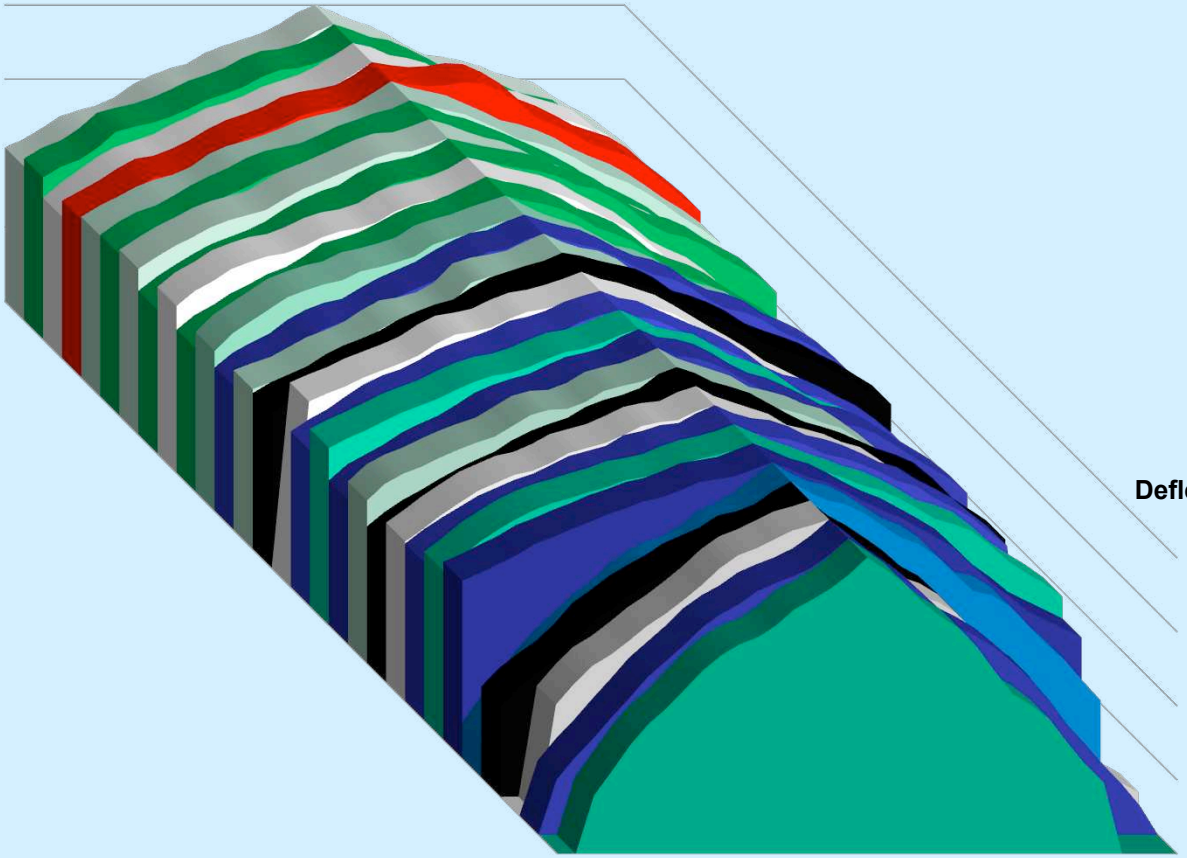
Cross-Slope Survey



Deflection from CL (mm)

Threshold Runway 27

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Friction Improvement Options

CYVQ IMPROVEMENT OPTIONS: COST COMPARISONS				
Treatment	**Shotblasting**	**Standard Grooves**	**Trapezoidal Grooves**	**Diamond Grinding**
cost estimate	**$242,099**	**$181,357**	**$205,624**	**$437,224**
recurrence	3	15	15	5
cost/year	**$80,700**	**$12,090**	**$13,708**	**$87,445**

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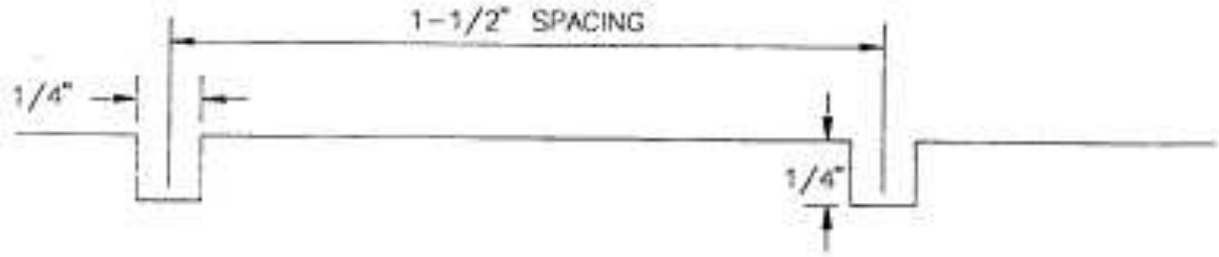
Groove Profile



TYPICAL GROOVE DETAIL

NOTE: GROOVES SHALL BE PERPENDICULAR TO R/W CENTERLINE.
(BASIC BID)

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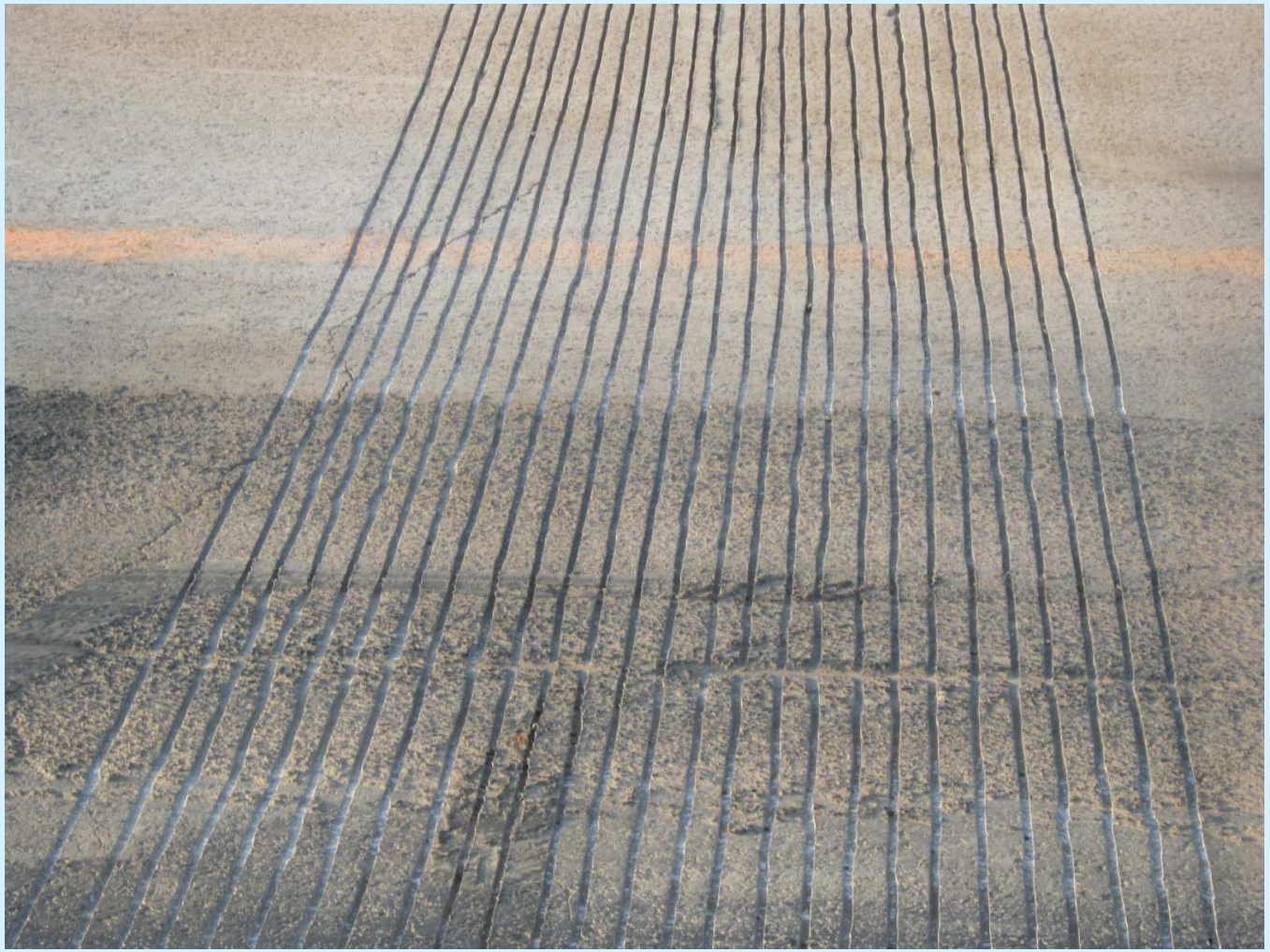
Test Grooves



October 2010

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Test Grooves

January 2011

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Decision

- Tender for grooving closed 25 May 2011
- Contractor was delayed at USA/Canada border
- Results from delay:
  - 6 July 2011: Incident Three: B737-200 hydroplaned landing Runway 27.
  - 13 July 2011: TC issued a Program Validation Inspection requiring a Corrective Action Plan regarding the runway surface.
  - 14 July 2011: Incident Four: B737-200 hydroplaned landing Runway 09.
- 26 July 2011—began work of grooving contract.

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Cutting Grooves

July 2011

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Cutting Grooves

July 2011

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Cutting Grooves

July 2011

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Results of Grooving - Summer

- Airlines are pleased. Friction has improved and there have been no more incidents.
- Grooved areas dry quickly after the rain.
- Sweeping during and after rain storms is no longer required.

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Results of Grooving - Summer

- 8 May 2012
- Grooved area dry, non-grooved area still wet.

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Results of Grooving - Winter

- Friction index was .05-.08 higher where grooved.
- Only used 65 tonnes of sand (typical use is 100 T).
- No chemicals used this winter
- CRFI improved more quickly during sweeping.
- Ice came off the surface more easily.
- Runway dried more quickly after wet snow and slush.
- Favourable feedback from the airlines.

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Some Issues

- Damage to runway crown from snow removal.
- Under icy conditions, aircraft had difficulty turning on the threshold areas which were not grooved.
- Snow compacts in grooves but comes out with sweeping.
- This winter season we went through 3 cores of brushes. The normal was 2 cores per year.
- Grooves are gone in some of the runway patch areas.

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Damage at Runway Crown

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Ungrooved Areas are Slippery

- 5 May 2012
- Ungrooved Threshold 27 is slippery.
- CRFI .35 in this location. Temperature -4°C

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Compact Snow in Grooves

- 5 May 2012
- First sweeper pass
- CRFI .42
  Temp. -4°C

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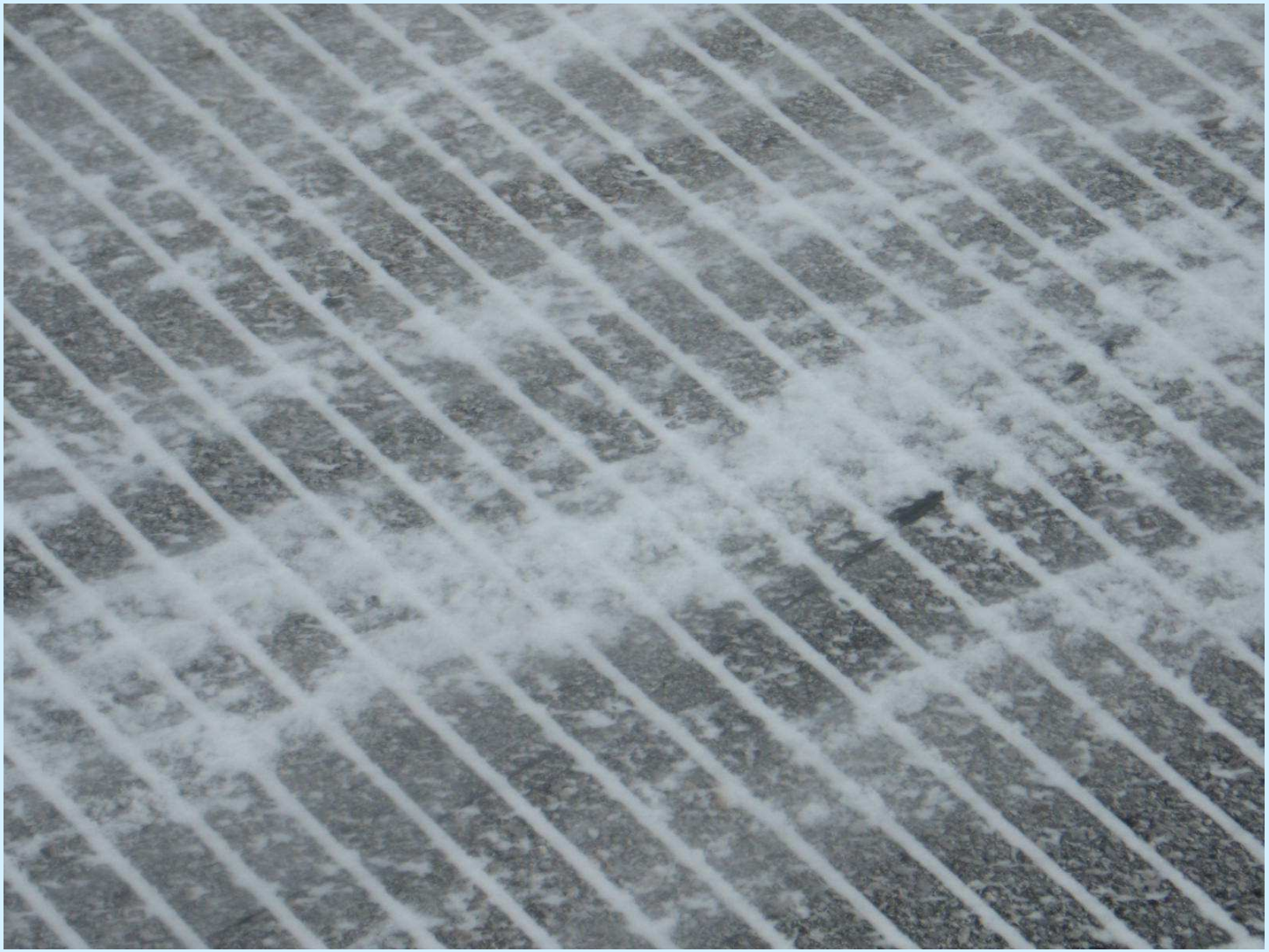
Compact Snow in Grooves



- May 05, 2012
- First sweeper pass--detail

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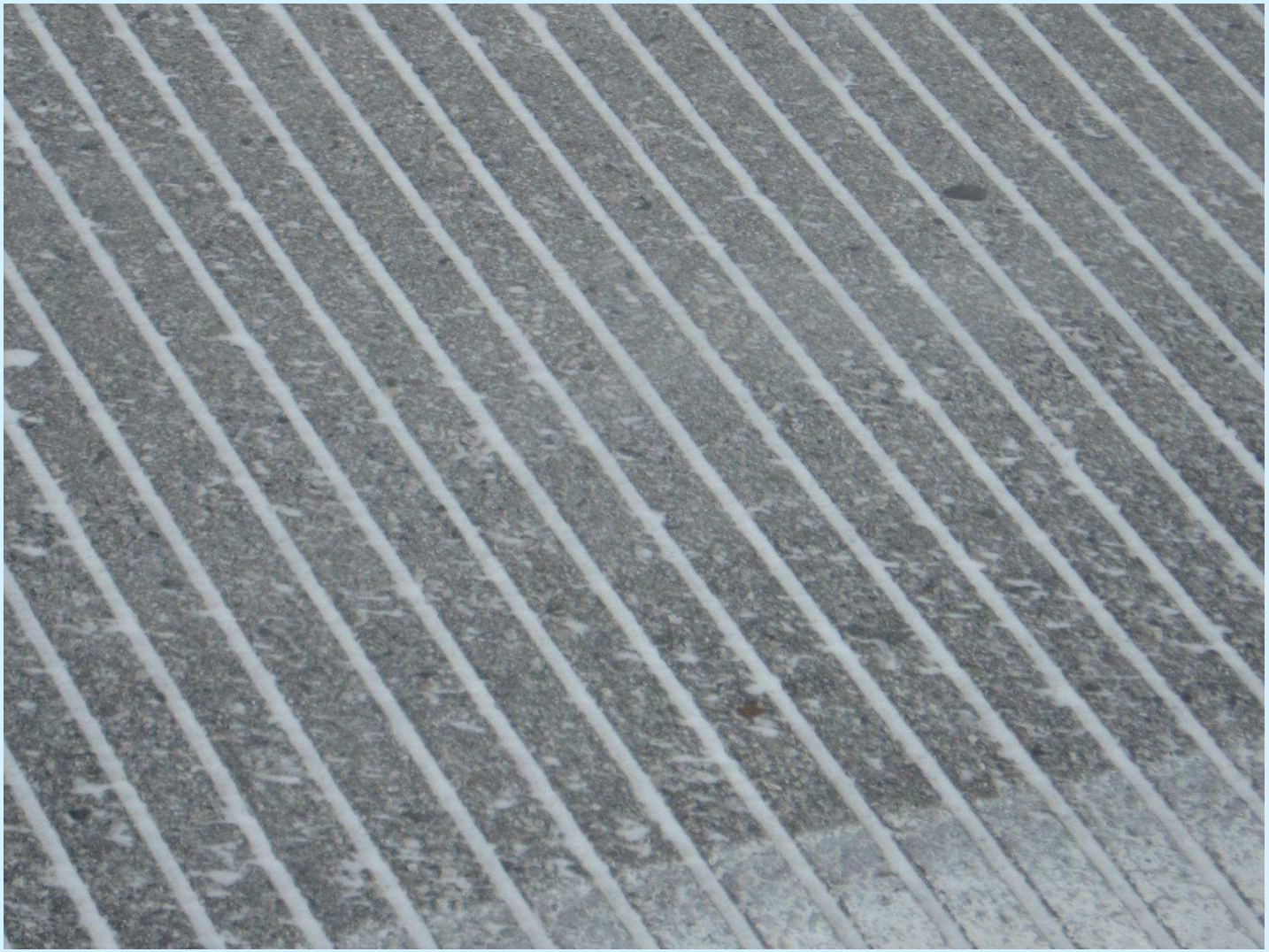
Compact Snow in Grooves



- May 05, 2012
- Second sweeper pass
- CRFI .57 -1°C

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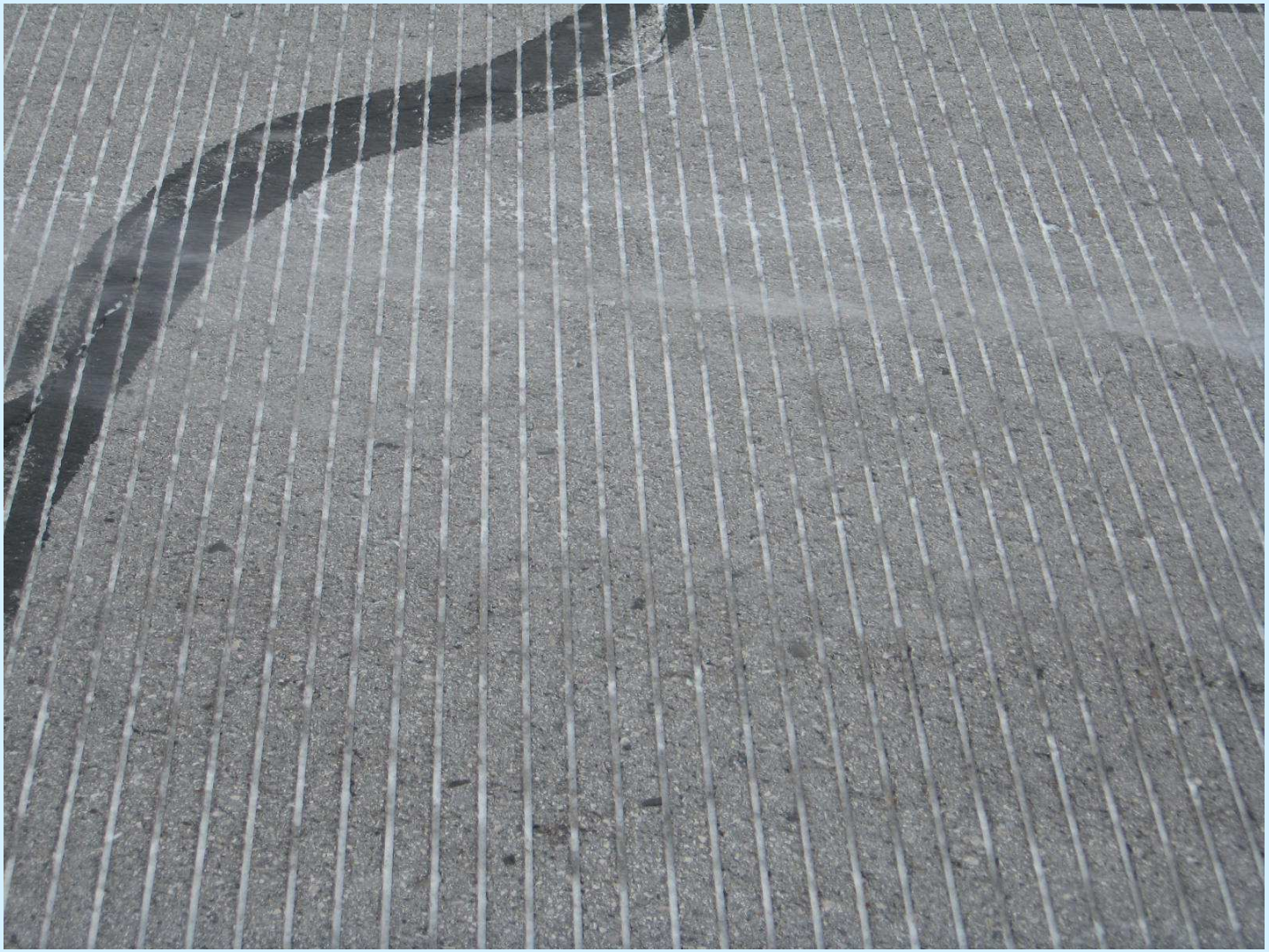
Compact Snow in Grooves



- 5 May 2012
- Third sweeper pass
- Most of the compact snow is gone

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Increased Broom Wear

- Still on the broom
  10 May 2012
  (using every inch)

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Wear at Patch Edges

10 May 2012

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Recommendations for Future Grooving

- Could we use grooves to improve winter friction elsewhere?
- Grooving should be done the same or following year of resurfacing of runway.
- Monitor the grooves during warm weather to see if there is any damage done by aircraft turning.

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The End—Questions?

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