

Panchromatic (Pan) and Multispectral (MS) Image Fusion or Image Merging Using UNB-Pansharp

**Technology Development:
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Characteristics of UNB-Pansharp:

- (1) Fully automated, one step, fast process.**
- (2) Optimal fusion results with:**
 - maximum detail increasing,**
 - minimum colour distortion, and**
 - natural colour and feature integration.**

Examples of Fusion, Merging, or Pan-sharpening of

1. IKONOS ,
2. Landsat ETM+,
3. QuickBird,
4. GeoEye-1, and
5. WorldView-2

Images

1. IKONOS Pan and MS Fusion, Merging or Pan-sharpening

Original IKONOS Pan and MS images courtesy of
GeoEye Inc. (formerly Space Imaging Inc.) and
the City of Fredericton

IKONOS Pan and MS Fusion

4m Multi-spectral



+



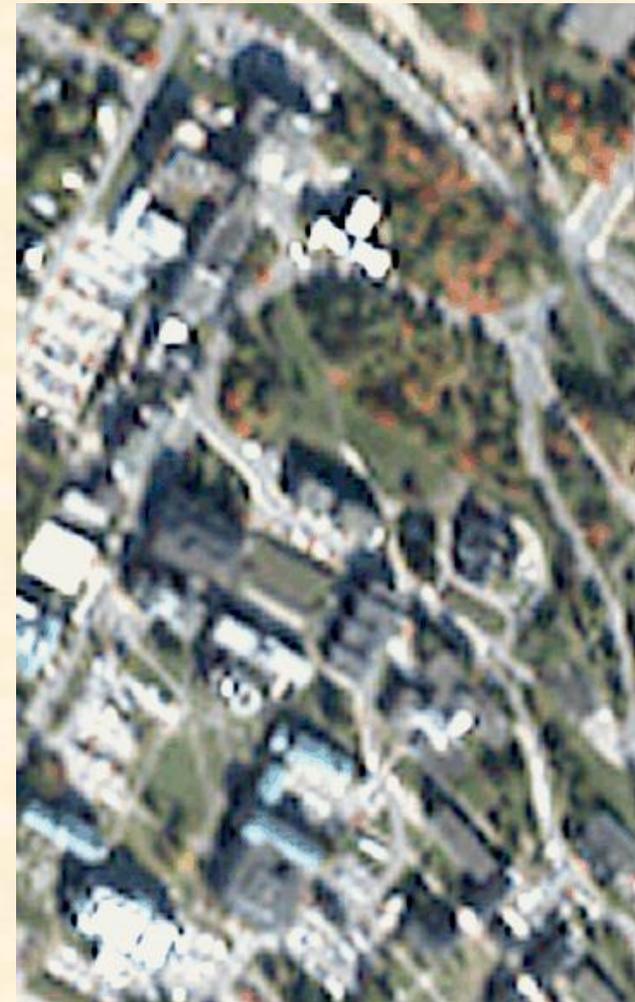
1m Panchromatic

=



1m UNB-Pansharp

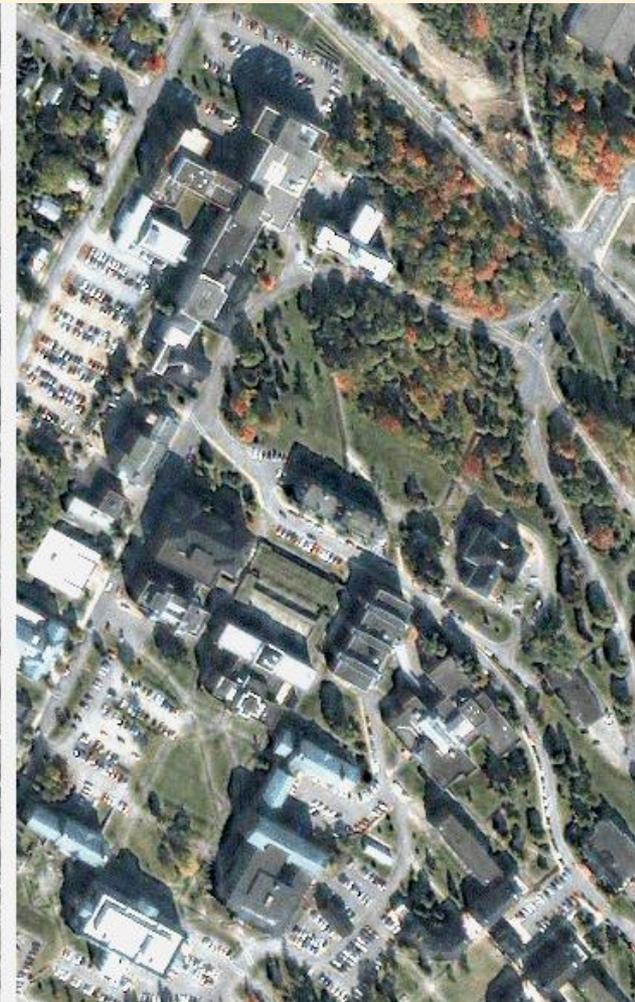
IKONOS Pan and MS Fusion



4m multispectral image



1m panchromatic image

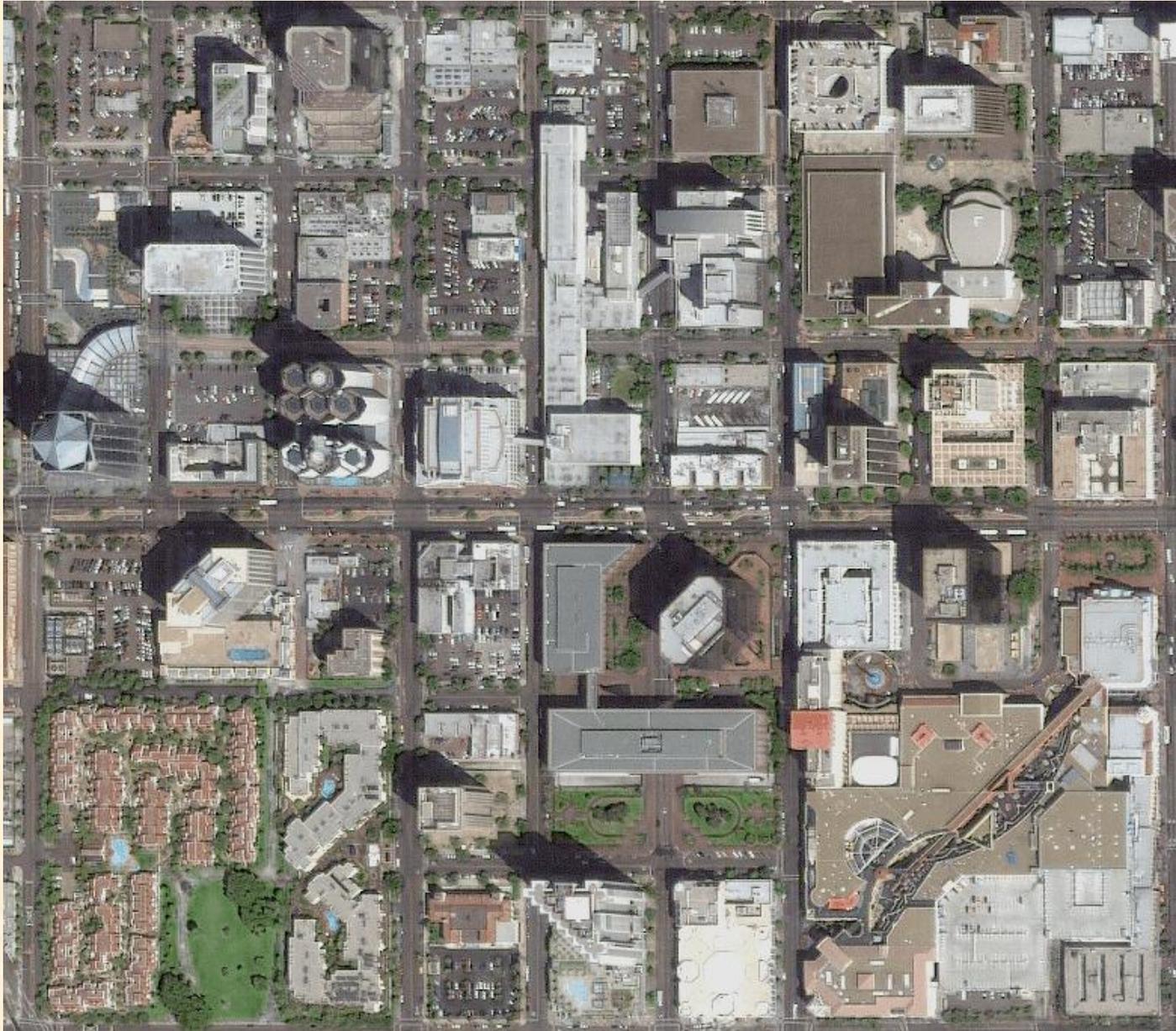


1m UNB-Pansharp image

Pan and MS Fusion with Different Options



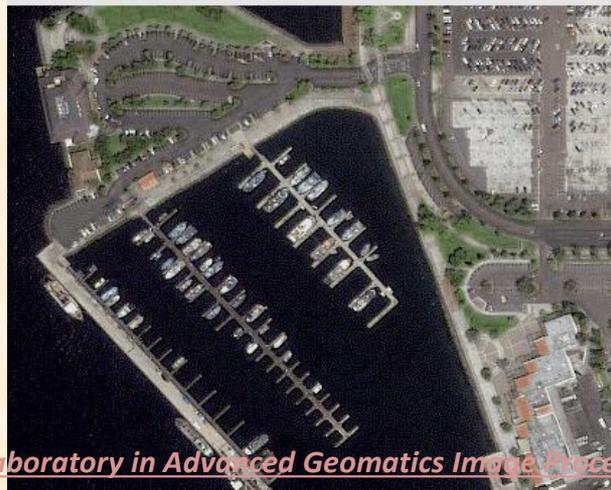
IKONOS Fusion (UNB-Pansharp), 1m, with colour enhancement



**IKONOS Fusion
(UNB-Pansharp)
1m**

**Colour
enhancement
option**

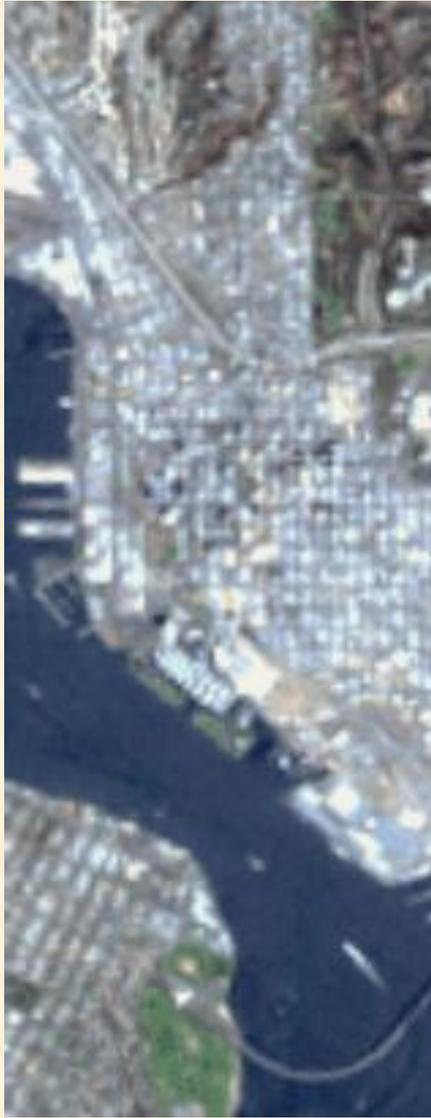
San Diego, USA



2. Landsat ETM+ Pan and MS Fusion, Merging or Pan-sharpening

Original Landsat ETM+ Pan and MS images
courtesy of PCI Geomatics Inc.

Landsat 7 ETM+ Image Fusion (Band 123 in BGR)



30m Multispectral



15m Panchromatic



15m UNB-Pansharp result

Landsat 7 ETM+ Image Fusion (Band 234 in BGR)



30m Multispectral



15m Panchromatic



15m UNB-Pansharp Result

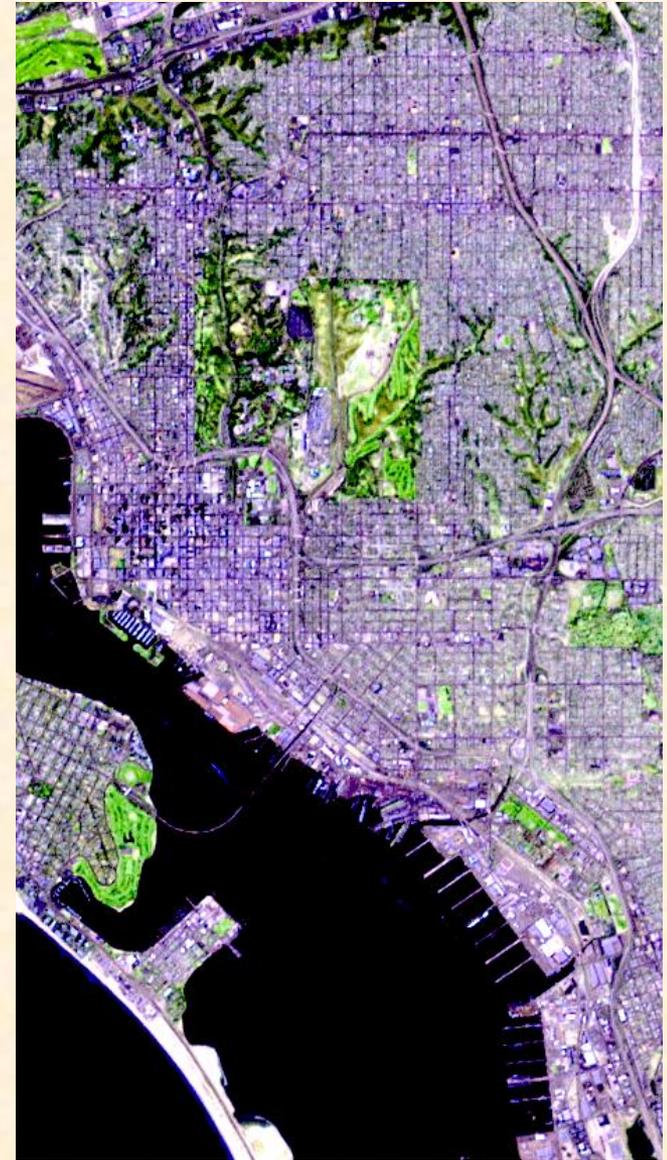
Landsat 7 ETM+ Image Fusion (Band 357 in BGR)



30m Multispectral



15m Panchromatic



15m UNB-Parsharp Result

3. QuickBird Pan and MS Fusion, Merging or Pan-sharpening

Original QuickBird Pan and MS images courtesy of
DigitalGlobe Inc. and the City of Fredericton

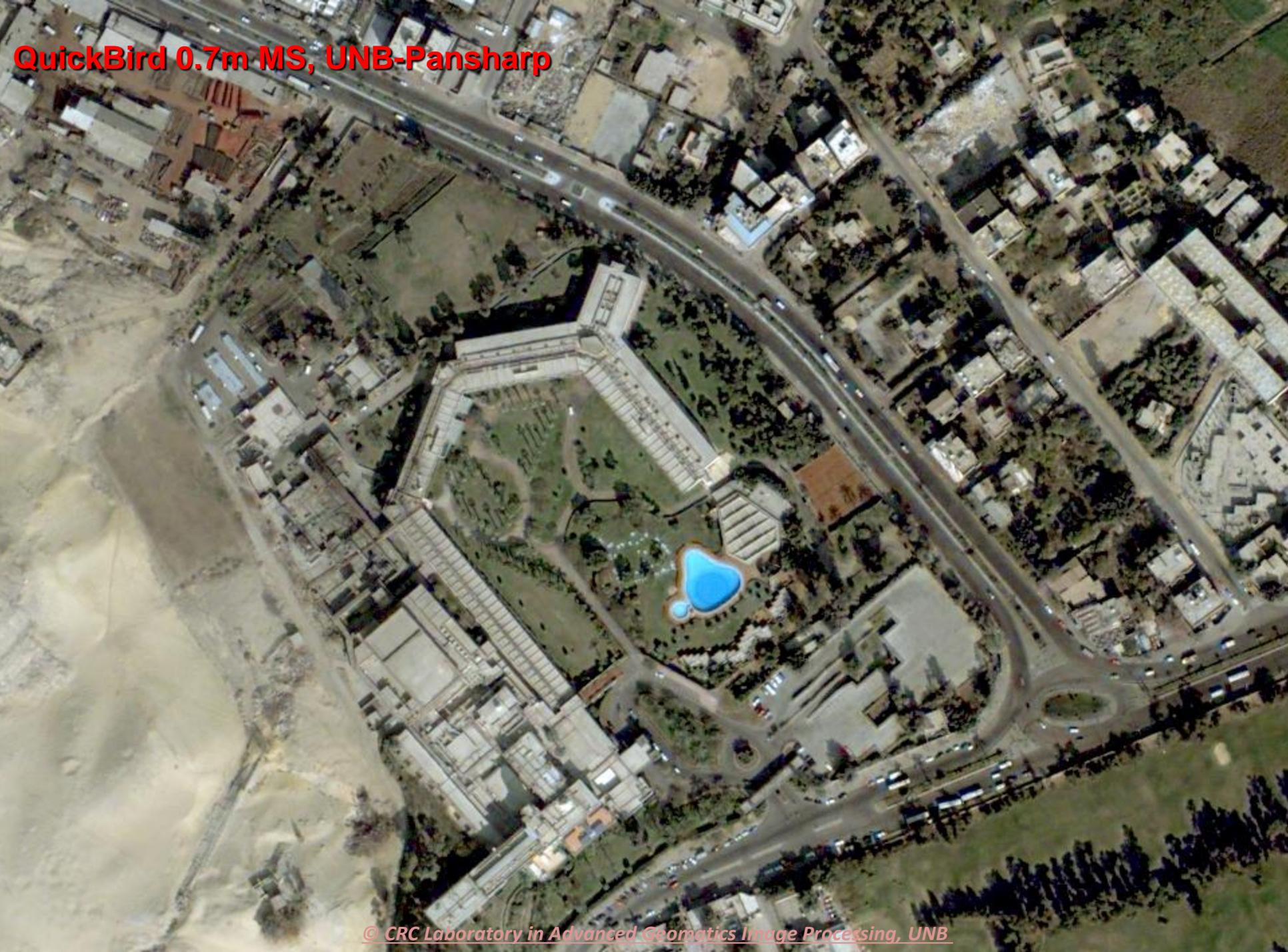
QuickBird 2.8m MS



QuickBird 0.7m Pan



QuickBird 0.7m MS, UNB-Pansharp



QuickBird 0.7m MS, UNB-Pansharp & Color Enhancement



QuickBird, 2.8m MS, 123 in BGR



QuickBird, 0.7m Pan



QuickBird, 0.7m MS, 123 in BGR, UNB-Pansharp



QuickBird, 2.8m MS, 234 in BGR



QuickBird, 0.7m Pan



QuickBird, 0.7m MS, 234 in BGR, UNB-Pansharp



QuickBird, 2.8m MS, 123 in BGR



QuickBird, 0.7m Pan



QuickBird, 0.7m MS, 123 in BGR, UNB-Pansharp





QuickBird, 0.7m MS, 123 in BGR, UNB-Pansharp with Enhancement

QuickBird, 2.8m MS, 234 in BGR



QuickBird, 0.7m Pan



QuickBird, 0.7m MS, 234 in BGR, UNB-Pansharp



QuickBird, 0.7m MS, 234 in BGR, UNB-Pansharp with Enhancement



QuickBird, 2.8m MS, 123 in BGR



QuickBird, 0.7m Pan



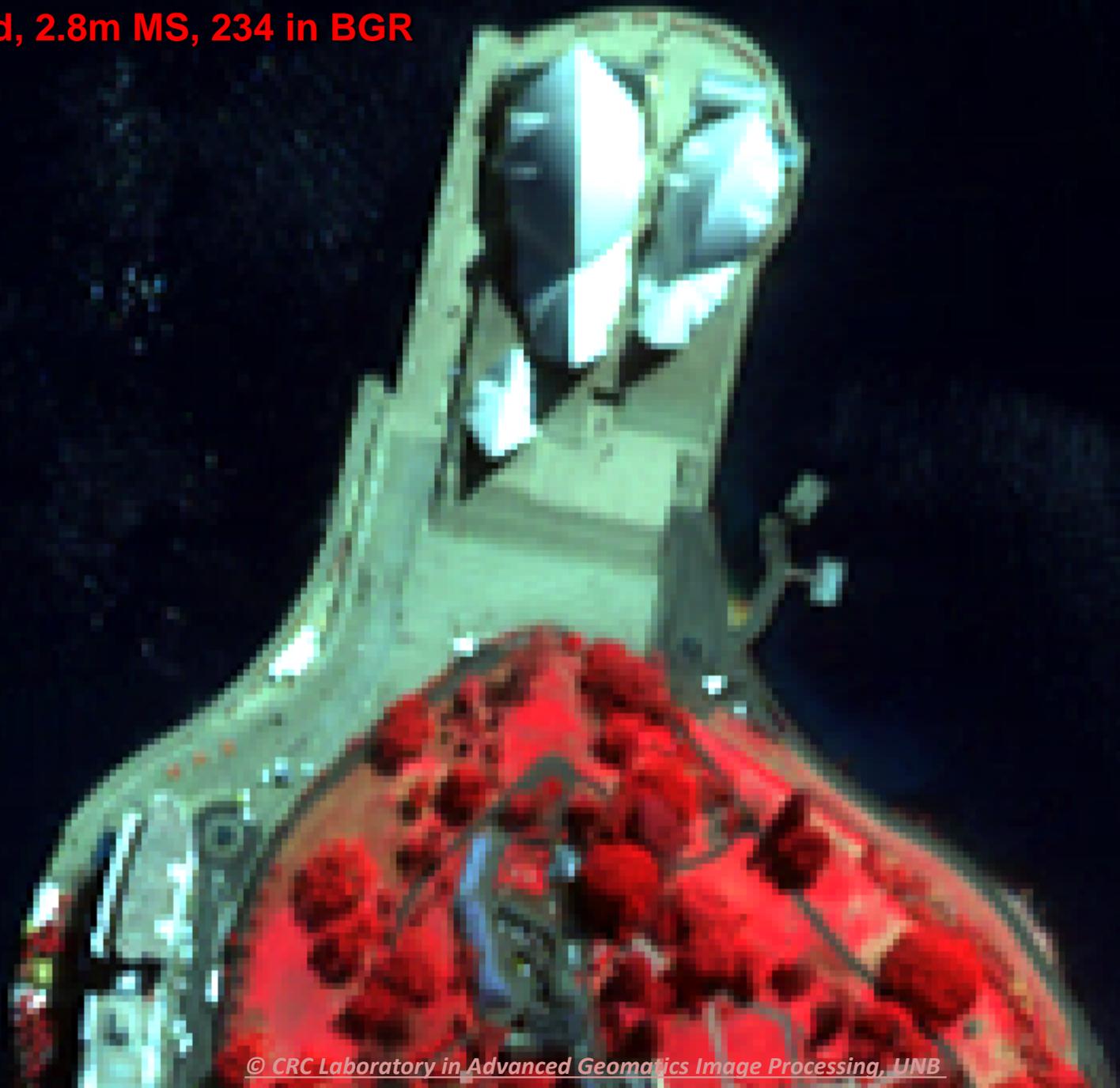
**QuickBird, 0.7m MS, 123 in BGR,
UNB-Pansharp**



**QuickBird, 0.7m MS, 123 in BGR,
UNB-Pansharp with Enhancement**



QuickBird, 2.8m MS, 234 in BGR



QuickBird, 0.7m Pan



**QuickBird, 0.7m MS, 234 in BGR,
UNB-Pansharp**



**QuickBird, 0.7m MS, 234 in BGR,
UNB-Pansharp with Enhancement**



4. GeoEye-1 Pan and MS Fusion, Merging or Pan-sharpening

Original GeoEye-1 Pan and MS images courtesy of
GeoEye Inc.

GeoEye-1, 2m MS, 123 in BGR



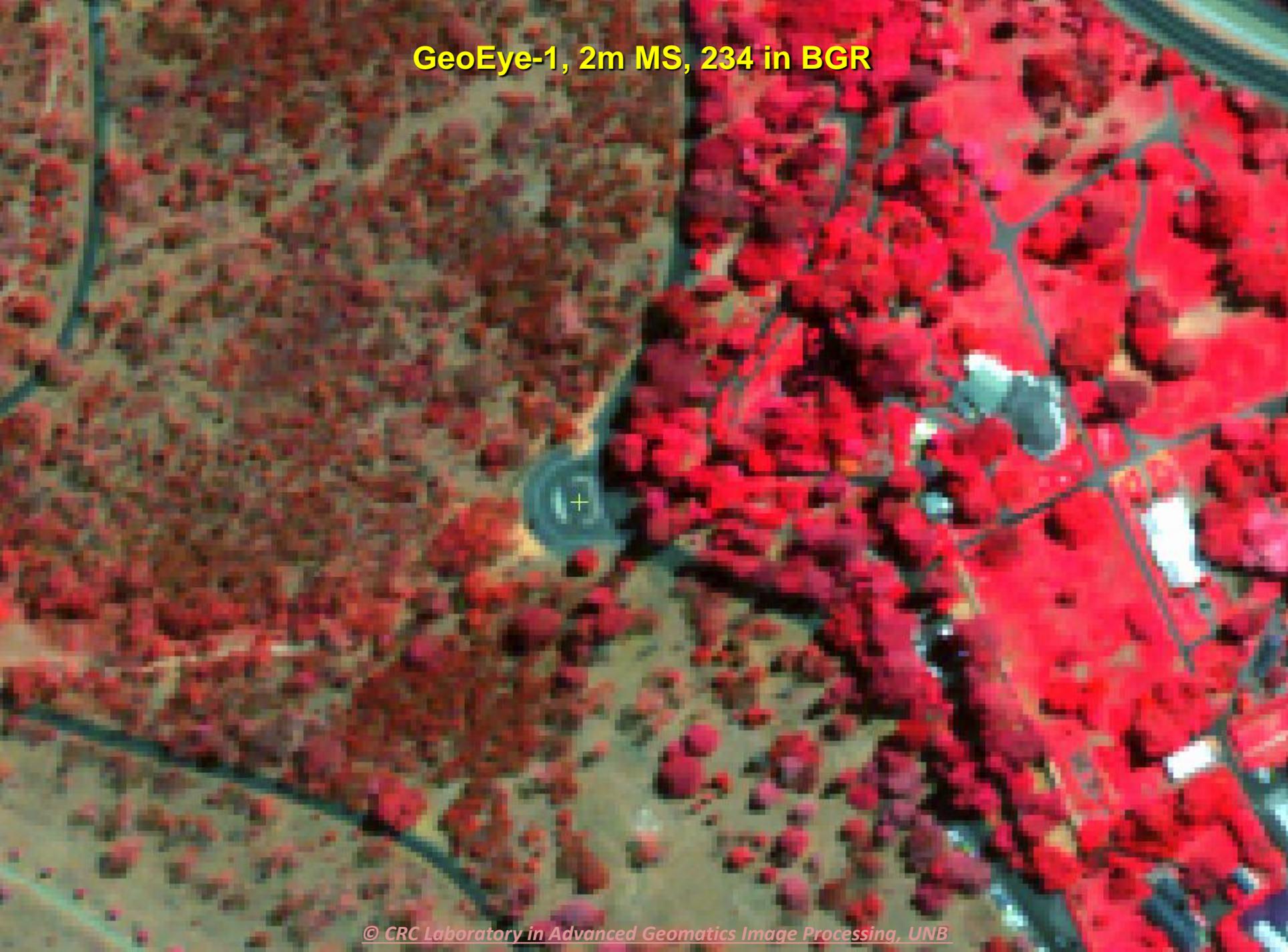
GeoEye-1, 0.5m Pan



GeoEye-1, 0.5m MS, 123 in BGR, UNB-Pansharp



GeoEye-1, 2m MS, 234 in BGR



GeoEye-1, 0.5m Pan



GeoEye-1, 0.5m MS, 234 in BGR, UNB-Pansharp



GeoEye-1, 2m MS, 123 in BGR



GeoEye-1, 0.5m Pan



GeoEye-1, 0.5m MS, 123 in BGR, UNB Pansharp



GeoEye-1, 2m MS, 123 in BGR



GeoEye-1, 0.5m Pan



GeoEye-1, 0.5m MS, 123 in BGR, UNB-Pansharp



GeoEye-1, 2m MS, 123 in BGR



GeoEye-1, 0.5m Pan



GeoEye-1, 0.5m MS, 123 in BGR, UNB-Pansharp



**GeoEye-1, 2m MS, 123 in BGR
(8 times enlarged)**



**GeoEye-1, 0.5m Pan
(2 times enlarged)**



**GeoEye-1, 0.5m MS, 123 in BGR, UNB-Pansharp
(2 times enlarged)**

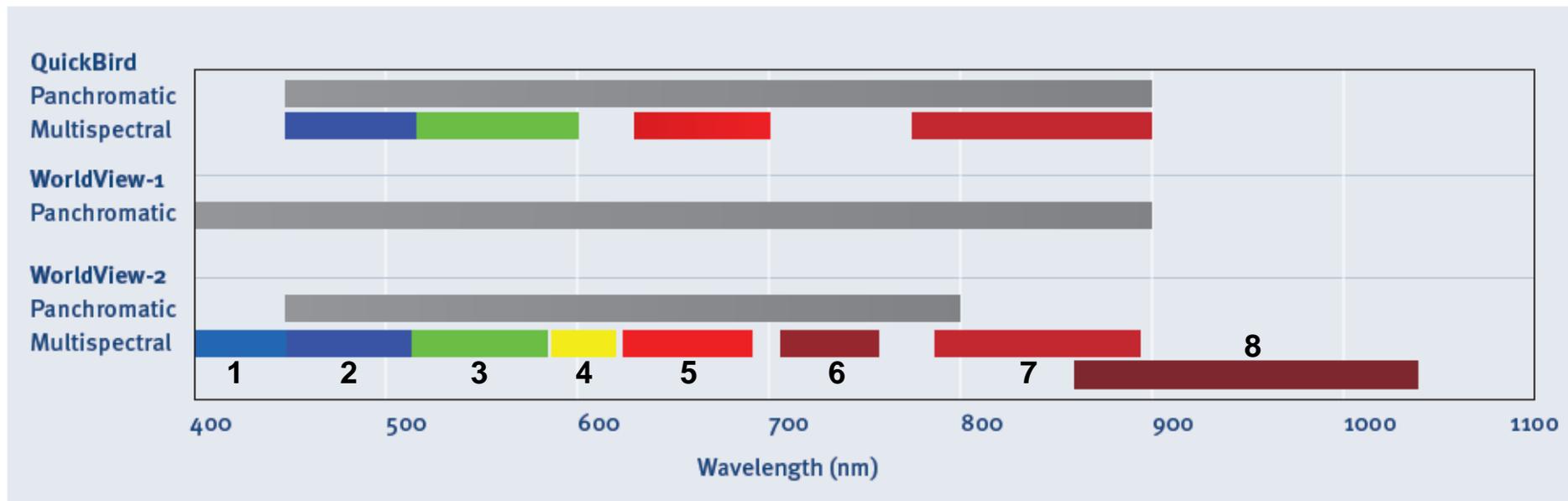


5. WorldView-2 Pan and MS Fusion, Merging or Pan-sharpening

Original WorldView-2 Pan and MS images courtesy
of DigitalGlobe Inc.

THE 8 SPECTRAL BANDS OF WORLDVIEW-2

WorldView-2 is the first commercial high-resolution satellite to provide 8 spectral sensors in the visible to near-infrared range. Each sensor is narrowly focused on a particular range of the electromagnetic spectrum that is sensitive to a particular feature on the ground, or a property of the atmosphere. Together they are designed to improve the segmentation and classification of land and aquatic features beyond any other space-based remote sensing platform.





WV2 MS 2.0m, 2, 3, 5 (b, g, r)



WV2 Pan 0.5m



UNB PanSharp (standard)
WV2 MS 0.5m, 2, 3, 5 (b, g, r)



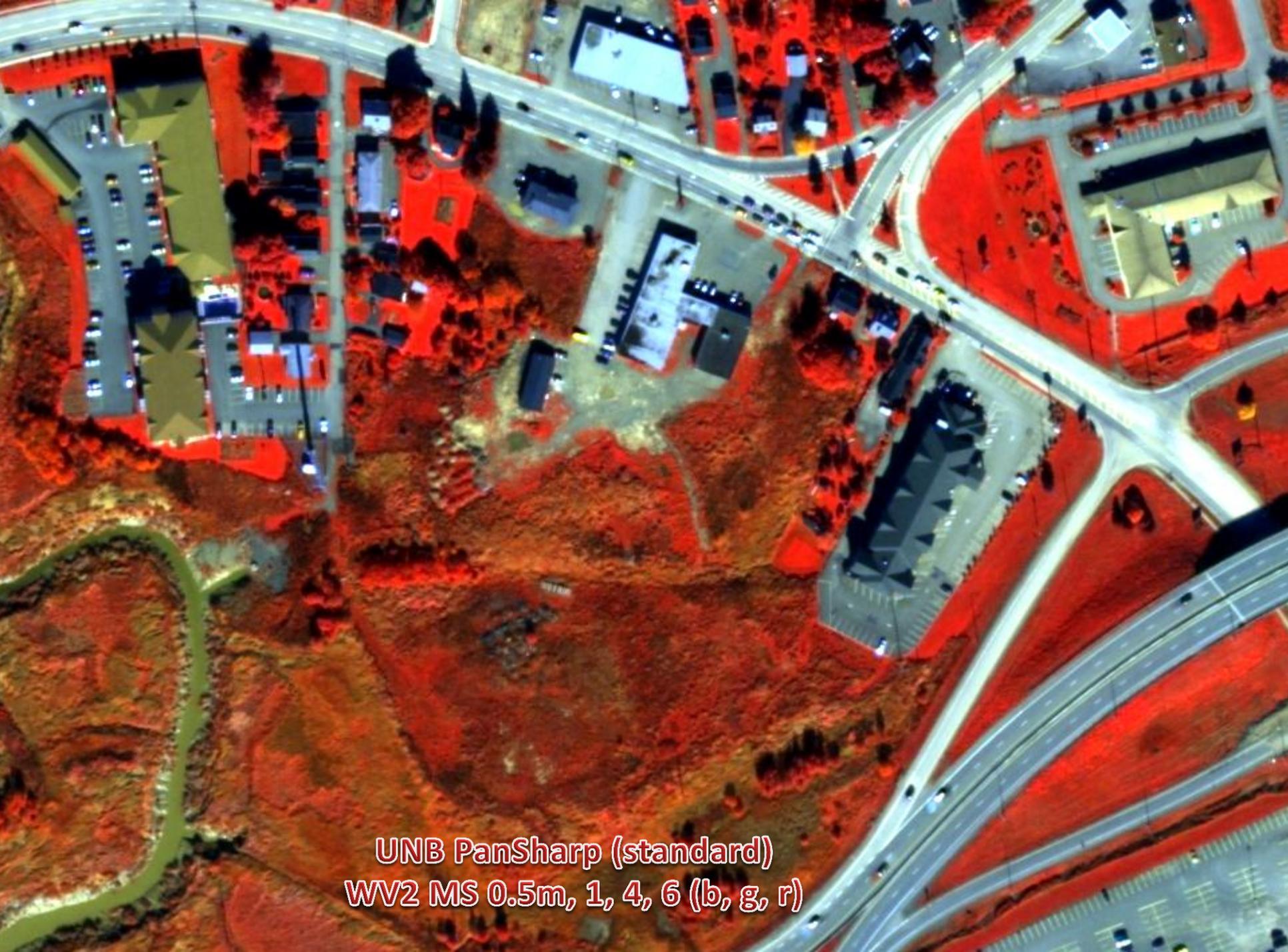
UNB PanSharp (enhanced)
WV2 MS 0.5m, 2, 3, 5 (b, g, r)



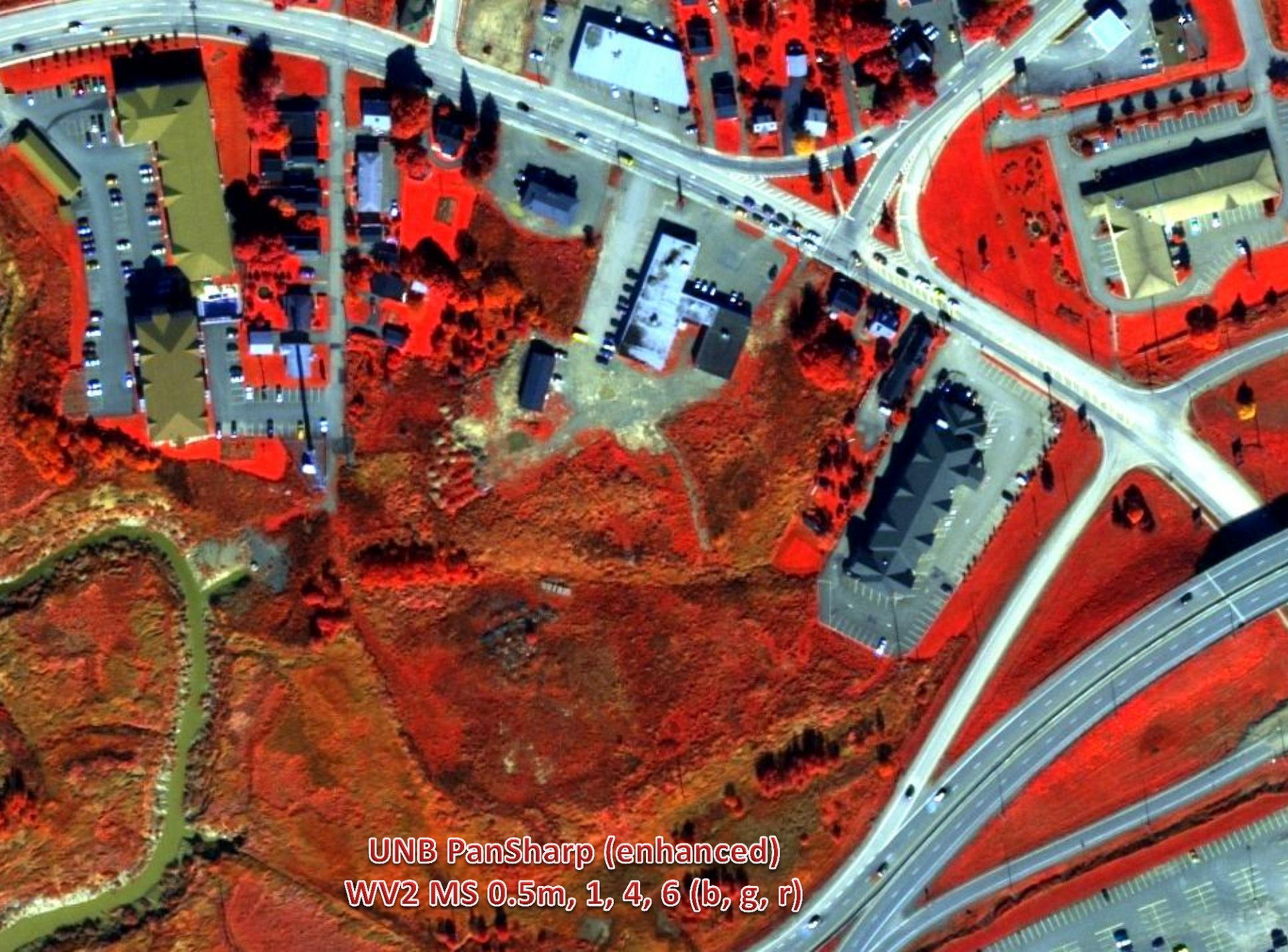
WV2 MS 2.0m, 1, 4, 6 (b, g, r)



WV2 Pan 0.5m



UNB PanSharp (standard)
WV2 MS 0.5m, 1, 4, 6 (b, g, r)



UNB PanSharp (enhanced)
WV2 MS 0.5m, 1, 4, 6 (b, g, r)



WV2 MS 2.0m, 1, 3, 6 (b, g, r)



WV2 Pan 0.5m



UNB PanSharp (standard)
WV2 MS 0.5m, 1, 3, 6 (b, g, r)



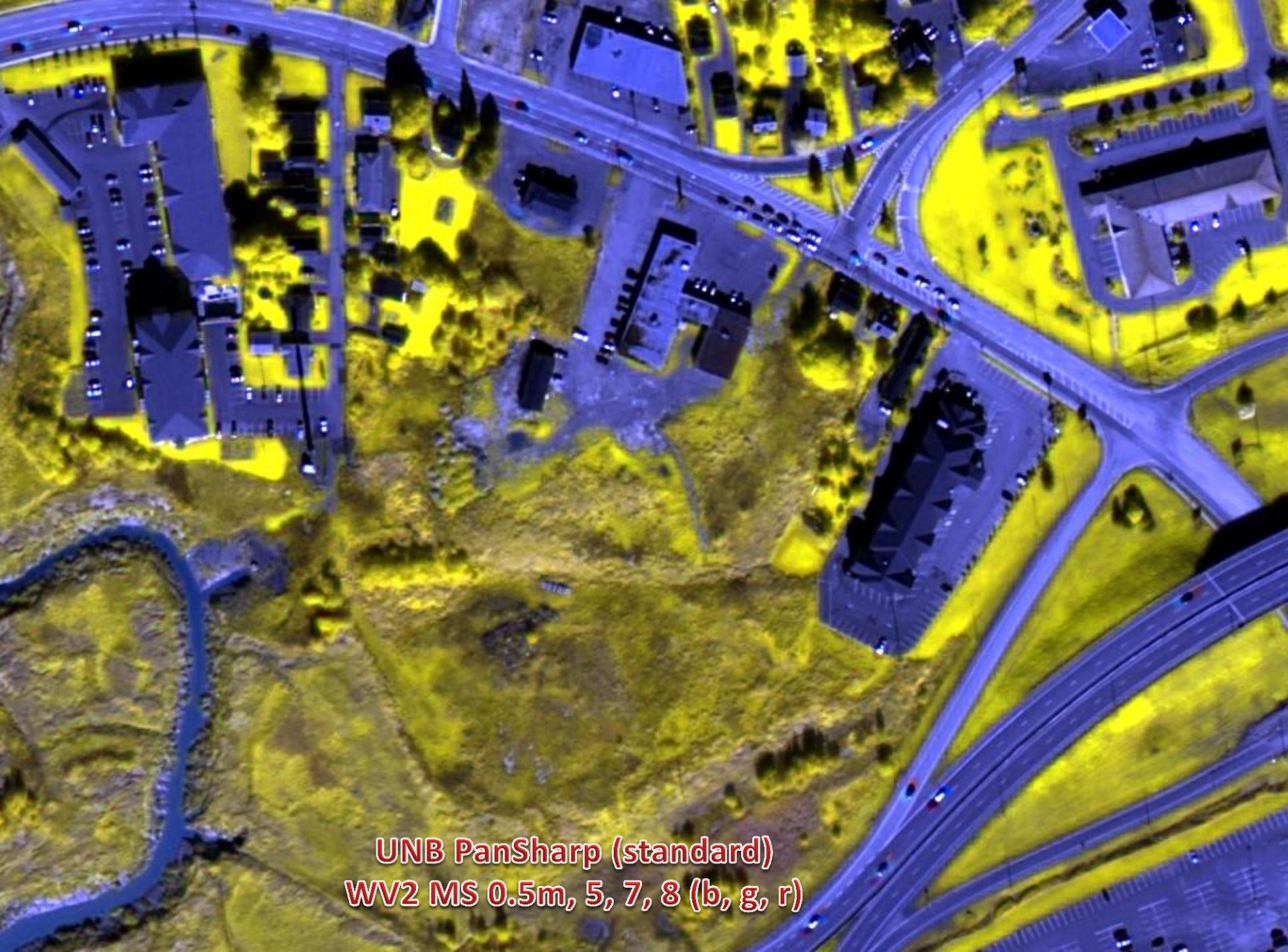
UNB PanSharp (enhanced)
WV2 MS 0.5m, 1, 3, 6 (b, g, r)



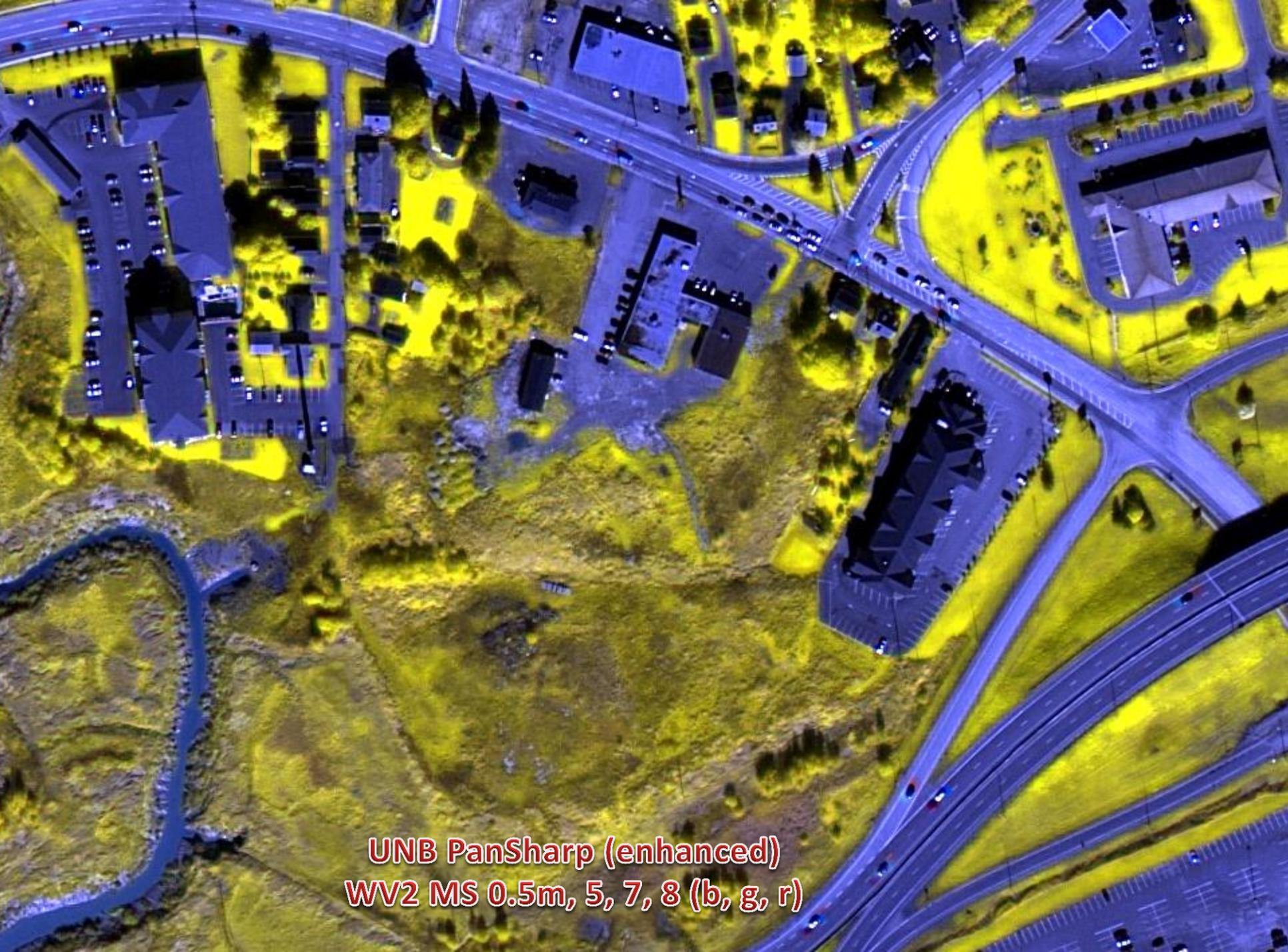
WV2 MS 2.0m, 5, 7, 8 (b, g, r)



WV2 Pan 0.5m



UNB PanSharp (standard)
WV2 MS 0.5m, 5, 7, 8 (b, g, r)



UNB PanSharp (enhanced)
WV2 MS 0.5m, 5, 7, 8 (b, g, r)

Conclusion

UNB-Pansharp:

- Fully automated, one step, fast process.

- Optimal fusion results with:

- maximum detail increasing,
- minimum colour distortion, and
- natural colour and feature integration.

Further information on UNB-Pansharp can be found at:

http://studio.gge.unb.ca/UNB/zoomview/PERS_Vol70_No6_paper.pdf

http://studio.gge.unb.ca/UNB/zoomview/PERS_Vol70_No6_cover.jpg

<http://studio.gge.unb.ca/UNB/zoomview/publications.html>

Acknowledgements

The original Pan and MS images are provided by:

- **DigitalGlobe**, <http://www.digitalglobe.com/>
- **GeoEye**, <http://combination.digitalglobe.com/>
- **PCI Geomatics**, <http://www.pcigeomatics.com/>
- **The City of Fredericton**, <http://www.fredericton.ca/en/>
- **CFB Gagetown**, http://www.army.forces.gc.ca/cfb_gagetown/