



## High-Resolution QuickBird Imagery and Related GIS Layers for Barrow, Alaska, USA

### Summary

This data set contains high-resolution QuickBird imagery and geospatial data for the entire Barrow QuickBird image area (156.15° W - 157.07° W, 71.15° N - 71.41° N) and Barrow B4 Quadrangle (156.29° W - 156.89° W, 71.25° N - 71.40° N), for use in Geographic Information Systems (GIS) and remote sensing software. The original QuickBird data sets were acquired by DigitalGlobe from 1 to 2 August 2002, and consist of orthorectified satellite imagery. Federal Geographic Data Committee (FGDC)-compliant metadata for all value-added data sets are provided in text, HTML, and XML formats.

Accessory layers include: 1:250,000- and 1:63,360-scale USGS Digital Raster Graphic (DRG) mosaic images (GeoTIFF format); 1:250,000- and 1:63,360-scale USGS quadrangle index maps (ESRI Shapefile format); an index map for the 62 QuickBird tiles (ESRI Shapefile format); and a simple polygon layer of the extent of the Barrow QuickBird image area and the Barrow B4 quadrangle area (ESRI Shapefile format).

Unmodified QuickBird data comprise 62 data tiles in Universal Transverse Mercator (UTM) Zone 4 in GeoTIFF format. Standard release files describing the QuickBird data are included, along with the DigitalGlobe license agreement and product handbooks.

The baseline geospatial data support education, outreach, and multi-disciplinary research of environmental change in Barrow, which is an area of focused scientific interest. Data are provided on four DVDs. This product is available only to investigators funded specifically from the National Science Foundation (NSF), Office of Polar Programs (OPP), Arctic Sciences Section. An NSF OPP award number must be provided when ordering this data.

### Citing These Data

Manley, W. F., L. R. Lestak, C. E. Tweedie, and J. A. Maslanik. 2006. *High-resolution QuickBird imagery and related GIS layers for Barrow, Alaska, USA*. Boulder, CO: National Snow and Ice Data Center. DVD.

As a condition of using these data, you must cite the use of this data set using the following citation. For more information, see our [Use and Copyright](#) Web page.

### Overview Table

Please [see the File List](#) and the FGDC metadata for details about specific layers, including data sources, processing, data format, spatial and temporal resolution, extent, projection, and datum.

Category	Description										
<a href="#">Data format</a>	Primary, derived, and accessory data layers are provided in different formats, including GeoTIFF, and ESRI Shapefiles.										
<a href="#">Spatial coverage</a>	<table border="0"> <tr> <td><b>Barrow QuickBird extent:</b></td> <td><b>Barrow Quadrangle extent:</b></td> </tr> <tr> <td>West: 157.070333° W</td> <td>West: 156.285758° W</td> </tr> <tr> <td>East: 156.148473° W</td> <td>East: 156.891234° W</td> </tr> <tr> <td>North: 71.405004° N</td> <td>North: 71.403168° N</td> </tr> <tr> <td>South: 71.147638° N</td> <td>South: 71.249662° N</td> </tr> </table>	<b>Barrow QuickBird extent:</b>	<b>Barrow Quadrangle extent:</b>	West: 157.070333° W	West: 156.285758° W	East: 156.148473° W	East: 156.891234° W	North: 71.405004° N	North: 71.403168° N	South: 71.147638° N	South: 71.249662° N
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North: 71.405004° N	North: 71.403168° N										
South: 71.147638° N	South: 71.249662° N										
<a href="#">Temporal coverage</a>	Data were acquired from 1 to 2 August 2002.										
<a href="#">Tools for accessing data</a>	These data are easily imported into ArcGIS and image processing software (ENVI, ERDAS IMAGINE, and others).										
Grid type and size	Refer to the FGDC metadata ( <a href="#">accessed from the File List</a> ) for details specific to each layer.										
File naming convention	<a href="#">See File List</a>										
File size	<a href="#">See File List</a>										
<a href="#">Parameter(s)</a>	Infrared imagery, visible imagery										
<a href="#">Procedures for obtaining data</a>	Data are available on four DVDs and are restricted to NSF OPP-funded investigators. To place an order, visit the <a href="#">NSIDC catalog description</a> for this data set.										

### Table of Contents

- [1. Contacts and Acknowledgments](#)
- [2. Detailed Data Description](#)
- [3. Data Access and Tools](#)
- [4. Data Acquisition and Processing](#)
- [5. References and Related Publications](#)
- [6. Document Information](#)

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Read the [DigitalGlobe Single Organization End User License Agreement](#).

## 2. Detailed Data Description

This product set contains high-resolution QuickBird imagery and geospatial data for the Barrow, Alaska, USA region for use in Geographic Information Systems (GIS) and remote sensing software packages. The product set includes the original QuickBird imagery, as well as [value-added mosaics](#), accessory GIS layers, and additional documentation. Together, the imagery and geospatial data support education, outreach, and multi-disciplinary research of environmental change in Barrow, which is an area of focused scientific interest.

The original QuickBird data were acquired by DigitalGlobe from 1 to 2 August 2002, and consist of orthorectified satellite imagery. The satellite imagery depicts the first-reflective visual and near-infrared surfaces during acquisition, and is useful for visualization, mapping, georectification, and a variety of analyses. The unmodified QuickBird data comprise 62 data tiles in Universal Transverse Mercator (UTM) Zone 4 in GeoTIFF format. The data tiles are accompanied by a DigitalGlobe license agreement, product handbook, and FGDC-compliant metadata files. All products went through rigorous quality reviews before final acceptance of the data from DigitalGlobe, Inc.

Value-added mosaics were created to avoid redundant effort or confusion, and to produce a suite of complete and consistent data. The 62 data tiles were converted to data mosaics at original 0.7 m and 2.8 m resolution with a common projection (UTM Zone 4) in GeoTIFF format. A multispectral mosaic is available for the full extent of the "Barrow QuickBird area" (156.15° W - 157.07° W, 71.15° N - 71.41° N). Multispectral and panchromatic mosaics are available also for the two overlapping scenes (Image 1 and Image 2). Each of the mosaics is available in both 8 bit and 16 bit spectral resolutions.

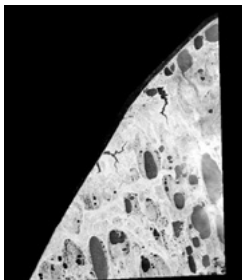
Value-added processing also included the creation of accessory GIS layers: 1:250,000- and 1:63,360-scale USGS Digital Raster Graphic (DRG) mosaic images (GeoTIFF format); 1:250,000- and 1:63,360-scale USGS quadrangle index maps (ESRI Shapefile format); an index map for the original QuickBird tiles (ESRI Shapefile format); and simple polygon layers of the extent of Image 1, Image 2, and the Barrow QuickBird area (ESRI Shapefile format).

For a smaller area of particular interest near Barrow, each of the mosaics and accessory layers was clipped to a subsetted extent of the Barrow Quadrangle (156.29° W - 156.89° W, 71.25° N - 71.40° N). These files are smaller, and can be more easily handled in GIS and remote-sensing packages, for those researchers interested only in this area.

Finally, detailed documentation is provided. A quality assessment report is included, as are DigitalGlobe Help documents. FGDC-compliant metadata (in text, HTML, and XML formats) were created for all of the value-added mosaics and accessory layers. Please read the metadata and view the thumbnail images ([accessed from the File List](#)) for a variety of details specific to each layer or image.

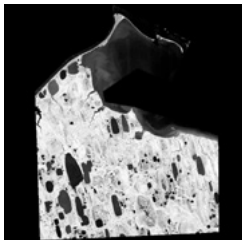
## Value-Added Image Mosaics

This section describes the value-added image mosaics. An orthoimage is remotely-sensed image data in which displacement of features in the image caused by terrain relief and sensor orientation have been mathematically removed. Orthoimagery combines the image characteristics of a photograph with the geometric qualities of a map. The panchromatic



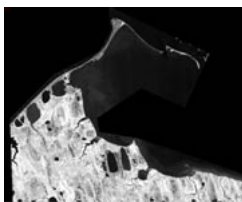
This orthoimage represents the first-reflective visual and near-infrared surfaces (445 - 900 nm) for the western portion of the Barrow QuickBird acquisition area. Data is available in both 8 bit and 16 bit.

**Panchromatic Mosaic, Image 2 (0.7 m, 8 bit)**



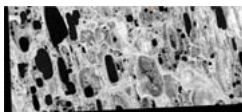
This orthoimage represents the first-reflective visual and near-infrared surfaces (445 - 900 nm) for the eastern portion of the Barrow QuickBird acquisition area. Data is available in 8 bit.

**Panchromatic Mosaic, Image 2, Tile 1 (0.7 m, 16 bit)**



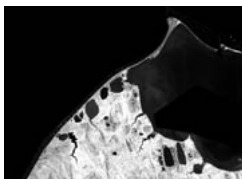
This orthoimage represents the first-reflective visual and near-infrared surfaces (445 - 900 nm) for the northeastern portion of the Barrow QuickBird acquisition area. Data is available in 16 bit.

**Panchromatic Mosaic, Image 2, Tile 2 (0.7 m, 16 bit)**



This orthoimage represents the first-reflective visual and near-infrared surfaces (445 - 900 nm) for the southeastern portion of the Barrow QuickBird acquisition area. Data is available in 16 bit.

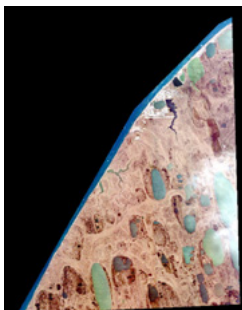
**Panchromatic Mosaic, Barrow Quadrangle (0.7 m, 8 bit and 16 bit)**



This orthoimage represents the first-reflective visual and near-infrared surfaces (445 - 900 nm) for the Barrow Quadrangle area. Data is available in both 8 bit and 16 bit.

**Note: Use this image for geocorrection.**

**Multispectral Mosaic, Image 1 (2.8 m, 8 bit and 16 bit)**



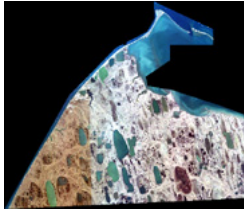
This 4-band orthoimage represents the first-reflective visual and near-infrared surfaces (450 - 900 nm) for the western portion of the Barrow QuickBird acquisition area. Data is available in both 8 bit and 16 bit.

**Multispectral Mosaic, Image 2 (2.8 m, 8 bit and 16 bit)**

This 4-band orthoimage represents the first-reflective visual and near-infrared surfaces (450 - 900 nm) for the eastern portion of the Barrow QuickBird acquisition area. Data is available in both 8 bit and 16 bit.



**Multispectral Mosaic, Full Extent (2.8 m, 8 bit and 16 bit)**



This 4-band orthoimage represents the first-reflective visual and near-infrared surfaces (450 - 900 nm) for the entire Barrow QuickBird acquisition area. Data is available in both 8 bit and 16 bit. This image is well suited as a display layer.

**Multispectral Mosaic, Barrow Quadrangle (2.8 m, 8 bit and 16 bit)**

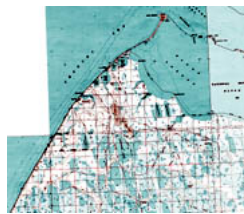


This 4-band orthoimage represents the first-reflective visual and near-infrared surfaces (450 - 900 nm) for the Barrow Quadrangle area. Data is available in both 8 bit and 16 bit. This image is well suited as a display layer.

## Selected Accessory Data Layers



**1:250,000 Scale USGS Digital Raster Graphic (DRG)**



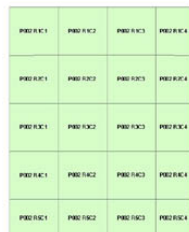
**Mosaicked 1:63,360 scale USGS DRG**



**1:63,360 scale USGS Quadrangle Boundaries**



**QuickBird Tile Boundaries, Image 1**



**QuickBird Tile Boundaries, Image 2**

## Format

The original QuickBird data, mosaics, and accessory layers are provided in two standardized data formats, GeoTIFF, and ESRI Shapefiles. The layers vary in terms of grid cell resolution and dimensions. For example, the panchromatic mosaic for image P002, tile 1 for the Barrow QuickBird area is available in GeoTIFF format, has grid cell spacing of 0.7 m, and dimensions of 14,237 rows by 30,677 columns. Please see the FGDC metadata ([accessed from the File List](#)) for details specific to each layer.

## File and Directory Structure

Please [see the File List](#) for file names, file types, file sizes, and descriptions.

## Spatial Coverage

The spatial coverage of the entire Barrow QuickBird acquisition area is:

South: 71.141662° N

The spatial coverage of the Barrow Quadrangle area is:

West: 156.285758° W

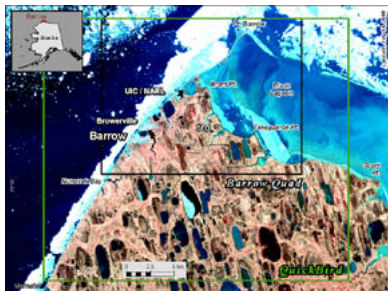
East: 156.891234° W

North: 71.403168° N

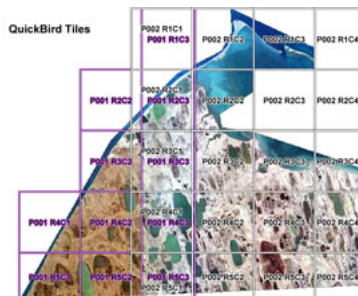
South: 71.249662° N

## Spatial Coverage Map

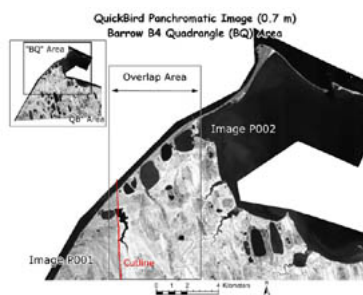
The following map displays the spatial coverage of the entire Barrow QuickBird area and the Barrow Quadrangle area. Click the thumbnail for a larger image.



The following map displays the names and extent boundaries of QuickBird tiles as originally provided by DigitalGlobe. Use this as a reference when working with unprocessed QuickBird tiles (DVD 4). Click the thumbnail for a larger image.



The following map illustrates the method for creating the Barrow B4 Quadrangle (BQ) mosaics from original tiles. Click the thumbnail for a larger image.



## Projection

The map projection for this data set is Universal Transverse Mercator (UTM) Zone 4. Horizontal datum is the North American Datum of 1983 (NAD83). The 62 unmodified QuickBird tiles are provided in UTM Zone 4. Please see the FGDC metadata ([accessed from the File List](#)) for details specific to each layer.

## Temporal Coverage

The DigitalGlobe QuickBird system collected data from 1 to 2 August 2002.

## Parameter or Variable

Pixel values in the QuickBird mosaics are values that represent magnitude of first-reflective visual and near-infrared surface return.

## Error Sources

Several potential sources of error exist in the QuickBird data, as well as other layers. For more information, refer to the FGDC metadata ([accessed from the File List](#)).

## Quality Assessment

The Barrow orthoimagery location accuracy is defined as custom; the investigator team supplied the digital elevation model (DEM) and ground control points (GCPs). Imagery meets and usually exceeds QuickBird's specifications for 1:12,000 scale orthoimagery, which is defined as 10.2 meters CE90% and 6.2 meters root-mean-square error. Radiometric, sensor, and geometric corrections were applied to separate images by DigitalGlobe and images were mapped to a cartographic projection using a digital elevation model (DEM) to correct parallax error due to local topographic relief. Each image has a different location accuracy. See the PDF file "Barrow QuickBird Quality Assessment Report.pdf" (distributed with the data) for GCPs used to geocorrect imagery, correction errors, and other issues related to quality control.

### 3. Data Access and Tools

#### Data Access

Data are available on four DVDs and are restricted to NSF OPP Arctic Sciences Section-funded investigators. To place an order, [visit the NSIDC catalog description](#) for this data set. Click "Register for Data" and read the license agreement. Scroll to the end of the agreement to accept it. You will be directed to a registration form; please complete this and provide your most recent NSF OPP grant number. NSIDC User Services will verify the grant number and contact you soon with an order confirmation.

[Reduced-resolution versions of these data are available](#) to the general public.

#### Volume

The entire data set is approximately 17.0 GB.

#### Software and Tools

NSIDC does not provide any software to read these data, which are easily imported into ArcGIS and image processing software.

#### Related Data Collections

- [Imagery and Related GIS Data for Barrow, Alaska, USA](#)
- [Reduced-Resolution QuickBird Imagery and Related GIS Layers for Barrow, Alaska, USA](#)
- [Point Barrow, Alaska and Vicinity Bathymetry](#)
- [Polar Ice Sheet DEMs and Elevation Data](#)
- [Alaska North Slope 100 m Digital Elevation Model \(DEM\)](#)

### 4. Data Acquisition and Processing

The original images were acquired by DigitalGlobe, Inc. Several Portable Document Format (PDF) files containing documentation from DigitalGlobe are distributed with this data set. The following table summarizes the documents that apply to the DigitalGlobe acquisition and processing of the data.

File Name	Summary
QuickBird Imagery Products – Product Guide.pdf	Overview of QuickBird processing levels and product options; includes information on the QuickBird satellite specifications, and on ordering QuickBird data
QuickBird – Aerial Photography Comparison Report.pdf	Compares QuickBird imagery to imagery obtained through traditional airborne cameras and processed via traditional digital photogrammetric means; assesses quality of QuickBird imagery and categorizes its usefulness for certain studies.
QuickBird Imagery Products – FAQ.pdf	Answers to frequently asked, general questions about QuickBird products.

The original DigitalGlobe QuickBird data was processed by a [team of investigators](#) to create this data set. This processing is described in the file "Barrow Quickbird Quality Assessment Report.pdf", which is distributed with the data set. This PDF file includes information about the images, the mosaic creating process, and quality control.

#### Sensor or Instrument Description

DigitalGlobe's QuickBird satellite provides the largest swath width, largest on-board storage, and highest resolution of any currently available or planned commercial satellite. QuickBird is designed to efficiently and accurately image large areas with industry-leading geolocational accuracy. The QuickBird spacecraft is capable of acquiring over 75 million square kilometers of imagery data annually (over three times the size of North America), allowing DigitalGlobe to populate and update its archive at unprecedented speed. The following table summarizes some of the QuickBird satellite characteristics. For more information, visit the [DigitalGlobe Web site](#).

<b>Launch Date</b>	October 18, 2001
<b>Launch Vehicle</b>	Boeing Delta II
<b>Launch Location</b>	Vandenberg Air Force Base, California
<b>Orbit Altitude</b>	450 km
<b>Orbit Inclination</b>	97.2 degree, sun-synchronous
<b>Speed</b>	7.1 km/second
<b>Equator Crossing Time</b>	10:30 a.m. (descending node)
<b>Orbit Time</b>	93.5 minutes
<b>Revisit Time</b>	1-3.5 days, depending on latitude (30° off-nadir)
<b>Swath Width</b>	16.5 km x 16.5 km at nadir
<b>Metric Accuracy</b>	23-meter horizontal (CE 90%)
<b>Digitization</b>	11 bits
<b>Resolution</b>	Pan: 61 cm (nadir) to 72 cm (25° off-nadir) MS: 2.44 m (nadir) to 2.88 m (25° off-nadir)

Red: 630 - 690 nm

Near IR: 760 - 900 nm

## Processing Steps

The QuickBird image for the Barrow region was originally delivered by DigitalGlobe as 2 images containing a total of 62 tiles, which were mosaicked in ENVI to create a single QuickBird image layer at full resolution and at full extent (Barrow "quickbird") in UTM Zone 4. The two images (the eastern and western portions) were collected on 1 and 2 August 2002. A non-radiometrically correct (color corrected) and panchromatic mosaic of both images is available at the reduced extent of the Barrow Quadrangle and at reduced resolution (10 m) for public release.

For more information about the processing for this data set, [see the Detailed Data Description](#).

## 5. References and Related Publications

[Digital Globe product documents and papers](#)

[Barrow Area Information Database - Internet Map Server](#)

## 6. Document Information

### List of Acronyms

The following acronyms are used in this document:

**ARCSS:** Arctic System Science

**CIRES:** Cooperative Institute for Research in Environmental Sciences

**DEM:** Digital Elevation Model

**DN:** Digital Number

**DRG:** Digital Raster Graphic

**DVD:** Digital Versatile Disc

**ENVI:** Environment for Visualizing Images

**ESRI:** Environmental Systems Research Institute

**FGDC:** Federal Geographic Data Committee

**GCP:** Ground Control Point

**GeoTIFF:** Geographic (geographically referenced) Tagged Image File Format

**GIS:** Geographic Information Systems

**HTML:** HyperText Markup Language

**INSTAAR:** Institute of Arctic and Alpine Research

**NAD:** North American Datum

**NSF:** National Science Foundation

**NSIDC:** National Snow and Ice Data Center

**OPP:** Office of Polar Programs

**PDF:** Portable Document Format

**URL:** Uniform Resource Locator

**USGS:** United States Geological Survey

**UTM:** Universal Transverse Mercator

**XML:** Extensible Markup Language

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