2013 CENTRAL EUROPE FLOODS – FLOOD FOOTPRINT MAPS

To help clients understand the impact of the June 2013 flood event that affected Central Europe, AIR has created maps that reflect the flood extent in Germany along the worst affected areas of the Elbe and Danube Rivers.

This document contains a description of AIR's methodology used to create these maps, a description of the rivers, and images of the flood extent. A shapefile of the flood footprint can be downloaded from the ALERT website for further analysis using AIR's Touchstone™ platform.

METHODOLOGY

AIR created the maps using available MODIS (Moderate-Resolution Imaging Spectroradiometer) sensor, Landsat 8 and DLR (German Space Agency) data. The data provided by the DLR is only available for certain areas within Germany, while MODIS and Landsat data were used to create footprints for areas not covered by the DLR as well as flooded areas in Austria and the Czech Republic.

Daily flood footprints were created using MODIS scenes for areas of the region that were not under cloud cover using the 500 meter daily surface reflectance product from the best available scenes from the sensors on the Terra and Aqua satellites. Since multiple days of data were used to fill in areas that were covered with clouds, the majority of the large flooded areas were captured using this data set.

Landsat data was used to supplement the daily MODIS data in the Elbe basin in Germany and on the Danube basin in Germany and Austria. Landsat 8's OLI (Operational Land Imager) sensor provides 30 meter resolution data and represents a large improvement in available detail compared to the MODIS sensor.

The DLR produced several flood maps showing flooded areas in Germany using several data source to determine flooded areas. These flood maps show a great amount of detail with respect to flooded areas but are limited in extent to urban and metropolitan areas. These were used where possible to extract the most accurate flood maps for the available areas.

The flood footprints for all three data sources were extracted using spectrally based classification algorithms in GIS software. The flood footprints were then converted into ArcGIS compatible polygons. The maximum extent of the floodwaters was then extracted from these polygons.

RIVER DESCRIPTIONS

Elbe River

The Elbe River is the fifth largest river in Europe after the Volga, Danube, Visla and Rhine. It flows easterly from the Krkonoše Mountains in the Czech Republic into Germany. From Germany the Elbe flows through several major cities and eventually empties into the North Sea through the Elbe river estuary in Hamburg.

The major tributaries of the Elbe are the Vltava, Saale, Mulde, Elster, Havel and Elde rivers. The Elbe basin drains an area 148,268 km^2 (57,247 mi^2) and drains portions of Germany, Czech Republic, Poland and Austria. Several large cities, industrial areas, and important ecological areas are located along the Elbe's 1,091 km (678 mi) course.

Danube River

The Danube (Donau) river is Europe's second longest river after the Volga River. Its course begins at the confluence of the Brigach and Breg rivers in Germany's Black Forest and flows South West through ten countries and four capital cities and eventually empties into the Black Sea through the Danube River Delta.

Major tributaries of the Danube include the Inn, Isar, Morava, Vah, Drava, and Iskar. The Danube basin drains an area of 801,463 km^2 (309,447 mi^2) and drains all or portions of nineteen countries. Areas along the Danube's 2,860 km (1,777 mi) length are prone to flooding including several major cities, important cultural sites and productive agricultural areas.

AIR WORLDWIDE

2013 EUROPE FLOODS

Reference Map for Detailed Flood Extent Maps

AIR WORLDWIDE®

Detailed Flood Extent Maps

Hamburg

Elbe R.

Bremen

Wittenberge (9)

Hannover

Dessau-RoBlau (5)

Berlin

Magdeburg (8)

Wittenberg (4)

Torgau (3)

Bernburg (7)

Riesa (2)

Leipzig

Dresden (1)

Halle (6)

Dortmund

Dusseldorf

Cologne

NETH.

POLAND

GERMANY

Saale R.

Mulde R.

Frankfurt

Prague

Elbe River

THE CZECH REP.

Morava River

Vltala River

Deggendorf (10)

Stuttgart

FRANCE

Danube River

Munich

Passau (11)

Vienna

SLOVAKIA

AUSTRIA

HUNGARY

Inn River

SWITZERLAND

ITALY

SLOVENIA

km

0   50   100   200   300   400

N
W — E
S

2013 EUROPE FLOODS

Dresden, Germany Flood Extent   June 5, 2013

AIR WORLDWIDE

Elbe R.

D r e s d e n

Waterbody

Flood Extent

Source: CNES - Pleiades

km

0 0.5 1   2   3   4

N
W   E
S
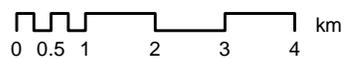
2013 EUROPE FLOODS

Riesa, Germany Flood Extent   June 9, 2013
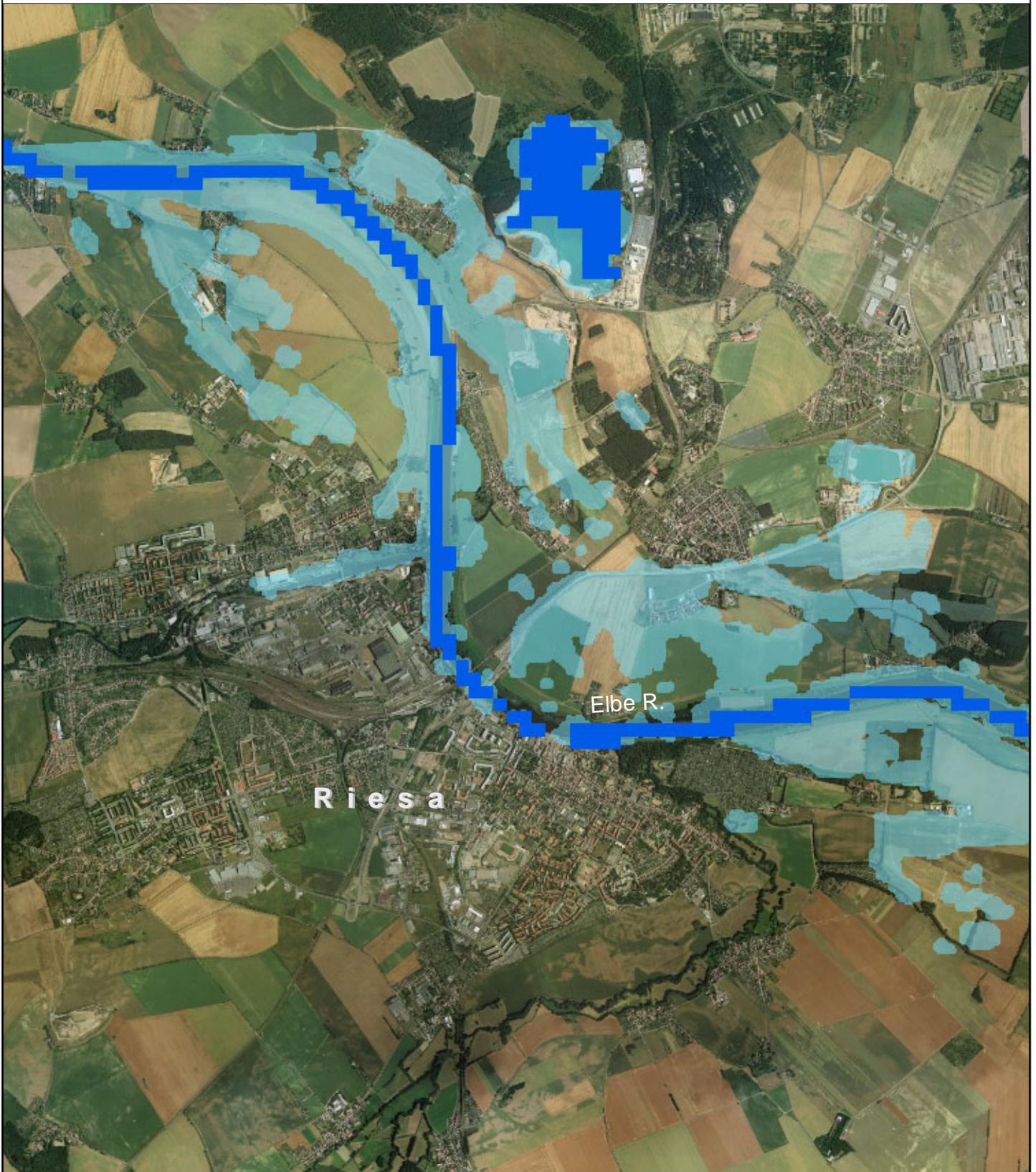
AIR WORLDWIDE®

Elbe R.

R i e s a

Waterbody

Flood Extent

Source: TerraSAR-X, German
Aerospace Center, Astrium
Services, DLR

0   0.25 0.5   1   1.5   2   km

N
W   E
S
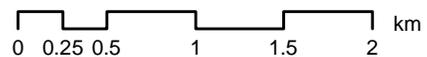
2013 EUROPE FLOODS

Torgau, Germany Flood Extent   June 9, 2013

AIR WORLDWIDE®

Elbe R.

T o r g a u

Waterbody

Flood Extent

Source: TerraSAR-X, German
Aerospace Center, Astrium
Services, DLR

km
0   0.25 0.5   1   1.5   2

N
W   E
S
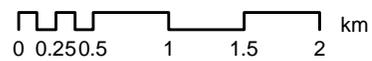
2013 EUROPE FLOODS

Wittenberg, Germany Flood Extent   June 9, 2013

AIR WORLDWIDE®

Wittenberg

Elbe R.

Waterbody

Flood Extent

Source: TerraSAR-X, German
Aerospace Center, Astrium
Services, DLR

km

0   0.5   1   2   3   4

N
W   E
S
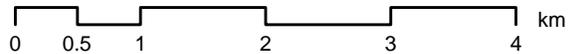
2013 EUROPE FLOODS

Dessau-Roßlau, Germany Flood Extent   June 5, 2013

AIR WORLDWIDE

Elbe R.

D e s s a u - R o ß l a u

●	Waterbody
●	Flood Extent

Source: RapidEye, DLR

km
0   0.5   1   2   3   4

N
W — E
S
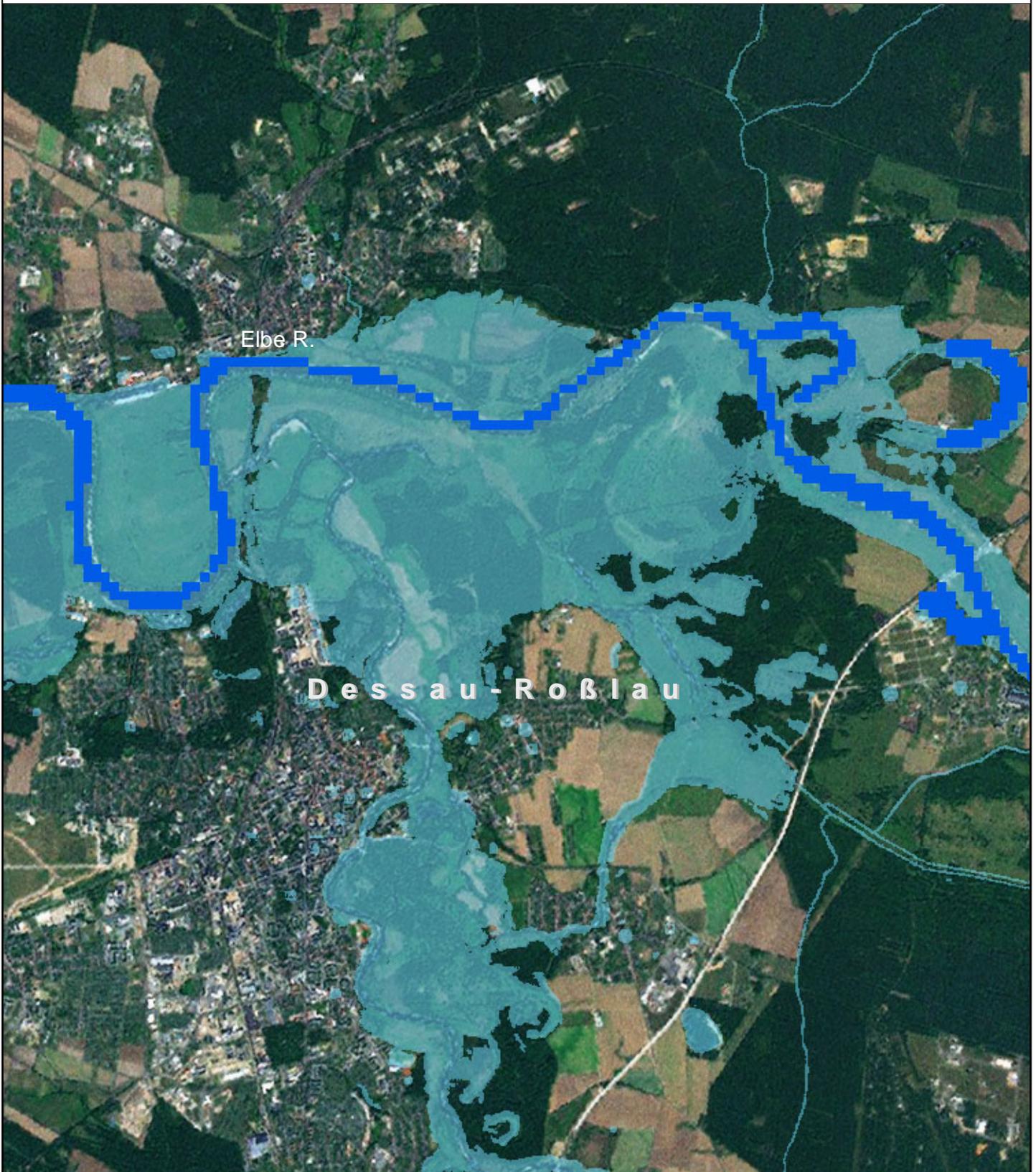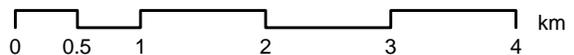
2013 EUROPE FLOODS

Halle, Germany Flood Extent   June 5, 2013

AIR WORLDWIDE

Saale R.

H a l l e

● Waterbody

● Flood Extent   Source: RapidEye, DLR

km
0   0.5   1   2   3   4

N
W   E
S
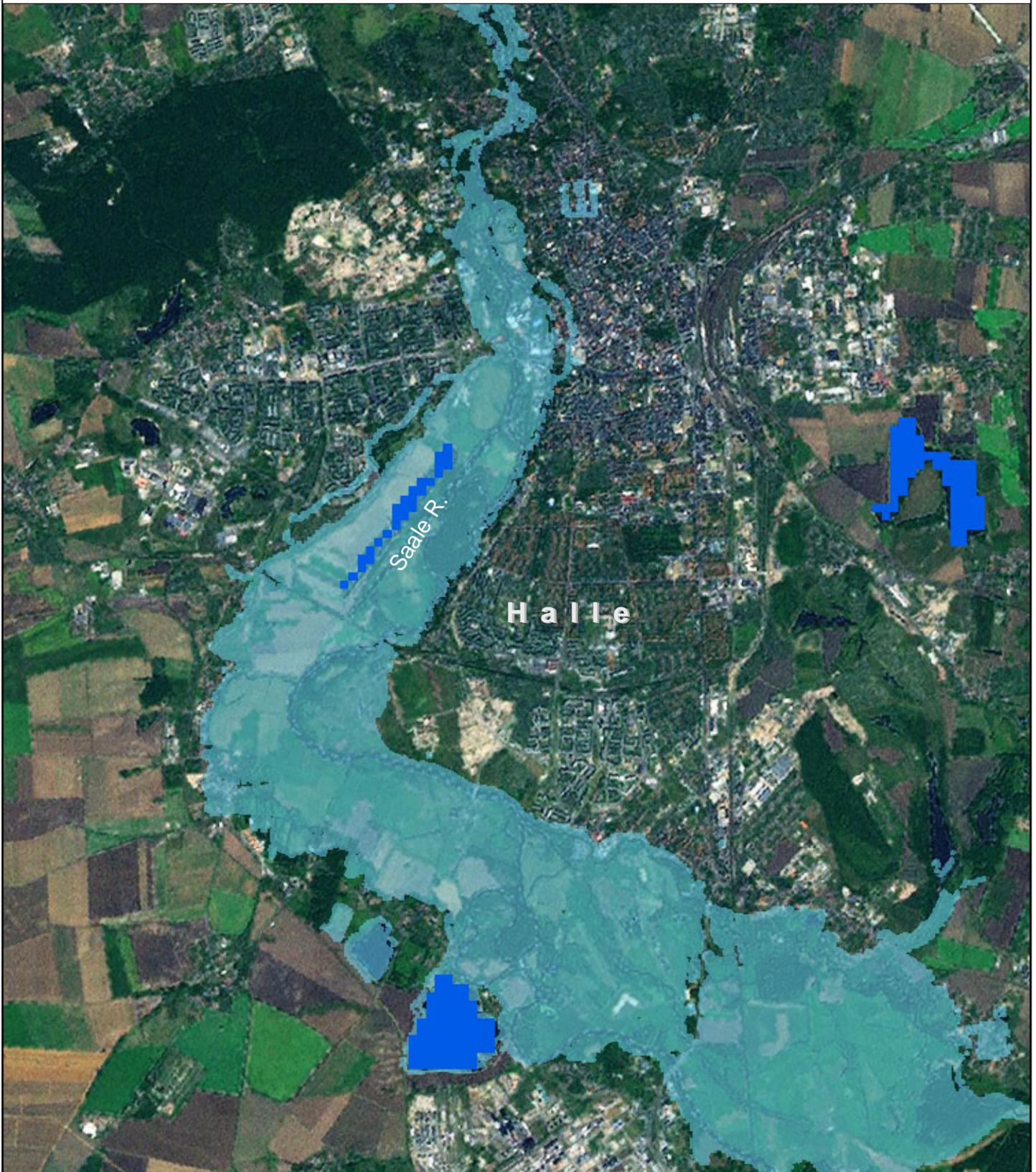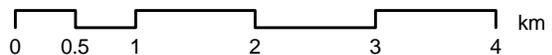
2013 EUROPE FLOODS

Bernburg, Germany Flood Extent   June 5, 2013

AIR WORLDWIDE

Saale R.

Bernburg

Waterbody

Flood Extent   Source: RapidEye, DLR

0   0.5   1   2   3   4   km

N
W   E
S
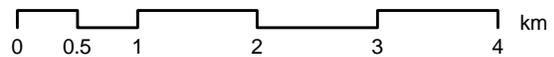
2013 EUROPE FLOODS

Magdeburg, Germany Flood Extent   June 9, 2013
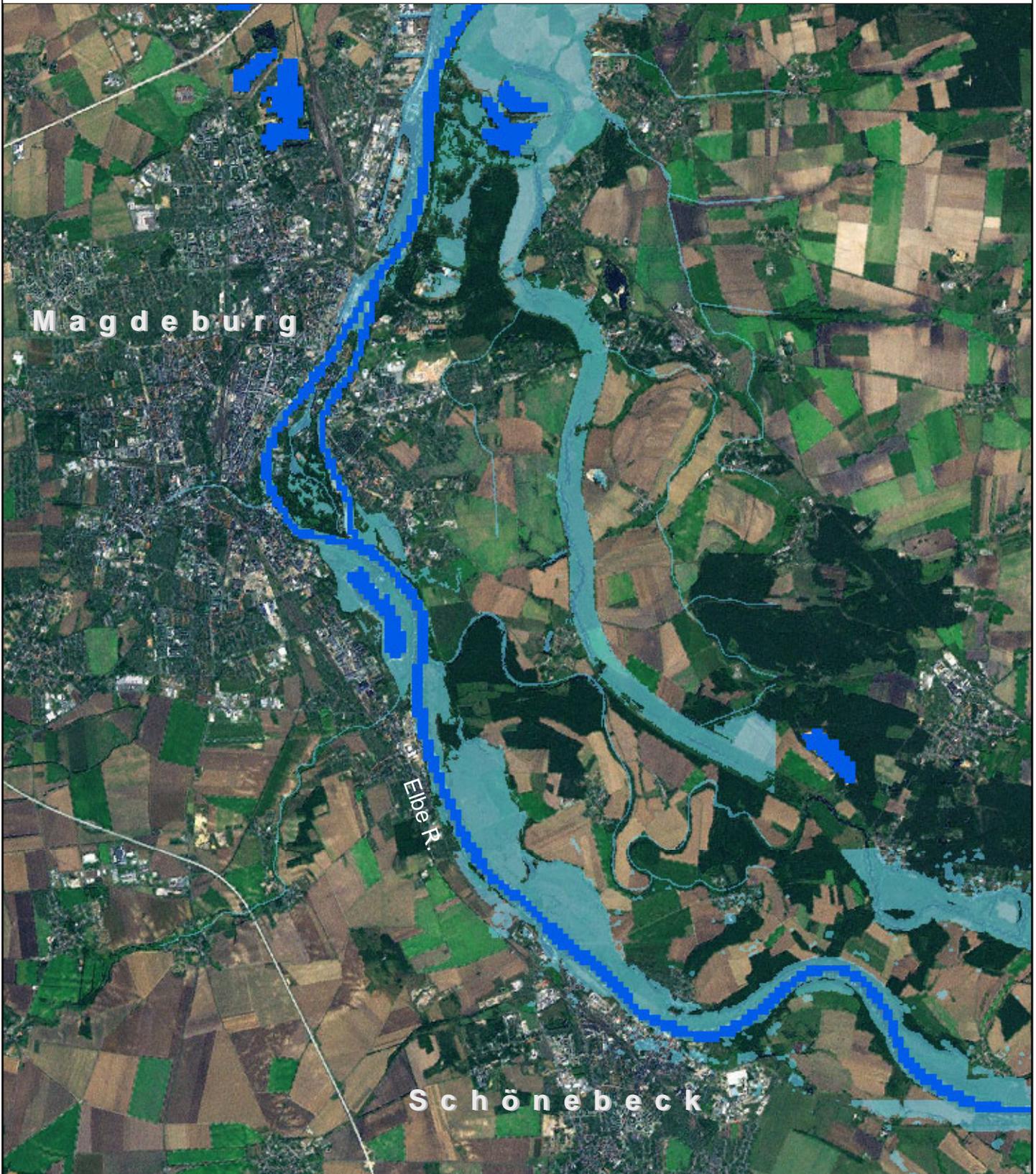
AIR WORLDWIDE®

M a g d e b u r g

Elbe R.

S c h ö n e b e c k

Waterbody

Flood Extent

Source: TerraSAR-X, German
Aerospace Center, Astrium
Services, DLR

km

0 0.5 1   2   3   4

N
W   E
S
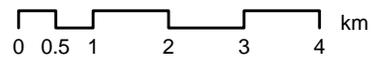
2013 EUROPE FLOODS

Wittenberge, Germany Flood Extent   June 9, 2013

AIR WORLDWIDE®

W i t t e n b e r g e

Elbe R.

Waterbody

Flood Extent

Source: TerraSAR-X, German
Aerospace Center, Astrium
Services, DLR

0 0.25 0.5   1   1.5   2   km

N
W   E
S
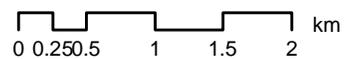
2013 EUROPE FLOODS

Deggendorf, Germany Flood Extent   June 7, 2013

AIR WORLDWIDE®

Deggendorf

Danube R.

Waterbody

Flood Extent

Source: TerraSAR-X, German
Aerospace Center, Astrium
Services, DLR

km

0   0.5   1   2   3   4

N
W   E
S
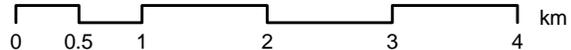
2013 EUROPE FLOODS

Passau, Germany Flood Extent   June 3, 2013

AIR WORLDWIDE®

Ilz R.

Danube R.

Passau

Inn R.

Waterbody

Flood Extent

Source: TerraSAR-X, German
Aerospace Center, Astrium
Services, DLR

km

0   0.25 0.5   1   1.5   2

N
W   E
S