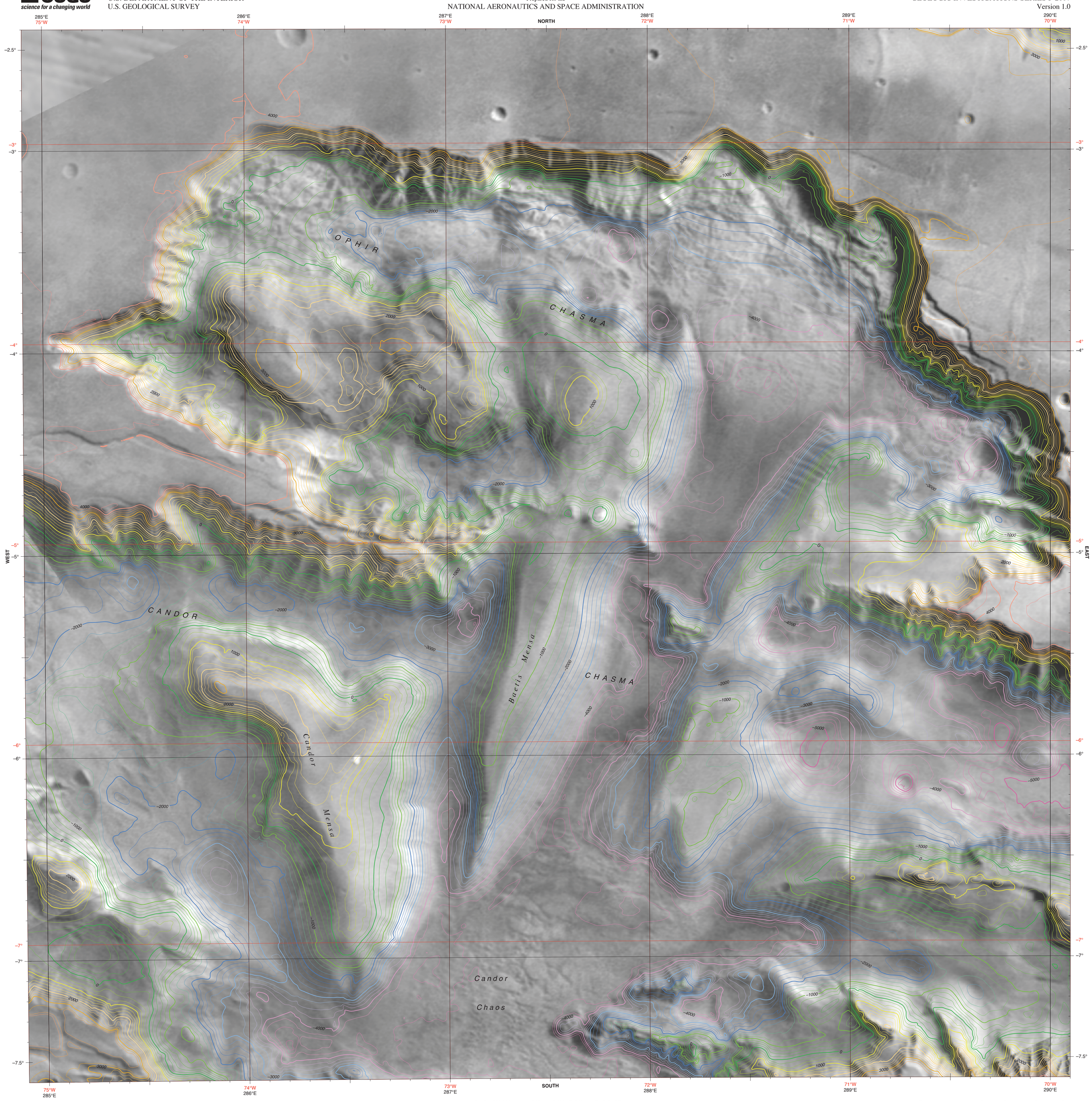
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared for the
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GEOLOGIC INVESTIGATIONS SERIES I–2807
Version 1.0



SCALE 1:502 000 (1 mm = 502 m) AT 290° E (70° W) LONGITUDE
TRANSVERSE MERCATOR PROJECTION

10 10 20 30 40 50 60 70 80 90 100

KILOMETERS

CONTOUR INTERVAL 250 METERS

Planetocentric latitude and east longitude coordinate system shown in black.
Planetographic latitude and west longitude coordinate system shown in red.

Prepared on behalf of the Planetary Geology and Geophysics Program, Solar System Exploration Division, Office of Space Science, National Aeronautics and Space Administration.

Manuscript approved for publication August 14, 2003

NOTES ON BASE

This map, compiled photogrammetrically from Viking Orbiter stereo image pairs, is part of a series of topographic maps of areas of special scientific interest on Mars.

ADOPTED FIGURE

The figure of Mars used for the computation of the map projection is an oblate spheroid (flattening of 1/176.875) with an equatorial radius of 3396.0 km and a polar radius of 3376.8 km (Kirk and others, 2000). The datum (the 0-km contour line) for elevations is defined as the equipotential surface (gravitational plus rotational) whose average value at the equator is equal to the mean radius as determined by Mars Orbiter Laser Altimeter (MOLA; Smith and others, 2001).

PROJECTION

The projection is part of a Mars Transverse Mercator (MTM) system with 20° wide zones. For the area covered by this map sheet the central meridian is at 290° E. (70° W.). The scale factor at the central meridian of the zone containing this quadrangle is 0.9960 relative to a nominal scale of 1:500,000.

COORDINATE SYSTEM

Longitude increases to the east and latitude is planetocentric as allowed by IAU/IAG standards (Seidelmann and others, 2002) and in accordance with current NASA and USGS standards (Duxbury and others, 2002). A secondary grid (printed in red) has been added to the map as a reference to the west longitude/planetographic latitude system that is also allowed by IAU/IAG standards (Seidelmann and others, 2002) and has been used for previous Mars maps.

CONTROL

Horizontal and vertical control was established using the Mosaicked Digital Image Model 2.0 (MDIM 2.0; Kirk and others, 2000) and MOLA data. A portion of MDIM 2.0 covering the mapping area was extracted in simple cylindrical projection. This MDIM image was georeferenced to the MOLA data with an affine transformation. The MDIM image and georeferencing information were imported into a digital photogrammetric workstation (Miller and Walker, 1993) and used as an orthophoto to provide horizontal control to stereopairs of Viking imagery. The horizontal information was used to extract vertical control from the MOLA data. Note that the distribution of Viking Orbiter images suitable for mapping at a scale of 1:500,000 is uneven. Areas mapped in this series are chosen, often in blocks of two or more adjacent quadrangles, based on scientific interest as well as on the availability of suitable data for accurate mapping.

CONTOURS

Contours were derived from a digital terrain model (DTM) compiled on a digital photogrammetric workstation using Viking Orbiter stereo image pairs with orientation parameters derived from an analytic aerotriangulation. Contours were drawn automatically using a commercial geographic information system (GIS) software package (Environmental Systems Research Institute, 1994). For the stereomodels, the local expected vertical precision, based on image resolutions, parallax-to-height ratio (that is, convergence angle), and a matching accuracy of 0.2 pixel ranges from 76 m to 268 m, with a mean of 159 m. Elevation (in meters) is given with respect to the adopted Mars topographic datum (see "Adopted Figure" section). A comparison of the DTM values at the MOLA point locations shows that the DTM is on average 25 meters lower than the MOLA points (n=238,656; μ=-25 m; σ=331 m). Contour lines were generated automatically using GIS software and were not edited. Because the contour lines were not edited, small closed contour lines, contour lines that intersect, and contour lines that do not match features are present. The post spacing for the DTM is 600 m; features that are less than 600 m in size will not be resolved and features that are smaller than 1800 m in size may only have four elevation measurements associated with them. This lack of elevation measurements may result in contour lines that do not adequately represent some features. The purpose of this mapping project is to produce the digital orthophoto and DTM. This map provides a graphical representation of the digital products that are available.

NOMENCLATURE

Names on this sheet are approved by the International Astronomical Union (IAU). For a complete list of IAU approved names, see the Gazeteer of Planetary Nomenclature at http://planetarynames.wr.usgs.gov.

MTM 500k –05/287E OMKT: Abbreviation for Mars Transverse Mercator; 1:500,000 series; center of sheet latitude 5° S., longitude 287.5° E. in planetocentric coordinate system (this corresponds to –05/072; latitude 5° S., longitude 72.5° W. in planetographic coordinate system); orthophotomosaic (OM) with color-coded (K) topographic contours and nomenclature (T) [Greeley and Batson, 1990]

IMAGE BASE

The image base for this map employs Viking Orbiter images from orbits 682, 608, 912, and 334. An orthophotomosaic was created on the digital photogrammetric workstation using the DTM compiled from stereo models. Integrated Software for Imagers and Spectrometers (ISIS; Torson and Becker, 1997) provided the software to project the orthophotomosaic into the Transverse Mercator Projection.

REFERENCES

Duxbury, T.C., Kirk, R.L., Archinal, B.A., and Neumann, G.A., 2002, Mars Geodesy/Cartography Working Group Recommendations on Mars Cartographic Constants and Coordinate Systems, *in* Joint International Symposium on Geospatial Theory, Processing and Applications, Ottawa, Canada, 2002, Commission IV, Working Group 9—Extraterrestrial Mapping, Proceedings: Ottawa, Canada, International Society for Photogrammetry and Remote Sensing [http://www.isprs.org/commission4/proceedings/ paper.html].

Environmental Systems Research Institute, 1994, Arc commands: Redlands Calif., Environmental Systems Research Institute, Inc.

Greeley, Ronald, and Batson, R.M., 1990, Planetary mapping: New York, Cambridge University Press, p. 261–276.

Kirk, R.L., Lee, E.M., Sucharski, R.M., Richie, J., Grecu, A., and Castro, S.K., 2000, MDIM 2.0: A revised global digital image mosaic of Mars *in* Lunar and Planetary Science XXXI:Houston, Lunar and Planetary Institute , abstract 2011 [CD–ROM].

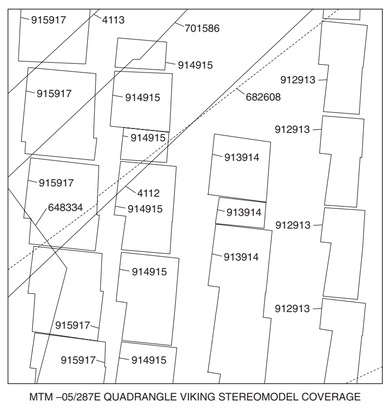
Miller, S.B., and Walker, A.S., 1993, Further developments of Leica Digital Photogrammetric Systems by Helava, ACSM/ASPRS Annual Convention and Exposition, Technical Papers, v. 3, p. 256–263.

Seidelmann, P.K. (chair), Abalakin, V.K., Bursa, M., Davies, M.E., De Bergh, C., Lieske, J.H., Oberst, J., Simon, J.L., Standish, E.M., Stooke, P., and Thomas, P.C., 2002, Report of the IAU/IAG Working Group on Cartographic Coordinates and Rotational Elements of the Planets and Satellites: 2000: Celestial Mechanics and Dynamical Astronomy, v. 82, p. 83–110.

Smith, D.E., Zuber, M.T., Frey, H.V., Garvin, J.B., Head, J.W., Muhleman, D.O., Pettengill, G.H., Phillips, R.J., Solomon, S.C., Zwally, H.J., Banerdt, W.B., Duxbury, T.C., Golombek, M.P., Lemoine, F.G., Neumann, G.A., Rowlands, D.D., Aharonson, O., Ford, P.G., Ivanov, A.B., McGovern, P.J., Abshire, J.B., Afzal, R.S., and Sun, X., 2001, Mars Orbiter Laser Altimeter (MOLA)–Experiment summary after the first year of global mapping of Mars: Journal of Geophysical Research, v. 106, p. 23,689–23,722.

Torson, J.M., and K.J., Becker, 1997, ISIS—A software architecture for processing planetary images (abs.), *in* Lunar and Planetary Science Conference XXVIII: Houston, Lunar and Planetary Institute, p. 1443.

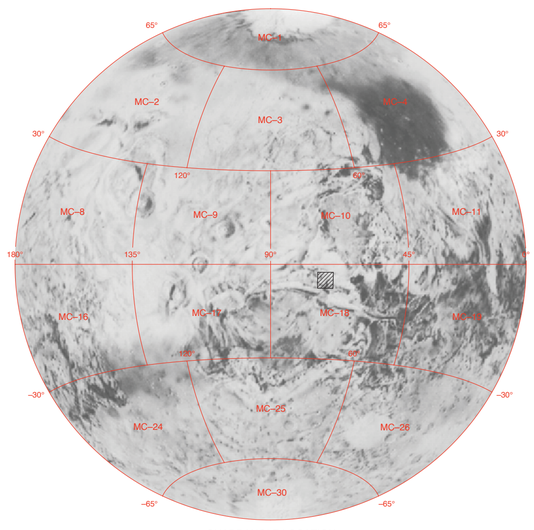
Contour Guide, in meters



MTM –05/287E QUADRANGLE VIKING STEREOMODEL COVERAGE

The following is a list of image pairs used to produce the topographic information for this map. Numbers below correspond to the numbers on the diagram above.

ID	IMAGE PAIR	ID	IMAGE PAIR	ID	IMAGE PAIR
915917	065A12–059A22		914A12–915A11		912A10–913A13
	915A16–917A17		914A12–915A09		912A10–913A11
	915A14–917A15		914A10–915A09		912A08–913A11
	915A14–917A13		914A10–915A07		912A08–913A09
	915A12–917A13	913914	913A18–914A15		912A06–913A09
	915A12–917A11		913A16–914A15		912A06–913A07
	915A10–917A11		913A16–914A13	701586	701A38–586A08
	915A10–917A09		913A14–914A13	682608	682A30–608A72
	915A08–917A07		913A14–914A11		682A29–608A74
914915	914A16–915A15		913A12–914A11		682A29–608A72
	914A16–915A13	912913	912A14–913A15	648334	648A10–334A44
	914A14–915A13		912A12–913A15	4112	041A30–012A13
	914A14–915A11		912A12–913A13	4113	041A20–013A13



QUADRANGLE LOCATION

Photomosaic showing location of map area. An outline of 1:5,000,000-scale quadrangles is provided for reference.

Topographic Map of the Ophir and Central Candor Chasmata Region of Mars

MTM 500k –05/287E OMKT

By

U.S. Geological Survey

2004

Digital files available on World Wide Web at *http://pubs.usgs.gov/imap/i2807*