U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division

Herbert Hoover National Historic Site

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for Herbert Hoover National Historic Site

heho_geology.pdf

Version: 6/6/2012

Geologic Resources Inventory Map Document for Herbert Hoover National Historic Site

Table of Contents

Geologic Resources Inventory Map Document

Herbert Hoover National Historic Site, Iowa

Document to Accompany Digital Geologic-GIS Data

heho_geology.pdf

Version: 6/6/2012

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Herbert Hoover National Historic Site, Iowa (HEHO).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

National Park Service (NPS) Geologic Resources Inventory (GRI) Program staff have assembled the digital geologic-GIS data that accompanies this document.

For information about the status of GRI digital geologic-GIS data for a park contact:

Tim Connors
Geologist/GRI Mapping Contact
National Park Service Geologic Resources Division
P.O. Box 25287
Denver, CO 80225-0287
phone: (303) 969-2093
fax: (303) 987-6792
email: Tim_Connors@nps.gov

For information about using GRI digital geologic-GIS data contact:

Stephanie O'Meara
Geologist/GIS Specialist/Data Manager
Colorado State University Research Associate, Cooperator to the National Park Service
1201 Oak Ridge Drive, Suite 200
Fort Collins, CO 80525
phone: (970) 491-6655
fax: (970) 225-3597
e-mail: stephanie.omeara@colostate.edu

About the NPS Geologic Resources Inventory Program

Background

Recognizing the interrelationships between the physical (geology, air, and water) and biological (plants and animals) components of the Earth is vital to understanding, managing, and protecting natural resources. The Geologic Resources Inventory (GRI) helps make this connection by providing information on the role of geology and geologic resource management in parks.

Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The Geologic Resources Inventory aims to raise awareness of geology and the role it plays in the environment, and to provide natural resource managers and staff, park planners, interpreters, researchers, and other NPS personnel with information that can help them make informed management decisions.

The GRI team, working closely with the Colorado State University (CSU) Department of Geosciences and a variety of other partners, provides more than 270 parks with a geologic scoping meeting, digital geologic-GIS map data, and a park-specific geologic report.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: http://science.nature.nps.gov/im/inventory/geology/GeologyGISDataModel.cfm

Geologic Reports: Park-specific geologic reports identify geologic resource management issues as well as features and processes that are important to park ecosystems. In addition, these reports present a brief geologic history of the park and address specific properties of geologic units present in the park.

For a complete listing of Geologic Resource Inventory products and direct links to the download site visit the GRI publications webpage http://www.nature.nps.gov/geology/inventory/gre_publications.cfm

GRI geologic-GIS data is also available online at the NPS Data Store Search Application: http://nrinfo.nps.gov/Reference.mvc/Search. To find GRI data for a specific park or parks select the appropriate park

(s), enter “GRI” as a Search Text term, and then select the Search Button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: http://www.nature.nps.gov/geology/inventory, or contact:

Bruce Heise
Inventory Coordinator
National Park Service Geologic Resources Division
P.O. Box 25287
Denver, CO 80225-0287
phone: (303) 969-2017
fax: (303) 987-6792
email: Bruce_Heise@nps.gov

The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division.

Surficial Mapping

Surficial Geology Map Units

The surficial geologic units present in the GRI surficial (*GRI Map Code HEHO*) digital geologic-GIS data produced for Herbert Hoover National Historic Site, Iowa (HEHO) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Qf - Fill). Units are listed from youngest to oldest. No description for water is provided. Information about each surficial geologic unit is also presented in the maps' Geologic Unit Information (HEHOUNIT) table included with the GRI geology-GIS data.

Cenozoic Era

Quaternary Period
Qf - Fill
Qo - DeForest Formation, Woden Member
Qal - DeForest Formation, alluvium undifferentiated
Qallt - DeForest Formation, Camp Creek and Roberts Creek Members, low terrace/modern channel belt
Qe - Peoria Formation, sand facies, sand dunes and sand sheets
Qnw - Noah Creek Formation, sand and gravel
Qptlp - Peoria Formation,silt and/or sand facies, late phase high terrace
Qptep - Peoria Formation, silt and/or sand facies, early phase high terrace
Qps - Peoria Formation, silt facies, loess
Qps1 - Peoria Formation, silt facies, loess and intercalated eolian sand
Qwa3 - Wolf Creek or Alburnett formations

Paleozoic Era

Devonian Period
Du - Fractured carbonate bedrock
Dw - Wapsipinicon Group

Silurian Period
Sg - Gower Formation
Ss - Scotch Grover Formation

** Unit names present on the source publication, which are based on the major lithology of a unit (e.g., dolomite for unit Ss), were not used in the GRI product. Instead, the unit's actual group, formation and/or member name was used (e.g., Scotch Grove Formation was used instead of dolomite for unit Ss).

Surficial Map Unit Descriptions

Qf - Fill (Quaternary)

Areas of major land filling. Fill associated with railroad grades, highway grades, and land leveling. Variable in texture. Extent mapped as shown in county soil surveys. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Fill Areas of cut and fill associated with railroad grades, major highways, airports, retail and industrial developments. Deposits within this map unit are similar to those in adjacent map units but may have

significant mantles of fill or deep cuts that expose underlying deposits. *GRI Source Map ID 75460* (Open File Map OFM-04-5)

Qo - DeForest Formation, Woden Member (Quaternary)

Generally 2.5 to 6 meters (8 to 16.5 feet) of black to very dark gray, calcareous, muck, peat and silty clay loam colluvium and organic sediments in drained and undrained closed and semi-closed depressions. Overlies Noah Creek Fm. sand and gravel in larger stream valleys or may be associated with seeps and springs along valley walls. Usually, associated with stream valley side slopes and areas of exhumed inter-till gravels. Supports wetland vegetation and can be permanently covered by water. High water table. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Qal - DeForest Formation, alluvium undifferentiated (Quaternary)

One to four meters (3 to 13 feet) of massive to weakly stratified, grayish brown to brown loam, silt loam, clay loam, or loamy sand overlying less than three meters (10 feet) of poorly to moderately well sorted, massive to moderately well stratified, coarse to fine feldspathic quartz sand, pebbly sand, and gravel and more than three meters of pre-Wisconsin or Wisconsin Noah Creek Formation sand and gravel. Unit also includes colluvial deposits derived from adjacent map units. Seasonally high water tables occur in this map unit. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Alluvium (De Forest Formation-Undifferentiated) One to seven meters of massive to weakly stratified, grayish brown to brown loam, silt loam, clay loam, or loamy sand overlying less than three meters of poorly to moderately well sorted, massive to moderately well stratified, coarse to fine feldspathic quartz sand, pebbly sand, and gravel and more than three meters of pre-Wisconsin or late Wisconsin Noah Creek Formation sand and gravel. Unit also includes colluvial deposits derived from adjacent map units. Seasonally high water tables occur in this map unit. *GRI Source Map ID 75460* (Open File Map OFM-04-5).

Qallt - DeForest Formation, Camp Creek and Roberts Creek Formations, low terrace/modern channel belt (Quaternary)

Variable thickness of less than one to 5 meters (3 to 16 feet) of very dark gray to brown, noncalcareous, stratified silty clay loam, loam, or clay loam, associated with the Holocene channel belt of the Cedar and Wapsipinicon river valleys. Overlies Noah Creek Formation sand and gravel. Ox-bow lakes and meander scars are common features associated with this terrace level. Post settlement alluvium thickness varies from 1.5 feet in higher areas to 6 feet along the river course and in lower lying areas. Seasonal high water table and frequent flooding potential. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Iowa River Valley- Low Terrace (DeForest Formation-Camp Creek Mbr. and Roberts Creek Mbr.) Variable thickness of less than 1 meter to 5 meters of very dark gray to brown, noncalcareous, stratified silty clay loam, loam, or clay loam, associated with the Holocene channel belt of the Iowa River valley. Overlies Noah Creek Formation. Ox-bow lakes and meander scars are common features associated with this terrace level. Post-settlement alluvium thickness varies from .5 meter in higher areas to 2 meters along the river course and in lower lying areas. Seasonal high water table and frequent flooding potential. *GRI Source Map ID 75460* (Open File Map OFM-04-5)

Qe - Peoria Formation, sand facies, sand dunes and sand sheets (Quaternary)

Generally less than six meters (20 feet) of yellowish brown, massive, calcareous loamy sand to fine sand. It may overlie yellowish-brown sand and gravel (Noah Creek Formation), or reworked unnamed loamy sediments associated with the Iowan Erosion Surface and/or it may overlie yellowish to grayish brown, often calcareous and fractured clay loam to loam diamicton (Wolf Creek and Alburnett formations). *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Qnw - Noah Creek Formation, sand and gravel (Quaternary)

More than ten meters (32 feet) of yellowish brown to gray, poorly to well sorted, massive to well stratified, coarse to fine feldspathic quartz sand, pebbly sand and gravel. In places mantled with one to three meters (3 to 10 feet) of fine to medium, well sorted sand derived from wind reworking of the alluvium. This unit encompasses deposits that accumulated in stream valleys during the Wisconsin Episode. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Qptlp - Peoria Formation, silt and/or sand facies, late phase high terrace (Quaternary)

Generally two to eight meters (6 to 26 feet) of yellowish brown to gray, massive, jointed, calcareous or noncalcareous, silt loam and intercalated fine to medium, well sorted, sand. Grades downward to poorly to moderately well sorted, moderately to well stratified, coarse to fine feldspathic quartz sand, loam, or silt loam alluvium. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Late Phase High Terrace (LPHT) (Peoria Formation—silt and/or sand facies) Two to seven meters of yellowish brown to gray, massive, jointed, calcareous or noncalcareous, silt loam and intercalated fine to medium, well sorted, sand. Grades downward to poorly to moderately well sorted, moderately to well stratified, coarse to fine feldspathic quartz sand, loam, or silt loam alluvium. *GRI Source Map ID 75460* (Open File Map OFM-04-5)

Qptep - Peoria Formation, silt and/or sand facies, early phase high terrace (Quaternary)

Generally two to twelve meters (6 to 39 feet) of yellowish brown to gray, massive, jointed, calcareous or noncalcareous, silt loam and intercalated fine to medium, well sorted, sand. The Peoria deposits overlie a Farmdale Geosol developed in Roxanna Silt which in turn overlies a well-expressed Sangamon Geosol developed in poorly to moderately well sorted, moderately to well stratified, coarse to fine sand, loam, or silt loam alluvium of Pre-Wisconsin age. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Early Phase High Terrace (EPHT) (Peoria Formation—silt and/or sand facies) Two to seven meters of yellowish brown to gray, massive, jointed, calcareous or noncalcareous, silt loam and intercalated fine to medium, well sorted, sand. The Peoria deposits overlie a Farmdale Geosol developed in Roxanna Silt which in turn overlies a well-expressed Sangamon Geosol developed in poorly to moderately well sorted, moderately to well stratified, coarse to fine sand, loam, or silt loam alluvium. *GRI Source Map ID 75460* (Open File Map OFM-04-5).

Qps - Peoria Formation, silt facies, loess (Quaternary)

Generally 2 to 8 m (6 to 25 ft) of yellowish to grayish brown, massive, jointed calcareous or noncalcareous silt loam to silty clay loam. Overlies a grayish brown to olive gray silty clay loam to silty clay (Pisgah Formation—eroded Farmdale Geosol) which is less than 1 5 m (5 ft) thick. The Farmdale Geosol appears to have been disturbed by periglacial action and was welded to an older Sangamon Geosol developed in loamy glacial till of the Wolf Creek or Alburnett formations. This mapping unit encompasses upland divides, ridgetops and convex sideslopes. Well to somewhat poorly drained landscape. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Qps1 - Peoria Formation, silt facies, loess and intercalated eolian sand (Quaternary)

Two to ten meters (6.6 to 33 feet) of yellowish brown to gray, massive, fractured, noncalcareous grading downward to calcareous silt loam and intercalated fine to medium, well sorted, sand. Sand is most abundant in lower part of the eolian package. Overlies massive, fractured, loamy glacial till of the Wolf Creek or Alburnett formations with or without intervening clayey Farmdale/Sangamon Geosol. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Loess and Intercalated Eolian Sand (Peoria Formation—silt facies) Two to five meters of yellowish brown to gray, massive, fractured, noncalcareous grading downward to calcareous silt loam and intercalated fine to medium, well sorted, sand. Sand is most abundant in lower part of the eolian package. Overlies massive, fractured, loamy glacial till of the Wolf Creek or Alburnett formations with or without intervening clayey Farmdale /Sangamon Geosol. *GRI Source Map ID 75460* (Open File Map OFM-04-5)

Qwa3 - Wolf Creek or Alburnett formations (Quaternary)

Generally 10 to 35 meters of very dense, massive, fractured, loamy glacial till of the Wolf Creek or Alburnett Formations with or without a thin loess mantle (Peoria formation - less than 2 meters) and intervening clayey Farmdale/Sangamon Geosol. This mapping unit encompasses narrowly dissected interfluves and side slopes, and side valley slopes. Drainage is variable from well drained to poorly drained.. *GRI Source Map ID 75460* (Open File Map OFM-04-5)

Du - Fractured carbonate bedrock (Devonian)

Interbedded limestones and dolostones primarily of the Cedar Valley Group and minor areas of the Wapsipinicon Group. Locally developed as bedrock aquifer. *GRI Source Map ID 75460* (Open File Map OFM-04-5)

Dw - Wapsipinicon Group (Devonian)

This group includes the Otis and Pinicon Ridge formations. Middle Devonian (upper Eifelian-lower Givetian). Maximum thickness 18-34 meters (60-110 feet). Primary lithology Otis Fm.: dolomite, part vuggy. Primary lithologies Pinicon Ridge Fm.: dolomite, laminated to argillaceous; limestone, dense, sublithographic, partly to wholly brecciated. Secondary lithologies: shale, dolomitic to sandy. Minor: chert and chalcedony; sandstone. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Sg - Gower Formation (Silurian)

This formation includes the Anamosa and Brady members. Silurian (Wenlock-Ludlow). Maximum thickness 40 meters (130 feet). Primary lithologies: dolomite, prominently laminated in part (Anamosa Mbr.); dolomite, fossiliferous to vuggy, carbonate mound facies (Brady Mbr.). Minor: nodular chert; intraclastic dolomite. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

Ss - Scotch Grove Formation (Silurian)

This formation includes the Welton, Buck Creek Quarry, Waubeek, Palisades-Kepler, and Johns Creek Quarry members. Lower Silurian (upper Llandovery-Wenlock). Maximum thickness generally <49 meters (160 feet); locally to 75 meters (250 feet) where upper strata are developed as large carbonate mounds (Palisades-Kepler Mbr.). Primary lithologies: dolomite, fossil-moldic to vuggy, part very crinoidal; dolomite, cherty to very cherty, dense. Secondary lithologies: dolomite, mounded facies (dipping strata), part very fossiliferous to vuggy. Minor: dolomite, slightly argillaceous; quartz druse, chalcedony. *GRI Source Map ID 75464* (Open File Map OFM-08-8).

GRI Surficial Map Sources and their Ancillary Information

The GRI digital geologic-GIS maps for Herbert Hoover National Historic Site, Iowa (HEHO) were compiled from the following sources:

Krieg, J.J., S.A. Tassier-Surine, D.J. Quade, E.A. Bettis III, J.A. Artz, and J.D. Giglierano, 2004, Surficial Geologic Materials of the Iowa City East 7.5` Quadrangle, Johnson County, Iowa, Iowa Geological Survey, Open-File Map OFM-04-5, 1:24,000 scale. (OFM-04-5) (*GRI Source Map 75460*)

Quade, D.J., S. Tassier-Surine, J.D. Giglierano, and E.A. Bettis III, 2008, Surficial Geology of Cedar County, Iowa final phase: Surficial Geologic Map of Cedar County, Iowa Geological Survey, Open-File Map OFM-08-8, 1:100,000 scale. (OFM-08-8) *GRI Source Map 75464*)

Tassier-Surine, S.A., J.J. Krieg, D.J. Quade, E.A. Bettis III, J.A. Artz, and J.D. Giglierano, 2004, Surficial Geologic Materials of Johnson County, Iowa, Iowa Geological Survey, Open-File Map OFM-04-3, 1:100,000 scale. (OFM-04-3) (*GRI Source Map 75556*)

Additional information pertaining to each source map is also presented in the Source Map Information (HEHOMAP) table included with the GRI geology-GIS data.

Open-File Map OFM-04-5

Krieg, J.J., S.A. Tassier-Surine, D.J. Quade, E.A. Bettis III, J.A. Artz, and J.D. Giglierano, 2004, Surficial Geologic Materials of the Iowa City East 7.5` Quadrangle, Johnson County, Iowa, Iowa Geological Survey, Open-File Map OFM-04-5, 1:24,000 scale. (*GRI Source Map 75460*)

Open File Map OFM-04-5 Title Page

SURFICIAL GEOLOGIC MATERIALS OF THE IOWA CITY EAST 7.5' QUADRANGLE, JOHNSON COUNTY, IOWA

Iowa Geological Survey Open File Map 04-05, September 2004

Prepared by Judith J. Krieg[2], Stephanie A. Tassier-Surine[1], Deborah J. Quade[1], E. Arthur Bettis III[3], Joe A. Artz[4], and James D. Giglierano[1]

Iowa Geological Survey, Robert D. Libra, State Geologist
Iowa Department of Natural Resources, Jeffrey R. Vonk, Director

Supported by the U.S. Geological Survey, Cooperative Agreement Number 03HQAG0087
National Cooperative Geologic Mapping Program (STATEMAP)

ACKNOWLEDGEMENTS: Recognized for their direct contribution to the map production: Bob Rowden of the Iowa Geological Survey completed shallow drilling. Deep drilling was provided under contract by Aquadrill; a special thanks to Diane Edberg and drilling crew members. Bill Bunker, Brian Witzke and Bob McKay of the Iowa Geological Survey provided information for the bedrock mapping units. Special thanks to the landowners who graciously allowed access to their land for drilling: David and Susan McCurry, John Weihl, Bill and Joan Frees, Joseph and Tonya Lehman, Prospect Farms, Michael Lehman, Dunlap Farms, Bob Crane, Tom and Anita Wall, Paul and Donna Hemingway, and Elmer Hemingway. Assistance obtaining drilling records and geologic information was also provided by Shoemaker and Haaland, Al Miller and Mike Gardner – Johnson County Secondary Roads Department, Johnson County Department of Public Health, and Lon Drake.

[1] Iowa Department of Natural Resources, Iowa Geological Survey, 109 Trowbridge Hall, Iowa City, IA 52242-1319

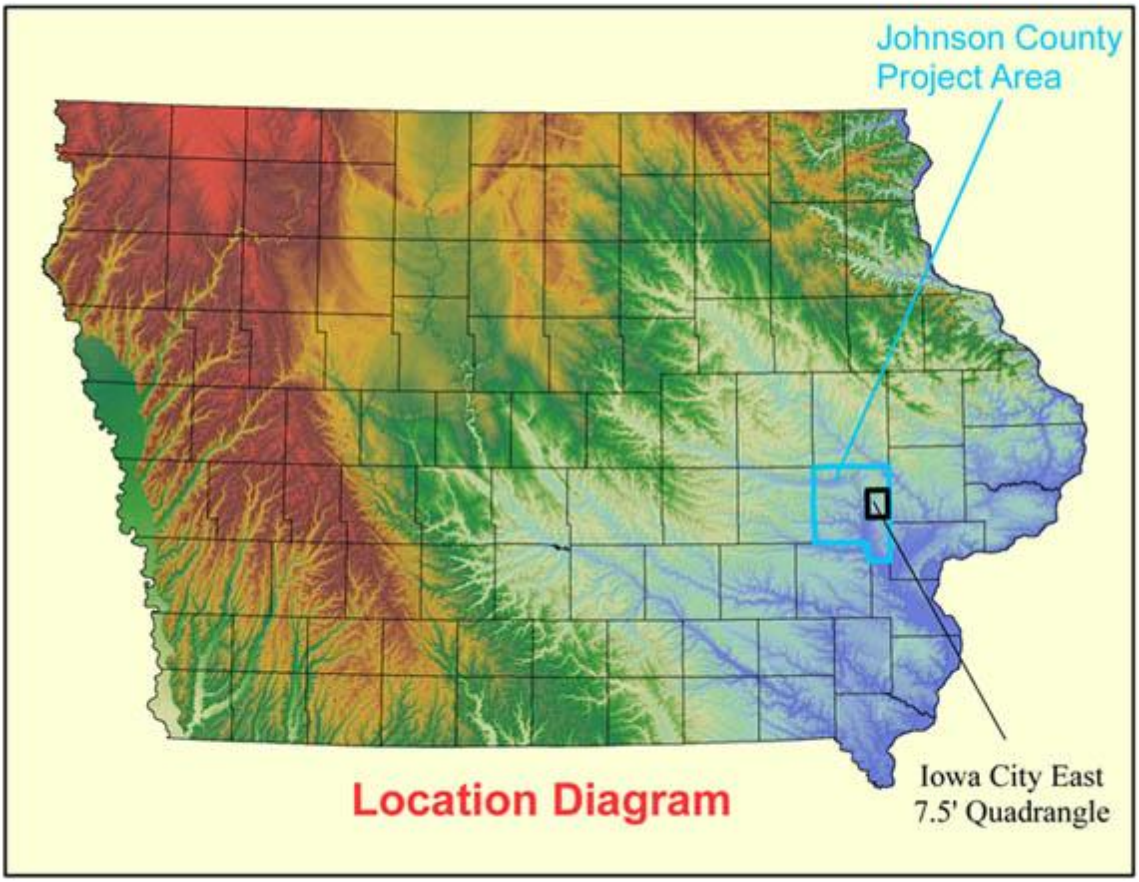
[2] Earthview Environmental, 1001 25th Ave., Suite 7, Coralville, IA 52241

[3] Department of Geoscience, The University of Iowa, 121 Trowbridge Hall, Iowa City, IA 52242

[4] Office of State Archaeologist, The University of Iowa, Iowa City, IA 52242

Extracted from: GRI Source Map ID 75460 (Open File Map OFM-04-5).

Open File Map OFM-04-5 Location Map



Extracted from: GRI Source Map ID 75460 (Open File Map OFM-04-5).

Open-File Map OFM-08-8

Quade, D.J., S. Tassier-Surine, J.D. Giglierano, and E.A. Bettis III, 2008, Surficial Geology of Cedar County, Iowa final phase: Surficial Geologic Map of Cedar County, Iowa Geological Survey, Open-File Map OFM-08-8, 1:100,000 scale. (*GRI Source Map 75464*)

Open File Map OFM-08-8 Title Page

COOPERATIVE MAPPING WITH THE NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
Final Phase: Surficial Geologic Map of Cedar County 1:100,000

Iowa Geological Survey
Open File Map OFM-08-8
August 2008

prepared by

Deborah J. Quade[1], Stephanie Tassier-Surine[1], James D. Giglierano[1] and E. Arthur Bettis III [2]

Environmental Services Division
Iowa Geological Survey and Land Quality Bureau

Supported by the U.S. Geological Survey
Cooperative Agreement Number 07HQAG0087
National Cooperative Geologic Mapping Program (STATEMAP)

Iowa Department of Natural Resources
Richard Leopold, Director

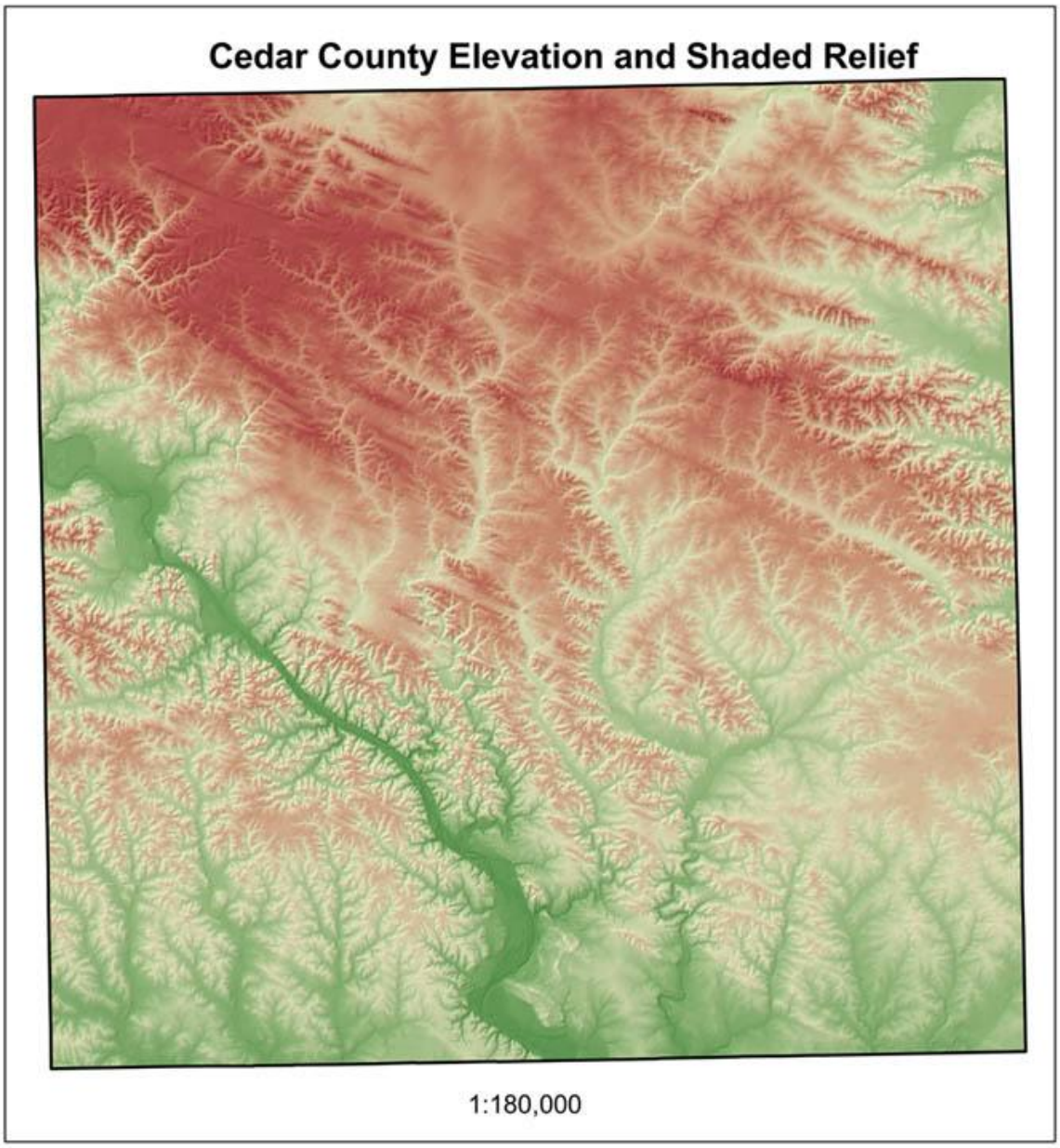
ACKNOWLEDGEMENTS

Recognized for contributions to map's production: Andrew Asell, Pete Kollasch, Mary Pat Heitman, and Lois Bair. Drilling was provided under a contract with Aquadrill of Swisher, Iowa; a special thanks to drilling crew members who worked at times in challenging drilling conditions. Also, thank you to the following individuals who graciously allowed access to their land for drilling in Cedar County, Elsie Becker, Steve Bockwoldt, Gary Chapman, Lavern Cook, Dennis and Linda Coppess, Jack Crowley, Brad Dircks, Harry Driscoll, Thelma Elijah, Ed Fisher, Bernadine Fitzer, Robert Flockhart, Carl Fobian, Larry Glick, Robert Glick, Gary Jackson, Julianne Jensen, Mike Kaufmann, Larry Kohl, Rod Kress, Cary Lieser, Duane Litscher, Murray Mente, Mike Moes, Brent Montz, Sharon and Curt Nash, Warren Nybergall, Olin Community Schools, Ron Paustian, Dennis Pearson, Joe Pennington, Steve Robinson, Margery Schott, Gary Suchomel, Robert Suchomel, Glen Swanson, Victor Thomsen, Patty and Bill Umrie, David Wickus, Ron Wieh and Richard Zeneshiek. And, thank you to NRCS for contributions of drilling and staff time to complete investigations at a number of drilling sites: Ryan Dermody, Jason Steele, Mark Lavan and Kathy Woida assisted in describing these cores as part of the mapping update for the Iowa Cooperative Soil Survey Update for Cedar County. In addition, recognition to Dr. Gerry Miller and Dr. Steve Esling for stratigraphic information collected during PhD dissertations; and to Dr. Art Bettis for contributing stratigraphic information from past investigations in Cedar County.

[1]Iowa Department of Natural Resources, Iowa Geological Survey
109 Trowbridge Hall, Iowa City, IA 52242-1319
[2]University of Iowa, Department of Geoscience
121 Trowbridge Hall, Iowa City, IA 52242-1319

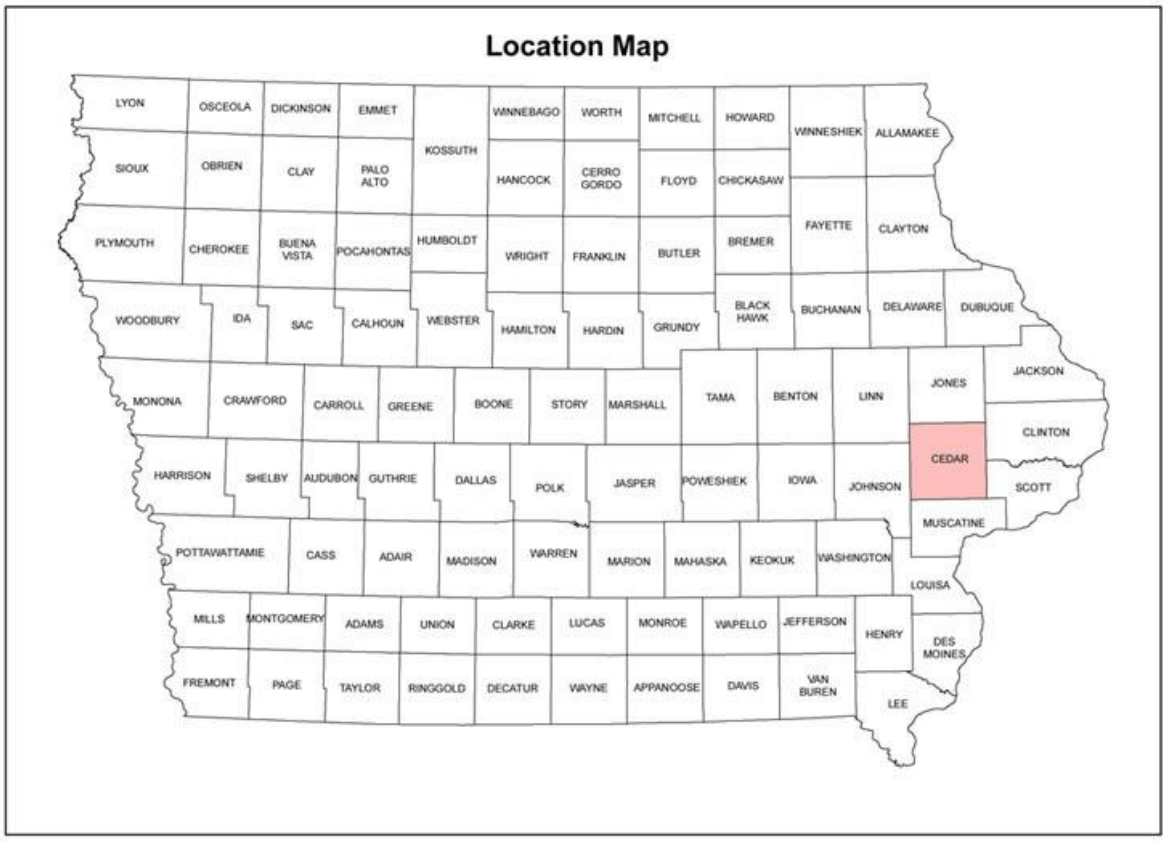
Extracted from: GRI Source Map ID 75464 (Open File Map OFM-08-8).

Open File Map OFM-08-8 Elevation and Shaded Relief



Extracted from: GRI Source Map ID 75464 (Open File Map OFM-08-8).

Open File Map OFM-08-8 Location Map



Extracted from: GRI Source Map ID 75464 (Open File Map OFM-08-8).

Open-File Map OFM-04-3

Tassier-Surine, S.A., J.J. Krieg, D.J. Quade, E.A. Bettis III, J.A. Artz, and J.D. Giglierano, 2004, Surficial Geologic Materials of Johnson County, Iowa, Iowa Geological Survey, Open-File Map OFM-04-3 1:100,000 scale. (*GRI Source Map 75556*)

Bedrock Mapping

Bedrock Geology Map Units

The bedrock geologic units present in the GRI (*GRI Map Code HHBR*) bedrock digital geologic-GIS data produced for Herbert Hoover National Historic Site, Iowa (HEHO) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., Pcl - Lower Cherokee Group and Raccoon Creek Group). Units are listed from youngest to oldest. No description for water is provided. Information about each bedrock geologic unit is also presented in the maps' Geologic Unit Information (HHBRUNIT) table included with the GRI geology-GIS data.

Paleozoic Era

Pennsylvanian Period
Pcl - Lower Cherokee Group and Raccoon Creek Group

Devonian Period
Df - Famennian formations
Dl - Lime Creek Formation and Sweetland Creek Shale
Dc - Cedar Valley Group
Dw - Wapsipinicon Group

Silurian Period
Sg - Gower Formation
Ss - Scotch Grove Formation

Bedrock Map Unit Descriptions

** Bedrock unit descriptions were derived from the metadata associated with source publication OFM-2010-01.

Pcl - Lower Cherokee Group and Raccoon Creek Group (Pennsylvanian)

(Lower-Middle Pennsylvanian; Morrowan-lower Desmoinesian) Lower Cherokee Group in southern, central, and western Iowa includes Kilbourn, Kalo, Floris formations (primarily Atokan-lower Desmoinesian, locally Morrowan at base); Raccoon Creek Group in eastern Iowa includes "Caseyville" and Tradewater formations (primarily Morrowan at most localities; locally includes Atokan-lower Desmoinesian Tradewater Formation in upper part). Primary Lithologies: shale/mudstone, light to dark gray, part silty to sandy; sandstone, very fine to medium grained; siltstone, gray. Secondary Lithologies: carbonaceous shale/mudstone, gray to black; phosphatic black shale; limestone, dense, part fossiliferous, part sandy; coal (beds locally > 2 ft). Minor: sandstone, coarse-grained to granular, part conglomeratic; mudstone, red to pink; limestone concretions (may be septarian); cone-in-cone limestone; siderite/ironstone concretions and pellets; pyrite. Maximum thicknesses Raccoon Creek Group in Muscatine-Scott counties: 230-250 ft (70-75 m). Maximum thicknesses Lower Cherokee Group across outcrop belt: 200-370 ft (60-113 m). Maximum thickness in southwest Iowa subsurface: 650 ft (200 m). *GRI Source Map ID 75555* (Open File Map OFM-2010-01).

Df - Famennian formations (Devonian)

(Upper Devonian, lower to upper Famennian). Interval includes Grassy Creek Shale, Saverton Shale, "Maple Mill" Shale, English River Formation, Louisiana Limestone (Lee County only), Aplington Formation (northern and western Iowa only), Sheffield Shale (central and northern Iowa). Famennian strata onlap Lime Creek Fm to the northwest. Primary Lithologies: shale, gray to green-gray, part silty; siltstone (especially English River Fm). Secondary Lithologies: shale, olive-brown and medium to dark brown, part laminated (Grassy Creek Fm, southeast Iowa); dolomite, part fossiliferous, part cherty, part argillaceous (Aplington Fm). Minor: interstratified dolomite and limestone, part fossiliferous (Louisiana Limestone); ooidal ironstone and phosphorite; phosphatic siltstone ("bone bed"); shale, red-brown. Maximum thicknesses in outcrop belt: southeast Iowa, 135-310 ft (41-95 m), thickest in Washington, Louisa, Des Moines counties; northern and central Iowa, 25-135 ft (8-41 m). *GRI Source Map ID 75555* (Open File Map OFM-2010-01).

Dl - Lime Creek Formation and Sweetland Creek Shale (Devonian)

(Upper Devonian, upper Frasnian). Interval includes Sweetland Creek Shale in southeast Iowa, and "Amana beds" of Iowa County. Lime Creek Fm onlaps eroded Ordovician surface in northwestern Iowa. Primary Lithologies: shale, gray to green-gray, dolomitic to calcareous; limestone, variably argillaceous, fossiliferous, part biostromal; dolomite, variably argillaceous, part fossiliferous. Secondary Lithologies: limestone, dense, "sublithographic" (upper part of carbonate-dominated facies in central and northwestern Iowa); shale, green-gray to brown, silty (Sweetland Creek Shale). Minor: siltstone; chert; oolitic limestone, carbonate breccia (central to northwestern Iowa). Thickness variations in outcrop belt: Sweetland Creek Shale of southeastern Iowa, 3-30 ft (1-9 m); Lime Creek Fm of southeastern to north-central Iowa, 40-200 ft (12-60 m); Lime Creek Fm of northwestern Iowa, 200-350 ft (60-105 m). *GRI Source Map ID 75555* (Open File Map OFM-2010-01).

Dc - Cedar Valley Group (Devonian)

(Middle-Upper Devonian, middle Givetian-middle Frasnian). Interval includes Little Cedar, Coralville, Lithograph City, and Shell Rock formations; Shell Rock Fm in northern Iowa only. Primary Lithologies: limestone, fossiliferous, variably argillaceous, part biostromal; dolomite, part fossil-moldic to vuggy, variably argillaceous. Secondary Lithologies: limestone, dense, "sublithographic"; dolomite/limestone breccia (evaporite collapse); limestone, sparse to unfossiliferous, argillaceous to shaly; shale, gray to green-gray, dolomitic. Minor: anhydrite/gypsum (outcrop belt only in Grundy, Tama, Poweshiek counties; extensive in subsurface of central and southern Iowa); chert; glauconite; sandy limestone/ sandstone. Maximum thicknesses in outcrop belt: southeast Iowa, 80-135 ft (24-41 m); east-central Iowa 130-210 ft (40-64 m); northern Iowa 250-350 ft (76-107 m). Cedar Valley Group thins and is overstepped by Dl westward in Winnebago County. *GRI Source Map ID 75555* (Open File Map OFM-2010-01).

Dw - Wapsipinicon Group (Devonian)

(Middle Devonian, upper Eifelian-middle Givetian). Interval includes Pinicon Ridge, Otis, Spillville, and Bertram formations. Otis and Bertram formations restricted to east-central Iowa only; Spillville Formation in northeast Iowa only. Pinicon Ridge Formation oversteps Spillville and Otis edges in Fayette, Bremer, Black Hawk, Buchanan, southern Chickasaw counties to directly overlie Sh, Sw, or Om. Primary Lithologies: dolomite, part laminated, variably argillaceous, part fetid; limestone, dense, "sublithographic", part laminated to intraclastic; dolomite, fossil-moldic to vuggy (Otis-Spillville fms). Secondary Lithologies: limestone/dolomite breccia (evaporite collapse); dolomitic shale and shaly

dolomite, gray to green-gray, part silty-sandy; limestone, part peloidal to fossiliferous (Otis Fm). Minor: chert and chalcedony nodules (Pinicon Ridge Fm); sandstone; oolitic limestone (Otis Fm). Extensive anhydrite/gypsum in subsurface outside of outcrop belt. Maximum thicknesses in outcrop belt: east-central Iowa, 60-160 ft (18-49 m); northern Iowa, 10-130 ft (3-40 m), locally absent in Bremer County beneath Dc. *GRI Source Map ID 75555* (Open File Map OFM-2010-01).

Sg - Gower Formation (Silurian)

(Lower-?Upper Silurian, Wenlock-?Ludlow). Formation includes Anamosa, Brady, LeClaire (Scott-Muscatine counties) members; Brady and LeClaire members are carbonate mound facies. Erosionally beveled and truncated beneath Dw. Primary Lithologies: laminated dolomite (Anamosa Mbr), part fetid/ organic to east (Scott-Clinton counties); dolomite mudstone, dense, featureless. Secondary Lithologies: dolomite, fossiliferous to vuggy, moldic, part brachiopod-rich (Brady Member); dolomite, part coarsely crystalline, vuggy, fossiliferous to sparsely fossiliferous, part crinoidal (LeClaire Member). Minor: chert; intraclastic dolomite. Maximum thickness: 180 ft (55 m); beveled and truncated beneath Dw. *GRI Source Map ID 75555* (Open File Map OFM-2010-01).

Ss - Scotch Grove Formation (Silurian)

(Lower Silurian, upper Llandovery-lower Wenlock). Formation includes Welton, Buck Creek Quarry, Waubeek, Palisades-Kepler, Johns Creek Quarry members; Palisades-Kepler and Johns Creek Quarry members contain carbonate mound facies. Erosionally beveled and truncated beneath Dw. Primarily Lithologies: dolomite, porous, fossil-moldic to vuggy, part very crinoidal (includes Welton Mbr); dolomite, cherty to very cherty, dense (Buck Creek Quarry Mbr). Secondary Lithologies: dolomite, sparsely fossil-moldic, dense, part vuggy (includes Waubeek Mbr); dolomite, coarsely crystalline, part very crinoidal (within Johns Creek Quarry, Palisades-Kepler mbrs); dolomite mudstone, dense. Minor: dolomite, slightly argillaceous; quartz druse, chalcedony, silicified fossils. Maximum thicknesses: 94-240 ft (29-73 m); may reach thicknesses to 300 ft (90 m); beveled and truncated beneath Dw. *GRI Source Map ID 75555* (Open File Map OFM-2010-01).

GRI Bedrock Map Sources and their Ancillary Information

The GRI digital geologic-GIS maps for Herbert Hoover National Historic Site, Iowa (HEHO) were compiled from the following sources:

Witzke, B.J., and R.R. Anderson, 2008, Bedrock Geology of Cedar County, Iowa final phase: Bedrock Geologic Map of Cedar County, Iowa Geological Survey, Open-File Map OFM-08-7, 1:100,000 scale. (OFM-08-7) (*GRI Source Map 75463*)

Witzke B.J, R.R. Anderson, and J.P. Pope, 2010, Bedrock Geologic Map of Iowa, Iowa Geological Survey, Open File Map OFM-2010-01, 1:500,000 scale. (OFM-2010-01) (*GRI Source Map 75555*)

Additional information pertaining to each source map is also presented in the Source Map Information (HEHOMAP) table included with the GRI geology-GIS data.

Open File Map OFM-08-7

Witzke, B.J., and R.R. Anderson, 2008, Bedrock Geology of Cedar County, Iowa final phase: Bedrock Geologic Map of Cedar County, Iowa Geological Survey, Open-File Map OFM-08-7 1:100,000 scale. (*GRI Source Map 75463*)

Cedar County Publications

Open File Map OFM-2010-01

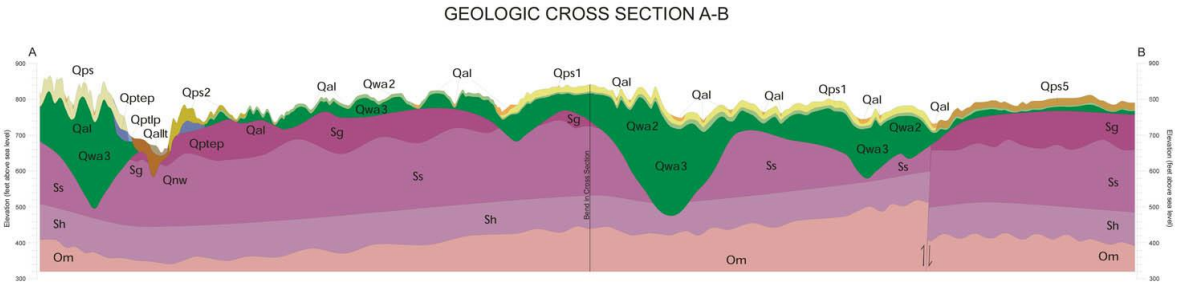
Witzke B.J, R.R. Anderson, and J.P. Pope. 2010. Bedrock Geologic Map of Iowa, Iowa Geological Survey, Open File Map OFM-2010-01, 1:500,000 scale. (*GRI Source Map 75555*)

Open File Map OFM-2010-01

Bedrock Map Geologic Cross Sections

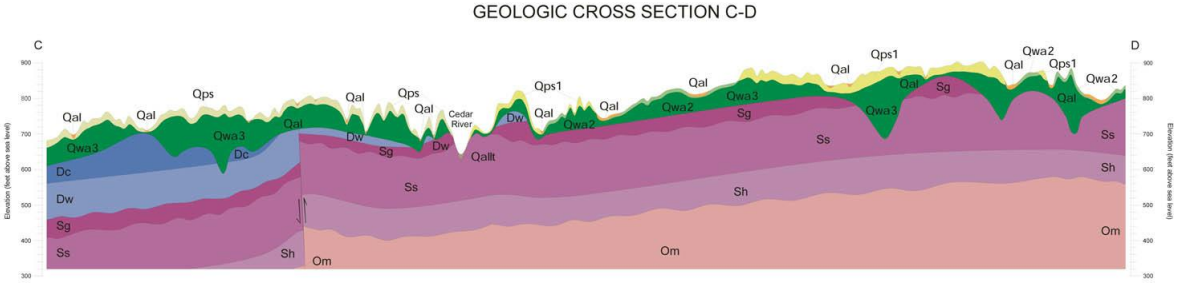
The geologic cross sections present in the GRI digital geologic-GIS data produced for Herbert Hoover National Historic Site, Iowa (HEHO) are presented below. Note that some cross section abbreviations (e. g., A - B) may have been changed from their source map abbreviation in the GRI data so that each GRI cross section abbreviation is unique. Cross section graphics were scanned at a high resolution and can be viewed in more detail by zooming in (when viewing the digital format of this document).

A-B



Extracted from: GRI Source Map ID 75464 (Open File Map OFM-08-8).

C-D



Extracted from: GRI Source Map ID 75464 (Open File Map OFM-08-8).

GRI Digital Data Credits

This document was developed and completed by Georgia Hybels (National Park Service) and Stephanie O'Meara (Colorado State University) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory(GRI) Program.

The information contained here was compiled to accompany the digital geologic-GIS map(s) and other digital data for Herbert Hoover National Historic Site, Iowa (HEHO) developed by Georgia Hybels (National Park Service) with quality control by Stephanie O'Meara (Colorado State University). Some formatting assistance from Max Jackl (Colorado State University).

GRI finalization by Stephanie O'Meara (Colorado State University).

GRI program coordination and scoping provided by Bruce Heise and Tim Connors (NPS GRD, Lakewood, Colorado).