Next Generation Simulation (NGSIM) US Route 101 Dataset

Identification Information

Citation

Citation Information

Originator: FHWA
Publication Date: 2016
Title: NGSIM Program US Route 101 data
Edition: Version 1
Geospatial Data Presentation Form: NAD83 – California State Plane Coordinate System, Zone 5

Publication Information

Publication Place: Washington, D.C.
Publisher: U.S. Department of Transportation Intelligent Transportation Systems Joint Program Office (JPO)
Online Linkage: https://www.its-rde.net/

Description

Abstract: The Next Generation Simulation (NGSIM) program was initiated by the United States Department of Transportation (US DOT) Federal Highway Administration (FHWA) in the early 2000's. The program developed a core of open behavioral algorithms in support of traffic simulation with a primary focus on microscopic modeling, including supporting documentation and validation data sets that describe the interactions of multimodal travelers, vehicles and highway systems, and interactions presented to them from traffic control devices, delineation, congestion, and other features of the environment. NGSIM stakeholder groups identified the collection of real-world vehicle trajectory data as important to understanding and researching driver behavior. The US 101 dataset was one of several detailed, high-quality datasets collected under the NGSIM effort that supported the development of algorithms for driver behavior at microscopic levels.

Researchers for the NGSIM program collected detailed vehicle trajectory data on southbound US 101, also known as the Hollywood Freeway, in Los Angeles, CA, on June 15th, 2005. The study area was approximately 640 meters (2,100 feet) in length and consisted of five mainline lanes throughout the section. An auxiliary lane is present through a portion of the corridor between the on-ramp at Ventura Boulevard and the off-ramp at Cahuenga Boulevard. Eight synchronized digital video cameras, mounted from the top of a 36-story building adjacent to the freeway, recorded vehicles passing through the study area. NGVIDEO, a customized software application developed for the NGSIM program, transcribed the vehicle trajectory data from the video. This vehicle trajectory data provided the precise location of each vehicle within the study area every one-tenth of a second, resulting in detailed lane positions and locations relative to other vehicles.

A total of 45 minutes of data are available in the full dataset, segmented into three 15 minute periods: 7:50 a.m. to 8:05 a.m.; 8:05 a.m. to 8:20 a.m.; and 8:20 a.m. to 8:35 a.m. These periods represent the buildup of congestion, or the transition between uncongested and congested conditions, and full congestion during the peak period. In addition to the vehicle trajectory data, the US 101 dataset also contains computer-aided design and geographic information system files, aerial ortho-rectified photos, loop detector data, and aggregate data analysis reports.

Purpose: The NGSIM program developed a core of open behavioral algorithms in support of traffic simulation with a primary focus on microscopic modeling, and collected high-quality primary traffic and trajectory data from US 101 to support the research and testing of the new algorithms.

Time Period of Content

Time Period Information

Range of Dates:
Beginning Date: 20050608
Ending Date: 20050622

Currentness Reference:
Ground condition (i.e., the previous dates refer to the time the information was collected)

Status
Progress: Complete
Maintenance and Update Frequency: None planned

Spatial Domain

Bounding Coordinates
West Bounding Coordinate: -118.359
East Bounding Coordinate: -118.365
North Bounding Coordinate: 34.139
South Bounding Coordinate: 34.135

Keywords

Theme
Theme Keyword: NGSIM
Theme Keyword: Freeway data
Theme Keyword: Simulation data
Theme Keyword: Behavioral algorithm

Place
Place Keyword: Los Angeles
Place Keyword: Hollywood
Place Keyword: US 101

Temporal
Temporal Keyword: 2005

Access Constraints:

To access the data set, users must register through the USDOT Research Data Exchange (RDE) portal (https://www.its-rde.net/). The registration process will include a request for contact information and agreement to terms of use for the data What information is optional versus mandatory for registration has not been finalized ; however in order to encourage broad access and use, mandatory information will be kept to a minimum and ease of use maximized. See the RDE Terms of Use and Data Privacy Policy on how registration information is kept secure and for uses only applicable to the RDE administration.

User Constraints:

Those who use data and data processing tools distributed by the Research Data Exchange have the following responsibilities:

1. Where the contributed materials have been utilized to any extent to enable, verify, supplement or validate performance measurement, analysis, research or software development, to fully reference the Research Data Exchange Program and the contributions of the individuals in all subsequent and related publications or public events, specifically:
    a. In publications, reference the Research Data Exchange website and the date accessed, data and/or data processing tools (by name and version number), and the individual contributors identified on the reference template associated with each data and/or data processing tool.
    b. In presentations or other oral communication, by noting the data and/or data processing tool by name and version number, and communicating the address of the Research Data Exchange website.
2. Users are encouraged to accurately post and update within the Research Data Exchange website a description of the project utilizing the data and/or the data processing tools, including:
    a. A description of the project, including a brief statement of the project goals.
    b. A summary of the hypotheses and findings (when available) of the project.
    c. Individuals directing and/or substantively participating in the project.
    d. The name and version number of the data and/or data processing tools downloaded and utilized in the project.
    e. The current state of the project (upcoming, underway, completed).
    f. References to published materials (if any).
3. Users are encouraged to report anomalies, errors or other questionable data elements using the Data Forum of the Research Data Exchange website, referencing the specific data or data processing tool by name and version number.
4. To refrain from duplication and dissemination of the data and data processing tools to third parties.

    Publication of certain derived information such as location of residence, specific stores visited, purpose of trips, etc. must be cleared with the data set originator prior to publication.

Point of Contact

Contact Information

Contact Organization Primary
Contact Organization: FHWA
Contact Person: James Colyar
Contact Electronic Mail Address: james.colyar@dot.gov

Contact Organization Secondary

Contact Organization: Cambridge Systematics, Inc.
Contact Person: Vassili Alexiadis
Contact Electronic Mail Address: valexiadis@camsys.com

National Highway Traffic Safety Administration (NHTSA) Security Information

Security Classification: Unclassified

Native Data Set Environment:

Documentation: The data are contained in seven data sets on the RDE, as follows:

1. Ortho photos (2 files in various formats)

2. CAD diagrams (4 files in DWG, SHX and JPG format)

3. Data analysis (3 files in PDF format)

4. Detector data (3 files in CSV/TXT, JPG and PDF format)

5. GIS files (10 files in various formats)

6. Signal Timing sheets (7 files in PDF and JPG format)

7. Vehicle trajectory data (3 files in both CSV and TXT format)

Note: TXT files are the original data files; CSV files are the converted data files. To ensure proper data, use the TXT files.

Cross Reference:

The data sets and corresponding metadata for fellow NGSIM data environments (I-80 in Emeryville, CA, Lankershim Boulevard in Los Angeles, CA and Peachtree Street in Atlanta, GA) are also available on the RDE.

Data Quality Information

Attribute Accuracy: No accuracy assessment has been performed for the data set.

Completeness Report: The USDOT does not make any claims regarding data completeness. There may be gaps in the data provided.

Lineage

Source Information

Source Citation
Citation Information
Originator: FHWA.
Publication Date: 2005

Process Step

Process Description: The vehicle tracking process consisted of capturing video data of a roadway, preprocessing the video images, and then extracting the vehicle trajectories from the video. The Trajectory Extraction phase involved using the NG-VIDEO software to track vehicles and put the trajectory data into a database. The disaggregate trajectory data was then processed to provide data inputs for algorithm research.

Process Contact:

Contact Information
Contact Organization Primary
Contact Organization: Cambridge Systematics
Contact Person: Vijay Kovvali
Contact Electronic Mail Address: vkovvali@camsys.com

Contact Organization: Cambridge Systematics
Contact Person: Lin Zhang
Contact Electronic Mail Address: lzhang@camsys.com

Entity and Attribute Information

Ortho Photographs

This directory contains ortho-rectified photographs of the study area.

Files:

- **LA-UniversalStudios.tif**
  The aerial image file coordinates are in California State Plane Coordinate System, Zone 5, NAD83 (the units are US Survey Feet).The ortho-rectified photographs are at a resolution of 1":1000' and a pixel resolution of 0.25 feet. The photographs provide a relative accuracy of 2.5 feet. Please note that the tif file is about 800 MB in size. Due to the size of this file, problems in opening the file in some photo editors may be encountered. ArcGIS software is capable of opening the file.
- **LA-UniversalStudios.tfw**
  Support for *LA-UniversalStudios.tif*

CAD Drawings

This directory contains CAD drawings of the study area. The CAD drawings were developed using the ortho-rectified photographs

Files:

- **LA-UniversalStudios.dwg**
  The dwg file provides a CAD drawing of the vehicle trajectory study area. A highly detailed representation of the network required for accurately transcribing vehicle trajectories is provided in the CAD network.
- **LA-UniversalStudios-dtm.dwg**
  The dwg file provides a CAD drawing of the vehicle trajectory study area. A highly detailed representation of the network required for accurately transcribing vehicle trajectories is provided in the CAD network.
- **LA-UniversalStudios.shx**
  Support for LA-UniversalStudios.dwg
- **LA-UniversalStudios-Legend.jpg**
  This file provides the legend for the data elements used in the CAD drawing (dwg file)

Data Analysis Reports

This directory presents aggregation of vehicle trajectory results to provide common macroscopic flow parameters. The results provided in the report include aggregations of flows, speeds and number of lane changes. Aggregation is conducted by distance (every 100 feet), by time (every 5 minutes), and by lane.
Files:

- **data-analysis-report-0750-0805.pdf**
  Contains data aggregation for 7:50 a.m. to 8:05 a.m. on June 15th, 2005 for SB US 101 in Los Angeles. Aggregates of speeds, volumes, headways are provided by section (100 feet), time period (5 minutes), and lane. Input-output analysis and number of lane changes are also provided in the data analysis report.
- **data-analysis-report-0805-0820.pdf**
  Contains data aggregation for 8:05 a.m. to 8:20 a.m. on June 15th, 2005 for SB US 101 in Los Angeles. Aggregates of speeds, volumes, headways are provided by section (100 feet), time period (5 minutes), and lane. Input-output analysis and number of lane changes are also provided in the data analysis report.
- **data-analysis-report-0820-0835.pdf**
  Contains data aggregation for 8:20 a.m. to 8:35 a.m. on June 15th, 2005 for SB US 101 in Los Angeles. Aggregates of speeds, volumes, headways are provided by section (100 feet), time period (5 minutes), and lane. Input-output analysis and number of lane changes are also provided in the data analysis report.

Detector Data

Wide-area detector data were collected for the US 101 (Hollywood Freeway) study area. The data were collected through the Freeway Performance Measurement System (PeMS) project. This project is conducted by the Department of Electrical Engineering and Computer Sciences at the University of California, at Berkeley, with the cooperation of California Department of Transportation. The intent of this project is to collect historical and real-time freeway data from freeways in the State of California in order to compute freeway performance measures. Relevant data collected through the PeMS project are provided in this data set. Available data from 5 detector stations on US 101 South for 11 days, from June 8 to June 22, excluding the weekends, are provided in this data set. Each detector station contains one detector per lane. This data set complements the vehicle trajectory data collection effort by providing information on volumes, speeds and occupancy, adjacent to the vehicle trajectory study area. Please NOTE that most of the detector data is imputed for the days that data is provided.
Files:

- **detector-data**

This file provides 5-minute processed, loop detector data for a period of 11 weekdays on US 101, between June 8, 2005 and June 22, 2005. Speed, volume and occupancy at each detector for the 5-minute time step are presented at each detector in each lane.

- **pems-US101-detector-health.pdf**
  Contains information on the health (working) of the five detectors during the 10-day period for which the detector data is provided in this dataset.
- **detector-locations.jpg**
  This file provides an image with the locations of the detectors.

Attribute

Attribute Label: Station (Column A)
Attribute Definition: Detector Station identification number (single loop detector in each lane)
Attribute Domain Values: Integer

Attribute

Attribute Label: Date (Column B)
Attribute Definition: Provides the date the detector data was collected.
Attribute Domain Values: Date (mm/dd/yyyy)

Attribute

Attribute Label: Local_Time (Column C)
Attribute Definition: Indicates the local time of day, the data has been aggregated into 30 second summaries.
Attribute Domain Values: Time (hh:mm:ss)

Attribute

Attribute Label: Global_Time (Column D)
Attribute Definition: This field is epoch time in milliseconds. Generally expressed as elapsed time since midnight (beginning of the calendar day) GMT on January 1, 1970, this elapsed epoch time must be shifted to the US Pacific time zone for comparisons to local time at the highway.
Attribute Domain Values: Integer

Attribute

Attribute Label: V1 (Column E)
Attribute Definition: This field represents the 5-minute volume count reported by the detector for Lane 1. There are five V fields in each row, representing reported counts in Lanes 1 (left-most lane) through 5 (right-most lane).
Attribute Domain Values: Integer

Attribute

Attribute Label: Occ1 (Column F)
Attribute Definition: This field represents the 5-minute average occupancy expressed as a percentage reported by the detector for Lane 1.
Attribute Domain Values: Double

Attribute

Attribute Label: Sp1 (Column G)
Attribute Definition: This field represents the 5-minute average speed in miles/hour reported by the upstream detector in Lane 1.
Attribute Domain Values: Double

Attribute

Attribute Label: V2 (Column H)
Attribute Definition: This field represents the 5-minute volume count reported by the detector for Lane 2. There are five V fields in each row, representing reported counts in Lanes 1 (left-most lane) through 5 (right-most lane).
Attribute Domain Values: Integer

Attribute

Attribute Label: Occ2 (Column I)
Attribute Definition: This field represents the 5-minute average occupancy expressed as a percentage reported by the detector for Lane 2.
Attribute Domain Values: Double

Attribute

Attribute Label: Sp2 (Column J)
Attribute Definition: This field represents the 5-minute average speed in miles/hour reported by the upstream detector in Lane 2.
Attribute Domain Values: Double

Attribute

Attribute Label: V3 (Column K)
Attribute Definition: This field represents the 5-minute volume count reported by the detector for Lane 3. There are five V fields in each row, representing reported counts in Lanes 1 (left-most lane) through 5 (right-most lane).
Attribute Domain Values: Integer

Attribute

Attribute Label: Occ3 (Column L)
Attribute Definition: This field represents the 5-minute average occupancy expressed as a percentage reported by the detector for Lane 3.
Attribute Domain Values: Double

Attribute

Attribute Label: Sp3 (Column M)
Attribute Definition: This field represents the 5-minute average speed in miles/hour reported by the upstream detector in Lane 3.
Attribute Domain Values: Double

Attribute

Attribute Label: V4 (Column N)
Attribute Definition: This field represents the 5-minute volume count reported by the detector for Lane 4. There are five V fields in each row, representing reported counts in Lanes 1 (left-most lane) through 5 (right-most lane).
Attribute Domain Values: Integer

Attribute

Attribute Label: Occ4 (Column O)
Attribute Definition: This field represents the 5-minute average occupancy expressed as a percentage reported by the detector for Lane 4.
Attribute Domain Values: Double

Attribute

Attribute Label: Sp4 (Column P)
Attribute Definition: This field represents the 5-minute average speed in miles/hour reported by the upstream detector in Lane 4.
Attribute Domain Values: Double

Attribute

Attribute Label: V5 (Column Q)
Attribute Definition: This field represents the 5-minute volume count reported by the detector for Lane 5. There are five V fields in each row, representing reported counts in Lanes 1 (left-most lane) through 5 (right-most lane).
Attribute Domain Values: Integer

Attribute

Attribute Label: Occ5 (Column R)

Attribute Definition: This field represents the 5-minute average occupancy expressed as a percentage reported by the detector for Lane 5.
Attribute Domain Values: Double

Attribute

Attribute Label: Sp5 (Column S)
Attribute Definition: This field represents the 5-minute average speed in miles/hour reported by the upstream detector in Lane 5
Attribute Domain Values: Double

Attribute

Attribute Label: V_avg (Column T)
Attribute Definition: This field represents the 5-minute average volume count reported by the detector for all the lanes at the detector station.
Attribute Domain Values: Integer

Attribute

Attribute Label: Occ_avg (Column U)
Attribute Definition: This field represents the 5-minute average occupancy expressed as a percentage reported by the detector for all the lanes at the detector station.
Attribute Domain Values: Double

Attribute

Attribute Label: Sp_avg (Column V)
Attribute Definition: This field represents the 5-minute average speed in miles/hour reported by the detector for all the lanes at the detector station.
Attribute Domain Values: Double

GIS files

This directory provides network data in the form of shapefiles. The files provide the geometry and attribute information for the area for which data is provided in the detector data study data set. This network includes area surrounding the vehicle trajectory study area.

Files:
- **US-101.shp**
  This file provides the geometry and attribute information of the study area**.**
- **US-101.dbf Support**
  This database file stores the data presented through the shapefile.
- **US-101.shx**
  Support for US-101.shp;
- **signals-and-ramp-meters.shp**
  This file presents the signal locations. The data are provided as points in the shapefile.
- **signals-and-ramp-meters.dbf**
  Support for signals-and-ramp-meters.shp;
- **signals-and-ramp-meters.shx**
  Support for signals-and-ramp-meters.shp;
- **camera-coverage.shp**
  This file provides the coverage of each of the eight cameras. The camera number and the length of coverage are provided.
- **camera-coverage.dbf**
  Support for camera-coverage.shp;
- **camera-coverage.shx**

Support for camera-coverage.shp;

- **US-101.mxd**
  This file provides an ArcView project file. The two shapefiles provided in the data set can be opened in any shapefile viewer without the need for this project file. This file is provided only for convenience purposes for those using ArcGIS software for opening the GIS files.

Signal Timing

This directory contains timing sheets for the ramp meters located on the on-ramp in the study area and for traffic signals present in the study area.

Files:
- **ramp-meter-lankershim-blvd.pdf**
  The timing sheet provides the controller settings for the on-ramp at Lankershim Boulevard.
- **ramp-meter-ventura-blvd.pdf**
  The timing sheet provides the controller settings for the on-ramp at Ventura Boulevard
- **campo-de-cahuenga-and-US101-ramp.pdf**
  The signal timing sheet provides the controller timings for the signal at the intersection (number 338) of US 101 Ramp and Campo De Cahuenga Way.
- **campo-de-cahuenga-and-ventura.pdf**
  The signal timing sheet provides the controller timings for the signal at the intersection (number 085) of Campo De Cahuenga Way and Ventura Boulevard.
- **lankershim-and-US101-ramp.pdf**
  The signal timing sheet provides the controller timings for the signal at the intersection (number 087) of US 101 Ramp and Lankershim Boulevard.
- **lankershim-and-ventura.pdf**
  The signal timing sheet provides the controller timings for the signal at the intersection (number 085) of Lankershim Boulevard and Ventura Boulevard.
- **signal-locations.jpg**
  This file provides an image with the locations of the traffic signals.

Vehicle Trajectory Data

Vehicle trajectory data was collected on the south-bound direction of US 101 (Hollywood Freeway) in Los Angeles, California on June 15th, 2005. The folder contains transcribed data from 7:50 a.m. to 8:05 a.m, 8:05 a.m. to 8:20 a.m., and 8:20 a.m. to 8:35 a.m. These data were collected using eight video cameras mounted on a 36-story building, 10 Universal City Plaza, which is located adjacent to the freeway study area in the Universal City neighborhood. Vehicle trajectory data were transcribed from the video data using a customized software application, Next Generation Vehicle Interaction and Detection Environment for Operations (NG-VIDEO), developed for NGSIM. This program was used to automatically detect and track most vehicles from the video images and transcribe the trajectory data to a database. Manual transcription was used to track any vehicles which failed to be automatically detected and tracked. The data provides X, Y coordinates of each vehicle, every 1/10th of a second in relative space and in the California State Plane Coordinate System, Zone 5, NAD83 (the units are US Survey Feet). Time is given in Epoch time, which is the elapsed time since midnight (beginning of the calendar day) GMT on January 1, 1970 in milliseconds. This elapsed epoch time must be shifted to the US Pacific time zone for comparisons to local time at the highway.

Files:

- **trajectories-0750am-0805am**
  This file contains all vehicle trajectories for the entire time period, sorted by time. The accompanying data dictionary file describes the file structure more fully. The X accuracy of this data set is estimated at around 2 feet and the Y accuracy is estimated at around 4 feet.
- **trajectories-0805am-0820am**
  This file contains all vehicle trajectories for the entire time period, sorted by time. The accompanying data dictionary file describes the file structure more fully. The X accuracy of this data set is estimated at around 2 feet and the Y accuracy is estimated at around 4 feet.
- **trajectories-0820am-0835am**
  This file contains all vehicle trajectories for the entire time period, sorted by time. The accompanying data dictionary file describes the file structure more fully. The X accuracy of this data set is estimated at around 2 feet and the Y accuracy is estimated at around 4 feet.

Attribute

Attribute Label: Vehicle_ID (Column A)
Attribute Definition: Vehicle identification number (ascending by time of entry into section)
Attribute Domain Values: Integer

Attribute

Attribute Label: Frame_ID (Column B)
Attribute Definition: Frame Identification number (ascending by start time)
Attribute Domain Values: Integer

Attribute

Attribute Label: Total_Frames (Column C)
Attribute Definition: Total number of frames in which the vehicle appears in this data set.
Attribute Domain Values: Integer

Attribute

Attribute Label: Global_Time (Column D)
Attribute Definition: Elapsed time in milliseconds since Jan 1, 1970.
Attribute Domain Values: Integer

Attribute

Attribute Label: Local_X (Column E)
Attribute Definition: Lateral (X) coordinate of the front center of the vehicle in feet with respect to the left-most edge of the section in the direction of travel.
Attribute Domain Values: Double

Attribute

Attribute Label: Local_Y (Column F)
Attribute Definition: Longitudinal (Y) coordinate of the front center of the vehicle in feet with respect to the entry edge of the section in the direction of travel.
Attribute Domain Values: Double

Attribute

Attribute Label: Global_X (Column G)
Attribute Definition: X Coordinate of the front center of the vehicle in feet based on CA State Plane III in NAD83.
Attribute Domain Values: Double

Attribute

Attribute Label: Global_Y (Column H)
Attribute Definition: Y Coordinate of the front center of the vehicle in feet based on CA State Plane III in NAD83.
Attribute Domain Values: Double

Attribute

Attribute Label: v_Length (Column I)

Attribute Definition: Length of vehicle in feet.
Attribute Domain Values: Double

Attribute

Attribute Label: v_Width (Column J)
Attribute Definition: Width of vehicle in feet.
Attribute Domain Values: Double

Attribute

Attribute Label: v_Class (Column K)
Attribute Definition: Vehicle type: 1 - motorcycle, 2 - auto, 3 - truck
Attribute Domain Values: Integer

Attribute

Attribute Label: v_Vel (Column L)
Attribute Definition: Instantaneous velocity of vehicle in feet/second.
Attribute Domain Values: Double

Attribute

Attribute Label: v_Acc (Column M)
Attribute Definition: Instantaneous acceleration of vehicle in feet/second square.
Attribute Domain Values: Double

Attribute

Attribute Label: Lane_ID (Column N)
Attribute Definition: Current lane position of vehicle. Lane 1 is farthest left lane; lane 5 is farthest right lane. Lane 6 is the auxiliary lane between Ventura Boulevard on-ramp and the Cahuenga Boulevard off-ramp. Lane 7 is the on-ramp at Ventura Boulevard, and Lane 8 is the off-ramp at Cahuenga Boulevard.
Attribute Domain Values: Integer

Attribute

Attribute Label: Preceding (Column O)
Attribute Definition: Vehicle ID of the lead vehicle in the same lane. A value of '0' represents no preceding vehicle - occurs at the end of the study section and off-ramp due to the fact that only complete trajectories were recorded by this data collection effort (vehicles already in the section at the start of the study period were not recorded).
Attribute Domain Values: Integer

Attribute

Attribute Label: Following (Column P)
Attribute Definition: Vehicle ID of the vehicle following the subject vehicle in the same lane. A value of '0' represents no following vehicle - occurs at the beginning of the study section and on-ramp due to the fact that only complete trajectories were recorded by this data collection effort (vehicle that did not traverse the downstream boundaries of the section by the end of the study period were not recorded).
Attribute Domain Values: Integer

Attribute

Attribute Label: Space_Headway (Column Q)
Attribute Definition: Space Headway in feet. Spacing provides the distance between the front-center of a vehicle to the front-center of the preceding vehicle.
Attribute Domain Values: Double

Attribute

Attribute Label: Time_Headway (Column R)
Attribute Definition: Time Headway in seconds. Time Headway provides the time to travel from the front-center of a vehicle (at the speed of the vehicle) to the front-center of the preceding vehicle. A headway value of 9999.99 means that the vehicle is traveling at zero speed (congested conditions).

Attribute Domain Values: Double

Distribution Information

Distributor

Contact Information

Contact Organization Primary
Contact Organization: Noblis
Contact Electronic Mail Address: richard.glassco@noblis.org

Metadata Reference Information
Metadata Date: 20160408
Metadata Review Date: 20160408
Metadata Future Review Date: not scheduled

Metadata Contact

Contact Information

Contact Organization Primary
Contact Organization: Noblis
Contact Person: Kathy Thompson
Contact Electronic Mail Address: kathy.thompson@noblis.org