



# CAD / GIS Spatial Data Standards

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**Vision:** *Establish collection standards that affirm GIS as the visualization tool to integrate corporate information assets and facilitate data visualization and analysis.*

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# CAD /GIS - Spatial Data Standards

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## 1. Introduction

The following document describes the spatial data standards of Chugach Electric Associations, Inc. (Chugach). The intent is to describe the:

- Coordinate System and Map Projection standard for delivered electronic data,
- Format of GPS and electronic survey data delivered in AutoCAD,
- Format of delivered electronic GIS data, project files, maps, and metadata.

This document is a reference guide for Chugach and Contractor employees working on behalf of Chugach; it specifies the standards for CAD/GIS spatial data deliverables. Any deviation from these specifications set forth in this document **MUST BE APPROVED PRIOR TO DATA COLLECTION**. This requirement ensures that the data collected will be viable when it enters Chugach's GIS records. When you request a deviation it enables us to evaluate and update this standards document as necessary. This document is intended to be a "living document" which will be updated as technology changes or as the standards adopted by Chugach change. In either case, we welcome your comments and specific feedback upon the Spatial Data Standards that follow.

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## 2. Coordinate System, Datum & Map Projection

The standard coordinate system, datum and map projection currently used in Chugach's GIS is Alaska State Plane Zone 4 NAD 83 (2002) also known as the (CORS96) realization.

NOTE: The term 'realization' is the National Geodetic Service's official name for revisions to the NAD83 system; however, 'epoch' is more commonly used in its place throughout the industry with the occasional use of 'revision' and 'datum tag'. Chugach has elected to use the term 'epoch' when referring to NGS realizations.

### a. Map Projection

The map projection that best serves Chugach facilities is Transverse Mercator. The specified coordinate system, datum and map projection is used by all of Chugach's GIS-based Transmission and Distribution Design and Mapping products.

Maps may be delivered to Chugach in other projections, with advance approval by the CAD/GIS manager.

### b. Datum, Coordinate System & Projection Information

Name: NAD 1983 Alaska State Plane Zone 4 FIPS (Federal Information Processing Standards) 5004 (US Survey Feet)

Projection: Transverse\_Mercator

#### i. **Map Projection Parameters**

Projection: Transverse\_Mercator

False\_Easting: 1640416.666667

False\_Northing: 0.000000

Central\_Meridian: -150.000000

Scale\_Factor: 0.999900

Latitude\_Of\_Origin: 54.000000

Linear Unit: Foot\_US (0.304800609601219)

#### ii. **Geographic Coordinate System**

Name: GCS\_North\_American\_1983

Angular Unit: Degree (0.017453292519943295)

Prime Meridian: Greenwich (0.000000000000000000)

#### iii. **Datum**

Name: D\_North\_American\_1983

Spheroid: GRS\_1980

Semimajor Axis: 6378137.000000000000000000

Semiminor Axis: 6356752.314140356100000000

Inverse Flattening: 298.257222101000020000

### c. NAD 27 to NAD 83 Conversion

The State Plane grid coordinates is a mathematical conversion that translates latitude and longitude into a Cartesian (or map) Northing (Y) and Easting (X) coordinate system, and this transformation must maintain the same datum tag (NAD83, NAD27, etc...) as the origin latitude and longitude coordinates. Following the conversion into State Plane (NAD27) a Lat-Long (NAD27) can be converted into State Plane (NAD83), using the NADCON conversion for Alaska.

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Chugach's original ArcINFO coverages were stored in Alaska State Plane Zone 4 NAD27. These coverages were converted in June 2003 to Alaska State Plane Zone 4 FIPS 5004 (US Survey Feet), NAD83 (CORS96) (2002) using ESRI's ArcToolbox, and the **NAD\_1927\_to\_NAD\_1983\_Alaska** algorithm, to avoid the 400ft errors that the standard NAD\_1927\_to\_NAD\_1983\_NADCON creates. Chugach stores our Spatial Database in an Oracle GeoDatabase. The Municipality of Anchorage's GIS data is also stored in the Alaska State Plane Zone 4 (it is Chugach's understanding that the Datum is NAD83 (CORS96) (2002).

**NOTE: Some State and Federal data may still be stored in the NAD27 Datum. If you utilize NAD27 data it will be necessary to convert your deliverable information into Chugach's standard datum. The NADCON datum conversion algorithm specific for Alaska will be used.**

NADCON is a very common algorithm, which is included in projection software such as ESRI ArcCatalog, Intergraph Projection Manager, Tralaine and others. NADCON works very well for transforming data which spans a large geographic area such as Chugach's distribution and transmission network.

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## GIS Data Deliverable Standards

The following standard is a guide for delivering GIS data to Chugach. These standards are designed to allow Chugach to easily import GIS data into their Oracle/SDE database.

### d. Data Format

GIS Data delivered to Chugach will be submitted in the currently installed version of ArcGIS in a personal or file geodatabase format. The use of feature datasets is encouraged within the personal or file geodatabase. Requests to deliver data in formats other than personal or file geodatabase must be approved by the GIS manager.

### e. Map Production

All GIS map products shall be completed using the currently installed version of ArcMap. Maps must be delivered to Chugach in MXD format. All data used to create maps must be contained within a personal or file geodatabase and delivered to Chugach. MXD's must be able to locate all data and attached files when transferred to Chugach. Maps must contain the following information:

- Chugach Logo
- All GIS map products shall display the copyright (©) symbol as follows: Copyright Chugach Electric Association, Inc. ©
- Chugach Disclaimer –  
“**Chugach** does not warrant the accuracy or completeness of the information contained on this map. The map may not be suitable for user's particular purpose. When accuracy is necessary for any purpose, it is the responsibility of the user to request locates of **Chugach** facilities. This map was produced for Chugach by [insert Engineering/Survey Firm Name].”

### f. Metadata

Complete ESRI metadata in the personal or file geodatabase will be required for each feature dataset or feature class. All fields listed as required in the metadata are to be filled out and detail the data acquisition and transformation processes utilized with the data being submitted to Chugach. In addition to populating, the Description Tab as shown in the sample of FGDC metadata below with the **REQUIRED** sections in bold, (which is important to Chugach long-term; it is vital that the Attributes Tab be populated, as it will allow us to know the meaning of the data represented in a given feature class.

NOTE: If you are editing metadata in ArcCatalog this can be found on the Attribute Tab inside the Entity Attribute Tab. It is imperative that column definitions be input and should include all value defaults and named domains. This information is the most important information for long term maintenance of the collected data being handed over to Chugach.

Identification\_Information:

Citation:

Citation\_Information:

Originator: **REQUIRED: The name of an organization or individual that developed the data set.**

Publication\_Date: **REQUIRED: The date when the data set is published or otherwise made available for release.**

Title:

Geospatial\_Data\_Presentation\_Form: vector digital data

Online\_Linkage:

Description:

Abstract: **REQUIRED: A brief narrative summary of the data set.**

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Purpose: **REQUIRED: A summary of the intentions with which the data set was developed.**

Time\_Period\_of\_Content:  
Time\_Period\_Information:  
Single\_Date/Time:  
Calendar\_Date: **REQUIRED: The year (and optionally month, or month and day) for which the data set corresponds to the ground.**

Currentness\_Reference: **REQUIRED: The basis on which the time period of content information is determined.**

**Status:**  
Progress: **REQUIRED: The state of the data set.**  
Maintenance\_and\_Update\_Frequency: **REQUIRED: The frequency with which changes and additions are made to the data set after the initial data set is completed.**

Spatial\_Domain:  
Bounding\_Coordinates:  
West\_Bounding\_Coordinate: **REQUIRED: Western-most coordinate of the limit of coverage expressed in longitude.**  
East\_Bounding\_Coordinate: **REQUIRED: Eastern-most coordinate of the limit of coverage expressed in longitude.**  
North\_Bounding\_Coordinate: **REQUIRED: Northern-most coordinate of the limit of coverage expressed in latitude.**  
South\_Bounding\_Coordinate: **REQUIRED: Southern-most coordinate of the limit of coverage expressed in latitude.**

Keywords:  
Theme:  
Theme\_Keyword\_Thesaurus: **REQUIRED: Reference to a formally registered thesaurus or a similar authoritative source of theme keywords.**  
Theme\_Keyword: **REQUIRED: Common-use word or phrase used to describe the subject of the data set.**

Access\_Constraints: **REQUIRED: Restrictions and legal prerequisites for accessing the data set.**  
Use\_Constraints: **REQUIRED: Restrictions and legal prerequisites for using the data set after access is granted.**  
Native\_Data\_Set\_Environment: Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 3; ESRI ArcCatalog 8.2.0.700

Spatial\_Data\_Organization\_Information:  
Direct\_Spatial\_Reference\_Method: Vector

Distribution\_Information:  
Resource\_Description: Downloadable Data

Metadata\_Reference\_Information:  
Metadata\_Date: 20030425  
Metadata\_Contact:  
Contact\_Information:  
Contact\_Organization\_Primary:  
Contact\_Organization: **REQUIRED: The organization responsible for the metadata information.**  
Contact\_Person: **REQUIRED: The person responsible for the metadata information.**  
Contact\_Address:  
Address\_Type: **REQUIRED: The mailing and/or physical address for the organization or individual.**  
City: **REQUIRED: The city of the address.**  
State\_or\_Province: **REQUIRED: The state or province of the address.**  
Postal\_Code: **REQUIRED: The ZIP or other postal code of the address.**  
Contact\_Voice\_Telephone: **REQUIRED: The telephone number by which individuals can speak to the organization or individual.**

Metadata\_Standard\_Name: FGDC Content Standards for Digital Geospatial Metadata  
Metadata\_Standard\_Version: FGDC-STD-001-1998  
Metadata\_Time\_Convention: local time  
Metadata\_Extensions:  
Online\_Linkage: <http://www.esri.com/metadata/esriprof80.html>  
Profile\_Name: ESRI Metadata Profile



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## 3. Survey (AutoCAD) Deliverable Standards

The following standards are a guide to use when submitting survey data stored in an AutoCAD drawing file.

### a. Format

The AutoCAD format is a (.dwg) file that is no more than two (2) previous platforms release behind the most current version of AutoCAD.

NOTE: A platform release is defined as a change to the .dwg file format and not necessarily the incremental release of updated AutoCAD software.

### b. Block and Data Dictionary

With the submittal of AutoCAD mapping to Chugach, a data dictionary describing the layer naming convention and a copy of blocks used will be required. The data dictionary should list all layers in the drawing and describe what is present on the layer, list all blocks in the file, and include a title or description of the block. If the block is per a certain industry standard (i.e., ANSI, etc.), indicate the standard used. Any inserted blocks or XREF files should be listed in data dictionary.

### c. Projection Information

#### c.1 Horizontal Projection Information

The map projection will be required to be documented for the data set. If a plant (or local) grid is used, tie coordinates to NAD 1983 (2003) (CORS96) epoch Alaska State Plane Zone 4 FIPS 5004 (US Survey Feet) will be required.

#### c.2 Vertical Projection Information

All vertical data shall be based on the most current geoid, unless otherwise specified.

### d. Plant Grid

Chugach also uses a “plant grid” for construction projects. Plant Grid may also be referred to as a construction grid or a local coordinate system. When using the plant grid it will be necessary to establish at a minimum 3 control points at opposite sides of the Plant Grid which have both plant grid coordinates and Alaska State Plane Zone 4 NAD83 (2003) (CORS96) epoch coordinates established. This will allow Chugach to scale and rotate the data used in the plant grid so that it can be incorporated with Chugach’s existing GIS data.

#### d.1 Linear Projects

Linear Projects, such as transmission lines, shall incorporate the requirements noted above in 3.d and shall require an additional control point for every line-mile included in the scope of the project.

### e. Survey Datum

The datum used for survey purposes will be NAD83 (2003) (CORS96) epoch; this level of precision is specified to ensure that the coordinates referenced will be re-creatable when the NGS CORS Multi-Year Solution is implemented, by Chugach.

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## 4. Conventional and GPS (RTK) Survey Standards

The following standards are a guide to use when using GPS survey techniques on Chugach projects. All surveying must meet the minimum requirements set out in the ASPLS; Standards of Practice for Professional Land Surveyors.

### a. Electronic Data Collection

Chugach recognizes that some of the field data may be electronically collected and printed out on supplemental sheets rather than being written by hand in the field book. If used, these supplemental sheets must be initialed by the Party Chief or GPS Operator, referenced in the field book, kept with the field book, and are considered part of the field book.

### b. Minimum Standards and Limitation of Use for GPS Technology

We require the use of Bureau of Land Management standards as set forth in their publication: Standards for the Positional Accuracy of Cadastral Surveys When Using Global Navigation Satellites Systems (GNSS), February 23, 2009. See Attachment 1.

### c. GPS Deliverables

The following are required:

- Station Observation Logs (and Field Notes for conventional surveying)
- Digital Raw GPS Data (for Trimble that would be a .dat file)
- Copies of all processing reports produced by GPS processing software (like Trimble Geomatics Office and OPUS)
- Survey Report containing the following:
  - Equipment used
  - Methodology used
  - Control used
  - Datum used
  - Issues with the survey

### d. Emerging GPS Technologies

Chugach recognizes the dynamic nature of GPS surveying in the areas of real time positioning, quick ambiguity determination and "on the fly" initializing. Chugach's specifications are not intended to hinder the integration of advancements which may be beneficial, efficient, and accurate to our program, but rather, to guarantee the degree of confidence, reliability, and repeatability for verification that Chugach considers necessary in the performance of Cadastral Surveys.

Chugach encourages the presentation and discussion of these emerging technologies when considered a viable option in the performance of specific projects or portions of projects. In these instances the Chugach GPS standards must guide the formulation of procedures that maintain the degree of confidence, reliability, and repeatability in the final product that Chugach attains in the current standards. These procedures must closely reflect the approach that follows the professional standards and accepted procedures of the established surveying community.