Information Technology & Telecommunications

Citywide Guidelines for Geographic Information Systems (GIS)

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City of New York
Department of Information Technology and Telecommunications
Application Development Management, GIS

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1.0 Overview

1.1 Introduction

The purpose of these guidelines is to help achieve the maximum utility and long-term return on the public's investment in the creation, maintenance, and distribution of New York City's geospatial data.

1.2 Audience

The primary audience of these guidelines is any public entity or contractor working for a public entity within the City's jurisdiction that maintains or publishes geospatial data.

1.3 Purpose

These guidelines for the use of geospatial data in New York City are intended to:

1. Provide guidance to City officials and staff as they work, either in-house or with private contractors, to develop or acquire computerized, geospatial data and thereby to increase the likelihood that the data acquired or developed will be suitable for the intended applications and future applications;
2. Improve public policy development and implementation by making geospatial data more current and readily accessible; and
3. Facilitate the sharing of geospatial data among public agencies or sub-divisions of agencies by establishing data standards and providing guidelines for use.

1.4 Scope

These guidelines apply to City entities responsible for maintaining or publishing geospatial data related to their respective business operations.

The guidelines are applicable to any data that will be shared or distributed to other public entities or the public.

2.0 Guidelines

2.1 Guidelines Statement

DoITT recommends that all City agencies follow the guidelines below, under circumstances as defined in the specific section.

2.1.1 Data Guidelines

1. **Datum:** Agency geospatial data layers should be based on the North American Datum 1983 (NAD83) and the North American Vertical Datum 1988 (NAVD88). Any existing systems developed based on other datums should consider conversion to these data.
2. **Coordinate System:** The New York State Plane Coordinate System, Long Island Zone should be used as the primary map coordinate system for geospatial data within New York City. Selection of any other projection should be done reluctantly and only after most careful consideration.
    a. The measurement units should be expressed in feet.
    b. Data being exported, or published, to the Open Data Portal or other public download sites should use the Web Mercator projection.

3. **Geodetic Control:** GIS systems developed with the goal of providing a multipurpose basemap for local government use should be referenced to a local geodetic reference framework that is properly connected to the National Spatial Reference System (NSRS).
4. **Ortho-base (Aerial Photo) and Planimetric Base Maps:** Both a Planimetric (surface features) base map and an Orthophoto (aerial photography) base map should be used to provide the geospatial reference framework upon which an agency's multipurpose GIS (including the development of new geospatial data layers) or mapping application is developed. For New York City, this base is collectively known as NYCMap. Both base maps adhere to the datum, coordinate system, and geodetic control standards above and have a level of spatial accuracy appropriate to a range of applications. The individual planimetric layers of NYCMap can be accessed via the NYC OpenData platform (https://nycopendata.socrata.com).
5. **Map Scale and Spatial Accuracy:** Agencies developing a GIS program should conduct data collection and development in a manner to achieve at least the minimum level of horizontal spatial accuracy consistent with the National Horizontal Map Accuracy Standards corresponding to a 1:1,200 (1"= 100') scale map (95% of the "well defined" horizontal locations must be within ±2 ft. of their real world location).
6. **Metadata:** All geospatial databases, and their associated attribute databases should be documented with Federal Geographic Data Committee (FGDC) compliant metadata outlining how the data was derived, attribute field definitions and values, coordinate systems, appropriate map scale, contact information, access and use restrictions, etc.

2.1.2 Web Application Guidelines

1. **Public-facing Applications:** Agencies considering developing public-facing mapping applications should strongly consider utilizing DoITT's hosting and development services. DoITT supports multiple technologies to meet the needs of agencies and the public. At a minimum, DoITT can provide guidance and technical assistance.
2. **Mobile:** With a large percentage of traffic coming from smartphones, public-facing applications should support smartphones by applying responsive design principles unless there are compelling reasons not to do so.

Use of a smartphones location through the on-board GPS should be strongly considered for determining location.

2.1.3 General Guidelines

1. **Attribute Data:** There is an expression in GIS/Cartography, "if it isn't in the data, it isn't on the map." To provide the foundation necessary for a wide variety of applications, attribute (non-graphic) data should be organized within a GIS framework. Attributes describe the characteristics of individual features (graphics) and include things like text for labels and annotation as well as values to be mapped thematically like feature type or value. In most cases, much of this attribute data will already exist in separate databases within an agency and should be tied to the spatial feature via a unique ID. In New York City, common ID fields for joining include but are not limited to:
    a. Borough, Block and Lot (BBL) for tax parcels;
    b. Building Identification Number (BIN) for buildings;
    c. Segment ID and Physical ID for street segments.
2. **Internal Topology:** Within a given feature class, the features should be topologically clean and free of errors, e.g. tax parcels should not overlap. They should be free of undershoots, overshoots, and sliver polygons unless required to correctly depict the map theme, in which case they would be flagged as valid exceptions.
3. **External Topology:** Within a given feature dataset, the feature classes should participate in relevant and appropriate topologic relationships and be topologically clean and free of errors, e.g., development

buildings should not overlap development boundaries. They should be free of overlap, underlap, intersections, etc. unless required to correctly depict the map theme, in which case they would be flagged as valid exceptions.

4. **Addressing:**
    a. Storage: Addresses are best stored in their individual parsed elements. This will ensure greater consistency and improve geocoding results. The minimum recommended elements are:

Element	Data Type	Length	Comment
House Number	String	9	House numbers can have non-numeric characters (hyphen, letters, and fractions).
Street Name	String	50	Street Type can be separated to ensure the correct abbreviations are used. A table of these can be provided on request.
Borough	String	9	Alternatively the borough code can be stored as an integer. Values as follows: 1 – Manhattan 2 – Brooklyn 3 – Bronx 4 - Queens 5 – Staten Island

    b. Mapping: If they intention is to map and analyze the data, then the facility or service location should be stored.
    c. Updates: Each borough in New York City employs a different methodology for the assignment of addresses. As a result, in the past, the standardization of address assignments was difficult at best. DoITT GIS has developed A4 (Address Assignment Application) to facilitate the standardization of address assignments across the five boroughs. In addition, A4 has notification in place to notify the principal agencies related to the assignment of new addresses.
5. **Street Centerlines and Address Points:** The Citywide Street Centerline (CSCL) is an enterprise geospatial database of street, address, and common place data to support public safety dispatching and existing City usages of such data. CSCL serves as the source repository for addressing information in the City of New York and provides agencies with an authoritative single source for accurate street and address data.

    CSCL data issues, omissions, or inaccuracies should be reported to the Centerline Maintenance Group (CMG) via the User Update Tracking System.
6. **Geocoding:** Geocoding should be performed using City Planning's Geosupport system. Geosupport is a data processing system customized for New York City's unique geography and addresses. There are internal and external interfaces to Geosupport (e.g., Geoclient). For the public, Geoclient can be accessed from the NYC Developer Portal (http://developer.cityofnewyork.us/).

2.1.4 Agency Quality Control

Agency Quality Control (QC) is a vital part of GIS work because it allows data administrators to ensure a level of accuracy and quality for all published datasets. As mentioned above, if it is not in the data, it is not in the map. The counter to this, is that if it whatever IS in the data will be on the map. It is thus vital that the data be of the highest quality. Quality Control is the principal method for accomplishing this. While source agencies will have varying

levels of agency-specific QC standards, DoITT encourages agencies to publish core standards for data distribution and storage, in order to ensure the development of appropriate procedures and tools moving forward. DoITT GIS has already developed several programs that ensure a high level of data integrity, including the CSCL maintenance tools, for maintaining centerline and address data.

In addition, implementing out-of-the-box ESRI functionality such as attribute domains, subtypes, and topology will further validate and standardize data. A number of these data validations can be automated and performed by each agency on their respective data. These include, but are not limited to, the tests defined in 2.1.4.1 through 2.1.4.4.

2.1.4.1 Single Column Attribute Tests

1. Unique Values - Detects non-unique values for a column. Useful for columns that are being used as primary keys or columns that represent feature identifiers where uniqueness is required.
2. Coded Domains - Detects invalid values based on pre-established geodatabase coded values, existing DBMS tables, or a user-defined list of valid values. All values for a tested column must contain only valid values.
3. Ranges Domains - Detects out-of-range values based on pre-established geodatabase Range Domains or user-defined minimums and maximums. All values for a tested column must contain only valid values.
4. Single Values - Detects values other than the specified single value for a column. All values for a column must equal the specified value.
5. Allow NULL Values - (Dis)allows NULL, blank, and/or zero values for a column. Can detect NULL occurrences if NOT NULL constraints are disabled while loading the data into the geodatabase. Also detects blank and/or zero values occurring in legacy INFO tables.
6. Non-standard Values - Detects non-standard keyboard values such as !@# and ? in a column. A list of these values may be configured for each column.
7. Column Format - Detects values that do not match the specified format, integer, date, etc.
8. Column Length - Detects values that are not the specified length.

2.1.4.2 Multiple Column Attribute Tests

1. Custom SQL Query - Reports results of a user-defined query to the database.
2. Multiple Column Unique - Detects non-unique values for multiple columns, e.g., searching for non-unique Borough, Block, Lot combinations.
3. General Table Relationship - Detects unmatched relationship keys between two tables in a join. No orphan table rows are allowed.

2.1.4.3 Custom QC Tools

In addition to the standardized QC documentation and software, custom QC tools should be developed and incorporated into the regular maintenance procedures. One of those tools will be the new CSCL Job Tracking website which will enable agency users to inform the CMG of any errors in the CSCL database. Users of the site will be able to:

1. Report errors that they find in the data;
2. Track each error issue's status as it is being resolved, e.g., Status = Error Submitted, Status = Error under Review, Status = Error Pending, Status = Error Resolved, etc.; and
3. Get notification that their dataset has been updated and is published or in the queue.

2.1.4.4 Agency Quality Assurance (QA)

The QC process described above will prevent a large number of errors from being introduced, but errors may still occur, particularly during data entry. Common errors include typos and formatting issues in attribute data and positional errors in spatial data. Agency QA involves making certain the data meets the agency's standards for

source materials. As a result, all agencies, at a minimum, should perform the following QA steps for geometries and attributes:

1. Assess the initial quality of the data;
2. Identify errors;
3. Define resolution of the errors; and
4. Fix the data.

2.2 Roles and Responsibilities

DoITT is responsible for developing, maintaining and distributing the City's enterprise geospatial data sets. Additionally, the agency hosts and develops public-facing applications.

Agencies are responsible for developing agency-specific datasets; creating, updating, and maintaining agency maps; developing and maintaining agency specific applications; and following the guidelines outlined above wherever possible, including the establishment of QC and QA processes. Where agencies would like to take advantage of DoITT services, agencies are responsible for submitting a request for services through the Service Catalog and collaborating with DoITT to identify the appropriate solution to meet agency needs.

3.0 Authority

DoITT was established by Local Law 24 (1995) as "New York City's information technology and telecommunications agency."

Chapter 48 of the New York City Charter established the authority of DoITT by assigning powers and duties "to plan, formulate, coordinate and advance information technology and telecommunications policies for the city."

Executive Order No.140 of 2010 directed DoITT to "be responsible for establishing and enforcing Citywide IT policies and for ensuring that such policies are aligned with the City's business needs and investments, as well as the individual business needs of each agency."

4.0 Ownership

This policy is owned by the DoITT GIS unit.

5.0 Change History

Version	Change Highlights	Date
1.1	Revisions and reformatting	5/29/2014
1.2	Annual review	7/14/2015
1.3	Update to 2.1.3: content on addressing	12/4/2015