Connecticut Geographic Framework Data

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Connecticut Geospatial Information Systems Council

Prepared By
Data Inventory and Assessment Working Group

Connecticut Geographic Framework Data Report

Report Sponsors
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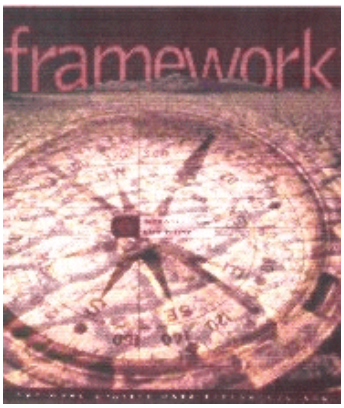
I. Introduction

The State of Connecticut much like our other fellow states is rich in information. For many years state, regional, and local governments, along with both the public and private sectors have been developing and using geospatial information for day-to-day business functions, for planning and analysis, for mapping and reports, and for solving critical needs in the time of emergencies or for incident management. Yet with this vast array of information, there exists a great deal of redundant effort and expenditure. Routinely data is developed for application specific purposes without consideration of other similar needs. Data is developed without standards or common coverage and often contain differing attribution resulting in users being left with the quandary of which is the best source of data. Connecticut, coordinating with the Federal Geographic Data Committee (FGDC) and the National Spatial Data Infrastructure (NSDI), has joined many states that have moved to development of a common framework for management of their geospatial data.

This report, prepared by the Data Inventory and Assessment Working Group of the Connecticut Geospatial Information Systems Council, serves to provide an up-to-date comprehensive assessment of Connecticut's Geographic Framework Data.

II. National Spatial Data Infrastructure Framework



The National Spatial Data Infrastructure (NSDI) is a means to assemble geographic data nationwide to serve a variety of users. GIS users of many different disciplines have a recurring need for a few themes of data. The framework is a collaborative community based effort in which these commonly needed data themes are developed, maintained, and integrated by public and private organizations within a geographic area. The framework is one of the key building blocks and forms the data backbone of the NSDI. The framework concept was developed by representatives of county, regional, state, federal, and other organizations under the auspices of the Federal Geographic Data Committee (FGDC). Local, regional, State and Federal government organizations, and private companies see the framework as a way to share resources, improve communications, and increase efficiency.

The NSDI provides an environment within which organizations and technology interact to foster activities for using, managing, and producing geographic data.

The Framework forms the data backbone of the NSDI. It has three aspects: data, procedures, and technology for building and using the data, and institutional relationships and business practices that support the environment. The framework is designed to

facilitate the production and use of geographic data, reduce costs and improve service and decision making.

Geographic data are essential to many operations, yet they are expensive and time-consuming to produce. Many organizations need the same basic geographic data for their applications and spend precious resources duplicating existing data sets. Others go without data because they cannot afford the production costs. Furthermore, when an application or problem covers more than one jurisdiction, it is often difficult to find and combine existing data. The framework meets these needs by providing a reliable, standardized source for commonly needed and used geographic data themes.

The initial NSDI framework includes the following seven core geographic data themes: Geodetic Control, Ortho Imagery, Elevation, Transportation, Hydrography, Governmental Units, and Cadastral Information.

These seven themes of geographic data are those produced and used by most organizations, are required by a majority or users, form a critical foundation for the NSDI, and have widespread usefulness. A cooperative approach to producing and sharing these common data will benefit most organizations that use geographic data.

III.Strategic Plan

The State of Connecticut Geographic Information Systems Council was awarded a Cooperative Agreements Program, or CAP, grant to develop a Strategic Plan for the development of GIS and geospatial information in the Connecticut. This grant is available through the National Spatial Data Infrastructure (NSDI) Program. The Federal Geographic Data Committee makes these monies available annually to assist the geospatial community to implement components of the NSDI.

During the first stages of this project a steering committee and project team were established and several Information Gathering Sessions were held around the state as group visioning sessions to identify and clarify goals and to define the needs at all levels of government. Over 75 members of state, regional and local governments along with the broader set of potential stakeholders attended these sessions which were held in four different geographic locations around the State.

In additional to the Listening Sessions an On-Line Survey was also prepared to reach out to those people who did not attend the planned sessions and well over 60 responses were received.

Consistent with the goals of the NSDI, findings from the Listening Sessions and the On-Line Survey identified the need for development of a State Spatial Data Infrastructure (SSDI) where data layer development, accuracy, and metadata standards would be

created and published. Data generated by state, regional, and local government efforts would be aggregated in a coordinated way and published for wider distribution at the statewide level.

The Strategic Planning process identified the following four (4) specific themes to be priority layers for the state's SSDI.

- Orthophotos – georeferenced aerial photography
- Parcels – geographic representations of private and public real property
- Street Centerlines – full hierarchy of all private and public roads
- Address Points – specific point locations for all addressed

In addition to these four data layers, administrative boundaries (in particular municipal boundaries) were also identified as a layer of great importance to the state. Currently there is no available statewide source for municipal boundaries and there are many known conflicts that exist along the boundaries of communities. It was recommended that a definitive administrative boundary layer be created.

IV. State Spatial Data Infrastructure (SSDI)

The goal of the Connecticut SSDI is to improve everyone's operations, reduce costs, and facilitate new analyses and joint decision making by providing a readily available set of basic digital geographic data. The infrastructure consists of commonly needed, used, and produced data brought into a common standard and made widely accessible. It is comprised of the initial seven NSDI themes and adds the following new themes critical to Connecticut's geospatial interests and business needs: Addressing, Census and Demographics, Critical Infrastructure and Key Resources, Geographic Names and Places, and Land Used and Land Cover.

The following are the guiding principles for building the infrastructure:

- The infrastructure should be a preferred data source. It should represent the best available data for an area – the most current, complete, and accurate data.
- The infrastructure should be widely used and useful. Users must be able to easily integrate framework data with their own and provide feedback and corrections to framework data.
- Access to infrastructure data should be at the lowest possible cost without restrictions on use and dissemination. The infrastructure is a public resource.
- Duplication of efforts should be minimized. Sharing the development and maintenance of framework data reduces the costs of individual users' data production.

- The infrastructure should be based on cooperation. It is built through the combined efforts of many participants who work together on its design and development and contribute data to it.

V. Connecticut Geographic Framework Data Themes

Consistent with the NSDI, the Data Inventory and Assessment Working Group had previously identified and recommended eleven (11) categories or themes of data to be the basis for Connecticut's Geographic Framework Data and SSDI to the CGISC. In addition, a new twelfth (12) theme was added to focus specifically on the needs of addressing.

Multi-Agency Coordination

Agencies at all levels of government within Connecticut have been involved in geographic data development. CGISC member agencies support statewide development of base map themes and the SSDI but the completion of these efforts often would not be possible without the participation of other groups. Federal agencies have devoted significant funds and in-kind work to Connecticut's base mapping programs. Federal agencies have also developed national standards that saved CGISC time in having to develop them and also help keep Connecticut base map data as compatible as possible with similar datasets developed in neighboring states. State and federal agencies provide standards, much of the funding, and often integrate multiple datasets to create large state and/or national coverages.

This is only part of the effort needed, however. The most accurate, complete, and timely data usually come from local and regional sources. State and federal agencies can develop large datasets at moderate to small scales but detailed datasets based on best available information require local participation. Local and regional groups that regularly collect geographic data include municipalities and planning regions. There are also many benefits to local data collection. Local data collectors have the most detailed knowledge of features being mapped (i.e. roads, properties) and have greater incentives to regularly maintain datasets. Local data are typically large-scale and generally provide higher accuracies and a broader range of features with a higher level of attribution.

In light of these advantages, locally supplied data cannot be ignored for base map development. We can conceptualize a two directional path for base map construction with GIS data "flowing" up from a local level to a state or national level while funding, standards, and data integration flow downward from state and federal organizations. This pattern also demonstrates the need for constant attention to the formation and nurturing of partnerships to produce the best base maps possible.

Detailed Theme Descriptions

Each theme is presented in an illustrated tabular format listing identical data fields for all themes. These reports were developed by committees of industry professionals and those most knowledgeable with the data. Individuals from academia, state, regional, and local government, and from both the public and private sectors have been involved in these efforts.

In general, the illustrations are intended be representative of the completed product and may either show the dataset or how it is used. The information categories for each theme are listed below:

- **Theme Description** – defines the dataset and offers a general overview. Note that Appendix One is a glossary that also defines the themes and related terms.
- **Theme Uses** – lists general applications the theme is suitable for.
- **Relationship to Other Base Map Themes** – describes how a theme is used with other base map themes both with regard to data production and applications.
- **Status** – lists status and any mitigating factors.
- **Source of Data** – lists datasets (base map themes and others) and organizations providing data.
- **Standards** – lists published standards wherever possible.
- **What is Needed to Complete** – this builds on theme status and lists action items to be taken next.
- **Data Custodians** – the organization responsible for data content and maintenance. All themes must have a CGISC member agency custodian. Appropriate federal agency is listed as needed because many themes use federal funds, standards, or other guidance.
- **Data Developer** – the group actually producing the data (not necessarily the custodian).
- **Data Distributors** – current and prospective sources for obtaining datasets.
- **Primary Data Users & Stakeholders** – agencies and other organizations actively using (or with the potential to use) the dataset.
- **Comments** – other information not applicable in the above categories.

A. Addressing

Addressing

▲ *Image depicts a set of address points with address numbers and street centerlines with street names and address ranges overlaid on top of an orthophoto.*

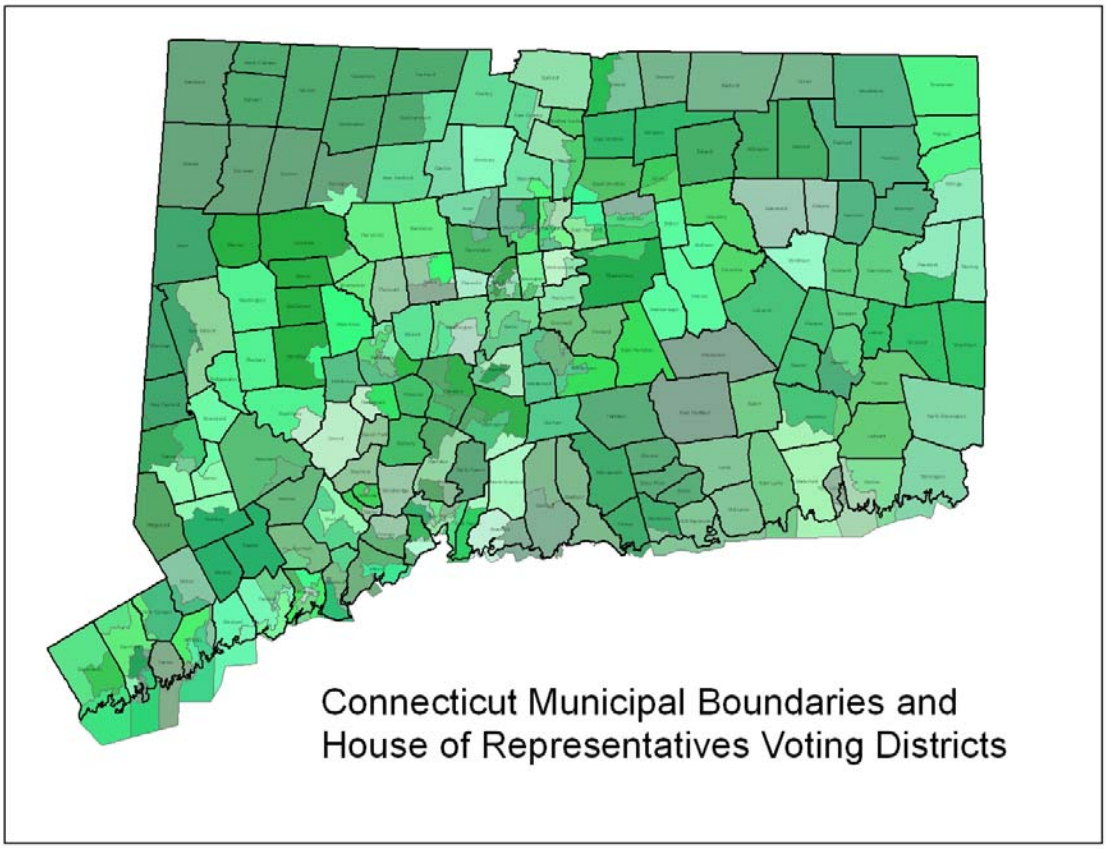
Theme Description	The Addressing theme contains the following types of features: • Address Points • Landmarks • Intersections The goal for Address Points is to spatially locate the entrance to a structure and have standardized attributes for street name and street number. Achieving this locational accuracy may begin with an interim solution such as a parcel or building centroid, or the geocoded location along a street centerline. The goal for Landmarks is to spatially locate prominent features that are not tied to a structure such as a park, ball field, village center, or commuter parking lot. The locational accuracy of these features is not critical, but should be within the boundary of the feature. The goal for Intersections is to spatially locate the convergence of roads that can be used as a reference for other features or as a general location of events. This separate feature is useful for GIS users that do not have network analysis capabilities. Note: No names of owners or occupants are part of any addressing theme. The intent is to create standardized address themes that can be linked to other data sources. For example, no confidential 9-1-1 data would ever be distributed with these themes. This data would be linked to standardized address themes by the end user or agency responsible for the data.

Addressing Continued…	
Theme Uses	Improved emergency response and routing, disaster mitigation and evacuation, utilities, tax appraisal, voting districts, 9-1-1, zoning, census, locating agency clients (e.g. insurance, health), and developing political jurisdictions and districts.
Relationship to Other Base Map Themes	Addressing features are closely related to features in the **Transportation** theme and must be developed in conjunction with those data sets. For example, street name information for this theme and the Transportation theme's street centerline will be derived from on of the same data. Also the address range information within the street centerline will be based on address point data. Addressing features are also related to the **Cadastra**l theme since most properties will have an address point or landmark feature. A property such as a condo or apartment complex will have multiple address points for a single parcel.
Status	No comprehensive point based address data is currently available for the entire state. Select municipalities do have address points or other addressing data that will be used to populate a statewide address database. Current option for address location is street centerline address range data provided with state licensed Tele Atlas street centerline data.
Source of Data	Municipalities, State, Utilities.
Standards	• FGDC Address Content Standard (see www.fgdc.gov/standards/status/sub2_4.html). • The National Emergency Number Association has standards for technical issues for database maintenance (see www.nena.org/9-1-1TechStandards/index.htm • U.S. Postal Service Publication 28 has standards for addressing, including street suffixes (see http://www.usps.com/ncsc/lookups/abbreviations.html#suffix
What is Needed to Complete	1. A business plan will be developed for the implementation of the Address theme. This plan will propose a draft address geodatabase model and a plan for the collection of address data. The plan will also propose procedures for the maintenance and distribution of this data. 2. A pilot address geodatabase model is currently being developed by DPS-OSET to facilitate collection and storage of address information. 3. An Addressing Guideline will be developed by the State to assist municipalities in the process of assigning addresses including street naming and numbering, unit identification, address ranges and rules to follow for common addressing issues.
Data Custodian	It is proposed that municipalities be the custodians of the data, but the State will act as the clearinghouse for statewide data and be responsible for adherence to standards. It is proposed that updates be received by the State from municipalities at least on an annual basis with January 1st being set as the deadline for submission to the State.
Data Developers	Local, municipal, regional, utilities, and state agencies.

Addressing Continued…	
Distributors	**To be Determined.**
Primary Data Users & Stakeholders	Virtually everyone in the State will make use of Addressing features including 9-1-1, Department of Public Health, Department of Public Safety, Department of Education, Department of Environmental Protection, Department of Transportation; Department of Emergency Management and Homeland Security, Municipalities, Utilities, Regional agencies, U.S. Postal Service and service delivery businesses.
Comments	The Connecticut GIS Council's Strategic plan has made a statewide point-based address database one of its Framework Data Layers.

B. Administrative and Political Boundaries

Administrative and Political Boundaries



Theme Description	This theme consists of the following Official Political Boundaries: State, Municipal, Incorporated Cities or boroughs, County, Regional Planning Organizations (including Councils of Governments, Councils of Elected Officials, and Regional Planning Agencies) Congressional Districts, and Voting Districts. This theme also includes State Administrative and Analytic Boundaries (ex. Department of Emergency Management & Homeland Security Regions), and other regional boundaries.
Theme Uses	Redistricting, drawing voting districts, zoning, sale of property, conservation & development plans, socioeconomic analysis (census/demographic), regional planning, disaster preparedness and emergency response, service distribution, map production, and other specialized purposes.
Relationship to Other Base Map Themes	**Cadastral** data should be bound by the municipal boundaries. **Orthoimagery** and **Geodetic Control** may be used to provide the geographic referencing for these data, as well as for **Cadastral. Transportation** features must be linked to municipal boundaries for geocoding and addressing needs. **Census** geographies are associated

Administrative and Political Boundaries Continued…	
	with municipal boundaries. Municipal boundaries may be coincident with **Hydrography**, where rivers, stream, or coastline acts as a boundary or **Transportation** where roads follow boundaries. Additionally, every feature represented by a framework theme exists within the state of Connecticut and its administrative boundaries
Status	Municipal Boundary data exists however there is no official map that has been established by statute. Current Municipal boundary data exists at 1:24,000 scale, 1:100,000 scale, and 1:125,000 scale. Many other boundary delineations have been developed utilizing existing municipal boundary data commonly available through State or Federal Agencies. While this data is generally considered to be complete and suitable for illustrative mapping on a statewide basis; it is outdated and not at the accuracy or precision necessary for use at local or regional scales.
Source of Data	There is no definitive source for municipal boundary data. Other administrative boundaries are developed and best obtained through the agency or entity responsible for delineating such boundaries. For example, the State Department of Public Health is the source of Local Health Departments and Districts boundaries.
Standards	None defined by the State. Federal standards defined by the U.S Geological Survey for 1:24,000 scale and 1:100,000 scale. The FGDC is in the process of developing a Governmental Unit Boundary Data content standard and some individual states have developed preliminary standards.
What is Needed to Complete	A statewide survey of municipal boundaries would be necessary in order to accurately complete this theme. Typically, other administrative boundaries are aggregations of municipal boundaries. While there are some administrative or political boundaries that are a subset of a municipality (such as a voting district) they may not require the level of precision as is needed for a municipal boundary.
Data Custodians	U.S. Geological Survey, U.S. Census Bureau, CT DEP, CT DOT
Data Developers	U.S. Geological Survey, U.S. Census Bureau, CT DEP, CT DOT
Data Distributor	U.S. Geological Survey, U.S. Census Bureau, CT DEP
Primary Data Users & Stakeholders	All Connecticut residents, municipalities, regional planning organizations, State Agencies, Federal Agencies businesses
Comments	Data sets in this theme are often developed by multiple agencies for a variety of different uses. With the exception of a small number of data sets that represent political or administrative units that are subsets of a municipality, administrative and political boundaries are aggregations of municipalities (ex. Regional Planning Organizations). Therefore, it may not be necessary to maintain these as separate polygon or polyline datasets, but rather as attributes of the municipal boundary datasets

C. Base Map Imagery

Base Map Imagery

A comparison of traditional orthophotograph, left, and oblique Imagery of Evergreen Walk, South Windsor

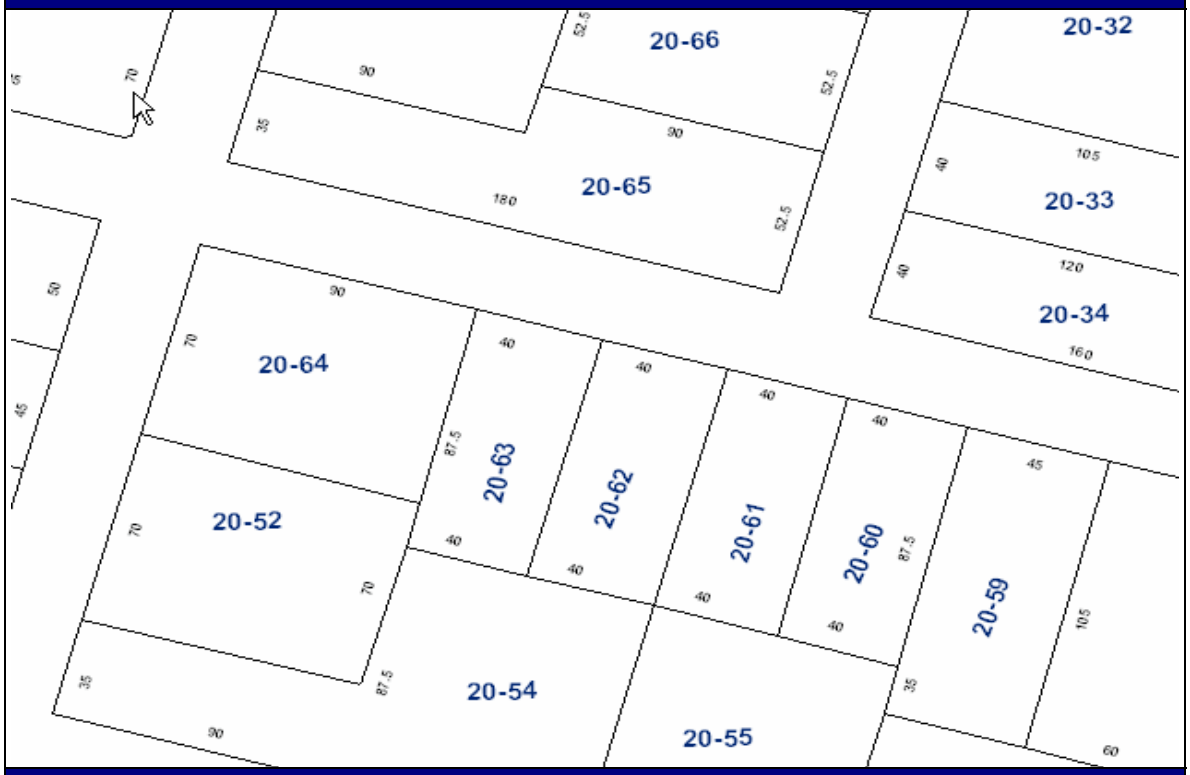
Theme Description	Connecticut has a variety of imagery contained within state, intuitional and local agencies. Currently we are focusing ortho and oblique imagery. With additional assistance we intend to catalog other forms such as infrared and photo imagery. Orthophotographic imagery contains georeferenced images of the Earth's surface collected by a sensor in which image surface feature displacement has been removed as a result of sensor distortions, orientation and terrain relief. For every large surface areas, an Earth curvature correction map be applied. Digital orthoimagery encode the optical electromagnetic spectrum as discrete values modeled in an array of georeferenced pixels. Digital orthoimages have the geometric characteristics of a map in which other map layers can be overlaid and the image qualities of a photograph. This quality makes digital orthophotography one of the most widely use data types in a GIS. Oblique imagery is angled view imagery in which four directions are captured so the sides of objects in the imagery can be viewed from north, south, east and west perspectives. Oblique imagery provides a three-dimensional view and, with the development of interpretive software, is used for a wide variety of applications including homeland security, emergency management and planning.
Theme Uses	Orthoimagery provides the visual content of an aerial photograph while being while being as accurate as a map for measurements. Uses include: • Measuring distances • Calculating areas • Determining shapes of features

Base Map Imagery Continued…	
	• Calculating directions • Base mapping coverage of geographic areas • Ecosystem restoration • Wetlands / soil type delineation • Verifying data accuracy • Classification (vegetation types, land use, protected areas, etc.) • Inspections • Planning impact & analysis • Economic development • Emergency response & management • Damage assessments • Identifying impermeable surfaces • Education
Relationship to Other Base Map Themes	This theme is used as a reference source for many other themes and possibly used as a source for creating and updating other theme features. Some related themes include **Cadastral, Transportation, Addresses, Administrative Boundaries, Hydrography, Geodetic Control** and **Elevation** These themes are used in conjunction with imagery to generate various map products and subsequent raster data sets such as hill shade and 3-D maps
Status	Currently a complete up to date orthoimagery dataset is not available for the State of Connecticut. The most current dataset accessible from the state of Connecticut's orthophoto program is the flight done in 2004. This imagery was done at 1:200' scale (+- 5’ spatial accuracy), uncolored balanced, black and white images, with 0.8' pixel resolution. Since the 2004 flight, there has not been another comprehensive flight of the state. There have been smaller initiatives on a regional and local level to capture orthoimagery. Individual towns or regional water companies, like the MDC, have contracted with private vendors to fly select areas within Connecticut. In 2006-2007, the state also contracted with Pictometry, a Rochester, New York company for acquisition of oblique photography along the Connecticut River and the Long Island Sound for homeland security applications. These images were provided to the selected towns included in the flight at no cost. Towns not included had the option to purchase the data directly from Pictometry for an additional cost. The purpose of the flight was to collect high resolution oblique images of the identified areas. Some municipalities in the State have licensing agreements with SBC to purchase orthoimagery and receive scheduled updates. They typically fly one third of the state a year at 1:200' accuracy with color imagery. Some towns have paid into the program to buy higher quality imagery or additional datasets. As of now SBC has suspended flights and those towns may have to find an alternative source.

Base Map Imagery Continued…	
	The State of Connecticut does not have a unified system for a state wide orthoimagery program. There are no set standards available for accurate imagery and no standards for the frequency of updates. The is also no legislative source of funding for a scheduled state wide orthophotography program.
Source of Data	State of Connecticut 2004 orthoimages are housed at the State of Connecticut DOT. Municipal and regional imagery data is exclusive to the area and can be purchased from the entity that owns the data. The Pictometry data is licensed to the State of Connecticut for the areas in the State they contracted to have flown. The remaining area would have to be purchased directly from Pictometry. The SBC data would also have to be licensed and can be used within the business that purchases the data, however, there is a degree of uncertainty with future imagery products being available at cost or otherwise from SBC.
Standards	Information on the FGDC content standards for Digital Orthoimagery can be found at: http://www.fgdc.gov/standards/projects/FGDC-standards-projects/orthoimagery/index_html There currently are no standards set forth for oblique imagery.
What is Needed to Complete	The results of the survey done through the State of Connecticut Geospatial Council, standards for a new flight have been identified. A need exists to determine whether a buy-in from individual towns is possible to increase the accuracy in their local area or to purchase additional datasets. Also, whether additional funding for the program would be available from commercial businesses who are interested in the images. At the very least a legislative ruling must be accomplished to ensure the funding needed to implement a scheduled state wide orthophotography program.
Data Custodian	The State of Connecticut Department of Information (DOIT) will host and distribute the imagery data. DOIT can incorporate download web services into their GIS portal application currently under development allowing public access to the imagery.
Data Developers	Digital orthophotos and oblique imagery will be developed by vendors contracted by the State of Connecticut to produced the imagery on a regular basis according to specifications and guidelines set by a State appointed imagery acquisition committee under guidance by the Connecticut GIS Council.
Distributors	DOIT can incorporate a download web service into their GIS portal application currently under development allowing public access to the imagery.
Primary Data Users & Stakeholders	• All Connecticut municipalities • State agencies such as DOT, DEP, DEMHS and OPM • Regional planning agencies • Utility companies both private (CL&P) and public (MDC) • Engineering and GIS Services firms • Connecticut educators
Comments	

D. Cadastral Information

Cadastral Information



Example of Cadastral mapping overlaying satellite imagery ▲

Theme Description	Cadastral is not a term commonly used in the New England states. Connecticut cadastral information is commonly referred to as parcel mapping, though parcel mapping is only a portion of the information within a cadastre. **Definition:** *Cadastre* or *Cadastral*: 1. Tax inventory and assessment of real property. (Black's Law Dictionary, 5th ed.) 2. An official register of the quality, value and ownership of real estate, used in appropriating taxes. (Definitions of Surveying and Associated Terms, American Congress on Surveying and Mapping, 1941). Cadastral information includes the tabular information (owner, building info, values and other information) that has traditionally stored on property cards and currently in assessor Computer Aided Mass Appraisal (CAMA) databases, information in the city/town clerk land records and the property mapping represented on the assessor tax maps. **Features:** Common map features include property lines, property IDs, property dimensions, right of ways, condominium names, addresses, street names, easements and physical characteristics that may influence property value. There is a wide range of features that are on assessor/tax maps in Connecticut. Some community assessor/tax maps have most of the features listed above plus physical features such as buildings, water bodies, and roads. There is no standard set of features on assessor tax maps except those by the original property mapping

Cadastral Information Continued….	
	consulting firm. **Attributes:** A single and unique identifier is a requirement for linking the property polygon to other property information including municipal assessor CAMA databases. The parcel ID definition and other specific attributes will be included in a forthcoming cadastral standard document.
Theme Uses	**Municipal Assessment.** Cadastral information is used for assessing the value of property for taxation purposes. Assessment and subsequent taxation is the primary application of cadastral information. Assessor tax maps are created to aid in the assessment process. **Municipal Planning and Zoning:** Cadastral information is one source used for landuse and planning decisions. Parcel boundaries are used in Natural Resource Inventory Maps, the Plan of Conservation and Development, as well as the basis for Zoning Maps. Administrative tasks such as zone change notification and
	certain application property abutter lists can be easily accomplished using parcel data in a GIS. **State/Regional Planning:** Cadastral information is used in regional and state Plan of Conservation and Development. State DEP: **The Dept. of Environmental Protection maintains parcel data for open space properties throughout the state, including DEP owned lands and municipal, non-profit, and private open space. In addition, the DEP maintains the parcel database for parcels whose development rights are acquired under the Farmland Preservation Program, administered by the Connecticut Dept. of Agriculture. Cadastral data is also used to identify potential properties for acquisition by the DEP for open space, recreation, conservation, wildlife management and forestry management purposes; encroachment issues; and other parcel-based land use decisions as relate to the mission of the DEP.** **State DOT Right of Ways:** The DOT Office of Rights of Ways utilizes Town assessor parcel data for the valuation, title search, acquisition and release of properties that may be associated with State transportation projects. Additionally, this information is used to aid in the identification of potential excess State property. **State DPW:** Statewide inventory of state land and buildings (except for DOT, DEP and Uconn) for facilities management and capital improvement planning. **Utility Companies:** Most utility companies utilize parcel mapping as an aid in right of way and easement management. Many utility companies also utilize cadastral information in the analysis of customer information systems. **Other Uses**: Local and state agencies utilize parcel information for hazard mitigation and planning, voter districting, and economic development.

Cadastral Information Continued….

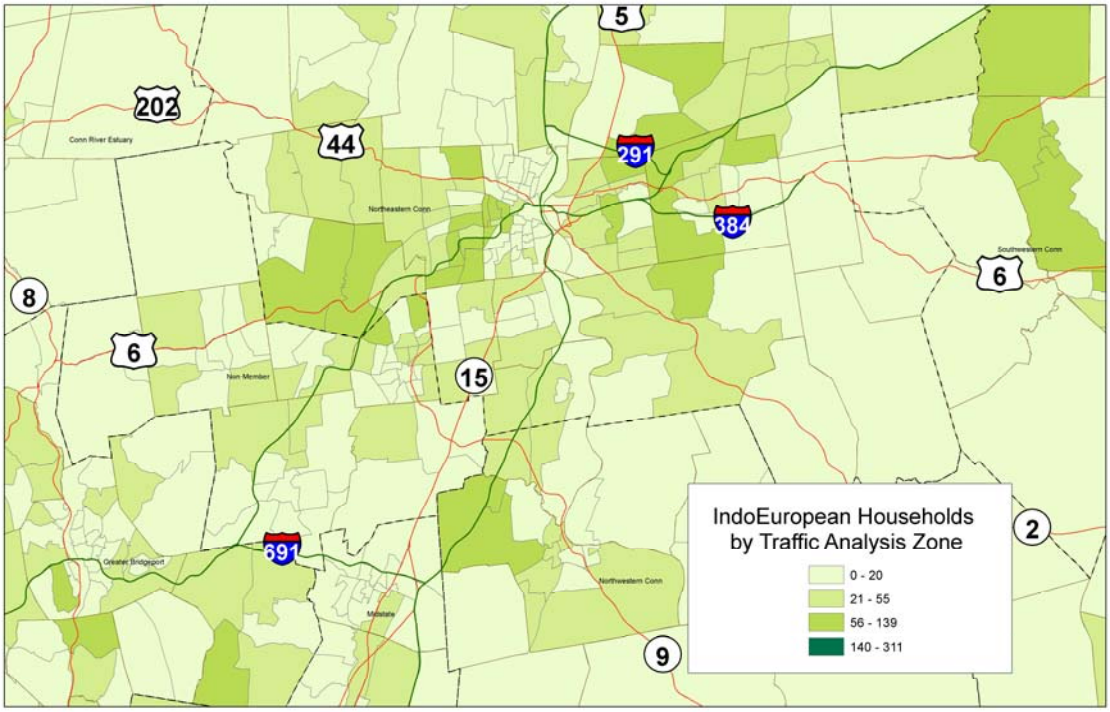
Relationship to Other Base Map Themes	**Administrative Boundaries:** State, town, borough, county and other administrative boundaries should be coincident with parcel boundaries. Currently, there are significant discrepancies between existing town boundary datasets and parcel boundary datasets. There are even neighboring town parcel datasets with as much as 500 foot overlaps or gaps at the two towns' boundary. It is very important that the administrative boundaries, especially the state and town boundaries be as accurate as possible. **Geodetic Control:** This dataset is the basis for Geo-referencing all maps, surveys, parcels and municipal boundaries to the latest State Plane Coordinate System (SPCS), NAD-83 (latest adjustment). Monuments, GPS CORS points and survey markers are used to tie surveys such as subdivision and boundary maps into State plane Coordinates. Without all data being geo-referenced into the same Statewide datum it will be difficult to create and update parcel datasets. It may be necessary to require that all new surveys performed after a certain date be tied into the latest SPCS. Geo-referencing existing maps and parcels not on the latest SPCS will require careful analysis and may require the assistance of professional
	land surveyors and experienced GIS professionals. **Orthophotography:** Used in many municipalities as the base map on which parcel datasets are created and updated. Orthophotography is a aerial photography that has been digitally adjusted so that it is to the same scale across the photo. Common boundary physical features like stone walls and fences, commonly referred as lines of occupation, can be seen in high quality and high resolution orthophotography. **Hydrography:** Many parcel boundaries are defined by either water body edges or centerlines. Riparian and littoral rights may affect property boundaries when physical conditions change the water body geometry or elevation such that the property may gain or lose area. **Elevation:** Property adjacent to the ocean or certain freshwater lakes/ponds is delimited by the mean high water line. The mean high water line is defined by elevation. **Addresses:** Parcels are typically associated with a primary address and may contain secondary addresses. For instance, a single family property will have one address while a condominium, apartment or high rise complex will have many addresses. **Transportation:** When converting assessor tax maps to GIS, right of way geometry can be derived from accurate road centerline offsets.
Status	**Proposed.** A single statewide parcel data set does not exist. Parcel data is typically collected and created at the municipal level and is neither collected nor distributed in a centralized statewide manner. Currently, numerous municipalities have a compiled and maintained parcel data set. Information gathered during the creation of the Connecticut Geographic Information Spatial Council Strategic Plan revealed that over 90% of the municipalities in Connecticut have or will have a digital parcel dataset within the next two years.

Cadastral Information Continued….	
Source of Data	Municipalities collect and store the sources of information to maintain this data set through daily operations. Definitive sources include assessor tax maps, town/city clerk land records (deeds, subdivision plans and surveyed maps of record), Railroad valuation maps, Highway Department right of way and acquisition maps, and maps not recorded in land records (unrecorded surveys and town/city surveys). Other sources include orthophotography and photogrammetrically derived topographic maps (in CAD or GIS form). A digital copy of the accepted subdivision plan can be required as part of the permit submission requirement in addition to mylars and other documents.
Standards	Currently, there are several official standards and guidelines in other states besides Connecticut and at the federal level. The FGDC The State of Massachusetts has a cadastral standard that should be utilized as a template. Work was done by the Connecticut GIS User to User Network to develop a parcel standard: http://ctgis.uconn.edu/committees/standards.htm. A digital subdivision submission standard should also be created to provide a consistent standard for surveyors and developers to follow for development permit filing requirements.
	This could provide a significant cost savings to maintaining a town-wide parcel dataset.
What is Needed to Complete	**Information Survey:** There is a need to collect information on town parcel datasets that are available, in progress, planned, and not available. Also, an evaluation of the attributes, features and the accuracy (attribute and spatial) of the existing town parcel datasets should be performed. This should be conducted as part of a Cadastral Information Strategic Plan that would map out the workflows and processes to bring municipal cadastral information into a state-wide system. **Grants:** The creation of a parcel grant program has been identified in the Connecticut Geographic Information Spatial Council Strategic and Business Plan. Two separate grants were identified to first obtain 100% town parcel dataset coverage and then provide assistance in maintaining the existing town parcel datasets. Another possible grant program could aid in developing easement datasets to enhance the mapping component of the cadastral datasets.
Data Custodian	The ultimate custodian of the *statewide* cadastral GIS dataset should reside with the Connecticut Office of Policy and Management (OPM) which, by state statutes, has limited authority in the area of property assessment and taxation. Cities, towns, regional planning agencies and any other agency would continue to be the data custodian of the local cadastral dataset(s).
Data Developers	Cities, towns, regional planning agencies, and other agencies have developed cadastral datasets. In most instances, consultants develop the initial cadastral dataset and provide update services to the local agency. It can be assumed that significantly less than half of the communities with digital parcel datasets perform their own updates.
Distributors	OPM should be the distributor of the state-wide cadastral dataset. The Department of Information Technology will facilitate online distribution through the web-base GIS portal on behalf of OPM. Local generators of cadastral datasets (towns and

Cadastral Information Continued….	
	RPOs) will continue to distribute their own datasets.
Primary Data Users & Stakeholders	The primary stakeholders of cadastral information are the municipal assessor represented by the Connecticut Association of Assessing Officers (CAAO), GIS and IT professionals in both the public and private sector and licensed land surveyors represented by the Connecticut Association of Land Surveyors (CALS). Primary data users include municipal departments (Planning & Zoning, Inland Wetlands, Building, Engineering, Public Works, Fire, Police,), state agencies (DEP, DOT, DPW, DPS, DHMS, federal agencies (Census, US Fish & Wildlife, DoD, DHS), regional planning agencies, utility companies, real estate professionals, appraisers, land developers, consulting engineers, and the general public.
Comments	The parcel dataset is to be used for reference purposes only and is not to be used in lieu of a surveyed product.

E. Census and Demographics

Census and Demographics



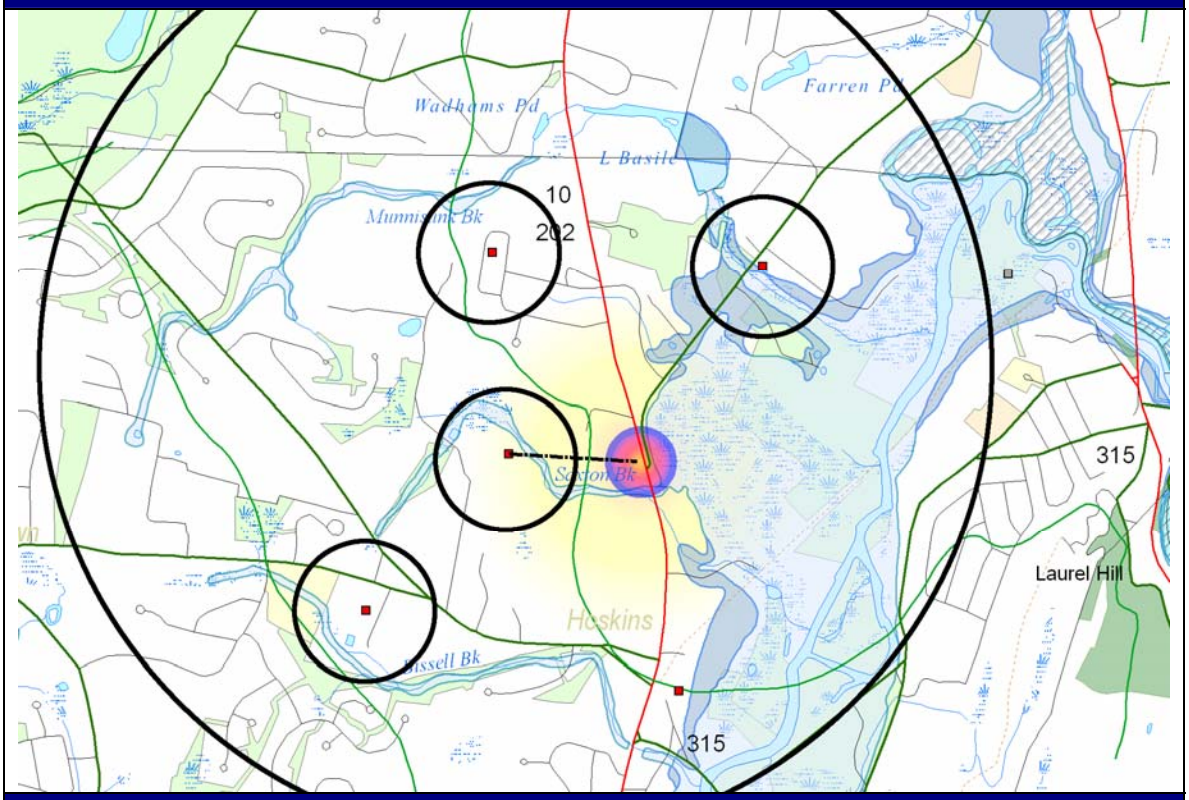
Example of the Five Types of Connecticut's ▲

Theme Description	Census and Demographic data are used for exploring the states socioeconomic conditions. This information can concern the population of our state including household demographics as well as business and economic information within and between towns. This data allows for a better understanding of the states growth and needs.
Theme Uses	Public planning, demography, population studies, forecasting, and development of socioeconomic metrics all benefit from this data. Census and Demographic data play a key in studying past trends and apply them to a population's current situation, or even expand to include an outlook on the future.
Relationship to Other Base Map Themes	Themes will be a mix of point and area features. The geographic extent of area features will vary between data sources and can be expected to be discontinuous with other area features. Point features will be linked to the address theme.
Status	Themes will be a mix of point and area features. The geographic extent of area features will vary between data sources and can be expected to be discontinuous with other area features. Point features will be linked to the address theme.

Census and Demographics Continued…	
Source of Data	An effort has begun to build a dictionary of data used by state agencies and municipalities. Normalizing and storing this data in a centralized relational database would be a benefit to all by reducing redundancy of data and effort.
Standards	A grant submission is in progress to obtain funds from the NSDI Cooperative Agreements Program (CAP) "Fifty States Initiative". Funding will be used to design a comprehensive database structure to store and update socioeconomic data, and allow for comparison over time and with differing area units.
What is Needed to Complete	Data will be utilized and shared as appropriate for each state agency and municipality. Issues of confidentiality will be addressed once a comprehensive data dictionary has been completed.
Data Custodian	CT Department of Information Technology (DoIT)
Data Developers	Data will be collected from numerous state/municipal agencies and combined with data from the decennial census and the ACS (American Community Survey). Links will be established to allow for analysis over time and with historic spatial variation in area units.
Distributors	To be determined.
Primary Data Users & Stakeholders	All data sensitive state agencies, municipalities, Regional Planning Organization, academia, libraries, business and individuals that uses the data for decision making activities.
Comments	

F. Critical Infrastructure and Key Resources

Critical Infrastructure and Key Resources



CI/KRs in Proximity of a Reported Incident ▲

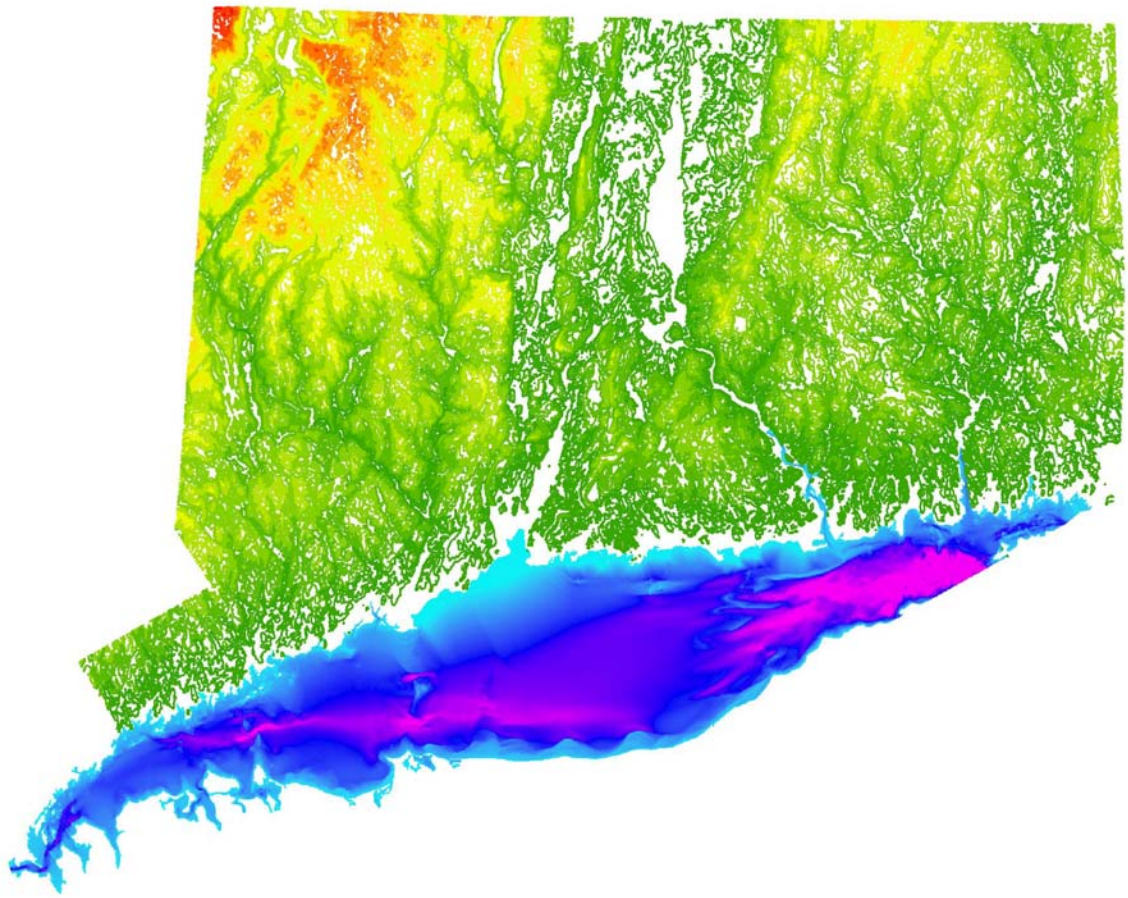
Theme Description	Critical infrastructure (CI) includes those assets, systems, networks, and functions – physical or virtual – that are vital to Connecticut, the region, and the country so that their incapacitation or destruction would have a debilitating impact on security, economic security, public health or safety, or any combination. Key resources (KR) are publicly or privately controlled resources essential to minimal operation of the government and economy. The federal government has organized CI/KR into 17 sectors that together provide essential functions and services that support various aspects of State and local government, private entities, and the general public. For purposes of identifying and organizing Connecticut's CI/KR GIS data, the following are the 17 sectors for which GIS data will be collected and organized: • Agriculture and Food • Defense Industrial base • Energy • Public Health and Healthcare • National and State Monuments and Icons • Banking and Finance • Drinking Water and Waste Treatment Facilities

Critical Infrastructure and Key Resources Continued…	
	• Chemical • Commercial Facilities • Dams • Emergency Services • Commercial Nuclear Reactors, Materials and Waste • Information Technology • Telecommunications • Postal and Shipping • Transportation Systems • Government Facilities
Theme Uses	In the event of a local, state, regional, or national crisis, or homeland security training exercise, the CI/KR data themes can be used for emergency response, recovery, long-term recovery, assessment, planning, and law enforcement.
Relationship to Other Base Map Themes	All other data themes. There are some themes that overlap with the CI/KR data themes.
Status	A complete or partial CI/KR GIS dataset does not exist at the state level. Due to the diversity of CI/KR data, there are many data custodians and developers, making coordination efforts difficult. While some data components of the CI/KR dataset exist in other datasets, a systematic methodology to collect and/or create this dataset is needed in order to develop a comprehensive, one-source repository for the dataset.
Source of Data	Federal, state, and local agencies, commercial institutions and vendors, and utility companies.
Standards	Individual dataset standards will generally be developed by the custodian of the data; however, for the purposes of accepting and using CI/KR GIS data, Connecticut Departments of Public Safety and Emergency Management and Homeland Security, in consultation with others, should develop "data acceptance" standards or criteria commensurate with their needs (i.e., minimum requirements). In addition, the data should be well documented, validated, follow Federal Geographic Data Committee standards, be interoperable, and cost-effective for local and state governments to implement.
What is Needed to Complete	Identification of specific data custodians/sources; reduce barriers regarding data sharing; set reasonable data deliverable dates; organize/extract CI/KR data from existing data themes; prioritize non-existing CI/KR GIS data and devote key staff resources (across all levels of government) to create these data; and take advantage of federal contractors or grants that exist to develop this dataset.
Data Custodian	Due to the diverse CI/KR data themes, data custodians vary significantly. A comprehensive list will be developed at a later time by the GIS CI/KR Subcommittee and others.
Data Developers	Federal, state, and local agencies, commercial institutions and vendors, and utility companies.

Critical Infrastructure and Key Resources Continued…	
Distributors	Federal, state, and local agencies, commercial institutions and vendors, and utility companies.
Primary Data Users & Stakeholders	Federal, state, and local agencies, and emergency responders.
Comments	Due to the inherent nature of CI/KR data, security standards need to be developed and the following state agencies (through their respective statutes) need to determine what data (or portions thereof) is public information and what is considered a security risk: • Department of Public Safety (municipal facilities*) • Department of Public Works (state facilities) • Department of Public Health (public water supply facilities) • Judicial Branch (Judicial facilities) • Department of Mental Health and Addiction Services (Whiting Forensic Division facilities-CVH) • Department of Corrections (Correctional facilities) • Joint Committee on Legislative Management (State Capitol and Legislative Office Building facilities) Utility companies should also, if they have not already, develop similar standards. Since CI/KR data relies on a diverse number of data custodians, there are barriers with data sharing in terms of data authorization agreements or contracts. A streamlined process should be developed to address conflicting requirements/needs. The CI/KR data themes need to be available to those who need it if remote access is not available (internet service is down) – a protocol/process needs to be developed. Also, a process needs to be established to ensure maintainability. ** Facilities mean, but are not limited to, structures, utilities, or security support structures.*

G. Elevation and Bathymetry

Elevation and Bathymetry



20m Statewide Hypsography Contours & 30m NOAA Long Island Sound Bathymetric DEM▲

Theme Description	The elevation and bathymetric data listed below provide vertical measurements for the topography (land) of Connecticut and bathymetry (water) of Long Island Sound. These data are available in both vector (point & line) and raster (gridded) formats. For example Light Detection and Ranging (LIDAR) sensors produce point data, contours exist as linear data, and Digital Elevation Models (DEMs) and Digital Surface Models (DSMs) exist as raster data. The data range temporally from the 1980's to 2006, with vertical accuracy levels ranging from +/-15m (30m Statewide DEM) to +/- 0.06m (1m 2004 Central CT Coastal LIDAR.)

Elevation and Bathymetry Continued…	
Theme Uses	Generalized cartographic basemap display, vertical aerial photo orthorectification, 3-D visualizations, volumetric calculations, visualization analyses for siting development/infrastructure projects, resource monitoring, hydrologic modeling, hydrology, climatology, civil engineering design, town planning, etc.
Relationship to Other Base Map Themes	The elevation data are closely tied to the **Geodetic Control** and **Orthoimagery** data because elevation data and geodetic control are used to support the creation of orthoimagery. Bathymetric data is closely tied the Hydrography data as both serve to map/display waterbodies and their characteristics.
Status	Varied. Much of the data are complete in the sense that they have been collected, processed, documented, and delivered for use. However, compared to newer sources of data or current ground conditions these data may be incomplete. Further, several data sources are have not been fully developed or delivered as of October 2007. All data have some form of description (metadata) although all may not fully comply with complete Federal Geospatial Data Commission (FGDC) standards.
Source of Data	NOTE: At present there is no one "official" set of data that necessarily represents the most current, accurate, statewide source of elevation or bathymetry. What follows is not intended to be an exhaustive inventory but rather a listing of notable sources that illustrate the breadth and scale of elevation and bathymetric data. ***Elevation:**** 30m Statewide DEM: • USGS National Elevation Dataset 20m Statewide Hypsography: • Long Island Sound Resource Center **7M 2000 STATEWIDE LIDAR & DEMS – (DRAFT SUITABLE FOR EDUCATION, PRESENTATION AND GENERAL RESEARCH ONLY:)** • University of Connecticut Center for Landuse and Education 1m 2004 Central CT Coastal LIDAR (DEM creation pending:) • University of Connecticut Center for Landuse and Education 2m 2004 CT Coastal DSM: • University of Connecticut Center for Landuse and Education/ CT Dept. of Environmental Protection 1m 2006 CT Coastal LIDAR & DEMS (delivery pending in Fall, 2007:) • FEMA/CT Dept. of Environmental Protection ***Bathymetry:*** 30m NOAA Long Island Sound Bathymetric DEM: • CT Dept. of Environmental Protection CT Lake Bathymetry Contours: • CT Dept. of Environmental Protection **5M LIS BATHYMETRY CONTOURS:**

Elevation and Bathymetry Continued…	
	• USGS/Long Island Sound Resource Center **1M LIS BATHYMETRY CONTOURS:** • USGS/Long Island Sound Resource Center Various scale NOAA Nautical Charts for LIS and coastal CT: • CT Dept. of Environmental Protection/ Long Island Sound Resource Center Various USGS/NOAA sonar surveys for parts of Long Island Sound (Six Mile Reef, the Race, North Central Long Island Sound, offshore Milford, offshore Hammonassett:) • USGS/ Long Island Sound Resource Center * It is likely that many CT municipalities have/maintain their own elevation data to support engineering/planning activities although at present, no statewide comprehensive inventory exists. Fairfield and New Haven counties were inventoried in 2005 as a result of scoping activities for the FEMA Flood Insurance Rate Map Modernization Program, though newer data may exist.
Standards	At present, all elevation/bathymetric data conform to varying standards developed by either their stated sources, or by agencies/companies that collected and compiled the data on their behalf. The 2004 and 2006 Coastal LIDAR data, however, were collected and compiled using FEMA LIDAR data collections standards (http://www.fema.gov/plan/prevent/fhm/lidar_4b.shtm), and are thus largely comparable data in terms of collection methodology, processing, spatial scale, vertical datums, and vertical/horizontal accuracy.
What is Needed to Complete	***Elevation:*** • Continued processing of 1m 2004 LIDAR data into DEMs. • Delivery of 1m 2006 CT Coastal LIDAR & DEMS to CT Dept. of Environmental Protection by FEMA (Fall, 2007.) • Process 2000 LIDAR data into *finalized* indexed statewide products (DEM/contours/points.) • Completion of FGDC compliant metadata where appropriate. ***Bathymetry:*** • Continued updates to CT Lake Bathymetry Contours. • Completion of FGDC compliant metadata where appropriate. The above action items address steps needed to bring existing individual datasets into completion. The following represent strategic goals for consideration to bring the theme area into a more robust/complete state. ***Elevation & Bathymetry:*** • Further inventory/assessment of other potential elevation/bathymetric data maintained by other State/Federal agencies as well as municipalities. • Development of mapping standards/guidelines (either from scratch or via modifications to existing standards) to assist future collection

Elevation and Bathymetry Continued…

	projects. • Development of a statewide elevation/bathymetric collection schedule (potentially to coincide with statewide orthophoto mapping.) • Completion of LIS Sea Floor Mapping Strategic Plan targeting areas and types of data needed by stakeholders (Preliminary Stakeholder Workshop will be convened November, 2007 to begin this process.) • Implementation of priority items from LIS Sea Floor Mapping Strategic Plan. • Integration of "best of breed" elevation data into one master elevation dataset. • Integration of "best of breed" bathymetry data into one master elevation dataset. • Creation of a seamless topographic/bathymetric elevation dataset. In many cases, elevation and bathymetric data may differ in measurement because of inconsistencies in their vertical datum (a reference surface to which values are either above or below; put more simply, where values of "zero" are placed.) Bathymetric data typically use a tidal datum (such as Mean Sea Level or Mean Lower Low Water) while topographic elevation data such as LIDAR typically use an orthometric datum such as the North American Vertical Datum of 1988 (NAVD88.) Because of differing vertical datums, it is not trivial to place all elevation data in the same plane of reference, which would allow for the seamless integration of the two data sets. Distribution of all elevation/bathymetry data and metadata via a system for storing, archiving, and public distribution. One possibility to explore is the Geospatial One Stop Program (www.geodata.gov) that includes the USGS National Elevation Dataset and the NOAA NGDC Coastal Relief Gridded Database.
Data Custodian	Presently, various State and Federal Agencies (potentially municipalities as well.) In the future, one elevation and one bathymetry custodian might be needed if master datasets are to be created.
Data Developers	Presently, various State and Federal Agencies (potentially municipalities as well.)
Distributors	As of October 2007, varied. Some of these data (typically LIDAR point data) are too large to be effectively stored and served to potential users and stakeholders. Only the following datasets are publicly available on the web (via their above referenced sources:) • 30m Statewide DEM • 20m Statewide Hypsography Contours • 7m 2000 Statewide DEMs (DRAFT versions suitable for education, presentation and general research only) CT Lake Bathymetry Contours

Elevation and Bathymetry Continued…	
	• **5M LIS BATHYMETRY CONTOURS** • **1M LIS BATHYMETRY CONTOURS** • Various USGS/NOAA sonar surveys for parts of Long Island Sound (Six Mile Reef, the Race, North Central Long Island Sound, offshore Milford, offshore Hammonassett) NOTE: See bullet item regarding distribution in the "**What is Needed to Complete**" section.
Primary Data Users & Stakeholders	Connecticut Department of Environmental Protection, Connecticut Department of Transportation, Connecticut Department of Emergency Management and Homeland Security, Connecticut Department of Public Works, Various other State Agencies, Academia, Regional Planning Organizations, Municipalities, Local Governments, US Navy, US Coast Guard, USGS.
Comments	

H. Geodetic Control

Geodetic Control

A Global Positioning System base station antenna atop the Connecticut Department of Transportation Brookfield building.

Theme Description	No state-wide, geodetic control GIS theme exists. The geodetic control infrastructure of Connecticut consists of geodetic resources to manage the Connecticut State Plane Coordinate System as mandated by Connecticut General Statute 13a-255 and provide the representation of the earth, its horizontal, vertical and gravitational components in regards to the multitude of geodetic reference datums. It consists of vertical and horizontal ground control points, a global navigation satellite system (GNSS) base station network, tide gauges and their associated tidal benchmarks. These geodetic resources enable government, municipalities, private surveyors and engineers to achieve their goals in transportation, communication, public safety, mapping and a multitude of other scientific and engineering applications. In the Department of Transportation, the geodetic infrastructure is maintained by Connecticut Geodetic Survey (CGS) and managed by a geodesist. Geodetic control is a key foundation of other geospatial themes because it ensures the geospatial positional integrity of the other themes.

Geodetic Control Continued…

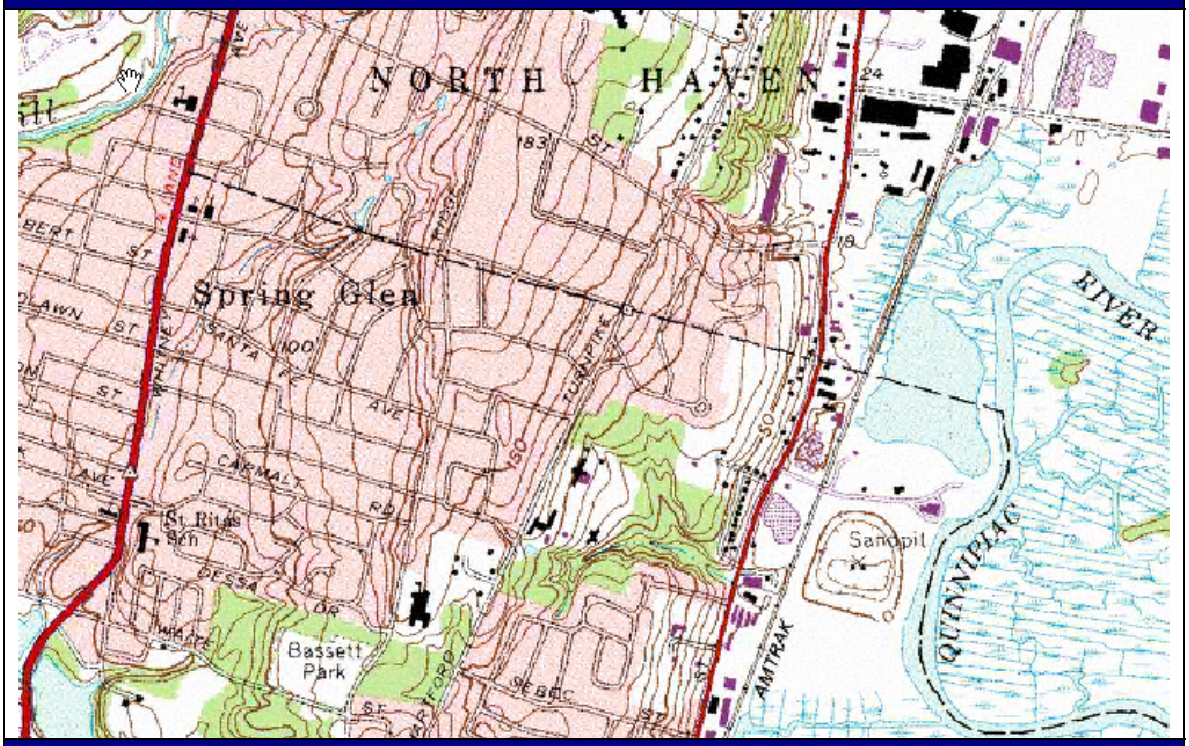
Theme Uses	Would be used to provide the control required for all geospatial data that need to tie to a geodetic datum, including any map, plat, or theme tied to the State Plane Coordinate System, oblique imagery, satellite imagery, elevation models and cadastral data.
Relationship to Other Base Map Themes	Geodetic control is the best mechanism to georeference other themes. Geodetic control must meet survey standards and uses permanent monuments that serve as control points.
Status	Over 9,000 geodetic survey markers of different accuracies exist in Connecticut. However, in many areas of the state, no monuments are available in the North American Datum of 1983 (NAD 83) or the North American Vertical Datum of 1988 (NAVD 88), which are required for most state and local projects. For a statewide geographic information system (GIS) to be implemented, all private, local, town, state, utility, and federal mapping data must be referenced to the same coordinate system. Many monuments have been damaged, lost or destroyed over the years and are not being replaced. There are eleven Continuously Operating Reference System (CORS) GNSS base stations, which are a vital part of the National Spatial Reference System (NSRS). With the use of these reference stations, knowledgeable users of survey grade GNSS equipment can establish their own georeferenced survey points as needed. This is the same approach that was pioneered by the National Geodetic Survey (NGS).
Source of Data	Connecticut Geodetic Survey (CGS) and National Geodetic Survey (NGS)
Standards	CGS propagates established NGS standards and advises the geospatial community on using them.
What is Needed to Complete	For geodetic control: 1. In order to take full advantage of the installed GNSS geodetic infrastructure and usage of real-time kinematic (RTK) techniques for multiple surveying and engineering applications, it is imperative to implement a real time network (RTN) to disseminate RTK corrections using Networked Transport of RTCM via Internet Protocol (NTRIP). 2. There is a need to finish a web-based application for accessing GNSS data via the ConnDOT web site. 3. NGS no longer maintains *in situ* monumentation, having shifted the burden of monument maintenance to the State level. Funds need to be allocated for this purpose, especially for the inventory, maintenance and replacement of First-Order Vertical Control markers (a.k.a. bench marks), which are often destroyed by road construction and not replaceable by GNSS heighting techniques. For a Geodetic Control Theme: 1. Create a GIS theme that incorporates the data sheet information embodied above.

Geodetic Control Continued…

Data Custodian	Connecticut Geodetic Survey (CGS)
Data Developers	National Geodetic Survey (NGS), Connecticut Geodetic Survey (CGS), local and regional agencies that provide geodetic data
Distributors	To Be Determined
Primary Data Users & Stakeholders	Engineering and Survey communities, all state agencies and municipalities
Comments	There is a need to build a World Wide Web-based application for the CGS in-house data base. This is a Dbase ™ database built by the CGS section of Central Surveys Office to manage the state-wide geodetic control data for dissemination to government, municipal and private sector professionals. This database is a primary tool in maintaining the State Plane Coordinate System and is used by all state survey sections on a daily basis. The database was developed on a Windows platform. Since CGS does not have the Internet capability for distributing these data, CGS added email functionality in PDF format for disseminating this data to the public.

I. Geographic Names and Places

Geographic Names and Places



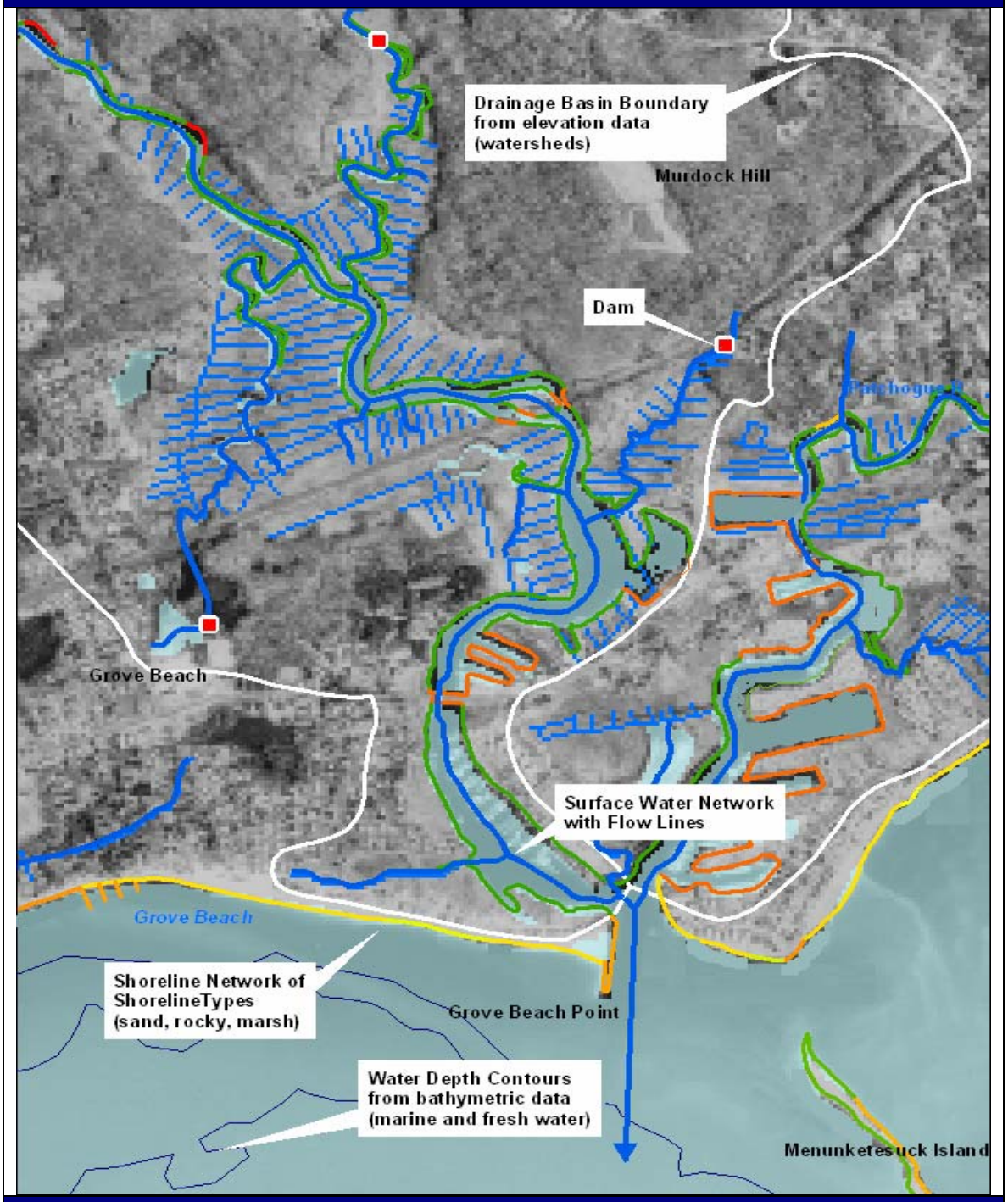
USGS topographic quadrangle map different named features. ▲

Theme Description	The geographic names theme is a tabular database with geographic coordinates of virtually every named place in Connecticut, such as towns, schools, parks, lakes, rivers, and mountains. The data is served through the geographic names information system (GNIS) maintained by the U.S. Geological Survey. The original source of the names was from the 1:24,000-scale U.S. Geological Survey topographic map series. To keep the data current, further work on GNIS has added names from other sources.
Theme Uses	Labels for maps, source of data for critical infrastructure, serves education and health organizations by locating their facilities, and provides references to historical sites and general purpose mapping.
Relationship to Other Base Map Themes	Provides names and labels for many geographic features depicted on other base map themes, including **orthoimagery, hydrography, transportation, elevation contours,** and **critical infrastructure.**
Status	**Complete/In Progress**. Connecticut Department of Environmental Protection (CTDEP) and the Connecticut Department of Transportation continue to update the GNIS. Theme is complete to USGS standards, but ongoing maintenance needed. Current status information is available at: http://geonames.usgs.gov/domestic/.

Geographic Names and Places Continued…	
Source of Data	U.S. Geological Survey 7.5-minute map series, and Numerous sources from agency databases, commercial sites, and the Internet are used to update the GNIS.
Standards	Information and metadata on names data collected for GNIS can be found here: geonames.usgs.gov/gnis_users_guide_toc.html.
What is Needed to Complete	Establish maintenance program to ensure that new place names (i.e. schools, public buildings, critical infrastructure) are provided to, and entered into, GNIS. Funds for half time position could provide this maintenance
Data Custodian	The Connecticut Department of Environmental Protection and the Connecticut Department of Transportation.
Data Developers	U.S. Geological Survey, the Connecticut Department of Environmental Protection and the Connecticut Department of Transportation.
Distributors	U.S. Geological Survey, the Connecticut Department of Environmental Protection and the Connecticut Department of Transportation.
Primary Data Users & Stakeholders	This theme is generally useful for anyone using GIS in Connecticut. It can be used for spatial querying, map labeling, feature identification/verification, and alternate name matching. It is particularly useful for adding labels to orthoimagery for reference purposes.
Comments	Addition of specialized geographic names for emergency operations and critical infrastructure has been discussed.

J. Hydrography

Hydrography



Example of Connecticut Hydrography Information with Descriptions ▲

Hydrography Continued…	
Theme Description	Hydrography defines the system of fresh and saline surface water in Connecticut, neighboring portions of Massachusetts, New York, and Rhode Island, and Long Island Sound (extending south to Long Island, west to New Rochelle, and east to Watch Hill). The surface water system is comprised of natural and manmade features. Hydrography features include rivers, streams, brooks, reservoirs, lakes, ponds, estuaries, bays, harbors, coves, ditches, canals, aqueducts, dams, tidal flood gates, breakwaters, jetties, and shorelines. Hydrography also includes surface water monitoring, discharge and withdrawal locations such as stream gage and precipitation monitoring stations, industrial and water supply intakes, wastewater outlets, and culverts. Hydrography excludes intermittent waterbody, wetland, marsh, swamp, tidal flat, and submerged rock information acquired and maintained using other methods or data sources.
Theme Uses	• ***Surface Water Base Map Information*** – A complete inventory of hydrography features, primarily used as background (base map) information and for geographic analysis. Absolute location and position are defined as points, lines, and areas. Surface water bodies are uniquely identified, classified by type, annotated by official name, and cartographically represented (at different levels of detail) according to scale. All associated features such as dams and wastewater outlets are uniquely identified and positioned in terms of absolute (true) location in the field. • ***Surface Water Network*** – Describes the order, direction, and distance water flows through rivers, streams, reservoirs, lakes and ponds. The surface water network establishes a linear (single-line) representation of hydrography used for mapping, overlaying and modeling water quality, fish habitat, bottom type, and stream flow conditions, for example. Single-line rivers and streams, waterbody centerlines, and marsh-pipeline connectors link to form continuous surface water flow lines. Site-specific information such as dam and wastewater outlets are represented (located) relative to one another along these flow lines, forming an integrated surface water model. • ***Shoreline Network*** – Defines the absolute location of marine and inland shorelines for the purpose of characterizing shoreline habitats, sensitive biological resources, and human-use resources, for example. Single-line waterbodies and waterbody shorelines (including the coastline) comprise the shoreline network. Includes mean high and low water lines. • ***Drainage-Watershed Information*** – Describes the direction of surface water flow across the landscape typically represented as drainage basin boundaries and areas. Used for reference and data cataloging purposes, one form of drainage information represents a predefined delineation of basin boundaries for all reservoirs, lakes, ponds, dam outlets, stream reaches and confluences. Drainage basin number, river reach number, and waterbody name identify and describe these basins hierarchically. A second form custom generates a drainage area at a given location on the landscape or along the surface water network

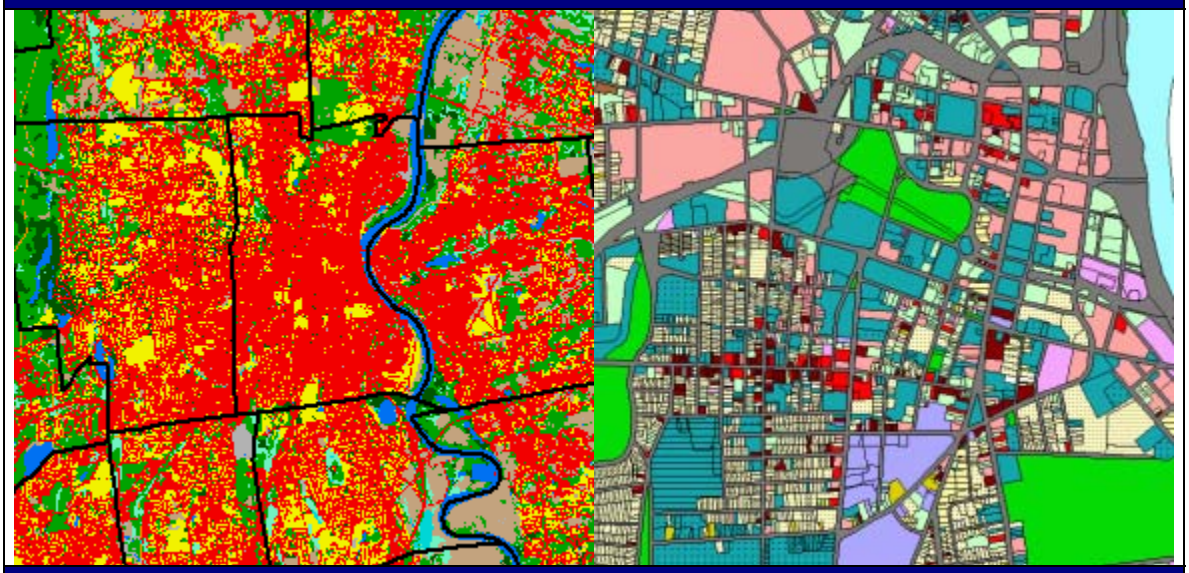
Hydrography Continued…	
Theme Uses Continued……	• ***Bathymetric Information*** – Describes the depth and water volume for public access reservoirs, lakes and ponds; water supply reservoirs; navigable rivers, bays, harbors and coves; and the near shore and deep waters of Long Island Sound. Bathymetric data is displayed as contour lines and 3D scenes. This information is integrated with topographic (land elevation) information to form a continuous topographic-bathymetric relief above and below water levels. Bathymetric data is not to be maintained for small and inaccessible rivers, streams, lakes and ponds typically on private land.
Relationship to Other Base Map Themes	The **orthoimagery** (locate and digitize rivers, streams, ponds, lakes and other tributary water bodies networks and courses) and **transportation** (ensuring road and stream data match at bridges) themes are used to generate hydrography. The **parcel index** is also tied to hydrography because water features form the boundaries of many parcels.
Status	**Complete – Ongoing Maintenance.** The hydrography theme is under continual update by CTDEP.
Source of Data	Surface Water Base Map Information is compiled based on statewide photo interpretation of the 2004 aerial photography. Surface water features are delineated and digitized directly off the photos. Attributes are incorporated from the DEP Hydrography data layer and verified for accuracy. Information for out-of-state surface waters is obtained from other comparable data sets from MA, NY, RI, and the USGS. Dam features are based on a DEP dam inventory. Other monitoring, intake, and outlet point features are based on DEP inventories with locations determined with GPS. The *Surface Water Network* is incorporated into the base map information by adding stream centerlines and incorporating stream reach information from the USGS National Hydrography Network (NHD). The USGS expects to complete NHD for Connecticut (1:24,000 scale) in Spring 2004, which can be considered as a template for a more detailed network based on aerial photography. Similarly, the *Shoreline Network* is built into the base map by grouping shoreline features. The method for acquiring mean high and mean low waterline information is not determined. *Drainage Basins and Watersheds* are delineated (software generated) based on topographic (LIDAR elevation) data from the 2004 flight. *Bathymetric Information* is based on existing data from DEP for certain reservoirs, lakes and ponds, plus new bathymetric data for navigable rivers and coastal waters of Long Island Sound possibly collected by NOAA. Currently, there are no firm plans or funding sources established for obtaining comprehensive bathymetric data for Long Island Sound, although NOAA has conducted some limited mapping.
Standards	Basic mapping standards derived from USGS. Further modifications to be made through input by CTGIGC agencies and addition of other attributes and features.

Hydrography Continued…

What is Needed to Complete	Hydrography features inherently change in location and shape over time as stream patterns, lake elevations, and shorelines respond to natural and man induced events. A second variable is the timing of aerial photography. Typically, water levels are higher at the time of year when (leaf off) aerial photography is obtained - early spring - with variations from year to year according to snowfall, etc. Nothing is fixed in place. One option for maintaining hydrography over time is to establish a hydrography census – a 10 year statewide assessment – to update and archive hydrography information based on recent aerial photography. This might be either a revision (of significant changes) or complete replacement, depending on available funding. On an "as needed basis" during the between years, localized updates would be performed in response to natural events (floods and hurricanes) or human intervention (highway construction and commercial development).
Data Custodian	Connecticut Department of Environmental Protection
Data Developers	Connecticut Department of Environmental Protection
Distributors	Connecticut Department of Environmental Protection
Primary Data Users & Stakeholders	Connecticut Department of Transportation, Connecticut Department of Emergency Management and Homeland Security, Connecticut Department of Environmental Protection, Various other State Agencies, Regional Planning Organizations, Municipalities, Local Governments, and Emergency Responders.
Comments	To Be Added……..

K. Land Use and Land Cover

Land Use and Land Cover



Satellite-derived 2002 Land Cover of the City of Hartford and surrounding municipalities (left), Downtown Hartford Land Use and parcels, derived by the Capitol Region Council of Governments, (right) ▲

Theme Description	Land Cover and Land Use are geospatial data layers that describe what is on the earth's surface at a given location. Often, Land Cover and Land Use are confused as interchangeable terms, but in actuality, they can describe very different characteristics of the landscape. **Land Cover** refers to natural and anthropogenic features that are observable on the earth's surface (examples include forest cover, developed/built, water, grass). **Land Use** involves human activities that take place on the land and therefore represents the current use of property (examples include residential, commercial, corn crop, reservoir, etc.). Land Cover and Land Use can be cross-referenced and used together.
Theme Uses	The state of Connecticut requires adequate information on the many complex and interrelated issues regarding its land use policies and activities in order to make properly informed decisions. Land Cover is typically used for general assessment where Land Use provides a more detailed representation of the landscape showing not only what is on the ground, but how it is being used. Common uses of Land Cover include, but are not limited to, forest and wildlife management, habitat suitability and assessment, watershed modeling, air quality modeling, ground water modeling, homeland security, hazard assessment, archaeological site assessment. Common uses of Land Use data include, but are not limited to, transportation planning, municipal and regional planning, infrastructure planning, open space acquisition, conducting buildout analyses.

Land Use and Land Cover Continued…

Relationship to Other Base Map Themes	Land Cover data are typically derived from **Base Map Imagery**, such as medium-resolution Landsat Satellite imagery. Land Use data are often derived from **Base Map Imagery** such as ortho-rectified aerial photography in conjunction with on-the-ground surveys. Both Land Use and Land Cover often make use of or contribute to other framework datasets, such as **transportation**, **hydrography**, and application-specific datasets such as state lands, open space, utility infrastructure and others. The Framework dataset, **Critical Infrastructure and Key Resources**, that currently doesn't exist, could become a component of a more accurate Land Use dataset. Land Use and **Parcel/Cadastral** data are often closely related.
Status	**Statewide** Historic Land Use maps were produced for Connecticut in 1954 (most of the state), 1961, 1970 and 1976 (currently available at UCONN MAGIC http://mapserver.lib.uconn.edu/magic/index_lulc.htm). The Connecticut Office of Policy and Management (OPM) has 1964 and 1970 Land Use Maps for Connecticut. OPM is in the process of georeferencing these maps. Each Land Use map has a unique set of classes. Combination Land Cover/Land Use maps are available for Connecticut for 1990 and 1995. Consistent satellite-derived Land Cover is available for 1985, 1990, 1995 and 2002 is currently available at UConn CLEAR (http://clear.uconn.edu/projects/landscape/index.htm). Modified versions of 1985, 1990, 1995, 2002 and a new 2006 version are in development by UConn CLEAR. Although these four maps have fewer classes, they were designed so they can be compared to identify areas of change. Other satellite-derived Land Use/Land Cover combination maps are available for Connecticut for the early 1990s, mid-1990s and early-2000s from Federal Agencies including USGS, NOAA and EPA (http://www.mrlc.gov/). **Local and Regional** We are aware of other Land Use/Land Cover maps that have been produced by Regional Planning Organizations and local governments. They were produced at different times and for different uses and the status, methods and classification systems vary.
Source of Data	For statewide Land Cover, at a minimum, medium-resolution satellite imagery, such as the Landsat Enhanced Thematic Mapper (or similar) is required. For a more spatially and thematically detailed Land Cover dataset and for Land Use information, a statewide image product with higher spatial resolution would be required, with minimally four spectral bands (blue, green, red, near-IR). Such imagery would likely be aircraft based, high resolution, ortho-rectified digital imagery. At this time, acquiring statewide, high-resolution satellite imagery is impractical due to the inability to control for clouds, the likelihood that images would be captured over a period of time and the resulting variations in weather and atmosphere. Land Use data can (and has in the case of the Capital Region) be developed using parcel lines and CAMA data. Once the two are linked, land use classifications can be derived from the land use codes in the CAMA database.

Land Use and Land Cover Continued…	
Standards	**Classification Scheme:** For the most part, Connecticut Land Cover and Land Use datasets have been produced independently and without coordination resulting in information that is not always universally beneficial. A standard classification scheme, including a standard integrated hierarchy, to meet the many needs of state, regional and local government needs to be researched and developed. **Update**: In order to remain useful, the Land Cover and Land Use data should be updated at a regular frequency. Land Cover is more easily produced and should be updated more frequently than Land Use. Land Use should also be updated regularly, but because it is more time intensive to produce, it should be updated, at a minimum, every ten years to coincide with decennial census. When parcels are used to determine Land Use, positional accuracy and attribution standards are closely related to cadastral standards.
What is Needed to Complete	Statewide moderate resolution, multi-spectral imagery is necessary for general Land Cover updates. More thematically and spatially detailed Land Cover and Land Use would require the collection of statewide high-resolution, multi-spectral ortho-rectified digital imagery. Financial support for a dedicated and experienced image analyst to create and update the Land Cover and Land Use datasets is required.
Data Custodian	TBD
Data Developers	**Land Cover:** The University of Connecticut Center for Landuse Education and Research has produced six sets of Land Cover data from moderate resolution Landsat satellite imagery and is well-positioned to continue to create and update this dataset. **Land Use:** TBD. **Proposed**: CLEAR researchers are investigating the potential for deriving a higher spatial resolution and more thematically detailed integrated Land Cover and Land Use dataset.
Distributors	All statewide data are currently in the public domain and are distributed by MAGIC, DEP, CLEAR, USGS and many federal agencies. Distribution of regional and local datasets varies.
Primary Data Users & Stakeholders	State agencies, regional planning organizations, local governments, academic intuitions, education, businesses, land developers, environmental groups, the public and others.
Comments	At the present time, the methods for developing land cover and land use are time consuming and costly. There is a need to continue to research ways to streamline the process, increasing accuracy and decreasing time and therefore cost. For example, the NOAA Coastal Service Center has researched ways to integrate high resolution and moderate resolution imagery in targeted areas that need update or more detail. Additionally, we recommend investigating the

Land Use and Land Cover Continued…	
	development of a hierarchical classification system that incorporates Land Use as a subset of Land Cover. There is potential for collaboration between the State and Federal Agencies, such as USGS, that produce NLCD Land Cover. There is a necessity to coordinate the acquisition of base imagery with the planned updates to Land Cover and Land Use. It is proposed that Land Use would be updated in order to coincide with the decennial census. Therefore, Base Imagery should be acquired in the same year as the decennial census.

L. Transportation

Transportation

Dense transportation network in New Haven, CT combined with some town boundaries ▲

Theme Description	Transportation data are used to model geographic locations, network connectivity between the various transportation modes, and characteristics of the transportation system within the United States. The transportation system includes both physical and non-physical components representing all modes of travel that allow the movements of goods and people between locations
Theme Uses	Uses of the Transportation theme includes urban and regional planning, land use planning, service delivery, emergency response, zoning, routing, intermodal planning, travel demand modeling and general map reference.
Status	**<u>ROADS</u>** **Publicly Funded Roadways** **Complete with ongoing maintenance –** The Connecticut Department of Transportation (CTDOT) maintains an inventory of all public roads in Connecticut. CTDOT also maintains a NAD27 based, GIS centerline road network with linear referencing capabilities. This road network consists of *only* state maintained

Transportation Continued…

	highways and does not contain ramps, HOV lanes, collectors or turning roadways. This road network base also lacks address ranges, restrictions and routing capabilities. The Department of Public Safety (DPS) – Office of Statewide Emergency Telecommunications (OSET) has a State Master Agreement/Enterprise License through the Department of Information Technology with TeleAtlas for their DynaMap Transportation Product. Updates are currently provided by TeleAtlas on a quarterly basis. The Department of Environmental Protection (DEP) has a statewide road layer (including local and private roadways) based on the USGS Topographical Quads. This street centerline layer does not have road name or addressing information. The United States Census Bureau has a nationwide street centerline file (TIGER) that contains street names and address ranges, but no routing or linear referencing capability. This data will be enhanced to 7-meter accuracy by around 2010. **In Production –** CTDOT has developed a new comprehensive road network and linear referencing system. It was developed with a NAD83 projection, capable of routing and linear referencing. Address ranges were also included. It contains all roads, including private. Limited access highways and divided highways will be digitized to reflect their dual carriageways. Depending on available resources, it is estimated that it will take two years to complete. **RAILS** **Complete with on-going maintenance –** CTDOT has a base map for the rail network that displays rail lines, usage and ownership. This base has been re-projected to the newer NAD 83 projection and is currently being maintained in a CADD environment. **In Production –** CTDOT is in the process of developing a new GIS rail network layer. **PORTS** **In Production -** CTDOT has a variety of attributes for ports and is working to establish GIS features. **AVIATION** **In Production–** CTDOT maintains an inventory of all aviation facilities in Connecticut. The features and metadata will eventually be added to the GIS.
Relationship to Other Base Map Themes	The Transportation theme is frequently created using Ortho Imagery. It is also closely related to the Addressing and Cadastral themes.

Transportation Continued…	
Source of Data	The core spatial components of this theme are derived from CTDOT's inventory of state roads, bridges, ports and aviation data. Additional information from the Department of Public Safety (DPS), Regional Planning Organizations, Municipal Governments, Amtrak, Metro-North, and other resources are used to update the transportation theme.
Standards	Information on the National Spatial Data Infrastructure (NSDI) standards can be found at http://www.fgdc.gove/standards/projects/FGDC-standards-proejcts/trans-id-standard/index.html Transportation theme standards are derived from the FGDC and NSDI. Addressing standards will be based FGDC addressing standard. The standard can be found at http://www.fgdc.gov/standards/projects/FGDC-standards-projects/street-address/index_html
What is Needed to Complete	Development of a complete road and rail network and database including information for Connecticut , New York and the surrounding New England states, as well as the establishment of efficient inventory and update processes. A true multimodal approach to transportation on a regional base would provide for a huge benefit and return.
Data Custodian	CTDOT, DPS, municipalities, Amtrak, Metro-North, Housatonic, Naugatuck, Providence and Worcester, Central New England, Boston and Maine, Inactive and Abandoned.
Data Developers	CTDOT, DPS, municipalities, Amtrak, Metro-North, Housatonic, Naugatuck, Providence and Worcester, Central New England, Boston and Maine, Inactive and Abandoned.
Distributors	CTDOT, DPS, DOIT
Primary Data Users & Stakeholders	Connecticut Department of Transportation (CTDOT), Connecticut Department of Public Safety (DPS), E-911/emergency response services, Connecticut Department of Emergency Management and Homeland Security(DEMHS), Connecticut Department of Environmental Protection(DEP), other state agencies, regional planning organizations, municipalities, local governments, Amtrak, Metro North.
Comments	Truly one statewide network for roads, rails and for the other modes of transportation, will require participation by all interested parties and is critical to the successful implementation of the transportation theme.

VI. Application Specific Data

Application specific data are data created and used by some participants that are not necessarily shared widely due to not having widespread common interest. Discussion of these is still however, very important to The categories below are provided as examples:

A. Bioscience
B. Climate
C. Environmental
D. Geoscience
E. Preparedness
F. Public Health
G. Public Safety
H. Utilities

VII. Coordination with Council Initiatives

The Strategic Planning Process identified the following program goals for the Council to focus on:

A. Coordinate and Organize GIS Efforts

Establish a GIS Coordination Unit, Inventory other Geospatial Activities within the state, and create a state GIS clearinghouse.

B. Framework Data Layers

Establish Statewide Orthophoto, Parcel, Street Centerline, and Address Programs.

C. Communicate and Educate

Identify programs that can benefit from geospatial technology, develop a communication and outreach program to gain support, and develop educational materials that support programs

To act on these programs goals, the Council has provided focused assignments to its Working Groups and to the GIS Coordination Office and DOIT. In addition to its work on the other framework data layers, the Data Inventory and assessment Working Group has been assigned the focus for development of the priority framework data layers as identified through the strategic planning process.

VIII. Framework Recommendations

During the initial Subcommittee reviews of the various framework data themes several needs were identified. These needs are presented as Framework Recommendations to consider below:

- The development of business plans for each of the data themes should be considered.
- Establish Statewide Orthophoto, Parcel, Street Centerline, and Address Programs.
- Better distribution and access of the various geospatial data layers throughout the state is recommended, thus providing more commonly accepted use.
- A streamlined process should be developed to overcome barriers with data sharing in terms of data authorization agreements or contracts.
- GIS security assessments need to be developed to determine what data (or portions thereof) is public information and what is considered a security risk.
- Geospatial data standards should be developed for all framework data themes.

IX. Next Steps

Over the next year the Data Inventory and Assessment Working Group will focus on; continued assessment and inventory of framework data themes including a focus on the priority framework data layers as identified in the strategic planning process; Identification and review of other theme areas not yet covered such as human services areas; Assessment of data standards; and Review of USGS CAP Grant opportunities and application process.

X. Appendix One: Glossary

A

Accuracy – the closeness of observations to true values or values accepted to be true. Accuracy relates to the quality of a result and is distinguished from precision, which relates to the quality of the operation by which the result is obtained. In common GIS practice, accuracy frequently refers to positional accuracy ("plus or minus X meters").

Address Points-Positional location of structures, landmarks, or intersections consisting of numerical and text elements such as street number, street name and city.

Address Range-the range of house numbers along a specific street segment

Administrative Boundaries-data which describe official boundaries of federal, state, local, governmental as reported to the U.S. Census Bureau by officials of each government.

Attribute – a descriptive characteristic or quality of a feature that can be assigned to one or more discrete values in a GIS. Data about geographic features usually stored as text in a database format.

B

Base data – set of information that provides a baseline orientation for another theme of primary focus, e.g., roads, streams, and other data typically found on USGS topographic and/or planimetric maps.

Bathymetry-the science of measuring and charting water bodies to determine the topography.

Bioscience-any of several branches of the sciences that deal with living organisms and their organization.

C

Cadastral – current, parcel based land information system containing a systematic description of land units within an area. This may include data on location, ownership, property outlines, and parcel identification.

CADD- Computer Aided Design and Drafting

CALS – Connecticut Association of Land Surveyors

CAMA-Computer Aided Mass Appraisal

CAOO- Connecticut Association of Assessing Officers

CAP-Cooperative Agreements Program.

Cartographic-representation of features on the earth graphically through maps or charts.

Census- data providing baseline information related to a community in terms of population demographics, employment statistics, and general household composition. This data is sourced through household surveys and then statistically compiled.

Census Boundaries – base map theme composed of polygons based on census mapping units (i.e. blocks and tracts) with attribute data containing demographic and socioeconomic information.

CGS-Connecticut Geodetic Survey.

CLEAR-Center for Land Use Education and Research.

CI – Critical Infrastructure.

CIR – Color Infrared. Infrared refers to non-visible light with wavelengths above 700 nanometers. CIR provides information on vegetative mass and health, as well as soil moisture and geology. CIR film shows infrared data typically by coloring the infrared data red, resulting in a false color image.

Climatology-the study of climates and their phenomena.

CGISC-Connecticut Geospatial Information Systems Council. Established by Executive Order, June 2005.

COG – Council of Governments.

Connecticut User to User Network-A voluntary association of individual and organizations in Connecticut that use GIS-base technologies and data.

Contour – a line connecting points of equal elevation.

Control point – a point in a horizontal or vertical control network that is identifiable in a data set or photograph and is used to correlate the dataset or photograph to actual ground coordinates.

Coordinate system – reference frame or system that uses linear or angular quantities to designate the position of points within that particular reference frame or system. Coordinates are used to represent locations on the earth's surface relative to other locations or fixed references.

Critical Infrastructure – base map theme that collects geographic locations and attribute information for a wide range of facilities in the transportation, energy, agriculture, telecommunications, chemical, defense, public health, and other sectors.

D

Data quality – refers to the degree of excellence exhibited by the data in relation to the portrayal of the actual phenomena.

Dataset – collection of similar and related information recorded in a common format.

Datum – a mathematical reference framework for geodetic coordinates defined by the latitude and longitude of an initial point, the azimuth of a line from this point, and the parameters of the ellipsoid upon which the initial point is located.

DEP- Department of Environmental Protection

DEM – see Digital Elevation Model.

Demographics-the statistical characteristics of a population such as age, income, birth rate, and race.

DEMHS – Department of Emergency Management and Homeland Security.

DSM- Digital Surface Model.

Digital data – of or relating to information presented in the form of digits–data displayed, recorded, or stored in binary notation.

Digital Elevation Model – a file with terrain elevations recorded at the intersections of a grid (either 10- or 30-meters) and organized by quadrangle to be the digital equivalent of the elevation data on a topographic base map.

Digital Orthophoto Quarter Quad – an orthoimage clipped to fit a USGS quadrangle grid – typically 3.75-minutes (see *Orthoimage*) or one-quarter of the familiar 7.5-minute grid.

DMV- Department of Motor Vehicles

DMHAS

DOC-Department of Corrections

DOD – Department of Defense.

DOE- Department of Education.

DOIT- Department of Information Technology

DOQ or DOQQ – see Digital Orthophoto Quarter Quad.

DOT-Department of Transportation

DPS – Connecticut Department of Public Safety.

DPW-Department of Public Works

DRG – Digital Raster Graphic. Scanned version of 7.5-minute U.S. Geological Survey topographic map.

E

ECAP – RRC's Electronic Compliance and Approval Process.

Elevation

Elevation Contours – GIS base map theme that depicts topographic relief as contour lines. Every point along a given contour line has the same elevation. Contour data are valuable to any application that is dependent on elevation.

EMS – Emergency Medical Services.

EPA-Environmental Protection Agency.

ETM+ – Enhanced Thematic Mapper Plus, an imaging sensor mounted on the Landsat 7 earth observing satellite.

F

Feature – an object that has a geographic location that can be represented by one or more points, lines, or polygons.

FEMA – Federal Emergency Management Agency.

FGDC – Federal Geographic Data Committee.

FIP – National Floodplain Insurance Program.

FIRM – Flood Insurance Rate Map series produced by FEMA.

First Order Vertical Control Marker-Benchmarks

Flood Hazard – this base map theme depicts 100 and 500-year floodplains, base flood elevations, and risk premium zones for property insurance purposes. An updated digital version of FEMA's FIRM map series.

Framework- the framework is a collaborative community based effort in which commonly needed data themes are developed, maintained, and integrated by public and private organizations within a geographic area.

G

GAM – Groundwater Availability Model.

Geodetic Control – this base map theme depicts a network of points spread across the landscape where sturdy monuments have been placed in the ground, along with a high-accuracy positional value for each point. By referencing field survey measurements to this network, the survey data can be more gathered with more accuracy.
Geographic Data-

Geographic Information System – a computer system for the input, editing, storage, maintenance, management, retrieval, analysis, synthesis, and output of geographic, or location-based, information. In the most restrictive usage, GIS refers only to hardware and software. In common usage, it includes hardware, software, and data. When organizations refer to their GIS, this latter usage is usually what they mean. For some, GIS also implies the people and procedures involved in GIS operation. In this document, the common usage-hardware, software, and data-is intended.

Geographic Names – GIS base map theme based on a tabular database with map coordinates of virtually every named place in Connecticut, such as towns, schools, parks, and creeks.

Dereference – to establish the relationship between raw coordinates of a geospatial dataset and known earth-based coordinates.

Geoscience-any of the sciences that deals with the earth

Geospatial data – information that identifies the geographic location and characteristics of natural or constructed features and boundaries on the earth.

Geospatial metadata – data about the content, quality, condition, and other characteristics of a geospatial dataset.

GeoTIFF – a version of the raster TIFF format that recognizes geospatial coordinates.

GIS – see Geographic Information System.

Global Positioning System – a satellite-based navigation system developed by the U.S. Department of Defense. GPS receivers can determine one's position on the earth's surface.

Governmental Units- legally documented and attributed jurisdictional boundaries, such as city, census, or state boundaries.

GNIS – USGS's Geographic Names Information System.

GNSS- Global Navigation Satellite System

GPS – see Global Positioning System.

Ground Control – see Control point.

H

Historical Aerial Photography – base map theme is based on scanned and georeferenced aerial photographs. The photos range from ten to seventy years old and are available by county across the state. The converted digital photos can be used with other base map themes and other GIS datasets.

Hydrography – a representation of surface water features including all flowing water, water bodies, marshlands, springs, and water-related, man-made features such as canals, locks, and dams.

Hypsography – a representation of the elevation features of surface topography, such as lines of equal elevation (contours) and point elevations.

I

Imagery – a two-dimensional digital representation of the earth's surface. Examples are a digital aerial photograph, a satellite scene, or an airborne radar scan.

J

K

KI- Key Resources

L

Land Cover – this base map theme depicts features that make up the earth’s surface based on a classification system. General classifications include forest, water, wetlands, urban, - and more detailed subdivisions of each.

Land Use- a map theme that classifies land according to what activities that take place, agricultural, industrial, residential, urban, etc.

Landsat – a system of satellites that image the earth repeatedly at a variety of wavelengths. The satellites return information that can be used to inventory and analyze a variety of natural and human resources.

Latitude – angular distance measured in degrees, minutes, and seconds, of a point north or south of the equator on the earth's surface.

Layer – see *Theme*.

LIDAR – "Light Detection And Ranging," laser-based distance measurement technology used to generate extremely precise surface elevation data.

Longitude–angular distance measured in degrees, minutes, and seconds, of a point east or west of the Greenwich (Prime) Meridian on the earth's surface.

M

Map projection – mathematical model that transforms the locations of features on a curved surface (Earth) to locations on a flat surface (map).

mesoscale (small-scale events) can be resolved.

Metadata – see Geospatial metadata.

Multispectral – The ability of a sensor to record two or more wavelength bands.

N

NAD83-North American Datum of 1983

NAVD88-North American Datum of 1988

NENA-National Emergency Number Association

NGA - National Geo-Intelligence Agency.

NGS – National Geodetic Survey. Part of the U.S. Department of Commerce.

NHD – National Hydrography Dataset. A national standard jointly developed by USGS and EPA.

NLCD – National Land Cover Dataset.

NOAA – National Oceanic and Atmospheric Administration.

NRCS – Natural Resources Conservation Service. Agency within the U.S. Department of Agriculture.

NSDI – National Spatial Data Infrastructure. The technology, policies, standards, and human resources necessary to acquire, process, store, distribute, and improve use of geospatial data.

NSRS – National Spatial Reference System of the National Geodetic Survey.

O

OPM- Office of Policy and Management

Orthoimagery – an aerial photograph or satellite image from which displacements caused by terrain relief and sensor tilt have been removed. The result combines the image characteristics of a photograph with the geometric qualities of a map.

Orthophoto – see *Orthoimage*.

Orthorectification – process or removing or minimizing geometric distortions in an image and converting its "raw" coordinates to earth–based coordinates.

P

Parcel Index – this base map theme depicts parcel data maintained by local appraisal districts. The proposed Parcel Index theme is a collaboration mechanism to link county-level digital maps containing deeded, recorded land parcels and depicting individual property boundaries for referential purposes. The parcel index would not contain survey-grade cadastral data and would not be a survey product.

Parcels-Unit of land defined by series of measured straight or curved oines that connect to form a polygon.

Point data – level of spatial definition referring to an object that has a location but no dimension, e.g., well or weather station.

Political Boundaries – base map theme with polygons depicting common boundaries including counties, city limits, federal lands, and local and state parks.

Polygon – a closed area of space defining the spatial extent of a geographic feature.
Positional accuracy – term used in evaluating the overall reliability of the positions of cartographic features relative to their true position.

Q

R

Raster data – a spatial data format employing a uniform two-dimensional array of cells. One data value is recorded for each cell describing a particular characteristic of that location, such as its color or elevation.

RTK-Real Time Kinematics

RTN-Real Time Network

Remote Sensing Control Network – base map theme is composed of a network of points with established positions, elevations, or both, used as fixed references in relating map features, aerial photographs or remote sensing imagery. Similar to ground control theme but the ground control points in remote sensing control network are intended primarily for imagery support.

RPA-Regional Planning Agency

RPO-Regional Planning Organization

S

Satellite Imagery *(also known as remote sensing imagery)* – this base map dataset is an index of images of the surface of the earth obtained by orbiting satellites using a digital remote sensing collection devices such as cameras, laser, or radar.

Scanning – an automated means of inputting data. When used in remote sensing applications, it refers to the imaging of the earth's surface.

Shape file – a digital spatial data format originated by Environmental Systems Research Institute and frequently used in GIS software packages.

Spatial data – see Geospatial

Spectral – refers to the portion of the electromagnetic spectrum that is recorded by a sensor (usually data.airborne).

Soil Surveys – GIS base map theme showing the soil resources of an area (typically county-based). It consists of a soil map, descriptions of the soils and soil map units, and predictions (interpretations) of soil behavior for different uses and management.

SPCS

Special Districts Boundaries – base map theme depicts local and administrative zones, including but not limited to, U.S. Congressional, state legislative, other electoral districts, school districts, voting precincts, and other taxing and non-taxing districts.

SSDI-State Spatial Data Infrastructure

SPCS-State Plane Coordinate System

Street Centerlines-lines representing the center of a street segment.

Standards – exact value, a physical entity, or an abstract concept, established and defined by authority, custom, or common consent to serve as a reference, model, or rule in measuring quantities or qualities, establishing practices or procedures, or evaluating results.

Street Addressing–this is a proposed base map theme containing street names and address ranges, and may include point locations of inhabited structures with unique addresses. Street Addressing is typically used in conjunction with the transportation and the parcel index layers.

Surface Geology – base map theme depicts the relative age, composition, and relationships among rocks and sediments at and near the earth's surface.

Surface Water – this base map theme depicts surface hydrographic features including rivers, streams, lakes, ponds, swamps, springs, and canals.

T

Terabyte – a measure of digital dataset size or computer storage capacity. A terabyte (1,000,000,000,000 bytes) is 1,000 gigabytes. Each gigabyte, in turn, is 1,000 megabytes.

Theme – a subset of a GIS database or map containing related spatial features. These can be visualized as "transparencies" which allow information to be viewed and analyzed selectively by theme. These themes are registered to each other by the common coordinate system of the database. Frequently referred to as data "layers" because multiple data themes are often stacked on top of each other using GIS software.

TIGER – "Topologically Integrated Geographic Encoding and Referencing" file. A digital map format and dataset developed by the U.S. Bureau of the Census. TIGER files contain all levels of census geography from block level to metropolitan areas and counties. Features such as roads and rivers are included since census geography if often defined by these features.

Topographic map – a map that represents the horizontal and vertical positions of features on the face of the earth. Elevations are usually depicted by spot elevations, contours, hill shading, or other symbology.

Transportation – base map theme depicting road-based features including roadbed centerlines and associated attribute information on public roads. Other transportation networks such as railroads, trails, and utilities are not included.

U

UCONN-University of Connecticut

USACE – U.S. Army Corps of Engineers.

USGS – U.S. Geological Survey.

US Census Bureau- The federal agency charged with the collection and dissemination of demographic statistics.

USPS- U.S. Postal Service

V-

Visualizing-the representation of data in a viewable medium or format. In GIS, visualization is used to organize spatial data and related information into layers that can be analyzed or displayed as maps, three-dimensional scenes, summary charts, tables, time-based views, and schematics.

Volumetric

W

Watershed – A base map theme showing the region drained upstream of a point selected along a stream or river. Watersheds vary in size and can be grouped to form larger basins. Watersheds are typically referenced by codes with two-digit watersheds representing very large regions drained by major rivers to 12-digit watersheds that cover much smaller areas.

Weather – a base map theme with real-time and historical weather data across Connecticut that are collected from a comprehensive weather sensor network and stored in a spatially referenced database.

XI. Framework Data Theme Subcommittees

Below are the Framework Data Themes Subcommittee Membership Lists. Please note the Subcommittee Chairs are denoted in bold.

Addressing

Mike Blake, GNHWPCA
Steve Biancardi, Hartford, PD
Jason Courtor, New England Geosystems
Dan Czaja, DPS, Chair
John Don Francisco, QVEC
Brett Flodine, City of Hartford
Eric Glover, DOT
Dawn Mulholland, Town of South Windsor
Drew O'Connor, Rocky Hill PD
Donna Ralston, Town of East Hampton
Scott Roberts, Town of South Windsor
Vice Pito, US Census Bureau
Mike Winters, Cheshire PD

Administrative & Political Boundaries

Bob Baron, DOT
Lynn Bjorklund, USGS
Tyler Kleykamp, OPM, Chair
Howie Sternberg, DEP

Base Map Imagery (Ortho, Oblique, Satellite and Scanned Imagery)

Bob Baron, DOT
Lynn Bjorklund, USGS
Dan Civco, UCONN
Rich Gallacher, Manchester, Chair
Kevin O'Brien, DEP
Bryan Pavlik, DPS
Sandy Prisloe, UCONN
Scott Roberts, South Windsor, Chair
Howie Sternberg, DEP
Steve Rice, CT State Library

Cadastral Information

Lawrence Baril, Town of Avon

Jeff Bolton, DPW
Jason Courter, New England Geosystems
Becky Cutler, DPW
Dan Czaja, DPS
Mark Goetz, City of Hartford, Chair
Len Desson, Planimetrics
John Durling, DOT
Melinda Fonda, Town of Stratford
Rich Gallacher, Town of Manchester
John Hangen, Town of Milford
Tyler Kleykamp, OPM
Patrick Ladd, Town of Meriden
Stephen Lowrey, Town of Vernon
Jackie Mickiewicz, DEP
Erik Snowden, CRCOG
Andy Tupper, CALS

Census and Demographics

Gary Archambault, DPH
Justin Brunetti, DOT
Steve Rice, CT State Library
Orlando Rodriguez, UCONN, Chair
Donna Weaver, DOT

Critical Infrastructure/Key Resources

Jeff Bolton, DPW, Chair
Dan Czaja, DPS
Becky Cutler, DPW
Sgt. Bob Eddy, DPS
Wayne Kasacek, DOA
Phil Moberg, DOT
Lauren McLane, DHS
Raymond Philbrick, DPW
Beth Stewart-Kelly, CTARNG
LTC Gerald Luwkowski, CTARNG
Peter Sandgren, DEMHS
Michael Varney, DOIT

Elevation and Bathymetry

Capt. Mike Alfultis, USCG
Bob Baron, DOT
Lynn Bjorklund, USGS
Tom Meyer, UCONN
Kevin O'Brien DEP, Chair

Howie Sternberg, DEP
Roman Zajac, UNH

Geodetic Control

Darek Massalski, DOT
Tom Meyer, UCONN, Chair
Andy Tupper, CALS

Geographic Names and Places

Lynn Bjorklund, USGS
Diana Danenberg, DEP
Steve Rice, CT State Library
Jim Spencer, DOT
Howie Sternberg, DEP

Hydrography

Lynn Bjorklund, USGS
Diana Danenberg, DEP
Pete Steves, USGS
Howie Sternberg, DEP, Chair

Land Use and Land Cover

Dan Civco, UCONN
Sandy Prisloe, UCONN
Erik Snowden, CRCOG
Howie Sternberg, DEP
Emily Wilson, UCONN, Chair

Transportation

Julie Annino, DOT
Bob Bruno, DOT
Jennifer Cartier, DOT
Dan Czaja, DPS
Raby David, DOT
Rich Gallacher, Manchester
Eric Glover, DOT
Rick Hanley, DOT
Matthew Kelly, DOT
Tyler Kleykamp, OPM
Yure Kuljis, DOT
Patrick Ladd, Town of Meriden
Stephen Lowrey, Town of Tolland
Brian Pavlik, DPS

William Pratt, DOT
Scott Roberts, DOT
Eric Snowden, CRCOG
Jim Spencer, DOT, Chair
Alan Stevens, DOT
James Stutz, DOT