Appendix I: Geospatial Data Management Plan

Geospatial Data Management Plan

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HOUSTON-GALVESTON AREA COUNCIL

Community & Environmental Planning Department

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under the authorization of the Texas Clean Rivers Act

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Introduction

The Data Management Plan (The Plan) outlines the standard policies and procedures for data management within the Community and Environmental Planning (C&E) Department. The Plan covers the management of both tabular (non-geographic) and spatial (geographic) datasets. Its primary purpose is to ensure the efficient access and maintenance of these datasets within the C&E Geospatial/Geographic Information Systems (GIS) environment.

GIS technology provides a systematic means to capture, manipulate, analyze, store and display spatially referenced data. GIS supports a wide variety of applications ranging from site assessments, environmental planning, urban planning, and spatial analysis to support organizational strategies. In general, GIS supports the overall departmental goals of guiding regional planning, enhancing the quality of the region's natural environment, and public education through outreach programs. The C&E GIS team supports various programs within the C&E department through data development, spatial analysis, geospatial applications development, cartography in support of departmental goals.

The Plan is considered a dynamic working document which responds to changing technology, funding, staffing, and project requirements. Consequently, the Plan is reviewed on an annual basis and amended as necessary.

Geospatial Services

The following section explains the geospatial services provided by the H-GAC C&E GIS team as it relates to the sharing of data, development of geospatial applications, cartography, and underlying GIS resources. The C&E GIS team is responsible for the development of data and sharing of many publicly viable datasets, developing geospatial applications, cartography, and coordination of maintenance of underlying geospatial hardware and software for C&E.

The C&E GIS team maintains a centralized geospatial warehouse (C&E SDE), an online mapping platform for web-based geospatial applications (Mapping Server), and an FTP download site (Data Clearinghouse). The C&E SDE utilizes ESRI's ArcSDE software running on a Microsoft SQLServer RDBMS. The mapping server uses ESRI's ArcGIS Server platform running on .NET. The Data Clearinghouse is an FTP server that provides C&E with storage space where it can post publicly available datasets for downloading. The C&E SDE, Mapping Server, and Data Clearinghouse platforms are installed by the H-GAC Data Services department (Data Services), with Data Services maintaining only the lower-level technology components such as the physical hardware, software installation, and low-level server and RDBMS functions. All upgrades and maintenance is coordinated by the C&E GIS Manager. All geospatial content stored in the C&E SDE, the Data Clearinghouse, and Mapping Server, are the responsibility of the C&E GIS staff, which resides within the C&E Socio-Economic Modeling program. A detailed schematic of the geospatial technical architecture and how the various systems are interconnected can be found in the *System Architecture* section below.

Data Sharing

The C&E SDE serves as the primary internal repository for geospatial data, metadata, and other information relevant to the activities and goals of the C&E department. All GIS users within C&E Socio-Economic Modeling program and some users from other H-GAC departments are provided *Editor* access to data in the C&E SDE. All other users have only viewer access to data in the C&E SDE.. H-GAC C&E staff without *Editor* access to the C&E SDE server are able to access a copy of the geospatial data through a separate server that houses imported versions of the original SDE data to develop GIS layers for project specific editing. This system ensures that the original formatting of geospatial data on the C&E SDE remains unchanged. All user access privileges are assigned by the C&E GIS Manager based upon business needs, GIS skills, and role within the organization. No users outside of the C&E department have editor level access to any GIS data in the C&E SDE, and in some instances there are datasets that are viewable by only C&E GIS users. Instructions for connecting to the C&E SDE are provided to authorized users.

Datasets determined to be viable for publication to the public are exported to the Data Clearinghouse website, thereby allowing the general public widespread access to this information via the internet. Members of the public may view metadata and download any of the datasets that are posted to the Data Clearinghouse. In some instances these datasets are used in web-based mapping applications and can be accessed online via the Mapping Server's services directory, or accessible via the Data Clearinghouse for downloading. All public C&E GIS data, applications, cartographic products, and the C&E map services directory can be accessed via our C&E GIS page at http://www.h-gac.com/rds/gis-data/gis-datasets.aspx, and a screen shot of the website can be found in Appendix 7.

Geospatial Applications

The C&E department has made a strategic decision to incorporate internet-based mapping applications into its deliverables for many programs and projects. Before, the results of most projects consisted of a large-format map printed on a plotter up to 48"x36" in diameter. This form of cartography although still useful in many settings, did not allow programs to communicate results to the public or external organizations that had an interest in our analysis results. By taking results from C&E projects and coupling this with base map data and imagery, C&E has been able to share the results of projects to a far greater audience, and has created opportunities whereby map layers published on the C&E mapping server can be utilized in other organizations mapping applications.

Currently there are three platforms upon which C&E provides internet-based mapping solutions. The first platform is based on the Adobe Flex programming environment, and all mapping applications developed using this platform run inside standard internet browsers that support the Flash technology, such as Internet Explorer. This platform is intended to provide users with a graphics rich user interface whereby the map can be navigated, layers turned on/off, and information obtained on each feature. In some instances, features have links to additional resources such as photos of monitoring stations, external websites, and detailed reports. This

mapping application environment allows the users to make full use of their computers internet browser window, and serves as a simple online GIS.

The second platform utilizes the capabilities of the ArcServer platform to allow users to directly access map layers published on the mapping server. This method of delivery is called 'streaming' and allows end users read-only access to individual map layers ad geoprocessing tools published on the server. Typical users of this method of delivery are other GIS users using desktop GIS, whereby they can connect directly to our ArcServer platform for read-only access and view our map layers. Other instances whereby users may utilize this method is where they are including our map layers in their own mapping applications.

The third and final platform involves developing applications for mobile devices or tablets. The C&E department has developed both native (installed) applications for the Apple iOS platform, as well as server-side scripted applications which utilize the free ESRI ArcGIS for Mobile Devices viewer app, which runs on iOS, Android, or Windows phone devices. In both instances, map layers used in these applications are delivered from the C&E ArcServer platform.

Mapping and Cartographic Products

The C&E department produces a variety of static cartographic maps for the region as a result of project activities and for general usage. To facilitate the sharing of these maps in an electronic format, C&E has implemented a Map Book as part of their C&E GIS page. Maps can be downloaded in multiple formats. The C&E Map Book can be accessed via our C&E GIS page at http://www.h-gac.com/rds/map-book/Default.aspx.

System Resources

System Architecture

The C&E department uses an integrated architecture to support the development, analysis, and dissemination of spatial information. The diagram below illustrates this system architecture at a high level. The goal of the overall system is to allow for a streamlined workflow to develop/maintain data, optimize the data for use in online applications, and the consumption of applications via multiple platforms.

Currently the C&E GIS platform supports sharing of geospatial data via the ArcServer mapping server platform. This allows end users internally or externally to consume map layers and geoprocessing tools via GIS desktop, mobile, tablet, or 3rd part applications.

In some instances, applications are configured with public feedback and volunteer GIS workflows that allow the C&E GIS team to obtain information for the public on various geographic features in the region. This public feedback loop allows C&E to investigate feedback and verify its validity prior to incorporating the information into the data warehouse.
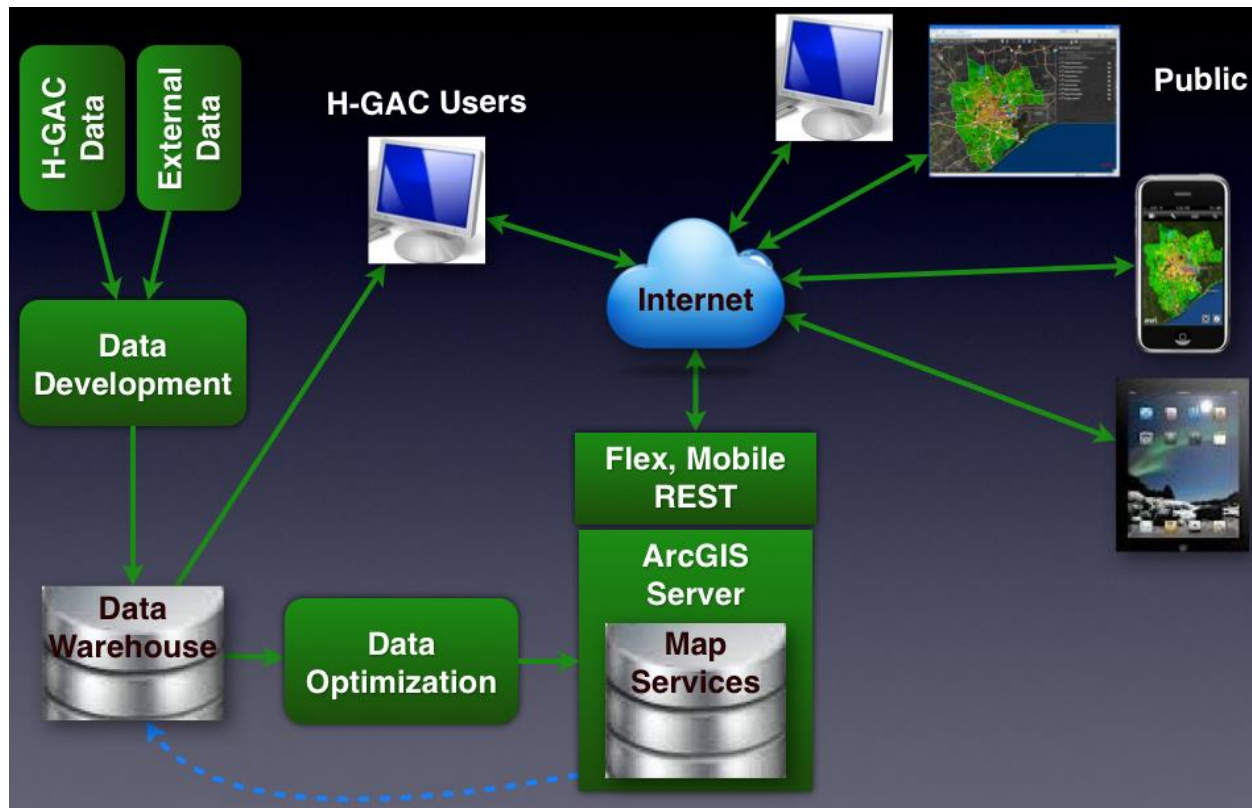
Hardware

The configuration of the hardware used by staff that performs GIS and data Management work is a distributed network" This network consists of several PC's which are connected to central file servers. The department also uses a central web mapping server for online mapping applications.

A complete listing of departmental hardware is found in Appendix 3.

Software

The C&E department relies upon the H-GAC Data Services department (Data Services) for all of its end user workstation configuration, installation, and maintenance. Each workstation for users comes with the Microsoft Office software package which includes Outlook (e-mail), Word (word processing), Excel (spreadsheets), PowerPoint (presentations), and in some instances Access (desktop database) should the user require desktop database capabilities. Each workstation is pre-configured and setup to operate within the H-GAC internal network, and has access to central servers for file storage. In some instances, certain personnel have additional non-standard software installed by Data Services as it is required for their responsibilities.

The C&E GIS staff utilizes ESRI's ArcGIS 10.1 platform for all geospatial analysis and mapping needs. In addition, as needed, the staff also utilizes the SAS software platform for further analysis and data development as deemed necessary. The ESRI ArcGIS 10.1 platform includes integrated Python programming capabilities, which allows for the creation of programming

scripts or batch programs to improve efficiency and documentation of processes. The Python programming language is an Open Source platform, and is freely distributable.

The centralized SDE is also provided by ESRI, and provided for a centralized geospatial database where GIS staff can store geospatial data for either read-only or editable access by GIS users in the C&E department. The C&E GIS staff maintains access privileges to the SDE datasets, and assigns individual users to various SDE access groups to grant approved accessed to data in the SDE. The SDE is considered the central warehouse where GIS users can go to for geospatial data to use in their analysis or mapping projects.

The software products currently used to accomplish the department's data management objectives are listed in Appendix 4.

Programming Languages
Programming services will be provided on an as needed and resource available basis. All programming efforts will follow a standard procedure from needs assessment, program planning, development and testing, to refinement and documentation. The principal programming languages to be used in task automation and project customization will depend on the nature of the need and the current state of the technology. At this time, all web-based GIS applications are developed using the ESRI ArcGIS Server platform, and user interface components to that platform are developed using the ESRI JavaScript API. Automated data development and analysis workflows utilize the Python programming language and the SAS programming platform as needed.

Data
Department staff members will be consulted annually to determine priority needs for data management. Based on this consultation, specific data sets will be acquired or further developed for the various program areas represented in the department. The current list of department-specific data sets is shown in Appendix 5.

A separate database lists all datasets regularly obtained from external sources, contact information, as well as the frequency of the datasets availability, and its cost. This database is developed using Microsoft Access, and is available to the C&E GIS team for tracking when updates to dataset may be available.

Personnel
The Data Management staff will be responsible for the maintenance and development of the C&E SDE, mapping server, geospatial applications, C&E GIS page, and Data Clearinghouse. These data management responsibilities cover a wide range from original data creation, acquisition and integration, data archiving and distribution. Additional responsibilities include enhancing the geographic extent, feature attributes, and metadata of the datasets.

The C&E GIS team is comprised of 3 full-time GIS professionals, one of which is the GIS Manager, and 2 full-time GIS Analysts. The C&E GIS team supports all programs within the C&E department, which include Clean Rivers/Water Quality, Sustainability, Economic Development, Solid Waste, Ped/Bike, Socio-Economic Modeling, and special project. The C&E GIS team is part of the Socio-Economic Modeling program within C&E.

H-GAC's Data Services Department plays an indirect role in the implementation and maintenance of The Plan. The Data Services Department is responsible for managing the underlying hardware and network upon which C&E stores GIS data and implements GIS-based applications.

Training
Training for all users of the system is a critical part of The Plan. C&E staff directly responsible for data management will attend conferences, seminars, and software/hardware training courses as needed. H-GAC users of the system will be trained and/or receive technical support by the C&E GIS Manger and other C&E subject matter experts.

Budget
Budgetary requirements to sustain data management efforts will be reviewed annually.

Data Maintenance, Manipulation, and Use

Quality Assurance/Quality Control

QA/QC is designed to standardize screening, documentation, entry, output, analysis, correction, and updating of data in the system. QA/QC will document those responsible for data and system maintenance.

Data Limitations

Prior to the integration of data within the C&E SDE and posting to the Data Clearinghouse, a review of the data set will be completed to determine predefined data limitations such as missing values, different sampling frequencies, multiple measurements, analytical uncertainty, censored or unavailable data, and duplicated data with existing data sets. After review of the data set, a report will be generated which records any errors detected and any corrections that may be necessary.

Data Development Protocol

The C&E GIS staff works to update existing dataset, acquire new data, and perform geospatial analysis in support of various C&E programs. All new data generated from the result of an analysis is a candidate to be stored not only in the SDE as a new dataset, but also as a layer with a mapping application should the need arise. All data development and analysis is done internally to C&E, and at times leverages outside resources such as consultants, other non-profits whom H-GAC is partnering with, as well as with other H-GAC departments to obtain necessary data. Two datasets that the C&E department uses regularly outside the C&E SDE are the Data Services StarMap road centerline dataset, and the Data Services aerial imagery database.

The C&E GIS staff uses a hybrid approach to conducting geospatial analysis. Much of the analysis being performed may need to be re-processed at a later date as new versions of datasets become available, or as inputs to the analysis models are updated themselves. Thus to minimize the time spent re-running analysis models, the C&E GIS staff utilizes the ESRI ArcGIS platform in conjunction with SAS and Python to develop repeatable and documented workflows. This approach saves more time than interactive methods whereby a user must remember the process to follow, and then execute each step in the analysis independently.

Documentation related to data management efforts such as system evolution, structure, and procedures for use will be compiled and made available for the end user. Documentation will be made available online and in hard copy format.

Data Input

Standard conventions for data input will be determined on a per project and/or individual data set basis. To ensure Year 2000 Compliance, all data sets with date/time fields will include a four-digit year (YYYY). Either of the following formats will be used: International Standard Date notation where the date field is represented as MM/DD/YYYY (Month/Day/Year), or an ordinal format where the date field is represented as YYYYDDD.

Data Dictionary

A list of all C&E data available in either the C&E SDE or other tabular formats can be found in Appendix 5.

Metadata

Metadata is data about the original source, quality, content, history, condition, and other characteristics of the geospatial data. All GIS datasets generated by H-GAC have been fully documented as per Federal Geographic Data Committee (FGDC) compliant metadata and follow Content Standards for Digital Geospatial Metadata (CSDGM) for all geospatial data. Similarly, data obtained from outside sources and used by H-GAC will include FGDC-compliant metadata from the source agency. Datasets without a known history and documented quality will be identified as provisional and used only when noted as such. The diagram below illustrates elements of the CSDGM standards. This standard is applied to all Point, Line, Polygon, Raster, and Tabular data that are stored in the C&E SDE. The C&E GIS data manager and/or point of contact (designee) has the authorized access to edit/change the metadata when a new dataset is created or updated in the SDE. Metadata for each dataset in the C&E SDE is stored with the datasets, and can be viewed by GIS users via their GIS desktop software. Any data provided for public download via the Data Clearinghouse also has a metadata html page that can be viewed via internet browsers.
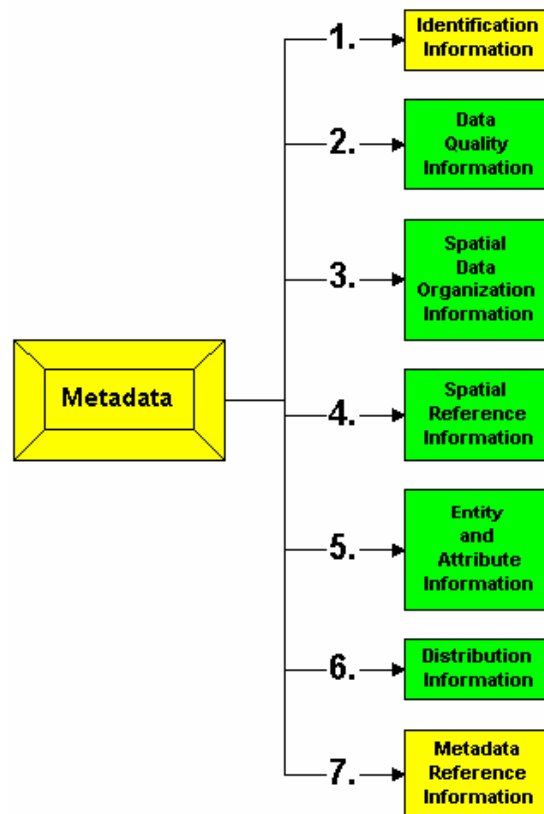
Data Conversion

Data to be imported into the C&E SDE from hard copy, digital or by manual data entry, will follow a uniform conversion protocol to comply with the structure of current data sets. The type of data being converted will determine the protocol. All data is stored in ESRI geodatabase format within the C&E SDE, and when posted to the Data Clearinghouse the data is stored in the ESRI File Geodatabase file format, unless there is a specific requirement to provide the data in another format such as Shapefile or GIS Coverage.

Coordinate Systems

The Texas Stateplane Coordinate System, North American Datum 1983 (NAD83) will be the standard for geographic data at H-GAC. This coordinate system is based on the Cartesian coordinate system, or rectangular coordinates. When receiving geographic data from other sources the data will be transformed into the Stateplane Coordinate System to ensure compatibility with current data sets.

When publishing mapping services for use in web-based GIS mapping applications, the Web Mercator Auxiliary Sphere projection is used for all Data Frame projections. However, the underlying GIS data within these mapping services still use the Texas Stateplane Coordinate System, North American Datum 1983 (NAD83) projection.

Data Validation

Data Quality Control

When data are received from any source, documentation will be created to include the source name, date received, format of data and a brief description of the contents. Data will be loaded onto the system from the media received and a review of the data will be made along with any corrections being made to the source documentation. An analysis will be made in order to determine the means of data entry into the system whether it is only a stand-alone database, a number of linked tables, or a geographic database. The data will be converted to the appropriate format for integration with the current system whether it is a conversion into MS Access, Excel, SAS, or ESRI ArcGIS. The data will be visually examined to determine its validity and accuracy. If the data is invalid it will be corrected (if possible) otherwise the data will be incorporated into the C&E SDE, and then if applicable, posted to the Data Clearinghouse and used in conjunction with existing data. A QA/QC report of all procedures and a detailed description of how the data was incorporated into the current system (from the date received to the date of integration) will be generated.

Equipment Quality Control

All printers, workstations, and server hardware and operating systems are maintained by the Data Services department, unless otherwise noted in Appendix 3.

Genealogy

Upon receipt of data from outside sources, all data will be screened for integrity and completeness. After the preliminary evaluation of the data, a log of the data source, type and completeness is created and maintained with the associated data. A description of the data and the responsible personnel are documented.

Migration/Transfer

A copy of every C&E generated GIS dataset will be housed in the C&E SDE which C&E GIS staff manage the contents and structure of datasets. The underlying hardware and network connections for the C&E SDE are maintained by the Data Services Department. Datasets that are of public interest will be placed in the Data Clearinghouse for public access. Transfer from the C&E SDE to the Data Clearinghouse will occur on an as needed basis following department QA/QC measures and is handled by the C&E GIS team.

Data Security & Access

Data placed on the Data Clearinghouse will be available to those with Internet browsing and/or FTP capability. Data requests for non-public data from other agencies and the general public will be evaluated on an individual basis. When the data requests are received, a preliminary evaluation of the deliverable will be determined and a timeline and cost if applicable will be provided to the requesting agency or individual.

GIS and tabular data will be secure through directory permissions. H-GAC will employ Firewall or Proxy Server Technology to filter and severely restrict access to internal networks and database systems. Virus protection will be implemented to ensure system and data integrity.

Archives/Backup

Each week the C&E GIS team runs a schedule backup program to store a copy of all C&E SDE datasets on a portable hard drive with resides in a secure location within the H-GAC office. In addition, Data Services backs up and archives C&E SDE data and server configuration at regular intervals. A backup will be performed daily and the tapes will be maintained for 8 weeks before they will be recycled. Every six month, a complete system backup will be performed and the tapes will be archived and kept for five years off-site for security.

Disaster Recovery

In the event of a disaster, the C&E department will have access to all C&E SDE data which is stored on the portable hard drive. The C&E GIS team will restore or provide needed data to GIS users from this portable hard drive until such as time that Data Services can restore the C&E SDE onto either a new server or a temporary server.

Appendices

Appendix 1 Data Source Information Sheet

Data Title:

Source Agency:
Contact:
Title:
Address
Phone:

Data Description:
Data source:
Date created:
Accuracy:
Media:
Data items:

Description of data:

Format (specify what software)
Map:
Tabular:
Image:
Text:

Retrieval Procedure:

Command(s):

Appendix 2 Data Log Sheet

Date received: _____

Report Prepared by: _____

Source Name and Phone: _____

Format: _____

Media: _____

Check the following steps to determine the validity of the data:

1. What is the extent of the geographic area? _____
_____

2. Structure (Circle One)   Vector   Raster

3. Scale? _____

4. Projection and Datum? _____

1. Do any of the key fields have missing values?   If so which parameters have missing values? Yes ___   No ___
_____
_____
_____

2. Any known duplicate records?   Yes ___ No ___

Appendix 3 Hardware

FTP Server
Windows 2000 Server

Mapping Application Servers
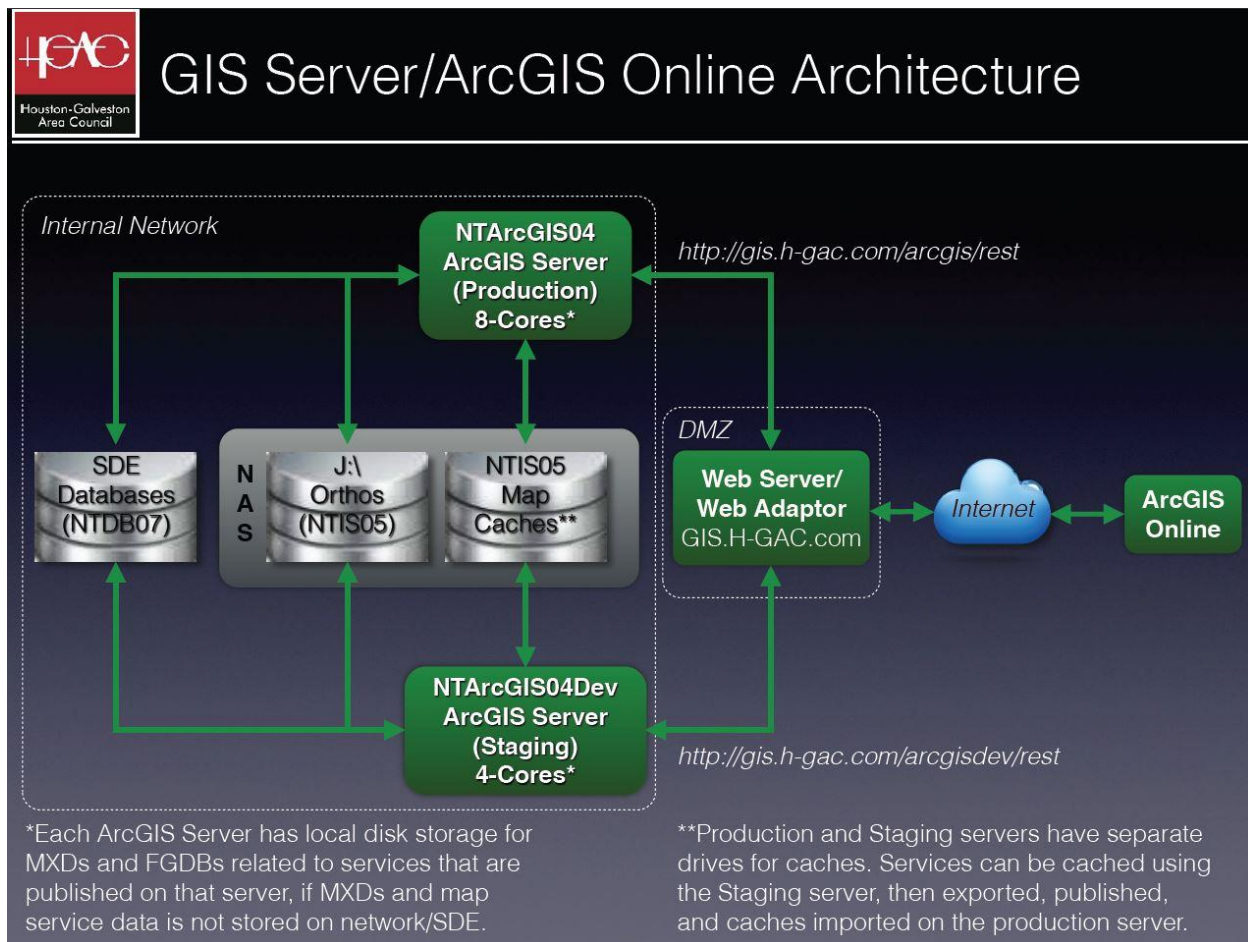
Printers & Plotters
HP1055CM Plotter - Used by C&E staff for large format printing of maps and schematics.

HP2500CM and LaserJet 4M Printers. C&E maintains both printers.

Global Positioning System (GPS) Units
The C&E Department possesses two GPS units.

Scanning Equipment
HP Scanjet 7400c. The CEP Department owns one network-accessible HP scanner.

Fax Equipment

Brother Intellifax 4750e. The C&E Department owns one fax machine.

Portable Storage Devices

Lacie 300GB external hard drive (USB, Firewire)

Appendix 4 Software

Office Productivity Software
Microsoft Office 365 - Word, Excel, Access, PowerPoint, publisher, InfoPath and Outlook.
Internet Explorer (ver 11) – Primary Development Tool

Graphics and Desktop Publishing
Macromedia Fireworks 4
Adobe Illustrator (ver 8.01) – Graphics
Adobe Photoshop (ver 5.0) – Graphics
Corel Draw (ver 7.0) - Graphics
Quark Express (ver 5.0) - Desktop Publishing.
Paintshop Pro (ver 4.12)
Camtasia Studio (ver 7.0) – Screen capture and video tutorial production

Programming
Visual Basic (ver 6.0) – Web Mapping Development Tool.
MS Active Server Pages (ver 2.0) – Web Database Development Tool.
Web AppBuilder for ArcGIS (ver 2.0) – Web-based GIS application development tool
SAS (ver 9.3) – Data development and analytics.

Geographic Information Systems (GIS)
ESRI ArcGIS (ver 10.2.2) – Computer mapping and database manipulation capable of using
ArcView, ArcInfo, and ArcEditor licenses as needed.
ESRI ArcGIS Server (ver 10, SP3) – Internet Mapping Application Server.
ESRI ArcSDE (ver 10.1, SP1) – Spatial data warehouse.

Data Management
Access (2007, 2010) - Relational Database.
SQL Server (2000) - Relational Database.

Operating Systems
Windows XP - PC working environment/Operating System
Windows 7 - PC working environment/Operating System
Windows 2003 & 2008 - Server Operating Systems

Appendix 5 Data List

<u>C&E Spatial Data Warehouse (SDE) Datasets</u>

Dataset Name	Type
AustCAD_Parcels_Coverage_2005	Polygon
AustCAD_Parcels_Coverage_2005_pts	Point
AustCAD_Parcels_Coverage_2006	Polygon
AustCAD_Parcels_Coverage_2006_pts	Point
AustCAD_Parcels_Coverage_2007	Polygon
AustCAD_Parcels_Coverage_2007_pts	Point
AustCAD_Parcels_Coverage_2008	Polygon
AustCAD_Parcels_Coverage_2008_Pts	Point
Austin_County	Polygon
AUSTIN_COUNTY_PARCEL_INFO_2005	Table
AUSTIN_COUNTY_PARCEL_INFO_2006	Table
AUSTIN_COUNTY_PARCEL_INFO_2007	Table
Austin_County_Parcel_Info_2008	Table
Austin_County_Parcel_Values_2006	Table
Austin_County_Parcel_Values_2007	Table
Austin_County_Parcel_Values_2008	Table
BrazCAD_Parcels_Coverage_2005	Polygon
BrazCAD_Parcels_Coverage_2005_pts	Point
BrazCAD_Parcels_Coverage_2006	Polygon
BrazCAD_Parcels_Coverage_2006_pts	Point
BrazCAD_Parcels_Coverage_2007	Polygon
BrazCAD_Parcels_Coverage_2007_pts	Point
BrazCAD_Parcels_Coverage_2008	Polygon
BrazCAD_Parcels_Coverage_2008_Pts	Point
Brazoria_County	Polygon
BRAZORIA_COUNTY_PARCEL_INFO_2005	Table
BRAZORIA_COUNTY_PARCEL_INFO_2006	Table
BRAZORIA_COUNTY_PARCEL_INFO_2007	Table
Brazoria_County_Parcel_Info_2008	Table
Brazoria_County_Parcel_Values_2005	Table
Brazoria_County_Parcel_Values_2006	Table
Brazoria_County_Parcel_Values_2007	Table
Brazoria_County_Parcel_Values_2008	Table
Brazoria_County_Political	Polygon
Chambers_County	Polygon
Chambers_County_Political	Polygon
Clean_Rivers_Public_Feedback	Point
Clean_Rivers_Public_Feedback__ATTACH	Table
Colorado_County	Polygon
CRP_Project_Areas	Polygon
FBendCAD_Parcels_Coverage_2005	Polygon

Dataset Name	Type
FBendCAD_Parcels_Coverage_2005_pts	Point
FBendCAD_Parcels_Coverage_2006	Polygon
FBendCAD_Parcels_Coverage_2006_pts	Point
FBendCAD_Parcels_Coverage_2007	Polygon
FBendCAD_Parcels_Coverage_2007_pts	Point
FBendCAD_Parcels_Coverage_2008	Polygon
FBendCAD_Parcels_Coverage_2008_Pts	Point
Fort_Bend_County	Polygon
Fort_Bend_County_Parcel_Info_2006	Table
Fort_Bend_County_Parcel_Info_2007	Table
Fort_Bend_County_Parcel_Info_2008	Table
Fort_Bend_County_Parcel_Values_2006	Table
Fort_Bend_County_Parcel_Values_2007	Table
Fort_Bend_County_Parcel_Values_2008	Table
GalvCAD_Parcels_Coverage_2005	Polygon
GalvCAD_Parcels_Coverage_2005_pts	Point
GalvCAD_Parcels_Coverage_2006	Polygon
GalvCAD_Parcels_Coverage_2006_pts	Point
GalvCAD_Parcels_Coverage_2007	Polygon
GalvCAD_Parcels_Coverage_2007_Pts	Point
GalvCAD_Parcels_Coverage_2008	Polygon
GalvCAD_Parcels_Coverage_2008_Pts	Point
Galveston_Bay_Estuary_Program_Watersheds	Polygon
Galveston_County	Polygon
GALVESTON_COUNTY_PARCEL_INFO_2005	Table
GALVESTON_COUNTY_PARCEL_INFO_2007	Table
Galveston_County_Parcel_Info_2008	Table
Galveston_County_Parcel_Values_2005	Table
Galveston_County_Parcel_Values_2007	Table
Galveston_County_Parcel_Values_2008	Table
Galveston_County_Political	Polygon
Grimes_County	Polygon
Gulf_Of_Mexico	Polygon
Harris_County	Polygon
Harris_County_FCD_Sub_Watersheds	Polygon
Harris_County_FCD_Watersheds	Polygon
HARRIS_COUNTY_PARCEL_INFO_2005	Table
HARRIS_COUNTY_PARCEL_INFO_2006	Table
HARRIS_COUNTY_PARCEL_INFO_2007	Table
Harris_County_Parcel_Info_2008	Table
Harris_County_Parcel_Values_2005	Table
Harris_County_Parcel_Values_2006	Table
Harris_County_Parcel_Values_2007	Table
Harris_County_Parcel_Values_2008	Table

Dataset Name	Type
Harris_County_Zones_58	Polygon
HCAD_Parcels_Coverage_2000	Polygon
HCAD_Parcels_Coverage_2000_pts	Point
HCAD_Parcels_Coverage_2003	Polygon
HCAD_Parcels_Coverage_2003_pts	Point
HCAD_Parcels_Coverage_2005	Polygon
HCAD_Parcels_Coverage_2005_pts	Point
HCAD_Parcels_Coverage_2006	Polygon
HCAD_Parcels_Coverage_2006_pts	Point
HCAD_Parcels_Coverage_2007	Polygon
HCAD_Parcels_Coverage_2007_Pts	Point
HCAD_Parcels_Coverage_2008	Polygon
HCAD_Parcels_Coverage_2008_Pts	Point
HGAC_13_County_Airports	Point
HGAC_13_County_Airports_ParcelIDs	Table
HGAC_13_County_BlockGroups_1990	Polygon
HGAC_13_County_BlockGroups_2000	Polygon
HGAC_13_County_BlockGroups_2010	Polygon
HGAC_13_County_Blocks_2000	Polygon
HGAC_13_County_Blocks_2010	Polygon
HGAC_13_County_Brownfield_Sites	Point
HGAC_13_County_Bus_Routes	Polyline
HGAC_13_County_Bus_Stops	Point
HGAC_13_County_Census_PL_Data_2010_Block_Groups	Table
HGAC_13_County_Census_PL_Data_2010_Blocks	Table
HGAC_13_County_Census_PL_Data_2010_Counties	Table
HGAC_13_County_Census_PL_Data_2010_Places	Table
HGAC_13_County_Census_PL_Data_2010_School_Districts	Table
HGAC_13_County_Census_PL_Data_2010_Tracts	Table
HGAC_13_County_Census_Places_2000	Polygon
HGAC_13_County_Census_Places_2000_Clipped	Polygon
HGAC_13_County_Census_Places_2000_Pts	Point
HGAC_13_County_Census_Places_2010	Polygon
HGAC_13_County_Census_Places_2010_Clipped	Polygon
HGAC_13_County_Census_Places_2010_Pts	Point
HGAC_13_County_Census_Urban_Areas_1990	Polygon
HGAC_13_County_Census_Urban_Areas_2000	Polygon
HGAC_13_County_Census_Urban_Areas_2009	Polygon
HGAC_13_County_Census_Urban_Areas_2010	Polygon
HGAC_13_County_Census_Zip_Codes_2010	Polygon
HGAC_13_County_City_Boundaries	Polygon
HGAC_13_County_City_Boundaries_Clipped	Polygon
HGAC_13_County_City_Ordinance_Areas	Polygon
HGAC_13_County_Closed_Landfill_Inventory	Point

Dataset Name	Type
HGAC_13_County_Landfill_Areas	Polygon
HGAC_13_County_Landfill_Areas_Historical	Polygon
HGAC_13_County_Landfills	Point
HGAC_13_County_Landfills_Historical	Point
HGAC_13_COUNTY_COASTAL_VIGNETTE	Raster
HGAC_13_County_Coastline	Polygon
HGAC_13_County_Coastline_Boundary	Polygon
HGAC_13_County_CRP_DO_Stations	Point
HGAC_13_County_CRP_Monitoring_Stations_2008	Point
HGAC_13_County_CRP_Monitoring_Stations_2010	Point
HGAC_13_County_CRP_Monitoring_Stations_2011	Point
HGAC_13_County_CRP_Monitoring_Stations_2012	Point
HGAC_13_County_CRP_Monitoring_Stations_2013	Point
HGAC_13_County_CRP_Monitoring_Stations_2014	Point
HGAC_13_County_CRP_Monitoring_Stations_2015	Point
HGAC_13_County_CRP_Monitoring_Stations_2016	Point
HGAC_13_County_CRP_Monitoring_Stations_2017	Point
HGAC_13_County_CRP_Monitoring_Stations_Historical	Point
HGAC_13_County_Dams	Point
HGAC_13_County_Districts	Polygon
HGAC_13_County_Election_Precincts_2010	Polygon
HGAC_13_County_Farmland	Polygon
HGAC_13_County_Federal_Aid_Roads	Polyline
HGAC_13_County_G1M	Polygon
HGAC_13_County_G3M	Polygon
HGAC_13_County_G5M	Polygon
HGAC_13_County_Grocery_Stores	Point
HGAC_13_County_Libraries	Point
HGAC_13_County_Libraries_Parcel_Xref	Table
HGAC_13_County_Major_Rivers	Polyline
HGAC_13_County_Major_Roads	Polyline
HGAC_13_County_Metropolitan_Statistical_Area	Polygon
HGAC_13_County_OSSF_Permits	Point
HGAC_13_County_Parks	Point
HGAC_13_County_Parks_Awards	Table
HGAC_13_County_Parks_Features	Table
HGAC_13_County_Parks_Parcels	Table
HGAC_13_County_Pipelines	Polyline
HGAC_13_County_Plats	Polygon
HGAC_13_County_Political	Polygon
HGAC_13_County_Political_Boundary	Polygon
HGAC_13_County_Railroads	Polyline
HGAC_13_County_Raster_Extent	Polygon
HGAC_13_County_Recycle_Centers	Point

Dataset Name	Type
HGAC_13_County_School_Districts_Census_2010	Polygon
HGAC_13_County_School_Districts_TEA_2010	Polygon
HGAC_13_County_Service_Area_Boundaries	Polygon
HGAC_13_County_Soils	Polygon
HGAC_13_County_State_Parks	Polygon
HGAC_13_County_Superfund_NPL_Sites	Polygon
HGAC_13_County_Superfund_NPL_Sites_Pts	Point
HGAC_13_County_TIRZs	Polygon
HGAC_13_County_Tracts_1990	Polygon
HGAC_13_County_Tracts_2000	Polygon
HGAC_13_County_Tracts_2010	Polygon
HGAC_13_County_Transit_Centers_Parks_and_Rides	Point
HGAC_13_County_Water	Polygon
HGAC_13_County_Water_Detailed	Polygon
HGAC_13_County_Watershed_Project_Monitoring_Sites	Point
HGAC_13_County_Zip_Codes_2000	Polygon
HGAC_13_County_Zip_Codes_2002	Polygon
HGAC_13_County_Zip_Codes_2005	Polygon
HGAC_15_County_Aquifer_Recharge_Zones	Polygon
HGAC_15_County_Basins	Polygon
HGAC_15_County_Bio_Monitoring_Sites	Point
HGAC_15_County_Census_Zip_Codes_2010	Polygon
HGAC_15_County_City_Boundaries	Polygon
HGAC_15_County_City_Boundaries_Clipped	Polygon
HGAC_15_County_Coastline	Polygon
HGAC_15_County_Coastline_Boundary	Polygon
HGAC_15_County_Contours_2_Feet	Polyline
HGAC_15_County_Contours_5_Feet	Polyline
HGAC_15_COUNTY_CRP_Impairments	Table
HGAC_15_County_CRP_Lakes	Polygon
HGAC_15_County_CRP_Stream_End_Points	Point
HGAC_15_County_CRP_Streams	Polyline
HGAC_15_County_DEM_10m	Raster
HGAC_15_County_Hillshade	Raster
HGAC_15_County_Major_Rivers	Polyline
HGAC_15_County_Major_Roads	Polyline
HGAC_15_County_Political	Polygon
HGAC_15_County_Political_Boundary	Polygon
HGAC_15_County_School_Districts_TEA_2010	Polygon
HGAC_15_County_Soils	Polygon
HGAC_15_County_Wastewater_Outfalls	Point
HGAC_15_County_Wastewater_Outfalls_Historical	Point
HGAC_15_County_Wastewater_Outfalls_Info	Table
HGAC_15_County_Water	Polygon

Dataset Name	Type
HGAC_15_County_Watershed_Insets	Polygon
HGAC_15_County_Watershed_Signs	Point
HGAC_15_County_Watersheds	Polygon
HGAC_15_County_Zip_Codes_2000	Polygon
HGAC_15_County_Zip_Codes_2002	Polygon
HGAC_8_County_Bikeway_Needs	Polyline
HGAC_8_County_Bikeways	Polyline
HGAC_8_County_BlockGroups_2000	Polygon
HGAC_8_County_BlockGroups_2010	Polygon
HGAC_8_County_Blocks_2000	Polygon
HGAC_8_County_Blocks_2010	Polygon
HGAC_8_County_Census_Places_2000	Polygon
HGAC_8_County_Census_Places_2000_Clipped	Polygon
HGAC_8_County_Census_Places_2000_Pts	Polygon
HGAC_8_County_Census_Places_2010	Polygon
HGAC_8_County_Census_Places_2010_Clipped	Polygon
HGAC_8_County_Census_Places_2010_Pts	Polygon
HGAC_8_County_Census_Urban_Areas_2000	Polygon
HGAC_8_County_Census_Urban_Areas_2009	Polygon
HGAC_8_County_Census_Urban_Areas_2010	Polygon
HGAC_8_County_Census_Zip_Codes_2010	Polygon
HGAC_8_County_City_Boundaries	Polygon
HGAC_8_County_City_Boundaries_Clipped	Polygon
HGAC_8_County_City_Ordinance_Areas	Polygon
HGAC_8_COUNTY_COASTAL_VIGNETTE	Raster
HGAC_8_County_Coastal_Vignette_50_25	Polygon
HGAC_8_County_Coastline	Polygon
HGAC_8_County_Coastline_Boundary	Polygon
HGAC_8_County_Comprehensive_Plan_2010_pts	Point
HGAC_8_County_Eco_Types	Polygon
HGAC_8_County_Forecast_Cities_h	Table
HGAC_8_County_Forecast_Cities_v	Table
HGAC_8_County_Forecast_Counties_h	Table
HGAC_8_County_Forecast_Counties_v	Table
HGAC_8_County_Forecast_G025M_h	Table
HGAC_8_County_Forecast_G1_h	Table
HGAC_8_County_Forecast_G10K_h	Table
HGAC_8_County_Forecast_G10K_v	Table
HGAC_8_County_Forecast_G1M_h	Table
HGAC_8_County_Forecast_G1M_v	Table
HGAC_8_COUNTY_FORECAST_LU_G1_H	Table
HGAC_8_County_Forecast_RAZ_h	Table
HGAC_8_County_Forecast_RAZ_v	Table
HGAC_8_County_Forecast_Region_v	Table

Dataset Name	Type
HGAC_8_County_Forecast_TAZ_h_2003	Table
HGAC_8_County_Forecast_TAZ_v_2003	Table
HGAC_8_County_Forecast_Tracts_h	Table
HGAC_8_County_Forecast_Tracts_v	Table
HGAC_8_County_Forecast_Zip_Codes_h	Table
HGAC_8_County_Forecast_Zip_Codes_v	Table
HGAC_8_County_G025M	Polygon
HGAC_8_County_G1	Polygon
HGAC_8_County_G10	Polygon
HGAC_8_County_G1M	Polygon
HGAC_8_County_Livable_Centers	Point
HGAC_8_County_Livable_Centers_Areas	Polygon
HGAC_8_County_Major_Rivers	Polyline
HGAC_8_County_Major_Roads	Polyline
HGAC_8_County_PedBike_Improvement_Areas	Polyline
HGAC_8_County_PedBike_Improvement_Locations	Polyline
HGAC_8_County_Pedestrian_Pathways	Polyline
HGAC_8_County_Political	Polygon
HGAC_8_County_Political_Boundary	Polygon
HGAC_8_County_Railroads	Polyline
HGAC_8_County_Raster_Extent	Polygon
HGAC_8_County_RAZ	Polygon
HGAC_8_County_School_Districts_TEA_2010	Polygon
HGAC_8_County_Soils	Polygon
HGAC_8_County_TAZ_2003	Polygon
HGAC_8_County_Tracts_1970	Polygon
HGAC_8_County_Tracts_1980	Polygon
HGAC_8_County_Tracts_2000	Polygon
HGAC_8_County_Tracts_2010	Polygon
HGAC_8_County_Water	Polygon
HGAC_8_County_Water_Detailed	Polygon
HGAC_8_County_Zip_Codes_2000	Polygon
HGAC_8_County_Zip_Codes_2002	Polygon
HGAC_8_County_Zip_Codes_2005	Polygon
HGAC_8_County_Zoning_2010_pts	Point
HGAC_Bastrop_Bayou_Sub_Watersheds	Polygon
HGAC_CRP_Watersheds	Polygon
HGAC_LAND_COVER_10_CLASS_2008	Polygon
HGAC_LAND_COVER_10_CLASS_ROADS_2008	Raster
HGAC_LAND_COVER_3X3_MODE_FILTERED_2008	Raster
HGAC_LAND_COVER_MERGED_6_CLASS_2008	Raster
HGAC_Other_CRP_Monitoring_Stations	Point
HGAC_Sea_Level_Rise_10Ft	Polygon
HGAC_Sea_Level_Rise_15Ft	Polygon

Dataset Name	Type
HGAC_Sea_Level_Rise_1Ft	Polygon
HGAC_Sea_Level_Rise_20Ft	Polygon
HGAC_Sea_Level_Rise_25Ft	Polygon
HGAC_Sea_Level_Rise_30Ft	Polygon
HGAC_Sea_Level_Rise_35Ft	Polygon
HGAC_Sea_Level_Rise_3Ft	Polygon
HGAC_Sea_Level_Rise_5Ft	Polygon
HGAC_Sea_Level_Rise_All_Levels	Polygon
HGAC_Sea_Level_Rise_Current_Sea_Level	Polygon
Hurricane_Dolly_Observations	Point
Hurricane_Dolly_Track	Polyline
Hurricane_Ike_High_Water_Measurements	Point
Hurricane_Ike_Observations	Point
HURRICANE_IKE_SALT_BURN_GULF_COAST	Raster
Hurricane_Ike_Storm_Surge_Model_i48_gl2	Polygon
HURRICANE_IKE_STORM_SURGE_MODEL_I48_GL2_RASTER	Raster
Hurricane_Ike_Track	Polyline
Land_Cover_1992_19_Class_NLCD	Raster
Land_Cover_1992_19_Class_NLCD_Corrected	Raster
Land_Cover_1996_22_Class_NOAA	Raster
Land_Cover_2001_15_Class_NLCD	Raster
Land_Cover_2001_15_Class_NLCD_Corrected	Raster
Land_Cover_2001_22_Class_NOAA	Raster
Land_Cover_2005_22_Class_NOAA	Raster
Land_Cover_2006_15_Class_NLCD	Raster
Land_Cover_2011_15_Class_NOAA	Raster
Land_Cover_2011_22_Class_NOAA	Raster
Land_Cover_Change_1992_to_2011_9_Class	Raster
LibCAD_Parcels_Coverage_2007	Polygon
LibCAD_Parcels_Coverage_2007_pts	Point
LibCAD_Parcels_Coverage_2008	Polygon
LibCAD_Parcels_Coverage_2008_Pts	Point
Liberty_County	Polygon
LIBERTY_COUNTY_PARCEL_INFO_2007	Table
Liberty_County_Parcel_Info_2008	Table
Liberty_County_Parcel_Values_2007	Table
Liberty_County_Parcel_Values_2008	Table
Matagorda_County	Polygon
Matagorda_County_Political	Polygon
METRO_LRT_Lines	Polyline
METRO_LRT_Stations	Point
Model_Buildings	Point
Model_Buildings_Rural	Point
Model_Buildings_Uses	Point

Dataset Name	Type
Model_Buildings_Uses_Rural	Table
Model_Parcels	Table
Model_Parcels_Acct_Nums	Polygon
Model_Parcels_Acct_Nums_Rural	Table
Model_Parcels_Addresses	Table
Model_Parcels_Addresses_Rural	Table
Model_Parcels_Features	Table
Model_Parcels_Features_Rural	Table
Model_Parcels_Forecast	Table
Model_Parcels_Removed_Merged	Table
Model_Parcels_Rural	Polygon
MontCAD_Parcels_Coverage_2005	Polygon
MontCAD_Parcels_Coverage_2005_pts	Point
MontCAD_Parcels_Coverage_2006	Polygon
MontCAD_Parcels_Coverage_2006_pts	Point
MontCAD_Parcels_Coverage_2007	Polygon
MontCAD_Parcels_Coverage_2007_pts	Point
MontCAD_Parcels_Coverage_2008	Polygon
MontCAD_Parcels_Coverage_2008_Pts	Point
Montgomery_County	Polygon
MONTGOMERY_COUNTY_PARCEL_INFO_2006	Table
MONTGOMERY_COUNTY_PARCEL_INFO_2007	Table
Montgomery_County_Parcel_Info_2008	Table
Montgomery_County_Parcel_Values_2006	Table
Montgomery_County_Parcel_Values_2007	Table
Montgomery_County_Parcel_Values_2008	Table
Montgomery_County_Zones_4	Polygon
NLCD_IMPERVIOUSNESS_2001	Raster
NLCD_IMPERVIOUSNESS_2006	Raster
NLCD_IMPERVIOUSNESS_CHANGE_2006	Raster
NLCD_TREE_CANOPY_2001	Raster
NOAA_Surge_MOM_Galveston_Bay	Polygon
NOAA_Surge_MOM_Matagorda_Bay	Polygon
San_Jacinto_County	Polygon
SEM_User_Input_Point	Point
SEM_User_Input_Polygon	Polygon
SEM_User_Input_Polyline	Polyline
Texas_113th_Congressional_Districts	Polygon
Texas_Census_BlockGroups_1990	Polygon
Texas_Census_BlockGroups_2000	Polygon
Texas_Census_BlockGroups_2010	Polygon
Texas_Census_Blocks_2000	Polygon
Texas_Census_Blocks_2010	Polygon
Texas_Census_School_Districts_2010	Polygon

Dataset Name	Type
Texas_Census_Tracts_1990	Polygon
Texas_Census_Tracts_2000	Polygon
Texas_Census_Tracts_2010	Polygon
Texas_Census_Urban_Areas_2009	Polygon
Texas_Coastal_Bathymetry	Point
Texas_Coastal_Vignette_50_25	Polygon
Texas_Coastline	Polygon
Texas_COG_Boundaries	Polygon
Texas_Counties_Coastline	Polygon
Texas_Counties_Political	Polygon
Texas_Highways	Polyline
Texas_Impairment_Streams_2008	Polyline
Texas_Impairment_Waterbodies_2008	Polygon
Texas_Major_Rivers	Polyline
Texas_Map_Extent	Polygon
Texas_State_House_Districts_2012	Polygon
Texas_State_Senate_Districts_2012	Polygon
Texas_Stream_Team_Monitoring_Sites	Point
Texas_Zip_Codes_2005	Polygon
The_Woodlands_Pathways	Polyline
TMDL_Project_Areas	Polygon
TMDL_Project_Areas_Mask	Polygon
TMDL_Watersheds	Polygon
US_State_Boundaries	Polygon
USFWS_Wetlands_2009	Polygon
USFWS_Wetlands_2010	Polygon
USFWS_Wetlands_2011	Polygon
USFWS_Wetlands_2012	Polygon
USGS_HUC_10_Watersheds	Polygon
USGS_HUC_12_Sub_Watersheds	Polygon
USGS_HUC_6_Basins	Polygon
USGS_HUC_8_Sub_Basins	Polygon
USGS_River_Basins	Polygon
USGS_Stream_Gauges_2009	Point
USGS_Stream_Gauges_2010	Point
USGS_Stream_Gauges_2012	Point
USGS_Sub_Watershed_Study_Areas	Polygon
WalkCAD_Parcels_Coverage_2005	Polygon
WalkCAD_Parcels_Coverage_2005_pts	Point
WalkCAD_Parcels_Coverage_2006	Polygon
WalkCAD_Parcels_Coverage_2006_pts	Point
WalkCAD_Parcels_Coverage_2007	Polygon
WalkCAD_Parcels_Coverage_2007_pts	Point
WalkCAD_Parcels_Coverage_2008	Polygon

Dataset Name	Type
WalkCAD_Parcels_Coverage_2008_Pts	Point
Walker_County	Polygon
WALKER_COUNTY_PARCEL_INFO_2005	Table
WALKER_COUNTY_PARCEL_INFO_2006	Table
WALKER_COUNTY_PARCEL_INFO_2007	Table
Walker_County_Parcel_Info_2008	Table
Walker_County_Parcel_Values_2005	Table
Walker_County_Parcel_Values_2006	Table
Walker_County_Parcel_Values_2007	Table
Walker_County_Parcel_Values_2008	Table
WallCAD_Parcels_Coverage_2007	Polygon
WallCAD_Parcels_Coverage_2007_Pts	Point
WallCAD_Parcels_Coverage_2008	Polygon
WallCAD_Parcels_Coverage_2008_Pts	Point
Waller_County	Polygon
WALLER_COUNTY_PARCEL_INFO_2007	Table
Waller_County_Parcel_Info_2008	Table
Waller_County_Parcel_Values_2007	Table
Waller_County_Parcel_Values_2008	Table
Wharton_County	Polygon
World_Country_Boundaries	Polygon

C&E Non-Spatial Data

Ambient Surface Water Quality Monitoring
Wastewater Self-reporting Data
Parcel-Based Land Use, Attributes, and Valuation (9 counties)
Census Data

Appendix 6 Data Dictionary

Data Dictionary
Houston-Galveston Area Council
Community and Environmental Planning Department

General Information	
Thematic Layer Name	
Feature Class	
Topology	
Table Name	
Data Source	
Report Prepared by	
Phone	Fax	E-Mail

Attribute Table				
Variable	Begin Column	Item Name	Alternate Name	Item Definition

Data History	
Source Agency	
Originating Date	
Originating Scale	

Status Information
Percentage Complete
Planned Completion Date
Geographic Extent
Planned Enhancements
Known problems or limitations

Maintenance Information
Maintaining Office/Division/Section
Contact Name
Contact Telephone Number
Type of updates performed
Frequency of Updates

Data Format Information
Data Format
Software/Version
Number of features/records
Total File Size

Projection
Geographic Projection:
Spheroid:
Zone:
Datum:
Units:
Fips Zone:
Quadrant:
X Shift:
Y Shift:
1st Standard Parallel:
2nd Standard Parallel:
Central Meridian:
Lat. of Projection Origin:
False Easting:
False Northing:

Additional Documentation
Quality Assurance Quality Control
Attribute Reports Available
Additional Documentation Available

Appendix 7 H-GAC C&E GIS Mapping Applications