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Spatial Data Management Framework

BUSINESS REQUIREMENTS SPECIFICATION GUIDELINE

ANNEXURE TO SPATIAL INFORMATION DISSEMINATION FRAMEWORK

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1. Introduction

1.1 Summary and Purpose

Data within the City of Cape Town, both spatial and non-spatial data, is not only intended for internal use but for external clients also. This data may be accessed by various departments for operational and management purposes. All spatial data must be consistent and compatible so that the data can be used effectively by both GIS personnel and other City units and non-City agencies as a useful information resource. Departments must use this document as a minimum framework of specifications for external parties when performing GIS projects for the city of Cape Town. It is important for departments to add industry specific GIS specifications standards to this document to ensure compliance and quality spatial information.

1.2 Overview

The Spatial Information Strategy for the City of Cape Town prepared by DI&GIS and approved as a policy document by council during 2008, outlines the City's overall goals for capturing, managing and using spatial data and the direction that the City is taking with the management of spatial data.

This document, the Spatial Data Management Framework for the City of Cape Town, is to give complete guidelines by supporting the Spatial Information Strategy and the delegations in relation to the SDI Act on how to manage all spatial data that is created and used within City of Cape Town.

The objective of this document is to identify the minimum standards necessary for City of Cape Town to fully implement enterprise wide GIS guidelines and spatial standards. This report sets the direction that will guide departments through the implementation of a Corporate Spatial Data Infrastructure (CSDI) which comprises of the Corporate Spatial Warehouse (CSW) and Operational Databases (OD).In order to meet the objectives of implementing the CSDI, various criteria need to be considered so that the CSW and OD's will have a lasting and positive effect amongst the various business units. In order to achieve the CSDI, the following criteria need to be met:

- A Spatial Database Engine (SDE)/SQL Server which includes corporate spatial warehouse, production and fail over
- Operational database environment(s) to support the day to day editing, maintenance and updates of each business area;
- Relevant datasets will be migrated from the exiting departmental environments to the SDE operational database within the CSDI infrastructure;
- Clear standards will be defined for the SDE layer naming, symbology, metadata requirements and access security;
- Enterprise applications will be used to facilitate data access, management, and editing where necessary.
- Data will be accessible to users through a corporate viewer (ArcGIS Server & Image Server), business viewers and/or GIS tools.

Development Information and GIS (DI&GIS) spatial systems are considered central to the development of an effective "integrated information management system" for appropriate management of all spatial data in the City.

The guidelines should be applied when City staff and contractors develop and implement a variety of projects (such as Project ISIS) for the City's spatial data. DI&GIS also liaises with a range of other government and non-government organisations in collaboration with GIS and other projects.

2. Spatial Data Standards & Specifications

2.1 SANS 19000 & 1883 Standards

Each standard describes and sets out specific requirements for managing geographical information in terms of;

- formatting,
- methods and tools,
- data acquisition,
- computing, analysis, accessing
- presentation,
- data transfer protocols.

Standards for GIS involve the naming and defining of files, features, attributes and

codes. The use of standard symbology, processing tolerances and documentation are also specifically defined. This ensures a common base for data acquisition, manipulation, application and mapping and is used to ensure that spatial data's integrity and accuracy is protected.

The South African National Standards (SANS) can be grouped into the following functional categories;

- Geographic information referencing systems;
- Conceptual framework and schema standard;
- Geographic information feature standards;
- Quality assessment standards;
- Geo-information functional standards

2.2 Geographic Information Reference or Coordinate Systems

A geographic coordinate system is a reference system that uses latitude and longitude to define the locations of points on the surface of a sphere or spheroid.

The geographical information referencing systems provide and group standards that are related to the use of national spatial referencing coordinate systems. The South African Datum referencing system is referred to as the Hartebeesthoek 94 Datum and uses the **World Geodetic System 1984** ellipsoid as a reference. This is an integrated survey reference system, which enables users the freedom to integrate their geo-spatial data.

The City uses the following WGS84 Projected Coordinate System as a standard for all spatial data:

Projection: Transverse_Mercator
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: 19.0
Scale_Factor: 1.0
Latitude_Of_Origin: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_Hartebeesthoek_1994

Spheroid: WGS_1984
Semimajor Axis: 6378137.0
Semiminor Axis: 6356752.314245179
Inverse Flattening: 298.257223563

2.2.1 Datum

A datum is the reference specifications of a measurement system, usually a system of coordinate positions on a surface (a Horizontal Datum) or heights above or below a surface (a Vertical Datum). The WGS84 datum for geographic coordinate systems has been adopted nationally and worldwide and is consistent with GPS use. The City of Cape Town has adopted the World Geodetic System 1984 – LO 19 Hartebeesthoek (WGS84) as the standard for all spatially referenced data created. Corporate GIS's Geomatics Section creates and maintains all Geo-Reference Points (TSM's) compliant with WGS-84 co-ordinates. These are available and should be used as the co-ordinate origin for all survey work undertaken for and on behalf of the City.

2.2.2 Vertical Datum

The City uses the South African National Vertical Datum as the standard vertical datum. South Africa uses the modified form of normal height in its vertical datum. Note that some data types are two dimensional and as such do not store height information. In such cases the vertical datum does not need to be specified.

2.2.3 Units of Measure

Units of measure recorded within spatial data (e.g. areas of polygons or distances of lines etc.) should be in metric standard scientific (SI) units (e.g. metres). The units of measure unless otherwise defined in the attributes should be referenced in the metadata. In ongoing projects, the unit of measure within the dataset attributes should be kept consistent.

2.2.4 Scale

The term scale refers to a statement of measure. It is often the ratio of the distance on a map as related to the true distance on the ground (eg. 1:50,000). In general, maps with smaller scales, e.g. 1:250,000 compared to 1:25,000, are less accurate and show less detail. This is also the case for spatial datasets which are derived from maps or images at given scales.

2.2.5 Accuracy

Accuracy is associated with the reliability of the data to a given standard and based on a lack of bias. Spatial datasets will require a level of positional accuracy that is appropriate to the application. For example, the position of a building may be required to be more accurate than service points or vegetation studies. Another example is facilities data for as- constructed purposes are to be collected with a horizontal accuracy of ± 0.050m. The initial horizontal set up position for the as-constructed survey must be established by using a minimum of 3 control points to confirm that control points have not been disturbed. Field data collected via normal hand held GPS devices must have a minimum ground accuracy of 5m.

- Any uncertainties with regard to accuracy of data must be:
    - Stated in the final documents
    - Recorded in the metadata;

2.2.6 Vertical Accuracy in Measurements

All spatial data captured or supplied to the City whose specification requires the measurement of height shall have their accuracy entered into the accompanying metadata for that dataset. The survey of an as-built building, e.g. facilities data will be captured in 3 dimensions (horizontal and vertical coordinates) in which case the required vertical accuracy will be ± 5cm. The initial vertical set up position for the as-constructed survey must be established by using a minimum of 2 control points to prove both the stability of the marks and correct identification of the marks.

2.3 Naming Standards

Users are requested to make use of standard naming conventions at physical database level in order to model the data in a consistent, predictable manner. This enables the City of Cape Town to have standard means of defining and analysing the data resources within the organization.

The entity/table/feature class names must be prefixed using the following:

- **RE_** : Relation Entity (resolves a many to many relationship)/Cluster Entity
- **SL_** : Spatial Entity (includes attribute/non spatial data with shape)
- **AT_** : Attribute Entity (contains non spatial data only)/Transparent Entity

- **LU_** : Lookup Entity (contains values to be applied in a consistent manner)/Pool Entity/Domain Data

- **IX_ATR_NAME** : Attribute Index (prefix with 'IX' and suffix with attribute/column name which is indexed

  Example:

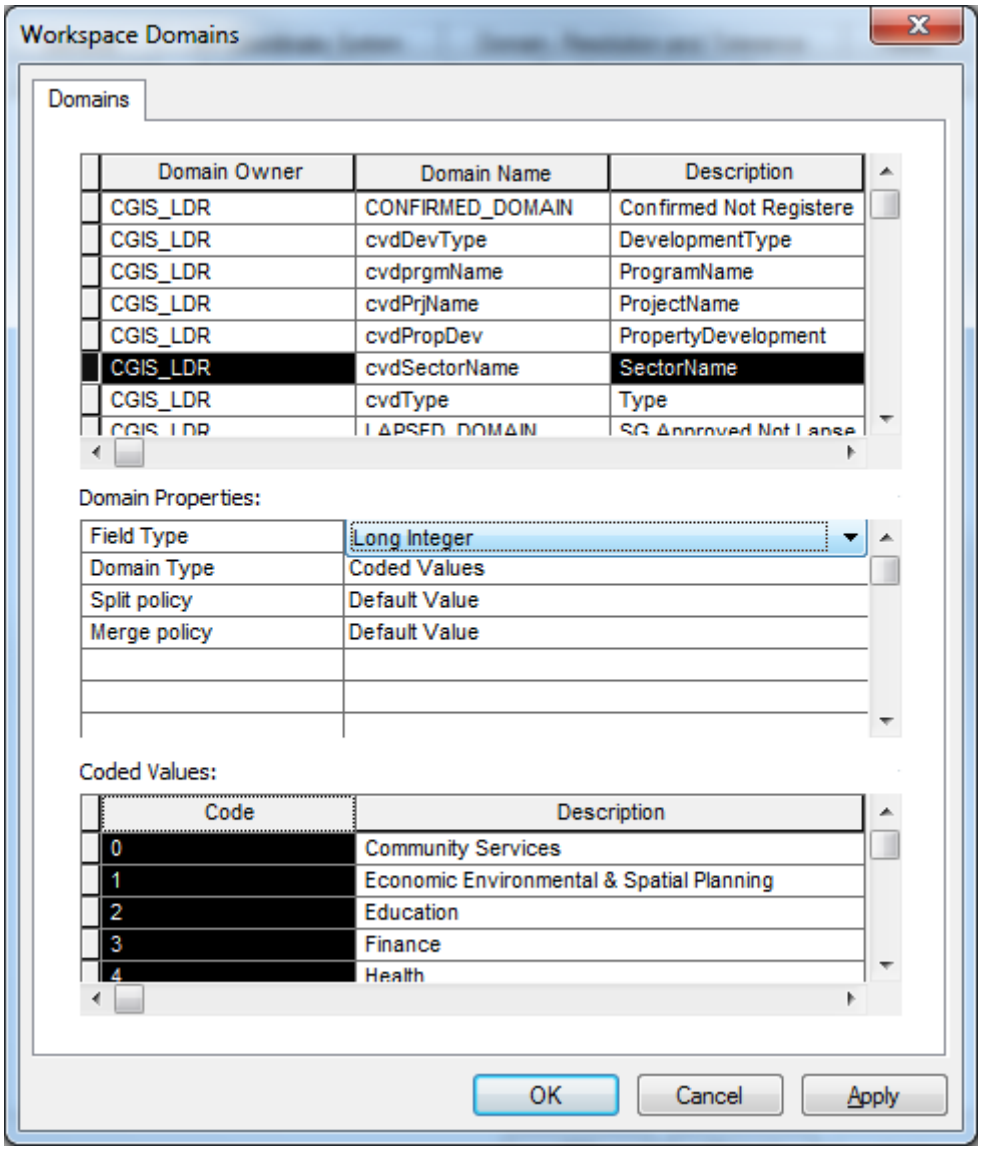
Object	Convention	Example	Description
Database Name	First letter of each word or syllable,	wgdb	ISIS Workspace Geodatabase
	all lower case	sra	Sports Recreation and Amenities
		erm	Environmental Resource Management
Topology	Feature dataset Name _ Topology	Legal_Boundaries_Topology	Topology setup in GDB
Spatial Layers	SL_(first character and next 2 or 3 consonants)	SL_LAND_PRCL_SG	Spatial Layer Land Parcel Surveyor General
Table Names	AT_(first character and next 2 or 3 consonants)	AT_LAND_PRCL_LNG	Attribute Table Land Parcel Linage
Spatial View	SV_(first character and next 2 or 3 consonants)	SV_LAND_PRCL	Spatial View Land Parcel
Database View	VW_(first character and next 2 or 3 consonants)	VW_LAND_PRCL_SG	View Land Parcel Surveyor General
Subtype	LU_(first character and next 2 or 3 consonants)_KEY	LU_LGL_STS_KEY	Look Up Table Legal Status Key
Coded Value Domain Field	CVD_(first character and next 2 or 3 consonants)	CVD_PRCL_STS	Coded Value Domain Status(Field or Column level)
Coded Value Domain Description	cvd(first character and next 2 or 3 consonants)	cvdLegalStatus	Coded Value Domain Legal Status (Description in domain setup)
Primary Key	SL_(Feature Class Name)_KEY	SL_LAND _PRCL_SG_KEY	Spatial Layer Name and Key to indicate Primary Key
Foreign Key	SL_(Feature Class Name)_FKEY	SL_LAND _PRCL_SG_FKEY	Foreign Key
Date Field	(first character and next 2 or 3 consonants of field)_DATE	SG_APRV_DATE	Date type field
Index	IX_ATR_NAME	IX_SL_LAND_PRCL_KEY	Attribute Index Land Parcel Key Column

- When naming entity/table/feature class and attributes at physical level, the name should ideally not be longer than 20 characters.
- This can be achieved by making sure that each word is no longer than 4 characters (and also not shorter than 2 characters).
- To do this the first character of a word must be taken together with the next 2 to 3 consonants of that word e.g. the Zoning Scheme entity can be named as the SL_ZNG_SCHM entity/table/feature class (do not repeat a consonant if two of the same follow e.g. Allotment = ALT not ALLT). If a word is no longer than 4 characters, the entire word can be used e.g. the Comment Date attribute can be named as the CMNT_DATE column. An important issue to remember, is that naming must be consistent e.g. if you decided to shorten CODE down to CD to restrict the length of a name, the CD abbreviation must be used consistently throughout.
- The name of the entity will follow the above mentioned prefix. When a relational table is created, a combination of the entity/table/feature class names are used between the many to many relationship for example RE_ENT1_ENT2.
- Department specific entities were also created. The naming convention for those entities will include the prefix followed by the department name and then the entity name for example SL_DPRT_ENT1.
- The primary attributes contain the name of the entity/table/feature class suffixed by "_KEY" to indicate that the attribute is a unique identifier. Those attributes that point to lookup values/domains are prefixed with "LU_" and can represent a number of options of an integer data type for example LU_TYPE_KEY.

In Summary:

1. The name of the feature class must always start with **SL** (Spatial Layer) or **AT** (Attribute table)
2. Always use underscores instead of spaces in between words
3. All the vowels need to be removed from the name and field names, unless the first letter of the layer name starts with a vowel, e.g. "Informal" will be **INFR**, the first character (if a vowel) may be left
4. Each "word" must only contain maximum 4 characters, e.g. **INFR** (Informal)**,** unless the word consists of 4 characters or less, e.g. **AREA** (Area) or **DAY** (Day)
5. Use the singular form of words, e.g. **RGN** for "Regions" and not RGNS
6. Do not repeat consonants in abbreviated word, e.g. **ILG** for "illegal" instead of "ILLG"
7. When you add a domain, please make sure the field type is set as **Long Integer,** and domain Type is set as **Coded Values**
8. The Domain name must start with small letters "cvd" and then the field name, e.g. **cvdAMDT**
9. All other letters to be typed in capitals

Example: ArcCatalog Domain properties



2.4 Metadata Standards

Data custodians are requested to implement Metadata Standards as prescribed by the customized City of Cape Town – ISO 19139 Metadata Editor style sheet.

Users are encouraged to use the ESRI ArcCatalog City of Cape Town – ISO 19139 Metadata Editor style sheet to capture & edit Metadata. Spatial data which are stored within the central database should have the following metadata:

Mandatory fields to be captured:

Item Description

- *Dataset Title:* Name or Title of dataset

- Tags: a set of terms that can be used by ArcGIS to search for the data.
- Summery: a brief summery of the data's content.
- *Abstract description:* Abstract describing the dataset and what it was intended for.
- Credits: recognition of those who created the data.
- Use limitations: describes limitations affecting the fitness of use of the data.

Topics & Keywords

- Topic Categories: identifies the primary themes associated with the data.
- Content type: indicates how one can access a shared copy of the data.

Contacts

- *Dataset Responsible Party:* Person or organisation responsible for the data.
- *Distributor Name:* Name of person or organisation.
- *Distributor Address:* Physical or Postal Address
- *Distributor Telephone:* Telephone Details
- *Distributor E-mail:* E-mail address
- *Distributor Fax:* Fax number

Details

- Status: status of the data
- Language: the language of information used within the data
- Spatial representation type: identifies the method used to spatially represent geographic information
- Scale resolution: the level of detail

Contraints

- Use limitations: describes limitations affecting the fitness of use of the data.

Maintenance

- Update frequency: the frequency with which the data is updated
- Custom frequency: Describes a custom maintenance period
- Next update: the scheduled revision date.
- Maintenance contact: contact person for data update

Citation

- Titles: the name by which the cited data is known
- Presentation form: describes the manner in which the data is presented
- FGDC Geospatial Data Presentation Form: indicates the form in which the data is provided.
- *Dates:* Date when Metadata was captured or last updated.

Contacts Manager

- Choose from the contacts manager list and click on the save check box.

Spatial reference (Automatically captured in ArcCatalog)

- *Spatial Reference:* Coordinate system, Map projection and Datum used.
- *Bounding Coordinates:* Left, Right, Top and Bottom Coordinates
- *Data Lineage:* Description of how dataset was created, data capture techniques and procedures followed to create dataset.

Attributes Information (Automatically captured in ArcCatalog)

- *Field Names:* Field names used in dataset with definitions

2.5 Database Standards

- Use ESRI File Geodatabase as the preferred format for storing vector data
- Implement subtypes and domains to ensure attribute accuracy
- Implement ESRI Geodatabase topology rules to ensure topological correctness
- Database design documentation needs to be compiled which describes the thinking behind the design.
- Every column//table/feature class must contain a user friendly table alias name.
- Every attribute/table/feature class name must contain a detailed description.
- Per Table/Schema stewardship needs to be defined. This relates to the maintenance of the data for overall quality and integrity.
- Per Table/Schema ownership needs to be defined. This resides with the enterprise or organisation as a whole.
- Per Table/Schema custodianship needs to be defined. This is the person who ensures

standards, policies, procedures, protocol and security requirements are met.

- Per Table/Schema championing needs to be defined. This is the person who responsible for reporting progress to the Executive Board and align to the over-arching policies and regulations

- Process for maintaining lookup data/domains, data models, metadata and databases (align with data models and specs) must be defined.

2.6 Cartographic Standards

- Implement industry standard marker symbols, line symbols, fill symbols & text symbols

- Utilise ArcGIS style sheets within the department

- Use layer files to standardize the presentation of spatial layers

- Ensure uniform map products by using map templates

3. Summary

The objective of this document is to identify the minimum standards necessary for City of Cape Town to fully implement enterprise wide GIS guidelines and spatial data standards. This report sets the direction that will guide departments through the implementation of a Corporate Spatial Data Infrastructure (CSDI) which comprises of the Corporate Spatial Warehouse (CSW) and Operational Databases (OD).

To deliver on these goals, the policy is dependent on the following key objectives as outlined in the Spatial Information Policy 2008:

I. *Establish spatial information that is reliable, trusted and interoperable*

II. *Strengthen the integrated, enterprise-wide management of spatial information to ensure information integration and sharing*

III. *Establish an effective governance model to ensure co-operation and coordination between role players*

IV. *Establish an effective supporting human resource and technology infrastructure*

The acceptance of the Spatial Data Management Framework at management level will ensure that sufficient initial focus is given to enterprise spatial information management. To sustain managerial support, high level on-going monitoring and frequent communication will be required.

4. Glossary

Accuracy — a measure of how well data represents true values.

ArcSDE - Spatial Data Engine; a ESRI relational database management system (RDBMS) that sits on top of a SQLserver, Informix, SQL Server database, etc

ArcSDE Layer - an ArcSDE layer references an ESRI Feature Class and defines characteristics about how it is represented when displayed or printed.

Cadastre — a register that defines boundaries of public and/or private land.

Coordinates — a sequence of numbers designating the position of a point in n-dimensional space [ISO 19111]. Examples of two-dimensional coordinate systems are Latitude/Longitude and Universal Transverse Mercator (UTM).

Coordinate Reference System — a reference system that relates a sequence of numbers or ***coordinates*** (*q.v.*) to the real world via a ***datum*** (*q.v.*).

Coordinate system — a system used to denote direct or relative positions by ***coordinates*** (*q.v.*).

Data Attribute - A particular characteristic of a data entity for which information is to be collected. For example, weight and gender could be attributes of a 'Person' entity.

Data Collection - An aggregation of datasets or similar data.

Data Warehouse - A collection of software and data organized to collect, cleanse, transform and store data from a variety of sources, and analyze and present information to support decision-making, tactical and strategic business processes.

Dataset - A type of folder within SDE which contains the Feature classes and topology rules. A managed grouping of similar business data with a single data custodian. The data that results from and is maintained by a distinct set of processes within a business area. Examples include Base data, Geology data, utilities data, etc

Data Quality — described 'fitness for use' (Juran 1964, 1994, Chrisman 1991, Chapman 2005a) of data. As a collector, you may have an intended use for the data you collect but data have the potential to be used in unforeseen ways; therefore, the value of your data is directly related to the fitness of those data for a variety of uses. As data become more accessible, many more uses become apparent (Chapman 2005c).

Datum — a parameter or set of parameters that serve as a reference or basis for the calculation of other parameters [ISO 19111]. A datum defines the position of the origin, the scale, and the orientation of the axes of a coordinate system. A datum may be a geodetic datum, a vertical datum or an engineering datum. In this document, the term ***datum*** generally refers to a ***geodetic datum*** (*q.v.*).

Decimal Degrees — degrees expressed as a single real number (e.g., −22.343456) rather than as a composite of degrees, minutes, seconds, and direction (e.g., 7° 54' 18.32" E). Note that minus (−) signs are

used to indicate southern and western hemispheres.

Easting and Northing — within a coordinate reference system (e.g., as provided by a GPS or a map grid reference system), *Eastings* are the vertical grid lines running from top to bottom (North to South) which divide a map from East to West and *Northings* are the horizontal lines running from left to right (East to West) dividing the map from North to South. The squares formed by intersecting eastings and northings are called grid squares. On 1:100,000 scale maps each square represents an area of 100 hectares or one kilometer square.

Elevation — the elevation of a geographic location is its height above mean sea level or some other fixed reference point (*cf*. ***vertical datum***). Elevation may be a negative number in those parts of the earth where the land surface is below mean sea level. Elevation may be recorded on maps in the form of contour lines linking points of uniform elevation, or as spot heights at ***trig points*** (*q.v.*) – usually at the summits of mountains, and rarely at low points. Elevation is used when referring to points on the earth, whereas altitude is used for points above the surface of the earth, such as the altitude of an aircraft, and depth for positions below the surface (of a lake, sea, etc.).

Extent — the geographic range, magnitude, or distance which a location may actually represent. With a town, the extent is the polygon that encompasses the area inside the town's boundaries. In this document, we usually refer to the linear extent – the distance from the geographic center of the location to the furthest point in the representation of the location.

Feature Class - An individual spatial layer that contains 1 to many features, IE polygons, lines, points etc. Feature classes allow homogeneous features to be grouped into a single unit for data storage purposes. For example, highways, primary roads, and secondary roads can be grouped into a line feature class named "roads."

Geodatabase: A spatial Database containing Datasets, relationships, feature Classes and topology rules

Geodetic Datum — a model of the earth used for geodetic calculations. A geodetic datum describes the size, shape, origin, and orientation of a coordinate system for mapping the surface of the earth (NAD27, SAD69, WGS84, etc.). In this document, we use the term to refer to the ***horizontal datum*** (*q.v.*) and not the ***vertical datum*** (*q.v.*).

Geodetic datums are often recorded on maps and in gazetteers, and can be specifically set for most GPS devices so the waypoints match the chosen datum. Use "not recorded" when the datum is not known.

Geographic Coordinate System — the net or graticule of lines of latitude (parallels) numbered 0° to 90° north and south of the equator, and lines of longitude (meridians) numbered 0° to180° east and west of the international zero meridian of Greenwich, used to define locations on the Earth's surface (disregarding elevation) with the aid of angular measure (degrees, minutes and seconds of arc).This is the traditional global coordinate system based on latitude and longitude.

Georeference — to translate a locality description into a mappable representation of a ***feature*** (*q.v.*) (verb); or the product of such a translation (noun).

GPS (Global Positioning System) **—** a satellite-based navigation system that provides 24 hour three-

dimensional position, velocity and time information to suitably equipped users (i.e., users with a GPS receiver) anywhere on or near the surface of the Earth. See discussions on accuracy elsewhere in this document.

Horizontal Datum — that portion of a ***datum*** (*q.v.*) which refers to the horizontal positions of mapped features with respect to parallels and meridians or northing and easting grid lines on a map as opposed to the ***vertical datum*** (*q.v.*).

Latitude — describes the angular distance that a location is north or south of the equator, measured along a line of ***longitude*** (*q.v.*).

Longitude — describes the angular distance east or west of a prime meridian (*q.v.*) on the earth's surface along a line of ***latitude*** (*q.v.*).

Map Projection — a method of representing the earth's three-dimensional surface as a flat two-dimensional surface. This normally involves a mathematical model (of which there are many) that transforms the locations of features on the earth's surface to locations on a two-dimensional surface. Such representations distort one or more parameters of the earth's surface such as distance, area, shape, or direction.

Meridian — the intersection in one hemisphere of the earth's surface with a plane passing through the poles, usually corresponding to a line of ***longitude*** (*q.v.*).

MXD File - A file in XML format used by ArcGIS server that stores the path to a source dataset and other layer properties, including symbology. Similar to a 'Layer File'.

Precision — with measurements and values, it describes the finest unit of measurement used to express that value (e.g., if a record is reported to the nearest minute, the precision is 1/3600th of a degree; if a decimal degree is reported to two decimal places, the precision is 0.01 of a degree). It is important to always calculate the precision from the original data and units of measurement.

Prime Meridian — a meridian from which longitude east and west is reckoned, the most recent standard for which passes through Greenwich, England.

Projection — see Map Projection

Theme - 1) A business grouping of data with one or more custodians. 2.) A complete set of layers with unique symbology bundled together to meet a specific business requirement in a mapping application. 3.) In GIS, a set of related geographic features such as streets, properties, or rivers, along with their attributes. All features in a theme share the same coordinate system, are located within a common geographic extent, and have the same attributes

Topology - These are relationships between Feature Classes and there associated rules, tolerances etc.

Transverse Mercator - Also known as Gauss–Krüger, and similar to the Mercator, except that the cylinder is longitudinal along a meridian instead of the equator. The result is a conformal projection that does not maintain true directions. The central meridian is placed in the center of the region of interest. This centering minimizes distortion of all properties in that region. This projection is best suited for north–south areas.

UTM (Universal Transverse Mercator) **—** a standardized coordinate system based on a metric rectangular grid system and a division of the earth into sixty 6-degree longitudinal zones. Zones are numbered consecutively with Zone 1 between 180 and 174 degrees west longitude. UTM only covers from 84° N to 80° S. When citing UTM coordinates, it is essential that the UTM Zone also be recorded.

Validation: A term used for a process that is run to automatically adjust features according to the rules as setup in the topology, Validation is run to check if any of the features that take part the topology are violating the setup rules

Vertical datum— that portion of a ***datum*** (*q.v.*) that refers to the vertical position of mapped features with respect to a base measurement point (such as mean sea level at a location) and from which all elevations are determined (e.g., AHD – The Australian Height Datum; NAVD88 – North American Vertical Datum, **South African National Vertical Datum**). See comments on accuracy under the section on GPS accuracy in this document.

WGS84 (World Geodetic System 1984) — a ***coordinate reference system*** (*q.v.*) in common use globally to fit the shape of the entire Earth as accurately as possible using a single ellipsoid. Other ellipsoids (*datum*) are commonly used locally to provide a better fit to the Earth in a local region.

5. References

1. City of Cape Town, Project ISIS Spatial Management Framework, 2010
2. City of Cape Town, 2008 Spatial Information Policy for the City of Cape Town prepared by Global Image
3. Spatial Data Migration Process 2010 prepared by Corporate GIS
4. Policy on Pricing of spatial information products and services, CSI 0002
5. Spatial Data Infrastructure Act, Act No. 54 of 2003
6. Promotion of Access to Information Act, Act No.2 of 2000

6. Document Approval

The undersigned do hereby indicate their agreement with the contents and outcomes of this document: *Spatial Data Management Framework*

Mark vd Merwe Date
Head: Corporate GIS
Information & Knowledge Management Department

Keith Smith Date
Director: Information & Knowledge Management