Collecting, creating and analysing spatial data for Disaster Risk Assessments: the issues and pitfalls

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Overview

- Spatial data types, representation and formats
- X and Y axes, and offsets
- Projections
- Data management principles
- Metadata
- Data analyses
- Storage/Curation of data

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"… data is every scientist's second priority. When scientists are evaluated … their efforts in curating, managing and quality assurance of data sets that future generations of researchers can use are not taken into account … ."

Dr J-B Minster, Chair: ICSU World Data Center System.

Collecting and analysing spatial data during Disaster Risk Assessments is generally seen as a relatively easy one where data is collected and thereafter most of the actual project work revolves around the analysis of the data and modeling the risks…

However, the time and effort that it takes to get the spatial data into a usable format and eventually give it back to the end-users in a way that they would be able to utilize it effectively in future exercises/projects, is generally underestimated…

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Spatial Data types

Notable commercial or proprietary GIS software

CAD / GIS (vector/raster):

Autodesk – MapGuide and AutoCAD.
Intergraph – photogrammetry.
ERDAS IMAGINE – Remote Sensing, and Photogrammetry by Leica Geosystems Geospatial Imaging.
ESRI – ArcView 3.x, ArcGIS, ArcSDE, ArcIMS, ArcServer, ArcPad (for GPS).
IDRISI – imagery/remote sensing by Clark Labs.
MapInfo – MapInfo Professional.
MapPoint – by Microsoft.

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Caliper –Maptitude, TransCAD and TransModeler. GIS for transportation.
Pictometry – allows oblique images to be draped with shapefiles.
Black Coral Inc —geospatial collaboration capabilities that enable better outcomes for personnel and tactical teams operating in emergency response and military environments.
CARIS (Computer Aided Resource Information System) – GIS systems for hydrography and cadastral systems.
DeLorme – GIS tools, data, and GPS hardware.
GMS – 3D environment for building geologic and groundwater models
Manifold System – Low-cost GIS software package.
Planet GIS – SA-based, – low cost package
Oracle Spatial.
Orbit GIS Generic and multi-purpose GIS toolkit, 100% Java-based.
Safe Software – Spatial ETL products including FME, SpatialDirect and the ArcGIS Data Interoperability Extension.
Smallworld – developed in Cambridge, England (Smallworld, Inc.) and purchased by General Electric and used primarily by public utilities.

Free and Open-source GIS software:

Many GIS tasks can be accomplished with free or open-source software.

With the broad use of open data formats such as the Shape File format (.shp) and the Geotiff (.tiff) format for raster data, the development of open source software continues to evolve, especially for web and web service applications.

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Open source software:

- GRASS (a complete GIS)
- MapServer – Web-based mapping server.
- gvSIG – Open source GIS written in Java.
- ILWIS – ILWIS (Integrated Land and Water Information System)
- JUMP GIS – Java Unified Mapping Platform.
- MapGuide Open Source – Web-based mapping server.
- OpenLayers – open source AJAX library
- PostGIS – Spatial extensions for the PostgreSQL database
- Quantum GIS – QGIS runs on Linux, Unix, Mac and Windows.
- TerraView
- uDig
- MapWindow GIS

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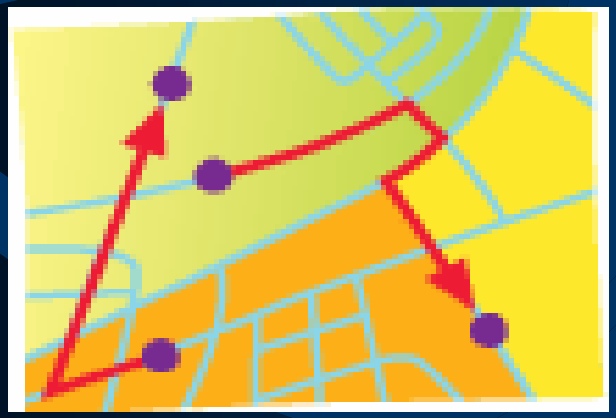
Data representation

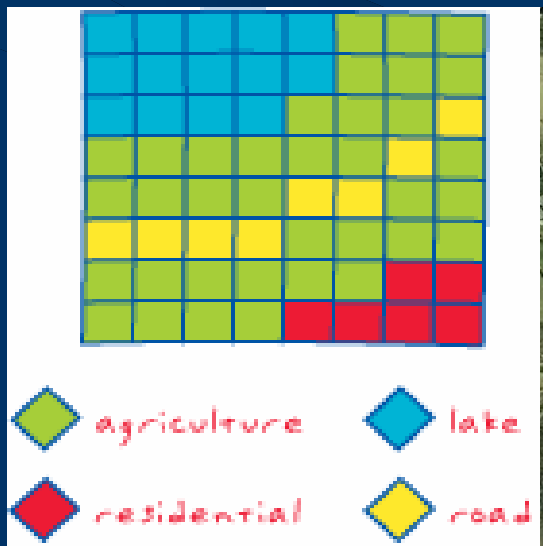
GIS data represents real world objects (roads, land use, elevation) with digital data. Real world objects can be divided into two abstractions: discrete objects (a house) and continuous fields (rain fall amount or elevation).

There are two broad methods used to store data in a GIS for both abstractions: Raster and Vector.

Vector:

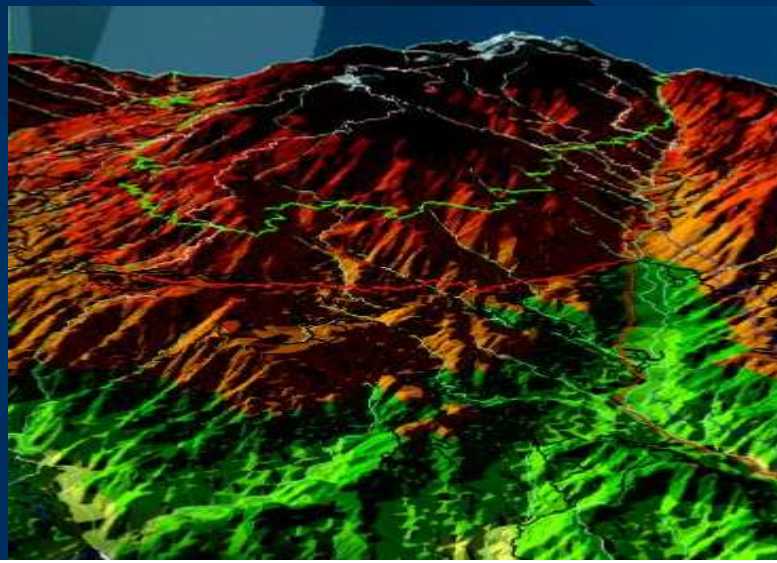


Raster:



Each of these geometries are linked to a row in a database that describes their **attributes**. For example, a database that describes lakes may contain a lake's depth, water quality, pollution level. This information can be used to make a map to describe a particular attribute of the dataset. For example, lakes could be coloured depending on level of pollution.

Contour lines and triangulated irregular networks (TIN) are used to represent elevation or other continuously changing values. TINs record values at point locations, which are connected by lines to form an irregular mesh of triangles. The face of the triangles represent the terrain surface.



Advantages and disadvantages: vector vs raster

•Raster data allows easy implementation of overlay operations.

•Raster data will appear as an image that may have a blocky appearance for object boundaries.

•Vector data can be easier to register, scale, and re-project. This can simplify combining vector layers from different sources.

•The file size for vector data is usually much smaller for storage and sharing than raster data. Image or raster data can be 10 to 100 times larger than vector data depending on the resolution.

•Vector data can be easily updated and maintained.

•Vector data allow much more analysis capability especially for "networks" such as roads, power, rail, telecommunications, etc. For example, with vector data attributed with the characteristics of roads, ports, and airfields, allows the analyst to query for the best route or method of transportation.

Non-spatial data

Non-spatial data can be stored besides the spatial data represented by the coordinates of a vector geometry or the position of a raster cell. In vector data, the additional data are attributes of the object.

Data formats

- Hard-copy only data?: Digitise / Digital Pen-technology
- Spreadsheets: what to aim for when collecting data to ensure seamless integration with GIS.
- Software differences/conversion of formats

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Average Hazard Ratings (0-1)	Central	Chobe	Francistown	Gaborone	Ghanzi	Jwaneng	Kgalagadi
Drought	0.80	0.88	0.50	0.53	0.45	1.00	1.00
Civil Unrest	0.79	0.63	0.47	0.60	0.25	0.57	0.63
Human Epidemics	0.73	0.80	0.71	0.51	0.69	0.43	0.88
Infestations		0.75	0.53		1.00		1.00
Road and Rail Transport Hazards	0.52	0.50	0.18	0.63		0.63	
Service Delivery Failure	0.57	0.79	0.73	0.33	0.16	0.50	0.60
Major Event Hazards		1.00	0.51	0.40		0.88	
Environmental Degradation	0.71	0.45		0.32			0.50
Air Pollution	0.62		0.25	0.69		0.75	
Land and Water Pollution	0.44	0.55	0.38	0.40	0.13	0.75	0.44
Fire Hazards	1.00	1.00		0.42	0.65	0.42	0.45
Animal Epidemics	0.62	0.50		0.11	0.71	0.45	0.45

No	ProjName	Budget	Year	Scope	Co-ordinator	Specialist	Comments	Address
13	Little Falls Nature Reserve	300000.00	2006_07_08	Entrance and fencing	Bishop Ngpbeli	Inhouse		Off Hendrik Potgieter
14	Botanical Gardens	1191000.00	2006_07_08	Construction of an education centre, parking and courtyard	Solomon Sumbane	KCS Architects	Budget on 2 lists as captured, third list budget 1500000	Thomas Bowler St Emmerantia
15	Norscott Nature Reserve	250955.61	2006_07_08	Entrance building and boardwalk	Bishop Ngobeli	Inhouse	Done	Alexander and Kingfisher
16	Outspan Bird Sanctuary	500000.00	2006_07_08		Bishop	KH	ON HOLD: EIA to complete	
17	Innis Free	1000000.00	2006_07_08		Bishop Ngobeli	Blue Print	Planning phase	Katherine St
18	Kloofendal	249800.00	2006_07_08		Jan Smit / Bishop Ngobeli	Sabelo Sithole	Done	
19	Panorama Cemetery	155000.00	2006_07_08	Paving	Solly Sumbane	Inhouse	Busy	Nic Diederick Boulevard
20	Ferndale Spruit	242123.59	2006_07_08	Picnic area and pathways	Bishop Ngobeli	Blueprint	Done	Rocky Street Ferndale

X and Y axes; and offsets

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Projections

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Map projections are attempts to **portray the round surface of the earth** or a portion of the earth on a **flat map surface**. Some distortions of conformality, distance, direction, scale, and area always result from this process. Some projections minimize distortions in some of these properties at the expense of maximizing errors in others. Some projection are attempts to only moderately distort all of these properties.

Conformality

When the scale of a map at any point on the map is the same in any direction, the projection is conformal. Meridians (lines of longitude) and parallels (lines of latitude) intersect at right angles. Shape is preserved locally on conformal maps.

Distance

A map is equidistant when it portrays distances from the center of the projection to any other place on the map.

Direction

A map preserves direction when azimuths (angles from a point on a line to another point) are portrayed correctly in all directions.

Scale

Scale is the relationship between a distance portrayed on a map and the same distance on the Earth.

Area

When a map portrays areas over the entire map so that all mapped areas have the same proportional relationship to the areas on the Earth that they represent, the map is an equal-area map.

Map projections can be constructed to preserve one or some of these properties, though **not all of them simultaneously**. Each projection preserves or compromises or approximates basic metric properties in different ways. The **purpose of the map**, then, determines which projection should form the base for the map. Since many purposes exist for maps, so do many projections exist upon which to construct them.

Another major concern that drives the choice of a projection is the **compatibility of data sets**. Data sets are geographic information. As such, their collection depends on the chosen model of the earth. Different models assign slightly different coordinates to the same location, so it is important that the model be known and that chosen projection be compatible with that model. On small areas (large scale) data compatibility issues are less important since metric distortions are minimal at this level. In very large areas (small scale), on the other hand, distortion is a more important factor to consider.

Different map projections result in different spatial relationships between regions: e.g.

- Three Different Map Projections of the United States

- Albers Equal Area and Lambert Conformal Conic Projections of North America

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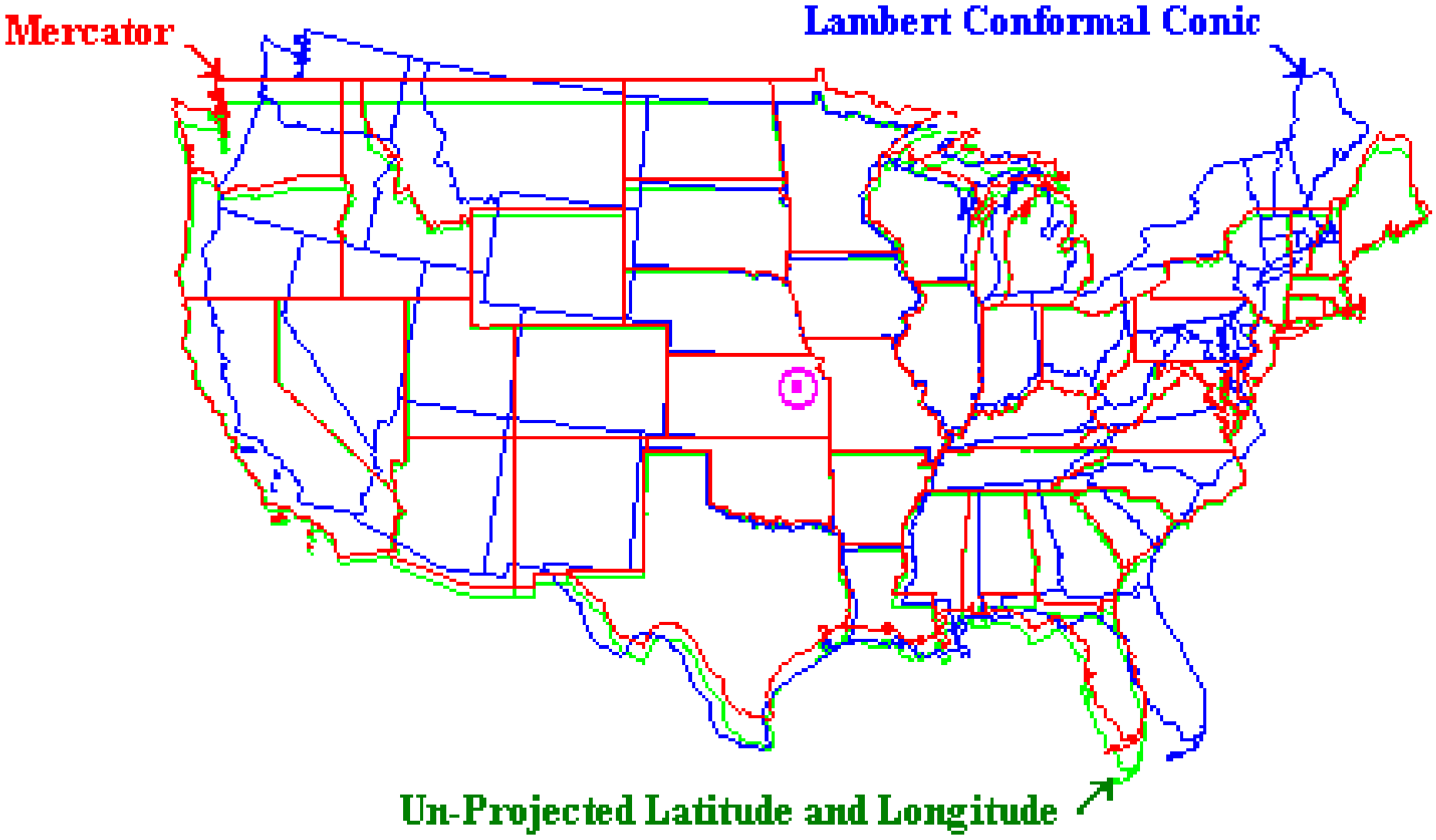
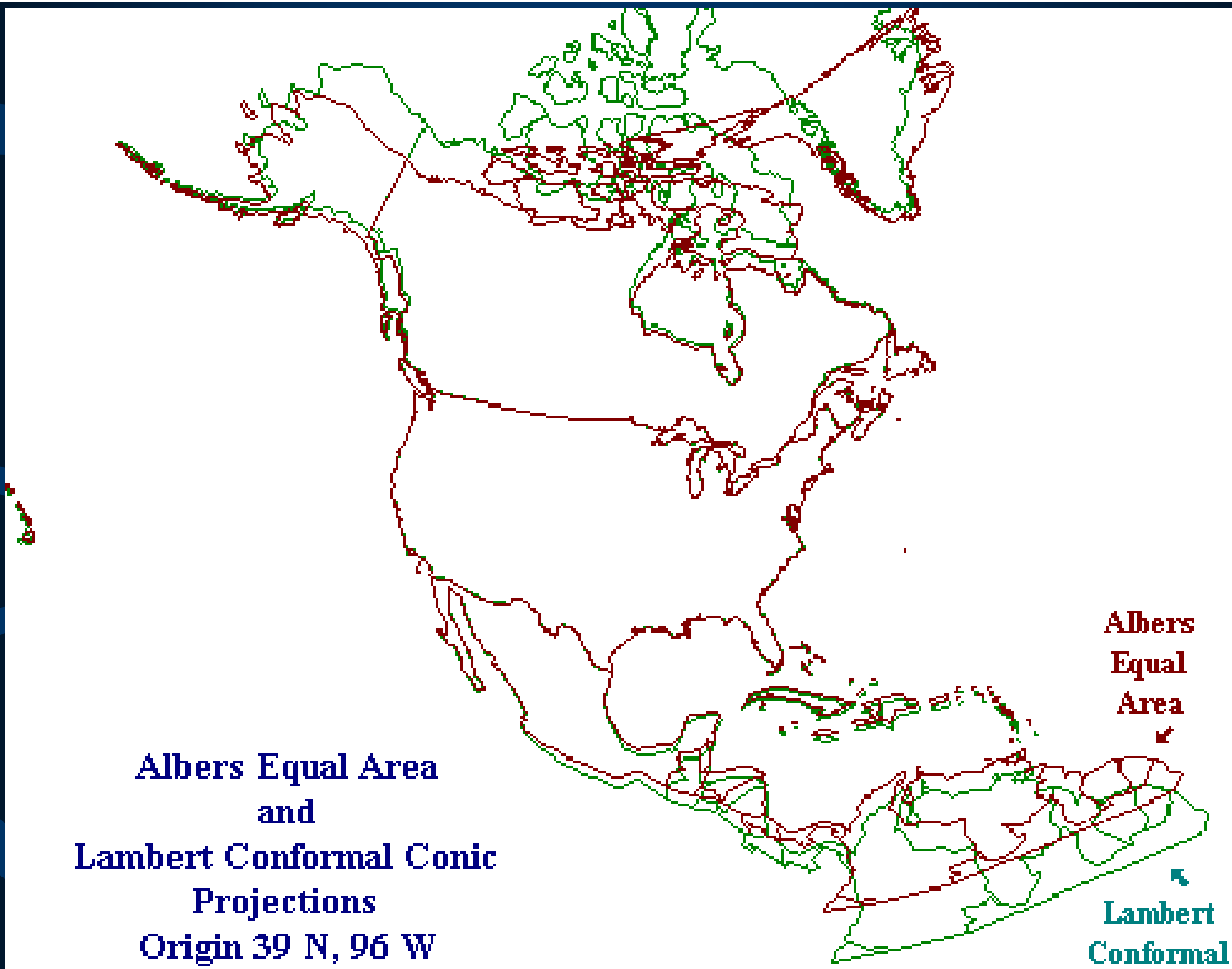
Three Map Projections Centered at 39 N and 96 W



Peter H. Dana 6/23/97



Albers Equal Area
and
Lambert Conformal Conic
Projections
Origin 39 N, 96 W
Standard Parallels 33 N and 45 N

Map projections fall into four general classes:

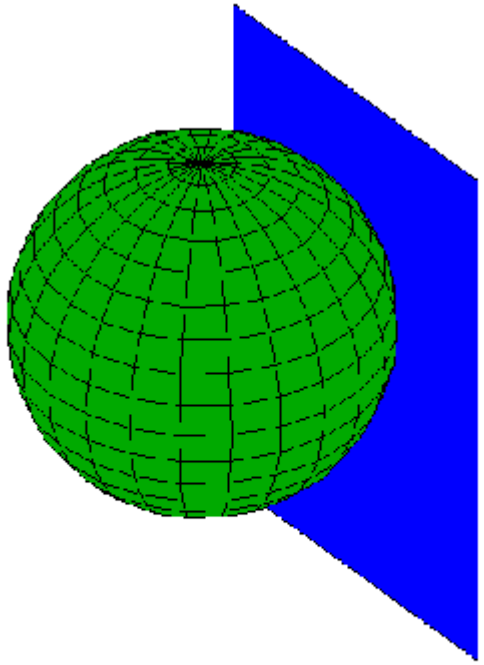
•Cylindrical projections result from projecting a spherical surface onto a cylinder.

•Conic projections result from projecting a spherical surface onto a cone.

•Azimuthal projections result from projecting a spherical surface onto a plane.

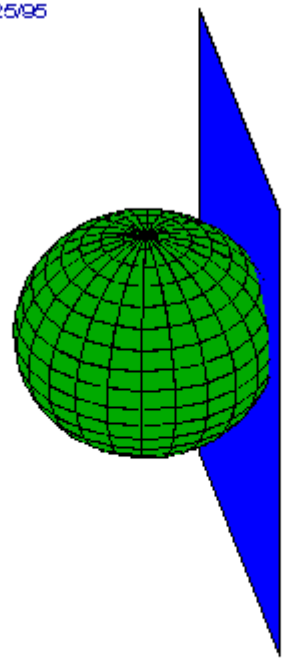
•Miscellaneous projections include unprojected ones such as rectangular latitude and longitude grids and other examples of that do not fall into the cylindrical, conic, or azimuthal categories

Peter H. Dana 9/20/94



Planar Projection Surface

Peter H. Dana 4/25/95



Secant Planar Projection

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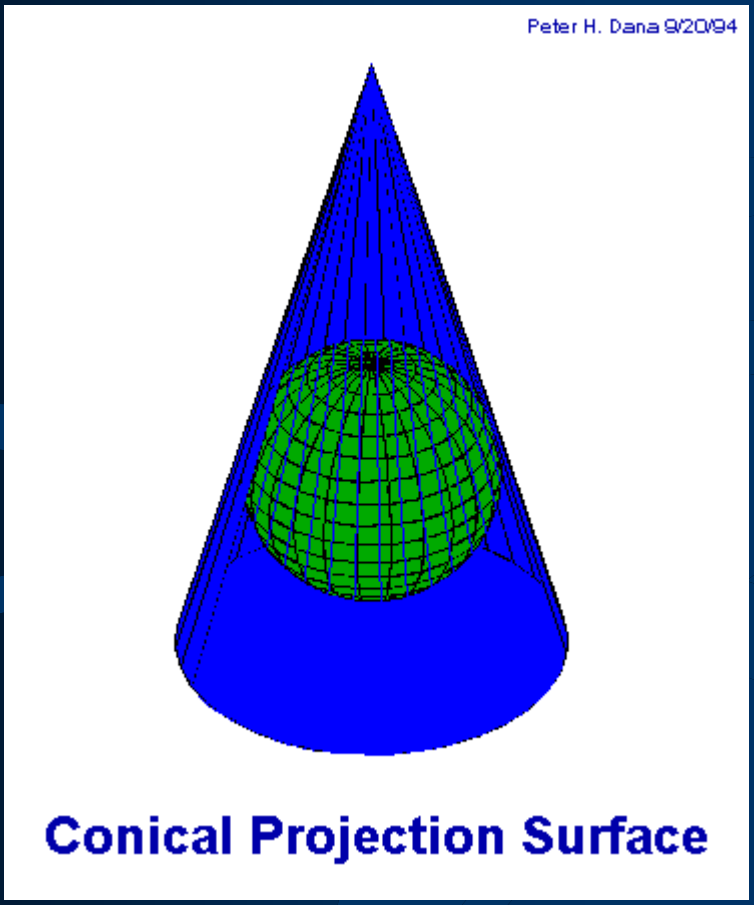
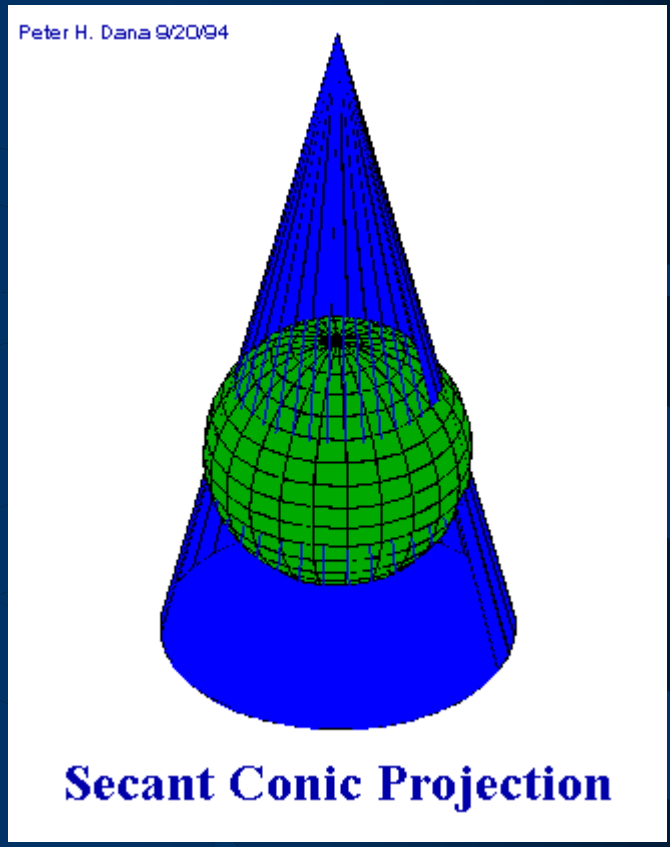


Conical Projection Surface



Secant Conic Projection

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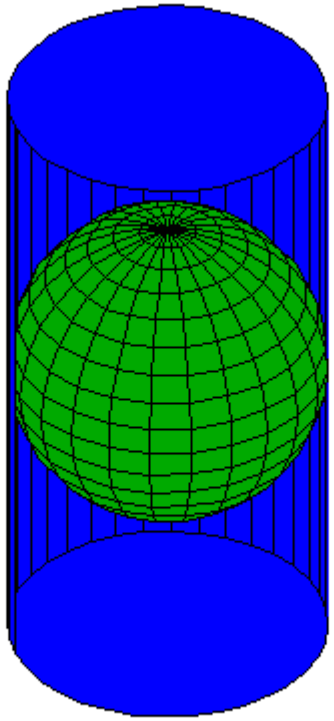
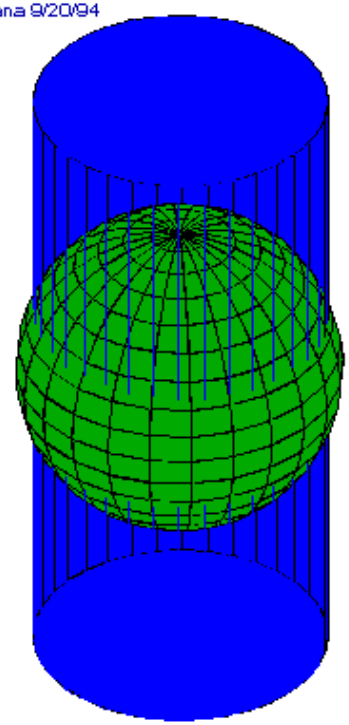


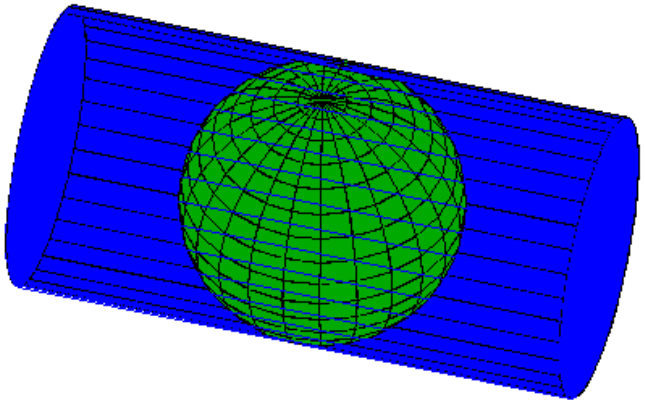
Cylindrical Projection Surface

Peter H. Dana 9/20/94



Secant Cylindrical Projection

Peter H. Dana 10/01/9



Transverse Cylindrical Projection Surface

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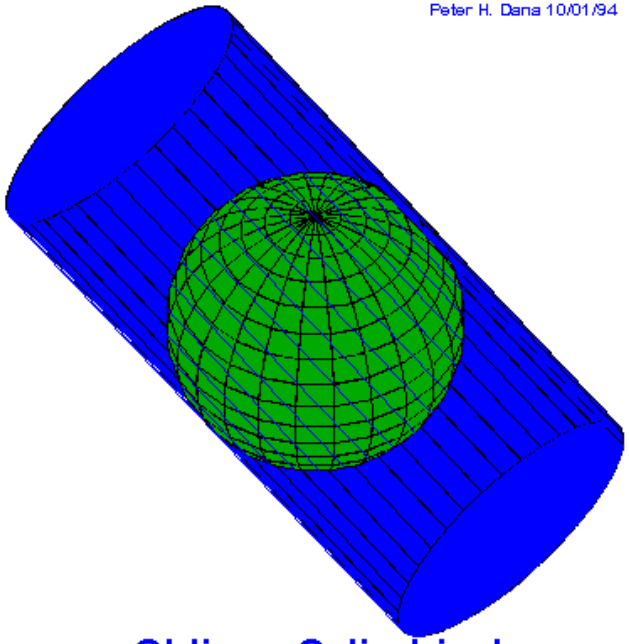
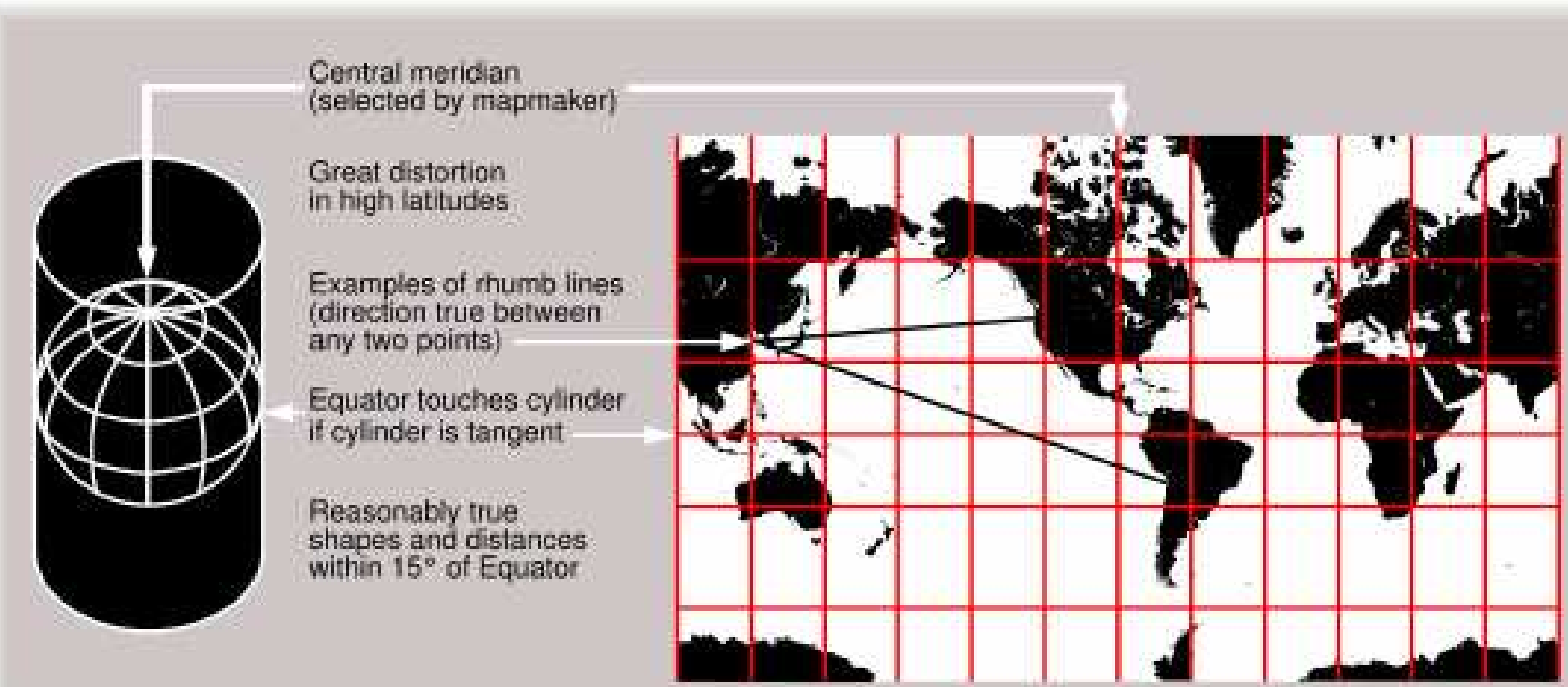
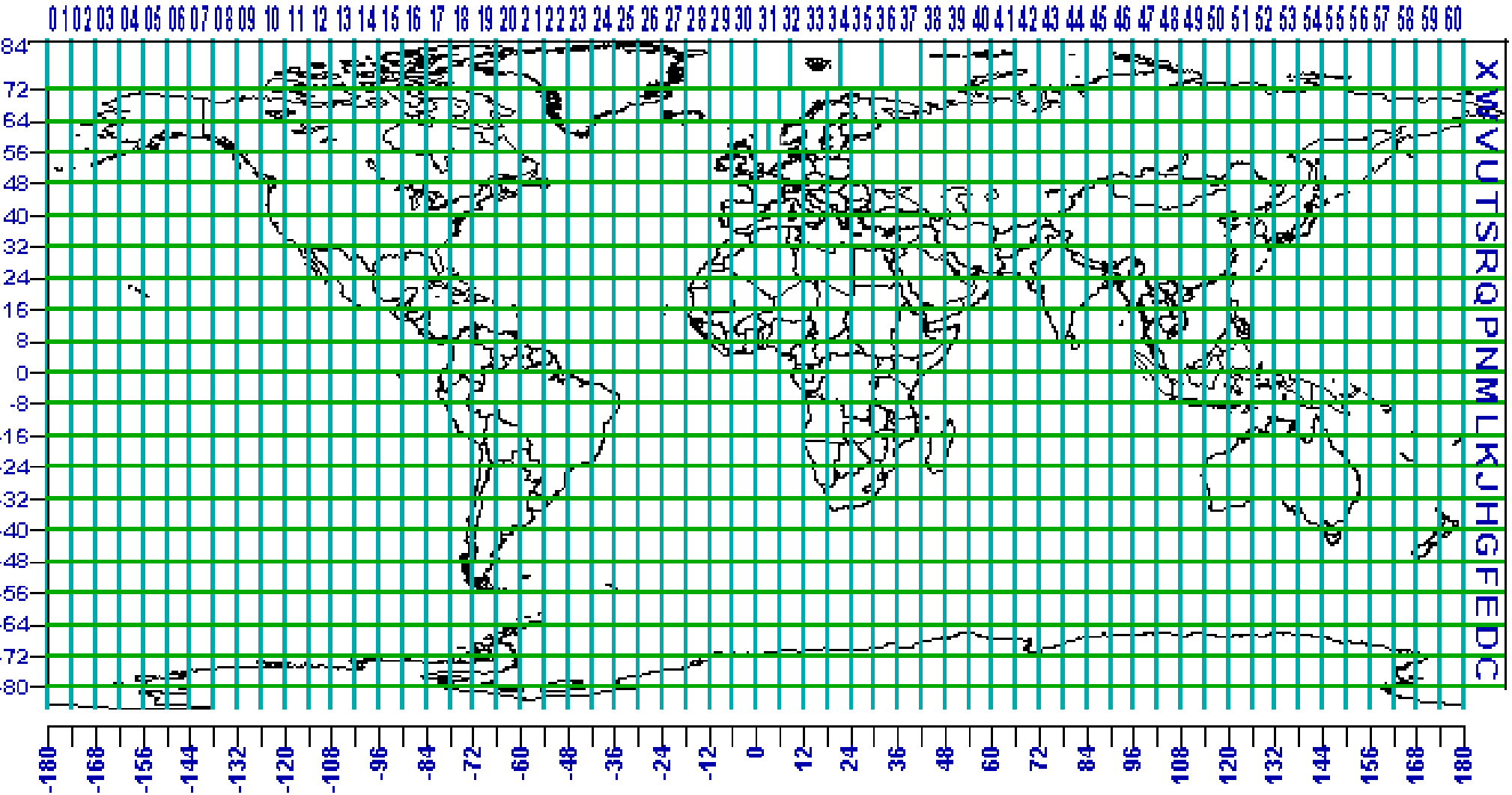


Oblique Cylindrical Projection Surface



he Mercator projection shows courses of constant bearing as straight lines.

UTM Zone Numbers



UTM Zone Designators

Universal Transverse Mercator (UTM) System

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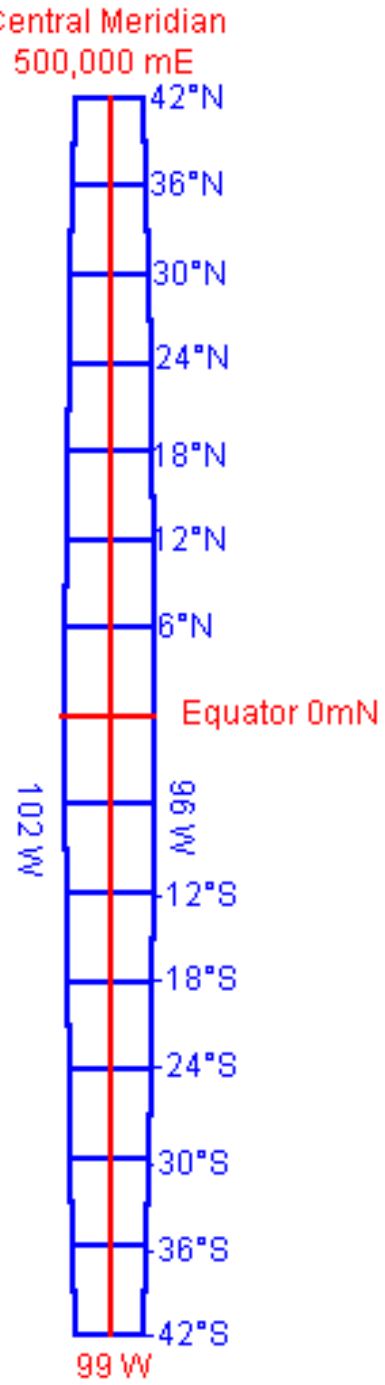
UTM Zone 14
(from 42°South to 42°North)



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Projections commonly used in South Africa:

Geographic

Transverse Mercator: LO (Rtb/Jhb: 27) – (CT 31);
Datum: WGS84; Hartebeesthoek 1994 (meters)

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Data management principles

- **Data flow** (diagram)
- **Tracking** hard copies, conversations and digital data
- **Procedures** (Capturing Methodology)
- **Directory management**
- **File naming standards** (Naming Convention)

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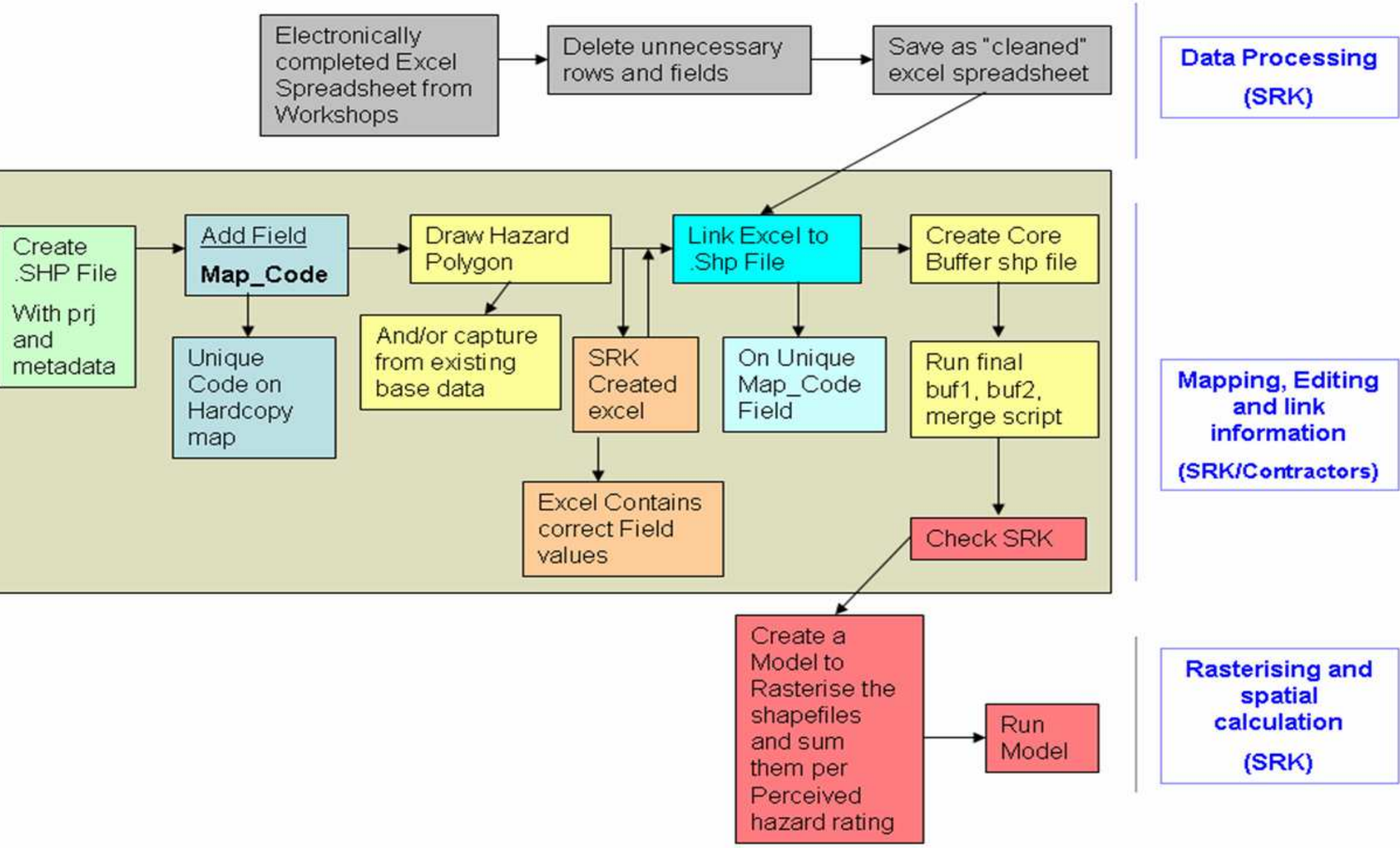
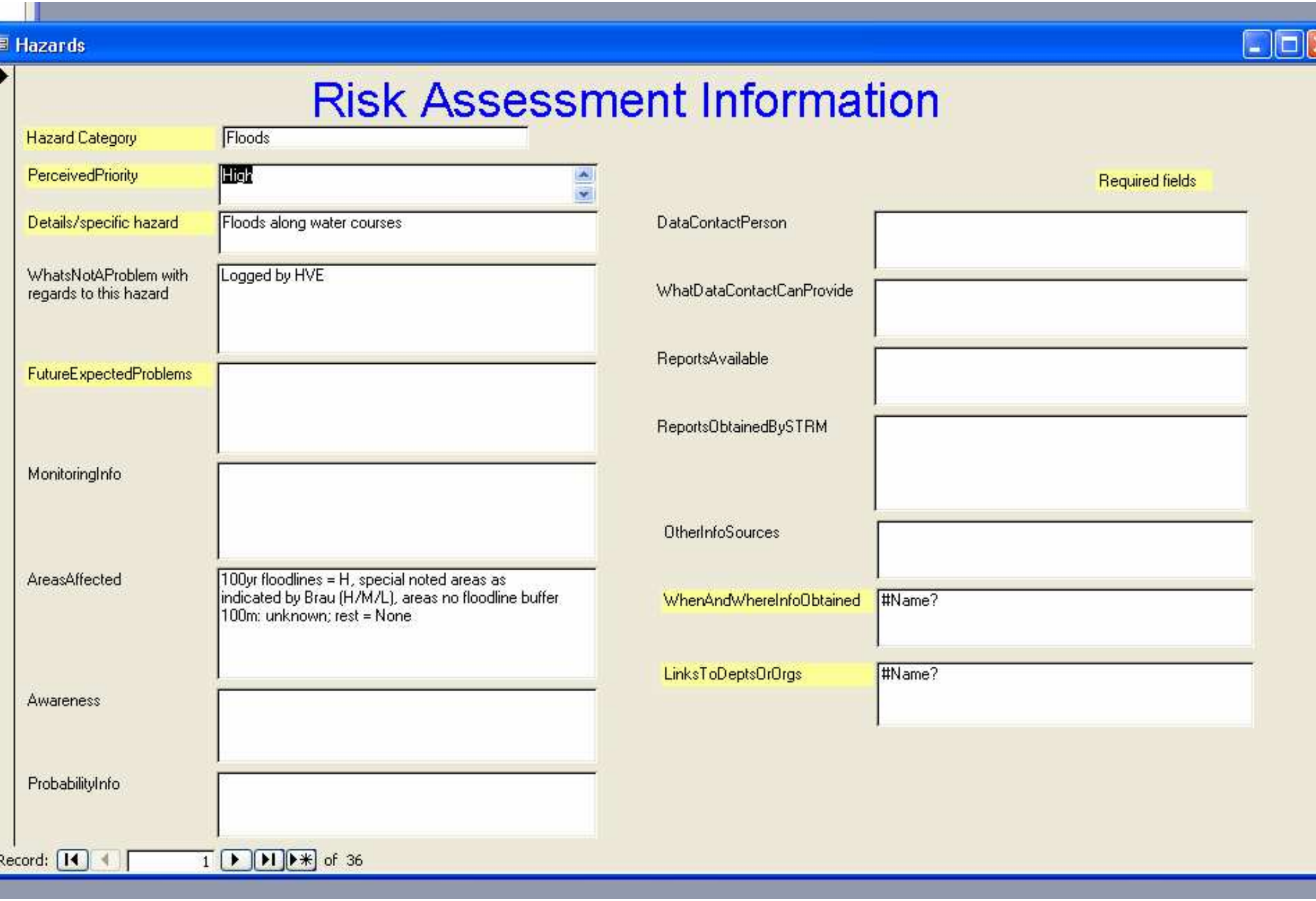

Electronically completed Excel Spreadsheet from Workshops
Delete unnecessary rows and fields
Save as "cleaned" excel spreadsheet
Data Processing (SRK)
Create .SHP File With prj and metadata
Add Field Map_Code
Draw Hazard Polygon
Link Excel to .Shp File
Create Core Buffer shp file
Unique Code on Hardcopy map
And/or capture from existing base data
SRK Created excel
On Unique Map_Code Field
Run final buf1, buf2, merge script
Excel Contains correct Field values
Check SRK
Mapping, Editing and link information (SRK/Contractors)
Create a Model to Rasterise the shapefiles and sum them per Perceived hazard rating
Run Model
Rasterising and spatial calculation (SRK)

Document tracking form

Collect from:	Sibongile Skhosana		
	Ekurhuleni Metropolitan Municipality	**Date:**	20 February 2008
Address:	Sanlam Building, Corner Kempton and Margaret Avenue, Kempton Park	**Project #:**	376200
Copies to:		**Project Engineer:**	Maryna Strydom

Title or Description	**No. of Copies**
MSDF and RSDF documents	1 of each


Hazards
Risk Assessment Information
Hazard Category
Floods
PerceivedPriority
High
Details/specific hazard
Floods along water courses
WhatsNotAProblem with regards to this hazard
Logged by HVE
FutureExpectedProblems
MonitoringInfo
AreasAffected
100yr floodlines = H, special noted areas as indicated by Brau (H/M/L), areas no floodline buffer 100m: unknown; rest = None
Awareness
ProbabilityInfo
Required fields
DataContactPerson
WhatDataContactCanProvide
ReportsAvailable
ReportsObtainedBySTRM
OtherInfoSources
WhenAndWhereInfoObtained
#Name?
LinksToDeptsOrOrgs
#Name?
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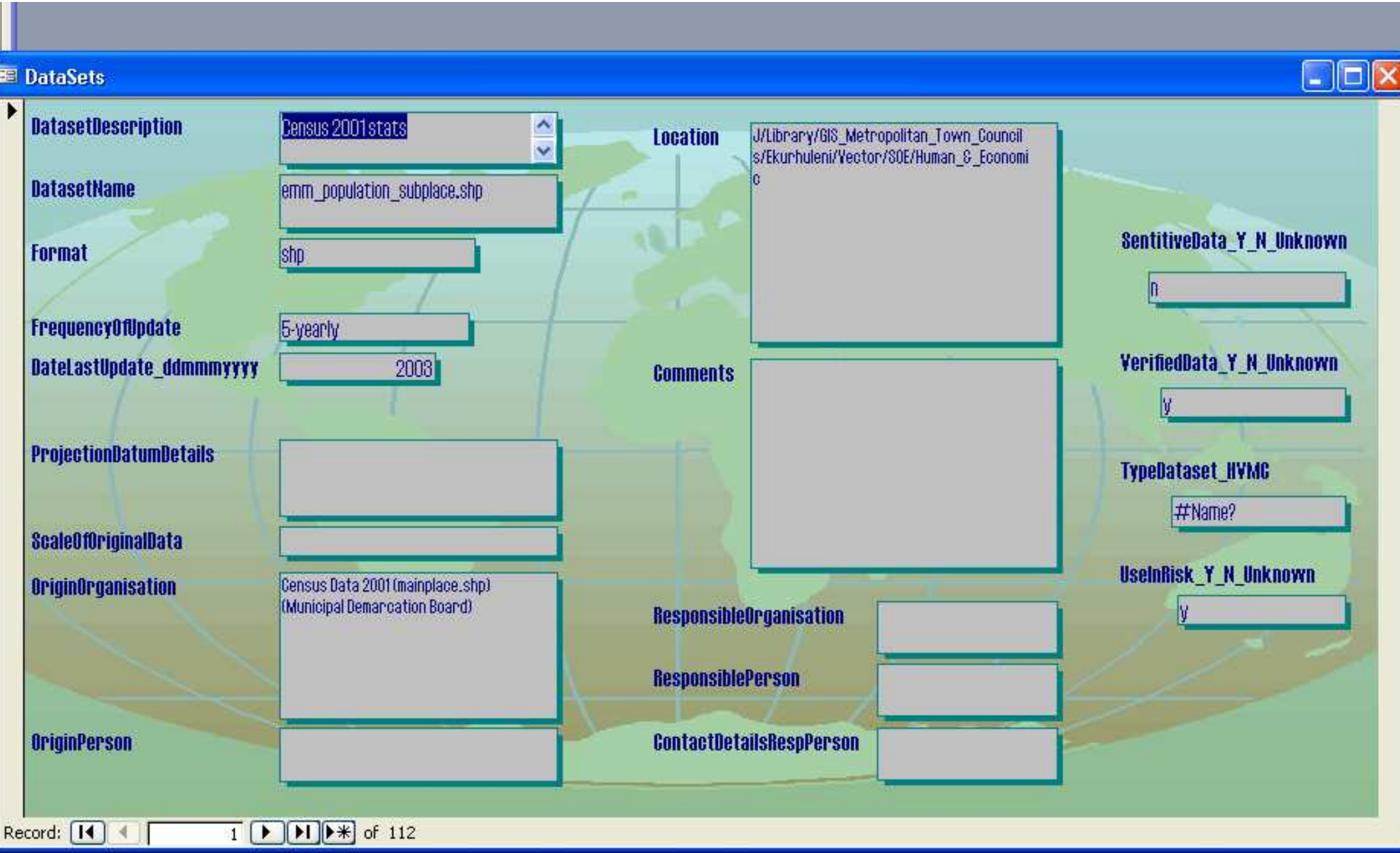
1
of 36


DataSets
DatasetDescription
Census 2001 stats
DatasetName
emm_population_subplace.shp
Format
shp
FrequencyOfUpdate
5-yearly
DateLastUpdate_ddmmmyyyy
2003
ProjectionDatumDetails
ScaleOfOriginalData
OriginOrganisation
Census Data 2001 (mainplace.shp)
(Municipal Demarcation Board)
OriginPerson
Location
J/Library/GIS_Metropolitan_Town_Council
s/Ekurhuleni/Vector/SOE/Human_&_Economi
c
Comments
ResponsibleOrganisation
ResponsiblePerson
ContactDetailsRespPerson
SentitiveData_Y_N_Unknown
n
VerifiedData_Y_N_Unknown
y
TypeDataset_HVMC
#Name?
UseInRisk_Y_N_Unknown
y
Record:
1
of 112

EMM DM Hazards and Contacts - [DataSets _ gapanalysis_table Query : Select Query]

File Edit View Insert Format Records Tools Window Help

DataCategory	DatasetDescription	Comments	OriginOrg	OriginPerson
Atmosphere	Air pollution distribution and content	SRK to obtain from EMM or Arished: Yvonne Scrogie	EMM	Louis de Klerk
Atmosphere	Prevailing wind directions and strenghts			
Atmosphere	Noise contours (for Rand Airport)	Noise Contours for Rand Airport within Ekurhuleni Metropolitan Municipality	ACSA	Airports Company of South Af
Development	EMM IDP		EMM	
Development	Detailed zoning info of EMM			
Electrical	Major Electrical substations			
Electrical	Bulk Electricity lines			
Environmental	Parks and open spaces			
Events	Cultural/political event locations / Municipal building locations used for events			
Events	Location of 2010 stadium (if any?)			
Events	Major tourism features within Metro			
Events	Major sports facilities			
Geological	1:50000 geology map	Detailed geology		
Geological	Geological studies (dolomite)			
Hazardous	Tank farm locations / petrol station locations			
Hazardous	Hazardous materials transport routes			
Hazardous	Major Hazardous Installtions locations			
Hydrological	200yr Indicative floodlines	Roads and Stormwater budget pending, to be appointed by end Dec		
Hydrological	Water supply pumpstations & Reservoirs			
Hydrological	Water pollution: industrial, water quality			
Services	Library	use for events		
Services	Disaster Management Satellite centres locations			
Services	Major shopping malls	use for events		
Sewer	Major sewer outfalls	esp if near rivers		
Transport	Air traffic routes: Rand airport			
Transport	Major traffic problem areas/routes			
Transport	Metro railway stations			
Transport	Airport location: Rand airport			
Transport	EMM bus routes			
Transport	Major traffic nodes			
Transport	Roads of metropolitan significance			
Transport	Street collisions			
Transport	Formal and informal taxi ranks			
Transport	Fly-over birdge crossings			
Transport	Refuse routes and frequency			
Transport	Intersection collisions			

EMM DM Hazards and Contacts - [ContactPersons : Table]

File Edit View Insert Format Records Tools Window Help

Co	Title	ContactNa	ContactSurname	ContactCell	ContactWTel	ContactFax	ContactEmail	Comments	CommunicationDetails
48	Mr	Pat	Adams				padams@ekurhuleni.com		Invited to stakeholder w/shop via e-mail
61	Mr	Ricardo	Afonso		(011) 827 4517			Airtraffic approach paths	Could not get hold of him
86	Mr	Jan	Bloem		(011) 861 2305		solidwaste@ekurhuleni.com		Will send someone to attend
46	Ms	Corrie	Bodenstein		(011) 861 2007		bodenstein@ekuhuleni.com		Invited to stakeholder w/shop via e-mail
14	Mr	Matt	Braune	082 600 5993	(012) 361 8821	(012) 361 9912	mbraune@srk.co.za	Project Director	Invited to stakeholder w/shop via e-mail
8	Ms	Colleen	Chetty		(011) 441 1020		chec@srk.co.za	GIS specialist	Invited to stakeholder w/shop via e-mail
87	Mr	Paul	Claassen		(012) 549-5949	(012) 549-2483	paul@environomics.co.za	Environomics P O Box 44108	Invited via e-mail
74	Mr	Steph	Coetzee	082 572 0282	(011) 921 2371		Steph@ekurhuleni.com	Director: Geological Studies (dolomite)	Will attend, if not ill (phoned when he was ill at hon
69	Mr	Enzo	Cosani				cosa@srk.co.za	Civil hydrology	Will attend s/holder w/shop
62	Mr	Louis	de Klerk	084 513 2217	(011) 456 0020	(011) 741 2144	dklerkwl@ekurhuleni.com	Environmental officer: Planning and coordination	Will attend, to e-mail details
77	Mr	Barend	Deminey		(011) 874 6757			Regional Executive Manager: Railway stations?	Could not get hold
63	Mr	Johan	Dreyer		(011) 861 2404			Chier Area manager	Will get Essie Esterhuizen to attend
84	Ms	Linda	du Plessis			(011) 871 7591		Head: Support	Faxed, asked to please forward to all relevant pers
55	Mr	Louw	Erasmus	083 332 9715	(011) 899 4476	(011) 899 4942	erasmusl@ekurhuleni.com	Emergency Planning	Will attend, to e-mail details
64		Es	Esterhuizen		(011) 861 2404			See: Johan Dreyer	Will attend the stakeholder workshop
58	Mr	Kenny	Fick		(011) 497-3081			Prov. Exec. Manager. MHI's	Could not get hold of him
68	Mr	Andre	Fourie		(011) 861 2472			Parks & open spaces: events	Could not get hold of him
78	Mr	Pieter	Grobler	082 492 1841			groblerp@ekurhuleni.com	Geology/dolomite	Will possibly attend, apologies presented, could no
72	Mr	Hendrik	Groenewald		(011) 861 2334		hendrikg@ekurhuleni.com	With Smuts Marais	Invited via e-mail
56	Mr	Eric	Hulley	082 555 3569	(011) 886-9702		eric@lpgas.co.za; hannerie@lpg	LP Gas installation locations	Spoke to secretary: Hannerie, will invite/send peop
47	Mr	Anthony	Kesten				akesten@ekurhuleni.com		Invited to stakeholder w/shop via e-mail
50	Mr	Oupa	Kgole	082 682 3488	(011) 970 1427				Not invited
85	Mr	Freddie	Kruger		(011) 907-9214/			Emergency services (Fire prevention)	Could not get hold
45	Mr	Francois	Kruger	082 821 5085	(011) 861 2013		fkruger@ekuhuleni.com	Alberton / Southern SDR manager	Invited to stakeholder w/shop via e-mail
54	Mr	Anton	Kruger	082 418 1015	(011) 827 8884			Rand Airport Manager	Airtraffic approach paths. Arranged for stakeholder
65	Mr	Andre	Labuschagne		(011) 617 8414			Risk Manager	Could not get hold of him
49	Mr	Ziggy	Lahle	073 884 9283	(011) 970 1427		ziggyl@ekurhuleni.com		Invited to stakeholder w/shop via e-mail
67	Mr	Sipho	Manana		(011) 617 8210			Public liason officer	Could not get hold of him
70	Mr	Smuts	Marais		(011) 861 2342		smuts@ekurhuleni.com	Tank farm locations, Water pollution: industrial, water quality	Invited via e-mail
57	Mr	G P	Marais	072 808 8992	(011) 861 2007	(011) 861 2012			Not invited
90	Mr	Fanie	Maree	082 576 5447	(011) 861 8828	(011) 861-8951	FanieM@ekurhuleni.com	Geology: Regional Executive Manager: Housing	Could not get hold, apologised, I told him to keep h
79	Mr	Eddie	Marshall		(011) 871 7588			Sports facilities	Retiring - rather speak to Giel/Andre/Johan
88	Mr	Johan	Marx	082 453 2362	(011) 874 6971		MARXJ@ekurhuleni.com	Boksburg	Invited via e-mail
80	Mr	Giel	Meyer		(011) 871 7588		gielm@ekurhuleni.com	Head of sports facilities	Should not be contacted, not part of sports: only p
83	Mr	Bob	Motshabi		(011) 861 2453			EMM bus routes	Attended
51	Ms	Violet	Ndwalawe	082 418 5958	(011) 970 1427		violetnd@ekurhuleni.com		Invited to stakeholder w/shop via e-mail
76		Corne	Pieterse		(011) 861 2251			Solid waste management: Health	Could not get hold
52	Mr	Steven	Podile	082 781 5927					Will attend stakeholder workshop
81	Mr	Johan	Pretorius		(011) 861 2472			Sports complexes	Could not get hold of him
7	Ms	Yvonne	Scorgie	083 266 7849				Sub-contract to SRK for NSOER, can provide air pollution dat	Not invited
59	Mr	Thabang	Shandu	082 299 6016			thabang.shandu@labour.gov.za	Asistant Manager: MHI's	Will send an e-mail to confirm attendance
60		Dudu	Sikonde	072 264 7674				Team leader: MHI's	Could not get hold of him
82		Mandla	Sithole		(011) 456 0001			Noise contours	Could not get hold of him
66	Ms	Sarah	Skinner		(011) 441 6167		skin@srk.co.za		Invited to stakeholder w/shop via e-mail
71	Mr	Rowen	Stow		(011) 861 2337		rowens@ekurhuleni.com		Could not get hold - wrong e-mail address

EMM DM Hazards and Contacts - [DataSets : Table]

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D	DataCategory	DatasetDescription	DatasetName	Format	FrequencyOfUpdate	Comments	OriginOrganisation	OriginPerson	ScaleOfOrig	Projection	ResponsibleC
2	Atmosphere	Noise contours (for Rand Airport)				Noise Contours for Rand Air	ACSA	Airports Compan			
2	Atmosphere	Air pollution distribution and content				SRK to obtain from EMM or	EMM	Louis de Klerk			
2	Atmosphere	Noise contours (for JIA)	emm_noise contours	shp	Unknown	Noise Contours for Johannes	Airports Company o	Mr Badisa Matsh			
2	Atmosphere	Jhb International airport air pollution	emm_buffer_1km_jia_pollution.shp	shp	Unknown	1km buffer around Johannes	SRK	Mr Donald Gibso			
2	Atmosphere	Vehicle emissions	emm_buffer_100m_roads_vehicle_	shp	Unknown	100 meter buffer for roads wi	SRK	Mr Donald Gibso			
1	Atmosphere	Prevailing wind directions and strenghts									
2	Atmosphere	Air pollution	emm_air_pollution_points.shp	shp	Unknown	Proposed Provincial Air Poll	SRK	Mr Vis Reddy, Ai			
2	Atmosphere	Weather station locations									
2	Cadaster	Towns	emm_towns.shp	shp	once-off		Municpal Demarcati	Deon van Baalen			
1	Cadaster	Metro cadastral info (erven, farms, small	Various shapefiles and directories	shp	Unknown		EMM	Deon van Baalen			
2	Cadaster	Suburbs	emm_suburbs.shp	shp	once-off		EMM	Deon van Baalen			
1	Cadaster	EMM boundary	emm_boundary.shp	shp	once-off		Municpal Demarcati				
1	Cadaster	Wards	wards.shp	shp	once-off		EMM	Deon van Baalen			
2	Cadaster	SDR boundaries	emm_sdr_boundary.shp	shp	once-off		EMM	Deon van Baalen			
2	Cadaster	Town boundaries (ccc's)	emm_ccc.shp	shp	once-off		SRK	Tracey de Ponte			
1	Census	Population density 2001	emm_population_density.shp	shp	5-yearly	There's a problem with the c	Census Data 2001 (				
1	Census	Census 2001 stats	emm_population_subplace.shp	shp	5-yearly		Census Data 2001 (				
2	Development	Economic focus areas	Econ_Focus_areas.shp	shp	Unknown		EMM	SDF; Deon van B			
2	Development	Industries	emm_buffer_industries.shp	shp	Unknown	Interpreted from Buffer Zones	GDACE				
2	Development	Disadvantaged areas	Disadvantaged_Areas.shp	shp	Unknown		EMM	SDF; Deon van B			
2	Development	Development areas	Development_Areas.shp	shp	Unknown		EMM	SDF; Deon van B			
2	Development	State of Environment Report	Various shapefiles, some of which	hard cc	5-yearly?		EMM	Louis de Klerk			
2	Development	Land use for spatial development framew	SDF_Land_Use.shp	shp	Unknown		EMM	SDF; Deon van B			
1	Development	Spatial development framework	SDF2003.shp	shp	Unknown		EMM	SDF; Deon van B			
1	Development	Detailed zoning info of EMM									
2	Development	Factories	emm_factory.shp	shp	Unknown	Interpreted from Buffer Zones	GDACE				
2	Development	Industries	emm_industries_category_1.shp	shp	Unknown	Interpreted from Buffer Zones	GDACE				
2	Development	Industries	emm_industries_category_2.shp	shp	Unknown	Interpreted from Buffer Zones	GDACE				
1	Development	EMM IDP		hard cc			EMM				
2	Electrical	Bulk Electricity lines									
2	Electrical	Major Electrical substations									
2	Environmenta	Parks and open spaces									
2	Environmenta	Land degradation index	emm_combined_degradation_inde			Land degradation - combine		Hoffman et al (20			
1	Environmenta	Archaeological sites	emm_archaeology.shp	shp	Unknown	Known archaeological sites	Private Heritage Cor	Locations receive			
1	Environmenta	Protected areas	emm_protected_areas.shp	shp	Unknown	Areas of Conservation Impor	Gauteng Conservati				
2	Environmenta	Bird sanctuaries	emm_bird_sanctuaries.shp	shp	Unknown	lat and long points only?	Received latitude an				
2	Environmenta	Protected areas (international significanc	emm_ramsar_site.shp	shp	once-off	point only, need polygon loc	SRK	D Gibson			
2	Environmenta	Erosion	emm_erosion_prediction.shp	shp	Unknown		Gauteng Natural Re				
2	Environmenta	Land cover	emm_nlc2000.shp	shp	5-yearly	National Land Cover 2000 Ve	ARC	Terry Newby			
1	Environmenta	Conservation plan	emm_c_plan.shp	shp	Unknown		Gauteng Conservati				
2	Events	Cultural/political event locations / Munici									
2	Events	Arts and culture sites	emm_arts_culture_&_heritage.shp	shp	Unknown		EMM	Draft Masterplan			
2	Events	Location of 2010 stadium (if any?)									
1	Events	Major sports facilities									

Metadata

- **Title** of the dataset
- **Creation date**
- **Abstrac**t – description of dataset and any methods used to derive it
- **Metadata author** – details on user and organization creating the data or capturing the metadata
- **Themes/categories** relevant to the data
- **Coordinate system and geographic bounding**
- Authorised **Distributor**
- **Publication format** – Software version and extensions used to create the software

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Data analyses

- **Document** the models that are used (mathematical formulas and actual programs/tools/scripts)

Storage/curation of data

OECD Principles and Guidelines

(ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT)

- Declaration on Access to Research Data from Public Funding
- Facilitate cost-effective **access** to the data

- RSA adopted the Declaration – leader country for Africa: “Observer member”

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OECD Principles:
motivation for sharing and promoting access to spatial data

- Openness
- Flexibility
- Transparency
- Legal conformity
- Protection of intellectual property
- Formal responsibility
- Professionalism
- Interoperatibility
- Quality
- Security
- Efficiency
- Accountability
- Sustainability

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Africa's Data:

- List of core data sets for Africa is available on EIS website www.eis-africa.org/EIS-Africa/publications/

- A lot of this data is available in repositories outside of Africa; a lot of data is still only available in hard copy maps. One problem with all this data is that there is **lack of metadata**. The best metadata often comes from the foreign repositories.

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Whose responsibility is the curation of data ?

- Researcher / individual / (organisation) need to have the **means** to curate
- Organisation needs to have the **work flow** to manage the data
- **Centralised vs Decentralised**; where and who should curate?
- **Networking** is important within a distributed model: **standards** and a **clearing house** is necessary for the country/per province?

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Concluding remarks

- Spatial data types, representation and formats
- X and Y axes, and offsets
- Projections
- Data management principles
- Metadata
- Data analyses
- Storage/Curation

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