GIS Applications

Lecture 5

Tutorial/practical

- http://franzy.yolasite.com
- http://franzysgeo-place.yolasite.com/

Cadastral Records and land information

- Importance:
  - Access to and use of land is fundamental to life
  - i.e food, fiber, habitation, recreation etc…

Cadastral Records and land information

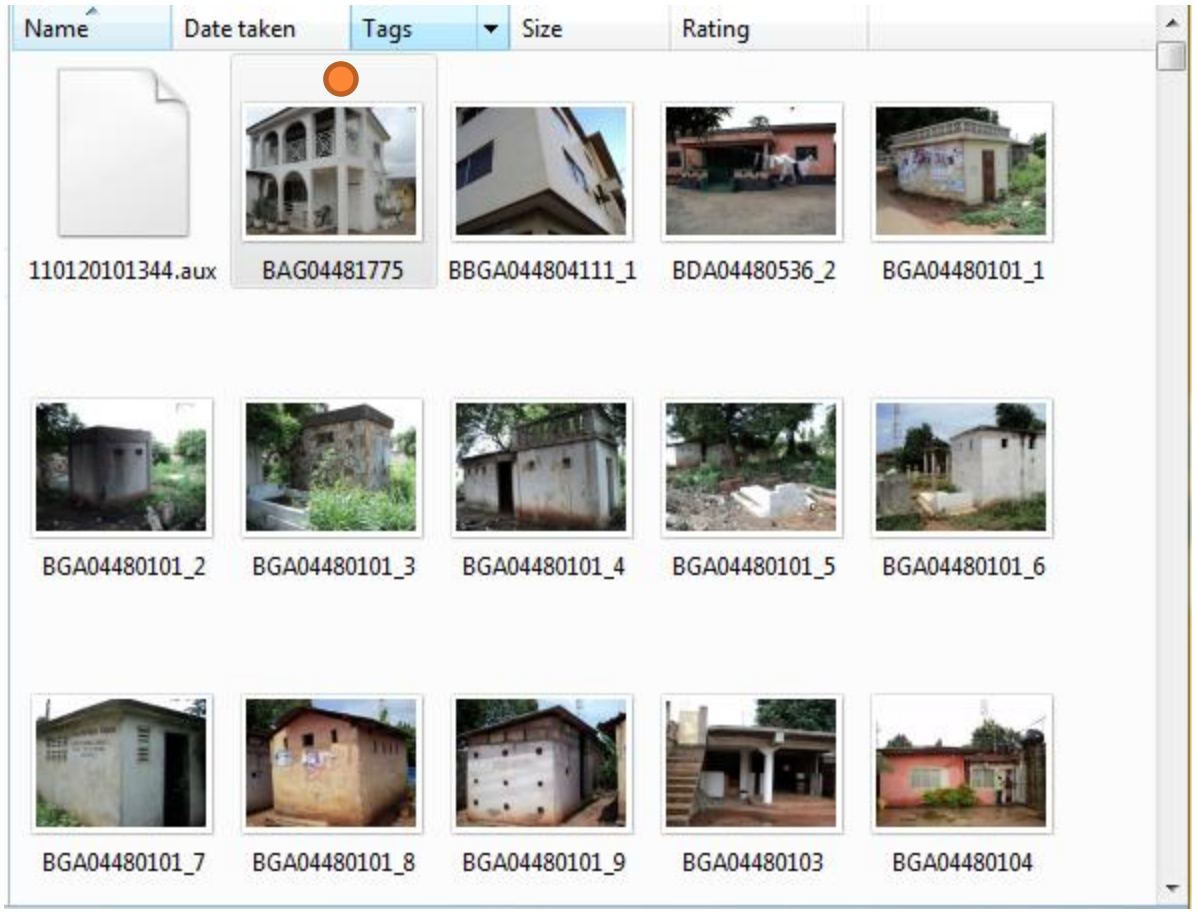
- Need for the most current, reliable land information is necessary
- Why?
  - land planning
  - infrastructure development and maintenance,
  - environmental protection and resource management
  - emergency services
  - social service programs
  - and so forth

Cadastral Records and land information

- Cadastral records are the basis for
  - land markets,
  - development,
  - and other economic activity
- **GIS issues in land records**
- Using GIS we are able to relate "legal" description of property to coordinate-based systems
  - relate a record of information to this attribute

Cadastral Records and land information

- Overlapping boundaries of adjacent parcels
- Complex nature of some attribute relations- buy a flat from a multi- story building
- Strata plans- contains a detailed pictorial description of lots within a strata complex
- The 'strata' part of the term refers to apartments being on different levels, or "strata"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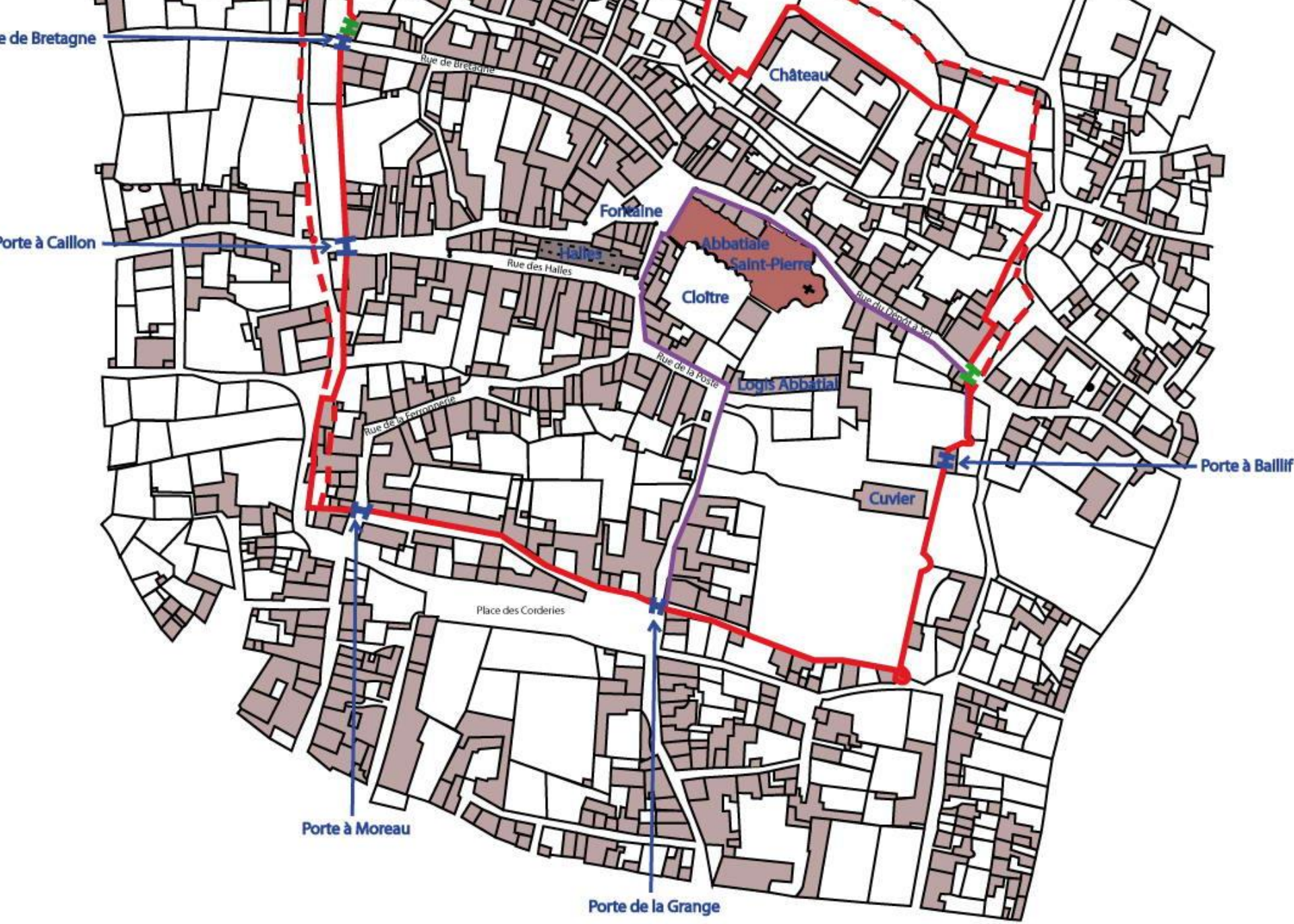
- A strata survey is a legal survey which describes a volume of space, for example:
- a) an apartment in an apartment building;
- b) a store in a shopping centre;
- c) an underground tunnel; or
- d) an overhead walkway.

Cadastral Records and land information

- Cadastre
- In the broader context a cadastre is a description of legal and fiscal interests in land whereas typically it is management of land ownership records.
  - *A legal cadastre-* parcel-based description of interests or rights in real property; typically supported by titles or deeds, and registry
  - *Fiscal cadastre* -property valuation and land taxation.

Cadastral Records and land information

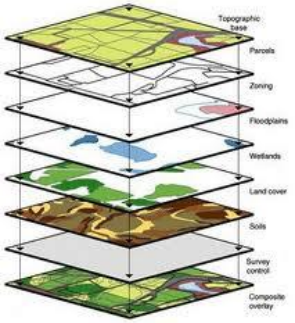
- Functions of a legal cadastre:
  - define property rights (often in conjunction with formal and case law)
  - describe the extent (spatial, sometimes temporal) of property rights
  - support land transfer
  - provide evidence of ownership (e.g., using land as collateral)
  - program administration (e.g., enforcement of laws, targeting of incentives)
  - public land management



Plan de Mathieu Chartier, basé sur le plan cadastral ancien

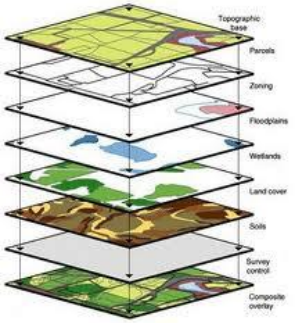
Cadastral Records and land information - Definitions

- Functions of fiscal cadastre (from Dale and McLaughlin, 1988):
  - information base for property taxation
  - distribution of funds from public programs
  - monitoring and supporting land markets
  - information for growth management and land use planning



Land information system (LIS)

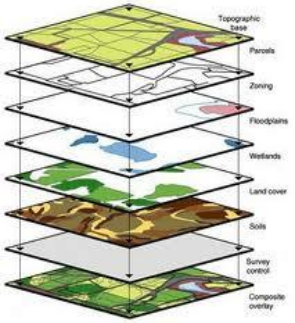
- An LIS is a system that provides the means to acquire, manage, retrieve, analyse, display land records.
- (GIS)
- The question as to whether LIS is component of GIS or vice-versa has been has been part of a long-standing debate
  - semantics and disciplinary orientation
- A typical LIS has
  - a cadastre as a primary component and
  - it is maintained by unit of government responsible for tracking land ownership, control



Land information system (LIS)

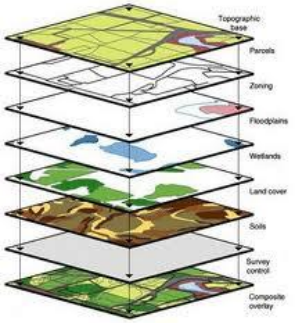
- An LIS deals with the parcel as the basic unit of spatial representation of land
- In LISs we deal with relatively large (cartographic) scale
  - e.g., 1:4800 in rural areas, 1:1200 in developed areas

LISs are GISs on parcels



Land information system (LIS)

- An LIS deals with the parcel as the basic unit of spatial representation of land
- In LISs we deal with relatively large (cartographic) scale
  - e.g., 1:4800 in rural areas, 1:1200 in developed areas
- A land information system serves as bridge between legal (e.g., deeds) and technical (e.g., maps, GIS coordinates) land descriptions

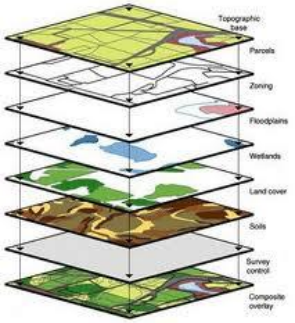


LAND INFORMATION SYSTEM (LIS)

- LIS incorporates other technologies
  - Parcel indexing system
  - Fische-a stable way to archive data/storage media
  - Surveying (via GPS DPT, etc)

multipurpose cadastre

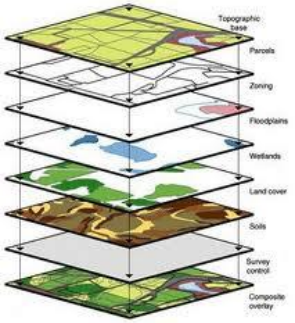
- recognition of the limitations in manual systems
- proposed automated methods for managing land records, linking to other spatial data
- parcel as primary organizing principle



LAND INFORMATION SYSTEM (LIS)

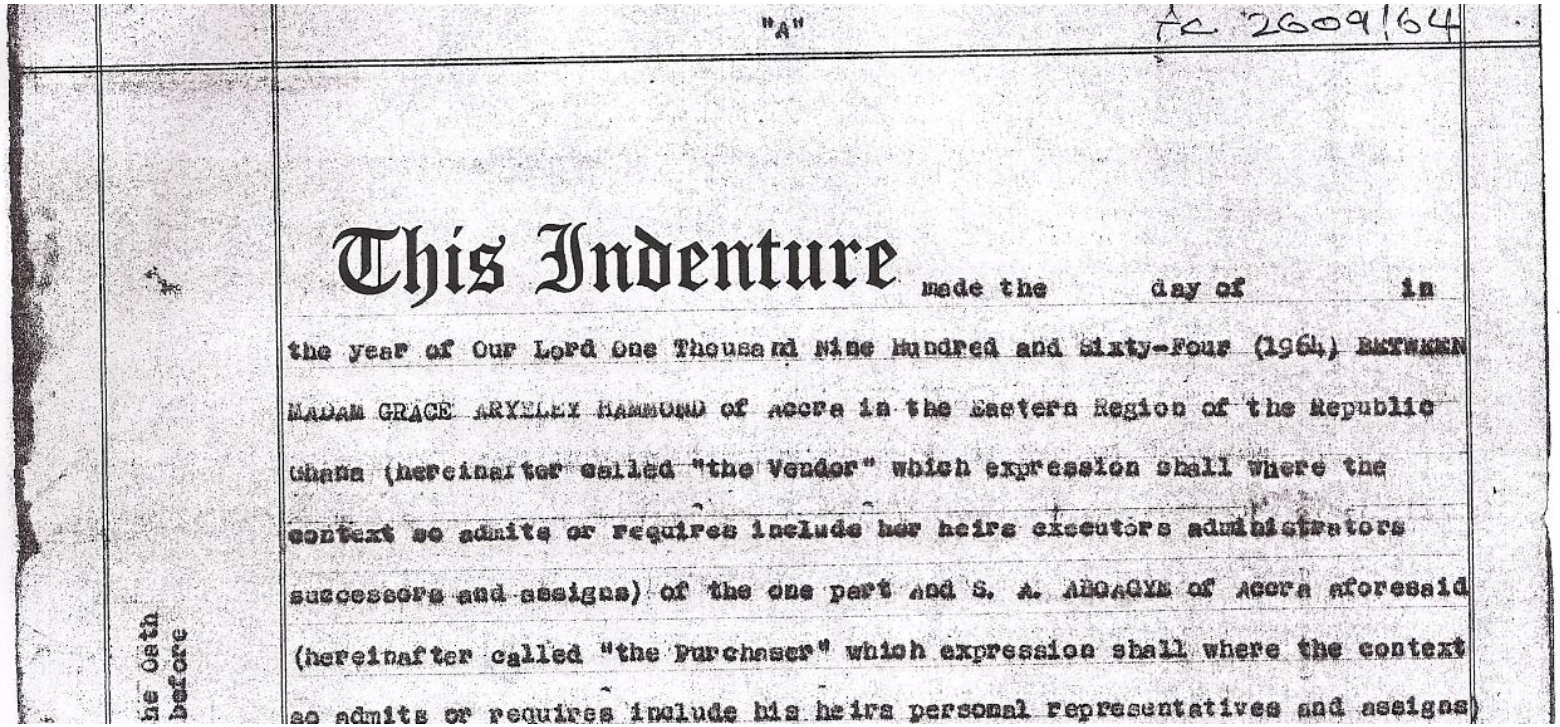
multipurpose land information system

- Alternative to multipurpose cadastre
- Parcels as one component of layer-based system
- oriented to integration and analysis of data
- geodetic reference framework as organizing principle-
- Knowledge in Coordinate References Systems.



LAND INFORMATION SYSTEM (LIS)

- Land Tenure- Land ownership
- Land tenure basically deals with the rights and obligations that individuals or corporate entities have in land, along with system for defining and governing.
- Definition of rights
  - "bundle of sticks"- possible ways of using land-individuals and state
  - rules and procedures defining who possesses which sticks
  - responsibilities -- obligations of tenure possessor



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This Indenture

made the day of in the year of Our Lord One Thousand Nine Hundred and Sixty-Four (1964) BETWEEN MADAM GRACE ARYELEE HAMMOND of Accra in the Eastern Region of the Republic Ghana (hereinafter called "the Vendor" which expression shall where the context so admits or requires include her heirs executors administrators successors and assigns) of the one part and S. A. ABOAGYE of Accra aforesaid (hereinafter called "the Purchaser" which expression shall where the context so admits or requires include his heirs personal representatives and assigns)

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before

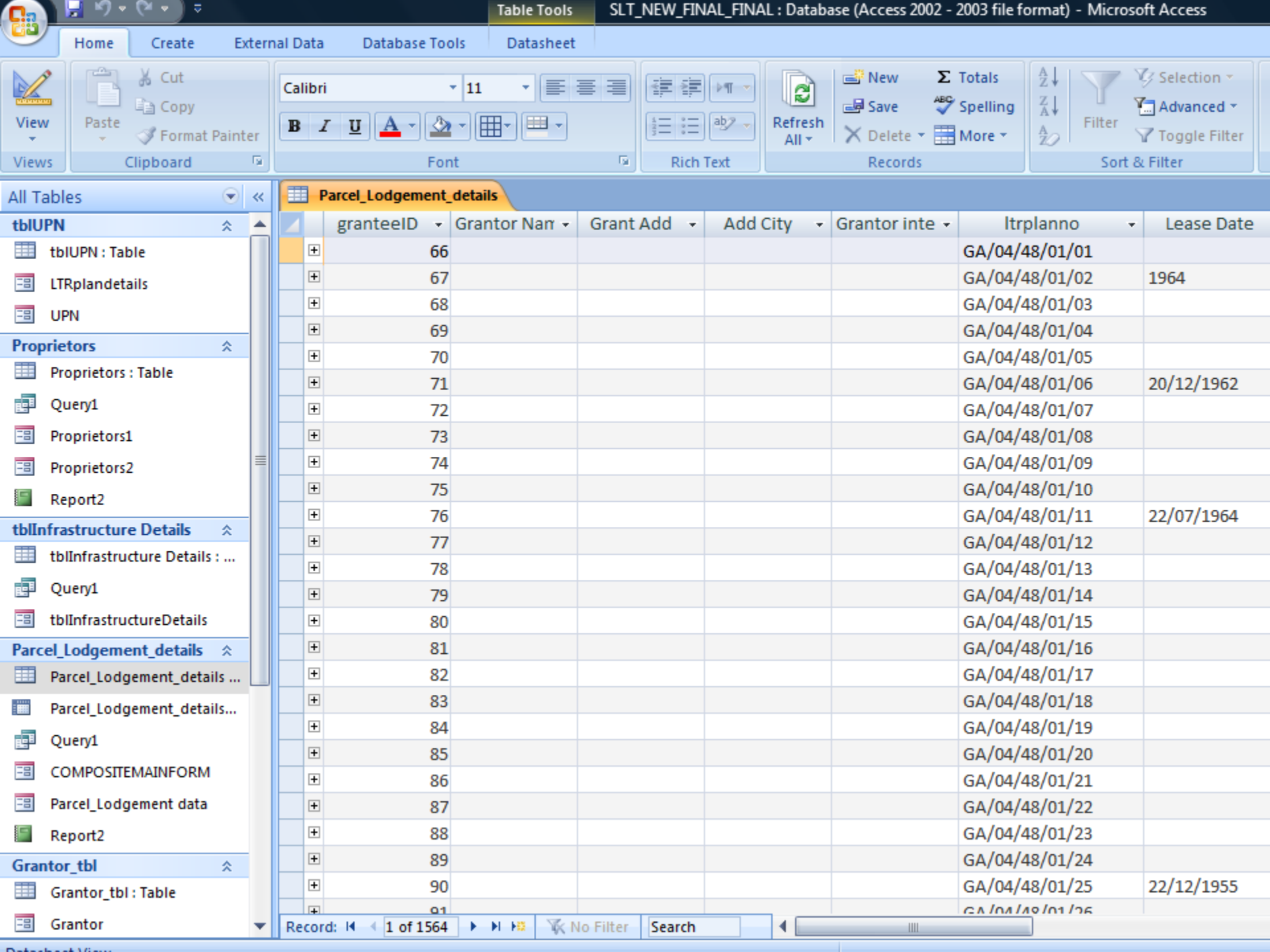
Table Tools
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Database Tools
Datasheet
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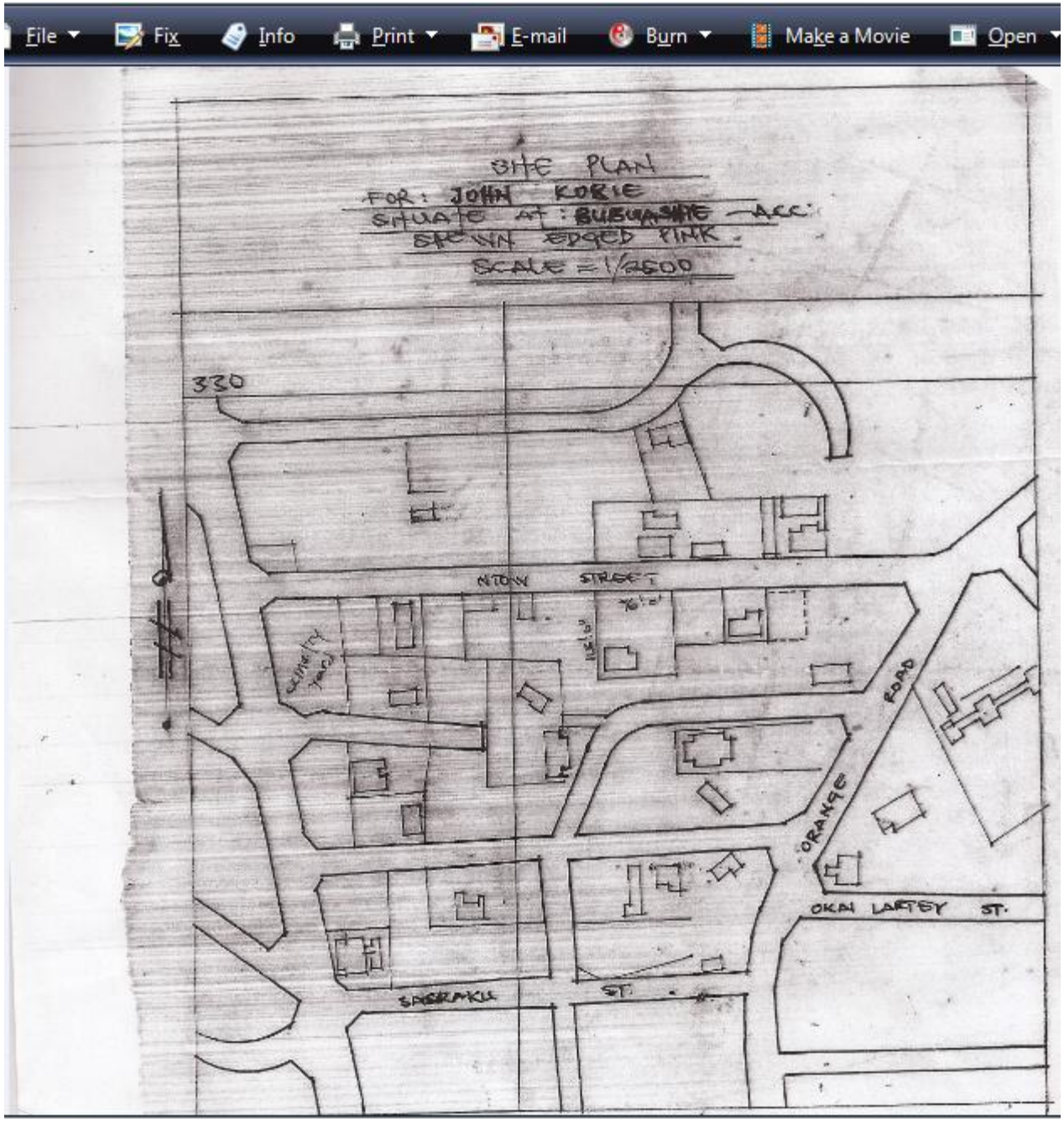
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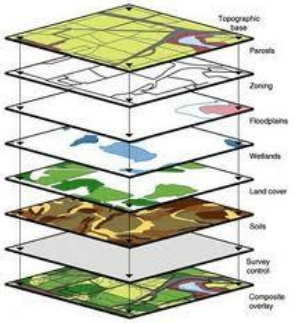


Land information system (LIS)

- Many components amenable to automation
- Titles -- a description of a land parcel, potentially including:
  - description of location or boundary (e.g., bearings and distances survey description, metes and bounds description, public land survey system reference, lot number in platted subdivision, etc.)
  - method of conveyance (e.g., warranty deed, quit claim, etc.)
  - "Torrens" system, found in some British commonwealth nations, government backs claim to land title

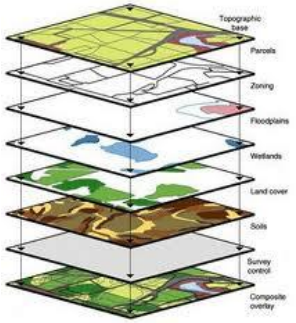
Land information system (LIS)

- Deeds - registration of land transaction with public authority (Register of Deeds)
  - land transaction are between individuals (no government guarantee)
  - only required government record is real estate transfer tax notice
  - registration is essentially voluntary, though typically done to support claim to land
  - grantor and grantee (conveyed from, to) used to organize records (manual system --> "book, volume, page" is reference)
- chains of title - a fully supported land claim must be traced back to original conveyance from government or crown, evidence tracing through all transactions to present is chain of title; *abstract* is summarization of chain of title

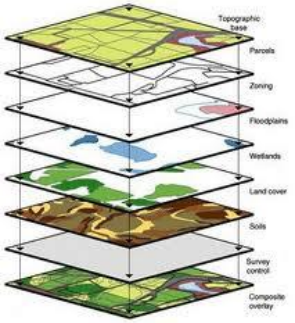
LIS

- Grantor and Grantee (conveyed from, to)
- Organisation of records
- (manual system --> "book, volume, page" is reference)

Land information system (LIS)



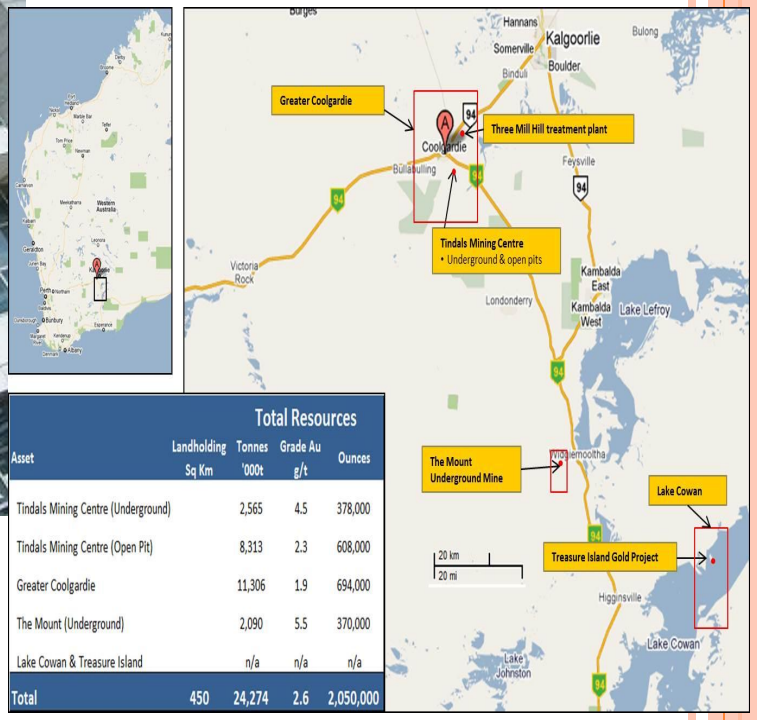
- Indexes -- to make chains of title easier to research, Register of Deeds may create *grantor/grantee* index, or *parcel* index. If all parcels are uniquely identified and linked to GIS representation, can search spatially into parcel index
- Tax rolls, tax maps -- other than Registry (which is maintained as public service) the main interest of local government in land ownership information is tax assessment. Tax rolls and associated tax maps:
  - account for all lands, their value and their owner.
  - may or may not be directly linked to Registry
  - may or may not be derived from deed/title descriptions
  - often used as source of data for GIS (Registry typically not involved in mapping)
  - often not maintained at accuracy needed to convey land, only to assess and collect taxes



Land information system (LIS)

- related "layers" -- assessment, zoning, permits, etc.
- private records
  - title insurance - private backing of title validity
  - title abstracts - summarization of evidence about ownership
  - plat maps -- approximations of land ownership parcels, derived from a variety of public and private data sources

Facilities Management- using GIS



Total Resources				
Asset	Landholding Sq Km	Tonnes '000t	Grade Au g/t	Ounces
Tindals Mining Centre (Underground)		2,565	4.5	378,000
Tindals Mining Centre (Open Pit)		8,313	2.3	608,000
Greater Coolgardie		11,306	1.9	694,000
The Mount (Underground)		2,090	5.5	370,000
Lake Cowan & Treasure Island		n/a	n/a	n/a
Total	450	24,274	2.6	2,050,000

Facilities Management using GIS

- Some of the earliest applications of GIS in facility management were related to
  - pavement management at airports,
  - municipal water and wastewater infrastructure, and
  - electric utility distribution.
- The spatial data that exists in a facility geodatabase has often been developed from aerial imagery or global positioning system-enabled (GPS) field data collection practices.
- The limitation of these data collection techniques is that they are blind to building interiors.
- Aerial photography cannot see through the roof!

Facilities Management using GIS

- Geospatial analysis and visualization can be applied to business processes that occur inside buildings
- How?
- New technologies and techniques -information about the insides of a building, such as
- CAD floor plans or
- building information models (BIM),
- with the surrounding landscape-level geospatial data framework.

Facilities Management using GIS

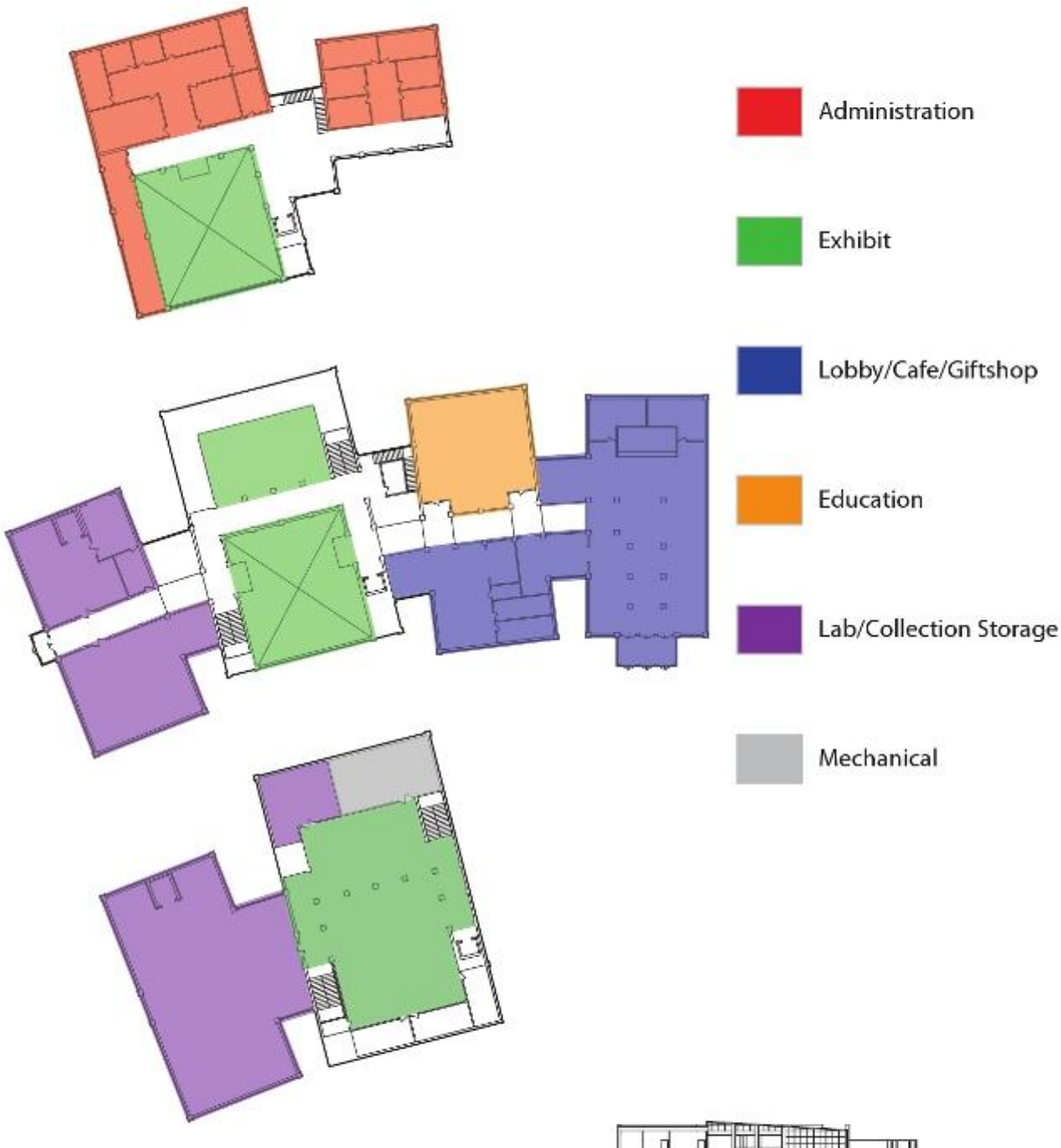
- None of the enterprise applications used within the arena of facility management have
- advanced spatial analytic capabilities
- to support business processes that
- span geographic areas or provide complex scenario modelling that includes multidimensional visualization including
- 3D (space),
- 4D (time) and
- 5D (money).
- But GIS supports integration!

Facilities Management using GIS

- **Example of DATA integration USING GIS:**
- Combining cost data with the visualization of space and occupancy across the campus
- • Analyzing routing barriers for disabled persons for use during evacuation planning and emergency action planning
- • Conducting visualization of energy consumption data at the room level while simultaneously managing maintenance workflows for mechanical, electrical and plumbing systems for a nationwide facility infrastructure
- • Managing security concerns both inside and outside buildings, across regions and continents, simultaneously (4D) and contiguously (3D)

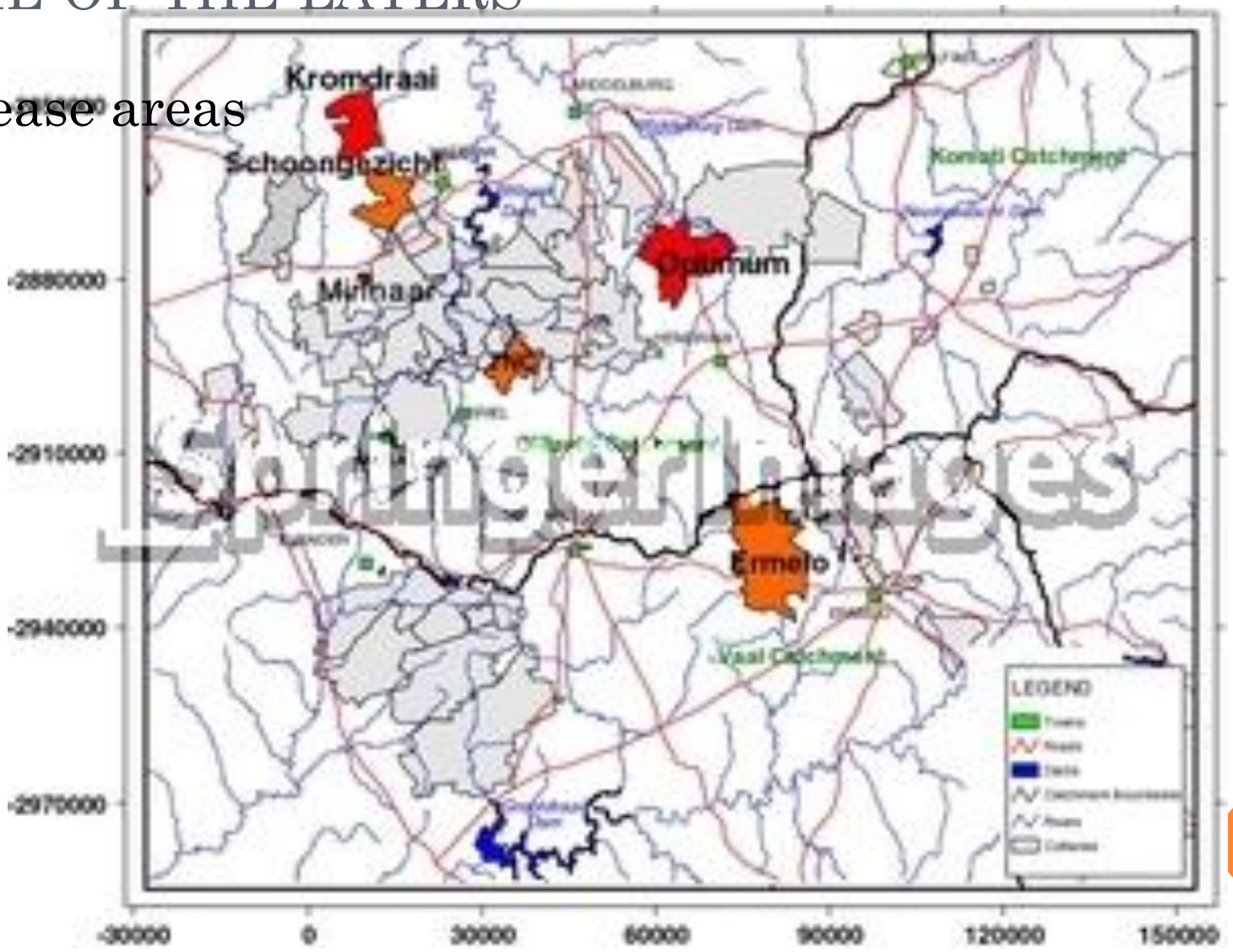
Facilities Management using GIS- Some of the layers

1. Space use and type definitions


Administration
Exhibit
Lobby/Cafe/Giftshop
Education
Lab/Collection Storage
Mechanical

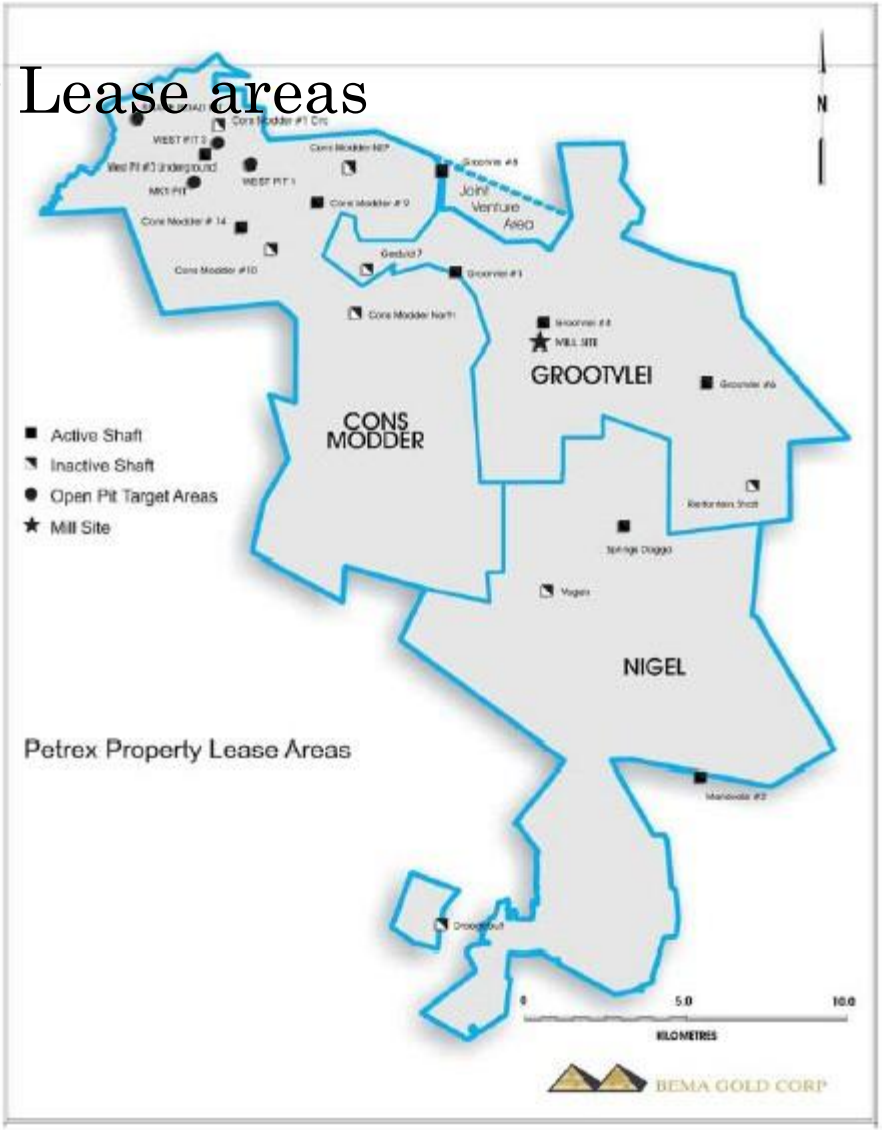
Facilities Management using GIS- Some of the layers

1. Lease areas



Facilities Management using GIS- Some of the layers

1. Property Lease areas

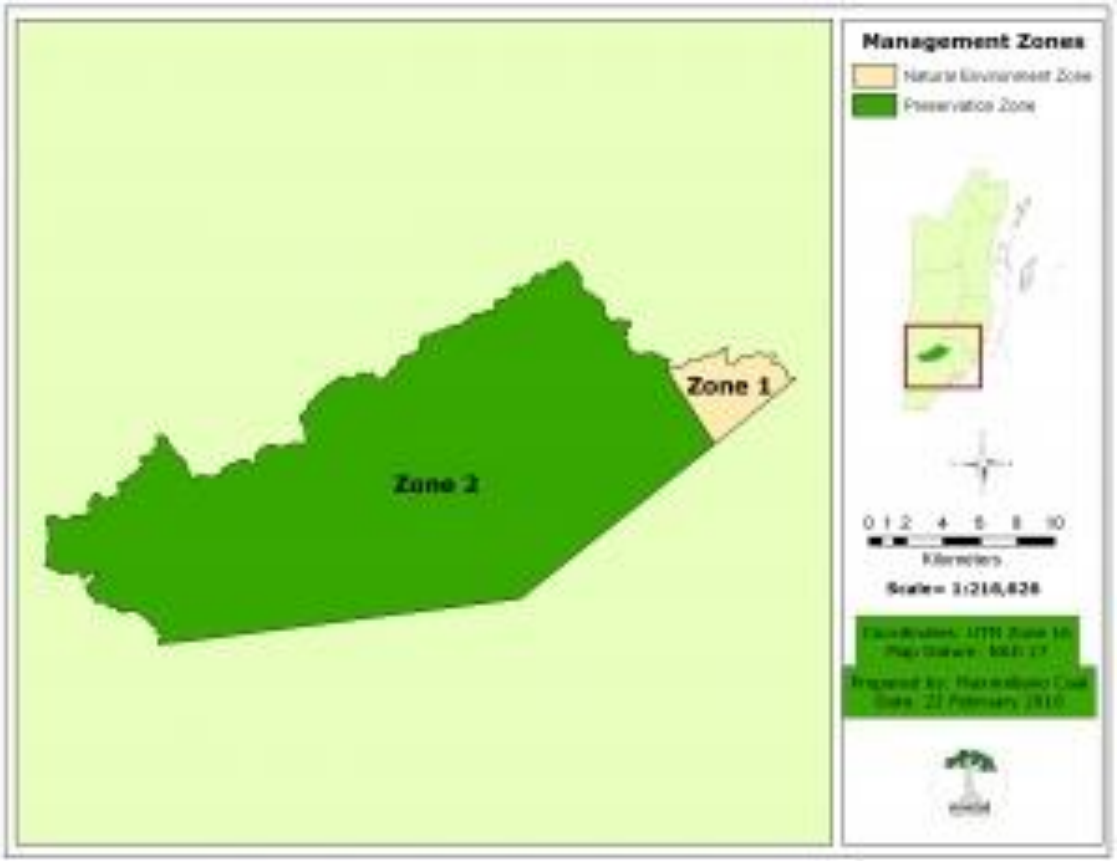


Facilities Management using GIS- Some of the layers

1. Security zones

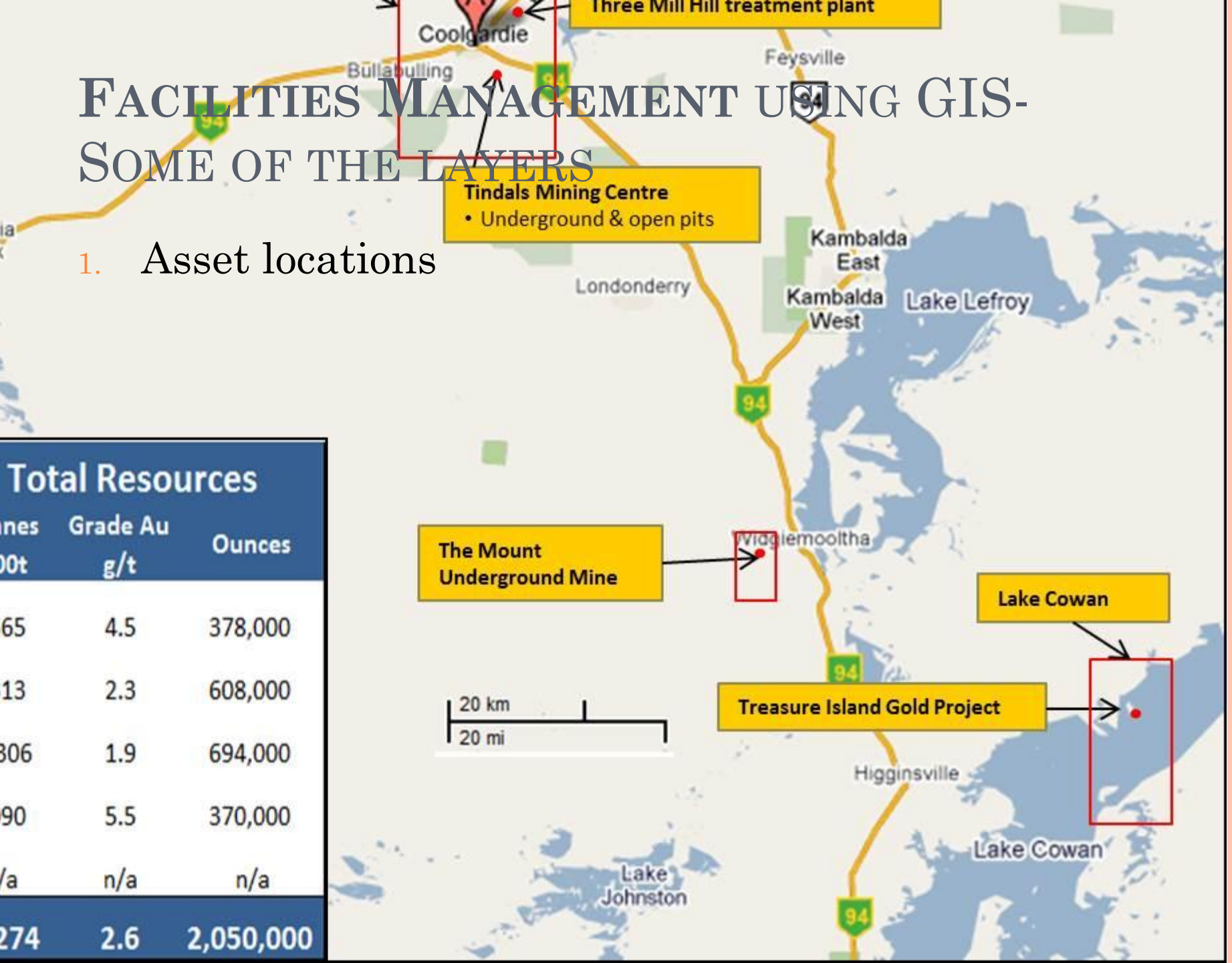
Facilities Management using GIS- Some of the layers

1. Management zones



Facilities Management using GIS- Some of the Layers

1. Asset locations



Total Resources		
nes 00t	Grade Au g/t	Ounces
65	4.5	378,000
13	2.3	608,000
806	1.9	694,000
90	5.5	370,000
/a	n/a	n/a
274	2.6	2,050,000

Facilities Management using GIS- Some of the layers

1. Evacuation areas

Evacuation drill

Before this happens

Facilities Management using GIS- Some of the layers

- Navigable routes
- Once this basic data has been added to the GIS, it is possible to provide geospatial support:
- Grouping multi-building and multisite work orders **by location** to reduce transportation and logistics costs
- Data at the room **Visualizing energy consumption** , building and/or enterprise level over time
- Analyzing **space use**, space availability and space optimization across campus or regional extents
- **Conducting building condition assessments**, fire safety inspections and asset inventories using handheld, location-aware (GPS-enabled) devices.

Facilities Management using GIS- Some of the layers

- Analyzing and **visualizing lease performance** metrics across the portfolio, regardless of geographic extent
- • Analyzing, route mapping and reporting of Americans/Ghanaians with Disabilities Act (ADA) **compliance** and/or ADA facility and fixture availability across the campus or portfolio
- • Visualizing the **impact of proposed building projects** on the campus environment
- • Conducting **line of sight analysis** for special events
- • **Modeling the impact of proposed use changes** on the supporting utility infrastructure
- • Visualizing proposed **space planning scenarios**