Web Mapping & Engineering Drawings

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Presentation Outline

- **Overview of BurnabyMap**
- **Overview of Engineering Drawings application**
- **Demo of Engineering Drawings application**
- **Q & A**
- **Webmap team:**
  - » Brian Sameshima, Chief Information Officer – Information Services
  - » James Ko, Mapping Technician – Engineering Systems
  - » Jas Dhudwal, System Analyst – Information Services
  - » George Bitcon, Programmer Analyst – Information Services
  - » Elsie Prevette, Planning Tech./Info Systems – Planning Department
  - » Terry Richard, Mapping Technician – Engineering Systems

Overview of BurnabyMap

- **BurnabyMap 1.0 Intranet service launched in 2000**
  - » ArcIMS 3.0, browser based [MS Internet Explorer only]
  - » Standard layout and user interface
  - » Limited data, query and reporting capabilities
- **BurnabyMap 2.0 Intranet and Internet service launched in 2001**
  - » ArcIMS 3.1
  - » Revised layout to maximize use of screen real-estate
  - » Simplified user interface [collapsible layer list, no "active" layer etc.]
  - » More powerful tools [.pdf printing, "drill-down" etc.]
  - » Additional data, query and reporting
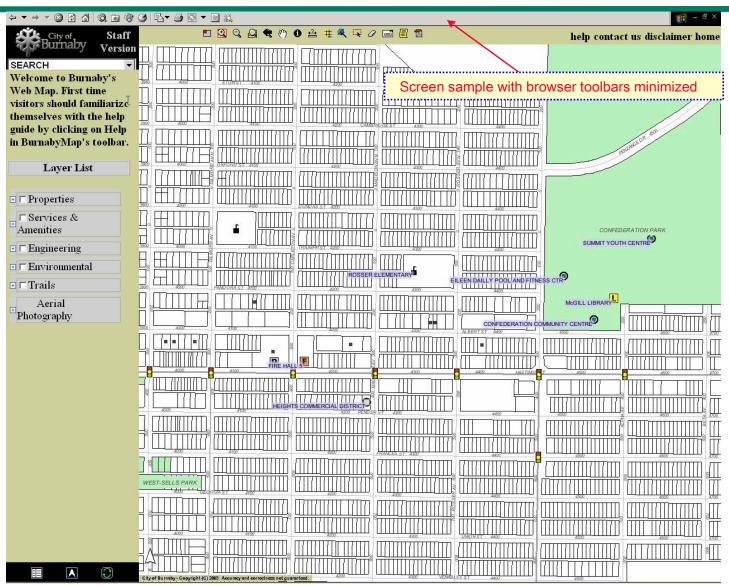- **BurnabyMap 3.0 Intranet and Internet coming soon**
  - » Portal front-end, new front-counter applications, etc.
  - » Always adding new data and stealing ideas from other WebMaps!

Demo of BurnabyMap

- **Screen layout, tools and user interface**
  - » Multi-function left frame [layers, legend, queries and reports]
  - » PDF print facility from **www.geocortex.net**
- **Data Layers**
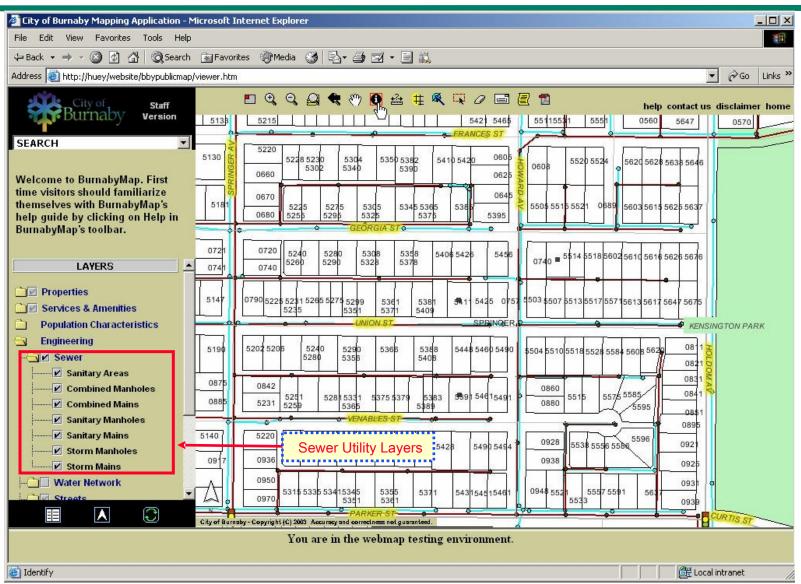- **Query capabilities**
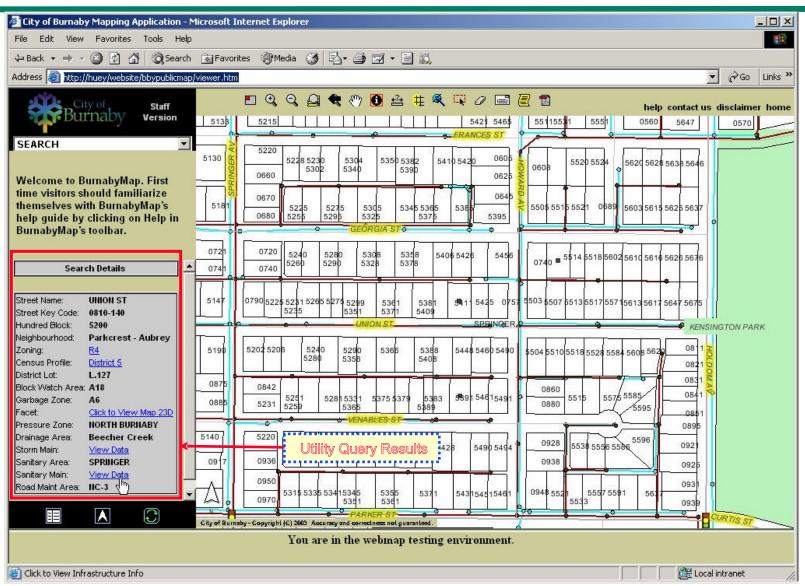- **Infrastructure data and queries**
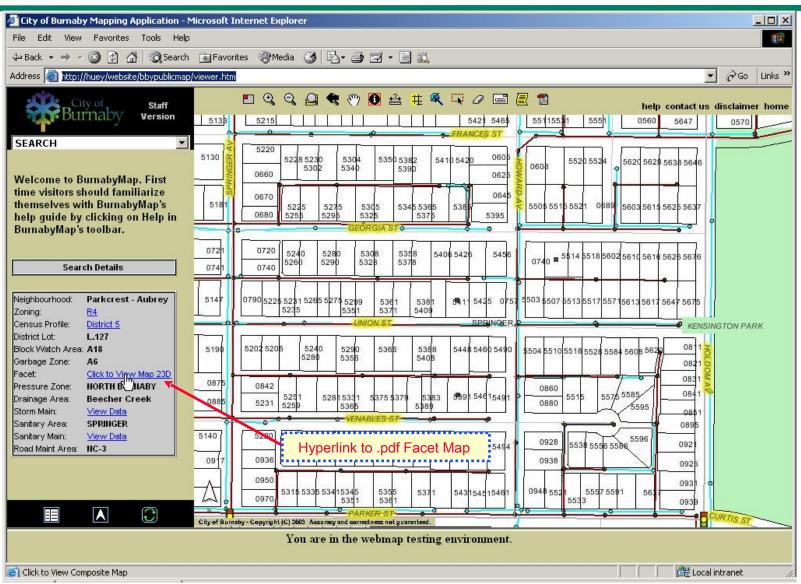
Webmap layout

Screen sample with browser toolbars minimized

Infrastructure Layers

Search Details

Hyperlink to Facet Map
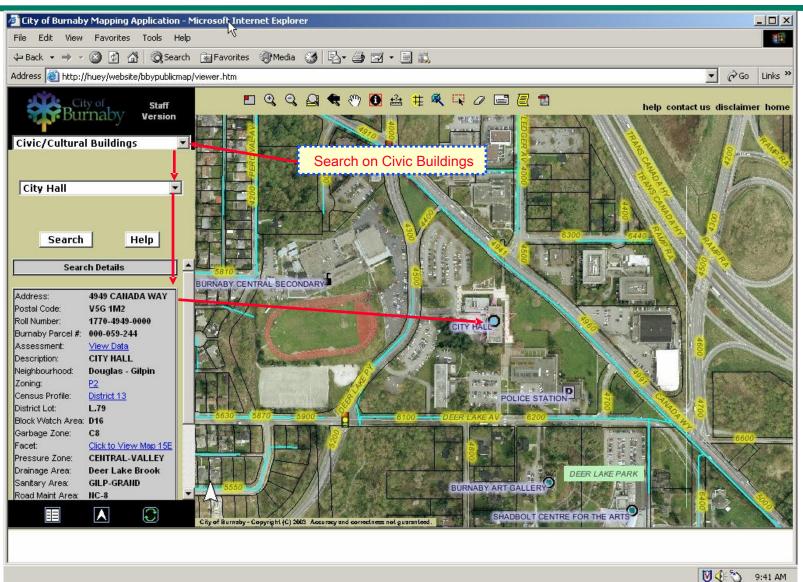

Hyperlink to .pdf Facet Map

Facet Map

Composite Map

Legend

Search Capabilities

Generate PDF files

PDF map generation tool

PDF map layout details

User specifies Title, Map Notes, Size, Scale

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PDF Map

PDF map with legend

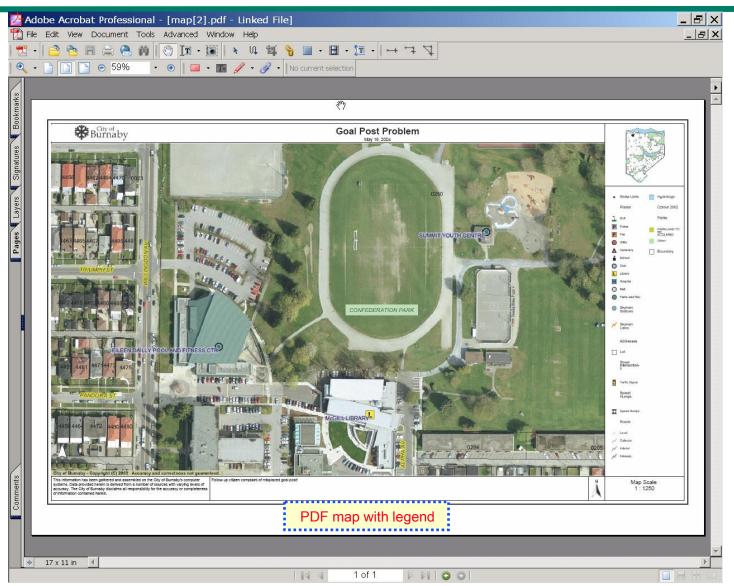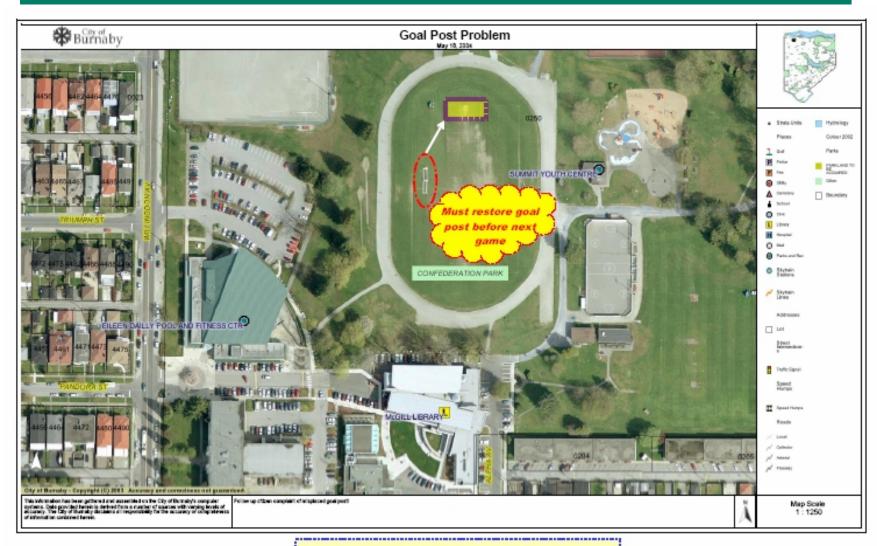# Redlining and Annotating Using Acrobat

Overview of Engineering Drawings project

- **Project Background**

- **Why use a GIS for Engineering Drawings?**

- **Engineering Drawings application characteristics**
  - » Document indexing
  - » Document retrieval
  - » Document usage

- **Demo of Engineering Drawings application**

- **What we've learned**

- **What's next**

Project Background

- **Burnaby has approximately 25,000 engineering drawings.**
- **Requirements: (1) backup; (2) on-line access from any PC**
- **The lowest cost scan conversion service [<$1.00 per drawing]:**
  - » Each document placed on flatbed table and microfilmed
  - » Microfilm images automatically scanned by machine
  - » CD-ROMs containing TIFF 4 images + Drawing IDs referenced to filenames
  - » NO index to support access via spatial or attribute query
- **Staff preference for hardcopy originals rather than digital copies**
- **Spatial document Indexing & Retrieval facility required because:**
  - » Resistance to change. Goal: to 'win' users by saving their time.
  - » Had to be easy to use and guaranteed to find what user is looking for.

Why use GIS for Eng. Drawing access?

- **DBMS is perfect for storage / retrieval of non-spatial documents:**
  - » Indexing on selected attributes to optimize query retrieval
  - » Query with Boolean logic on attribute values
- **DBMS (without spatial processing) is problematic for spatial documents:**
  - » The basic problem is to identify what is contained within a picture.
  - » What alphanumeric data accurately describes a picture?
    - ③Attribute data entry/verification [e.g. 6-12 fields, 50-100 characters]
    - ③Any errors [spelling, abbreviations, punctuation] compromise query
    - ③Cannot **guarantee** that <u>all</u> relevant documents will be found
- **GIS technology is the natural solution for spatially related documents:**
  - » Index and query on combined spatial and attribute data

Overview of spatial indexing and retrieval

- **'Spatial Index' polygon corresponding to area covered by each Drawing**

- **Retrieval based upon spatial query:**
  - » Query-Point [e.g. Hydrant ID] in Drawing-Polygon
  - » Query-Line [e.g. Water Main ID] intersecting Drawing-Polygon
  - » Query-Polygon [e.g. Parcel ID] intersecting Drawing-Polygon
  - » Buffered Query-Point/Line/Polygon intersecting Drawing-Polygon

- **GIS technology is the natural solution for spatial documents!**
  - » No need to identify what is contained within a picture
  - » Attribute data [e.g.drawing type, date] can optionally be used to refine query
  - » Reduced cost and effort to create and to use
  - » **Guarantees** that <u>all</u> relevant documents will be found

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Engineering Drawings application

- **Spatial Document Indexing Facility**
  - » Based upon ESRI's MapObjects and Microsoft Visual Basic
  - » Developed for the City of Burnaby by GDS & Assoc.
  - » Most of indexing work done by student temp. staff
  - » Maintained by drafting staff via ArcMAP update into ArcSDE
- **Spatial Document Retrieval via BurnabyMap**
  - » Browser-based service using ESRI's ArcIMS [Internet Map Server]
  - » Developed by Burnaby staff, with consulting support by Inform Systems Ltd.
- **User processing of retrieved documents**
  - » Adobe Acrobat6Pro to scale, measure, crop, annotate, save and print
  - » Print full-size on Océ TDS400 36" laser, or reduced size on any laser printer
  - » Also acquired 36" scanner for rescanning poor quality documents

Spatial Document Indexing Facility

- **Design parameters**
  - » Visual Basic with ESRI's MapObjects application running on a PC
  - » Performance goal: 1 min. per document
- **Functional specifications**
  - » key-in address or intersection contained within drawing
  - » zoom to base-map centered on identified location
  - » draw bounding box in Drawing window
  - » select two identifiable points in both Drawing and Map windows
  - » software automatically 'rotates' and 'calibrates' the drawing and map spaces
  - » software automatically converts bounding box to map space coordinates
  - » create RDBMS attribute record with drawing ID, type and year etc.

Spatial Document Query Facility

- **Design goals**
  - » Query response time: < 10 seconds
- **Technology platform**
  - » Burnaby WebMap: Intranet/Internet service based on MS IE 5+ ArcIMS
- **Functional specifications: Combined Spatial and Attribute query**
  - » Spatial Query
    - ③ specify ANY spatial feature [i.e. point, line, polygon]
    - ③ specify spatial feature either through GUI or by keying attribute [e.g. address]
    - ③ generalized selection set with optional buffer around specified feature
    - ③ optional selection criteria [e.g.. Contained within, Intersection with etc.]
  - » Attribute Query
    - ③ Boolean logic on any attribute field(s)

A Simple Concept with Wide Applicability

- **Suitable for any form of business data that is spatially related:**
  - » Works with any file type – e.g. .pdf, .doc, .dxf, .jpg, etc.

- **Index shapes can be used as 'folders' for groupings of documents**
  - » Project based records
  - » "Existing geometry" based [e.g. park boundary, planning zone boundary etc.]

- **Potential to tie spatial indexing approach to generalized and industry standard Electronic Document Management packages [e.g. PC Docs]**
  - » Many documents can be easily geo-coded and linked to spatial features in GIS [e.g. Parcel address, Infrastructure-ID etc.]

- **Spatial document indexing and retrieval is just as natural a GIS application as mailing labels**

What we've learned!

- **GIS based spatial document retrieval even better than expected!**
  - » Query response time about 8 seconds to select 100 drawings from 25,000
  - » Display time about 1 second per drawing [depends on viewer and file size]
- **Need full service before rollout:**
  - » Most users are very resistant to change. They appreciate convenience, efficiency and ease of use—but still want hardcopy.
  - » Print-to-scale a requirement for most Engineering users [36" laser printer].
  - » Lack of access to 'foreign utilities' is an issue for some.
- **Image quality issues**
  - » Monochrome vs Grayscale images.
- **Underestimated cost/effort of index build, and amount of rescanning**

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Future Plans

- **Provide public access to Engineering Drawings via Internet WebMap?**

- **Add other spatial documents**
  - » Foreign utilities?
  - » Other departments and data [e.g. Planning, Parks, Survey etc.]

- **Provide enhanced query/retrieval services**
  - » Query by address
  - » Query by zone polygons
  - » Tighter coupling with Acrobat

Demo of Engineering Drawings app.

- **Spatial query & report:**
  - » Specify spatial query area
  - » Generate report of drawings that intersect spatial query area
  - » View drawings with appropriate viewer [.tif and .dwf]
  - » Save selected drawings to folder
- **Process via Acrobat:**
  - » Create multi-page .pdf file. Rearrange/remove pages if required.
  - » Measuring and cropping
  - » "Redline" annotation
  - » Save & email
  - » Printing and scaling

Engineering Drawings

Select Features

Specify selection method

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Select by Polygon

Complete selection by Line or Polygon

Selected As-builts

Each pink polygon represents a drawing that intersects selection polygon

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Create report of selected drawings

Create a Report of selected drawings

Find desired drawing

Scroll through list of selected drawings sorted by type

Hyperlink to DWF viewer

View of .dwf drawing

DWF viewer functionality

Layers Option

Turn layer on/off

DWF properties

Hyperlink to TIF drawing

Hyperlink to selected drawing with appropriate .tif or .dwf viewer

TIF viewer

Shareware browser plug-in .tif viewer

TIF Magnifier

Saving file

Save .tif drawing for processing in Acrobat

Acrobat: distance calibration

Calibrate drawing scale using Acrobat distance measurement tool and scale specification

Scale Calculation Parameters

Measured distance = 3.37"

Actual distance = 275 + 275 + 300 = 850'

Scale Bar Calibration

Measured distance = 3.37"

Key-in "scale bar" calibration

Calculate Scale Correction

Calculated scale correction factor for printing:
True-Distance / Measured-distance = 8.50/3.37 = 2.52 = 252%

Crop tool

Crop scanned image for printing @ 36x48"

Cropped Image

Cropped image ready for printing

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Print to Scale

Key-in scale correction to print @ original scale

Questions & Answers

- **Q & A**

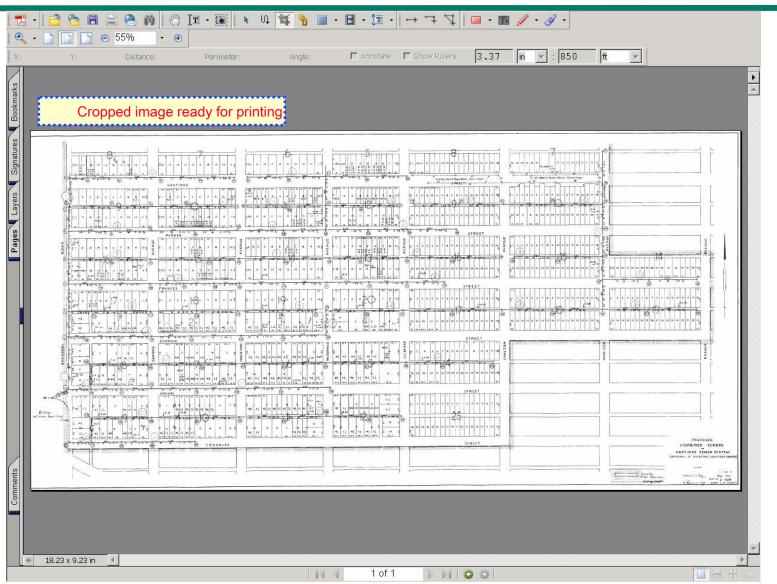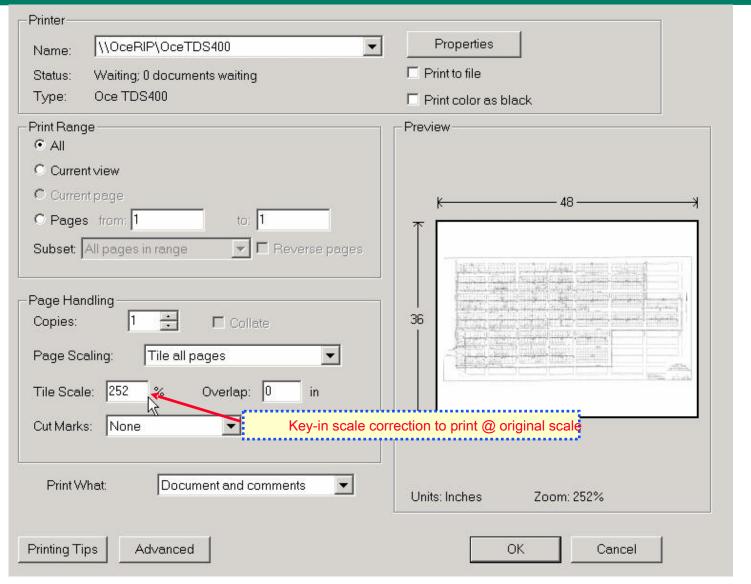---

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