ParcelMap BC
Compiling a Parcel Fabric for the Province of British Columbia

Presented by: Ellen Styner (General Manager) and Wendy Amy (GIS Manager)
Who is MNC?

- MNC is a geomatics engineering firm with a qualified team of surveyors, geomatics engineers, survey technicians and GIS specialists

- Established 20 years ago in Calgary Alberta

- Experts in Surface Land Mapping (Cadastral, Parcel, Disposition)

- Esri users since 2002

- Esri Silver Partner
- Alberta Title parcels (1.9 million) and Cadastral (250K Plans) since 1998
- Alberta Disposition Mapping since 2005 (½ million parcels)
- Property Parcel Fabric for Manitoba Hydro in Esri’s Parcel Fabric - 2012 (1.5 million parcels)
- ParcelMap BC build completed in 2017 (2 million parcels)
The Land Title and Survey Authority of British Columbia (LTSA)

- Responsible for land titles and survey systems in British Columbia (BC)

- Stakeholders had a longstanding need for an easy, efficient means of accessing land title and survey information

- Intuitive map-based access
Primary goal for the ParcelMap BC (PMBC) project is to create and develop an operational model for a **single, complete, trusted** and **sustainable** visual representation of lands within a given parcel and its relationship to adjacent parcels.

<table>
<thead>
<tr>
<th>Objective</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>Includes parcel fabrics for all local government areas including municipalities, the rural areas of all Regional Districts, and all surveyed parcels of provincial Crown lands.</td>
</tr>
<tr>
<td>Complete</td>
<td>Includes all active parcels in the provincial Crown Land Registry and all parcels with active titles in the LTSA’s Land Title Register.</td>
</tr>
<tr>
<td>Trusted</td>
<td>The parcel fabric will adhere to standards for parcel attribution, topology, currency, auditability and spatial accuracy. New surveys are to adhere to spatial accuracy standards, and as a result, the quality of the entire parcel fabric will improve over time.</td>
</tr>
<tr>
<td>Sustainable</td>
<td>PMBC parcel fabric and operational framework is financially sustainable and will be maintained and enhanced over time by LTSA with guidance from our stakeholders.</td>
</tr>
</tbody>
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MNC Scope for PMBC – Three Elements

#1 CADASTRAL TIE COLLECTION
To support accuracy assessments and on-going spatial improvements

#2 PARCEL FABRIC
Single, complete, trusted and sustainable (conversion and compilation)

#3 SURVEY PLAN SUBMISSIONS
Web based digital plan submission and checking system
Field Tie Collection

To support accuracy assessments and on-going spatial improvements
Field CAD Tie Collection Process

- **Challenge**: Collecting, checking and managing the survey data (spatial and metadata) in an affordable way

- ArcGIS Online; CAD tie planning and workflow management

- Configured ArcGIS Collector; field tie collection
ArcGIS Online Planning Field Ties
Plan Image Red Lines
Field Crew Training
Tie Collection from Survey Plans

To support accuracy assessments and on-going spatial improvements
Red Lining the Survey Plan

P2680385
Metadata Collection

Metadata collected from the survey plan:

- Survey Method
- UTM Zone
- Datum
- Elevation Type
- Elevation
- Combined Scale Factor (CSF)
- CSF Source
- Positional Accuracy
- Degrees, Minutes and Seconds (to Mascot)
- Distance (to Mascot)

Other fields are automatically collected:

- Control ID (automatically assigned)
- LTSA Plan
- Mascot is selected from the map:
  - Mascot #
  - GCM
  - Northing and Easting
#2 Parcel Fabric

Single, complete, trusted and sustainable (conversion and compilation)
Esri’s Parcel Fabric

Esri’s parcel fabric was selected as the preferred data model and maintenance tool set for LTSA operations team because:

1. Commercial off-the-shelf (COTS) solution

2. Proven solution – implemented in various other large jurisdictions similar to BC (2 million parcels)

3. Least Squares Adjustments (LSA) engine to improve the fabric’s spatial accuracy
The ‘best’ parcel fabric is one built from survey plans, whereby all observations (distances and bearings) are captured and retained.
Generate Fabric-Ready Geometry – CPDM

- Input polygons (ICF)
- Input polygons Crown Subdivision & Reminders, Local Government As-is Cadastral

- Fix overlaps, gaps
- Feature to 2-point line
- Fix dangles, undershoots, duplicates

- Feature to centroid points
- Re-Build polygons
- Connection lines

- Join point attributes onto polygons
- Staging polygons fabric attributes creation (Type, Accuracy, Planname)
- Staging lines fabric attributes creation (Type, Accuracy, Planname)

- Staging polygons fabric attributes creation (Type, Accuracy, Planname)
- Load topology to a parcel fabric (Create point features and COGO attributes)

- QA staging
- Attribute validation
- Topology Validation

- Parcel Fabric

- Line – Must be Covered by Boundary Of (polygon)
- Line – Must Not Self-Overlap
- Line – Must Not Self-Intersect
- Line – Must be Single Part
- Line – Must Not Intersect or Touch Interior
- Polygon – Boundary Must be Covered by (Line)
METES AND BOUNDS

PARCEL IDENTIFIER (PID):

SHORT LEGAL DESCRIPTION: U/YDYD//26/11///33///NW4///A
MARG:*

TAXATION AUTHORITY:
1 CHILLIWACK ASSESSMENT AREA

FULL LEGAL DESCRIPTION: CURRENT
THAT PART OF SECTION 33 TOWNSHIP 11 RANGE 26 WEST OF THE SIXTH MERIDIAN YALE DIVISION YALE DISTRICT BEING COMPOSED OF THAT PART OF THE NW 1/4 OF SEC 33 LYING TO THE NORTH OF THE SOUTHERN LIMIT OF BOOTHROYD INDIAN RESERVE NO 5B, AS THE SAID RESERVE IS SHOWN UPON A PLAN OF SURVEY OF BOOTHROYD INDIAN RESERVES NOS 5B AND 5C OF RECORD IN THE DEPARTMENT OF THE INTERIOR UNDER NO 37164, WHICH IS TAKEN FOR THE RIGHT OF WAY OF THE CANADIAN NORTHERN PACIFIC RAILWAY AS THE SAID RIGHT OF WAY IS SHOWN UPON A PLAN OF SURVEY ON RECORD IN THE DEPARTMENT OF THE INTERIOR UNDER NO 35099, A DUPLICATE BEING ON RECORD IN THE LAND REGISTRY OFFICE UNDER NO A526, THE SAID LAND TAKEN FOR RIGHT OF WAY CONTAINING BY ADMEASUREMENT 80/100 OF AN ACRE MORE OF LESS TO BE KNOWN HEREAFTER AS PARCEL A (DD 177676F) OF THE NORTH WEST 1/4 OF SECTION 33 TOWNSHIP 11 RANGE 26 WEST OF THE 6TH MERIDIAN YALE DIVISION YALE DISTRICT
Interesting Data Conditions
Acceptance Process

- A test plan organized the testing and acceptance process
- Total of 54 tests to ensure completeness and correctness
- Comprehensive – increment and/or province-wide
- Random samples for visual inspection
- Lesson Learned Review
#3 Survey Plan Submissions
Web based digital plan submission and checking system
Survey Plan Submissions (SPS)

- To support sustainability, BC Land Surveyors are required to submit their survey plan datasets to LTSA as part of the mandatory process for plan package submissions.

- Surveyors submit their datasets through Survey Plan Submissions (SPS); an innovative web map application that runs custom geoprocessing services to perform various **business rule checks** that validate their digital survey plan **quality** online.

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#3 SURVEY PLAN SUBMISSIONS:

Built a web based application called Survey Plan Submission (SPS) to support BC’s operational maintenance.
Plan Submission & Online Checking

- **British Columbia**: Survey Plan Submission (SPS) 2016
- **Alberta**: Survey Plan Online Checker (SPOC) 2010
- **Saskatchewan**: Plan Submission Online (PSO) 2013

**The Benefits**
- ✓ Reduced Errors & Costs
- ✓ Improved Quality
- ✓ User Friendly
- ✓ Visual Check for Users
- ✓ Faster Approvals
- ✓ Reduced Effort
- ✓ More Secure
- ✓ More Information and Detail
Create a New Dataset

To submit their survey plan datasets in SPS, surveyors must first create a new dataset

- Enter in metadata (E.g., Survey Date, UTM Zone, etc.)
- Upload the survey data CAD file (in DWG format)
- Upload the control point CSV file

Save changes to move onto the next step
Validate the Dataset

A number of business rules are checked to validate the integrity of data provided and report any errors.
Parcel Topology Check Result

Parcel corner(s) in the CAD file at the LTMA grid coordinates noted below do not close within a tolerance of 0.05. Please review the CAD file for closure errors and resubmit.

<table>
<thead>
<tr>
<th>X Coordinate</th>
<th>Y Coordinate</th>
</tr>
</thead>
<tbody>
<tr>
<td>498023.47</td>
<td>5449915.146</td>
</tr>
<tr>
<td>498083.081</td>
<td>5449899.911</td>
</tr>
<tr>
<td>498294.542</td>
<td>5449820.666</td>
</tr>
<tr>
<td>497561.937</td>
<td>5449934.712</td>
</tr>
<tr>
<td>498304.6</td>
<td>5449831.97</td>
</tr>
<tr>
<td>498033.101</td>
<td>5449909.921</td>
</tr>
</tbody>
</table>

Override Error | Close
Perform a Map Check

Surveyors perform a visual check to ensure the plan is correctly positioned within the PMBC fabric.
Submit the Dataset
**From Disparate Source Data to a Single, Complete, Trusted and Sustainable Parcel Fabric**

- **Input**
  - Land Title Register (Parcel Attribute Data): 2 Million
  - ICIS Source Parcels: 1.7 Million
  - ICF Source Parcels: 1.5 Million

- **Fabric Compilation**
  - Cadastral Ties: 65,400
  - Crown Primaries: 76,000
  - Crown Subdivisions: 173,000
  - Crown Transportation: 107,000
  - Crown Undersurface: 16,000
  - Crown SRW: 31,000
  - Indian Reserves: 1,450
  - Assessment Areas: 19
  - Conservancy Areas: 157
  - Federal Harbor & Port Authority: 19
  - Integrated Survey Areas: 53
  - Land Districts: 7
  - Land Title Districts: 61
  - Municipalities: 160
  - National Parks: 7
  - Parks and Protected Areas: 924
  - Regional Districts: 29
  - Survey Plans: 200,000

- **Output**

  - **Extract, Transform and Load**
  - Cadastral Field Ties: 2,600
  - Cadastral Ties from Plans: 4,500
  - Catch-up Plans: 2,500
  - Attribute Enhancements: 55,000
  - Precision Input of Missing Parcels: 10,000

2 Million Parcels Completed in 2½ Years
### Project Status

**Project Start**

- Field Tie Program
- PWL (Province Wide Layers)
- FCP (Fabric Compilation Plan)
- Acceptance Test Plan
- Ties from Survey Plans

**Fabric Increments Accepted**

- Inc. 1
- Inc. 2
- Inc. 3
- Inc. 5/6
- Inc. 7/9
- Inc. 11/12
- Inc. 4/8
- Inc. 10/13
- Inc. 14/15
- Inc. A
- Inc. B
- Inc. C

**SPS Application Mandatory for Surveyors**

**Project Completed**

- July 2014
- August 2014
- September 2014
- October 2014
- November 2014
- December 2014
- January 2015
- February 2015
- March 2015
- April 2015
- May 2015
- June 2015
- July 2015
- August 2015
- September 2015
- October 2015
- November 2015
- December 2015
- January 2016
- February 2016
- March 2016
- April 2016
- May 2016
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- July 2016
- August 2016
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- October 2016
- November 2016
- December 2016
- January 2017
- February 2017
- March 2017
- April 2017
- May 2017

**“Largest Parcel Fabric Implementation in Canada”**
Thank you!

If you have any questions or would like more information please contact:
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403-294-1028

@MNCLtd

MNC (Martin Newby Consulting Ltd.)