The City of Vancouver, Autodesk, and Pitney Bowes Software: A Match Made in Business and Software

Dan Campbell – City of Vancouver

GS2513

The City of Vancouver uses both Autodesk® applications and Pitney Bowes Software products extensively for creating and sharing 2D to 3D workflows, districtation, and other GIS, design, and infrastructure tasks. To date, Autodesk products have been used primarily for the design and maintenance of infrastructure and for 3D modeling and visualization, while Pitney Bowes Software MapInfo Professional® has been used for analysis on urban planning projects. With the announcement of the strategic partnership between Autodesk and Pitney Bowes Software, the City is expecting to be able to integrate workflows and information much more easily than ever before. This class will provide an overview of how a range of products are being used together. We will outline specific workflows, focusing on how to take advantage of existing 2D GIS data and to work through the plan, design, build, and manage lifecycle of infrastructure, and to visualize that same data in 3D

Learning Objectives

At the end of this class, you will be able to:

- List the potential benefits of the Autodesk and Pitney-Bowes strategic partnership

- Explain how interoperability can improve workflows from GIS to Building Information Modeling (BIM)

- List ways to take advantage of existing GIS data in a 3D environment

- Outline the steps that are required to manage the lifecycle of infrastructure

About the Speaker

Dan Campbell is a graphics planner with the city of Vancouver, responsible for coordinating 3D visualization and analysis activities, and managing the city of Vancouver 3D model. He has a background in fine art, planning, and urban design which he is able to apply in the context of GIS, and city modeling. Dan has spoken at many conferences including Autodesk University, Map Asia, GeoWeb, GeoTec, GITA, URISA and the Pitney Bowes Insight event on the topic of 3D as it relates to design and public involvement. Dan has articles published by Vector1 Media and GeoWorld, and was awarded the 2012 Pitney Bowes Insight Award for Technical Achievement

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Introduction

This class provides an overview of how a range of products from Autodesk and Pitney Bowes are being used together at the City of Vancouver. It outlines specific workflows, focusing on how to take advantage of existing 2D GIS data and to work through the plan, design, build, and manage lifecycle of infrastructure, and to visualize that same data in 3D. The history behind how the workflows between products from two different vendors evolved will be explained, as will the context of the City of Vancouver. Three specific case studies examined. These include:

1. Election boundary districtation

2. Building footprints

3. Population projections

4. Line of sight analysis

City of Vancouver Context

To assist in better understanding how workflows evolved, and how decisions were made, some information about the City of Vancouver will be helpful. Some key data includes:

- City population about 600,000
- Metro population about 2,100,000
- 44 square miles, water on three sides
- Approximately 50% of population has English as a 2nd language
- City designs and constructs its own infrastructure
- Host to the 2010 Winter Olympic Games

The city has a mature GIS environment, whose evolution will be outlined in more detail. Relevant information about it includes:

- Oracle Spatial enterprise database
- Extensive use of Autodesk desktop and web products
- Extensive use of MapInfo
- Long and extensive use of MapGuide for our public and staff web mapping applications (VanMap)

Like cities themselves, the work that the City is involved with is diverse and complex. While many of the functions will be familiar to a groups involved with GIS and infrastructure, such a managing zoning, subdivision, development review and processing, related work is forever expanding. This has included visualization, public consultation, facilities management, beat

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analysis, paper map production, public art databases, social housing inventories, shadow analysis, energy analysis, 3D city modelling, massing development, view analysis, urban forest management, sea level rise analysis, earthquake mitigation, crime mapping, way finding, election boundary redistricting, BIM implementation, homeless inventory, bike share programs, asset management, performance facilities management, social amenities inventories, parks inventory, emergency management, event management, animations, capacity analysis, population projections…and, well, a lot more. Just a boundaries between what is GIS and what is CAD have blurred, the roles of those of us involved will blur and expand in unexpected ways.

With these changes, the City is having to respond to myriad forces. These include:

- The growing role of BIM
- The Open Data movement
- A growing hunger for 3D data, and 3d analysis
- The need to visualize ever more complex data
- The Public's demand for more participation in decision making
- Expectation for higher cartographic quality
- Greater web access to, and interaction with, City data

In addition to these forces, staff need to meet specific City initiatives, the most important of which include:

- Make Vancouver the greenest city in the world by 2020
- Replacement of a permit system on its last legs
- Move to shared services model
- Improving earthquake preparedness
- Meeting expectations for more collaboration and public participation (at a lower-cost)

Of course this needs to be done while working under substantial budget pressures.

While we expect to respond to some these forces and initiatives as major projects in a managed manner, I also expect that in many cases our response will be organic, messy, but effective. That is how we tackled strategically integrating Pitney Bowes' MapInfo Pro and a range of Autodesk Products. There was never a formal plan, and it points to the software's adaptability and flexibility that it just happened. As well, the integration has evolved up from the end user

This is how we always hope projects will unfold. Sometimes, if we are lucky, we have the time, resources and funding to have this happen.
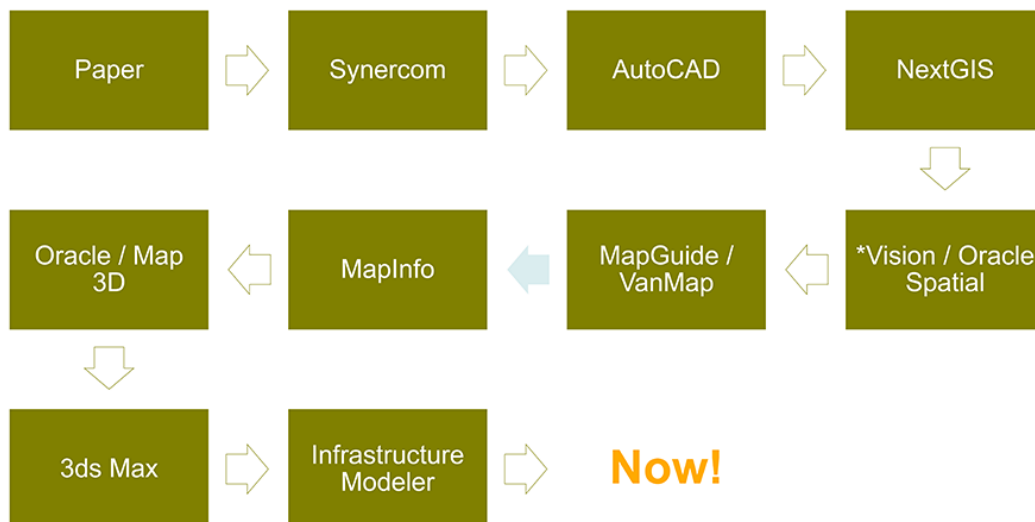
The Ideal

Single isolated problem → Get lots of money → Introduce New Workflow → Replace all hardware / software → Train all staff → Live happily ever after

Often we have to make do with what we have. The process is often messier than what we would like to admit to, but the Darwinian aspect of an organic, incremental process can ensure that that what develops meets actual needs. As the integration has evolved up from the end user, rather than being imposed from above, there has always been staff buy-in to the workflow. The workflow works, because the work flows.

The Reality

Key Events – 1980 to…

Paper ➡ Synercom ➡ AutoCAD ➡ NextGIS

⬇

Oracle / Map 3D ⬅ MapInfo ⬅ MapGuide / VanMap ⬅ *Vision / Oracle Spatial

⬇

3ds Max ➡ Infrastructure Modeler ➡ **Now!**

Vancouver's first GIS *Vision was not initially an Autodesk product. While *Vision meet specific infrastructure needs of the Engineering Department, it lacked the ease of use and functionality expected for desktop GIS tools. At that point in the early nineties, the Planning Department purchased its first copy of MapInfo Pro, to meet their objective of being able to undertake basic GIS analysis and thematic mapping. Soon after, since a few of us had been using AutoCAD for basic urban design and mapping work, Autodesk Map 3D r1.0 entered our palette of software. It fell to my group at that time to undertake some analysis work ourselves, as well begin to feed data from the Enterprise GIS to MapInfo users. Incrementally, and quietly, form that single licence of MapInfo Pro has grown to 42 licences.

The following diagram illustrates how the core software is dispersed between City departments, and where there are overlaps.

What's In the Silos

Community Services		Engineering Services		Other	
Map 3D	MapInfo	Map 3D	Topobase	Emergeo	HAZUS
Infrastructure Modeler	3ds Max	Oracle Spatial	Infrastructure Map Server	MapInfo	Map 3D
SketchUp	Adobe Illustrator	AutoCAD			
AutoCAD	FME				
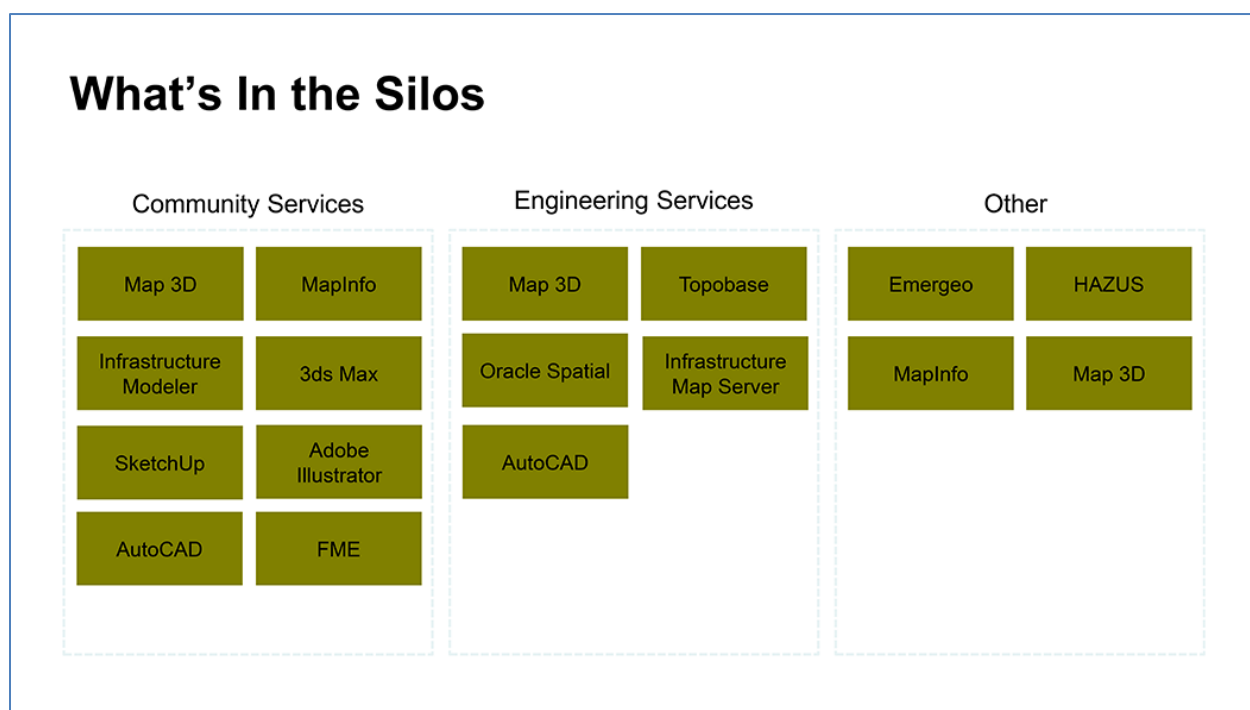
Through trial and error, we found the strengths and weaknesses of each of the products, and workflows evolved. We didn't set out to integrate the products in a workflow for any other reason than to get a job done. As a result, we were most pleased when the strategic initiative between Pitney Bowes and Autodesk validated what we had been doing.

The following slide illustrates the general configuration of our GIS-ish environment. I have called it GIS-ish because of the extent to which boundaries of what is specifically GIS, CAD, visualization, cartography, and 3D modelling are getting very blurry. The labels could restrict how one works with the applications.
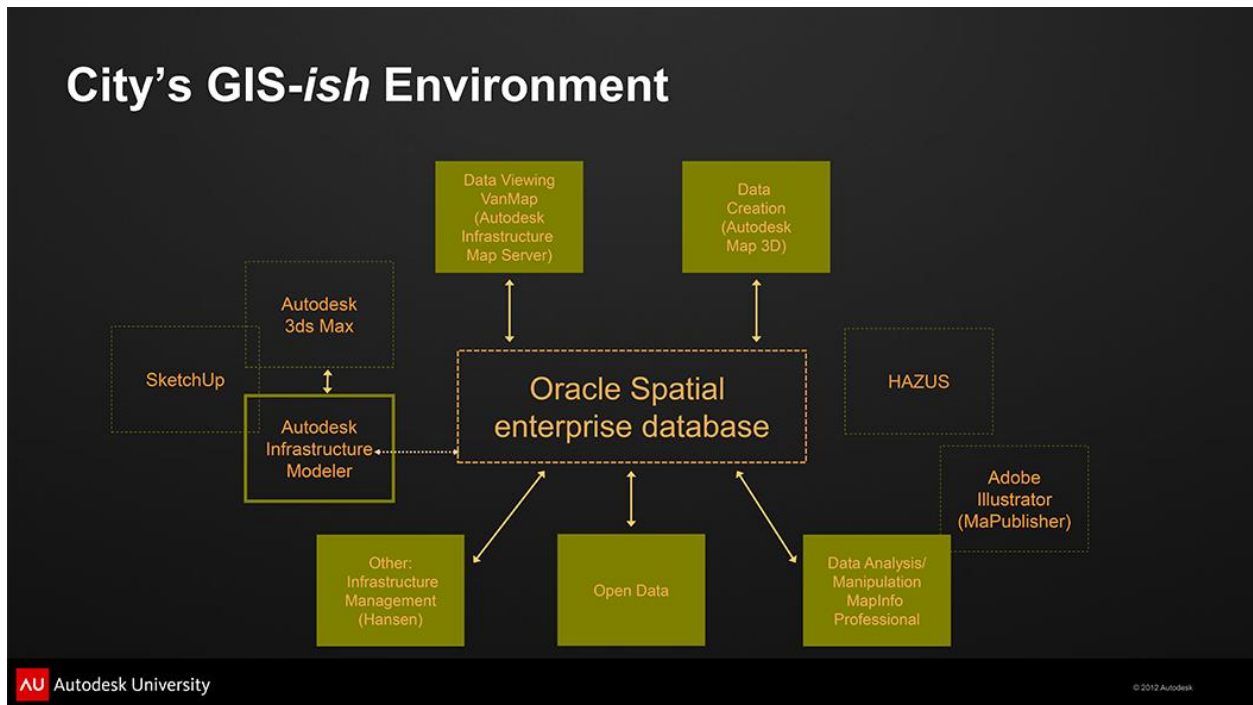
As we had discovered ourselves, Autodesk has particular strength in the design and build stages of infrastructure lifecycle.
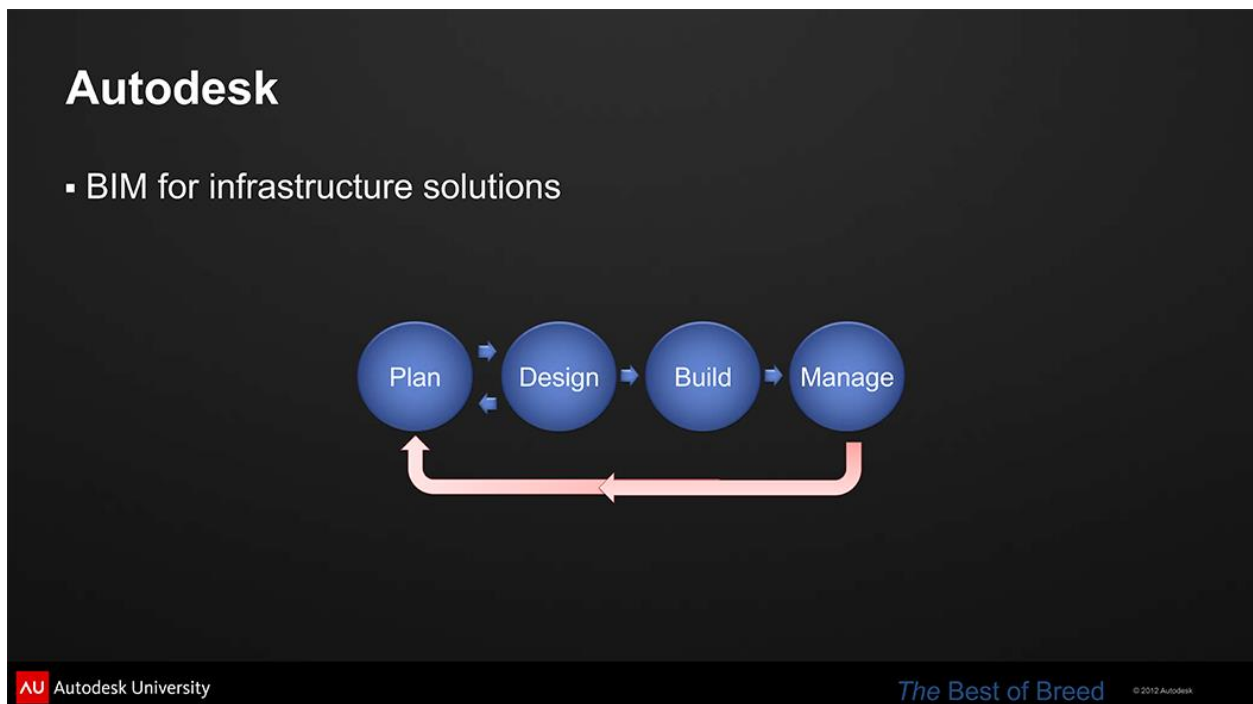
While Pitney Bowes excels in the visioning, planning, management and analysis stages of the lifecycle. Once again, these were strengths that we intuitively recognized and took advantage of.
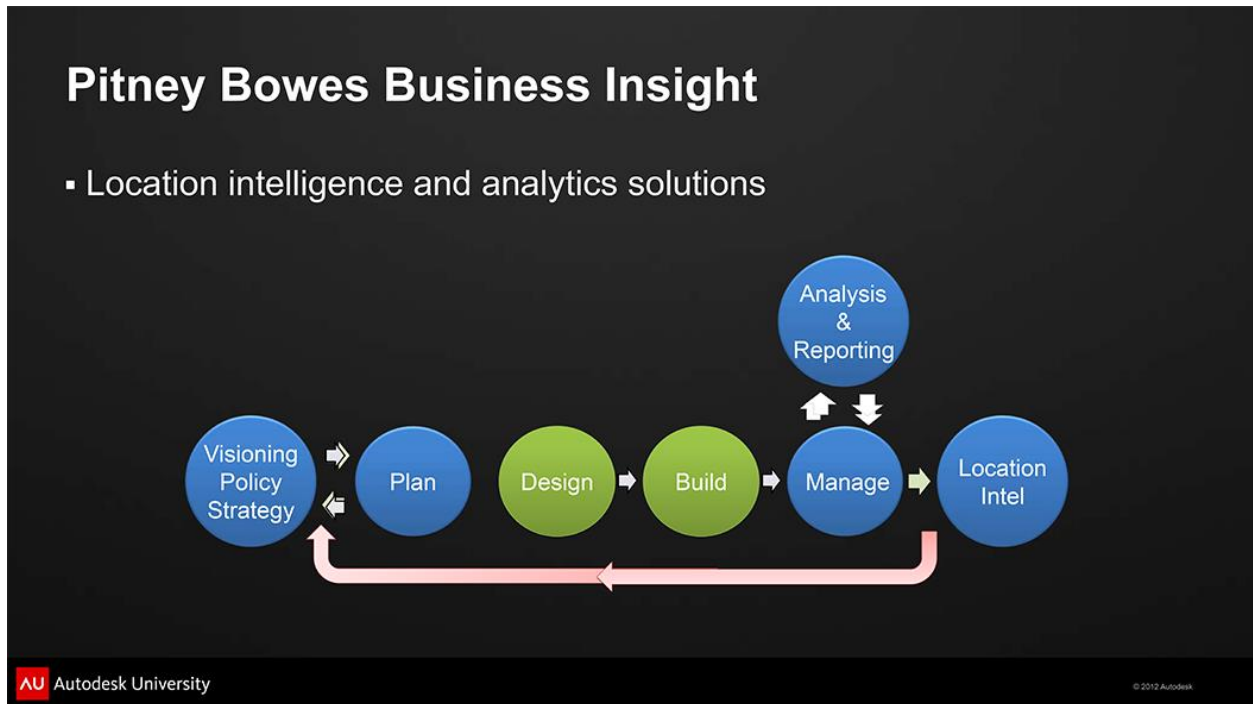
As the strategic initiative between Autodesk and Pitney Bowes was evolving, we had a similar strategic initiative occurring at the City of Vancouver. Adopting a shared services model what had been independent groups dealing with GIS, CAD and visualization in Community Services, Engineering, and Corporate IT were merged into a centralized group.

As the model proposed by Autodesk and Pitney Bowes mirrors how we have been working, we look forward to improved interoperability and product focus that can only improve how we will do things in the future.
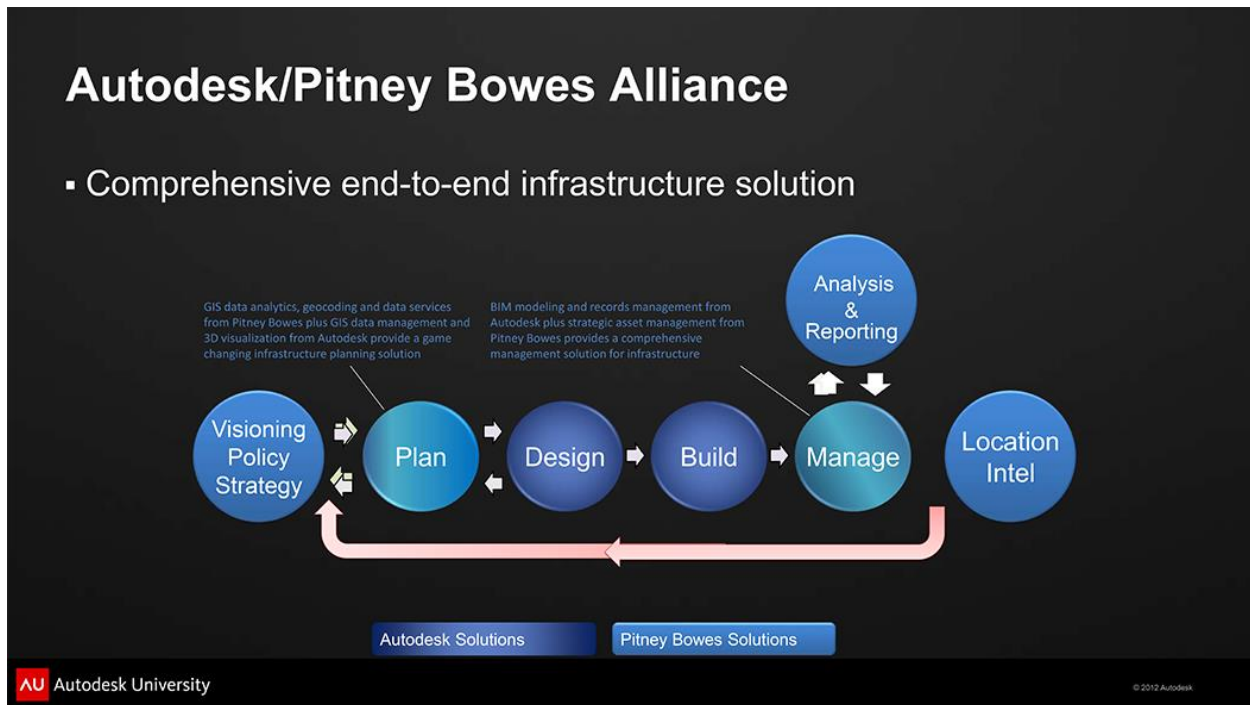
Heading

City of Vancouver Integrated Workflow 1 – Election Boundary Districtation

Vancouver is a city that has been experiencing a lot of recent development. As a result of this, there have been notable changes in population, especially in our high density False Creek area. Vancouver has a civic election every three years, and to ensure that election is run efficiently, the objective is to divide the City into districts with an equal number of voters, while trying to respect neighbourhood boundaries, arterial streets, and take advantage of centralized facilities in each zone. It is a daunting task. To do this we have used MapInfo Pro's powerful redistricting tools to assign voters to zones on the fly. This work is complemented by Map 3d's CAD tools, drawing cleanup functions and ability to directly output to MapGuide for the public viewing of the boundaries.
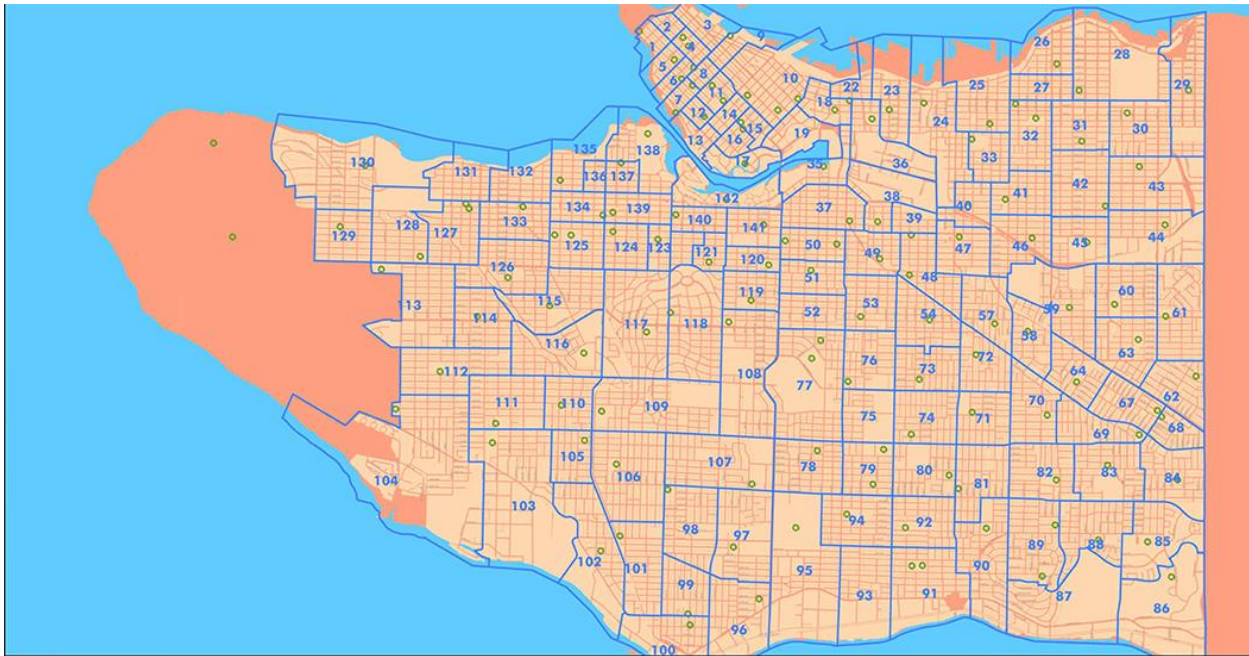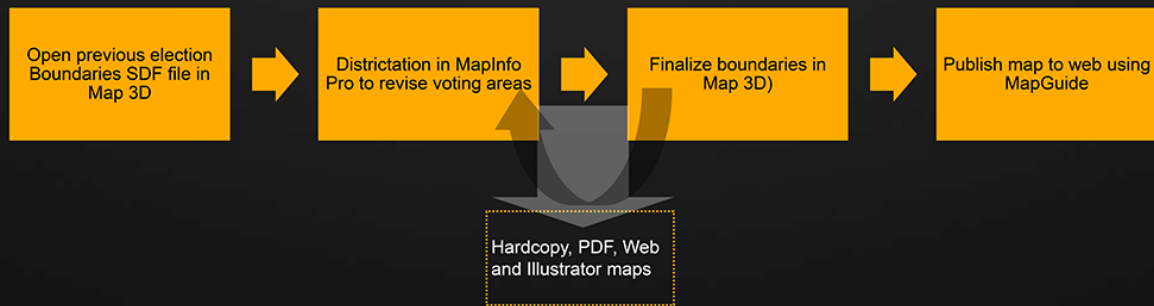
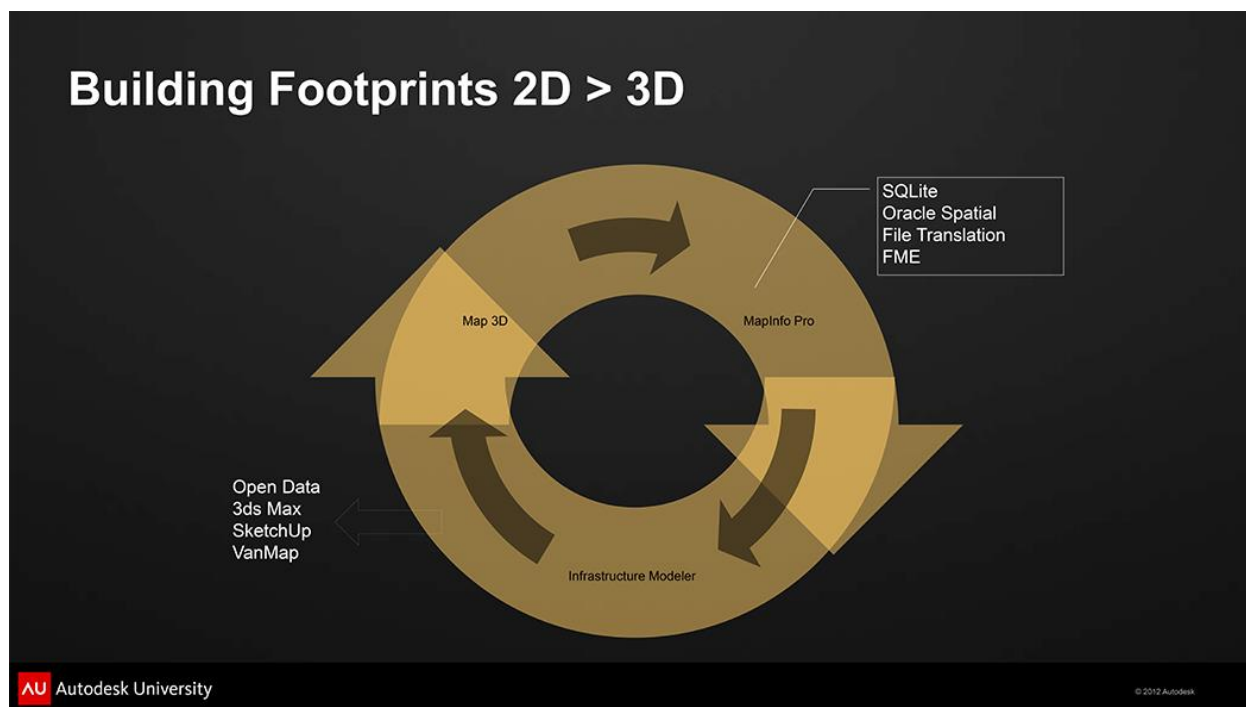## City of Vancouver Integrated Workflow 2 – Building Footprints

Cities are large, very, very large. Working with traditional 3D modeling tools simply is not a feasible way to approach working at the city scale.

The City of Vancouver has approximately 170,493 buildings. If one were to use traditional 3d modeling software to model each building to even a minimal level of detail it would take at least twenty minutes each. That would take a single employee the equivalent of 29 years to complete. Obviously that is not a feasible workflow.

With the advent of Autodesk Infrastructure Modeler, we recognized that there was a new way to approach modelling the city in 3D – taking advantage of our existing 2D GIS data. Actually, the data is 2.5D. While the geometry of the City's building footprints are only 2D, they possess attributes that include height, elevation, and roof pitch. This allows Autodesk Infrastructure Modeler to generate 3D geometry based on the attribute information.
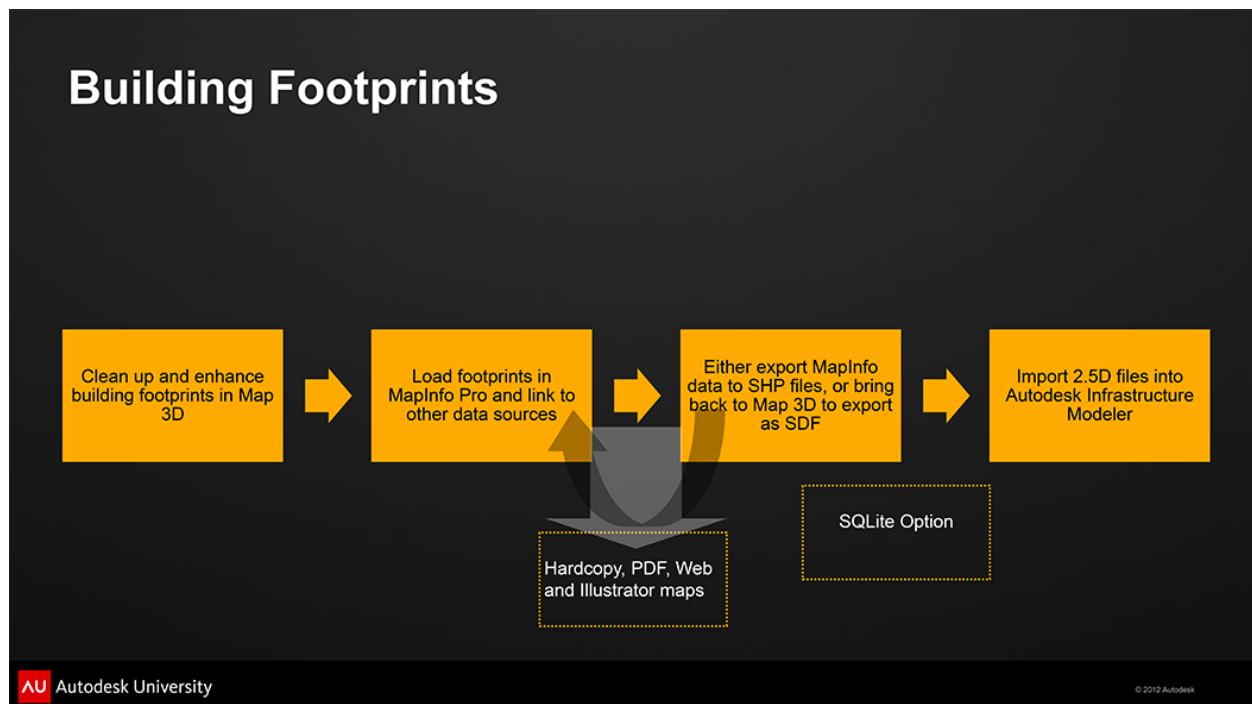

This need to only be a one way process. Once the data is in Infrastructure Modeler, there is an opportunity to enrich the data through analysis that is only possible in a 3D environment. This additional information can then be saved an re-exported to do further analysis with in MapInfo Pro.

The following are some sample images showing how fully realized 2.5D data can be, and how one data set can be themed in both MapInfo Pro and Infrastructure Modeler.
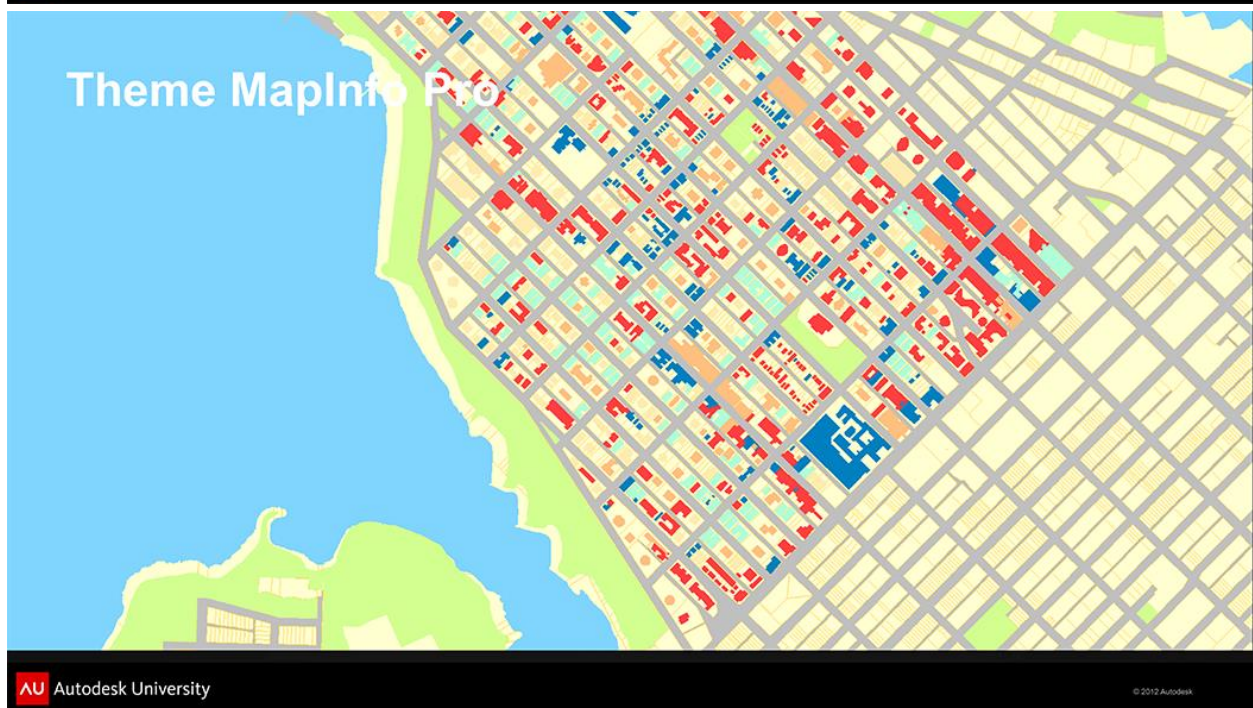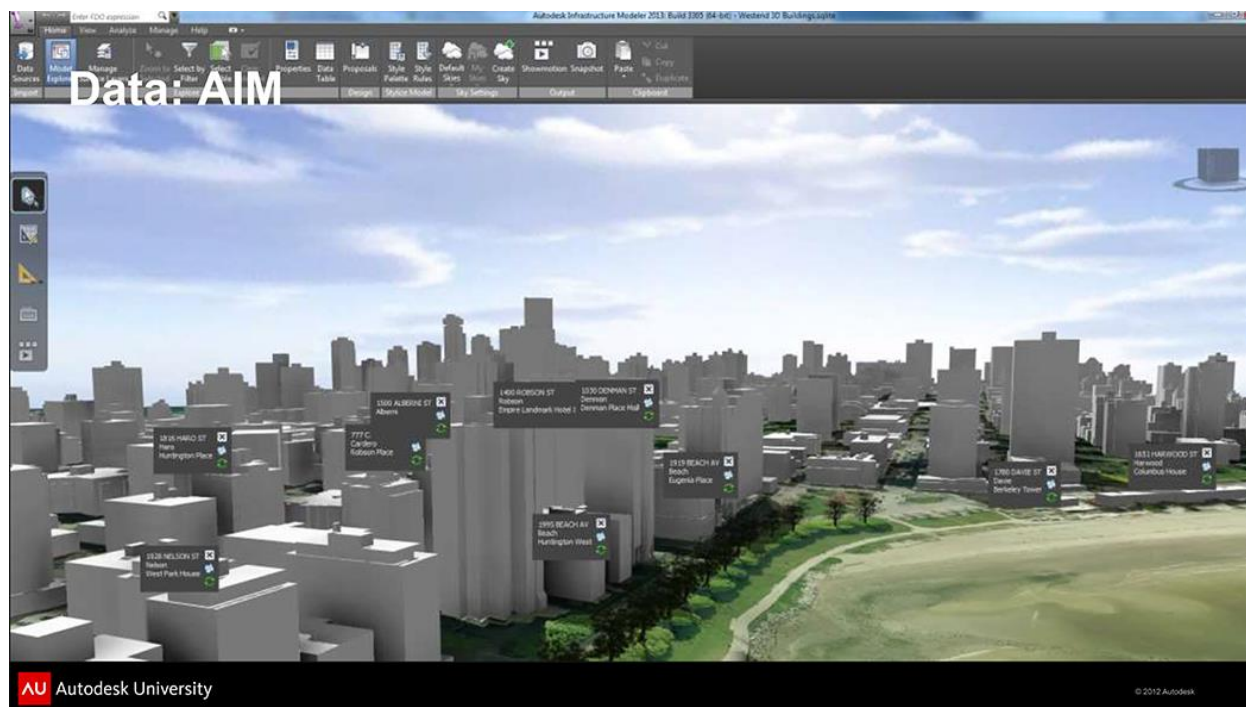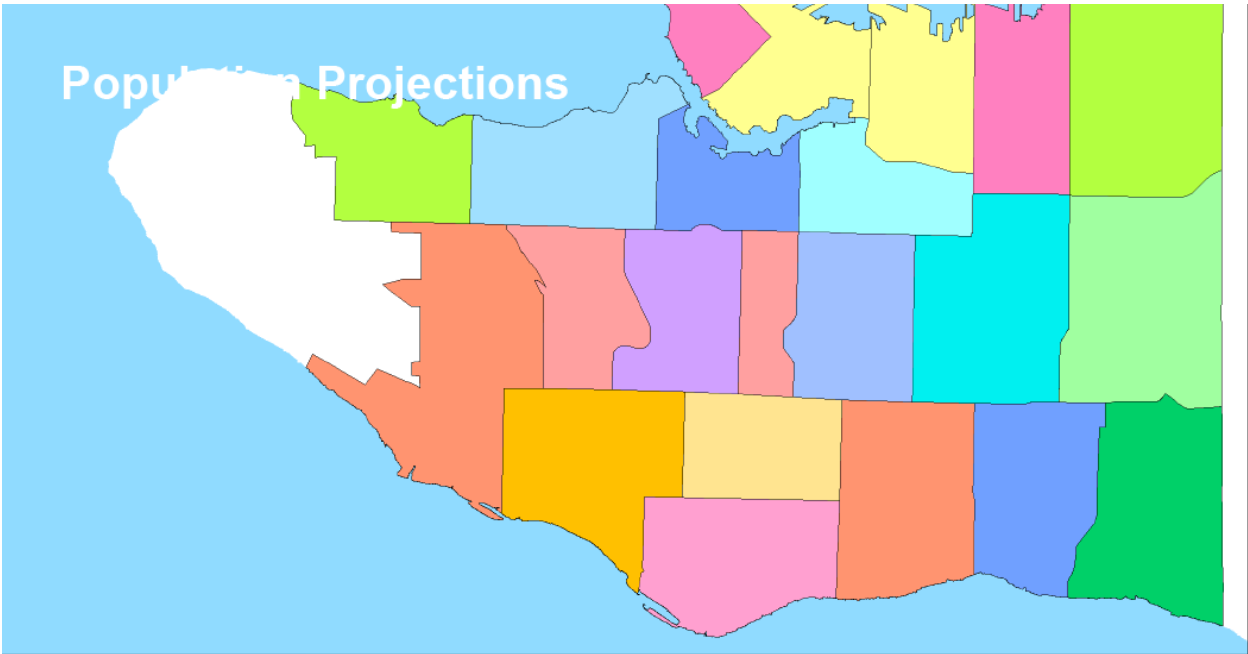
City of Vancouver Integrated Workflow 3 – Population Projections

Looking forward to the future of Vancouver, the Planning Department has been developing a range of population projections (both residential and commercial) based on a range of factors. The majority of this work has been done in MapInfo Pro, and some excellent 2D thematic maps were produced. We decided that these same data sets could be visualized in Autodesk Infrastructure Modeler to make them more dramatic, but at the same time place them in a 3D environment that would allow them to be more accessible and perhaps less abstract. The following are some of the example renderings.
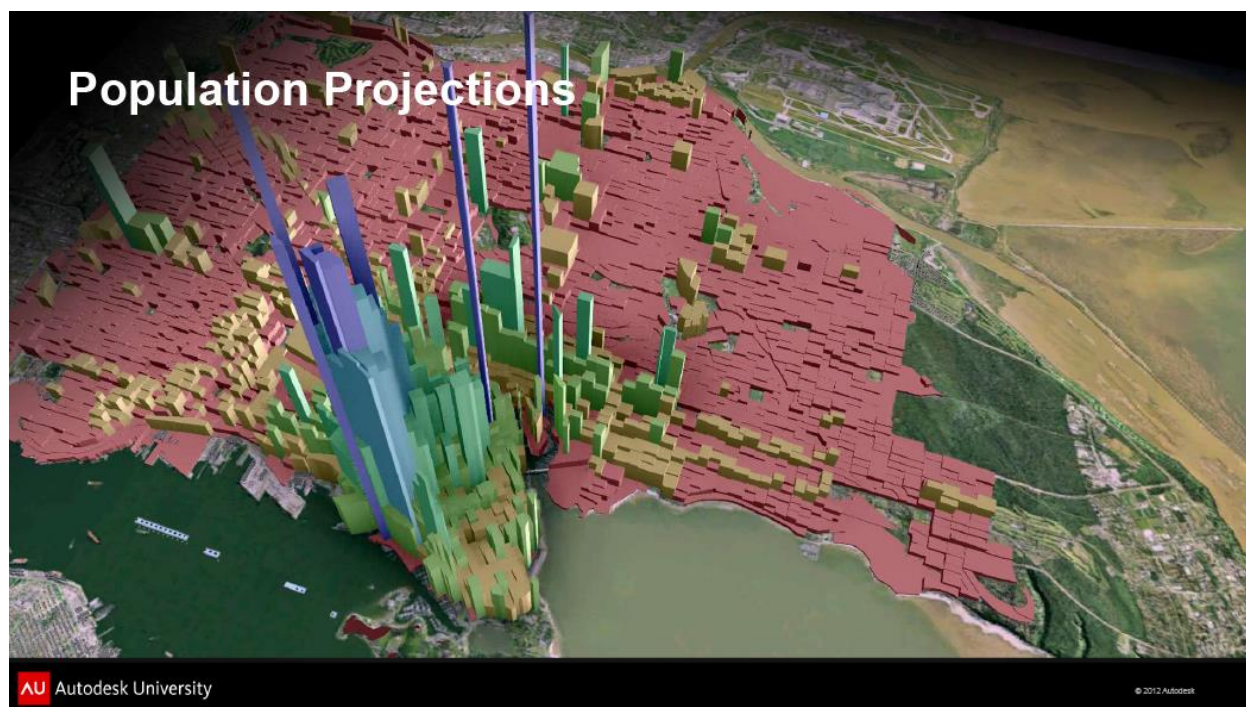
City of Vancouver Integrated Workflow 4 – Line of Sight

This is a proof of concept exercise we conducted. View preservation is a priority in Vancouver and we struggle to find ways to properly represent the complexity and its impacts on development. Is this, quite complex process, we take advantage of Autodesk Infrastructure Modeler's line of sight function to identify what buildings are visible from a specific spot. Once identified, this data is saved as sub-set, and is exported to MapInfo Pro where a buffer analysis is undertaken to select all the building visible within a specific radius from the central visible building. These buildings are identified, and the actual buffer object is sent back to AIM. Once in AIM, its impact on building height can be reviewed.
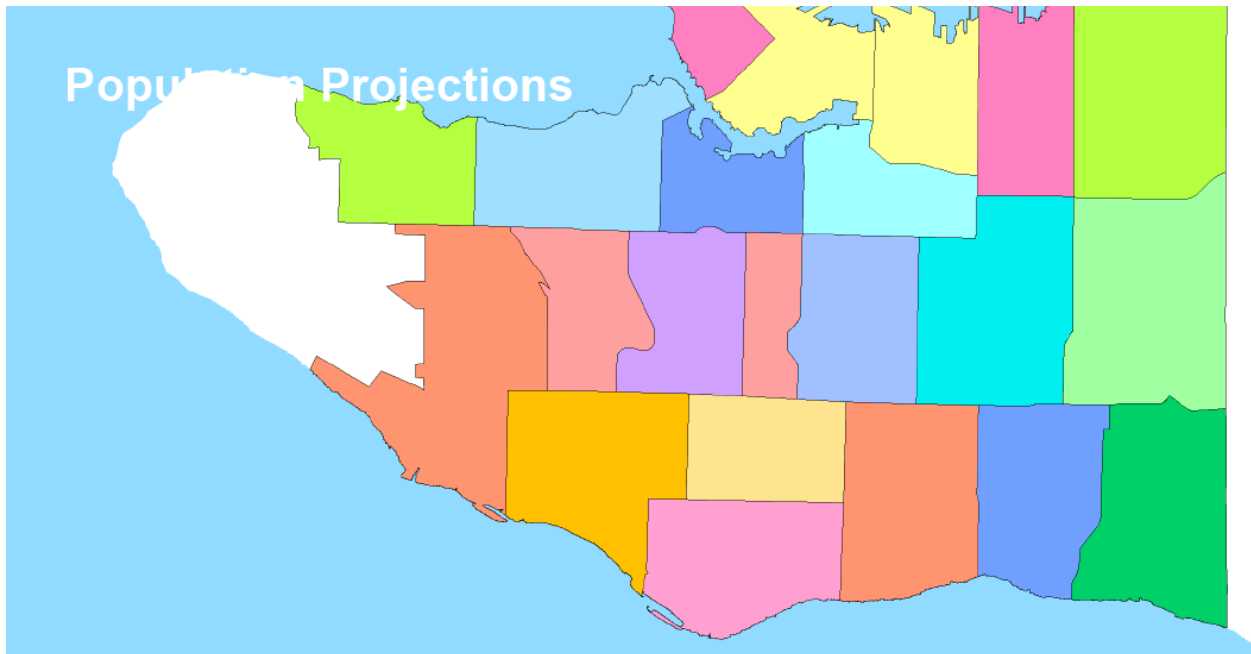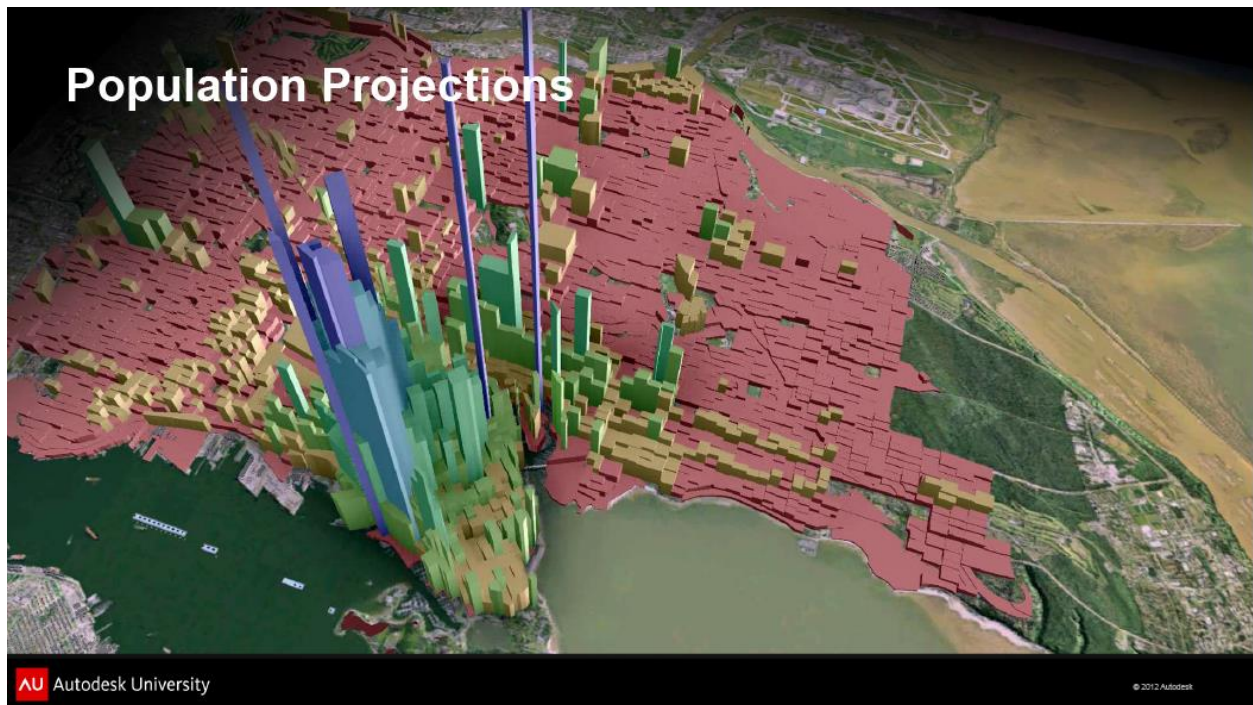
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At the City, we have been pleased at how well tools from Pitney Bowes and Autodesk have complemented each other, and have allowed to achieve objectives that would not have otherwise been possible. Like a teacher might write in a report card, the applications "work well with others". We look forward to what will be possible as the products from both companies are developed to further complement each other.