

# Challenges Planning in a 3D World



Chris Rotondo, GIS Specialist



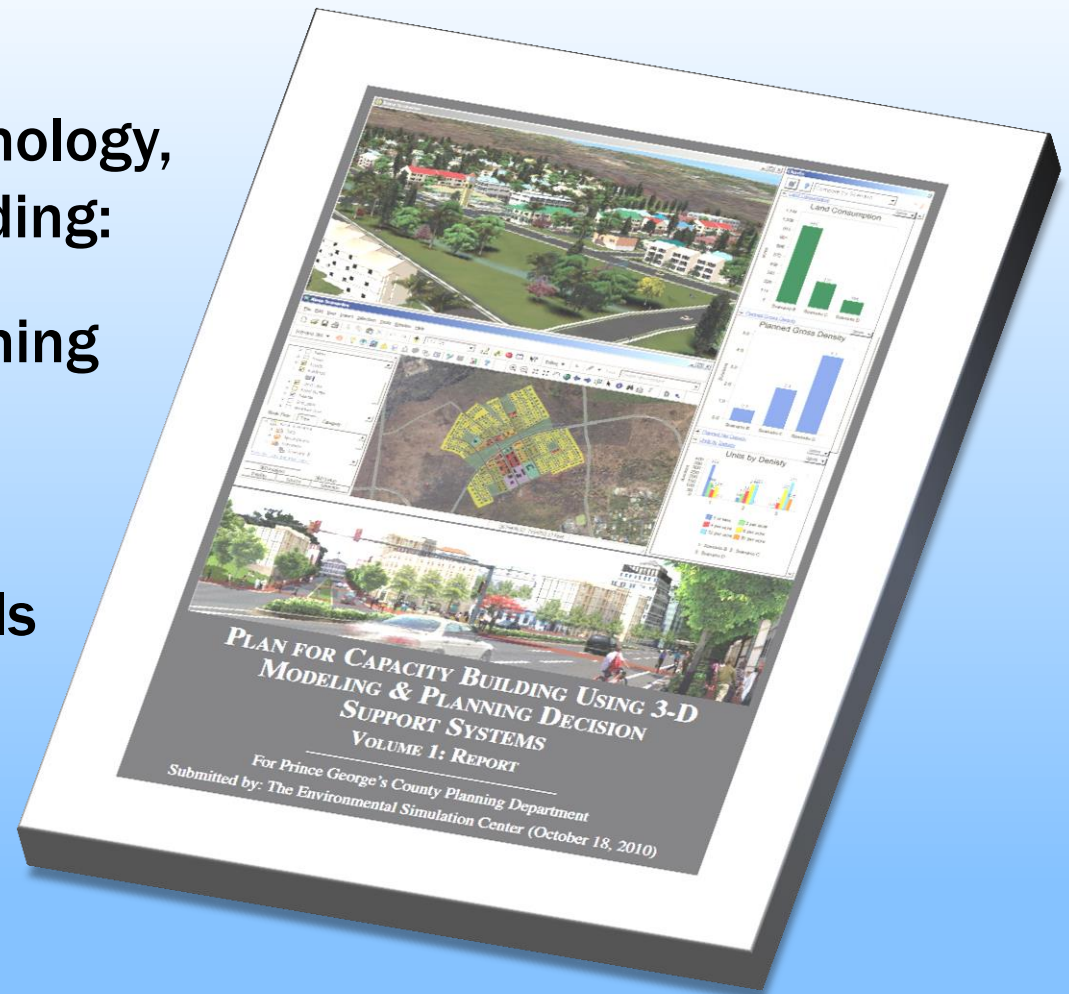
Prince George's County Planning Department  
The Maryland-National Capital Park and Planning Commission

MSGIC, July 2015

# Starting Point

A 150-page report on implementing 3D technology, prepared by ESC, including:

- Feedback from Planning Agencies
- Needs Assessment
- Evaluation of 3D Tools
- Recommendations



This report is available on the web in PDF format at:

[http://www.mncppcapps.org/planning/publications/pdfs/240/Plan for Capacity Building.pdf](http://www.mncppcapps.org/planning/publications/pdfs/240/Plan%20for%20Capacity%20Building.pdf)

Or, it is the first result in Google for the search term: 'Capacity Building 3D'



# Key Discoveries

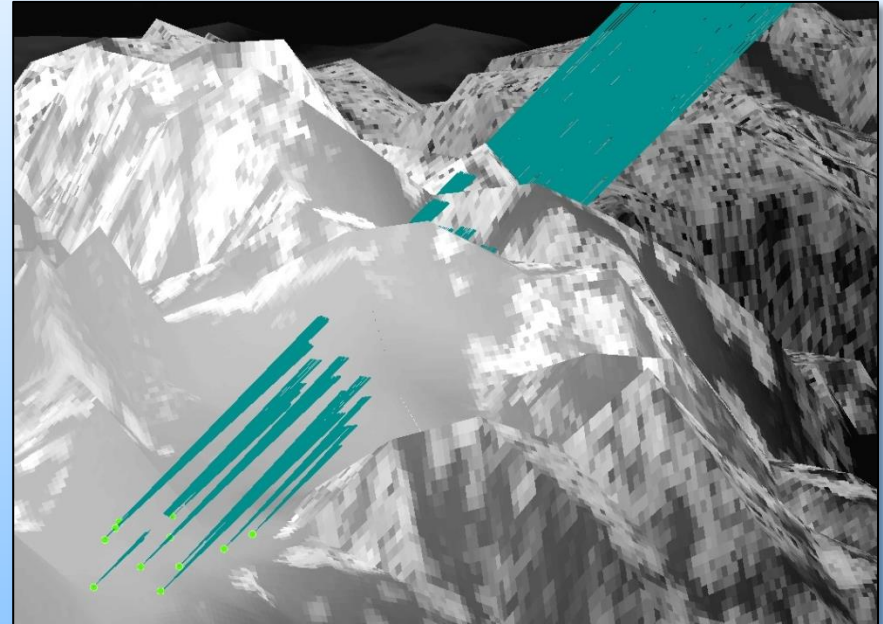
## I. The Best uses for 3D in Planning:

### 3D Models



- To visualize future development for:
  - Detailed site plans
  - Conceptual community plans
- Assist staff decision making
- Relay information to the public

### 3D Analysis



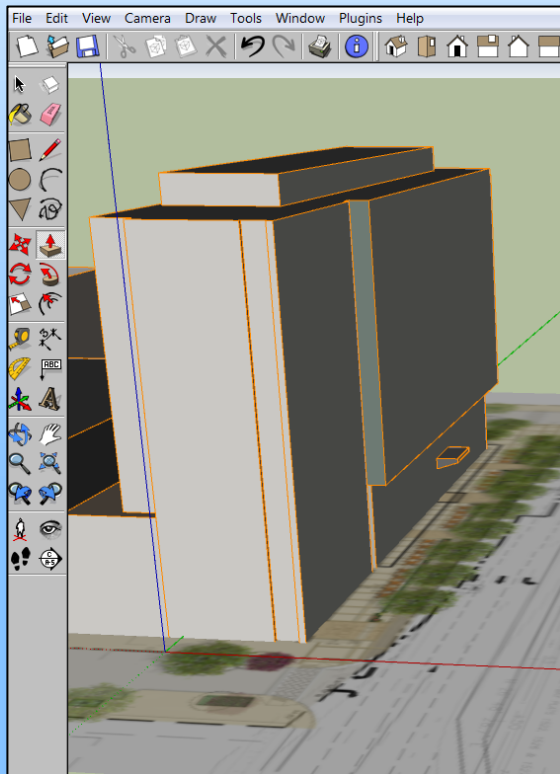
- Visibility and obstruction analysis
- Determine the impact of future development on existing view conditions

# Key Discoveries

## II. The Tool Best Suited for 3D Modeling:



- Cost (free)
- Easy to use with intuitive interface
- Used by many other agencies



### Key

- Excellent Support
- Good Support
- Some Support

### 3D Modeling Tools

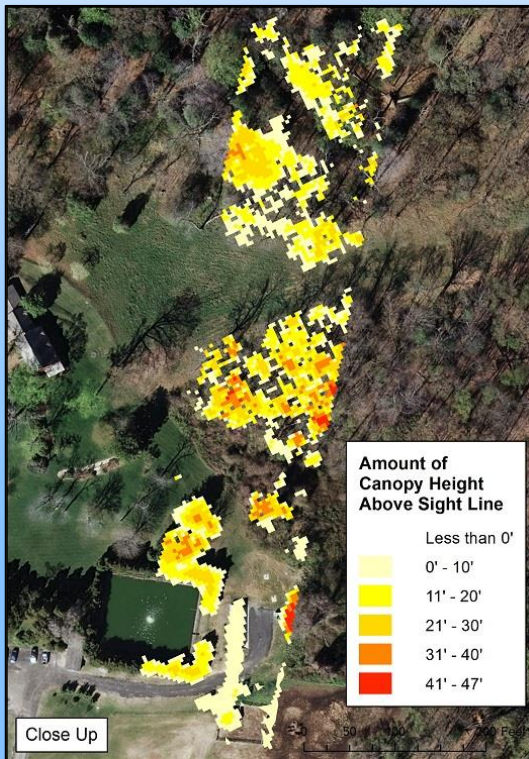
|                 | 1. Community Outreach | 2. Visioning & Planning | 3. Developing Plans | 4. Developing Regulations | 5. Urban Design | 6. Development Review | 7. Visual Impact Analysis | 8. Shadow Impact Analysis | 9. Quantitative Impact Analysis | 10. Build-out Analysis |
|-----------------|-----------------------|-------------------------|---------------------|---------------------------|-----------------|-----------------------|---------------------------|---------------------------|---------------------------------|------------------------|
| 3DS Max         | ○                     | ○                       | -                   | ●                         | ●               | ●                     | ●                         | ●                         | -                               | -                      |
| ArchiCAD        | ○                     | ○                       | ●                   | ○                         | ●               | ●                     | ○                         | ○                         | ○                               | -                      |
| AutoCAD         | ○                     | ○                       | ●                   | ○                         | ●               | ●                     | ○                         | ○                         | -                               | -                      |
| Google SketchUp | ●                     | ●                       | ○                   | ●                         | ●               | ●                     | ○                         | ○                         | -                               | ○                      |
| Microstation    | ○                     | ○                       | ●                   | ○                         | ●               | ●                     | ○                         | ○                         | ○                               | -                      |
| Vector-works    | ○                     | ○                       | ●                   | ○                         | ●               | ●                     | ○                         | ○                         | ○                               | -                      |

# Key Discoveries

## III. The Tool Best Suited for 3D Analysis:



- Already had in-house
- Powerful geoprocessing tools
- Access to ArcScene visualization software



|                             | 1. Community Outreach | 2. Visioning & Planning | 3. Developing Plans | 4. Developing Regulations | 5. Urban Design | 6. Development Review | 7. Visual Impact Analysis | 8. Shadow Impact Analysis | 9. Quantitative Impact Analysis | 10. Build-out Analysis |
|-----------------------------|-----------------------|-------------------------|---------------------|---------------------------|-----------------|-----------------------|---------------------------|---------------------------|---------------------------------|------------------------|
| <b>Key</b>                  |                       |                         |                     |                           |                 |                       |                           |                           |                                 |                        |
| ● Excellent Support         |                       |                         |                     |                           |                 |                       |                           |                           |                                 |                        |
| ○ Good Support              |                       |                         |                     |                           |                 |                       |                           |                           |                                 |                        |
| ○ Some Support              |                       |                         |                     |                           |                 |                       |                           |                           |                                 |                        |
| <b>3D GIS Tools</b>         |                       |                         |                     |                           |                 |                       |                           |                           |                                 |                        |
| ArcGIS 3D Analyst           | ○                     | ●                       | ●                   | ○                         | ●               | ○                     | ●                         | -                         | ○                               | -                      |
| AutoCAD Map 3D              | ○                     | ○                       | ●                   | ○                         | ●               | ●                     | ●                         | ●                         | ○                               | -                      |
| CommunityViz® - Scenario 3D | ○                     | ●                       | ●                   | ○                         | ●               | ○                     | ○                         | -                         | ●                               | ○                      |

# Key Discoveries

## **IV. Who Should Perform the 3D Work:**

- **Need specialized technical staff who use 3D software on a regular basis.**
- **Some planners use 3D, but not regularly enough to efficiently perform modeling or analysis in the timeframe required.**
- **Should take a few days of up-front training, and a few more days to become familiar with the software before staff are ready for 3D production.**
- **So far, our workload has only required one staff person to perform all 3D work.**



# Lessons Learned

## Level of Model Detail



**Detailed Model**

- Time Intensive
- Complex Process



**Textured Model**

- Faster & Simpler
- May not be appropriate for all projects

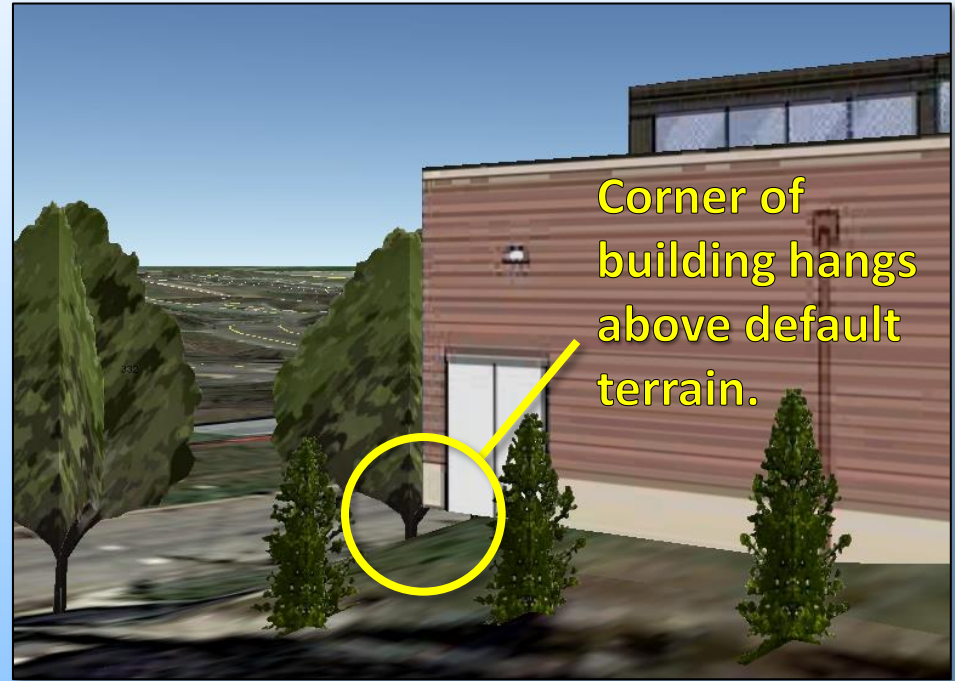
**Determining factors:** Size & purpose of model, how close it will be viewed, time available

# Lessons Learned

## Scene Creation Software

Initially used Google Earth

- Simple to use
- Also free
- Easy import from SketchUp
- Inability to edit Google Earth's default terrain became a problem



A more flexible and customizable application (ESRI ArcScene, in our case) is a better environment for scene creation.



# Lessons Learned

## Model Presentation Format

### Options:

- Screenshot Image
- Video
- Live Demo



Determined that video was the best option for us.

Allows us to also share the model on the web for public outreach.

All 3D videos we produce are now posted to our 3D Development Google+ site.  
(Google: “3D Prince George’s County” – our site is the first result)

# Lessons Learned

## Hardware Requirements

Minimum Requirements to run SketchUp and ESRI ArcScene:

- 2.2 GHz Processor
- 4 GB RAM
- 3 GB Free Hard-disk space
- 3D Class Video Card with min. 512 MB Memory
  - with OpenGL 2.0 or higher support

The machine we currently use has a 2.3 GHz Intel Core i7 processor and 8GB RAM.

- Cost: ~\$4,000



Storage Needs:

- 3D models and video files can be quite large.
- Average 3D project takes up 1.7 GB of disk space.

Network Demands:

- We store and work on our 3D projects locally.
- Since each project is a single-user operation, there's no reason to run it over the network.

# Lessons Learned

## Software & Source Data Needs

### Required Software:

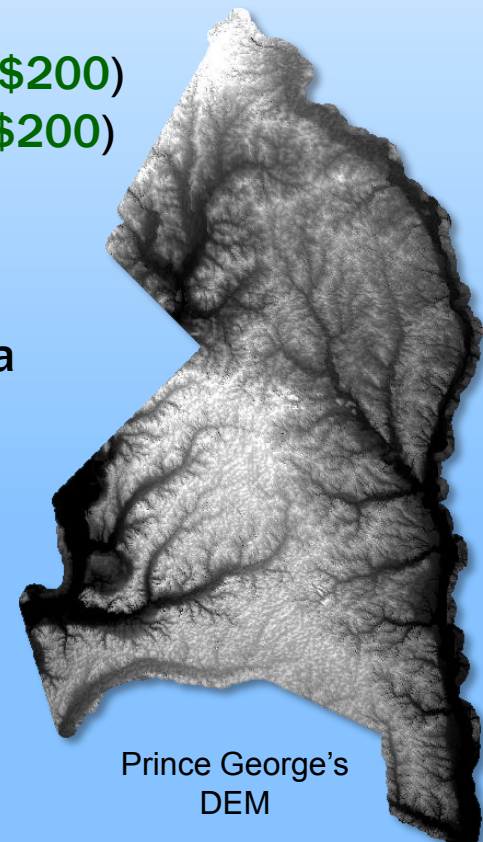
- SketchUp (Annual Cost: **free**)
- ESRI ArcGIS Pro with 3D Analyst Extension (Annual Cost: **\$10k**)

### Additional Recommended Software:

- Adobe Acrobat – for processing digital plans (Annual Cost: **\$200**)
- Adobe Photoshop – for image manipulation (Annual Cost: **\$200**)
- Camtasia Studio – for video editing (Annual Cost: **\$200**)

### Required Source Data:

- Digital Elevation Model (DEM) – generated from LiDAR data
- Aerial Photography
- Building Footprints with Height Attributes – to represent existing buildings
  - Another option: purchase textured building models from a contractor at ~\$2,500 per km<sup>2</sup>
- Building and Site Plans – submitted by developers



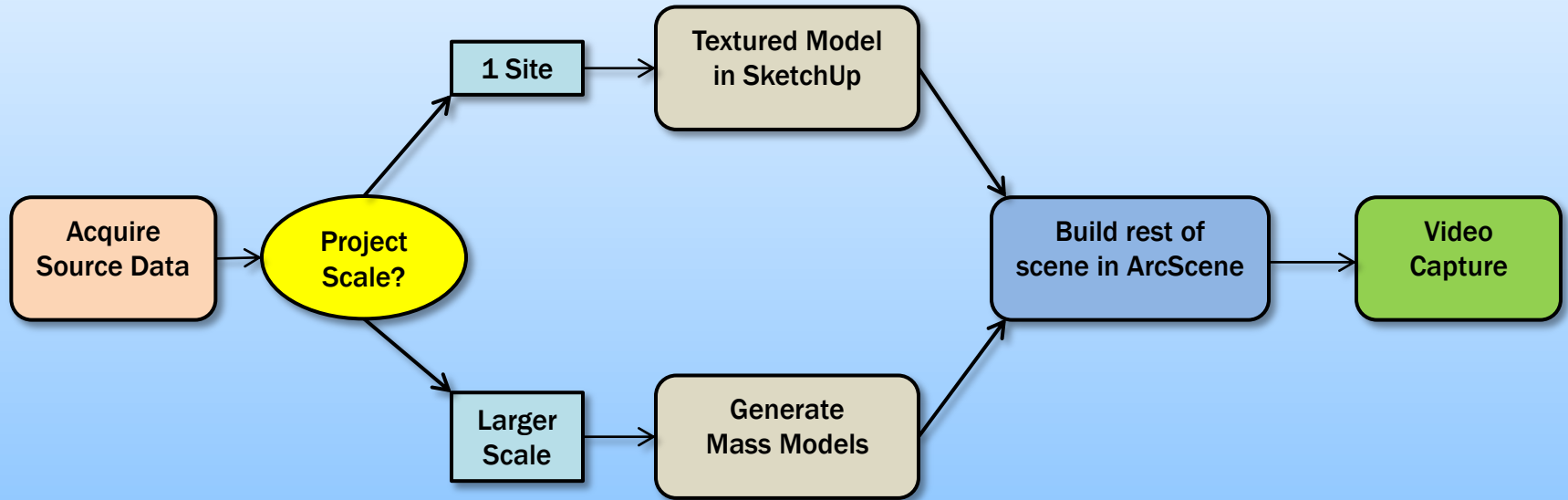
Prince George's  
DEM



# Modeling Workflow

## Basic Process

PROJECT START

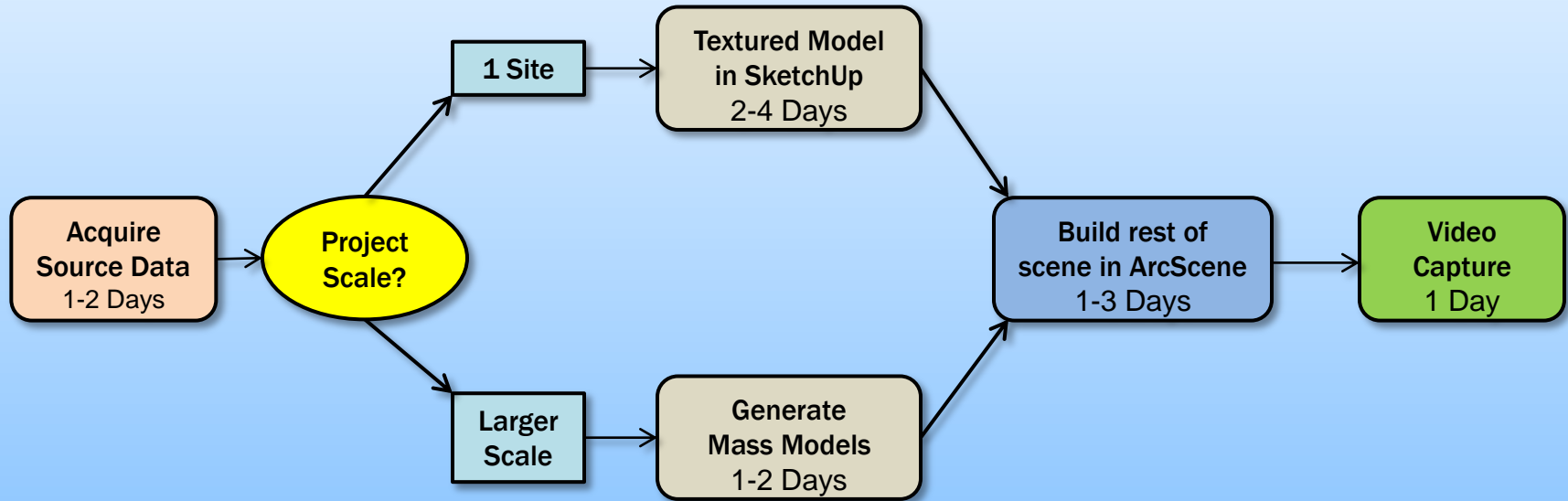


DELIVERY

# Modeling Workflow

## Time Requirements

PROJECT START



DELIVERY

**Total Production Time: 1-2 Weeks per project**

# Modeling Examples



Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Gray Buildings © District of Columbia (DC GIS) & CyberCity

©200 Google™

## Maryland Book Exchange





**Largo Town Center Conceptual Plan**

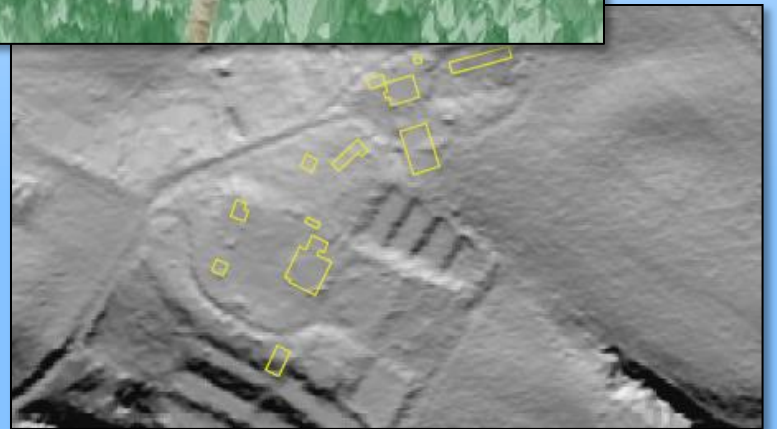
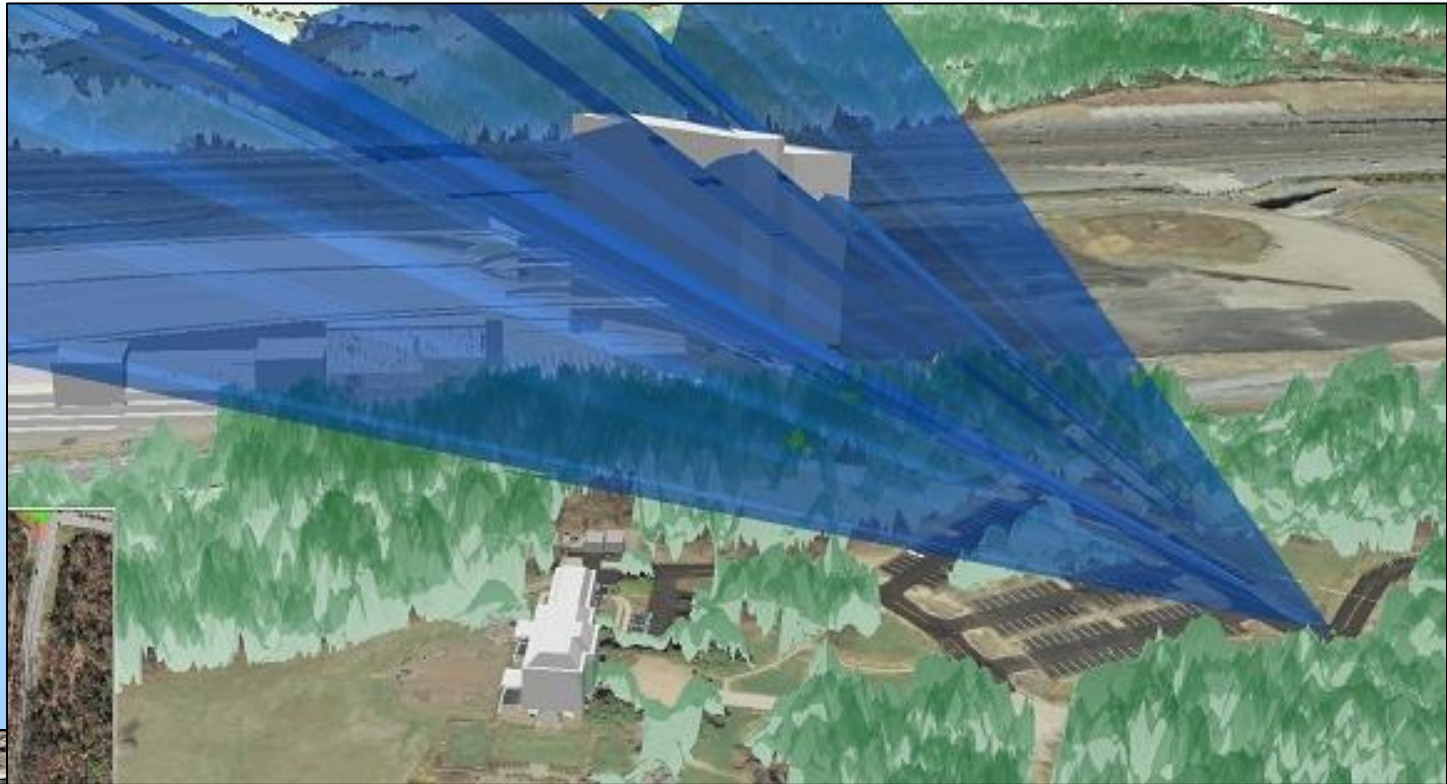




**Crescents at Largo Town Center**



# 3D Analysis



**The majority of 3D analysis deals with visibility and obstruction.**



# 3D Analysis

## Requirements

### Hardware:

- Same as Modeling

### Staff:

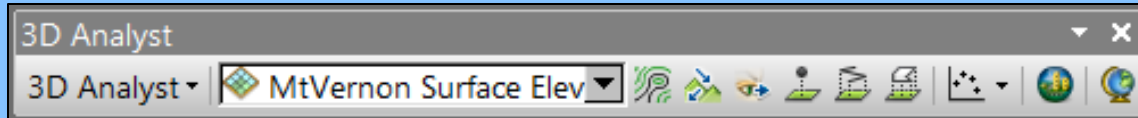
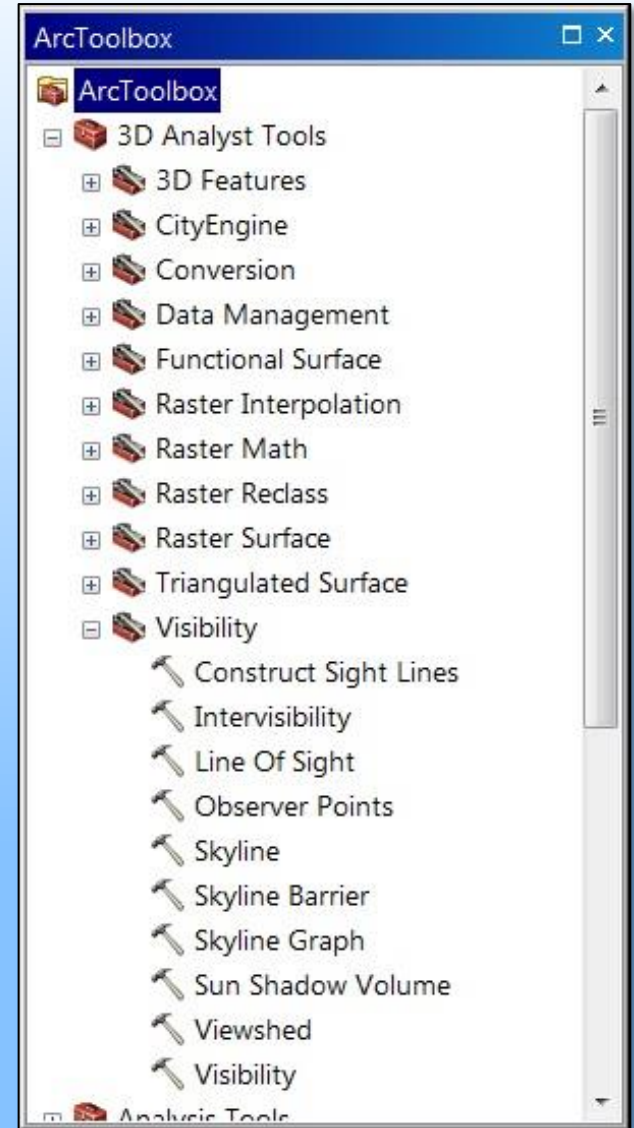
- Should definitely have GIS analysis & ArcGIS background
- Will require less up-front training

### Source Data

- LiDAR elevation data for both ground (DEM) and features (DSM)

### Time Commitment

- Most analysis can be completed in a day
- Additional days needed to format the analysis output into a presentable map



# 3D Analysis

## Potential Challenges

Communications between technical and non-technical staff is essential

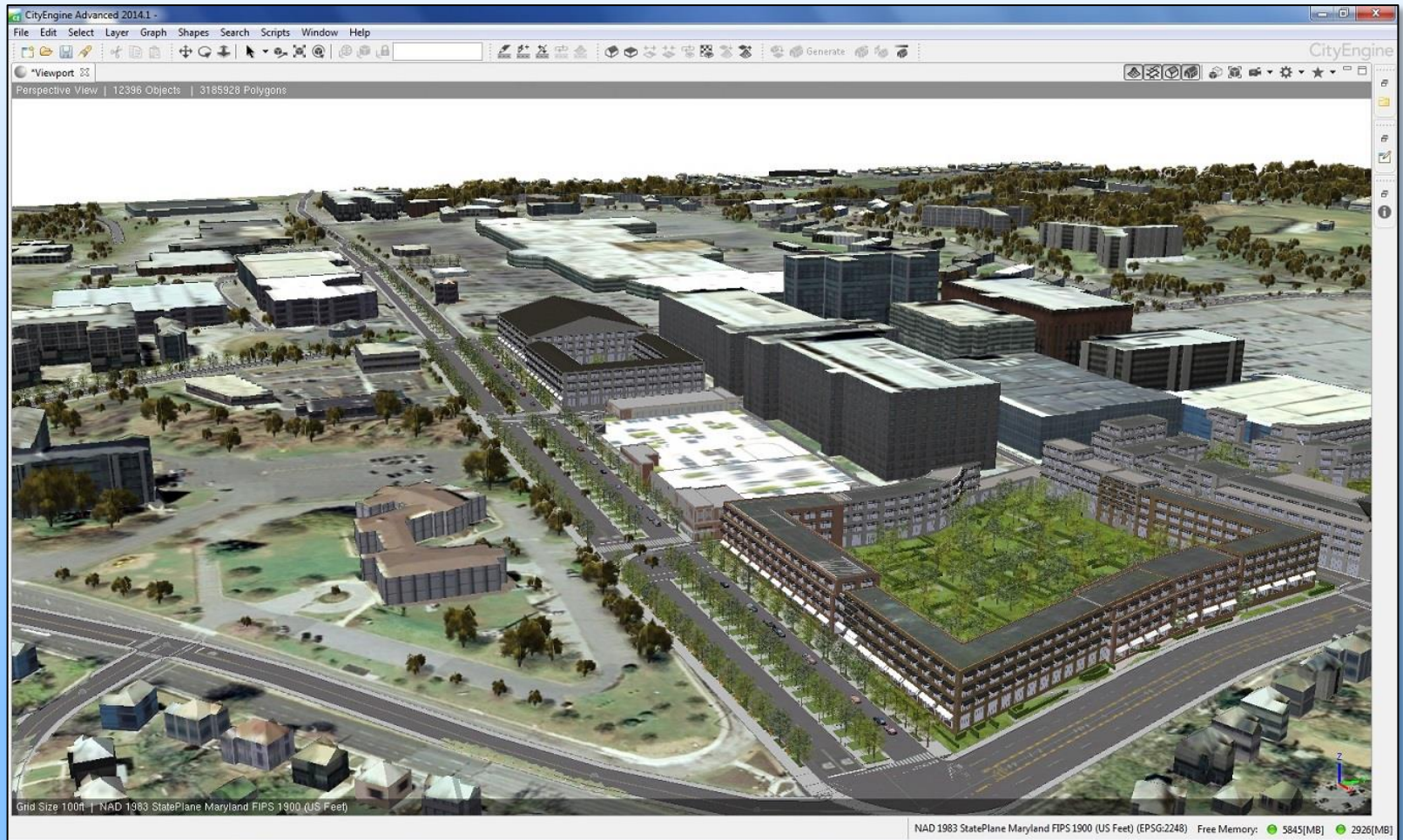
- Planners don't know the full capabilities of 3D analysis
- Analysts don't know what would be most helpful to planners
- Need to communicate and basically advertise what types of analysis are available so Planning staff knows what to ask for.

How to display analysis results in a relatable format?

- Sometimes analysis output is a 2D layer that can easily be added to a map
- Other times the output is a 3D dataset. Displaying this in a 2D format can be more difficult.

# Future 3D Enhancements

## ESRI CityEngine

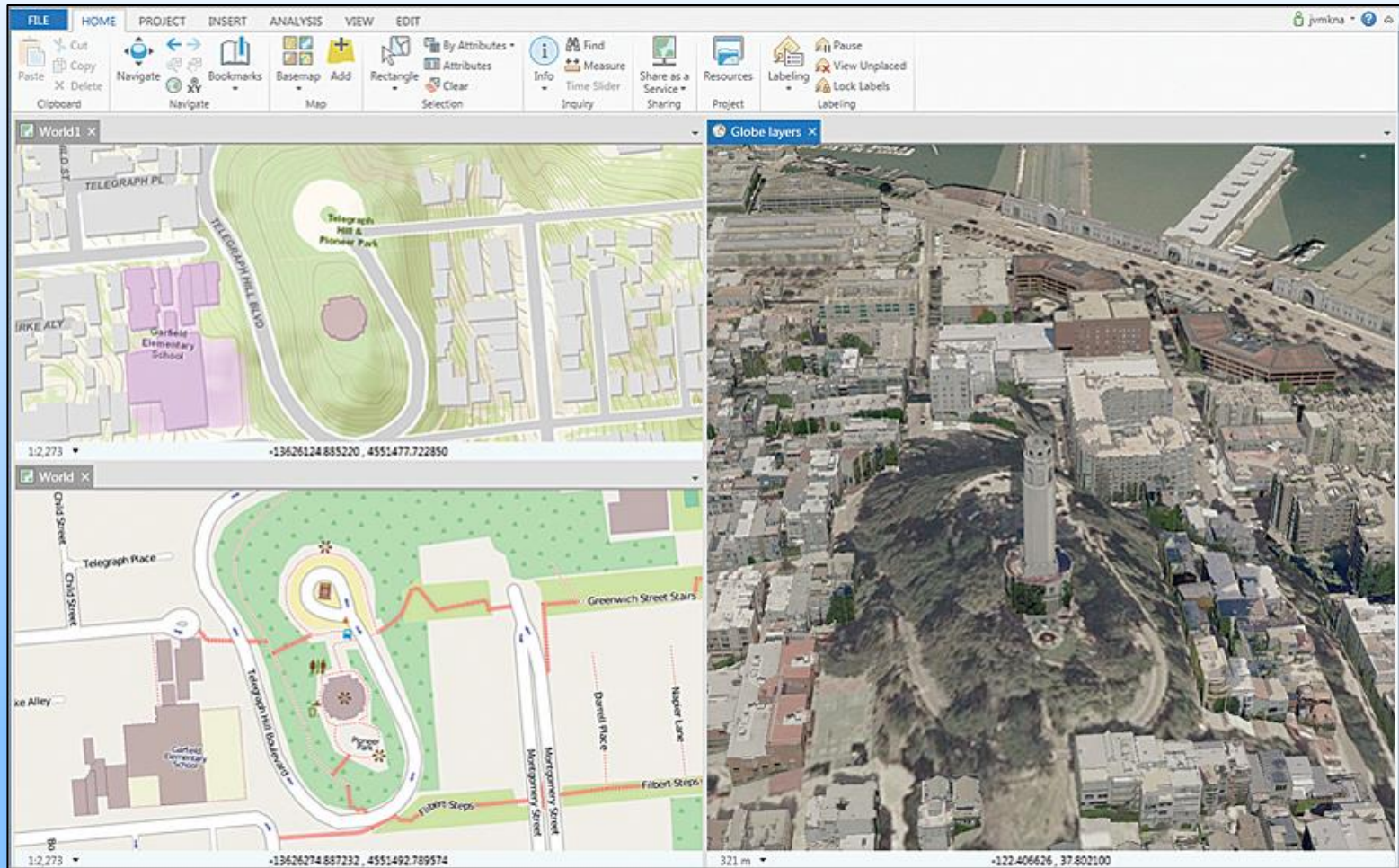


Software-generated photorealistic models for large-scale projects



# Future 3D Enhancements

## ESRI ArcGIS Pro



Work on GIS data while viewing it in 2D and 3D at the same time

# Summary of Challenges

- **Getting Started:** Since the software is not expensive and most technical staff can handle the work, the biggest challenge to initializing a 3D program is training.
- **Time Commitment:** will need dedicated staff for 1-2 weeks per project.
- **Adjusting to 3D:** Some non-technical staff may be reluctant to change and consider adding 3D to be a disruption to the existing workflow.
- **Communication:** It is necessary for technical and non-technical staff to work closely and communicate in order to bridge the understanding gap.

# Questions?

Feel free to contact me...

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