



DEVELOPER SUMMIT

March 10–13

Urban Planning in a 3D City

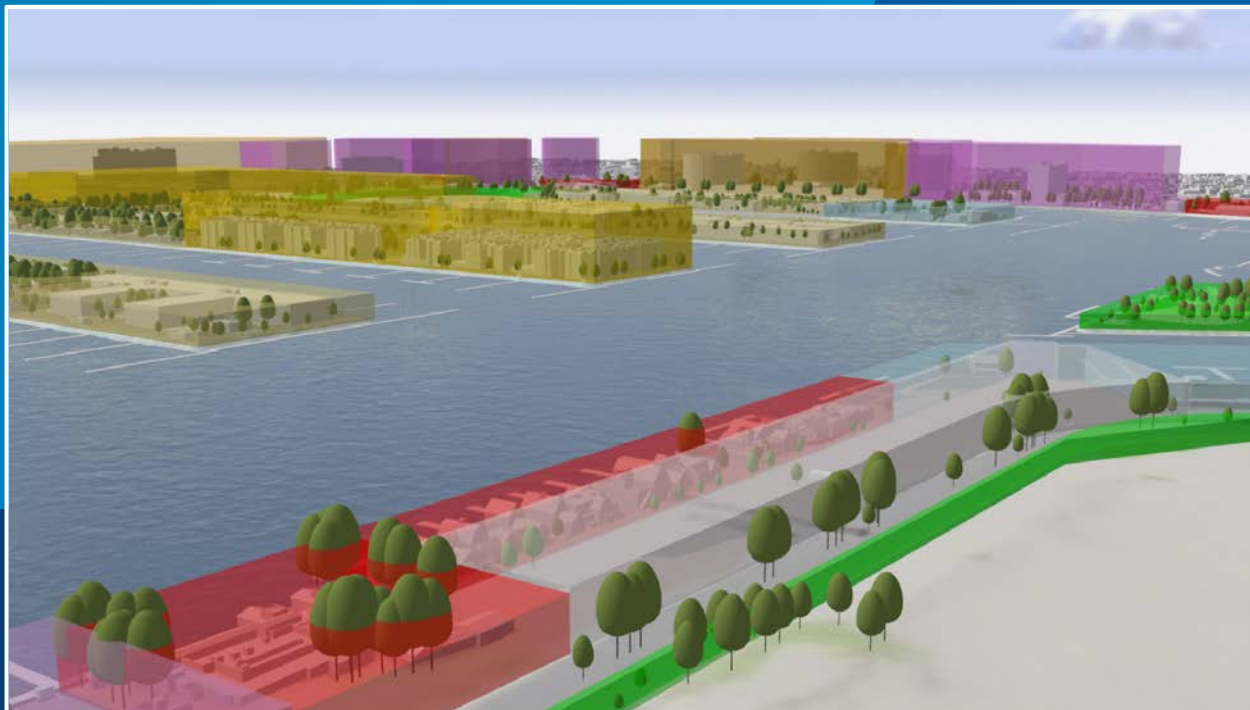
Thorsten Reitz, Craig McCabe, Thomas Knabl

Agenda

ArcGIS for 3D Cities for Urban Planning

1. Introduction to ArcGIS for 3D Cities
2. Setting the Scene: Base Layer Workflows
3. Import and manage Urban Planning data
4. Analyze proposed developments
5. Share development scenarios in ArcGIS Pro/Online



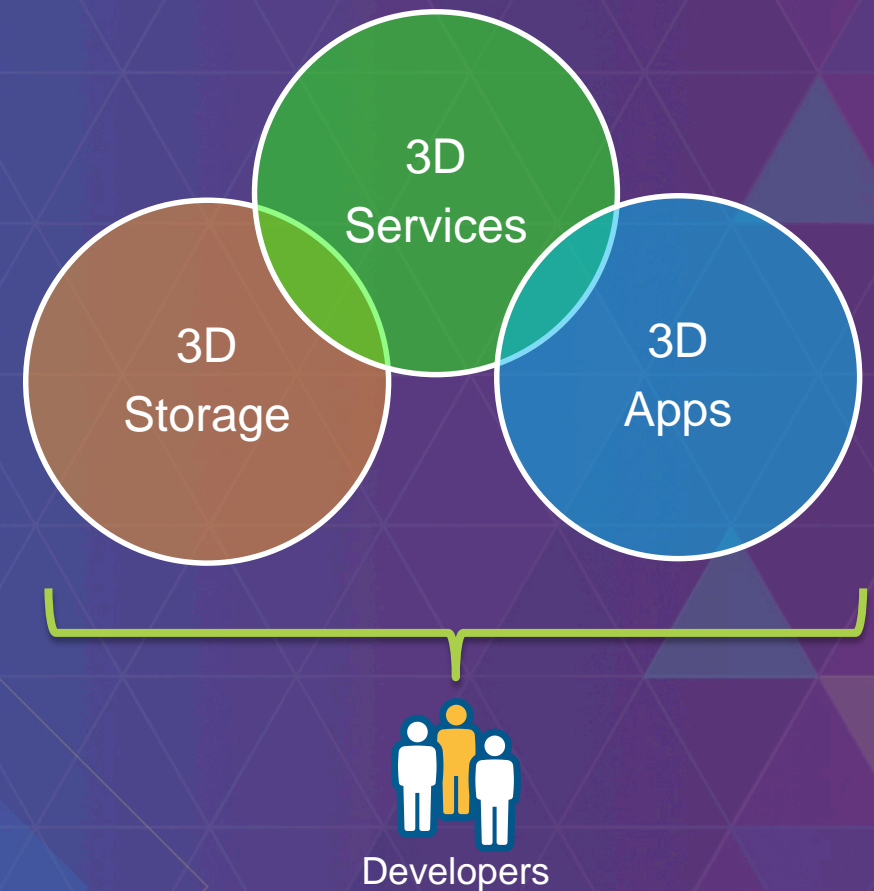


ArcGIS for 3D Cities

An Introduction

Why ArcGIS for 3D Cities?

Driving the platform's 3D capabilities



What is ArcGIS for 3D Cities?

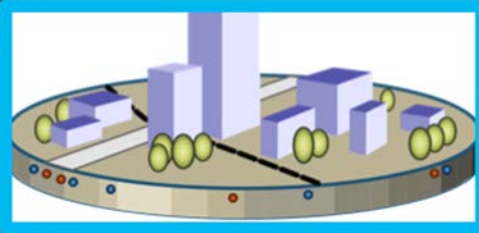
Ready-to-use Workflows, Tools and Sample Data for Urban Management

- Create 3D City Base Layers
- Build a 3D Campus Map
- Understand Zoning
- Perform Solar Analysis
- Visualize New Developments **beta**
- Roof-Form Extraction **beta**



Check out the workflows now: <http://bit.ly/esri3dcities>

3D Cities Information Model: Themes



Built Environment

- *Created and actively managed by people*
 - Structures, utilities, transportation networks, installations



Legal Environment

- *Defines restrictions on land use*
 - Land use zones, property ownership boundaries, regulations

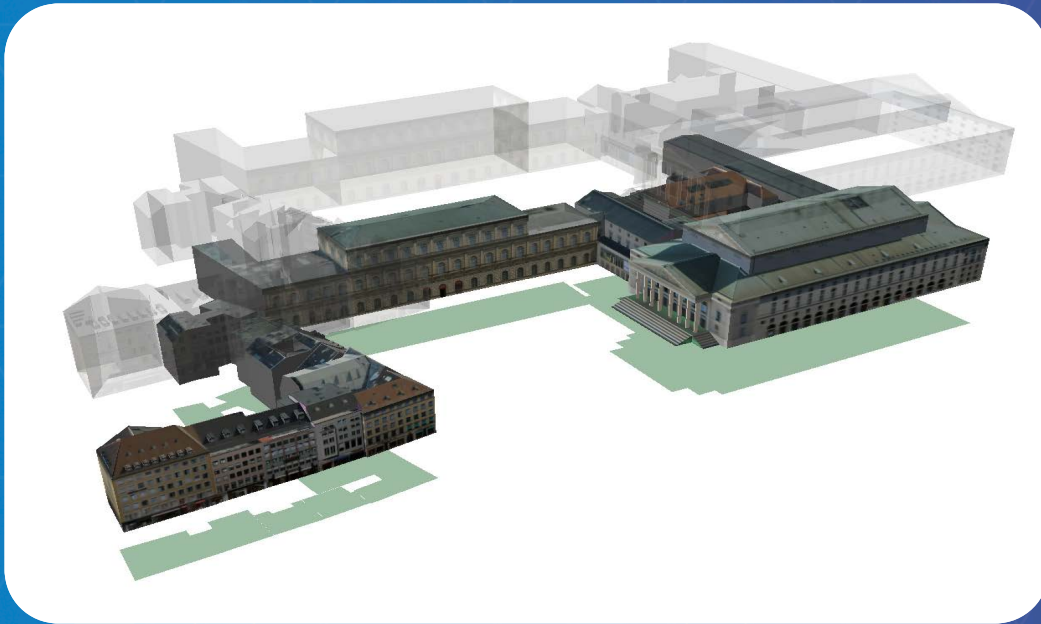


Natural Environment

- *Naturally occurring features on, above, or below the earth's surface*
 - Land cover, subsurface geology, atmosphere/climate/weather

Built Environment: Buildings

Connecting 2D and 3D Buildings



- The **Building** (Footprint object) carries most of the attributive information.
- **BuildingShell** represents the complete outer shell in 3D.
 - Procedural
 - Modeled
- **BuildingShellParts** can be used when separate processes for roofs/walls/ground plates are needed.

Built Environment: Building Interiors

Seamless usage of interior/exterior data



- **Building interior data:**

- Building
- Floor
- Space
- Structure
- Entrance

- **Used in analysis:**

- Query (where/who)
- Routing
- Asset allocation

Built Environment: Installations

Managing Portfolio of City Installations



- **Street Furniture**

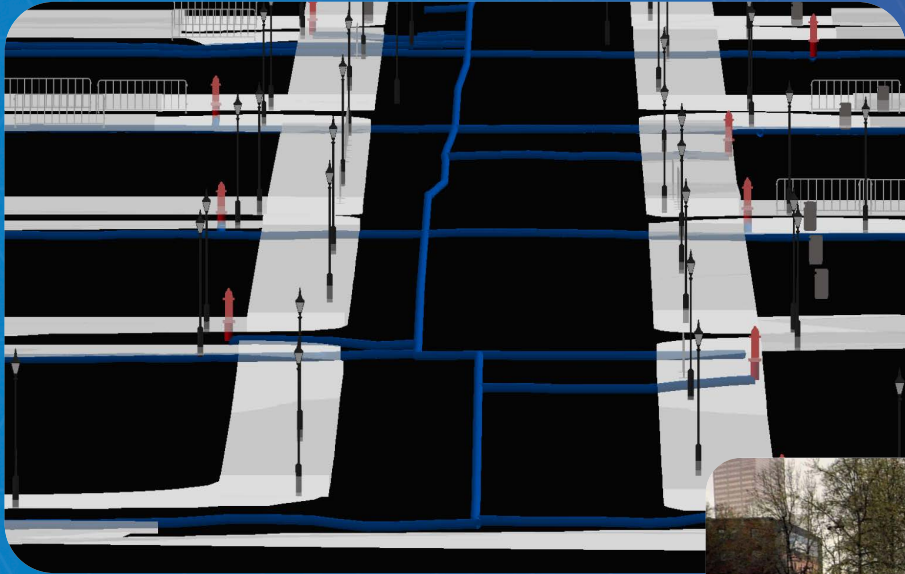
- Fire hydrants
- Benches
- Bike racks
- Trash cans
- Kiosks
- Poles

- **Vegetation**

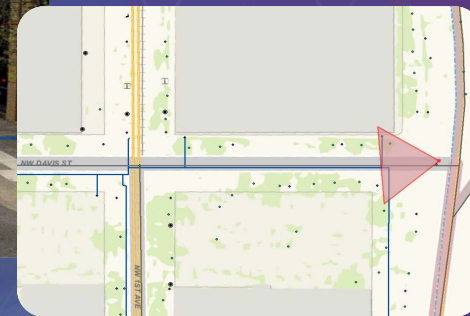
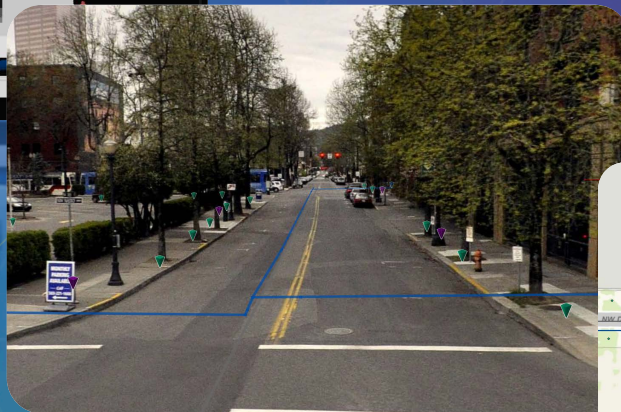
- Trees

Built Environment: Utility Networks

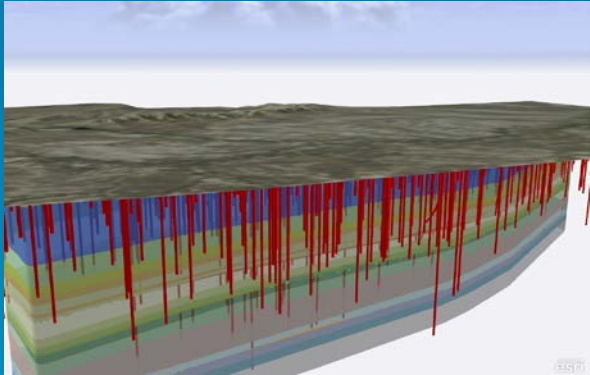
Discover the underground potential of your city



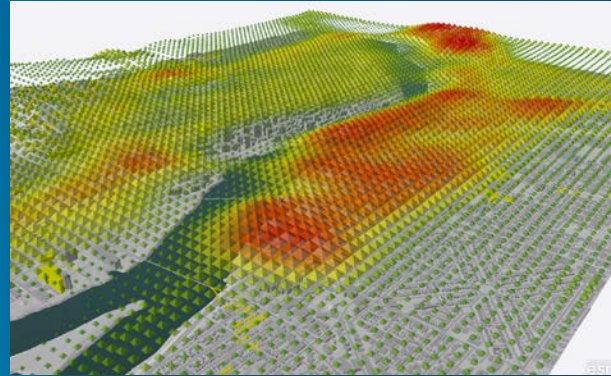
- Water
- Sewer
- Stormwater
- Gas
- Electric



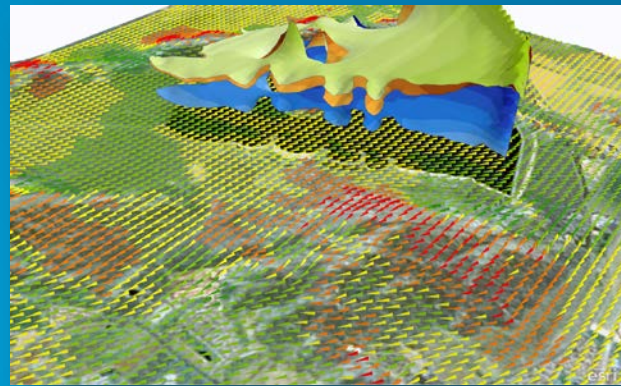
The Natural Environment



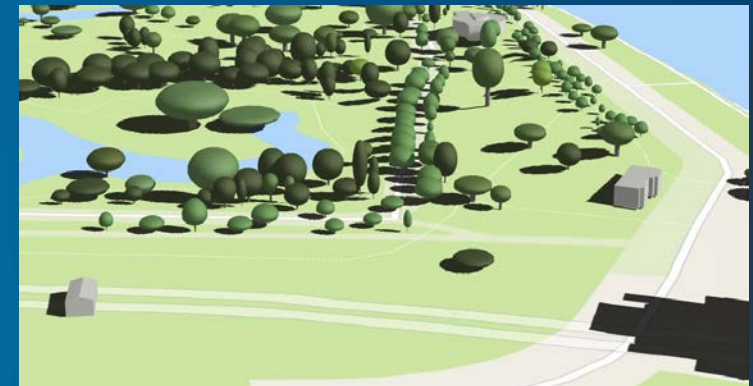
Subsurface Geology



Atmosphere & Pollution

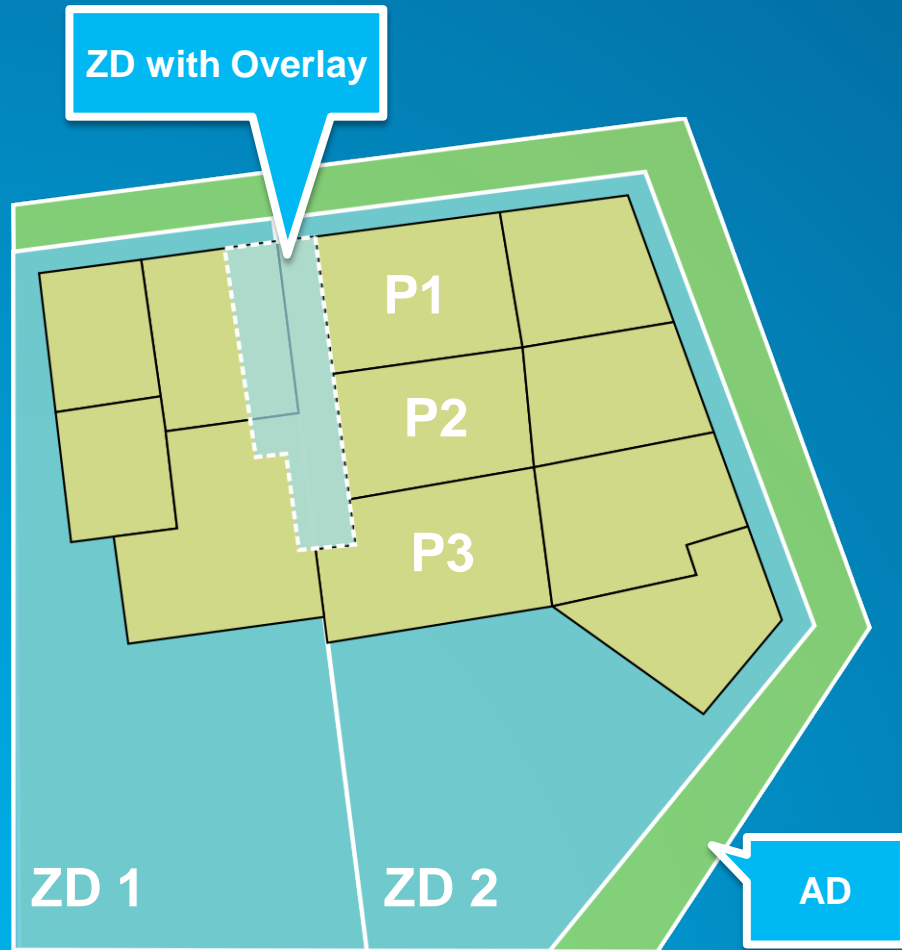


Wind & Weather



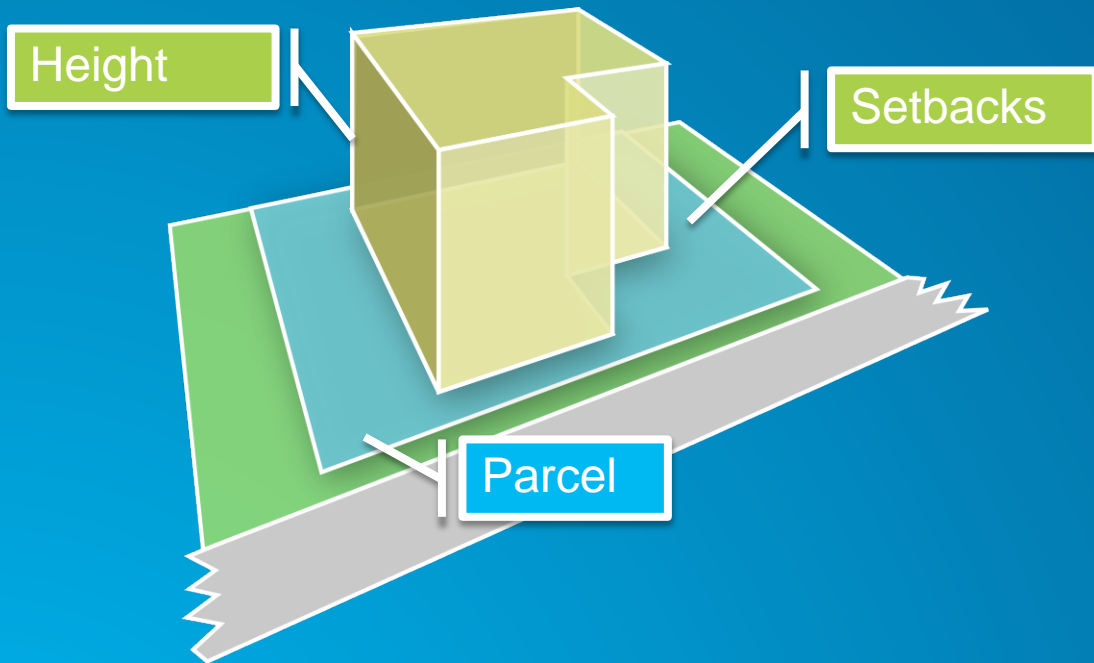
Land Cover

Legal Environment: From 2D to 3D



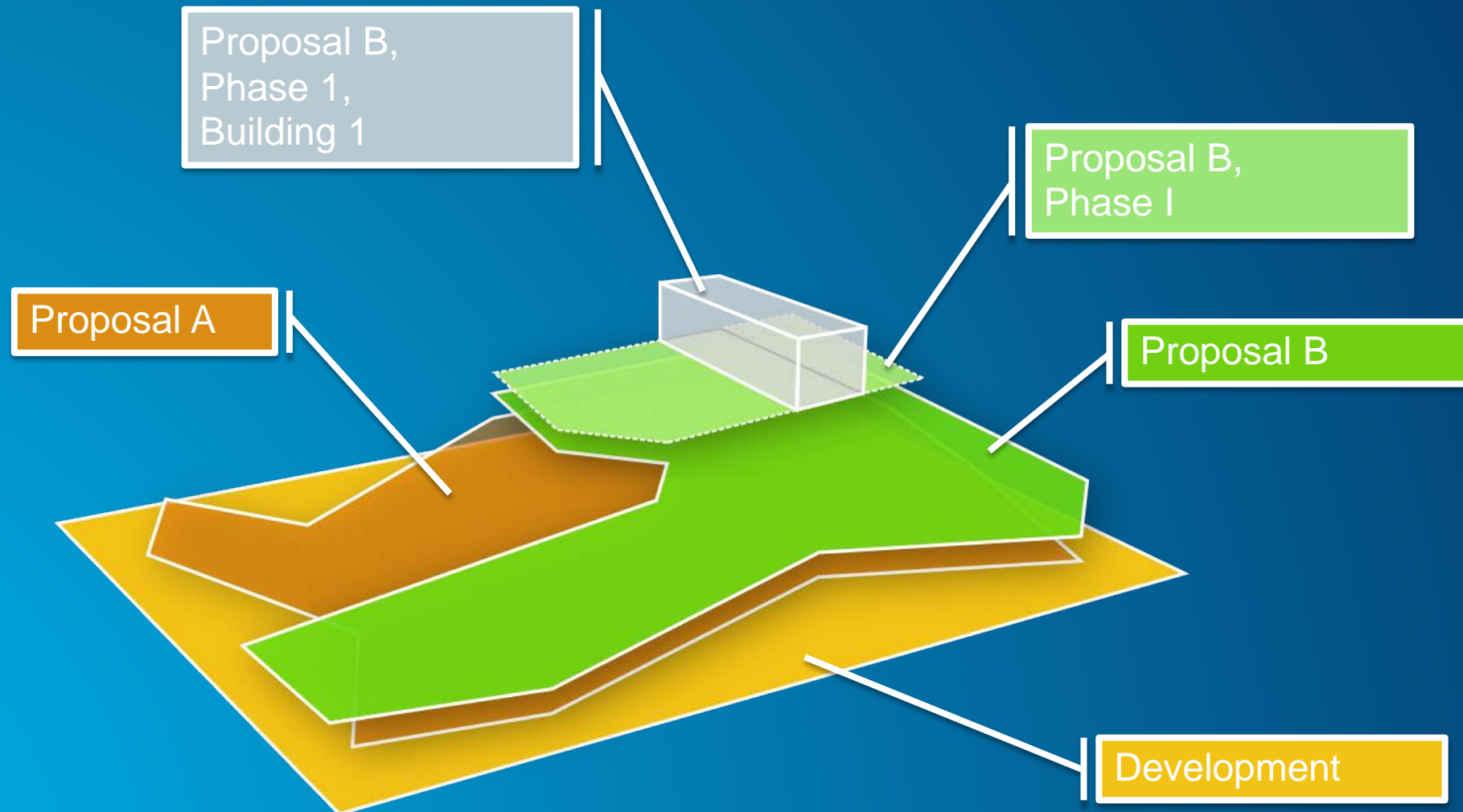
- **Administrative Districts**
 - How are territories organized?
- **Zoning Districts**
 - What current and future land usage is defined here?
- **Parcels (Land/Tax/Unit)**
 - Who owns this property and how can it be identified?
- **Regulations**
 - How can a Parcel or Zoning District be used?

Legal Environment: Regulations



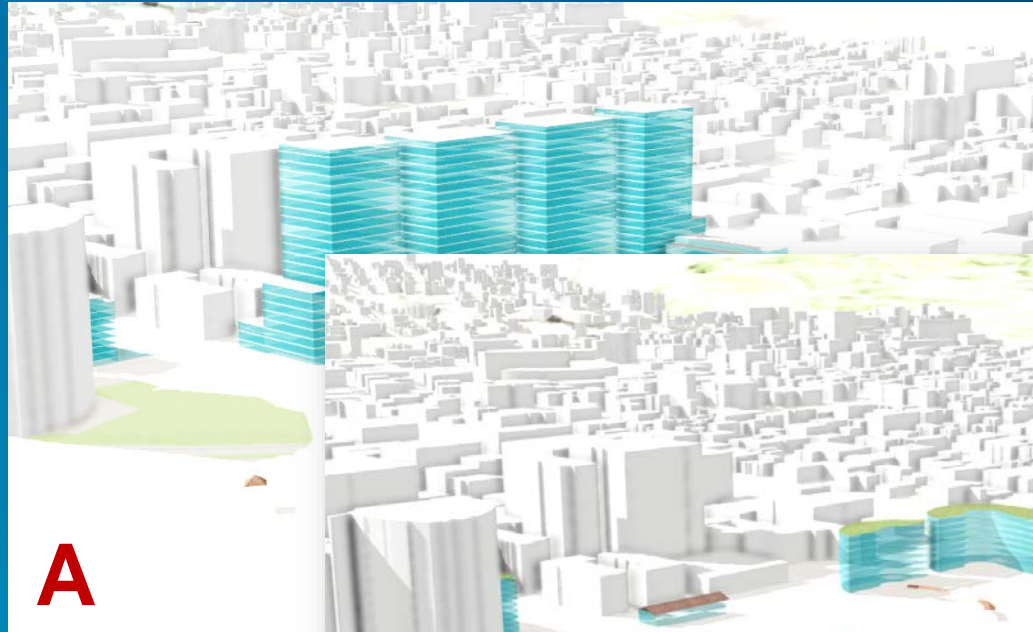
Attribute	Type
Setback Front	Min 5', max 15'
Setback Sides	Min 8'
Roof Type	Flat
Total Height	Max 40'
Site Coverage	0.6
FAR	Max 1.2
Levels Above Ground	Max 4
Units per Parcel	Max 4

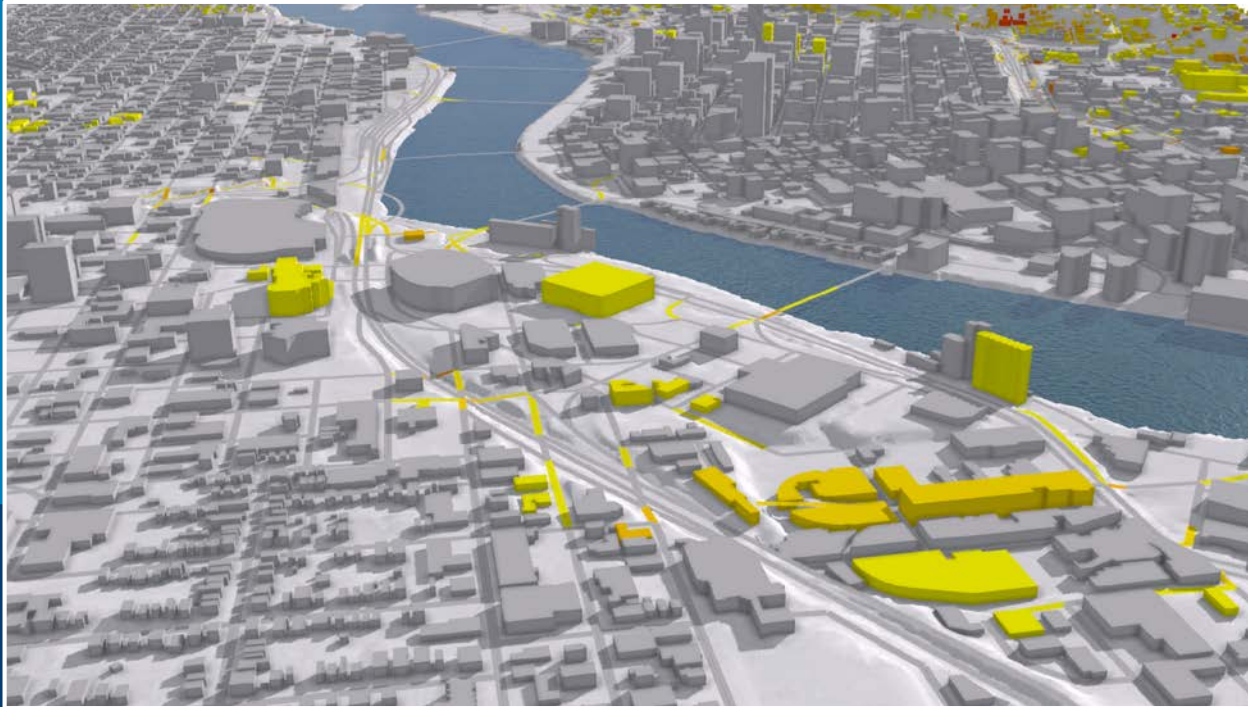
Legal Environment: Development Proposals



North Portland Development Example

- Now: Light Industry
- Two proposals
 - High Density („A“)
 - Medium Density („B“)
- Carbon Footprint
- View Quality
- Integration in Urban Context





Setting the Scene

All About the Base Layer Workflows

3D City Base Layers

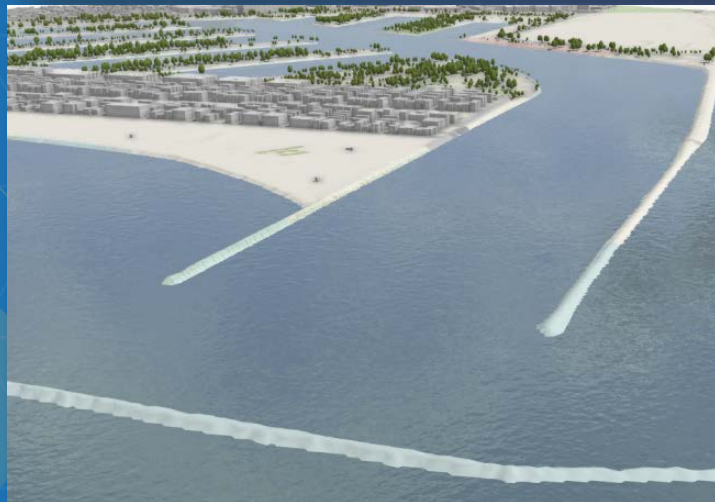
Buildings



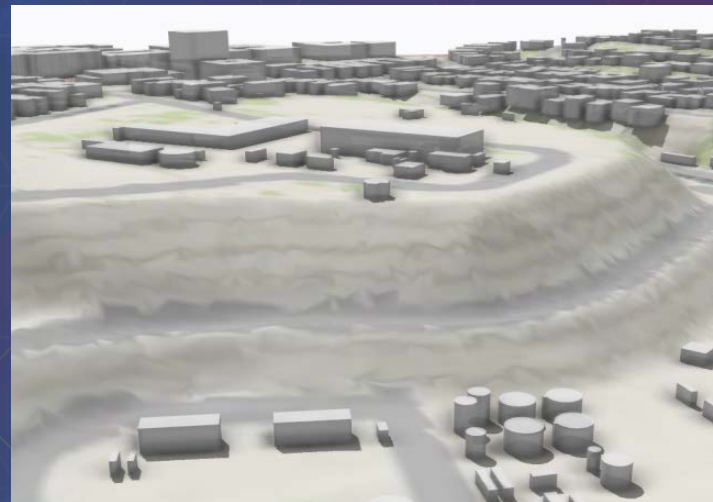
Trees



Water



Elevation



Base Layer Workflows

The screenshot shows the ArcGIS Desktop 3D Cities documentation page. At the top, there is a navigation bar with 'ArcGIS for Desktop' and a dropdown arrow, followed by 'DOCUMENTATION' and 'SUPPORT'. On the right side of the navigation bar, there is a search icon labeled 'SEARCH' and a 'Sign In' link. Below the navigation bar is a blue header with the title '3D Cities' and three tabs: 'Home', '3D City Base Layers', 'Solar Analysis', and 'Zoning Regulations'. The main content area features a sub-header 'Understand and manage your city by 3D-enabling your GIS.' followed by two columns of content. The left column is titled 'Create 3D City Base Layers' and includes an image of a 3D city model, a paragraph of text, and a 'Show me how >' link. The right column is titled 'Perform Solar Analysis' and includes an image of a 3D city model with solar panels, a paragraph of text, and a 'Show me how >' link. To the right of these columns is a light blue box titled 'Explore Example 3D Cities' containing a paragraph of text and three links: 'Washington, DC, Height Study', 'Los Angeles Solar Potential Analysis', and 'Esri Campus'. Below this box is a white box titled 'Latest news on the ArcGIS Blog >'. At the bottom right of the screenshot, there is a partially visible link '...the dimensions on GeoNet >'. The entire screenshot is set against a background of a blue and purple geometric pattern.


ArcGIS for Desktop ▾ DOCUMENTATION SUPPORT

SEARCH Sign In

3D Cities

Home 3D City Base Layers Solar Analysis Zoning Regulations


Understand and manage your city by 3D-enabling your GIS.



Create 3D City Base Layers

A 3D City needs a set of base layers—terrain, buildings, and vegetation—to provide the foundation for design and analysis. Create your 3D City by 3D-enabling your existing GIS data, and gain inspiration from other cities by [exploring example 3D cities](#).

[Show me how >](#)



Perform Solar Analysis

Find rooftops suitable for solar generation for a single building or citywide. Identify potential kilowatt-hour yield for installations.

[Show me how >](#)

Explore Example 3D Cities

See how you can better understand your city by going 3D.

- [Washington, DC, Height Study](#)
- [Los Angeles Solar Potential Analysis](#)
- [Esri Campus](#)

[Latest news on the ArcGIS Blog >](#)

[...the dimensions on GeoNet >](#)

<http://desktop.arcgis.com/en/3d/3d-cities/>

Demo

Base Layers Video & Example Scenes



Manage Urban Planning Data

Data Import from DCC +
OGC/W3C standard formats

Formats and Challenges

Collada

VRML

FBX

CityGML

KML/KMZ

Revit, IFC

Obj, 3ds, ...



Semantics

Data Quality

Maintenance

Ambiguity

Complexity

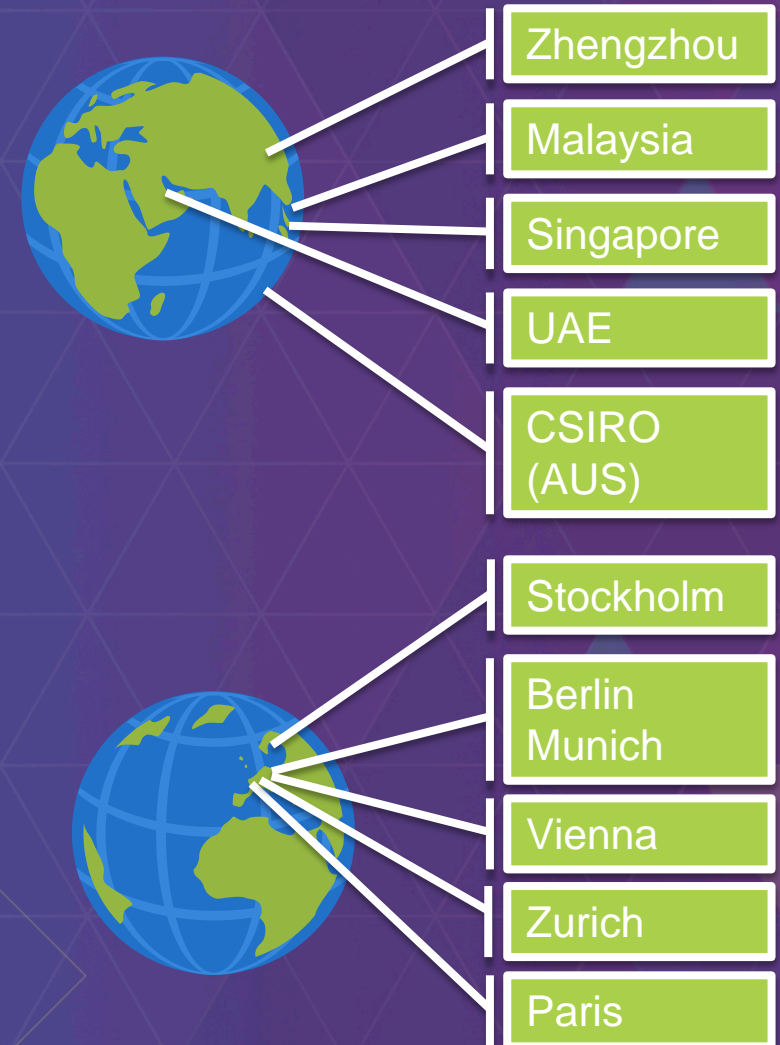
Structure

Visual Appeal

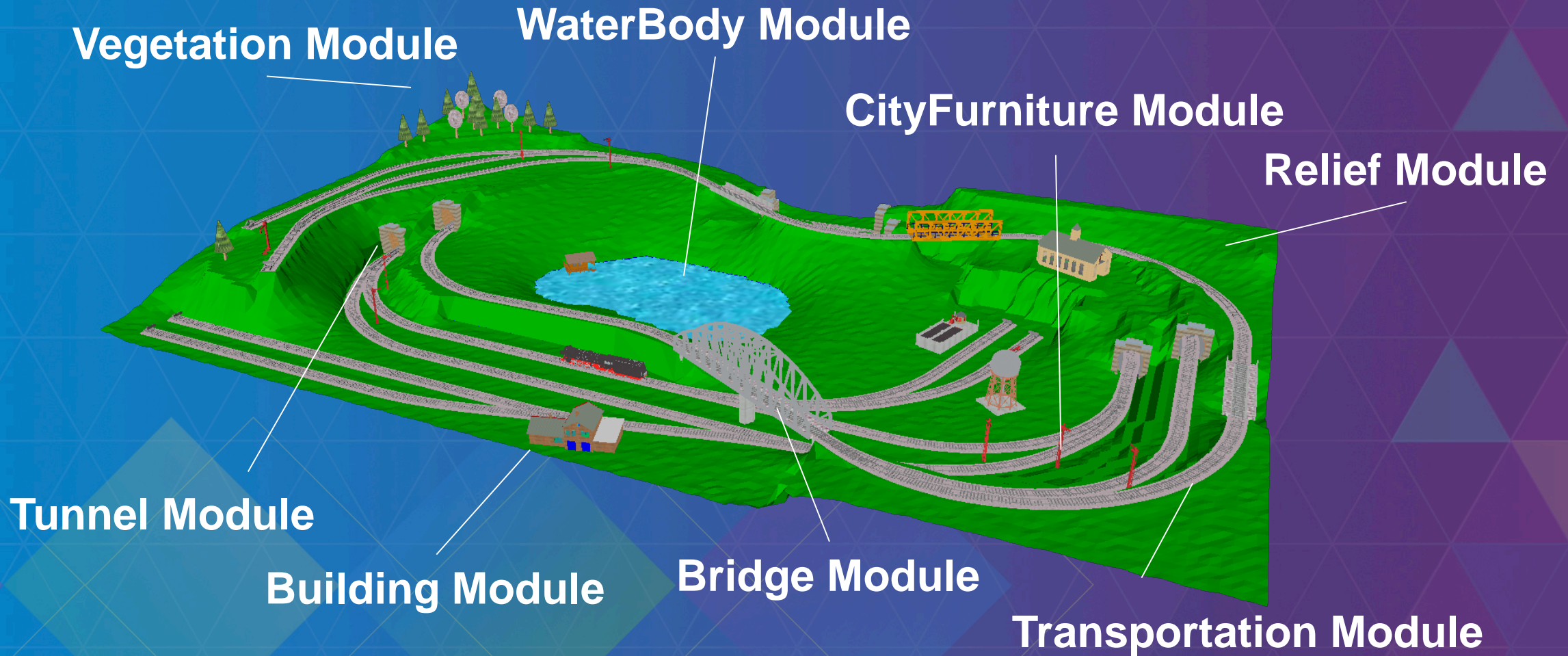
CityGML Applications

Who uses CityGML?

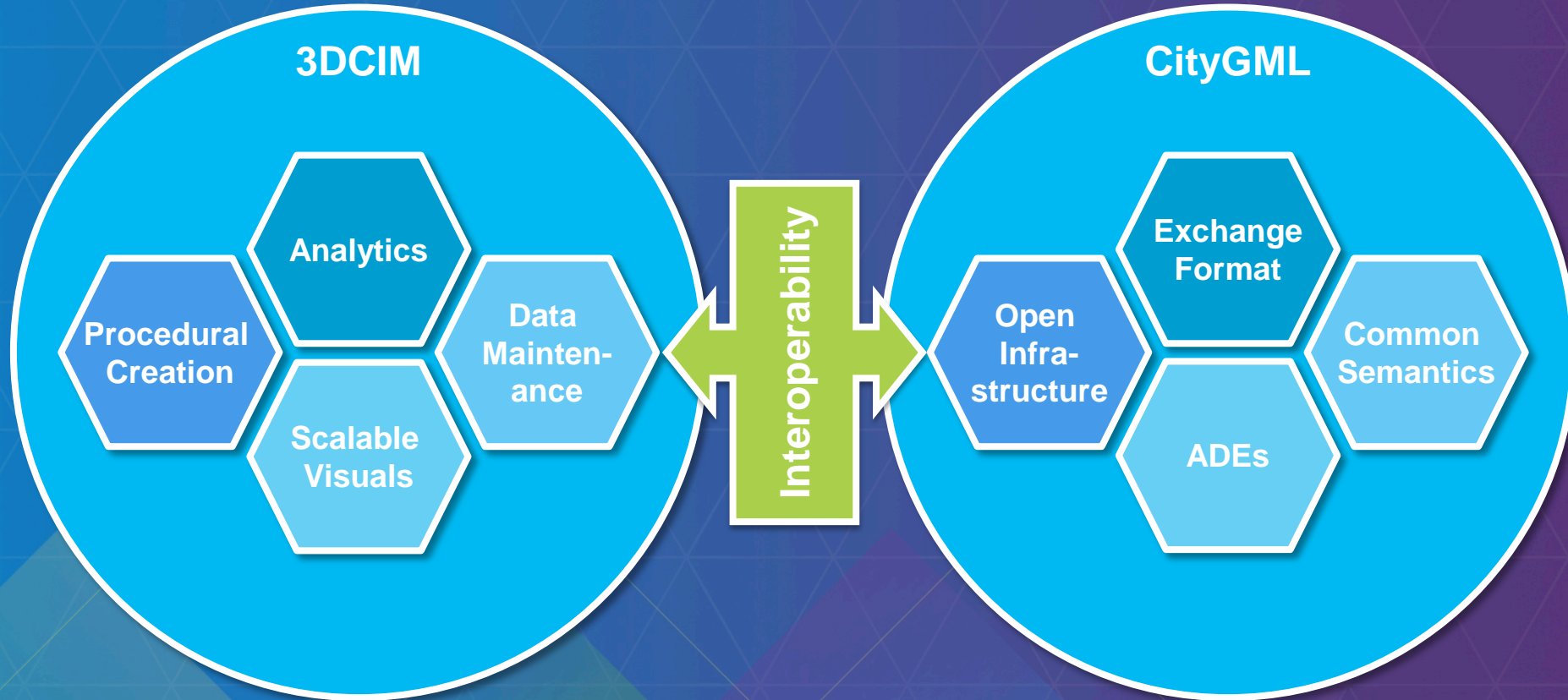
- **Cities**
 - Store and share information about City Models
 - Used in conjunction with cadastre/ land register
- **Regional and local authorities**
 - Create state-wide models (e.g. all in Germany)
 - Create nation-wide models (e.g. Netherlands)
- **INSPIRE Buildings Theme**
 - Re-use of Buildings Module



CityGML Modules

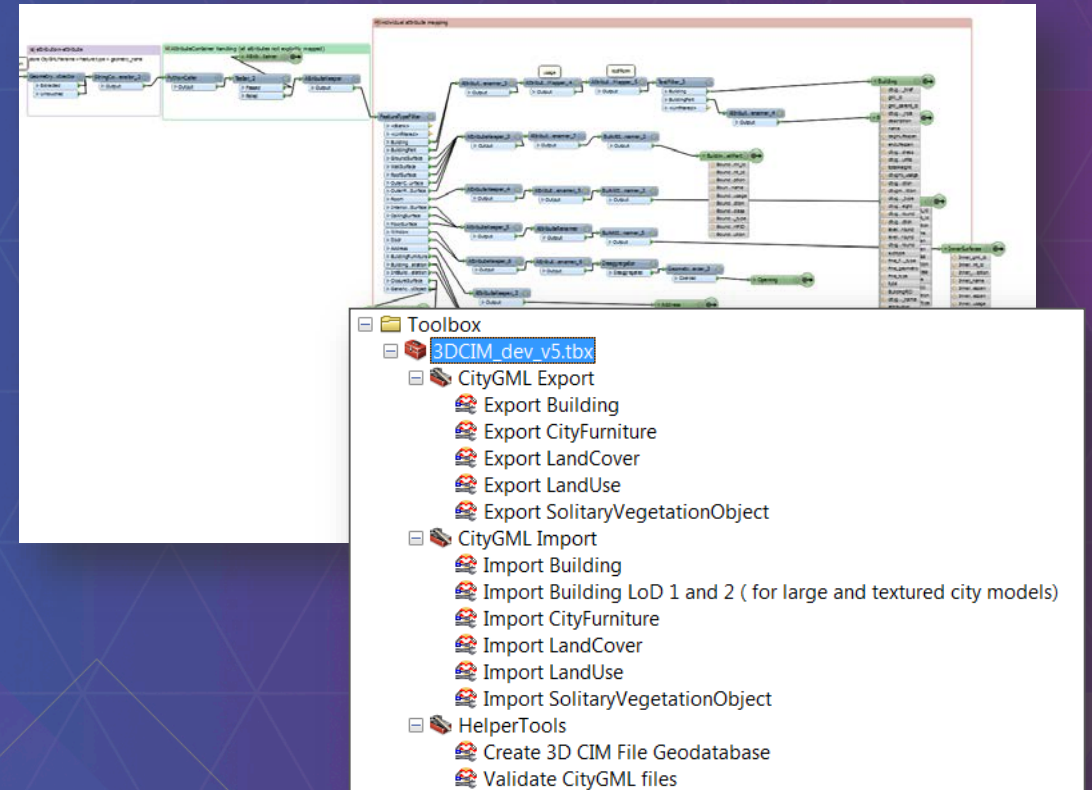


Coupling CityGML and the 3DCIM



CityGML Import and Export Principles

- ETL Tools
 - Ready to use
 - Customizable
- Lossless import and export (round trips)
- CityGML version 1.0 and 2.0
 - All Level of Details (0-4)
 - Multiple representations
 - Textures
- System requirements
 - ArcGIS 10.2.2
 - Data Interoperability Extension or FME® Desktop 2014



Supported CityGML Feature Classes

Building, BuildingPart

- Roof-, Wall-, GroundSurface
- Room
- BuildingFurniture
- IntBuildingInstallation
- BuildingInstallation
- Opening, Window, Door
- FloorSurface
- InteriorWallSurface

PlantCover

SolitaryVegetationObject

CityFurniture

TrafficArea

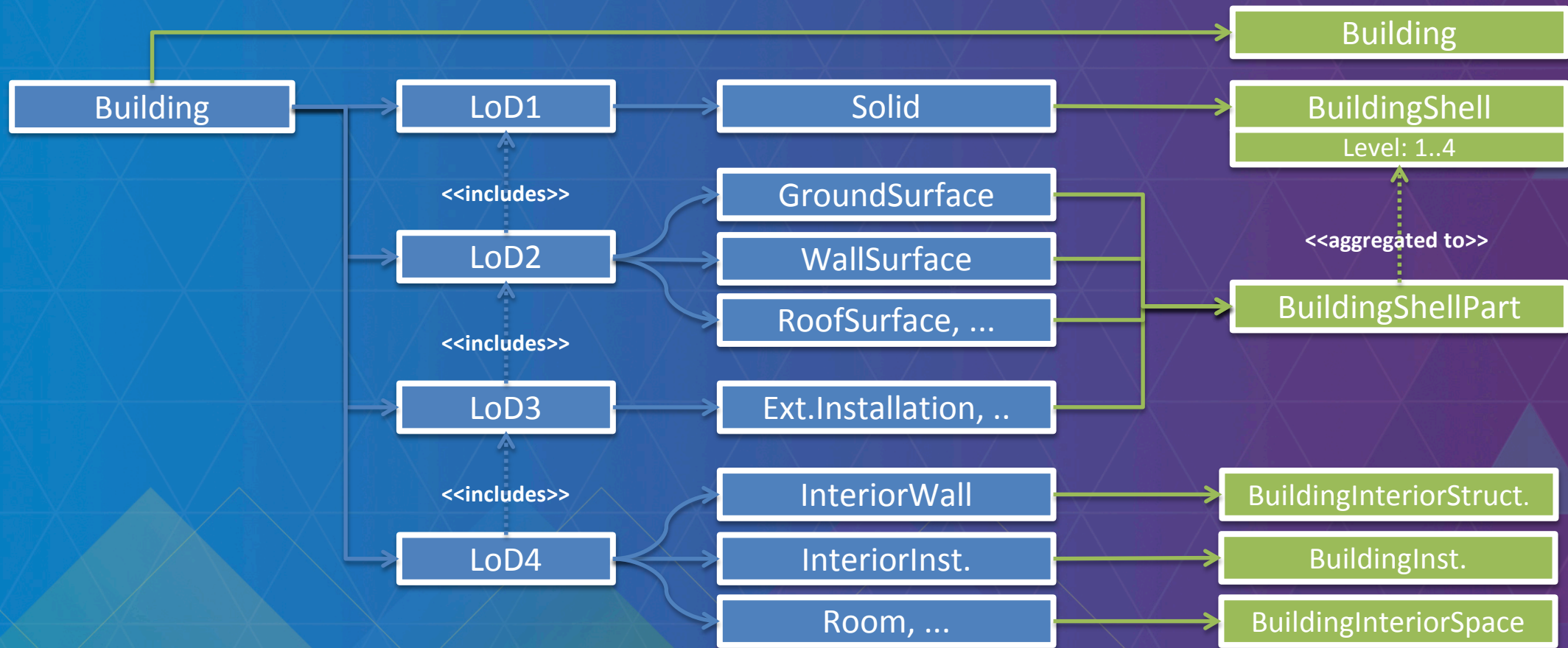
Address

LandUse

WaterBody & Surface

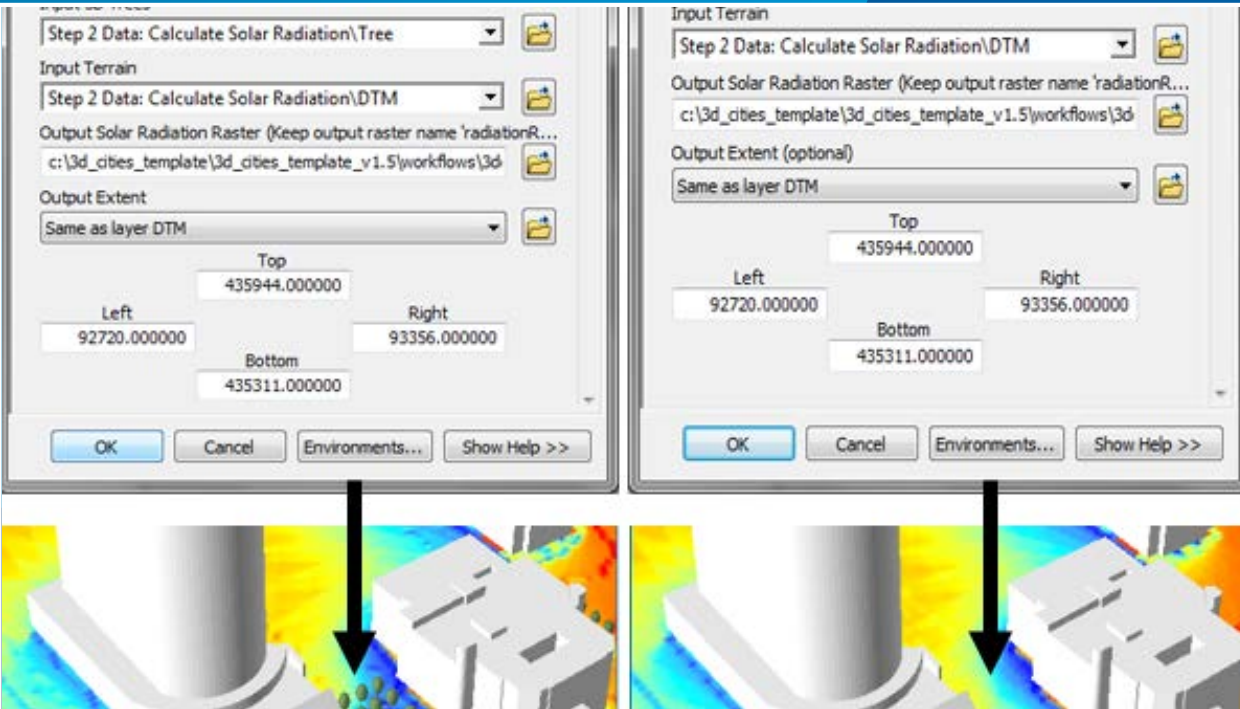
3D Cities Information Model in File GDB 

Example Mapping for Building



Demo

Import a Development Proposal from CityGML

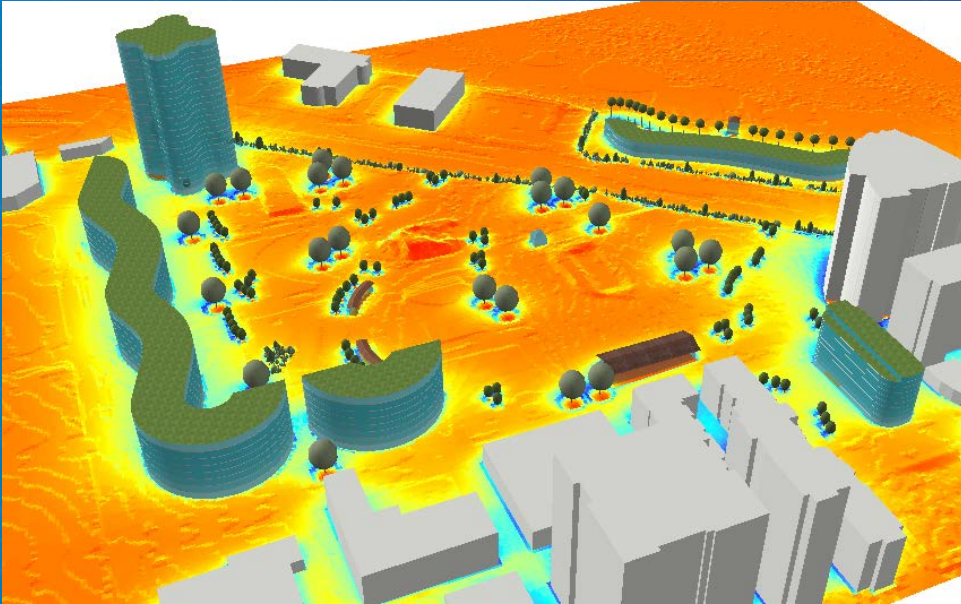


Analyze Proposed Developments

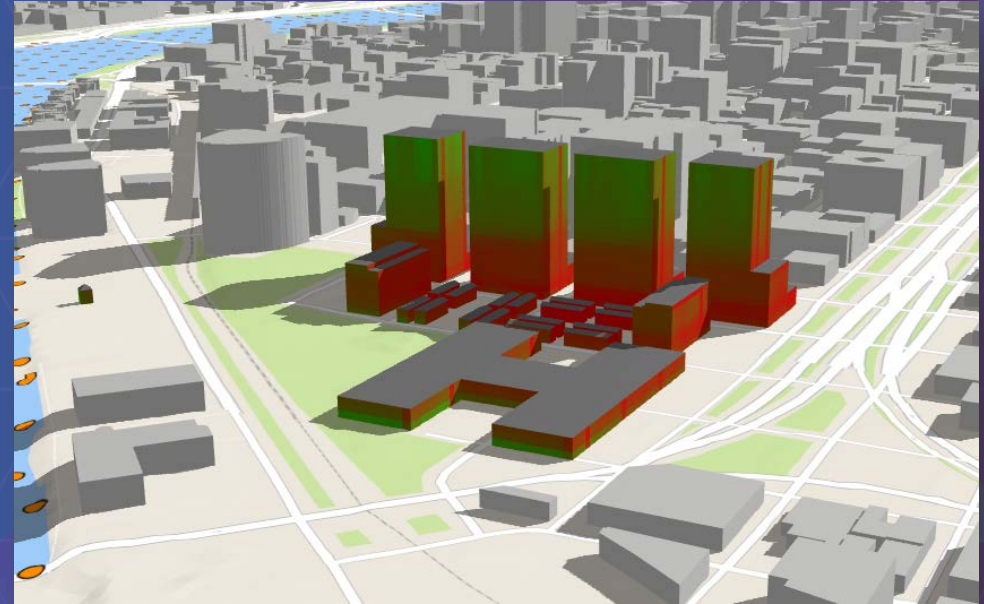
Analyze Proposed Developments

Solar Potential and View Quality

Two Analytical Workflows for Urban Planning



Solar Potential



View Quality

Solar Potential Workflow

<http://desktop.arcgis.com/en/3d/3d-cities/solar-analysis/>

The screenshot shows the ArcGIS Desktop 3D Cities Solar Analysis workflow page. The page has a white header with the ArcGIS logo and navigation links for 'DOCUMENTATION' and 'SUPPORT'. A search bar and a 'Sign In' link are also present. Below the header is a blue navigation bar with the title '3D Cities' and four menu items: 'Home', '3D City Base Layers', 'Solar Analysis', and 'Zoning Regulations'. The main content area is white and features a heading 'Understand and manage your city by 3D-enabling your GIS.' Below this heading are two main sections. The first section, 'Create 3D City Base Layers', includes an image of a 3D city model and a paragraph explaining that a 3D city needs base layers like terrain, buildings, and vegetation. The second section, 'Perform Solar Analysis', includes an image of a 3D city model with orange roofs and a paragraph explaining how to find rooftops suitable for solar generation. To the right of these sections is a light blue box titled 'Explore Example 3D Cities' which lists three examples: 'Washington, DC, Height Study', 'Los Angeles Solar Potential Analysis', and 'Esri Campus'. Below this box is a white box titled 'Latest news on the ArcGIS Blog >'. At the bottom of the page, there is a partial link to 'Learn the dimensions on GeoNet >'. The entire screenshot is framed with a torn paper effect.


ArcGIS for Desktop ▾ DOCUMENTATION SUPPORT

SEARCH Sign In

3D Cities

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- [Esri Campus](#)

[Latest news on the ArcGIS Blog >](#)

[Learn the dimensions on GeoNet >](#)

Demo

Calculate Solar Potential

View Quality Analysis

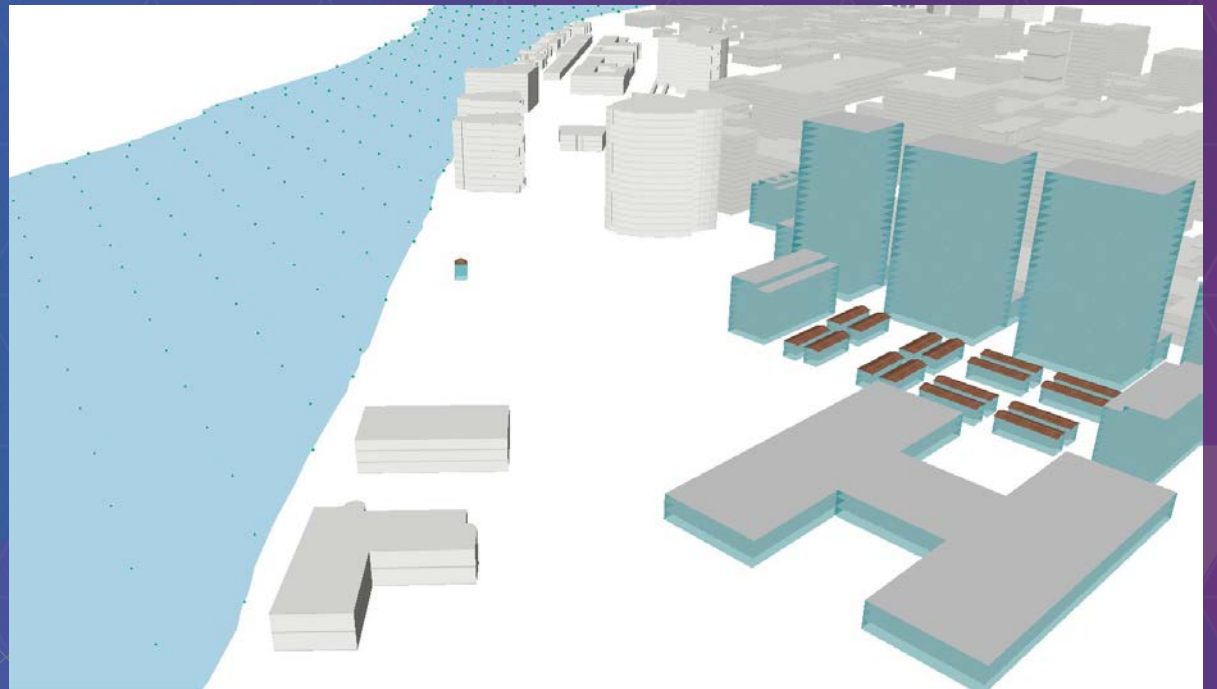
Motivation

What is it about

1. Riverview from proposed buildings
2. Line of sight analysis

Visual valuation of the properties for:

1. The city to review possible taxation
2. As a support to get funding



View Quality Analysis Workflow

Show view quality analysis workflow steps

The screenshot shows the ArcGIS Resources website's CityEngine Gallery. The page features a navigation bar with 'Home', 'Communities', 'Help', 'Blog', 'Forums', and 'Videos'. A search bar is located in the top right. The main content area is titled 'CityEngine Gallery' and includes a search bar, a display mode selector (set to 'Thumbnail'), and a pagination indicator showing 'Page 1 of 1 (1 - 5 of 5 items)'. On the left, there are filter sections for 'Resource Type', 'Industry', 'Architectural Style', and 'CE Version'. The 'Resource Type' section has 'ArcGIS - CityEngine workflows' selected. The main gallery displays five items, with '3DCity: Analysis (part 5)' highlighted with an orange border.

ArcGIS Resources ArcGIS Online Sign In English ▾

Home Communities Help Blog Forums Videos Search City Engine

CityEngine Gallery

Communities / CityEngine

Resource Type Clear All

- ArcGIS – CityEngine workflows
- CityEngine Examples
- CityEngine Tutorials
- CityEngine Web Scenes
- Rule Packages

Industry

- GIS
- Urban Design
- Simulation
- Entertainment

Architectural Style

- Schematic
- Ancient
- Medieval
- Contemporary
- Sci-Fi

CE Version

Search CityEngine Gallery

Display: List | **Thumbnail** | Detail
Show: 15 | 30 | 45 items

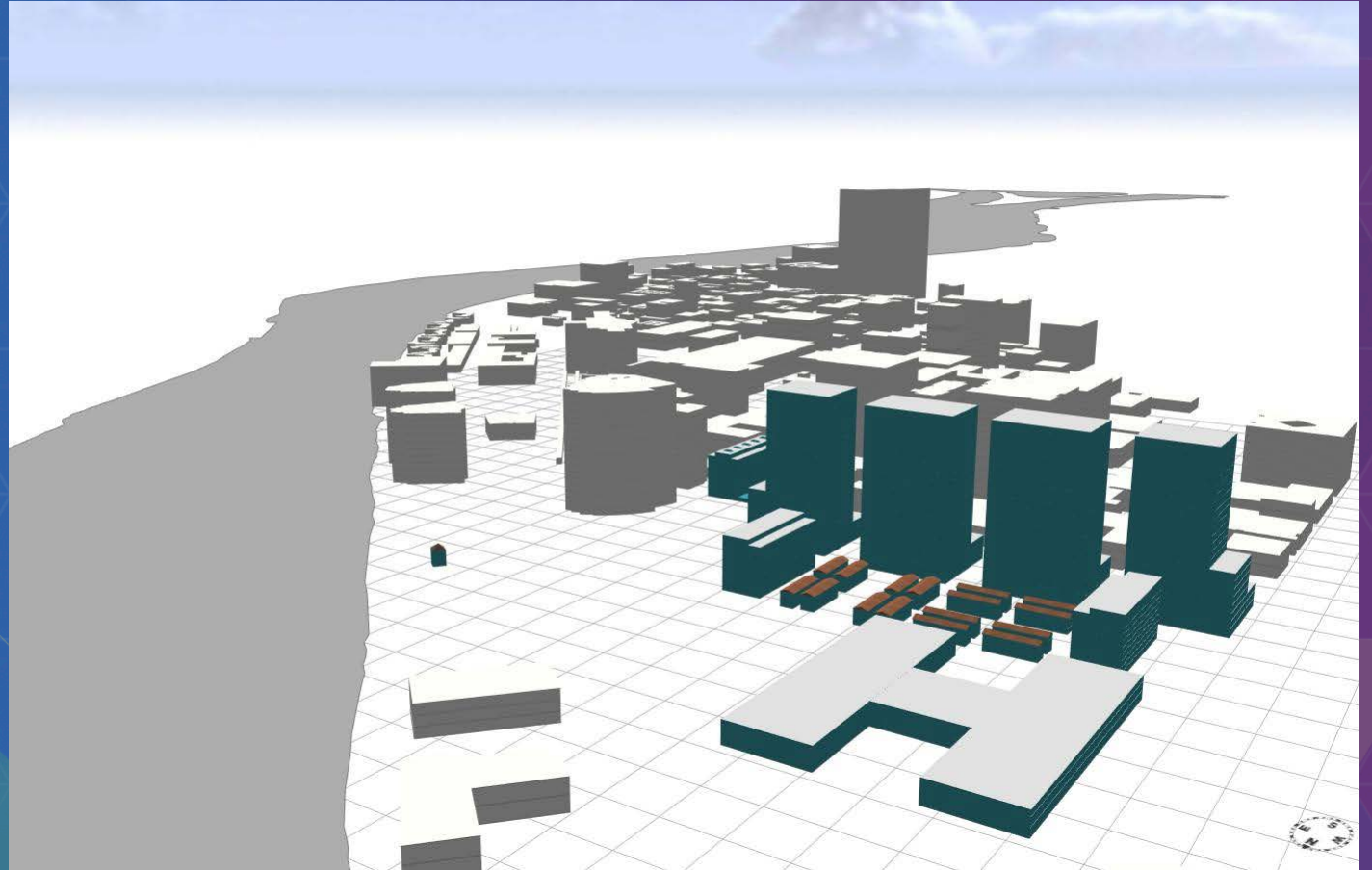
Page 1 of 1 (1 - 5 of 5 items)

- 3DCity: Creation (part 2)
- 3DCity: Publish (part 6)
- 3DCity: Maintenance (part 3)
- 3DCity: Design (part 4)
- 3DCity: Analysis (part 5)

View Quality Analysis Workflow

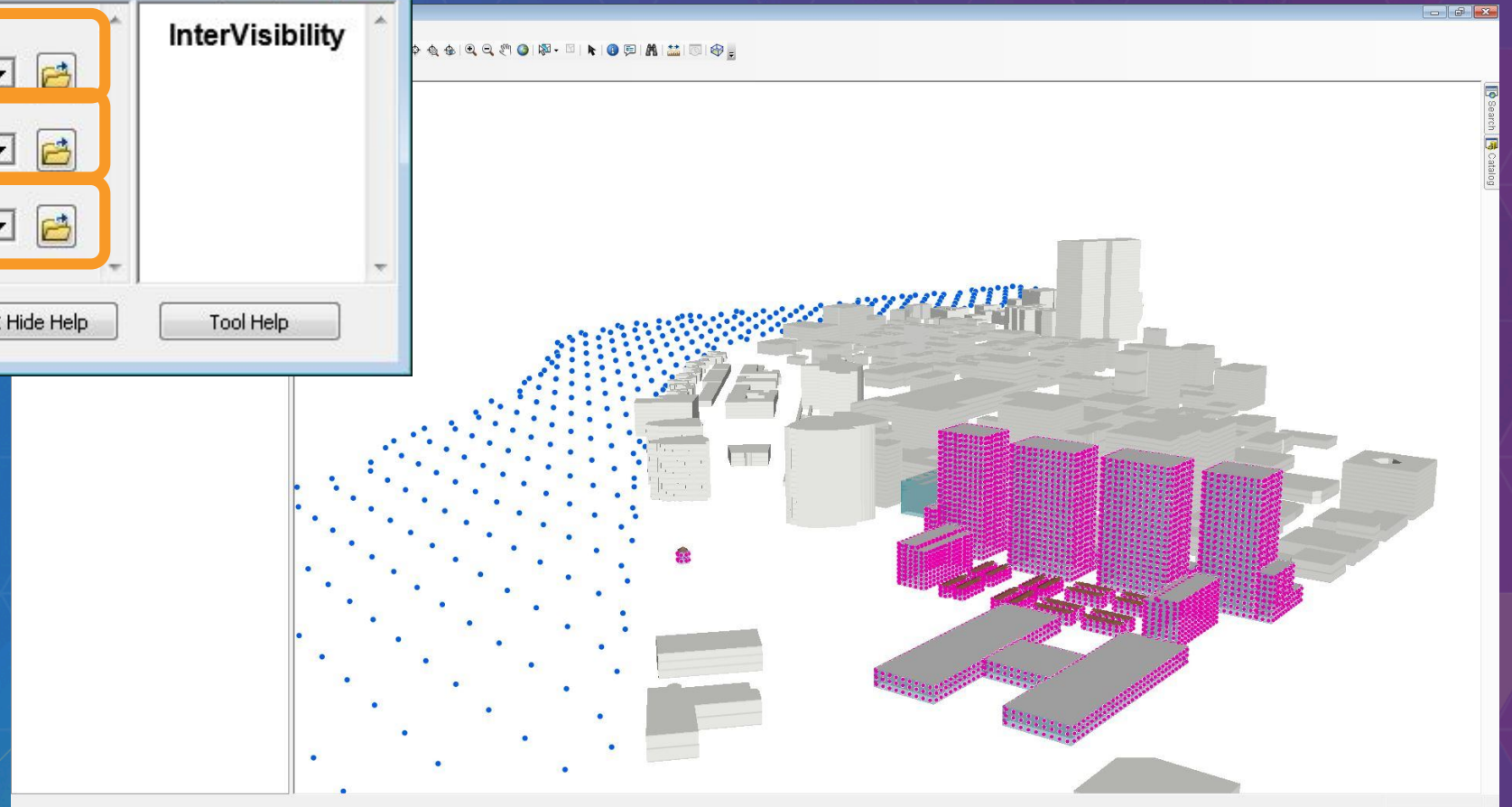
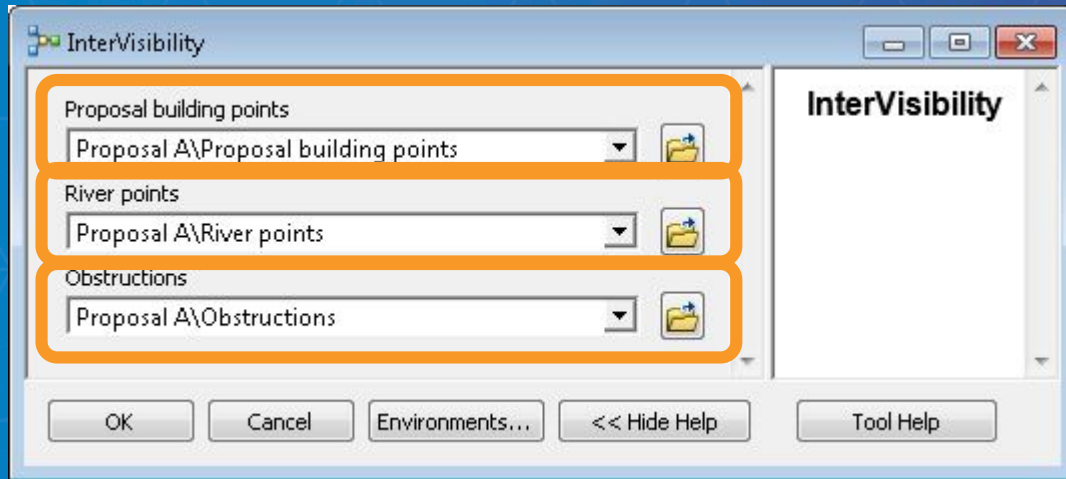
Prepare base data

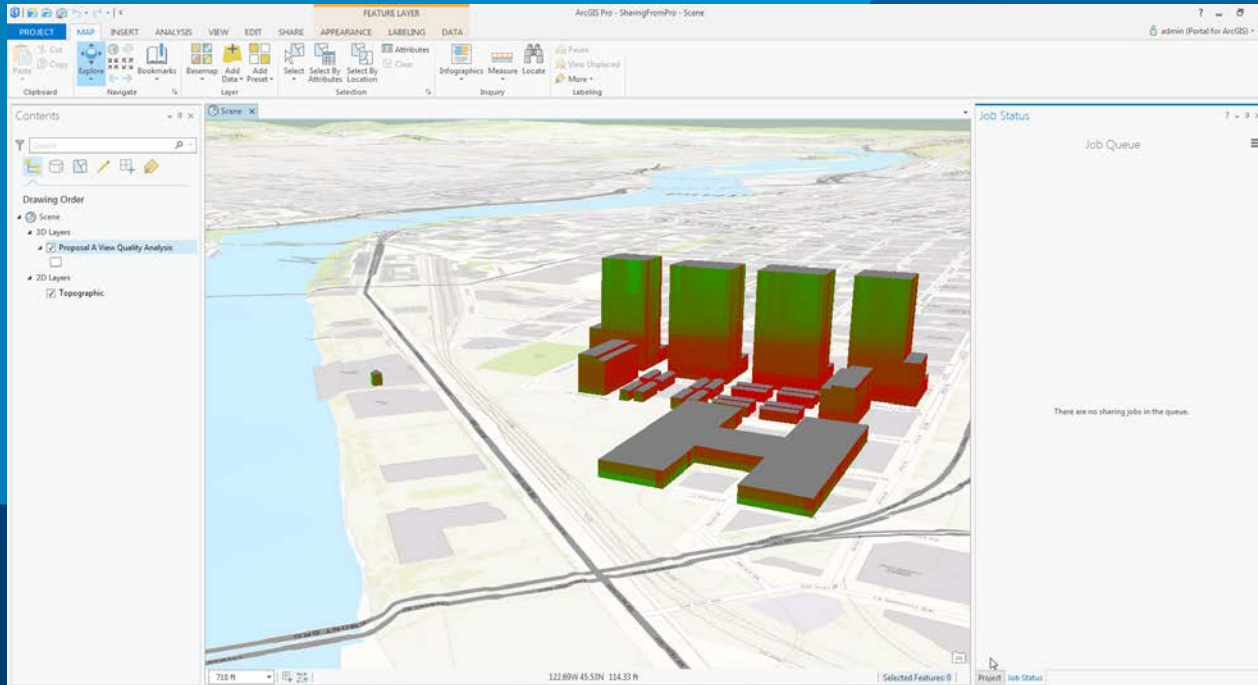
1. Import data
2. Apply panelize rule
3. Export each to feature class



View Quality Analysis Workflow

Run intervisibility tool with the pre exported feature classes





Sharing

ArcGIS Pro & Online

Sharing

The screenshot displays the ArcGIS Pro interface with the 'Share Web Layer' dialog box open. The dialog box is titled 'Share Web Layer' and shows the following configuration:

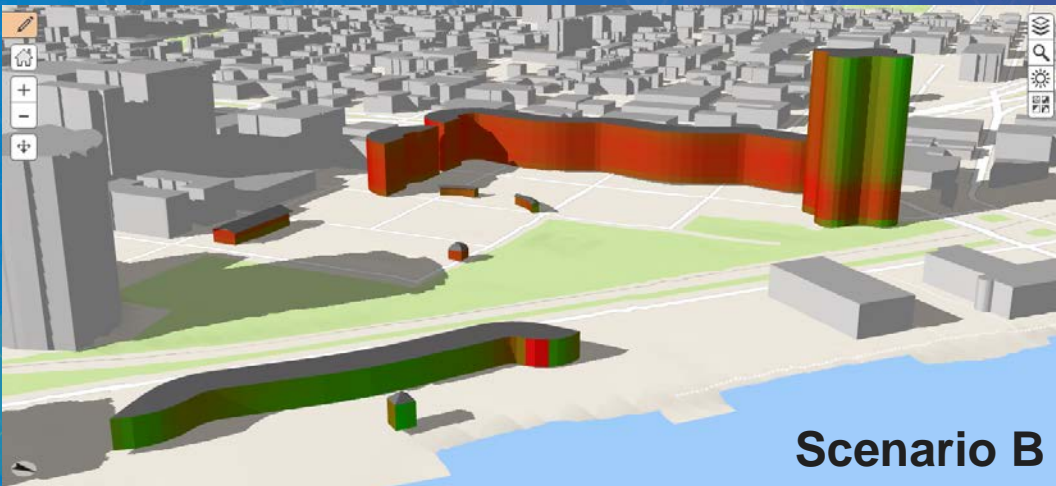
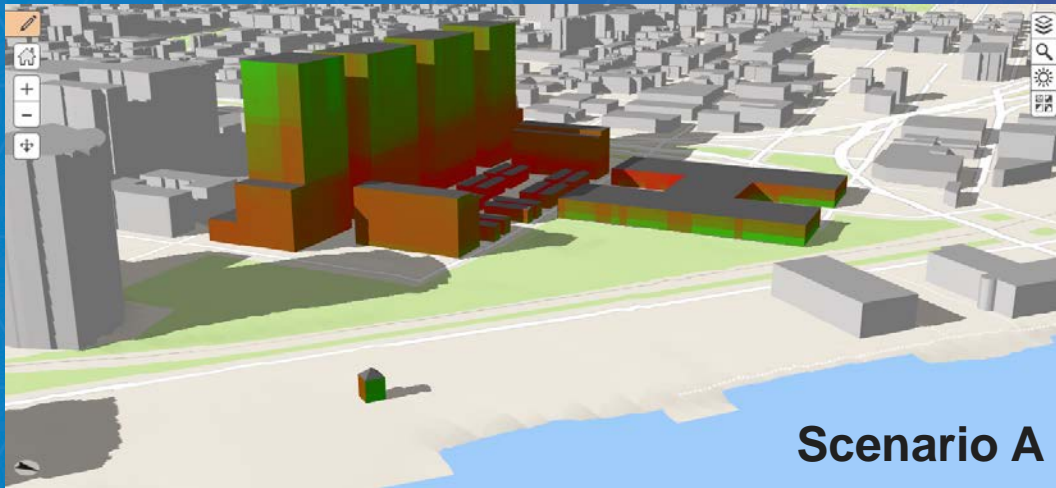
- Name:** Proposal_A_View_Quality_Analysis
- Layer Type:** Scene
- Item Description:** View quality analysis for proposal A
- Tags:** view, quality, analysis, proposal, A
- Sharing Options:** My Content (checked), Portal for ArcGIS (unchecked), Everyone (unchecked), Groups (dropdown)
- Final Sharing:** Analyze, Publish, Jobs (buttons)

The context menu for the 'Proposal A View Quality Analysis' layer in the Contents pane is open, with 'Share As Web Layer' highlighted. A tooltip for 'New Web Layer' is visible, stating: 'Share selected layers as a new web layer.'

Demo

Consume published layers online

View Quality Analysis - Summary



3,106



Scenario A

522



Scenario B

Related sessions

WEDNESDAY


- **CityEngine: What's New and What's Next**
 - 1:00pm – 2:00pm, San Jacinto
- **Scene Services and the Open Indexed 3D Scene Format**
 - 2:30pm – 3:30pm, Santa Rosa
- **CityEngine: Developing Rule Packages for ArcGIS Pro**
 - 4:00pm – 5:00pm, Santa Rosa

THURSDAY

- **How does the 3D Scene Viewer Work?**
 - 1:00pm – 2:00pm, Mesquite GH

Get the 3D Cities Template

- **GitHub:**
 - <https://github.com/Esri/3d-cities-template>
- **Learn more about 3D Cities:**
 - <http://desktop.arcgis.com/en/3d/3d-cities/>
- **Type less:**
 - <http://bit.ly/esri3dcities>

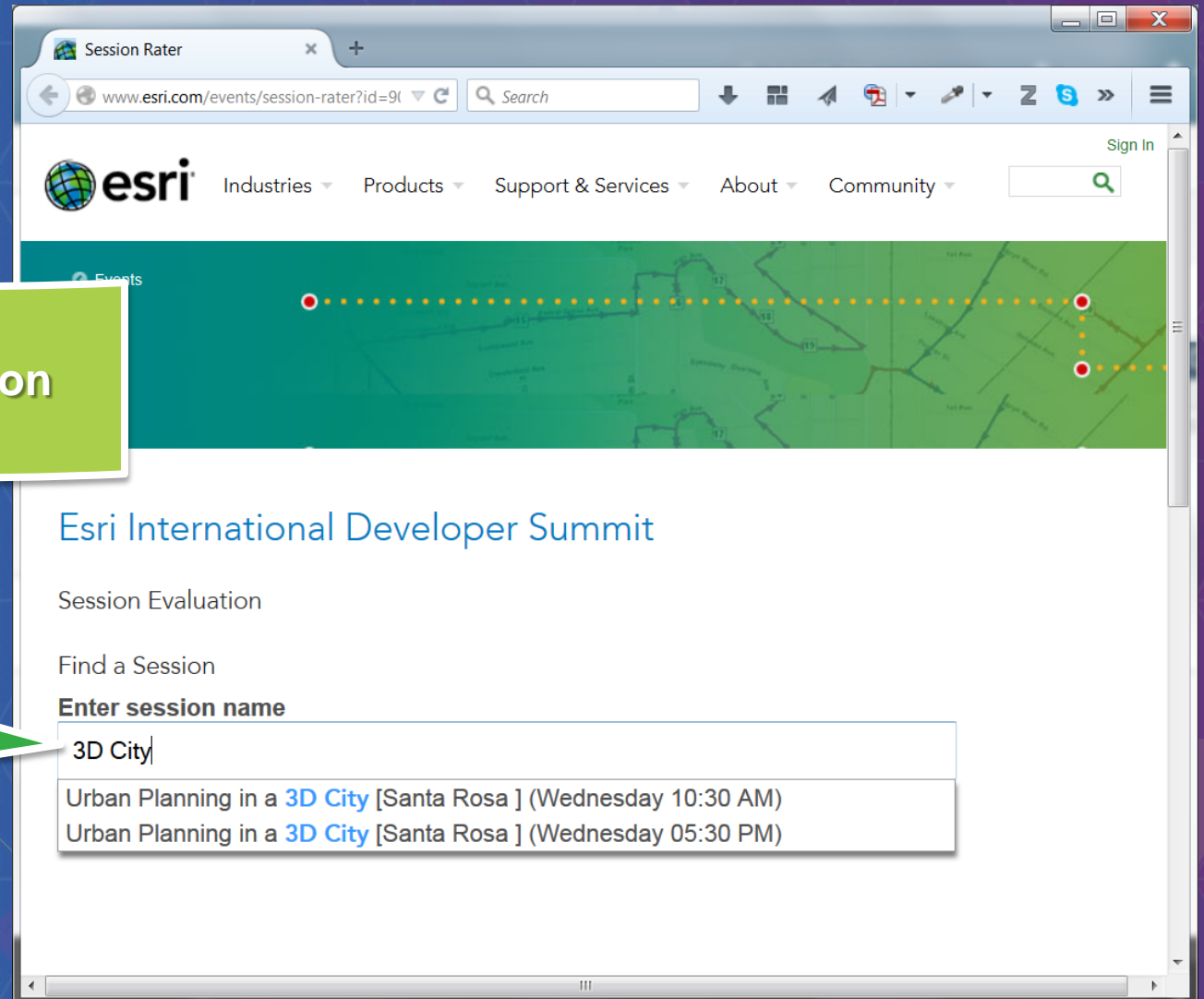


Any Questions?
Ideas?
Comments?

Thank you!

[Esri.com/RateMyDevSummitSession](https://www.esri.com/RateMyDevSummitSession)

3D City



The screenshot shows a web browser window titled "Session Rater" with the URL www.esri.com/events/session-rater?id=90. The page features the Esri logo and navigation links for Industries, Products, Support & Services, About, and Community. A search bar is visible in the top right corner. Below the navigation, there is a map showing a route with red and yellow markers. The main content area is titled "Esri International Developer Summit" and includes a "Session Evaluation" section. Underneath, there is a "Find a Session" section with a search input field labeled "Enter session name". The search results show "3D City" entered in the input field, with two suggestions: "Urban Planning in a 3D City [Santa Rosa] (Wednesday 10:30 AM)" and "Urban Planning in a 3D City [Santa Rosa] (Wednesday 05:30 PM)".



Understanding our world.