Smart City Planning with ArcGIS Urban & ArcGIS CityEngine

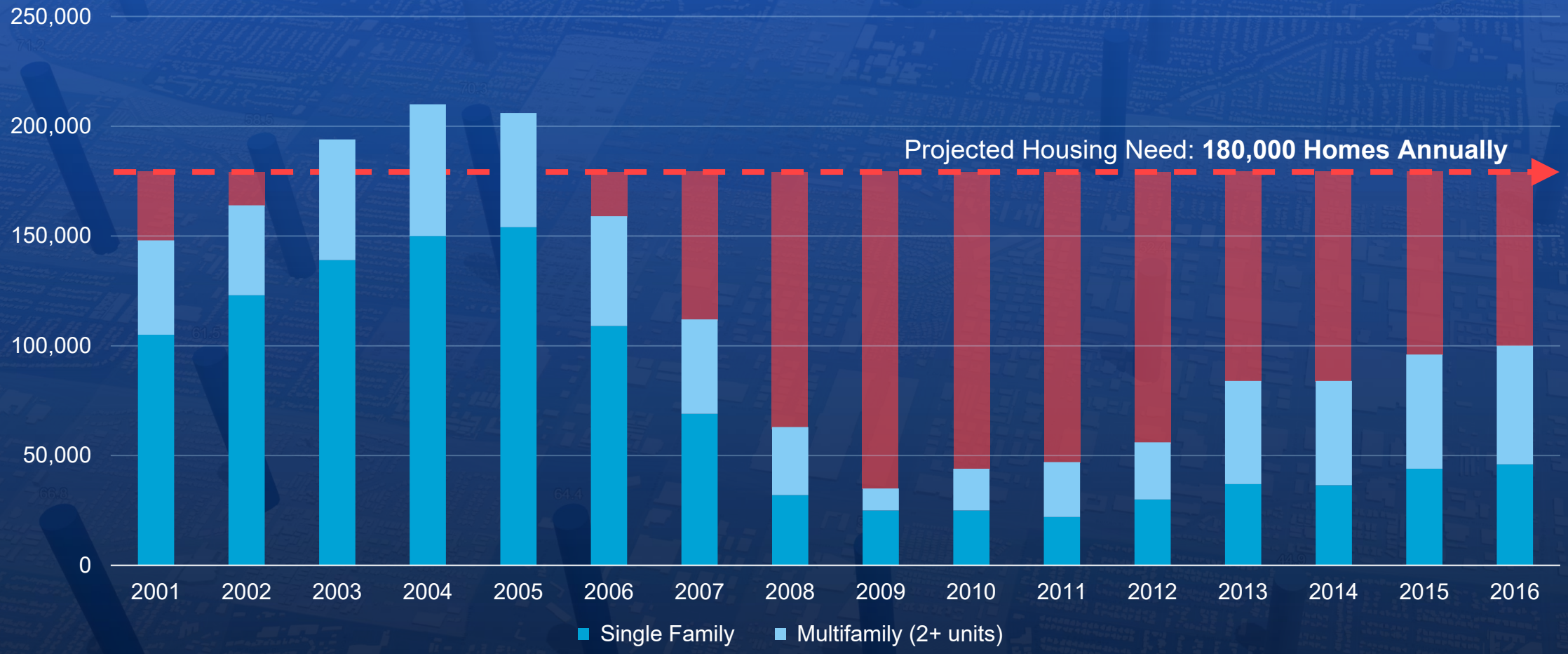


Eric Wittner
Senior Product Manager,
ArcGIS Urban and CityEngine
ewittner@esri.com

2021 ESRI DEVELOPER SUMMIT

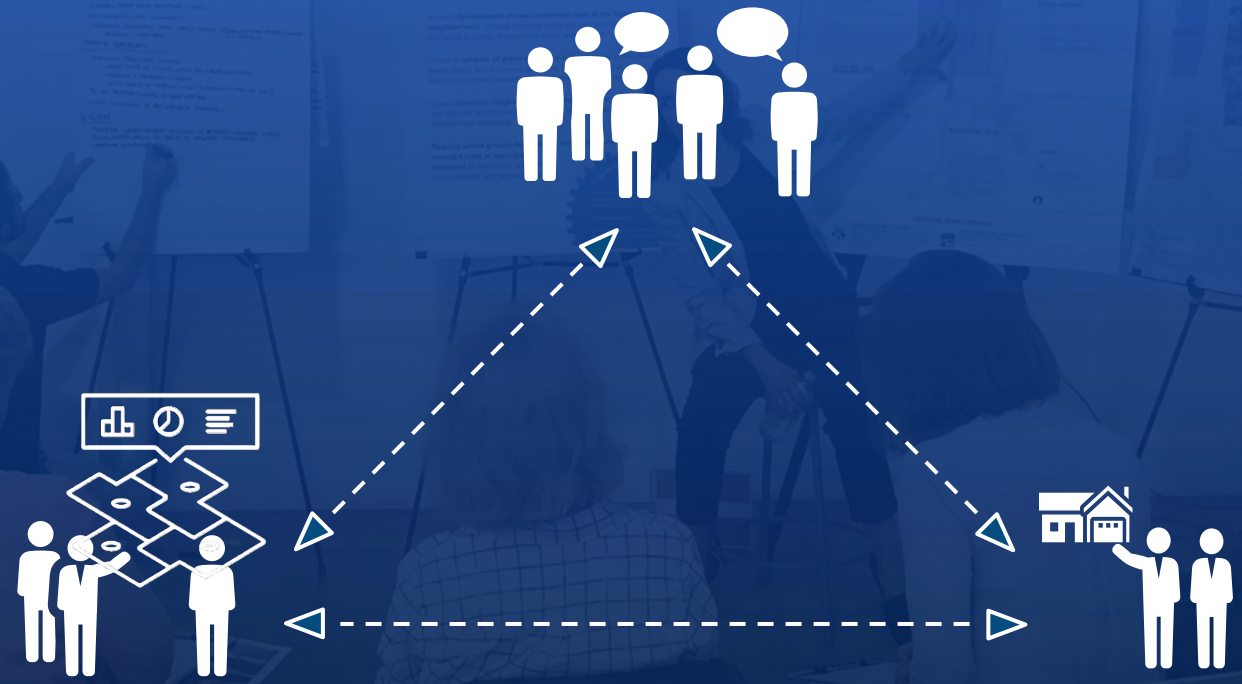
California's Housing Shortfall

Annual Permitted Housing Units Compared to Projected Statewide Need for Additional Homes



Source: 2001-2016 New construction housing permit data from Construction Industry Research Board.

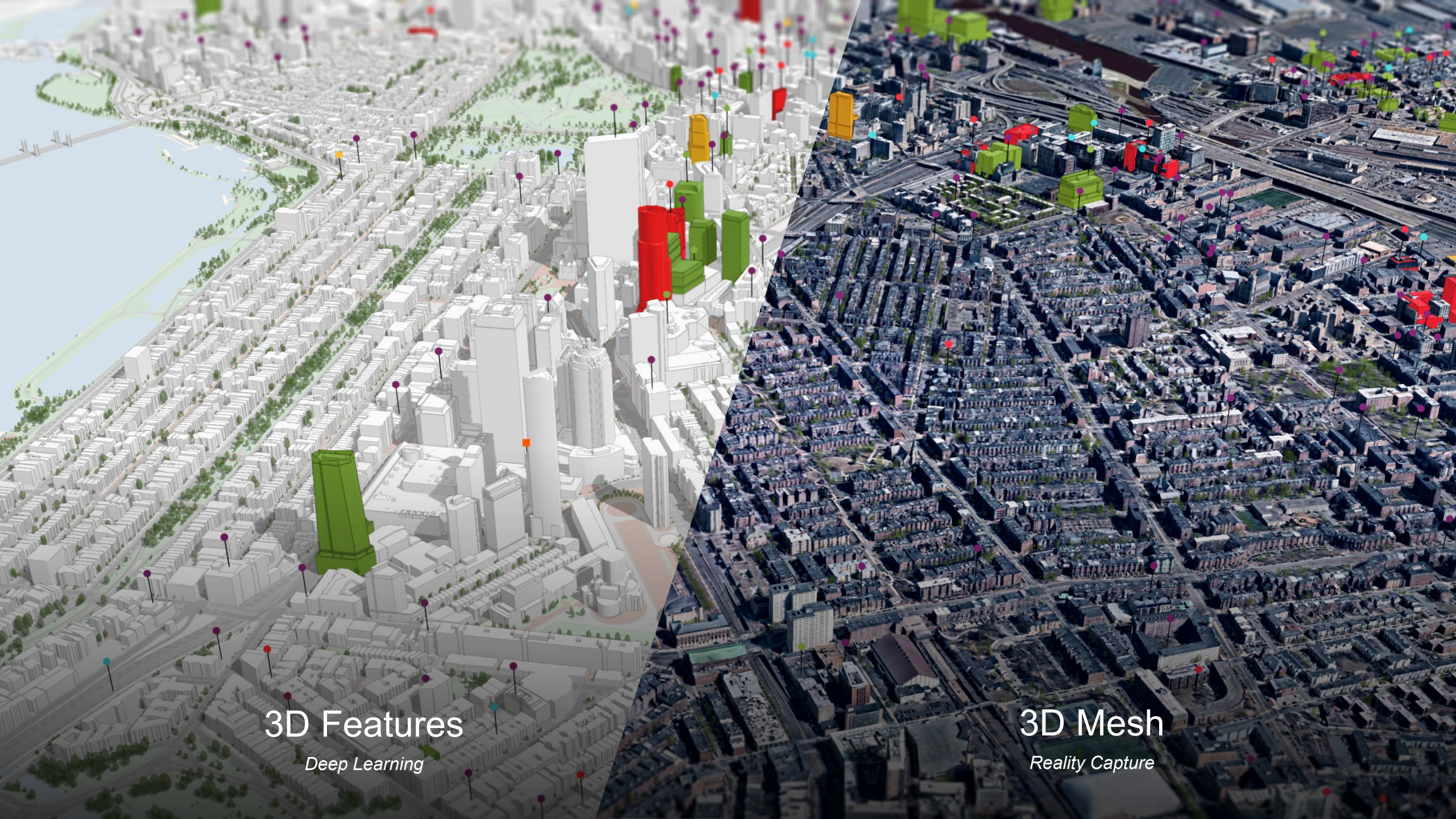
Citizens need opportunities get involved on their own time and be notified of projects



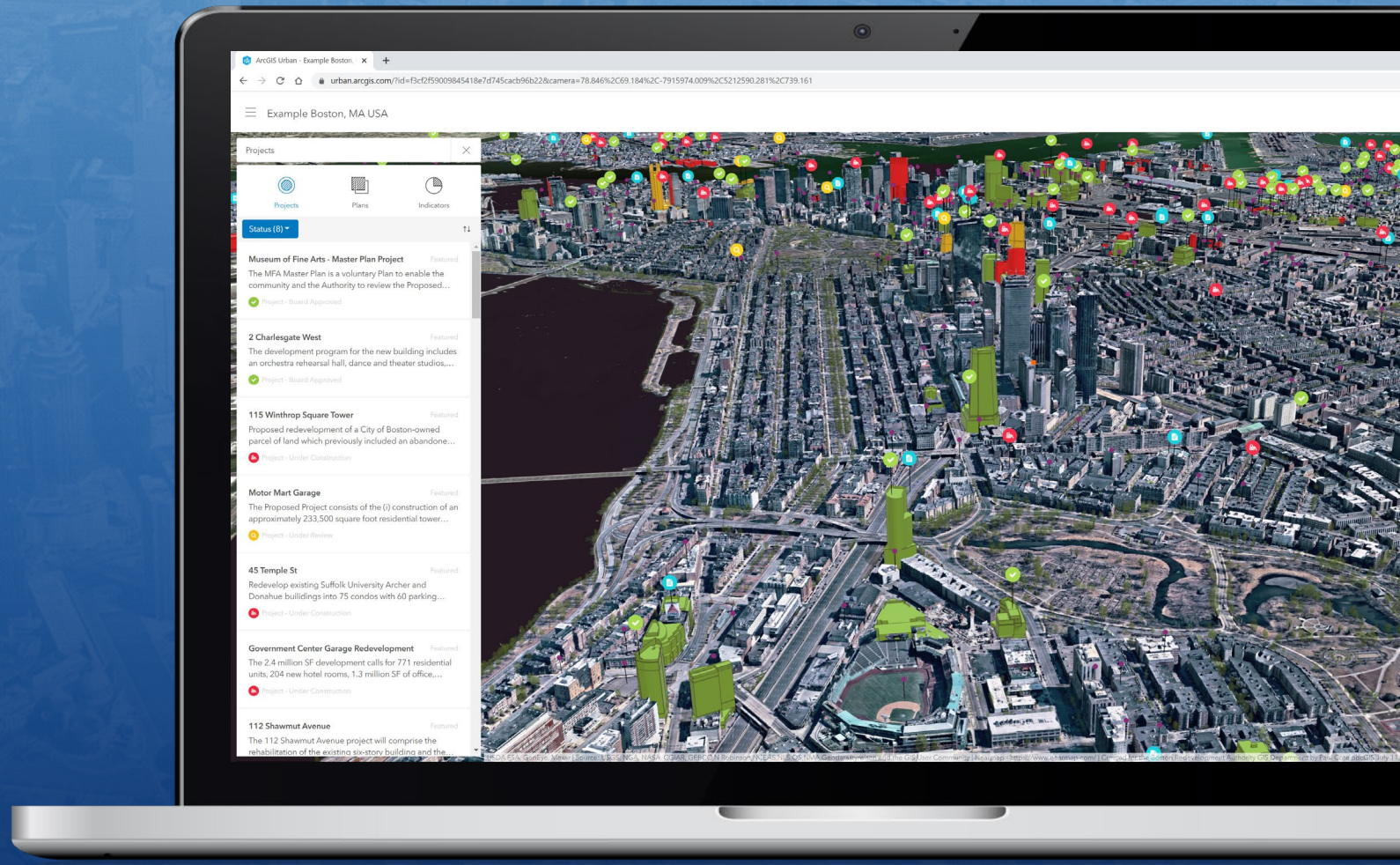
Planning Teams need spatial analysis tools to evaluate proposals and deliver digital engagement

Developers & AECs need connection to context and regulatory information as a basis to calibrate proposals


© 2020 by Boston Planning & Development Agency

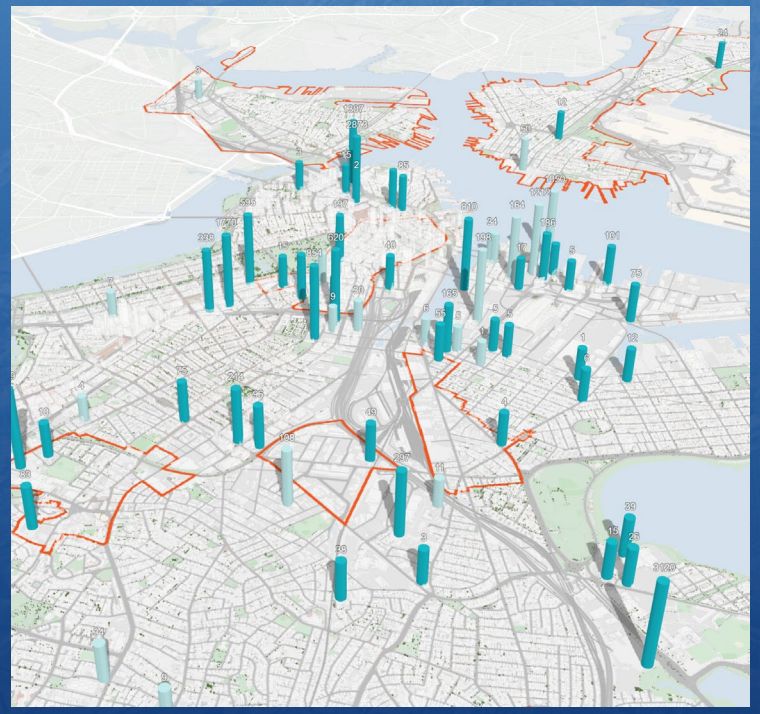

3D Features
Deep Learning
3D Mesh
Reality Capture

ArcGIS Urban



Urban Connects Public and Private Sectors

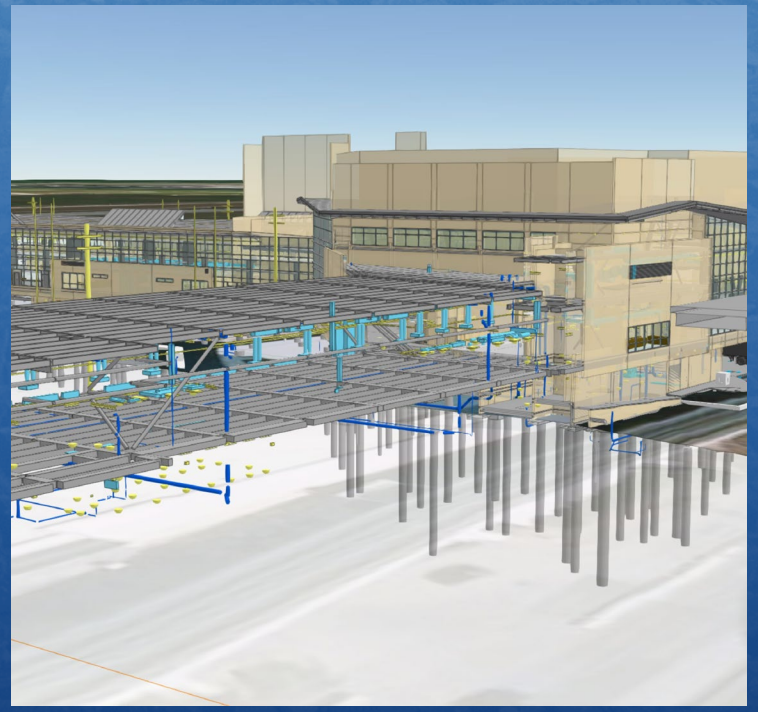
Through the Integration of Data Models and Technologies



Urban Information Models



Zoning and Land Use

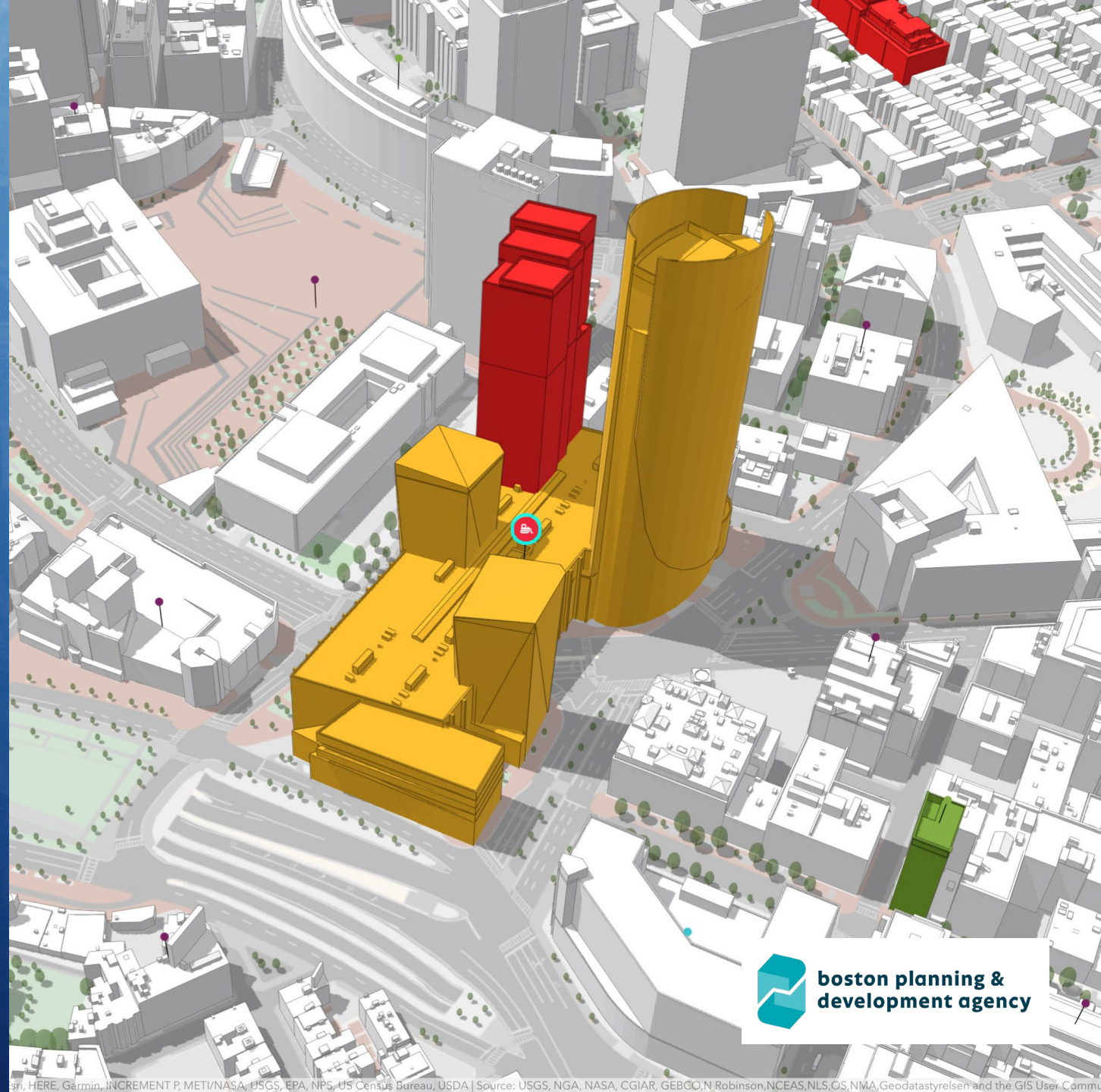


Project Lifecycles (BIM)

. . . a common platform for collaboration

Visualize Projects Citywide

Streamline the development review process with a digital twin of your city.



Scenario Planning

Build and share instant visual feedback to accelerate policy making.



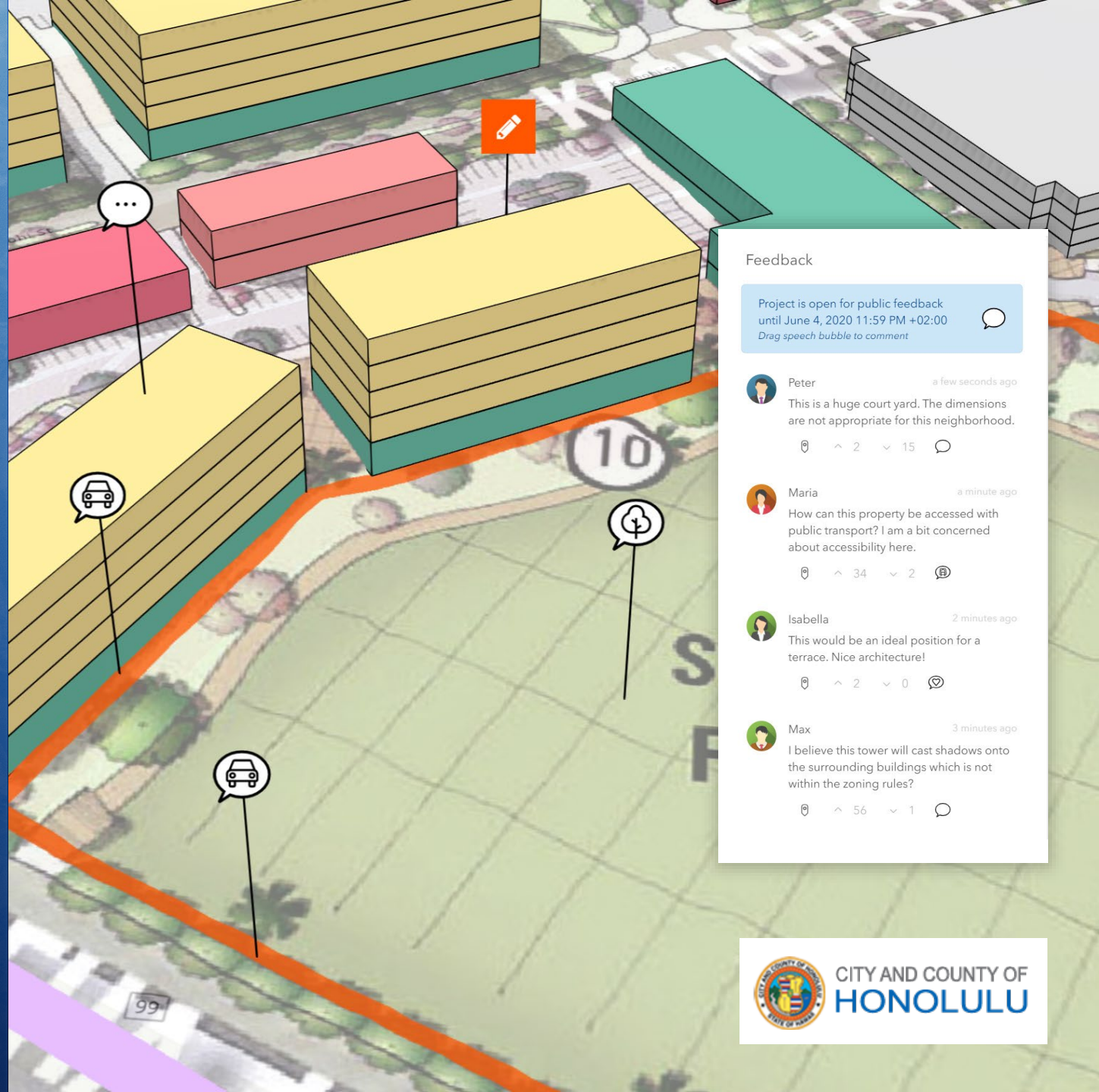
Guide Change and Measure Impact

Incorporate data-driven land-use scenarios for a more resilient and responsive plan.

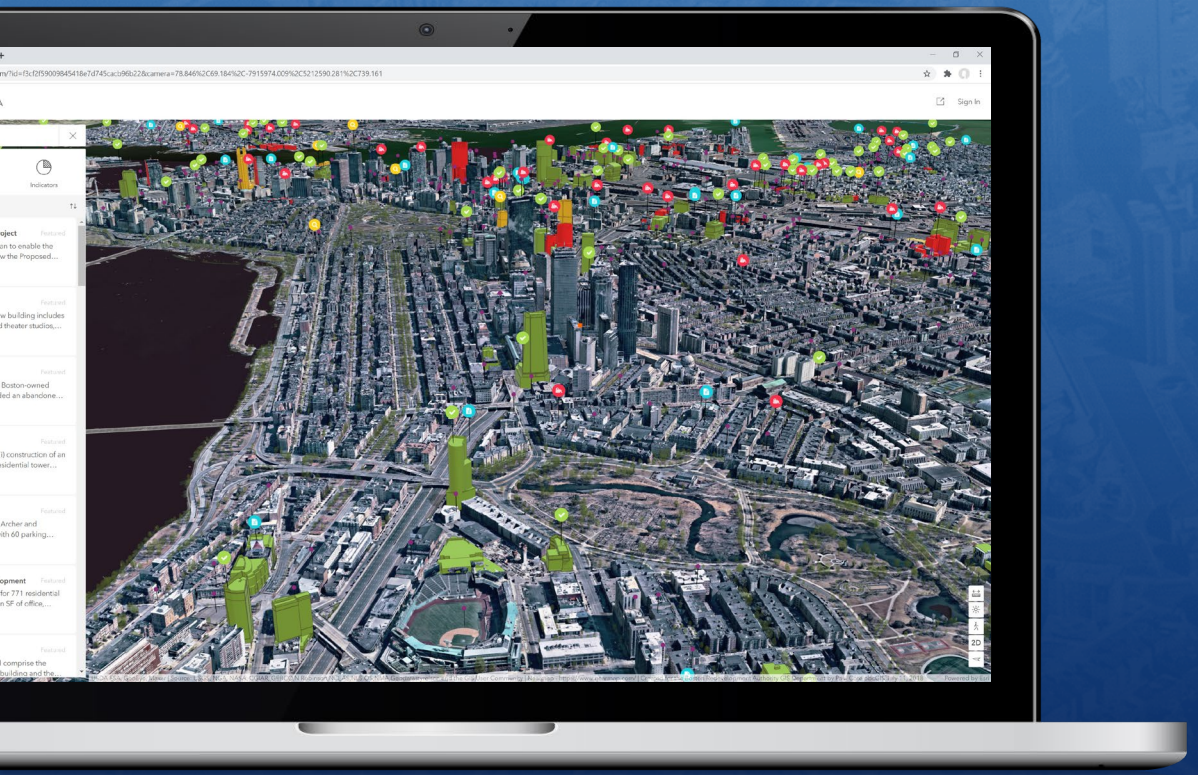


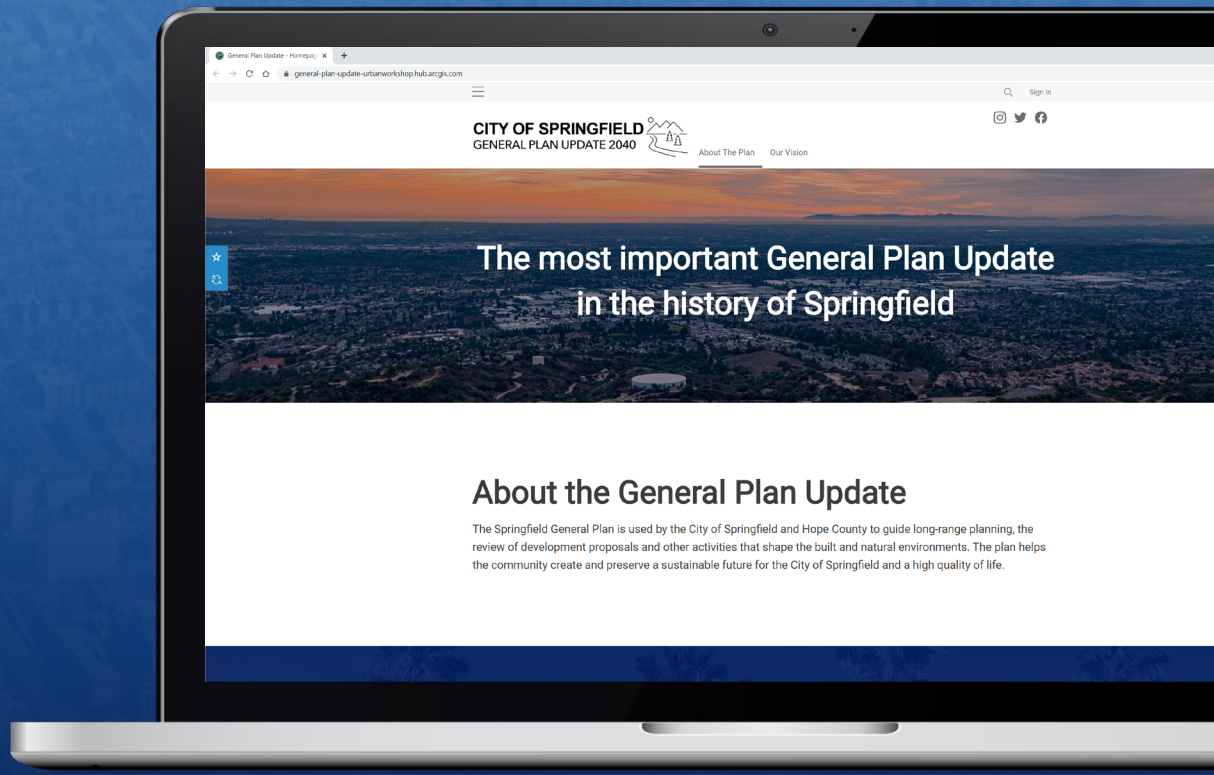
Deliver Digital Engagement

Simple community involvement to gain feedback on plans and projects.



ArcGIS Urban + ArcGIS Hub





ArcGIS Urban

What is it?

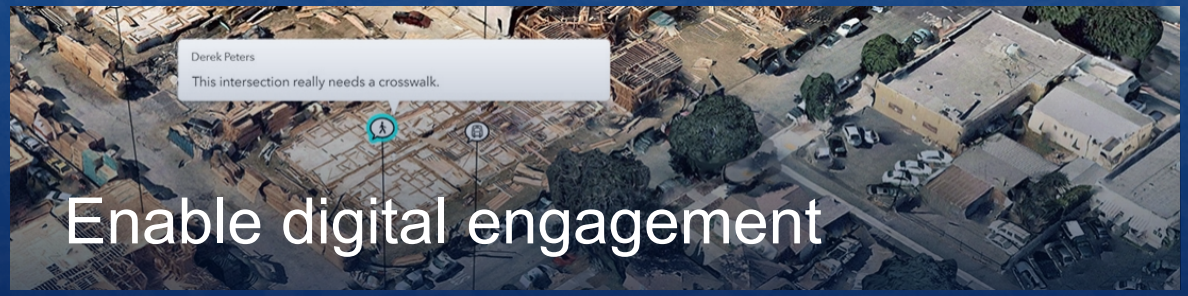
ArcGIS Urban is a web-based planning system built as an extension to ArcGIS Online.

- It provides web-based tools designed to simplify zoning and land use planning.
- Cities can use Urban to make informed planning and development decisions.
- Cities can use Urban to improve collaboration between public and private stakeholders.
- Urban helps Cities simulate private investment and support development to achieve your vision for the community.









ArcGIS Urban

What's new in 2020



Support for 3D Meshes



Enhance your Projects with BIM



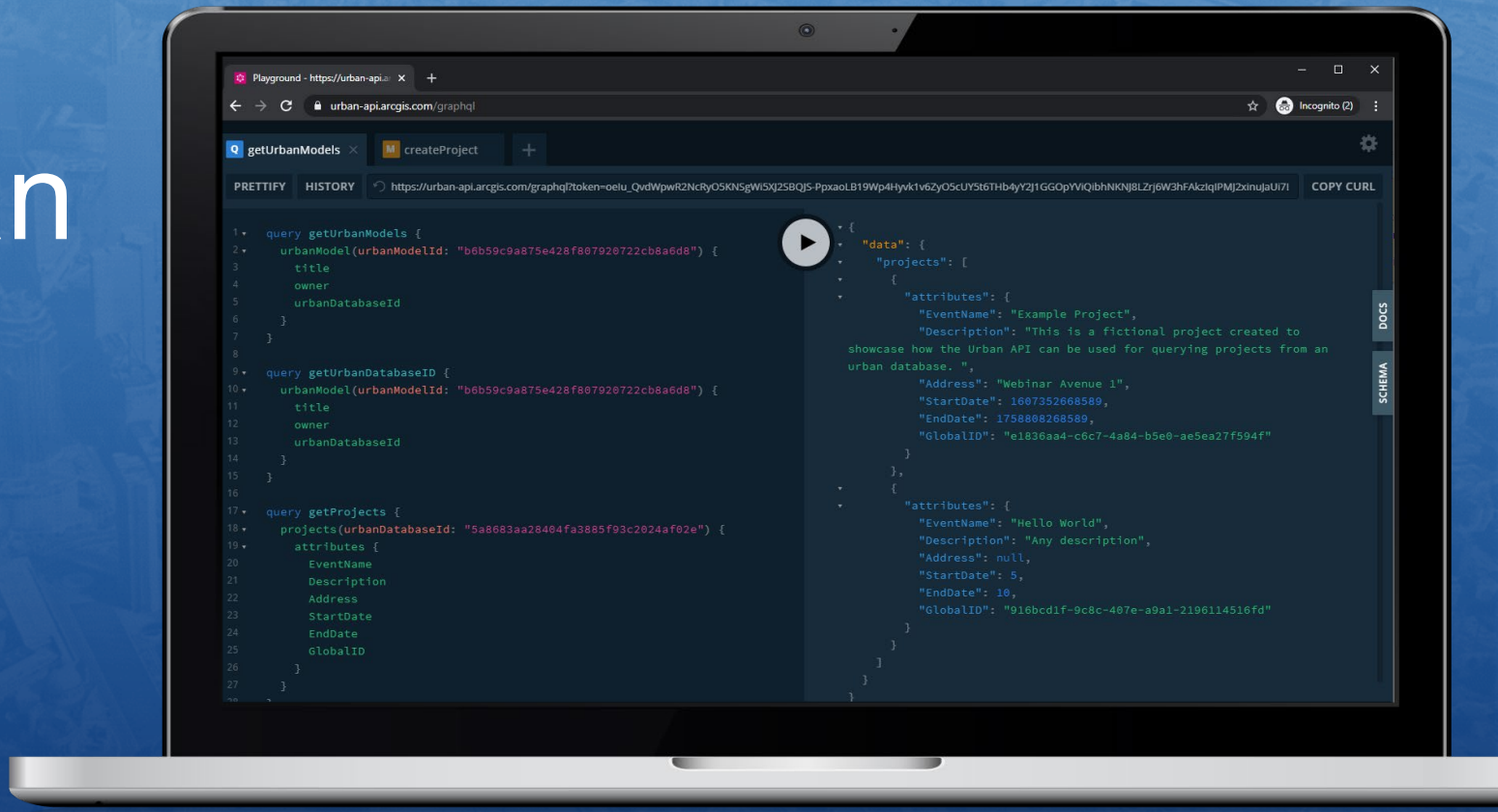
Search Parcels Citywide & Explore Zoning Potential



Engage the Public Through Hub Premium



Extending Urban With the Urban API



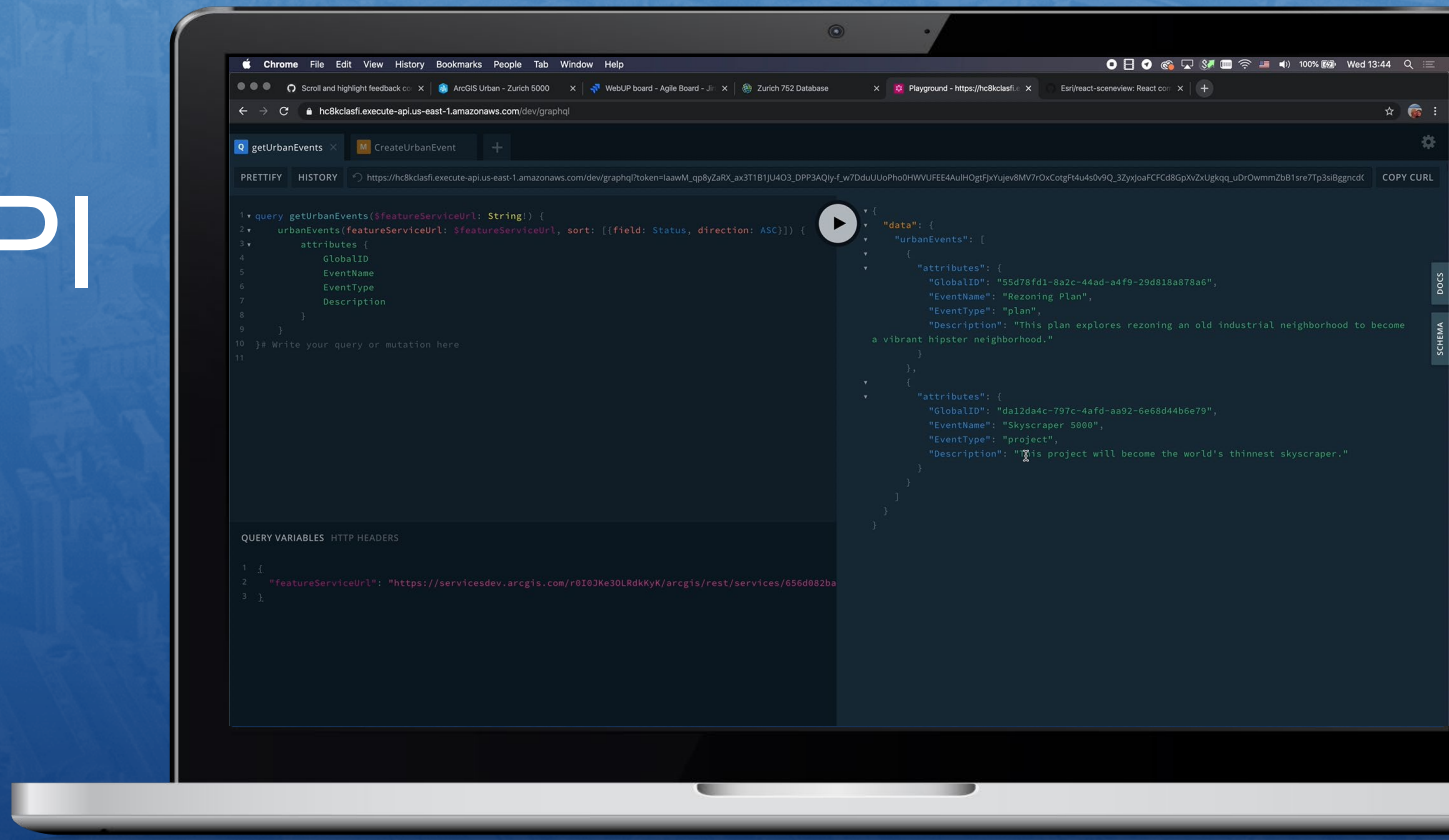
Beta is released!

ArcGIS Urban API

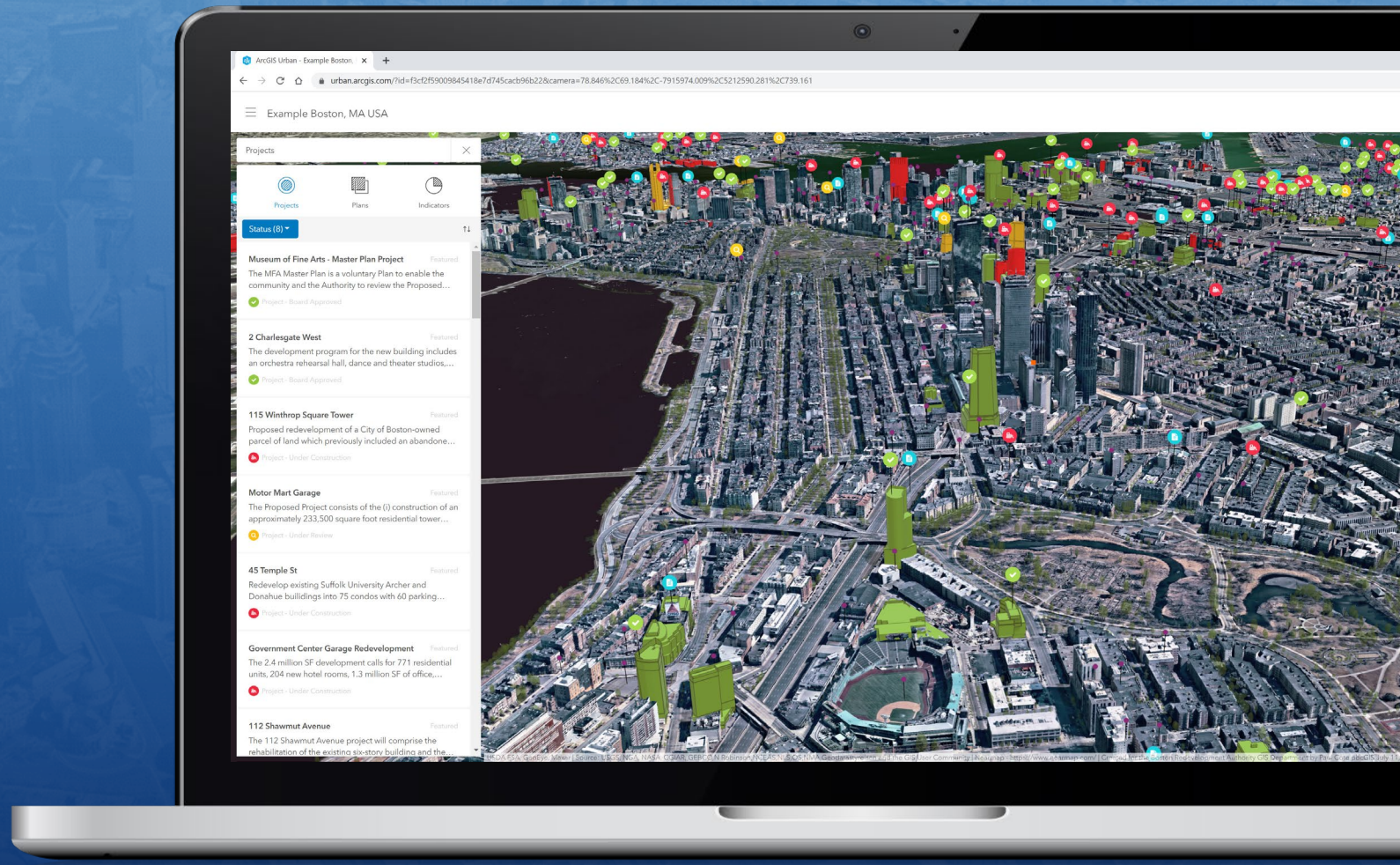
Expanding the capabilities of ArcGIS Urban

Help documentation for the ArcGIS Urban API
https://developers.arcgis.com/arcgis-urban-api/

Learn more about the ArcGIS Urban API and the software architectures behind the app
https://www.esri.com/en-us/about/events/devsummit/agenda/agenda/detail?q=Urban&date=2021-04-08



Product Roadmap



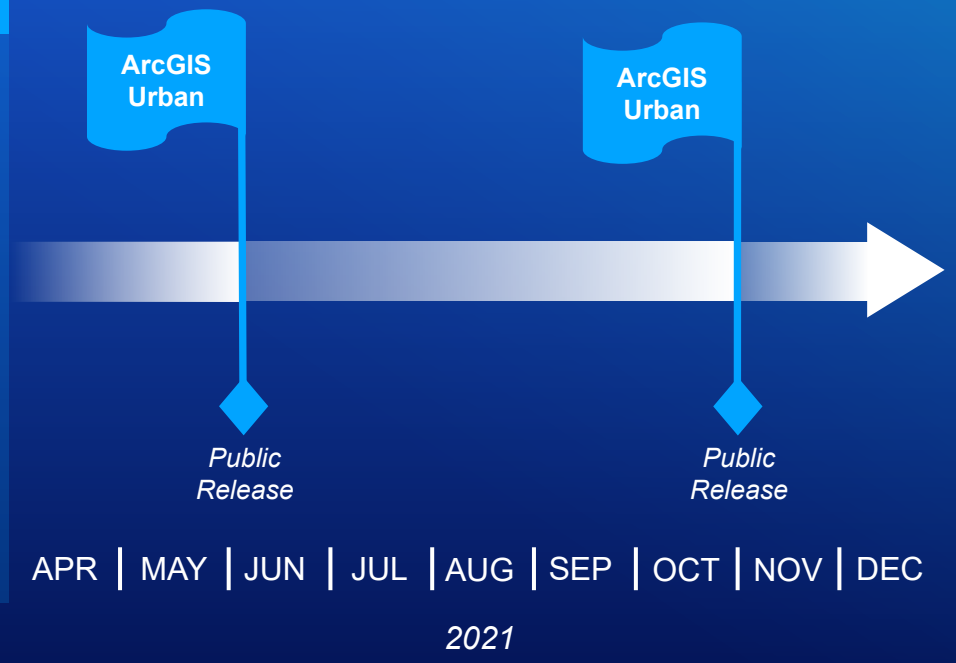
ArcGIS Urban Roadmap

2020 Fall Release

- Parcel Exploration
- 3D Mesh Basemaps
- Integration with Hub Community Login
- Support for Building Scene Layer (BIM)
- Performance Improvements
- Urban API (Beta)

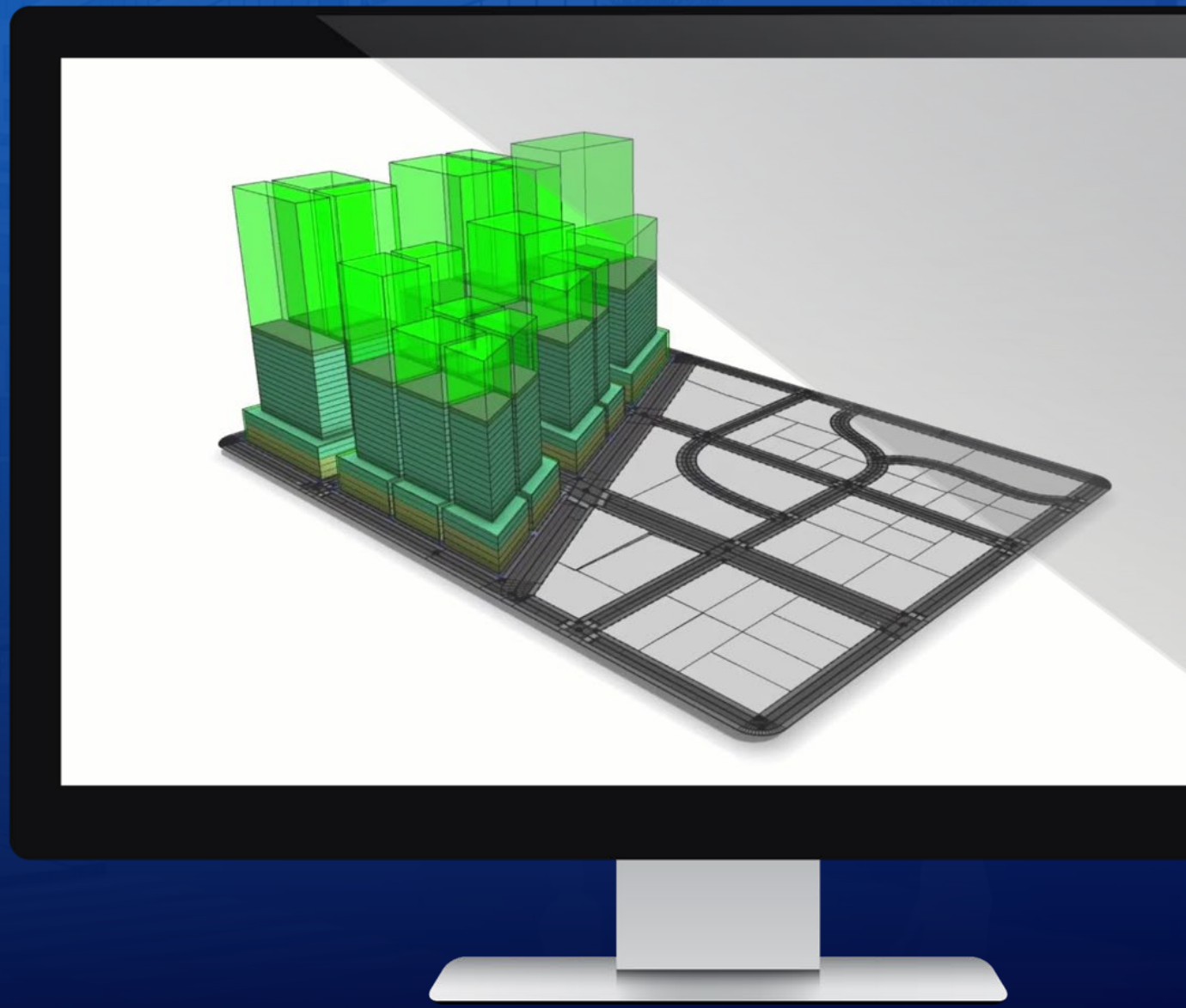
Future Releases

- Custom Building Modeling
- Custom Capacity Metrics
- Internal Feedback (Markup)
- Suitability and Place Types
- Project Submission
- ArcGIS Enterprise



Public Roadmap: bit.ly/Urban-Roadmap-Public

ArcGIS CityEngine



CityEngine Advanced 2017.0 - Redlands Redevelopment 64bit.cej

File Edit Select Layer Graph Shapes Search Scripts Window Help

Generate

Not signed in

*Navigator

Search for files in All types

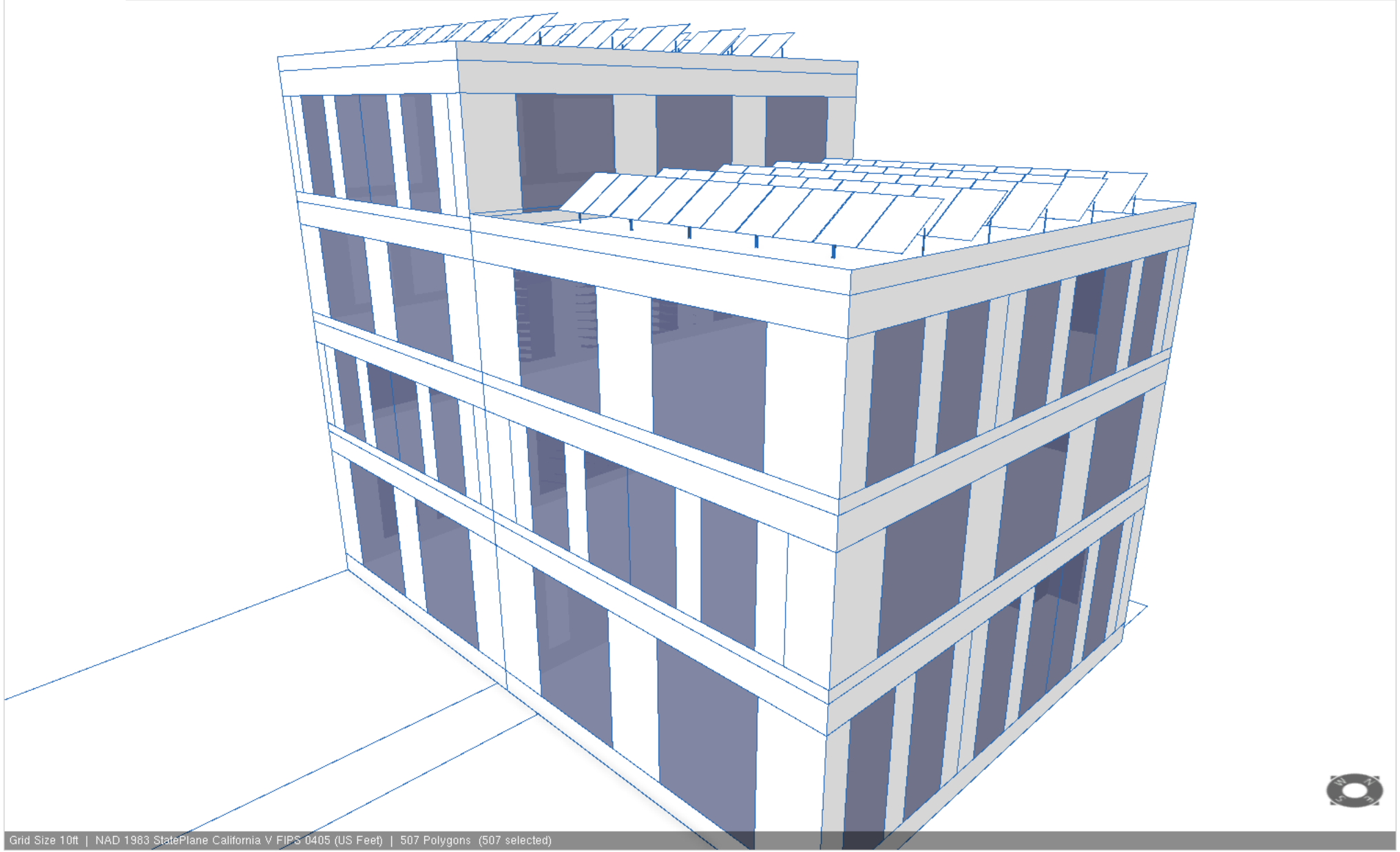
ESRI.lib
Example_Redlands_Redevelopment_2016
Rule of the week
Test
Utilities

*Scene

Search for layers, objects or attributes

Terrain DTM
Streets with Redevelopment M
Network
Blocks
CyberCity3D_Buildings [68 obje
Custom Green Space [3 objects]
Custom Parcel [1 object]
Trees [341 objects]

3D View



Grid Size 10ft | NAD 1983 StatePlane California V FIPS 0405 (US Feet) | 507 Polygons (507 selected)

CityEngine Advanced 2017.0 - Redlands Redevelopment 64bit.cej

File Edit Select Layer Graph Shapes Search Scripts Window Help

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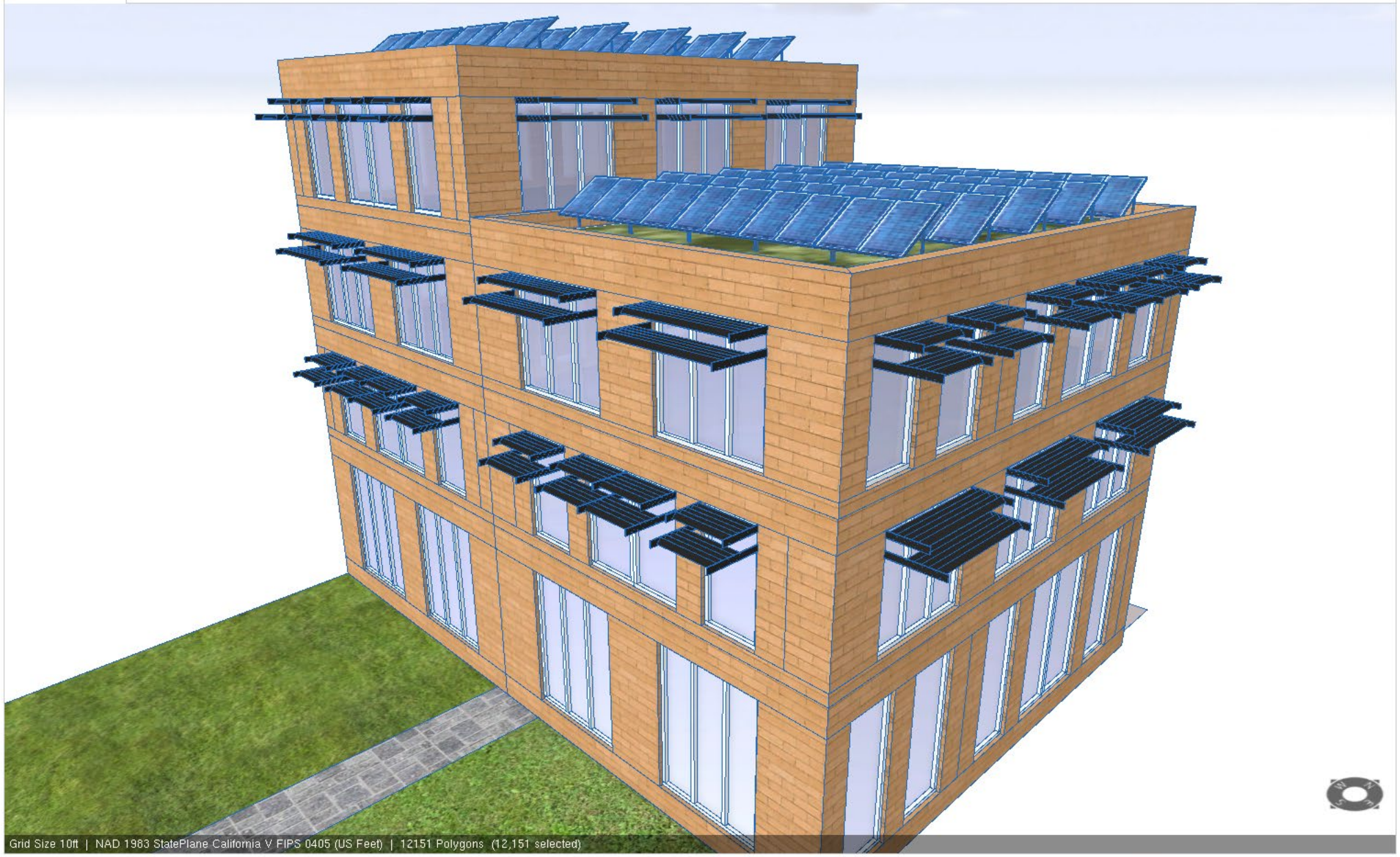
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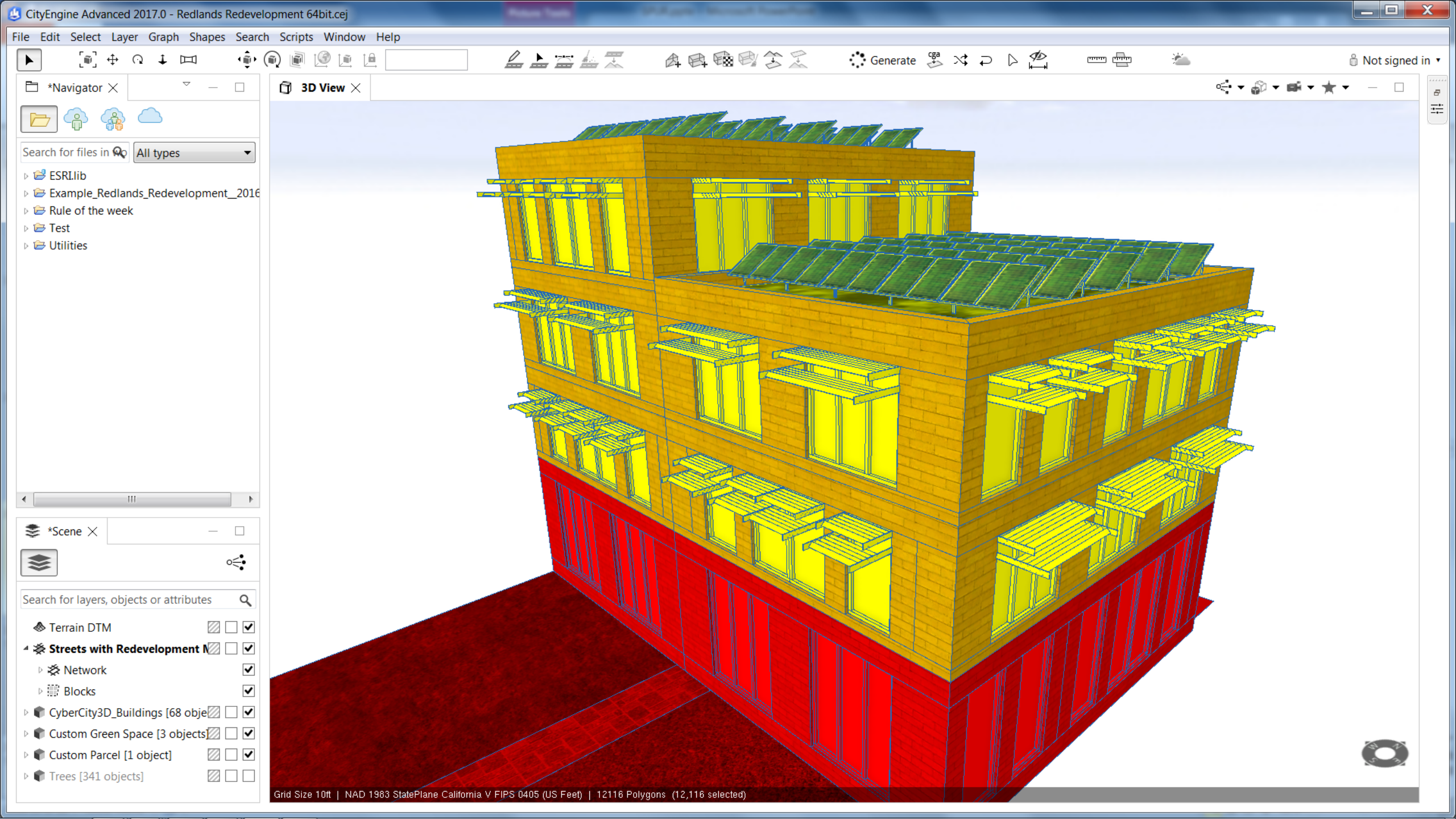
*Scene

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3D View




CityEngine Advanced 2017.0 - Redlands Redevelopment 64bit.cej
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All types
ESRI.lib
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Custom Green Space [3 objects]
Custom Parcel [1 object]
Trees [341 objects]
3D View
Grid Size 10ft | NAD 1983 StatePlane California V FIPS 0405 (US Feet) | 12116 Polygons (12,116 selected)

CityEngine Advanced 2017.0 - Redlands Redevelopment 64bit.cej

File Edit Select Layer Graph Shapes Search Scripts Window Help

Generate Not signed in

*Navigator

Search for files in All types

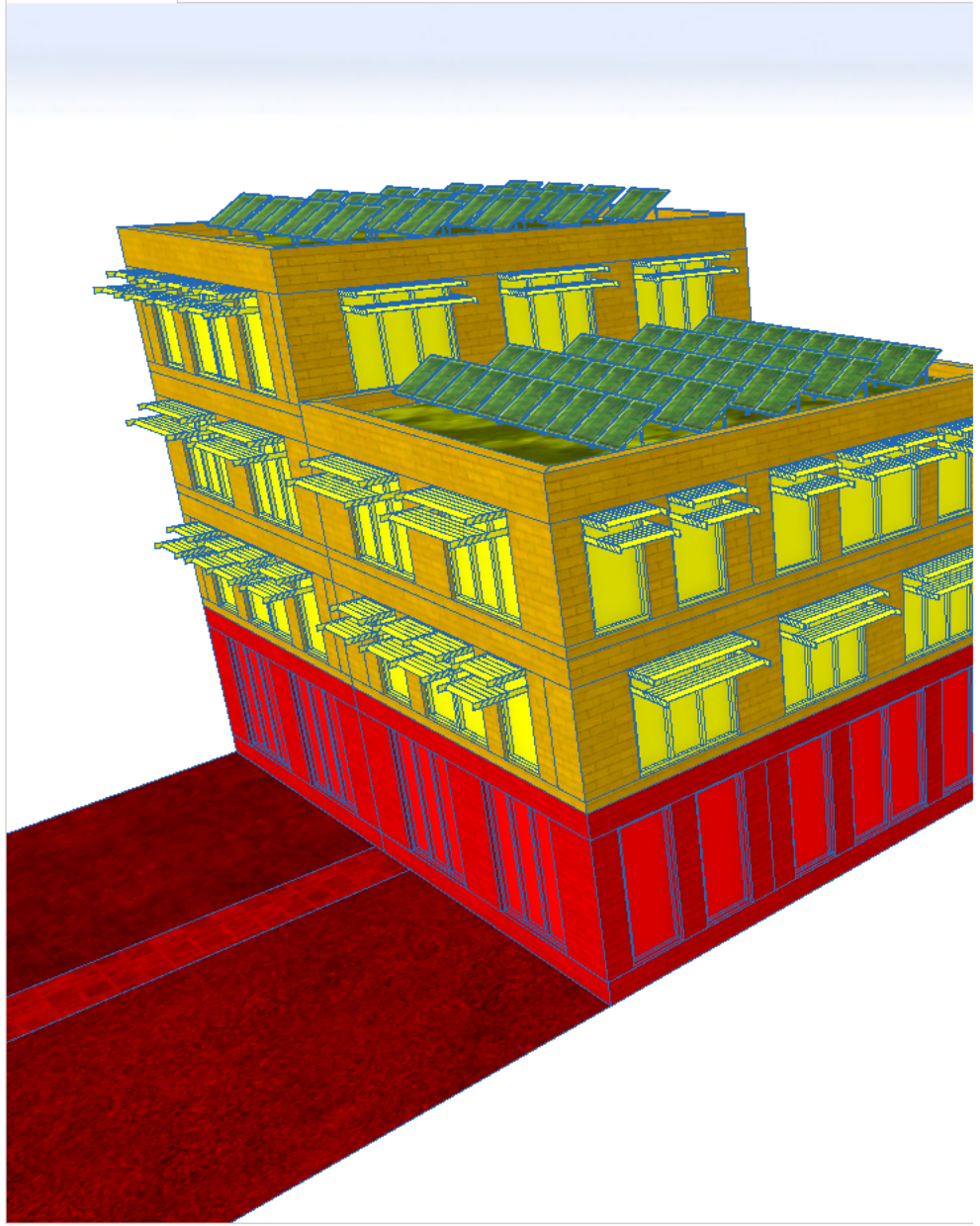
ESRI.lib
Example_Redlands_Redevelopment_2016
Rule of the week
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*Scene

Search for layers, objects or attributes

Terrain DTM
Streets with Redevelopment N
Network
Blocks
CyberCity3D_Buildings [68 obje
Custom Green Space [3 objects]
Custom Parcel [1 object]
Trees [341 objects]

3D View



Inspector

Shape

Building_Performance Default Style

Reports

Report	N	%	Sum
Building Performance Baseline, Energy, Electrical Consumption (kWh/yr)	7	0.00	425175.37
Building Performance Baseline, Energy, Heating Consumption (kWh/yr)	7	0.00	261352.57
Building Performance Baseline, Waste, Domestic (kg/yr)	7	0.00	40841.11
Building Performance Baseline, Water, Consumption (l/yr)	7	0.00	6042345.77
Building Performance Baseline, Water, Produced Blackwater (l/yr)	7	0.00	1812703.73
Building Performance Baseline, Water, Produced Greywater (l/yr)	7	0.00	4229642.04
Building Performance Target, Energy, Electrical Consumption (kWh/yr)	7	0.00	425175.37
Building Performance Target, Energy, Heating Consumption (kWh/yr)	7	0.00	261352.57
Building Performance Target, Energy, Solar Generated (kWh/yr)	90	0.00	236014.82
Building Performance Target, Waste, Domestic (kg/yr)	7	0.00	40841.11
Building Performance Target, Water, Consumption (l/yr)	7	0.00	6042345.77
Building Performance Target, Water, Produced Blackwater (l/yr)	7	0.00	1812703.73
Building Performance Target, Water, Produced Greywater (l/yr)	7	0.00	4229642.04
Building Performance Target, Water, Recycled Greywater (l/yr)	7	0.00	0.00
Building, Footprint Area (m2)	2	0.00	327.65
Building, Gross Floor Area (m2)	7	0.00	1142.94
Construction, Building Cost	7	0.00	1600116.05
Construction, Cut/Fill, Cost	4	0.00	57143.37
Construction, Cut/Fill, Cut Volume (m3)	4	0.00	5714.34
Construction, Cut/Fill, Fill Volume (m3)	4	0.00	0.00
Construction, Grass Area (m2)	3	0.00	296.45
Construction, Grass Cost	3	0.00	2964.55
Construction, Hardscape Area (m2)	3	0.00	91.97
Construction, Hardscape Cost	3	0.00	2299.14
Construction, Solar Panel Cell Area	90	0.00	129.32
Construction, Solar Panel Cost ($)	90	0.00	129323.19
Construction, Waste (kg)	7	0.00	17144.10
Parcel, Area (m2)	1	0.00	716.28
Parcel, Coverage (%)	2	0.00	45.74
Parcel, Floor Area Ratio (Density)	7	0.00	1.60
Parcel, Green Space Area (m2)	3	0.00	388.42
Site Conditions, Slope (%)	1	0.00	0.02

Scene

1 2 3 4

- Baseline Scenario [116 obje
  - Network
  - Blocks
- Pedestrian Preference [0 ob
  - Network
  - Blocks
- Bicycle Preference [0 objec
  - Network
  - Blocks
- Transit Preference Paste [0
  - Network
  - Blocks

*3D View - Baseline

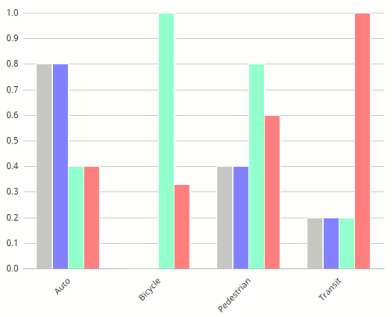


Inspector

Dashboard

Page 0

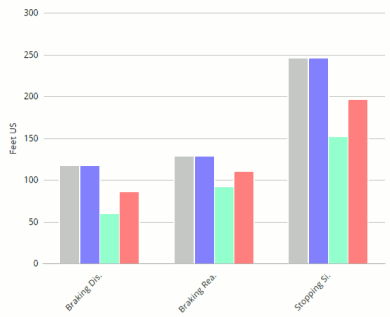
Mode Preference



Mode Space AllocationM Estimates



Stopping Distances



Esri CityEngine

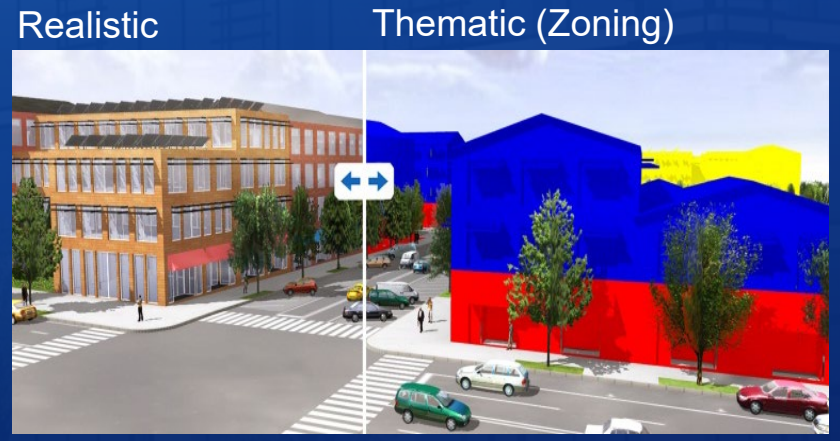
How it work?

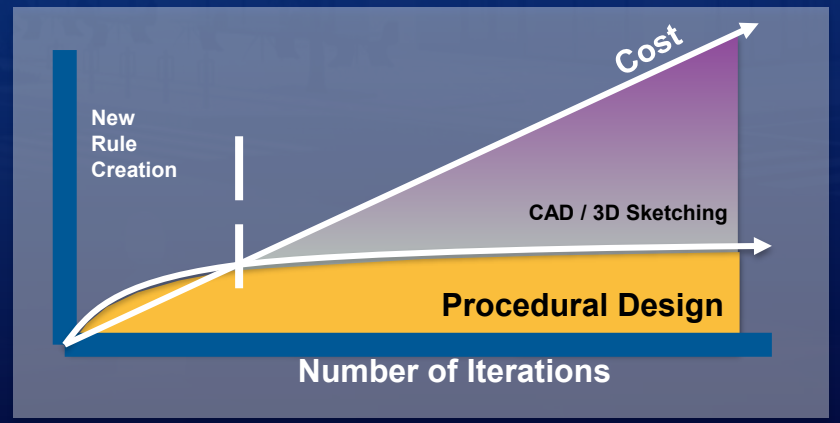
- Create existing condition (Get Map Data)
- Author Rules (or use Library)
- Draw your designs, and apply rules
- Evaluate alternative scenarios
- Publish as share for feedback

CityEngine's Capabilities

- Realistic, thematic, and conceptual representation
- Metrics in reports and dashboards, analysis tools
- Scenario management and comparison
- Publishing to web, game engines, and VR
- Integrated with the ArcGIS Platform







Urban Design with CityEngine

Conceptual Planning
SMEs in AEC





Master Planning
Large AEC firms

Site Planning
City Planning Dept





VR/AR Experiences
Planning & GIS Professionals

ArcGIS CityEngine SDK

Using Procedural in other products

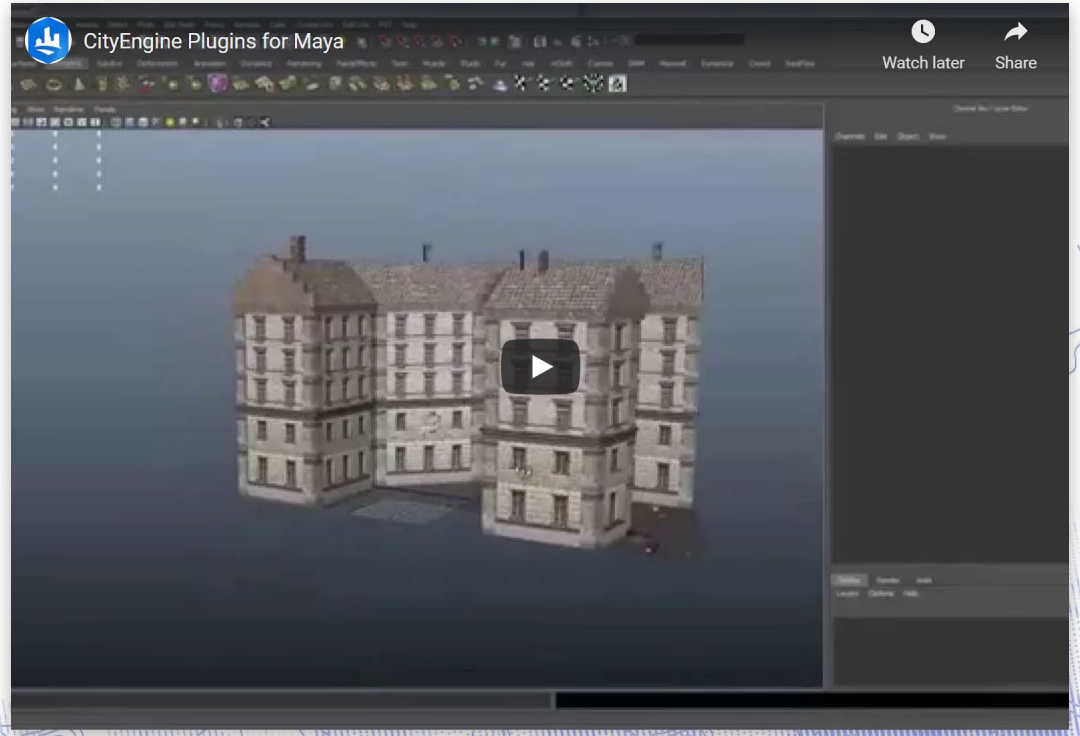


Palladio

CityEngine Plugin for SideFX Houdini



Palladio is a plugin for SideFX Houdini. It provides "surface operator" nodes which enable the execution of CityEngine CGA rules within Houdini networks. Therefore, 3D environment artists do not have to leave their familiar Houdini toolset anymore to make use of the procedural modeling power of CityEngine.



Serlio

CityEngine Plugin for Autodesk Maya

Serlio is a plugin for Autodesk Maya. It provides a modifier node which enables the execution of CityEngine CGA rules within a Maya scene. This allows the 3D environment artist to make use of the power of procedural modeling in CityEngine without have to leave the familiar Maya toolset.

Vitruvio

CityEngine Plugin for Unreal Engine



Vitruvio is a plugin for Unreal Engine (UE). It enables the use of CityEngine CGA rules for the generation of procedural buildings in the Unreal Editor or at runtime.

PyPRT

Python Bindings for the CityEngine SDK



PyPRT provides Python bindings for the “Procedural Runtime” (PRT) of CityEngine. It enables the execution of CityEngine CGA rules within Python. Using PyPRT, the generation of 3D content in Python is greatly simplified.

CityEngine SDK

C++ APIs, Documentation and Examples for the Procedural Runtime (PRT)



One of the most important components of CityEngine is the "Procedural Runtime" (PRT). It consumes Rule Packages (RPK) authored with CityEngine and generates the 3D geometry of building models.



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