



Creating 3D Engineered Models

January 8, 2013

11:00 am – 12:30 pm EST



U.S. Department of Transportation
Federal Highway Administration



Welcome & Introductions

Douglas Townes, P.E.
FHWA Resource Center



U.S. Department of Transportation
Federal Highway Administration



Introduction: Webinar Topics

Webinar 1: Overview of 3D Models for Construction

Webinar 2: Creating 3D Engineered Models

Webinar 3: Applications of 3D Models in the Contractor's Office

Webinar 4: Applications of 3D Models on the Construction Site

Webinar 5: Managing and Sharing 3D Models for Construction

**Webinar 6: Overcoming Challenges to Using 3D Engineered Models
for Construction**

**Webinar 7: Steps to Requiring 3D Engineered Models for
Construction**

**Webinar 8: The Future: Adding Time, Cost and other Information
to 3D Model**



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to 3D Model**



Webinar 1

Overview of 3D Engineered Models for Construction

www.fhwa.dot.gov/3D

FHWA / Programs / Construction / Technologies and Innovations / 3D Engineered Models

Management Bridge Pavement Contract Administration Technologies and Innovations

3D Modeling Intelligent Compaction Accelerated Construction Every Day Counts SHRP2

3D Engineered Models

- [Automated Machine Guidance](#)

Publications

- [3D Engineered Models for Construction - Case Study for Policies and Organizational Changes for Implementation: The Kentucky Case Study](#), FHWA-HIF-13-049 2013
- [3D Engineered Models for Construction - Understanding the Benefits of 3D Modeling in Construction: The Wisconsin Case Study](#), FHWA-HIF-13-050 2013
- [3D, 4D, and 5D Engineered Models for Construction - Executive Summary](#), FHWA-HIF-13-048 2013

Webinars

- Overview of 3D Engineered Models for Construction November 20, 2013 at 1:00 AM 2:30 pm

Events

- [Slide in Bridge Construction \(SIBC\) from the Engineer/Designer Perspective](#) Webinar 1/28/2014
- [View all Upcoming Construction Events](#)

More Information

- [FHWA Public-Private Partnerships](#)
- [TIFIA](#)

Contact

- Chris Schneider**
Office of Asset Management, Pavement, and Construction
202-493-0551
[E-mail:Chris](mailto:Chris)



Today's Speakers

Speaker	Topic
Douglas Townes (FHWA-RC)	Welcome and Introductions
John Krause (Florida DOT)	Surveying Methods for 3D Models
Brett Wood (Florida DOT)	Surveying Methods for 3D Models
Francesca Maier (Parsons Brinckerhoff)	Creating 3D Models in Design
Mike Pullen (Multnomah County)	Using 3D Models in Public Outreach
Douglas Townes (FHWA-RC)	Information on Next Webinar and Close

Supporting 3D Design

Florida Department of Transportation
Surveying & Mapping Office

John Krause, PSM and Brett Wood, PSM



U.S. Department of Transportation
Federal Highway Administration



Learning Objectives

- Identify best practice for capturing existing conditions
- Describe how survey data is processed into useful outputs for design and construction

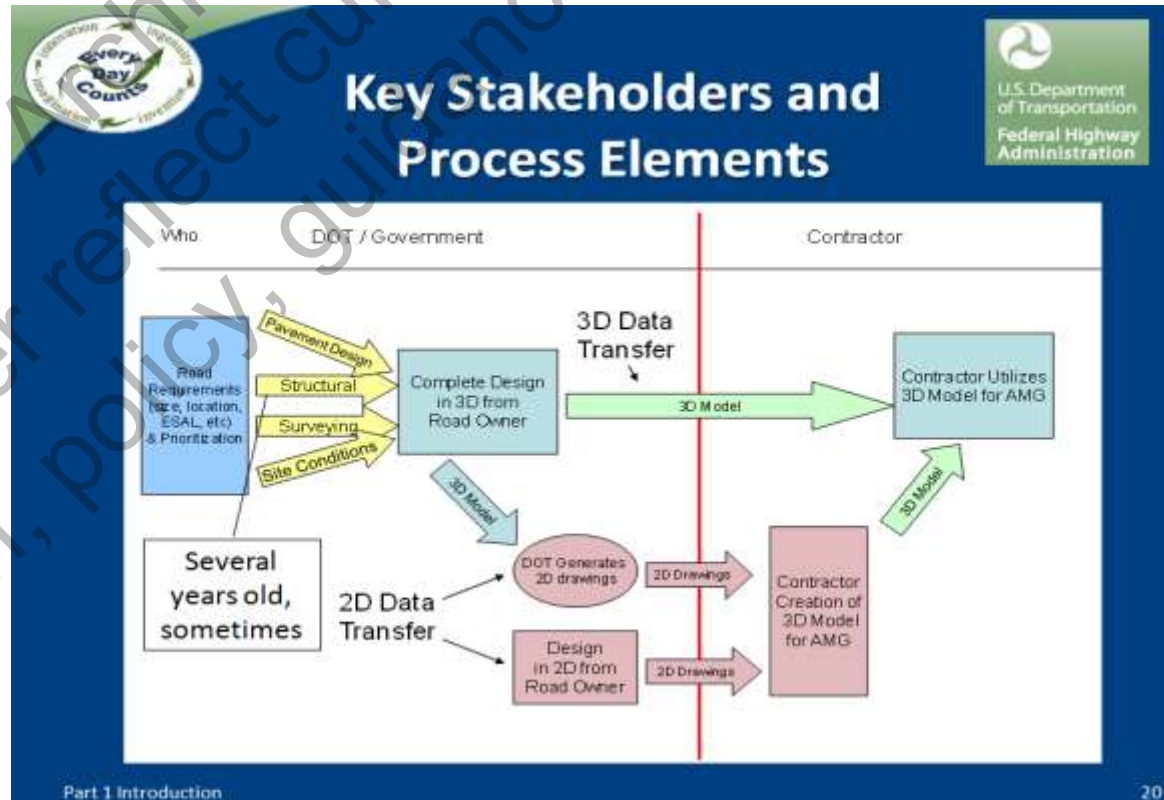


3D design efficiencies start early and go on throughout the life of the project

- 3D design efficiencies start early and go on throughout the life of the project
- To fully realize the cost savings of 3D design FDOT is moving towards providing the contractors with digital 3D design plans.
 - This will allow the contractors to estimate the project more accurately.
 - Project packages can be sent to responding contractors much faster and more efficiently than traditional paper hard copies.
 - All respondents will be estimating from the same “sheet of music”.

- Supporting certified digital survey data of existing conditions.

- Typically this would include a topographic surface and 3D data.
- Provided with digital signatures using
- <http://www.identrust.com/government/index.html>





Supporting 3D Design

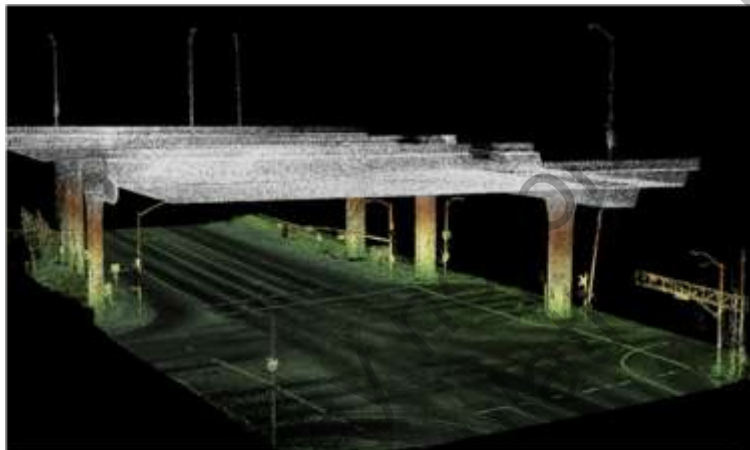
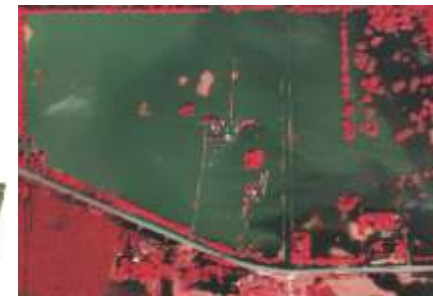
- SOME KEY ELEMENTS DRIVING 3D DESIGN ARE THE ADVANCEMENTS IN SURVEYING WHICH ALLOW SWIFT COLLECTION OF REMOTELY SENSED **IMAGERY** DATA WITH ACCURACIES SUFFICIENT FOR DESIGN.

The Old Way



Imagery Characteristics:

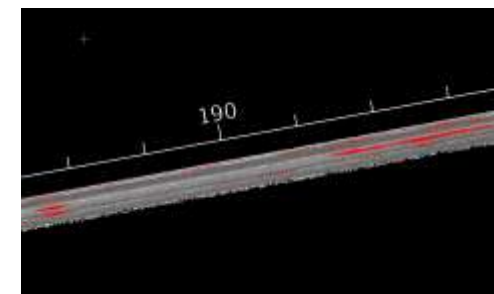
- Often includes valuable ancillary information
- Details difficult if not impossible to collect conventionally
- Better representation of change
- More detail
- Downside – storage!



<http://www.saminc.biz/project/detail/crenshaw-light-rail-mobile-mapping>



<http://www.earthmagazine.org>





FDOT Implementation of Terrestrial Mobile LiDAR

- TML Task Team established in 2012 by the State Surveyor and District Surveyors
- Establish Consistent, Predictable & Repeatable (CPR) survey processes and documentation
- Included FDOT Central Office Remote Sensing and Location Survey personnel.
- Representatives from each FDOT District
- Interested consultants with experience using technology
- Limited Team size to maintain functionality.

TML Guidelines



TML General Scope



TML Project Staff Hour Form

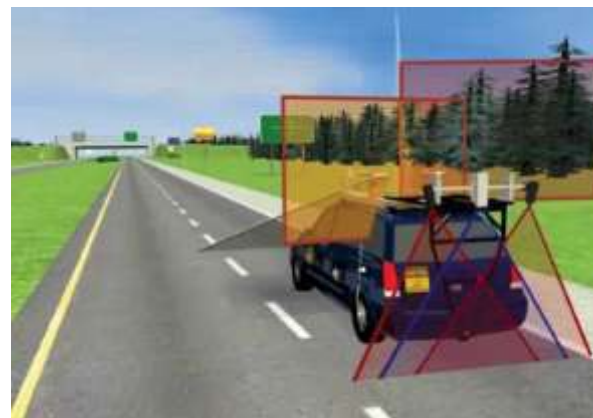
Task No.	Task	Units	No. of Staff	Hours / Staff	Hours	Other Senior Staff	Other Senior Staff Hours	Other Staff	Other Staff Hours	Total Staff Hours	Comments
3.0.1	3.0.1 Mission Planning	1	1	1.00	1.00					1.00	
3.0.2	3.0.2 Project Control Point Coordination	1	1	1.00	1.00					1.00	
3.0.3	3.0.3 Mobilization	1	1	1.00	1.00					1.00	
3.0.4	3.0.4 Mobile LiDAR Mission	1	1	1.00	1.00					1.00	
3.0.5	3.0.5 LiDAR Processing	1	1	1.00	1.00					1.00	
3.0.6	3.0.6 Terrestrial Mobile Photography Processing	1	1	1.00	1.00					1.00	
3.0.7	3.0.7 Translocation / Adjustment	1	1	1.00	1.00					1.00	



General Mobile LiDAR Survey Methods and Vertical Accuracies

- Fixed Wing Aerial LiDAR Mapping (ALS) = +/- 0.5 – 1.0 feet
- Low Altitude MLS = +/- 0.1 – 0.2 feet
- Vehicle TMLS = +/- 0.050 – 0.1 feet
- Static Laser Scanning = +/- 0.005 – 0.05 feet

3D Design projects are beginning to be supported by several survey imagery technologies



May no longer refer to current guidance or practice.



Improving Technology

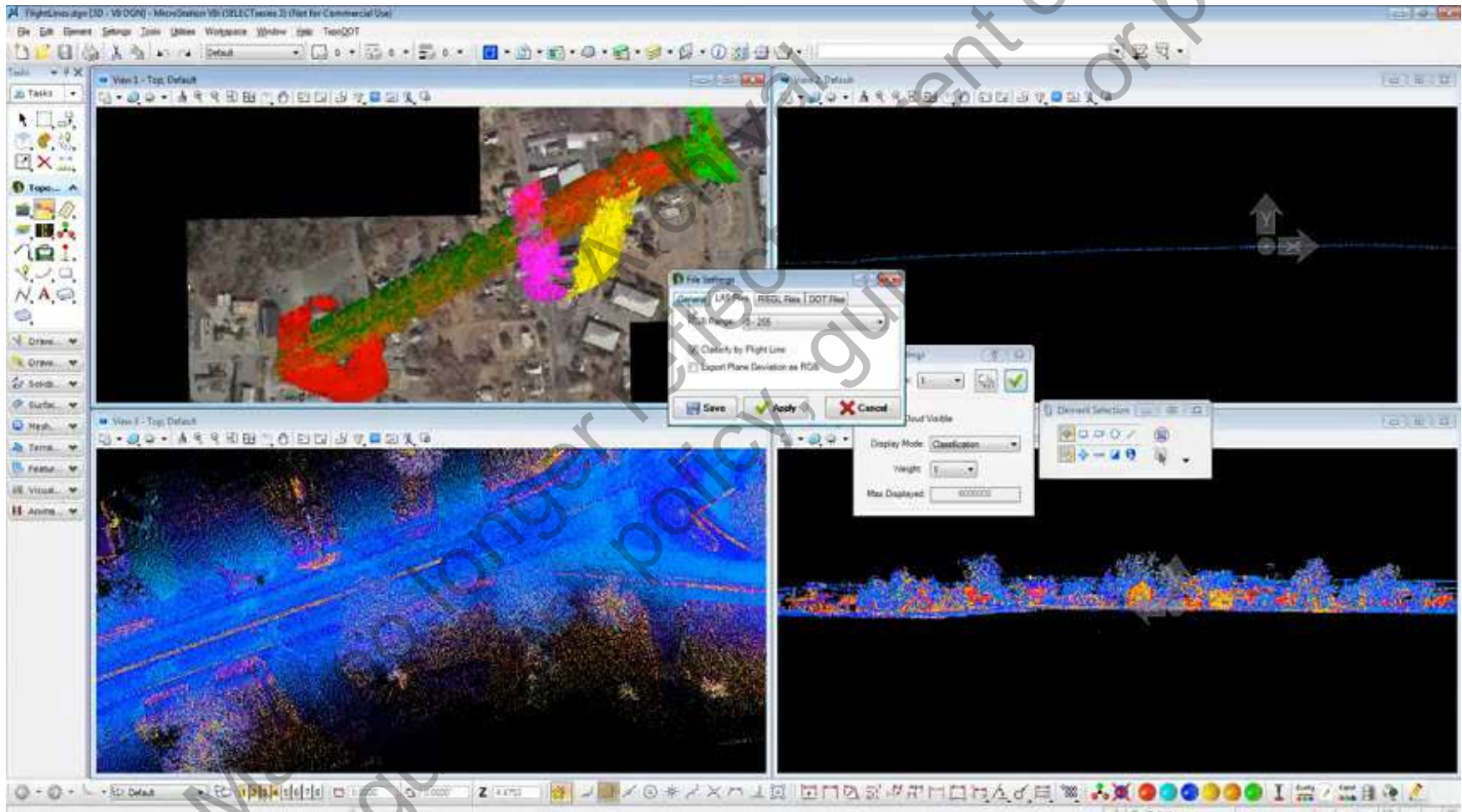
Low Altitude LiDAR Testing in District 3

Washington County SR 10	FDOT		150kHz		80kHz		150kHz		240kHz		400kHz	
	X-Sections	Difference	Roto-X	Difference	FrgSet1-X	Difference	FrgSet2-X	Difference	FrgSet3-X	Difference	FrgSet4-X	
BEGIN 1	1	0	1	0	1	0	1	0	1	0	1	
1562524.429 649544.226	78.304	-0.163	78.467	-0.097	78.401	0.061	78.243	0.063	78.241	-0.093	78.397	
1562523.036 649548.922	78.634	-0.088	78.722	-0.015	78.649	0.202	78.432	0.156	78.478	-0.051	78.685	
1562520.116 649560.522	78.959	-0.083	79.042	0.007	78.952	0.21	78.749	0.123	78.836	-0.052	79.011	
1562517.459 649572.428	78.967	-0.084	79.051	-0.054	79.021	0.155	78.812	0.153	78.814	0.045	78.922	
1562516.255 649576.851	78.722	-0.087	78.809	-0.007	78.729	0.059	78.663	0.034	78.688	-0.06	78.782	
END												
BEGIN 2	2	0	2	0	2	0	2	0	2	0	2	
1562623.897 649570.799	79.857	-0.109	79.966	-0.081	79.938	0.119	79.738	0.095	79.762	-0.051	79.908	
1562622.459 649575.294	80.203	-0.061	80.264	0.002	80.201	0.16	80.043	0.091	80.112	-0.06	80.263	
1562619.377 649586.984	80.587	-0.065	80.652	-0.006	80.593	0.207	80.38	0.122	80.465	-0.038	80.625	
1562616.357 649598.829	80.443	-0.115	80.558	0.006	80.437	0.2	80.243	0.144	80.299	-0.026	80.469	
1562615.191 649603.490	80.168	-0.146	80.314	-0.056	80.224	0.06	80.108	-0.01	80.178	-0.081	80.249	
END												
BEGIN 3	3	0	3	0	3	0	3	0	3	0	3	
1562722.625 649597.367	82.064	-0.099	82.163	-0.012	82.076	0.114	81.95	0.11	81.954	-0.05	82.114	
1562721.847 649601.856	82.399	-0.049	82.448	0.003	82.396	0.195	82.204	0.148	82.251	-0.03	82.429	
1562718.872 649613.402	82.696	-0.017	82.713	0.016	82.68	0.165	82.531	0.102	82.594	-0.014	82.71	
1562715.747 649625.257	82.498	-0.062	82.56	-0.03	82.528	0.156	82.342	0.145	82.353	-0.08	82.578	
1562715.168 649630.244	82.187	-0.108	82.295	-0.051	82.238	0.144	82.043	0.118	82.069	-0.029	82.216	
END												



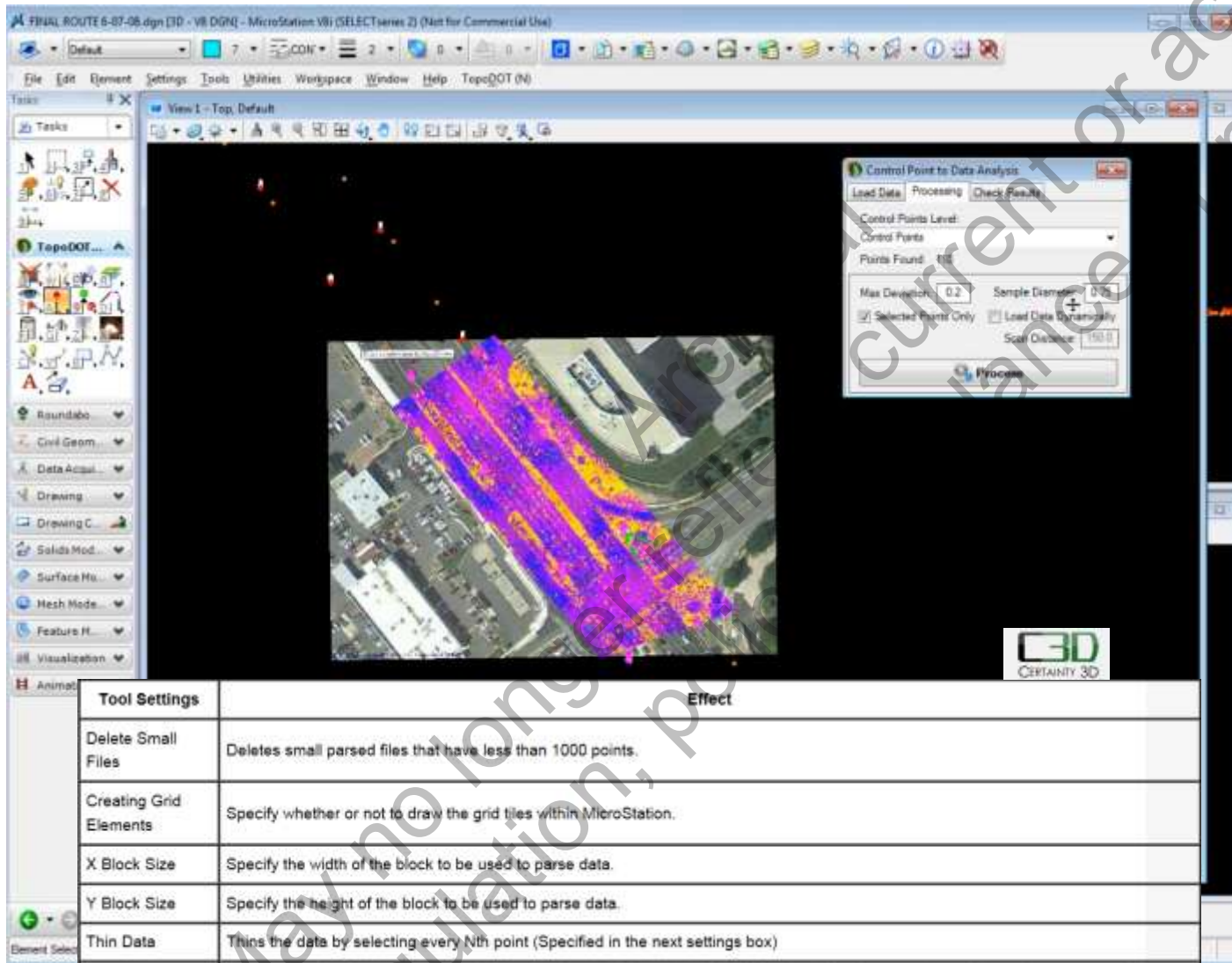
Managing LiDAR Data

- Using TopoDOT to filter Mobile LiDAR Data for quality control
- Usual step is to delineate point cloud data by vehicle trajectory
- Compare passes for coverage and to estimate vertical precision.





Managing LiDAR Data



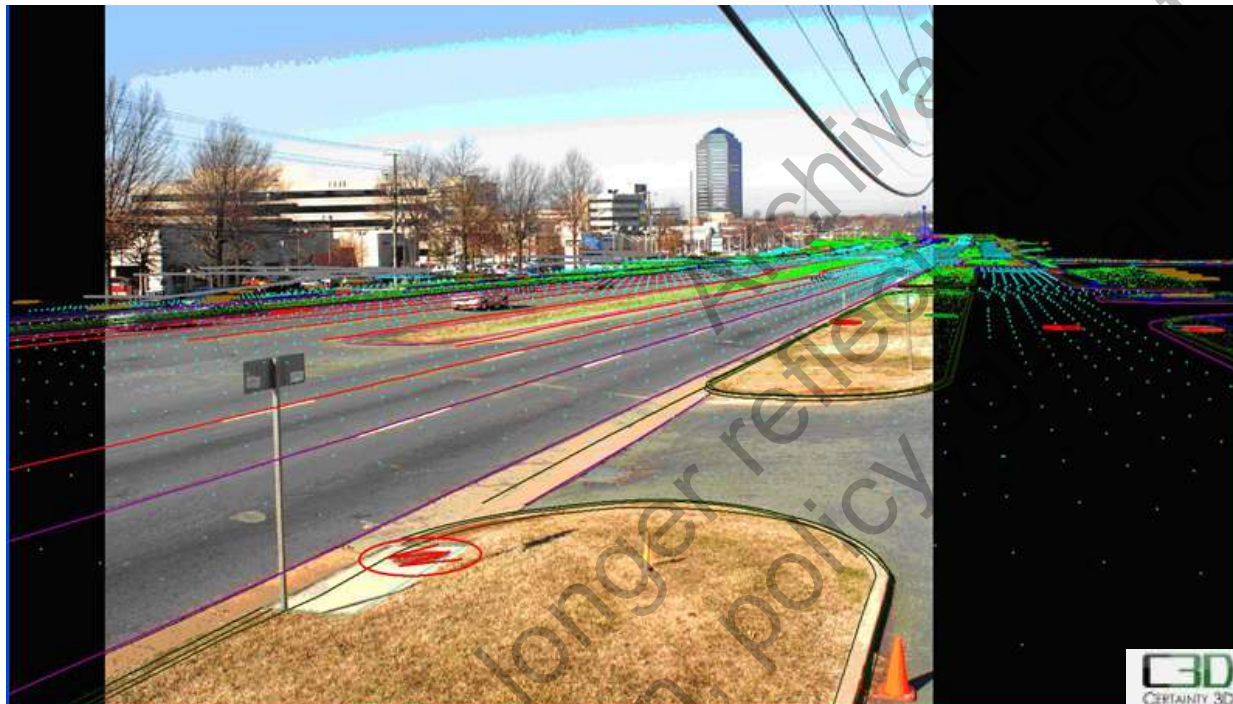
- Using TopoDOT to filter Mobile LiDAR Data into manageable sizes
- Usual step is to segregate point cloud data by uniform tile areas with matching filenames
- Be careful when thinning data
 - Filter, don't delete
 - Always be mindful of final object design criteria as it relates to accuracy and point density

Tool Settings	Effect
Delete Small Files	Deletes small parsed files that have less than 1000 points.
Creating Grid Elements	Specify whether or not to draw the grid tiles within MicroStation.
X Block Size	Specify the width of the block to be used to parse data.
Y Block Size	Specify the height of the block to be used to parse data.
Thin Data	Thins the data by selecting every Nth point (Specified in the next settings box)
Nth Point	The number of points to skip when thinning the data. (Ex: Inputting 2 for Nth point will load every other point into the new parsed data tiles. Inputting 3 for Nth point will load every third point into the new parsed data tiles. Etc)



Combining Photography With Mobile LIDAR

- Combining the two remote sensing technologies yields better 3d survey information
- Keep in Mind it is not independent if processed from same SBET

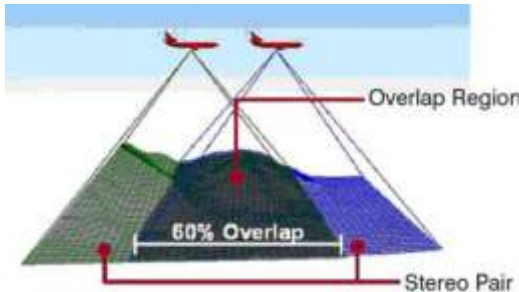


May no longer reflect current regulation policy. Accepted for publication.



Photogrammetry - Autocorrelation

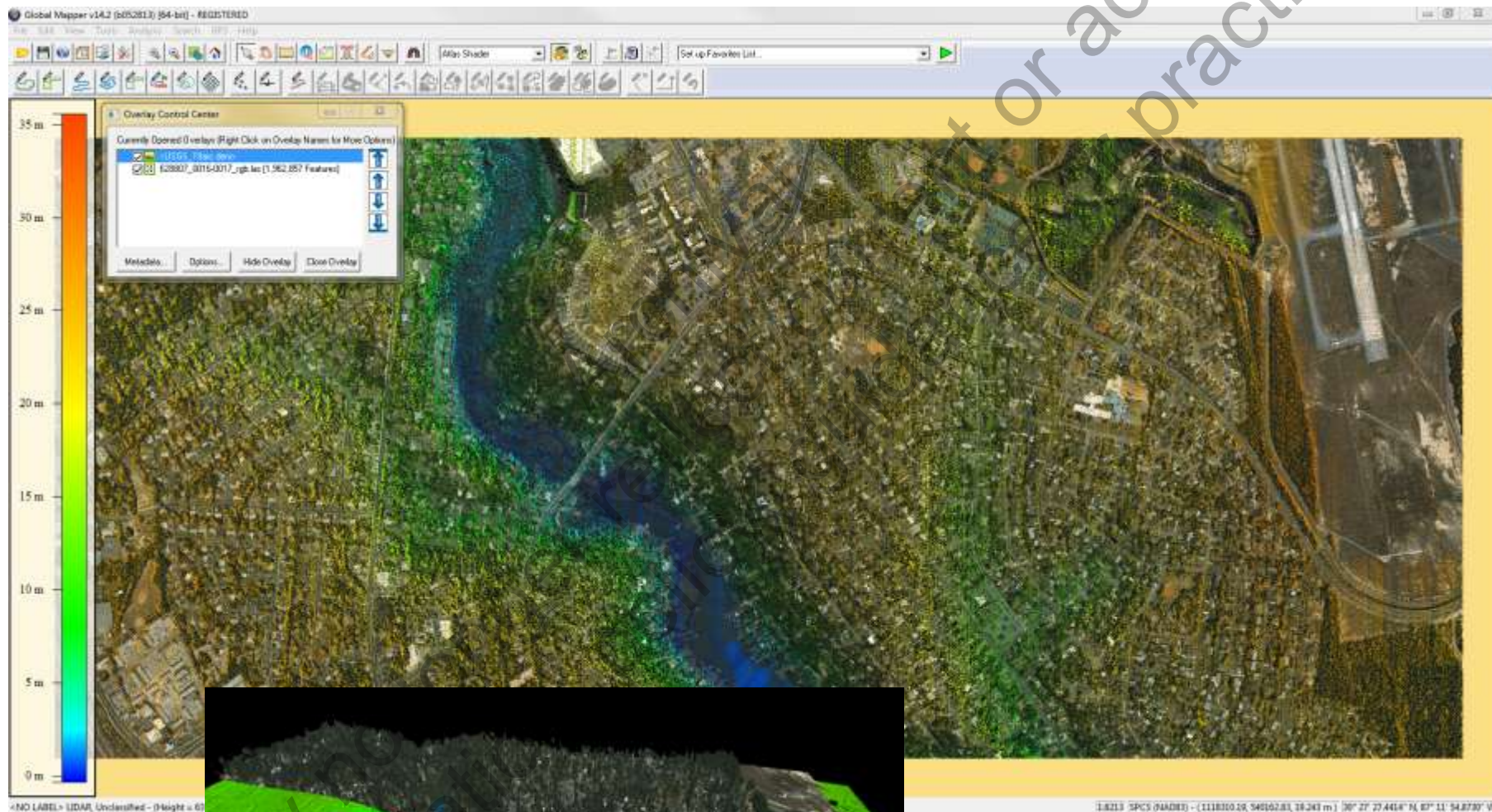
Fort Pickens





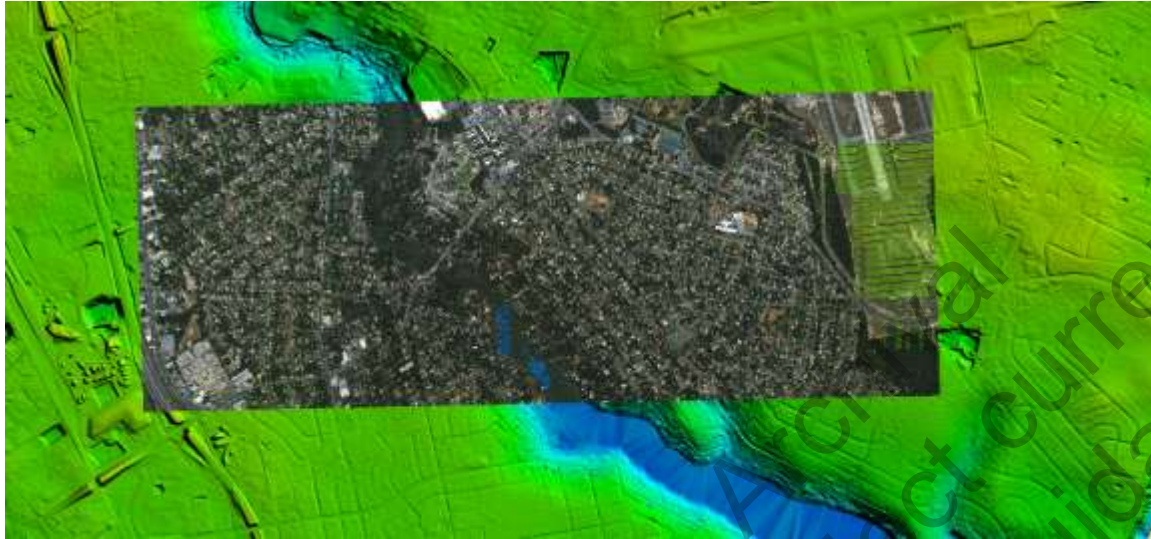
Advantage of Additional Datasets

Global Mapper Software – Comparing Image Data

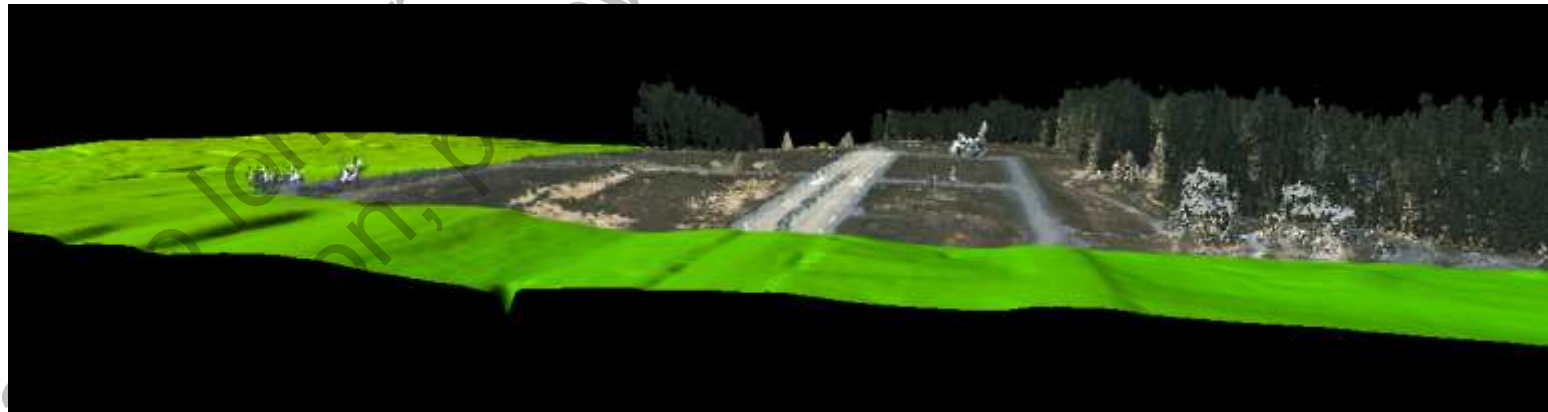
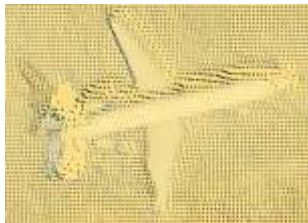




Verifying USGS DEM Surface for Orthophotography



FDOT - SMO



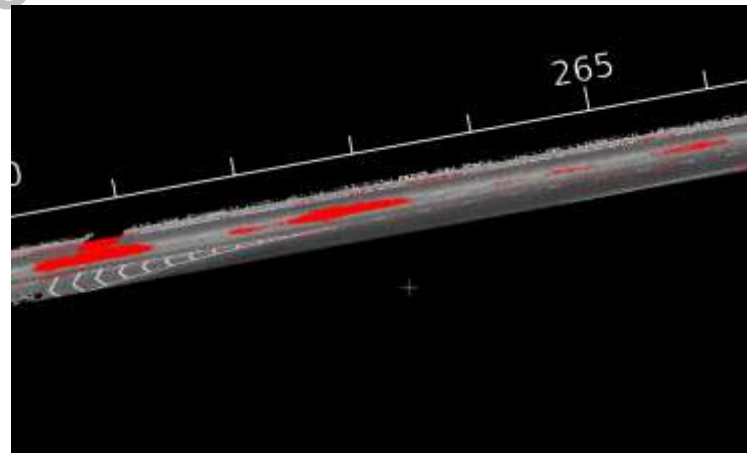
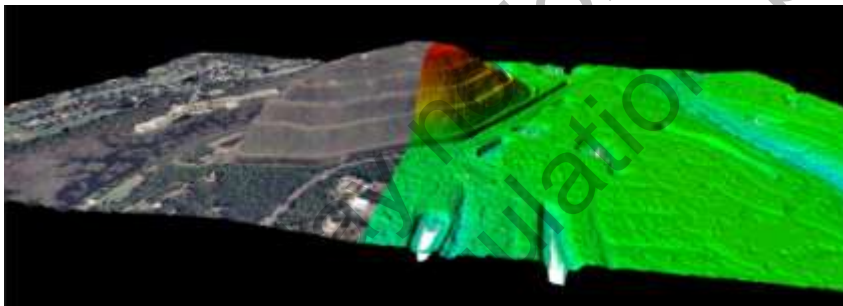
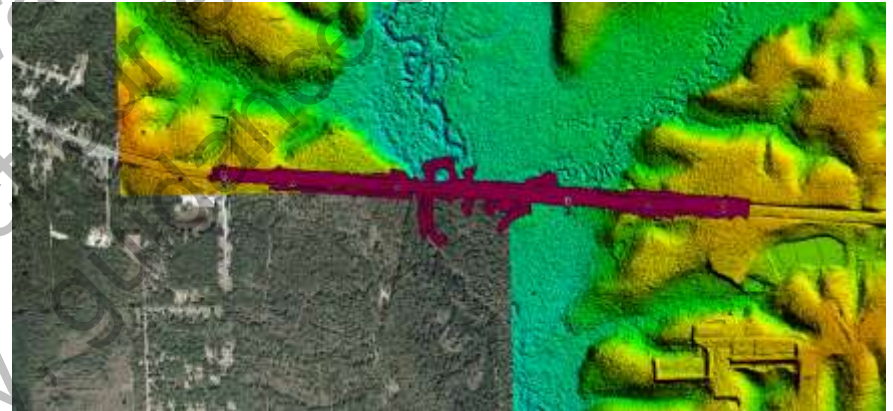
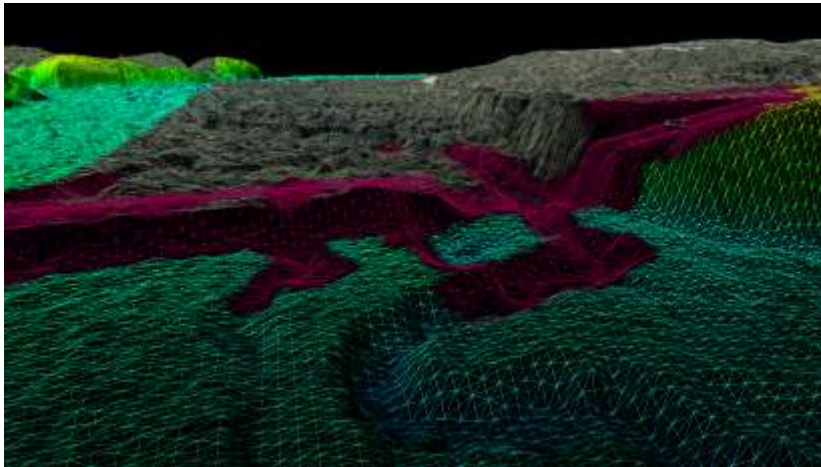
Autocorrelation from Digital Mapping Camera (DMC) Imagery



Summary

- When measured on a common datum, imagery from different sources can be very beneficial
 - Verify Accuracy
 - More complete Information
 - Change detection
- The 3D model - Greater than the some of it's parts

Photogrammetry, LiDAR, and
Conventional Surveying



Rutting on
Interstate 10



Verify Learning Outcomes

- Identify best practice for capturing existing conditions
- Describe how survey data is processed into useful outputs for design and construction

Creating 3D Engineered Models in Design

Francesca Maier, PE
Parsons Brinckerhoff



U.S. Department of Transportation
Federal Highway Administration

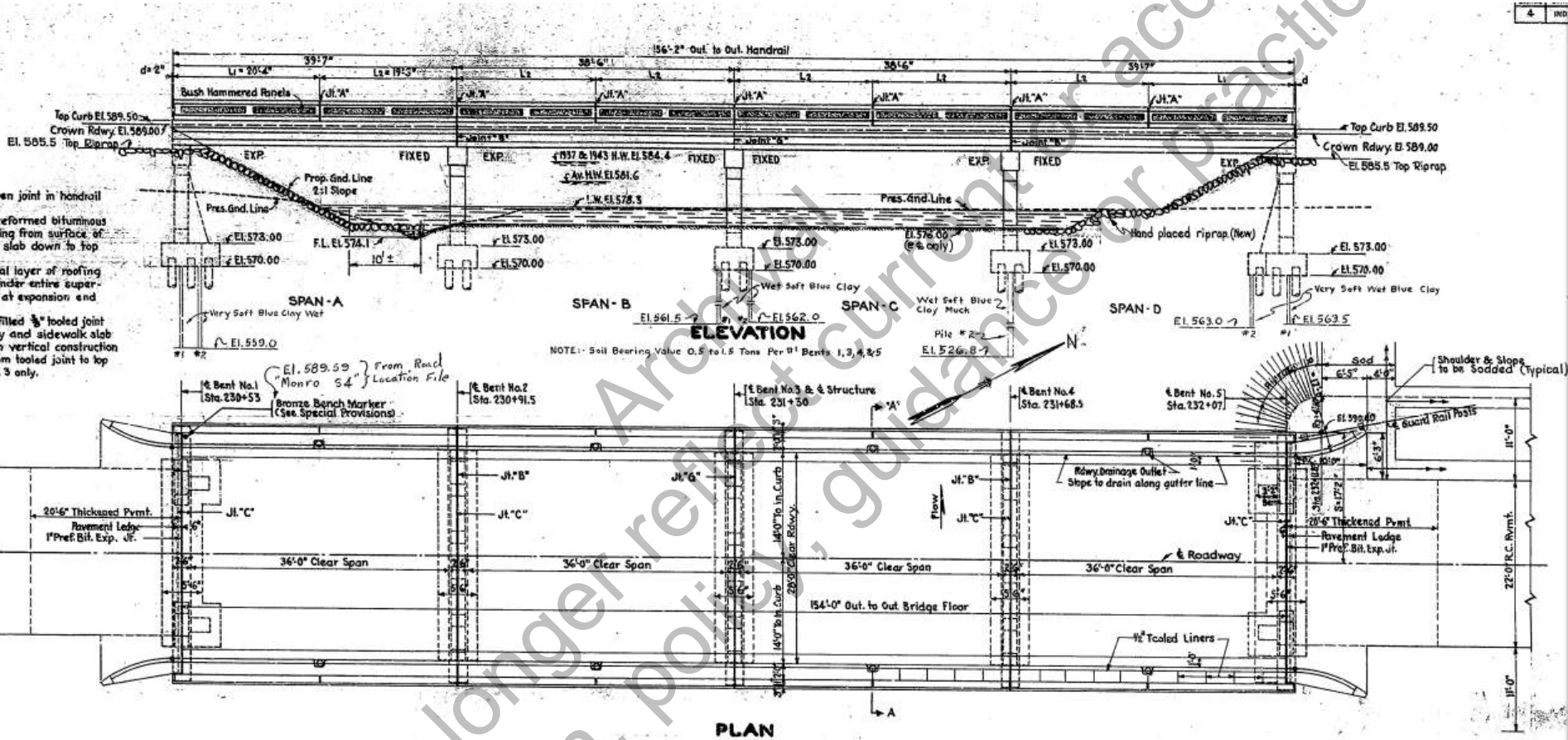


Learning Objectives

- Identify rapid 3D Modeling tools using GIS data
- Describe types of 3D models developed during design
- Describe how 3D models are prepared for Automated Machine Guidance



Lifecycle Data



Bridge as-built plans, 1946

May no longer regulate, policy guidance for practice.



Lifecycle Data





Use of 3D Data in Planning





3D Context Models from GIS Data

The image shows a screenshot of a GIS application interface. On the left is a 'Data Sources' panel with a tree view and a table. The table lists various data layers with their source types and import dates. On the right is a 3D perspective view of a city model, showing buildings, roads, and terrain. A large watermark 'May not be reproduced for publication or practice.' is overlaid diagonally across the entire image.

Name	Source Type	Status	Date Loaded
<No Feature Type>			
CL-clipped	Vector	Not Configured	
CL-clipped	Vector	Not Configured	
Buildings			
building	Vector	Imported	Wed Jan 30 2013
Coverage Areas			
vegetated_area	Vector	Imported	Thu Jan 10 2013
Roads			
Aleys	Vector	Imported	Thu Dec 27 2012
CL-clipped	Vector	Imported	Fri Jan 11 2013
Serran			
Surface - SURFACES	Autodesk DDX	Imported	Fri Jan 11 2013
Water Areas			
water	Vector	Imported	Fri Jan 11 2013

Data Source Details

Name: <Empty>

Description: <Empty>

Source type: <Empty>

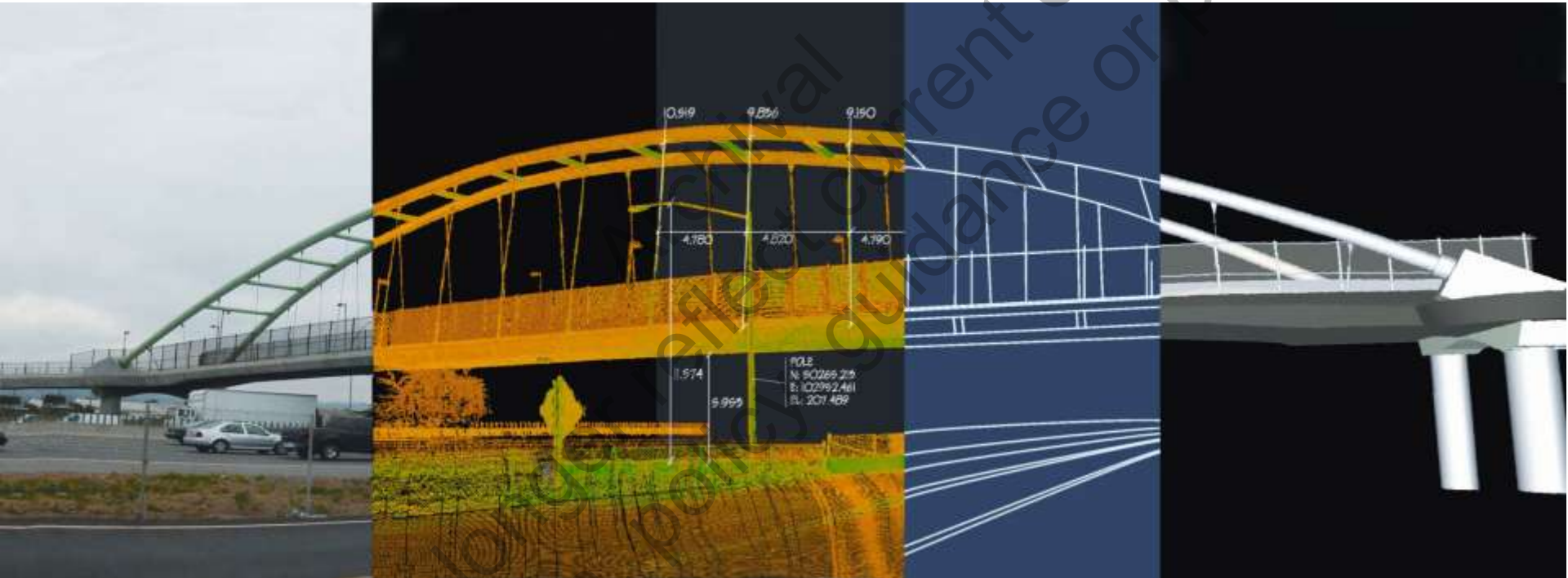
Connection string: <Empty>

Coordinate system: <Empty>

Date loaded: <Empty>



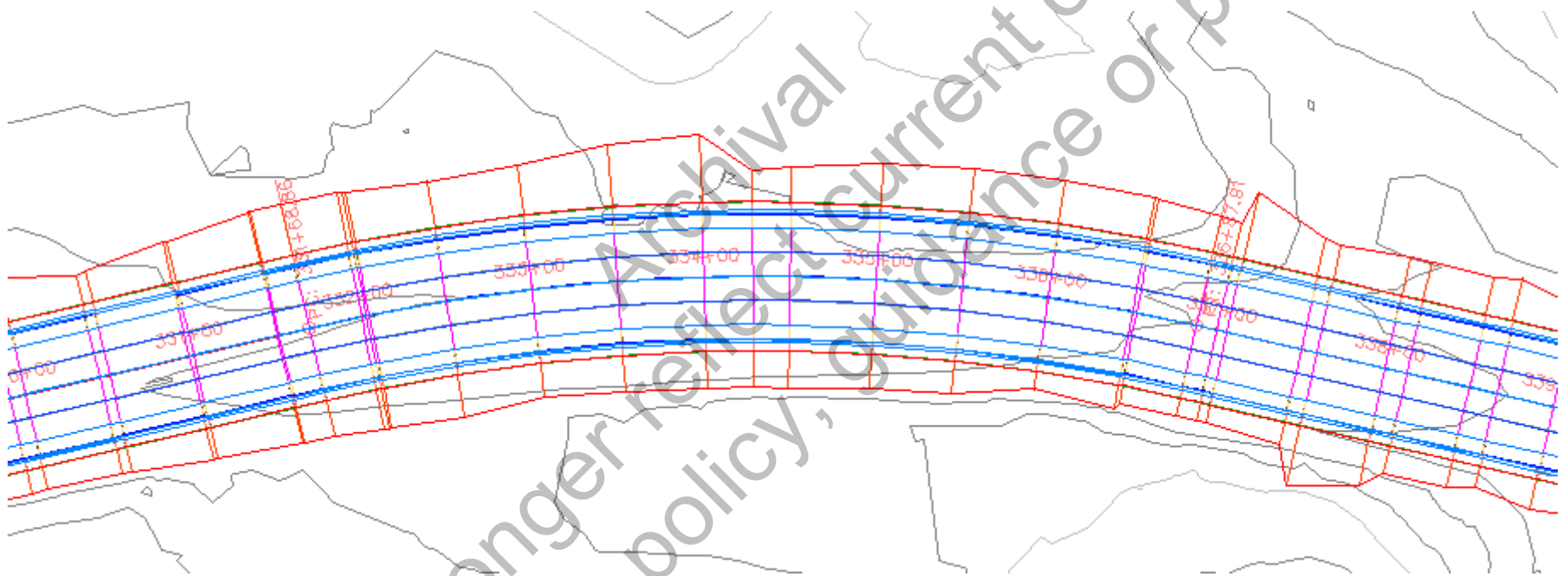
Growing Detail in Design Models



Source: Wisconsin DOT



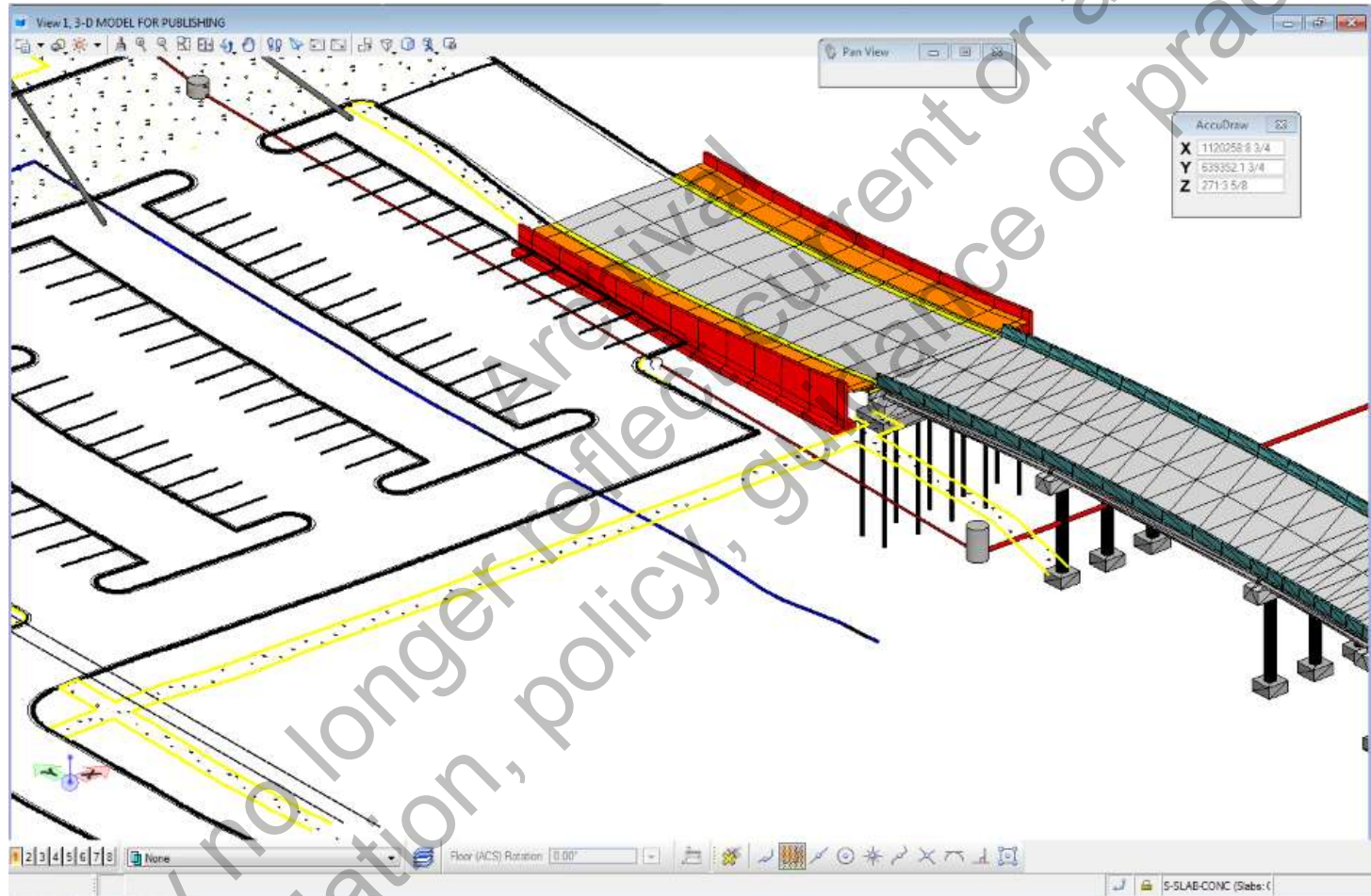
Growing Detail in Design Models



Archival
May no longer reflect current or accepted
regulation, policy, guidance or practice.

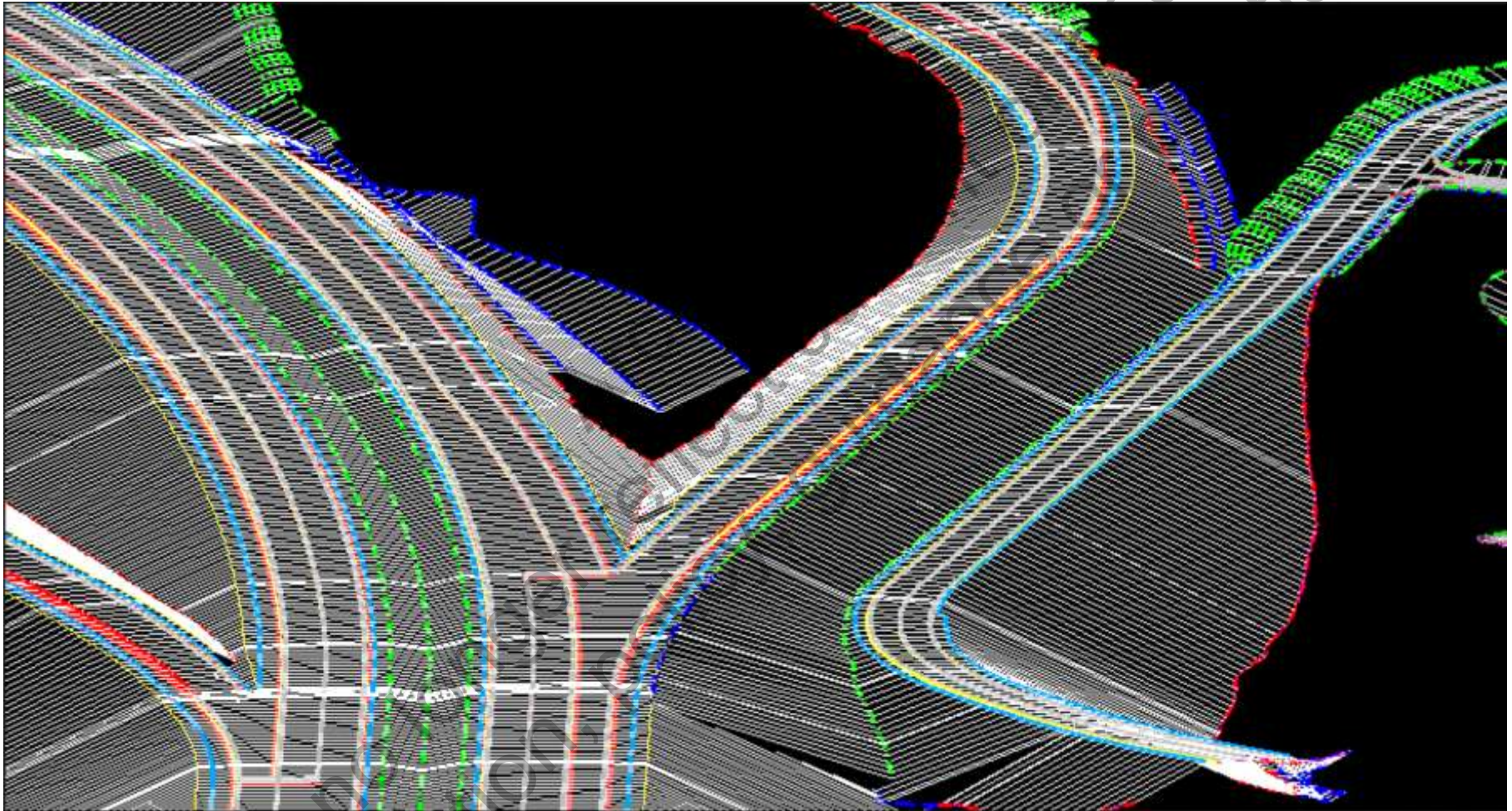


Growing Detail in Design Models





Growing Detail in Design Models



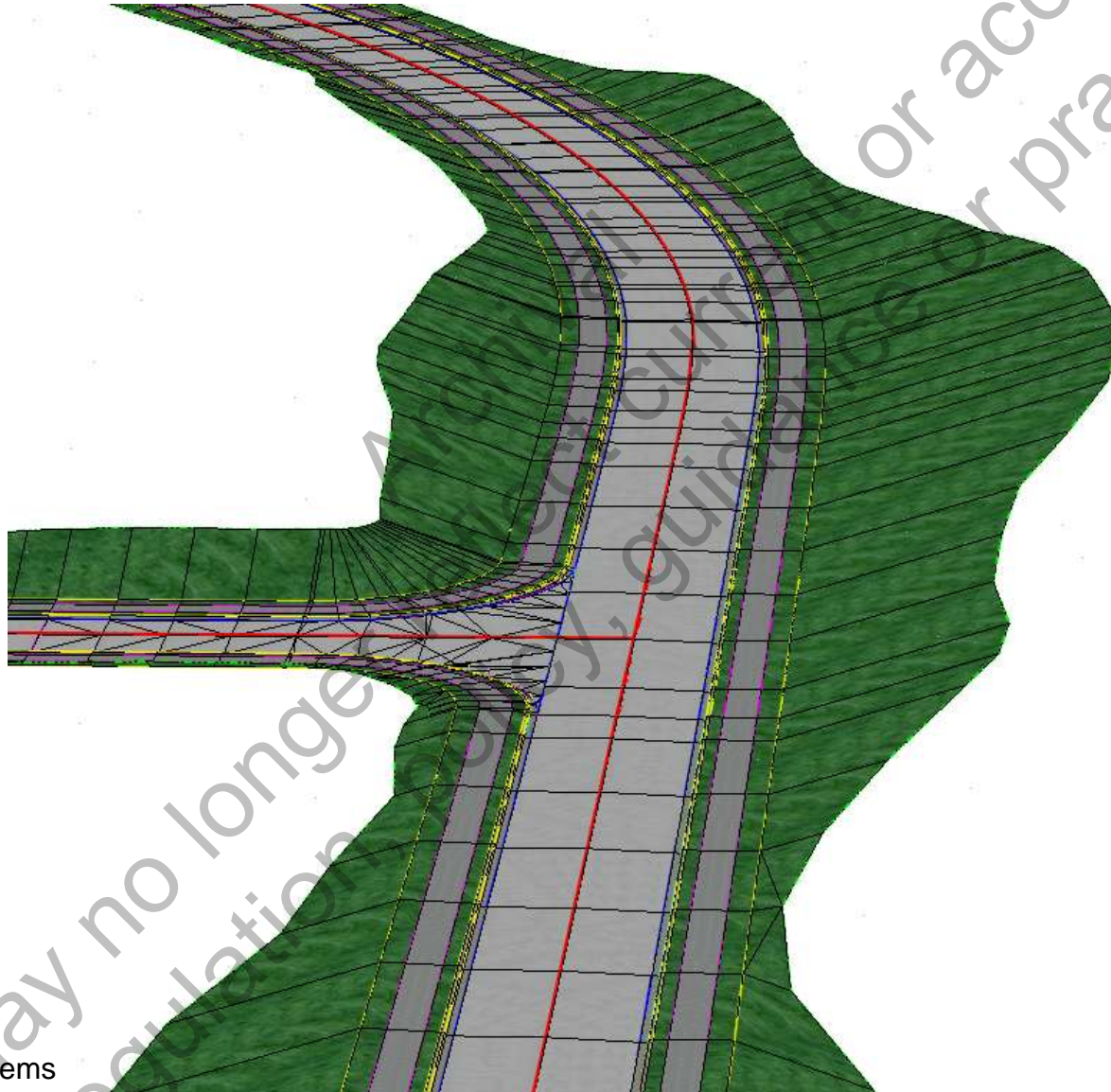


What's in your design workflow?

- CADD alignments, profiles and superelevation
- Criteria for cross-sections and earthworks
- Corridor models for cross-sections and earthworks
- Proposed TINs for earthworks
- Outputting LandXML for bidding
- Outputting line strings for bidding
- Releasing corridor models for bidding



Detail Needed for Construction: Design Intent





Detail Needed for Construction: AMG



Source: Sundt Construction



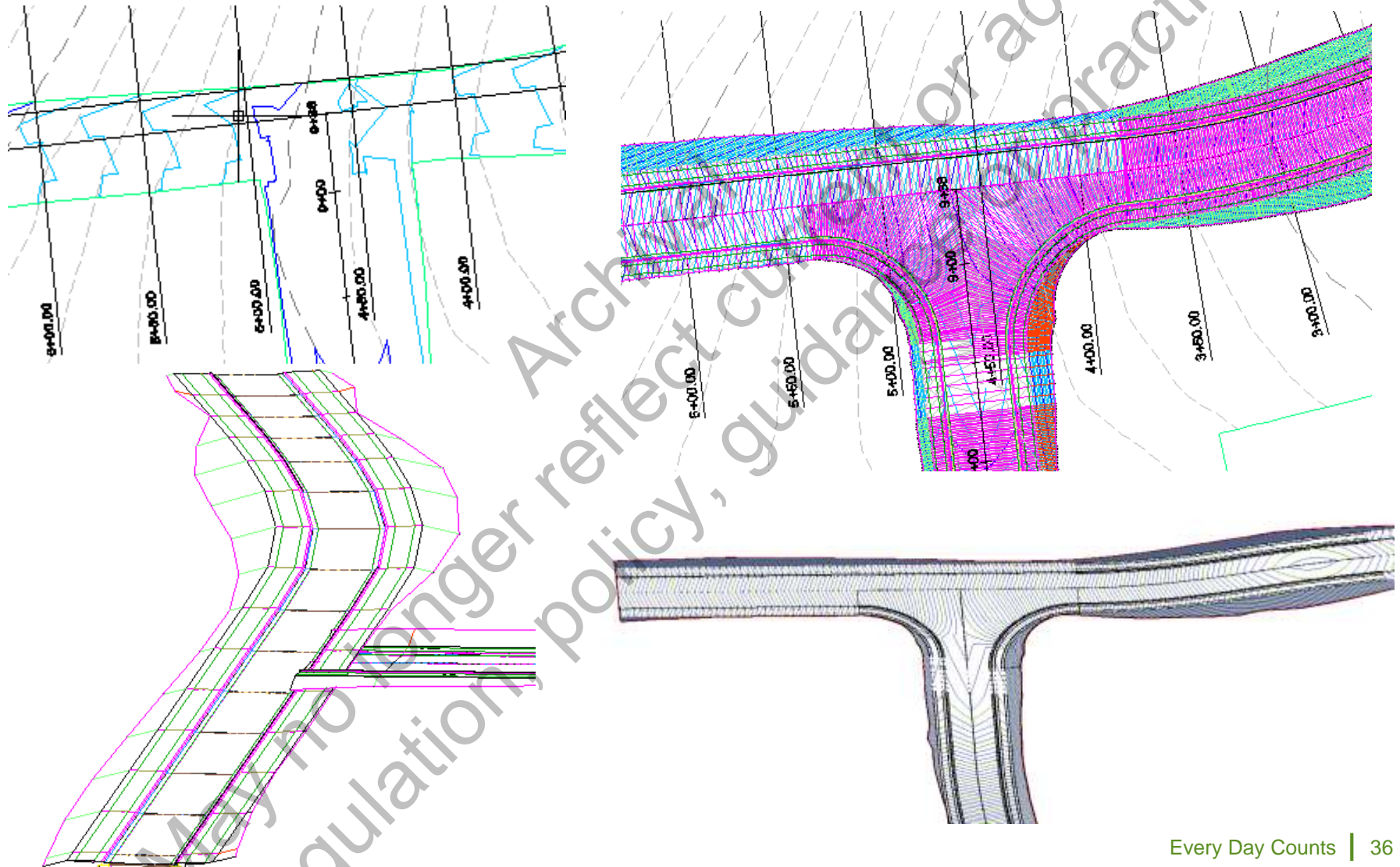
Detail Needed for Construction: AMG



Source: Florida DOT

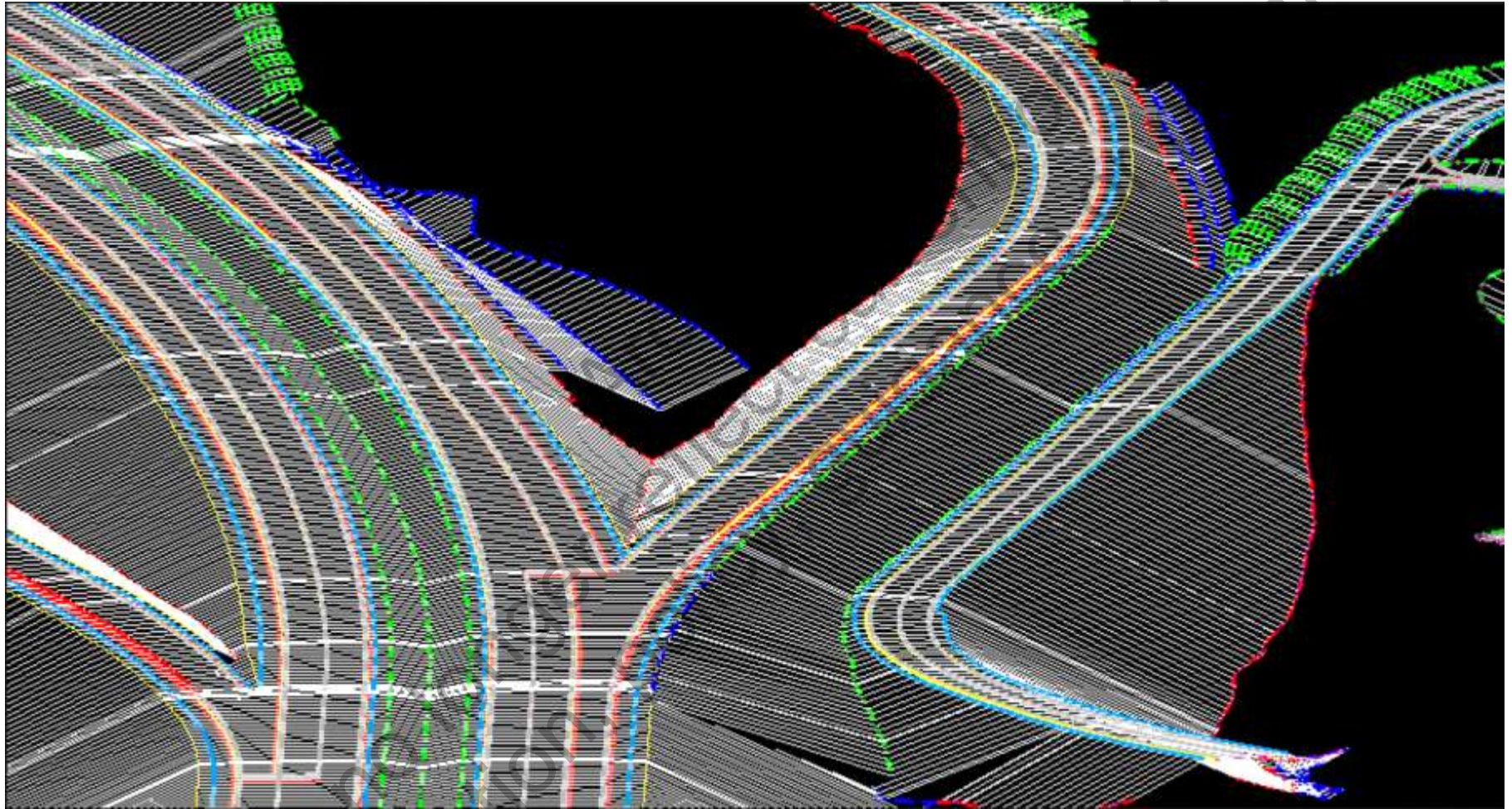


3D for Plans versus 3D for AMG





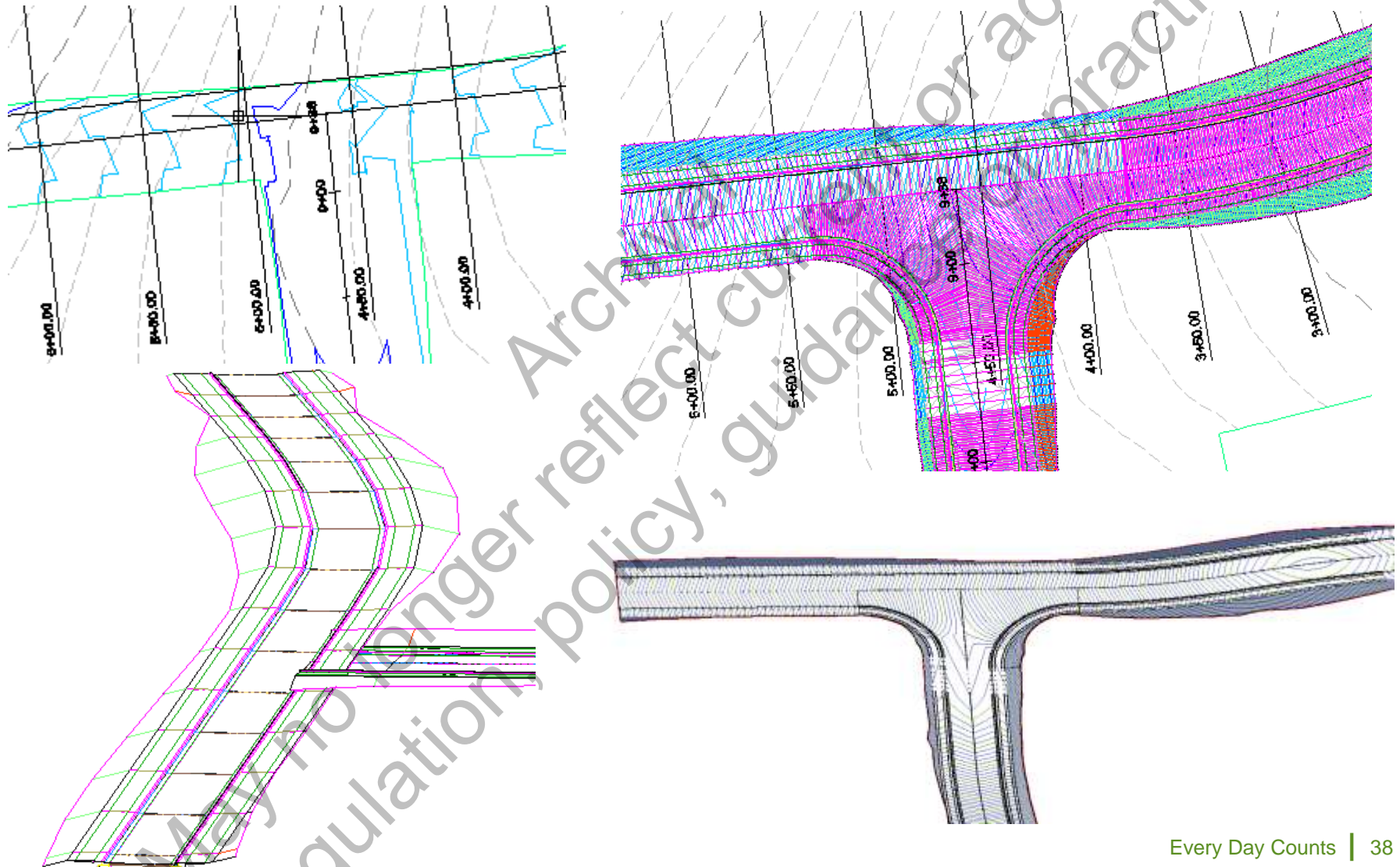
3D for Plans versus 3D for AMG



May 2014
Regulatory



3D for Plans versus 3D for AMG

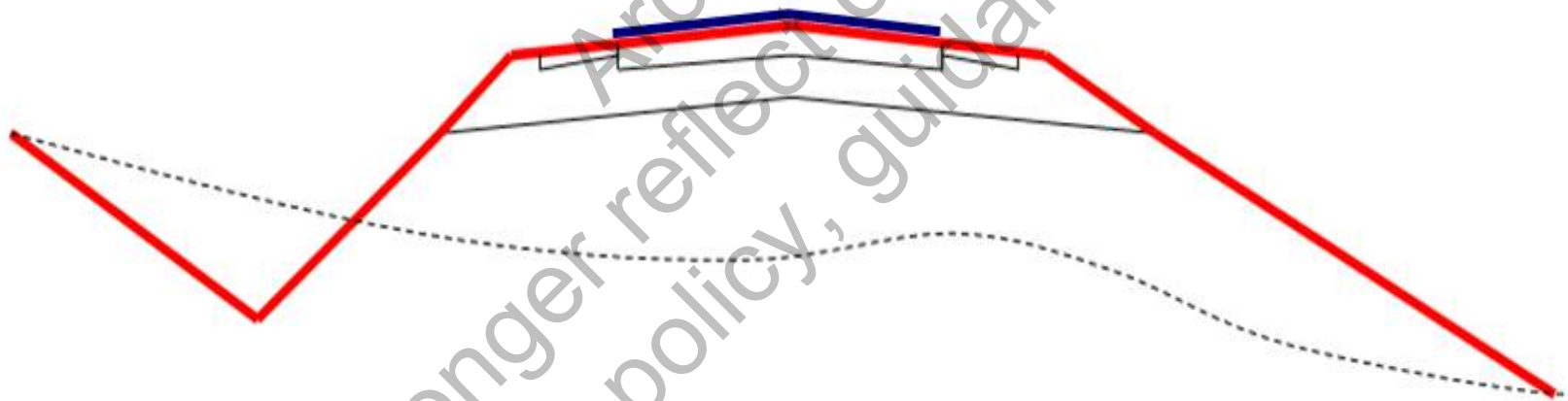




Surface Definitions for AMG

Roadway Model Surface - Top

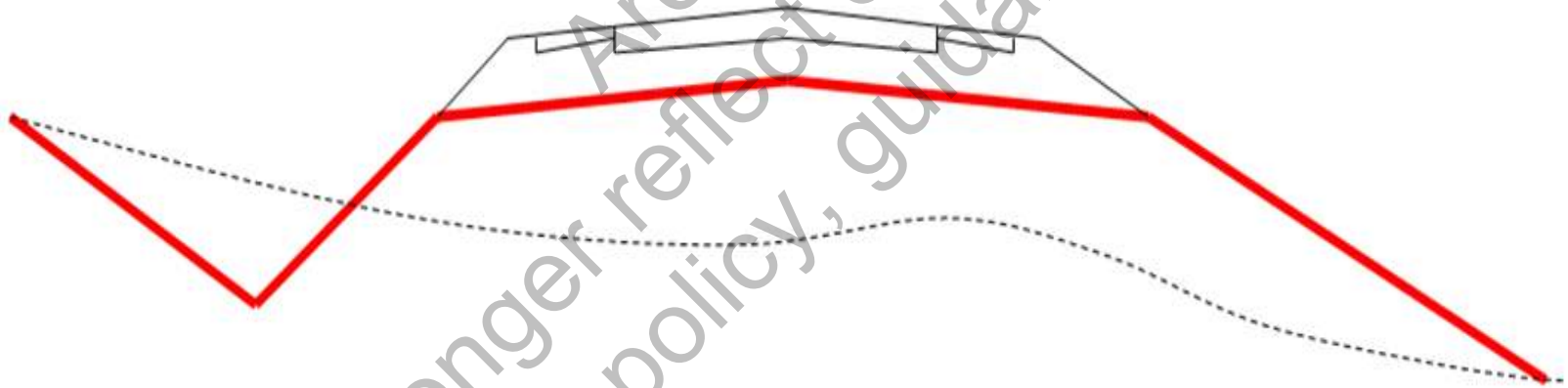
Roadway Model Surface - Pavement





Surface Definitions for AMG

Roadway Model Surface - Datum





Digital Data for Information Only

- Do you have concerns about releasing Digital Data for Information Only?
 - Yes, I'd rather not release any digital data
 - Yes, but I'll release PDFs of the plans
 - Yes, but I'll release Alignments, Control Points and Existing Surfaces
 - Yes, but I'll release LandXML & 3D line strings
 - No, I'd release all digital data



Sharing 3D Models with Others



- Useful Links
- For the Consumer
- Schema Versions
- About

WELCOME LAND DEVELOPMENT PROFESSIONALS!

Quick Statistics

November 28, 2013

Members: 757

Organizations: 664

Countries: 41

Registered Software: 70

Stay informed and participate by

[joining the LandXML.org](#)

Industry Consortium.

[See LandXML.org members from 2006 mapped in Google Earth.](#)

[View the message archives.](#)

LandXML.org in a Nutshell

Launched January 2000, LandXML.org is committed to providing an non-proprietary data standard ([LandXML](#)), driven by an industry consortium of partners. *There is no direct cost to join LandXML.org, nor specific level of participation required.*

Once you join, stay informed and participate by using the

News December 8, 2013

Thanks to Ladd Nelson of [Carlson Software](#) for updating the web site UI and layout.

New web application to convert FAA NGS survey data to LandXML-1.2 on [web applications](#).

[Expanded domain/email mapping to Google Earth & Google Maps web application](#)

Is your software [LandXML Registered and Certified?](#)

Software vendors [Apply for Registered Software status today](#)

LandXML.org has resumed active status. [Contact us](#)

LandXML Validator & Report Generator on the [Web Applications](#) page.

[LandXML to SVG Web Application](#) (Works for LandXML-1.0, LandXML-1.1, LandXML-1.2 files)

Is your software application [LandXML Registered and Certified?](#)



LandXML.org XML Data Exchange Standards

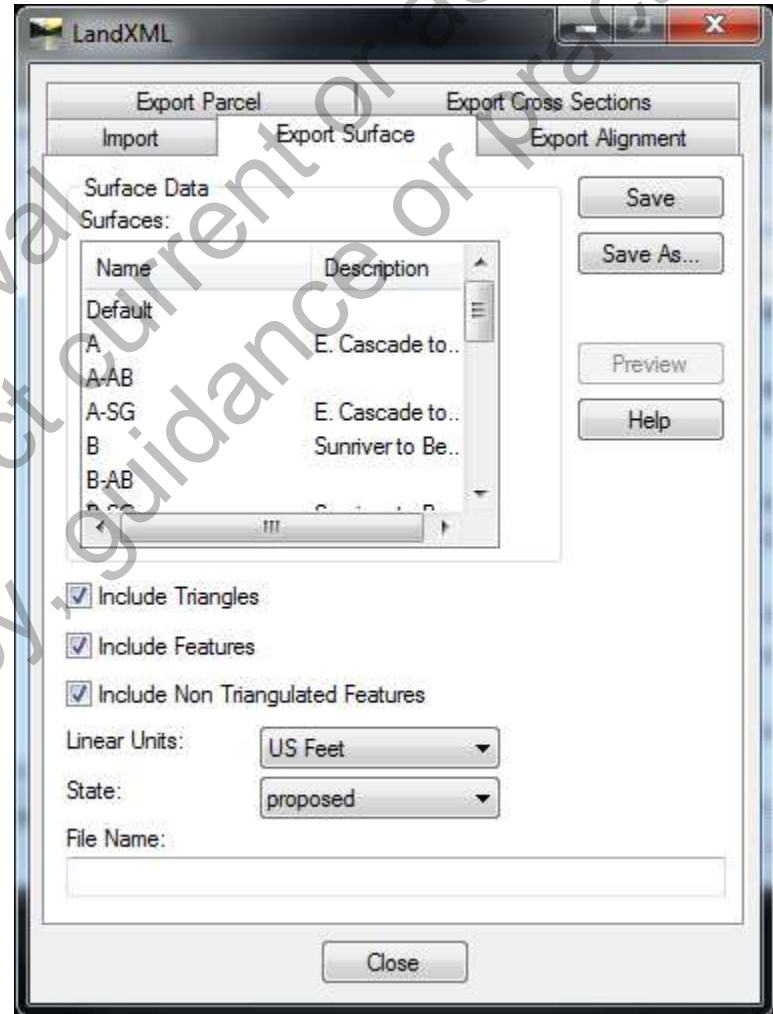
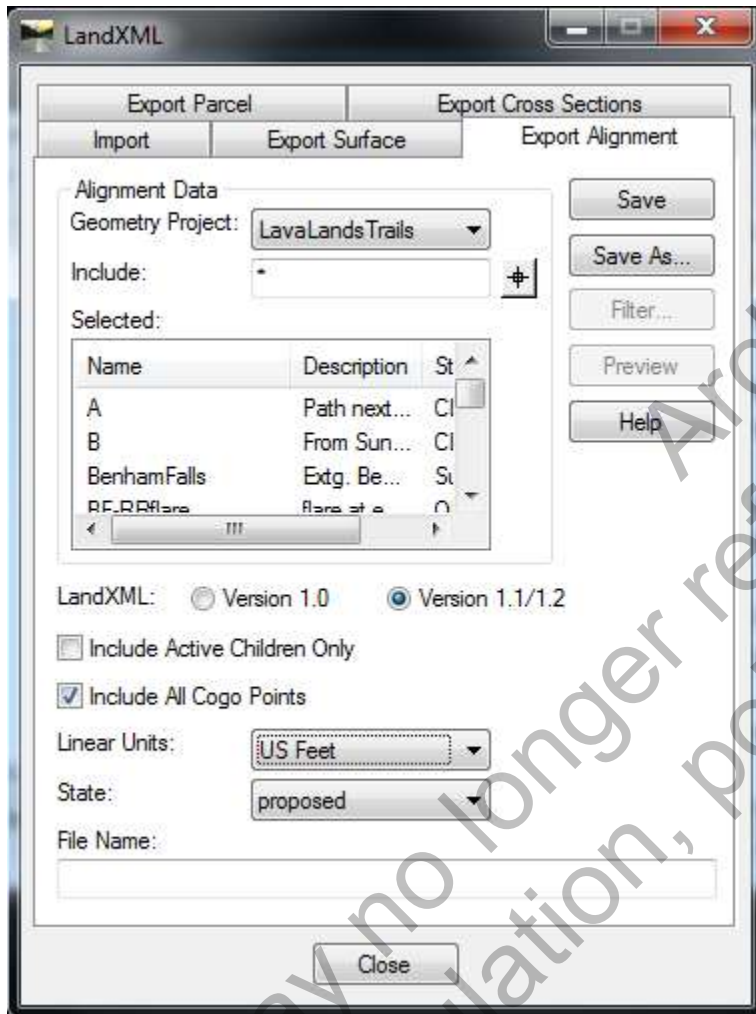
[LandXML-1.2 schema](#): Ratified/Standardized on **August 15, 2008**

[LandXML-1.1 schema](#): Ratified/Standardized on **July 21, 2006**

[LandXML-1.0 schema](#): Ratified/Standardized on **July 17, 2002**



Convert Data to Exchangeable Format





Convert Data to Exchangeable Format

LandXML Settings - SectionROW

Import | Export

Property	Value
Translation	
Translate	Off
Base Point Northing	0.0000'
Base Point Easting	0.0000'
Base Point Elevation	0.000'
Translated Coordinate Northing	0.0000'
Translated Coordinate Easting	0.0000'
Translated Coordinate Elevation	0.000'
Rotation	
Point Import Settings	
Surface Import Settings	
Surface Data	full import
Create snapshot after import	On
Create Source data in Drawing	On
Convert Survey Foot to International Foot	Off
Pipe Network Import Settings	
Conflict Resolution Settings	
Default Diameter Units	
Alignment Import Settings	
Element Constraint Assignment	Free and floating curve groups

Element Constraint Assignment: Determines how constraints will be assigned to each element in the alignment. Fixed only: Assigns a fixed constraint to all elements. Floating off the first element: Assigns a fixed constraint to the first element, all subsequent elements are assigned a float constraint. Free and floating curve groups: Assigns free or float constraints to supported Civil 3D curve group types.

OK Cancel Apply Help



Build a Model from Exchanged Data

Drawing Settings - SectionROW

Units and Zone | Transformation | Object Layers | Abbreviations | Ambient Settings

Drawing units: Feet
Imperial to Metric conversion: US Survey Foot(39.37 Inches per Meter)
Scale: 1" = 50'

Angular units: Degrees
 Scale objects inserted from other drawings
 Set AutoCAD variables to match
Custom scale: 50

Zone

Categories: USA, Pennsylvania

Available coordinate systems: NAD83 Pennsylvania State Planes, South Zone, US Foot

Selected coordinate system code: PA83-SF

Description: NAD83 Pennsylvania State Planes, South Zone, US Foot

Projection: LM

Datum: NAD83

OK Cancel Apply Help

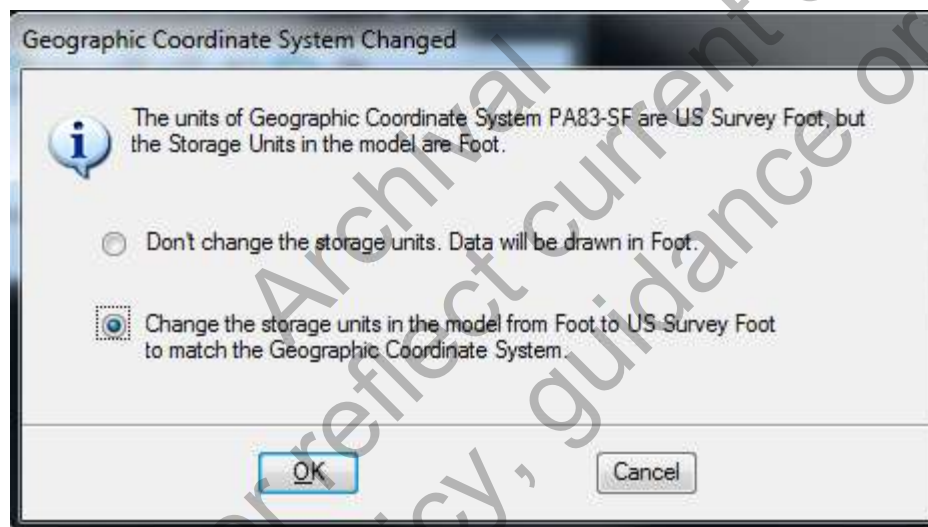


Build a Model from Exchanged Data

Coordinate System	
Name	PA83-SF
Description	NAD83 Pennsylvania State Planes, Southern 2
Projection	Lambert Conformal Conic
Source	Calculated from PA83-S by Mentor Software
Units	US Survey Foot
First Standard Parallel	40°58'00.0000"N
Second Standard Parallel	39°56'00.0000"N
Origin Longitude	77°45'00.0000"W
Origin Latitude	39°20'00.0000"N
False Easting	1968500
False Northing	0
Quadrant	Positive X and Y
Minimum Longitude	81°00'00.0000"W
Maximum Longitude	74°00'00.0000"W
Minimum Latitude	39°15'00.0000"N
Maximum Latitude	41°30'00.0000"N
Datum	
Name	NAD83
Description	North American Datum of 1983
Source	US Defense Mapping Agency, TR-8350.2-B, D
Ellipsoid	
Name	GRS1980
Description	Geodetic Reference System of 1980
Equatorial Radius	6378137
Polar Radius	6356752.3141403478
Eccentricity	0.081819191042830641
Source	Stem, L.E., Jan 1989, State Plane Coordinate
Vertical Datum	
Vertical Datum	North American Vertical Datum of 1988

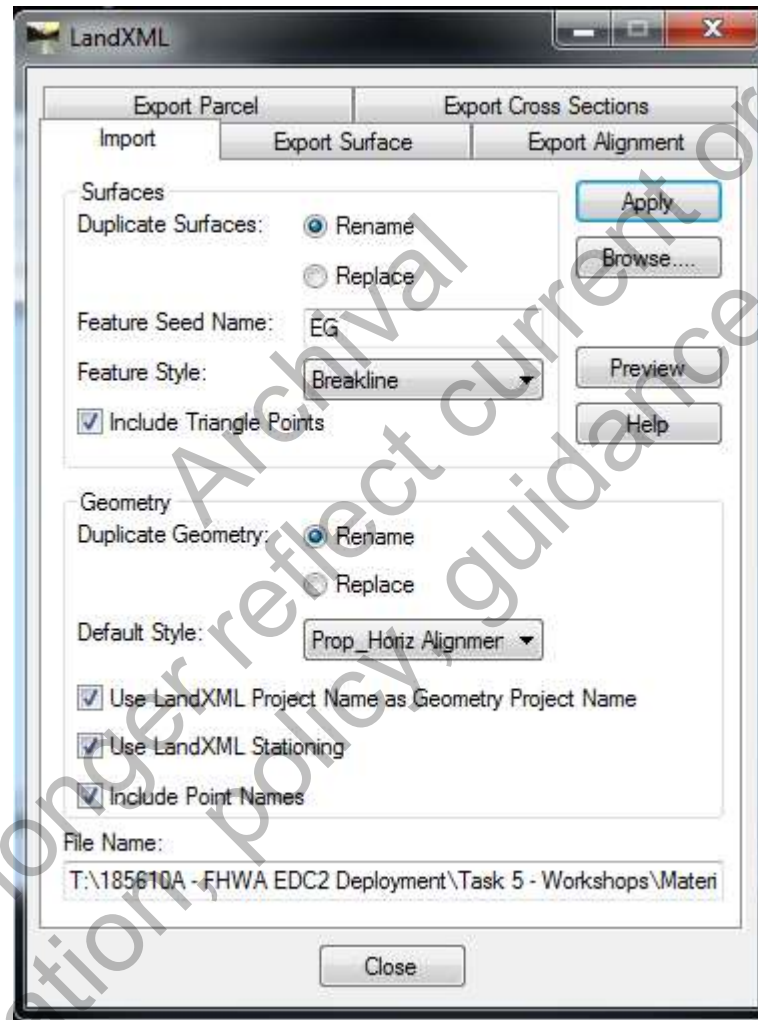


Build a Model from Exchanged Data





Build a Model from Exchanged Data





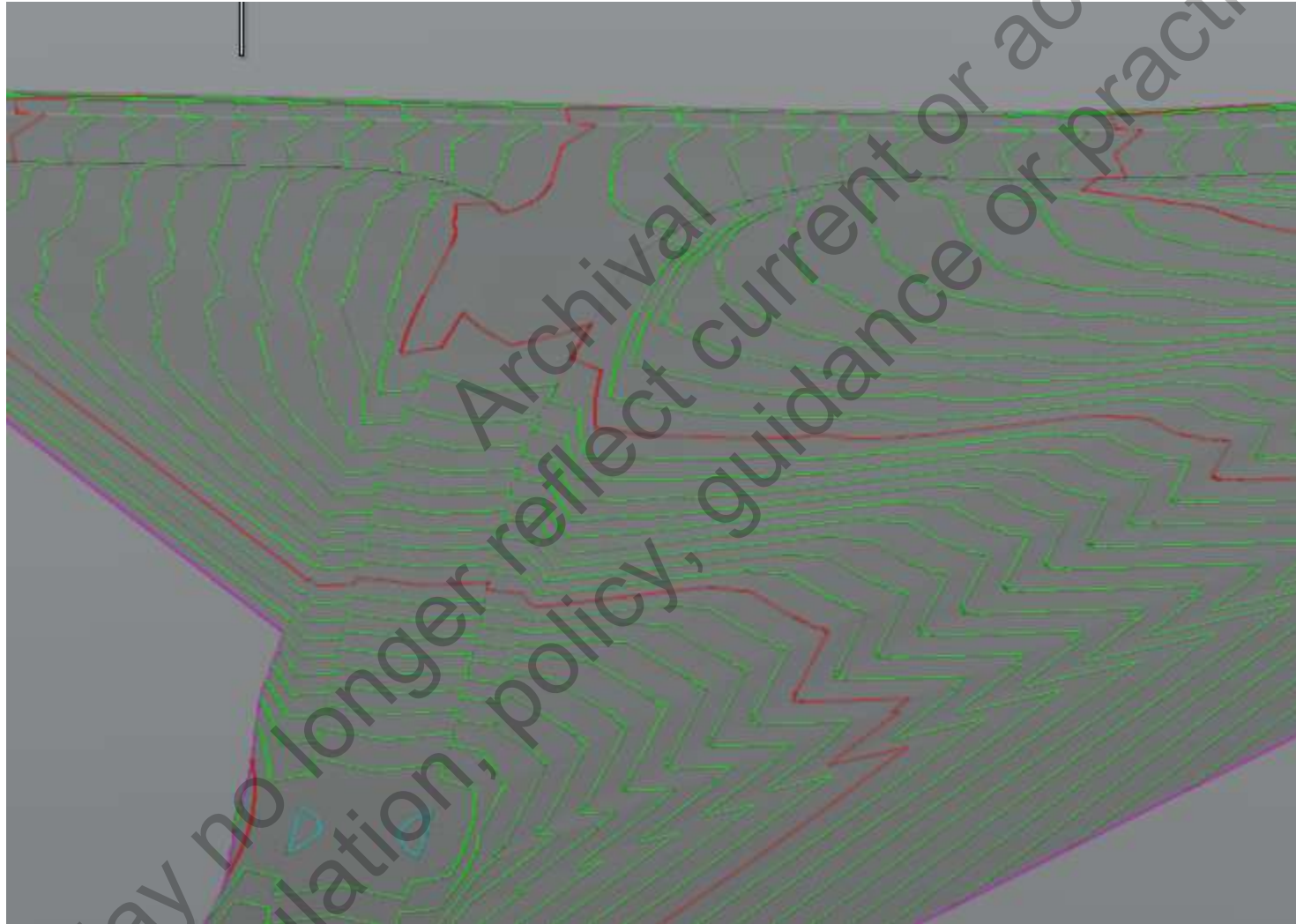
Build a Model from Exchanged Data

The screenshot shows the Bentley InRoads Suite V8i (SELECTseries 2) software interface. The 'Surface' menu is open, displaying various options for surface management and analysis. A data table is visible on the right side of the interface, showing counts for various features.

	Features	Deleted	Total
Perimeter...	0	0	0
Triangles...	0	0	0
Contours...	0	0	0
Label Contours...	0	0	0
Features...	0	0	0
Components...	0	0	0
Annotate Feature...	0	0	0
Surface Elevations...	0	0	0
View Bathymetric Elevations...	0	0	0
Slope Vectors...	0	0	0
Single Point	0	0	0
Two Point Slope...			
View Crossing Segments...			
Inferred Breaklines...			
Profiled Model...			
Gridded Model...			
Color-Coded Aspects...			
Color-Coded Elevations...			
Color-Coded Slopes...			
Options...			

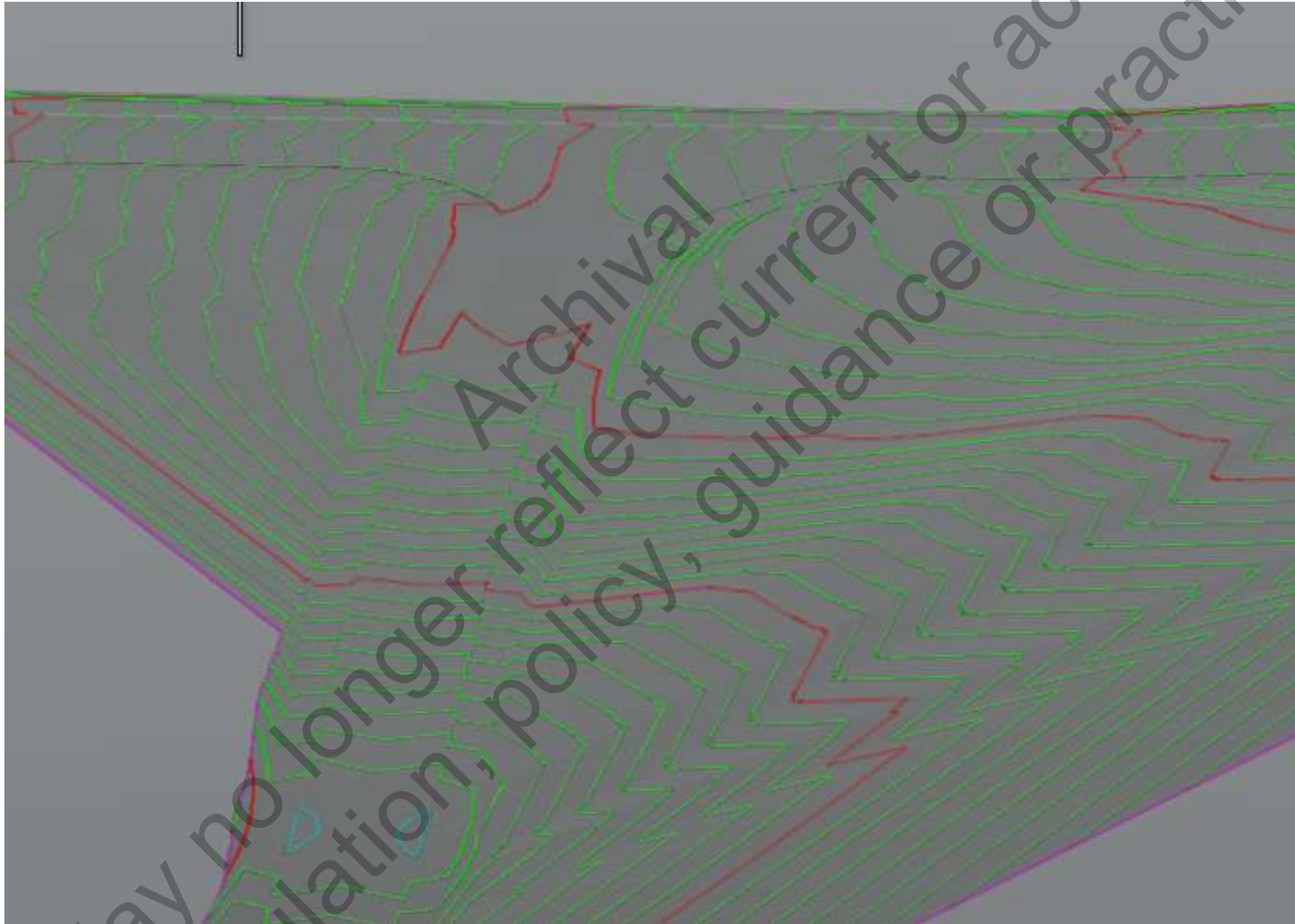


Build a Model from Exchanged Data





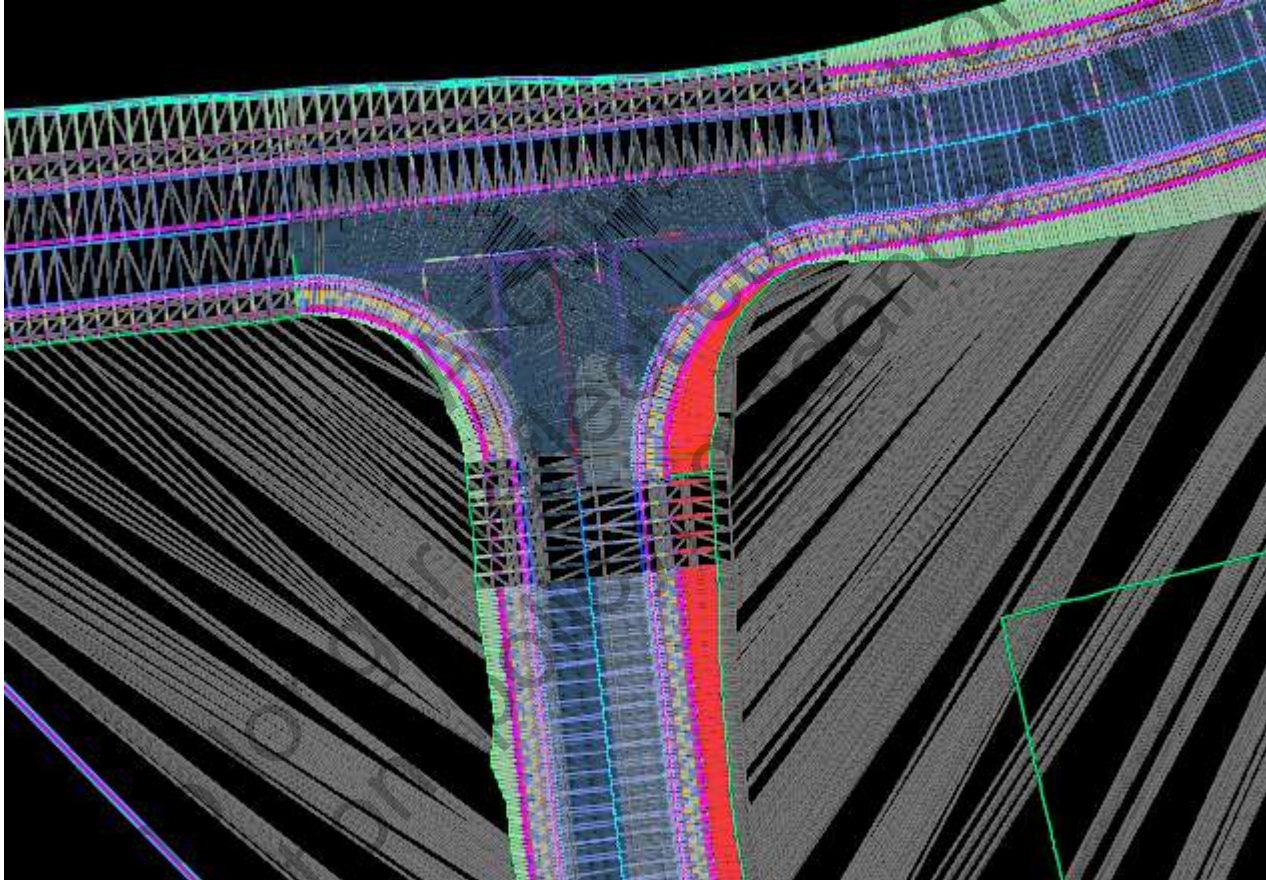
Compare Exchanged Model to Design Model



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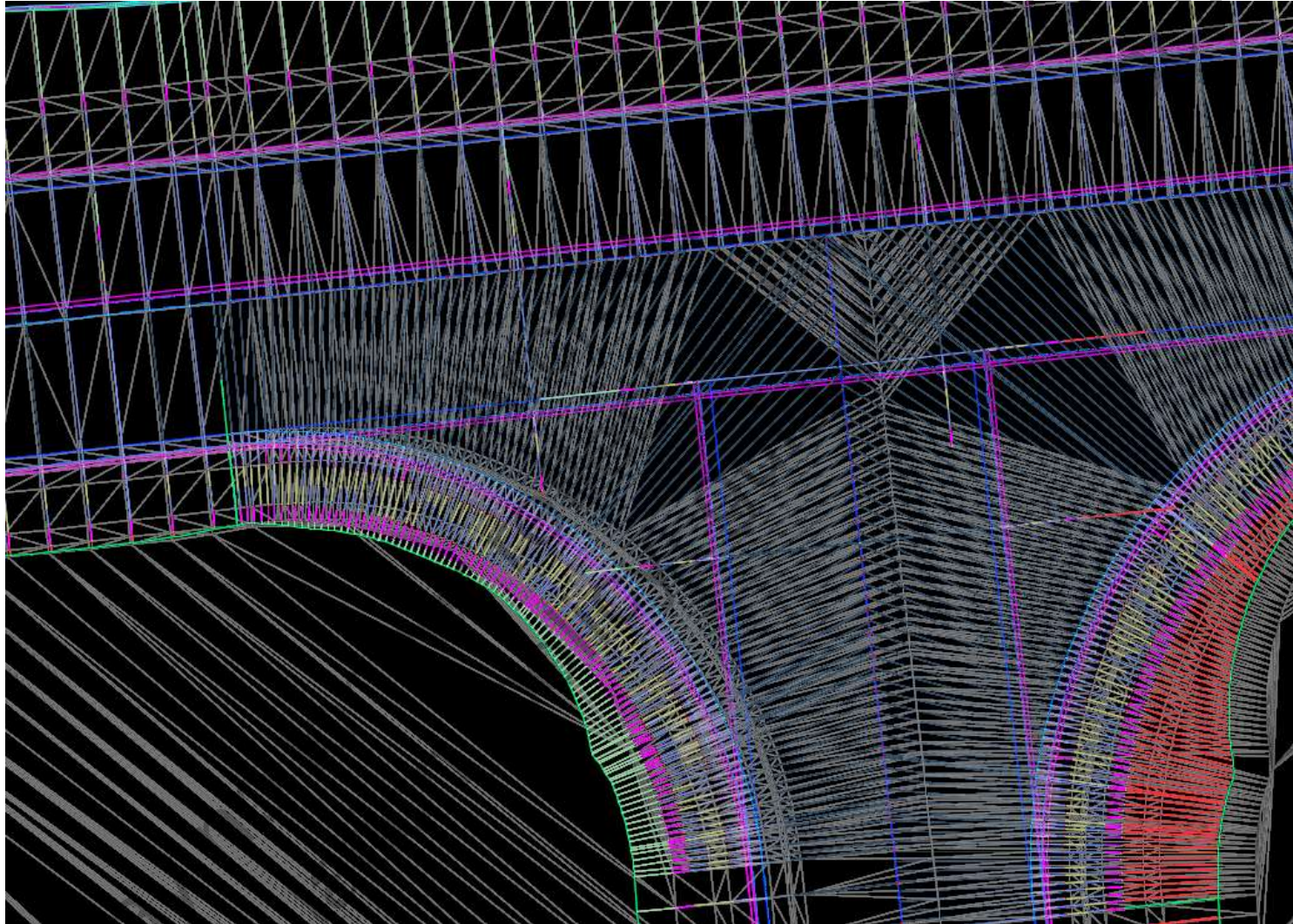


Compare Exchanged Model to Design Model



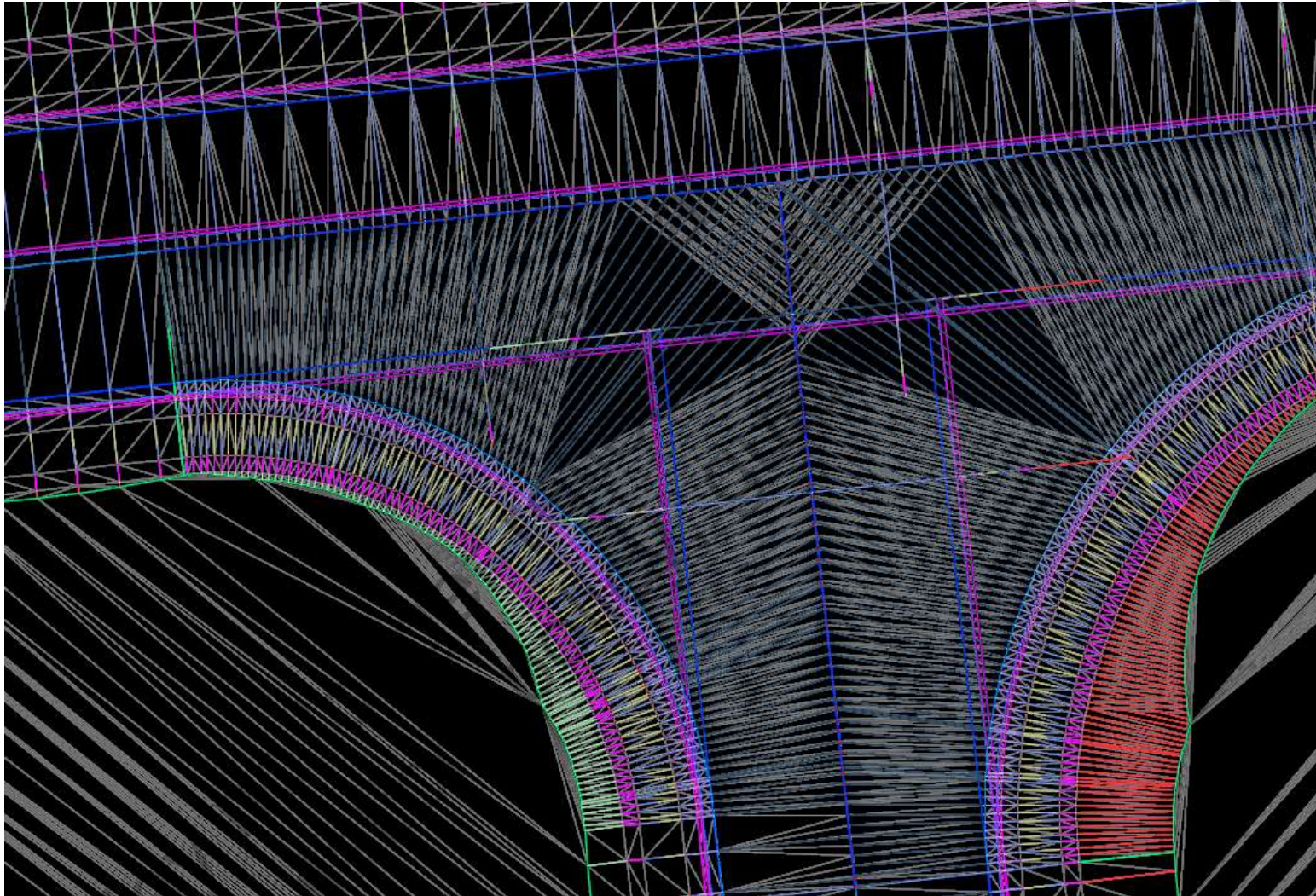


Compare Exchanged Model to Design Model



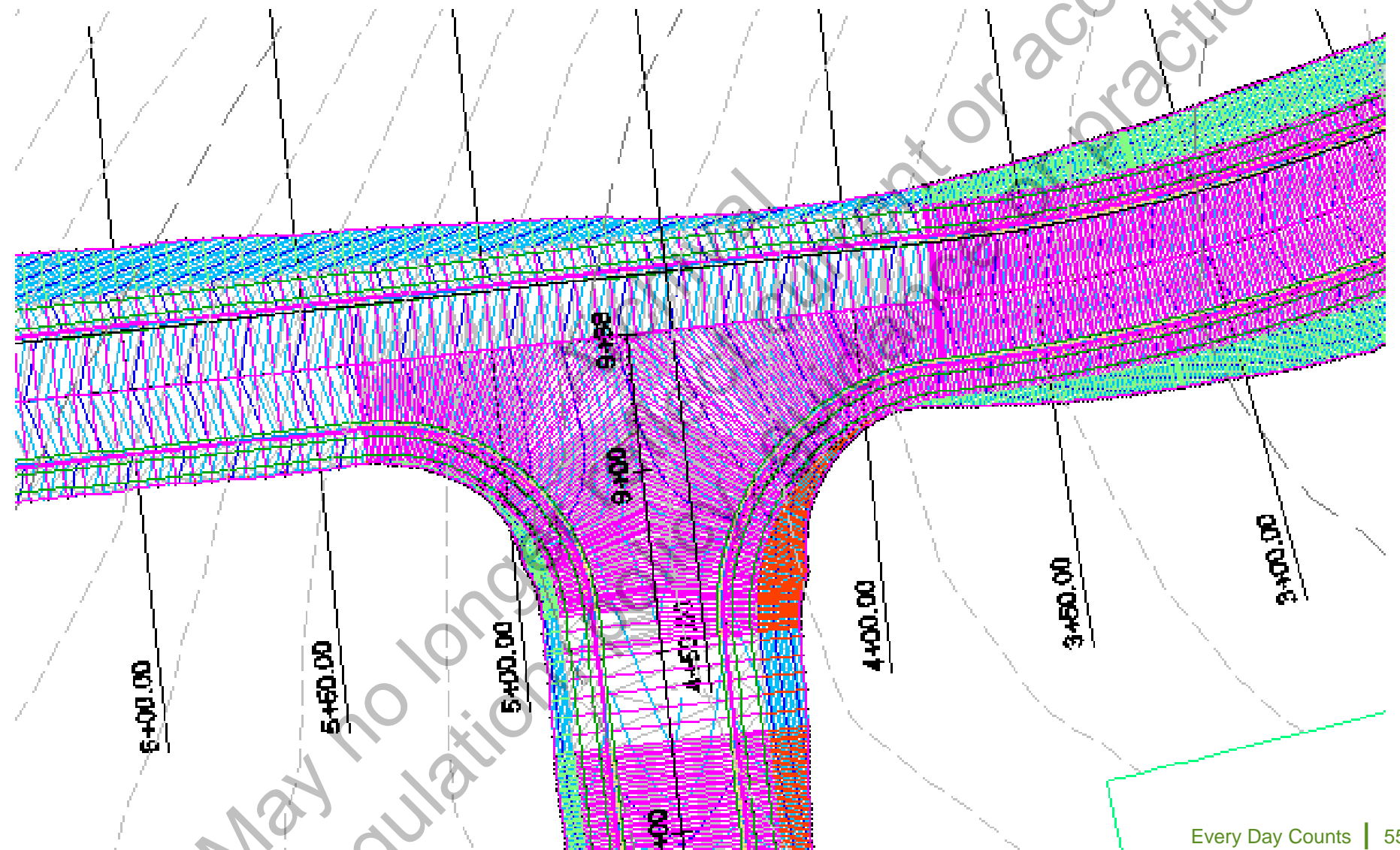


Compare Exchanged Model to Design Model





Compare Exchanged Model to Design Model





Summary

1.800 m **BANK**

Dsn Elv 1: ---	Cut: ---	
E: 4411698.638	N: 5446615.974	Elv: 0.000

AB **ACH** **AUS** **BAN** **BM**

ESC Exit **Measure**

Source: Iowa State University



Verify Learning Outcomes

- Identify rapid 3D Modeling tools using GIS data
- Describe types of 3D models developed during design
- Describe how 3D models are prepared for Automated Machine Guidance



3D Modeling as a Public Information Tool

Multnomah County's Sellwood Bridge Project

Mike Pullen
Multnomah County



U.S. Department of Transportation
Federal Highway Administration



Poll Pod

Does your organization use 3D models for public outreach?

- Yes
- No
- Not Sure

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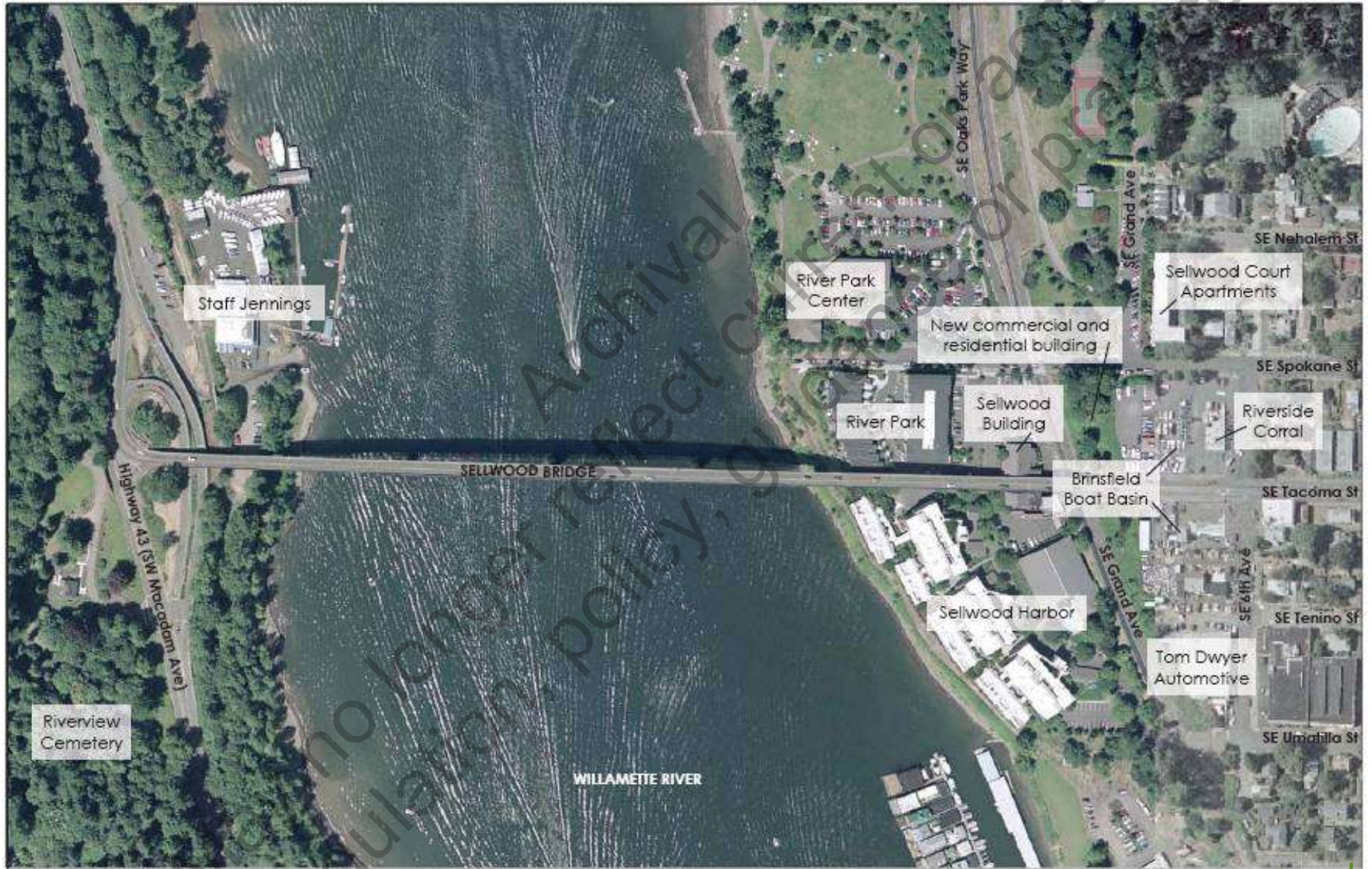


Overview

- Project Background
- Phased Construction vs. Detour
- Public Information Challenge
- 3D Model as Tool
- Results



Sellwood Bridge in Portland, Oregon





Project Background

- Investigated closing bridge during construction of new bridge
- Significant economic and business concerns
- County commitment to keep crossing open
- Goal = no more than 30 days of closure during 3-year bridge replacement



Staged Construction

- Original assumed option
- Bridge built in 2 phases, 1 half at a time
- Keep bridge in service during work
- Use existing bridge while first half of new bridge is built on southside
- Traffic shifts to south half of new bridge
- Old bridge removed
- North half of new bridge built to form one new bridge



Detour Construction

- Proposed in 2011 by newly-hired design and construction teams
- Approved by County Board in June 2011
- Old bridge moved north, out of work zone
- Bridge moved *carefully and safely* by specialty subcontractor
- Detour bridge will not include worst sections of old bridge



Detour Construction

- Uses portion of old east approach
- Detour bridge as strong or stronger than old bridge (including seismic)
- New bridge can be built in one phase
- Similar number of bridge closure days



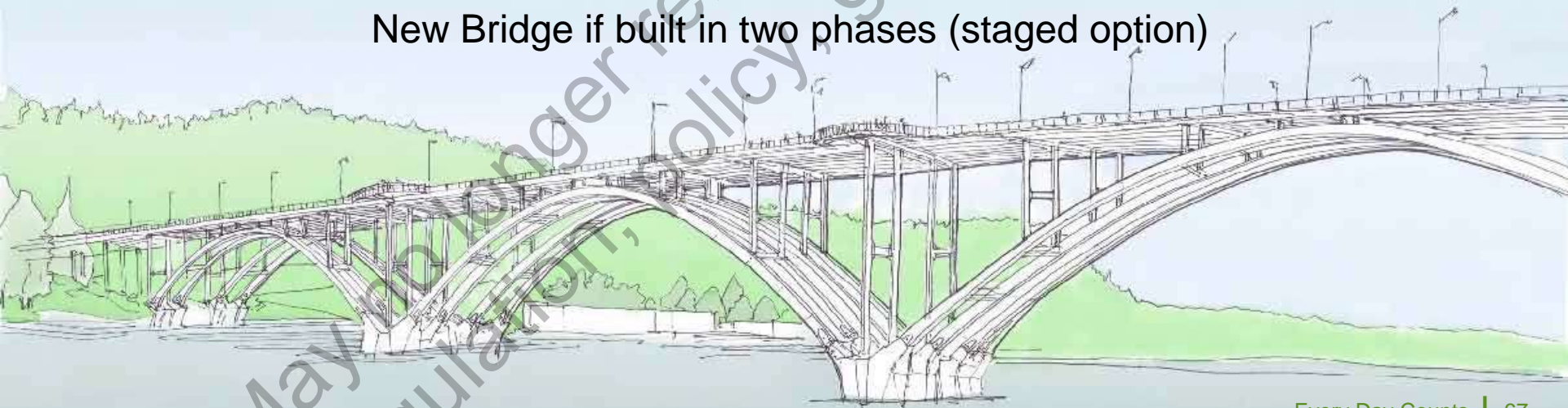
Detour Bridge Benefits

- **Time:**
 - Reduce construction by up to 12 months
- **Money:**
 - Reduce cost (\$5 to \$10 million) in materials, labor, and equipment
- **Safety:**
 - Separation improves safety for workers and travelling public.
- **Design:**
 - Eliminates redundant features
 - Improves appearance (two arch ribs instead of four)
- **Environmental Impacts:**
 - Fewer temporary work bridges
 - Less construction time
 - Less in-water and riparian impacts

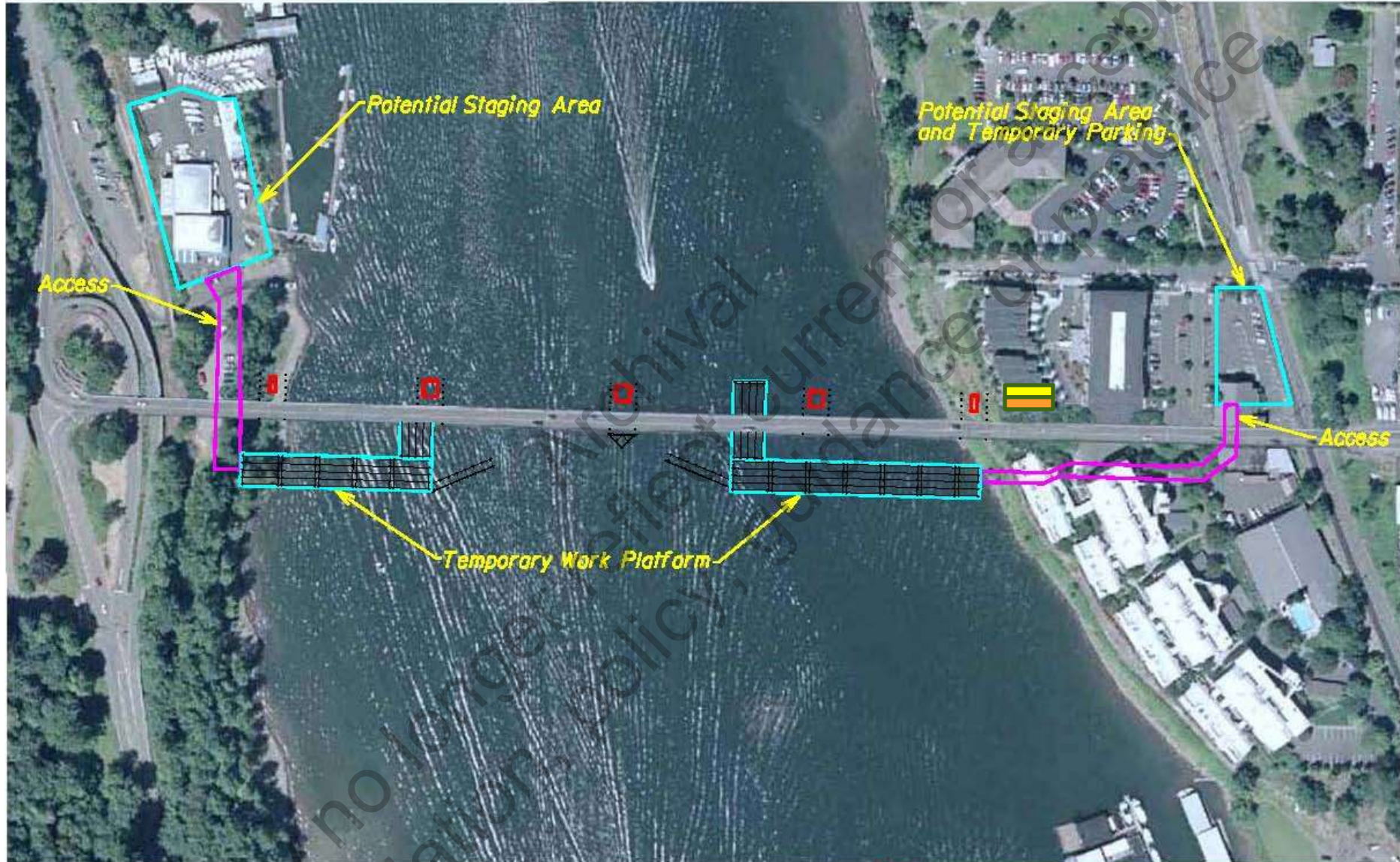
New Bridge if built in one phase (detour option)



New Bridge if built in two phases (staged option)

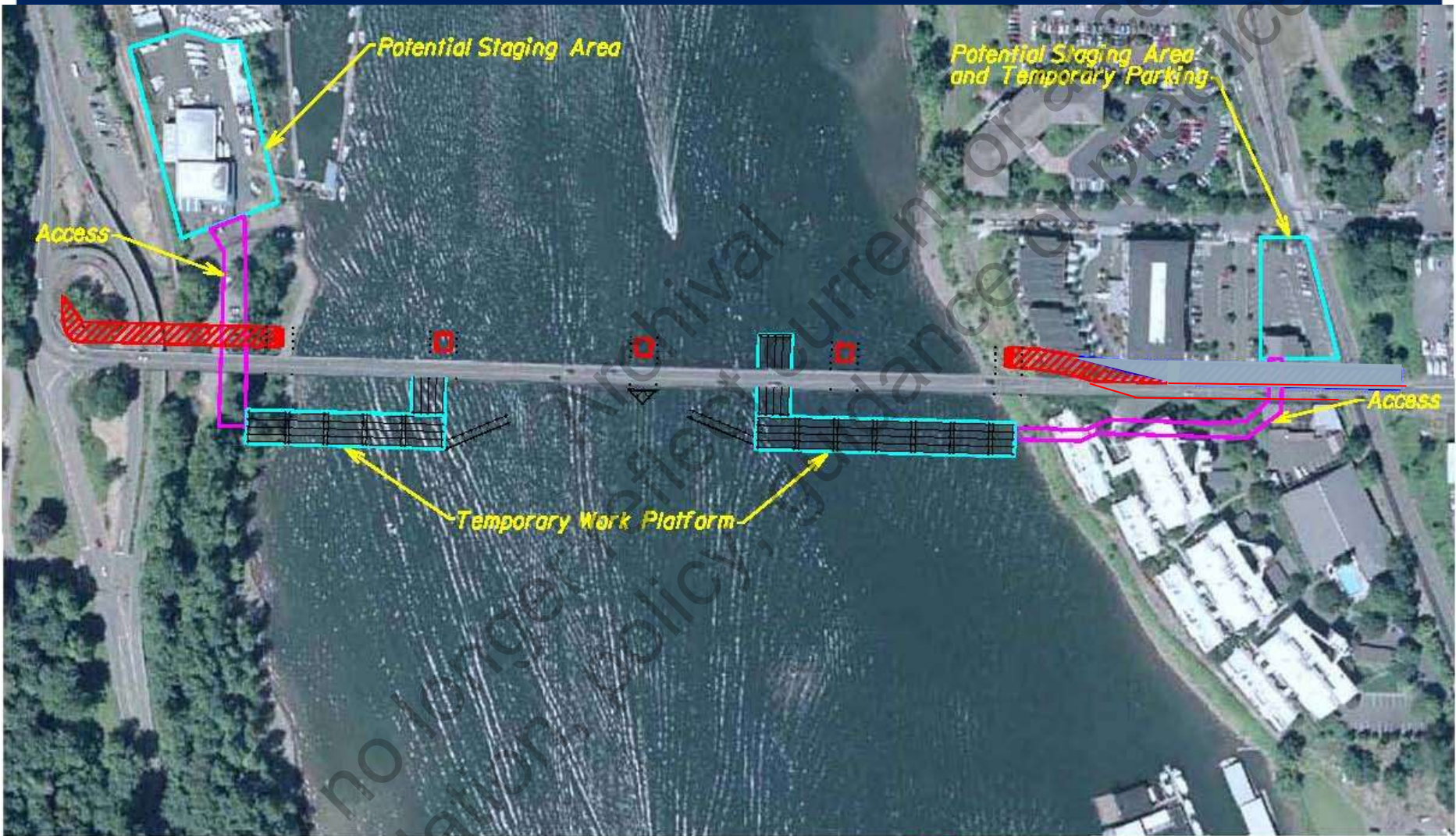


Detour Construction: Early Phase



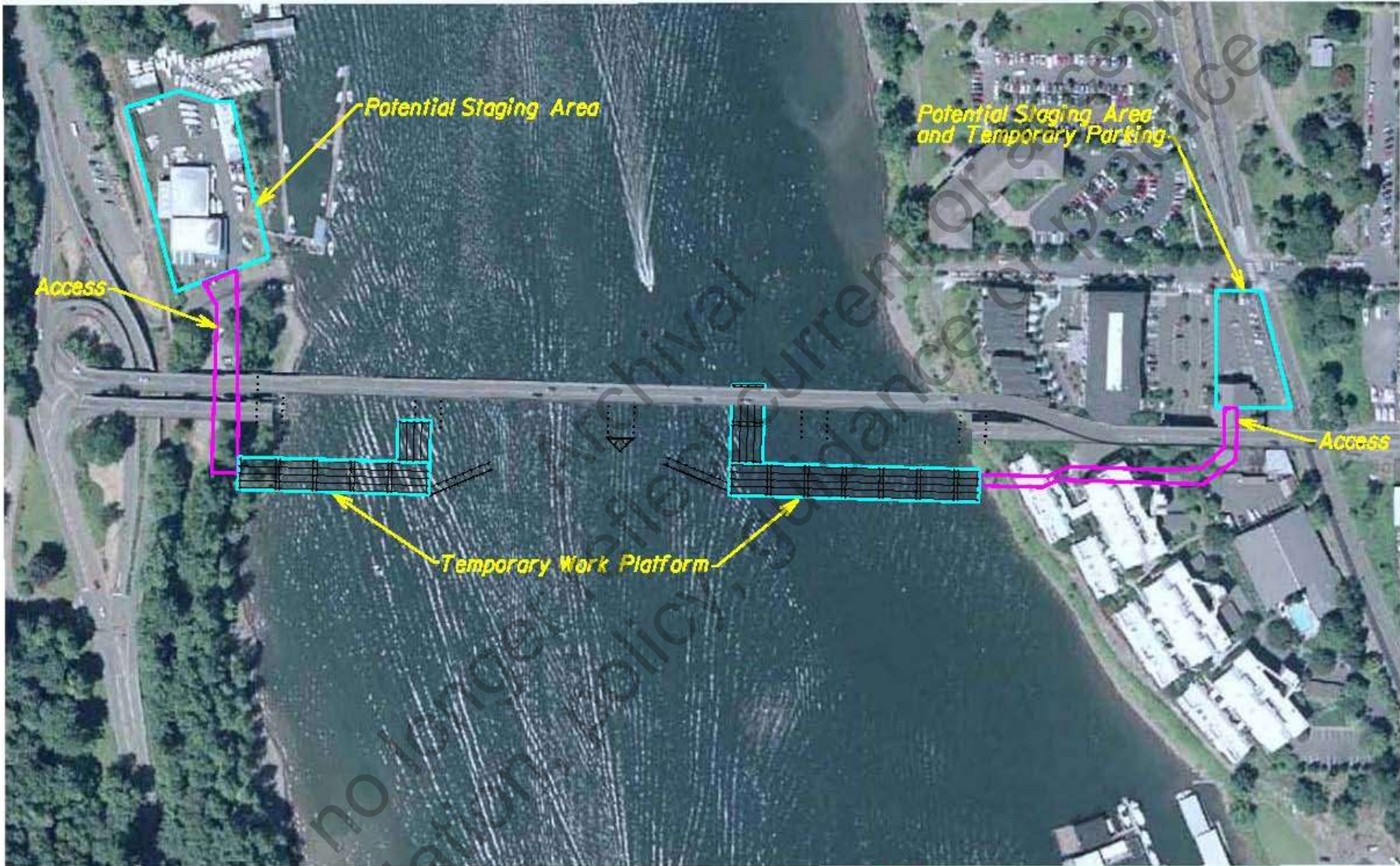
 **Detour In-Water Foundations**

Detour Construction: Approaches & Piers



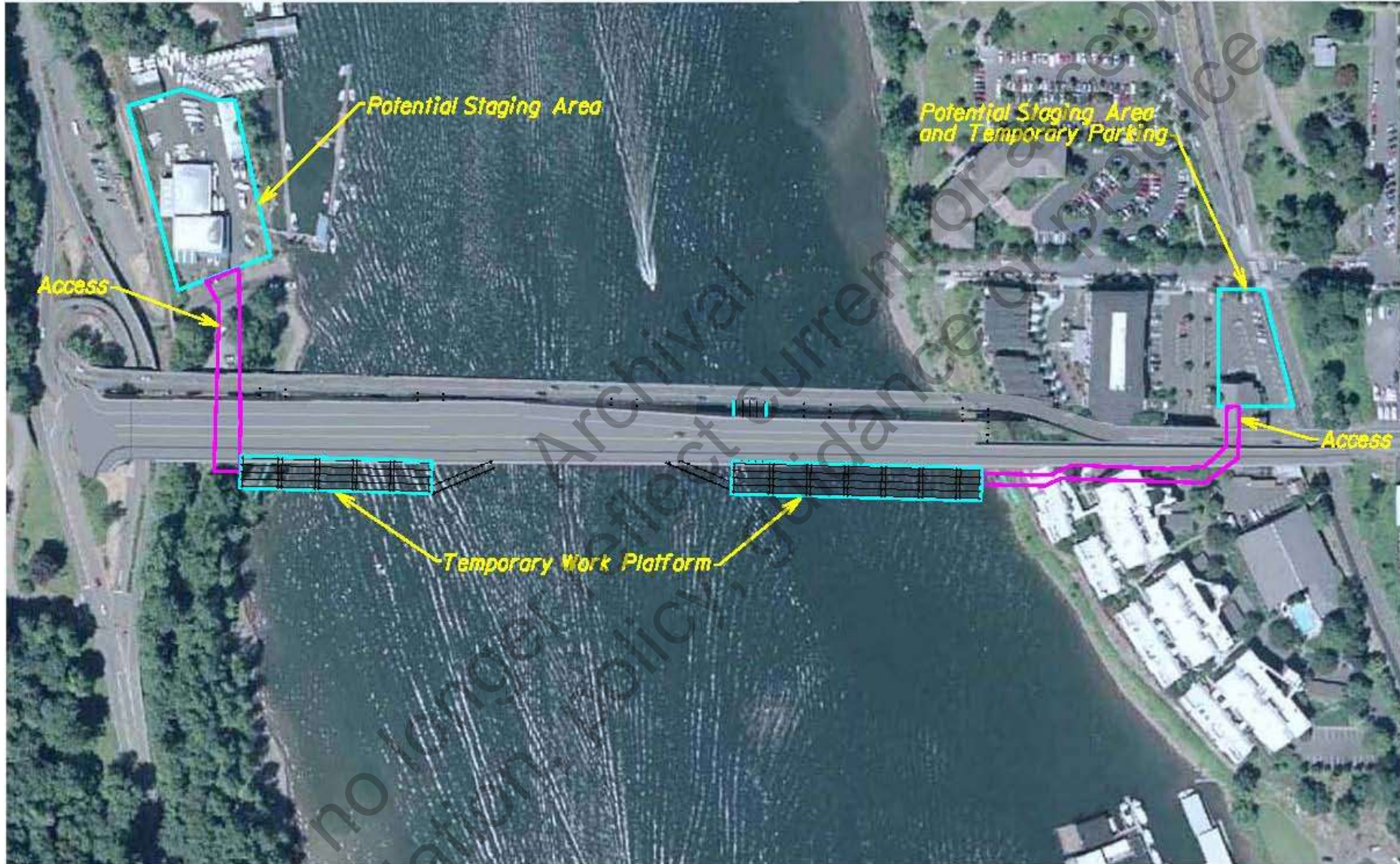
 **Detour Alignment Option 1**

Detour: Slide Old Bridge North



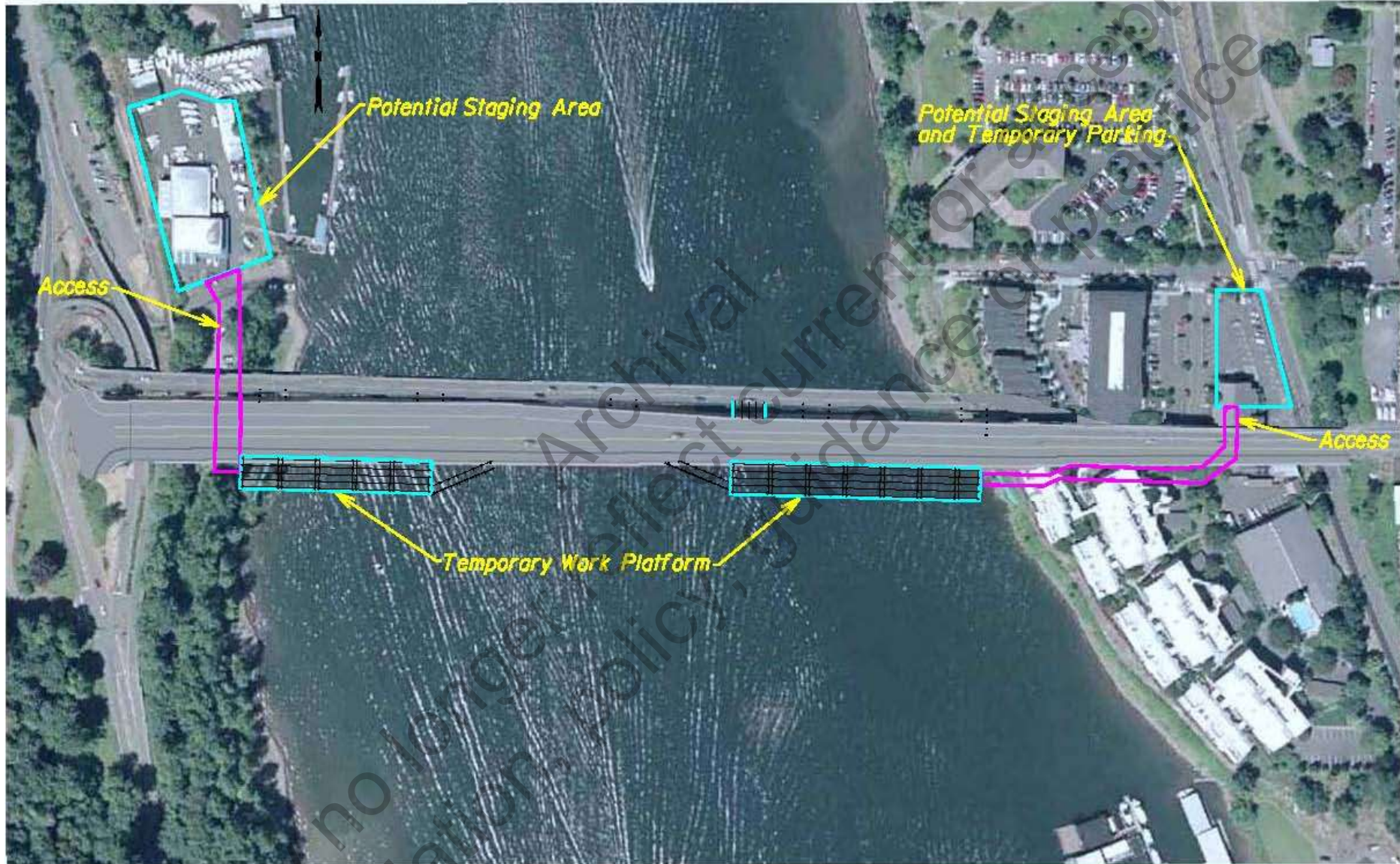
 Detour Option 1, Stage 1

Detour: Construct New Bridge



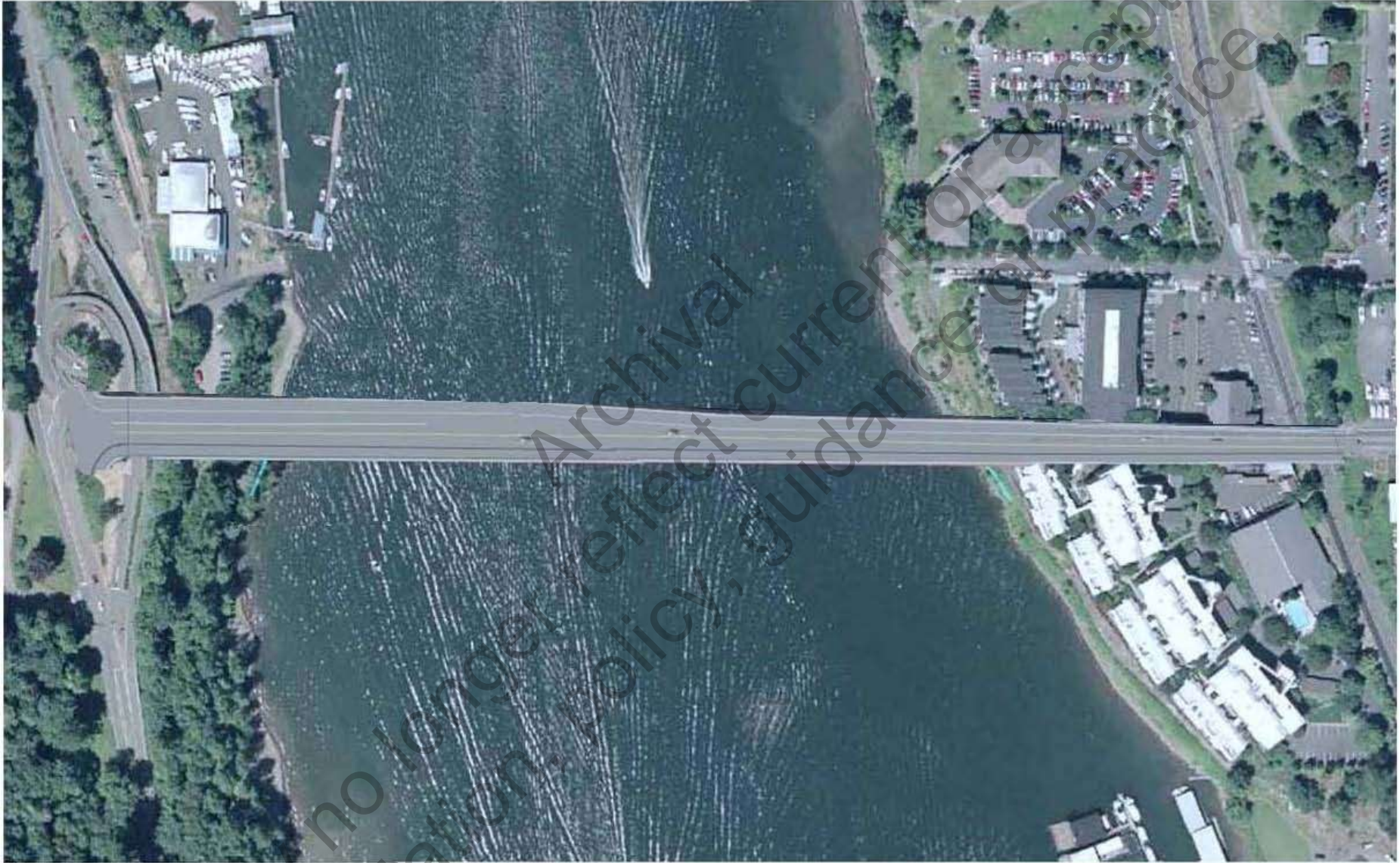
Detour Option 1 - Stage 2,
East Approach First
Stage Construction

Detour: Fill In East Approach



**Detour Option 1 - Stage 3,
East Approach First
Stage Construction**

Detour: Completed Bridge



Finished Bridge



Public Information Challenges

- Public doubts about moving the old bridge, then re-opening it
- Neighbor concerns about proximity of new alignment
- Risks to regional traffic flow and county's reputation if bridge was damaged during move



Public Information Tools

- Meetings with neighbors, businesses
- Newsletter
- Drawings to explain bridge move
- Website update
- Media (news conferences, tours)
- Timelapse video
- **3D model**



3D Model as Public Information Tool

- Animated 3D model by general contractor Slayden-Sundt prepared for proposal
- County and web consultant added narration by general contractor and titles to video for lay audience
- Posted video with 3D model to website and shared with public audiences to show bridge move sequence



Video Sequence

Screen 3D animation of bridge construction sequence

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3D Model Images of Detour Bridge



Concept for detour bridge construction



3D Model Images of Detour Bridge



Constructing detour bridge near residences



3D Model Images of Detour Bridge



Traffic on detour bridge during construction of new bridge



3D Model Images



Completed new bridge after removal of detour bridge



Results

- Successful bridge move in January 2013
- Bridge closure limited to five days, over holiday weekend
- Positive local and national media coverage
- Large public turnout on bridge move day
- Increased credibility for project owner, contractor and design team





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or practice.

NYCT
22



Bridge Move Facts and Figures

- Truss span moved –
 - 6.8 million pounds (3,400 tons)
 - 1095 feet long
 - 31 feet wide
 - 32 feet tall
- Lift – about 2-1/2 inches
- Sliding
 - 66 feet North at West End
 - 33 feet North at East End
 - Maximum Speed – 6 inches per 10 seconds
 - Move Time = 14 hours



Project Information

- Overall budget - \$307.5 million
- Traffic on detour bridge – January 2013
- Traffic on new span – Summer 2015
- East approach/Hwy. 43 interchange complete – Summer 2016



Bridge Move Team

- Slayden/Sundt Joint Venture – General Contractor (prepared 3D model)
- Omega Morgan – Heavy move Subcontractor
- T. Y. Lin International – Design in-river piers
- Multnomah County – Owner, oversight



Verify Learning Outcomes

- Describe uses of 3D models during design and construction

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Questions



U.S. Department of Transportation
Federal Highway Administration



Upcoming Webinars and Close

Douglas Townes, P.E.
FHWA Resource Center



U.S. Department of Transportation
Federal Highway Administration



Webinar Series Topics

Webinar 1: Overview of 3D Models for Construction

Webinar 2: Creating 3D Engineered Models

Webinar 3: Applications of 3D Models in the Contractor's Office

Webinar 4: Applications of 3D Models on the Construction Site

Webinar 5: Managing and Sharing 3D Models for Construction

**Webinar 6: Overcoming Challenges to Using 3D Engineered Models
for Construction**

**Webinar 7: Steps to Requiring 3D Engineered Models for
Construction**

**Webinar 8: The Future: Adding Time, Cost and other Information
to 3D Model**



Webinar 3

Applications of 3D Models in the Contractor's Office

February 19, 2014

1:00 pm – 2:30 pm

www.fhwa.dot.gov/3D

Douglas.townes@dot.gov