



# What is *Constructioneering*?


Chris Collins  
Senior Engineering Consultant



# The **Infrastructure** Dilemma







# U.S. and World Population Clock

Tell us what you think 

 **The United States**  **The World**

Mar 14, 2018 15:39 UTC (+4)

[Learn More](#)  | [Download and Share](#) 

 **U.S. Population**  **World Population**

**3 2 7 , 3 5 2 , 7 8 ' 9** **7 , 4 5 9 , 9 1 3 , 5 5 4**

## COMPONENTS OF POPULATION CHANGE

15:39:36 UTC

- One birth every **8** seconds 
- One death every **11** seconds 
- One international migrant (net) every **29** seconds 
- Net gain of one person every **15** seconds 

## TOP 10 MOST POPULOUS COUNTRIES

1. China	1,384,688,986	6. Pakistan	207,862,518
2. India	1,296,834,042	7. Nigeria	195,300,343
3. United States	329,256,465	8. Bangladesh	159,453,001
4. Indonesia	262,787,403	9. Russia	142,122,776
5. Brazil	208,846,892	10. Japan	126,168,156

 Select a Date

The United States population on **March 13, 2018** was: **327,344,481**

Select a Date 

[Learn More](#)  | [Download and Share](#) 

# Exponential Population Growth



2018  
7.5 Billion



2030  
8.2 Billion

# Infrastructure Funding Deficit

\$60 Trillion



by year 2030

Based upon Standard & Poors analysis using 2010 US\$ base value.



Why does infrastructure need to be an election issue? Pourquoi l'infrastructure doit-elle être un enjeu électoral?

Infrastructure is a core responsibility of government and decisive leadership is... L'infrastructure étant une responsabilité fondamentale du gouvernement, il est un leadership décisif en 2015 et post...

# Infrastructure Funding Deficit

\$60 Trillion



\$24 Trillion

by year 2030

Based upon Standard & Poors analysis using 2010 US\$ base value.



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**In its 2017 report, the ASCE finds that the nation’s infrastructure averages a “D,” meaning that conditions are “mostly below standard,” exhibiting “significant deterioration,” with a “strong risk of failure.”**





In the same report, ASCE estimates that there is a total “infrastructure gap” of nearly \$1.5 trillion needed by 2025.

# DOT Goals?

Better, Faster, Cheaper and Safer!

How are we going to accomplish that?



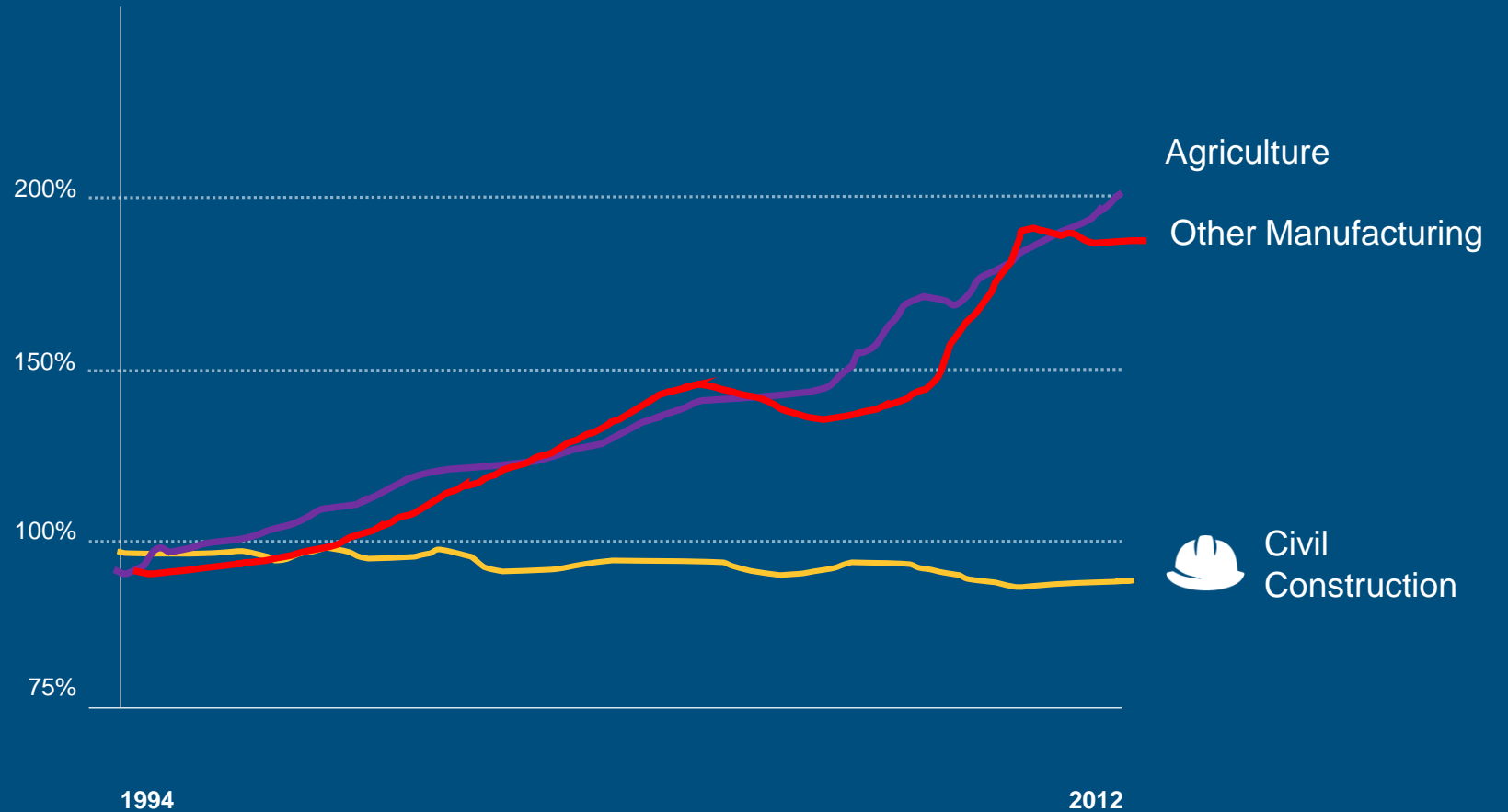


*PRODUCTIVITY*

MIN

MAX

# Decrease in productivity





*Technology sometimes  
hurts as much as it helps.*

WEAPONS OF



MASS DISTRACTION

You've got mail!

@anna is now following you

A playlist was updated

Alex wants to be friends with you

Mike liked your photo

Sophie is near you

Hugh responded to your company

@channel we need to work more on our roadmap


Jack commented on your blog post

There is a meeting with Jack in 15 mins.

New email from Emmet

New message from Sarah



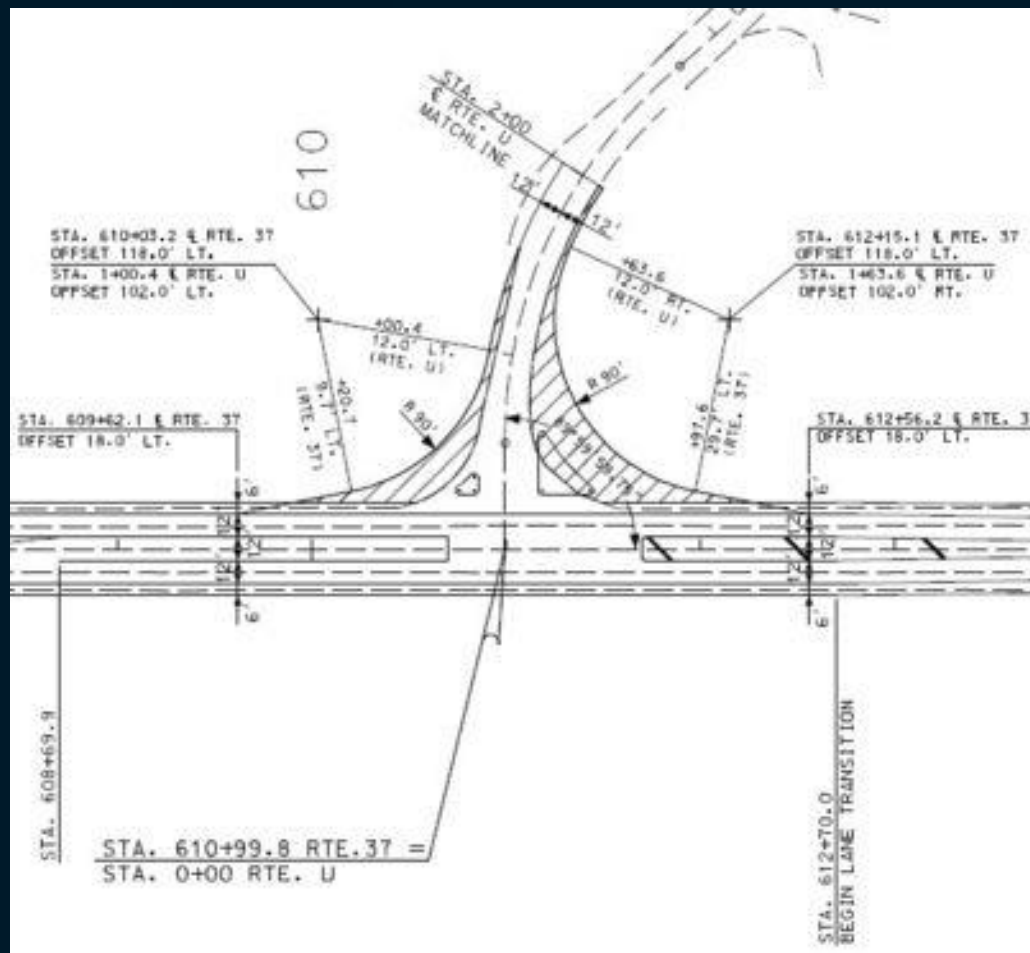


*As technology has advanced our business practices have not kept up.*

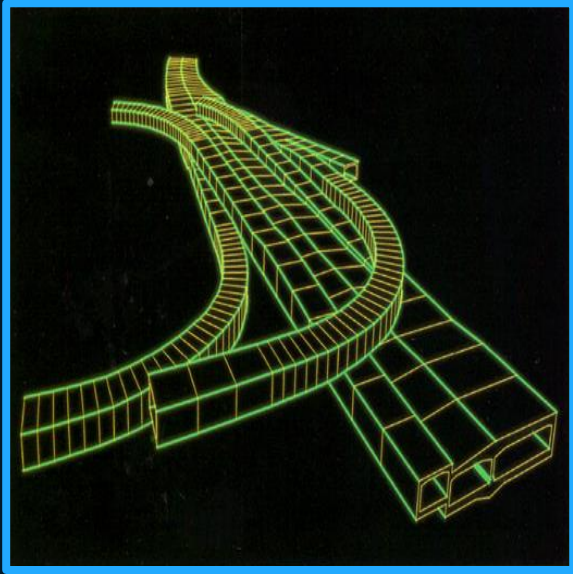




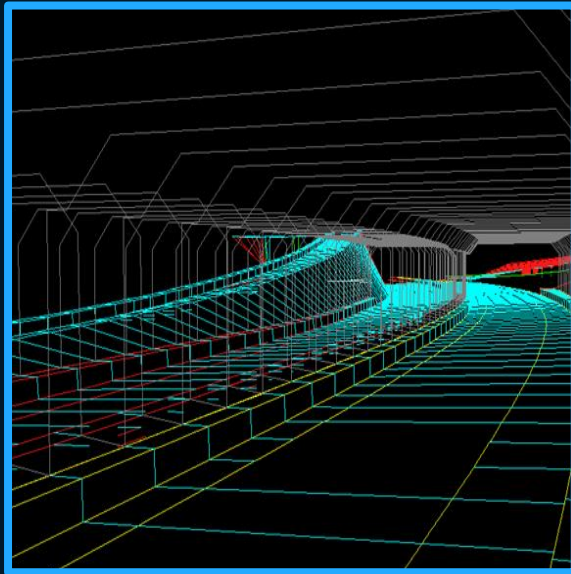
# Deliverables



# Modeling Evolution



1985 – 1992



1992 – 2004



2004 – 2014



2014 - ...

# Inefficient Data Flow





*An inefficient project  
lifecycle.*

# Traditional Project Lifecycle





PLANNING



# Traditional Project Lifecycle



PLANNING

SURVEY



# Traditional Project Lifecycle





PLANNING

SURVEY

DESIGN



◆  
**Traditional** Project Lifecycle



PLANNING

SURVEY

DESIGN

LAYOUT



**Traditional** Project Lifecycle



PLANNING

SURVEY

DESIGN

LAYOUT

EXECUTION



# Traditional Project Lifecycle



PLANNING

SURVEY

DESIGN

LAYOUT

EXECUTION

INSPECTION



**Traditional** Project Lifecycle



PLANNING

SURVEY

DESIGN

LAYOUT

EXECUTION

INSPECTION

MAINTENANCE



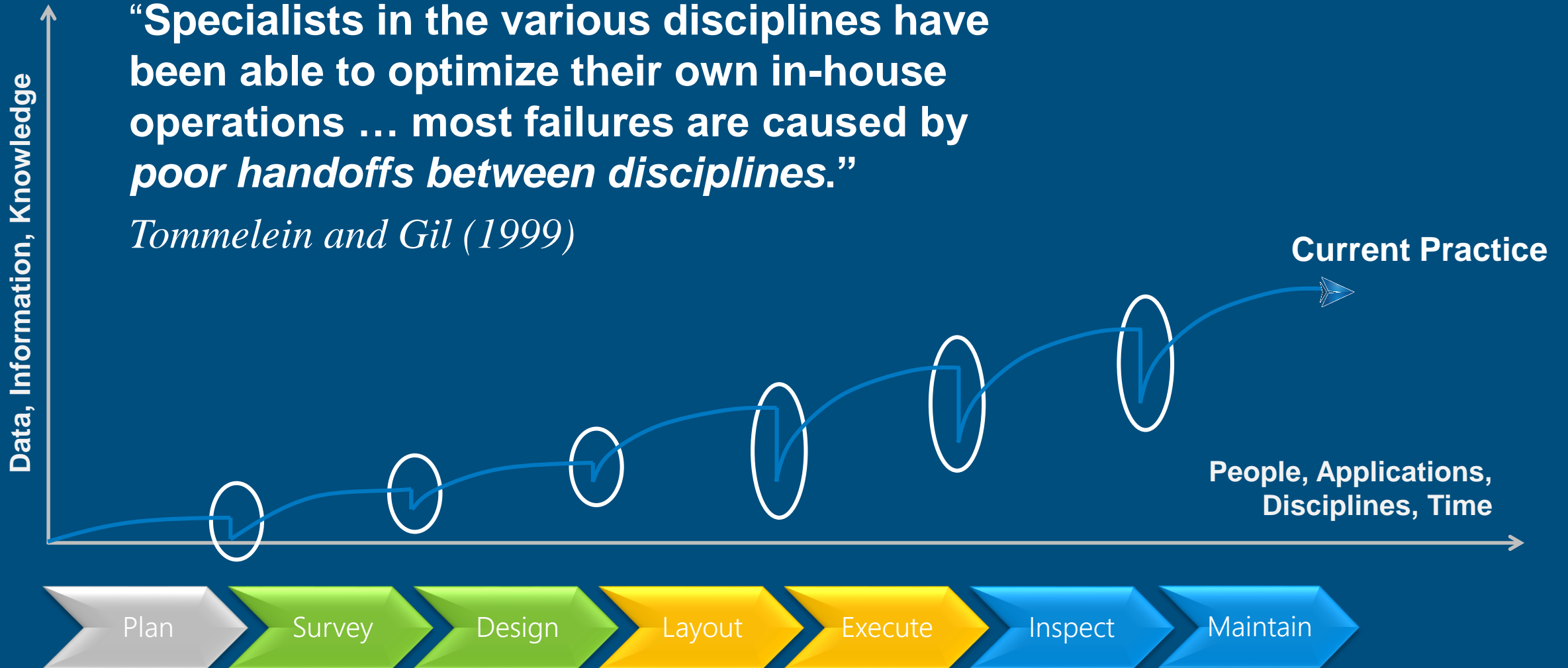
# Traditional Project Lifecycle



# Why So Inefficient?

“Specialists in the various disciplines have been able to optimize their own in-house operations ... most failures are caused by *poor handoffs between disciplines.*”

*Tommelein and Gil (1999)*



# Typical Project Workflow

- Design Models
  - **Delivers Paper**
    - Construction Re-Models
      - Builds the facility
        - **Delivers Paper**
          - 10 years later we re-survey everything anyway!



# What is *Constructioneering*?

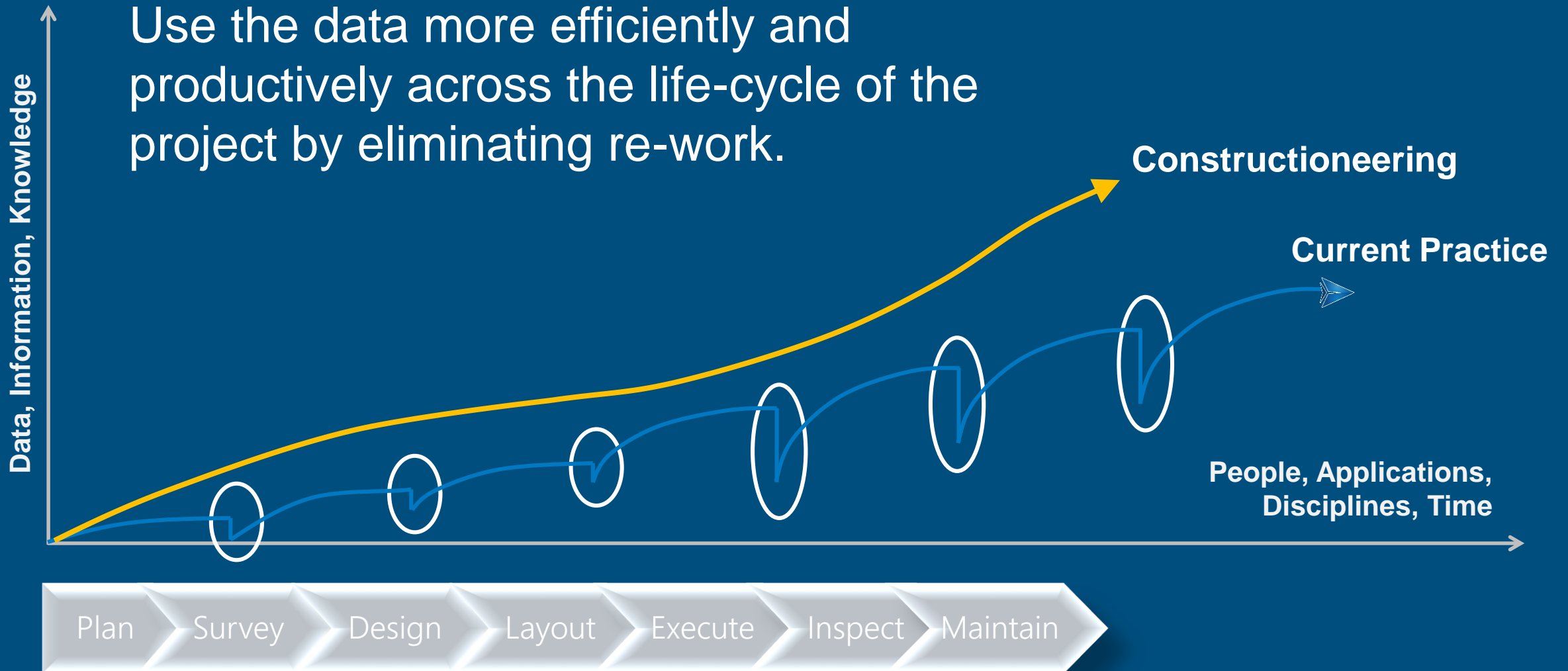
Automating **the digital construction process** through surveying, engineering design, constructible model development, and as-built data collection **within a connected data environment** to improve construction execution and reduce project costs.





# Constructioneering

Use the data more efficiently and productively across the life-cycle of the project by eliminating re-work.



# What is *Constructioneering*?

- Blurring the lines between disciplines
- Re-using intelligent data
- Eliminating re-work
- Increasing productivity

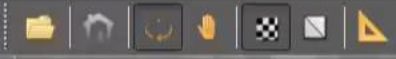




# Constructioneering in Action

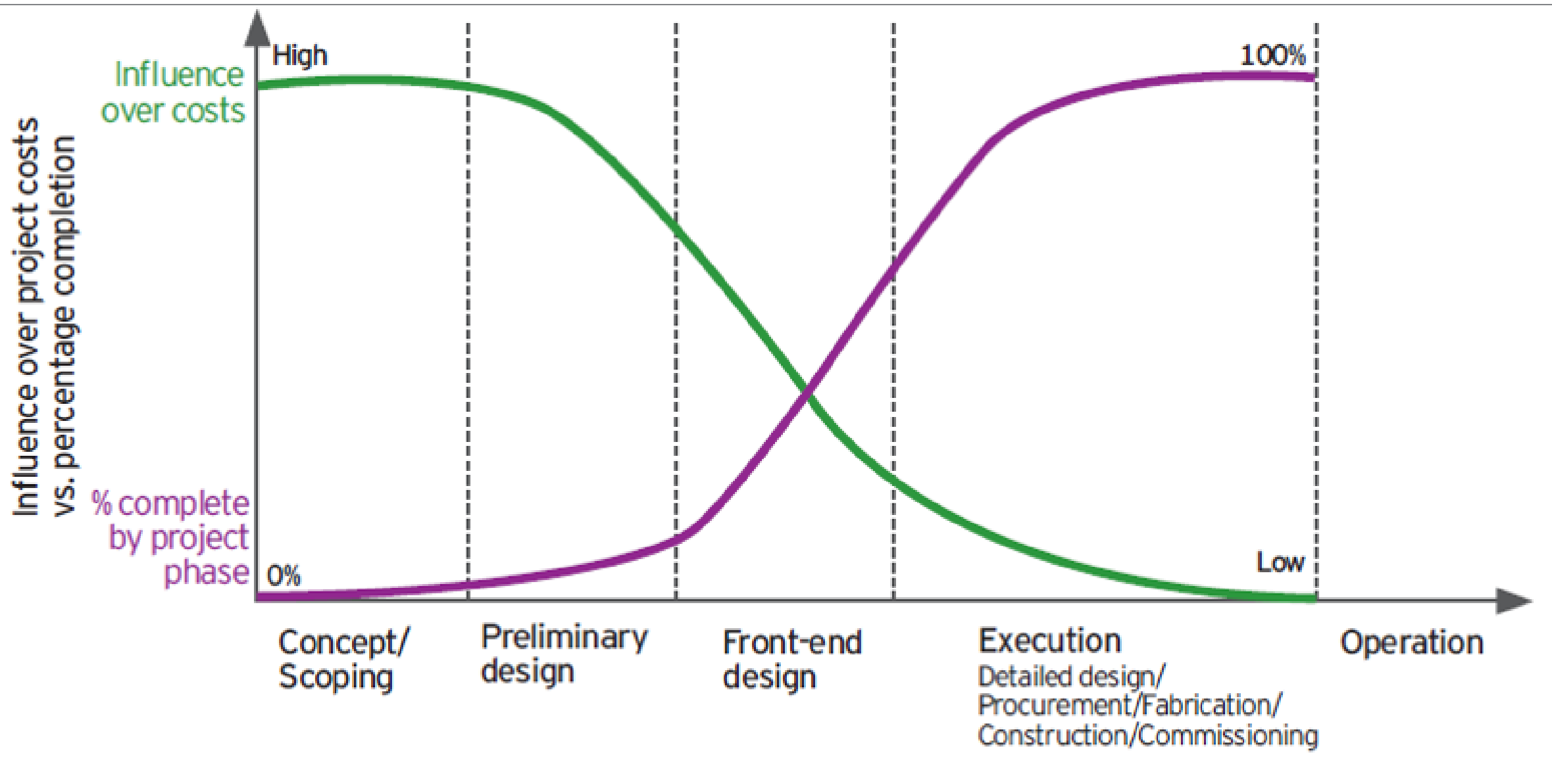


# New Technologies





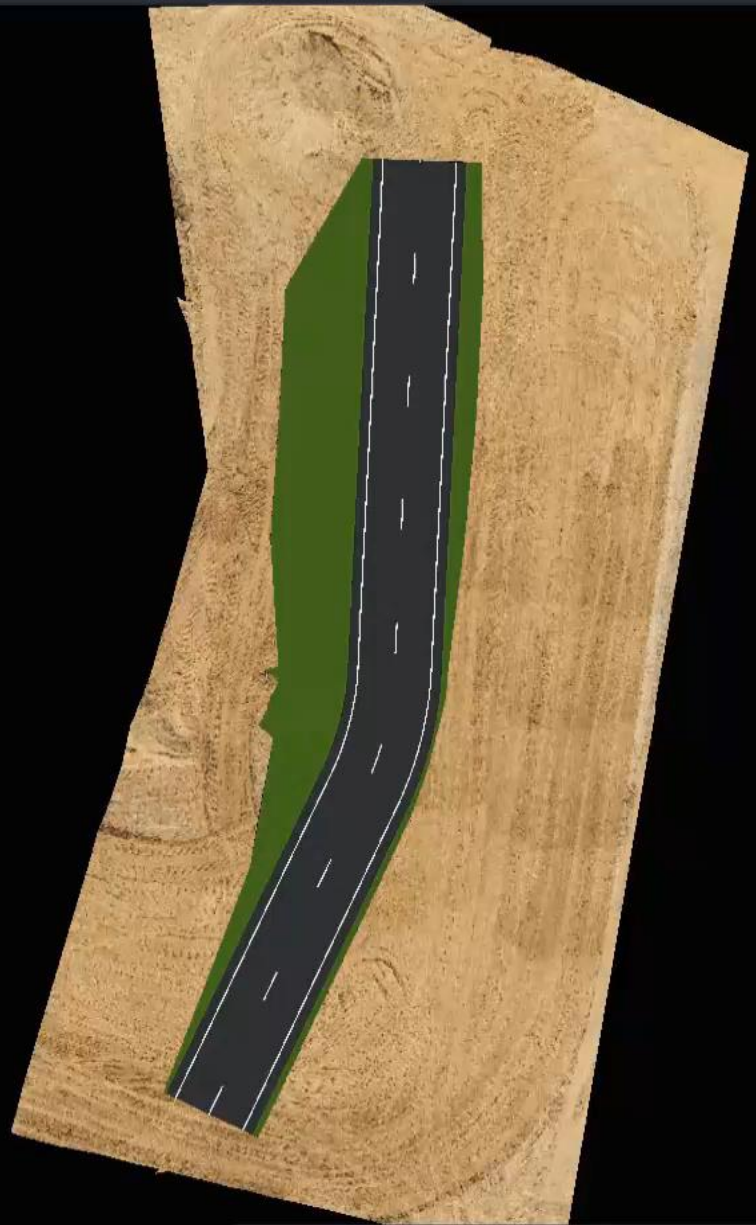
# Analytics



Source: Ernst & Young analysis

A vertical toolbar on the left side of the interface. It contains several icons for different tools: a large speaker icon at the top, followed by a blue lightning bolt icon, and a series of smaller icons for various drawing and editing functions.

A vertical toolbar on the right side of the interface. It includes navigation icons (undo, redo, home, top), a hand icon for panning, zoom in (+) and zoom out (-) icons, and a 'Top' button. Below these are icons for a home button, a refresh button, and a camera icon.



Select item with mouse click or tap. Select multiple items by holding down CTRL key. X

No new notifications -

A horizontal navigation bar at the bottom of the screen. It contains several icons: a back arrow, a home icon, a list icon, and a blue icon representing a specific tool or function.





File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Search Ribbon (F4)

Element Selection

From File From Graphical Filter From Elements

Additional Methods

Active Edit Model

Edit Complex Model Feature Management Boundary Options

Points Volumes Hydraulic Reporting Aquaplaning

Graphical Filter Manager Export To File

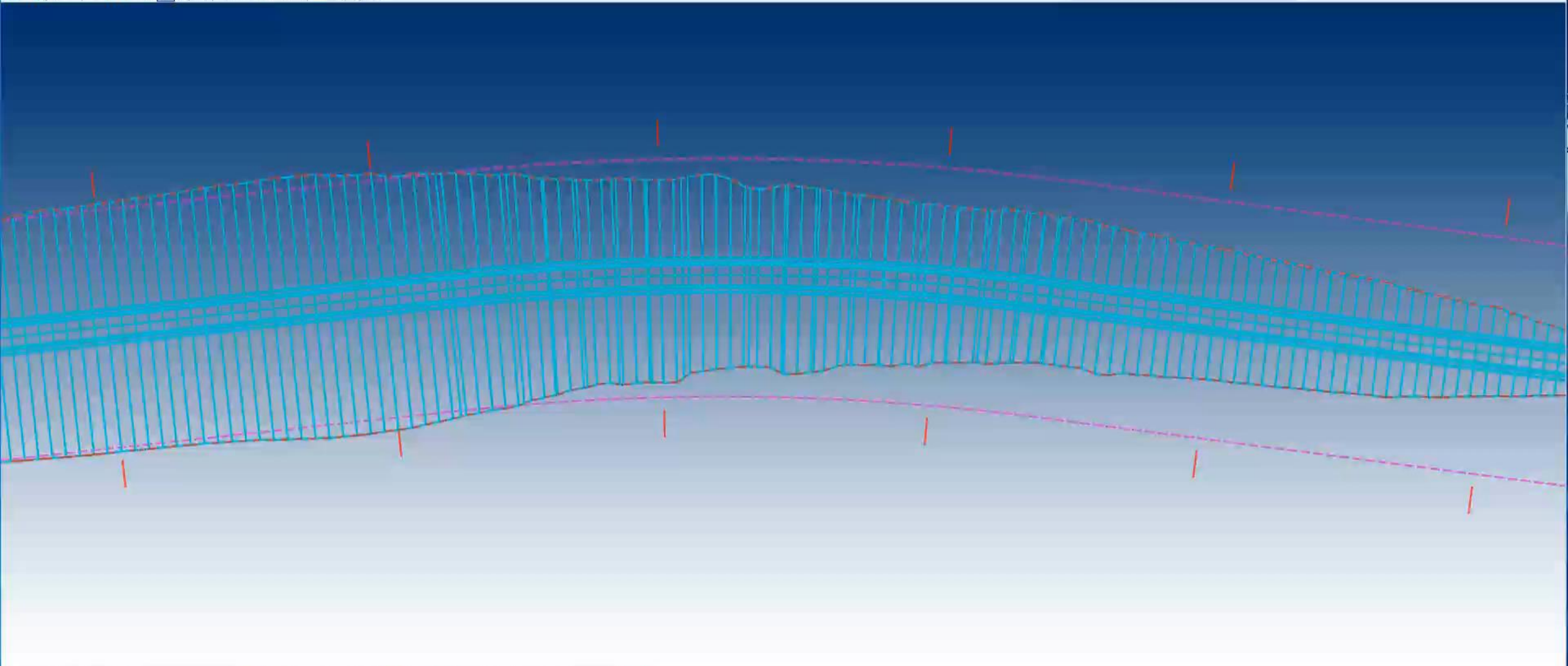
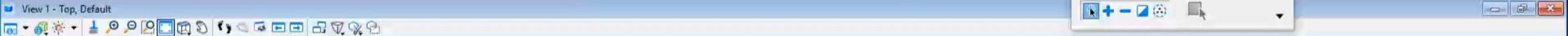
Label Terrain Contours Label Terrain Spots

Create Edit Miscellaneous Labeling

Element Selection



View 1 - Top, Default



Adjust the magnification of a view so all elements are visible

Default

1 2 3 4 5 6 7 8

Default



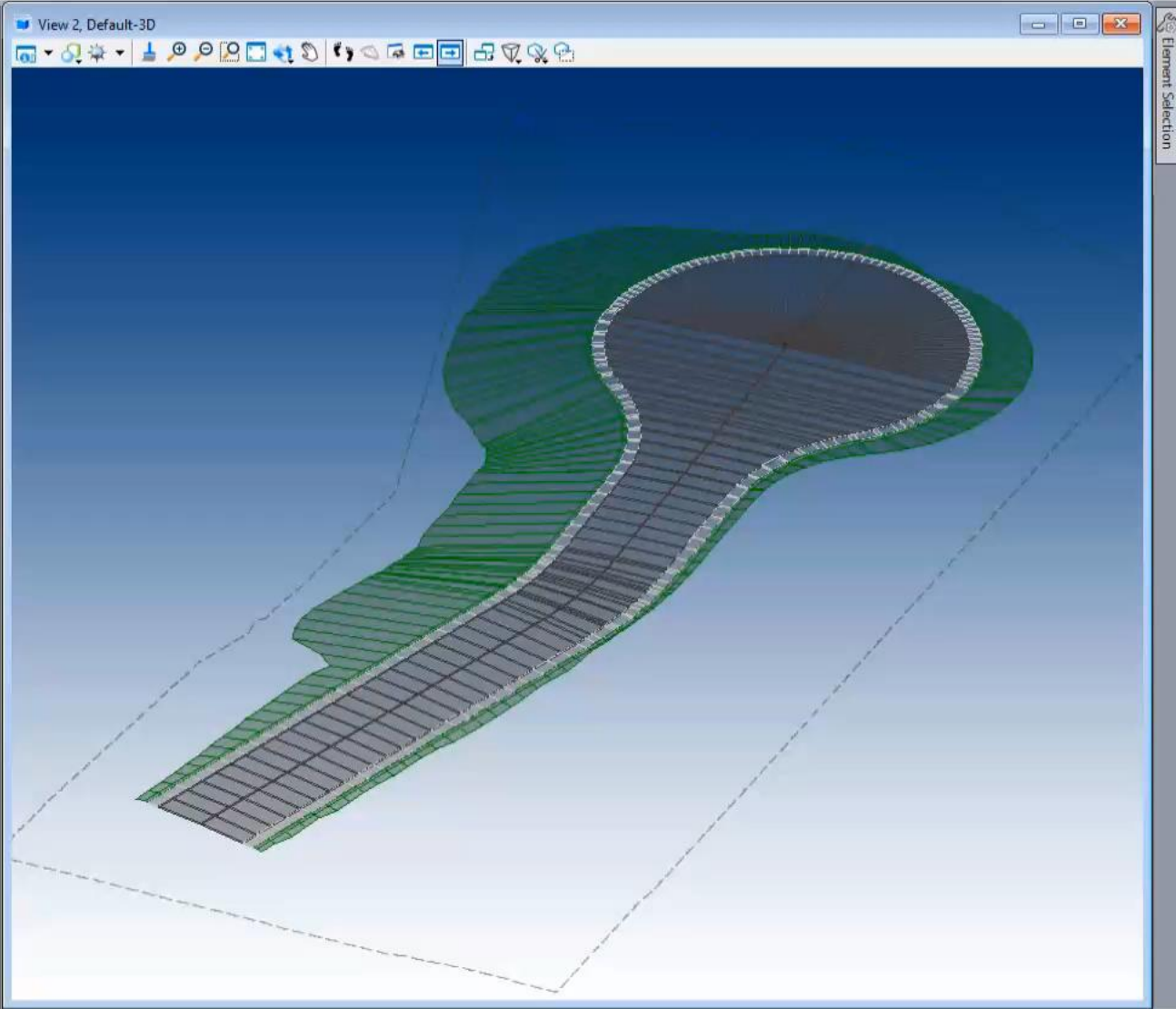
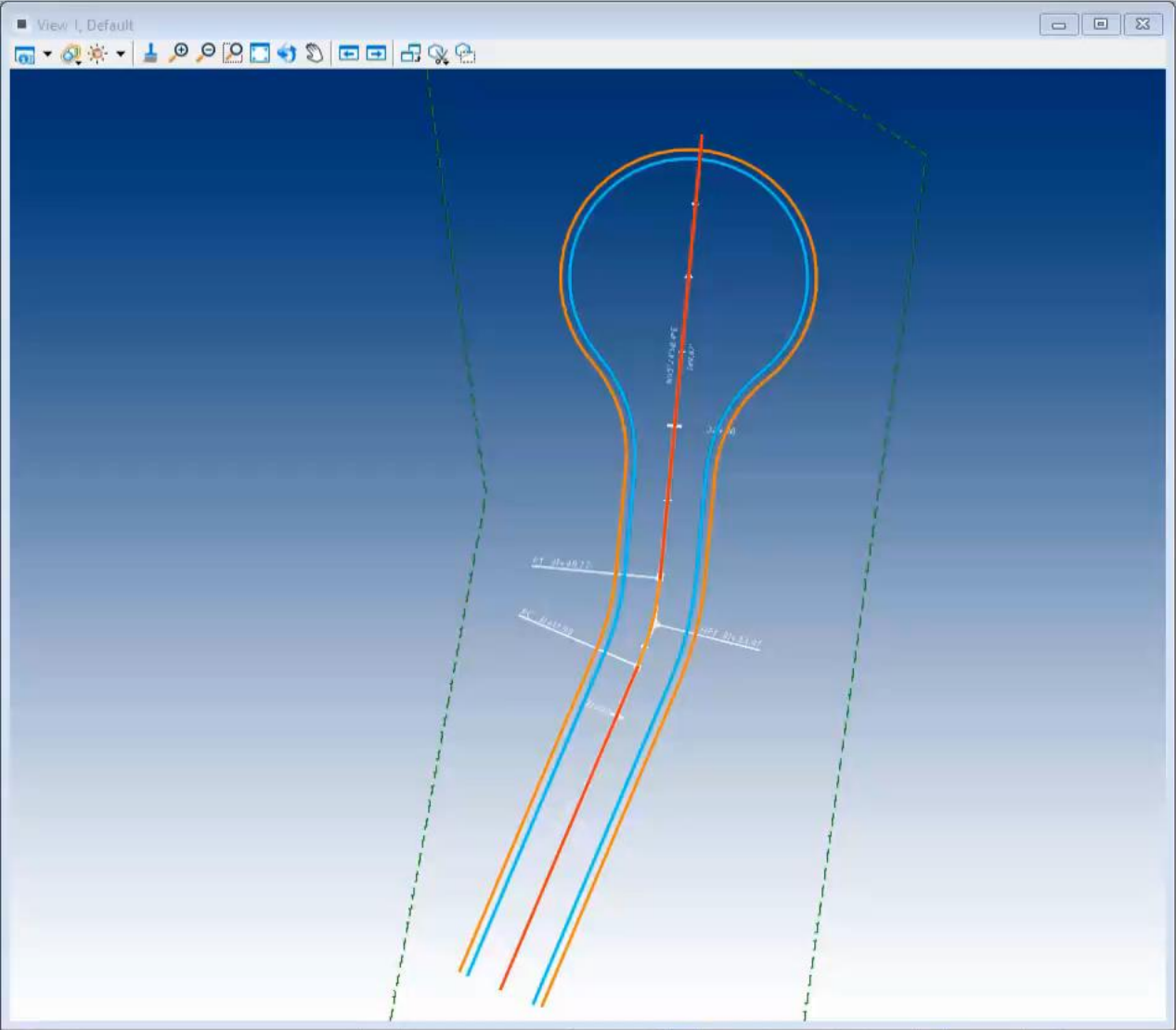


**Eliminate Re-Work**

File Home Terrain Geometry Corridors Model Detailing Drawing Production Drawing View

Search Ribbon (F4) Sign in

Element Selection, Clip Volume, Create Saved View, Update Saved View Settings, Apply Saved View, Place Table, Place Note, Place Label, Place Text, Edit Text, Change Text Attributes, Element Annotation, Model Annotation, Named Boundary



Multi-Model Views 1 2 3 4 5 6 7 8

Element Selection

Default

# Mobility



iPad

5:11 PM

29%

# Bentley



Bentley LEARN



Map Mobile



Navigator



OpenRoads



# Integrated Solutions

## Trimble and Bentley Accelerate Information Mobility with an Integrated Workflow for Road and Site Construction



Matt Ball on August 3, 2014 - 9:09 pm in Construction, Corporate, Roads, Transportation

Trimble and Bentley Systems announced today the next advance of information mobility between project design and field construction. Using Bentley's ProjectWise collaboration servers and services, along with its *i-model technology for the open exchange of infrastructure information*, and Trimble's Business Center – HCE office software, an integrated workflow for road and site construction is now possible. The U.S. Federal Highway Administration, as part of its "Every Day Counts" vision, has recognised that using 3D models with GPS-enabled heavy equipment for road construction can increase productivity by up to 50 per cent. Trimble and Bentley are at the forefront of enabling this vision by joining forces to optimise the transfer of information-rich 3D engineered models to 3D constructible models.

The announcement was made today at the Transportation Research Board AFB80 2014 Summer Committee Meeting.

## Topcon announces connectivity enhancements with Bentley Systems

LIVERMORE, Calif., U.S./ CAPELLE A/D IJSSEL, the Netherlands – October 9, 2017 – Topcon Positioning Group announces advances in its direct communication between the Bentley Systems design applications and the Topcon suite of software solutions with the release of MAGNET® 4.3.1. The MAGNET Enterprise Data Manager is designed to allow operators to directly access Bentley ProjectWise data with MAGNET Field, MAGNET Office or MAGNET Enterprise applications.

"The updates are part of our commitment to working with third-party software applications, such as the Bentley offering, to provide efficient data exchange and a seamless workflow environment," said Jason Hallett, Topcon vice president of global product management. "When connected to MAGNET Enterprise from MAGNET Field, you can directly upload and download data from ProjectWise, allowing surveyors or machine control model-builders upload or download iModels or other project file types."

The integration is designed to simplify data transfer from design to field, with the unique ability to read and import only the data users need for their projects.

"It builds upon our industry-first ability to offer 'round trip' iModels — sending them directly to field operators who can use and update them directly on the jobs site, and then send the updated iModels from the field back to Bentley ProjectWise," said Hallett.





*Embrace*  
**Manage Change**



Projects

AA-200  
Coffs Harbour Bypass




Open


- ★ Favorites
- 🕒 Recent
- 🌐 iModelHub**
- 🔗 ProjectWise Share


Search for... 🔍





# iModelHub

  
Download


CHB - Drainage 


  
Download


CHB - Geometry 


  
Download


CHB - Industrial Area 


  
Download

CHB - Miscellaneous 

  
Download

CHB - Ramps 

  
Download

CHB - Right of Way 

  
Download

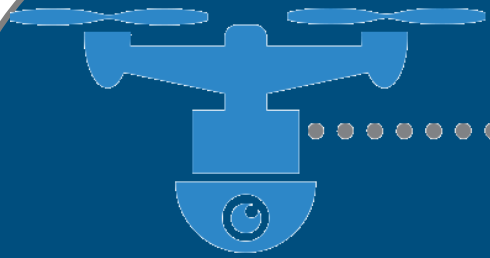
CHB - Wetlands 

Browse...

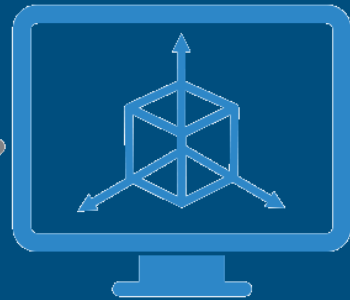
# The Cloud



# Cloud Connectivity



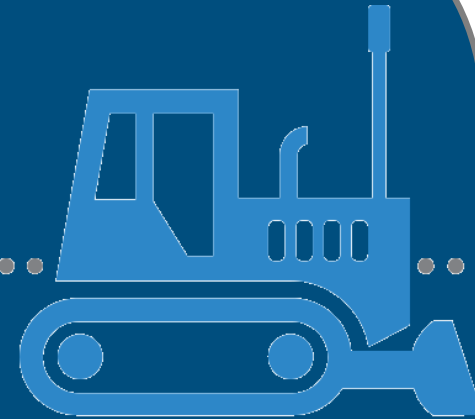
**Survey**



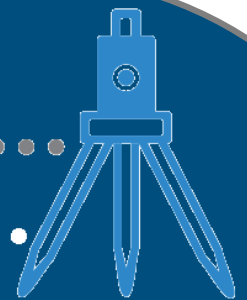
**Conceptual  
Design**



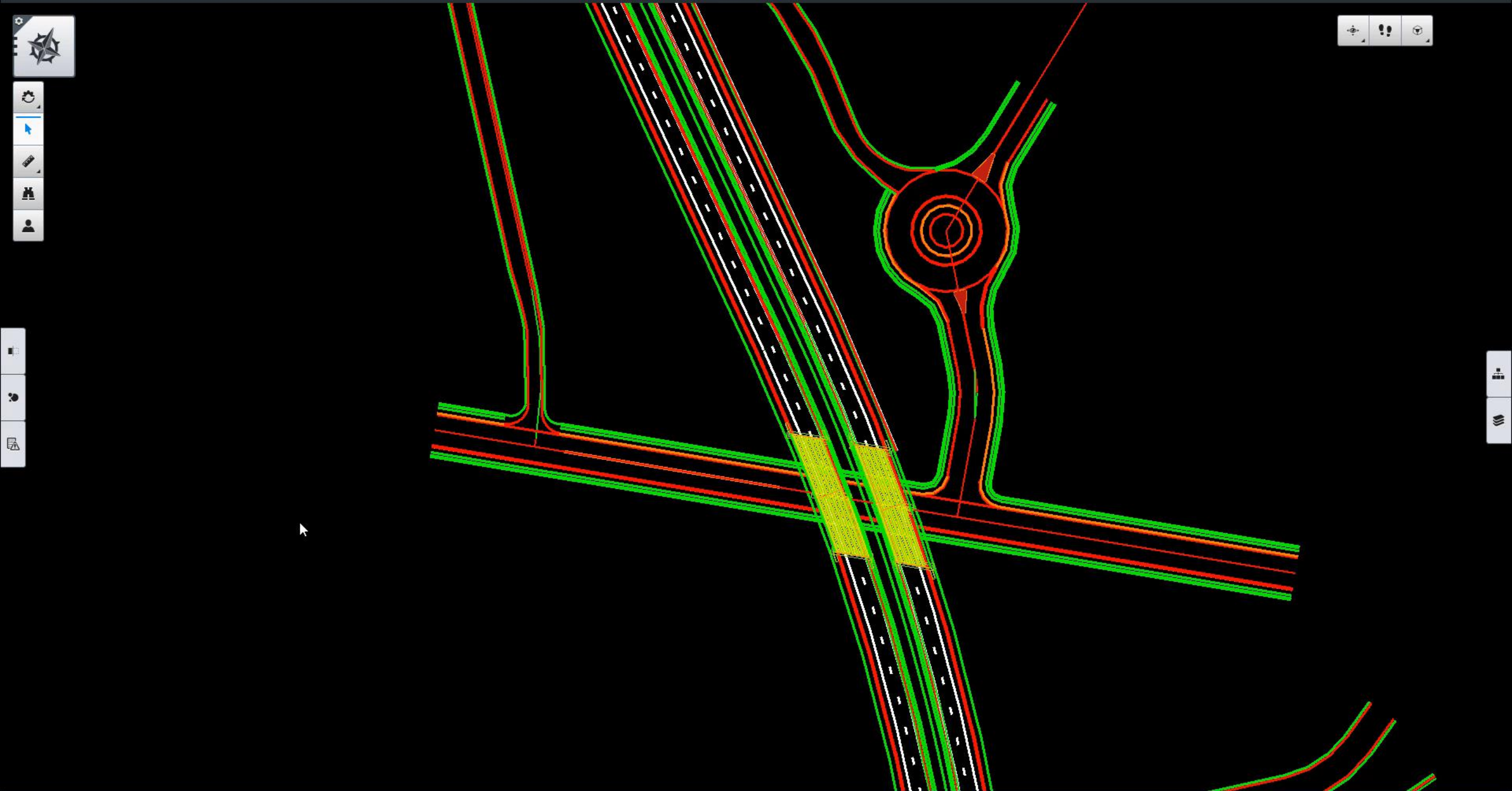
**Detailed  
Design**



**Construction**



**Monitoring**



# Software: One Piece of the Puzzle





*PRODUCTIVITY*

MIN

MAX



Thank you!

And have a great conference.

