3D Highway Design - Iowa DOT

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April 14, 2015

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Benefits of 3D Design from Road perspective

- Seeing whole model as one (communicates design intent)
- Ensure all parts tie together
- Valuable tool to represent data to others.
- Validates constructability of staging/final product.
- Better understanding of Staging plan.

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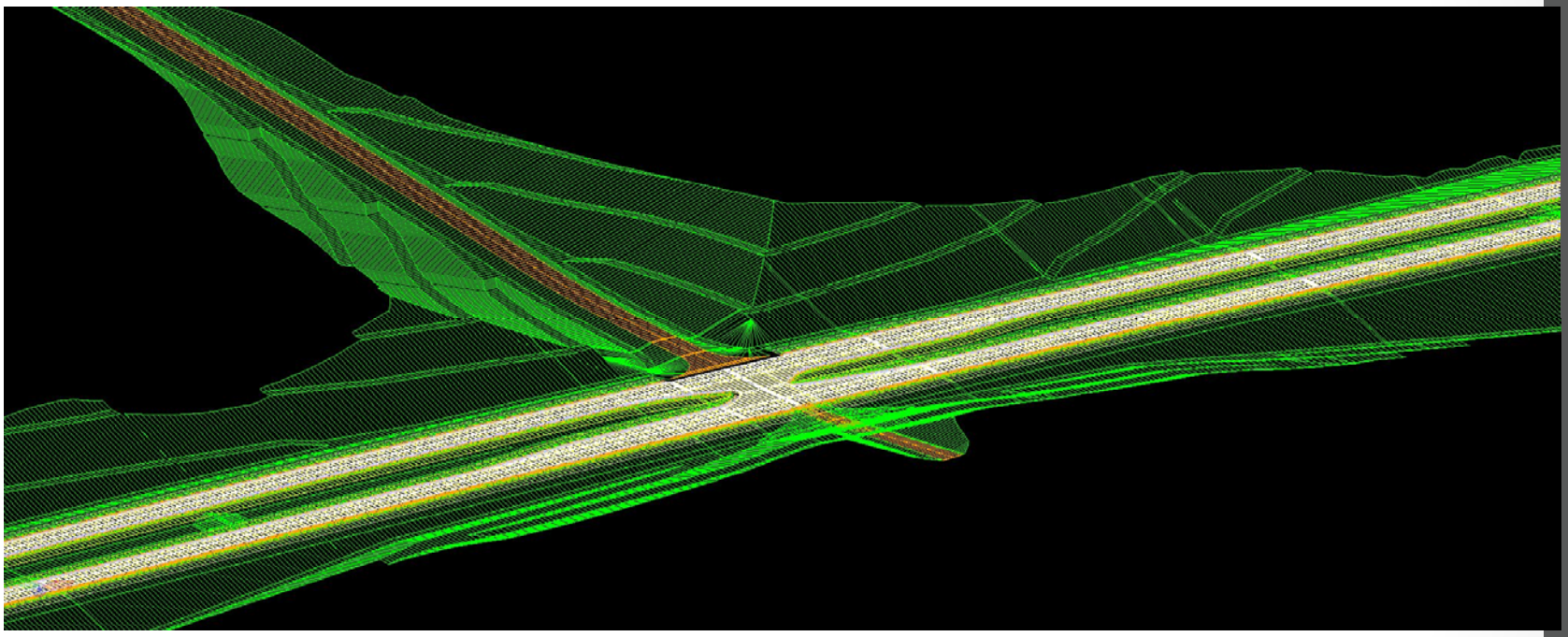
Communicate Design Intent



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Valuable tool to represent data to others

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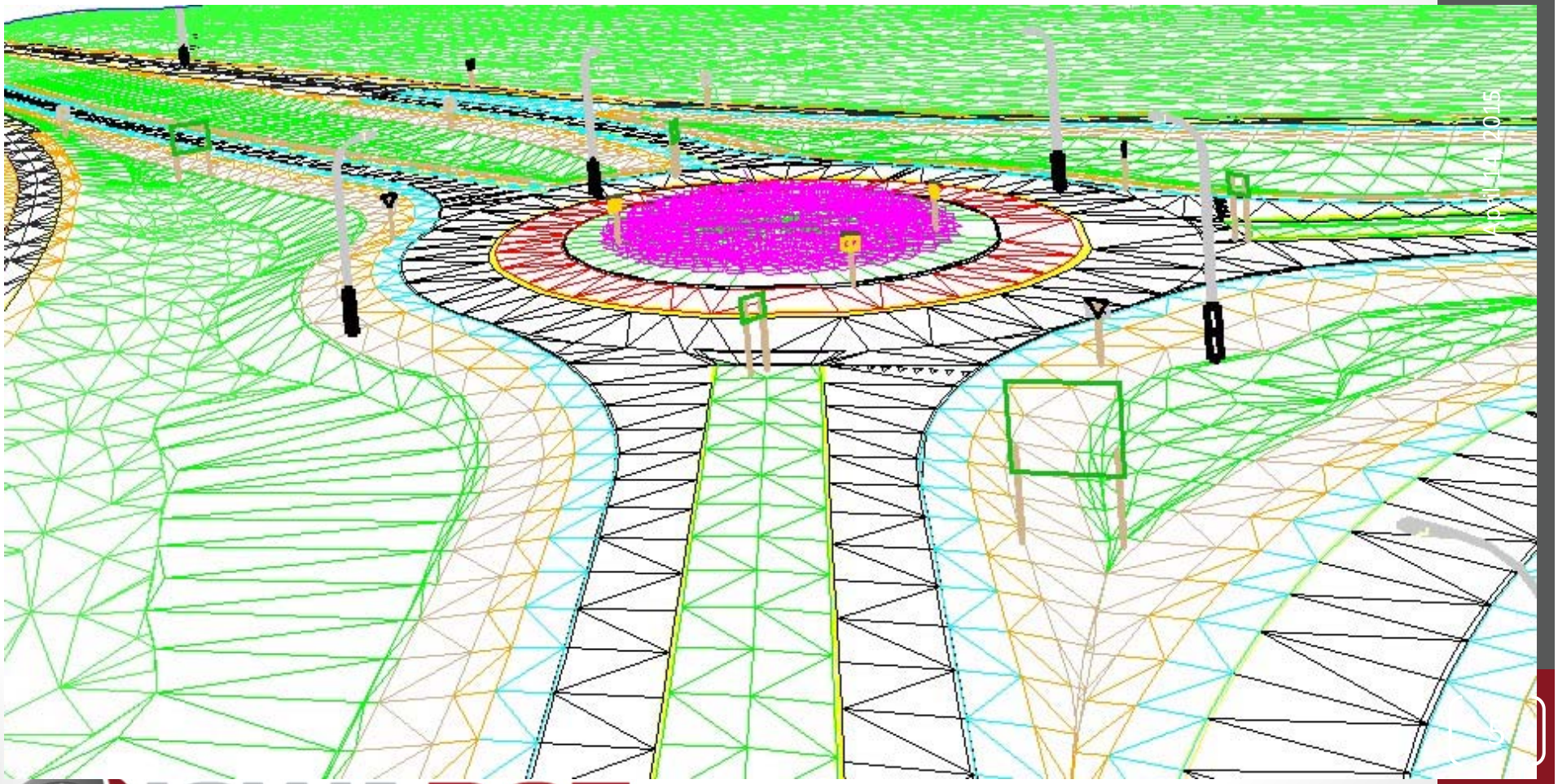
Ensure all parts tie together



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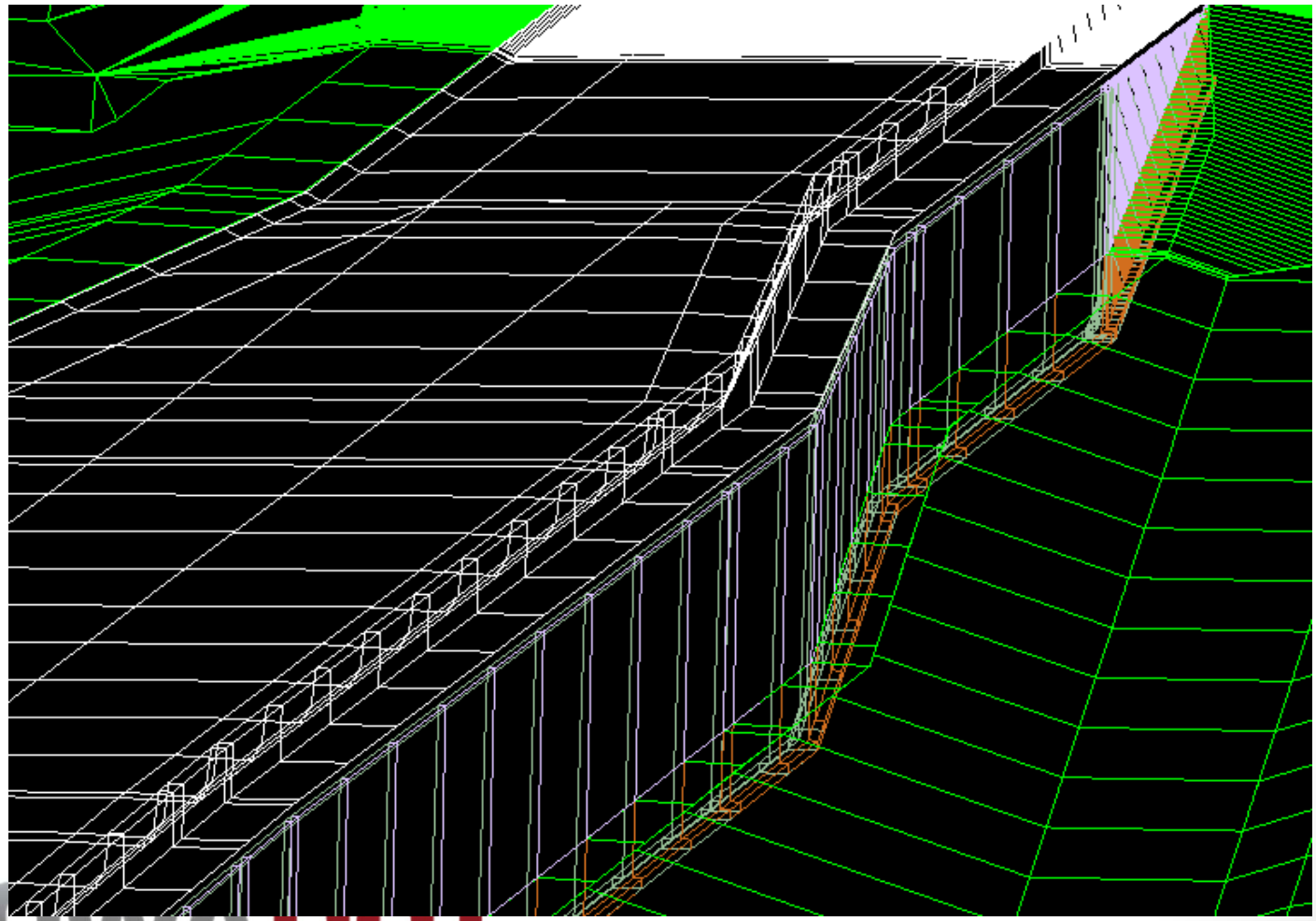

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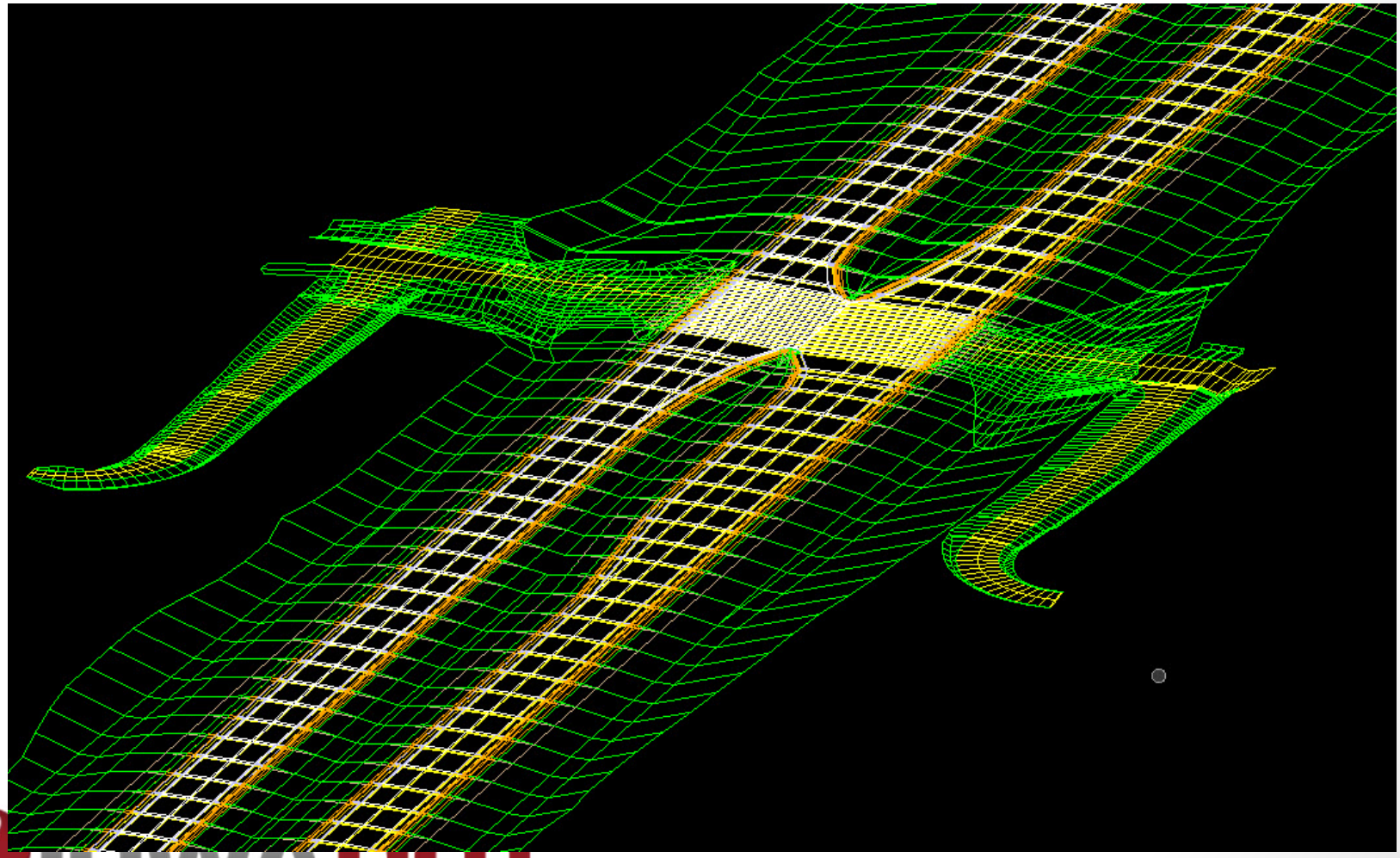
Validates constructability of staging/final product



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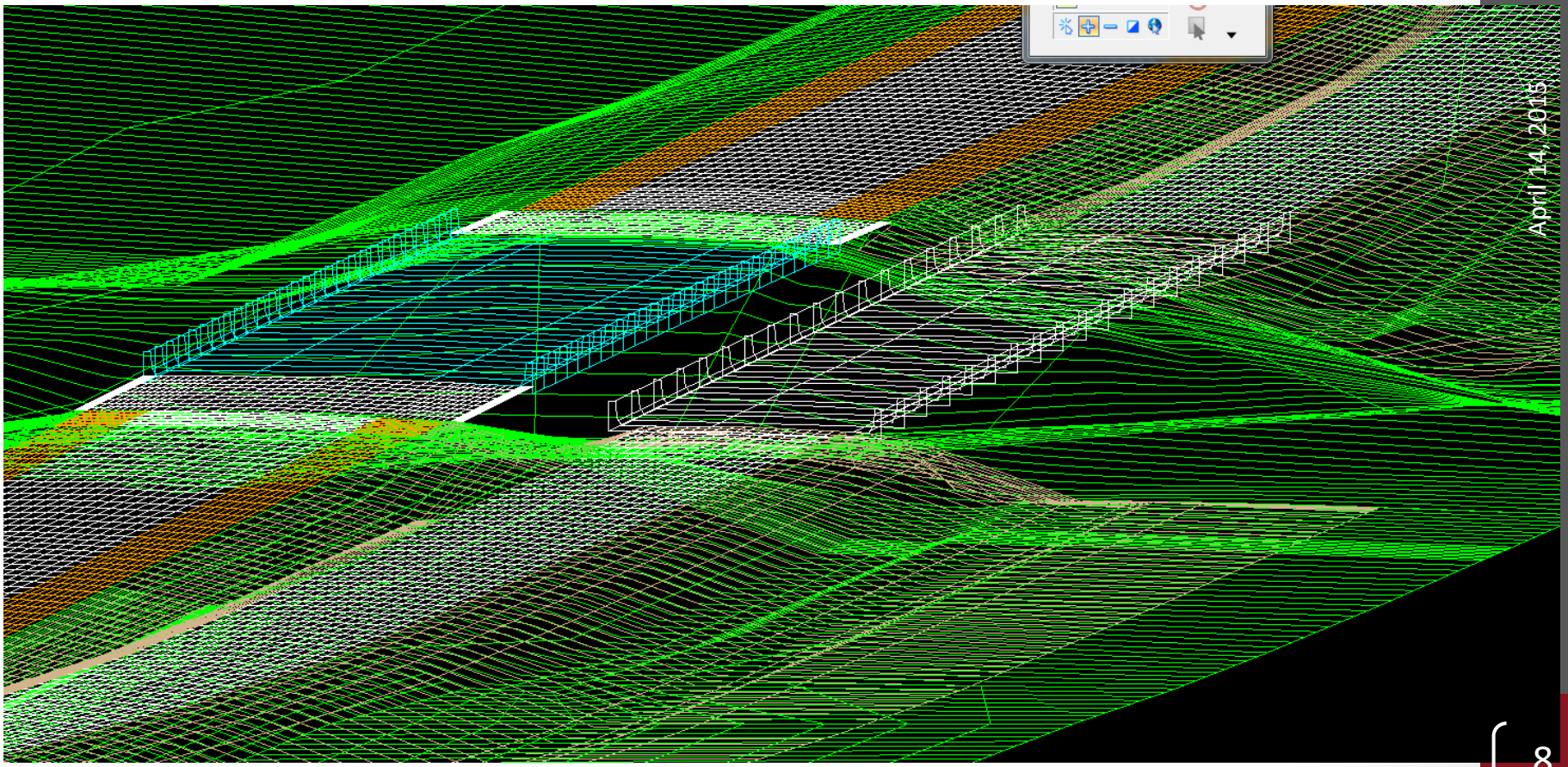
Better understanding of Staging plan.



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Changes in Survey

- LiDAR data is 3D
  - Tremendous amount of data that is only valuable in 3D.
- SUE
  - Identify subsurface conflicts with abutments, piers, piles, etc.
- Construction survey wants to use real coordinate systems, not calculated.
  - Less construction errors.

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LiDAR

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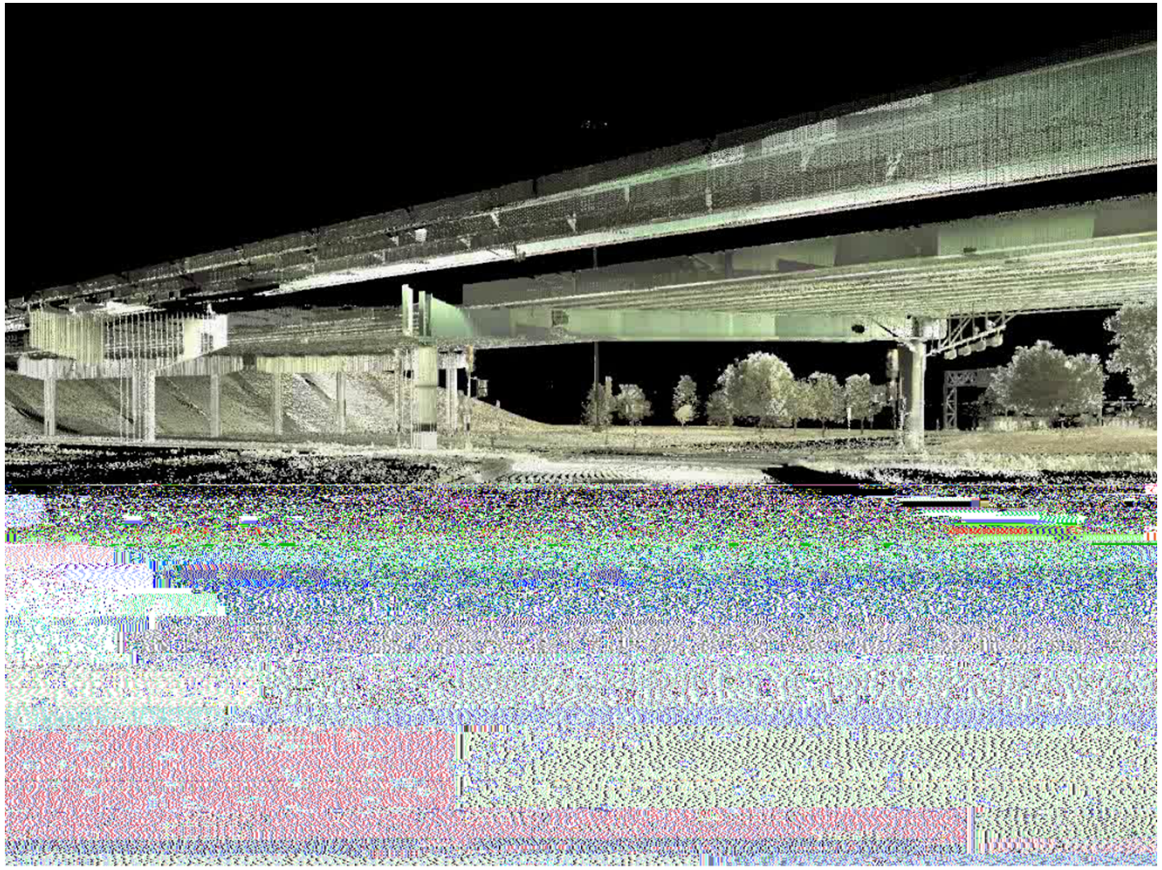
LiDAR Animation



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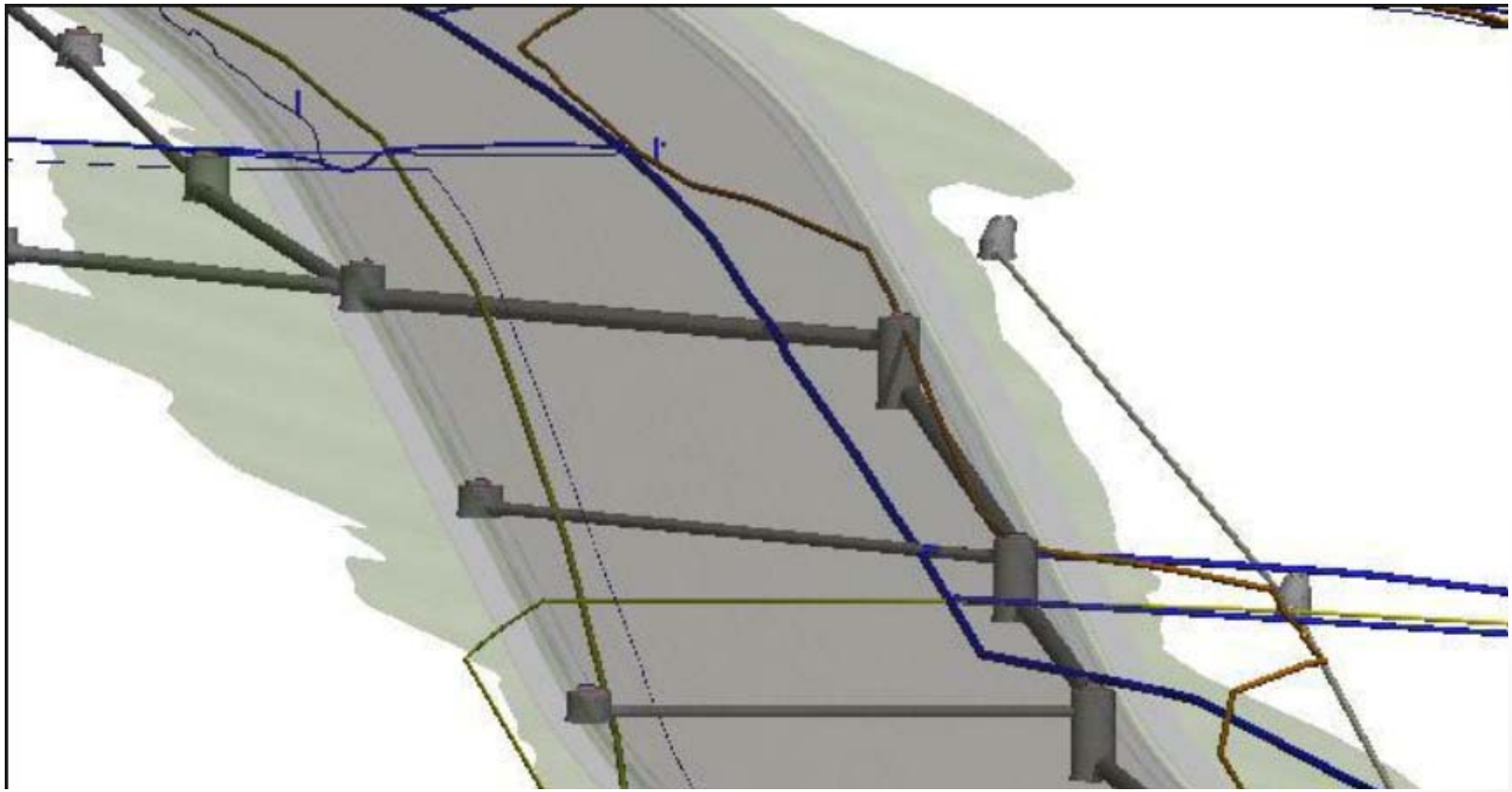
SUE



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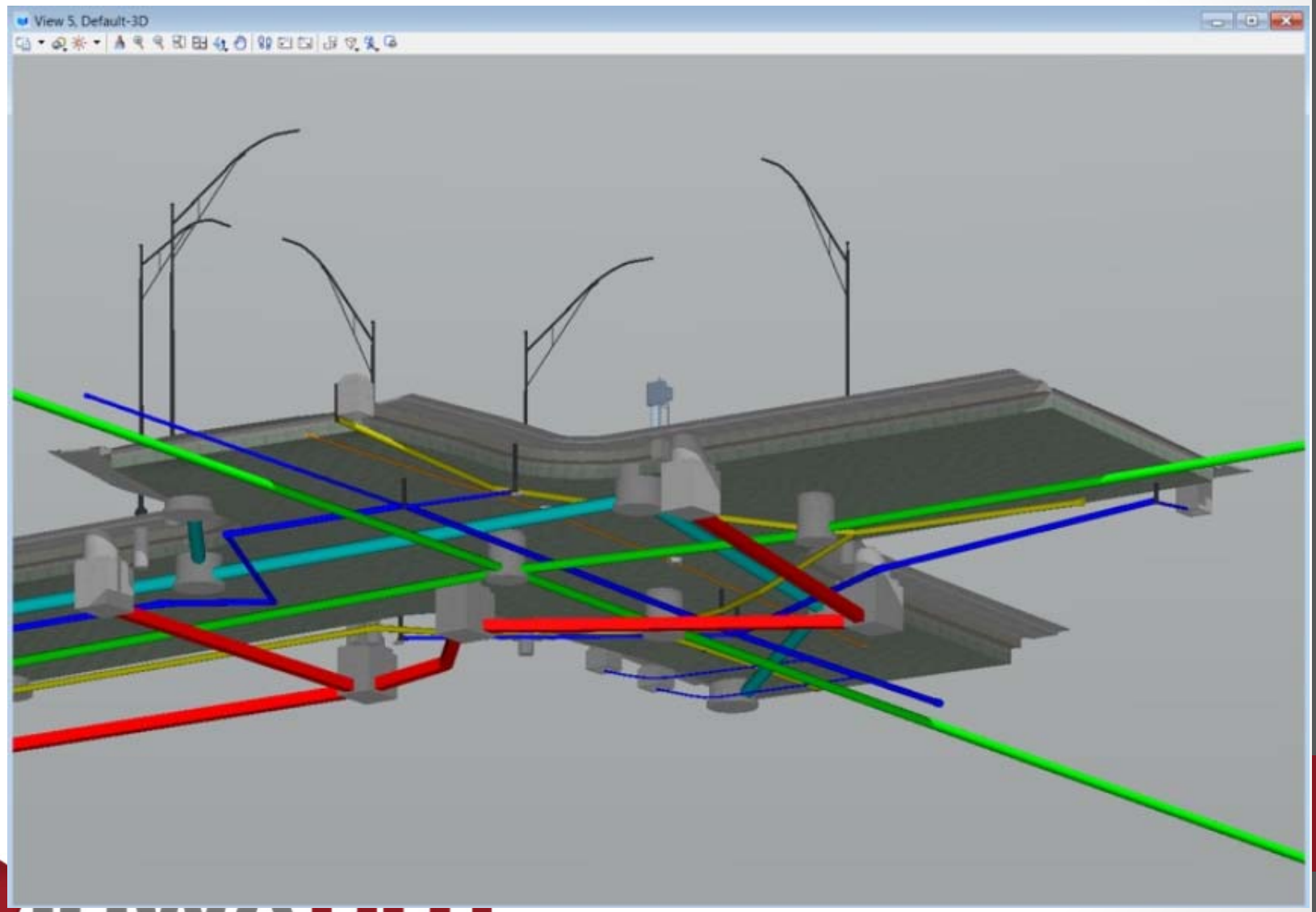
SUE



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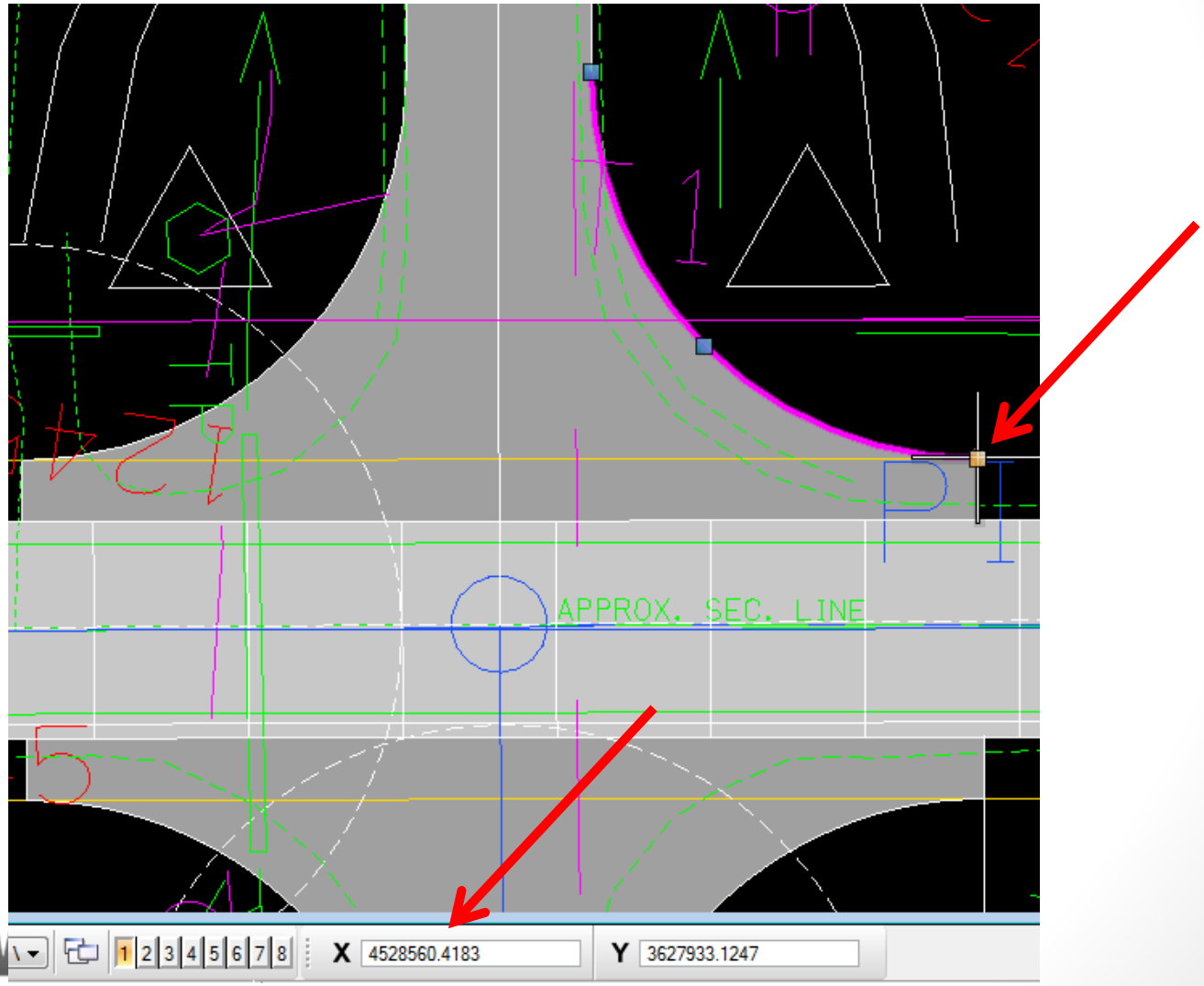
Coordinate Systems



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Benefits for Structural 3D

- Road can identify where road templates don't match structure layout.
- Easy identification of vertical clearance issues.
- Easier modeling of drainage.
- Subsurface conflict resolution.
- Complex staging between existing & new structures can be better reviewed.
- Sight distance on structures can better be reviewed.
- Interaction of overhead signing structures.

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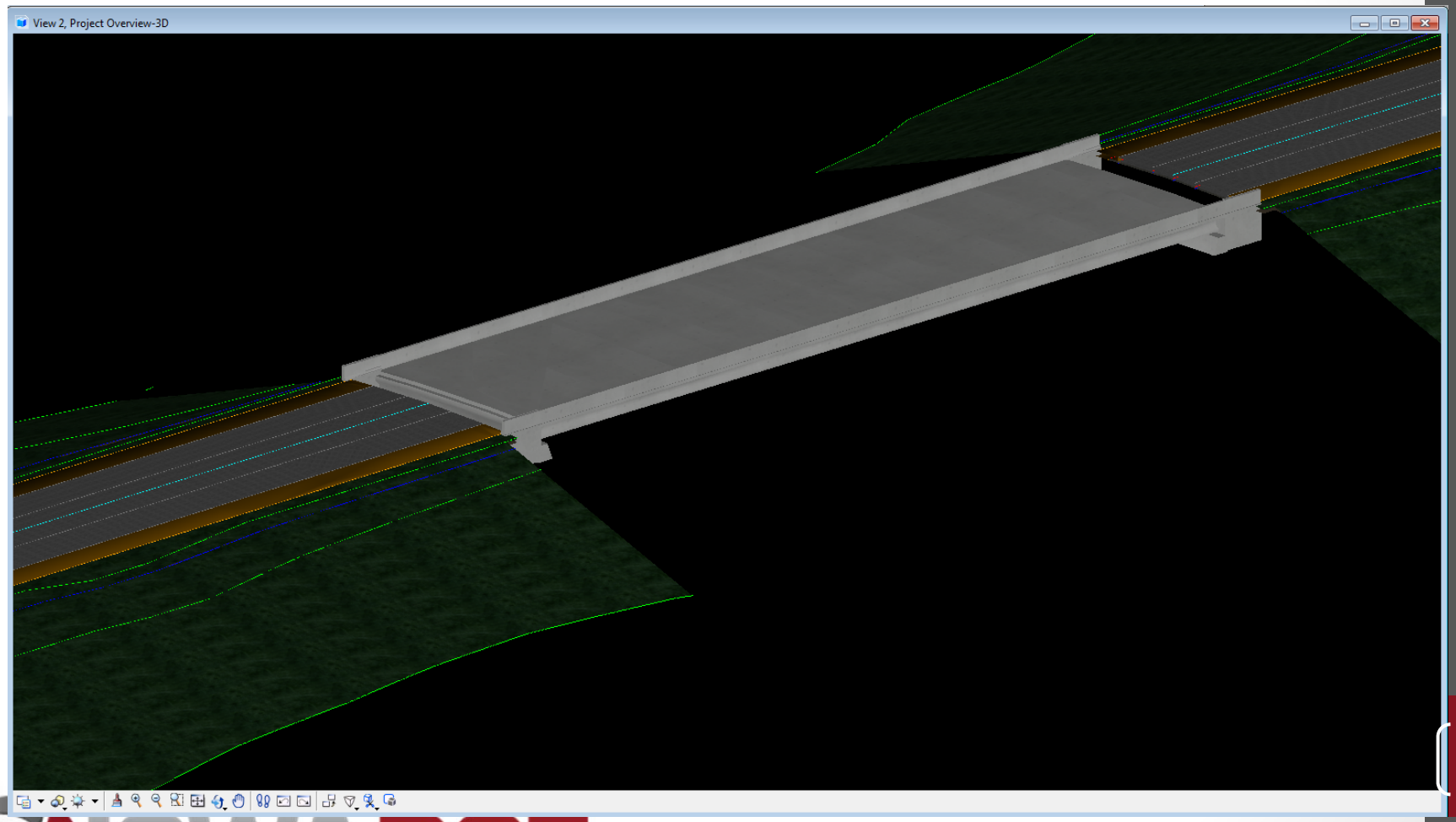
Road and Bridge Match



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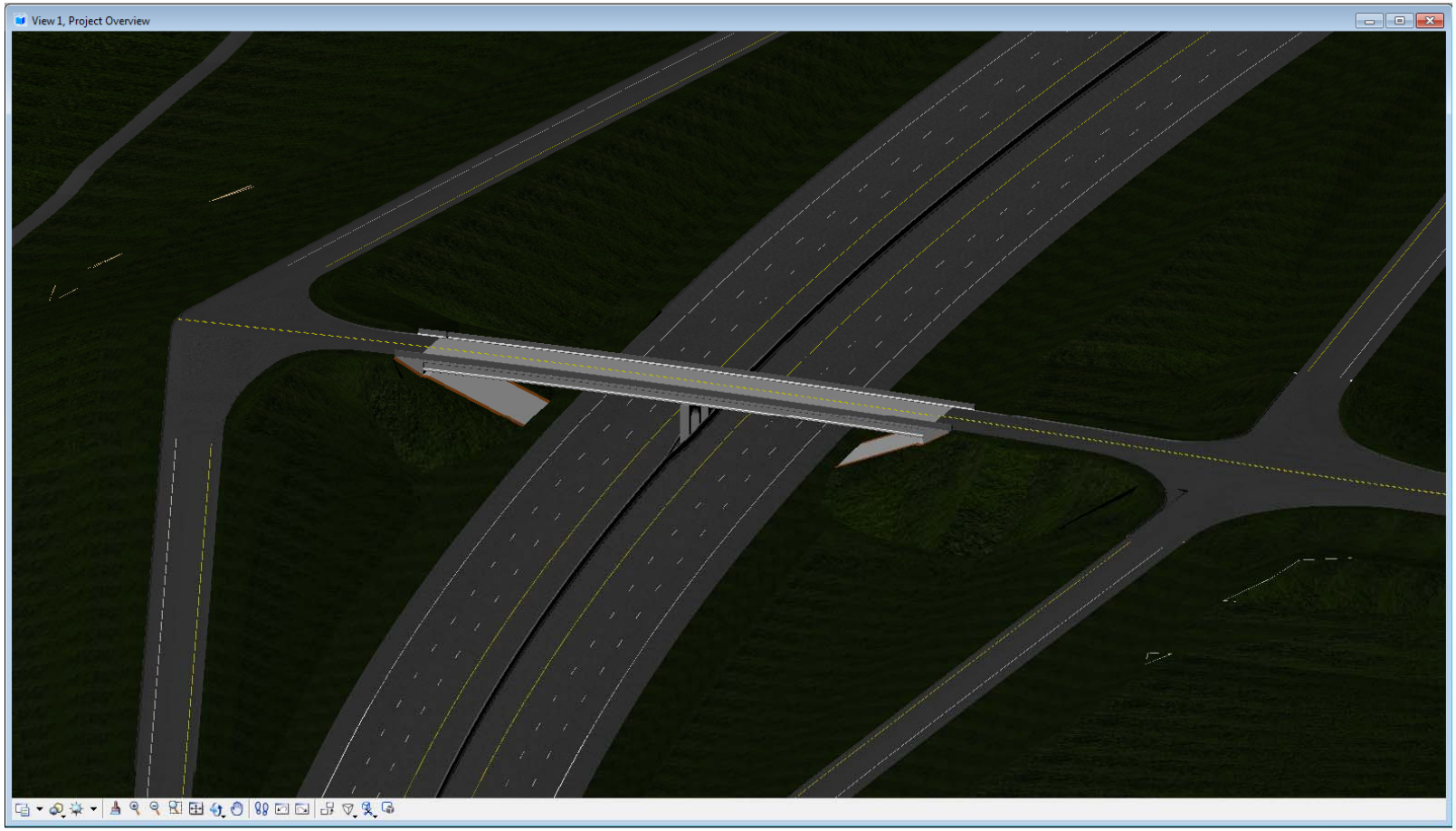
Vertical Clearance



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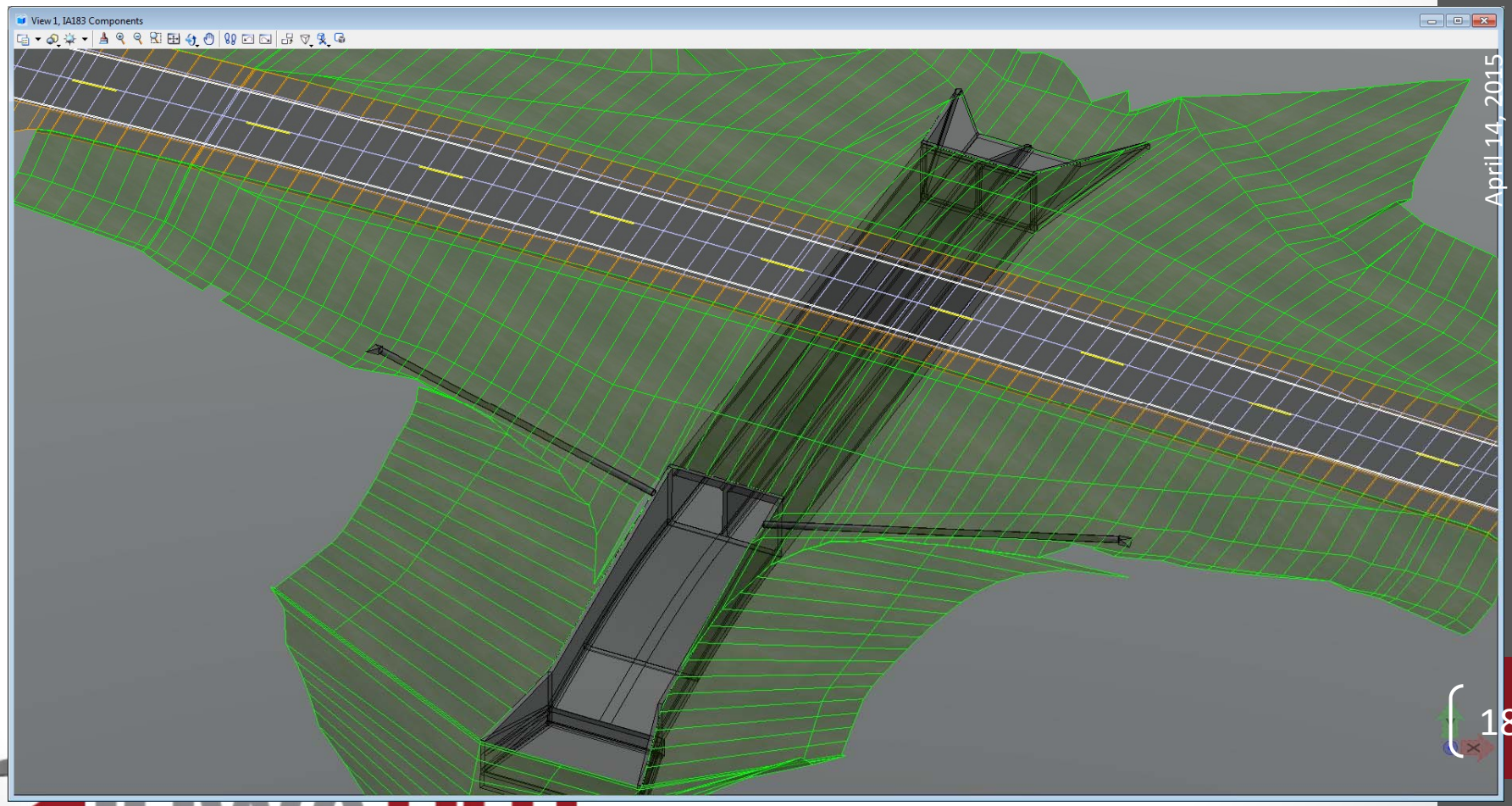
Modeling of Drainage



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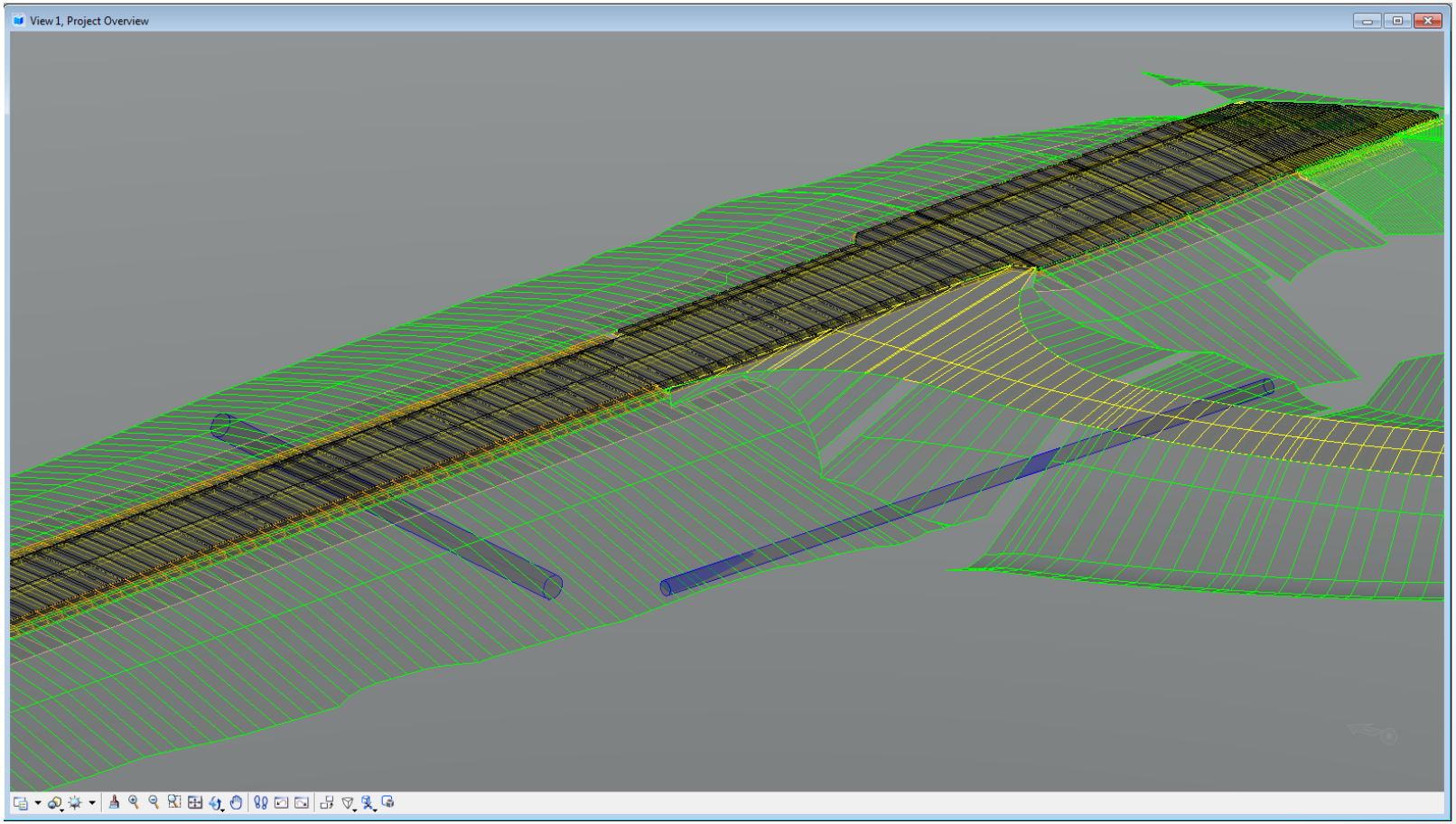
Modeling of Drainage



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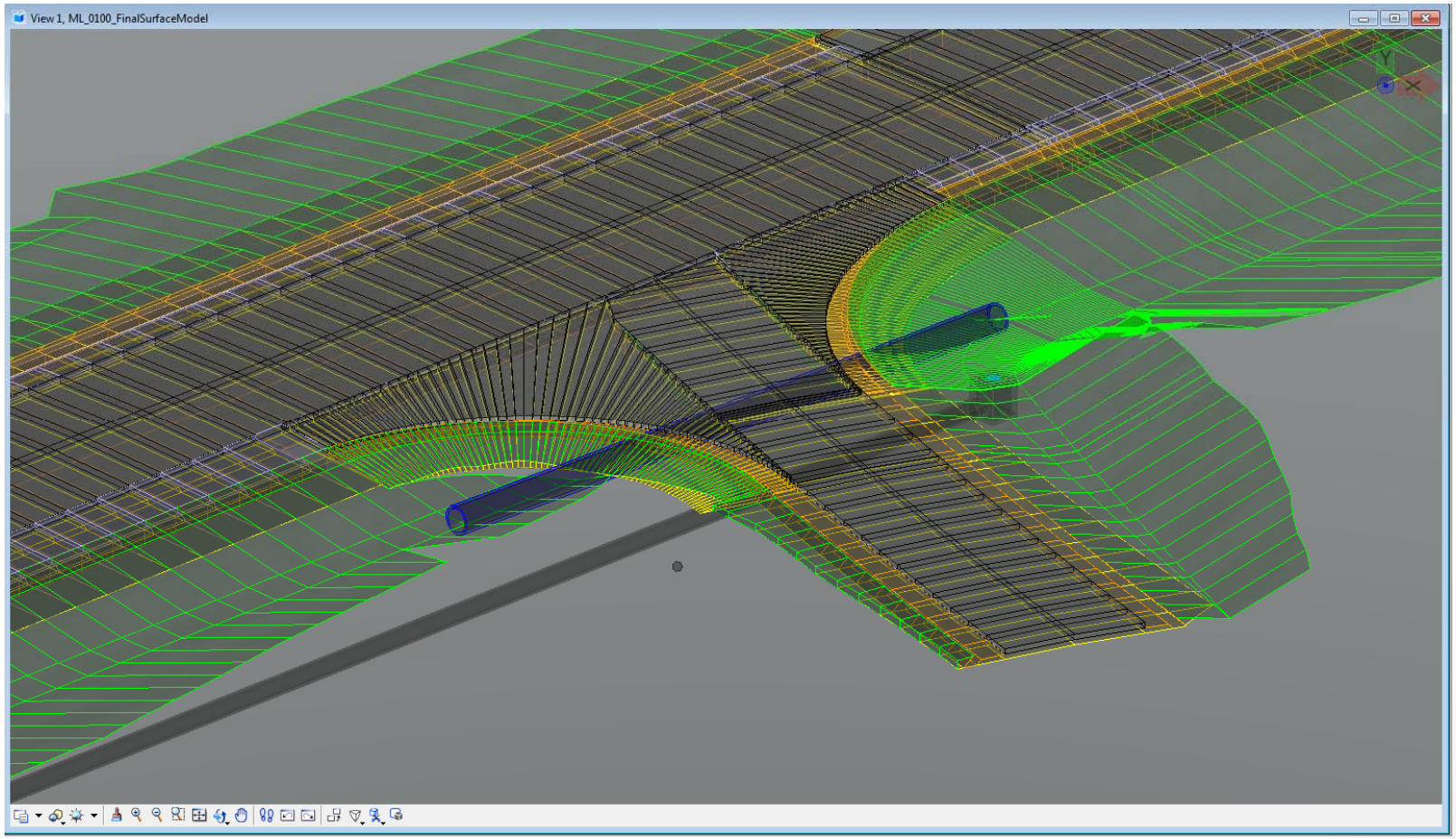
Subsurface Conflict Resolution



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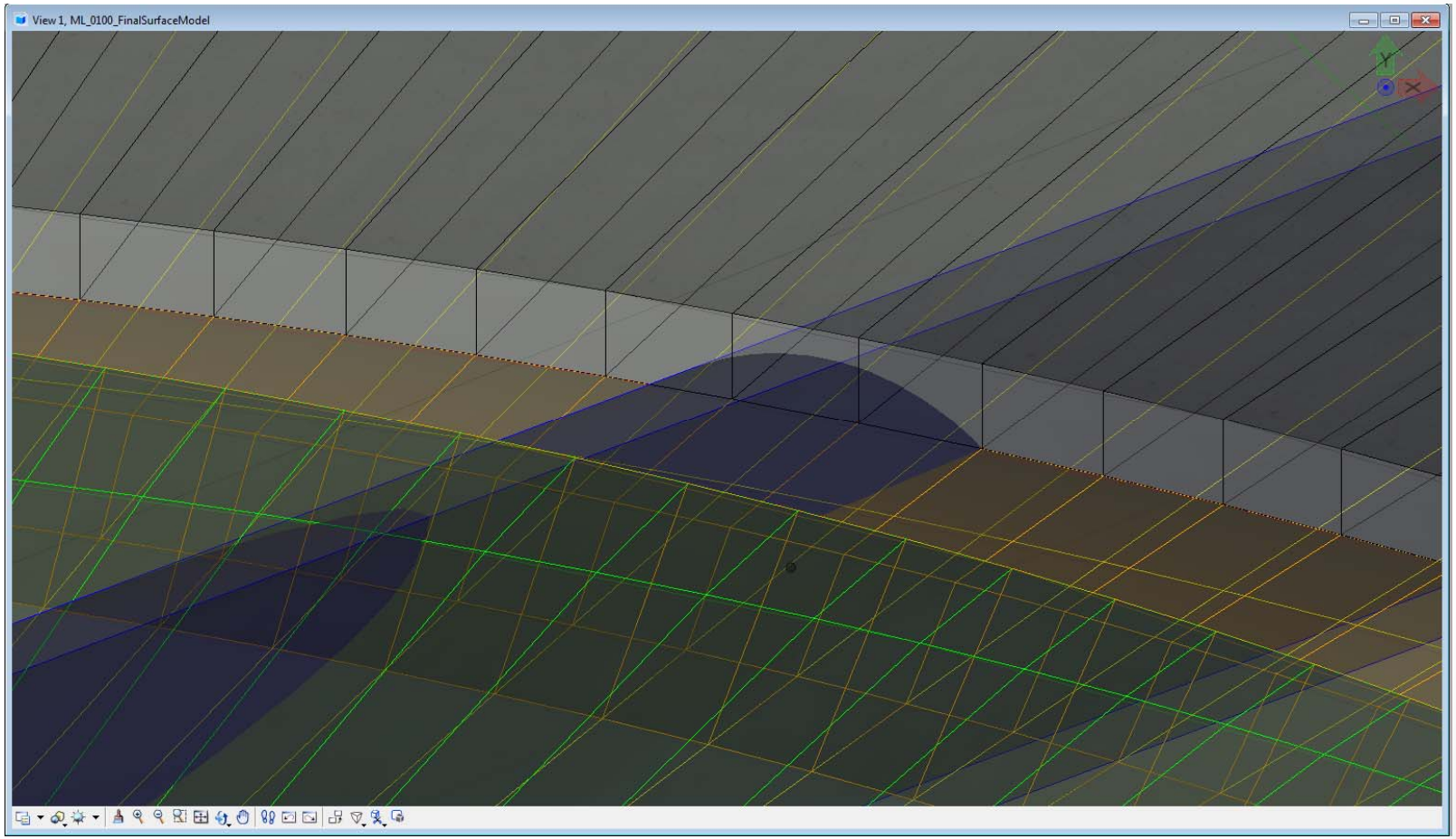
Subsurface Conflict Resolution



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Sight Distance

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Interaction of overhead signing structures.

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Lessons Learned

- **Just in time training**. This is essential to gaining early success, and sustaining it through implementation. Make sure as designers are trained they can immediately apply what they have learned to a real project. Studies show that retention is down to 25% after 5 weeks if they are not able to apply what they have learned.

- **Designer Resources**: Documentation and videos outlining how to perform certain tasks is also valuable. We have developed a video library to supplement our training effort. We also have documentation on the level of detail required at the major milestones in our development process.

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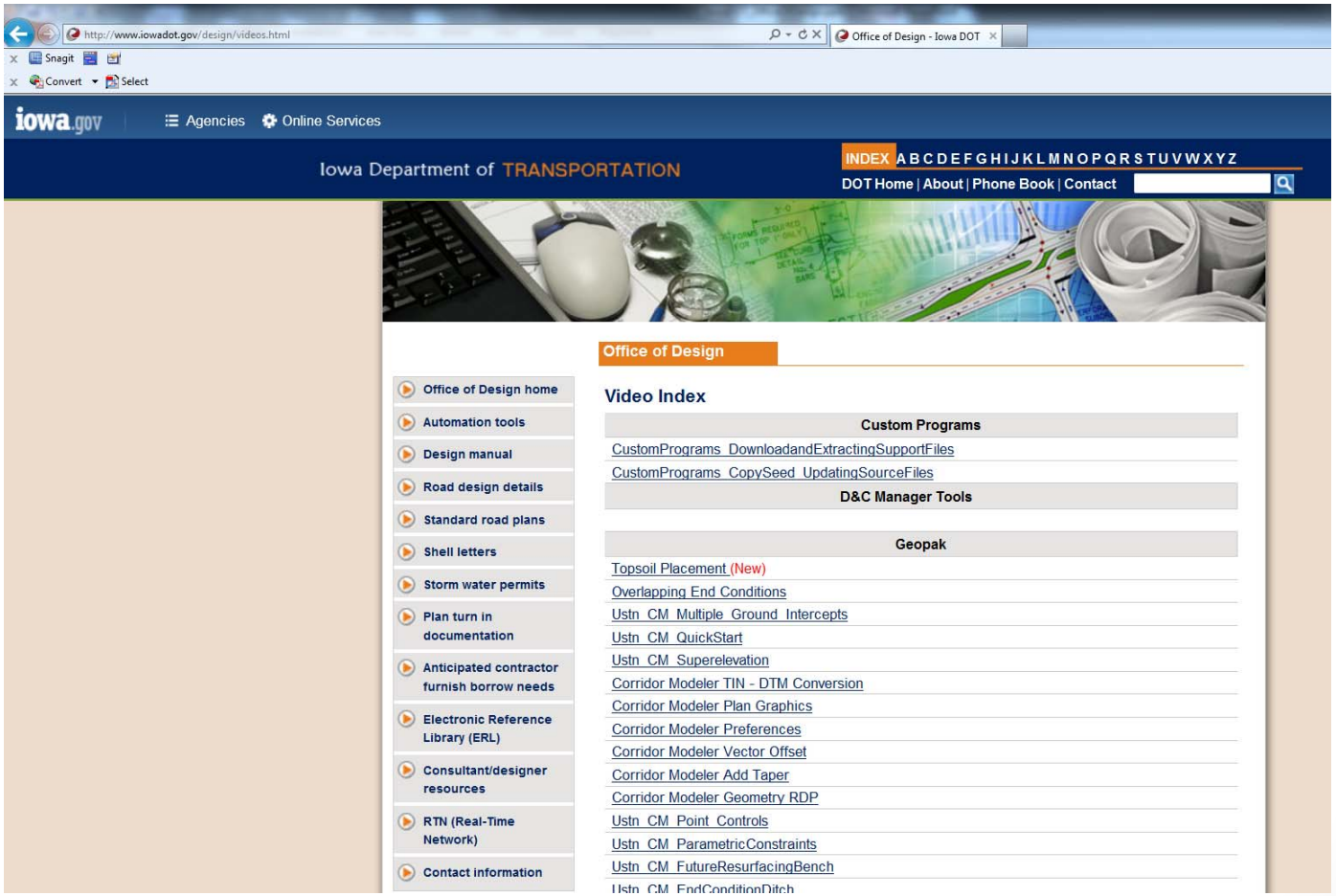
Designer Resources



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Key Takeaways from our Transition to 3D Design

- **IT support is crucial to success**. I think it is key to secure this upfront and maintain it throughout the process. There is no phase of this where having easy access to IT support will not be essential. That support can either be internal IT staff and through your software provider if that is available but it is a fundamental block to your success.
- **Designing in 3D will take more time**. We estimate 5-10 percent more depending on the complexity of the projects, and the experience of the designer. This is not necessarily because designing in 3D is more difficult as much as it is elements that may have been left to a detail sheet or standard drawing are now worked out in the model.

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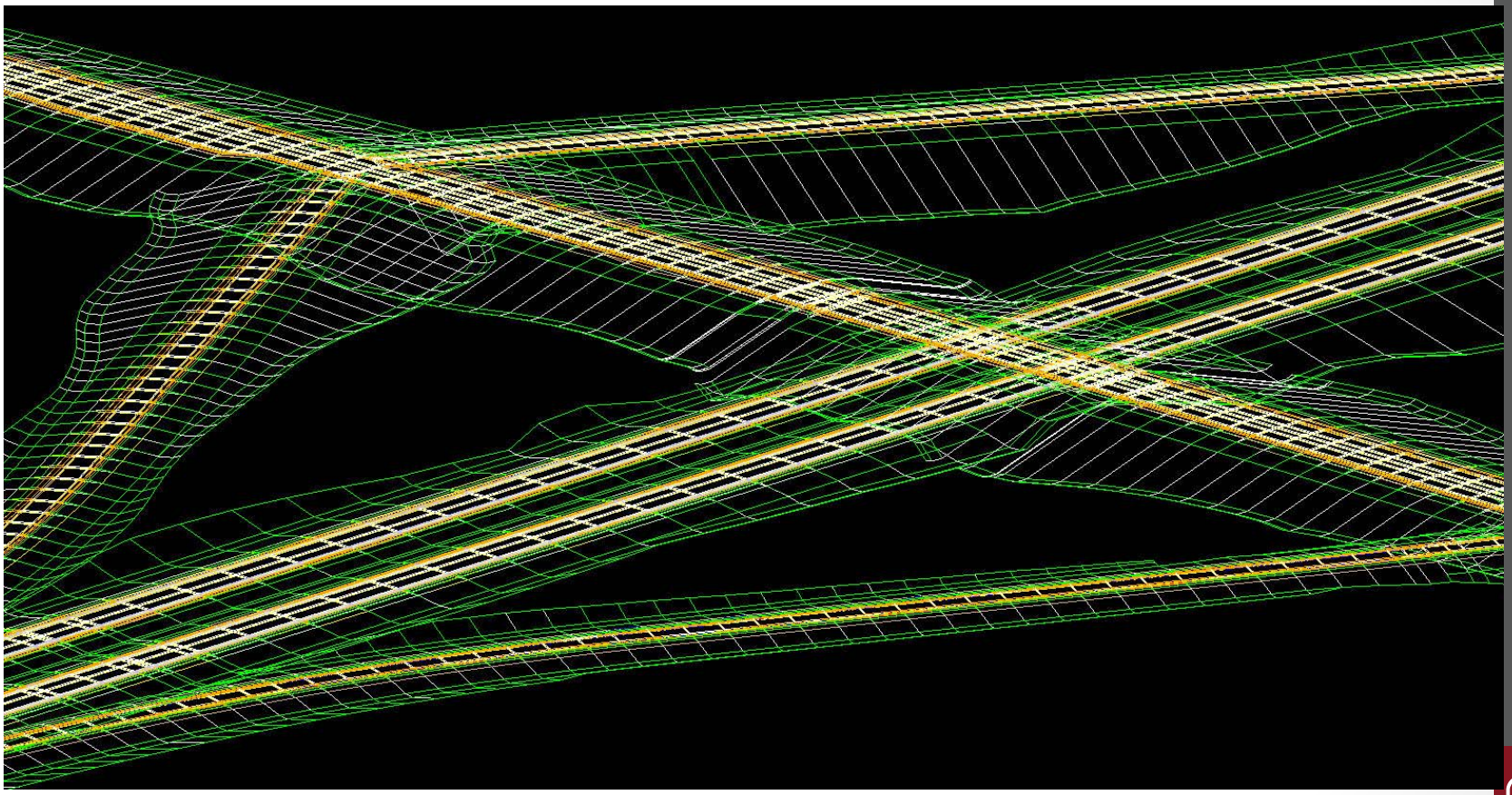
Design Guidance: 30 Percent Design



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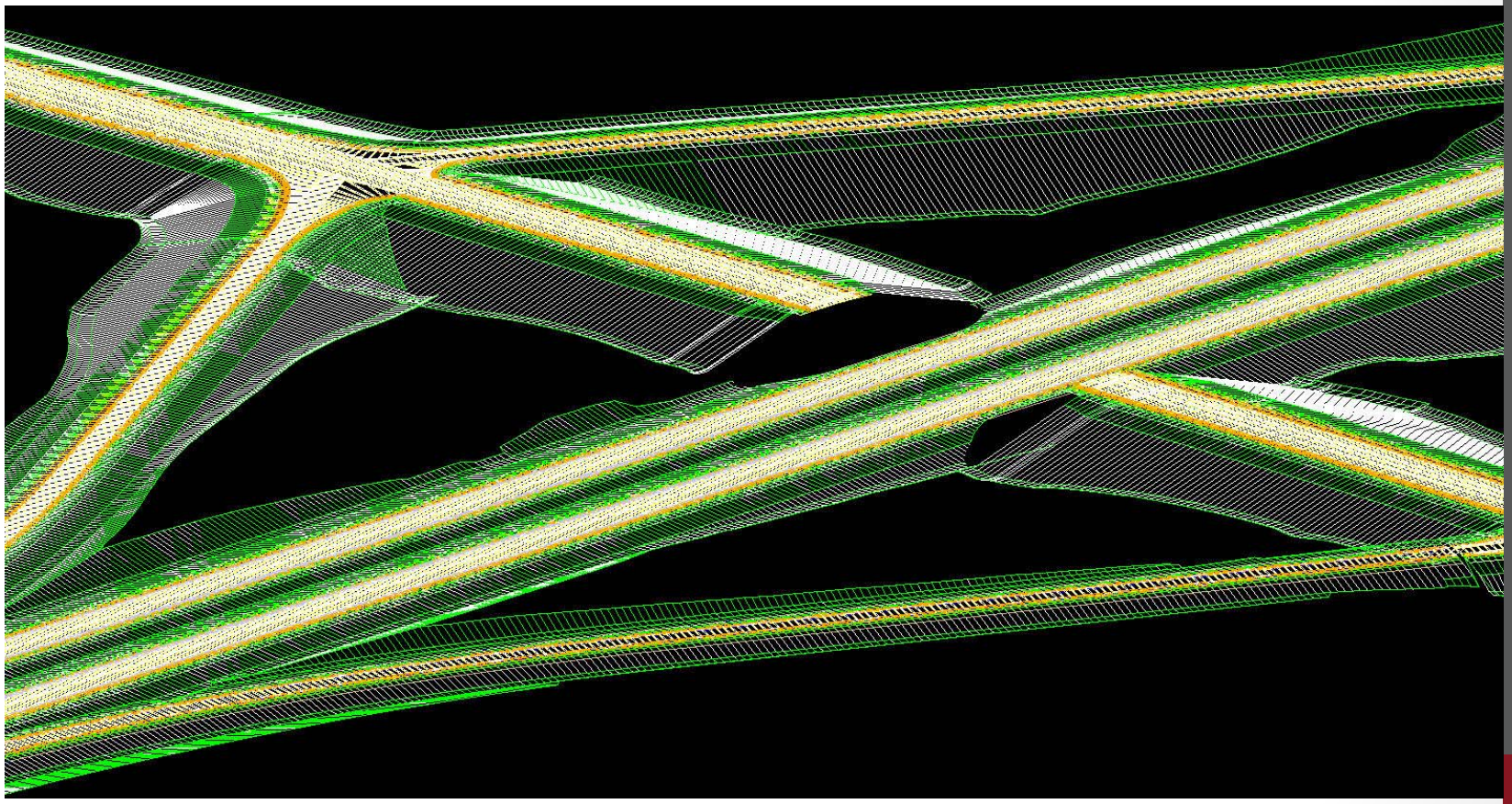
Design Guidance: 60 Percent Design



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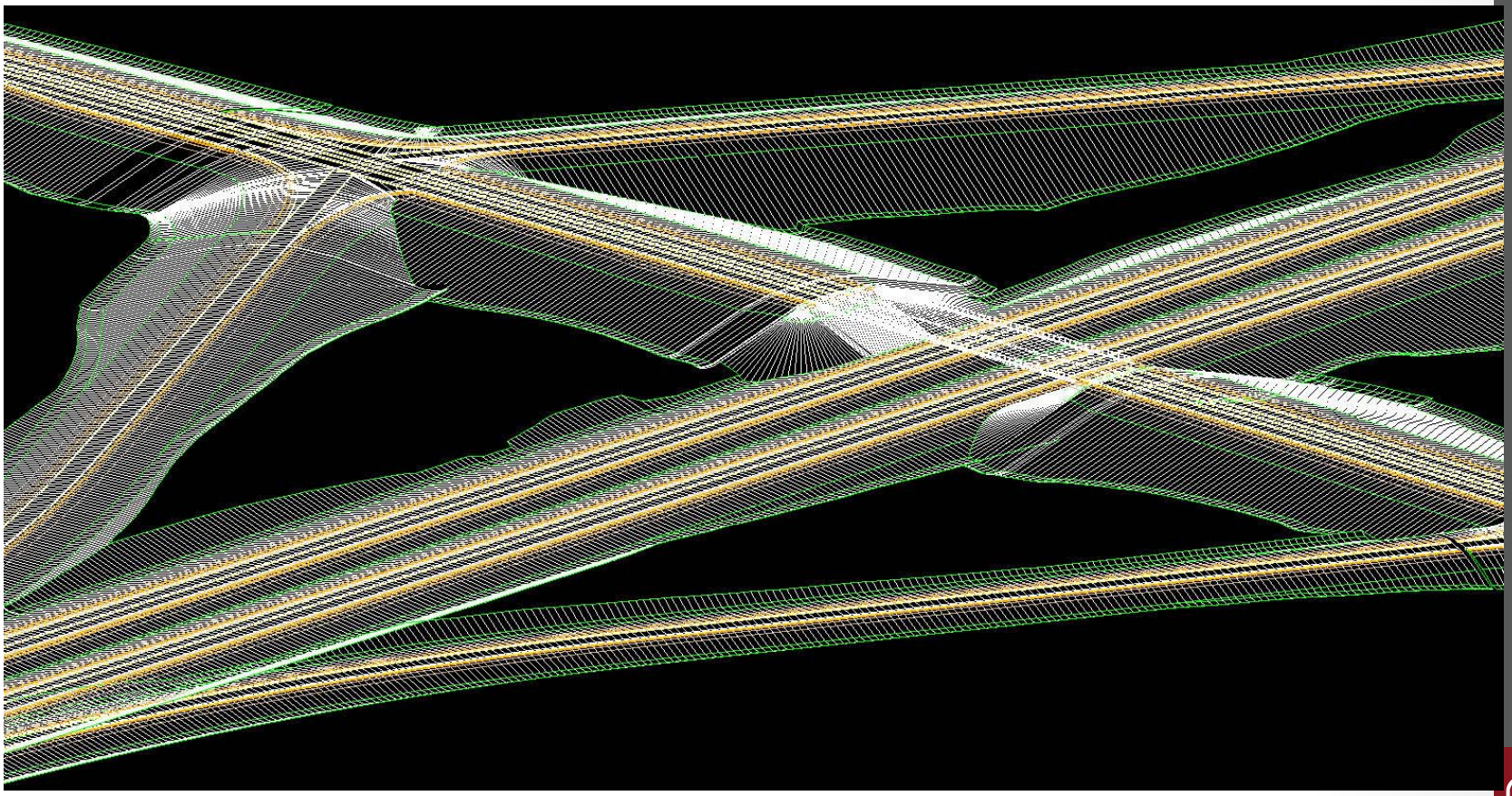
Design Guidance: 90 Percent Design



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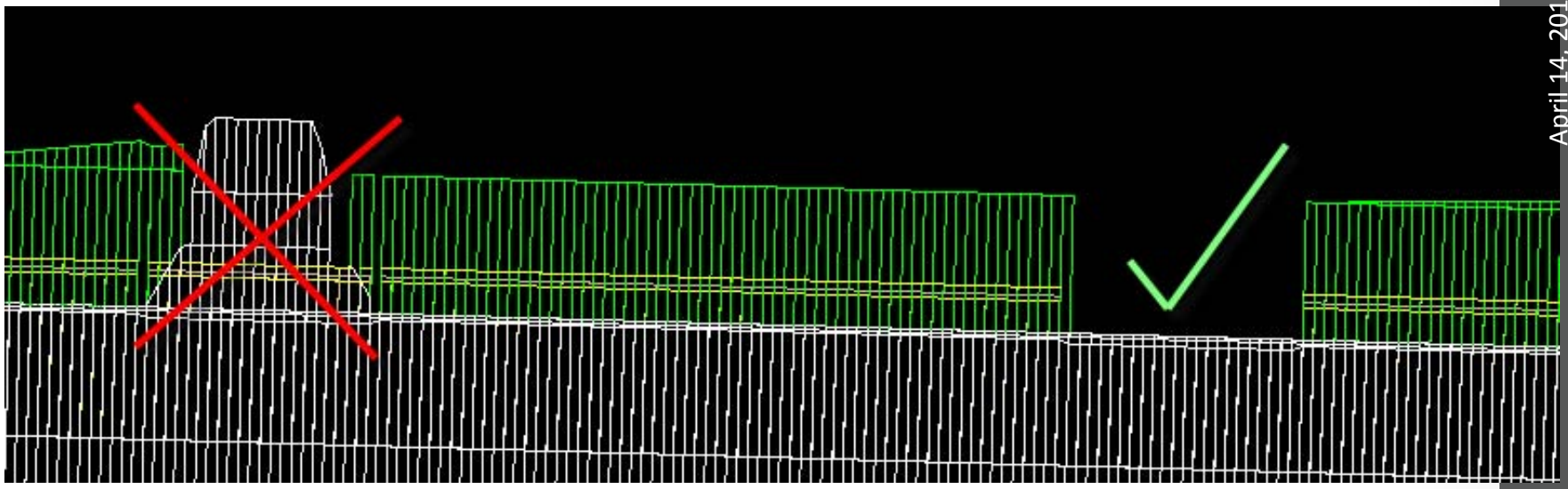
Design Guidance: What not to model



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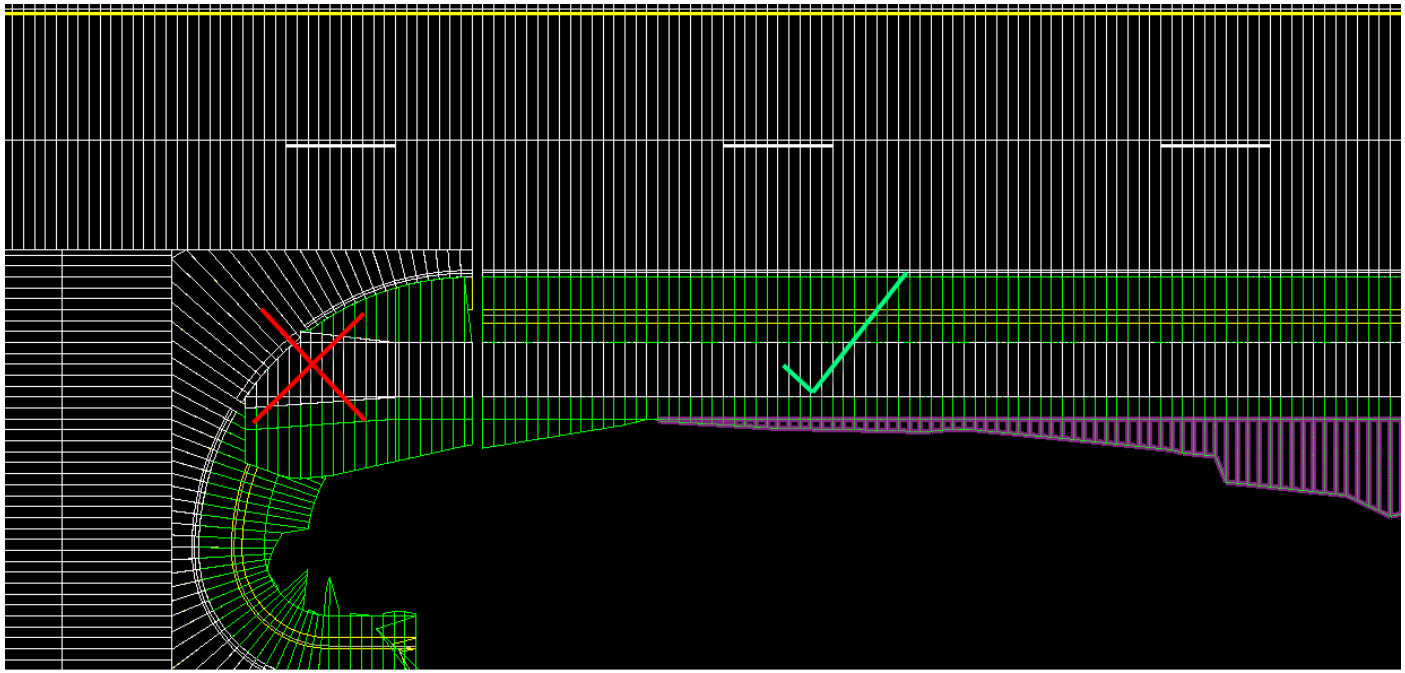

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Key Takeaways from our Transition to 3D Design

- **Change will take time, and it will not be easy**. This is a new environment that for some will be exciting and for others it will be scary. 3D Design requires designers to think differently than with traditional 2D design and you have to allow for that transition. The key is you are bound to encounter resistance and that's OK.

- **Not plug and play**. Take the time to review your development process and examine how moving to a 3D environment may affect your workflow. Some of the changes may be subtle, and may result in significant changes to how work is accomplished. The key is its an opportunity to improve the process.

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Key Takeaways from our Transition to 3D Design

- **Communicating Design Intent**: At the end of the day a plan is nothing more than a communication tool and what it communicates is design intent. Moving to a 3D environment provides the opportunity to communicate more effectively with designers, contractors, stakeholders and the pubic.

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- Questions?????

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