**Utilization of 3-D**

**Bridge**
- Promotes the use of 3D modeling in the development of bridge site plans
- Visualization of complex existing conditions leads to better site layout
- Clash detection

**Road**
- Shows connectivity of bridge to:
  - Approach roadway
  - Warping end slopes
  - Riprap and embankment

**Construction**
- Can identify constructability issues earlier
- Promotes buy-in of resource agencies that have difficulty visualizing end product
- Allows machine grade control

Provides information for multiple disciplines to make engineering decisions.

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**Utilization of 3D: Road**

- Road Design’s utilization is more design and construction oriented
  - 3D models are conducive to efficient machine-controlled construction
- Provides great visual for landowners, utilities, and others impacted by project footprint
**DESIGN ADVANTAGES OF 3D**

- 3-D (visualization) helps to mitigate risks:
  - Verify survey data
  - Identify utility and right-of-way conflicts
  - Identify design and construction conflicts
  - Clash detection
- Fast and accurate quantity calculations
- Project visualization
  - Can be used to convey the design intent to non-technical audiences such as: public, politicians, property owners, etc.

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**CONSTRUCTION ADVANTAGES OF 3D**

- Constructability and sequencing issues identified before work begins
- Visualization of final contours over complex existing conditions enhance project intent
- Machine grade control - Road
Projects incorporating 3D:

- Musselshell River - 7m NE Roundup
- Deer Lick Cr – 6m E West Glacier
- S Fk Flathead – Hungry Horse
- Morrel Creek – Seeley Lake South

Musselshell River is known for its erratic flooding and ever-changing channel. The hydraulics of the river near Roundup dictated a complicated site plan for this bridge replacement project. A 3D model of the crossing was key in both the design and detailing phases of this project.
High seismic demands required a complicated reinforcing scheme for the abutment pile caps on this structure. A 3D model of the rebar layout helped facilitate plan sheet development and was referenced by the Contractor during construction.
Deer Lick Cr – 6m E West Glacier

TOOLS & IMPLEMENTATION

- Software
  - GEOPAK
  - OpenRoads
  - PDF
- Training
- Selecting projects
  - Requires more upfront work

3D Bridge Demo
AUDIENCE PARTICIPATION

- Examples of where the advantages of 3D were realized
  - Identify survey blows
  - Clash detection
  - Constructability issues identified
  - Quantity calculations
- Public meetings: convey design intent to non-technical audiences such as the public, politicians

CONCLUSION

Where the road ends the, bridge begins...

- Use of 3-D tools can enhance:
  - Design
  - Resource agency and public understanding and acceptance of the project
  - Constructability
- The intent of a 3D model is to provide a comprehensive and true representation of a project, not only in the design phase, but also in construction.
Questions?

Cool round table!
Who built it?
Sir Cumference.