The Road Processing Goes on Forever

Transportation Corridor Grading Automation with Python

Presented by:

Jeremy Gaskins
Zach Lansford

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Introductions

Jeremy Gaskins

BGE, Inc.

Zach Lansford

BGE, Inc.

Agenda

1 **Background**

2 **Previous Workflow**

3 **Generating Actionable Data**

4 **Automating with Python**

5 **Using ArcGIS Online**

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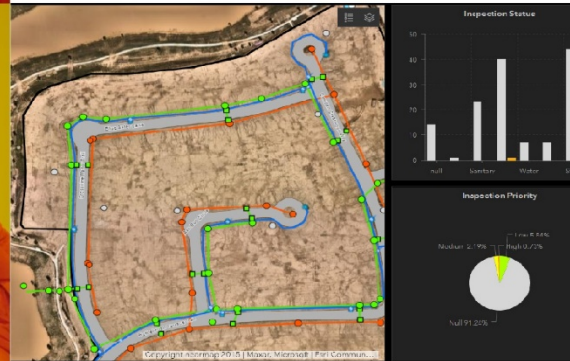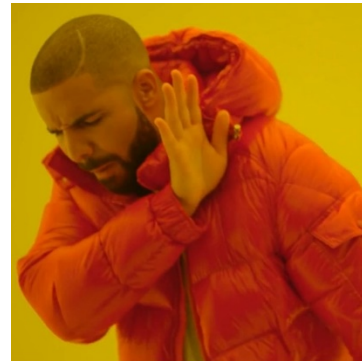- Civil Engineering Firm
- Office Locations
- Clients

Technology Solutions

- GIS Analysts
- Solution Architects
- Embedded Program

Project Information


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Workflow

- Overlay proposed ROWs on top of data sets and count, measure, and estimate
- Enter the data into a spreadsheet with formulas
- Relay results to clients and stakeholders

Issues:

- Very tedious and error-prone
- SPREADSHEETS
  - Fragile data storage
  - No real visuals or analytics to explain results
  - Easy to get multiple versions
- All data and results are basically thrown away when new possibilities come up or data changes
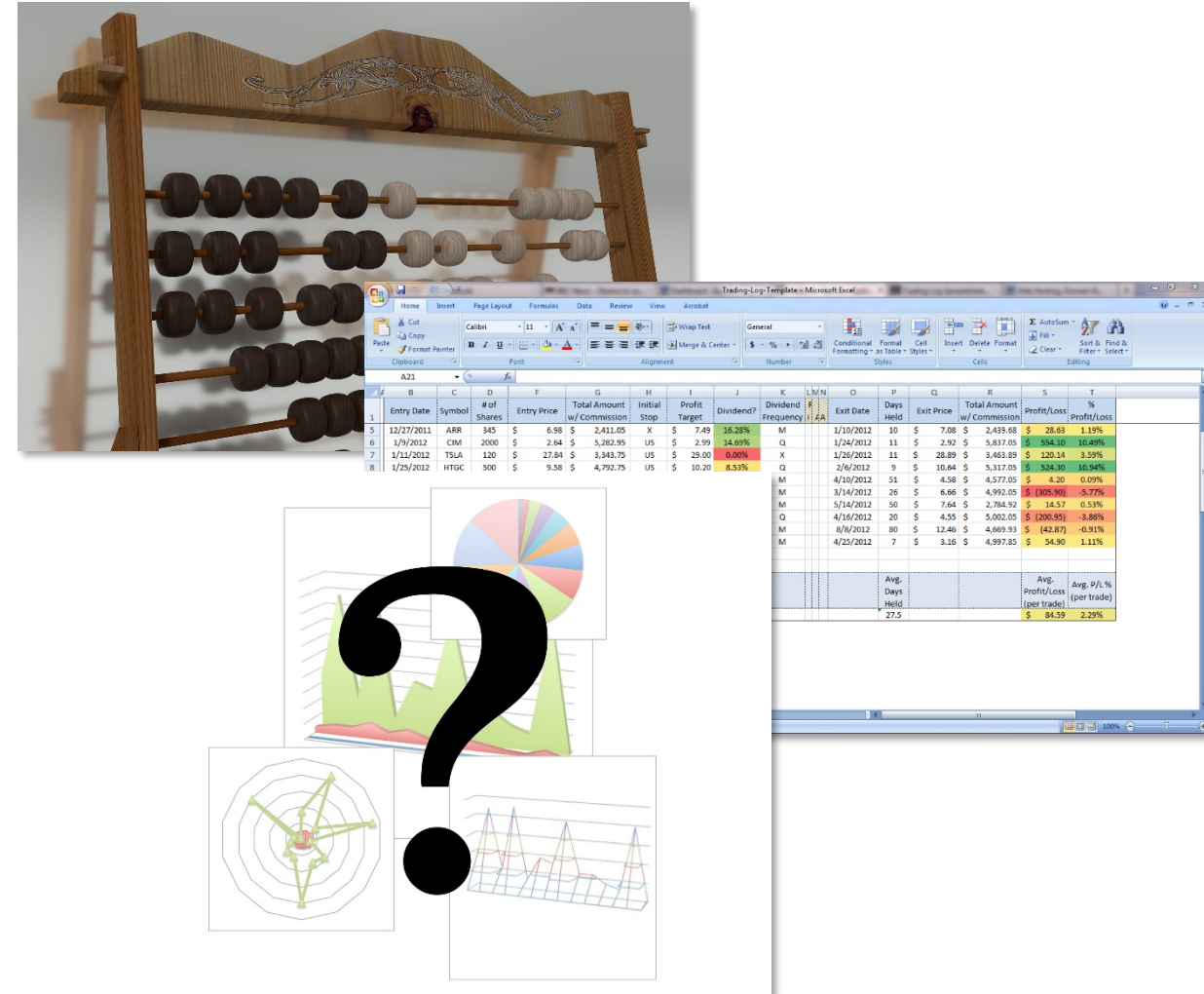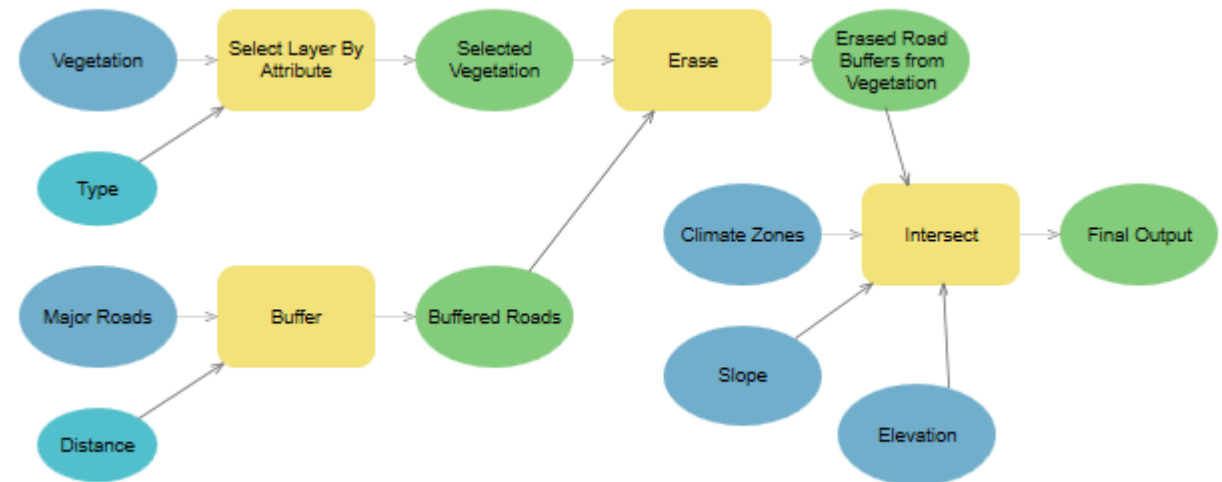
- **Understand the needs**
  - What is required to generate the final grading matrix?

- **Source the data**
  - Acquire the relevant datasets
    - FEMA Floodplains, Parcel Data, Building Footprints, etc

- **Manipulate the Information**
  - Determine which geoprocessing tools will be used

- **Benefits of Python**
  - Allows for iterative logic tools (for/while loops, if statements)
  - Allows for inclusion of functions available in other Python Libraries (os, numpy, re, etc)
  - Easily Repeatable once script is written

- **ArcGIS Notebooks**
  - Built off Jupyter Notebooks
  - Able to run Python Code within ArcGIS Pro Project
  - Easily Shareable

Geoprocessing Examples

Need

| Acres of ROW Acquisition Required |

Solution

→ | Sum the acreage of parcels that fall within Route ROW
arcpy.analysis.summarizeWithin |

| Number of Streams or Waterbodies intersected |

→ | Create intersections between Route and Streams
arcpy.analysis.TabulateIntersection |

| Residential Displacements |

→ | Classify Building Footprints based off parcel classification
arcpy.analysis.TabulateIntersection
Calculate number of buildings that fall within Route ROW
arcpy.analysis.Statistics |

- **Creating the Suitability Matrix**
  - Worked with engineering team to create grading ranges for each dataset that was manipulated
    - 50 homes displaced was a 1, while 5 homes displaced or less was a 5
  - Summarized and weighed scores
  - Final Values were both assigned to Route feature and Excel output

Western Caldwell County Transportation Study
Alternatives Evaluation Criteria Data

CAMPO — CAPITAL AREA METROPOLITAN PLANNING ORGANIZATION — CENTRAL TEXAS

	Weight	Yellow	Red	Purple	Blue	Green	Light Blue	Gray	Maroon	Pink	Orange
Mobility/Engineering											
Route Length (mi)	3	9.49	9.96	10.16	8.39	11.10	10.19	10.22	9.59	9.79	7.95
Western Terminal	5	4	5	5	2	4	5	5	4	4	1
Eastern Terminal	5	2	5	5	1	5	5	5	4	5	2
Land Use											
Parcels Impacted	3	90	119	107	38	156	121	95	99	117	28
Residential Displacements	5	5	32	2	6	56	6	2	1	16	4
Commercial Displacements	5	0	1	0	0	20	0	0	0	2	0
Other Displacements	4	2	4	1	3	3	2	1	1	6	0
Number of railroad crossings	3	1	0	0	0	0	1	0	1	1	0
Prime Farmland Impacted	3	190.40	230.85	238.35	114.57	247.42	239.25	244.93	174.92	219.20	170.53
Impacts to Fire Departments	2	0	0	0	0	0	0	0	0	0	0
Number of Roadway Crossings	2	9	13	14	9	28	13	11	18	17	7
Environmental											
Archaeological & Historic Resource Pr	3	3	4	6	1	7	5	4	5	3	0
Impacts to Petroleum Storage	3	0	0	0	0	2	0	0	0	0	0
Stream Crossings (#)	3	8	10	11	13	10	10	12	9	11	9
Wetlands impacted (acres)	4	2.95	1.35	1.67	6.00	1.60	4.46	2.14	3.52	4.47	3.24
Waterbodies impacted	4	1.72	0.00	0.26	3.28	0.17	0.41	0.32	2.22	0.26	0.93
Floodplains/Floodways (acres)	4	21.41	30.21	29.28	42.07	42.09	44.42	31.64	23.59	44.17	49.53
Utilities											
Oil/Gas Pipeline crossings	2	6	6	6	2	6	6	6	6	6	3
Transmission power line crossings	3	2	3	4	3	5	6	3	4	2	2

- **Pushing to AGOL**
  - Encountered issue with trying to automatically publish results to AGOL
    - Dashboards and other applications would break if we overwrote the published feature
  - Used Delete and Append functions to keep Dashboards online
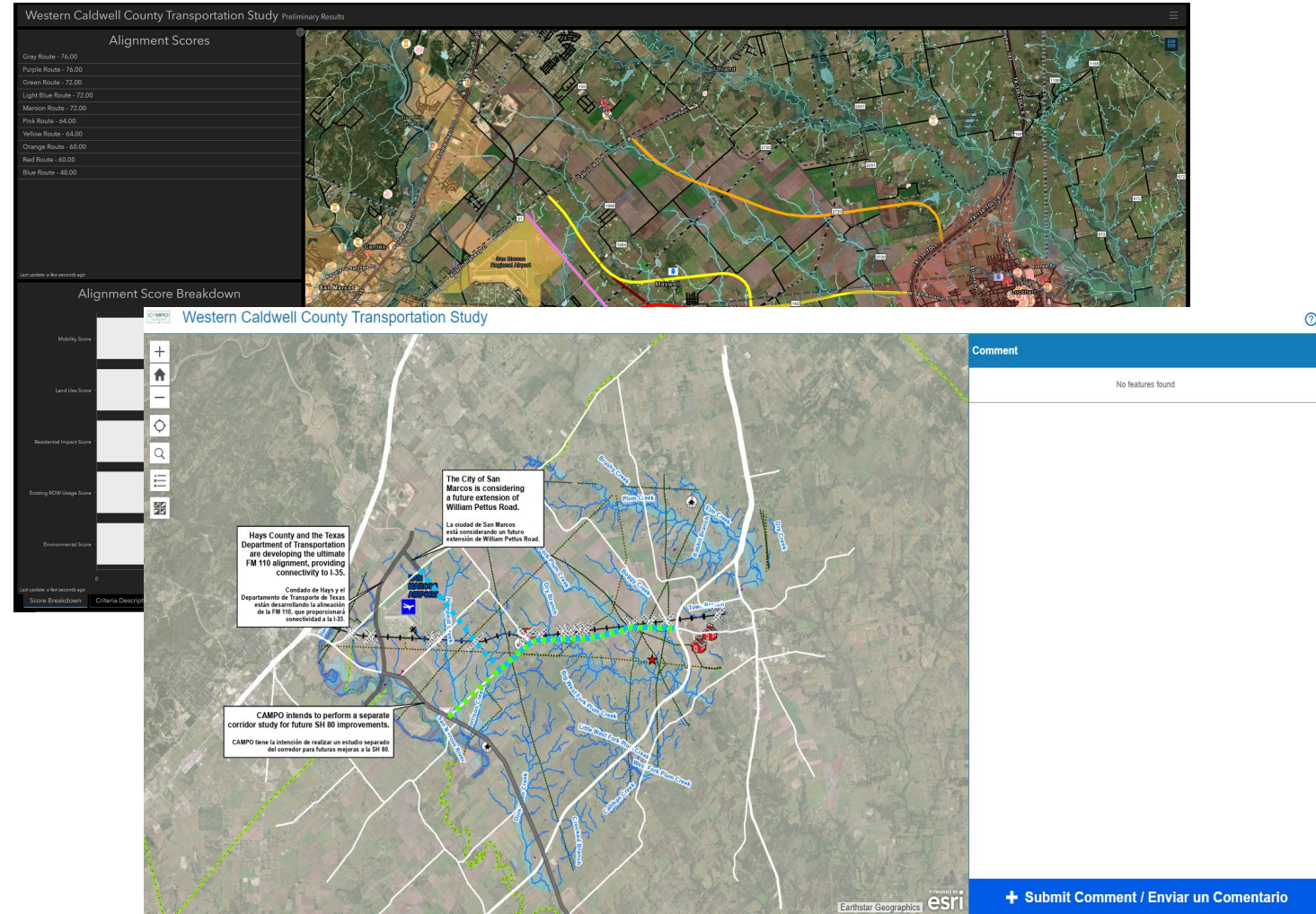   - Written into the script – no manual effort needed

- **Viewing our Results**
  - Dashboard
    - Provided way to visualize both routes, data used, and results all in one page
  - Public Engagement App
    - Built off Crowdsource Reporter tool
      - Provided opportunity from public to provide feedback on possible routes and view grading

Conclusion

Results and Benefits

- Increased efficiency and accuracy of data

- Repeatable solution that provides an easier way to consume the results

- Utilize our skills and introduce new ideas to our organization

- Collaborate with our partners and clients to better understand their needs

QUESTIONS?

Contacts

Jeremy Gaskins

BGE, Inc.

jgaskins@bgeinc.com

Zach Lansford

BGE, Inc

zlansford@bgeinc.com