Mundane Civil 3D Tasks to Automate with Dynamo for Civil 3D

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About the speakers

Stacey Morykin

- 20 years experience in AEC Industry
- Associate Degree in Computer Science
- Teaches Engineering Graphics at local college
- Autodesk Certified Professional in Civil 3D
- President of User Group in Philadelphia, PA

Dylan Kahle

- 8 years experience in AEC Industry
- Bachelor’s Degree in Civil Engineering
- Autodesk Certified Professional in Civil 3D

Thank you,
Lab Assistants!

Key Learning Objectives

- Identify repetitive tasks in your daily workflow
- Learn how to import and manipulate AutoCAD Objects and/or Civil 3D data
- Produce Dynamo for Civil 3D scripts to automate repetitive tasks
- Discover ways that Dynamo for Civil 3D can elevate efficiency

Class Agenda:

- What is Dynamo and Why would I use this?
- Lab Format / Structure
- Complete 3 Scripts in Dynamo
  - Changing a Layer
  - Combining an Alignment / Point table
  - Placing trees along an alignment
- Dynamo Community!

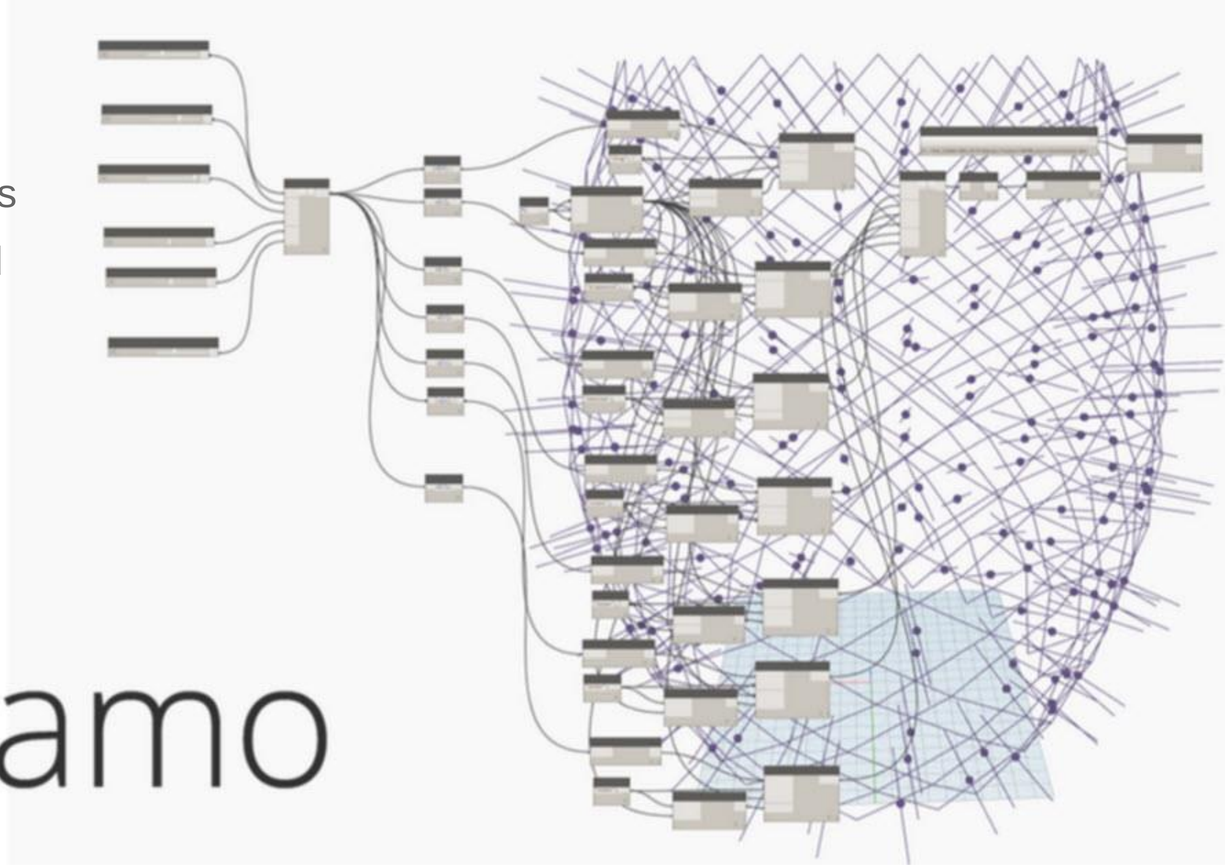
Not Covering today:

- Custom nodes using Python, C#, etc.

Intro to Dynamo

What is Dynamo?

Dynamo is a visual programming environment that lets designers create visual logic to explore parametric conceptual designs and automate tasks.



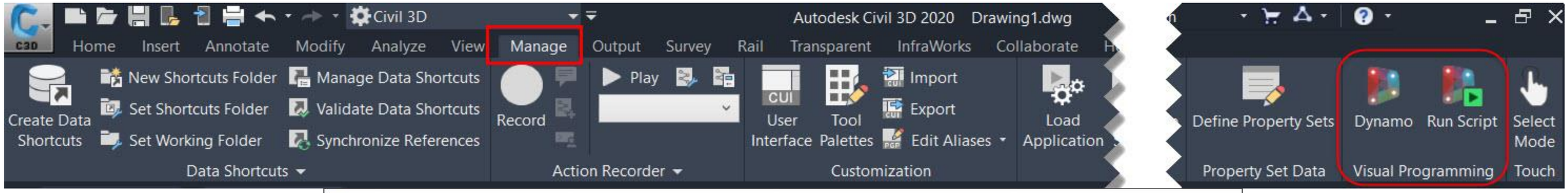
- Visually write code!
- Easy for non-programmers!

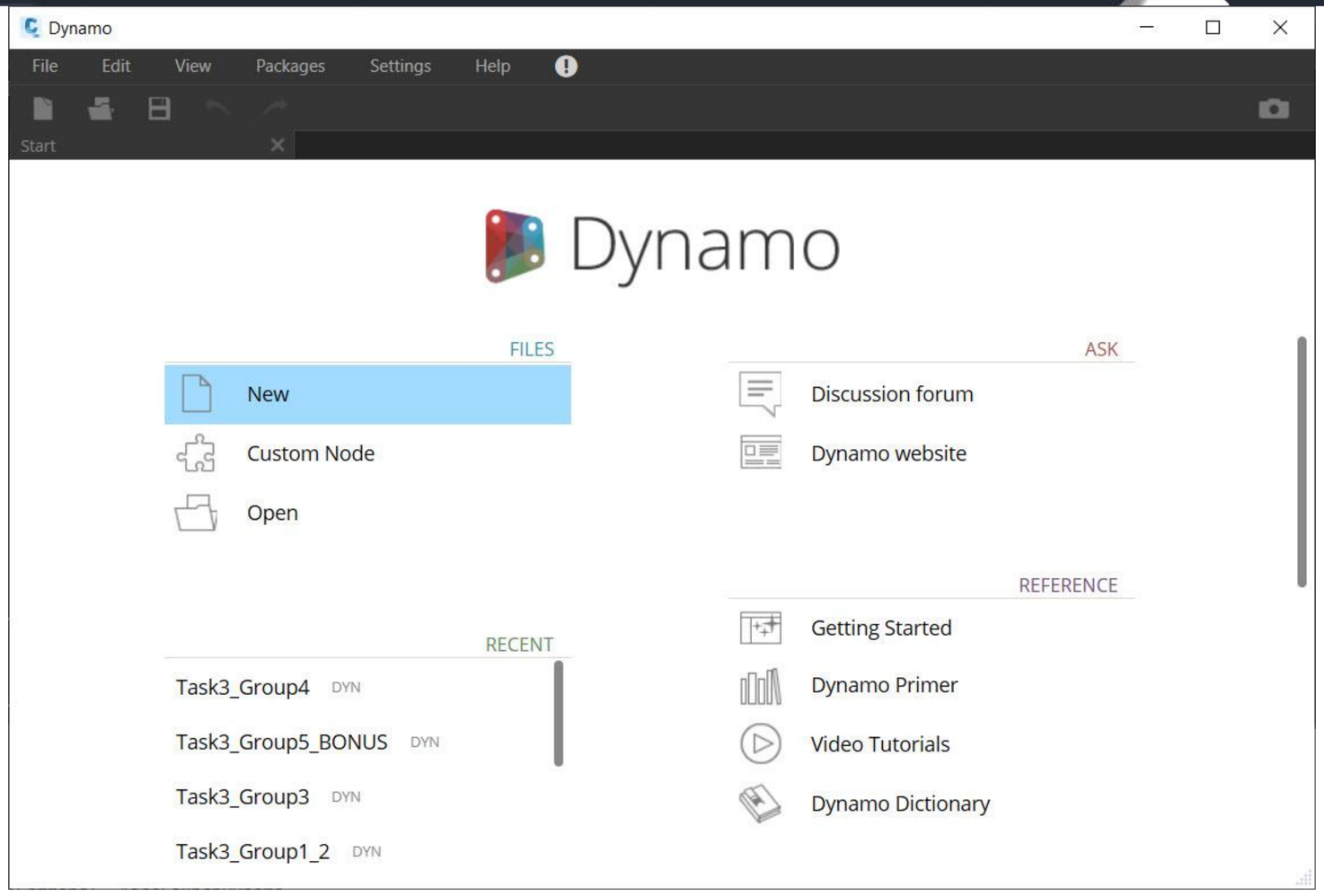
Dynamo

Why should I use this?

- Automate repetitive tasks, reduce the number of clicks!
- Access the data within Civil 3D
- Easier to visualize, not just code (text)
- Improve efficiency and productivity

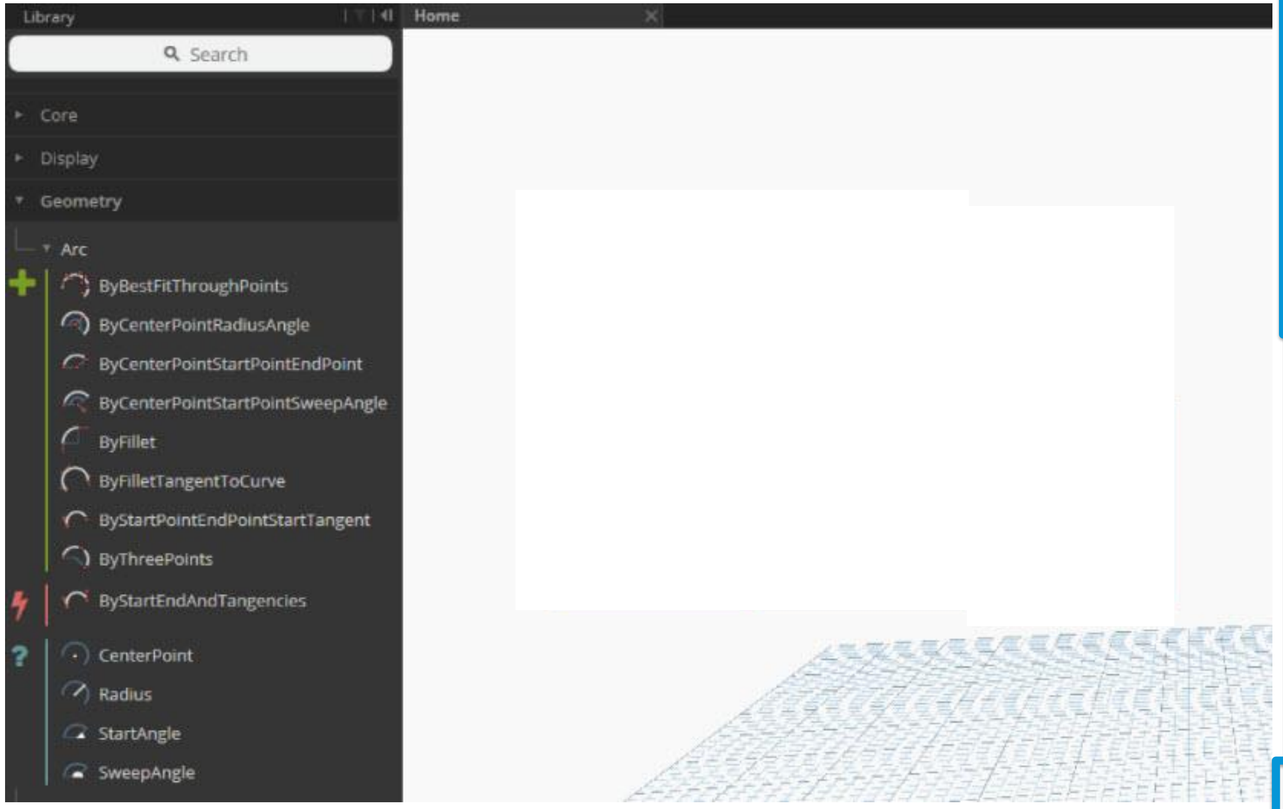
Opening Dynamo for Civil 3D



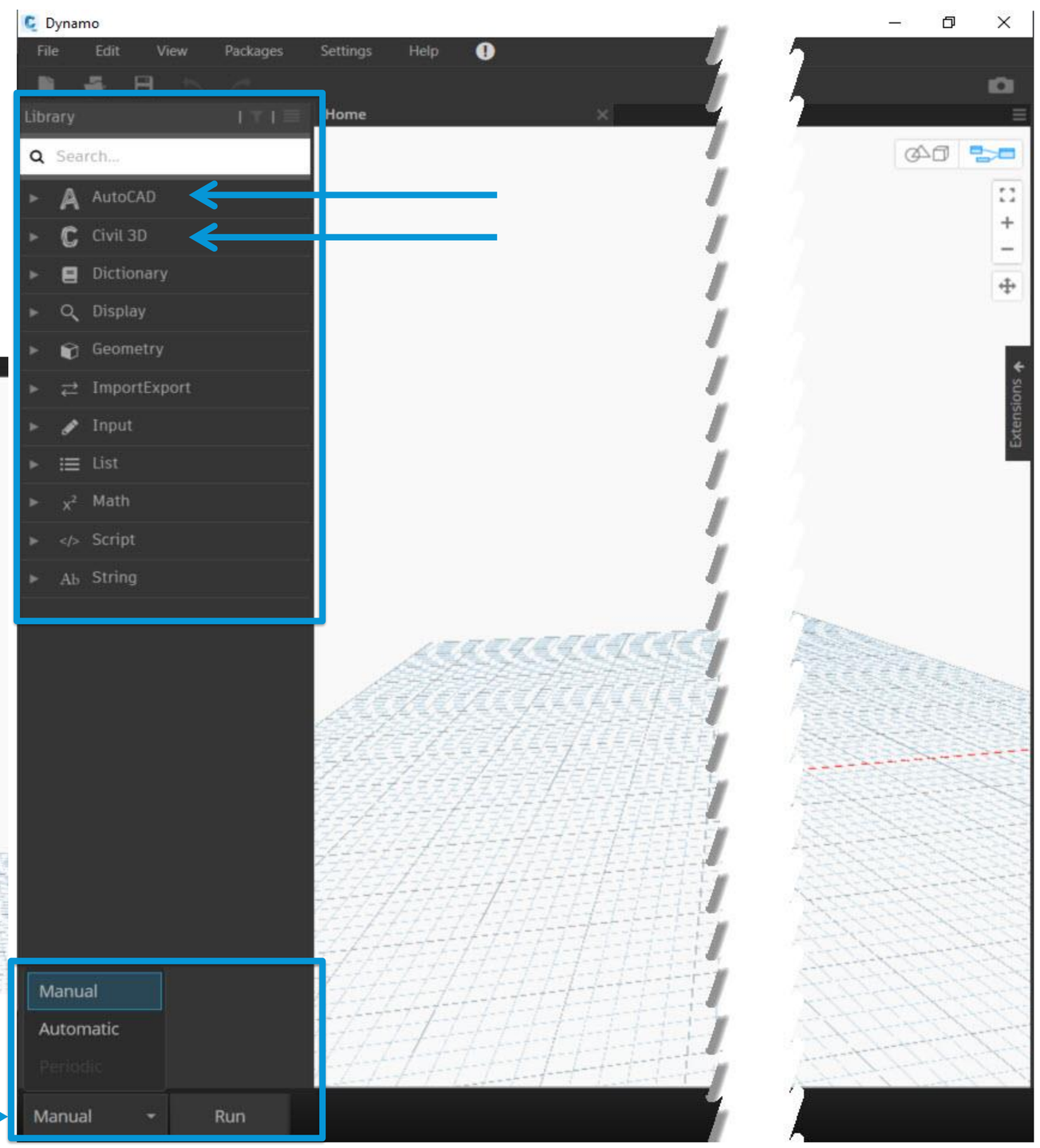


Before we start…

1. Library
   - All nodes organized in categories
   - “Node” is an operation
2. All nodes perform an operation

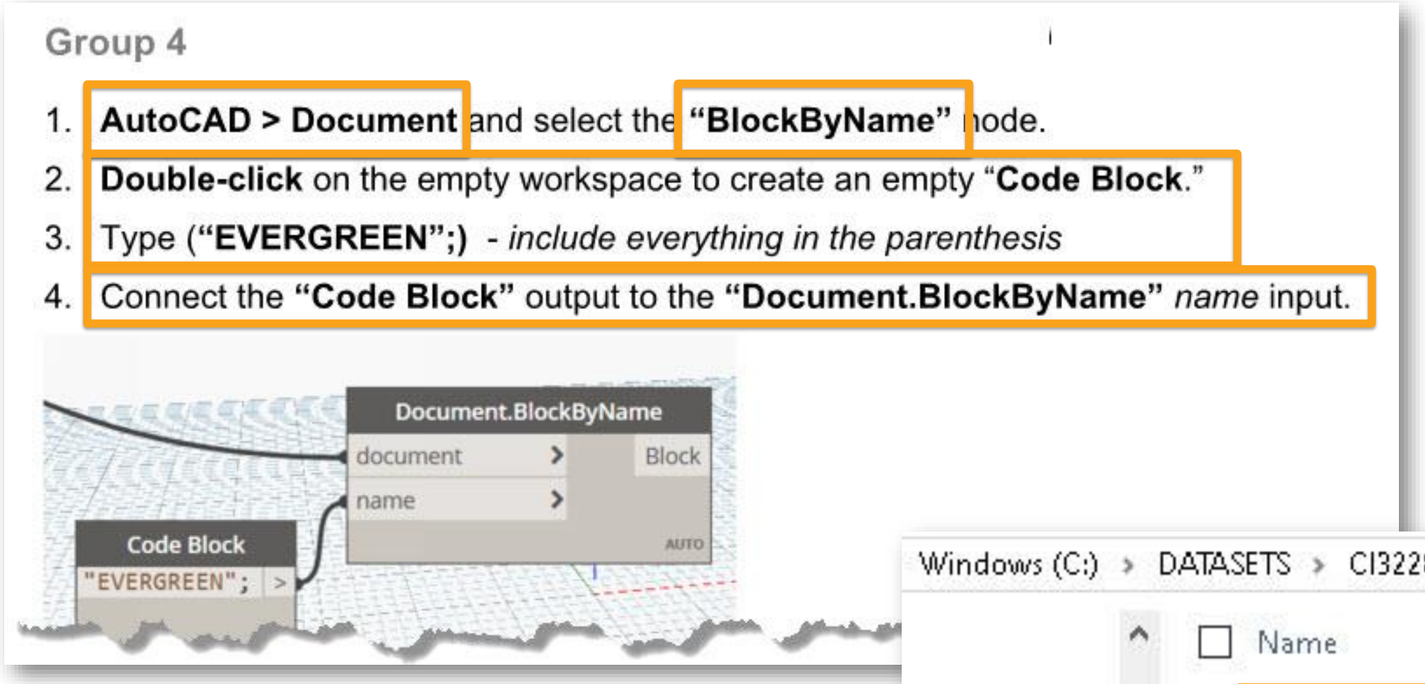


3. Execution Bar
   - Different options for running the program



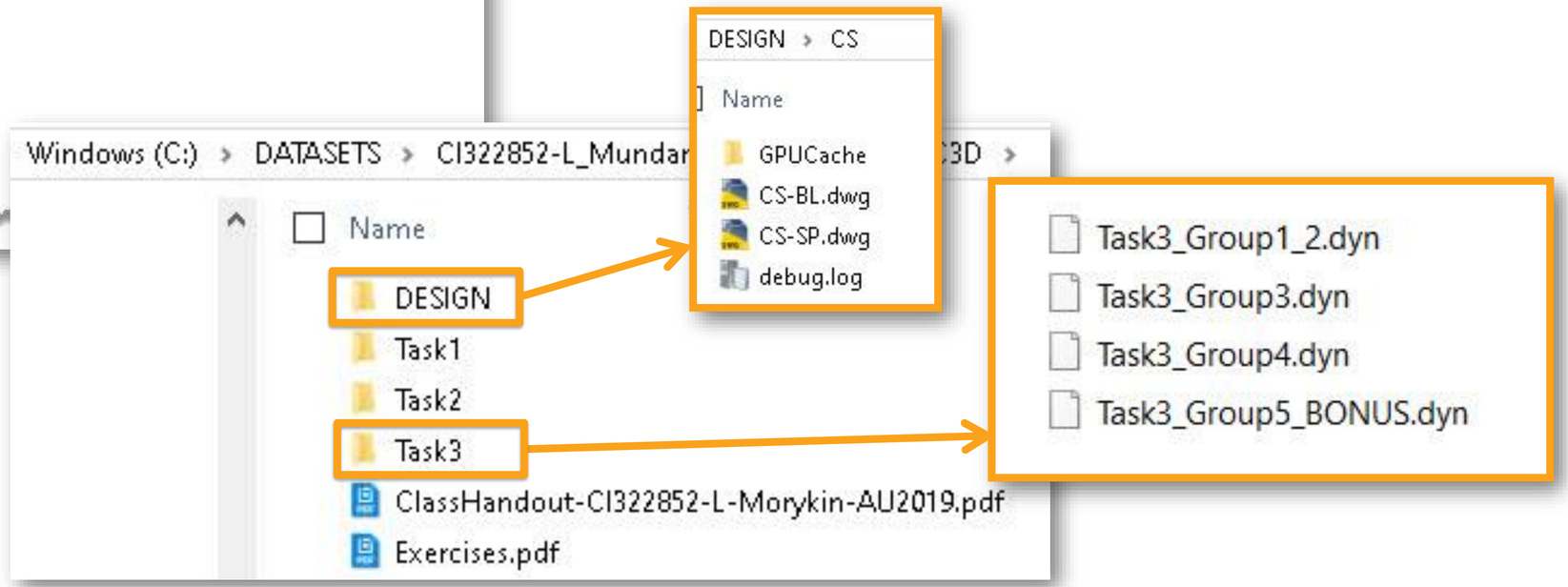
Lab Format / Structure

1. Why we chose this task
2. Demo of individual steps to complete
3. Try the exercise on your own!



- Category > Sub-Category
- Node name in **BOLD**
- Actions
- Use wires to connect outputs to inputs

4. Location of Data Set



POWER CLAP!

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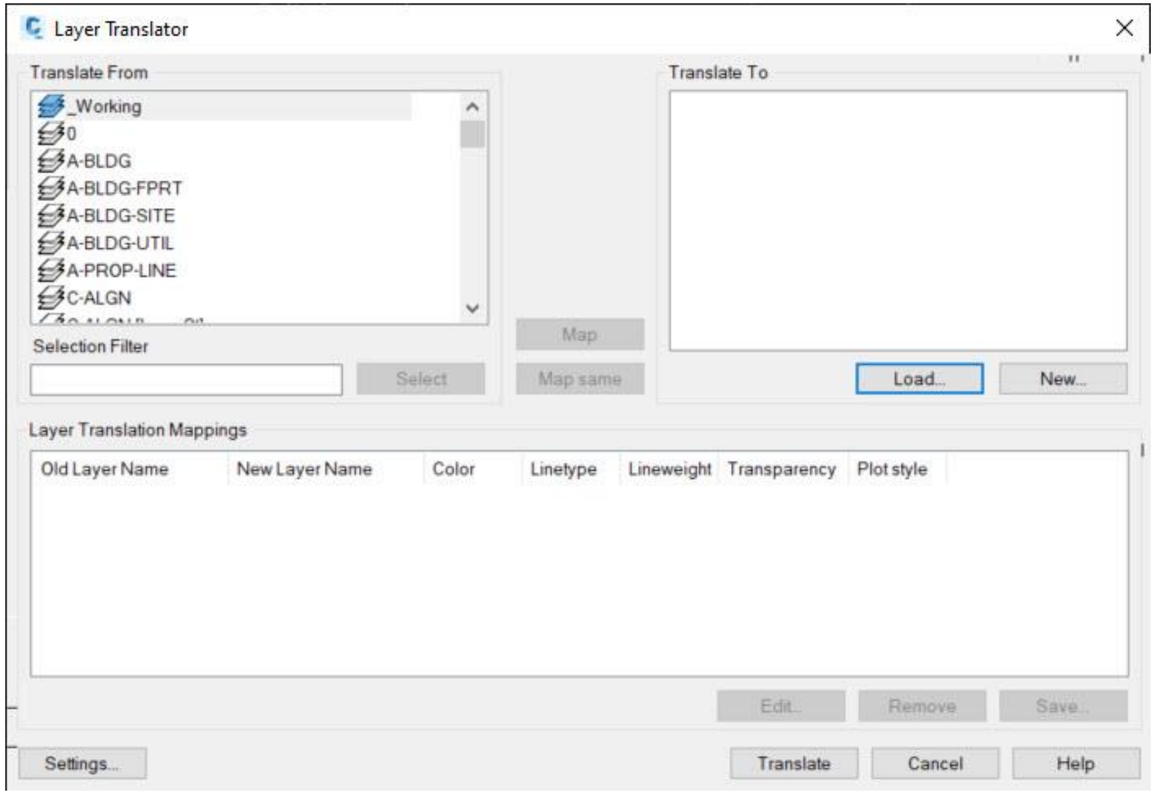
Task 1 – Changing Layers

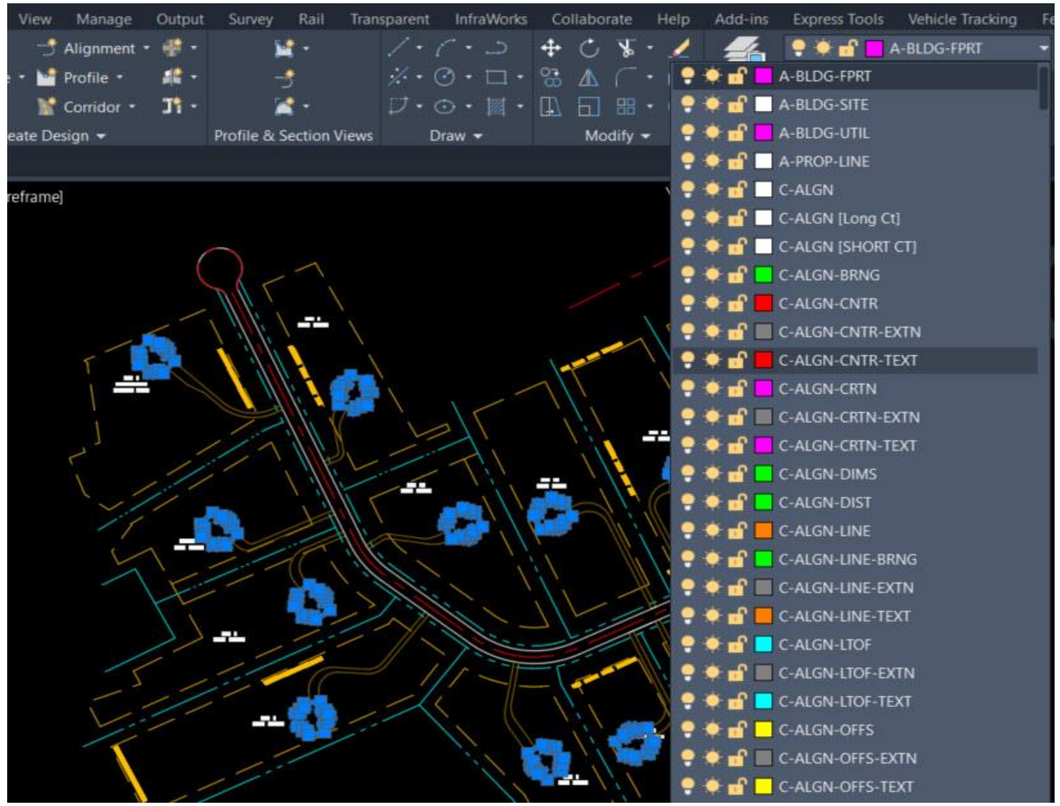
Why a graph for this task?



Method 1 – Layer Translator

Initiate Command, load the “translate to” side on the right, scroll on the left to click the layer, scroll on the right to click the layer, click map same, translate, accept;

7 Clicks



Method 2 - Manually

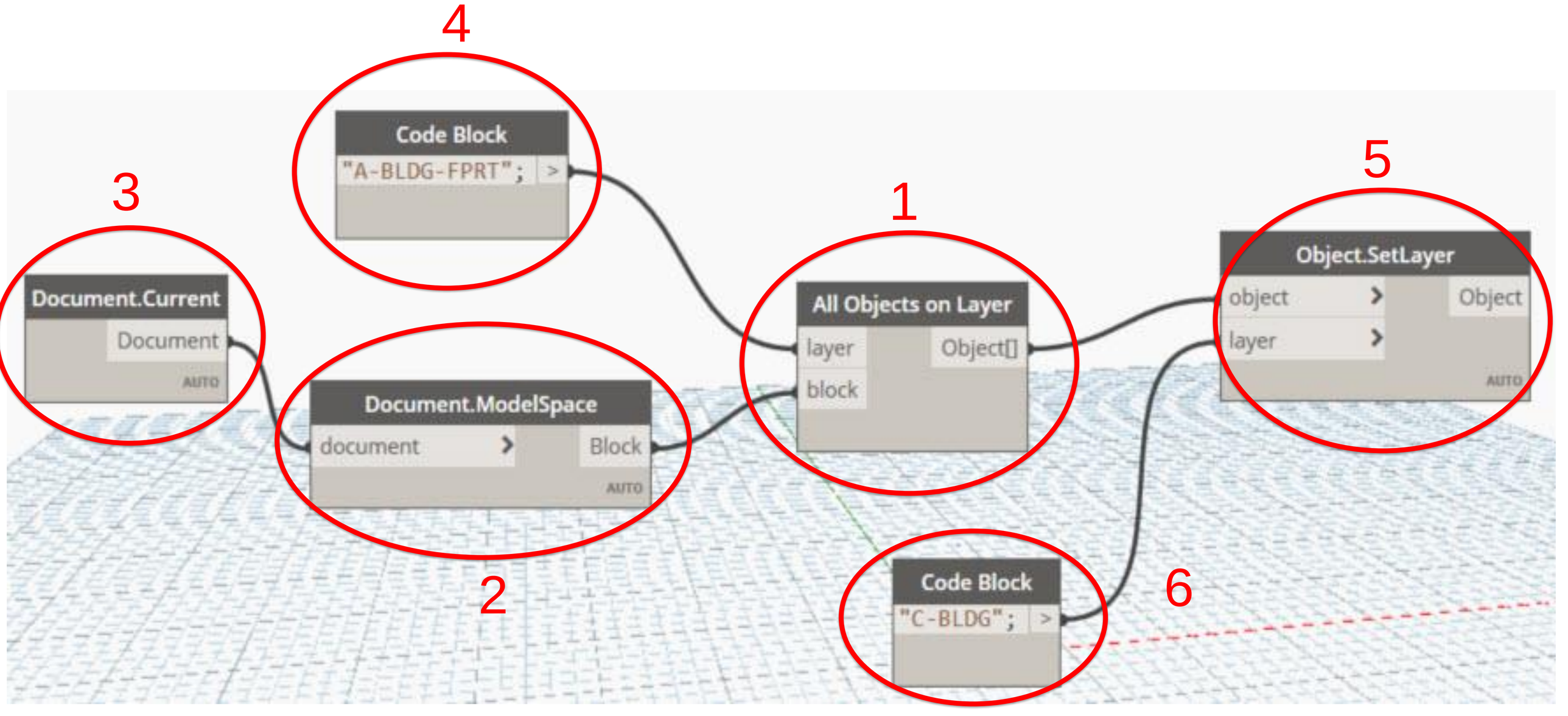
Select an object, right-click to select similar, click layer drop down, scroll to select new layer;

4 Clicks

Drawing with 200 layers, could take all day… Let’s Automate!

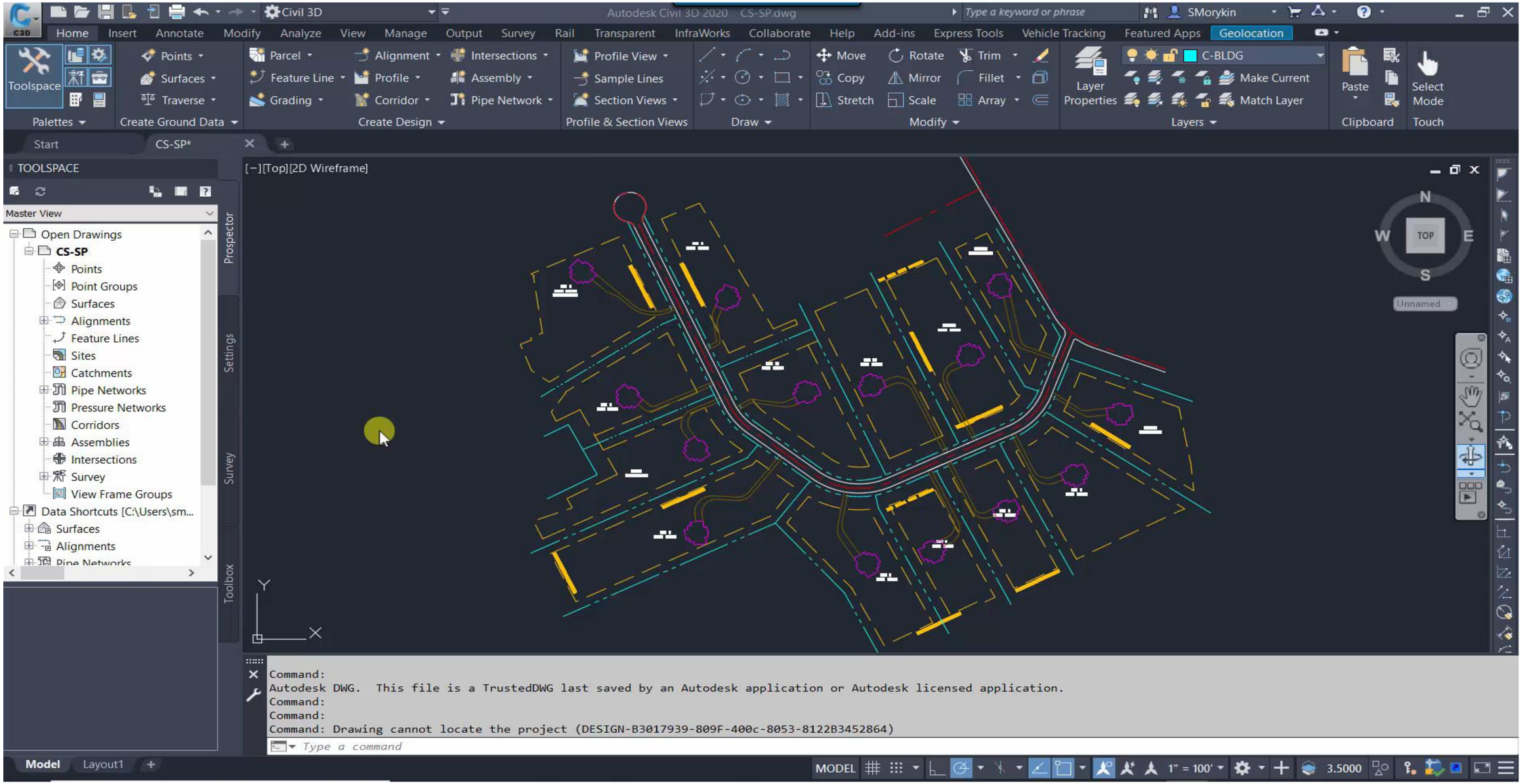
Where do I start?

Commands = Nodes in Dynamo!



Task 1

Try the Exercise Page 19 Handout



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POWER CLAP!

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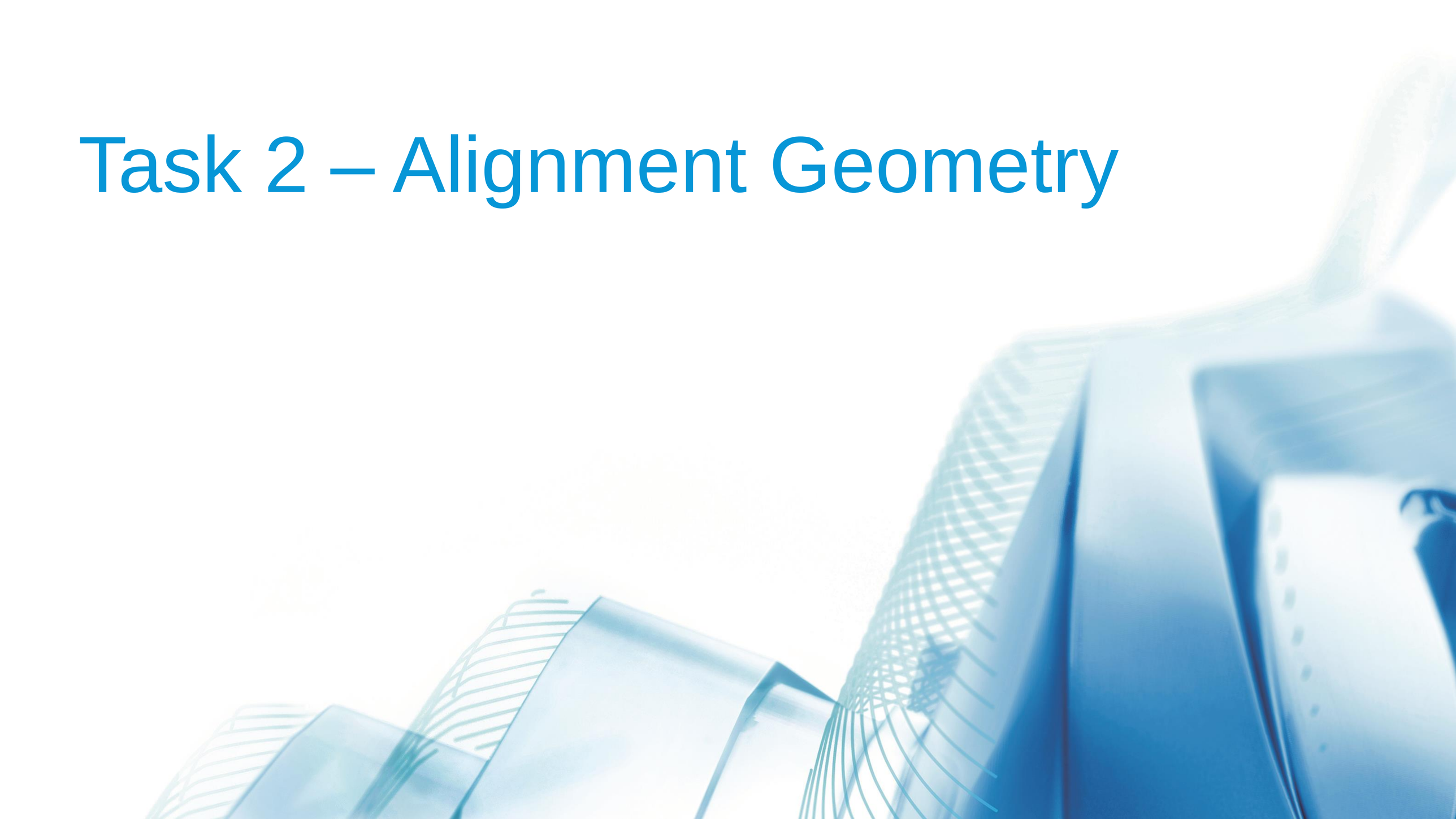
Task 2 – Alignment Geometry



Task 2: Introduction

LONG CT							
NUMBER	START STATION	END STATION	START NORTHING	STARTING EASTING	RADIUS	LENGTH	LINE/CHORD DIRECTION
L4	0+00.00	6+04.45	453354.9026	2633267.3670		604.45'	S 24°39'00" E
C4	6+04.45	7+01.24	452805.5353	2633519.4683	200.00'	96.79'	S 38°30'51" E
L5	7+01.24	9+28.61	452730.5394	2633579.1528		227.38'	S 52°22'41" E
C5	9+28.61	11+48.15	452591.7382	2633759.2467	200.00'	219.53'	S 83°49'26" E
L6	11+48.15	15+19.07	452569.2875	2633966.7113		370.92'	N 64°43'49" E
C6	15+19.07	16+73.66	452727.6256	2634302.1381	200.00'	154.59'	N 42°35'14" E
L7	16+73.66	18+75.67	452838.6293	2634404.1652		202.02'	N 20°26'38" E

Alignment Table

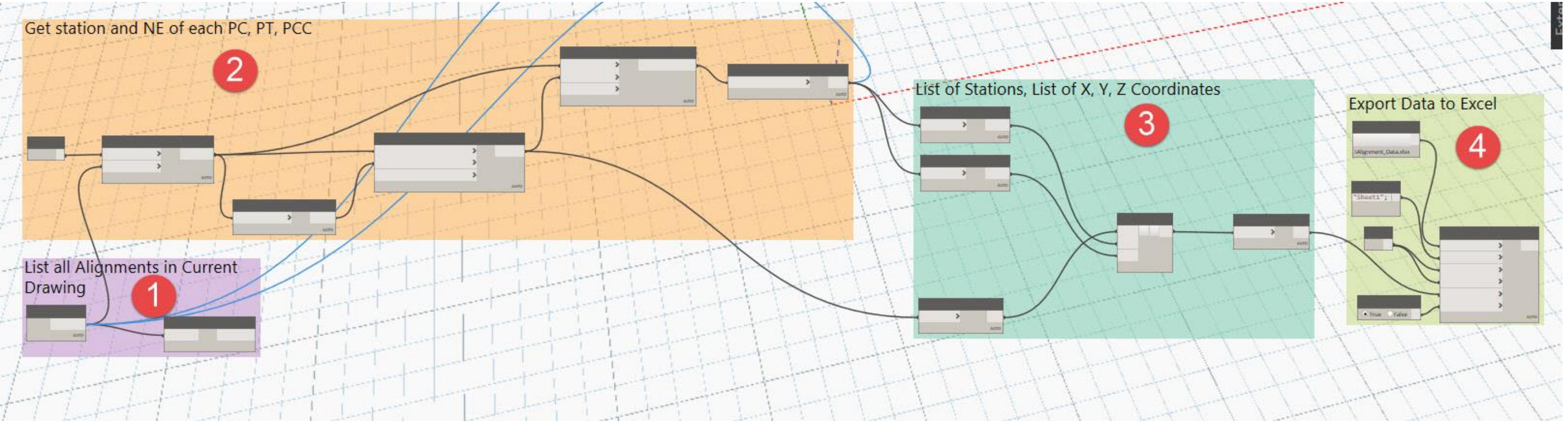
- Rigid in displayed information
- Customization takes time
- Static once customized

TIES & ALIGNMENT DATA						
NO.	STATION	OFFSET	BASELINE	North COORD.	East COORD.	REMARKS
21	22+43.34	54.00' RT.	RTE. 130 C.L.	498751.5703	2008806.9045	RAMP "M" P.C. – 8+84.97
22	24+11.87	73.18 RT.	RTE. 130 C.L.	498871.3633	2008927.0268	RAMP "M" P.C.C. – 10+54.97
23	25+15.50	109.45 RT.	RTE. 130 C.L.	498929.7457	2009019.9999	RAMP "M" P.C.C. – 11+64.97
24	25+88.01	161.94 RT.	RTE. 130 C.L.	498953.6719	2009106.2473	RAMP "M" P.C.C. – 12+54.97
25	316+68.49	85.87 LT.	RTE. I–195 B.L.	498556.5344	2009095.9472	RAMP "M" P.C.C. – 19+29.94
26	313+23.74	66.00 LT.	RTE. I–195 B.L.	498625.1869	2008757.5280	RAMP "M" P.T. – 22+43.34
27	32+86.10	54.00' RT.	RTE. 130 C.L.	499566.6922	2009457.2471	RAMP "N" P.C. – 6+99.04
28	29+41.35	73.87 RT.	RTE. 130 C.L.	499284.8105	2009257.7755	RAMP "N" P.C.C. – 10+44.55
29	27+85.22	183.57 RT.	RTE. 130 C.L.	499094.3447	2009246.1431	RAMP "N" P.T. – 12+43.47
30	320+57.13	187.01 LT.	RTE. I–195 B.L.	498555.2601	2009497.5240	RAMP "N" P.C. – 18+38.28
31	321+41.30	121.45 LT.	RTE. I–195 B.L.	498470.4192	2009562.2141	RAMP "N" P.C.C. – 19+45.79
32	322+44.92	85.19 LT.	RTE. I–195 B.L.	498408.9462	2009653.1655	RAMP "N" P.C.C. – 20+55.79
33	324+13.46	66.00 LT.	RTE. I–195 B.L.	498347.4382	2009811.2525	RAMP "N" P.T. – 22+25.79

Needed Information

- Flexible in displayed information
- Easy to customize
- Maintain Dynamic nature

Where do I start?



Group 1

- List all alignments in current drawing

Group 2

- Get Station, X, Y Values
- Convert coordinates to points

Group 3

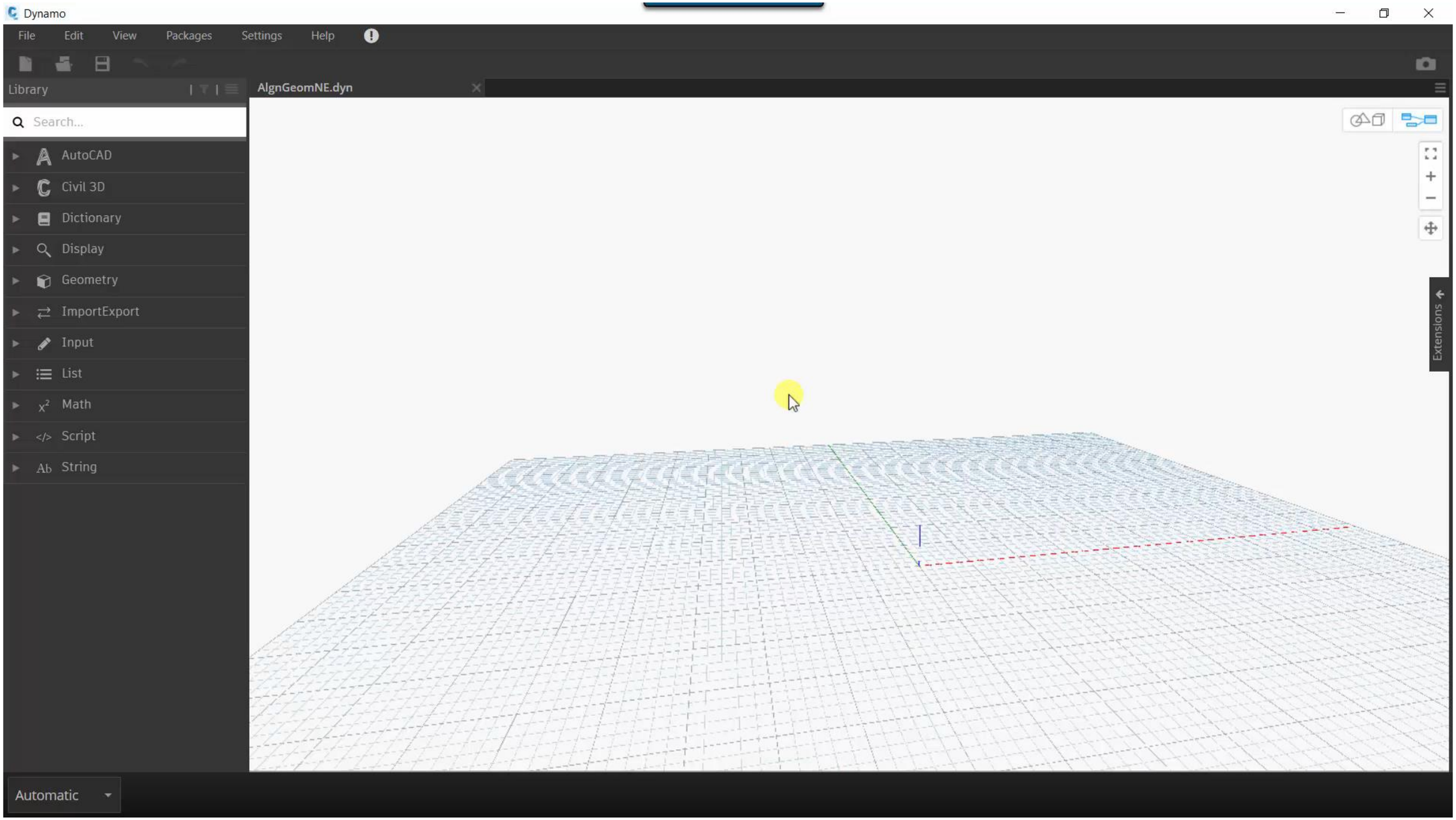
- Organize gathered info

Group 4

- Export to Excel

Task 2: Groups 1 & 2

Try the Exercise Page 32 Handout



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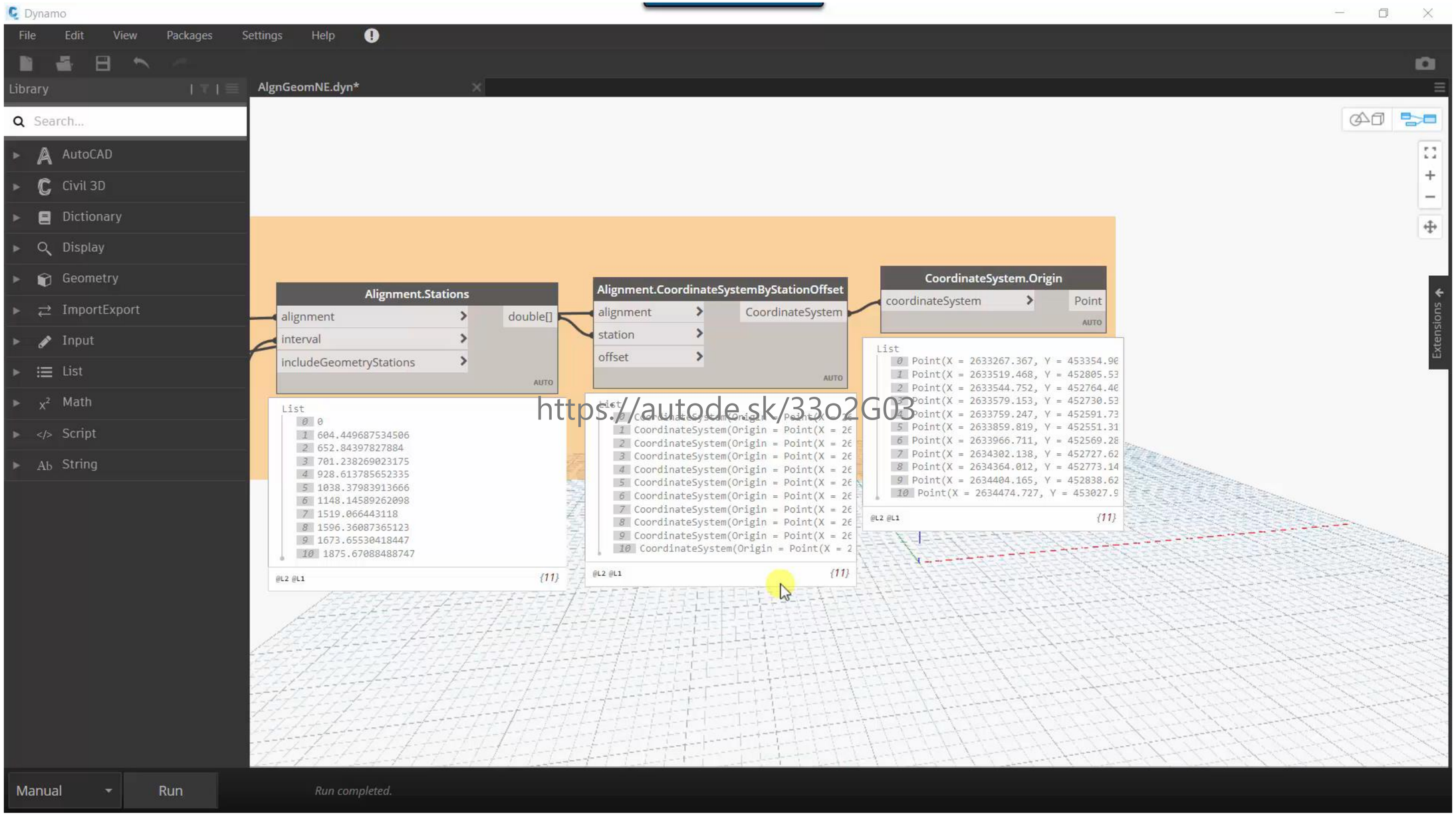
Task 2: Group 3

Try the Exercise Page 38 Handout



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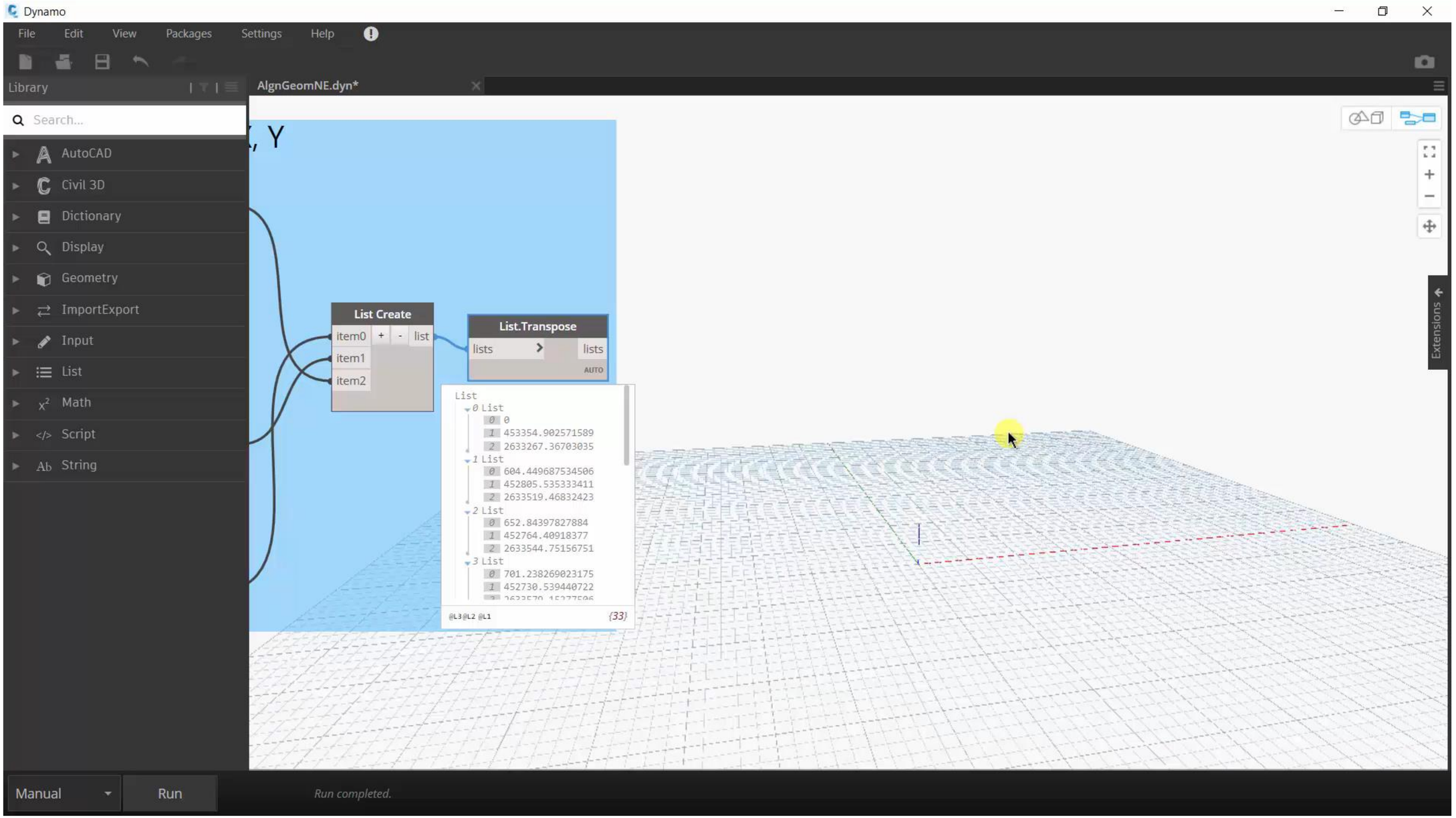
Task 2: Group 4

Try the Exercise Page 42 Handout



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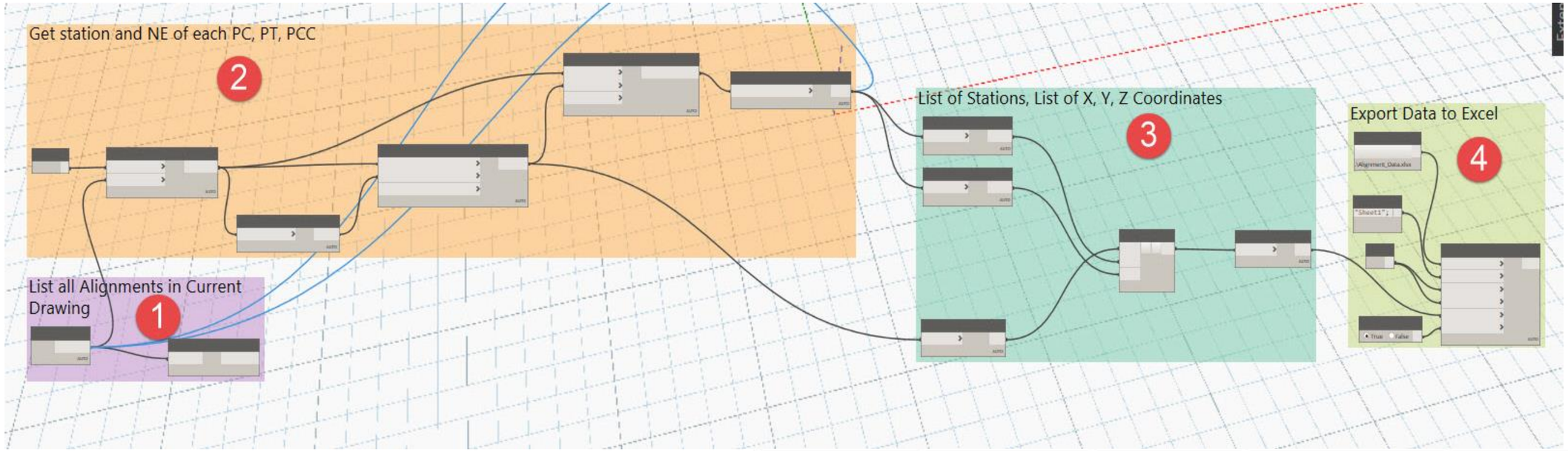
Task 2 Conclusion



- Capture data from within C3D
- Export to Excel

- Customized table in Civil 3D
- Dynamic

NO.	STATION	BASELINE	NORTHING	EASTING	REMARKS
	0+00	LONG CT	453354.9026	2633267.367	START
	6+04.45	LONG CT	452805.5353	2633519.468	PC
	6+52.84	LONG CT	452764.4092	2633544.752	MID
	7+01.24	LONG CT	452730.5394	2633579.153	PT
	9+28.61	LONG CT	452591.7382	2633759.247	PC
	10+38.38	LONG CT	452551.3103	2633859.819	MID
	11+48.15	LONG CT	452569.2875	2633966.711	PT
	15+19.07	LONG CT	452727.6256	2634302.138	PC
	15+96.36	LONG CT	452773.1452	2634364.012	MID
	16+73.66	LONG CT	452838.6293	2634404.165	PT
	18+75.67	LONG CT	453027.9208	2634474.727	END

POWER CLAP!

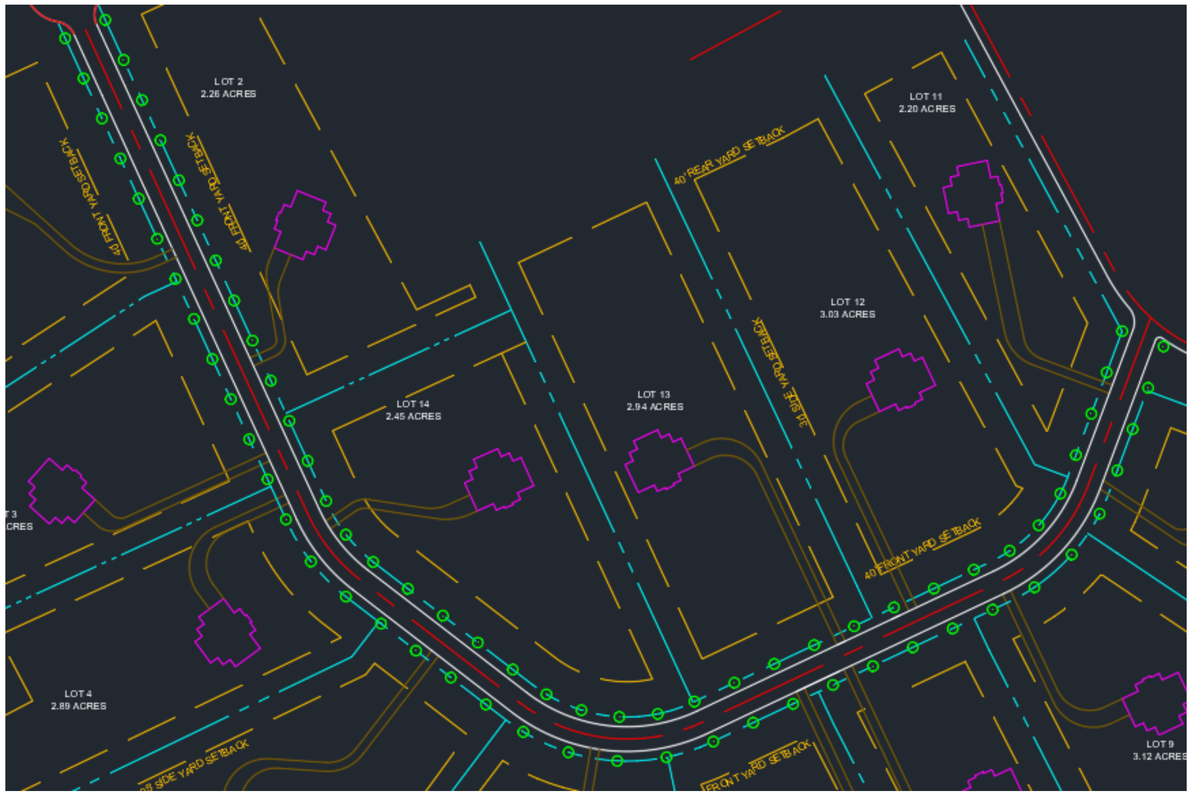
Image caption goes here

Task 3 – Create Block Along an Alignment

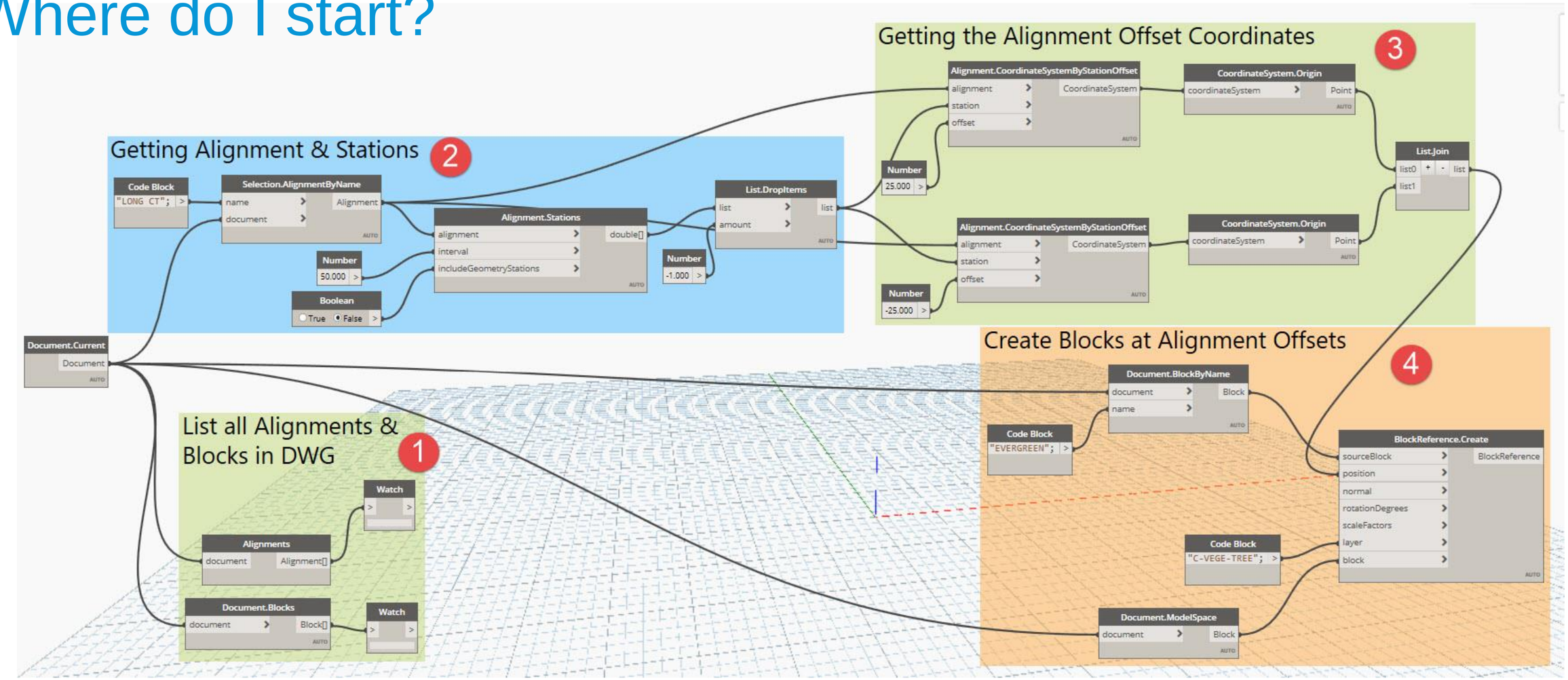
Task 3: Introduction

- Place a tree block along an alignment
- Why Automate?

- Steps needed:
  - Establish the alignment and block
  - Stations and offsets
  - Insert block



Where do I start?



Group 1

- List all alignments
- List all blocks

Group 2

- Get Alignment
- Get Stations

Group 3

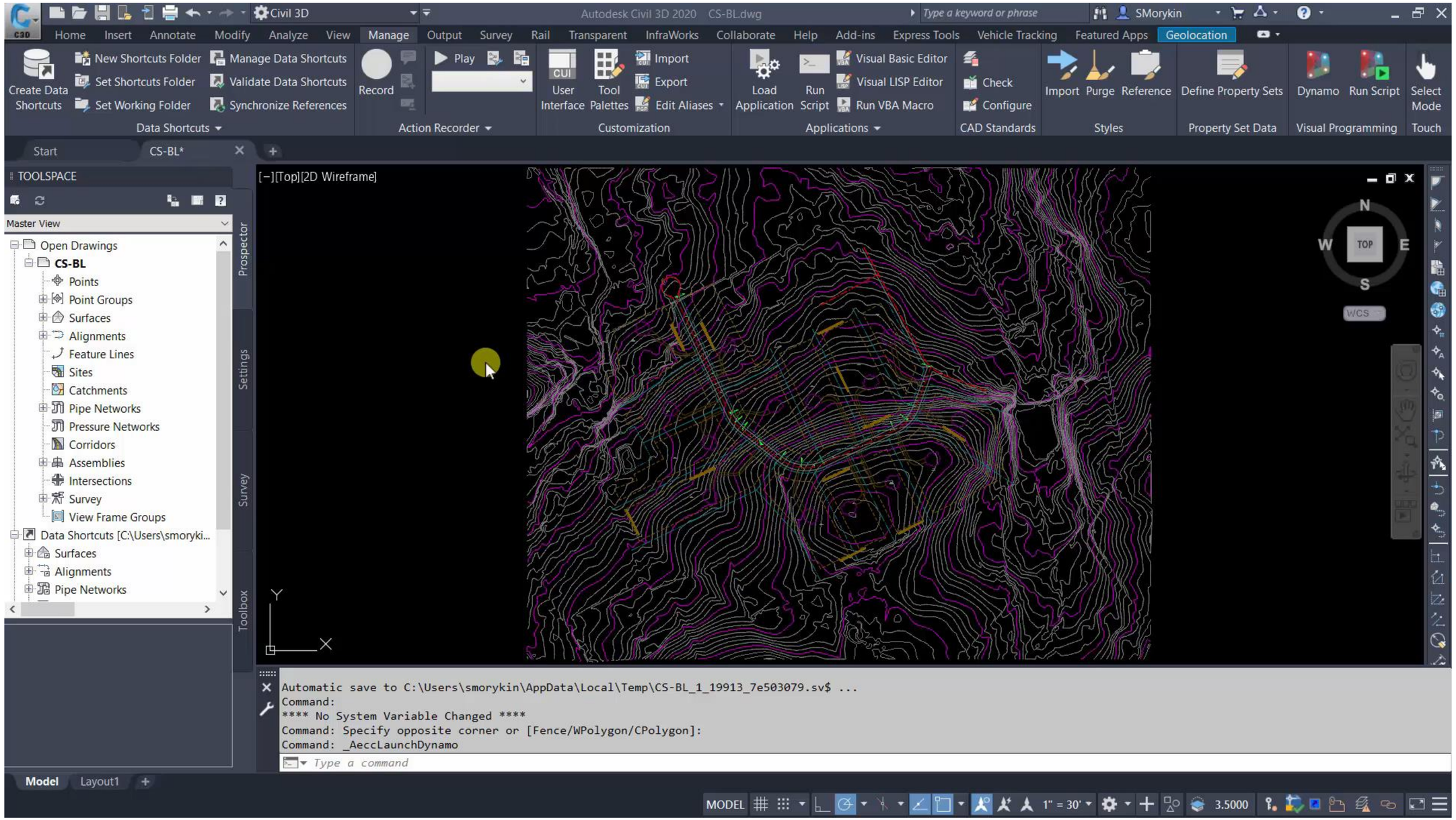
- Get Alignment offset coordinates

Group 4

- Create blocks at alignment offsets

Task 3: Groups 1 & 2

Try the Exercise Page 57 Handout



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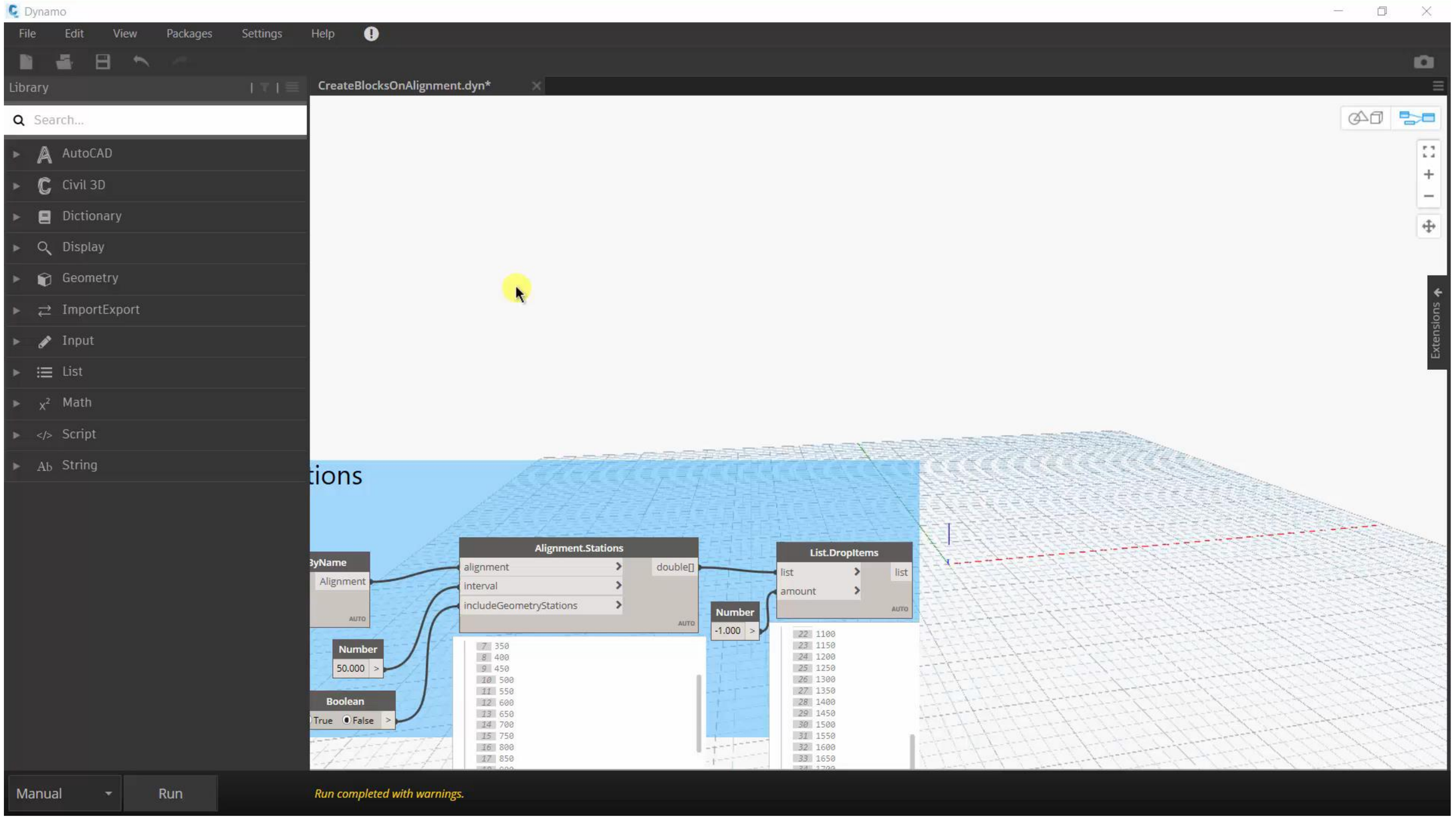
Task 3: Group 3

Try the Exercise Page 63 Handout



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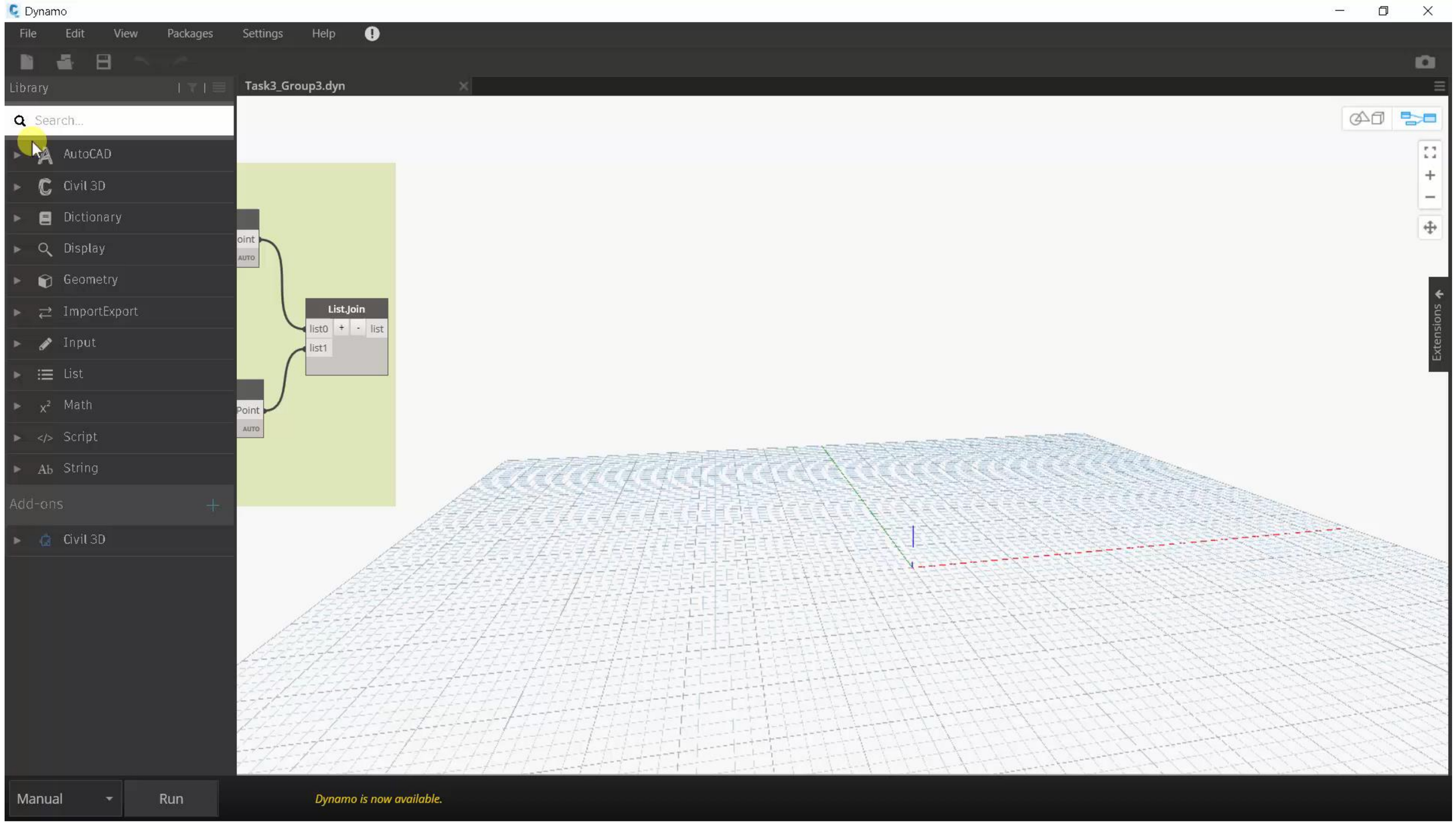
Task 3: Group 4

Try the Exercise Page 67 Handout



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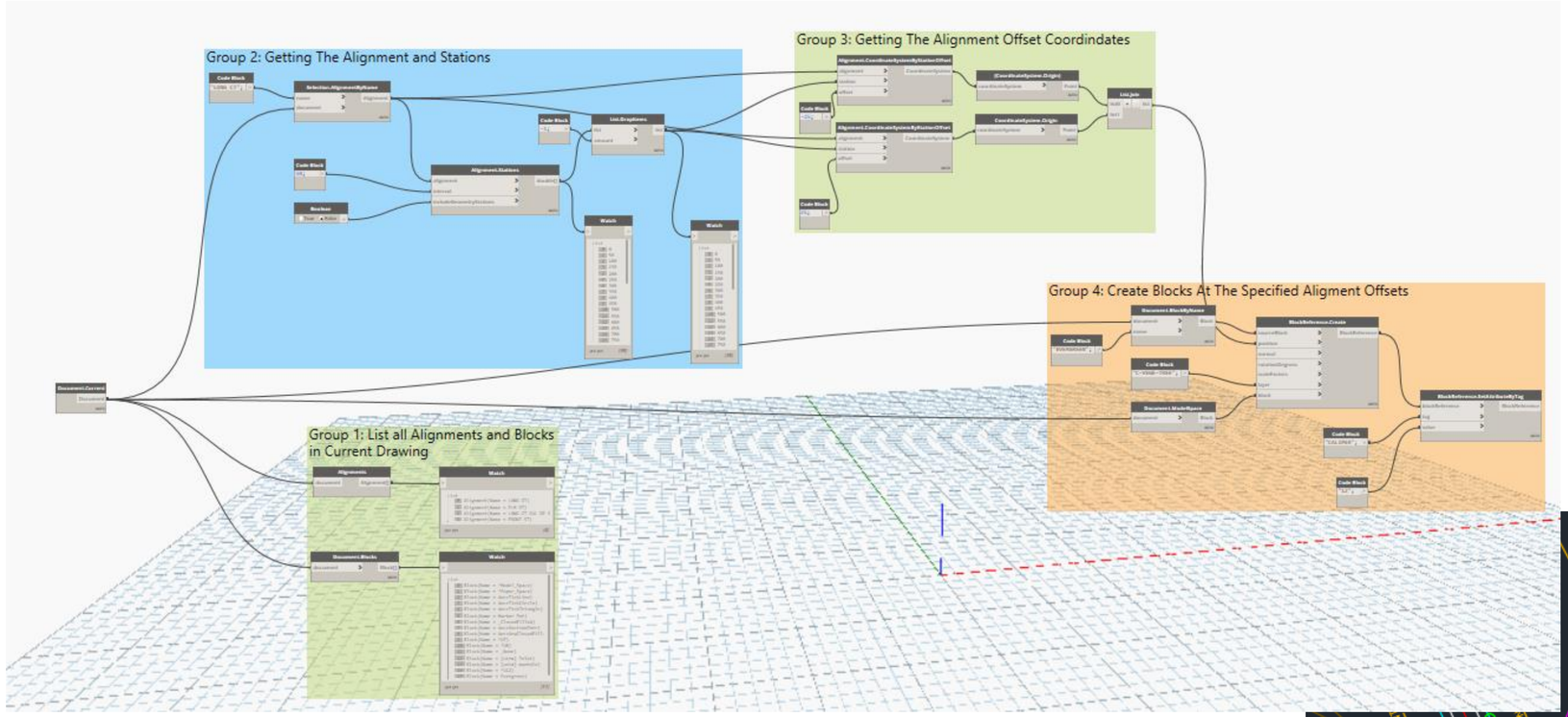
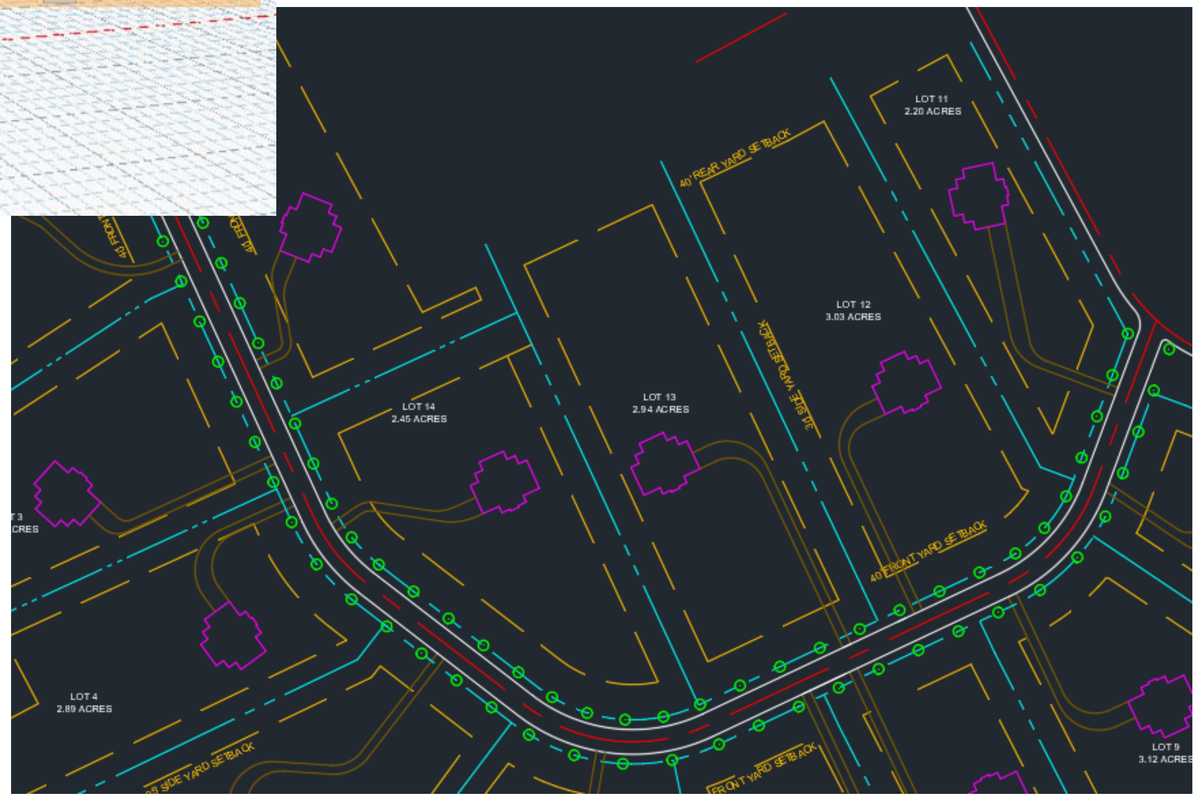
Task 3 Conclusion





- Listed stations and offsets along the alignment
- Created blocks along the alignment
- Easily modified for future drawings

POWER CLAP!

Image caption goes here

Wrap Up - Closing

Key Learning Objectives

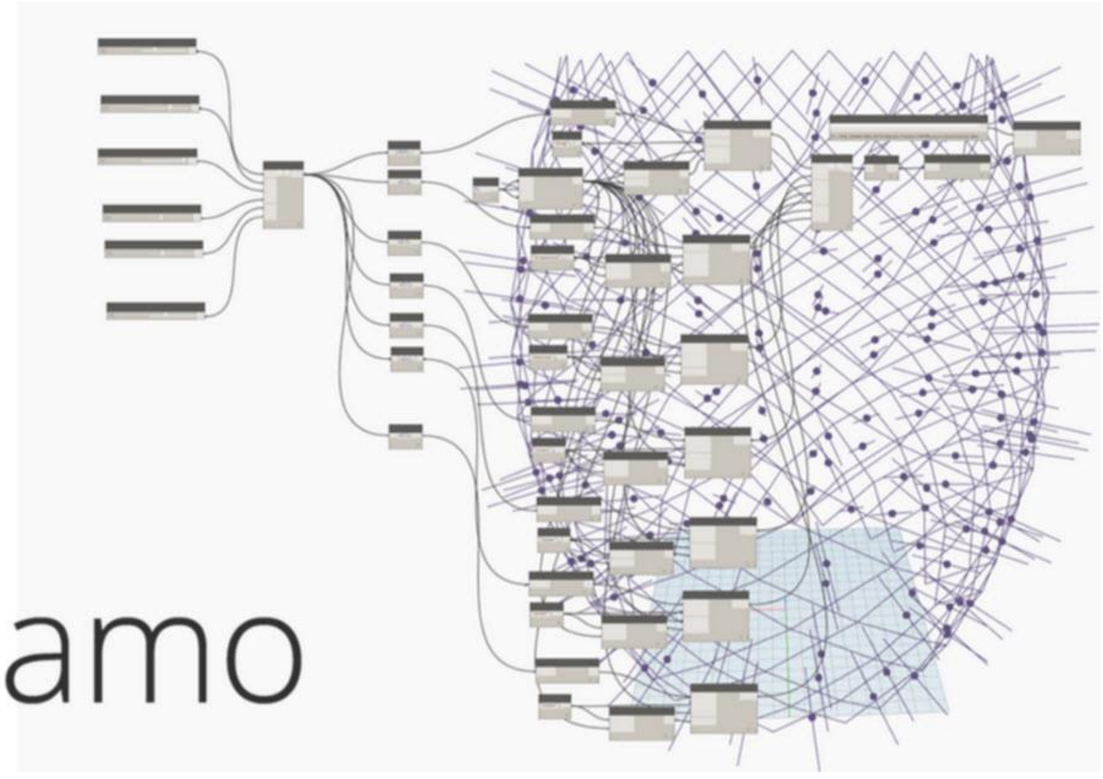
- [x] Identify repetitive tasks in your daily workflow
- [x] Learn how to import and manipulate AutoCAD Objects and/or Civil 3D data
- [x] Produce Dynamo for Civil 3D scripts to automate repetitive tasks
- [x] Discover ways that Dynamo for Civil 3D can elevate efficiency

Handout:

- Bonus Material!
  - Create Cogo Points in DWG
  - Create Points instead of blocks for trees
  - Alternate tree types at interval along Alignment

Mix and match any group in these 3 scripts to create something new!

Dynamo



Let’s start automating!!

HAVE IDEAS ALREADY?... JOIN THE COMMUNITY!

Official Website – https://dynamobim.org/

Dynamo Forum - https://forum.dynamobim.com/

Sample files – Check them out under Help > Samples

NEED MORE HELP?

User’s Guide – https://primer.dynamobim.org/

Node Dictionary – https://dictionary.dynamobim.com/#/

Learn Python - https://www.python.org/

Join the Dynamo Community!

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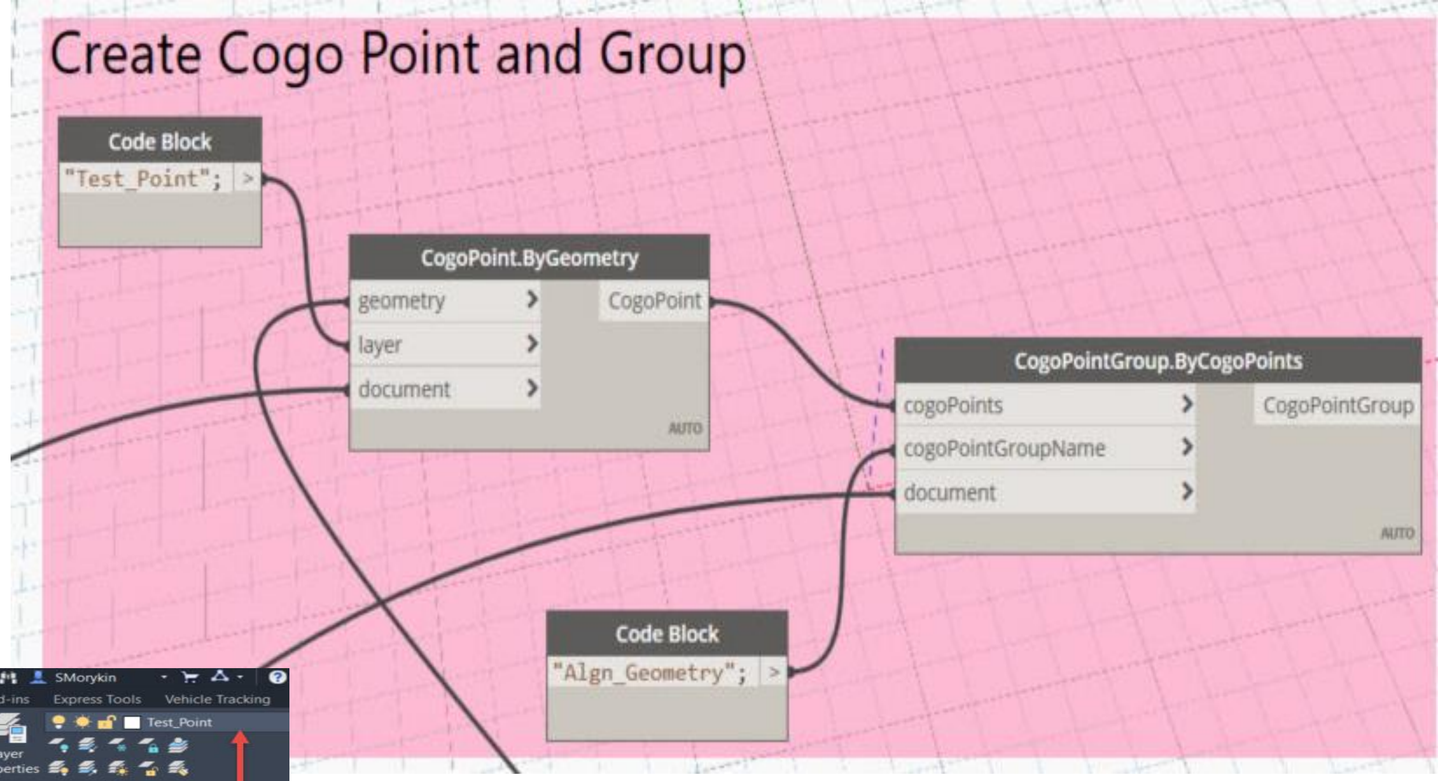
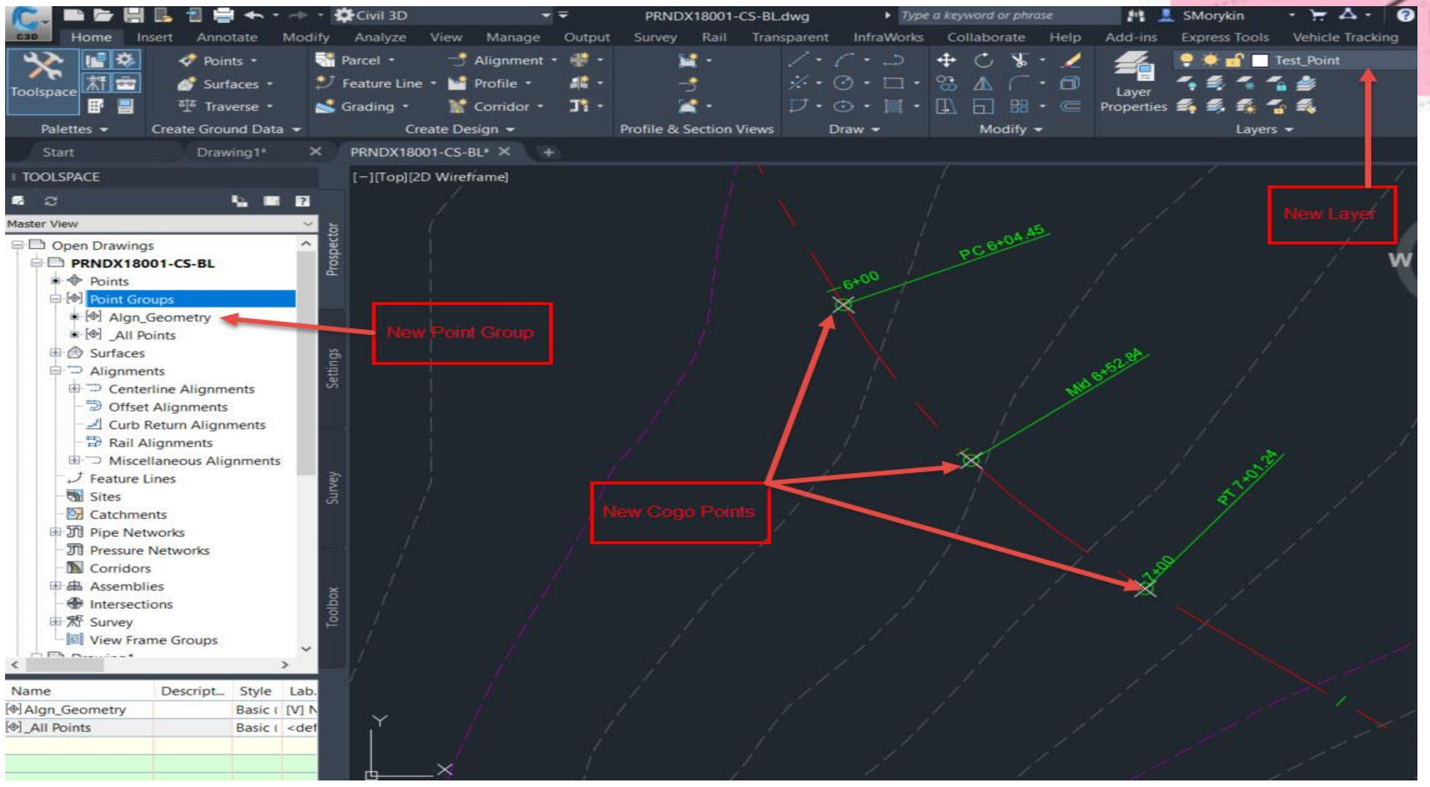
Task 2 – Bonus (Dynamo)

- Create Cogo Points from Stations in Group 2
  - Placed on New “Test_Point Layer”
- New Point Group created
  - Named Algn_Geometry



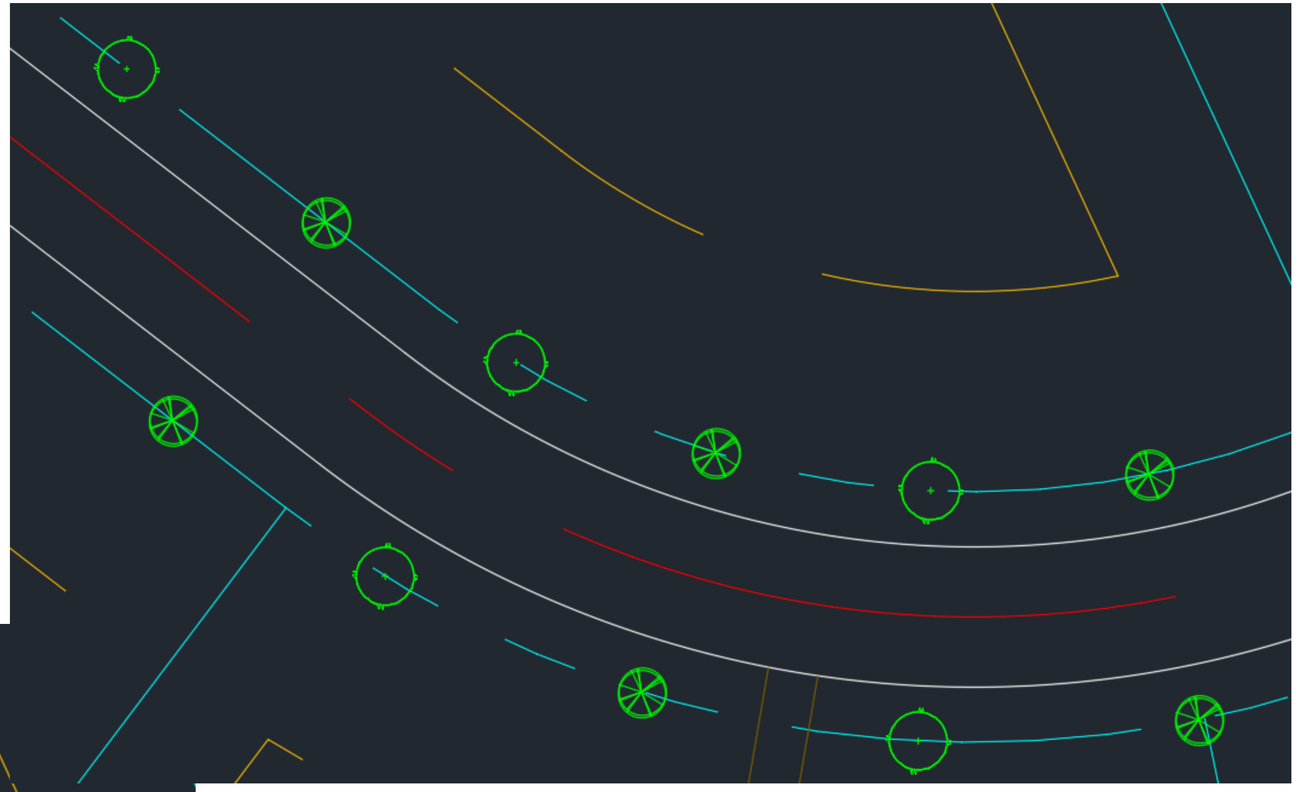


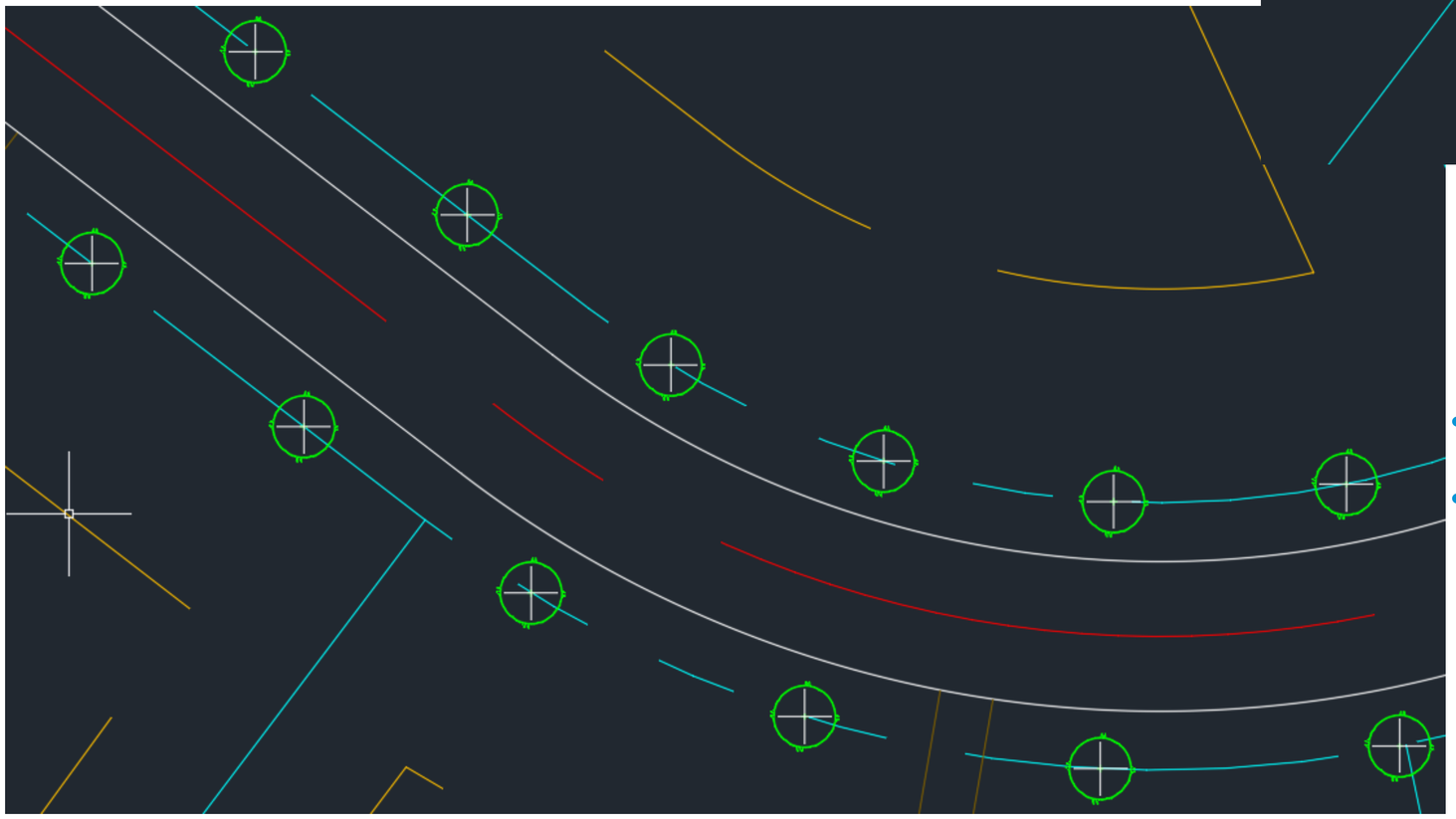
Bonus Inside Civil 3D

- Cogo Points created at alignment stations & geometry
- Cogo Points on new layer
- New Point Group Created in Civil 3D
  - Dynamo will not add to existing point group

Task 3 - Bonus

- Create Cogo Points from Stations Offsets in Group 3
  - Placed on New “C-VEGE-TREE” layer
- New Point Group created
  - Named “Proposed Trees”





Bonus

- Create two different tree types along the alignment
- Type of tree alternates

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