



Master Planning Automation (Infraworks & Civil 3D)

Ahmed Hamdy

Landscape Architect – Urban Planning and Design at GHD

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About the speaker

- Ahmed Hamdy, Landscape Architect
- Graduated from Ain Shams University, Cairo, Egypt
- Bsc. in Architecture and Urban Planning.
- Ahmed is a Landscape Architect at GHD's Urban Planning & Design team
- Based in GHD UAE operating center since 2014.
- Ahmed.Hamdy@ghd.com



About the Speaker

- Siva Koppula, Senior Implementation Consultant
- Civil Engineer, Masters in Urban Planning, MBA
- Expert knowledge of BIM, GIS, Data management, workflow development, Solution Architecture
- Working with Autodesk since 2008 implementing BIM projects across EMEA for all major AEC and UK Public sector customers
- Based in the UK
- siva.koppula@autodesk.com

Agenda

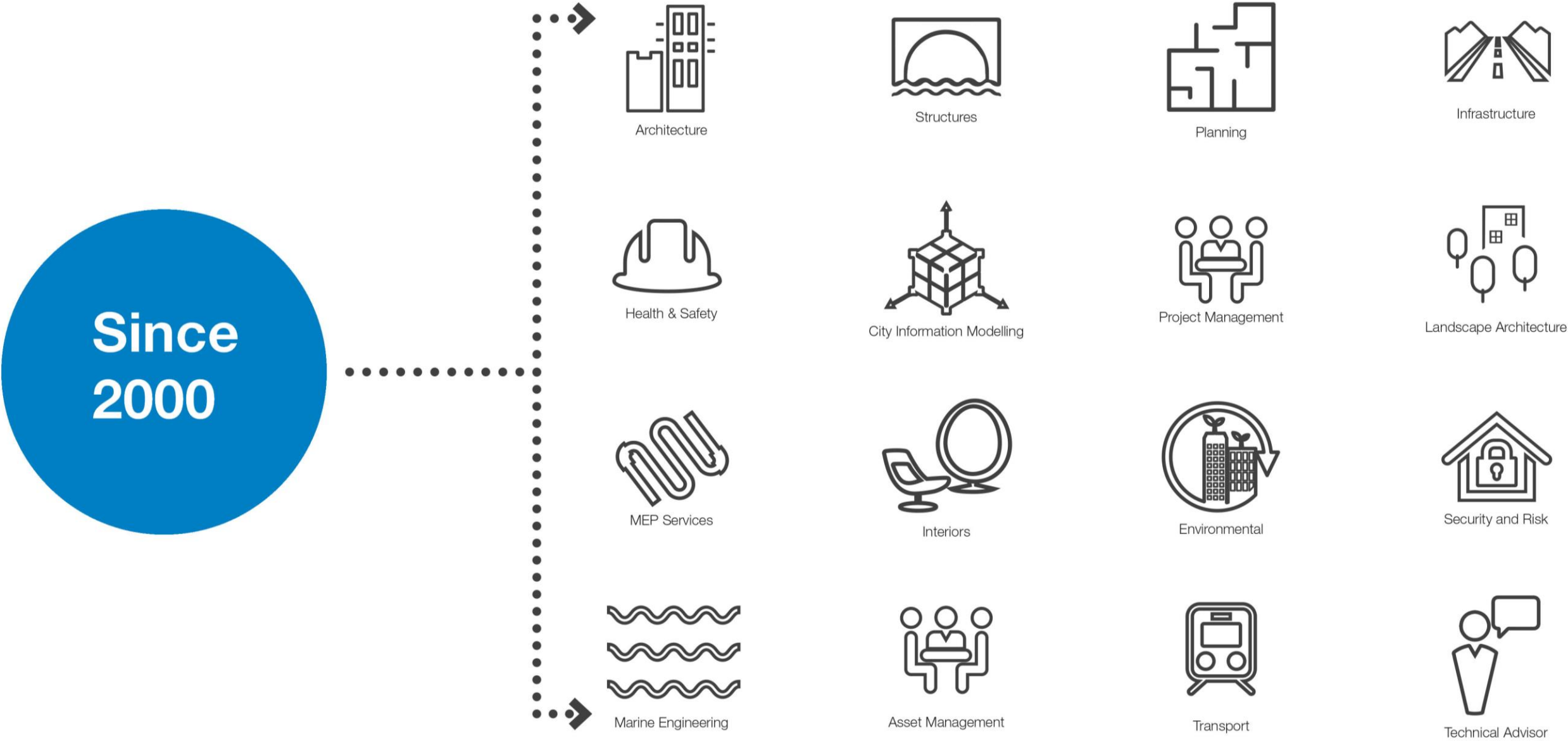
- GHD, Who we are.
- Master Planning Process.
- Challenges in Design with Current Workflow.
- GHD – Autodesk (Ultimate) Solution (WIP).

Who we are?

GHD around the world



GHD Service offerings



Master Planning



What is Master Planning ?

Master planning involves the integration of multidisciplinary approach to planning of a site and its context and environment.

These disciplines include environmental (topography, storm water, existing vegetation and views), transport (including understanding and developing a road network or hierarchy, including car parking and public transport), landscaping, economics (cost of developing the site and cost of building accommodation)

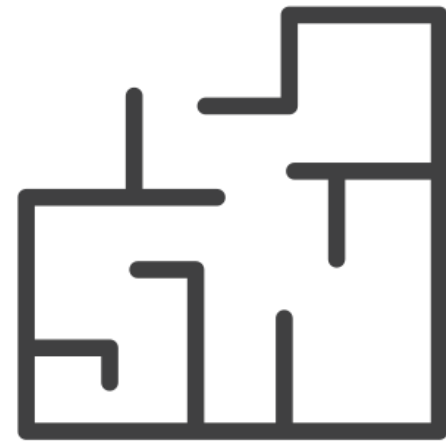


Master Planning Components



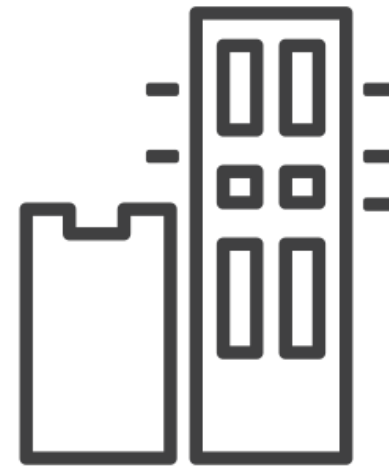
Roads

- Infrastructure & Utilities



Super Plots

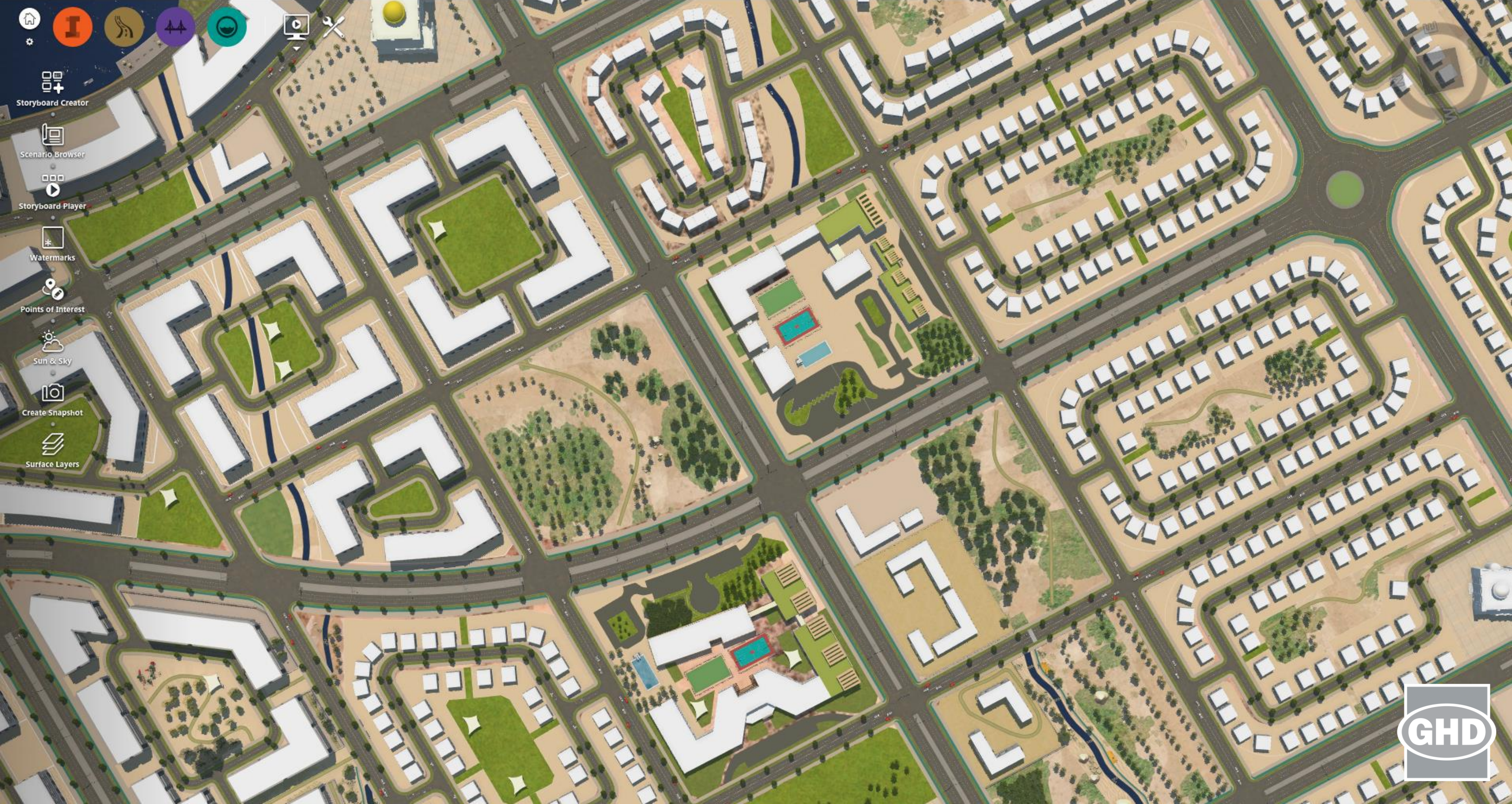
- Landuse
- Open Spaces



Buildings



Master Plan



-      
- Storyboard Creator
- Scenario Browser
- Storyboard Player
- Watermarks
- Points of Interest
- Sun & Sky
- Create Snapshot
- Surface Layers

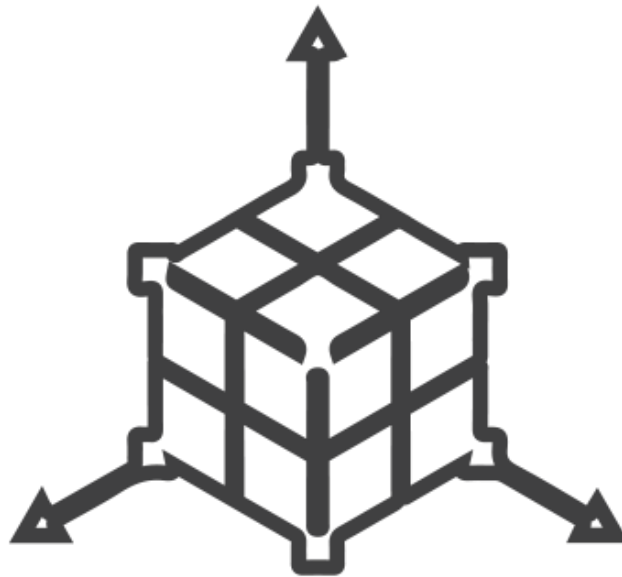


Master Planning Challenges



Master Plan Statistics

- Efficient Automation

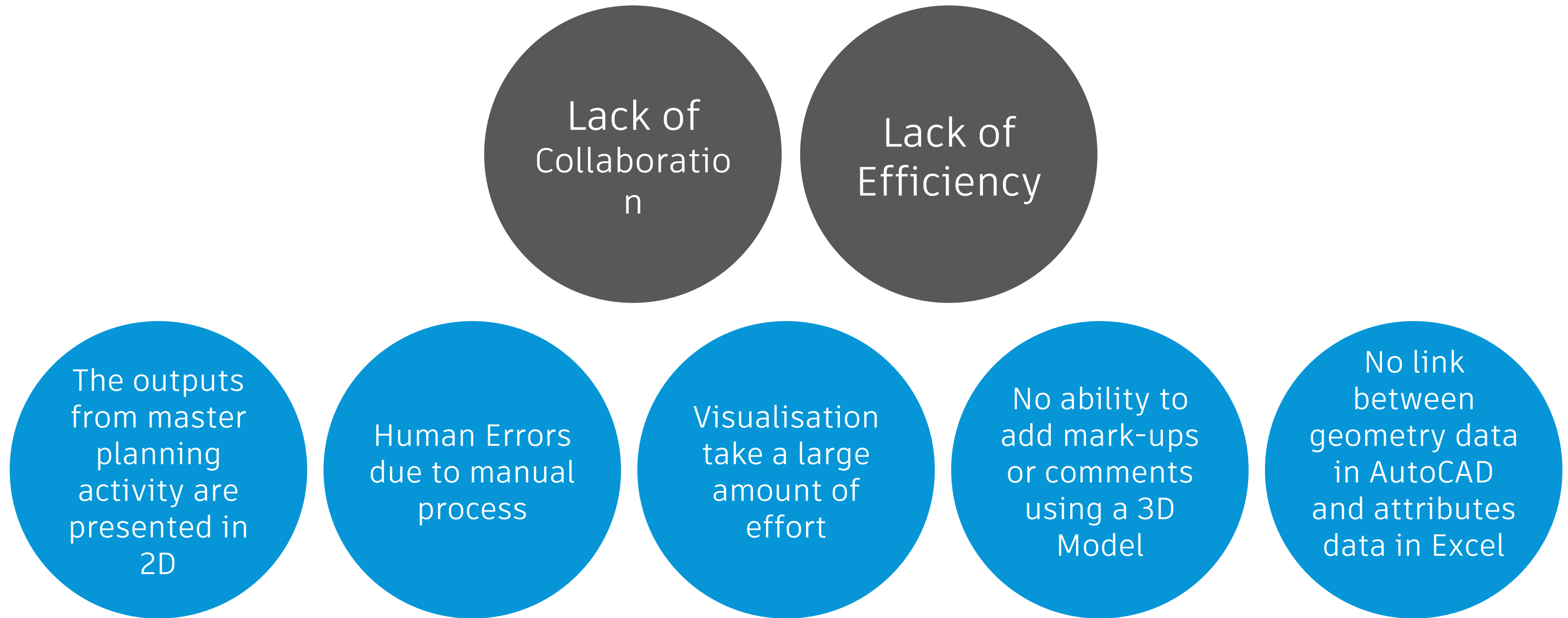


Rapid Visualization



Collaboration and Stakeholder Engagement with Authorities and Clients

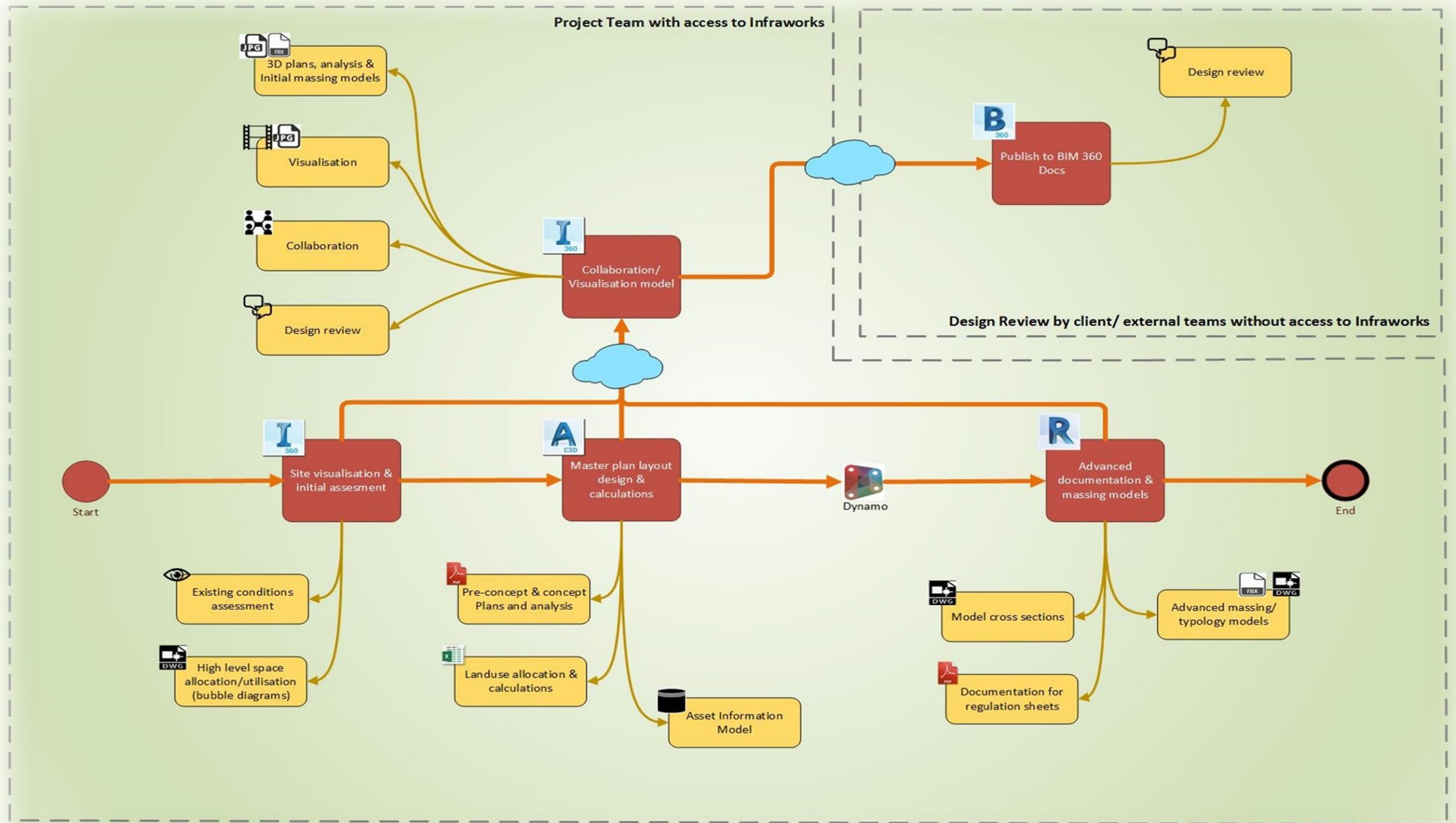
Current Workflow



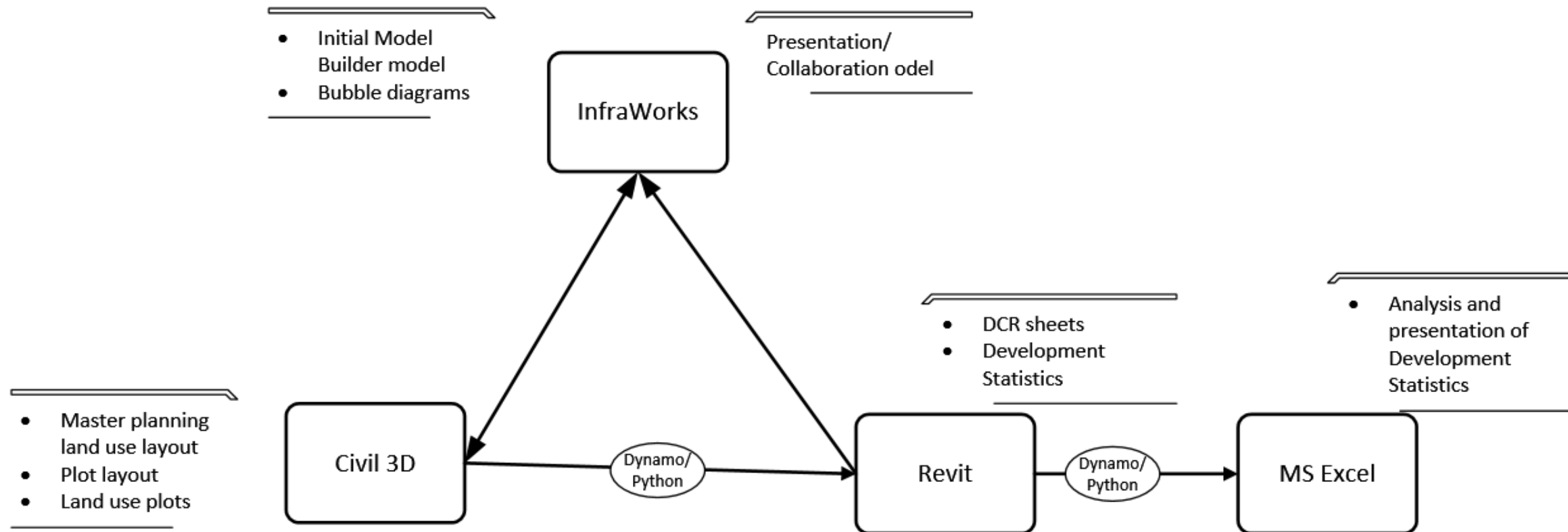
**GHD with Autodesk has
developed a solution for large
scale urban development projects
using Infracore and Civil 3D**



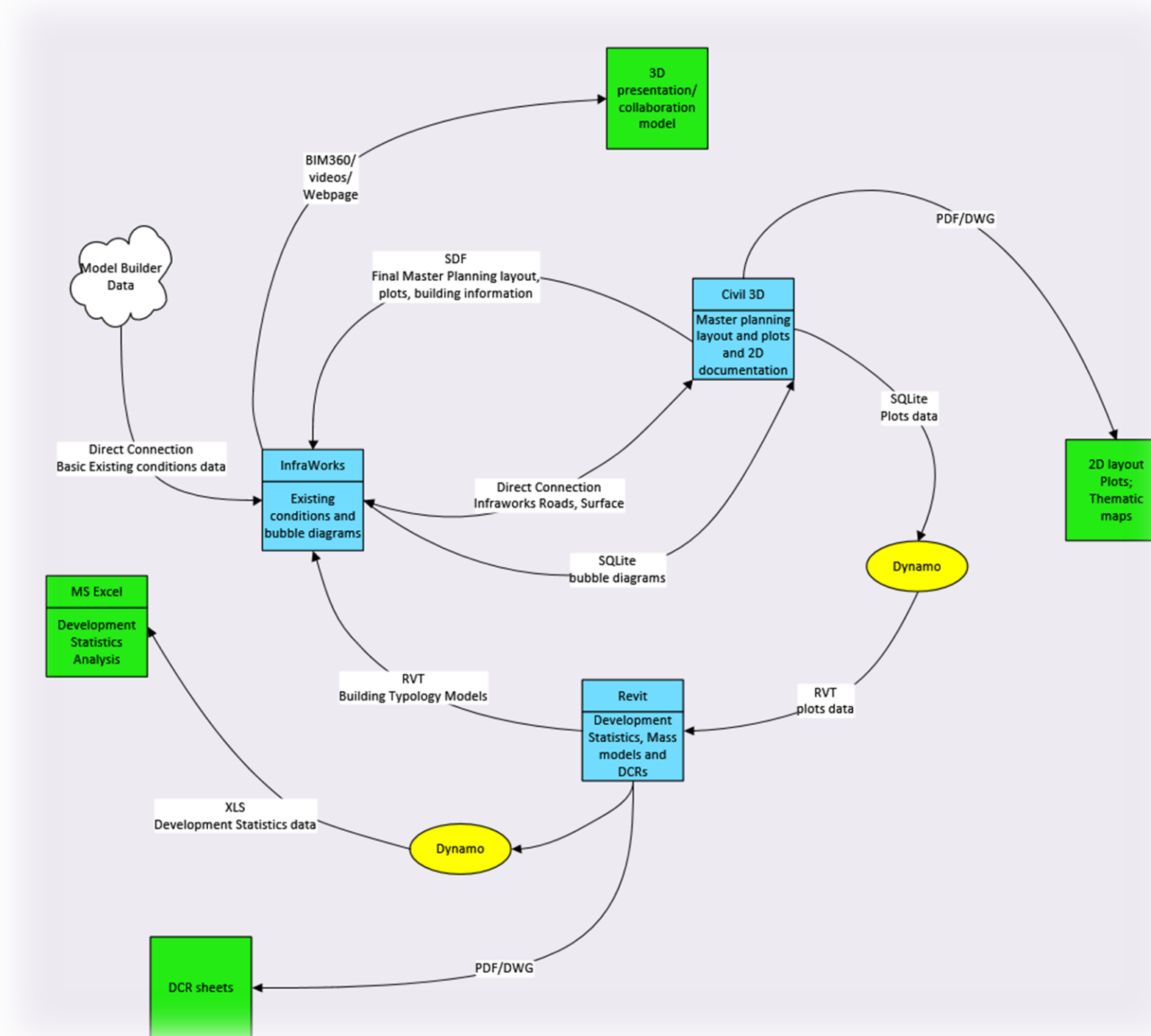
Master Planning proposed process



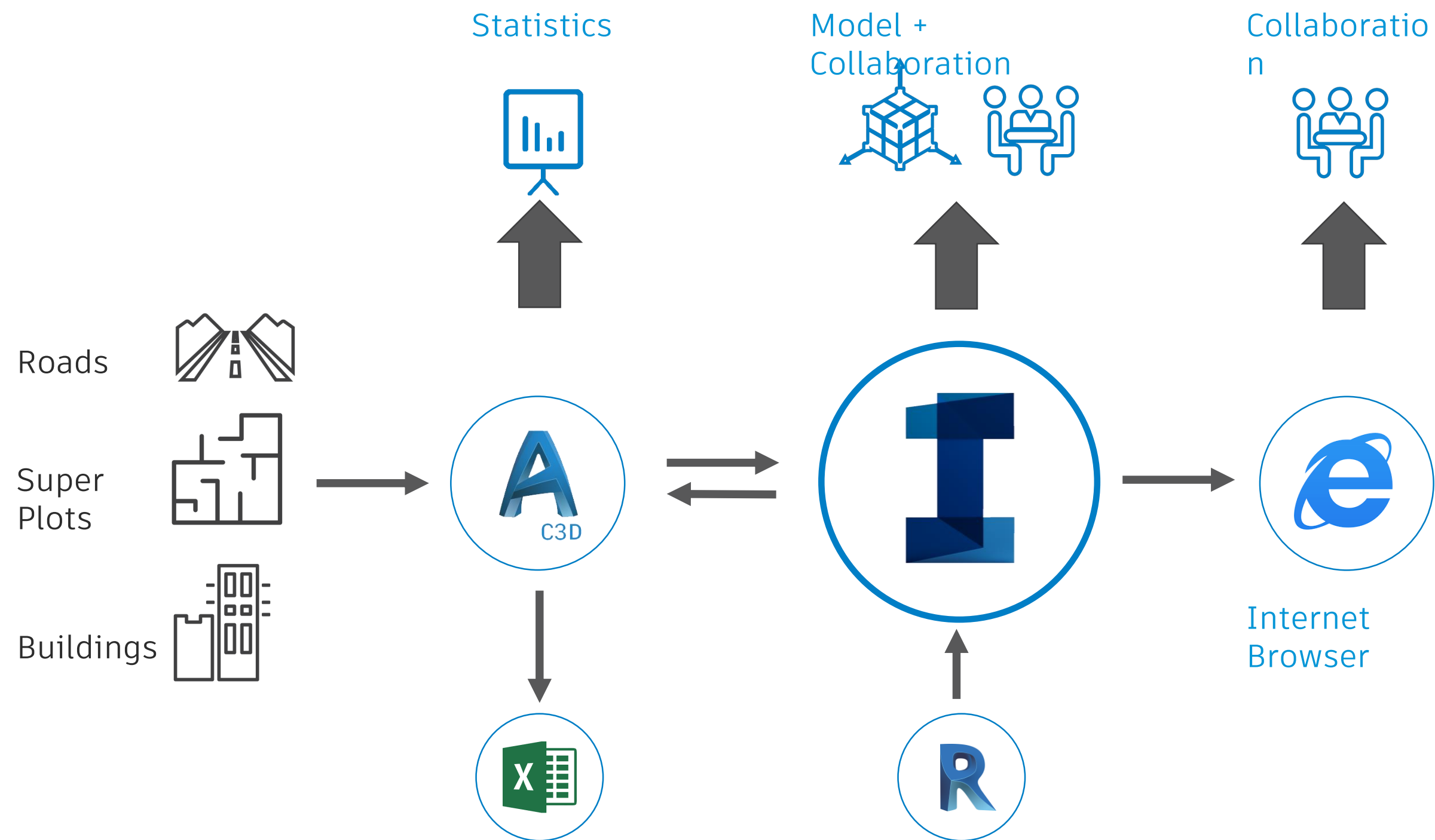
Master Planning Process – Application View



Master Planning Process – Data Flow



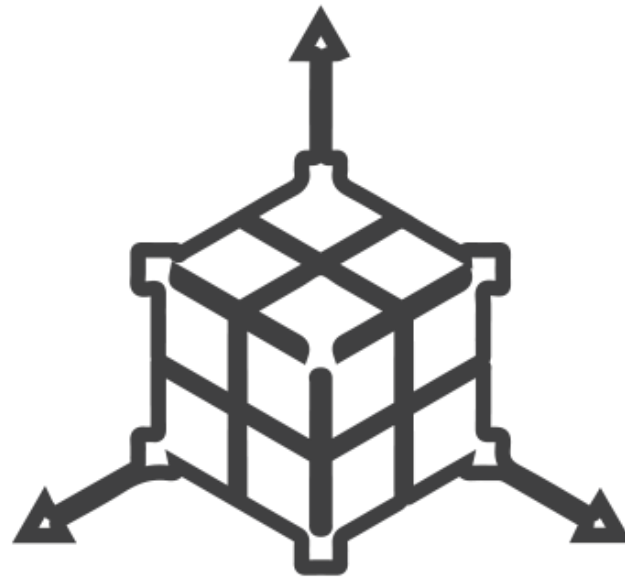
GHD Master Planning Workflow





Master Plan Statistics

- Efficient Automation

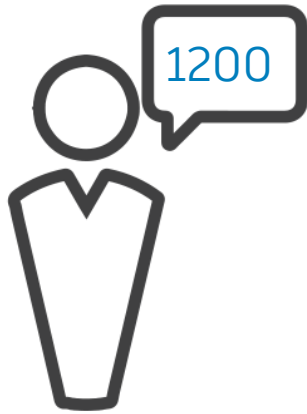


Rapid Visualization



Collaboration and Stakeholder Engagement with Authorities and Clients

Master Planning Statistics



Development Advisory



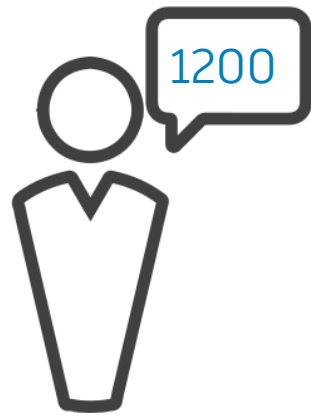
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Master Plan Statistics



Master Planning Statistics



Development Advisory



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Master Plan
Statistics



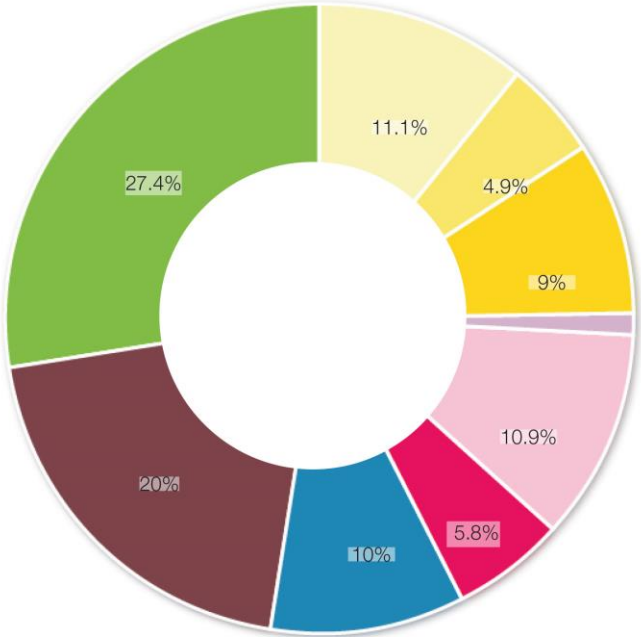
Master Planning Statistics



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Land Use Type	Measure	Number	Land (sqm)	GFA (sqm)	Revenue per sqm GFA (AEDSM)
Villas	Unit	750	301,875	166,500	\$390
Townhouses	Unit	750	134,250	113,250	\$173.5
Apartments	Unit	5000	245,000	612,500	\$316.5
Office	GLA	40,000	25,000	50,000	\$25.9
Retail	GLA	102,5000	298,810	141,369	\$309
Hospitality	Keys	430	157,800	36,900	\$163.1
Leisure & Entertainment	-	-	0	0	0
Community Facilities	-	-	273,906	158,259	0
Roads & Utilities	-	-	546,251	0	0
Parks & Open Space	-	-	748,364	0	0
Total	-	-	2,731,256	1,278,778	\$1,378

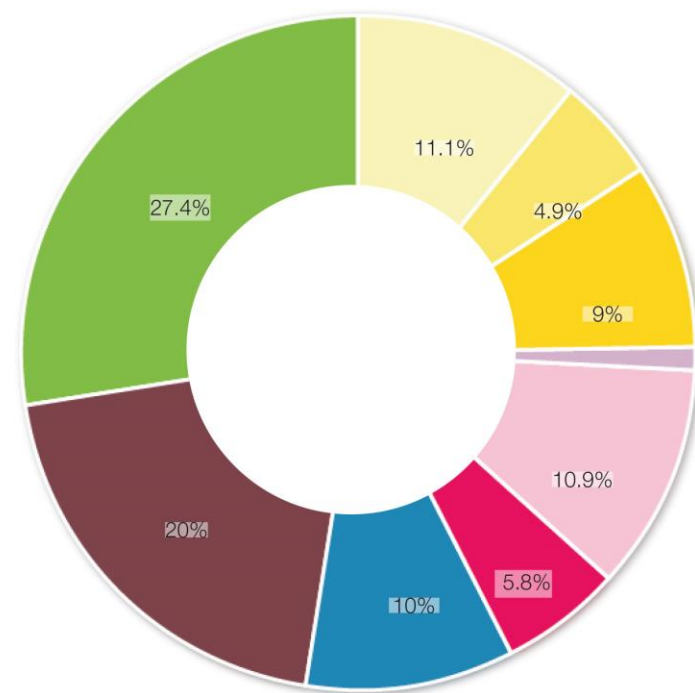
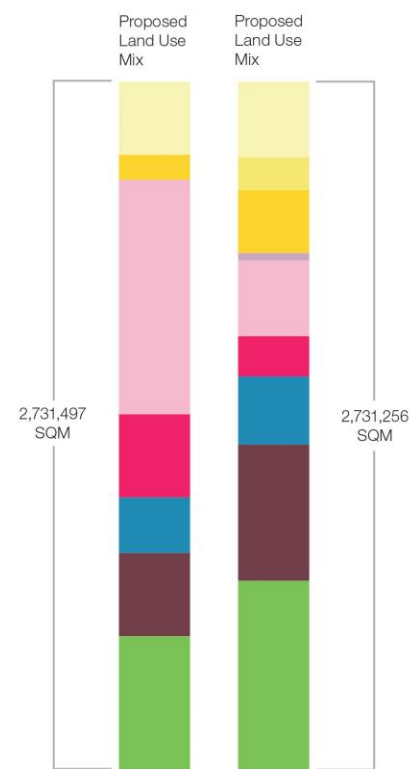
- Legend
- Emirati Housing
 - Villas
 - Townhouses
 - Apartments
 - Office
 - Retail
 - Hospitality
 - Leisure & Entertainment
 - Community Facilities
 - Roads & Utilities
 - Parks & Open Space



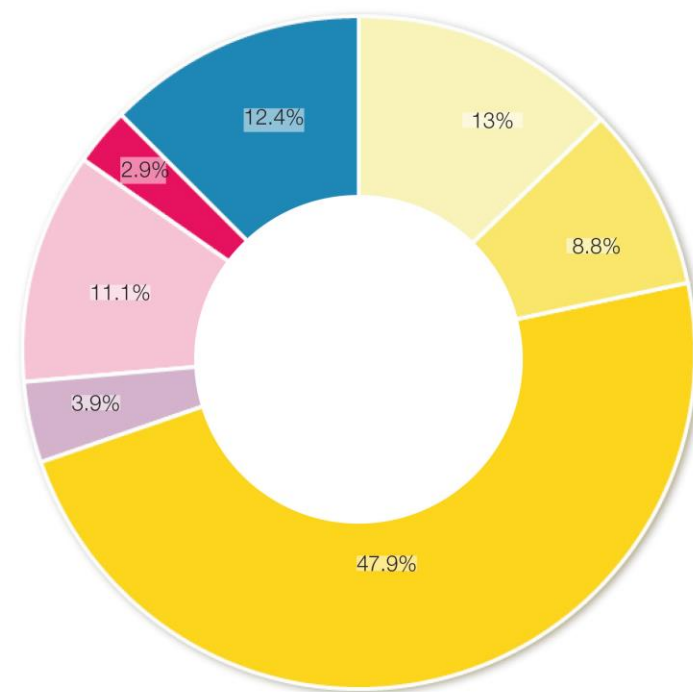
Land share per land use type



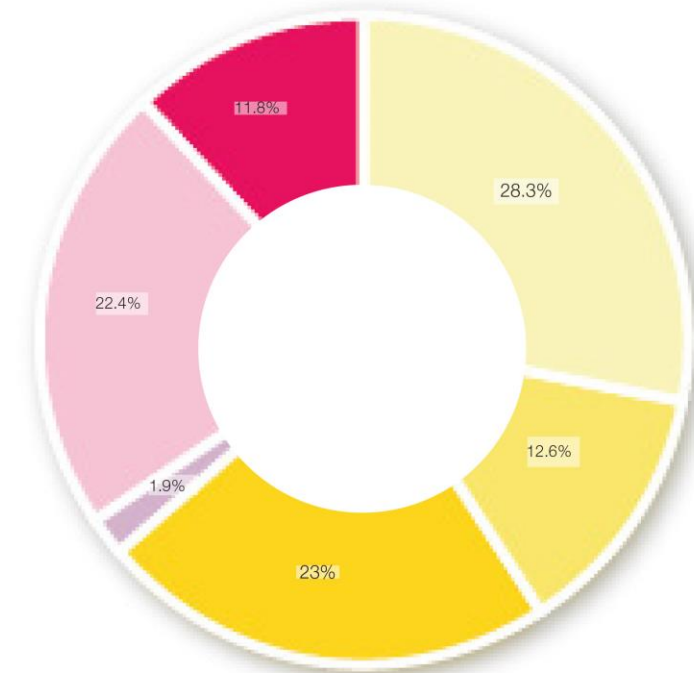
Master Planning Statistics



Land share per land use type



GFA per land use type



Revenue per land use area



Test Spatial Arrangements

CAD Process

Sketch in
AutoCAD



Calculate area



Manually copy
individual
parcels to Excel



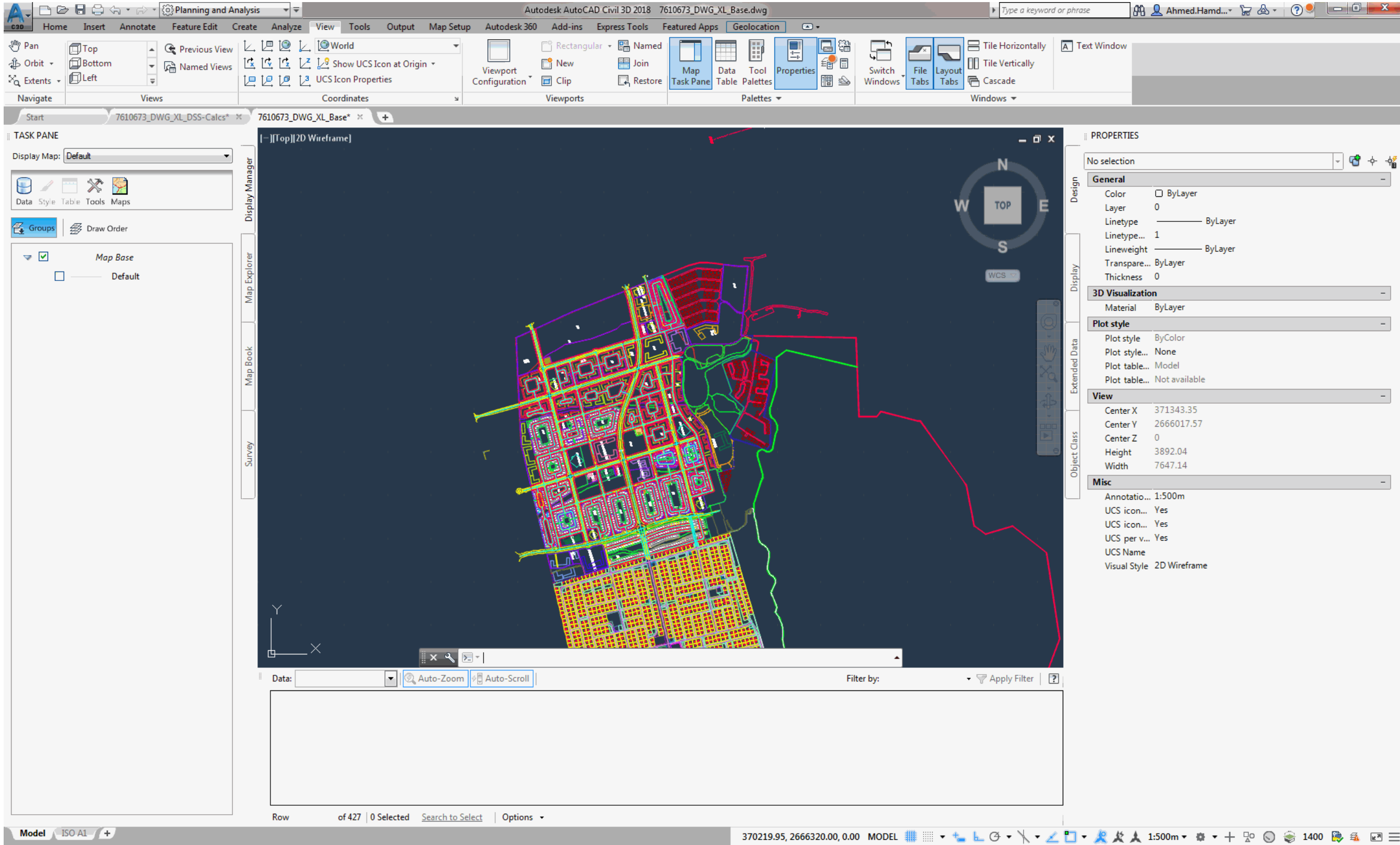
Review GFA FAR
values in Excel

BIM Process

Sketch parcel/ plot
and verify area, GFA,
FAR etc., directly in
AutoCAD Civil 3D



Test Spatial Arrangements



Generate Automatic Development Statistics

CAD Process

For each plot/building

Sketch in
AutoCAD

Calculate area

Manually copy
individual
parcels to Excel

Generate
Development
Statistics

BIM Process

For all plots/buildings

Sketch in
AutoCAD Civil3D
and verify GFA,
FAR etc.

Export/Link
data to Excel

Generate
Development
Statistics



Generate Automatic Development Statistics

7610673-SCH-D-DSS_TEMPLATE-20180212.xlsx - Excel

Ahmed Hamdy

Share

Clipboard

Font

Alignment

Number

Styles

Cells

Editing

WebEx

R317

1

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Concept Stage

Job No.76-10673

RevisionRev A

Date19/03/2018

Land Use Category	# of Plots	# of Units	# of Buildings	Site Area (m²)	GFA (m²)	FAR	Parking	Max Building Height	Construction				
							Required ***	Proposed	Metres	Storeys	Phase	Commence	Complete
Residential	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
Household Living - Multi Unit - Residential Apartments	0	0	0	0.0	0.0	0			0.0	0.0			
Household Living - Single Unit (Attached) - Townhouses	0	0	0	0.0	0.0	0			0.0	0.0			
Household Living - Single Unit (Detached) - Residential Villa	0	0	0	0.0	0.0	0			0.0	0.0			
Mixed-use Residential	0	0	0	0.0	0.0	0			0.0	0.0			
Total	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Commercial	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
General Sales & Services	0	0	0	0.0	0.0	0			0.0	0.0			
General Sales & Services - Convenience Retail	0	0	0	0.0	0.0	0			0.0	0.0			
Hotel	0	0	0	0.0	0.0	0			0.0	0.0			
Hotel - Hotel Apartment	0	0	0	0.0	0.0	0			0.0	0.0			
Office - Business Park	0	0	0	0.0	0.0	0			0.0	0.0			
Total	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Industrial	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
City Serving Industrial	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Total	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Governance & Institutional	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
Safety & Security - Civil Defence	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Total	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Social and Cultural Services	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
Community Centre	0	0	0	0.0	0.0	0	108	108	0.0	0.0			
Petrol Station	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Total	0	0	0	0.0	0.0	0	108	108	0.0	0.0			
Educational	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
School - Intermediate School (C2)	0	0	0	0.0	0.0	0			0.0	0.0			
School - Mixed Grades	0	0	0	0.0	0.0	0			0.0	0.0			
School - Mixed Grades - Mixed Gender - Private	0	0	0	0.0	0.0	0			0.0	0.0			
School - Primary School (C1)	0	0	0	0.0	0.0	0			0.0	0.0			
School - Secondary School (C3)	0	0	0	0.0	0.0	0			0.0	0.0			
Total	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Healthcare	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
Clinic	0	0	0	0.0	0.0	0			0.0	0.0			
Hospital - Speciality	0	0	0	0.0	0.0	0			0.0	0.0			
Total	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Religious	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
Religious Facilities - Mosque	0	0	0	0.0	0.0	0			0.0	0.0			
Religious Facilities - Mosque - Jame'e	0	0	0	0.0	0.0	0			0.0	0.0			
Total	0	0	0	0.0	0.0	0	0	0	0.0	0.0			
Open Space	Column1	Column2	Column3	Column4	Column5	Column6	Column7	Column8	Column9	Column10	Column11	Column12	Column13
Developed Open Space - Non recreational Open Space - Public Realm	0	0	0	0.0	0.0	0			0.0	0.0			
Developed Open Space - Park/Public Garden - City Park (50-300 ha) - Waterfront	0	0	0	0.0	0.0	0			0.0	0.0			
Natural Open Space	0	0	0	0.0	0.0	0			0.0	0.0			

100_Development Statistics

200_PCharts-Land Share

200A_PCharts-GFA Main

201_PCharts-Residential

201A_PCharts-Residential GFA

Ready

80%



Generate Automatic Development Statistics

7610673-SCH-D-DSS_TEMPLATE-20180212.xlsx - Excel											Ahmed Hamdy					Share					
File Home Insert Page Layout Formulas Data Review View ACROBAT PDF-XChange 2012 Tell me what you want to do...																					
Clipboard			Font			Alignment			Number			Styles			Cells			Editing		WebEx	
K40																					
	FeatId	Main Landuse Category	Sub Landuse Category	Parcel ID	Phase	Extra1	Extra2	Extra3	Plot Area												
1																					
2	29	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				10031.14242												
3	30	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				6352.617129												
4	31	Infrastructure	Transportation - Transport Facilities (land based)	RoW	3				1118.612323												
5	32	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				4459.008971												
6	33	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				4989.363373												
7	34	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				258.47279												
8	35	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				1679.203176												
9	36	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				1613.570042												
10	37	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				2275.435194												
11	38	Infrastructure	Transportation - Transport Facilities (land based)	RoW	4				1691.946463												
12	39	Open Space	Developed Open Space - Park/Public Garden - City Park (50-300 ha) - Waterfront	Water_Body	1				17289.34402												
13	40	Open Space	Developed Open Space - Park/Public Garden - City Park (50-300 ha) - Waterfront	Water_Body	1				57669.79393												
14	41	Commercial	Hotel	5_Star_Hotel	4				47751.77586												
15	42	Commercial	Hotel	5_Star_Hotel	4				2627.153723												
16	43	Commercial	Hotel	5_Star_Hotel	4				1710.886687												
17	44	Open Space	Natural Open Space	Open_Spaces	1				38638.0154												
18	45	Open Space	Natural Open Space	Open_Spaces	1				3888.305408												
19	46	Open Space	Natural Open Space	Open_Spaces	1				2958.996625												
20	47	Open Space	Natural Open Space	Open_Spaces	1				14018.05055												
21	48	Open Space	Natural Open Space	Open_Spaces	1				1015.520799												
22	50	Open Space	Developed Open Space - Non recreational Open Space - Public Realm	Open_Spaces	4				4621.384734												
23	51	Healthcare	Hospital - Speciality	Hospital	4				17581.13625												
24	57	Governance & Institutional	Safety & Security - Civil Defence	Civil_defence	4				4976.346645												
25	59	Healthcare	Hospital - Speciality	Hospital	4				17412.85605												
26	60	Commercial	Hotel	5_Star_Hotel	4				3958.899151												
27	61	Open Space	Natural Open Space	Open_Spaces	1				22479.42771												
28	95	Infrastructure	Transportation - Transport Facilities (land based)	RoW	1				69430.41186												
29	98	Open Space	Natural Open Space	Open_Spaces	1				1864.30055												
30	114	Open Space	Natural Open Space	Open_Spaces	1				18104.96893												
31	115	Open Space	Natural Open Space	Open_Spaces	1				4541.374459												
32	129	Open Space	Natural Open Space	Open_Spaces	4				51161.52242												
33	130	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	2				49887.44816												
34	131	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	2				51955.59118												
35	132	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	2				24828.6196												
36	133	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	3				5885.05278												
37	134	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	3				47012.27728												
38	138	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	3				949.7572821												
39	139	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	4				1124.96554												
40	140	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	4				4754.067007												
41	141	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	4				2197.768228												
42	142	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	3				6088.910213												
43	143	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	3				16182.32906												
44	145	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	4				12237.58797												
45	147	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	4				21998.20576												
46	148	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	4				2551.120201												
47	150	Infrastructure	Transportation - Transport Facilities (land based) - Corridors/ROWS	RoW_new	4				2684.19269												
02_Landuse Input 100_Development Statistics 200_PCharts-Land Share 200A_PCharts-GFA Main 201_PCharts-Residential 201A_PCharts-Residential GFA																					



Creation of Masterplan Graphic & Documentation

CAD Process

Sketch in
AutoCAD



Manually apply
colours to each
parcel in
AutoCAD



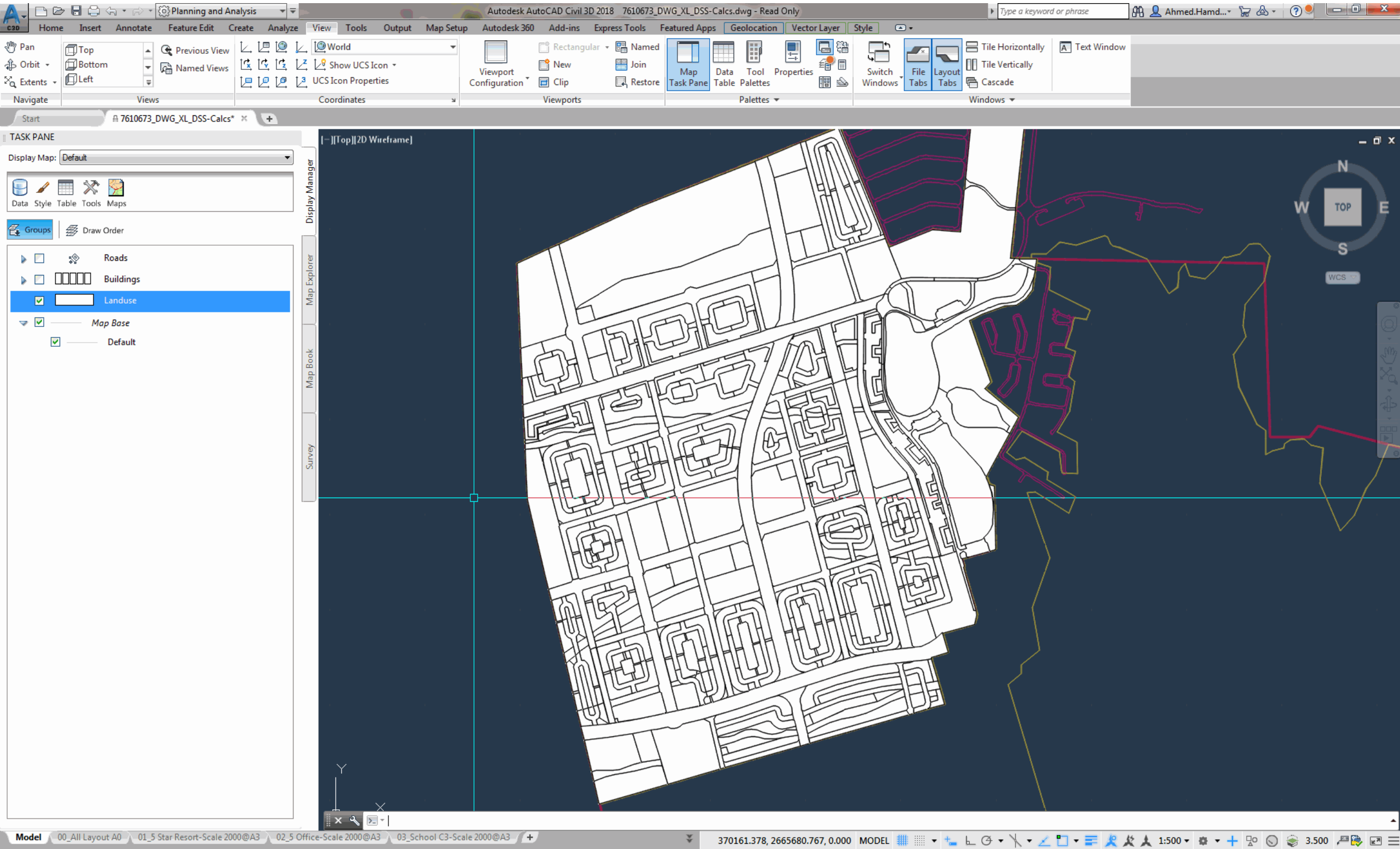
Import to Adobe
for further
enhancements

BIM Process

Sketch in
AutoCAD Civil3D
and create
thematic display



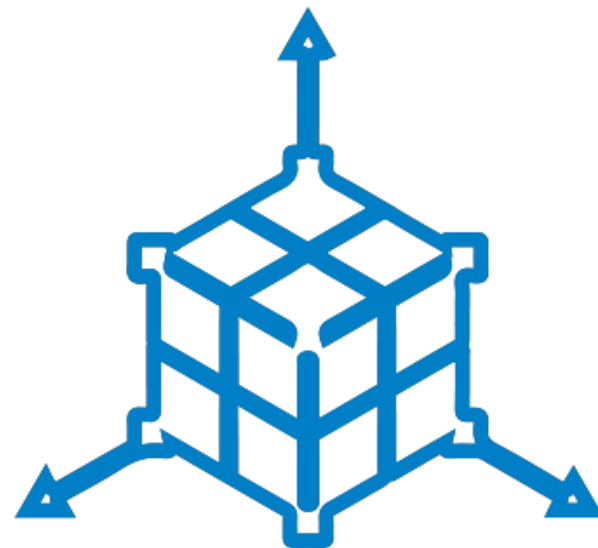
Creation of Masterplan Graphics





Master Plan Statistics

- Efficient Automation



Rapid Visualization



Collaboration and Stakeholder Engagement with Authorities and Clients

Create Master Planning Massing Models

CAD Process

For each building

Sketch building
foot print in
AutoCAD



Copy or create
the footprint in
Sketchup



Calculate
building height
in Excel



Extrude building
foot print height
in Sketchup

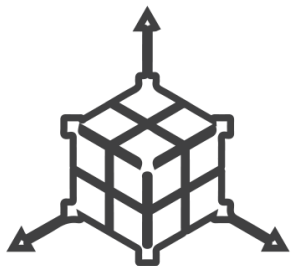
BIM Process

For all buildings

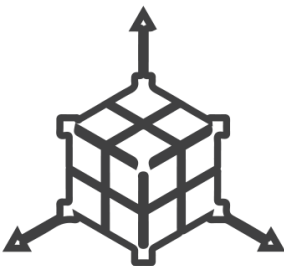
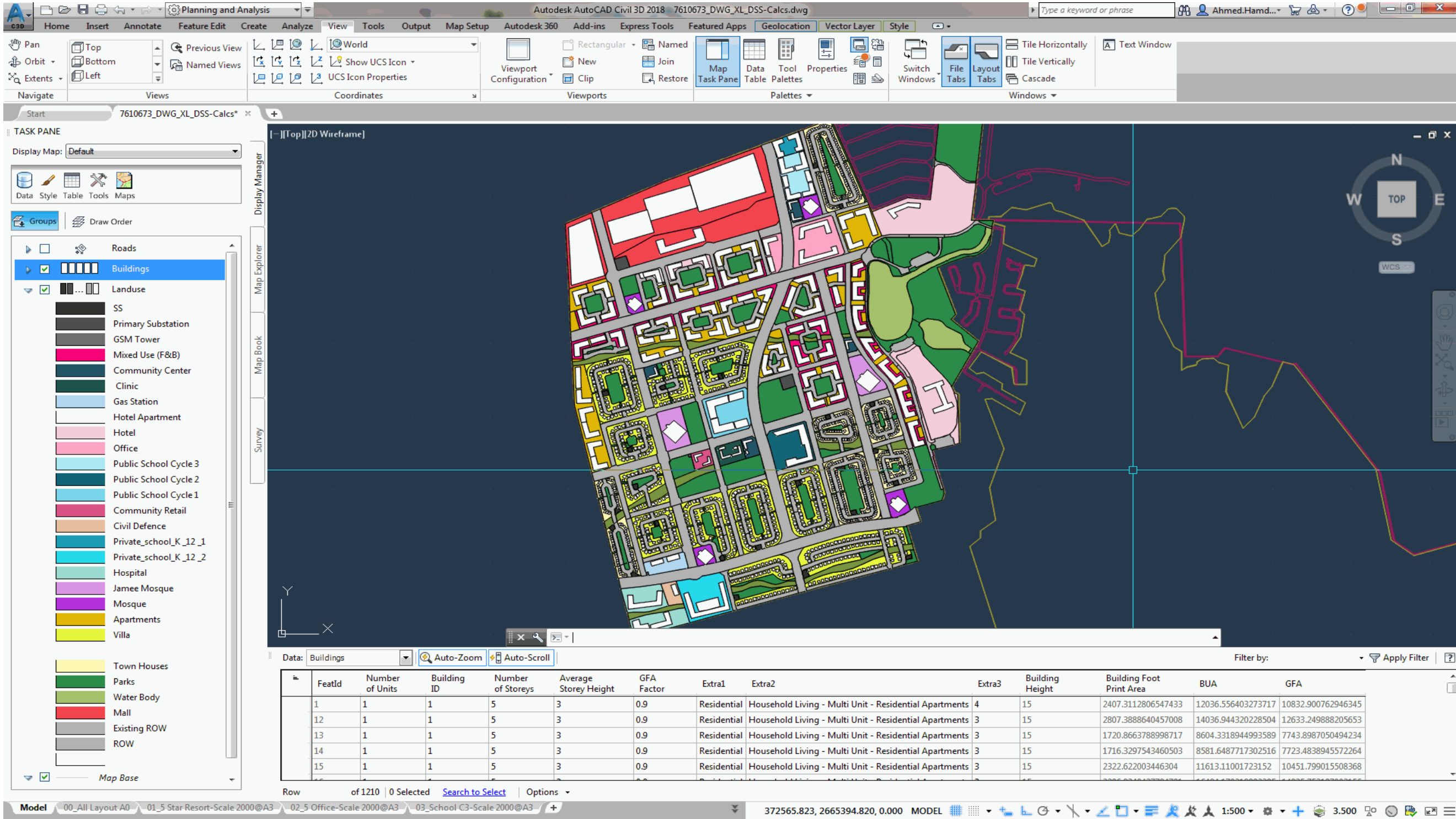
Sketch building
foot print in
AutoCAD Civil
3D



Configure &
Refresh data in
Infraworks



Create Master Planning Massing Models



Creation of RoW & Infrastructure Corridors

CAD Process

Sketch in
AutoCAD RoW &
Corridor



Show RoW and
corridor outline
only



Include typical
cross section
details

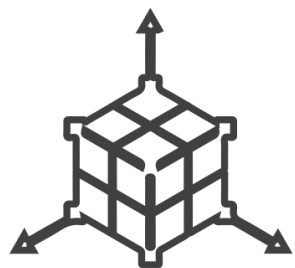
Roads not
shown with
component
details

BIM Process

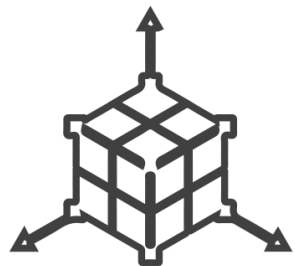
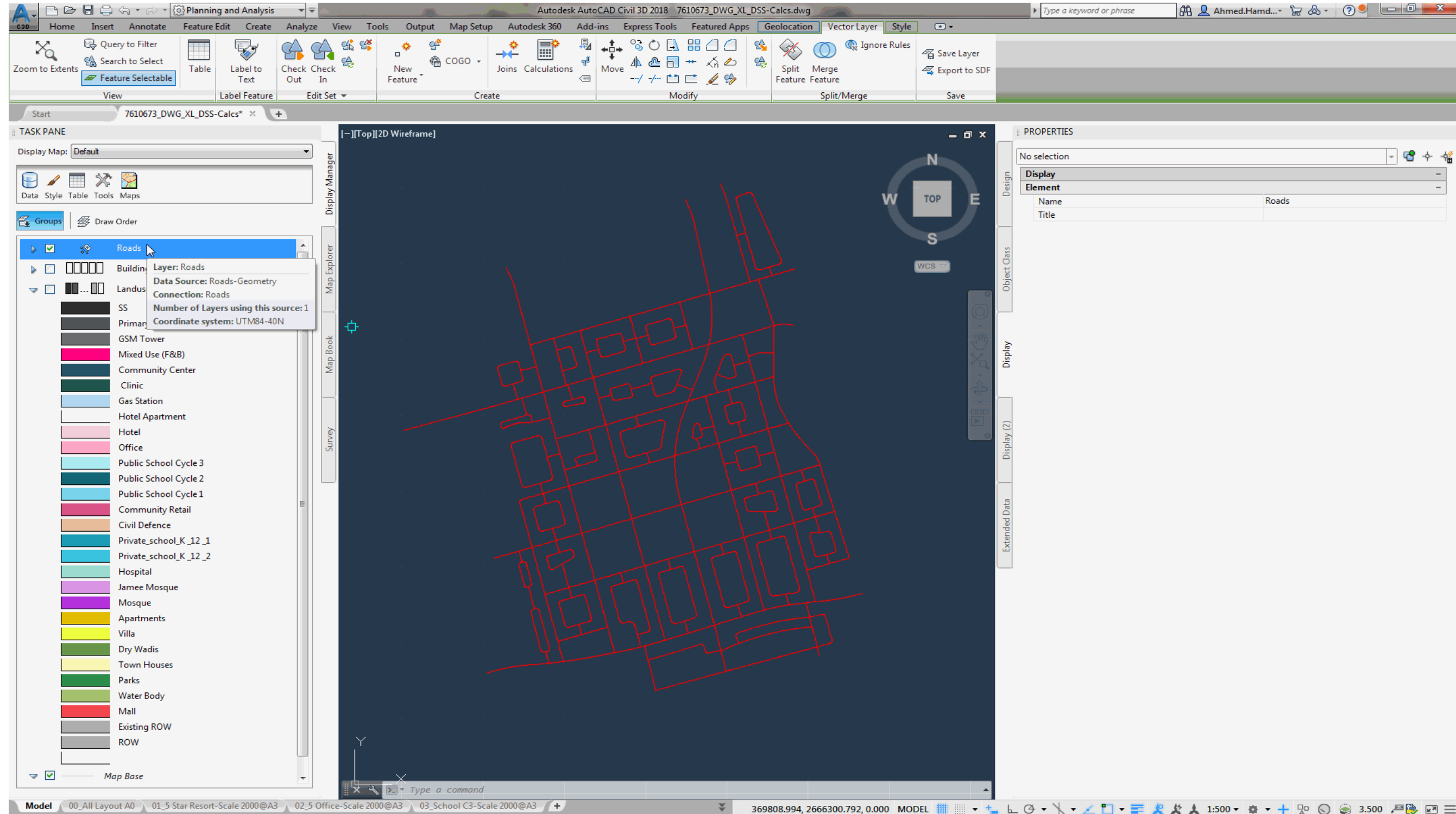
Sketch routes in
AutoCAD Civil3D



Display roads
with component
details in
Infraworks



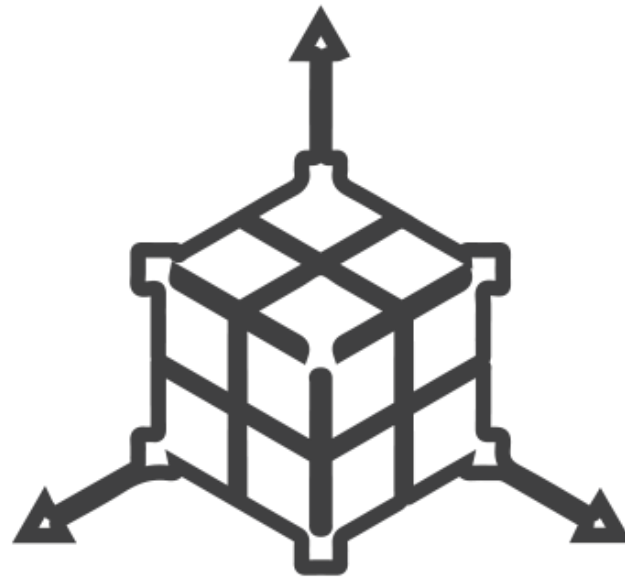
Creation of RoW & Infrastructure Corridors





Master Plan Statistics

- Efficient Automation



Rapid Visualization



Collaboration and Stakeholder Engagement with Authorities and Clients

Creation Design Review & Presentation Model

CAD Process

None - design
Review based
on 2D (PDF)

BIM Process

Create near
realistic
Infraworks
model



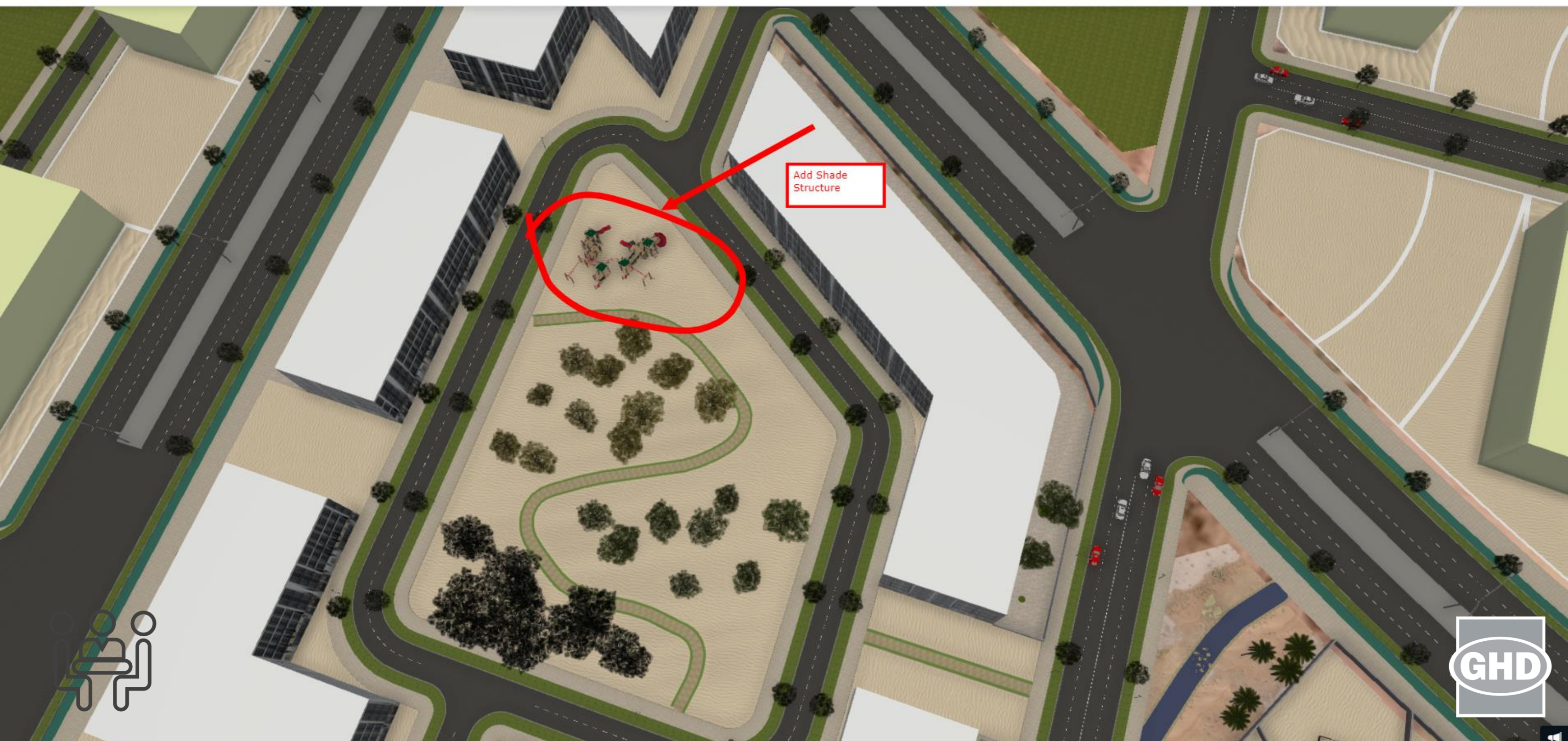
Publish to web/BIM 360
for external collaboration,
Design Review and Issue
tracking/management

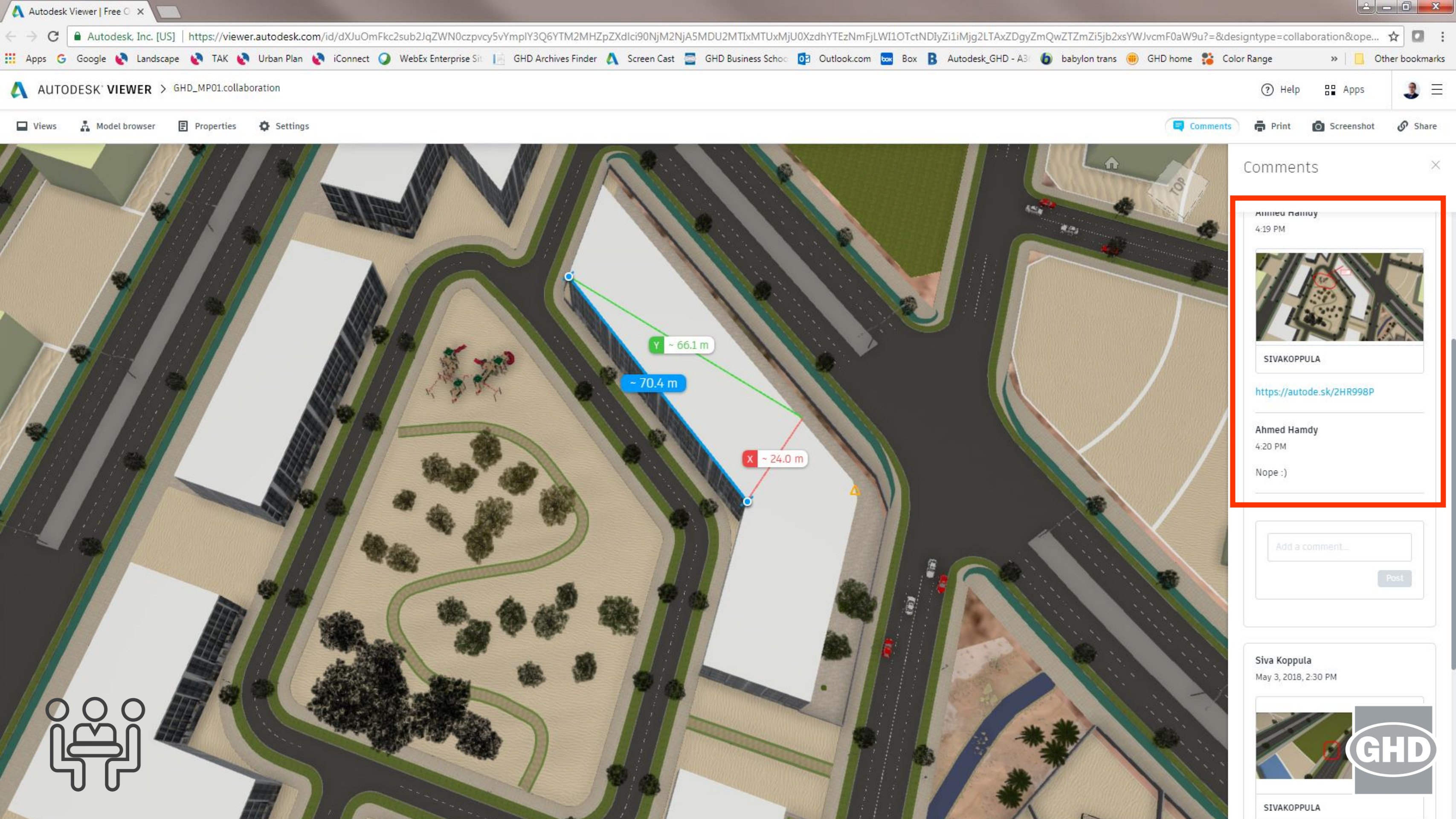


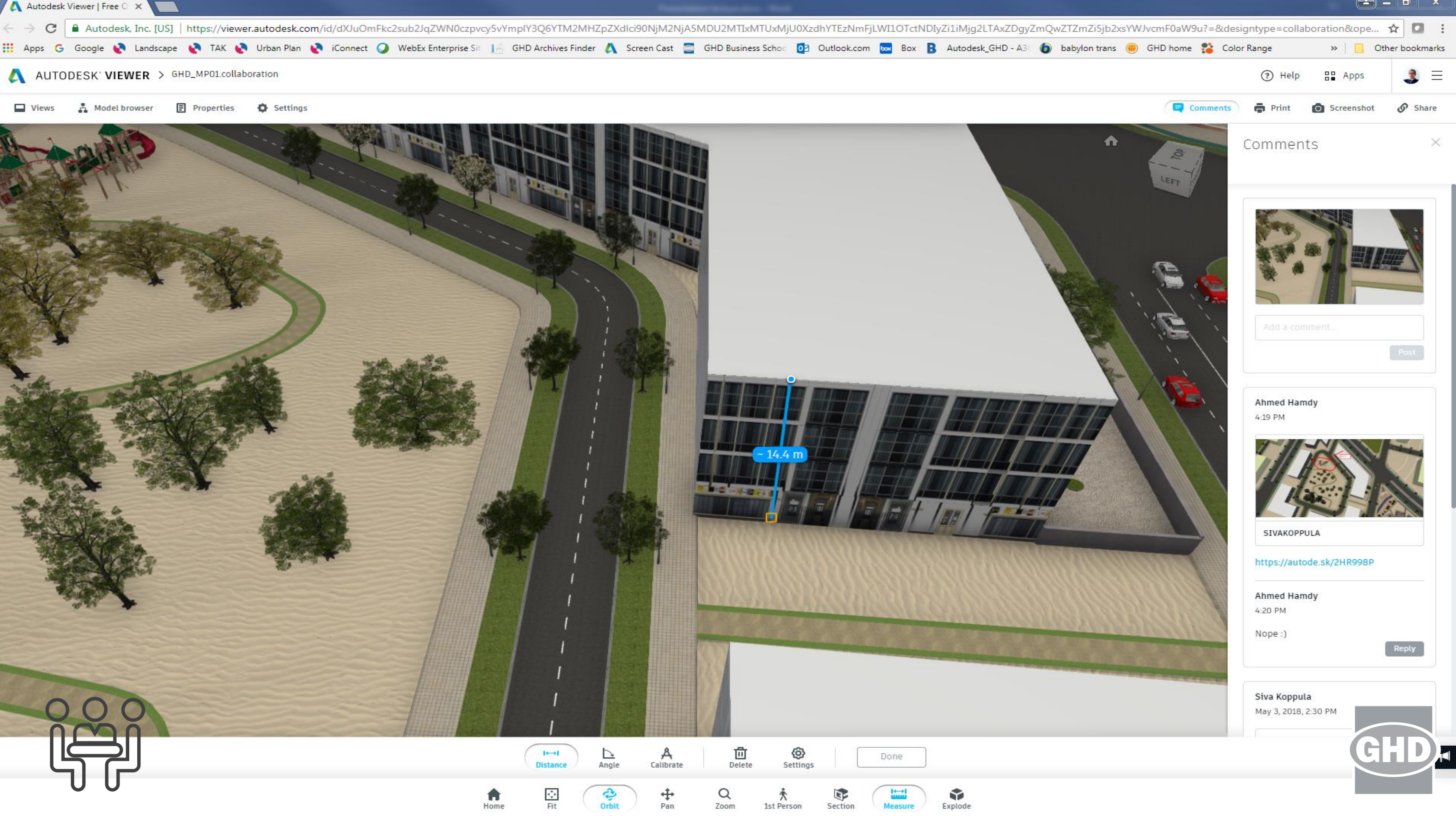
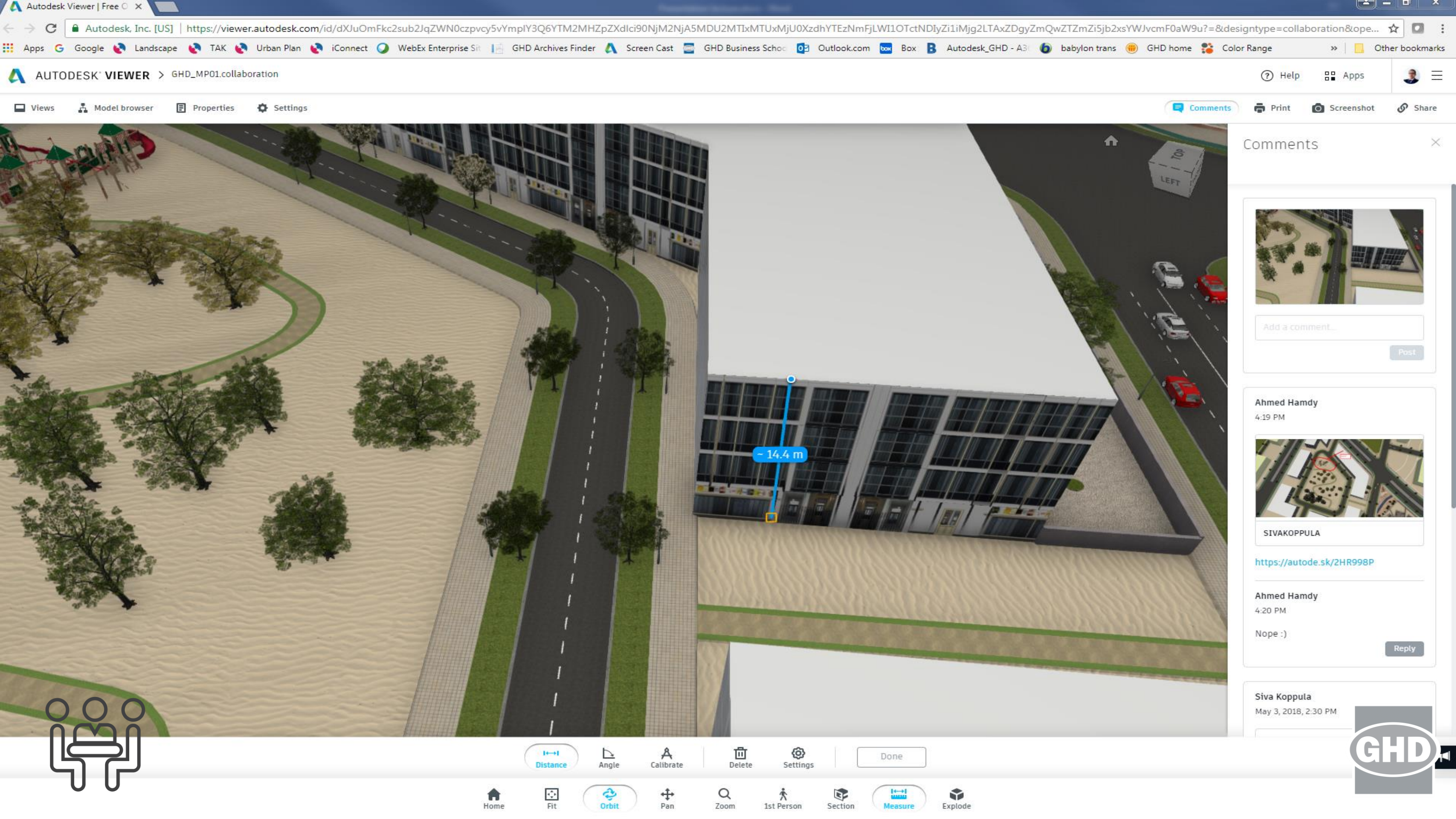


- Storyboard Creator
- Scenario Browser
- Storyboard Player
- Watermarks
- Points of Interest
- Sun & Sky
- Create Snapshot
- Surface Layers





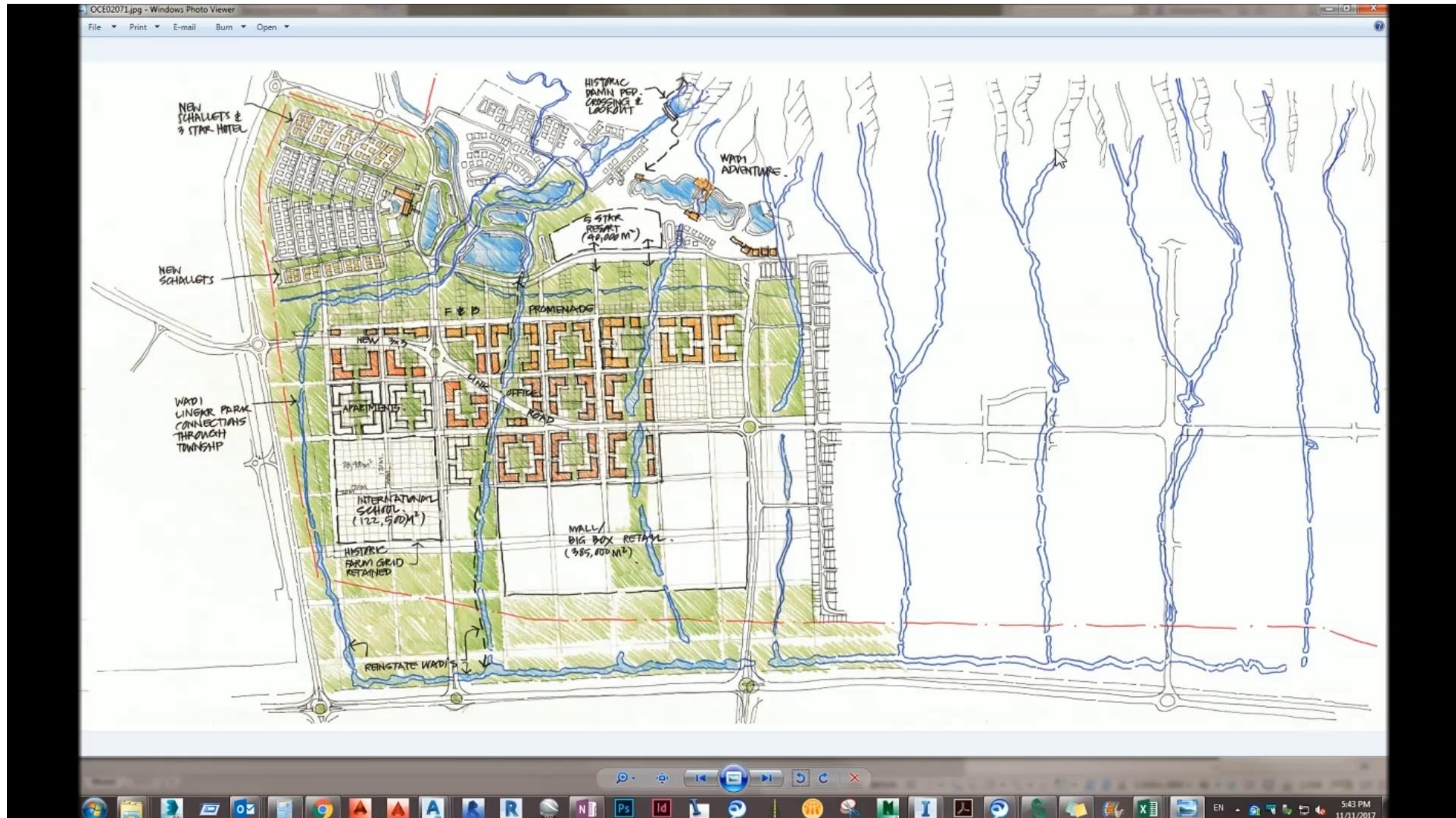




Master Planning - CAD vs BIM Process

Topic	CAD Process	BIM Process
Geometry & Calculation Information	Manual, disconnected process	Automatic, synchronized process resulting in 50% to 70% efficiency improvement
Massing	Manual modelling task using Sketch up	Automatic mass generation using attributes values resulting over 50% efficiency improvement
Analysis	Manual Drafting task	Automatic generated using attributes values resulting in 99% efficiency improvement
Documentation	Manual Tagging	Automatic Tagging and feature theme display using attributes values resulting in 75% efficiency improvement
Visualization	Out sourced task	In House task, except for high end photo realistic visualization
Collaboration	Not enabled	Enabled through Infraworks

GHD Master Planning Workflow - Overview

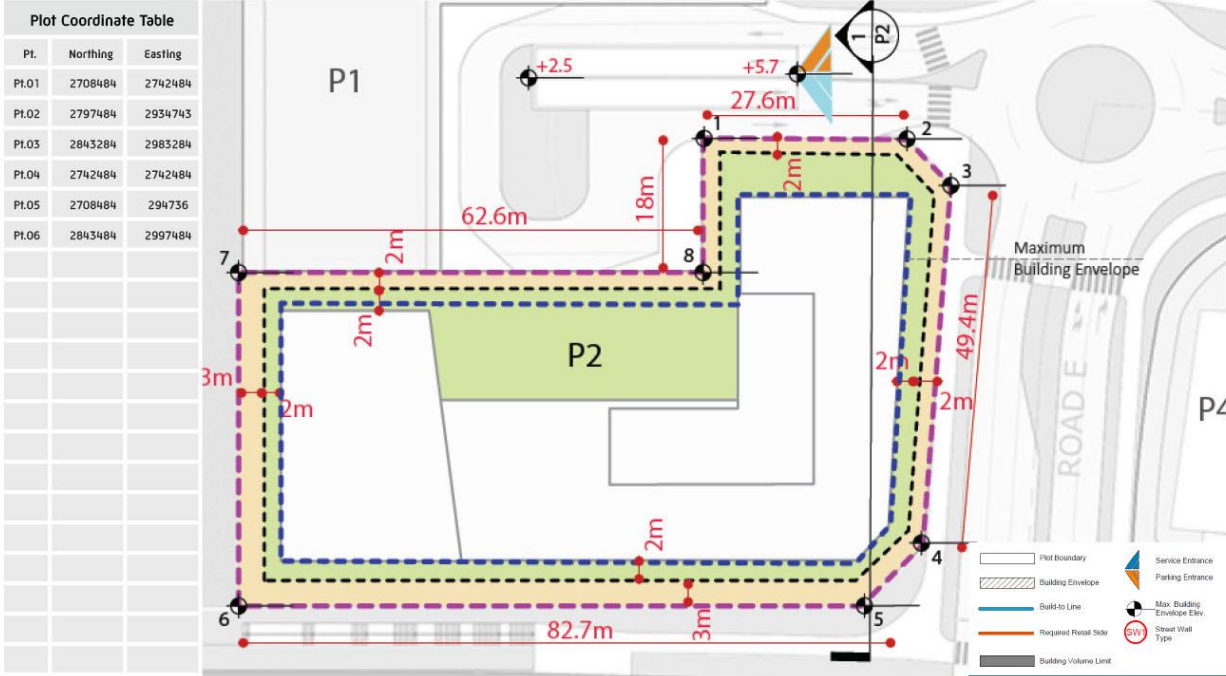


What's next ?

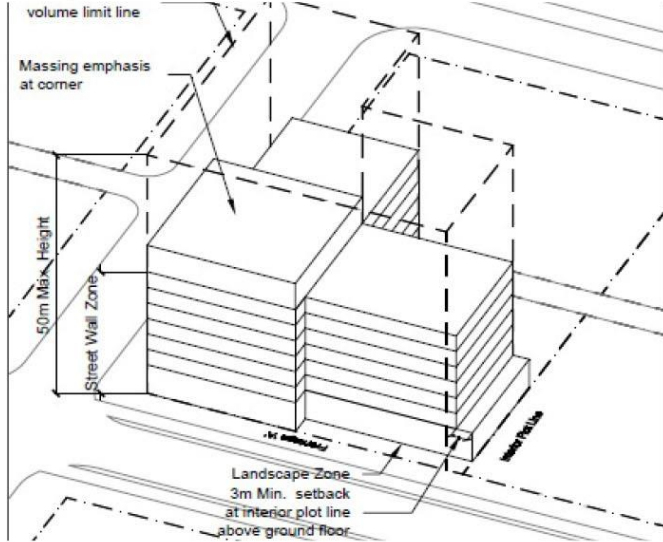
PLAN DISTRICT
(Name of the Masterplan)

SECTOR #
PLOT #

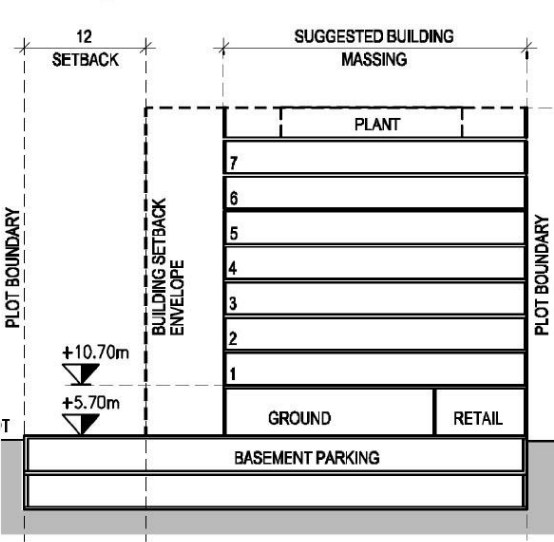
Plot Design



Building Orientation

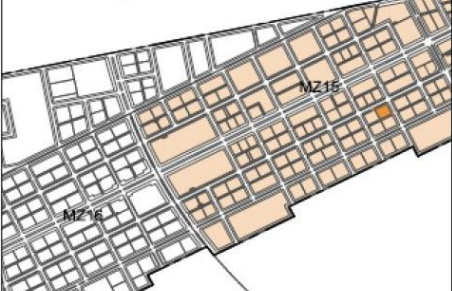


Section Diagram



Note: Compliance with the Code does not negate the need to comply with all other regulatory, statutory and permitting requirements within the Emirate of Abu Dhabi.
Note: The Allocated Use on any current affecation plan must accord with one of the permitted or limited uses within the Use Regulations table above.

Overview Map



Plot Data

Sector	
Plot	
Land Allocation	
FAR	
Site Area	
Maximum Allowable GFA	
Population	
Land Use 1	
Maximum GFA	
No. of Units	
Average Unit Size	
Land Use 2	
Maximum GFA	
No. of Units	
Average Unit Size	
Land Use 3	
Maximum GFA	
No. of Units	
Average Unit Size	
Maximum Plot Coverage	
Stories	
Maximum Height	
Maximum Building Levels	
Minimum Estidama Pearl Rating	
Safety & Security Priority Level	

Land Use Regulations

Code Number	Land Uses	Use Status Key: P = Permitted L = See Limitations Table	Permitted only on Floors
10	Multi-Family Residential		
3	Retail		

Development Notes

N-1	Refer to the affecation plan should there be any discrepancies between the DCR's and the affecation plan for plot-coordinates and/or plot dimensions.
N-2	All plots are subject to the requirements and approvals of authorities, which may have an effect on the plot boundary details as shown and/or requirements for electrical substations within the plot.
N-3	Refer to the Infopack document for further design control information.
N-4	The build-to line will account towards the 70% of the required frontage (as indicated) with an acceptable variation of +/- 1 metre.
N-5	Waterfront Projects: <ul style="list-style-type: none">• Ground level 3.6m above Mean Sea Level• Waterfront setback• Compliance with the waterfront overlay district
N-6	Car parking ratio to be calculated as per DMAT Requirements
N-7	Population is to be calculated as per the Household Size associated in the community facility manual.

Definitions

Build-to-line	Indicates the zone to which the building plan must be built to. Refer to Development Control Planning Guidelines for specific implementation requirements.
Floor Area Ratio (FAR)	The ratio of the gross plot area of all buildings on a plot to the total plot area of the plot upon which such building or buildings are intended to be erected.
Gross Floor Area (GFA)	The sum of the areas of each floor of a building where the area of each floor is taken to be the area within the outer face of the external enclosing walls as measured at a height of 1400 millimeters above each floor level, but excluding: <ul style="list-style-type: none">a. Columns, fin walls, sun control devices, awnings, any other elements, projections or works outside the general lines of the outer face of the external walls;b. Lift towers, stairs, cooling towers, machinery and plant rooms, ancillary storage space and air-conditioning ducts;c. Space for loading and unloading of goods;d. Internal public arcades, thoroughfares, shared corridors, and terraces and balconies with outer walls less than 1400 millimeters high; ande. Basement Car parking
New Abu Dhabi Datum (NADD)	New Abu Dhabi Datum. Used to determine building heights. For example: <ul style="list-style-type: none">+16.0 is equal to 16 meters above NADD and-4.0 is equal to 4 meters below NADD

Master Plan Design Guidelines

1	Please refer to the Master Plan Design Guidelines to ensure compliance.
2	
3	
4	
5	
6	

Questions ?



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