

# SBEnc: Digital Engineering Theme

Ammar Shemery

Chief Operating Officer, SBEnc, Australia

June 2024

# Our Partners



## **2017. P2.51. Developing a Cross Sector Digital Asset Information Model Framework for Asset Management**

- Determine the effectiveness of existing asset information classification and structuring systems in supporting the practical requirements of asset managers.

## **2018. P2.64. Unlocking Facility Value through Lifecycle Thinking**

- Demonstrates the value of lifecycle thinking and evidence-based decision making in facility asset management.

## **2020. P2.72. Leveraging an Integrated Information Lifecycle Management Framework – Building and Infrastructure Sectors**

- Industry best practices and international standards related to structured and integrated data.

## **2021. P2.82.** Digitally-enabled Asset Life-cycle Management

- A DE-enabled asset life-cycle management process and prototype (MetaBIM) to ensure that DE/BIM models can stay alive after construction and handover.

## **2023. P2.92.** Smarter and greener built assets through digitalisation and AI

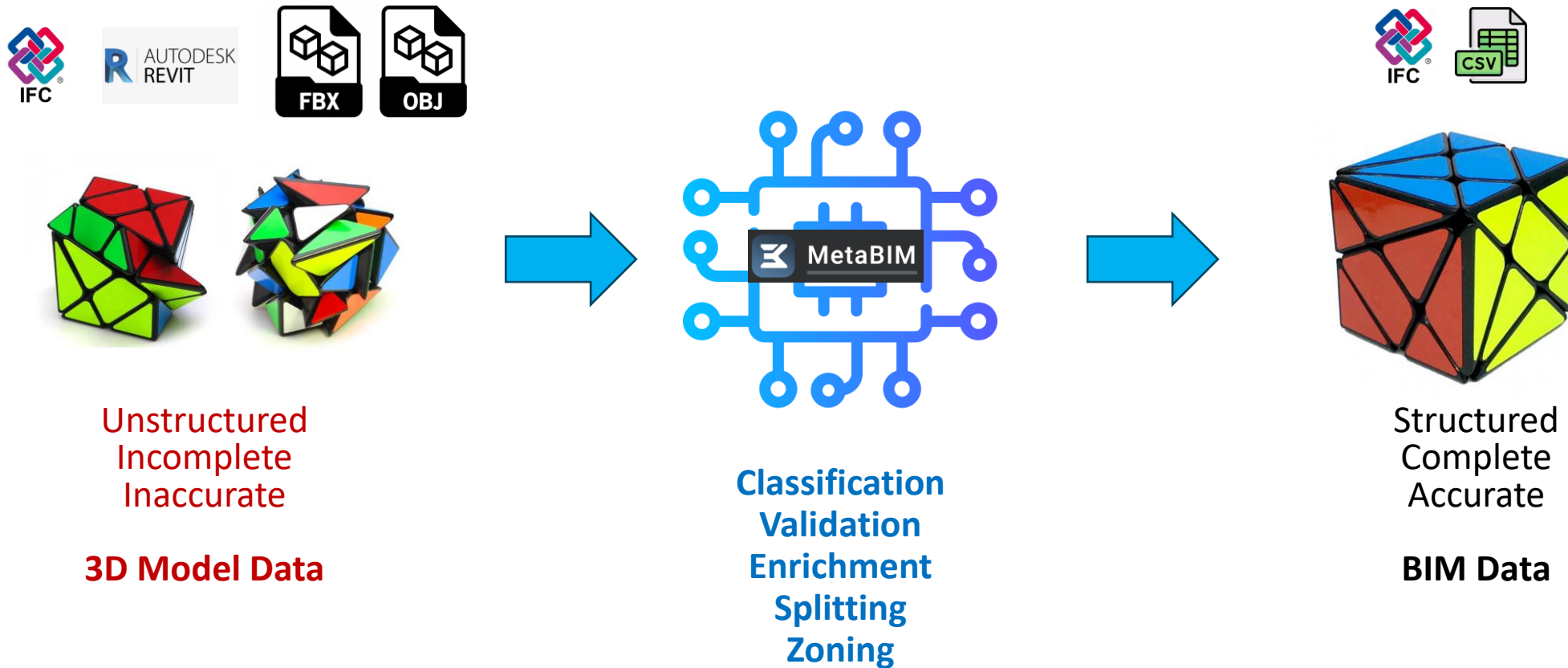
- To embed life cycle assessment (LCA) approach into digital twin (digital models with appropriate IoT sensors if required) to assess life cycle emissions of built assets, including housing, building and infrastructure assets.

# MetaBIM: Unlocking the power of your BIM data

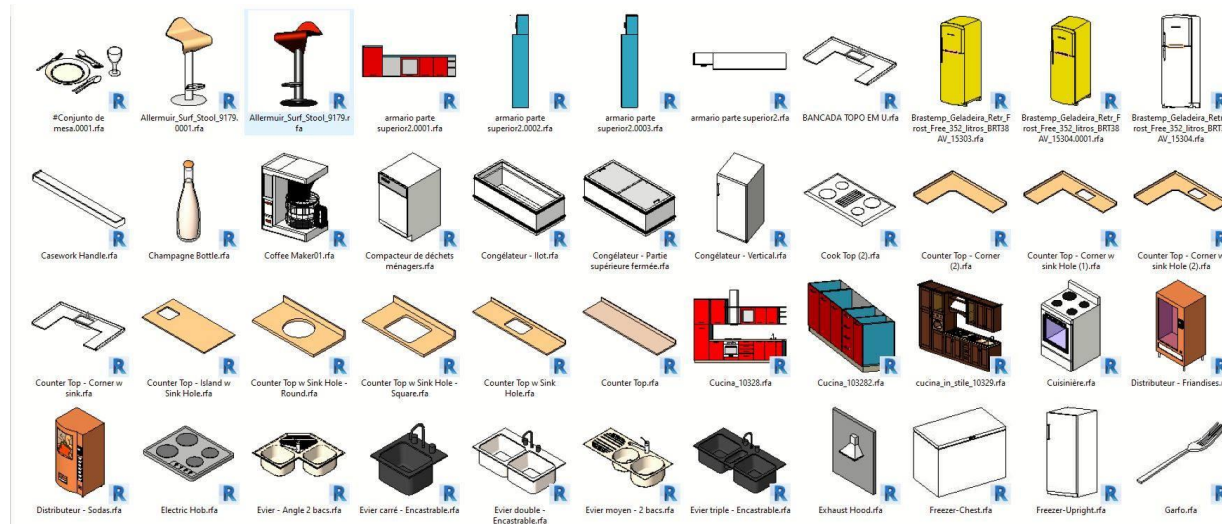
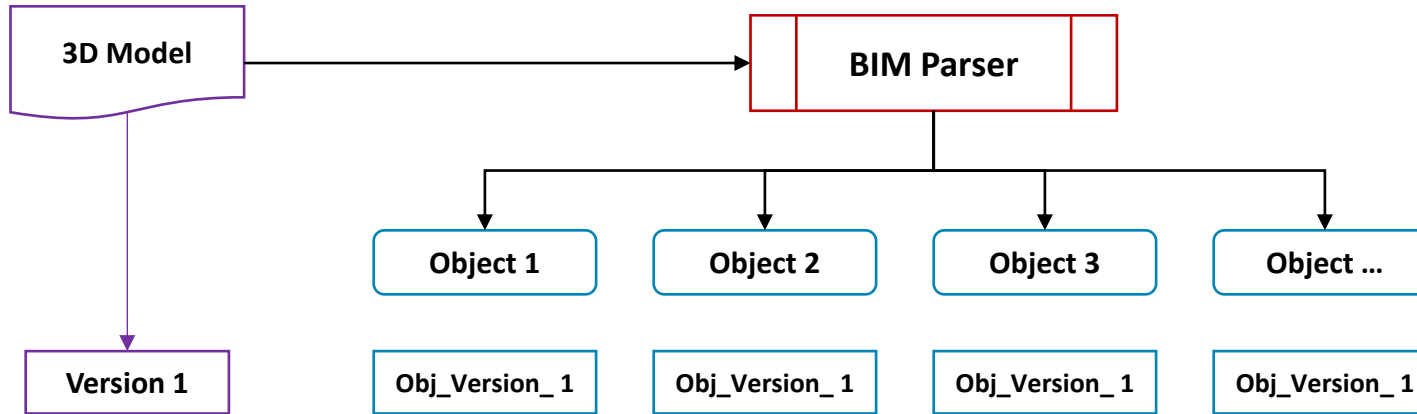
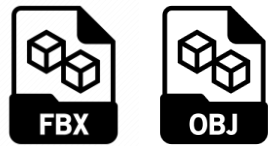
**Dr Jun Wang**  
Western Sydney University  
2024.06

# MetaBIM

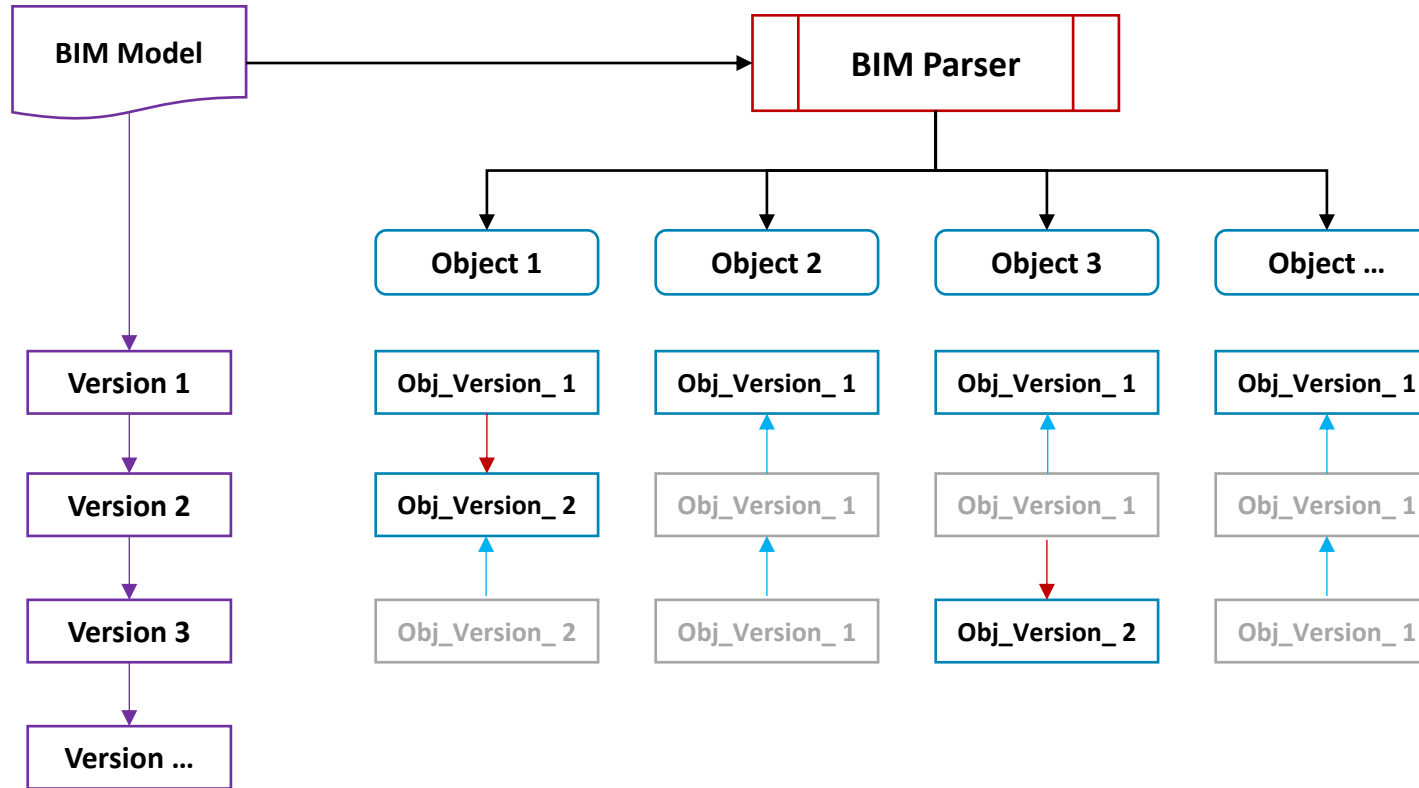
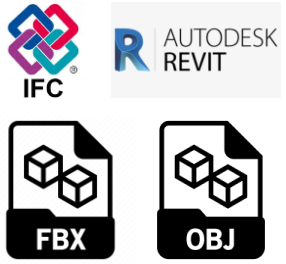
MetaBIM is designed in-house from the ground up to be fully customisable.



# MetaBIM: Data Parser

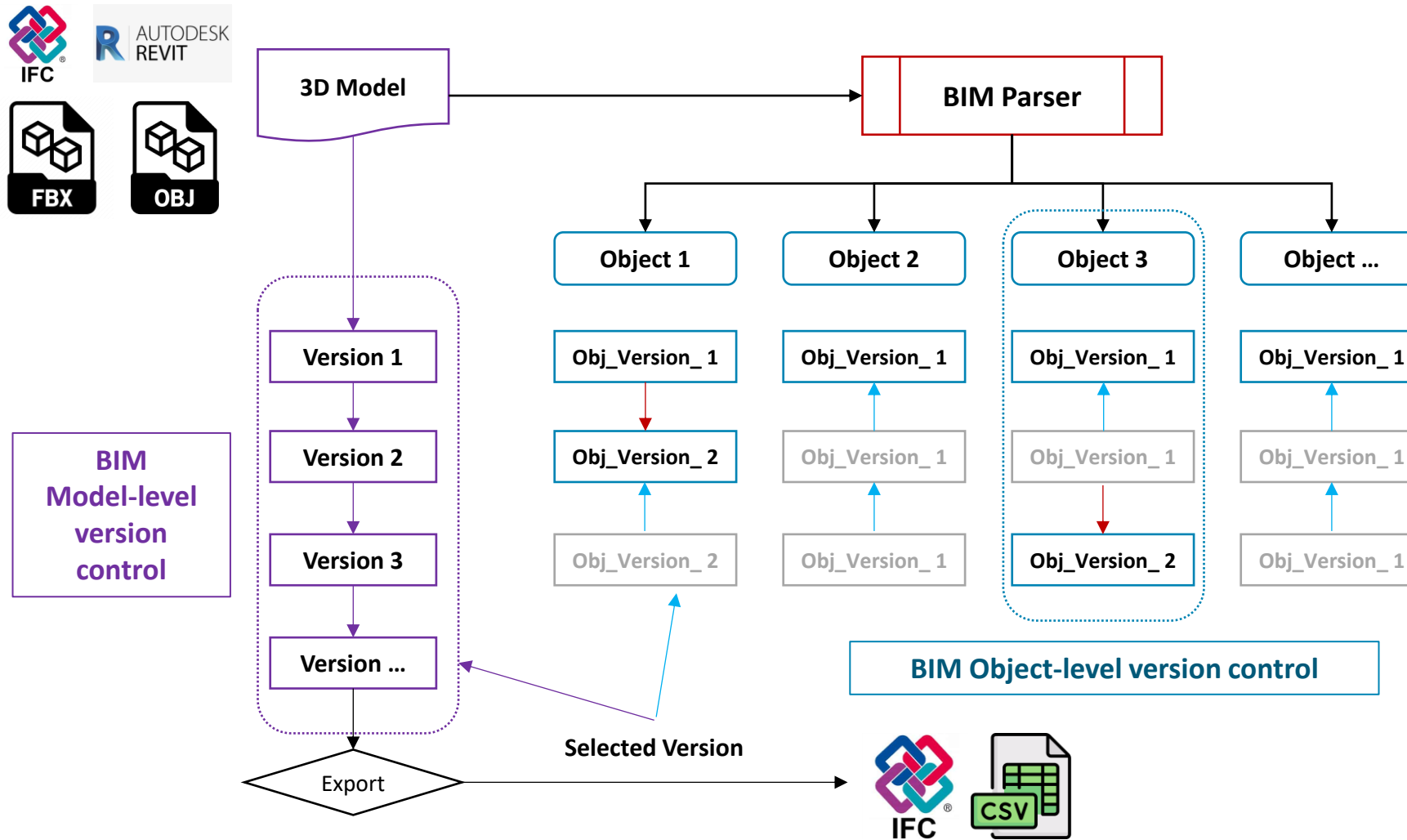


# MetaBIM: Data Parser





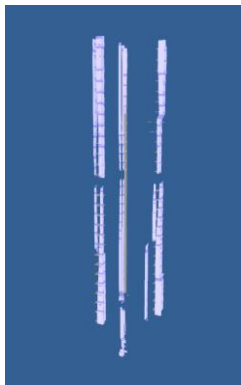
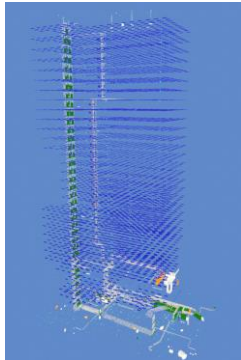
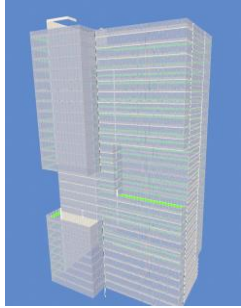
# MetaBIM: Data Parser



Great efficiency in:

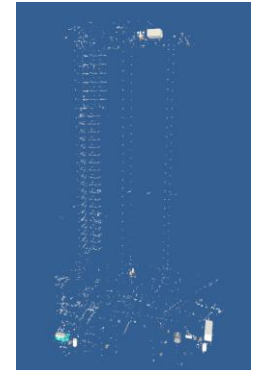
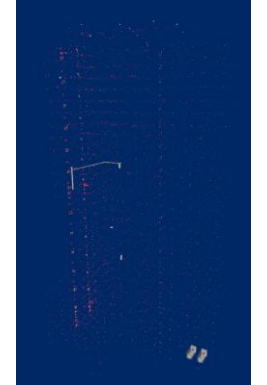
- Storage
- Query
- Comparison
- Auditing

# MetaBIM: Data Parser Performance

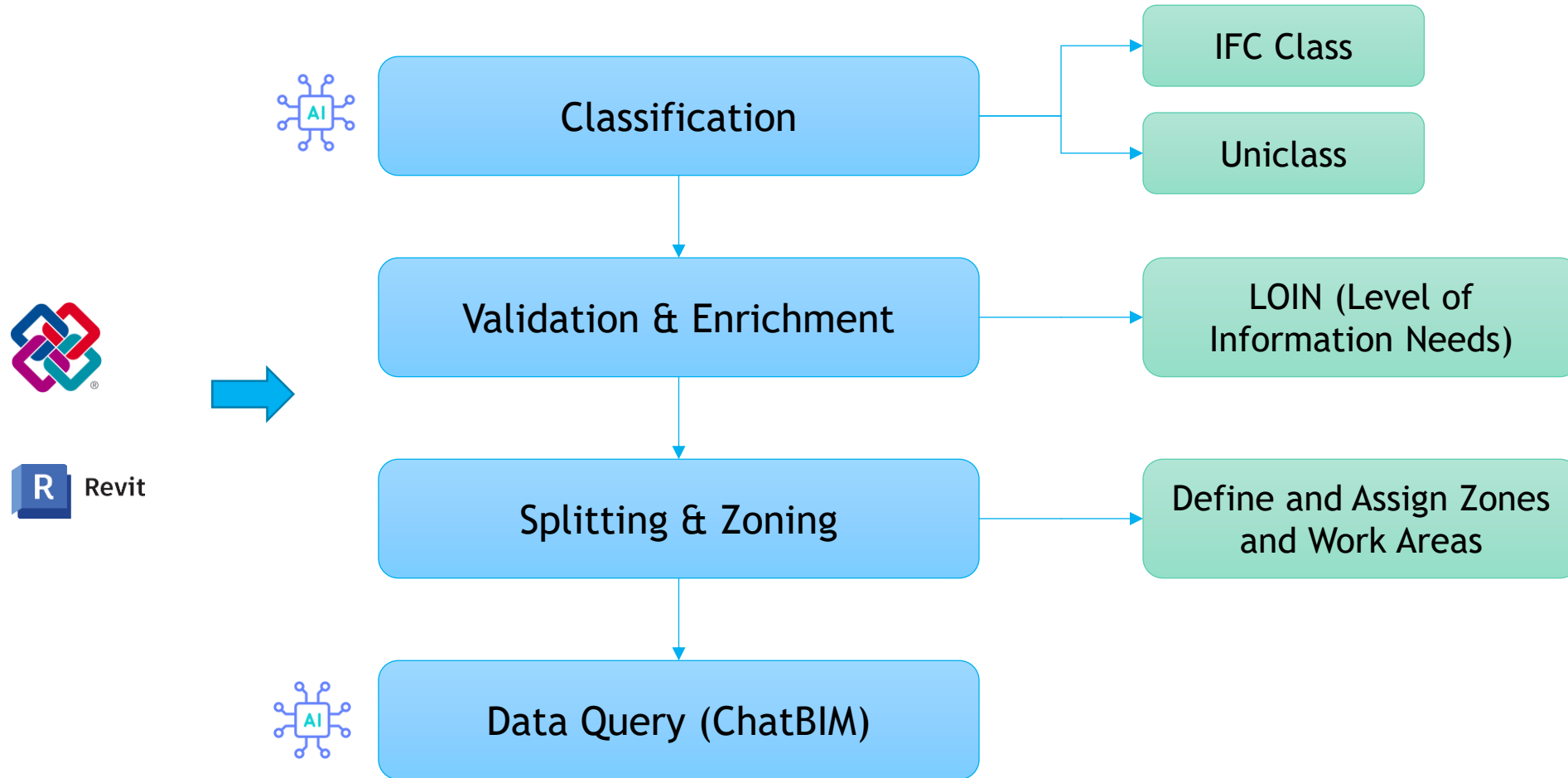


BIM Models	Revit Model Size (MB)	IFC Size Optimised (MB)	Tree Size (MB)	IFC Elements	BIM Objects	Triangles/Vertices (Million)
Architecture	578	40.8	67.1	125,935	25,378	3.1/6.8
Electrical	40.8	37.4	33.1	54,052	12,715	9.6/16.5
Fire Protection	113	66.5	71.4	47,209	15,213	36/46.2
Hydronic	93.9	128	58.5	27,201	9,081	19.2/26.7
Mechanical	110	7.35	8.89	8,954	2,937	0.22/0.3
Structural	99.7	28.1	16.1	11,263	3,821	1.1/1.6

Model Conversion (Second)	Hierarchy Building (Second)	Parser (Second)	Total Server Processing Time (Second)	First Loading Time (Second)	Reloading Time (Second)	Download Time (Second)
15	152	17	<b>184</b>	34	6	2-6
41	35	6	<b>82</b>	7	2	2-6
51	411	7	<b>469</b>	11	2	2-6
271	128	4	<b>403</b>	3	1	2-6
122	12	4	<b>138</b>	4	1	2-6
44	6	1	<b>51</b>	7	1	2-6



# MetaBIM: Processor



# MetaBIM: Classification

The screenshot displays the MetaBIM web interface for a project named "Snowdon Towers EX". At the top left, the MetaBIM logo and a "trial" badge are visible, along with a "Back" navigation link. On the top right, the user's profile is shown as "MetaBIM" with the email "info@metabim.com.au".

The main dashboard features three key metrics in blue boxes: "Active Model" with a count of 2 and a "Refresh Project" button; "Processed Versions" with a count of 2; and "Data usage" at 125MB. To the right of these metrics is a "New Model" form with a "Model Name" input field and a "Create" button.

Below the metrics is a "My Models" section with sorting icons. It contains two model cards: "Structural" (last updated 2024-05-27 10:53, 1312 elements) and "Architectural" (last updated 2024-06-03 15:57, 6321 elements). Each card includes a "Version" dropdown menu.

On the right side, a "Model" panel is open for the "Structural" model. It features "Open", "Archive", and "Upload" buttons. Below these are tabs for "IFC", "3D Model", "Point Cloud", "Image", and "Document". The "IFC" tab is active, showing a file named "Snowdon Towers Sample Structural.lfc" (IFC 4.0) with a unique ID, a timestamp of 2024-05-27 10:57, and a size of 24MB. At the bottom of the panel, a "Version" tab is active, displaying a notification: "1311 updates has been made." (2024-05-27 10:54) with "Build", "Clear", and "Load" buttons.

# MetaBIM: Validation & Enrichment



<b>IfcWall</b>	
<b>Properties</b>	<b>Values</b>
GlobalId	~
Uniclass	Level 3 classification
Status	New, Existing, Demolish, Temporary
FireRating	~
AcousticRating	[30, 50]
Combustible	TRUE, FALSE
IsExternal	TRUE, FALSE
LoadBearing	TRUE, FALSE
ExtendToStructure	TRUE, FALSE
ThermalTransmittance	[0, 100] W/(m2·K)
FireExit	TRUE, FALSE
SelfClosing	TRUE, FALSE
SmokeStop	TRUE, FALSE
Compartmentation	TRUE, FALSE
<b>IfcColumn</b>	
<b>Properties</b>	<b>Values</b>
GlobalId	~
Uniclass	Level 3 classification
Status	New, Existing, Demolish, Temporary
Slope	[0, 90] degree
FireRating	~
IsExternal	TRUE, FALSE
LoadBearing	TRUE, FALSE
ThermalTransmittance	[0, 100] W/(m2·K)

# MetaBIM: Validation & Enrichment

The screenshot displays the MetaBIM web interface. At the top left, there is a 'MetaBIM trial' logo and a 'Back' button. At the top right, a user profile for 'MetaBIM' with the email 'info@metabim.com.au' is shown. The main dashboard features three summary cards: 'Active Model' with a count of 3 and a 'Refresh Project' button; 'Processed Versions' with a count of 3; and 'Data usage' showing 71MB. To the right is a 'New Model' form with a 'Model Name' input field and a 'Create' button. Below these is a 'My Models' section with three model cards: 'Structure' (2023-09-07 16:51, Processing 51%), 'Architecture' (2023-09-07 16:51, Elements: 5754), and 'Mechanical' (2023-09-07 16:52, Elements: 6396). On the right side, a 'Model' details panel is open, showing options to 'Open', 'Archive', or 'Upload'. It lists a model named 'rst\_advanced\_sample\_project-RV-Structure...' with a version of 'IFC 4.0', a timestamp of '2023-09-07 16:58', and a size of '8MB'. At the bottom of this panel, a notification states '1548 updates has been made.' with a timestamp of '2023-09-07 16:55' and buttons for 'Build', 'Clear', and 'Load'.

# MetaBIM: Splitting

The screenshot displays the MetaBIM software interface. At the top left, the MetaBIM logo and a 'Back' button are visible. At the top right, a user profile for 'MetaBIM' with the email 'info@metabim.com.au' is shown. The main interface is divided into two primary sections: a left-hand panel for the BIM Structure tree and a central 3D model view.

The BIM Structure tree on the left is titled 'BIM Structure' and includes a search bar with the text 'Search a name or ID' and an 'Advanced' filter icon. Below the search bar, the tree is organized into columns: 'Spatial', 'Object', 'IFC Class', and 'Un'. The tree lists various building elements, each with a checkbox and a small icon. The elements are grouped into several categories:

- Basic Wall:Concrete 18"-935924 through 18"-936763
- Floor:Concrete 12"-935200 through 12"-935216
- Basic Wall:Concrete 18"-936762 through 18"-936763
- W Shapes:W18x55:765115
- Basic Wall:Concrete 12"-586648 through 12"-586803
- W Shapes:W18x55:631696 through 664019
- Structural Beam System:Structural Framing (indicated with a '8' in a box)
- LH-Series Bar Joist:18LH04:664155 through 664159

The 3D model view on the right shows a perspective view of a building's structural frame. The structure consists of multiple levels of floor slabs supported by a grid of columns and beams. The walls are shown as solid grey blocks, and the floor slabs are also grey. The structural framing is highlighted in a reddish-brown color. The model is set against a light blue background.

At the bottom of the 3D view, there is a toolbar with various icons for navigation and manipulation, including a home icon, a back arrow, a forward arrow, a refresh icon, a view toggle icon, a zoom in/out icon, a pan icon, a rotate icon, and a download icon.

# MetaBIM: Zoning

The screenshot displays the MetaBIM software interface. At the top left, the MetaBIM logo and a 'Back' button are visible. At the top right, there is a user profile icon and the text 'MetaBIM info@metabim.com.au'. The main area is divided into two parts: a 3D model of a building structure on the right and a detailed list of BIM elements on the left.

The 3D model shows a multi-story building with a complex structural frame, including columns, beams, and floors. The structure is rendered in a light gray color with red highlights for the structural members.

The left-hand pane, titled 'BIM Structure', contains a search bar and a list of elements. The list is organized into columns: Spatial, Object, IFC Class, and Un. The elements are listed as follows:

Spatial	Object	IFC Class	Un
✓	Basic Wall:Concrete 24"	935927	
✓	Basic Wall:Concrete 18"	935924	
✓	Basic Wall:Concrete 18"	935925	
✓	Basic Wall:Concrete 18"	935922	
✓	Basic Wall:Concrete 18"	935923	
✓	Floor:Concrete 12"	935200	
✓	Floor:Concrete 12"	935208	
✓	Floor:Concrete 12"	935216	
✓	Basic Wall:Concrete 18"	936762	
✓	Basic Wall:Concrete 18"	936763	
✓	W Shapes:W18x55	765115	
✓	Basic Wall:Concrete 12"	586648	
✓	Basic Wall:Concrete 12"	586570	
✓	Basic Wall:Concrete 12"	586801	
✓	Basic Wall:Concrete 12"	586802	
✓	Basic Wall:Concrete 12"	586803	
✓	W Shapes:W18x55	631696	
✓	W Shapes:W18x55	664895	
✓	W Shapes:W18x55	664896	
✓	W Shapes:W18x55	665215	
✓	W Shapes:W18x55	664019	
✓	Structural Beam System:Structural Framing		8
✓	LH-Series Bar Joist:18LH04	664155	
✓	LH-Series Bar Joist:18LH04	664154	
✓	LH-Series Bar Joist:18LH04	664153	
✓	LH-Series Bar Joist:18LH04	664152	
✓	LH-Series Bar Joist:18LH04	664157	
✓	LH-Series Bar Joist:18LH04	664156	
✓	LH-Series Bar Joist:18LH04	664151	

At the bottom of the interface, there is a toolbar with various icons for navigation and manipulation of the 3D model.



# MetaBIM: Data Query (ChatBIM)

The screenshot displays the MetaBIM web interface for a project named "Snowdon Towers EX". At the top left, there is a "MetaBIM trial" logo and a "Back" button. At the top right, the user's profile "MetaBIM" with the email "info@metabim.com.au" is shown.

The main dashboard features four key metrics:

- Active Model:** 2, with a "Refresh Project" button.
- Processed Versions:** 2.
- Data usage:** 125MB.
- New Model:** A form with a "Model Name" input field and a "Create" button.

Below these metrics is a "My Models" section with two model cards:

- Structural:** Last updated 2024-05-27 10:53, 1312 elements. Version: 0, Snowdon Towers Sample Stru.
- Architectural:** Last updated 2024-06-03 15:57, 6321 loaded elements. Version: 0, Snowdon Towers Sample Arc.

On the right side, a "Model" panel provides actions like "Open", "Archive", and "Upload". It lists the current model: "Snowdon Towers Sample Architectural.ifc" (IFC 4.0), updated on 2024-06-03 17:18, with a size of 101MB. Below this, a "Version" history table shows four entries, each indicating "6321 updates has been made." with timestamps from 16:03 to 17:10. Each entry has "Build", "Clear", and "Load" buttons.

# Ongoing Development

The screenshot displays the MetaBIM software interface. On the left, the 'BIM Structure' panel shows a tree view of the model's hierarchy, including 'Road for Carbon\_V2', 'Default', 'Not Provided', and 'Level 0'. The 'Level 0' folder is expanded, showing a list of floor elements such as 'Floor:Road\_Wearing Course:320641' and various 'Floor:Road\_Line Mark' and 'Floor:Road\_Shoulder' elements. A search bar and filter options are visible at the top of this panel.

In the center, the 'AusLCI Emission Factors' dialog box is open, showing a list of material categories and their corresponding emission factors. The 'Concrete' category is selected, and the 'concrete 25 MPa 30% GGBFS, at batching plant' material is highlighted. The dialog also shows the unit 'm3' and the emission factor '274.63667' for 'Climate change - total (Infr Excl)'. The dialog has 'OK', 'Apply', and 'Cancel' buttons at the bottom.

On the right, the 'Properties' panel displays the IFC class 'IfcSlab' and its associated parameters. The 'IFC Parameter' section shows 'Export to IFC As' as 'IfcSlab', 'IFC Predefined Type' as 'FLOOR', and 'IFC Guid' as '1wy6gsuITAJ9xBTrIkDoi8'. The 'Zone' section shows 'Zone Identifier' as 'Unassigned', 'Zone Type' as 'Construction', 'Area' as '0', 'Volume' as '0', 'Unit' as 'm', and 'Placement' as '0 0 0'. The 'Attributes' section shows 'IfcElementType' as 'IfcSlab', 'id' as '1wy6gsuITAJ9xBTrIkDoi8', 'Name' as 'Floor:Road\_Base Layer:320805', 'ObjectType' as 'Floor:Road\_Base Layer', 'ObjectPlacement' as '1000010000100001', 'Tag' as '320805', 'PredefinedType' as 'FLOOR', and 'Pset\_EnvironmentalImpactIndicators' as '0Yip8URfSjclBfQHaj6Ut'. The 'Reference' section shows 'Road\_Base Layer'.

EasyCarbon

MetaBIM (Data Foundation)

# Ongoing Development

Carbon Emission Report

CB-ST-01K  
4093feed-e3f8-49b9-87f1-18e953c7820a

Darkspede Pty Ltd.  
4/75 Mark Street North Melbourne VIC 3051  
02 MAY 2024

Model Information  
IFC 4.0  
Design, Transport, Construction  
1000.00 m  
2.20 m

Geo-Information  
WSG84  
-28.782801, 114.620131  
5.710 m  
East 7.8°

Assets & database  
AusLCI [1.42]  
DMS-FT-559

Load from Project Access Link  
Export to PDF

Design Transport Construction Dashboard Setting

Material	Elements	Unit	Volume	Weight(T)	Actual Weight(T)	Emission Factor	Emission
Asphalt	133	m3	2500	6250	6250	0.04kg CO2e	250t CO2e
Sand	12	m3	3000	4750	4750	0.01kg CO2e	47.5t CO2e
Concrete	19	m3	3500	5650	5650	214.66kg CO2e	1,212,83t CO2e
Landscaping	19	sqm	1820	172	172	0.08kg CO2e	13.76t CO2e
Gravel	97	m3	2720	0	1800	0.01kg CO2e	18t CO2e
Rebar Steel	157	-	-	120	120	1.5kg CO2e	180t CO2e
Soil	10	m3	5750	3200	3200	2kg CO2e	6400t CO2e
Marking Paint	10	m3	60	2	2	0.25kg CO2e	0.5t CO2e
Geotextile	10	sqm	1000	0.5	0.5	50kg CO2e	25t CO2e
Structural Steel	10	-	-	15	15	1.5kg CO2e	22.5t CO2e

New Material

EasyCarbon

MetaBIM (Data Foundation)

# Ongoing Development

Carbon Emission Report

CB-ST-01K  
4093feed-e3f8-49b9-87f1-18e953c7820a

Darkspede Pty Ltd.

4/75 Mark Street North Melbourne VIC 3051

02 MAY 2024

Model Information

IFC 4.0

Design, Transport, Construction

1000.00 m

2.20 m

Geo-Information

WSG84

-28.782801, 114.620131

5.710 m

East 7.8°

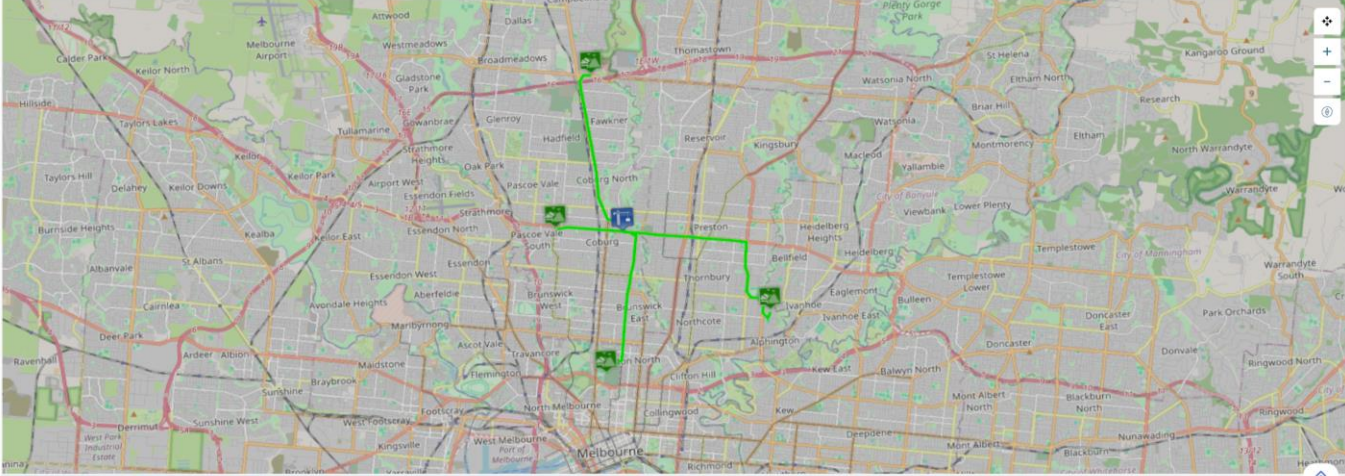
Assets & database

AusLCI [1.42]

DMS-FT-559

Load from Project Access Link

Export to PDF



Design Transport Construction Dashboard Setting

Supplier	Material	Unit	Quantity	Transportation	Emission Factor	Emission	Add Supply
Campbellfield Concrete & Mini Mix	Concrete	m3	1500	Road	0.28 Kg CO2e	420 t CO2e	
Campbellfield Concrete & Mini Mix	Gravel	m3	2720	Road	0.10 Kg CO2e	272 t CO2e	
XL CONCRETE	Concrete	m3	2000	Road	0.37 Kg CO2e	740 t CO2e	
Citywide Asphalt Group North Melbourne	Asphlat	m3	2500	Road	0.28 Kg CO2e	700 t CO2e	
Coburg Sand & Soil	Sand	m3	3000	Road	0.10 Kg CO2e	300 t CO2e	
Coburg Sand & Soil	Soil	m3	5750	Road	0.10 Kg CO2e	575 t CO2e	

EasyCarbon

MetaBIM (Data Foundation)

# Ongoing Development

Carbon Emission Report

**CB-ST-01K**  
4093feed-e3f8-49b9-87f1-18e953c7820a

**Darkspede Pty Ltd.**

4/75 Mark Street North Melbourne VIC 3051

02 MAY 2024

**Model Information**

IFC 4.0

Design, Transport, Construction

1000.00 m

2.20 m

**Geo-Information**

WSG84

-28.782801, 114.620131

5.710 m

East 7.8°


**Assets & database**

AusLCI [1.42]

DMS-FT-559

Load from Project Access Link

Export to PDF



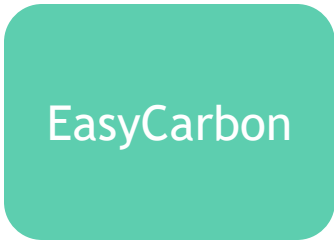
Design Transport Construction Dashboard Setting

**Energy Use Emissions**

Energy Use	Quantity	Unit	Emission Factor	Emission	Evidence/Source/Comment
Electricity use, on-site total	50000	MWh	960 Kg CO2e	20 t CO2e	-
Diesel consumption for site vehicles	10	kL	2849 Kg CO2e	26.8t CO2e	-
Diesel consumption for stationary plant end equipment	5	kL	2849 Kg CO2e	13.4t CO2e	-
Diesel consumption for mobile plant and equipment	15	kL	2849 Kg CO2e	40.2t CO2e	-
Total of other fuels consumed	2	kL	2849 Kg CO2e	5.36t CO2e	-

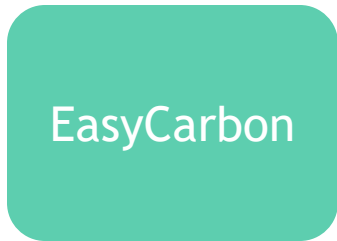
**Waste Related Emissions**

Construction and demolition waste to landfill	Quantity	Unit	Transportation	Emission Factor	Emission	Evidence/Source/Comment
Concrete - Altona North Landfill Site	1000	Ton	Road	0.12 Kg CO2e/km	2400kg CO2e	-
Masonry - Altona North Landfill Site	500	Ton	Road	0.12 Kg CO2e/km	1200kg CO2e	-
Glass - ESG Deer Park Clean Fill Tip Site	50	Ton	Road	0.12 Kg CO2e/km	370kg CO2e	-
Metal - ESG Deer Park Clean Fill Tip Site	100	Ton	Road	0.12 Kg CO2e/km	710kg CO2e	-
Timber - Altona North Landfill Site	200	Ton	Road	0.12 Kg CO2e/km	480kg CO2e	-
Vegetation - ESG Deer Park Clean Fill Tip Site	300	Ton	Road	0.12 Kg CO2e/km	1330kg CO2e	-
Mixed waste - Altona North Landfill Site	350	Ton	Road	0.12 Kg CO2e/km	840kg CO2e	-



MetaBIM (Data Foundation)

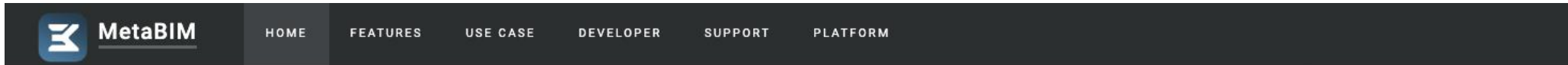
# Ongoing Development



MetaBIM (Data Foundation)

Further Information...

<https://metabim.com.au/>



METABIM

# Unlocking the power of your BIM Data

MetaBIM is the ultimate tool for architects, engineers, and construction professionals seeking to unlock the full potential of their BIM data. Our user-friendly web platform simplifies the process of checking, editing, and auditing your building information models, while also enabling you to extract valuable insights to optimise your workflows, reduce costs, and achieve better project outcomes. With MetaBIM, you can effortlessly harness the power of your BIM data and take your projects to new heights.

FREE TRIAL



[jun.wang@westernsydney.edu.au](mailto:jun.wang@westernsydney.edu.au)